2009 ENGINE

Engine Mechanical - Highlander Hybrid

ENGINE

ON-VEHICLE INSPECTION

1. **INSPECT COOLANT**

   HINT:

   See **ON-VEHICLE INSPECTION** .

2. **INSPECT ENGINE OIL**

   HINT:

   See **ON-VEHICLE INSPECTION** .

3. **INSPECT BATTERY**

   Standard specific gravity: 1.25 to 1.29 at 20°C (68°F)

4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**
   a. Remove the air cleaner filter element from the air cleaner case.
   b. Visually check that there is no dirt, clog, and damage to the air cleaner filter element.

      HINT:

      - If there is any dirt or a clog on the air cleaner filter element, clean it with compressed air.
      - If any dirt or a clog remains even after cleaning the air cleaner filter element with compressed air, replace it.
5. **INSPECT SPARK PLUG** (See **ON-VEHICLE INSPECTION**)
6. **INSPECT IGNITION TIMING**
   a. Set the vehicle to inspection mode (See **INSPECTION MODE PROCEDURE**).
   b. Warm up the engine.
   c. When using the Techstream:
      1. Connect the Techstream to the DLC3.
      2. Enter DATA LIST MODE on the Techstream.

         Ignition timing: 8 to 12° BTDC

         NOTE:

         - **Turn all the electrical systems off.**

- **Inspect the engine idle speed with the cooling fan off.**

HINT:

Refer to the Techstream operator's information if you need help to select DATA LIST.

3. Check that the ignition timing advances immediately when the engine speed is increased.

d. When not using the Techstream:

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

SST 09843-18040

NOTE:

- **Confirm the terminal numbers before connecting them. Connecting wrong terminals can damage the engine.**
- **Turn off all electrical systems before connecting the terminals.**
- **Perform this inspection after the cooling fan motor is turned off.**

2. Pull out the red-colored wire harness as shown in the illustration.

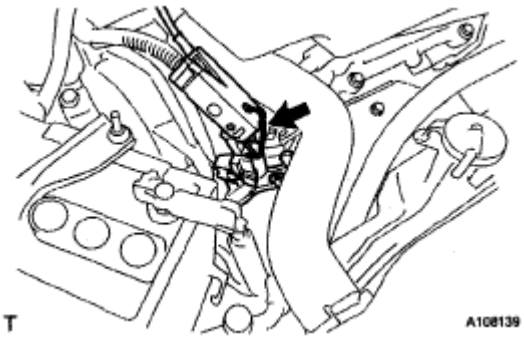


Fig. 1: Locating Tester Terminal Of Timing Light To Engine
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Connect the tester terminal of the timing light to the red-colored wire.

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

4. Inspect ignition timing at idle.

Ignition timing: 8 to 12° BTDC

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

HINT:

Run the engine at 1,000 to 1,300 rpm for 5 seconds, check that the engine rpm returns to idle speed.

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

Ignition timing: 7 to 24° BTDC

7. Confirm that the ignition timing advances when the engine rpm is increased.
8. Remove the timing light.

7. **INSPECT ENGINE IDLE SPEED**
   a. Set the vehicle to inspection mode (See **INSPECTION MODE PROCEDURE**).
   b. Warm up the engine.
   c. Connect the Techstream to the DLC3.
   d. Enter DATA LIST MODE on the Techstream.

Idle speed: 850 to 950 rpm.

NOTE:
- **When checking the idle speed, the transmission is in neutral.**
- **Check the idle speed with the cooling fan off.**
- **Switch off all accessories and air conditioning before connecting the Techstream.**

HINT:

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

8. **INSPECT COMPRESSION**
   a. Set the vehicle to inspection mode (See **INSPECTION MODE PROCEDURE**).
   b. Warm up and stop the engine.
   c. Remove the intake air surge tank (See **REMOVAL**).

NOTE: **If the throttle body connector is disconnected because the DTC is detected in inspection, always reconnect it.**

   d. Disconnect the injector connectors.
   e. Remove the ignition coils.

NOTE: **If the ignition coil assembly connector is disconnected because the DTC is detected in inspection, always reconnect it.**

f. Remove the spark plugs.

g. Inspect cylinder compression pressure.

1. Insert a compression gauge into the spark plug hole.

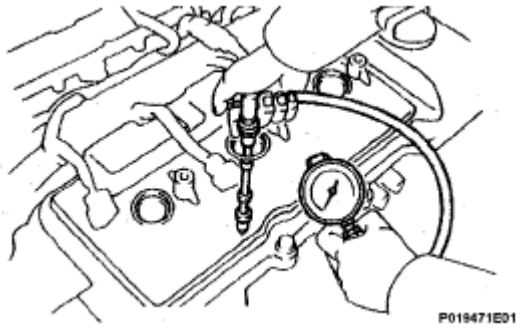


Fig. 2: Checking Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Connect the Techstream to the DLC3.

NOTE: Check the fully charged battery to indicate HV battery voltage in the ECU data list.

3. Enter ACTIVE TEST MODE on the Techstream.
4. While cranking the engine, measure the compression pressure.

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

Minimum pressure: 0.74 MPa (7.5 kgf/cm^2 , 107 psi)

Difference between each cylinder: 100 kPa (1.0 kgf/cm^2 , 15 psi)

NOTE:

- **Check other cylinder's compression pressure in the same way.**
- **This measurement must be done as quickly as possible.**
- **After performing all the procedures, be sure to clear DTCs stored in the memory. Then, check that the normal system code is output.**

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

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be

worn or damaged.

- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

9. **INSPECT CO/HC**
   a. Set the vehicle to inspection mode (See **INSPECTION MODE PROCEDURE**).
   b. Start the engine.
   c. Run the engine at 2,500 rpm for approximately 180 seconds.
   d. Insert the CO/HC meter testing probe at least 40 cm (1.3 ft.) into the tailpipe during idling.
   e. Check CO/HC concentration at idle and/or 2,500 rpm.

   HINT:

   When doing the 2 mode (idle and 2,500 rpm) test, the measuring procedures are prescribed by the applicable local regulations.

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

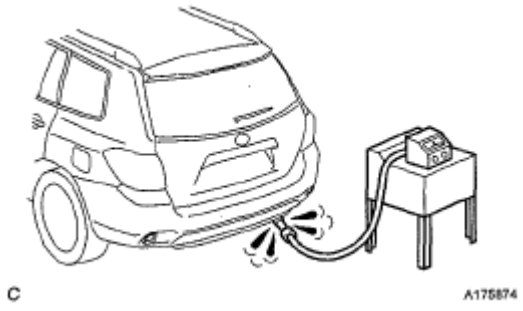


Fig. 3: Checking CO/HC
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Check heated oxygen sensor operation (See **INSPECTION**).
2. Check heated air fuel ratio sensor operation (See **INSPECTION**).
3. See the table below for possible causes, and then inspect and repair the applicable causes if necessary.

PROBLEMS CHART

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: o Incorrect timing o Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance 3. Leaks in intake and exhaust valves

			4. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: o PCV hoses o Intake manifold o Throttle body o Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty EFI systems: o Faulty pressure regulator o Defective water temperature sensor o Defective mass air-flow meter o Faulty ECM o Faulty injectors o Faulty throttle position sensor

VALVE CLEARANCE

ADJUSTMENT

1. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
2. **REMOVE FRONT WIPER ARM AND BLEND ASSEMBLY RH** (See **REMOVAL**)
3. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
4. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
5. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
6. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
7. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
8. **REMOVE FRONT WHEEL RH**
9. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
10. **SEPARATE FRONT FENDER LINER RH** (See **REMOVAL**)
11. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
12. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
13. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
14. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
15. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
16. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)

17. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)
18. **DISCONNECT INLET RADIATOR HOSE**
19. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
20. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
    a. Remove the 2 engine wire harness clamps.

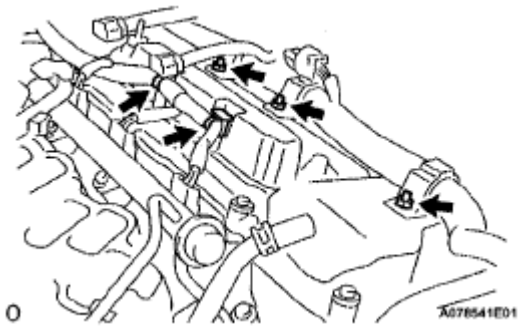


Fig. 4: Locating Engine Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the 3 nuts and disconnect the engine wire harness.
    c. Remove the 9 bolts and the cylinder head cover.

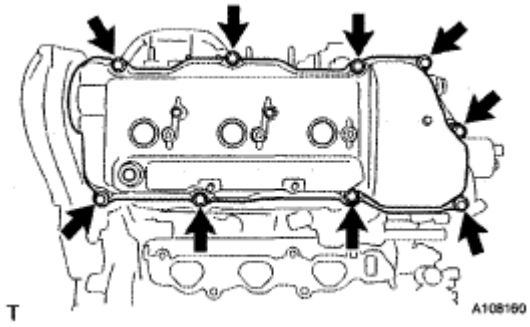


Fig. 5: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH**
    a. Using an E6 "TORX" socket wrench, remove the 2 bolts and disconnect the engine wire harness protector.

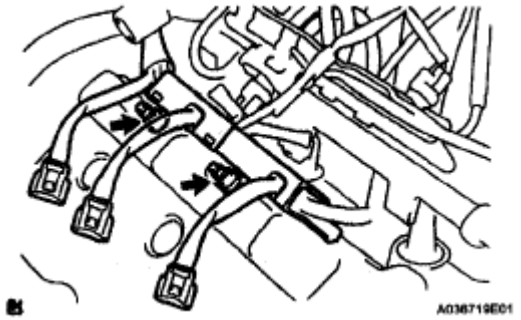


Fig. 6: Locating Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 engine wire harness clamps.

CAUTION: Wear insulating gloves.

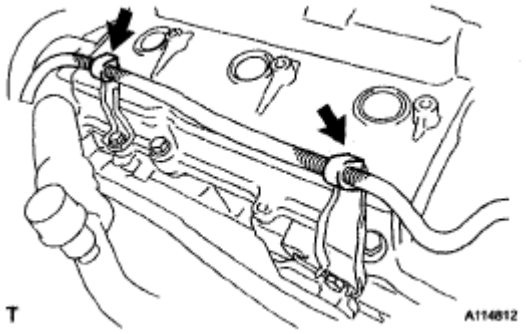


Fig. 7: Locating Engine Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 2 bolts and 2 brackets.

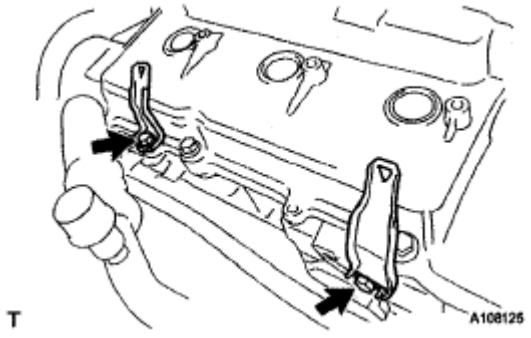


Fig. 8: Locating Brackets With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the 9 bolts and the cylinder head cover.

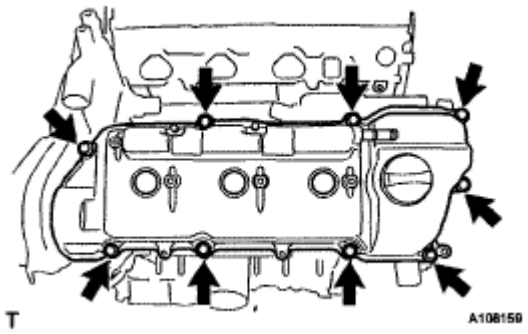


Fig. 9: Locating Cylinder Head Cover And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. **INSPECT VALVE CLEARANCE**

a. Turn the crankshaft pulley, and align the timing notch with the timing mark "0" of the No. 1 timing belt cover.

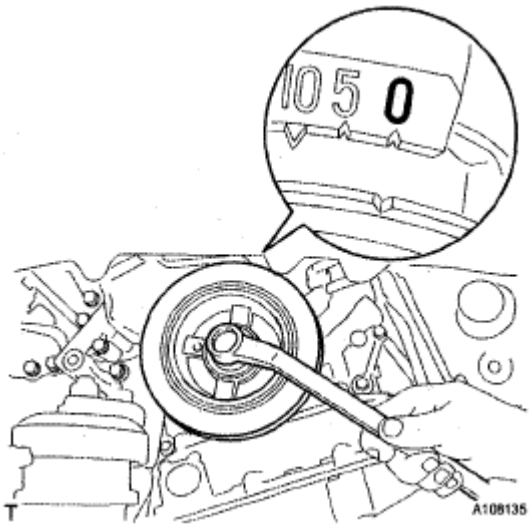


Fig. 10: Identifying Timing Notch With Timing Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Check that the valve lifters on the No. 1 cylinder (IN and EX) are both loose.

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

c. Check the valves indicated in the illustration.

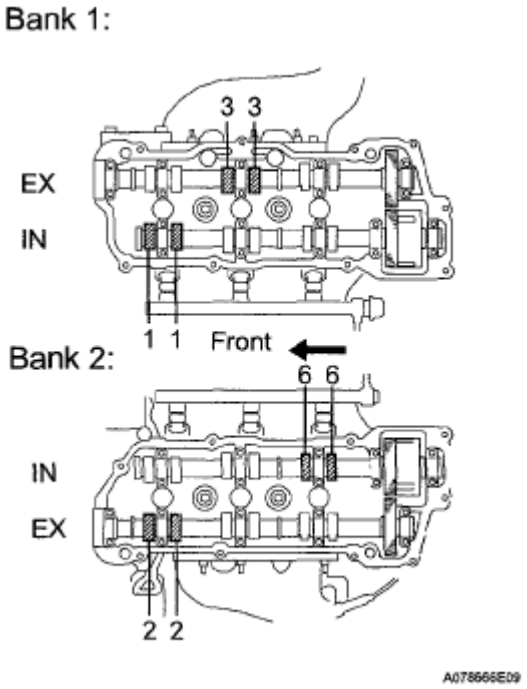


Fig. 11: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

   Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

   Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

d. Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration.

1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

   Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

   Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

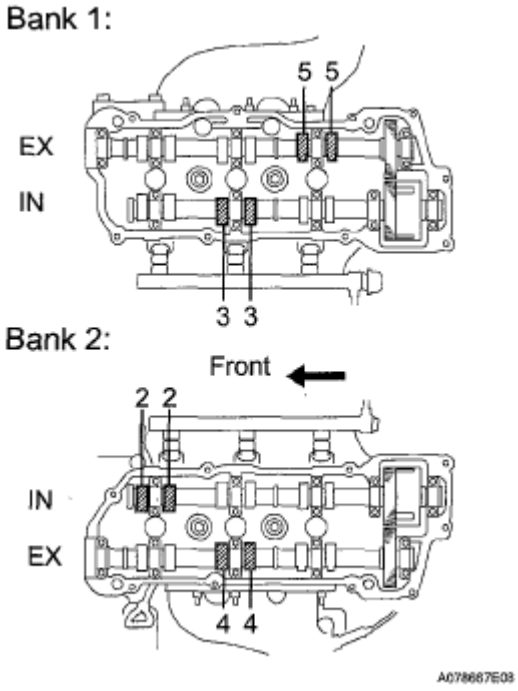


Fig. 12: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration.
   1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

      Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

      Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

   2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

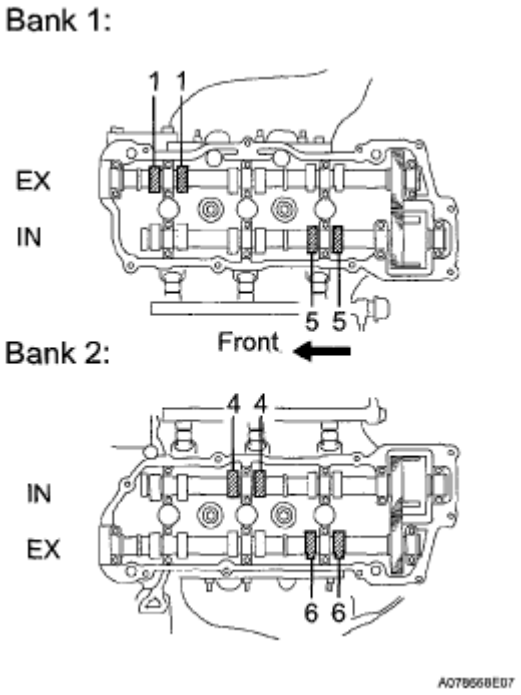


Fig. 13: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **ADJUST VALVE CLEARANCE**
    a. Turn the camshaft so that the cam lobe faces upward.
    b. Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

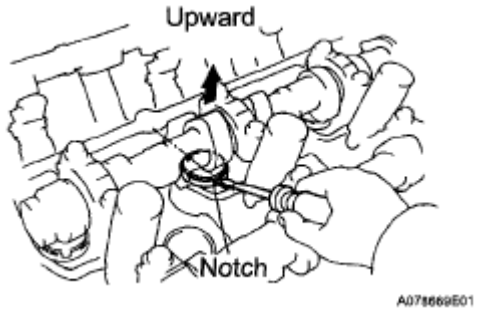


Fig. 14: Identifying Valve Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

    SST 09248-55040 (09248-05410, 09248-05420)

    HINT:

- Apply SST (B) at a slight angle on the side marked with "9" or "7" at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side at a slight angle.

TOOL REFERENCE

SST (A)	09248-05410
SST (B)	09248-05420

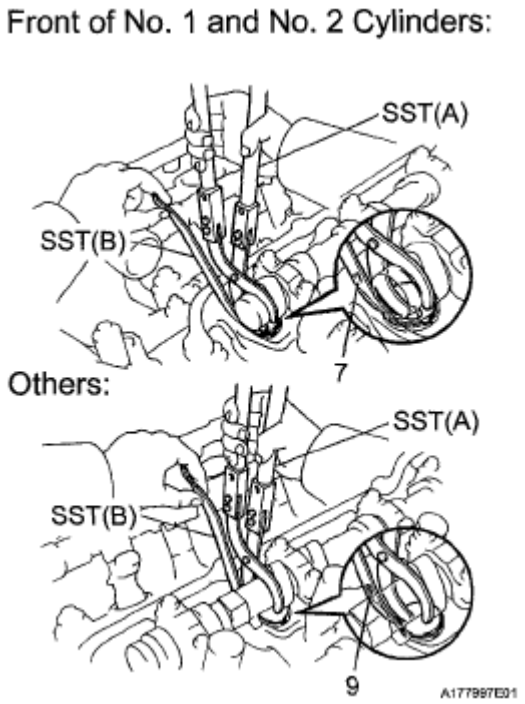


Fig. 15: Identifying Valve Lifter And SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a screwdriver and magnetic pick-up tool, remove the adjusting shim.

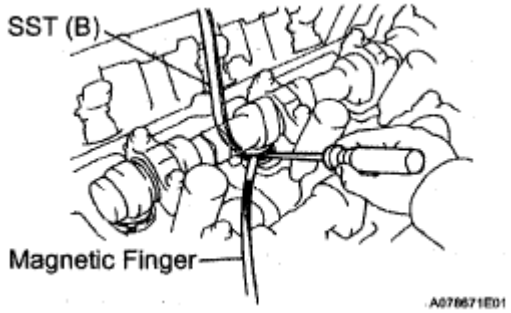


Fig. 16: View Of Adjusting Shim
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a micrometer, measure the thickness of the removed shim.

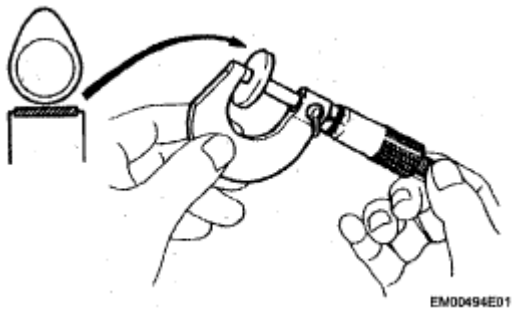


Fig. 17: Measuring Thickness Of Removed Shim
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Calculate the thickness of a new shim so the valve clearance comes within the specified value.

SHIM THICKNESS SPECIFICATION

A	Thickness of new shim
B	Thickness of used shim
C	Measured valve clearance

Specified value (Cold): Intake A = B + (C - 0.20 mm (0.0079 in.))

Exhaust A = B + (C - 0.30 mm (0.0118 in.))

g. Select a new shim with a thickness as close as possible to the calculated values.

EXAMPLE (Intake):

Measured valve clearance = 0.45 mm (0.0177 in.)

0.45 mm (0.0177 in.) - 0.20 mm (0.0079 in.) = 0.25 mm (0.0098 in.)

(Measured - Specification = Excess clearance)

Used shim measurement = 2.80 mm (0.1102 in.)

0.25 mm (0.0098 in.) + 2.80 mm (0.1102 in.) = 3.05 mm (0.1201 in.)

(Excess clearance + Used shim = Ideal new shim)

Closest new shim = 3.05 mm (0.1201 in.)

Select No. 12 shim

HINT:

- Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).
- Refer to new shim thickness table below.

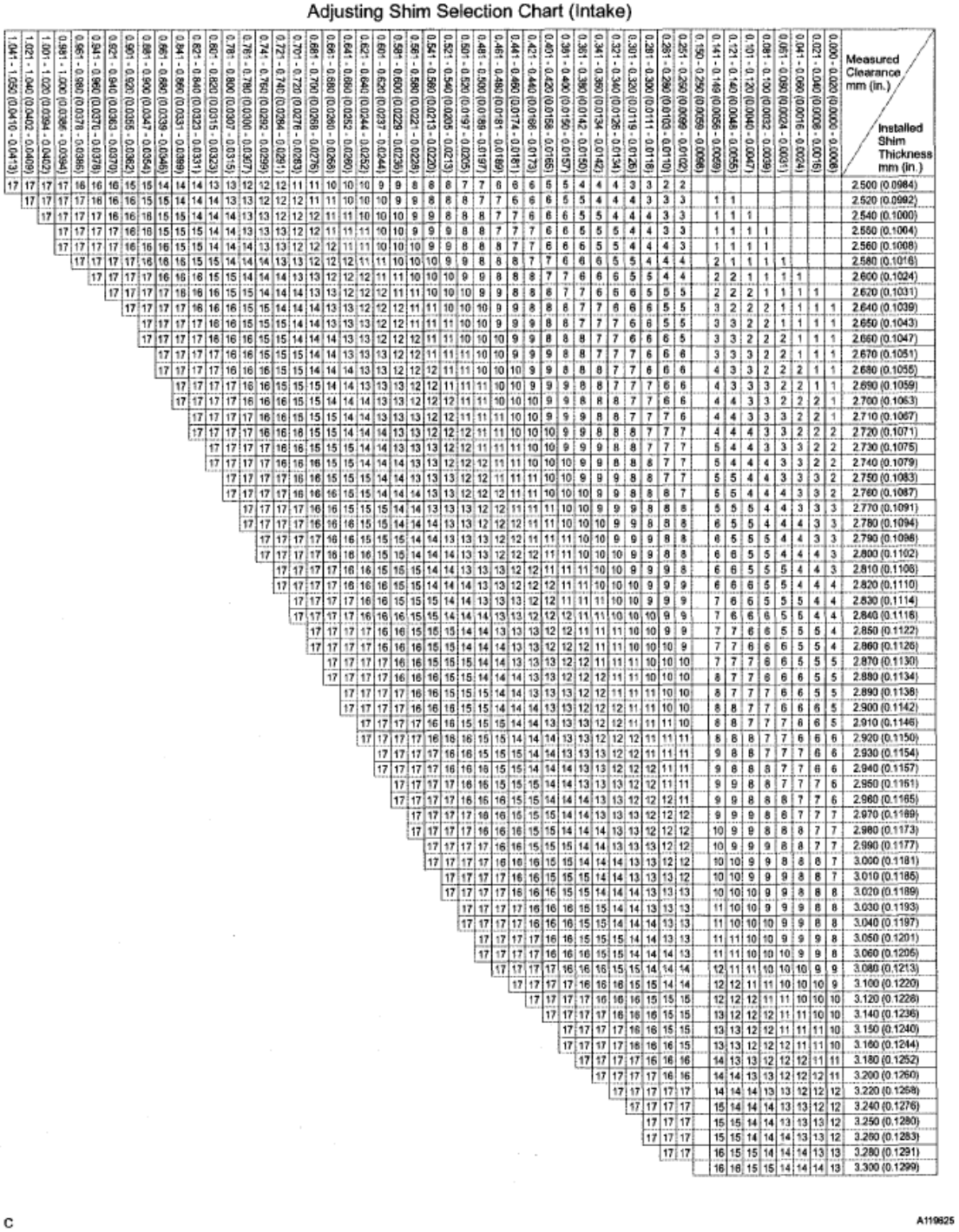


Fig. 18: Adjusting Shim Selection Chart (Intake Valve)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Intake valve clearance (Cold): 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

EXAMPLE:

The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 12 shim.

New shim thickness mm (in.)

SHIM THICKNESS SPECIFICATION

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT:

New shims have the thickness in millimeters imprinted on the face.

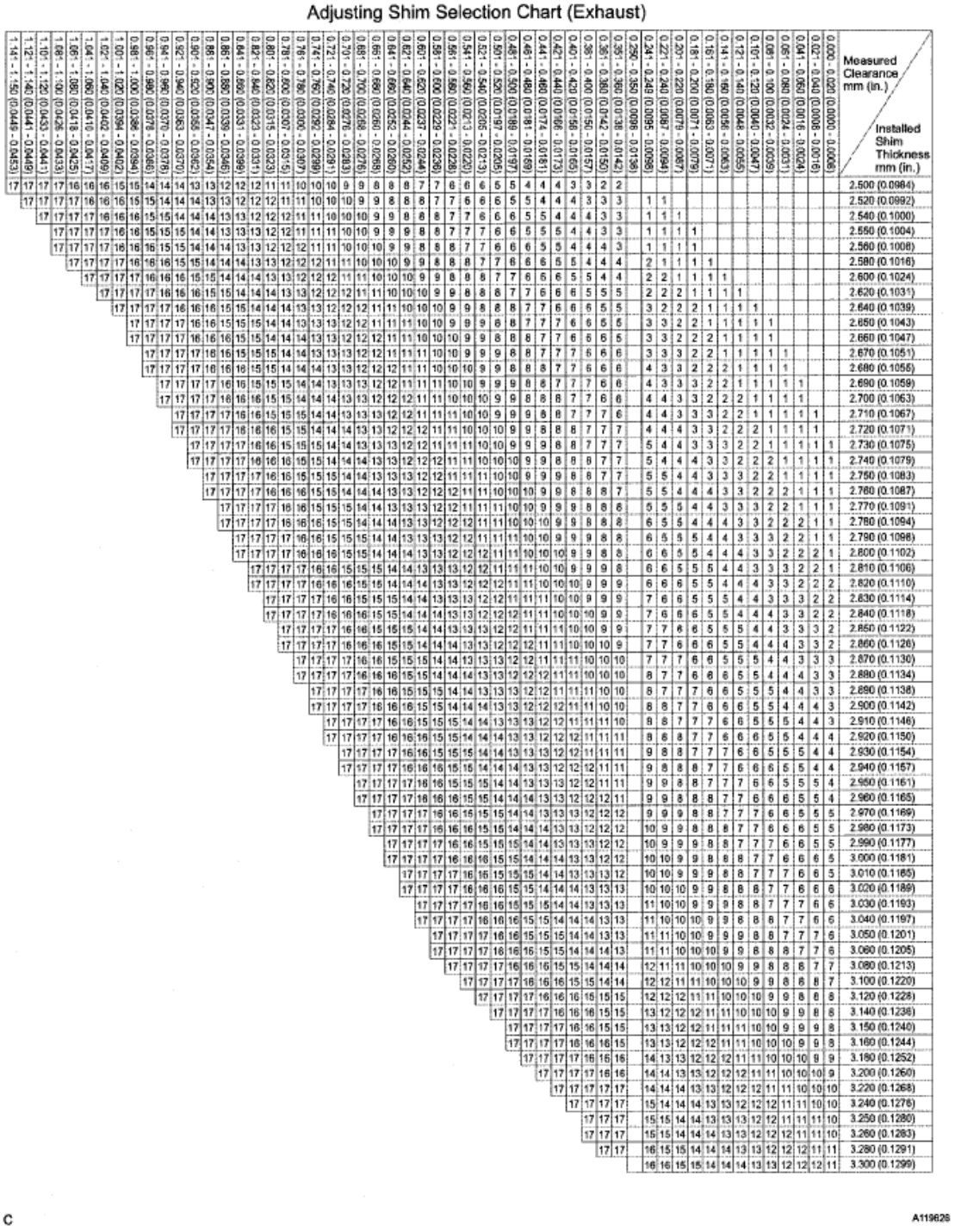


Fig. 19: Adjusting Shim Selection Chart (Exhaust Valve)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Exhaust valve clearance (Cold): 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

EXAMPLE:

The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 10 shim.

New shim thickness mm (in.)

SHIM THICKNESS SPECIFICATION

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT:

New shims have the thickness in millimeters imprinted on the face.

h. Place a new adjusting shim on the valve lifter with imprinted number facing down.
i. Press down the valve lifter with SST (A), and remove SST (B).

SST 09248-55040 (09248-05410, 09248-05420)

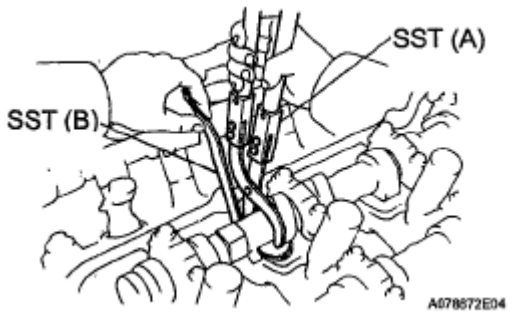


Fig. 20: View Of Pressing Down Valve Lifter With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Recheck the valve clearance.

24. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
a. Install a new cylinder head cover gasket to the cylinder head cover sub-assembly.
b. Apply seal packing to the cylinder head as shown in the illustration.

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

NOTE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine within 2 hours after installing.**

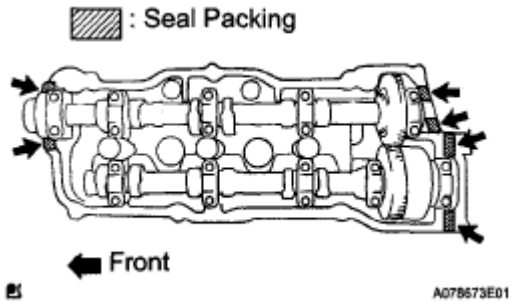


Fig. 21: Locating Seal Packing To Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.

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

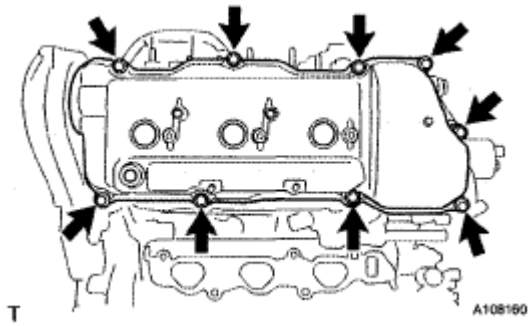


Fig. 22: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the engine wire harness with the 3 nuts and 2 clamps.

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

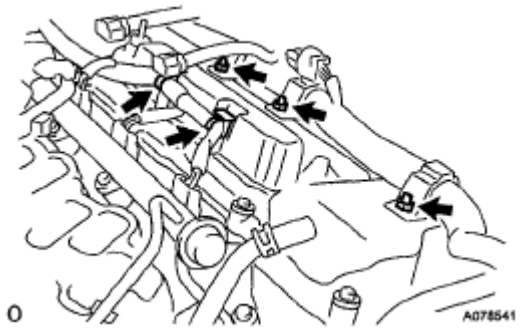


Fig. 23: Locating Engine Wire Harness With Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH**
    a. Install the a No. 2 cylinder head cover gasket to the cylinder head cover sub-assembly LH.
    b. Apply seal packing to the cylinder head as shown in the illustration.

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

    NOTE:
    - **Remove any oil from the contact surface.**
    - **Install the cylinder head cover within 3 minutes after applying seal packing.**
    - **Do not start the engine within 2 hours after installing.**

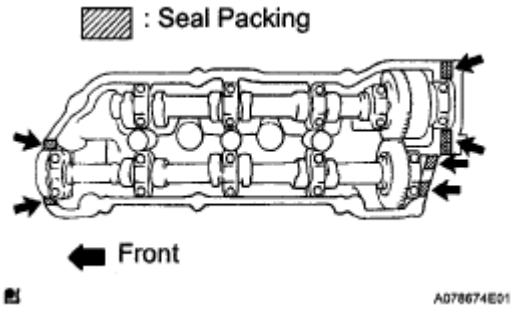


Fig. 24: Locating Seal Packing To Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.

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

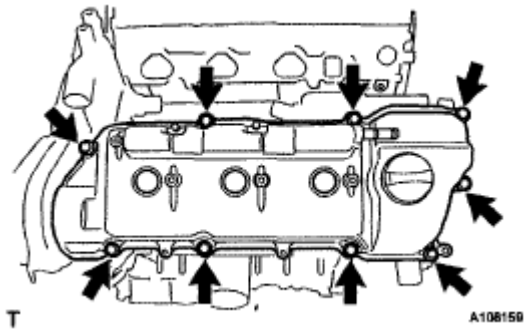


Fig. 25: Locating Cylinder Head Cover And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the 2 brackets with the 2 bolts.

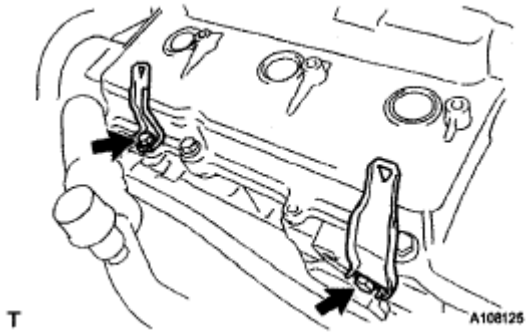


Fig. 26: Locating Brackets With 2 Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Install the 2 engine wire harness clamps.

CAUTION: Wear insulating gloves.

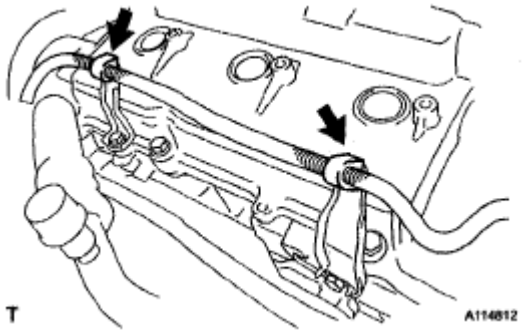


Fig. 27: Locating Engine Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using an E6 "TORX" socket wrench, install the engine wire harness protector with the 2 bolts.

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

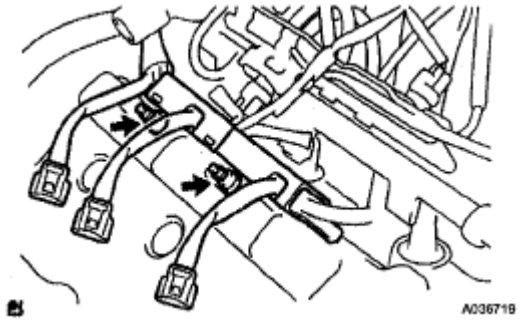


Fig. 28: Locating Engine Wire Harness Protector With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
27. **CONNECT INLET RADIATOR HOSE**
28. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
29. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)
30. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
31. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
32. **ADD ENGINE OIL**
33. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
34. **INSPECT FOR ENGINE COOLANT LEAK (for Engine)** (See **ON-VEHICLE INSPECTION**)
35. **INSPECT FOR OIL LEAK**
36. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
37. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
38. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
39. **INSTALL FRONT WHEEL RH**
40. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
41. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
42. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
43. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
44. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
45. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
46. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

TIMING BELT

COMPONENTS

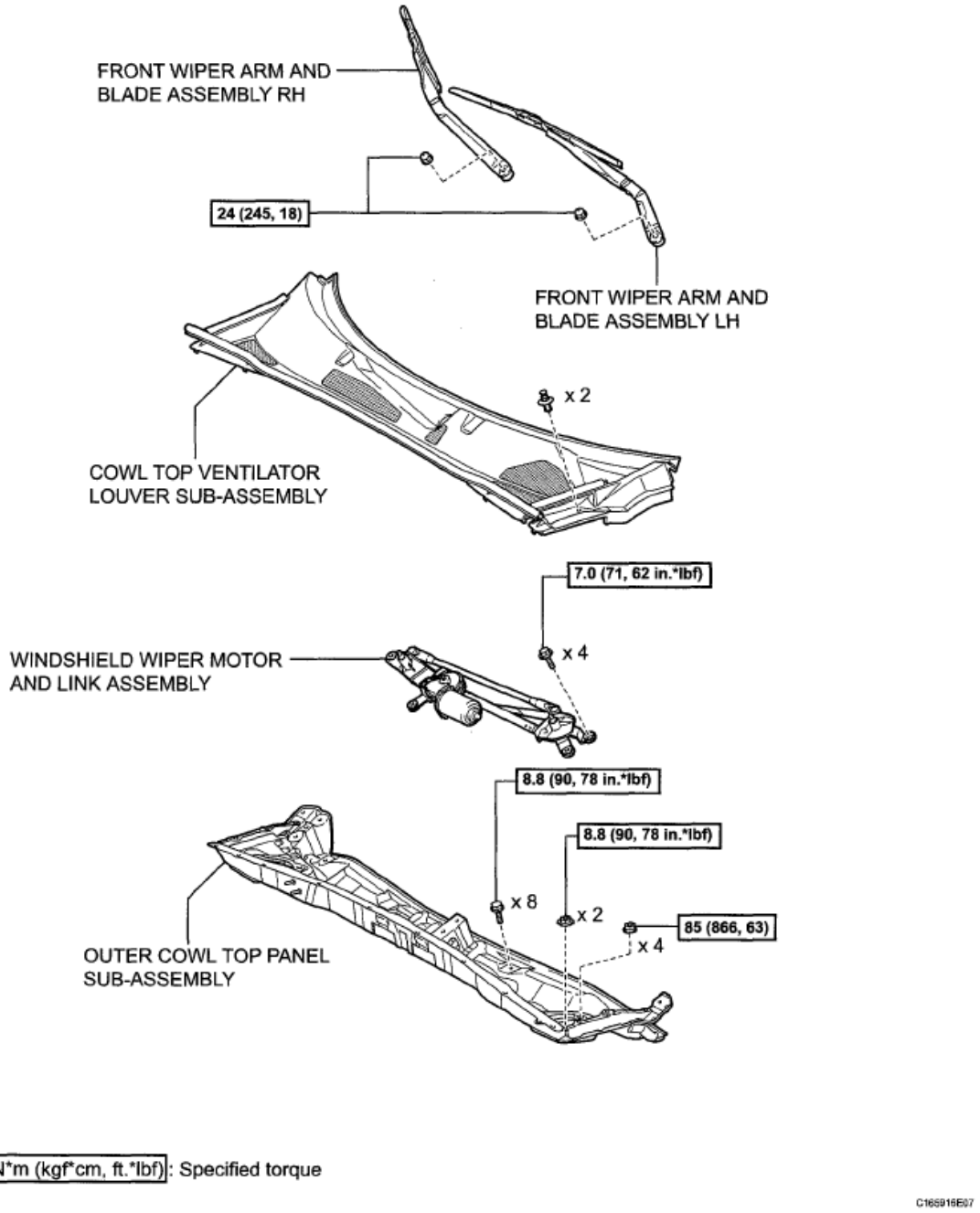


Fig. 29: Identifying Timing Belt Replacement Components With Torque Specifications (1 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

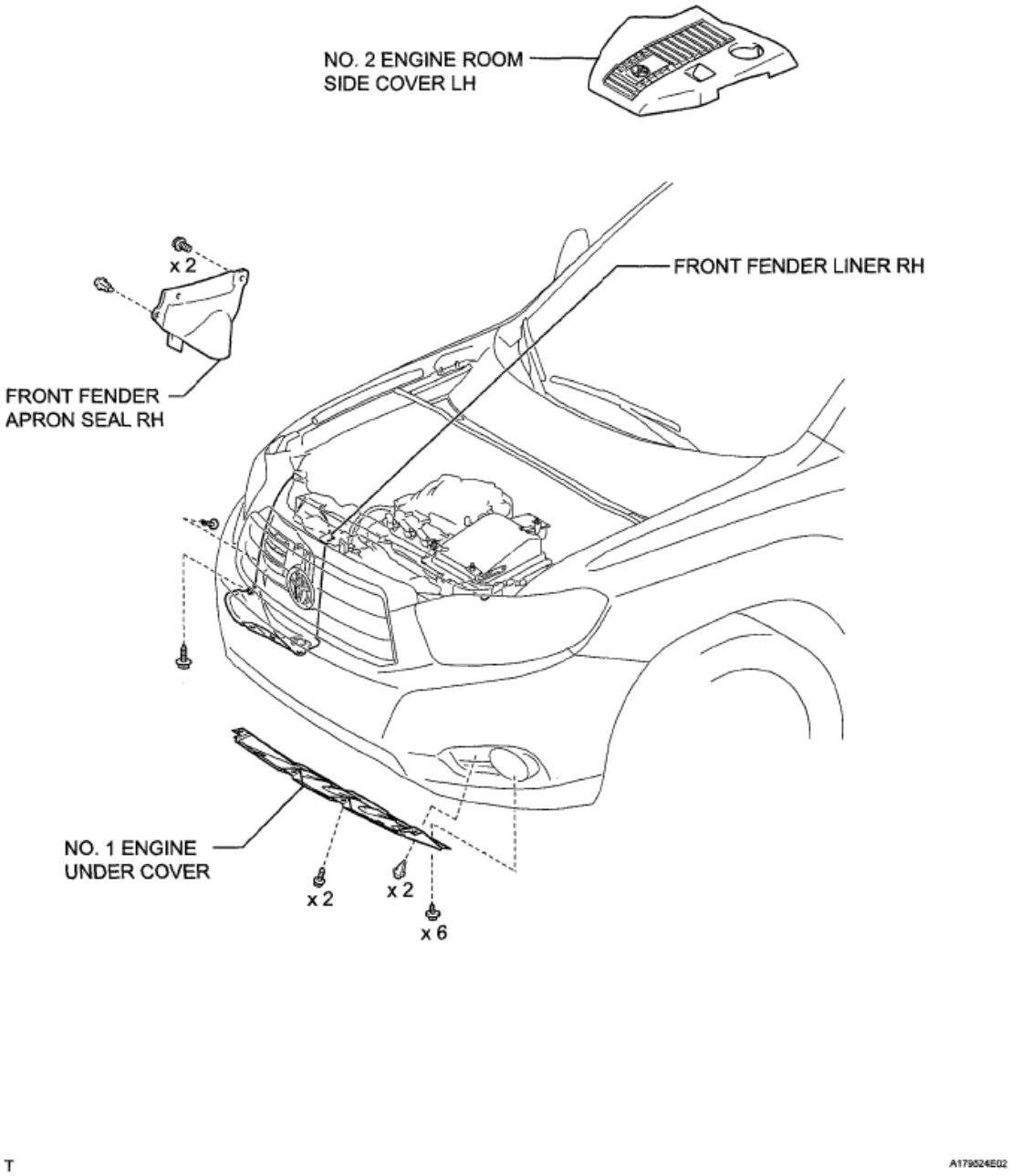


Fig. 30: Identifying Timing Belt Replacement Components (2 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

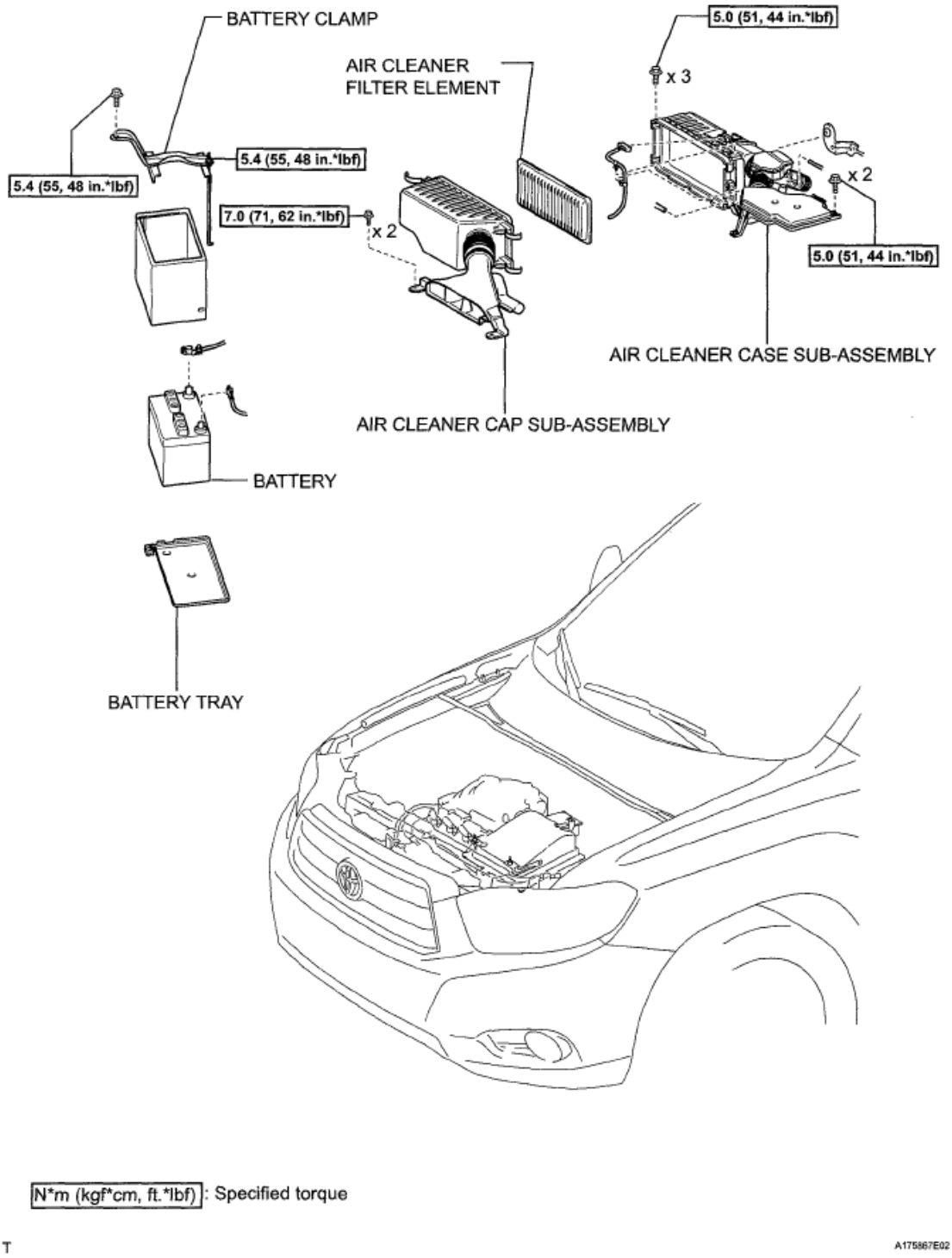


Fig. 31: Identifying Timing Belt Replacement Components With Torque Specifications (3 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

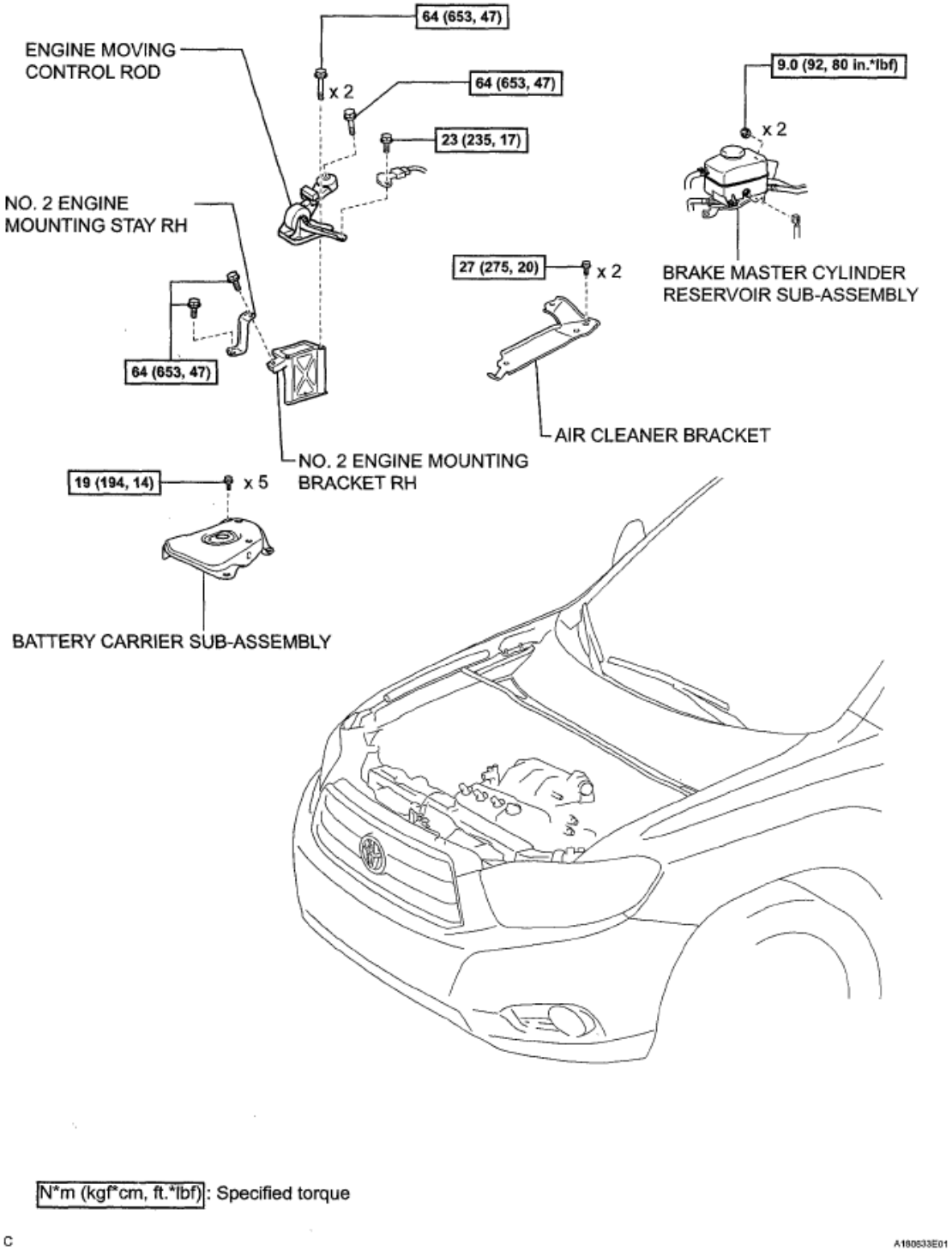


Fig. 32: Identifying Timing Belt Replacement Components With Torque Specifications (4 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

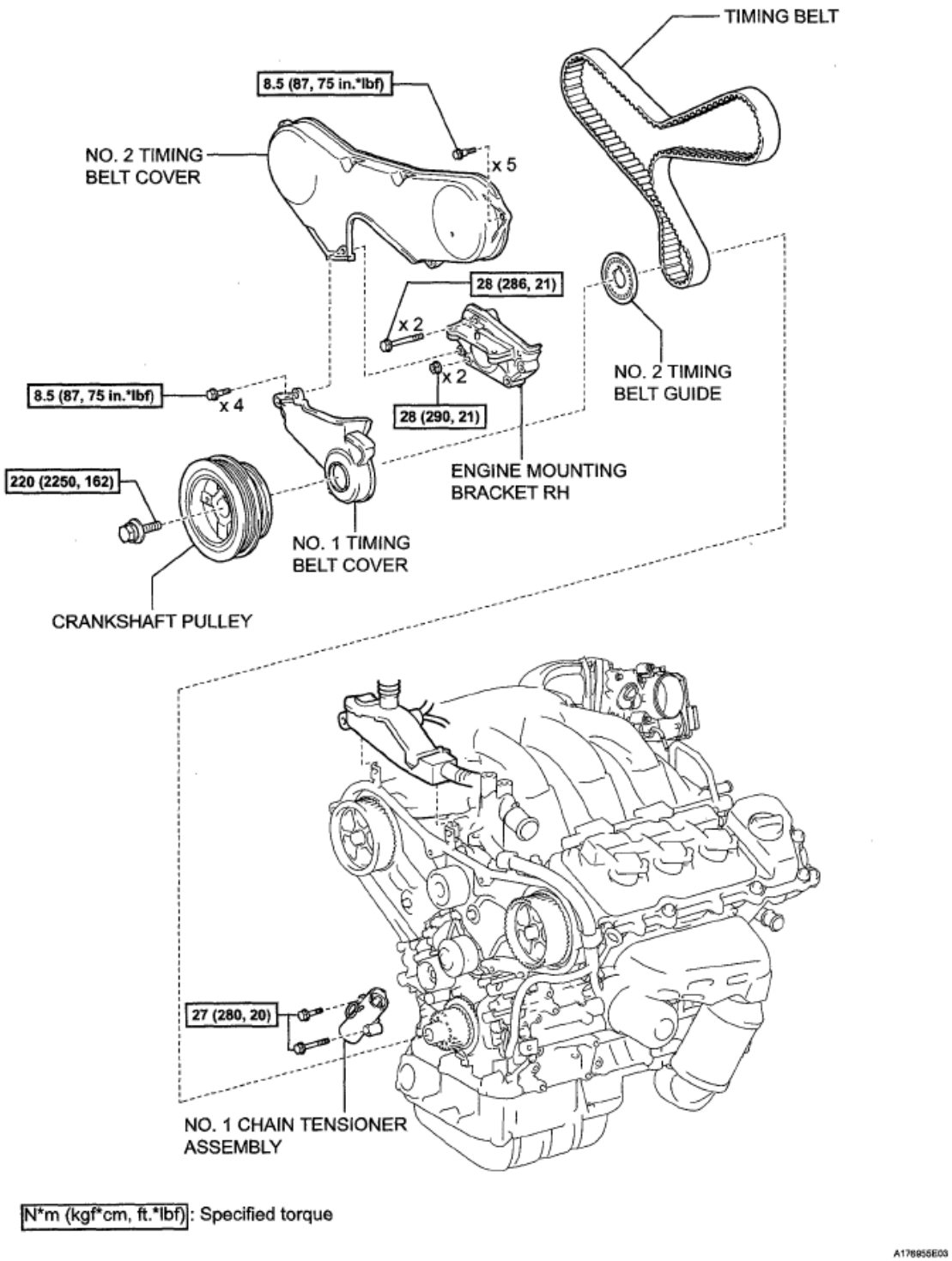


Fig. 33: Identifying Timing Belt Components With Torque Specifications (5 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)

2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
3. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
4. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
5. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
6. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
7. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
8. **REMOVE FRONT WHEEL RH**
9. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
10. **SEPARATE FRONT FENDER LINER RH**
    a. Remove the screw and clip, and separate the front fender liner.

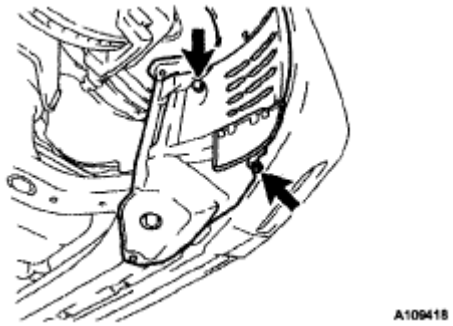


Fig. 34: Locating Fender Splash Shield With Screw And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

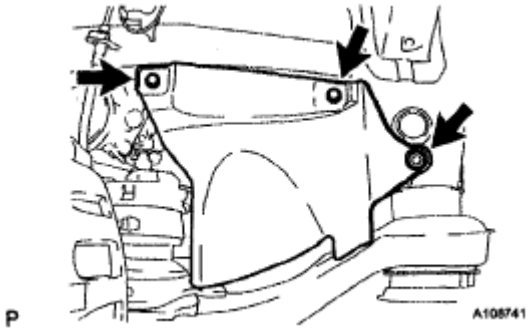


Fig. 35: Locating Bolts, Clip And Fender Apron Seal RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **REMOVE BATTERY** (See **REMOVAL**)
13. **REMOVE BATTERY CARRIER SUB-ASSEMBLY** (See **REMOVAL**)
14. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
15. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)

16. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **REMOVAL**)
17. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
18. **REMOVE ENGINE MOVING CONTROL ROD**
    a. Remove the 4 bolts, the engine moving control rod and the bracket.

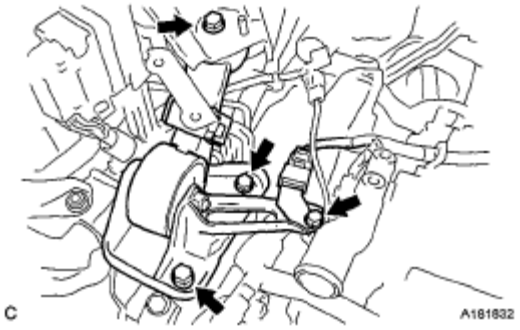


Fig. 36: Locating Engine Moving Control Rod And Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE NO. 2 ENGINE MOUNTING STAY RH**
    a. Remove the bolt, the No. 2 engine mounting stay and the No. 2 engine mounting bracket.

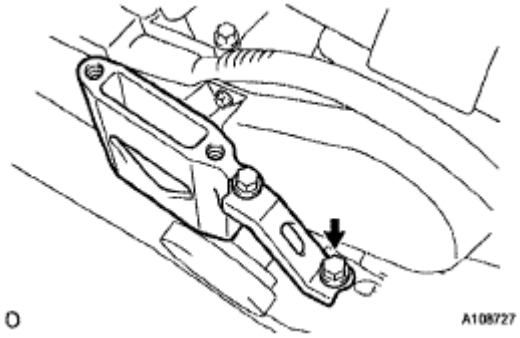


Fig. 37: Locating Engine Mounting Stay, Engine Mounting Bracket And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE CRANKSHAFT PULLEY**
    a. Using SST, loosen the pulley bolt.

    SST 09213-54015 (91651-60855), 09330-00021

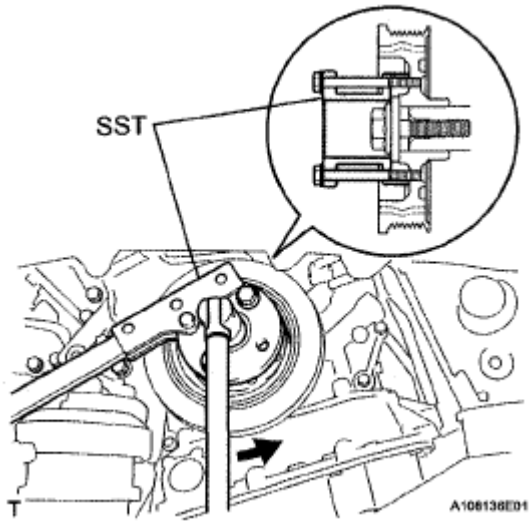


Fig. 38: Loosening Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

NOTE: Before using SST, apply lubricating oil to the threads and tip of the center bolt.

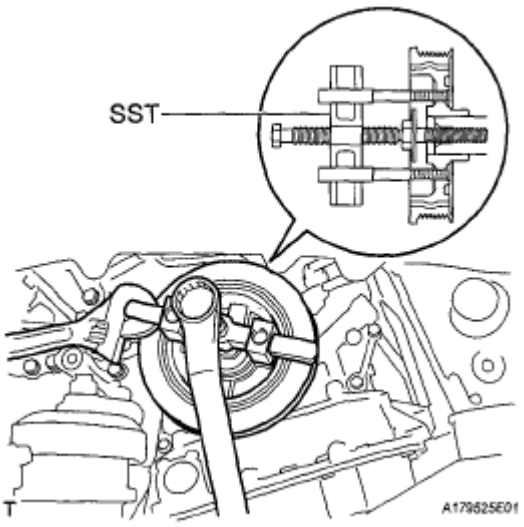


Fig. 39: Identifying Pulley Bolt With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE NO. 1 TIMING BELT COVER**
    a. Remove the 4 bolts and the No. 1 timing belt cover.
22. **REMOVE NO. 2 TIMING BELT COVER**

a. Disconnect the engine wire protector clamps from the No. 2 timing belt cover.
b. Remove the 5 bolts and the timing belt cover.

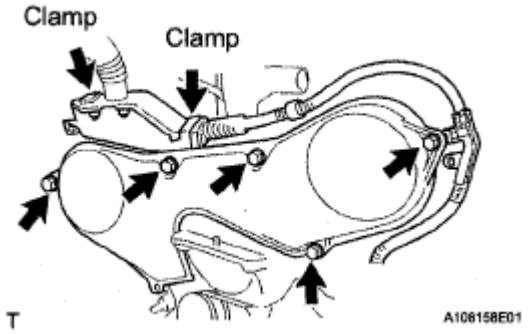


Fig. 40: Locating Timing Belt Cover And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE ENGINE MOUNTING BRACKET RH**
    a. Remove the 2 bolts, 2 nuts and engine mounting bracket RH.

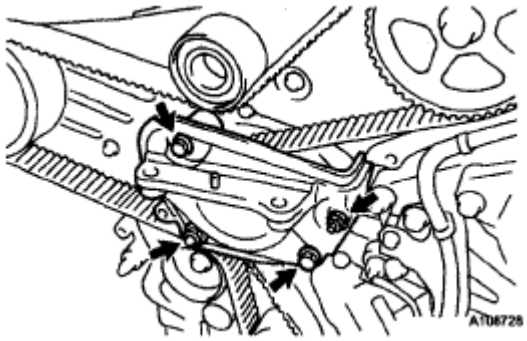


Fig. 41: Locating Engine Mounting Bracket RH With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **REMOVE NO. 2 TIMING BELT GUIDE**
25. **REMOVE TIMING BELT**
    a. Set No. 1 cylinder to TDC/compression.
        1. Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
        2. Turn the crankshaft clockwise, and align the timing mark of the crankshaft timing pulley with the oil pump body.

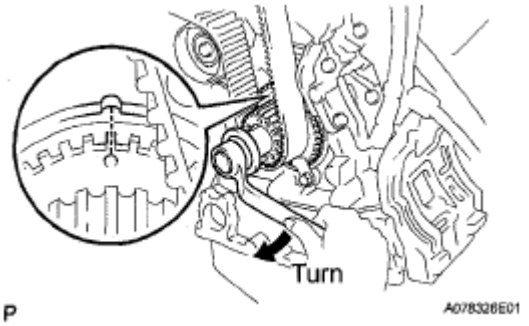


Fig. 42: Identifying Timing Mark Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Check that the timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

   If not, turn the crankshaft 1 revolution (360°).

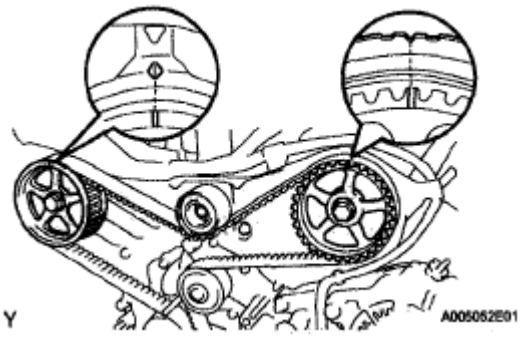


Fig. 43: Identifying Timing Marks Of Camshaft Timing Pulleys And Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Remove the crankshaft pulley bolt.

b. If reusing the timing belt, check that there are 4 installation marks on the timing belt as shown in the illustration.
   1. If the installation marks have disappeared, put new installation marks on the timing belt before removing.

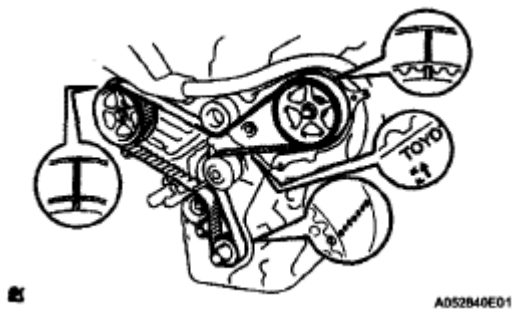


Fig. 44: Identifying Timing Mark Of Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Set No. 1 cylinder to approximately 60° BTDC/ compression.
   1. Turn the crankshaft counterclockwise by approximately 60°.

NOTE: If the timing belt is disengaged, having the crankshaft pulley at a wrong angle can cause the piston head and valve head to come into contact with each other when you remove the camshaft timing pulley and camshaft, causing damage. So always set the crankshaft pulley at the correct angle.

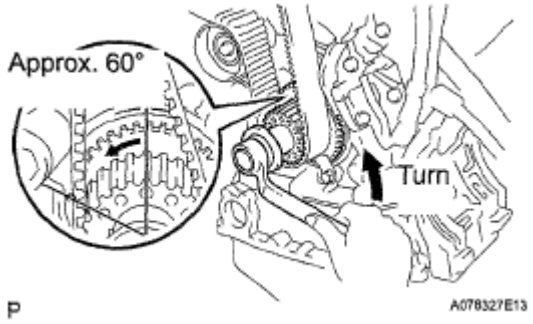


Fig. 45: Identifying Timing Mark Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the 2 bolts and No. 1 chain tensioner.
e. Remove the timing belt in the following order.

TIMING BELT REFERENCE

1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

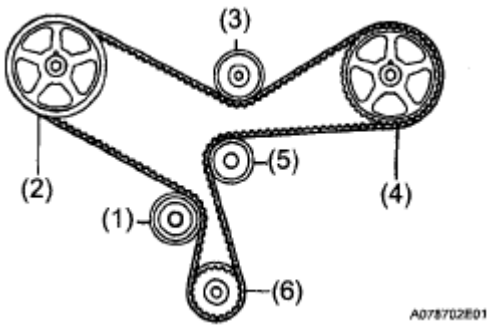


Fig. 46: Identifying Timing Belt Installing Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT TIMING BELT**

NOTE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.**

Check the belt for any defects, as shown in the illustration. Also, check the points below.

a. If there is premature parting:
   - Check for proper installation.

b. If the belt teeth are cracked or damaged, check if either camshaft is locked.

c. If there is noticeable wear or cracks on the belt face, check if there are nicks on the side of the idler pulley lock and water pump.

d. If there is wear or damage to only one side of the belt, check the belt guide and the alignment of each pulley.

e. If there is noticeable wear on the belt teeth:

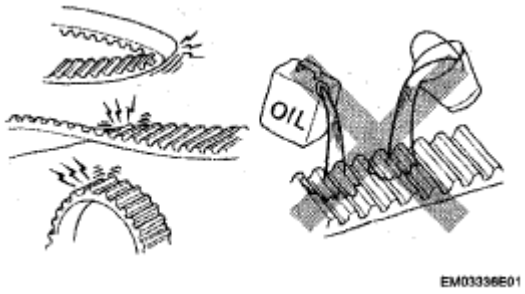


Fig. 47: View Of Timing Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Check the timing cover for damage.
- Check for foreign objects oh the pulley teeth. If there is any trouble in the belt condition, replace the timing belt.

INSTALLATION

1. **INSTALL TIMING BELT**
   a. Remove any oil or water on the pulleys, and keep them clean.

NOTE:

- **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**
- **Wipe only the pulleys. Do not use any cleaning agent.**

b. Inspect the idler pulleys.
   1. Check that the idler pulley turns smoothly.
   2. Visually check the seal portion of the idler pulley for oil leakage.

c. Inspect the water pump.
   1. Turn the pulley, and check that the water pump bearing moves smoothly and does not make any noise.
   2. Visually check the drain hole for coolant leakage.

d. Temporarily install the crankshaft pulley bolt and washer to the crankshaft.

e. Turn the crankshaft counterclockwise by approximately 60°.

NOTE: **To prevent contacting the piston head and the valve head, set the crankshaft pulley at 60° BTDC/compression position.**

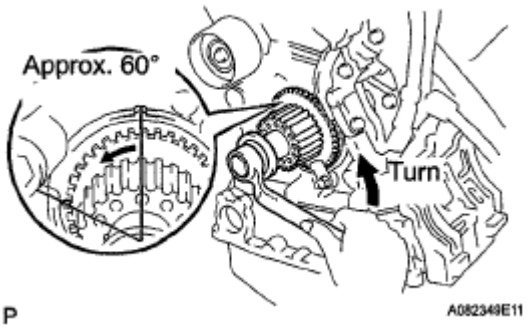


Fig. 48: Identifying Timing Mark Of Timing Pulleys
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using SST, turn the timing pulleys, and align the timing marks of the timing pulleys with the No. 3 timing belt cover.

SST 09960-10010 (09962-01000, 09963-01000)

NOTE: **Be sure to hold SST with the timing marks aligned to prevent the left bank pulley from deviating to the right.**

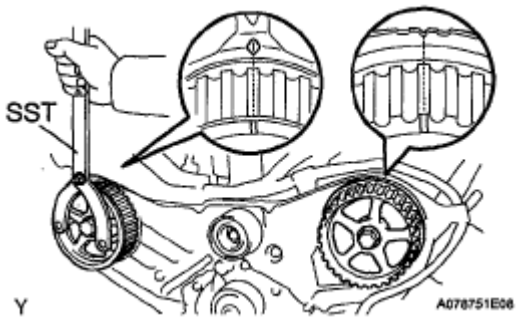


Fig. 49: Identifying Timing Marks Of Timing Pulleys With No. 3 Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Turn the crankshaft, and align the timing mark of the crankshaft timing pulley with the oil pump body.

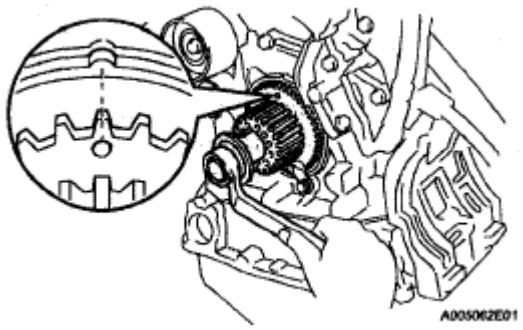


Fig. 50: Identifying Timing Mark Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Face the front mark on the timing belt forward.

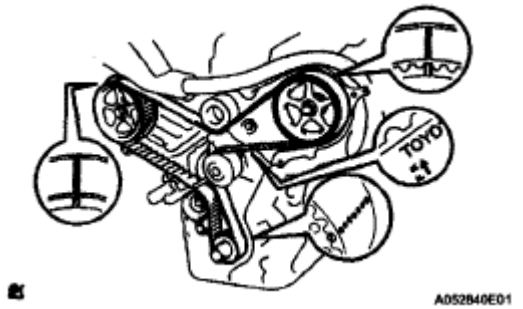


Fig. 51: Identifying Timing Mark Of Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
j. Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.

k. Install the timing belt in the following order.

TIMING BELT REFERENCE

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley

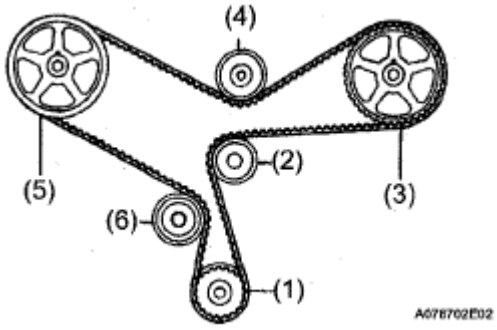


Fig. 52: Identifying Mark On Timing Belt With Timing Mark Of Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure to hold SST with the timing marks aligned to prevent the left bank pulley from deviating to the right.

2. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**
   a. Set the timing belt tensioner upright on the press.
   b. Slowly press in the push rod.

NOTE: Do not apply pressure more than 9.8 kN (1000 kgf, 2205 lbf) to the rod.

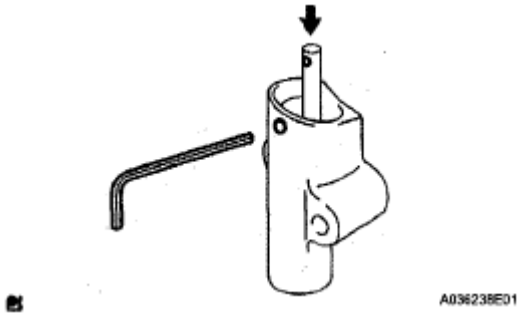


Fig. 53: Identifying Holes Of Push Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Align the holes of the push rod and housing, and pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.
d. Release the press.
e. Install the tensioner with the 2 bolts. Alternately tighten the 2 bolts.

Torque: 27 N*m (280 kgf*cm, 20 ft.*lbf)

NOTE: Be sure to tighten the bolts equally. Installing the tensioner at an angle may cause improper operation.

f. Remove the 1.5 mm hexagon wrench from the tensioner.
g. Turn the crankshaft 2 revolutions slowly and align the timing mark of the crankshaft timing pulley with the oil pump body.

NOTE: Always turn the crankshaft clockwise.

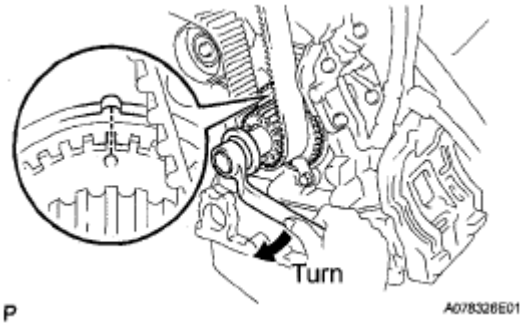


Fig. 54: Identifying Timing Mark Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Check the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover as shown in the illustration. If the marks do not align, remove the timing belt and reinstall it.

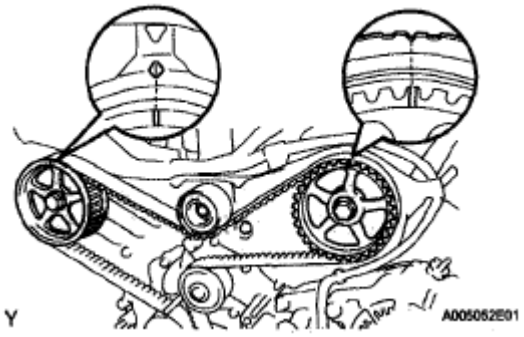


Fig. 55: Identifying Timing Marks Of Camshaft Timing Pulleys And Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Remove the crankshaft pulley bolt.

3. **INSTALL NO. 2 TIMING BELT GUIDE**
   a. Install the timing belt guide with the cup side facing toward the engine front.

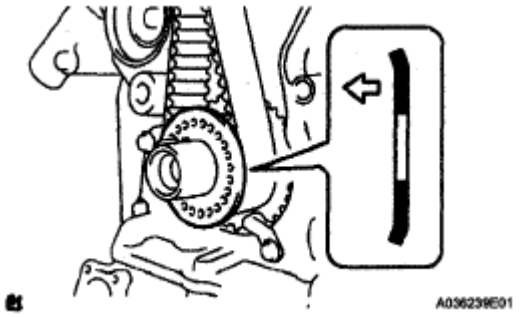


Fig. 56: Identifying Timing Belt Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL ENGINE MOUNTING BRACKET RH**
   a. Install the engine mounting bracket RH with the 2 bolts and 2 nuts.

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

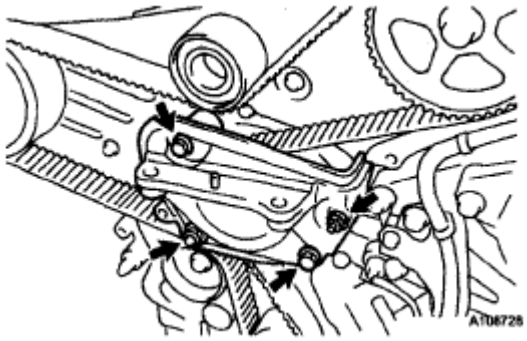


Fig. 57: Locating Engine Mounting Bracket RH With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL NO. 2 TIMING BELT COVER**
   a. Visually check for cracks and breaks on the gasket of the timing belt cover.

   If a trace of water is found in the visual check, replace the timing belt cover.

   b. Install the timing belt cover with the 5 bolts.

   Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

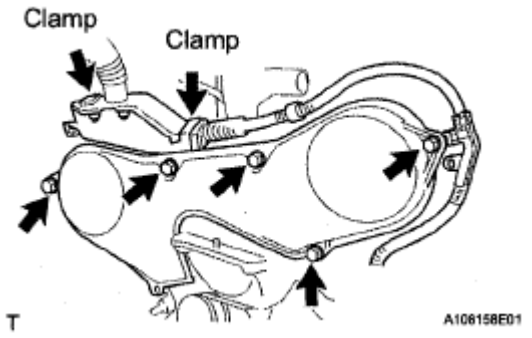


Fig. 58: Locating Timing Belt Cover And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Connect the 2 clamps.

6. **INSTALL NO. 1 TIMING BELT COVER**
   a. Visually check for cracks and breaks on the gasket of the timing belt cover.

      If a trace of water is found in the visual check, replace the timing belt cover.

   b. Install the timing belt cover with the 4 bolts.

      Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

7. **INSTALL CRANKSHAFT PULLEY**
   a. Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.
   b. Using SST, install the pulley bolt.

      SST 09213-54015 (91651-60855), 09330-00021

      Torque: 220 N*m (2243 kgf*cm, 162 ft.*lbf)

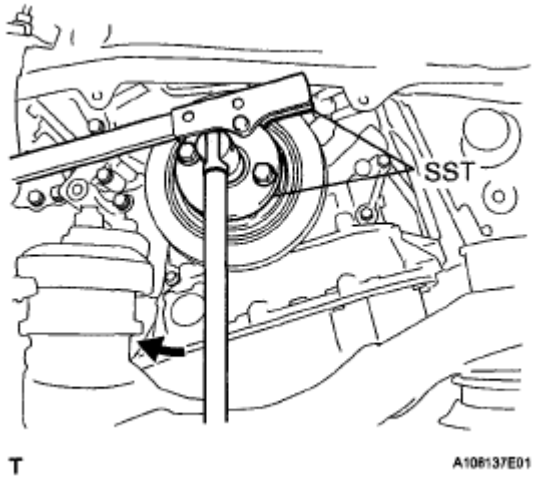


Fig. 59: Identifying Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

      Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

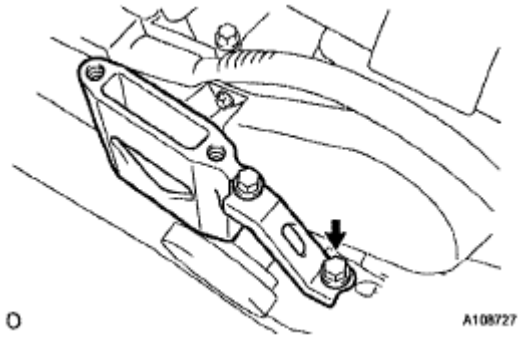


Fig. 60: Locating Engine Mounting Stay, Engine Mounting Bracket And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL ENGINE MOVING CONTROL ROD**
   a. Temporarily install the engine moving control rod and bracket with the 4 bolts.

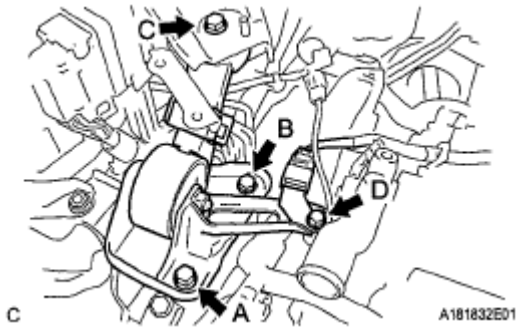


Fig. 61: Locating Engine Moving Control Rod And Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. First tighten bolt A, bolt B, then bolt C in this order.

      Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

   c. Tighten bolt D.

      Torque: 23 N*m (235 kgf*cm, 17 ft.*lbf)

10. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)

11. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **INSTALLATION**)
12. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
13. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
14. **INSTALL BATTERY CARRIER SUB-ASSEMBLY** (See **INSTALLATION**)
15. **INSTALL BATTERY** (See **INSTALLATION**)
16. **INSTALL FRONT FENDER APRON SEAL RH**
    a. Install the fender apron seal RH with the 2 bolts and clip.

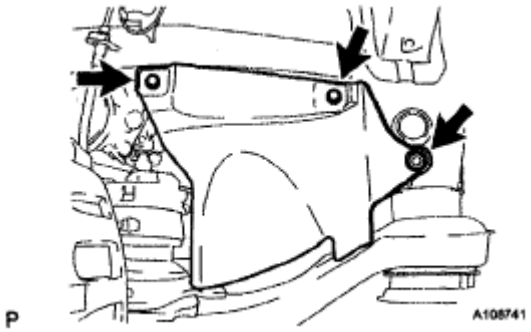


Fig. 62: Locating Bolts, Clip And Fender Apron Seal RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **INSTALL FRONT FENDER LINER RH**
    a. Install the front fender liner with the screw and clip.

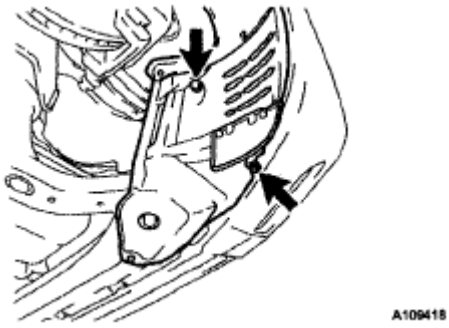


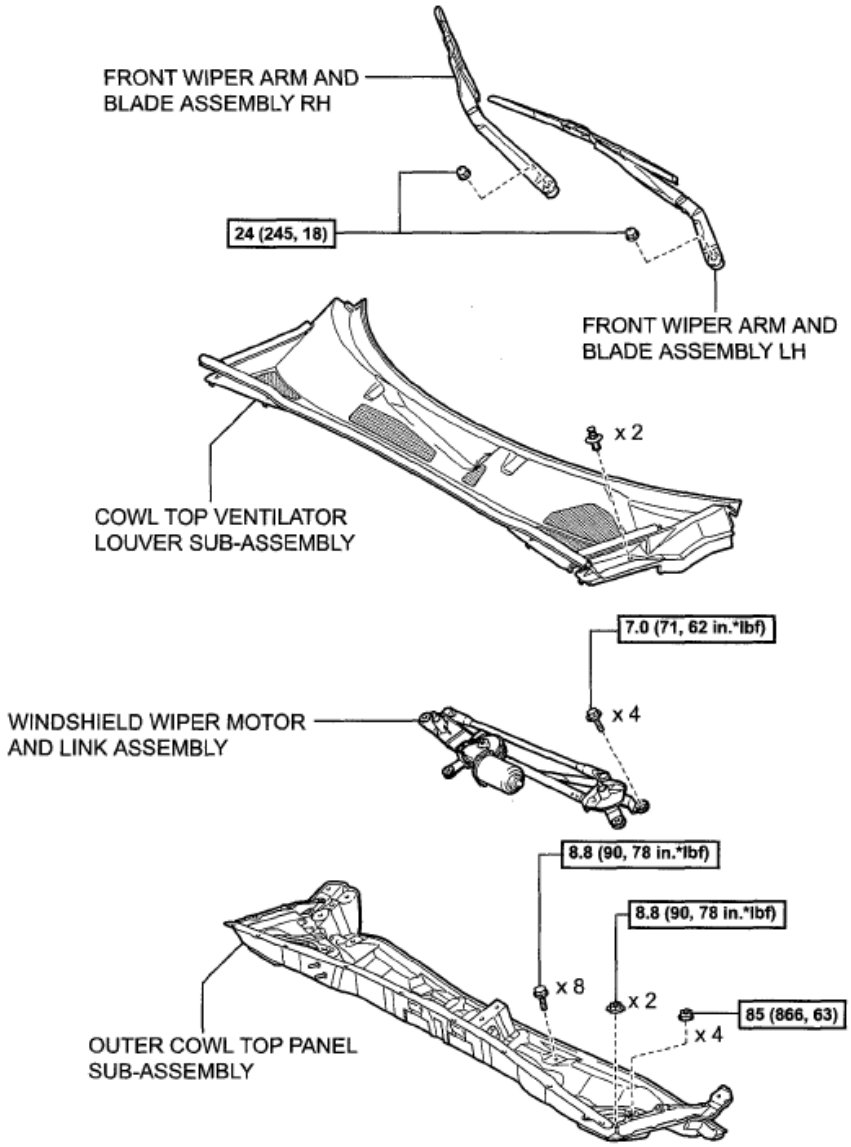
Fig. 63: Locating Fender Splash Shield With Screw And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
19. **INSTALL FRONT WHEEL RH**
20. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
21. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
22. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
23. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)

24. **Install cowl top ventilator louver sub-ASSEMBLY** (See **INSTALLATION**)
25. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
26. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
27. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

CAMSHAFT (FOR BANK 1)

COMPONENTS



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

P

C165916E07

Fig. 64: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (1 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

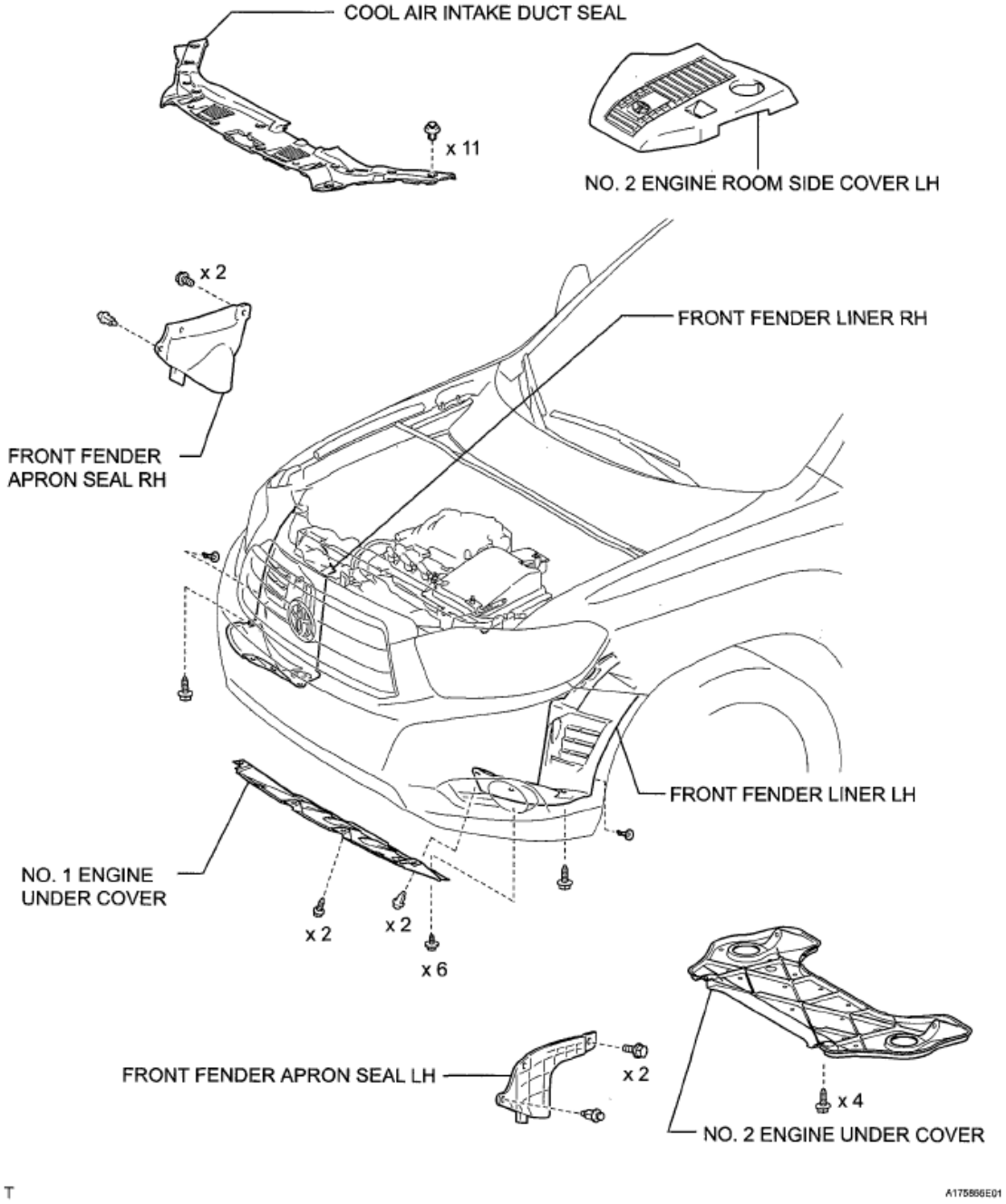


Fig. 65: Identifying Camshaft (Bank 1) Replacement Components (2 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

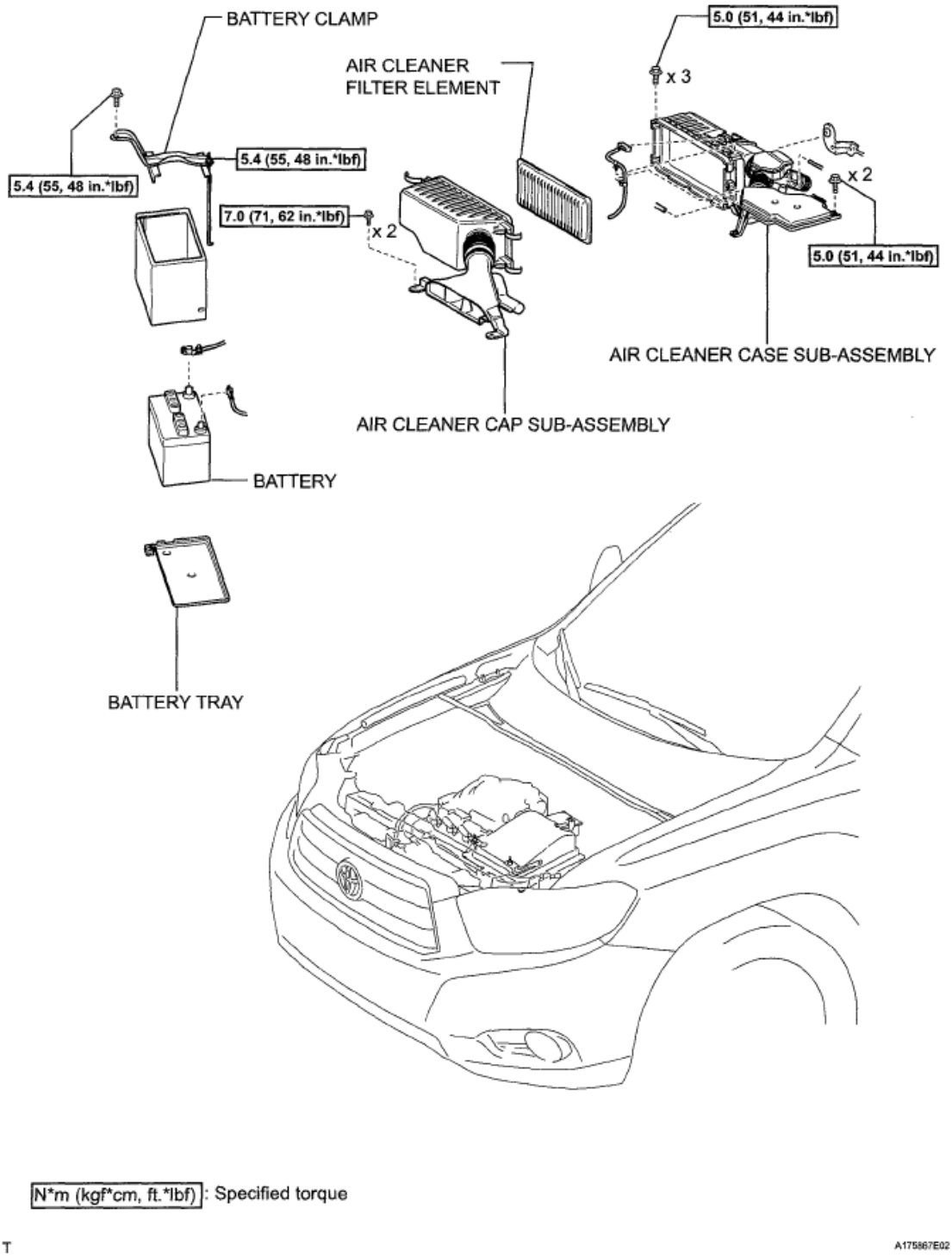


Fig. 66: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (3 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

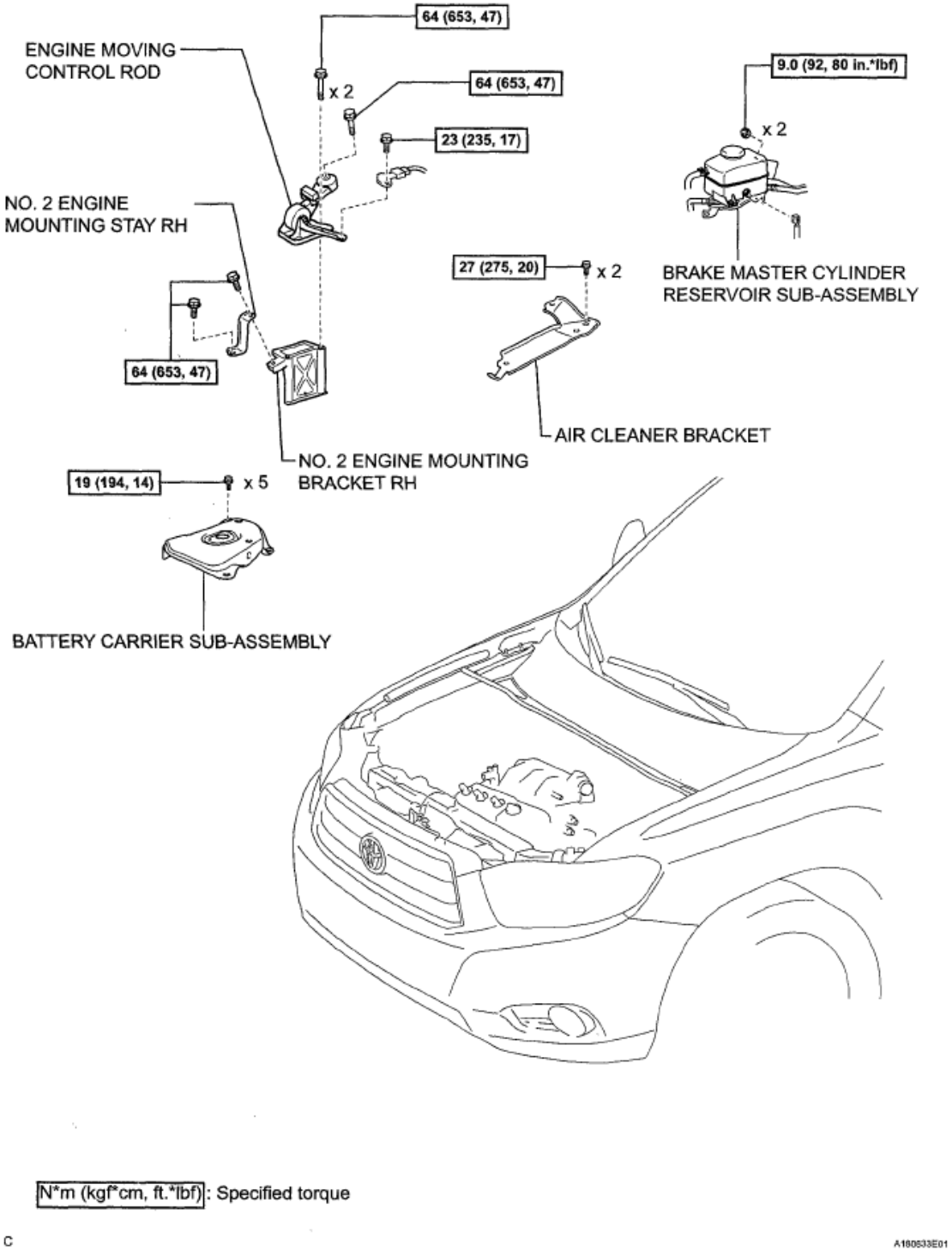


Fig. 67: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (4 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

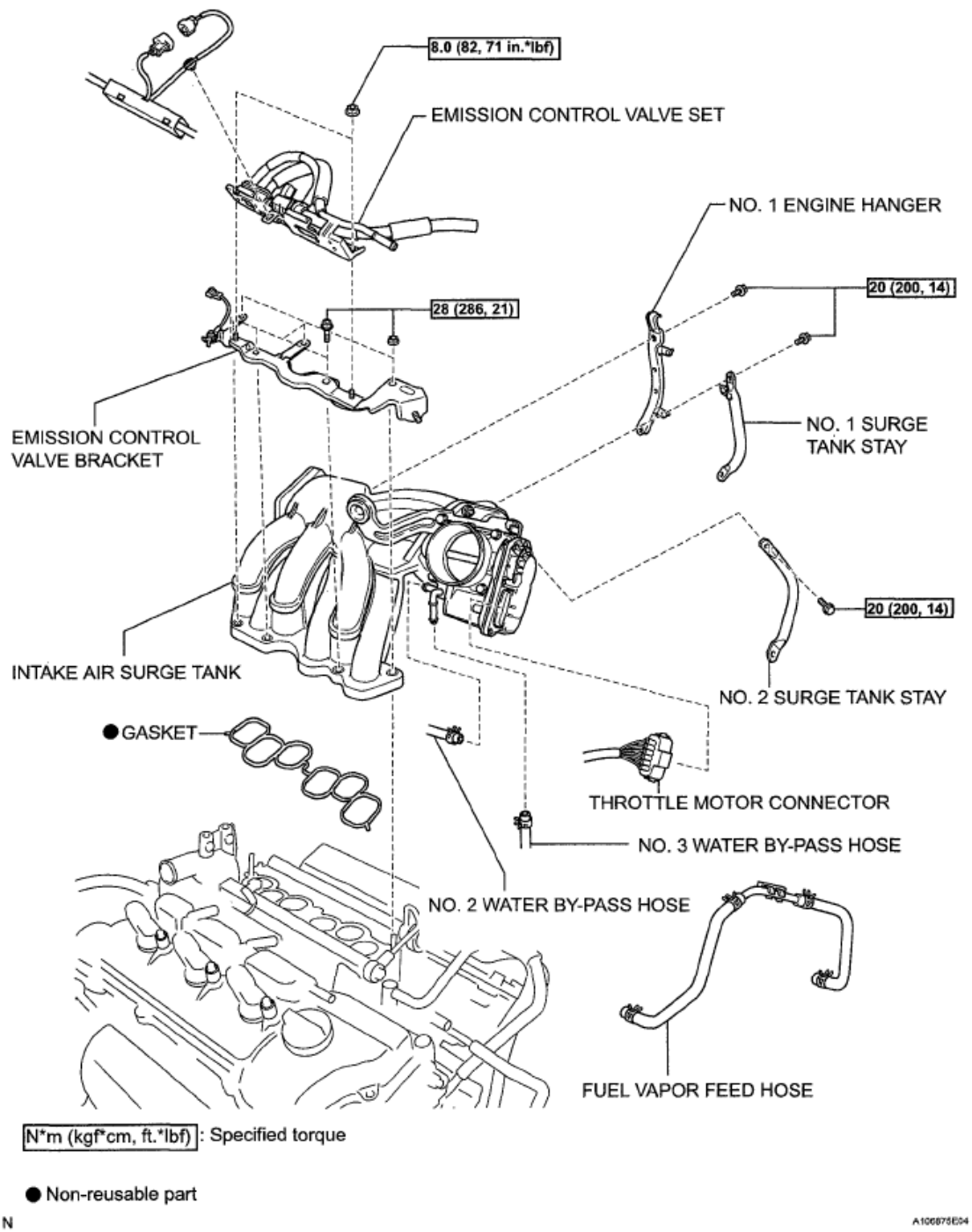


Fig. 68: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (5 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

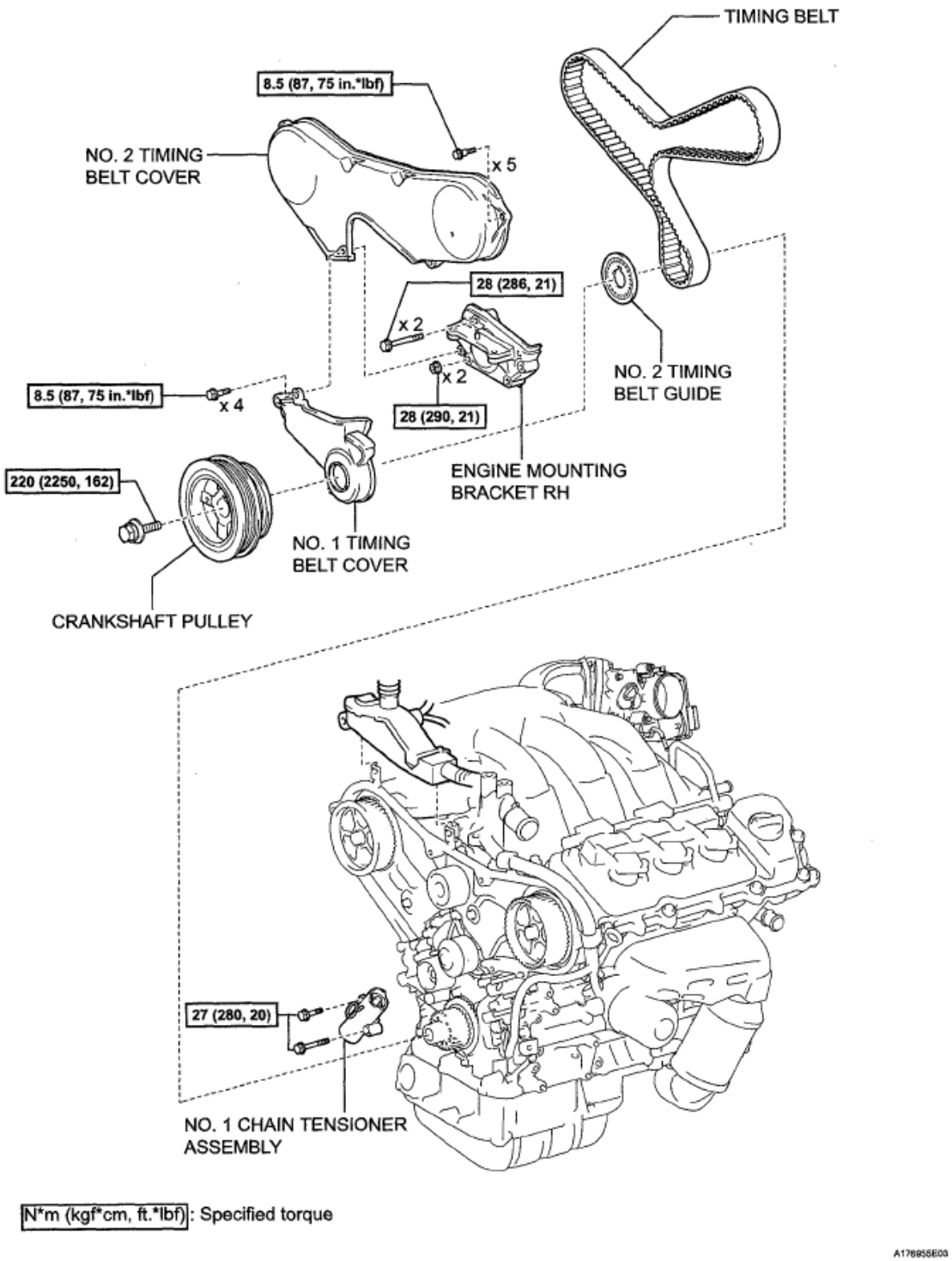


Fig. 69: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (6 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

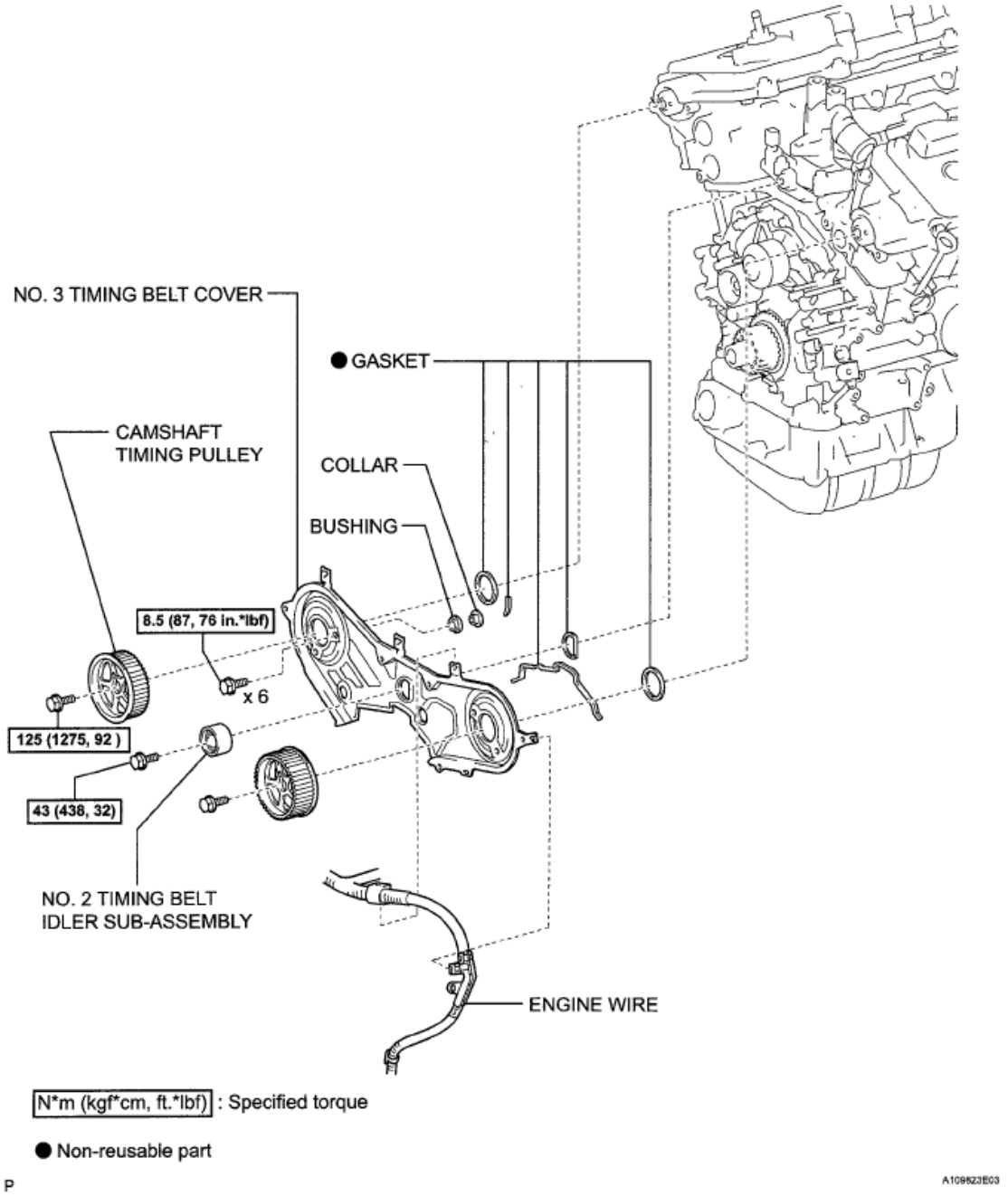


Fig. 70: Identifying Camshaft (Bank 1) Components With Torque Specifications (7 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

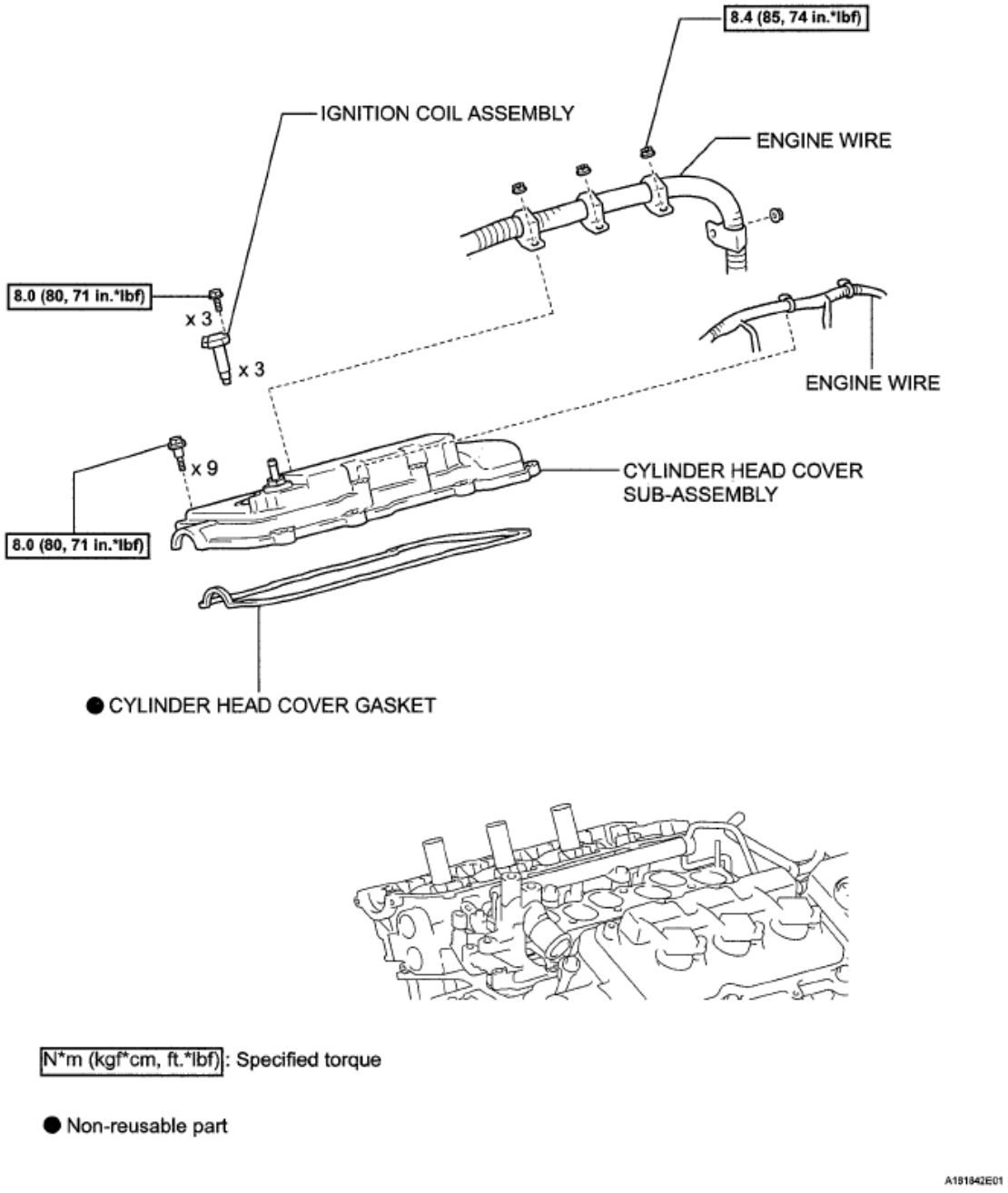


Fig. 71: Identifying Camshaft (Bank 1) Replacement Components With Torque Specifications (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

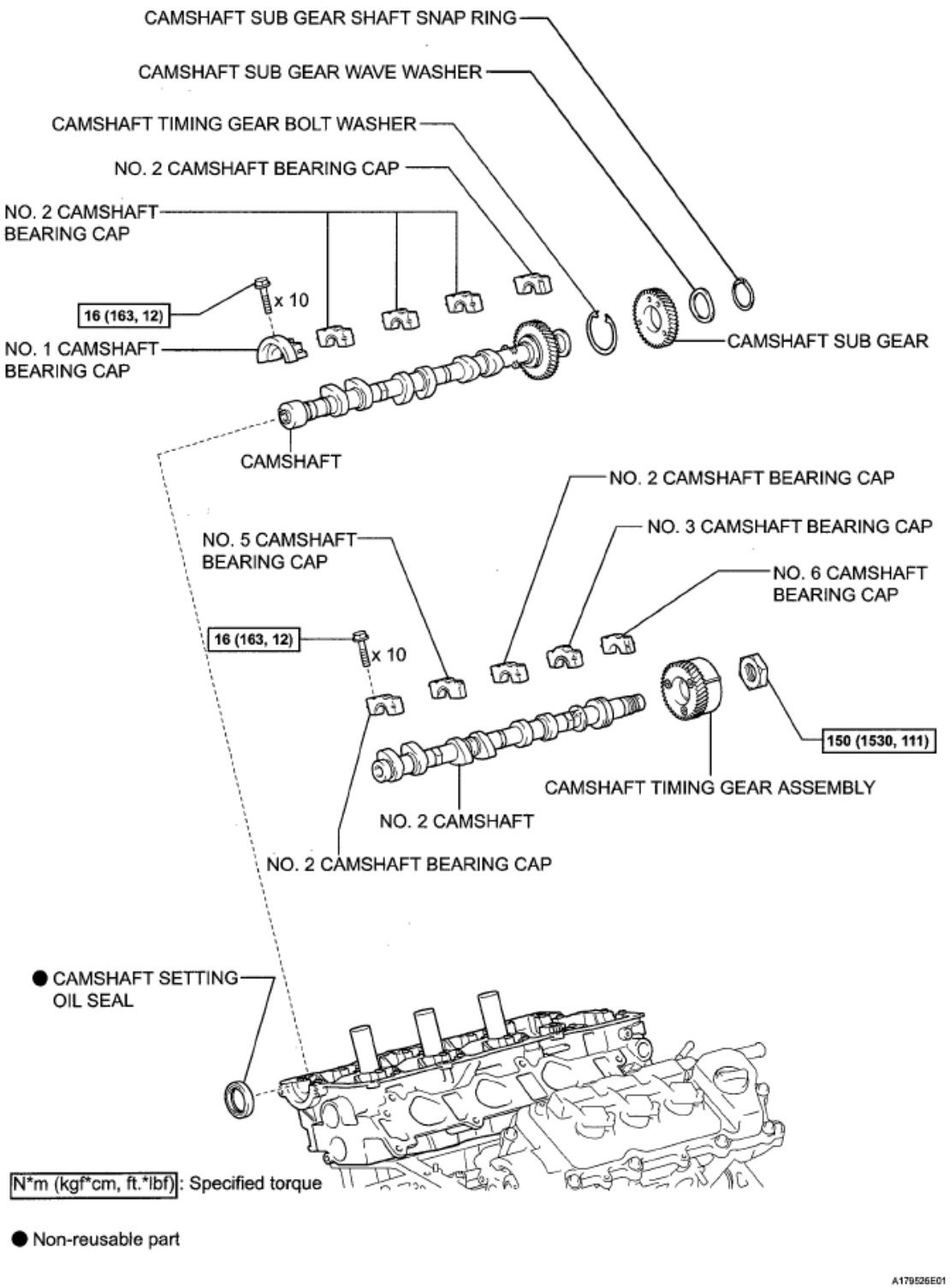


Fig. 72: Identifying Camshaft (Bank 1) Components With Torque Specifications (9 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
3. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
4. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
5. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
6. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
7. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
8. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
9. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
10. **REMOVE FRONT WHEEL RH**
11. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
12. **REMOVE FRONT FENDER LINER RH** (See **REMOVAL**)
13. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
14. **REMOVE BATTERY** (See **REMOVAL**)
15. **REMOVE BATTERY CARRIER SUB-ASSEMBLY** (See **REMOVAL**)
16. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
17. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
18. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)
19. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)
20. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
21. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **REMOVAL**)
22. **REMOVE ENGINE MOVING CONTROL ROD** (See **REMOVAL**)
23. **REMOVE NO. 2 ENGINE MOUNTING STAY RH** (See **REMOVAL**)
24. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
25. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See **ADJUSTMENT**)
26. **REMOVE CRANKSHAFT PULLEY** (See **REMOVAL**)
27. **REMOVE NO. 1 TIMING BELT COVER** (See **REMOVAL**)
28. **REMOVE NO. 2 TIMING BELT COVER** (See **REMOVAL**)
29. **REMOVE ENGINE MOUNTING BRACKET RH** (See **REMOVAL**)
30. **REMOVE NO. 2 TIMING BELT GUIDE**
31. **REMOVE TIMING BELT** (See **REMOVAL**)
32. **REMOVE NO. 2 TIMING BELT IDLER SUB-ASSEMBLY**
    a. Remove the bolt and No. 2 timing belt idler sub-assembly.
33. **REMOVE CAMSHAFT TIMING PULLEY**
    a. Using SST, remove the bolt and the RH timing pulley.

       SST 09960-10010 (09962-01000, 09963-01000), 09961-00950

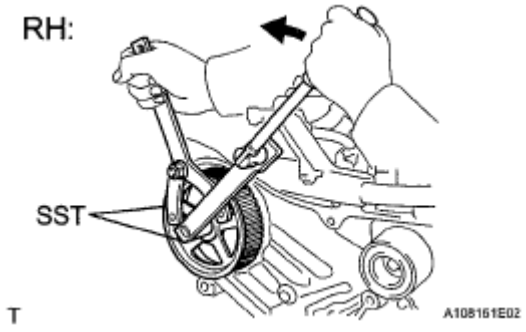


Fig. 73: Removing RH Camshaft Timing Pulley With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, remove the bolt and the LH timing pulley.

SST 09960-10010 (09962-01000, 09963-01000)

HINT:

Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.

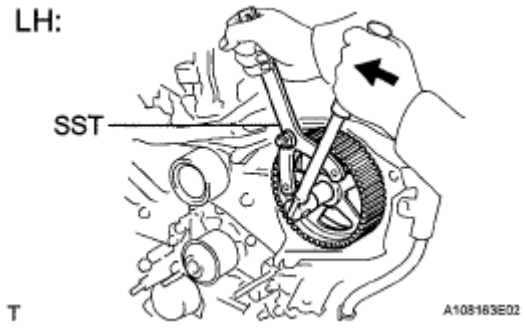


Fig. 74: Removing LH Camshaft Timing Pulley With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **REMOVE NO. 3 TIMING BELT COVER**
    a. Disconnect the 2 engine wire harness clamps from the No. 3 timing belt cover.
    b. Remove the 6 bolts and the timing belt cover.

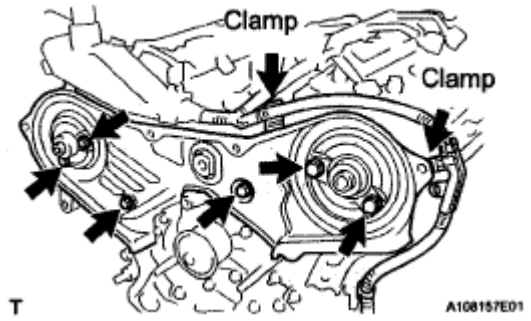


Fig. 75: Locating Timing Belt Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. **REMOVE CAMSHAFT**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Align the timing marks (2-dot mark) of the camshaft drive and the driven gears by turning the camshaft with a wrench.

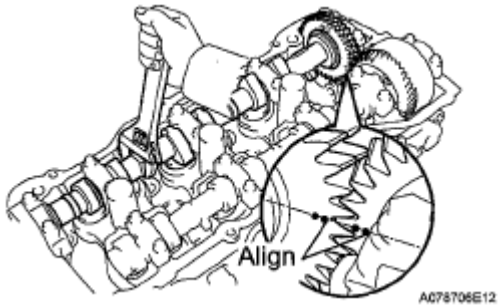


Fig. 76: Identifying Timing Marks Of Camshaft Drive And Driven Gears
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

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

Recommended service bolt:

SERVICE BOLT THREAD DIAMETER SPECIFICATION

Thread diameter	6.0 mm (0.24 in.)
Thread pitch	1.0 mm (0.04 in.)
Bolt length	16 to 20 mm (0.63 to 0.79 in.)

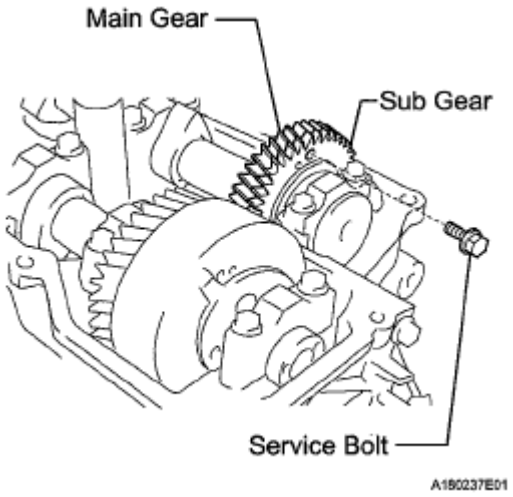


Fig. 77: Identifying Main Gear, Sub Gear And Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

c. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

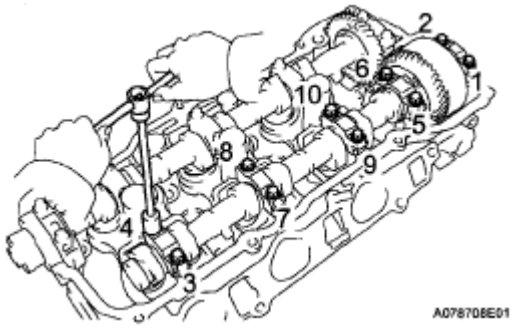


Fig. 78: Removing Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **REMOVE NO. 2 CAMSHAFT**

a. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

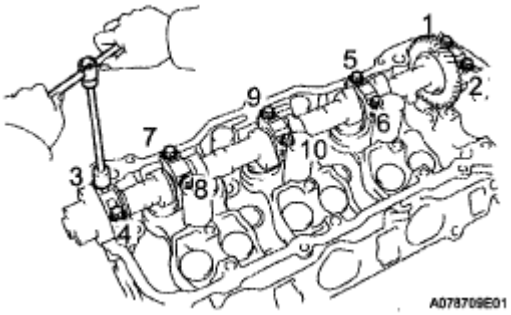


Fig. 79: Removing Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the oil seal from the No. 2 camshaft.

37. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**

a. Clamp the camshaft in a vise on the hexagonal lobe.

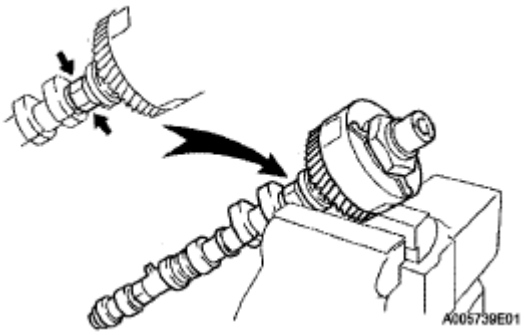


Fig. 80: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Check that the WT-i does not turn.

c. Cover all the oil ports with vinyl tape except the port on the advance angle side (nearest to the convex portion) shown in the illustration.

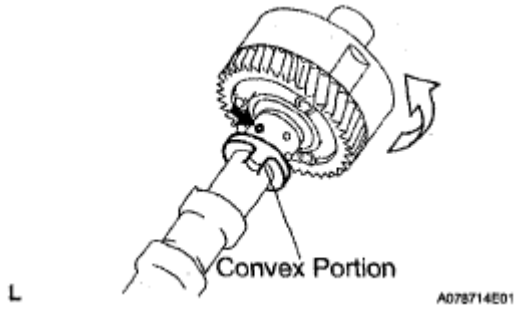


Fig. 81: Identifying All Oil Ports With Vinyl Tape Except Port On Advance Angle Side
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply about 100 kPa (1 kgf/cm^2 , 14 psi) of air pressure to the port on the advance angle side.

NOTE: Cover the ports with a shop rag or piece of cloth when applying pressure to keep oil from splashing.

HINT:

This operation releases the lock pin for the most retard angle lock.

e. Turn the VVT-i to the advance angle side (the white arrow marked direction in the illustration) by hand.

Standard: The VVT-i turns.

HINT:

Depending on the air pressure, the VVT-i will turn to the advance angle side without applying force by hand. Also, if the pressure can be hardly applied because of the air leakage from the port, it might be difficult to get the lock-pin to release.

f. (f)Check that the VVT-i moves freely within about 30° range. Do not move the VVT-i unit to the most retard angle position as the lock-pin will be engaged again.

Standard: Smooth movable range is about 30°

g. Turn the VVT-i by hand and lock it at the most retard angle position.

38. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**

NOTE: Do not remove or install the camshaft timing gear (VVT-i) unless the VVT-i or the camshaft needs to be replaced.

a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

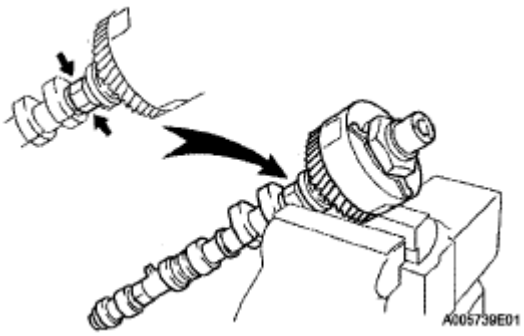


Fig. 82: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTE:

- **Remove it with the lock-pin engaged and locked at the most retard angle position.**
- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

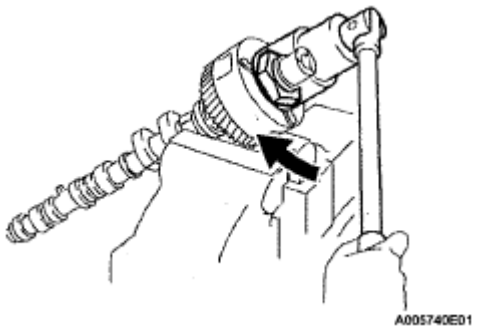


Fig. 83: Identifying Lock Nut With Turning
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the camshaft timing gear assembly.

NOTE: Never remove the 3 bolts on the gear. If it is difficult to remove the timing gear assembly, tap it lightly using a plastic-faced hammer and then remove it.

39. **REMOVE CAMSHAFT SUB GEAR**
    a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

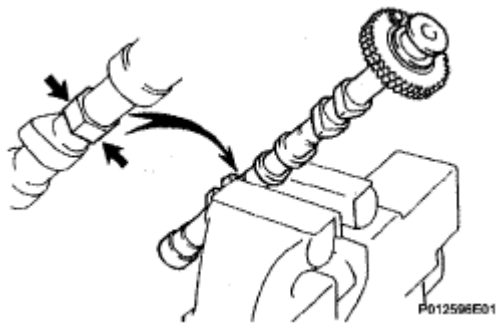


Fig. 84: Identifying Camshaft Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, turn the sub-gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

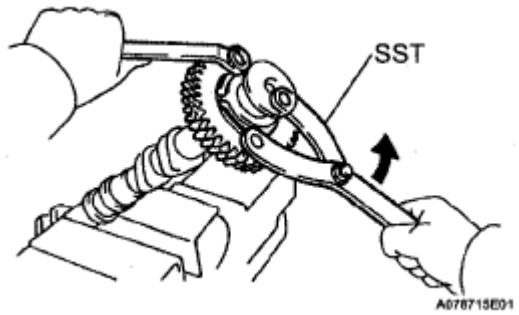


Fig. 85: Removing Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using snap ring pliers, remove the snap ring.

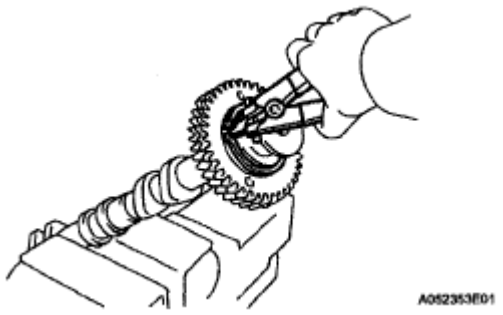


Fig. 86: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the wave washer, camshaft sub-gear and camshaft gear bolt washer.

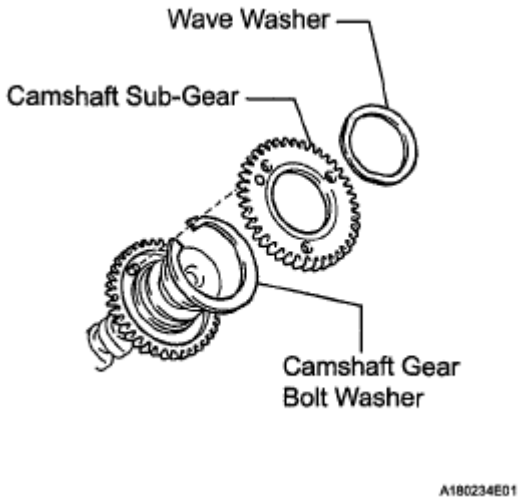


Fig. 87: Identifying Wave Washer, Camshaft Sub-Gear And Camshaft Gear Bolt Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL CAMSHAFT SUB GEAR**
   a. Clamp the camshaft in a vise on the hexagonal lobe.

      NOTE: Do not damage the camshaft.

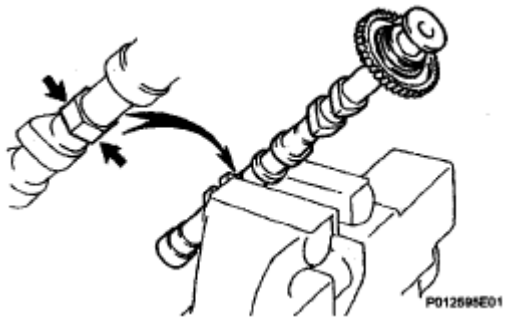


Fig. 88: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the camshaft gear bolt washer and the camshaft sub-gear.

      HINT:

      Attach the pins on the gears to the gear bolt washer ends.

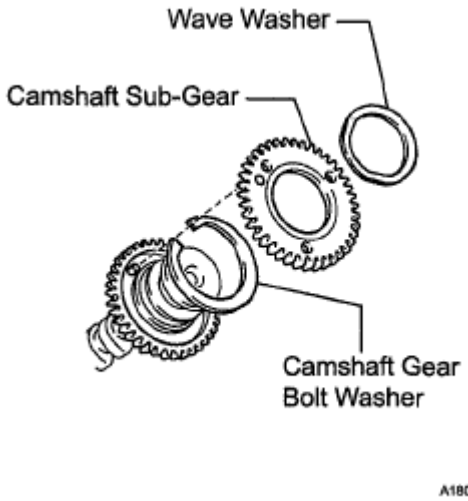


Fig. 89: Identifying Camshaft Gear Bolt Washer And Camshaft Sub-Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the wave washer.
d. Using snap ring pliers, install the snap ring.

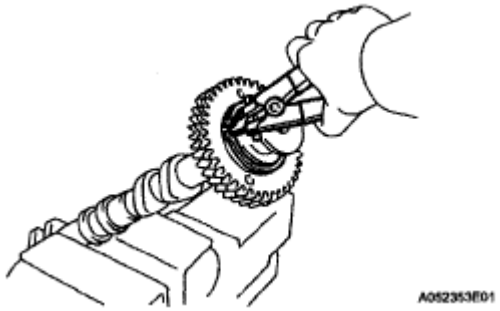


Fig. 90: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using SST, align the holes of the camshaft main gear and sub-gear by turning the camshaft sub-gear counterclockwise, and temporarily install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

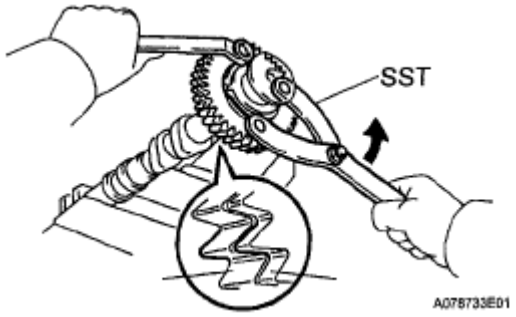


Fig. 91: Aligning Gear Teeth Of Main Gear And Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

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

NOTE: Do not damage the camshaft.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

2. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Align the alignment pin with the groove and install the camshaft timing gear on the camshaft.

NOTE: Install it with the lock-pin engaged and locked at the most retard angle position.

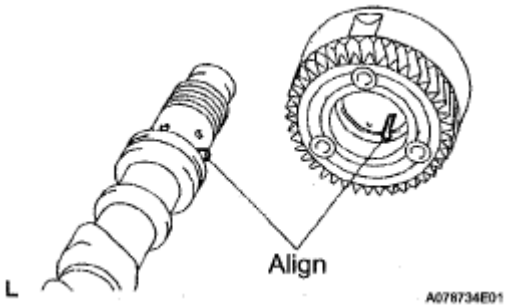


Fig. 92: Identifying Alignment Pin With Alignment Pin Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Apply engine oil to the nut, the mounting surface of the camshaft timing gear and the screw threads.

NOTE:
- **Be sure to apply oil, otherwise the specified torque cannot be**

obtained.

- **A new nut must be used when replacing the camshaft timing gear unit.**

c. Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N*m (1530 kgf*cm, 111 ft.*lbf)

NOTE:

- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

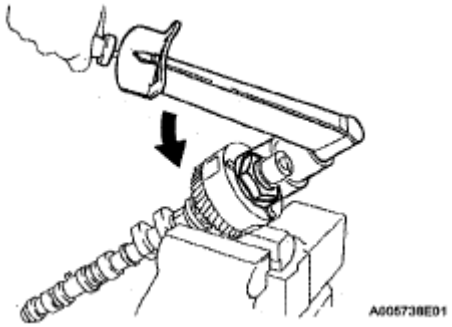


Fig. 93: Installing And Tightening Lock Nut By Turning Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL NO. 2 CAMSHAFT**

NOTE: **Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.**

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Place the No. 2 camshaft at 90° angle of the timing mark (2-dot mark) on the cylinder head.

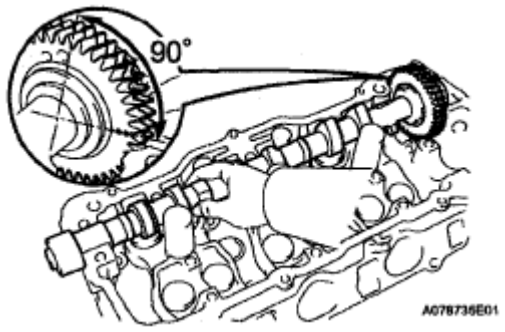


Fig. 94: Placing Camshaft At 90 Degrees Angle Of Timing Mark On Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply MP grease to a new oil seal lip.
d. Install the oil seal to the camshaft.

NOTE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

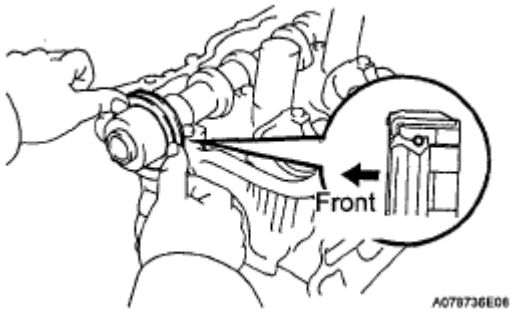


Fig. 95: Installing Oil Seal To Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove any old packing material from the contact surface.
f. Apply seal packing to the No. 1 bearing cap as shown in the illustration.

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

NOTE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

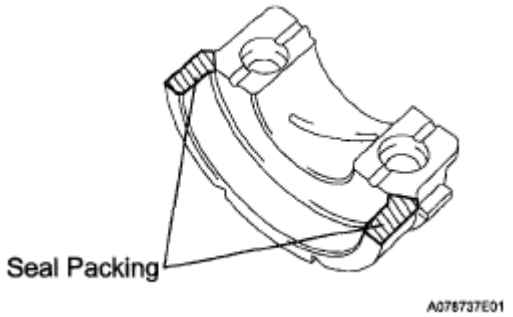


Fig. 96: Identifying Seal Packing To No 1 Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Install the 5 bearing caps in their proper locations.
h. Apply a light coat of engine oil to the threads of the bearing cap bolts.

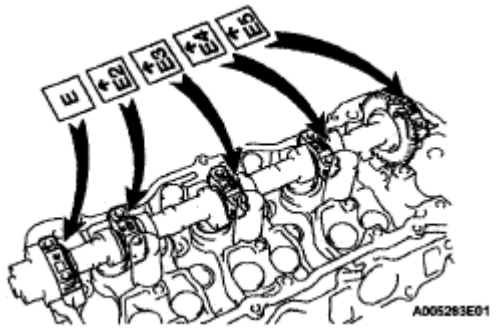


Fig. 97: Identifying Light Coat Of Engine Oil On Threads Of Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

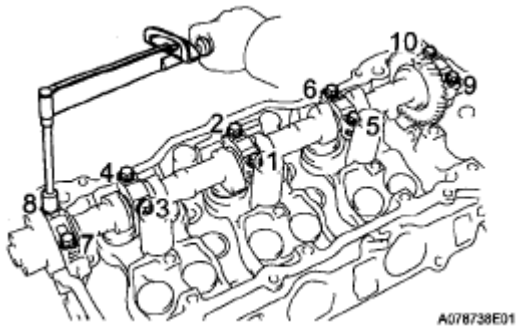


Fig. 98: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL CAMSHAFT**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Align the timing marks (2-dot mark) of the camshaft drive gear with the mark on the driven gear.

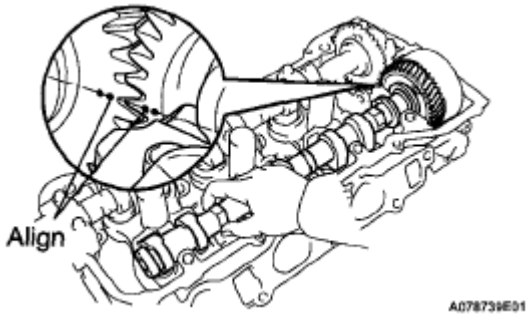


Fig. 99: Aligning Timing Marks Of Camshaft Drive Gear With Mark On Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Place the camshaft on the cylinder head.
d. Install the 5 bearing caps in their proper locations.
e. Apply a light coat of engine oil to the threads of the bearing cap bolts.

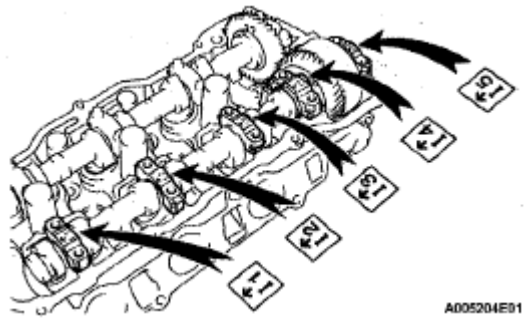


Fig. 100: Identifying Light Coat Of Engine Oil On Threads Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

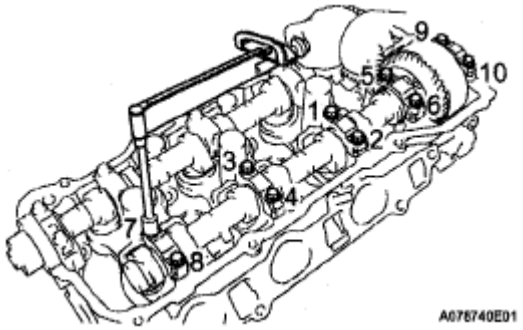


Fig. 101: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the service bolt.

5. **INSTALL NO. 3 TIMING BELT COVER**

a. Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:

If a trace of water is found in the visual check, repair it with seal packing when the crack length is within 20 to 30 mm (0.79 to 1.18 in.). Replace the gasket when the crack length is 30 to 40 mm (1.18 to 1.57 in.) and more.

b. If the timing belt cover gasket is needed to repair, follow the procedure below.

1. Repair the cracks and breaks by applying the seal packing to the damaged area.

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

NOTE: When applying the seal packing, apply it as wide and high as possible to fill the surface area of the gasket.

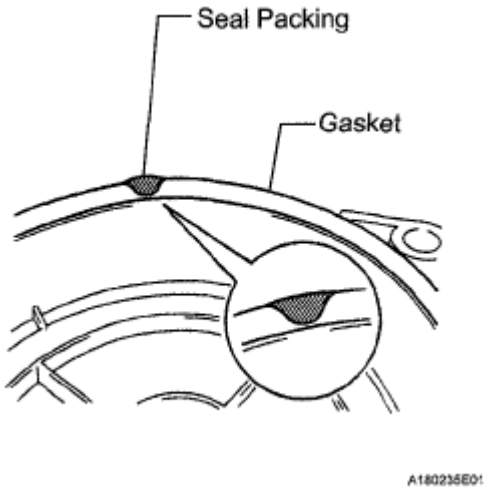


Fig. 102: Identifying Seal Packing To Damaged Area

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

c. If the timing belt cover gasket is needed to replace, follow the procedure below.
   1. Using a screwdriver and gasket scraper, remove the remaining gasket.

      NOTE: Do not damage the timing belt cover.

   2. Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

      NOTE:
      - **Affix the gasket in the center of the groove.**
      - **At the corners, try to keep the gasket thickness uniform.**

      HINT:

      Gasket length

      GASKET LENGTH REFERENCE

Gasket	D	E	F	G
Length	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

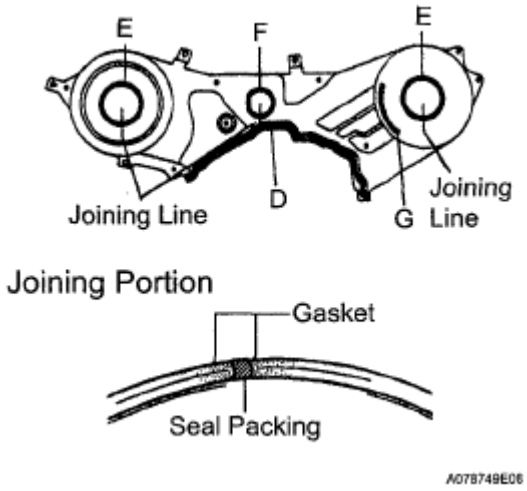


Fig. 103: Identifying Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   3. If there is a gap on the joint of the gasket, apply seal packing to close the gap.

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

      NOTE: When applying the seal packing, apply it as wide and high as possible to fill the surface area of the gasket.

d. Install the timing belt cover No. 3 with the 6 bolts.

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

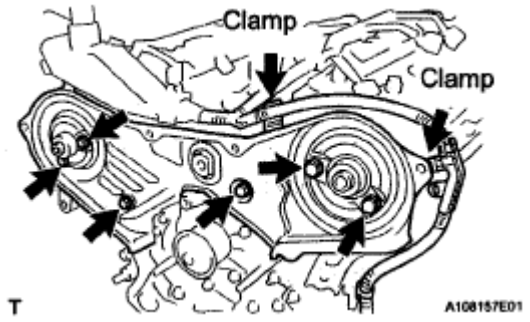


Fig. 104: Locating Timing Belt Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL CAMSHAFT TIMING PULLEY**
   a. Paying attention to the direction of the belt guide, install the camshaft timing pulley and tighten the bolt temporarily.

      HINT:

      - Face the belt guide of the RH timing pulley toward the front of the engine.
      - Face the belt guide of the LH timing pulley toward the rear of the engine.

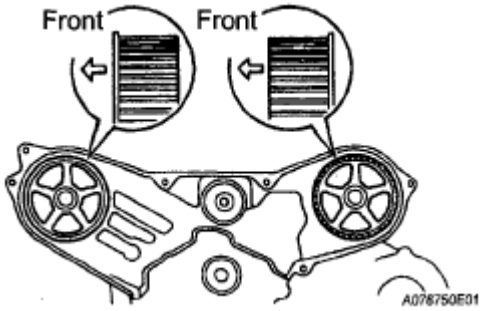


Fig. 105: Identifying Camshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using SST, tighten the RH pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000), 09961-00950

Torque: 125 N*m (1275 kgf*cm, 92 ft.*lbf) for use without SST

90 N*m (913 kgf*cm, 66 ft.*lbf) for use with SST

HINT:

- Use a torque wrench with a fulcrum length of 380 mm (14.96 in.).
- Make sure that SST and the wrench are connected in a straight line.

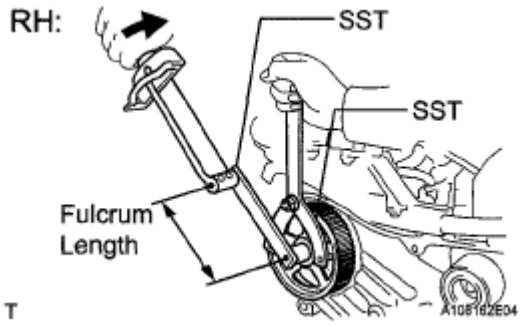


Fig. 106: Identifying Torque Wrench With Fulcrum Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using SST, tighten the LH pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 125 N*m (1275 kgf*cm, 92 ft.*lbf)

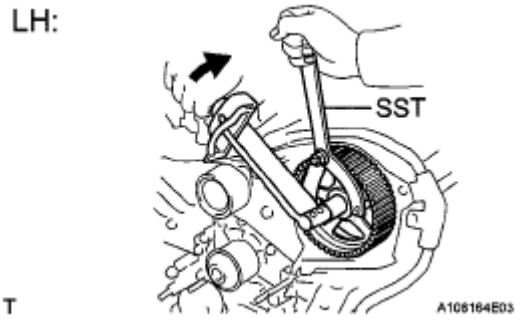


Fig. 107: Identifying Pulley Bolt With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL NO. 2 TIMING BELT IDLER SUB-ASSEMBLY**
   a. Install the No. 2 timing belt idler sub-assembly with the bolt.

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

8. **INSPECT TIMING BELT** (See **INSPECTION**)
9. **INSTALL TIMING BELT** (See **INSTALLATION**)
10. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL NO. 2 TIMING BELT GUIDE** (See **INSTALLATION**)

12. **INSTALL ENGINE MOUNTING BRACKET RH** (See **INSTALLATION**)
13. **INSTALL NO. 2 TIMING BELT COVER** (See **INSTALLATION**)
14. **INSTALL NO. 1 TIMING BELT COVER** (See **INSTALLATION**)
15. **INSTALL CRANKSHAFT PULLEY** (See **INSTALLATION**)
16. **INSTALL NO. 2 ENGINE MOUNTING STAY** (See **INSTALLATION**)
17. **INSTALL ENGINE MOVING CONTROL ROD** (See **INSTALLATION**)
18. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)
19. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **INSTALLATION**)
20. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See **ADJUSTMENT**)
21. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
22. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
23. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)
24. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
25. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
26. **INSTALL BATTERY CARRIER SUB-ASSEMBLY** (See **INSTALLATION**)
27. **INSTALL BATTERY** (See **INSTALLATION**)
28. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
29. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
30. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
31. **INSTALL FRONT WHEEL RH**
32. **ADD ENGINE OIL** (See **REPLACEMENT**)
33. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
34. **INSPECT FOR COOLANT LEAK (for Engine)** (See **ON-VEHICLE INSPECTION**)
35. **INSPECT FOR OIL LEAK**
36. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
37. **INSPECT IDLE SPEED** (See **ON-VEHICLE INSPECTION**)
38. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
39. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
40. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
41. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
42. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
43. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
44. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

CAMSHAFT (FOR BANK 2)

COMPONENTS

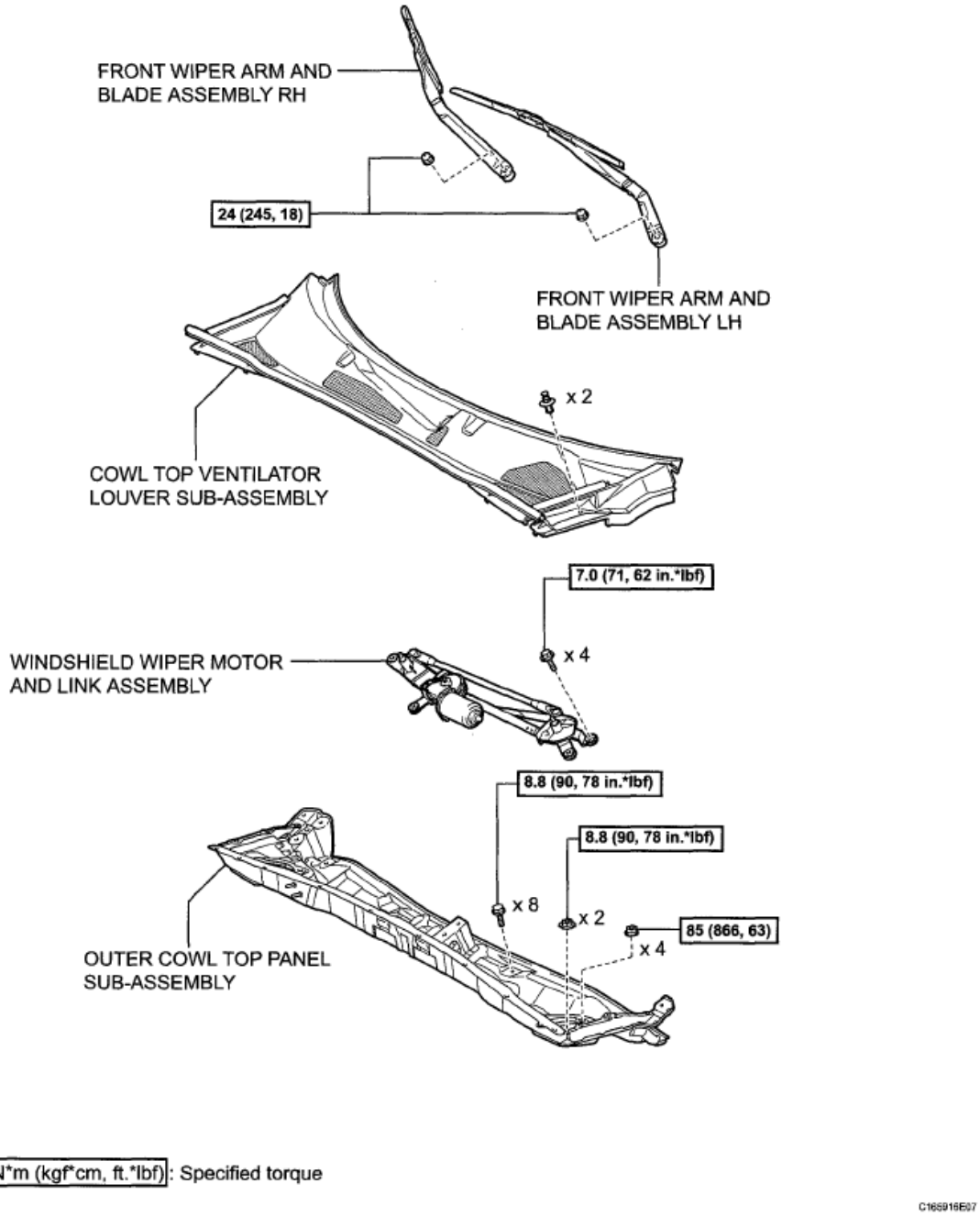


Fig. 108: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (1 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

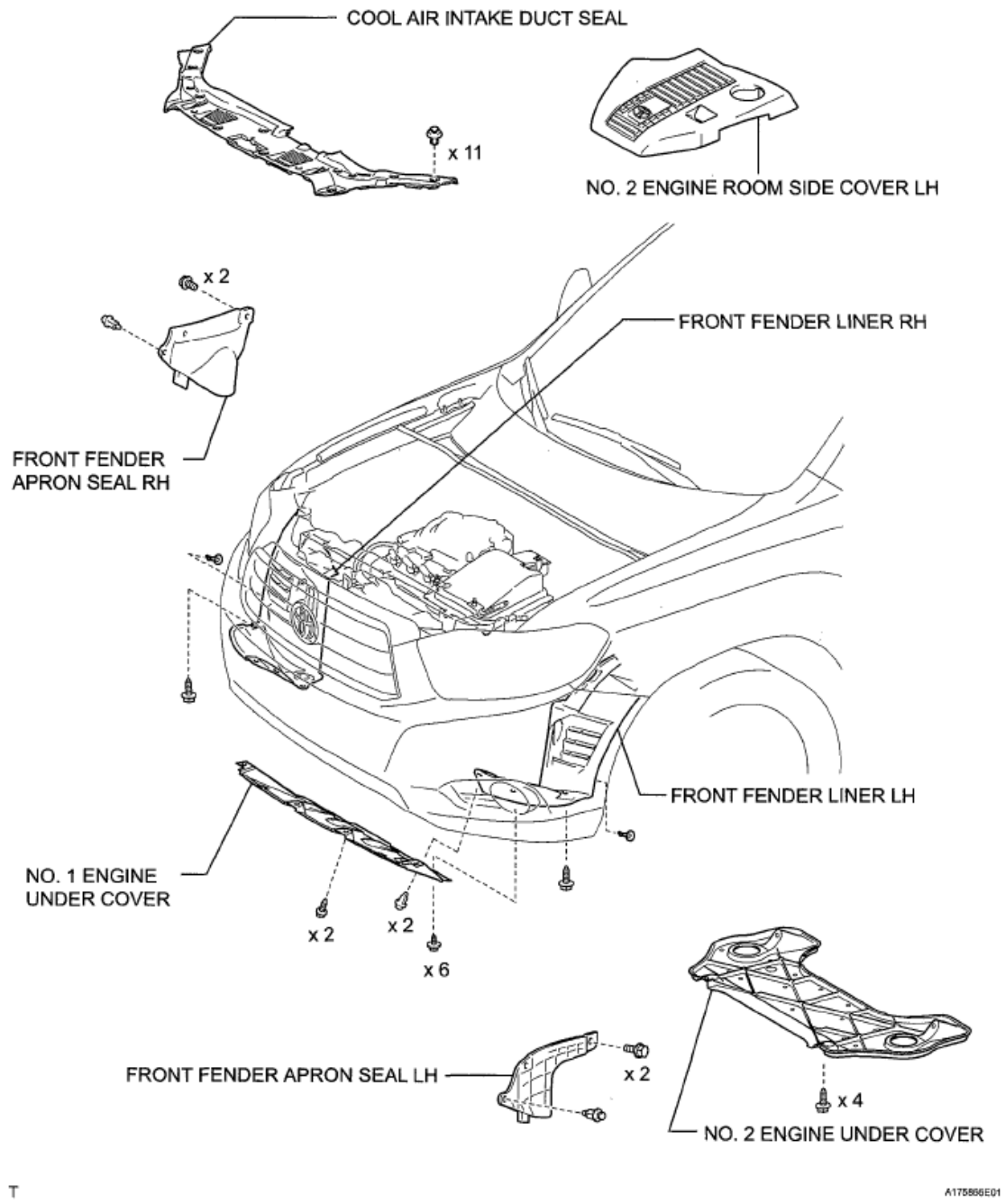


Fig. 109: Identifying Camshaft (Bank 2) Replacement Components (2 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

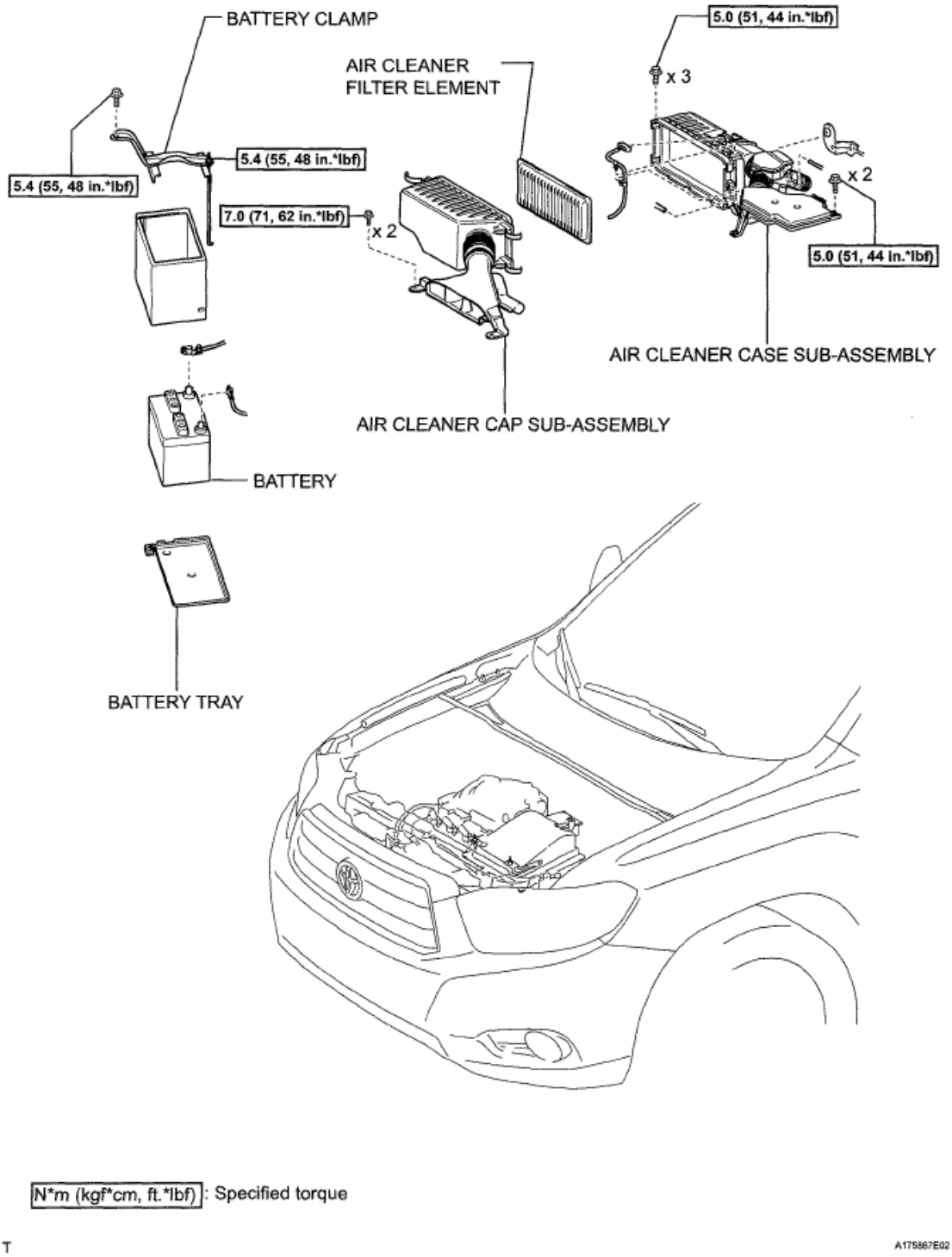


Fig. 110: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (3 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

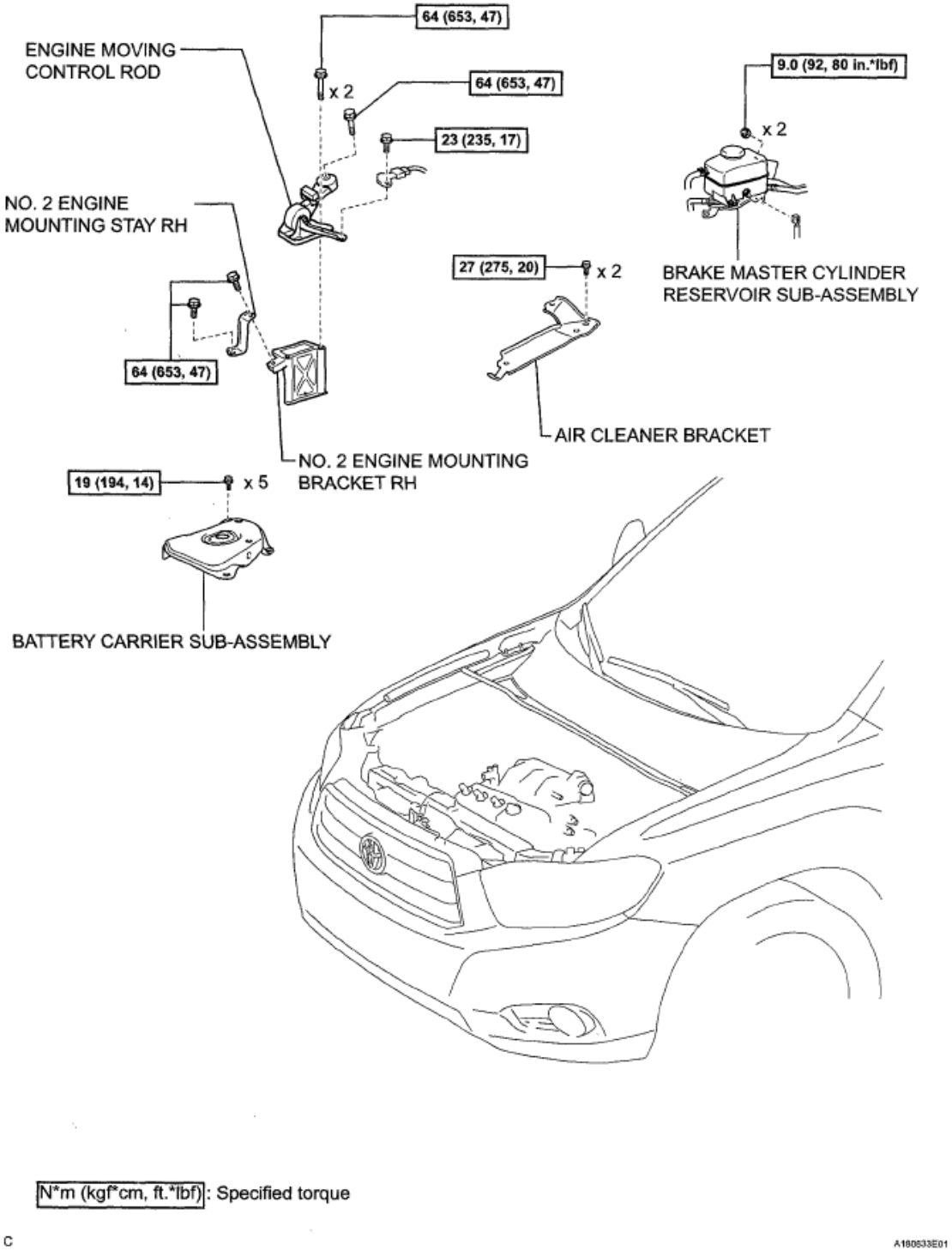


Fig. 111: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (4 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

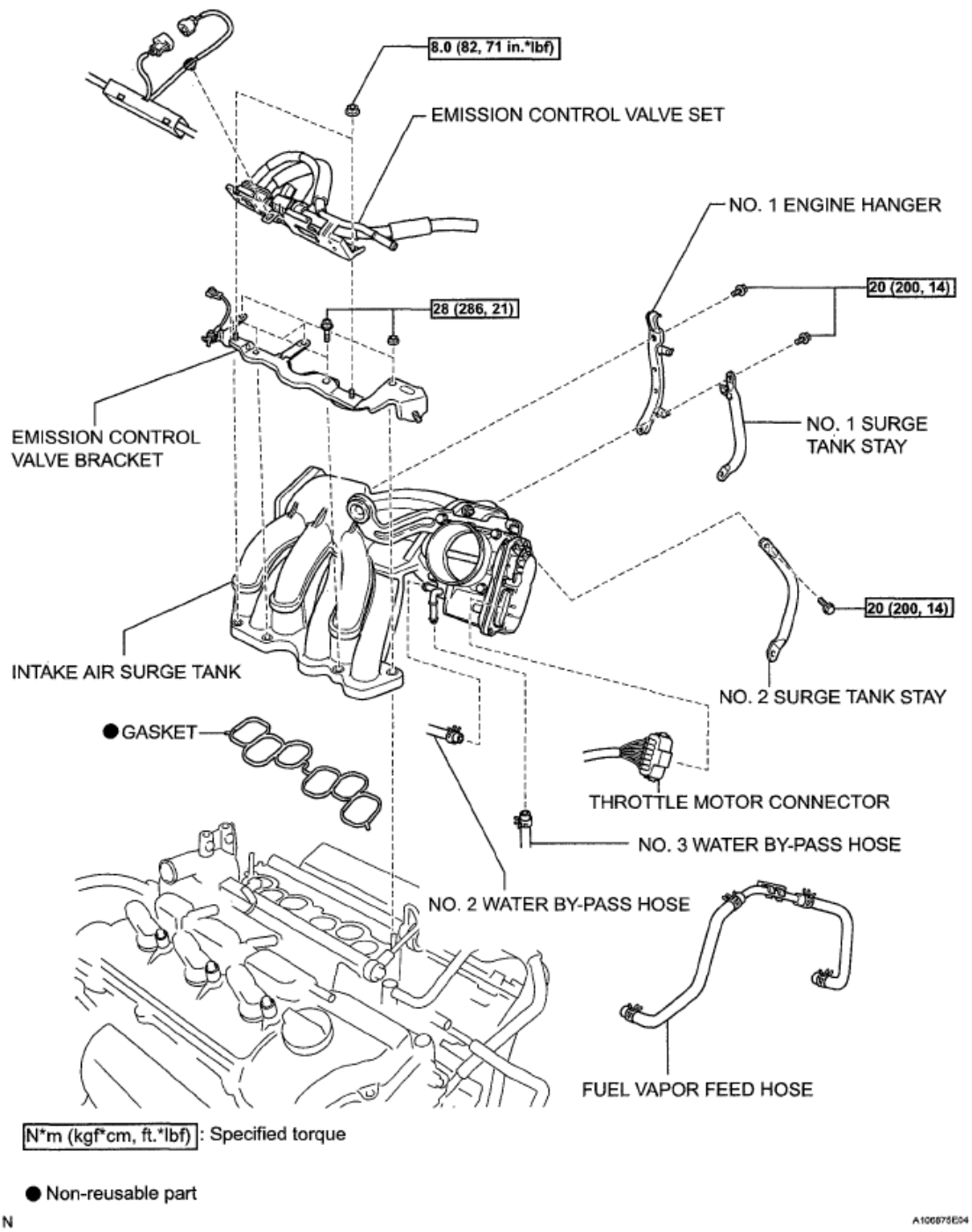


Fig. 112: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (5 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

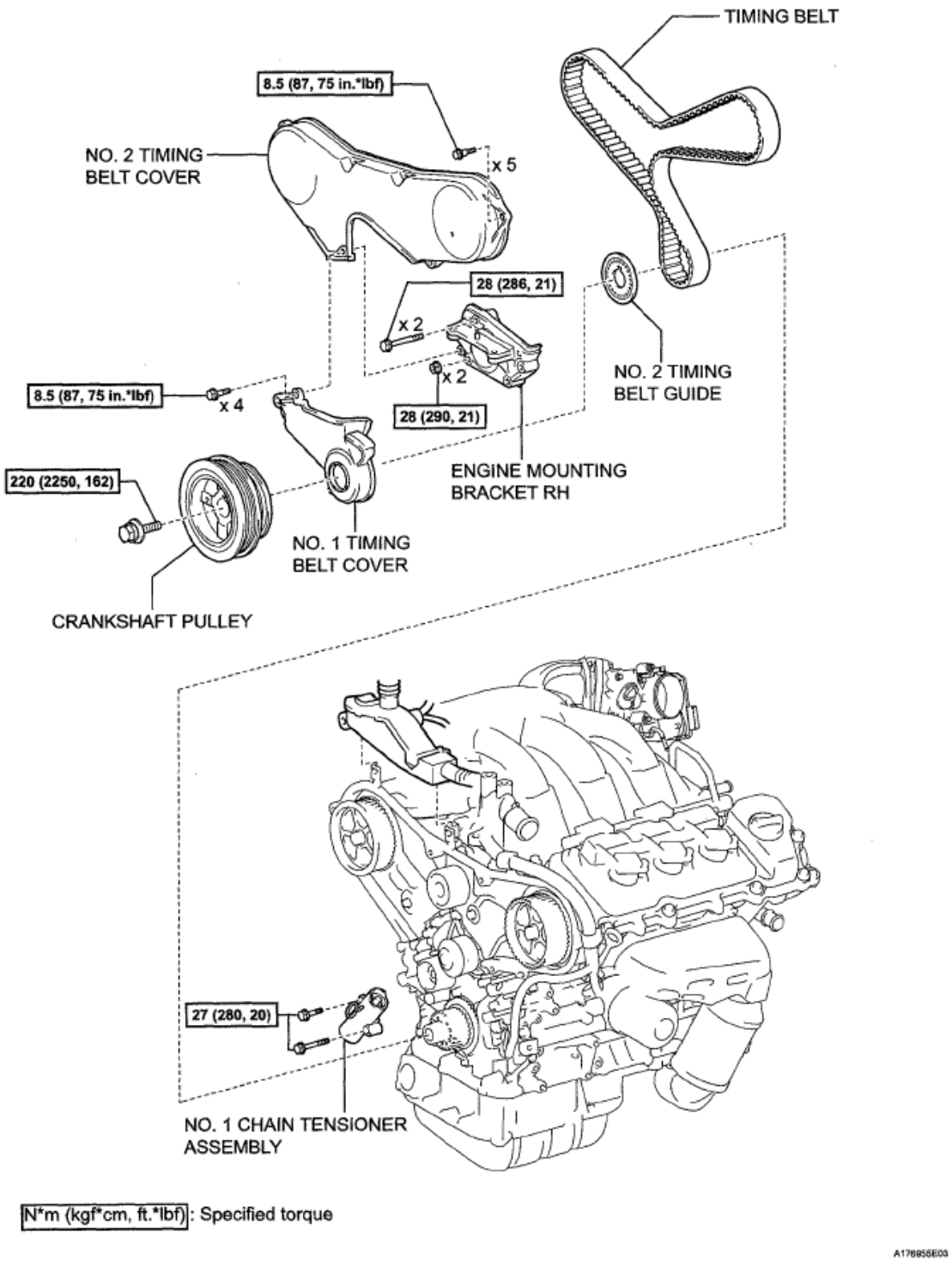


Fig. 113: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (6 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

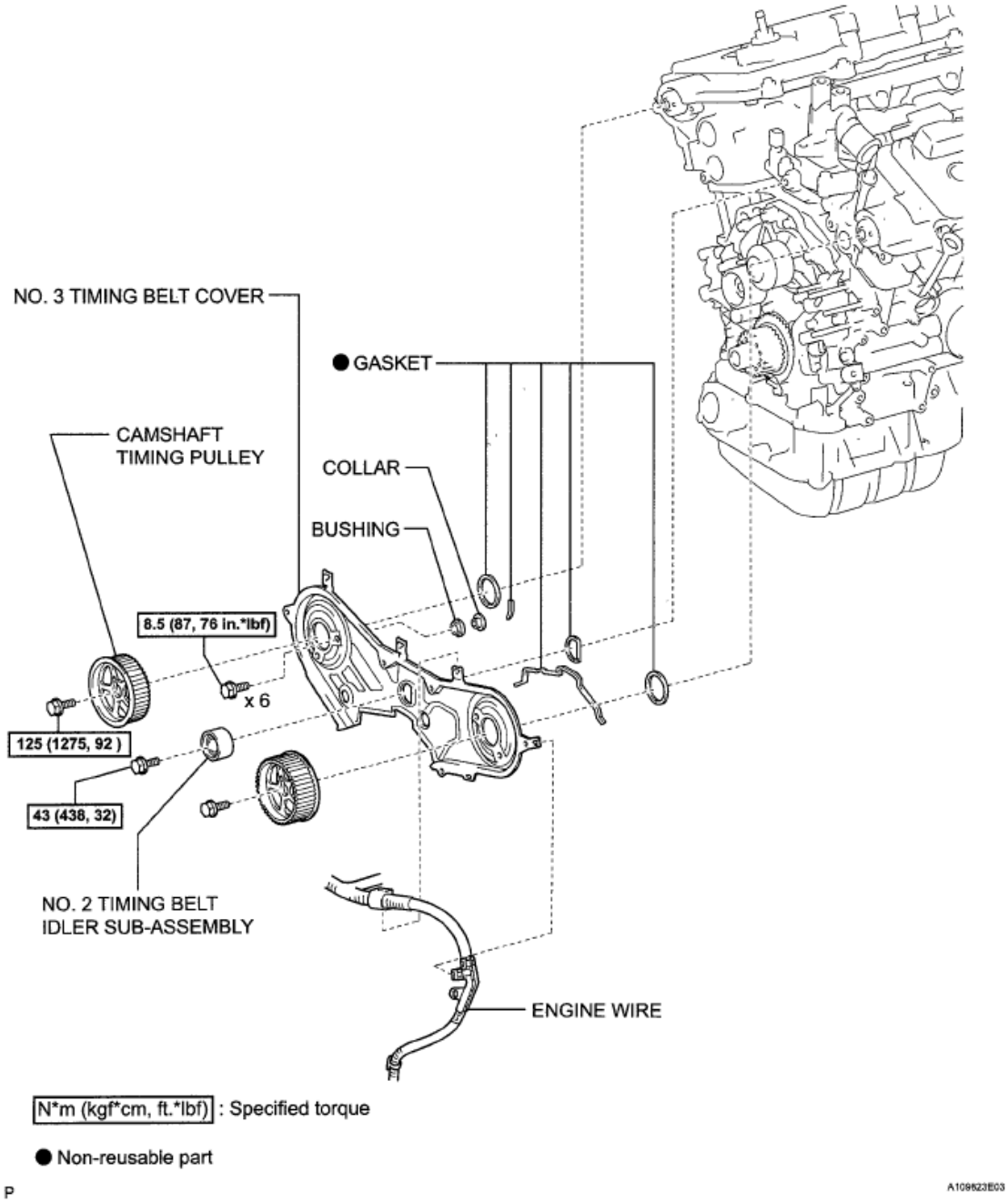


Fig. 114: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (7 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

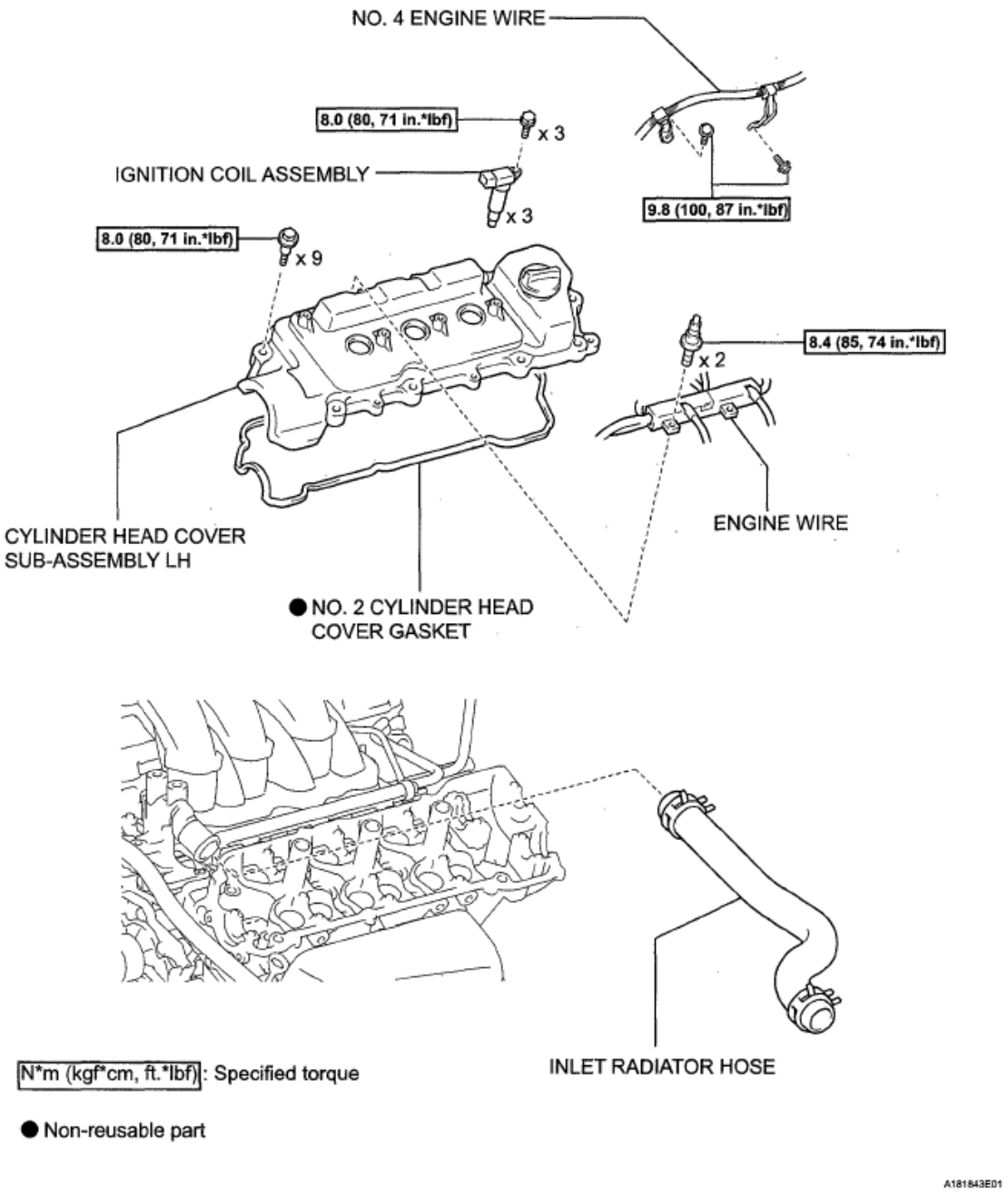


Fig. 115: Identifying Camshaft (Bank 2) Replacement Components With Torque Specifications (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

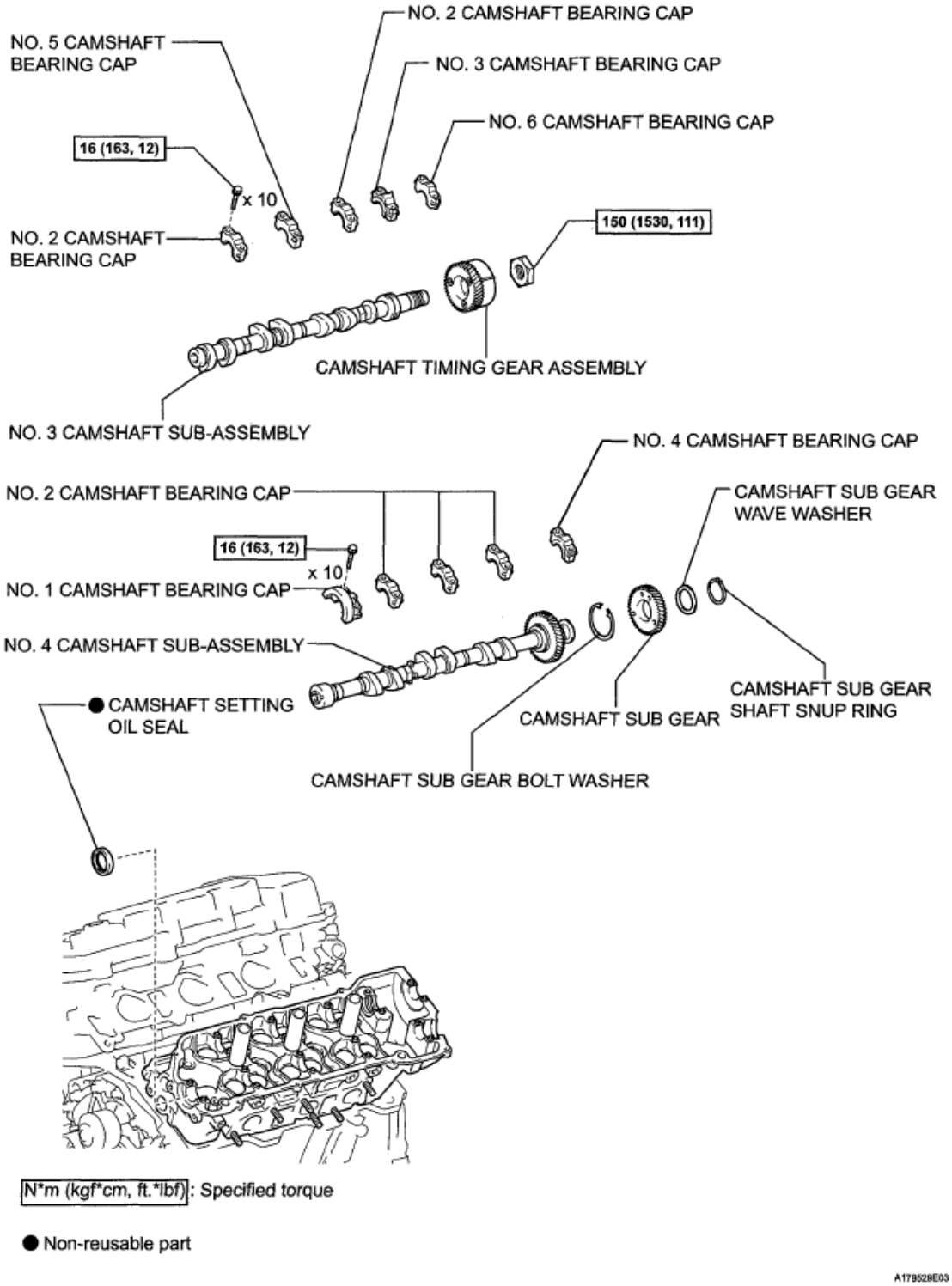


Fig. 116: Identifying Camshaft (Bank 2) Components With Torque Specifications (9 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
3. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
4. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
5. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
6. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
7. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
8. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
9. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
10. **REMOVE FRONT WHEEL RH**
11. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
12. **REMOVE FRONT FENDER LINER RH** (See **REMOVAL**)
13. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
14. **REMOVE BATTERY** (See **REMOVAL**)
15. **REMOVE BATTERY CARRIER SUB-ASSEMBLY** (See **REMOVAL**)
16. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
17. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
18. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)
19. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)
20. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
21. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **REMOVAL**)
22. **REMOVE ENGINE MOVING CONTROL ROD** (See **REMOVAL**)
23. **REMOVE NO. 2 ENGINE MOUNTING STAY RH** (See **REMOVAL**)
24. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
25. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH** (See **ADJUSTMENT**)
26. **REMOVE CRANKSHAFT PULLEY** (See **REMOVAL**)
27. **REMOVE NO. 1 TIMING BELT COVER** (See **REMOVAL**)
28. **REMOVE NO. 2 TIMING BELT COVER** (See **REMOVAL**)
29. **REMOVE ENGINE MOUNTING BRACKET RH** (See **REMOVAL**)
30. **REMOVE NO. 2 TIMING BELT GUIDE**
31. **REMOVE TIMING BELT** (See **REMOVAL**)
32. **REMOVE NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **REMOVAL**)
33. **REMOVE CAMSHAFT TIMING PULLEY** (See **REMOVAL**)
34. **REMOVE NO. 3 TIMING BELT COVER** (See **REMOVAL**)
35. **REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY**

NOTE: **Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level,**

damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Align the timing marks (1-dot mark) of the camshaft drive and the driven gears by turning the camshaft with a wrench.

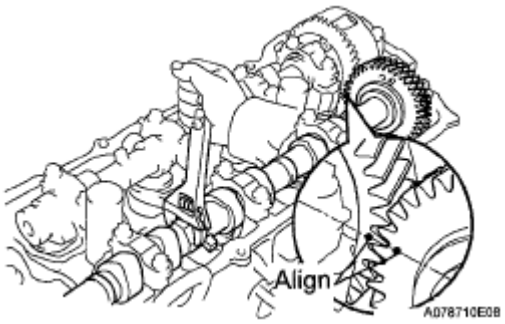


Fig. 117: Identifying Timing Marks Of Camshaft Drive And Driven Gears
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

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

Recommended service bolt:

SERVICE BOLT THREAD DIAMETER SPECIFICATION

Thread diameter	6.0 mm (0.24 in.)
Thread pitch	1.0 mm (0.04 in.)
Bolt length	16 to 20 mm (0.63 to 0.79 in.)

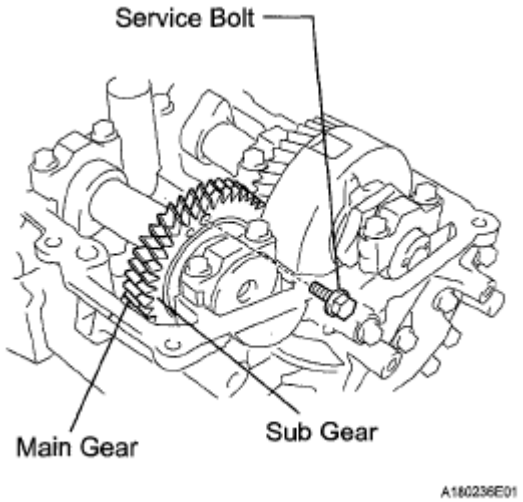


Fig. 118: Identifying Sub-Gear, Main Gear With Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

c. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

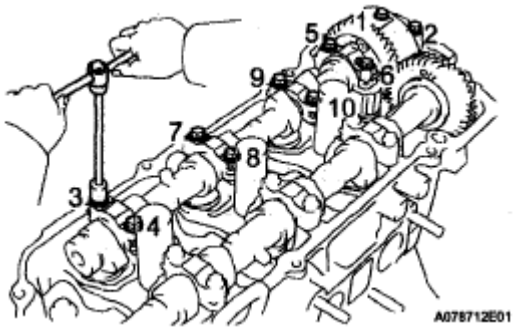


Fig. 119: Identifying Loosening Sequence Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY**

a. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

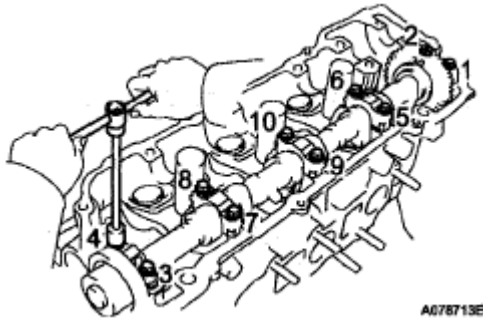


Fig. 120: Identifying Loosening Sequence Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the oil seal from the No. 4 camshaft.

37. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**

a. Clamp the camshaft in a vise on the hexagonal lobe.

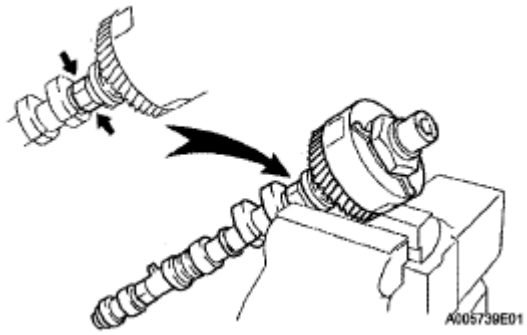


Fig. 121: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Check that the VVT-i does not turn.

c. Cover all the oil ports with vinyl tape except the port on the advance angle side (nearest to the convex portion) shown in the illustration.

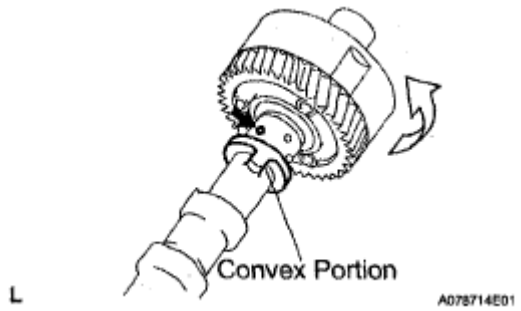


Fig. 122: Identifying All Oil Ports With Vinyl Tape Except Port On Advance Angle Side
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply about 100 kPa (1 kgf/cm^2 , 14 psi) of air pressure to the port on the advance angle side.

NOTE: Cover the ports with a shop rag or piece of cloth when applying pressure to keep oil from splashing.

HINT:

This operation releases the lock pin for the most retard angle lock.

e. Turn the VVT-i to the advance angle side (the white arrow marked direction in the illustration) by hand.

Standard: The VVT-i turns.

HINT:

Depending on the air pressure, the VVT-i will turn to the advance angle side without applying force by hand. Also, if the pressure can be hardly applied because of the air leakage from the port, it might be difficult to get the lock-pin to release.

f. Check that the VVT-i moves freely within about 30° range. Do not move the VVT-i unit to the most retard angle position as the lock-pin will be engaged again.

Standard: Smooth movable range is about 30°.

g. Turn the VVT-i by hand and lock it at the most retard angle position.

38. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**

NOTE: Do not remove or install the camshaft timing gear (VVT-i) unless the VVT-i or the camshaft needs to be replaced.

a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

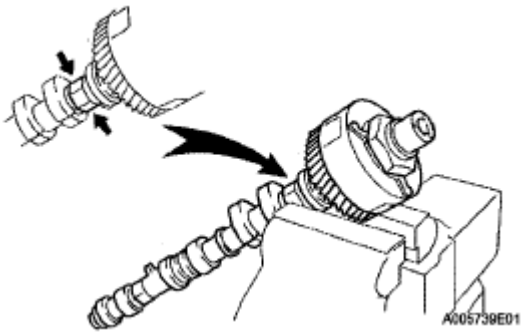


Fig. 123: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTE:

- **Remove it with the lock-pin engaged and locked at the most retard angle position.**
- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

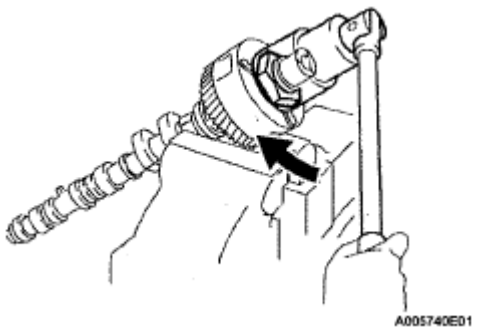


Fig. 124: Identifying Lock Nut With Turning
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the camshaft timing gear assembly.

NOTE: Never remove the 3 bolts on the gear.

If it is difficult to remove the timing gear assembly, tap it lightly using a plastic-faced hammer and then remove it.

39. **REMOVE CAMSHAFT SUB GEAR**

a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

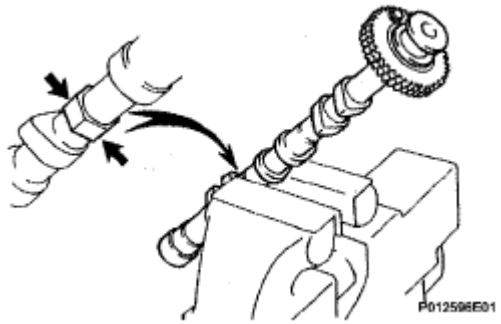


Fig. 125: Identifying Camshaft Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, turn the sub-gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

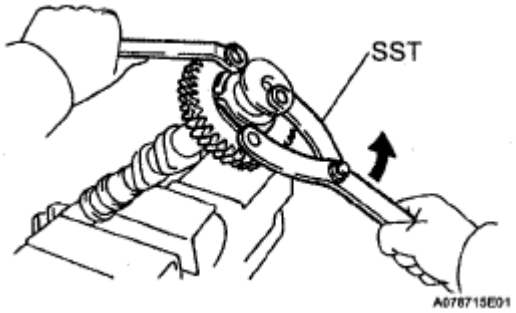


Fig. 126: Removing Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using snap ring pliers, remove the snap ring.

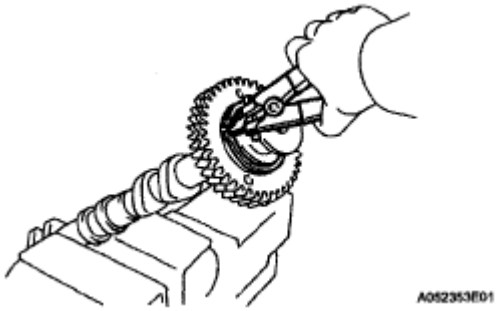


Fig. 127: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the wave washer, camshaft sub-gear and camshaft gear bolt washer.

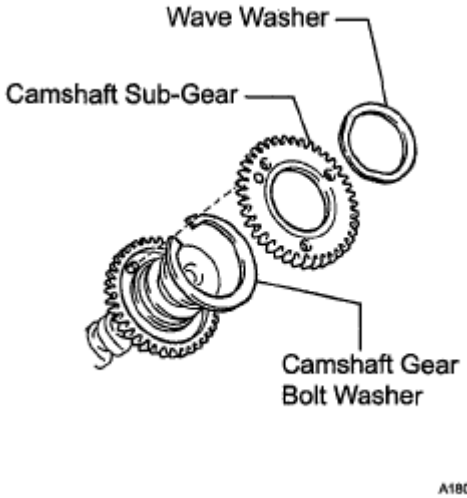


Fig. 128: Identifying Wave Washer, Camshaft Sub-Gear And Camshaft Gear Bolt Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL CAMSHAFT SUB GEAR**
   a. Clamp the camshaft in a vise on the hexagonal lobe.

   NOTE: Do not damage the camshaft.

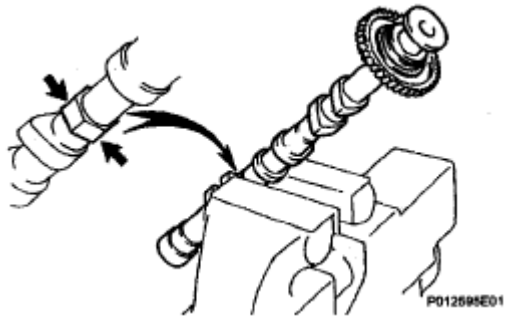


Fig. 129: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the camshaft gear bolt washer and the camshaft sub-gear.

   HINT:

   Attach the pins on the gears to the gear bolt washer ends.

   c. Install the wave washer.

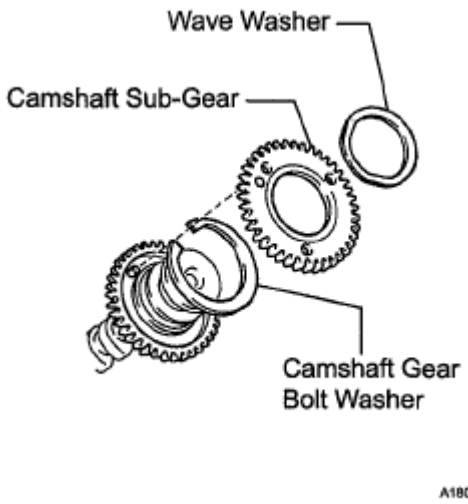


Fig. 130: Identifying Wave Washer, Camshaft Sub-Gear And Camshaft Gear Bolt Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   d. Using snap ring pliers, install the snap ring.

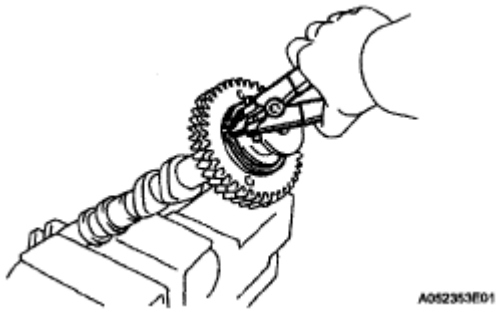


Fig. 131: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using SST, align the holes of the camshaft main gear and sub-gear by turning the camshaft sub-gear counterclockwise, and temporarily install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

f. Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

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

NOTE: Do not damage the camshaft.

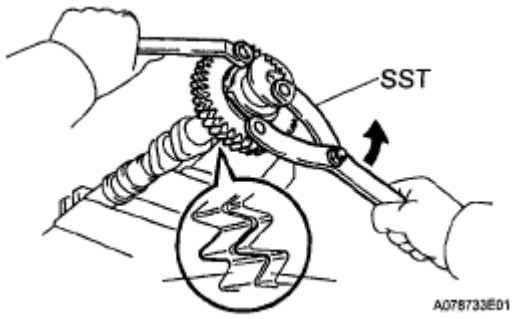


Fig. 132: Aligning Gear Teeth Of Main Gear And Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

2. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Align the alignment pin with the groove and install the camshaft timing gear on the camshaft.

NOTE: Install it with the lock-pin engaged and locked at the most retard angle position.

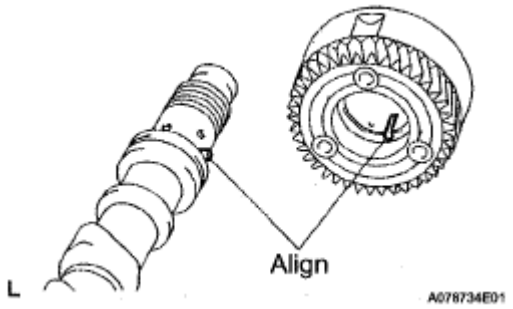


Fig. 133: Identifying Alignment Pin With Alignment Pin Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Apply engine oil to the nut, the mounting surface of the camshaft timing gear and the screw threads.

NOTE:
- **Be sure to apply oil, otherwise the specified torque cannot be obtained.**
- **A new nut must be used when replacing the camshaft timing gear unit.**

c. Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N*m (1530 kgf*cm, 111 ft.*lbf)

NOTE:
- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

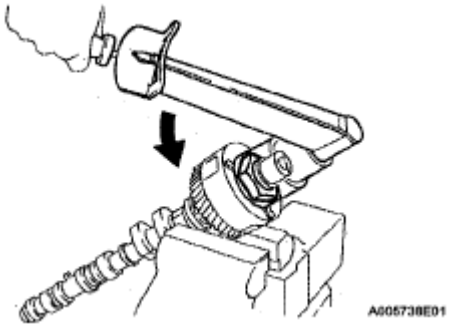


Fig. 134: Installing And Tightening Lock Nut By Turning Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be

kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Place the No. 4 camshaft at 90° angle of the timing mark (1-dot mark) on the cylinder head.

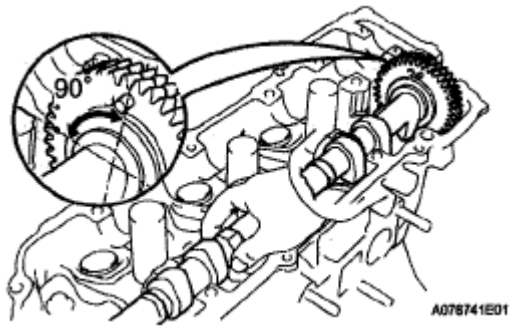


Fig. 135: Placing Camshaft At 90 Degrees Angle Of Timing Mark On Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply MP grease to a new oil seal lip.
d. Install the oil seal to the camshaft.

NOTE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

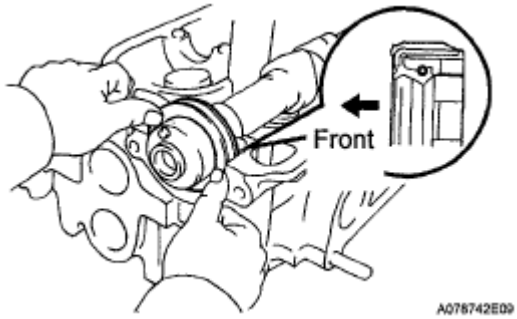


Fig. 136: Identifying Oil Seal To Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove any old packing material from the contact surface.
f. Apply seal packing to the No. 1 bearing cap as shown in the illustration.

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

NOTE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal**

packing.

- **Do not expose the seal to engine oil within 2 hours after installing.**

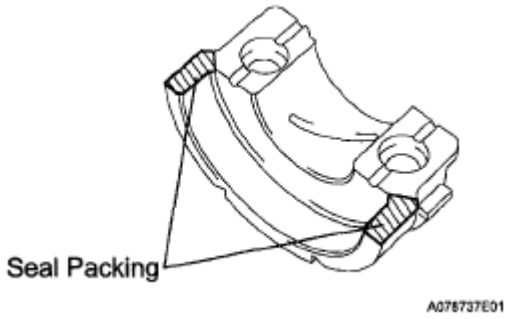


Fig. 137: Identifying Seal Packing To No 1 Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Install the 5 bearing caps in their proper locations.
h. Apply a light coat of engine oil to the threads of the bearing cap bolts.

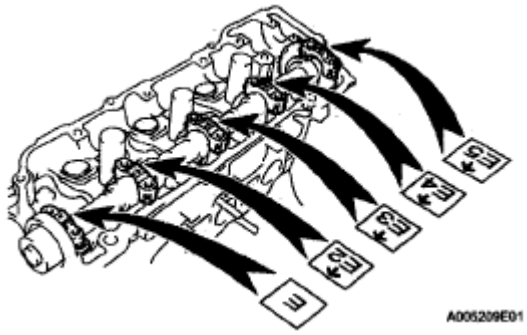


Fig. 138: Identifying Light Coat Of Engine Oil On Threads Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

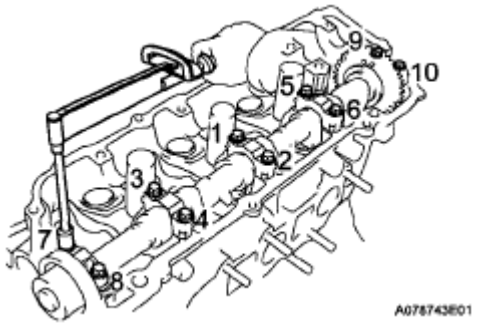


Fig. 139: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Align the timing marks (1-dot mark) of the camshaft drive gear with the mark on the driven gear.

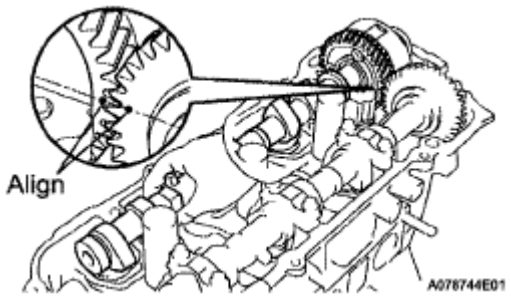


Fig. 140: Aligning Timing Marks Of Camshaft Drive Gear With Mark On Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Place the camshaft on the cylinder head.
d. Install the 5 bearing caps in their proper locations.
e. Apply a light coat of engine oil to the threads of the bearing cap bolts.

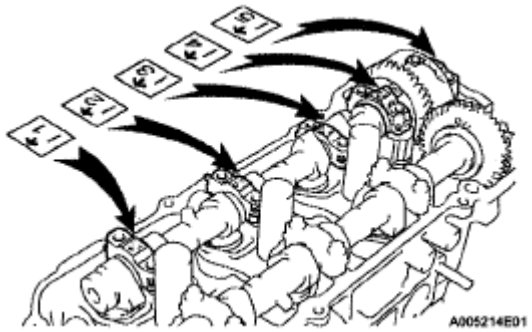


Fig. 141: Identifying Light Coat Of Engine Oil On Threads Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

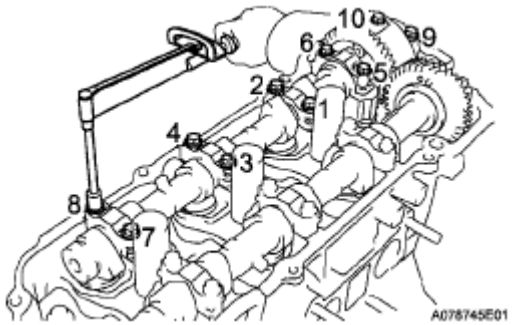


Fig. 142: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the service bolt.

5. **INSTALL NO. 3 TIMING BELT COVER** (See **INSTALLATION**)
6. **INSTALL CAMSHAFT TIMING PULLEY** (See **INSTALLATION**)
7. **INSTALL NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **INSTALLATION**)
8. **INSPECT TIMING BELT** (See **INSPECTION**)
9. **INSTALL TIMING BELT** (See **INSTALLATION**)
10. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL NO. 2 TIMING BELT GUIDE** (See **INSTALLATION**)
12. **INSTALL ENGINE MOUNTING BRACKET RH** (See **INSTALLATION**)
13. **INSTALL NO. 2 TIMING BELT COVER** (See **INSTALLATION**)
14. **INSTALL NO. 1 TIMING BELT COVER** (See **INSTALLATION**)
15. **INSTALL CRANKSHAFT PULLEY** (See **INSTALLATION**)
16. **INSTALL NO. 2 ENGINE MOUNTING STAY** (See **INSTALLATION**)

17. **INSTALL ENGINE MOVING CONTROL ROD** (See **INSTALLATION**)
18. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **INSTALLATION**)
19. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)
20. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH** (See **ADJUSTMENT**)
21. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
22. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
23. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)
24. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
25. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
26. **INSTALL BATTERY CARRIER SUB-ASSEMBLY** (See **INSTALLATION**)
27. **INSTALL BATTERY** (See **INSTALLATION**)
28. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
29. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
30. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
31. **INSTALL FRONT WHEEL RH**
32. **ADD ENGINE OIL** (See **REPLACEMENT**)
33. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
34. **INSPECT FOR COOLANT LEAK (for Engine)** (See **ON-VEHICLE INSPECTION**)
35. **INSPECT FOR OIL LEAK**
36. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
37. **INSPECT IDLE SPEED** (See **ON-VEHICLE INSPECTION**)
38. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
39. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
40. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
41. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
42. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
43. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
44. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

CYLINDER HEAD GASKET (FOR BANK 1)

COMPONENTS

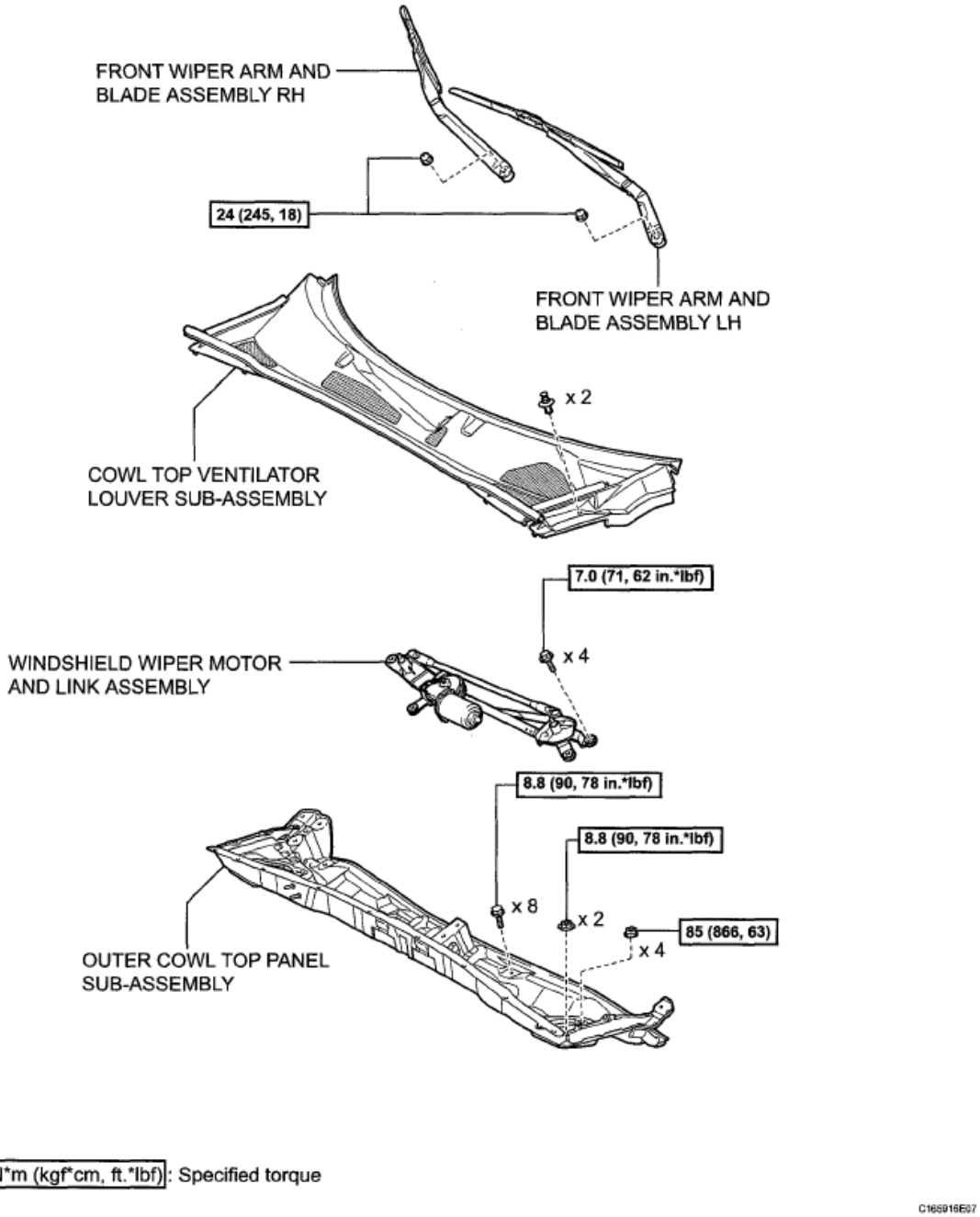


Fig. 143: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (1 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

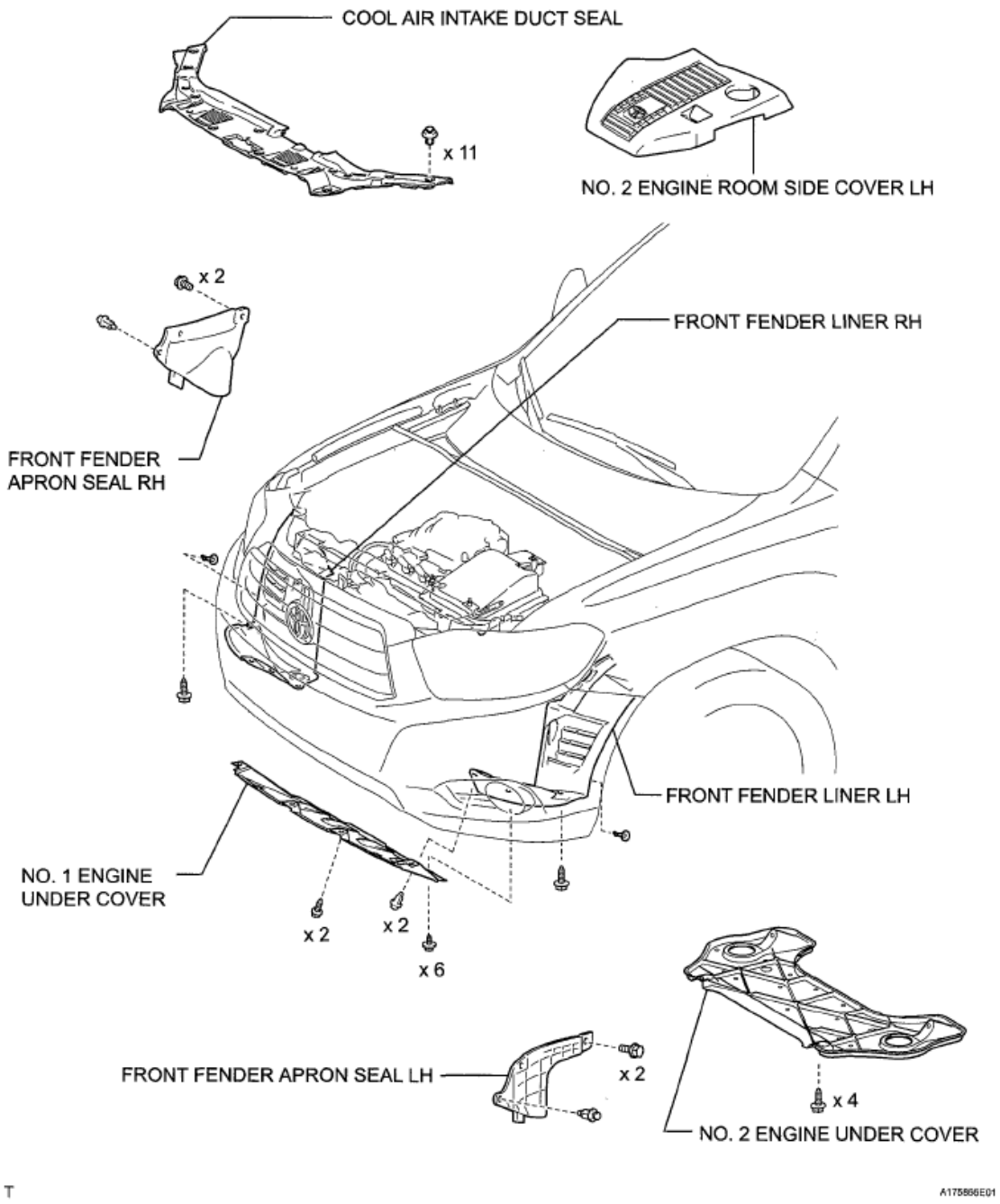


Fig. 144: Identifying Cylinder Head Gasket (Bank 1) Replacement Components (2 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

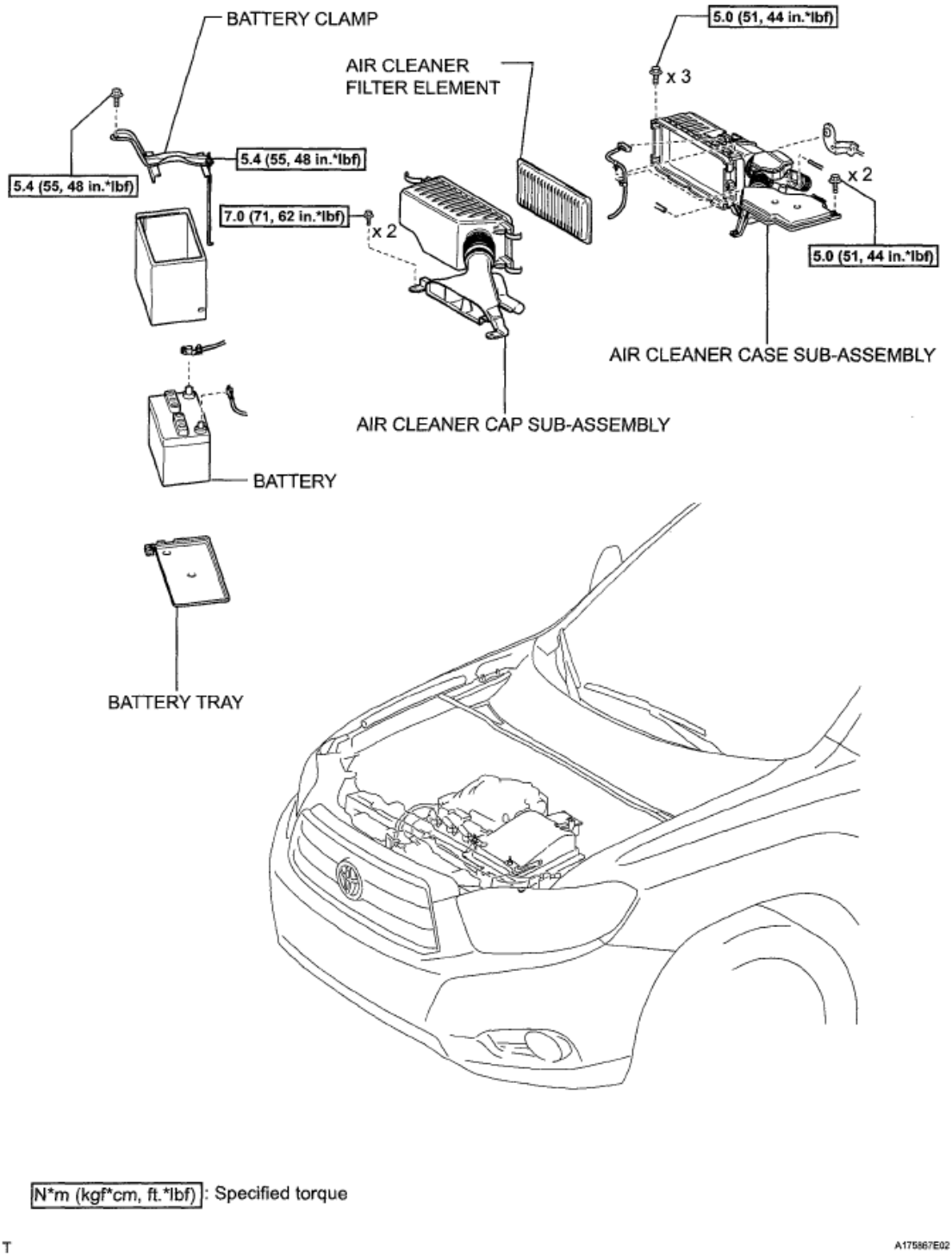


Fig. 145: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (3 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

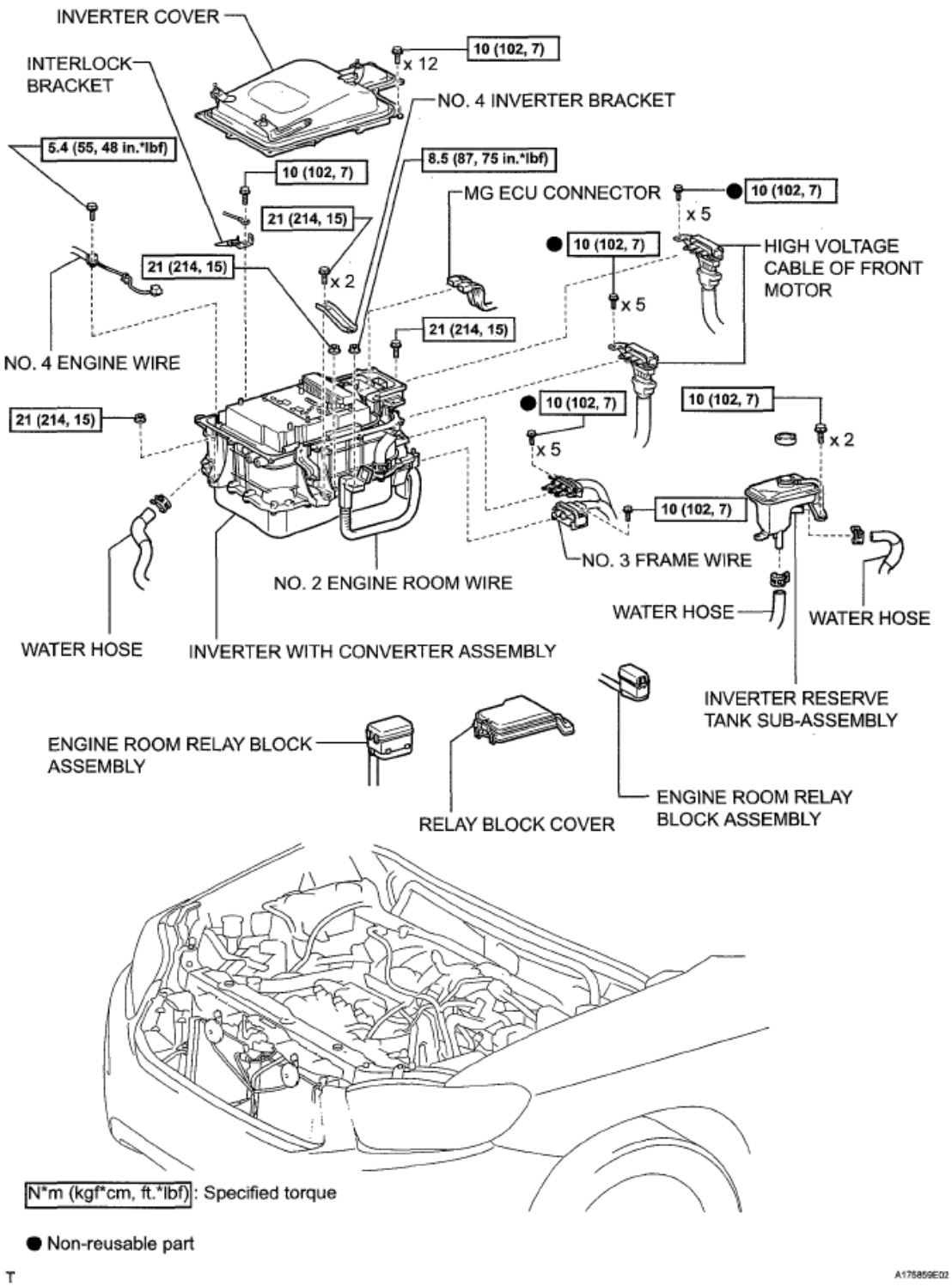


Fig. 146: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (4 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

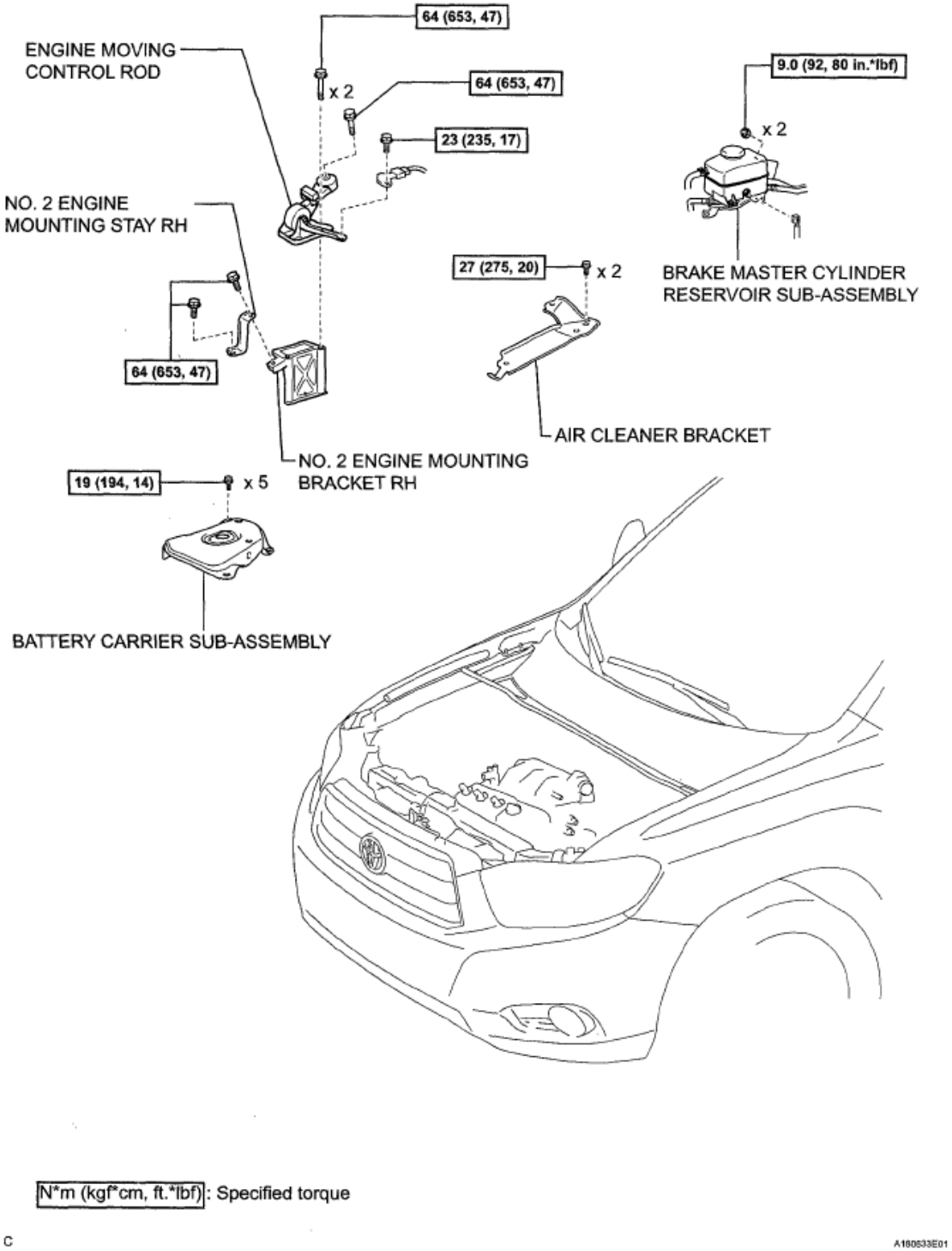


Fig. 147: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (5 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

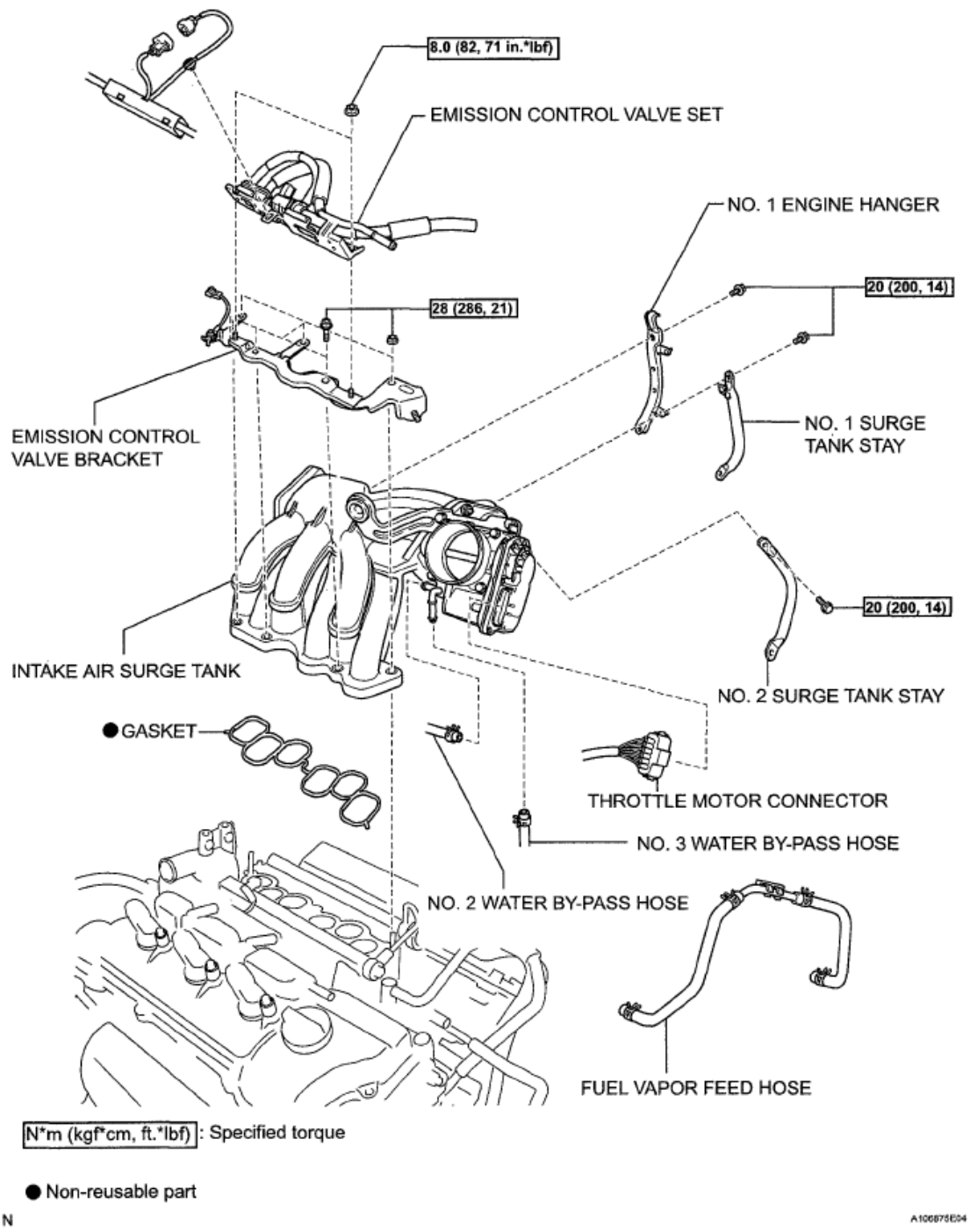


Fig. 148: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (6 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

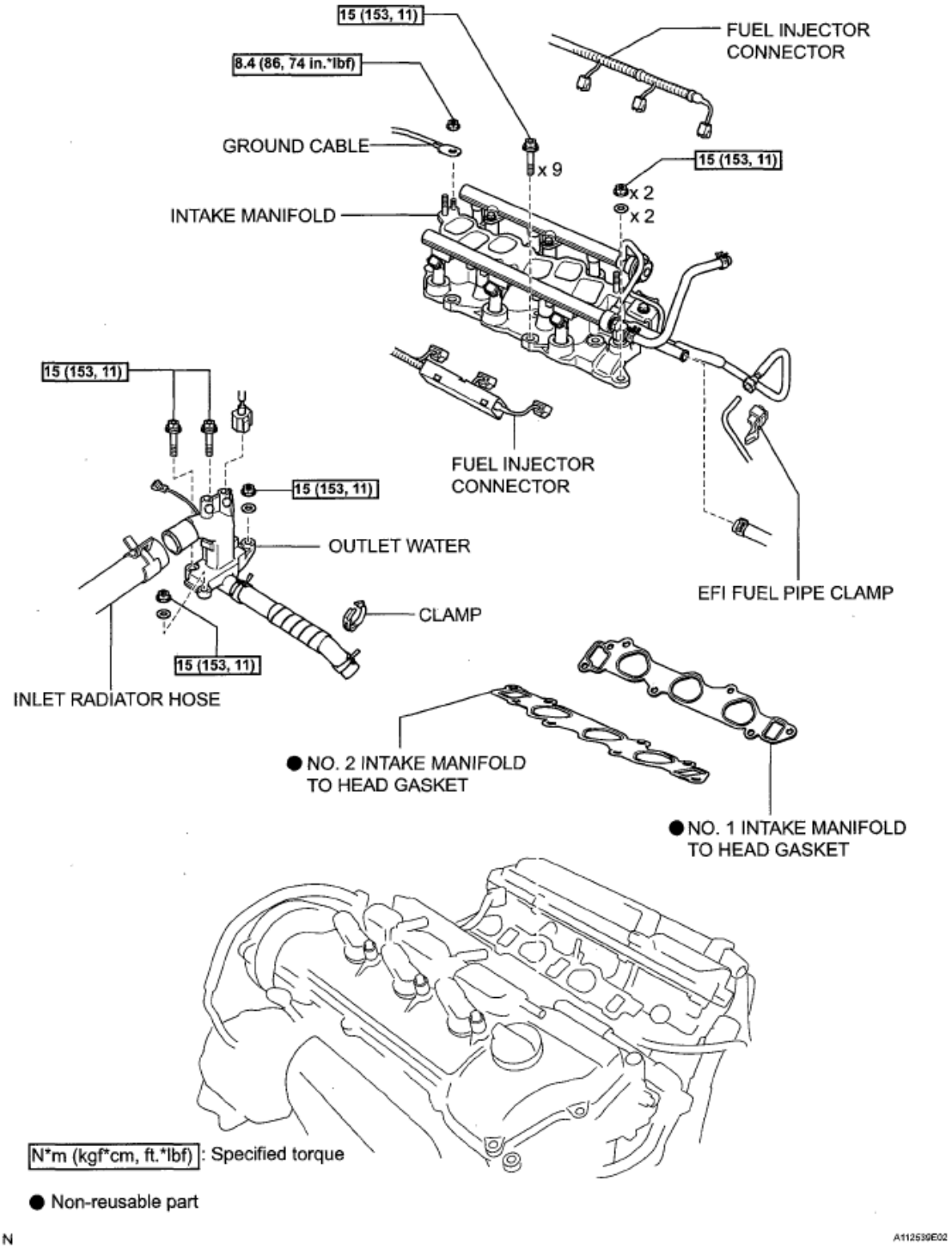


Fig. 149: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (7 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

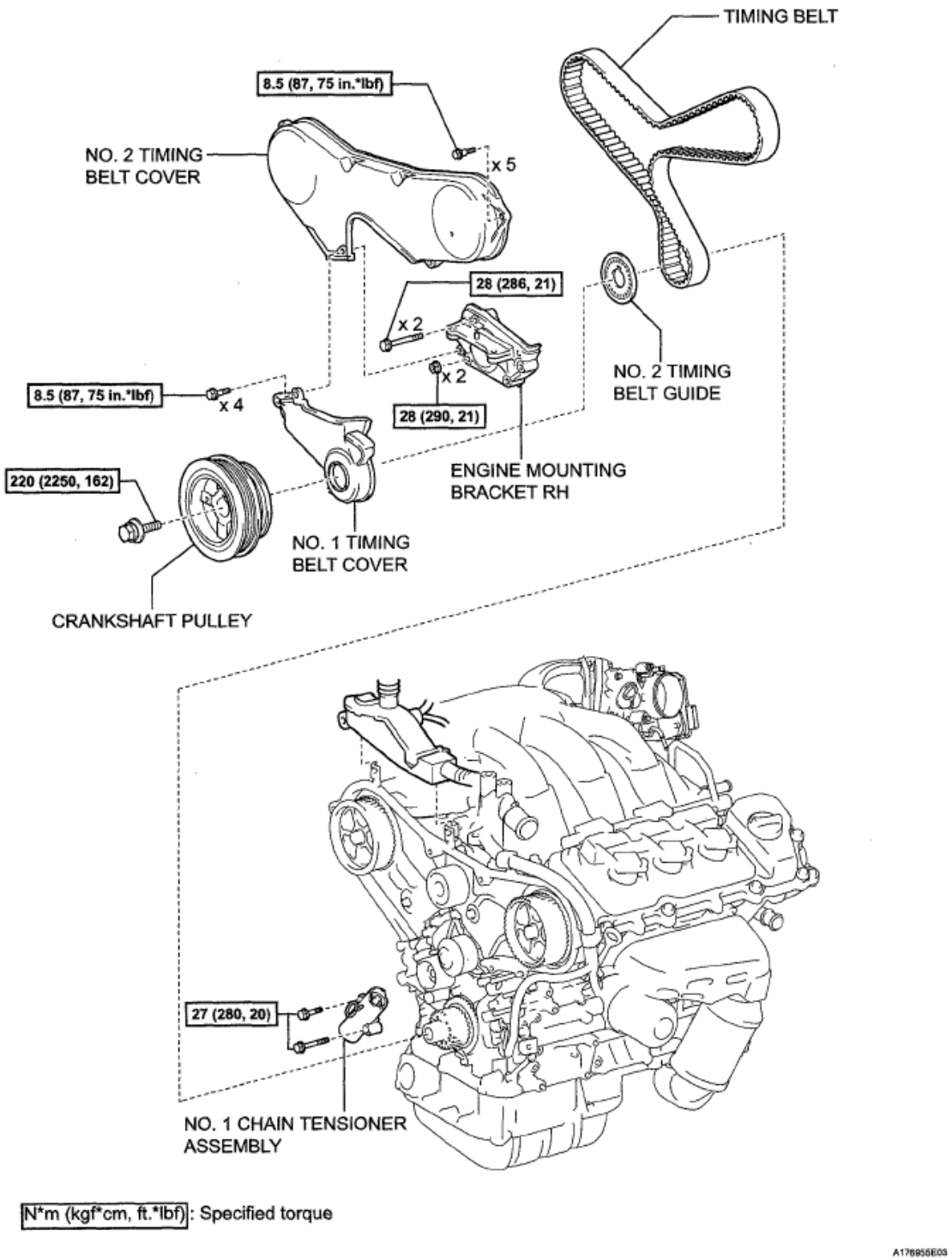


Fig. 150: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (8 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

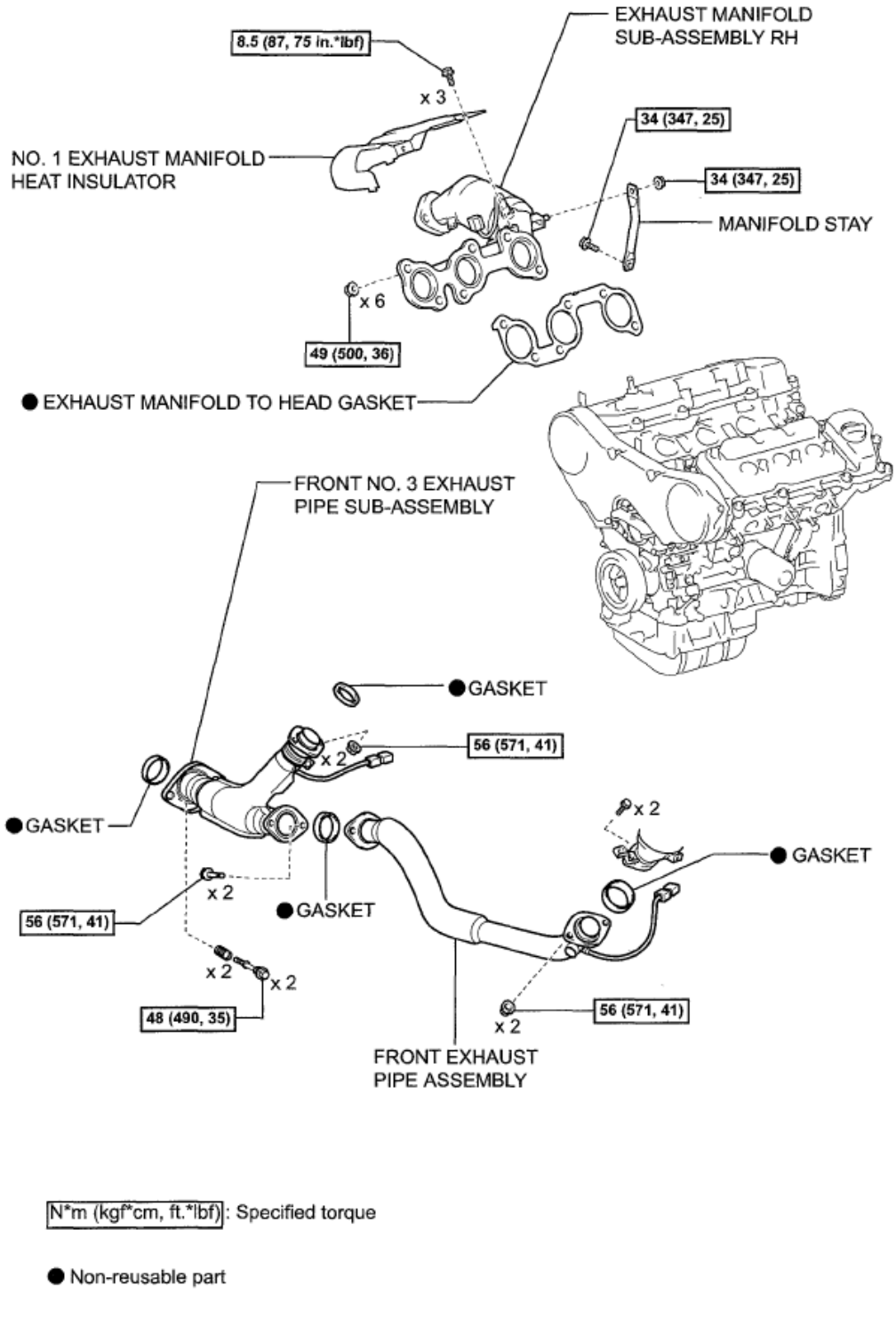


Fig. 151: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (9 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

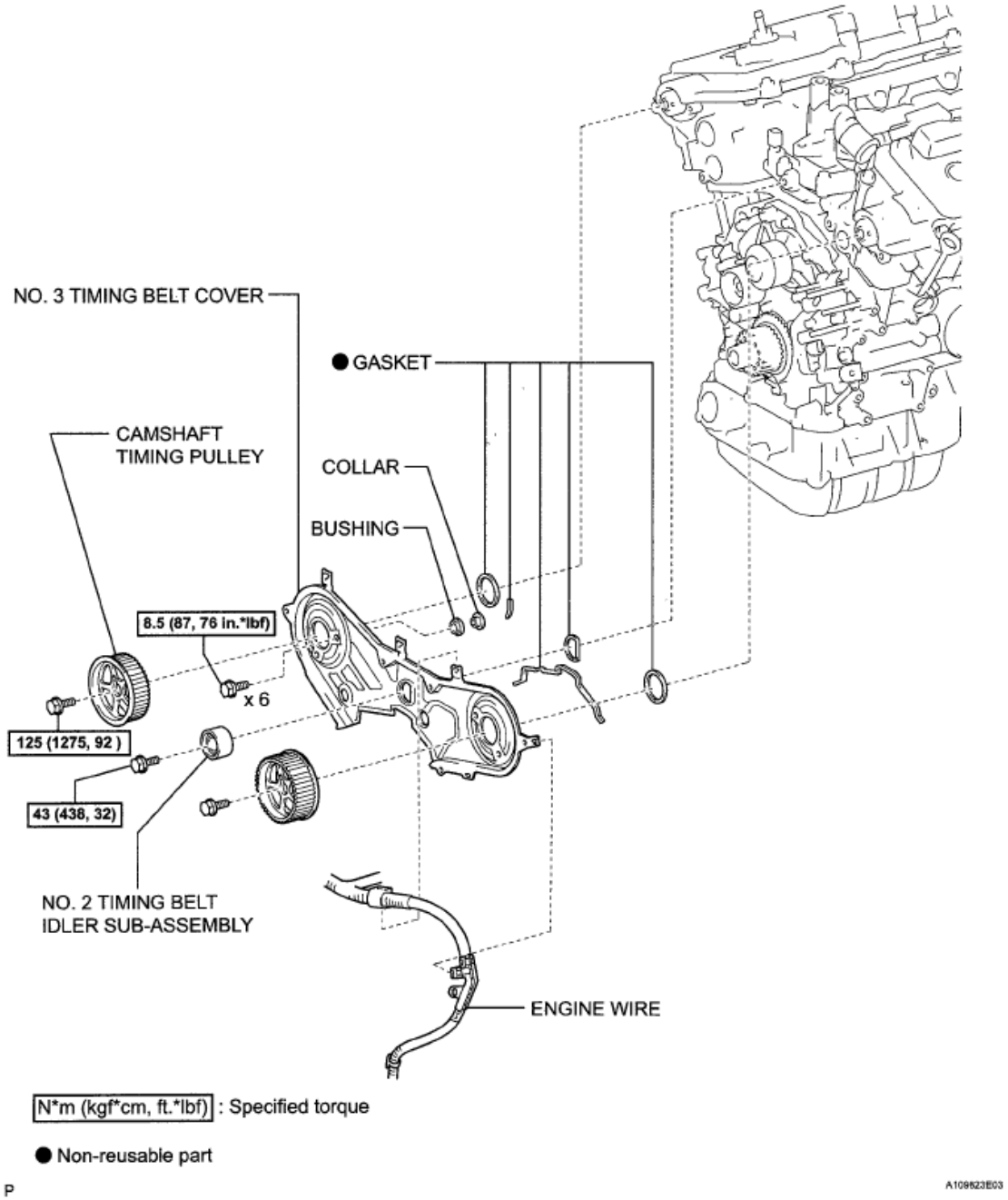


Fig. 152: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (10 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

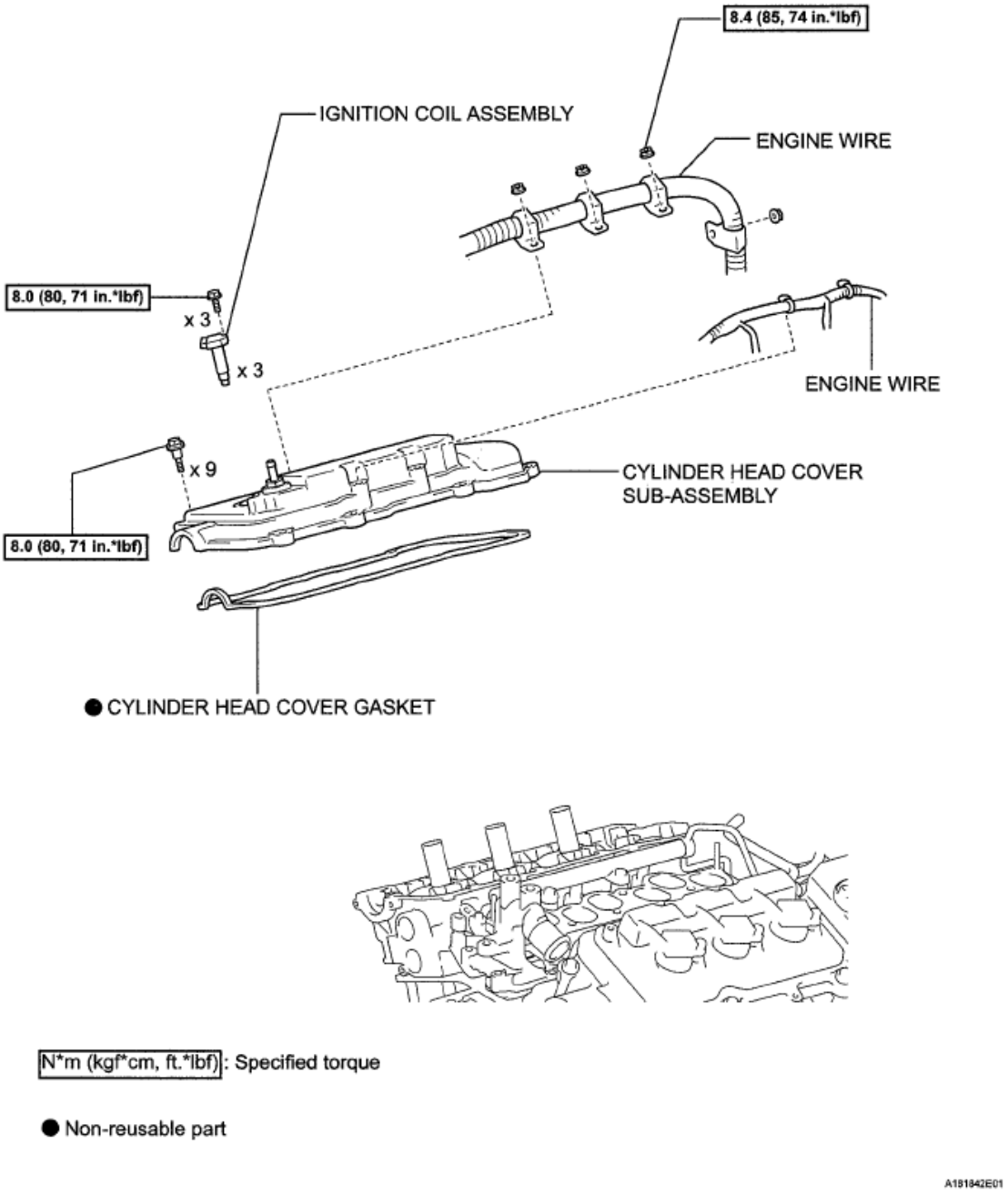


Fig. 153: Identifying Cylinder Head Gasket (Bank 1) Replacement Components With Torque Specifications (11 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

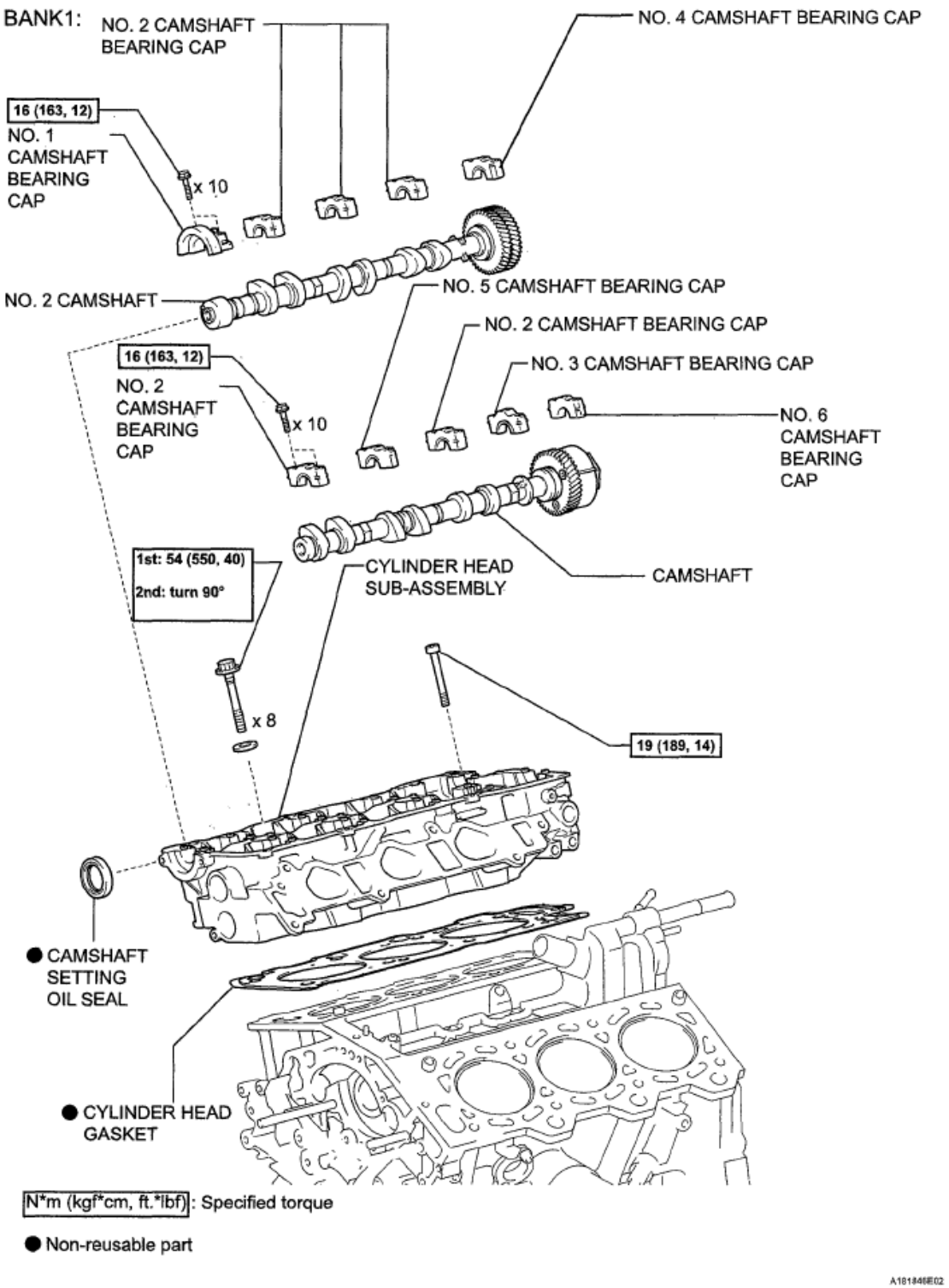


Fig. 154: Identifying Cylinder Head Gasket (Bank 1) Components With Torque Specifications (12 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **PRECAUTION**
   a. Check for DTCs (See **PRECAUTION**).

   NOTE: Confirm the P0AA6 (Hybrid Battery Voltage System Isolation Fault) is not output before doing removal or installation work inside the battery. If the DTC is output, perform troubleshooting procedures first.

2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
4. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
8. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
9. **REMOVE DISCHARGE FUEL SYSTEM PRESSURE**

   HINT:

   See **PRECAUTION** .

10. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
11. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
12. **REMOVE FRONT WHEEL RH**
13. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
14. **REMOVE FRONT FENDER LINER RH** (See **REMOVAL**)
15. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
16. **REMOVE NO. 2 ENGINE UNDER COVER** (See **REMOVAL**)
17. **REMOVE BATTERY** (See **REMOVAL**)
18. **REMOVE BATTERY CARRIER SUB-ASSEMBLY** (See **REMOVAL**)
19. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
20. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
21. **REMOVE SERVICE PLUG GRIP** (See **REMOVAL**)
22. **REMOVE INVERTER WITH CONVERTER ASSEMBLY**

    HINT:

    See **REMOVAL** .

23. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)
24. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)

25. **DISCONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY** (See **REMOVAL**)
26. **DISCONNECT INLET HEATER WATER HOSE**
    a. Lock the hose clamp as shown in the illustration (A).

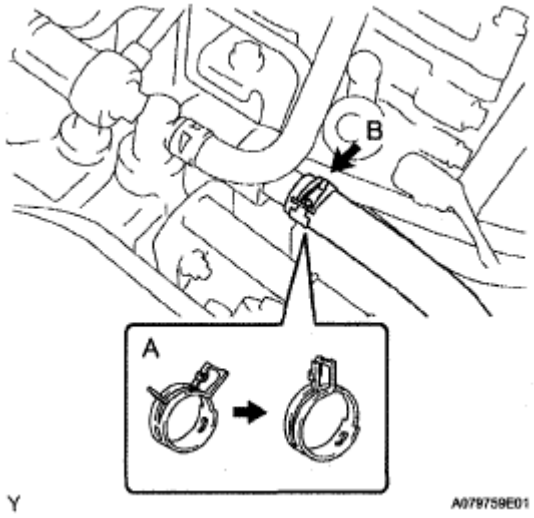


Fig. 155: Locating Heater Inlet Water Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Disconnect the inlet heater water hose (B).
27. **REMOVE INTAKE MANIFOLD**
    a. Remove the nut and disconnect the ground cable (A).
    b. Disconnect the 6 fuel injector connectors.

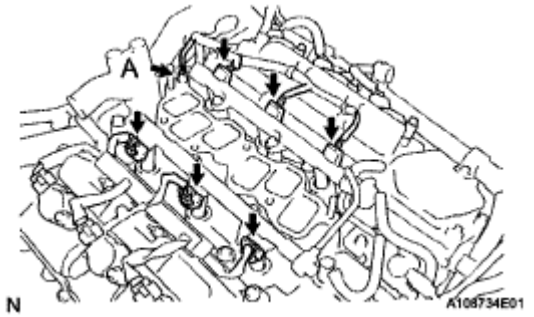


Fig. 156: Locating Fuel Injector Connectors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. In order to remove the intake manifold, using several steps, remove the 9 bolts and 2 nuts in the sequence shown in the illustration.

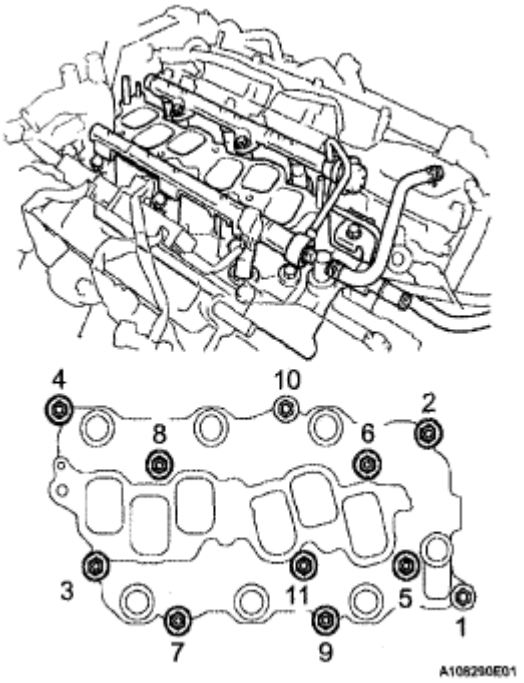


Fig. 157: Identifying Ground Cable Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. **DISCONNECT INLET RADIATOR HOSE**
29. **REMOVE OUTLET WATER**
    a. Disconnect the ground cable connector (A).
    b. Disconnect the engine coolant temperature sensor connector (B).
    c. Remove the clamp (C).
    d. Remove the 2 bolts, 2 nuts and 2 washers.
    e. Lock the hose clamp as shown in the illustration (D) and remove the water outlet together with No. 1 water by-pass hose (E).

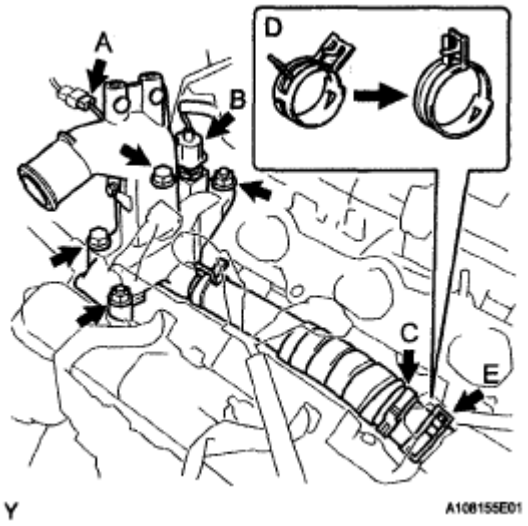


Fig. 158: Locating Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Remove the 2 gaskets from the 2 cylinder heads.

30. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **REMOVAL**)
31. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
32. **REMOVE ENGINE MOVING CONTROL ROD** (See **REMOVAL**)
33. **REMOVE NO. 2 ENGINE MOUNTING STAY** (See **REMOVAL**)
34. **REMOVE CRANKSHAFT PULLEY** (See **REMOVAL**)
35. **REMOVE NO. 1 TIMING BELT COVER** (See **REMOVAL**)
36. **REMOVE NO. 2 TIMING BELT COVER** (See **REMOVAL**)
37. **REMOVE ENGINE MOUNTING BRACKET RH** (See **REMOVAL**)
38. **REMOVE NO. 2 TIMING BELT GUIDE**
39. **REMOVE TIMING BELT** (See **REMOVAL**)
40. **REMOVE NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **REMOVAL**)
41. **REMOVE CAMSHAFT TIMING PULLEY** (See **REMOVAL**)
42. **REMOVE NO. 3 TIMING BELT COVER** (See **REMOVAL**)
43. **REMOVE FRONT EXHAUST PIPE ASSEMBLY** (See **REMOVAL**)
44. **REMOVE FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY** (See **REMOVAL**)
45. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**
    a. Remove the 3 bolts and No. 1 exhaust manifold heat insulator.

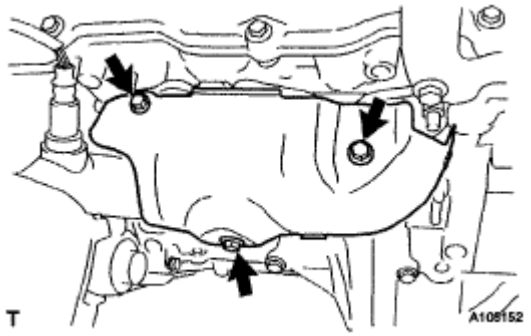


Fig. 159: Locating Heated Oxygen Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. **REMOVE MANIFOLD STAY**
    a. Remove the 2 bolts and manifold stay.
47. **REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH**
    a. Disconnect the heated oxygen sensor connector.
    b. Using several steps, loosen and remove the 6 nuts in the sequence shown in the illustration.

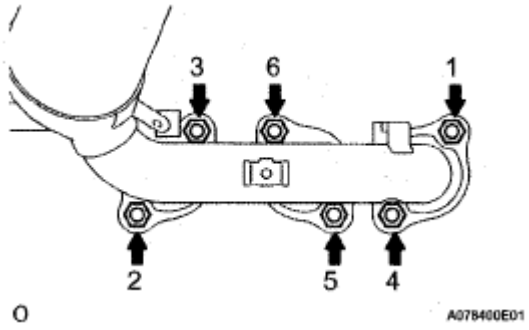


Fig. 160: Locating Heated Oxygen Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Remove the exhaust manifold RH and the gasket from the cylinder head RH.
48. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
49. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See **ADJUSTMENT**)
50. **REMOVE CAMSHAFT** (See **REMOVAL**)
51. **REMOVE NO. 2 CAMSHAFT** (See **REMOVAL**)
52. **REMOVE CYLINDER HEAD SUB-ASSEMBLY**
    a. Disconnect the VVT sensor connector.
    b. Disconnect the camshaft timing oil control valve connector.
    c. Remove the nut and disconnect the engine wire harness clamp.

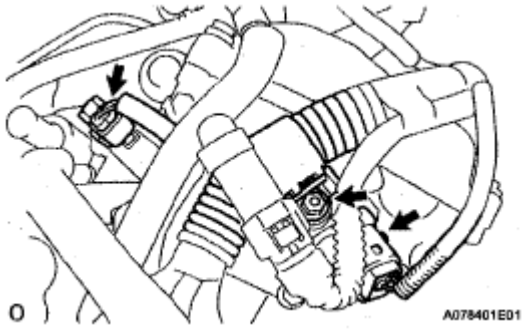


Fig. 161: Locating Engine Wire Harness Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using an 8 mm socket hexagon wrench, remove the hexagon bolt.

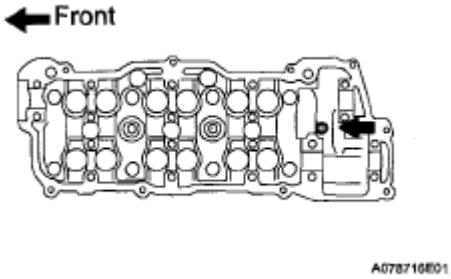


Fig. 162: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTE:

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

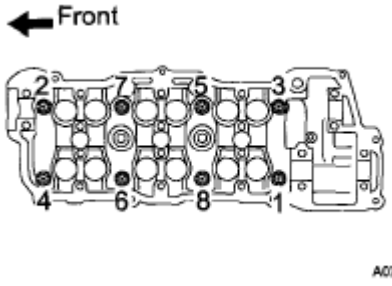


Fig. 163: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Remove the cylinder head.

53. **REMOVE CYLINDER HEAD GASKET**

INSTALLATION

1. **INSPECT CYLINDER HEAD SET BOLT**
   a. Using vernier calipers, measure the tension portion diameter of the bolt.

      Standard outside diameter: 8.95 to 9.05 mm (0.3524 to 0.3563 in.)

      Minimum outside diameter: 8.75 mm (0.3445 in.)

      If the diameter is less than the minimum, replace the bolt.

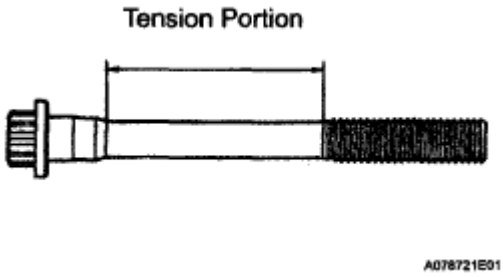


Fig. 164: Identifying Tension Portion Diameter Of Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL CYLINDER HEAD GASKET**
   a. Place a new cylinder head gasket on the cylinder block with the R mark upward.

NOTE:

- **Remove any oil from the contact surface.**
- **Be sure to install the gasket in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

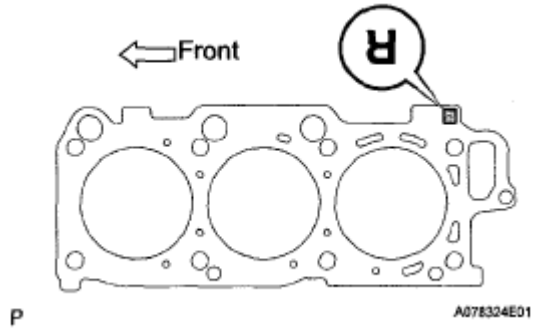


Fig. 165: Identifying Cylinder Block With R Mark Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

a. Install the cylinder head.
b. Apply a light coat of engine oil to the threads of the cylinder head bolts.
c. Install the plate washers to the cylinder head bolts.
d. Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

Torque: 54 N*m (550 kgf*cm, 40 ft.*lbf)

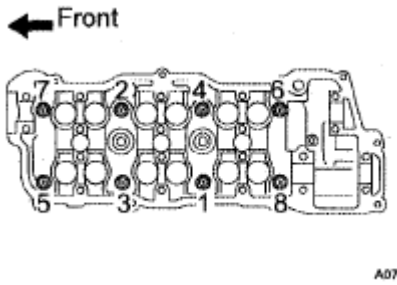


Fig. 166: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

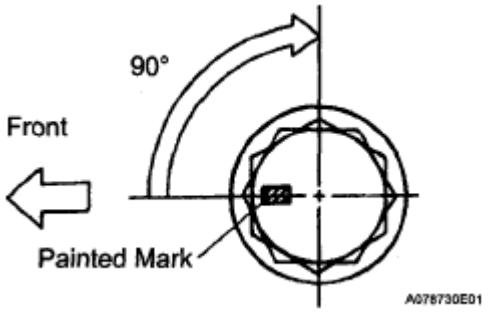


Fig. 167: Identifying Cylinder Head Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Retighten the cylinder head bolts by 90° in the same sequence as step (c).

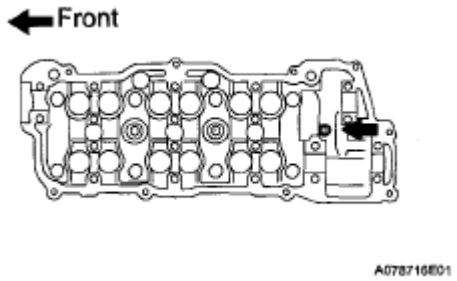


Fig. 168: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Check that each painted mark is now at 90° angle to the front.
h. Using an 8 mm socket hexagon wrench, install the hexagon bolt.

Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)

i. Connect the engine wire harness clamp with the nut.

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

4. **INSTALL NO. 2 CAMSHAFT** (See **INSTALLATION**)
5. **INSTALL CAMSHAFT** (See **INSTALLATION**)
6. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See **ADJUSTMENT**)
7. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
8. **INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH**
   a. Install a new gasket as shown in the illustration.

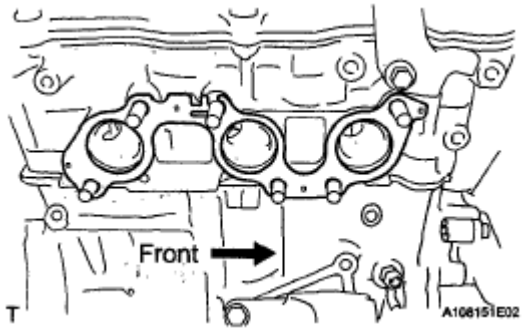


Fig. 169: Identifying Exhaust Manifold Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install a new gasket and the exhaust manifold RH with the 6 nuts. Using several steps, tighten the nuts uniformly in the sequence shown in the illustration.

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

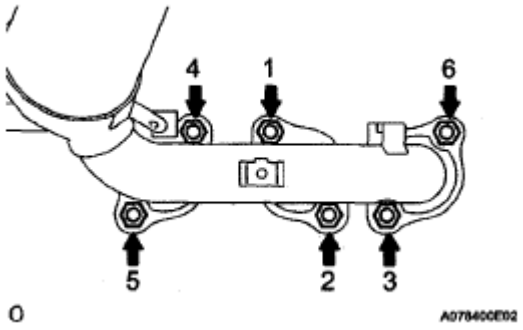


Fig. 170: Identifying Gasket And Exhaust Manifold RH With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Retighten nuts 1 and 2 shown in the illustration.

9. **INSTALL MANIFOLD STAY**
   a. Temporarily install the manifold stay to the exhaust manifold and transaxle with the 2 bolts.
   b. Fully tighten the 2 bolts.

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

10. **INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**
    a. Install the No. 1 exhaust manifold heat insulator with the 3 bolts.

    Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

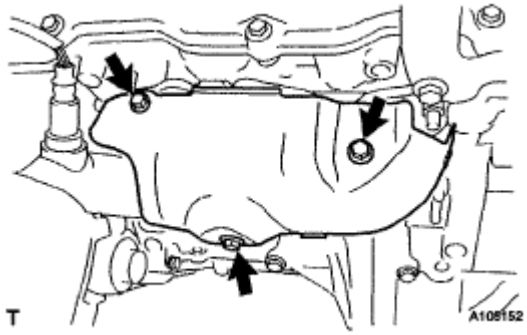


Fig. 171: Locating No. 1 Exhaust Manifold Heat Insulator With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **INSTALL FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY** (See **INSTALLATION**)
12. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** (See **INSTALLATION**)
13. **INSTALL NO. 3 TIMING BELT COVER** (See **INSTALLATION**)
14. **INSTALL CAMSHAFT TIMING PULLEY** (See **INSTALLATION**)
15. **INSTALL NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **INSTALLATION**)
16. **INSPECT TIMING BELT** (See **INSPECTION**)
17. **INSTALL TIMING BELT** (See **INSTALLATION**)

18. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See **INSTALLATION**)
19. **INSTALL NO. 2 TIMING BELT GUIDE** (See **INSTALLATION**)
20. **INSTALL ENGINE MOUNTING BRACKET RH** (See **INSTALLATION**)
21. **INSTALL NO. 2 TIMING BELT COVER** (See **INSTALLATION**)
22. **INSTALL NO. 1 TIMING BELT COVER** (See **INSTALLATION**)
23. **INSTALL CRANKSHAFT PULLEY** (See **INSTALLATION**)
24. **INSTALL NO. 2 ENGINE MOUNTING STAY RH** (See **INSTALLATION**)
25. **INSTALL ENGINE MOVING CONTROL ROD** (See **INSTALLATION**)
26. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)
27. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **INSTALLATION**)
28. **INSTALL OUTLET WATER**
    a. Install 2 new gaskets to the 2 cylinder heads.
    b. Install the outlet water together with water by-pass hose No.1 and unlock the hose clamp.
    c. Tighten the 2 bolts, 2 nuts and 2 washers.

       Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

    d. Install the clamp.
    e. Connect the engine coolant temperature sensor connector.
    f. Connect the inlet radiator hose.
29. **CONNECT INLET RADIATOR HOSE**
30. **INSTALL INTAKE MANIFOLD**
    a. Install the intake manifold with the 9 bolts, 2 nuts and 2 washers. Using several steps, tighten the bolts and nuts uniformly in the sequence shown in the illustration.

       Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

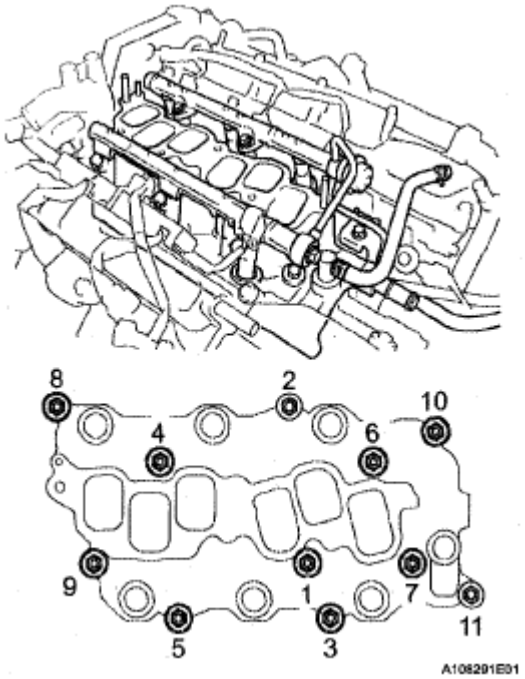


Fig. 172: Identifying Intake Manifold Bolts, Nuts And Washers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Retighten the water outlet mounting bolts and nuts.

Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

c. Install the ground cable with the nut.

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

d. Connect the heater inlet water hose.

31. **CONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY** (See **INSTALLATION**)
32. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
33. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)
34. **INSTALL INVERTER WITH CONVERTER ASSEMBLY**

    HINT:

    See **INSTALLATION** .

35. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
36. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
37. **INSTALL BATTERY CARRIER SUB-ASSEMBLY** (See **INSTALLATION**)
38. **INSTALL BATTERY** (See **INSTALLATION**)

39. **INSTALL SERVICE PLUG GRIP** (See **INSTALLATION**)
40. **INSTALL NO. 2 ENGINE UNDER COVER** (See **INSTALLATION**)
41. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
42. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
43. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
44. **INSTALL FRONT WHEEL RH**
45. **ADD ENGINE OIL** (See **REPLACEMENT**)
46. **INSPECT FOR FUEL LEAK** (See **ON-VEHICLE INSPECTION**)
47. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
48. **INSPECT FOR OIL LEAK**
49. **INSPECT FOR COOLANT LEAK (for Engine)** (See **ON-VEHICLE INSPECTION**)
50. **INSPECT FOR EXHAUST GAS LEAK** (See **ON-VEHICLE INSPECTION**)
51. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
52. **INSPECT ENGINE IDLE SPEED** (See **ON-VEHICLE INSPECTION**)
53. **INSPECT COMPRESSION** (See **ON-VEHICLE INSPECTION**)
54. **INSPECT CO/HC** (See **ON-VEHICLE INSPECTION**)
55. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
56. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
57. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
58. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
59. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
60. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
61. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

CYLINDER HEAD GASKET (FOR BANK 2)

COMPONENTS

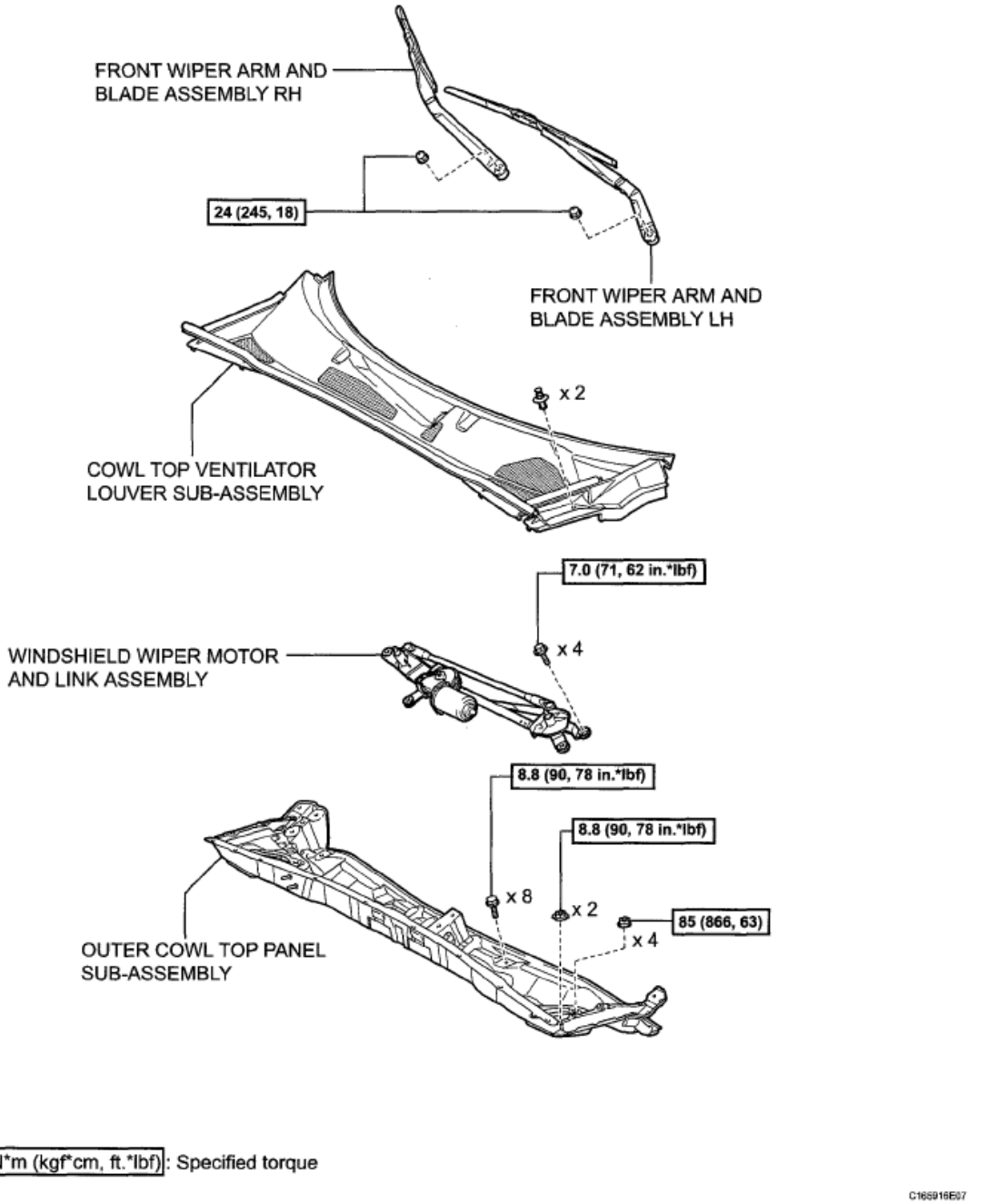


Fig. 173: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (1 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

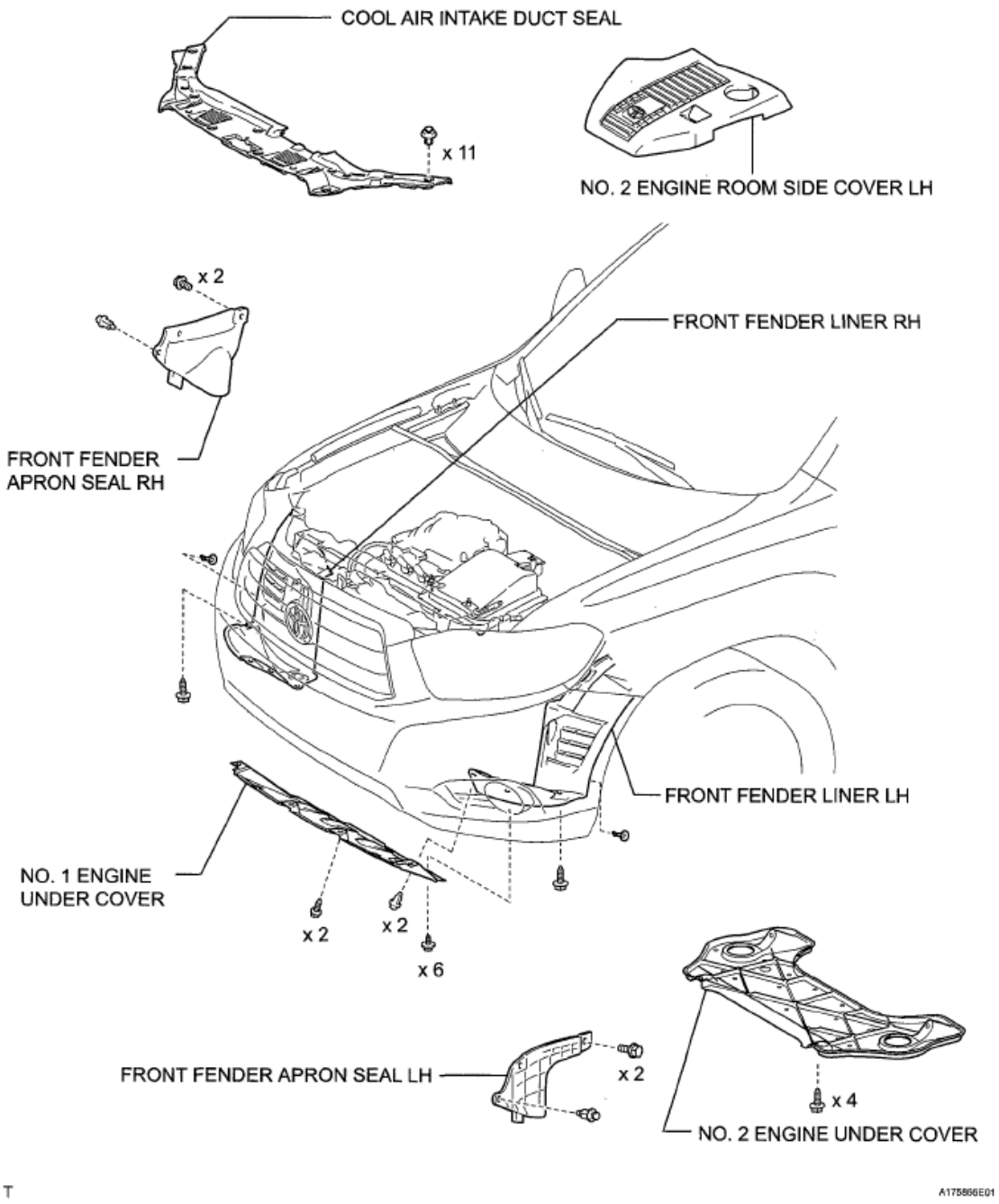


Fig. 174: Identifying Cylinder Head Gasket (Bank 2) Replacement Components (2 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

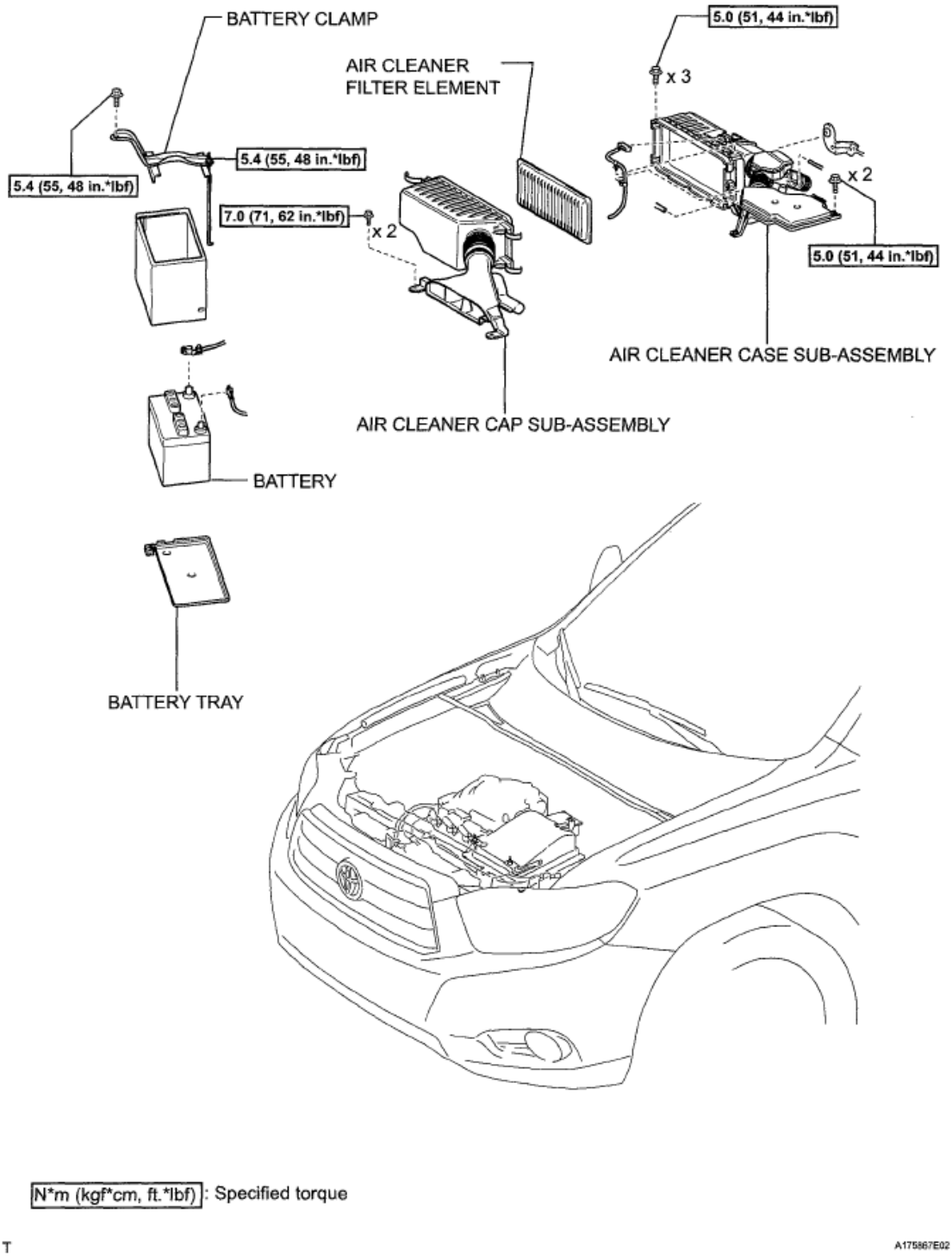


Fig. 175: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (3 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

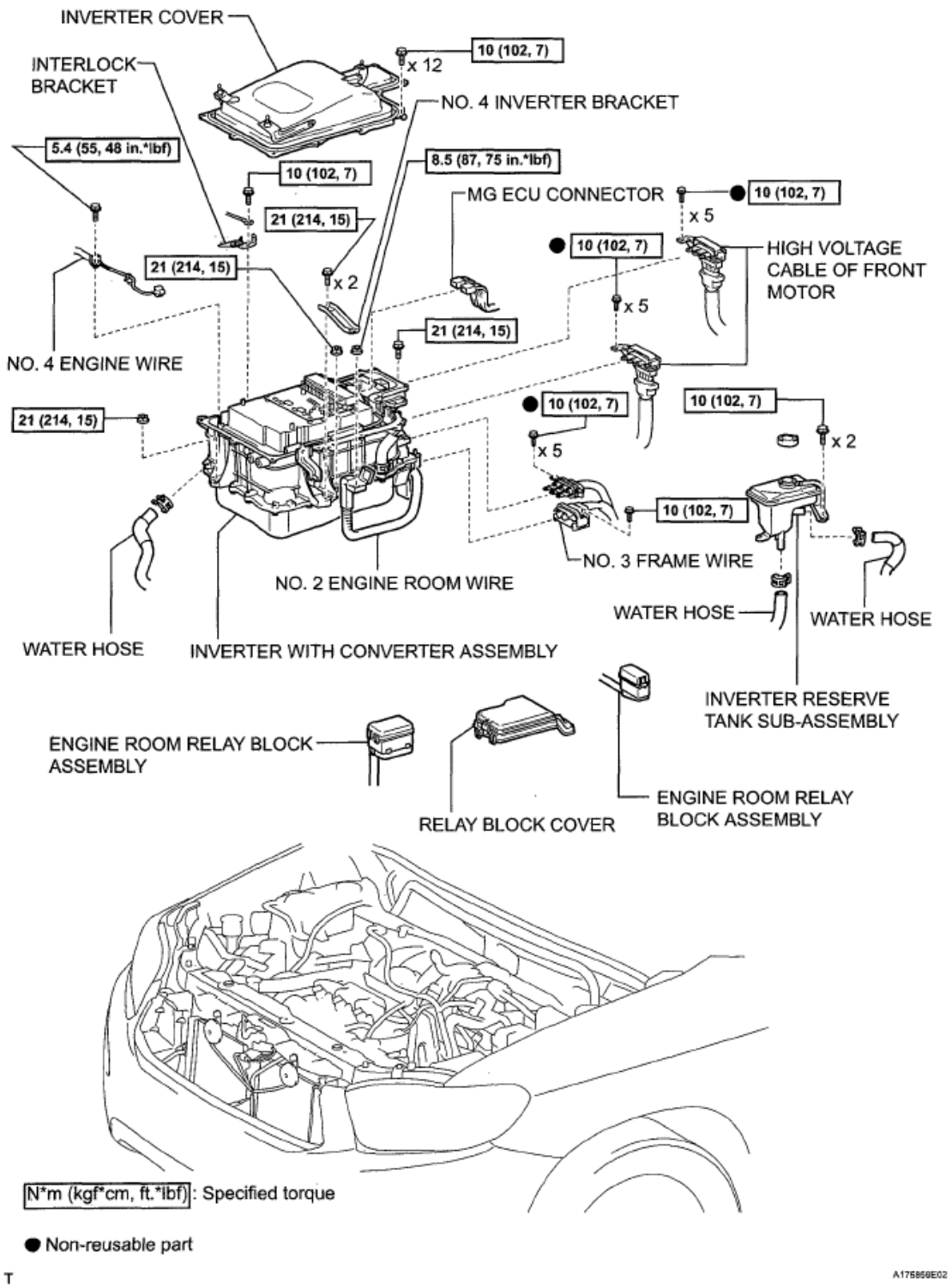


Fig. 176: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (4 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

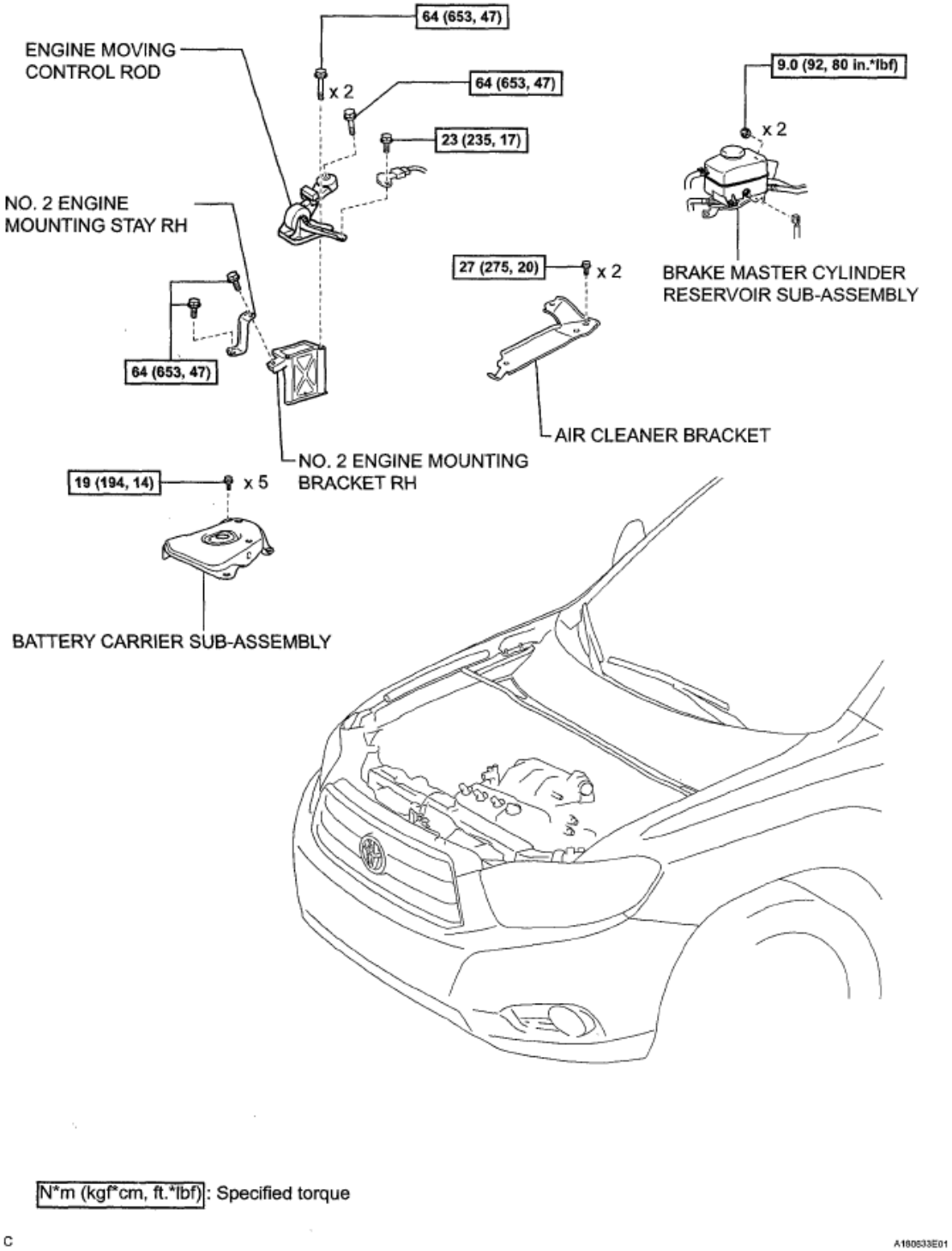


Fig. 177: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (5 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

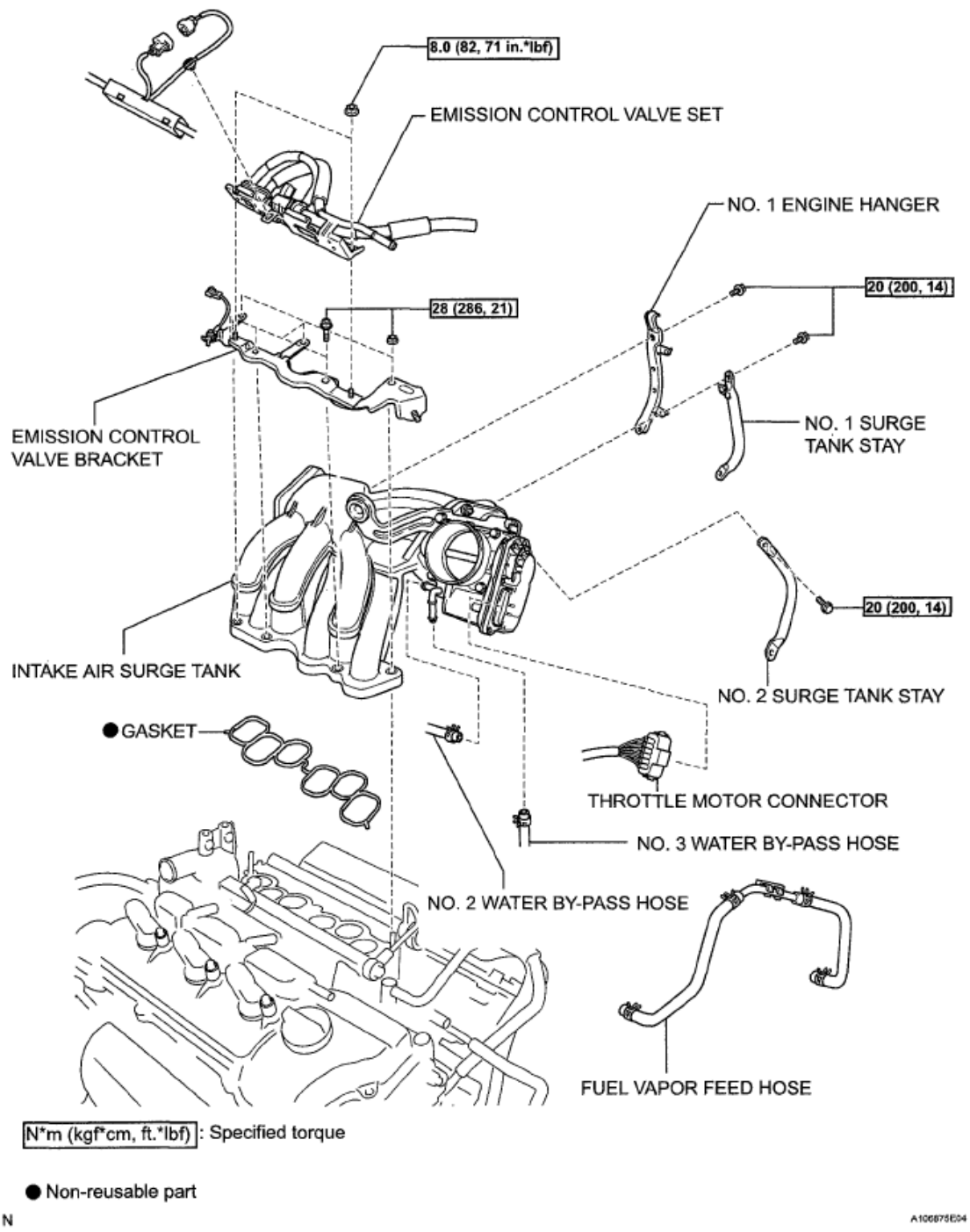


Fig. 178: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (6 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

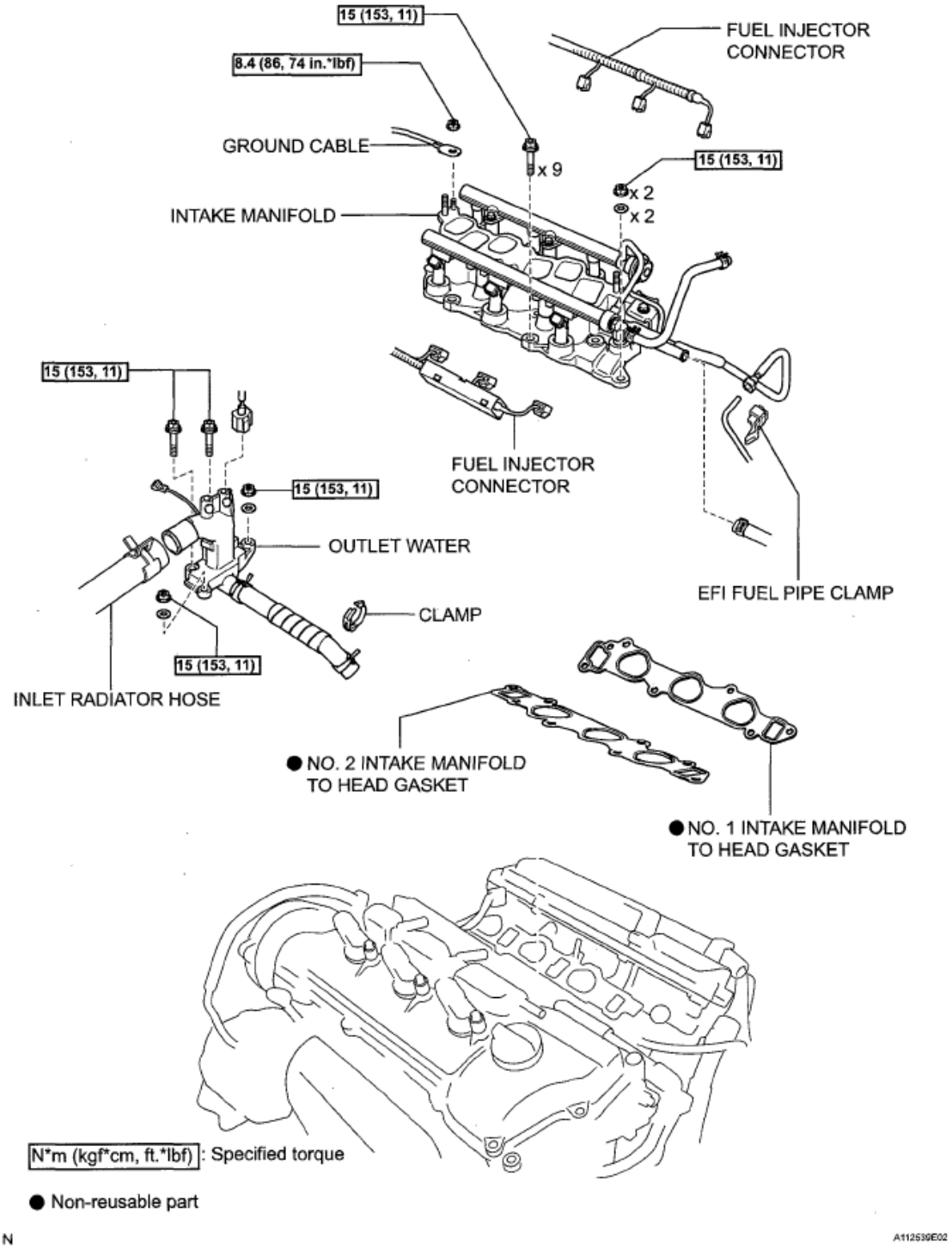


Fig. 179: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (7 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

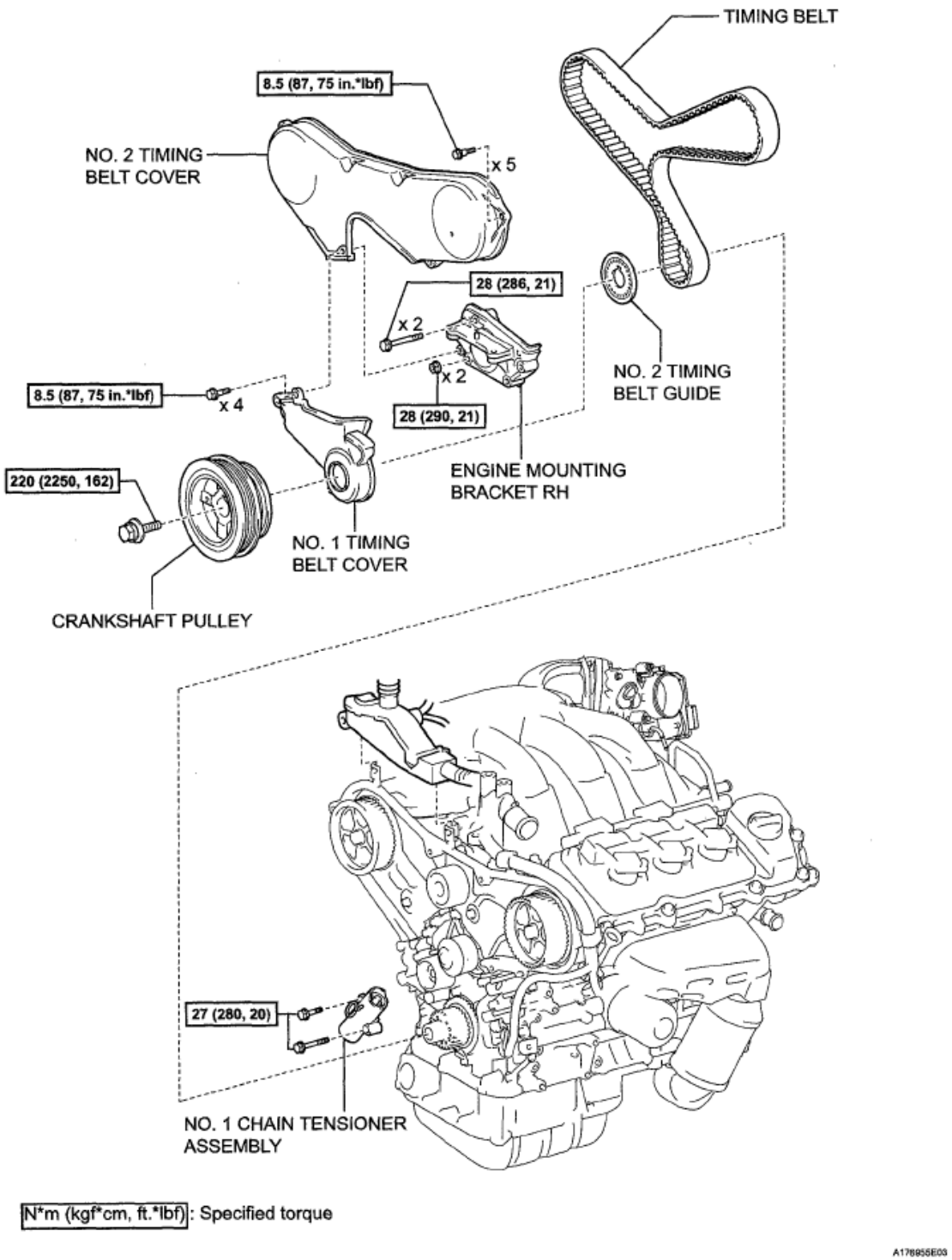


Fig. 180: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (8 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

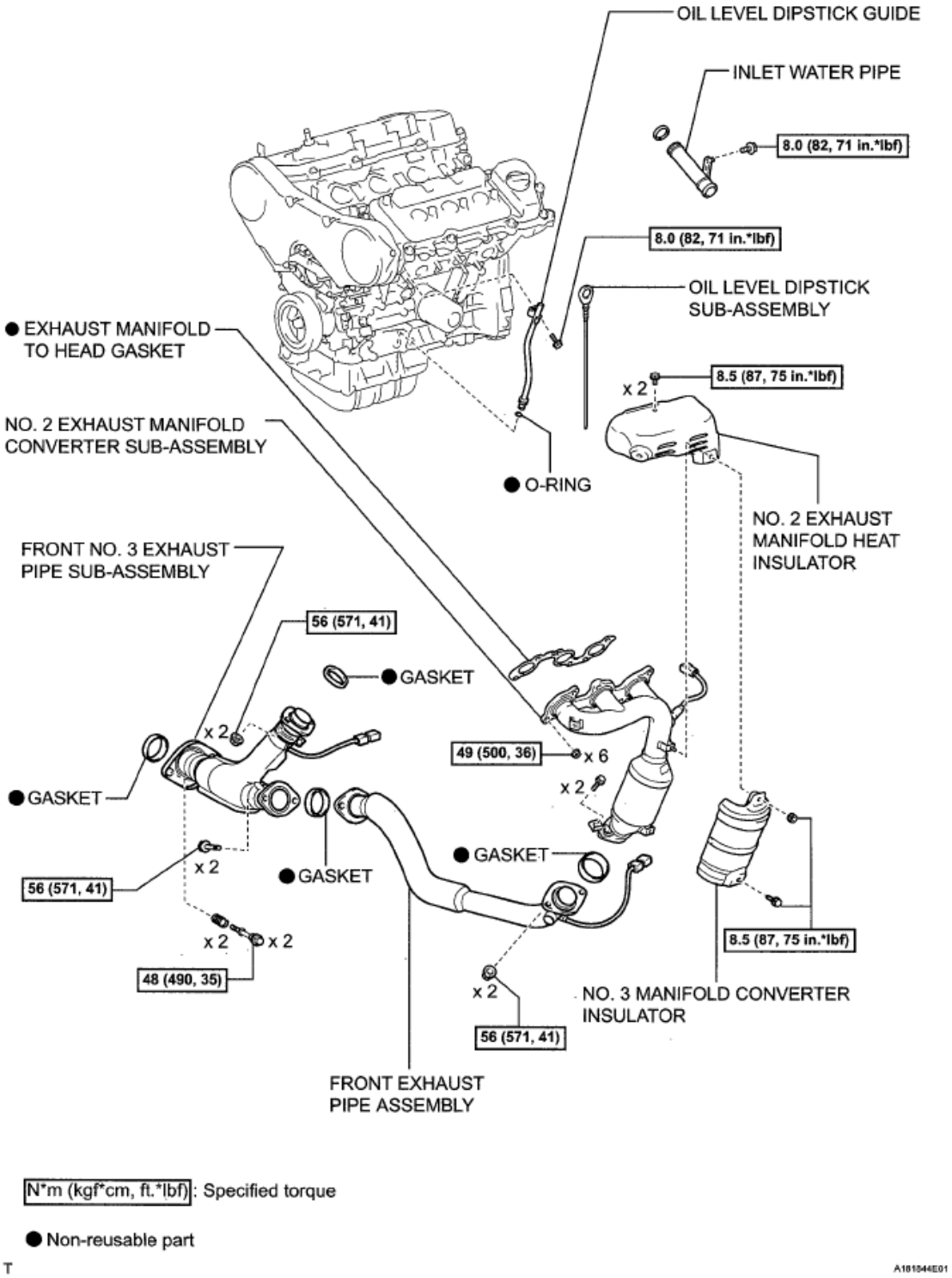


Fig. 181: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (9 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

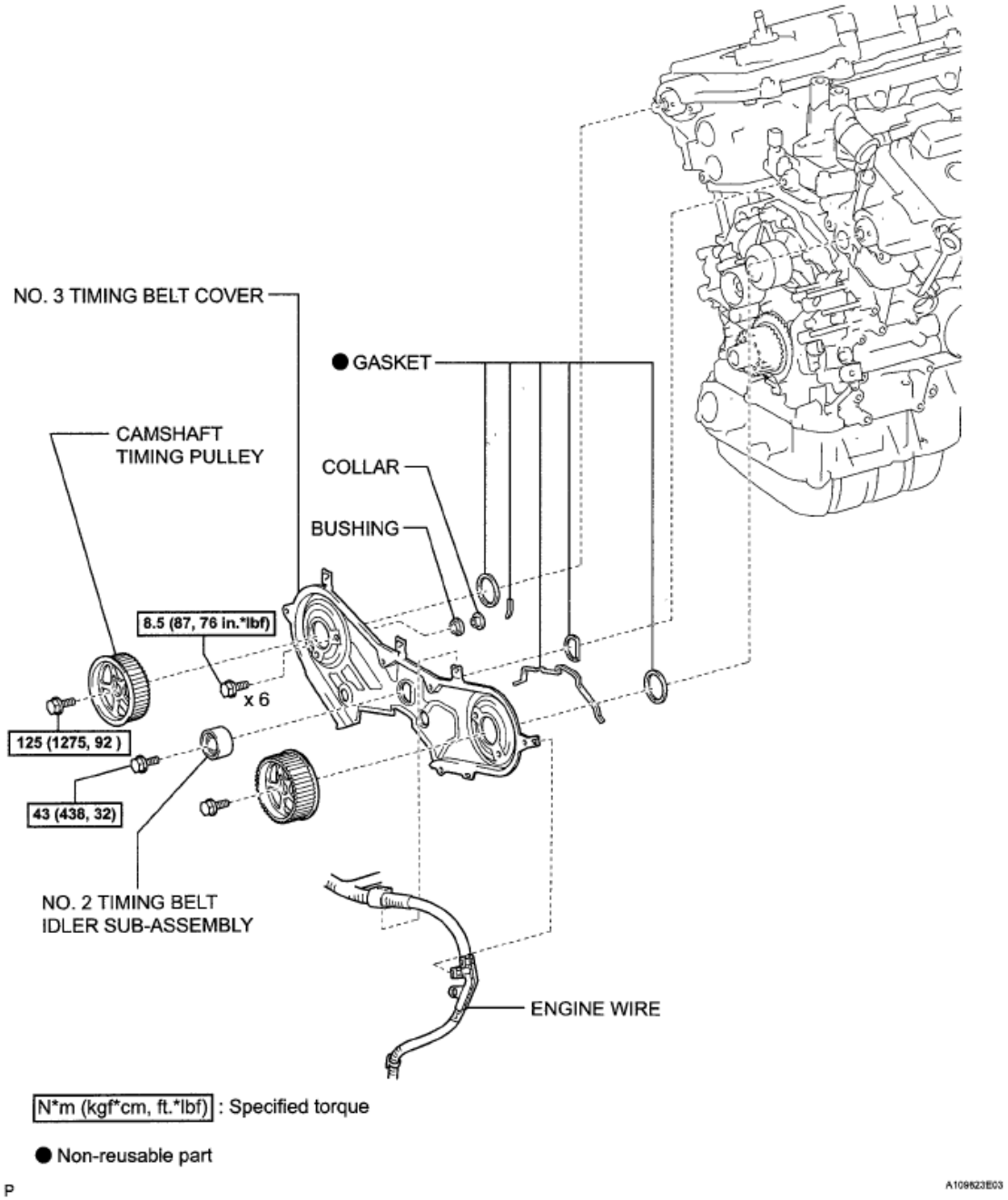


Fig. 182: Identifying Cylinder Head Gasket (Bank 2) Replacement Components With Torque Specifications (10 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

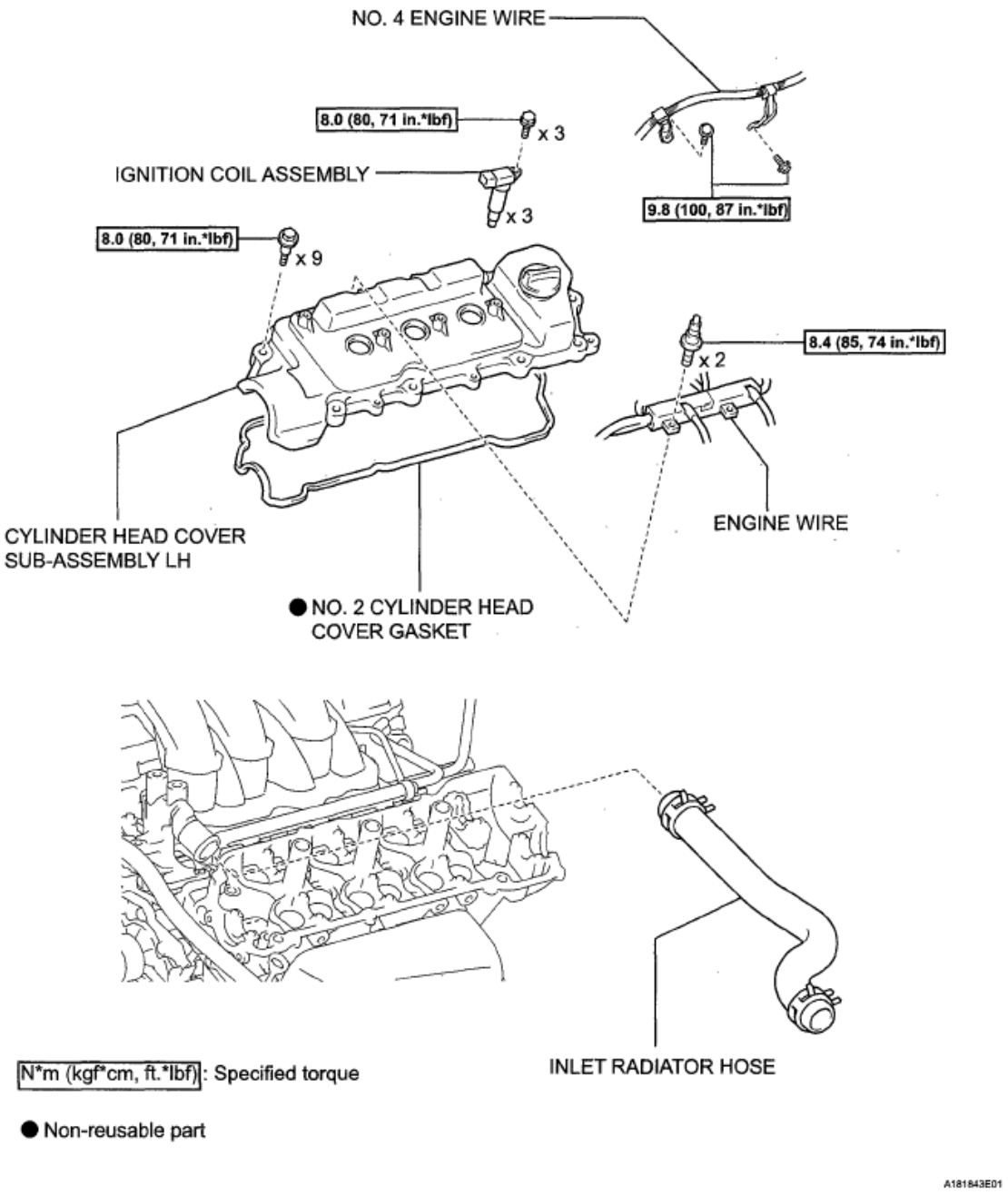


Fig. 183: Identifying Cylinder Head Gasket (Bank 2) Components With Torque Specifications (11 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

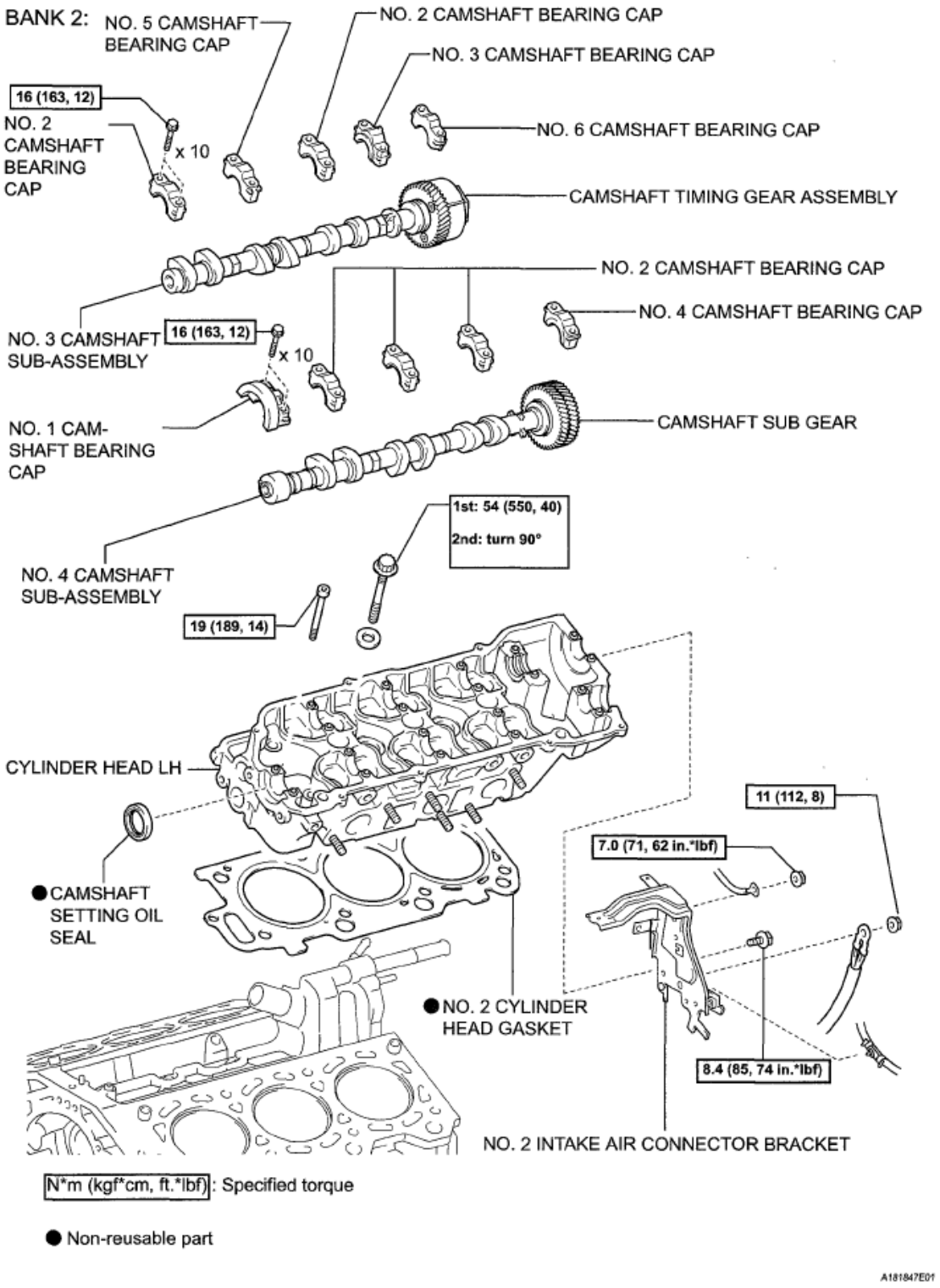


Fig. 184: Identifying Cylinder Head Gasket (Bank 2) Components With Torque Specifications (12 Of 12)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **PRECAUTION**
   a. Check for DTCs (See **PRECAUTION**).

   NOTE: Confirm the P0AA6 (Hybrid Battery Voltage System Isolation Fault) is not output before doing removal or installation work inside the battery. If the DTC is output, perform troubleshooting procedures first.

2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
4. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
8. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH** (See **REMOVAL**)
9. **REMOVE DISCHARGE FUEL SYSTEM PRESSURE**
10. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
11. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
12. **REMOVE FRONT WHEEL RH**
13. **REMOVE NO. 1 ENGINE UNDER COVER** (See **REMOVAL**)
14. **SEPARATE FRONT FENDER LINER RH** (See **REMOVAL**)
15. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
16. **REMOVE NO. 2 ENGINE UNDER COVER** (See **REMOVAL**)
17. **REMOVE BATTERY** (See **REMOVAL**)
18. **REMOVE BATTERY CARRIER SUB-ASSEMBLY** (See **REMOVAL**)
19. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
20. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
21. **REMOVE SERVICE PLUG GRIP** (See **REMOVAL**)
22. **REMOVE INVERTER WITH CONVERTER ASSEMBLY**

    REMOVAL

23. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)
24. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)
25. **DISCONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY** (See **REMOVAL**)
26. **DISCONNECT INLET HEATER WATER HOSE** (See **REMOVAL**)
27. **REMOVE INTAKE MANIFOLD** (See **REMOVAL**)
28. **DISCONNECT INLET RADIATOR HOSE**
29. **REMOVE OUTLET WATER** (See **REMOVAL**)
30. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **REMOVAL**)

31. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
32. **REMOVE ENGINE MOVING CONTROL ROD** (See **REMOVAL**)
33. **REMOVE NO. 2 ENGINE MOUNTING STAY** (See **REMOVAL**)
34. **REMOVE CRANKSHAFT PULLEY** (See **REMOVAL**)
35. **REMOVE NO. 1 TIMING BELT COVER** (See **REMOVAL**)
36. **REMOVE NO. 2 TIMING BELT COVER** (See **REMOVAL**)
37. **REMOVE ENGINE MOUNTING BRACKET RH** (See **REMOVAL**)
38. **REMOVE NO. 2 TIMING BELT GUIDE**
39. **REMOVE TIMING BELT** (See **REMOVAL**)
40. **REMOVE NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **REMOVAL**)
41. **REMOVE CAMSHAFT TIMING PULLEY** (See **REMOVAL**)
42. **REMOVE NO. 3 TIMING BELT COVER** (See **REMOVAL**)
43. **REMOVE FRONT EXHAUST PIPE ASSEMBLY** (See **REMOVAL**)
44. **REMOVE FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY** (See **REMOVAL**)
45. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
46. **REMOVE NO. 3 MANIFOLD CONVERTER INSULATOR**
    a. Remove the bolt, nut and No. 3 manifold converter insulator.

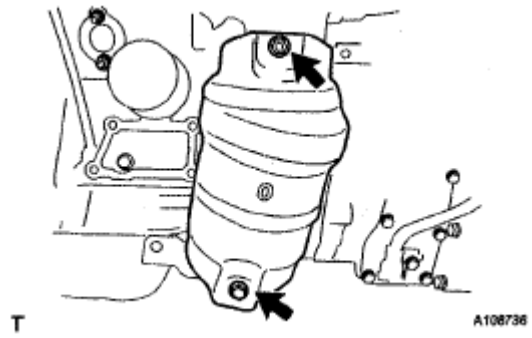


Fig. 185: Locating Bolt, Nut And Manifold Converter Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. **REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR**
    a. Remove the 2 bolts and No. 2 manifold heat insulator.

Fig. 186: Locating Bolts And Exhaust Manifold Heat Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **REMOVE NO. 2 EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY**
    a. Disconnect the heated oxygen sensor connector.
    b. Using several steps, loosen and remove the 6 nuts and bolt in the sequence shown in the illustration.

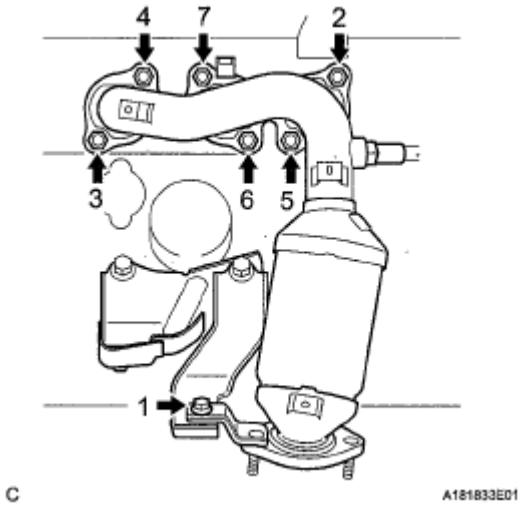


Fig. 187: Locating Exhaust Manifold Converter Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Remove the No. 2 exhaust manifold converter and the gasket from the cylinder head LH.

49. **REMOVE OIL LEVEL DIPSTICK GUIDE**
    a. Remove the bolt which is used to secure the oil dipstick gauge guide from the cylinder head LH.

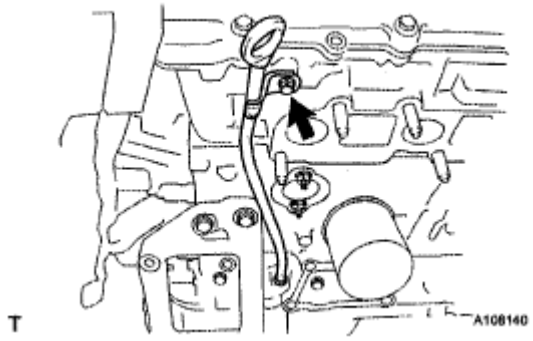


Fig. 188: Locating Oil Level Gauge Guide With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Pull out the oil level gauge guide and the oil dipstick gauge together from the cylinder block.
c. Remove the O-ring from the oil level gauge guide.

50. **REMOVE INLET WATER PIPE** (See **REMOVAL**)
51. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH** (See **ADJUSTMENT**)
52. **REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY** (See **REMOVAL**)
53. **REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY** (See **REMOVAL**)
54. **REMOVE CYLINDER HEAD LH**
    a. Disconnect the VVT sensor connector (A).
    b. Disconnect the camshaft timing oil control valve connector (B).
    c. Remove the 2 nuts and disconnect the ground cable (C).

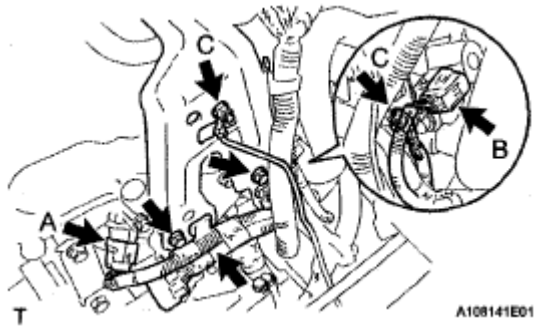


Fig. 189: Locating Nuts And Ground Cable
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the 2 bolts, wire harness clamp and No. 2 intake air connector bracket.
e. Using an 8 mm socket hexagon wrench, remove the hexagon bolt.

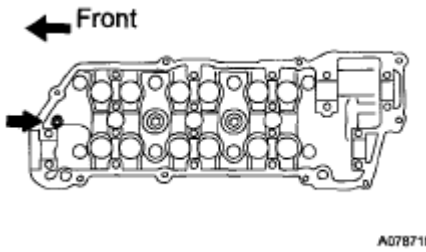


Fig. 190: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTE:

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

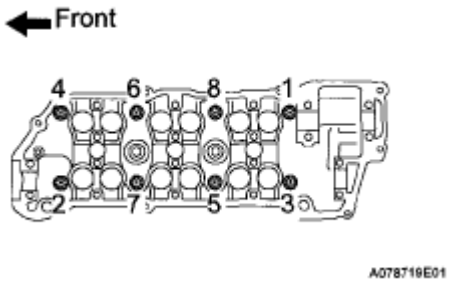


Fig. 191: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the cylinder head.

55. **REMOVE NO. 2 CYLINDER HEAD GASKET**

INSTALLATION

1. **INSPECT CYLINDER HEAD SET BOLT**
   a. Using vernier calipers, measure the tension portion diameter of the bolt.

   Standard outside diameter: 8.95 to 9.05 mm (0.3524 to 0.3563 in.)

   Minimum outside diameter: 8.75 mm (0.3445 in.)

   If the diameter is less than the minimum, replace the bolt.

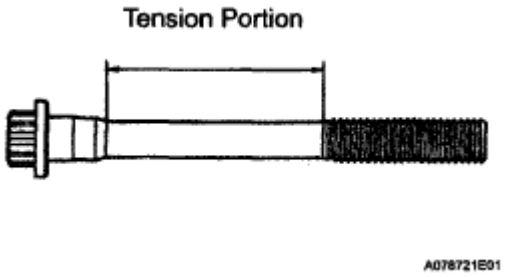


Fig. 192: Identifying Tension Portion Diameter Of Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL NO. 2 CYLINDER HEAD GASKET**
   a. Place a new cylinder head gasket on the cylinder block with the L mark upward.

NOTE:

- **Remove any oil from the contact surface.**
- **Be sure to install the gasket in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

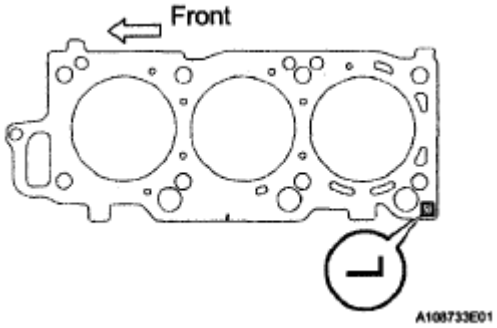


Fig. 193: Identifying Cylinder Block With L Mark Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL CYLINDER HEAD LH**

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

   a. Install the cylinder head.
   b. Apply a light coat of engine oil to the threads of the cylinder head bolts.
   c. Install the plate washer to the cylinder head bolt.
   d. Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

Torque: 54 N*m (550 kgf*cm, 40 ft.*lbf)

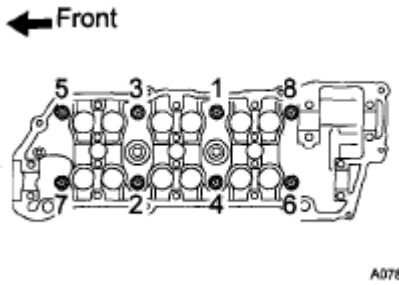


Fig. 194: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

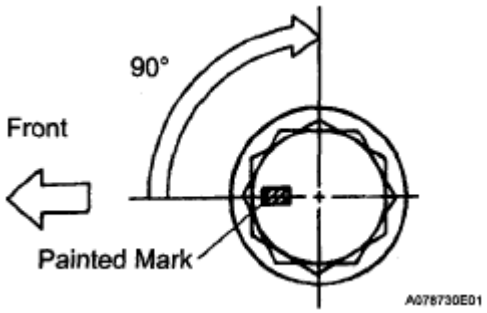


Fig. 195: Identifying Cylinder Head Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Retighten the cylinder head bolts by 90° in the same sequence as step (c).
g. Check that each painted mark is now at 90° angle to the front.
h. Using an 8 mm socket hexagon wrench, install the hexagon bolt.

Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)

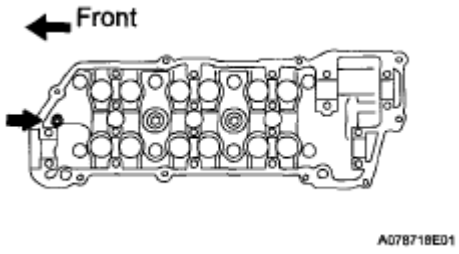


Fig. 196: Locating Hexagon Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Using several steps, install and tighten the 2 bolts and No. 2 intake air connector bracket uniformly in the sequence shown in the illustration.

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

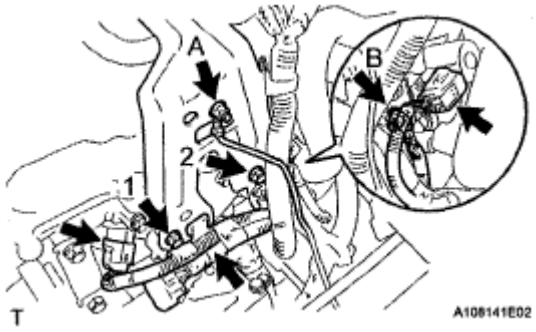


Fig. 197: Locating Bolts And Intake Air Connector Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Connect the ground cable with the 2 bolts.

Torque: Nut A

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

Nut B

11 N*m (112 kgf*cm, 97 in.*lbf)

4. **INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY** (See **INSTALLATION**)
5. **INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY** (See **INSTALLATION**)
6. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH** (See **ADJUSTMENT**)
7. **INSTALL INLET WATER PIPE** (See **INSTALLATION**)
8. **INSTALL OIL LEVEL DIPSTICK GUIDE**
   a. Install a new O-ring to the oil level gauge guide.
   b. Apply soapy water to the O-ring.
   c. Push in the oil level dipstick guide end into the guide hole of the cylinder block.
   d. Install the oil level dipstick guide with the bolt.

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

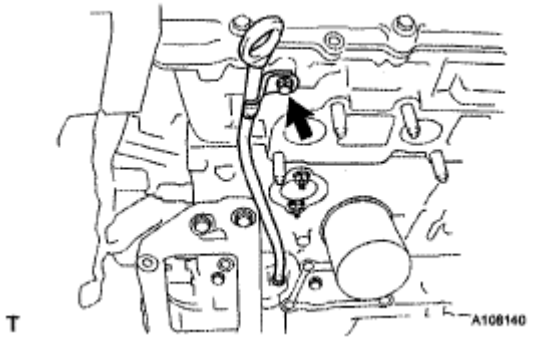


Fig. 198: Locating Oil Level Gauge Guide With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Install the oil level gauge.

9. **INSTALL NO. 2 EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY**
   a. Install a new gasket as shown in the illustration.

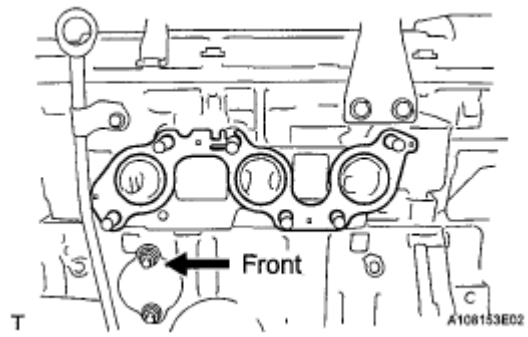


Fig. 199: Identifying Exhaust Manifold Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the No. 2 exhaust manifold converter with the 6 nuts and bolt. Using several steps, tighten the nuts uniformly in the sequence shown in the illustration.

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

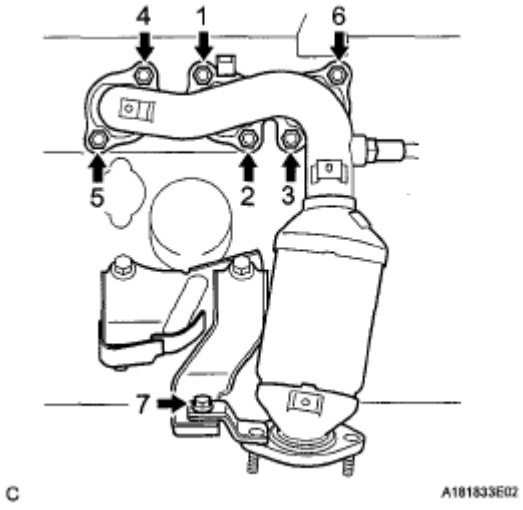


Fig. 200: Locating Exhaust Manifold Converter With Nuts And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Retighten nuts 1 and 2 shown in the illustration.

10. **INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR**
    a. Install the No. 2 exhaust manifold heat insulator with the 2 bolts.

Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

Fig. 201: Locating Bolts And Exhaust Manifold Heat Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **INSTALL NO. 3 MANIFOLD CONVERTER INSULATOR**
    a. Install the No. 3 manifold converter insulator with the bolt and nut.

    Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

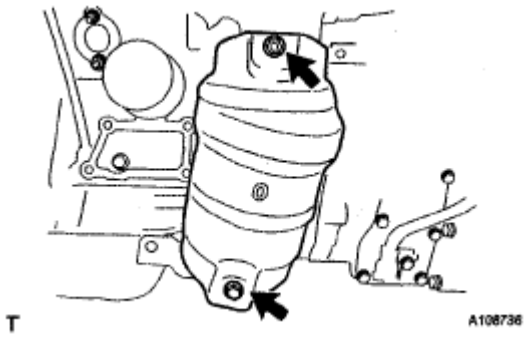


Fig. 202: Locating Bolt, Nut And Manifold Converter Insulator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
13. **INSTALL FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY** (See **INSTALLATION**)
14. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** (See **INSTALLATION**)
15. **INSTALL NO. 3 TIMING BELT COVER** (See **INSTALLATION**)
16. **INSTALL CAMSHAFT TIMING PULLEY** (See **INSTALLATION**)
17. **INSTALL NO. 2 TIMING BELT IDLER SUB-ASSEMBLY** (See **TIMING BELT**)
18. **INSPECT TIMING BELT** (See **INSPECTION**)
19. **INSTALL TIMING BELT** (See **INSTALLATION**)
20. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See **INSTALLATION**)
21. **INSTALL NO. 2 TIMING BELT GUIDE** (See **INSTALLATION**)
22. **INSTALL ENGINE MOUNTING BRACKET RH** (See **INSTALLATION**)

23. **INSTALL NO. 2 TIMING BELT COVER** (See **INSTALLATION**)
24. **INSTALL NO. 1 TIMING BELT COVER** (See **INSTALLATION**)
25. **INSTALL CRANKSHAFT PULLEY** (See **INSTALLATION**)
26. **INSTALL NO. 2 ENGINE MOUNTING STAY** (See **INSTALLATION**)
27. **INSTALL ENGINE MOVING CONTROL ROD** (See **INSTALLATION**)
28. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)
29. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See **INSTALLATION**)
30. **INSTALL OUTLET WATER** (See **INSTALLATION**)
31. **CONNECT INLET RADIATOR HOSE**
32. **INSTALL INTAKE MANIFOLD** (See **INSTALLATION**)
33. **CONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY** (See **INSTALLATION**)
34. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
35. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)
36. **INSTALL INVERTER WITH CONVERTER ASSEMBLY**

    HINT:

    See **INSTALLATION** .

37. **INSTALL SERVICE PLUG GRIP** (See **INSTALLATION**)
38. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
39. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
40. **INSTALL BATTERY CARRIER SUB-ASSEMBLY** (See **INSTALLATION**)
41. **INSTALL BATTERY** (See **INSTALLATION**)
42. **INSTALL NO. 2 ENGINE UNDER COVER** (See **INSTALLATION**)
43. **INSTALL FRONT FENDER APRON SEAL RH** (See **INSTALLATION**)
44. **INSTALL FRONT FENDER LINER RH** (See **INSTALLATION**)
45. **INSTALL NO. 1 ENGINE UNDER COVER** (See **INSTALLATION**)
46. **INSTALL FRONT WHEEL RH**
47. **ADD ENGINE OIL** (See **REPLACEMENT**)
48. **INSPECT FOR FUEL LEAK** (See **ON-VEHICLE INSPECTION**)
49. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
50. **INSPECT FOR OIL LEAK**
51. **INSPECT FOR COOLANT LEAK (for Engine)** (See **ON-VEHICLE INSPECTION**)
52. **INSPECT FOR EXHAUST GAS LEAK** (See **ON-VEHICLE INSPECTION**)
53. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
54. **INSPECT ENGINE IDLE SPEED** (See **ON-VEHICLE INSPECTION**)
55. **INSPECT COMPRESSION** (See **ON-VEHICLE INSPECTION**)

56. **INSPECT CO/HC** (See **ON-VEHICLE INSPECTION**)
57. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH** (See **INSTALLATION**)
58. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
59. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
60. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
61. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
62. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
63. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

CYLINDER HEAD

COMPONENTS

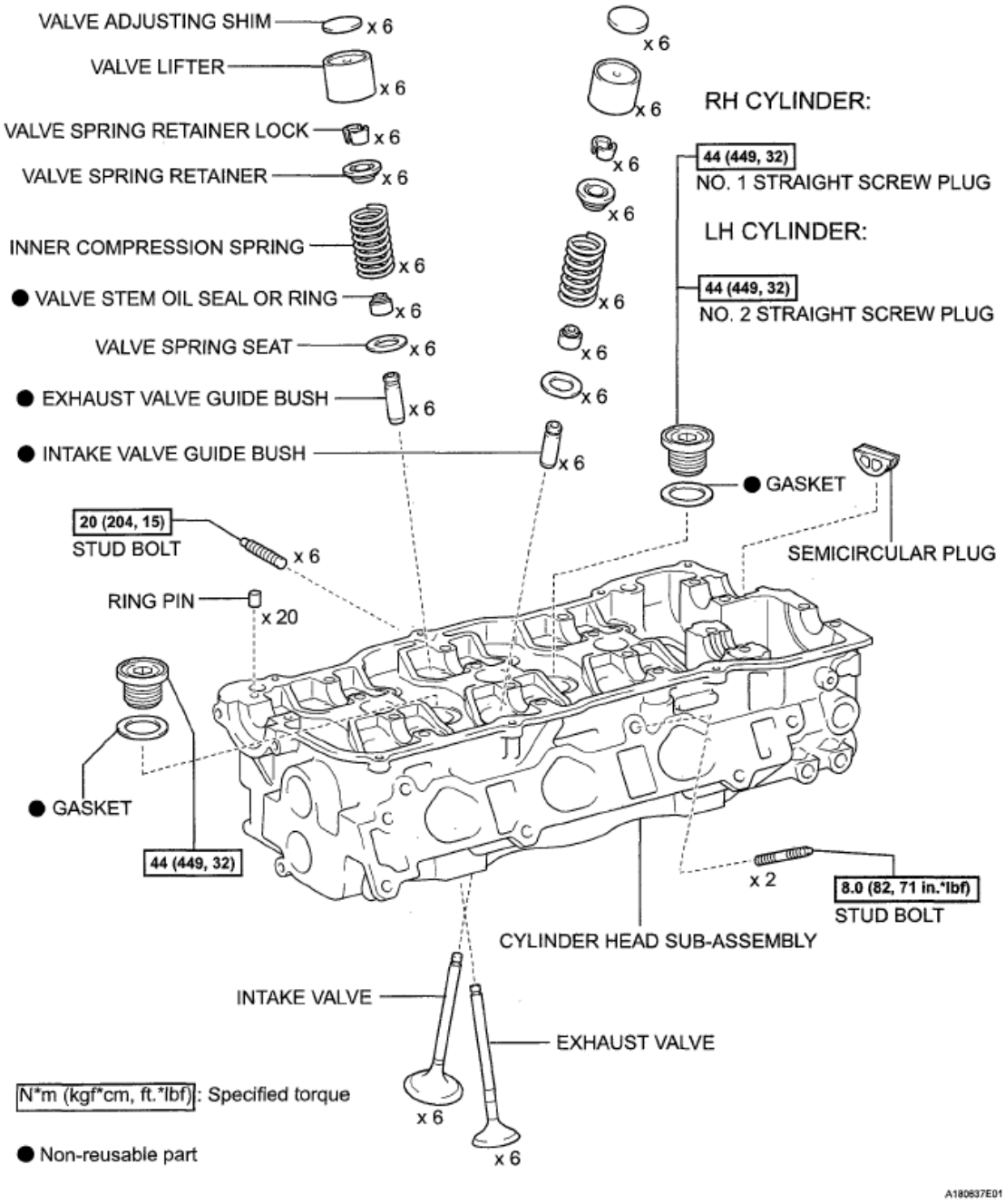


Fig. 203: Identifying Cylinder Head Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. **REMOVE NO. 1 STRAIGHT SCREW PLUG (for Bank 1)**
   a. Remove the valve stem caps from the cylinder heads.

      HINT:

Arrange the removed parts in the correct order.

2. **REMOVE NO. 2 STRAIGHT SCREW PLUG (for Bank 2)**
   a. Remove the valve stem caps from the cylinder heads.

      HINT:

      Arrange the removed parts in the correct order.

3. **REMOVE VALVE LIFTER**

   HINT:

   Store the lifters in the correct order so that they can be returned to the original locations when reassembling.

4. **REMOVE INTAKE VALVE**
   a. Using SST, compress the valve spring and remove the 2 retainer locks, retainer, spring and valve.

      SST 09202-70020 (09202-00010)

      HINT:

      Store the valves, valve springs and spring retainers in the correct order so that they can be returned to the original locations when reassembling.

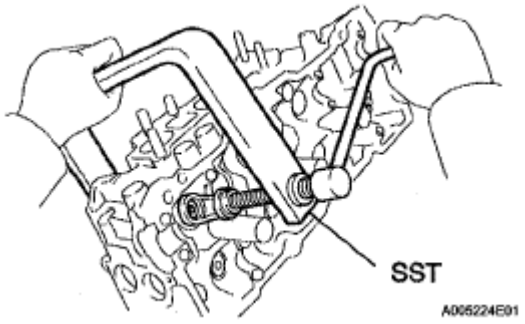


Fig. 204: Removing Retainer Locks, Retainer, Spring And Intake Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE EXHAUST VALVE**
   a. Using SST, compress the valve spring and remove the 2 retainer locks, retainer, spring and valve.

      SST 09202-70020(09202-00010)

      HINT:

      Store the valves, valve springs and spring retainers in the correct order so that they can be returned

to the original locations when reassembling.

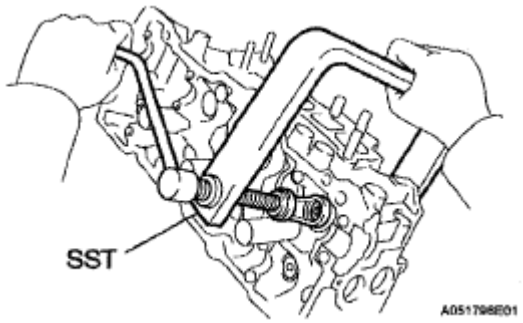


Fig. 205: Removing Exhaust Valve Spring With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **REMOVE VALVE STEM OIL SEAL OR RING**
   a. Using needle-nose pliers, remove the oil seals.
7. **REMOVE VALVE SPRING SEAT**
   a. Remove the valve spring seats from the cylinder head.
8. **REMOVE SEMICIRCULAR PLUG**
   a. Remove the semicircular plug from the cylinder head.
9. **REMOVE RING PIN (for Bank 1)**
10. **REMOVE RING PIN (for Bank 2)**
11. **REMOVE STUD BOLTS**

INSPECTION

1. **INSPECT CYLINDER HEAD SUB-ASSEMBLY**
   a. Using a precision straight edge and a feeler gauge, measure the warpage of the contacting surface between the cylinder block and the manifolds.

   Maximum Warpage

CYLINDER BLOCK SURFACE REFERENCE

Cylinder block surface	Intake manifold surface	Exhaust manifold surface
0.05 mm (0.0020 in.)	0.10 mm (0.0039 in.)	0.10 mm (0.0039 in.

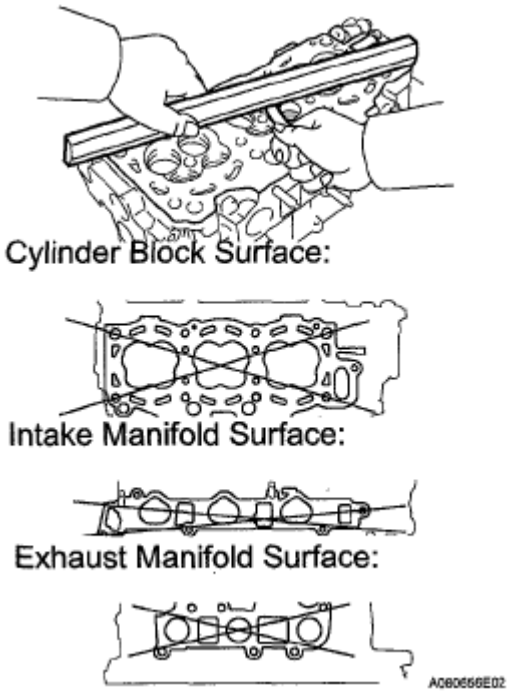


Fig. 206: Identifying Warpage Of Contacting Surface Between Cylinder Block And Manifolds
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

2. **INSPECT CYLINDER HEAD FOR CRACKS**
   a. Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

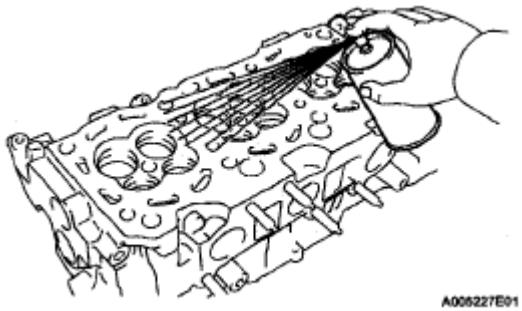


Fig. 207: Checking Combustion Chamber, Intake Ports, Exhaust Ports And Cylinder Block Surface For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSPECT INTAKE VALVE**
   a. Check the valve overall length.

      Standard overall length: 95.45 mm (3.7579 in.)

Minimum overall length: 94.95 mm (3.7382 in.)

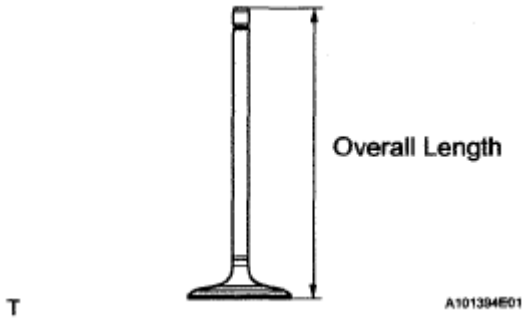


Fig. 208: Identifying Valve Overall Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter: 5.470 to 5.485 mm (0.2154 to 0.2159 in.)

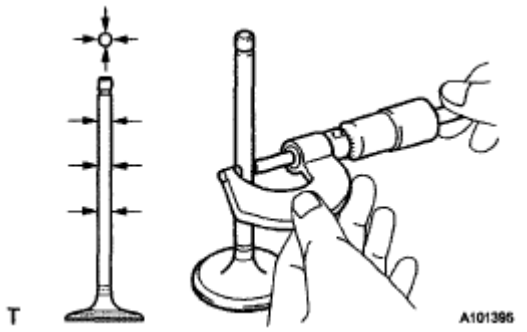


Fig. 209: Measuring Diameter Of Intake Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

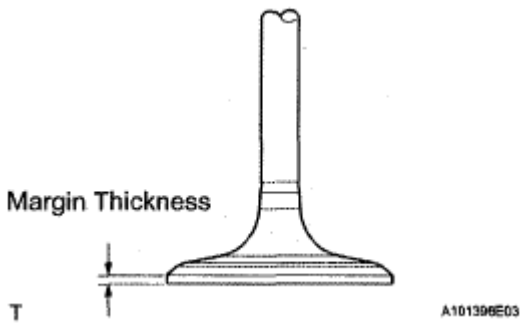


Fig. 210: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT EXHAUST VALVE**
   a. Check the valve overall length.

      Standard overall length: 95.40 mm (3.7559 in.)

      Minimum overall length: 94.90 mm (3.7362 in.)

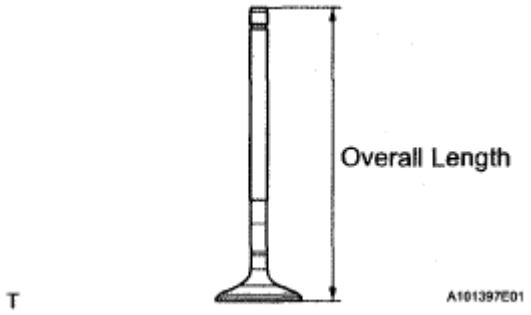


Fig. 211: Identifying Valve Overall Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using a micrometer, measure the diameter of the valve stem.

      Valve stem diameter: 5.465 to 5.480 mm (0.2152 to 0.2157 in.)

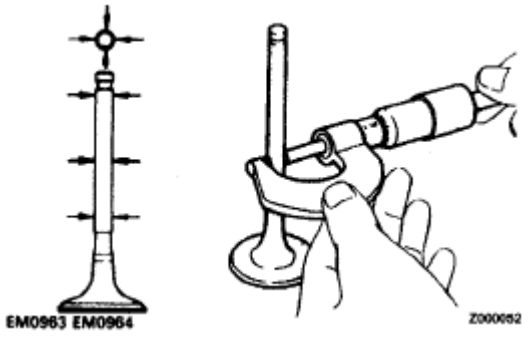


Fig. 212: Measuring Diameter Of Intake Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Check the valve head margin thickness.

      Standard margin thickness: 1.0 mm (0.039 in.)

      Minimum margin thickness: 0.5 mm (0.020 in.)

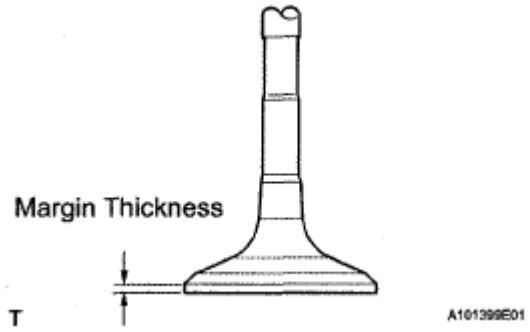


Fig. 213: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSPECT INNER COMPRESSION SPRING**
   a. Using vernier calipers, measure the free length of the valve spring.

      Free length: 45.50 mm (1.7913 in.)

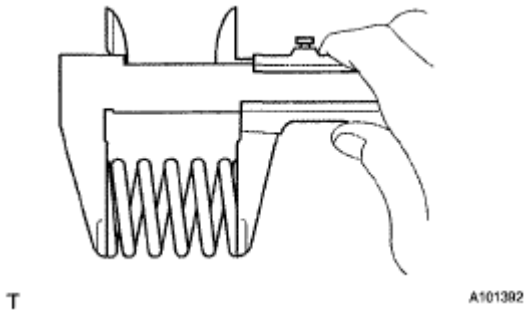


Fig. 214: Identifying Free Length Of Inner Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

      Maximum deviation: 2.0 mm (0.079 in.)

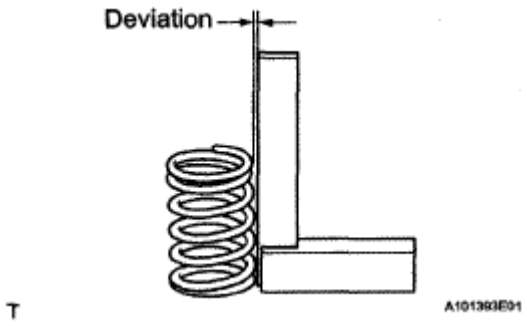


Fig. 215: Identifying Deviation Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension: 186 to 206 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf)

at 33.8 mm (1.331 in.)

If the installed tension is not as specified, replace the valve spring.

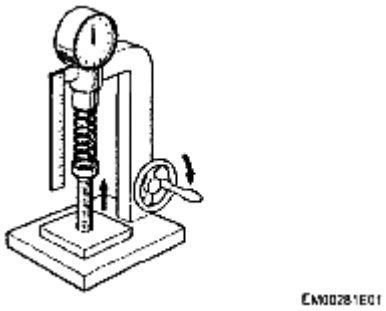


Fig. 216: Measuring Tension Of Inner Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSPECT VALVE GUIDE BUSHING OIL CLEARANCE**
   a. Using a caliper gauge, measure the inside diameter of the guide bushing.

   Bushing inside diameter: 5.510 to 5.530 mm (0.2169 to 0.2177 in.)

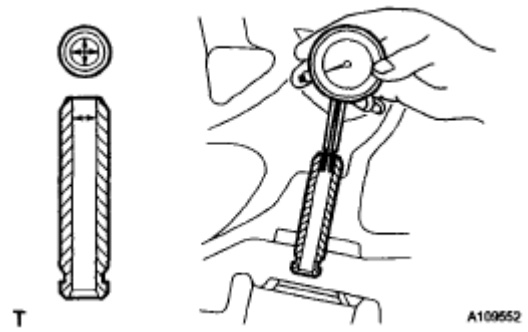


Fig. 217: Identifying Inside Diameter Of Guide Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

   Standard oil clearance

STANDARD OIL CLEARANCE SPECIFICATION

Intake	Exhaust
0.025 to 0.060 mm (0.0010 to 0.0024 in.)	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum oil clearance

MAXIMUM OIL CLEARANCE SPECIFICATION

Intake	Exhaust
0.08 mm (0.0031 in.)	0.10 mm (0.0039 in.)

7. **INSPECT VALVE SEATS**
   a. Apply a light coat of prussian blue (or white lead) to the valve face.
   b. Lightly press the valve against the seat.

      NOTE: Do not rotate the valve.

   c. Check the valve face and seat according to the following procedure.
      1. If prussian blue appears around the entire face, the valve is concentric. If not, replace the valve.
      2. If prussian blue appears around the entire valve seat, the guide and face are concentric. If not, resurface the seat.
      3. Check that the seat contacts in the middle of the valve face with the width between 1.0 and 1.4 mm (0.039 and 0.055 in.).

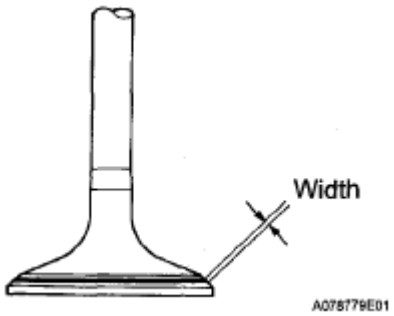


Fig. 218: Identifying Valve Face And Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSPECT VALVE LIFTER**
   a. Using a micrometer, measure the lifter diameter.

      Lifter diameter: 30.966 to 30.976 mm (1.2191 to 1.2195 in.)

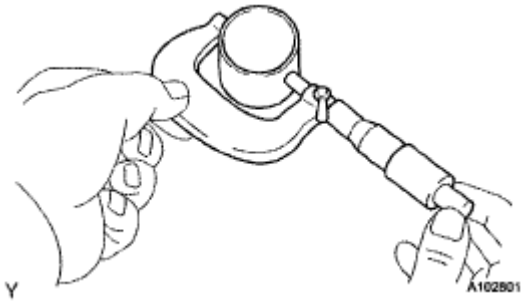


Fig. 219: Measuring Lifter Diameter Using Micrometer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSPECT VALVE LIFTER OIL CLEARANCE**
   a. Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

      Lifter bore diameter: 31.009 to 31.025 mm (1.2208 to 1.2215 in.)

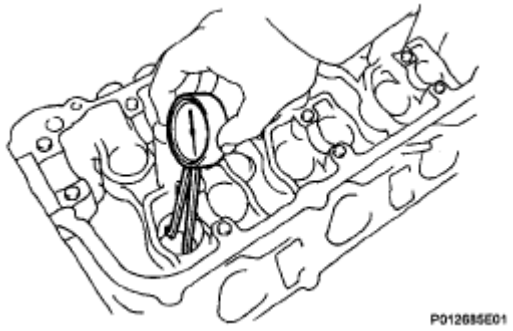


Fig. 220: Identifying Lifter Bore Diameter Of Cylinder Head Using Caliper Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Subtract the lifter diameter measurement from the lifter bore diameter measurement.

      Standard oil clearance: 0.033 to 0.059 mm (0.0013 to 0.0023 in.)

      Maximum oil clearance: 0.07 mm (0.0028 in.)

REPLACEMENT

1. **REMOVE VALVE GUIDE BUSH**
   a. Heat the cylinder head to 80 to 100°C (176 to 212°F).

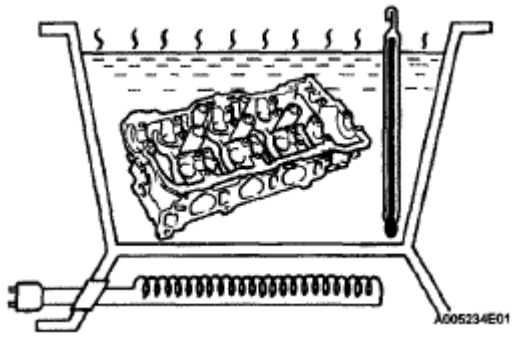


Fig. 221: View Of Heating Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST and a hammer, tap out the guide bush.

SST 09201-10000 (09201-01055), 09950-70010 (09951-07100)

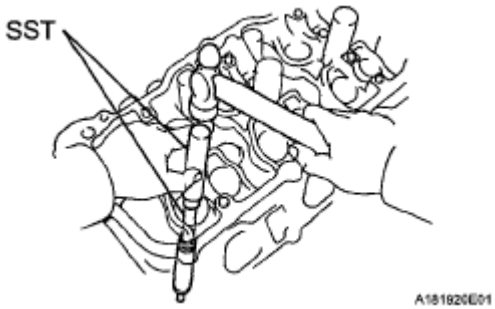


Fig. 222: Identifying Tapping Out Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL VALVE GUIDE BUSH**
   a. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

   Diameter: 10.295 to 10.313 mm (0.4053 to 0.4060 in.)

   If the bush bore diameter of the cylinder head is greater than 10.313 mm (0.4060 in.), machine the bush bore to the dimension of 10.345 to 10.363 mm (0.4073 to 0.4080 in.).

   HINT:

   Using a caliper gauge, measure the cylinder head.

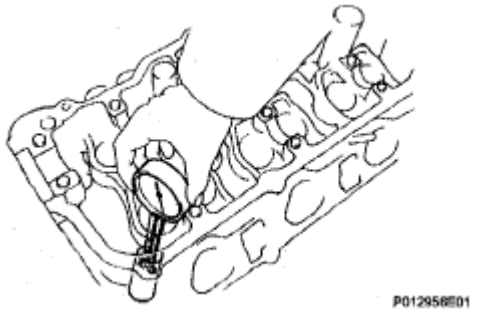


Fig. 223: Measuring Bush Bore Diameter Of Cylinder Head Using Caliper Gauge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bush diameter

BUSH DIAMETER SPECIFICATION

	Bush diameter
STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
O/S	10.383 to 10.394 mm (0.4088 to 0.4092 in.)

b. Using vernier calipers, measure the new bush length.

HINT:

Using vernier calipers, measure the bush.

Bush length

BUSH LENGTH SPECIFICATION

	Bush length
Intake	34.5 mm (1.358 in.)
Exhaust	40.5 mm (1.594 in.)

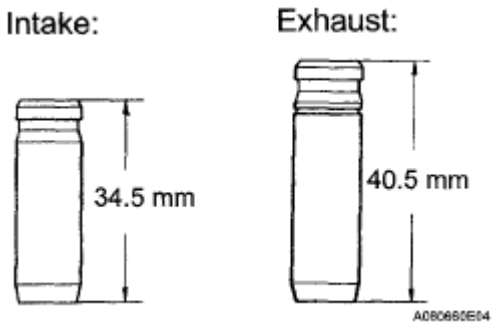


Fig. 224: Identifying Intake And Exhaust Bush Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Heat the cylinder head to 80 to 100°C (176 to 212°F).

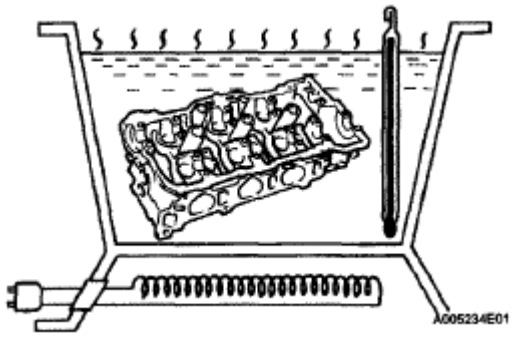


Fig. 225: View Of Heating Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

SST 09201-10000 (09201-01055), 09950-70010 (09951-07100)

Protrusion height

BUSH LENGTH SPECIFICATION

	Bush length
Intake	11.1 to 11.5 mm (0.437 to 0.453 in.)
Exhaust	8.9 to 9.3 mm (0.350 to 0.366 in.)

Fig. 226: View Of Tapping Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard oil clearance

BUSH LENGTH SPECIFICATION

	Bush length
Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)

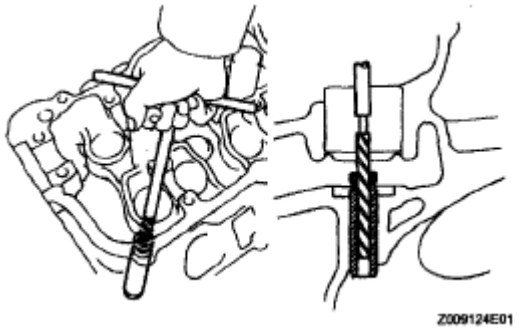


Fig. 227: View Of Reaming Guide Bush To Clearance Between Guide Bush And Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. **INSTALL RING PIN (for Bank 1)**
   a. Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

      Protrusion height: 3 mm (0.12 in.)

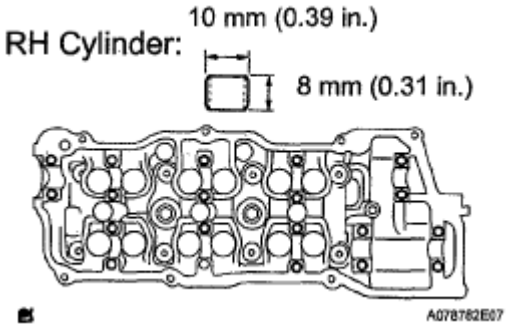


Fig. 228: Identifying Ring Pin Height (Bank 1)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL RING PIN (for Bank 2)**
   a. Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

      Protrusion height: 3 mm (0.12 in.)

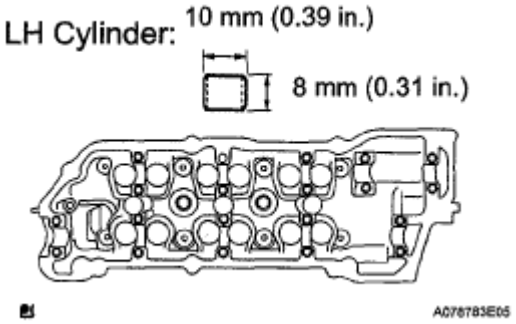


Fig. 229: Identifying Ring Pin Height (Bank 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL STUD BOLTS**
   a. Install the stud bolts on the intake side.

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

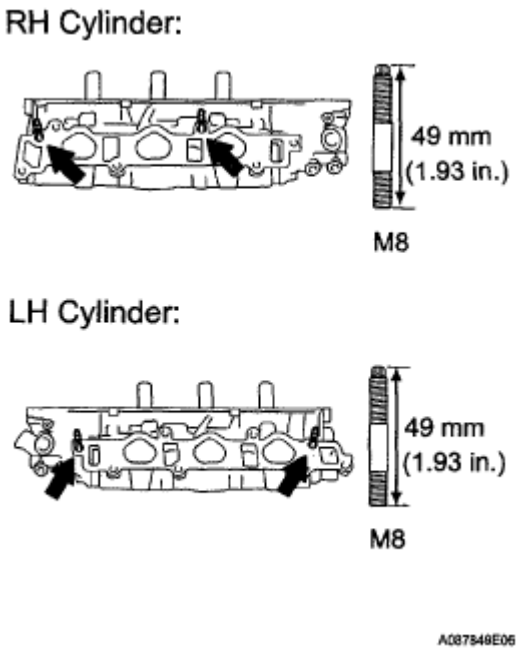


Fig. 230: Locating Stud Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the stud bolts on the exhaust side.

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

4. **INSTALL VALVE SPRING SEAT**
   a. Install the valve spring seat.
5. **INSTALL VALVE STEM OIL SEAL OR RING**

a. Apply a light coat of engine oil to the valve stem.

NOTE: Pay much attention when assembling the oil seal for intake and exhaust. Assembling the wrong one may cause an improper installation.

HINT:

The intake valve oil seal is light brown and the exhaust valve oil seal is gray.

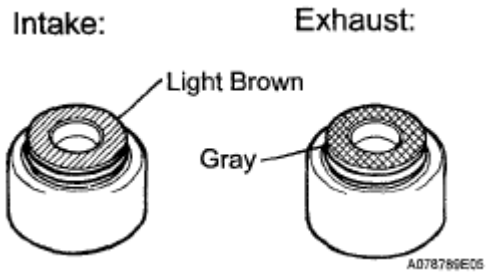


Fig. 231: Identifying Intake Valve Oil Seal Light Brown And Exhaust Valve Oil Seal Gray
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, push in new oil seals.

SST 09201-41020

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

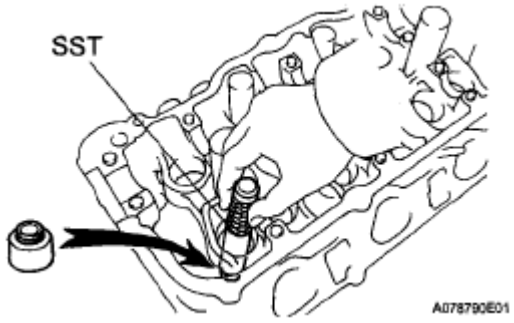


Fig. 232: Pushing In New Oil Seals Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL INTAKE VALVE**
   a. Install the valve, spring seat, valve spring, and spring retainer.

NOTE: Install the same parts in the same combination to the original

locations.

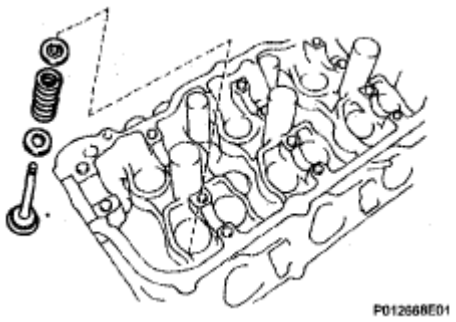


Fig. 233: Identifying Intake Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

SST 09202-70020 (09202-00010)

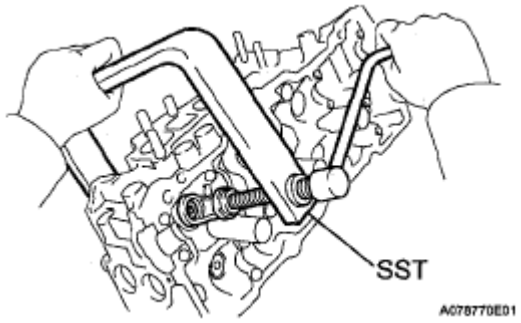


Fig. 234: Compressing Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a plastic-faced hammer and a discarded valve (the tip is wrapped with tape), lightly tap the installed valve to fit into place.

NOTE: Do not damage the installed valve stem tip.

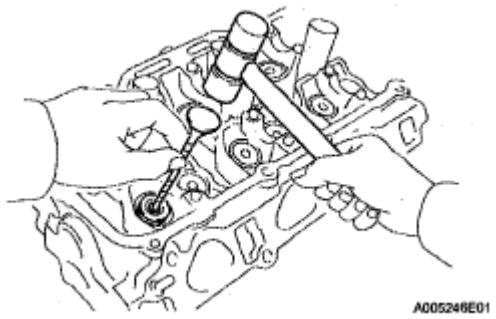


Fig. 235: View Of Tapping Valve Lifter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL EXHAUST VALVE**
   a. Install the valve, spring seat, valve spring, and spring retainer.

NOTE: Install the same parts in the same combination to the original locations.

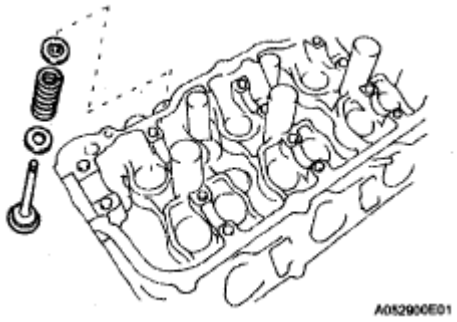


Fig. 236: Identifying Exhaust Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.

SST 09202-70020 (09202-00010)

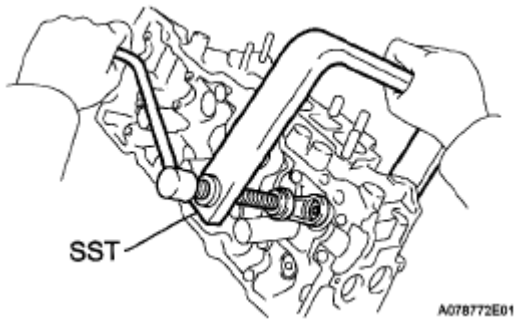


Fig. 237: View Of Compressing Valve Spring And Placing 2 Retainer Locks Around Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Using a plastic hammer and a discarded valve (the tip is wrapped with tape), lightly tap the installed valve to fit into place.

NOTE: Do not damage the installed valve stem tip.

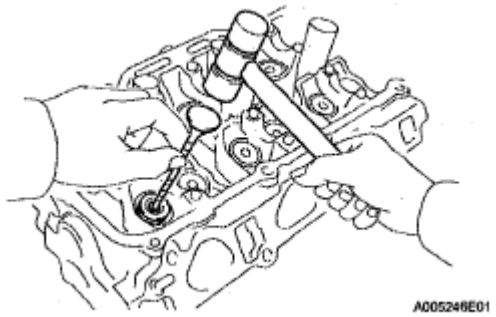


Fig. 238: View Of Tapping Valve Lifter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL VALVE LIFTER**
   a. Apply a light coat of engine oil to the valve lifter.

NOTE: **Install the same parts in the same combination to the original locations.**

   b. Install the valve lifter.
   c. Check that the valve lifter rotates smoothly by hand.
9. **INSTALL SEMICIRCULAR PLUG**
   a. Remove any old seal packing (FIPG) material.
   b. Apply seal packing to the semicircular plug grooves.

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

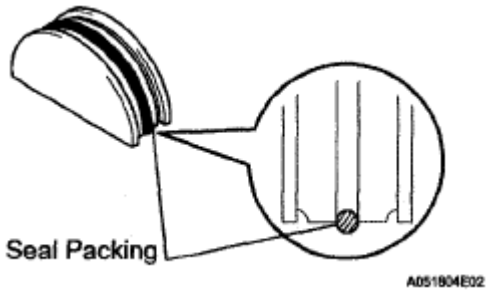


Fig. 239: Identifying Seal Packing To Semi-Circular Plug Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Install the 2 semi-circular plugs to the cylinder heads.

NOTE:
- **Install the plugs so that it is flush with the top of the cylinder head.**
- **Install the semicircular plugs within 3 minutes after applying seal packing.**

- **Do not expose the seal to engine oil within 2 hours after installing.**

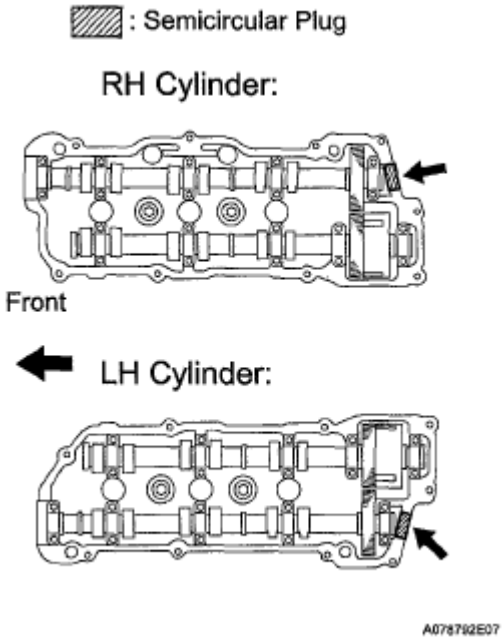


Fig. 240: Identifying Semicircular Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL NO. 2 STRAIGHT SCREW PLUG (for Bank 2)**
    a. Using a 14 mm hexagon wrench, install 2 new gaskets and the 2 screw plugs.

       Torque: 44 N*m (448 kgf*cm, 32 ft.*lbf)

11. **INSTALL NO. 1 STRAIGHT SCREW PLUG (for Bank 1)**
    a. Using a 14 mm hexagon wrench, install 2 new gaskets and the 2 screw plugs.

       Torque: 44 N*m (448 kgf*cm, 32 ft.*lbf)

REPAIR

1. **REPAIR VALVE SEATS**

   NOTE: Releasing the seat-cutter pressure gradually helps to make smoother valve seat faces.

   a. If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

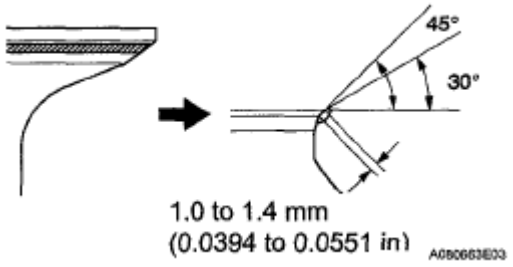


Fig. 241: Identifying Valve Seat Faces Angle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.

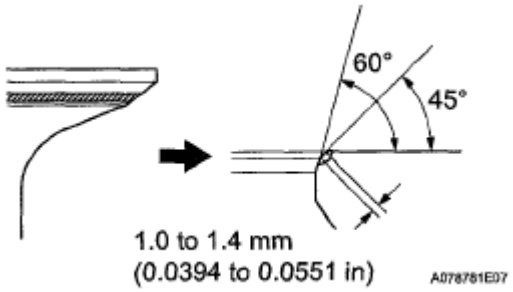


Fig. 242: Identifying Valve Seat Faces Angle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Handrub the valve and valve seat with an abrasive compound.
d. Recheck the valve seating position.

CYLINDER BLOCK

COMPONENTS

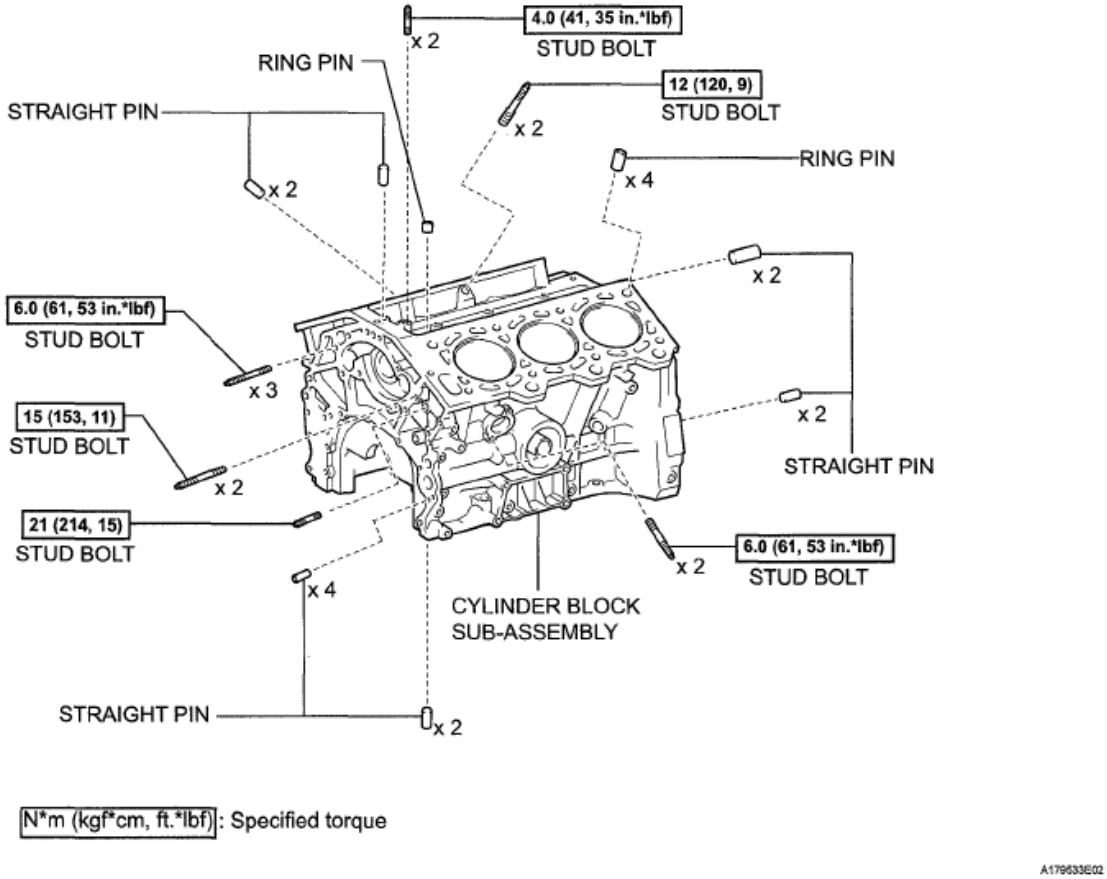


Fig. 243: Identifying Cylinder Block Components With Torque Specifications (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

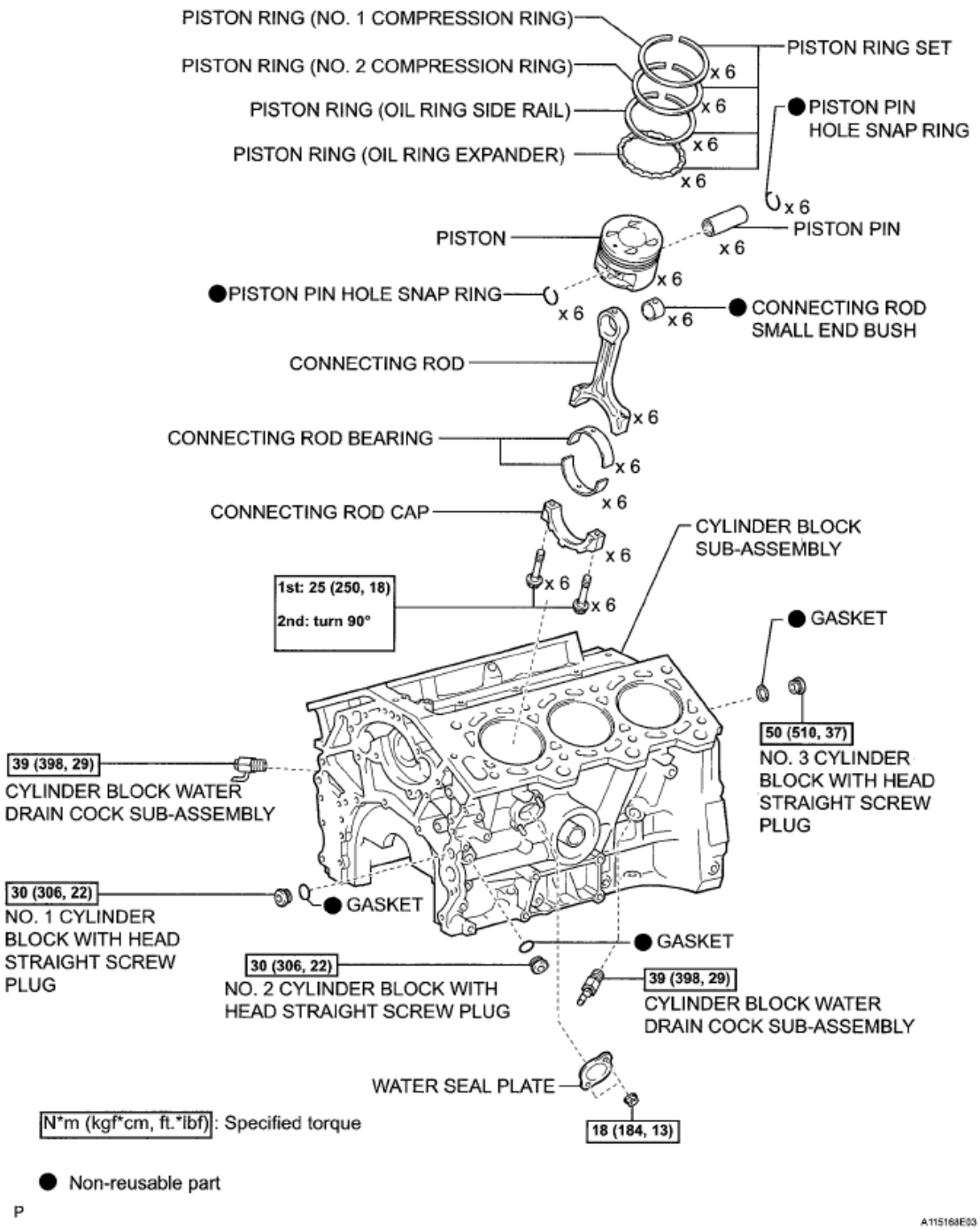


Fig. 244: Identifying Cylinder Block Components With Torque Specifications (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

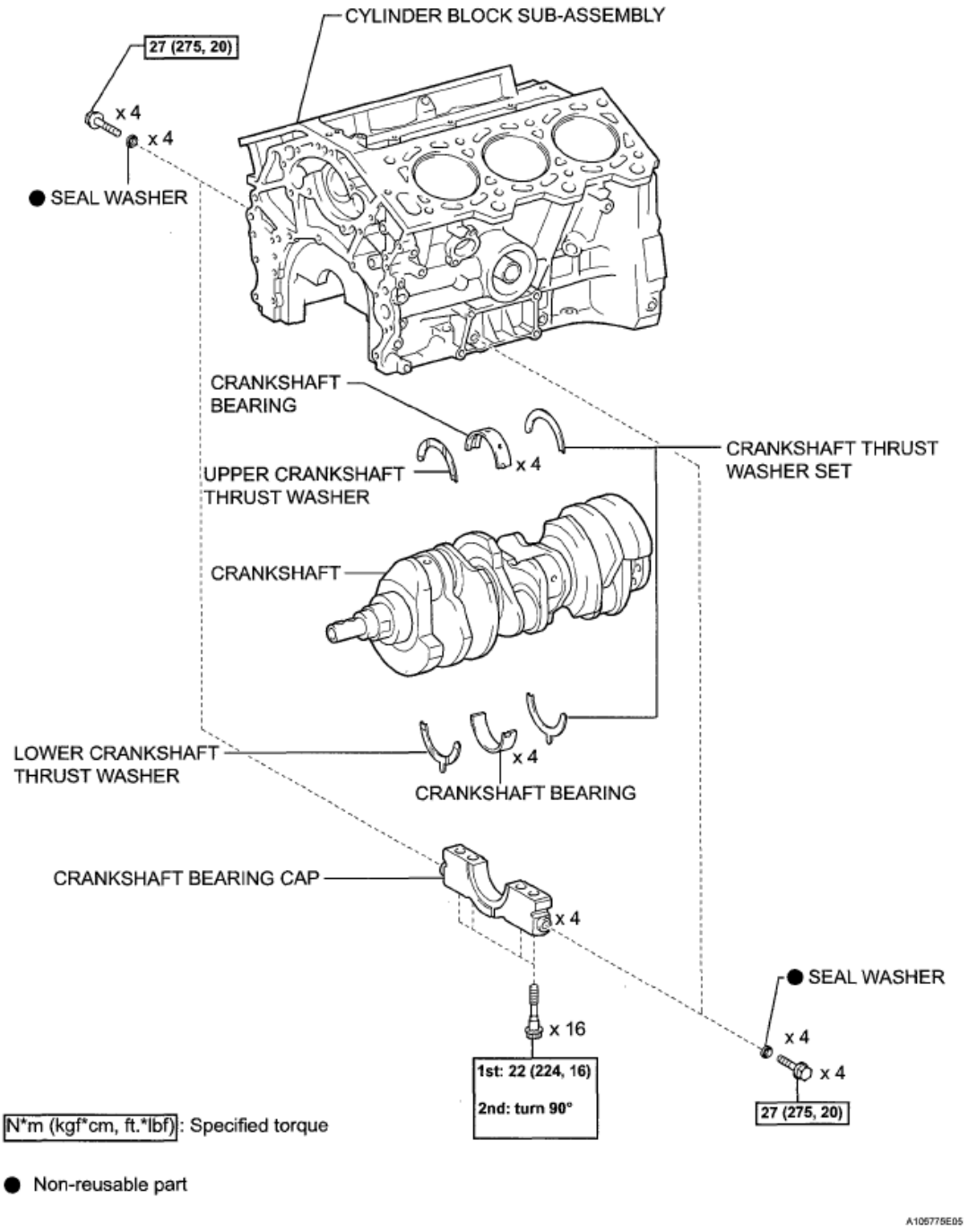


Fig. 245: Identifying Cylinder Block Components With Torque Specifications (3 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
   a. Remove the water drain cock sub-assembly from the cylinder block.
2. **REMOVE WATER SEAL PLATE**

a. Remove the 2 nuts and water seal plate from the cylinder block.

3. **REMOVE NO. 1 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
   a. Using a 10 mm socket hexagon wrench, remove the No. 1 straight screw plug and gasket.
4. **REMOVE NO. 2 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
   a. Using a 10 mm socket hexagon wrench, remove the No. 2 straight screw plug and gasket.
5. **REMOVE NO. 3 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
   a. Using a 10 mm socket hexagon wrench, remove the No. 3 straight screw plug and gasket.
6. **REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD**
   a. Check that the matchmarks on the connecting rod sub-assembly and connecting rod cap are aligned.

      HINT:

      The matchmarks on the connecting rod sub-assembly and connecting rod cap are guides for the correct reassembly.

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

      HINT:

      Keep the lower bearing inserted to the connecting rod cap.

   d. Using a ridge reamer, remove all the carbon from the top of the cylinder.

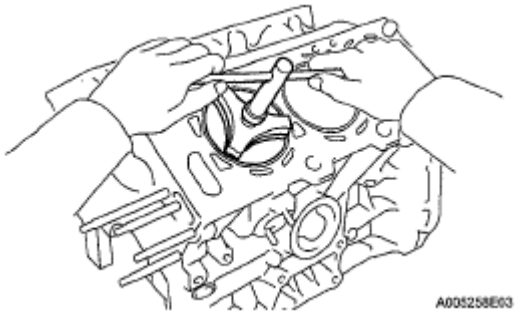


Fig. 246: Identifying Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

      HINT:

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

7. **REMOVE CONNECTING ROD BEARING**

   HINT:

   Arrange the removed parts in the correct order.

8. **REMOVE PISTON RING SET**
   a. Using a piston ring expander, remove the 2 compression rings.
   b. Remove the oil ring expander and 2 side rails by hand.

      HINT:

      Arrange the removed parts in the correct order.

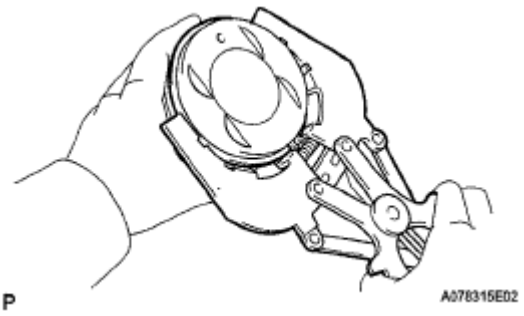


Fig. 247: Removing Compression Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **REMOVE PISTON SUB-ASSEMBLY WITH PIN**
   a. Check the fitting condition between the piston and piston pin.
      1. Try to move the piston back and forth on the piston pin.

         If any movement is felt, replace the piston and pin as a set.

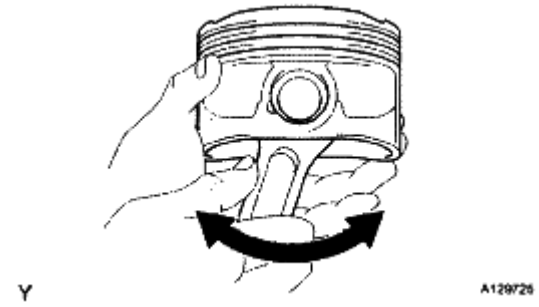


Fig. 248: Locating Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Disconnect the connecting rod from the piston.

1. Using a screwdriver, pry off the piston pin hole snap rings from the piston.

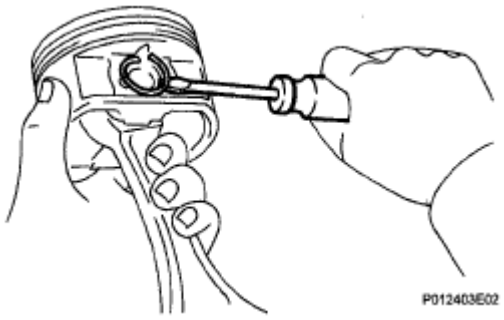


Fig. 249: Prying Snap Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Gradually heat the piston to approximately 80°C (176°F).

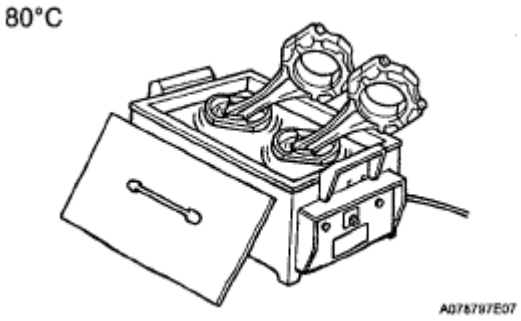


Fig. 250: View Of Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Using a brass bar and plastic hammer, lightly tap out the piston pin and remove the connecting rod sub-assembly.

   HINT:

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

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

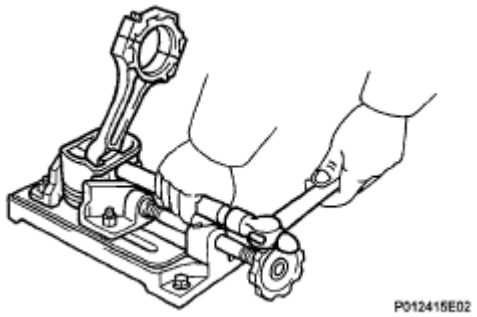


Fig. 251: View Of Tapping Out Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a groove cleaning tool or broken ring, clean the piston ring grooves.
e. Using solvent and a brush, thoroughly clean the piston.

NOTE: Do not use a wire brush.

10. **REMOVE CONNECTING ROD SMALL END BUSH**
    a. Using SST and a press, press out the bushing.

    SST 09222-30010

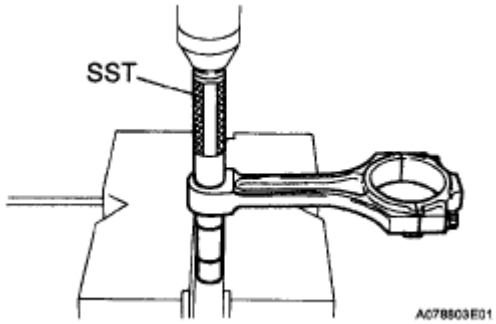


Fig. 252: Identifying Bushing Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **REMOVE CRANKSHAFT**
    a. Using several steps, loosen and remove the 8 main bearing cap bolts and seal washers uniformly in the sequence shown in the illustration.

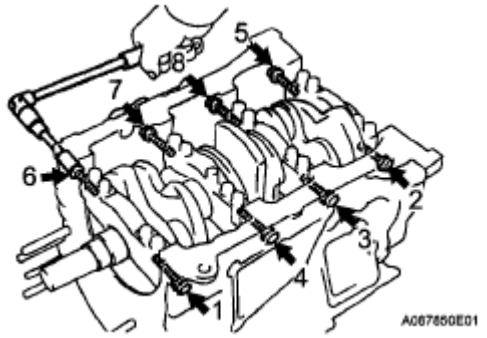


Fig. 253: Identifying Loosening Sequence Of Main Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using several steps, loosen and remove the 16 main bearing cap bolts uniformly in the sequence shown in the illustration.

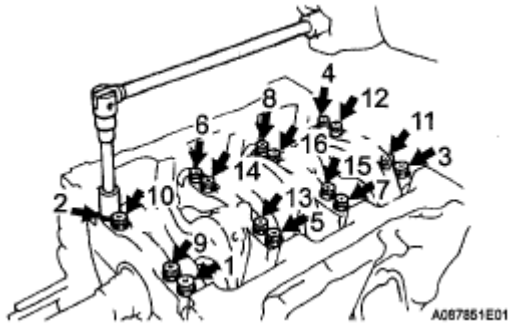


Fig. 254: Identifying Loosening Sequence Of Main Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a screwdriver, pry out the main bearing caps. Remove the 4 main bearing caps and the lower bearings.

NOTE:

- **Carefully pry out the main bearing cap by alternating lifting a little at a time on each end of the cap.**
- **Do not damage the joint surface of the cylinder block and the main bearing cap.**

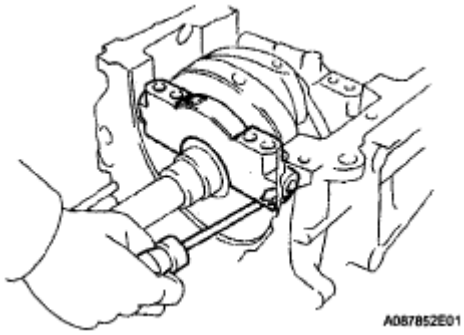


Fig. 255: View Of Prying Out Main Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Check the damaged the joint surface of the cylinder block and the main bearing cap.

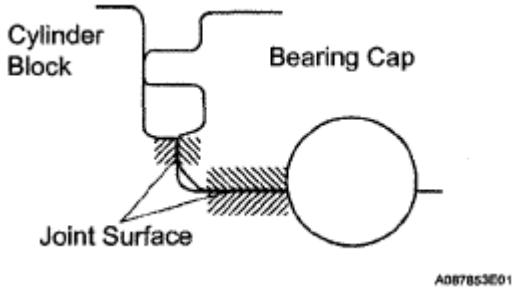


Fig. 256: Identifying Damaged Joint Surface Of Cylinder Block And Main Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **REMOVE CRANKSHAFT BEARING**
    a. Remove the upper crankshaft bearing and lower crankshaft bearing.

       HINT:

       Arrange the removed parts in the correct order.

13. **REMOVE CRANKSHAFT THRUST WASHER SET**
    a. Remove the crankshaft thrust washer set.
14. **REMOVE STUD BOLTS**
15. **REMOVE STRAIGHT PINS**
16. **REMOVE RING PINS**

INSPECTION

1. **INSPECT CONNECTING ROD THRUST CLEARANCE**
    a. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance: 0.15 to 0.30 mm (0.0059 to 0.0118 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

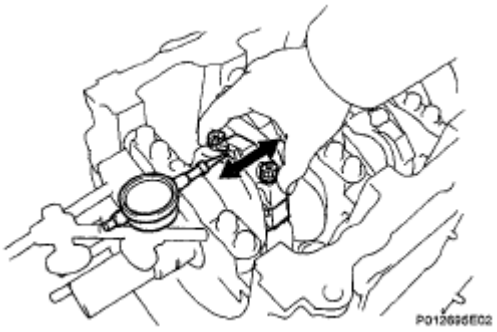


Fig. 257: Connecting Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT CONNECTING ROD OIL CLEARANCE**
   a. Check that the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
   b. Remove the 2 connecting rod cap bolts.
   c. Clean the crank pin, the bearing and the connecting rod.
   d. Check the crank pin and bearing for pits and scratches.
   e. Lay a strip of Plastigage across the crank pin.

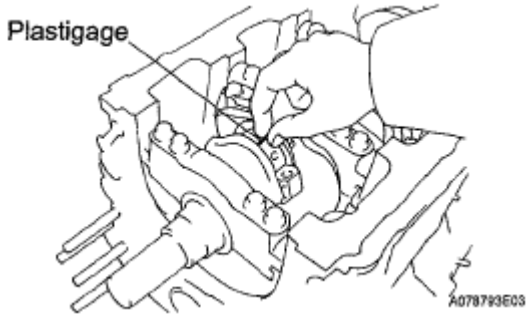


Fig. 258: View Of Laying Strip Of Plastigage Across Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   f. Check that the protrusion of the connecting rod cap is facing the correct direction.
   g. Apply a light coat of engine oil to the threads of the connecting rod cap bolts.

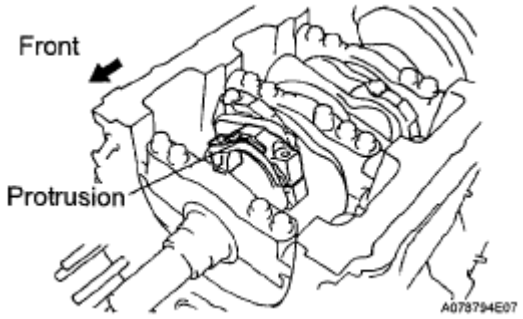


Fig. 259: Identifying Connecting Rod Cap Facing Correct Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Tighten the bolts in several steps to the specified torque.

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

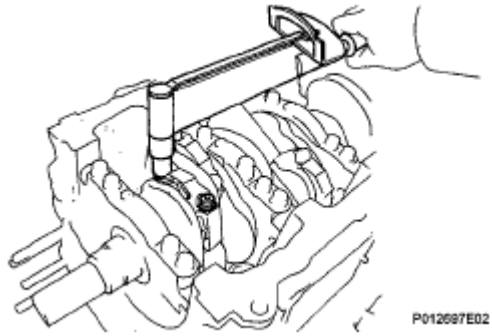


Fig. 260: Identifying Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Mark the front side of each connecting cap bolt with paint.

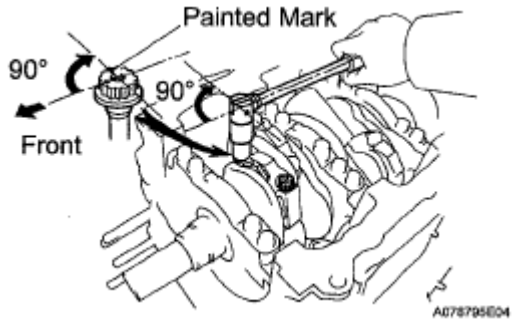


Fig. 261: View Of Tightening Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Retighten the cap bolts by 90° as shown in the illustration.

NOTE: Do not turn the crankshaft.

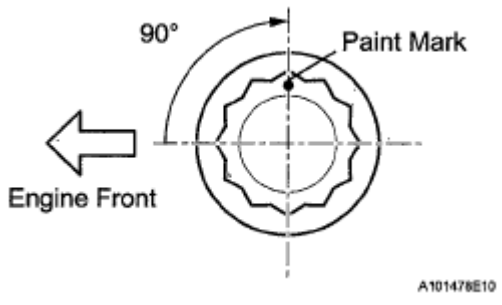


Fig. 262: Identifying Connecting Rod Cap Bolts Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

k. Remove the 2 bolts, the connecting rod cap and the lower bearing.
l. Measure the Plastigage at its widest point.

Standard oil clearance: 0.038 to 0.066 mm (0.0015 to 0.0026 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

NOTE: Completely remove the Plastigage.

Fig. 263: Identifying Plastigage Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

m. If replacing the bearing, replace it with one that has the same number as marked on the connecting rod.

Standard bearing center wall thickness

STANDARD BEARING CENTER WALL THICKNESS SPECIFICATION

Mark	mm (in.)
"1"	1.484 to 1.487 (0.0584 to 0.0585)
"2"	1.488 to 1.490 (0.0586 to 0.0587)

"3"	1.491 to 1.493 (0.0587 to 0.0588)
"4"	1.494 to 1.496 (0.0588 to 0.0589)

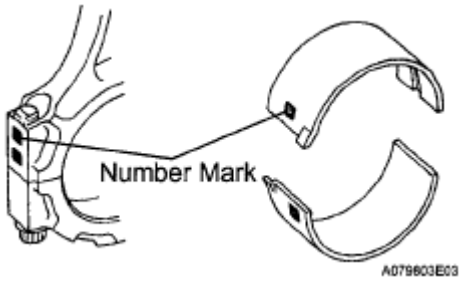


Fig. 264: Identifying Connecting Rod Bearing Mark Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.**

3. **INSPECT CYLINDER BLOCK FOR WARPAGE**
   a. Using a precision straight edge and feeler gauge, measure the warpage of the contacting surface of the cylinder head gasket.

      Maximum warpage: 0.05 mm (0.0020 in.)

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

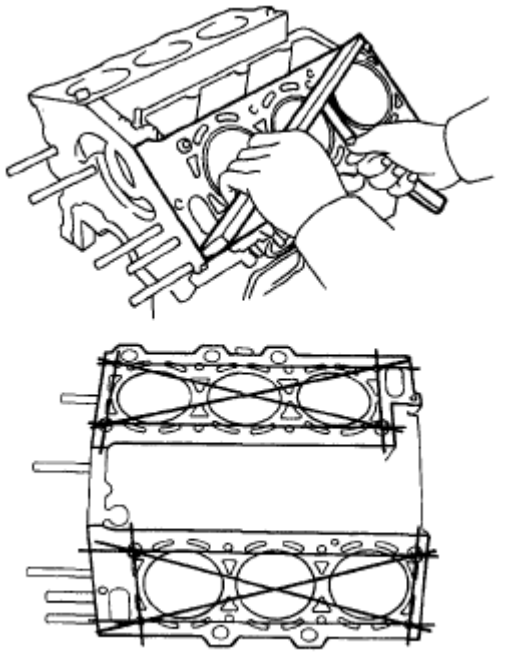


Fig. 265: View Of Measuring Warpage Of Contacting Surface Of Cylinder Head Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT CYLINDER BORE**
   a. Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

      Standard diameter: 92.000 to 92.012 mm (3.6220 to 3.6225 in.)

      Maximum diameter: 92.132 mm (3.6272 in.)

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

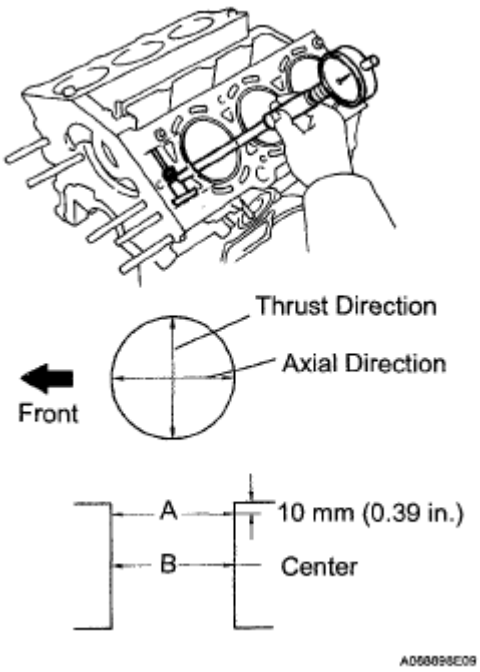


Fig. 266: View Of Measuring Cylinder Bore Diameter Positions A And B
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSPECT PISTON SUB-ASSEMBLY WITH PIN**
   a. Using a micrometer, measure the diameter of the piston. When measuring the diameter, attach the micrometer to a location where 13.0 mm (0.512 in.) above from the piston bottom at the right angles to the piston pin hole.

      Piston diameter: 91.975 to 91.989 mm (3.6211 to 3.6216 in.)

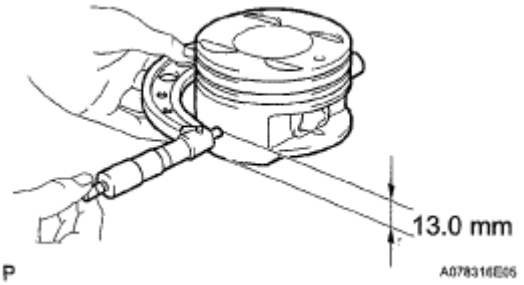


Fig. 267: View Of Measuring Diameter Of Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSPECT PISTON OIL CLEARANCE**
   a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

      Standard oil clearance: 0.033 to 0.059 mm (0.0013 to 0.0023 in.)

      Maximum oil clearance: 0.13 mm (0.0051 in.)

      If the oil clearance is greater than the maximum, replace all the 6 pistons. If necessary, replace the cylinder block.

7. **INSPECT RING GROOVE CLEARANCE**
   a. Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

      Standard ring groove clearance

STANDARD RING GROOVE CLEARANCE SPECIFICATION

Item	Specified Condition
No. 1	0.03 to 0.08 mm (0.0012 to 0.0031 in.)
No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
Oil (Side rail)	0.03 to 0.11 mm (0.0012 to 0.0043 in.)

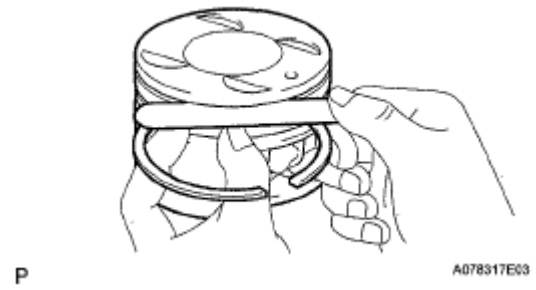


Fig. 268: View Of Measuring Clearance Between Piston Ring And Wall Of Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the clearance is not as specified, replace the piston.

8. **INSPECT PISTON PIN OIL CLEARANCE**
   a. Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

      Bushing inside diameter: 22.005 to 22.014 mm (0.8663 to 0.8667 in.)

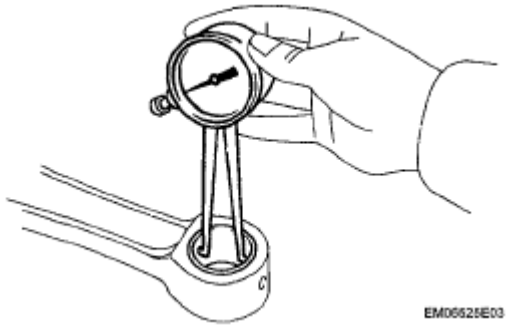


Fig. 269: View Of Measuring Inside Diameter Of Connecting Rod Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using a micrometer, measure the piston pin diameter.

      Piston pin diameter: 21.997 to 22.006 mm (0.8660 to 0.8664 in.)

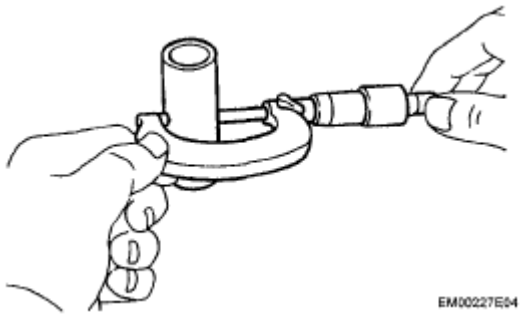


Fig. 270: View Of Measuring Piston Pin Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

      Standard oil clearance: 0.005 to 0.011 mm (0.0002 to 0.0004 in.)

      Maximum oil clearance: 0.05 mm (0.0020 in.)

9. **INSPECT PISTON RING END GAP**
   a. Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

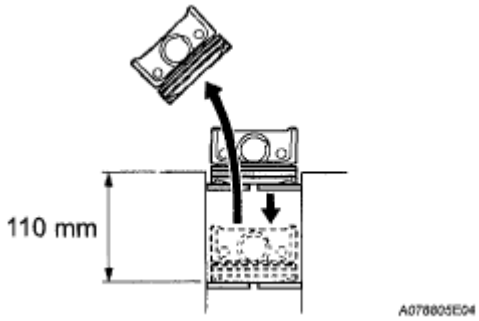


Fig. 271: Identifying Piston Ring End Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard end gap

STANDARD END GAP SPECIFICATION

Item	Specified Condition
No. 1	0.30 to 0.40 mm (0.0118 to 0.0157 in.)
No. 2	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
Oil (Side rail)	0.15 to 0.40 mm (0.0059 to 0.0157 in.)

Maximum end gap

MAXIMUM END GAP SPECIFICATION

Item	Specified Condition
No. 1	0.95 mm (0.0374 in.)
No. 2	1.05 mm (0.0413 in.)
Oil (Side rail)	1.00 mm (0.0394 in.)

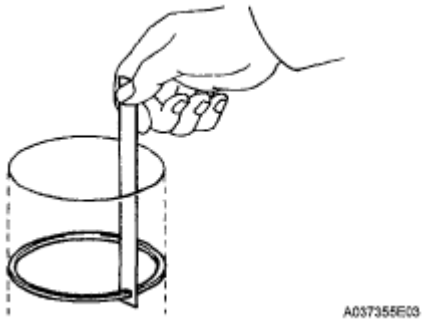


Fig. 272: View Of Measuring End Gap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum even with a new piston ring, replace the cylinder block.

10. **INSPECT CRANKSHAFT THRUST CLEARANCE**
    a. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

    Standard thrust clearance: 0.04 to 0.24 mm (0.0016 to 0.0094 in.)

    Maximum thrust clearance: 0.30 mm (0.0118 in.)

    If the thrust clearance is greater than the maximum, replace the thrust washers as a set. Check the crankshaft for wear, repair or replace if necessary.

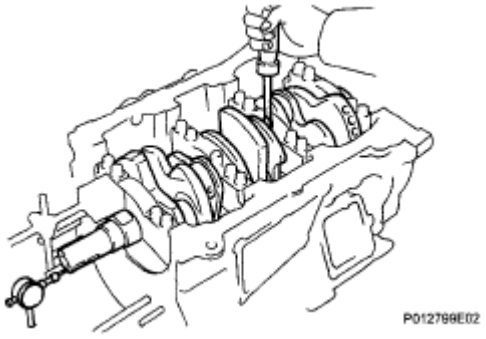


Fig. 273: View Of Measuring Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

11. **INSPECT CONNECTING ROD SUB-ASSEMBLY**
    a. Using a rod aligner and feeler gauge, check the connecting rod alignment.
    1. Check for misalignment.

    Maximum misalignment: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

    If misalignment is greater than the maximum, replace the connecting rod assembly.

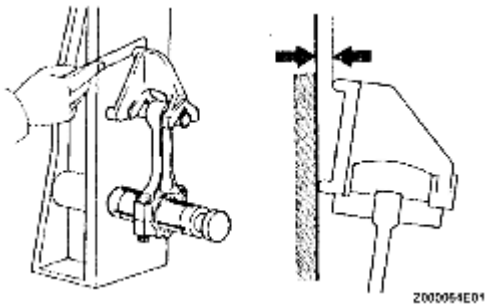


Fig. 274: Identifying Connecting Rod Alignment

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

2. Check for twist.

Maximum twist: 0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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

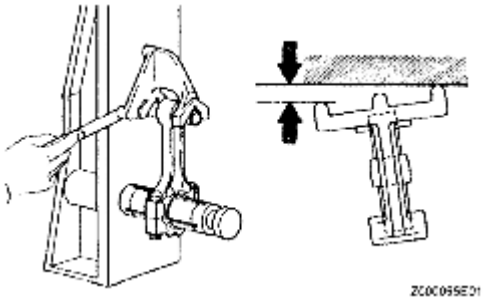


Fig. 275: Identifying Twisting
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **INSPECT CONNECTING ROD BOLT**
    a. Using vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)

Minimum diameter: 7.0 mm (0.276 in.)

If the diameter is less than the minimum, replace the bolt.

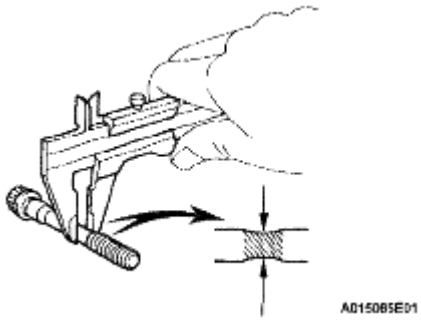


Fig. 276: View Of Measuring Tension Portion Diameter Of Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **INSPECT CRANKSHAFT BEARING CAP SET BOLT**
    a. Using vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 7.5 to 7.6 mm (0.295 to 0.299 in.)

Minimum diameter: 7.2 mm (0.283 in.)

If the diameter is less than the minimum, replace the bolt.

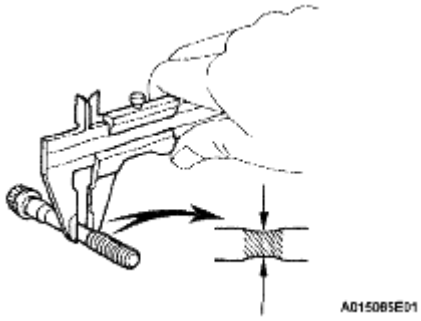


Fig. 277: View Of Measuring Tension Portion Diameter Of Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **INSPECT CRANKSHAFT**
    a. Using a dial indicator and V-blocks, measure the runout as shown in the illustration.

    Maximum circle runout: 0.06 mm (0.0024 in.)

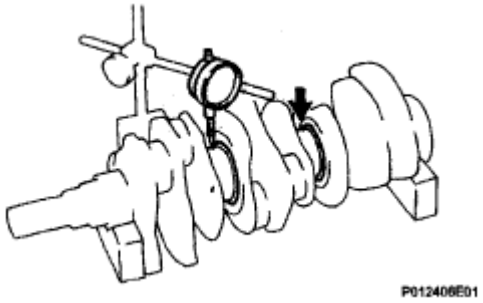


Fig. 278: View Of Measuring Crankshaft Runout Using Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

    Diameter: 60.988 to 61.000 mm (2.4011 to 2.4016 in.)

    c. Check each main journal for taper and out-of-round as shown.

    Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

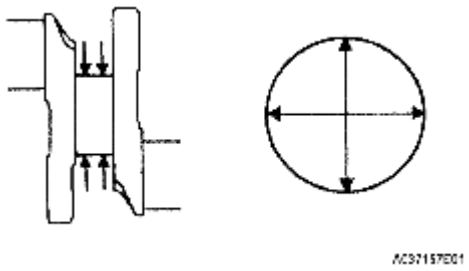


Fig. 279: Identifying Main Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a micrometer, measure the diameter of each crank pin.

Diameter: 52.992 to 53.000 mm (2.0863 to 2.0866 in.)

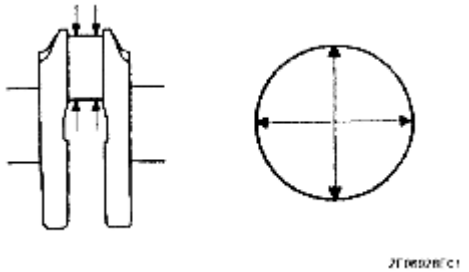


Fig. 280: Identifying Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Check each crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

15. **INSPECT CRANKSHAFT OIL CLEARANCE**
    a. Clean each main journal and bearing.

    HINT:

    Main bearings come in widths of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.), install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 2 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 3 and No. 4 positions.

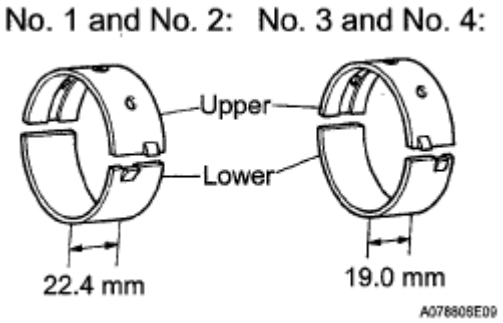


Fig. 281: Identifying Upper And Lower Bearings Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Align the bearing key with the keyway of the cylinder block, and push in the 4 upper bearings.

NOTE: Do not apply engine oil to the bearing and its contact surface.

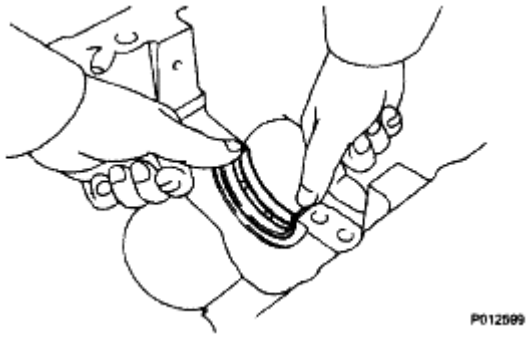


Fig. 282: Identifying Bearing Claw With Claw Groove Of Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Align the bearing key with the keyway of the main bearing cap, and push in the 4 lower bearings.

NOTE: Do not apply engine oil to the bearing and its contact surface.

HINT:

A number is marked on each main bearing cap to indicate the installation position.

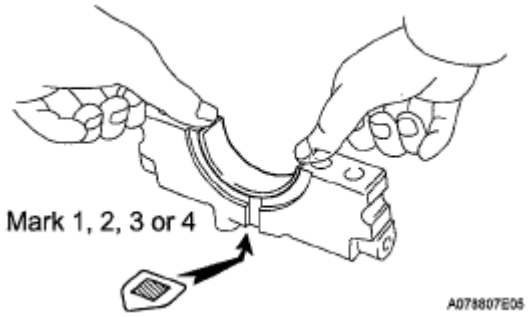


Fig. 283: View Of Pushing Lower Bearings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Place the crankshaft on the cylinder block.
e. Lay a strip of Plastigage across each journal.

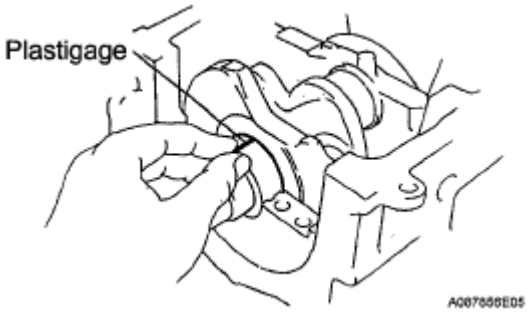


Fig. 284: Identifying Strip Of Plastigage Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Examine the front marks and numbers and install the bearing caps on the cylinder block.
g. Apply a light coat of engine oil to the threads of the bearing cap bolts.
h. Temporarily install the 8 main bearing cap bolts to the inside positions.

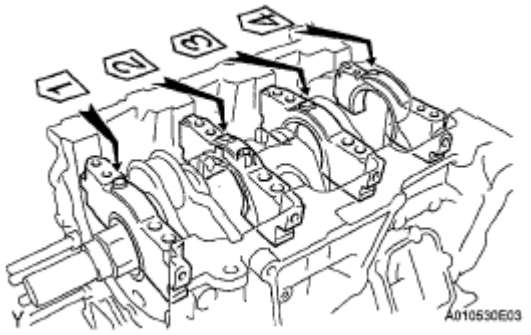


Fig. 285: Identifying Bearing Caps Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Install the main bearing cap by hand until clearance between the cylinder block and the bearing cap

becomes 6 mm (0.23 in.) or less.

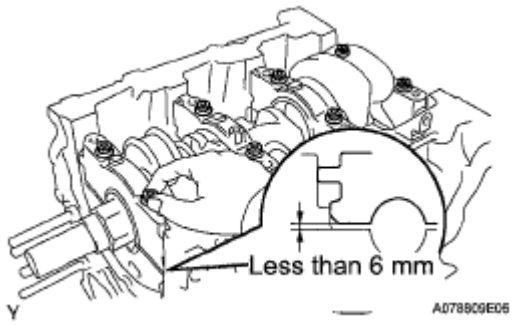


Fig. 286: Identifying Clearance Between Cylinder Block And Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.

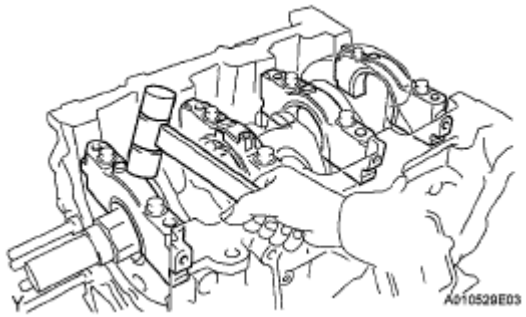


Fig. 287: View Of Tapping Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

k. Apply a light coat of engine oil to the threads of the main bearing cap bolts.
l. Using several steps, install and tighten the 16 main bearing cap bolts uniformly in the sequence shown in the illustration.

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

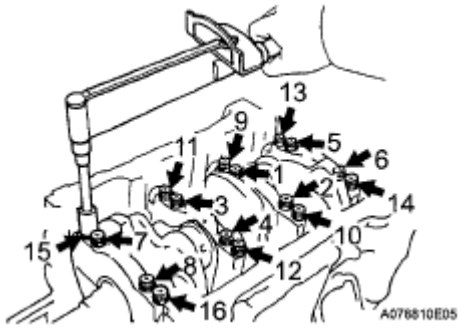


Fig. 288: View Of Tightening Main Bearing Cap Bolts Sequence

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

m. Mark the front side of the bearing cap bolts with paint.
n. Retighten the bearing cap bolts by 90° in the same sequence shown as step (I).

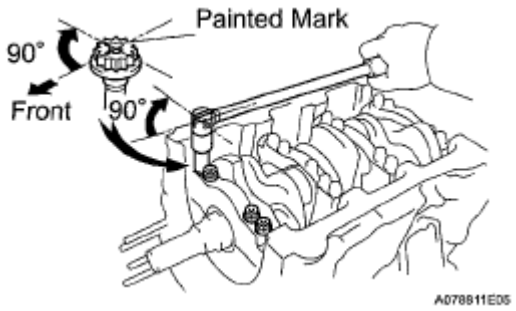


Fig. 289: Identifying Main Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

o. Check that each painted mark is now at a 90° angle to the front.

NOTE: Do not turn the crankshaft.

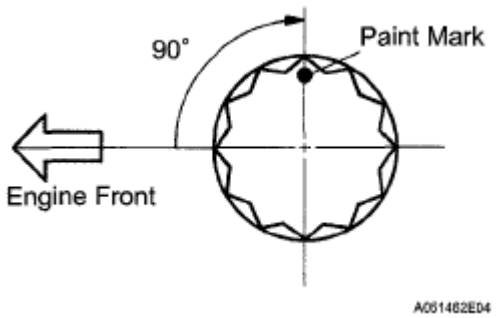


Fig. 290: Identifying Painted Mark Angle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

p. Using several steps, install and tighten the 8 main bearing cap bolts uniformly in the sequence shown in the illustration.

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

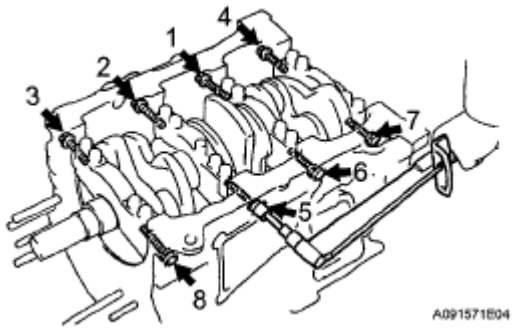


Fig. 291: Identifying Main Bearing Caps Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

q. Remove the main bearing caps.
r. Measure the Plastigage at its widest point.

Standard clearance

STANDARD CLEARANCE SPECIFICATION

	Standard oil clearance	Maximum clearance
No.1 and No.2 journals	0.014 to 0.031 mm (0.0006 to 0.0012 in.)	0.05 mm (0.0020 in.)
No.3 and No.4 journals	0.026 to 0.043 mm (0.0010 to 0.0017 in.)	0.06 mm (0.0024 in.)

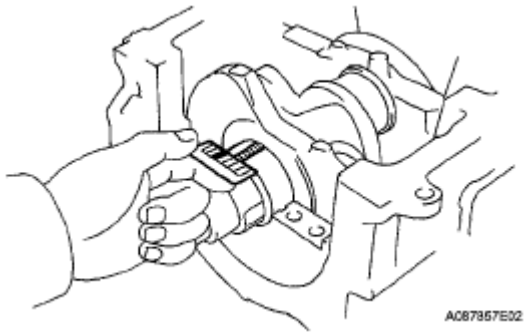


Fig. 292: Identifying Plastigage Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

NOTE: Completely remove the Plastigage.

s. If replacing a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. The No. 1 and No. 2 journal bearings come in sizes, marked "3", "4", "5", "6" and "7". The No. 3 and No. 4 journal bearings come in 5 standard bearing sizes, marked "1", "2", "3", "4" and "5".

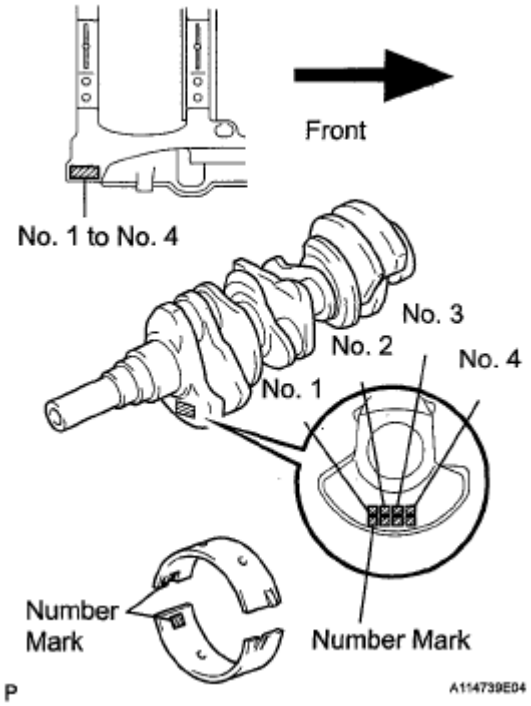


Fig. 293: Identifying Crankshaft Number Mark Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

No. 1 and No. 2 journal standard bearings selection chart

NO. 1 AND NO. 2 JOURNAL STANDARD BEARINGS SELECTION CHART

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
00	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5
01	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5
02	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	6
03	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	6	6
04	4	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6
05	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6
06	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6
07	4	4	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6
08	4	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	7
09	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	7	7
10	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7
11	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7	7
12	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7	7	7

No. 3 and No. 4 journal standard bearings selection chart

NO. 3 AND NO. 4 JOURNAL STANDARD BEARINGS SELECTION CHART

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
00	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3
01	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
02	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4
03	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4
04	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4
05	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4
06	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4
07	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4
08	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5
09	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5
10	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5
11	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5
12	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5

CYLINDER BLOCK MAIN JOURNAL BORE DIAMETER SPECIFICATION

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	"00"	66.000 (2.59842)
	"01"	66.001 (2.59846)
	"02"	66.002 (2.59850)
	"03"	66.003 (2.59854)
	"04"	66.004 (2.59858)
	"05"	66.005 (2.59862)
	"06"	66.006 (2.59866)
	"07"	66.007 (2.59870)
	"08"	66.008 (2.59874)
	"09"	66.009 (2.59878)
	"10"	66.010 (2.59881)
	"11"	66.011 (2.59885)
	"12"	66.012 (2.59889)
	"13"	66.013 (2.59893)
	"14"	66.014 (2.59897)
	"15"	66.015 (2.59900)
	"16"	66.016 (2.59905)
Crankshaft main journal diameter (B)	"00"	61.000 (2.40157)
	"01"	60.999 (2.40153)
	"02"	60.998 (2.40149)
	"03"	60.997 (2.40145)
	"04"	60.996 (2.40141)
	"05"	60.995 (2.40137)

	"06"	60.994 (2.40133)
	"07"	60.993 (2.40129)
	"08"	60.992 (2.40126)
	"09"	60.991 (2.40122)
	"10"	60.990 (2.40118)
	"11"	60.989 (2.40114)
	"12"	60.988 (2.40110)
Standard bearing center wall thickness	"1"	2.486 to 2.489 (0.09787 to 0.09799)
	"2"	2.489 to 2.492 (0.09799 to 0.09811)
	"3"	2.492 to 2.495 (0.09811 to 0.09823)
	"4"	2.495 to 2.498 (0.09823 to 0.09835)
	"5"	2.498 to 2.501 (0.09835 to 0.09846)
	"6"	2.501 to 2.504 (0.09846 to 0.09858)
	"7"	2.504 to 2.507 (0.09858 to 0.09870)

REASSEMBLY

1. **INSTALL STUD BOLTS**
   a. Using E8 and E10 "TORX" sockets, install the stud bolts.

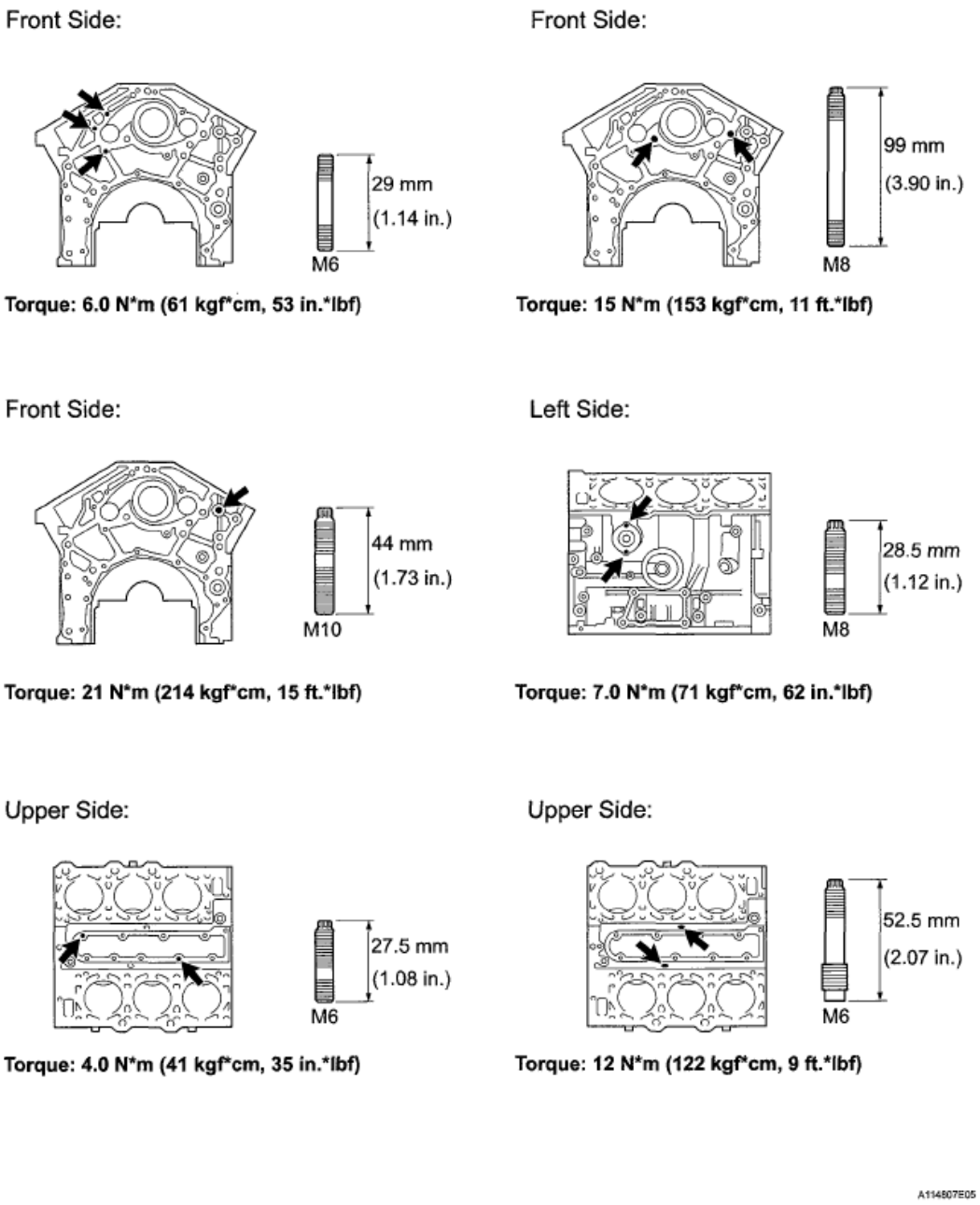


Fig. 294: Stud Bolts Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL STRAIGHT PINS**
   a. Using a plastic-faced hammer, tap in the straight pins.

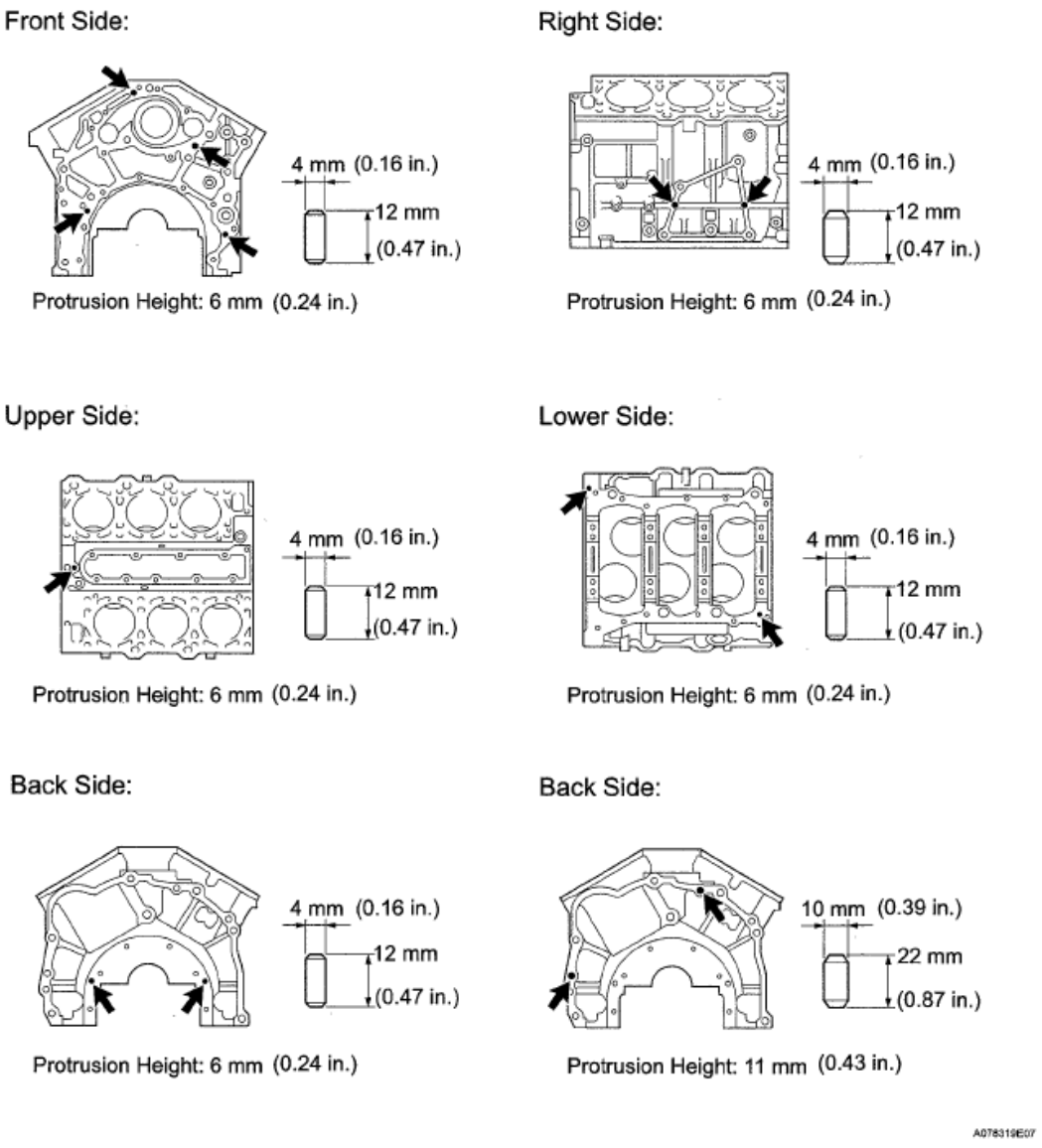


Fig. 295: Straight Pins Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL RING PINS**
   a. Using a plastic-faced hammer, tap in a new ring pins.

Upper Side:

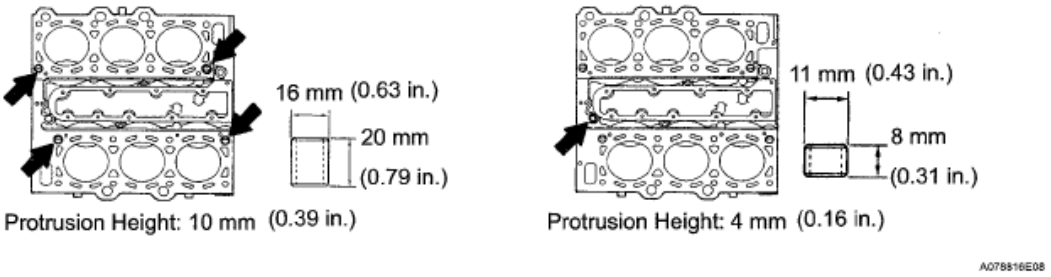


Fig. 296: Locating Ring Pins Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL CONNECTING ROD SMALL END BUSH**
   a. Align the oil holes of a new bushing and the connecting rod.

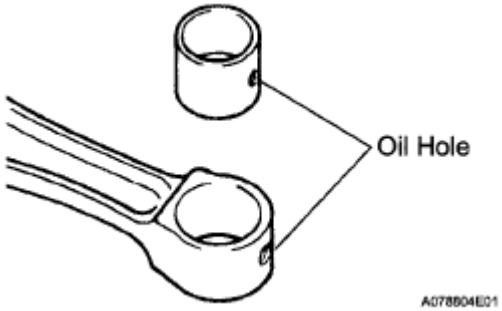


Fig. 297: Identifying Oil Holes Of Bushing And Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using SST and a press, press in the bushing.

SST 09222-30010

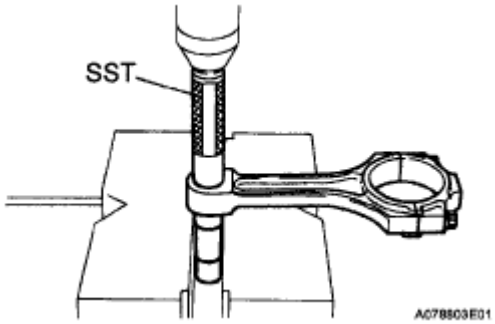


Fig. 298: Identifying Bushing Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Using a pin hole grinder, hone the bushing to obtain the standard specified clearance between the

bushing and piston pin.

Standard oil clearance: 0.005 to 0.011 mm (0.0002 to 0.0004 in.)

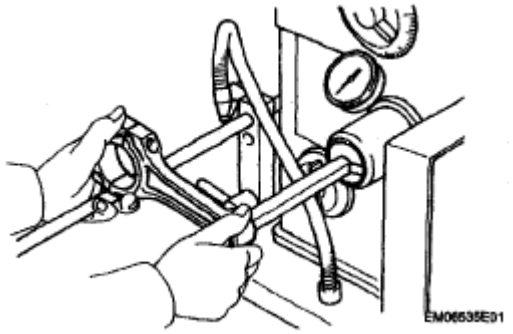


Fig. 299: Identifying Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Check the piston pin fit at normal room temperature, coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

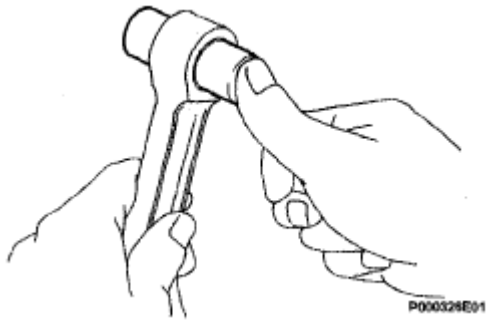


Fig. 300: Identifying Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL PISTON PIN HOLE SNAP RING**
   a. Using a screwdriver, install a new snap ring at one end of the piston pin hole.

      HINT:

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

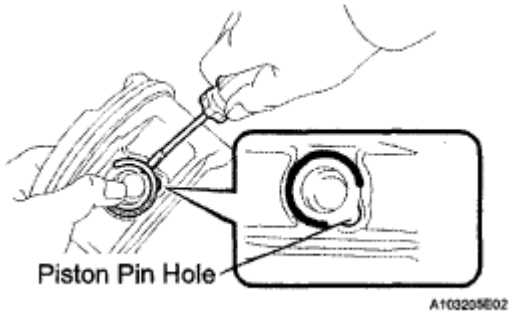


Fig. 301: Identifying Piston Pin Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Gradually heat the piston to about 80°C (176°F).

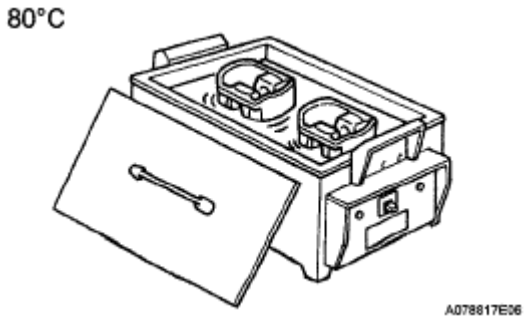


Fig. 302: View Of Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Coat the piston pin with engine oil.
d. Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb until the pin contacts the snap ring.

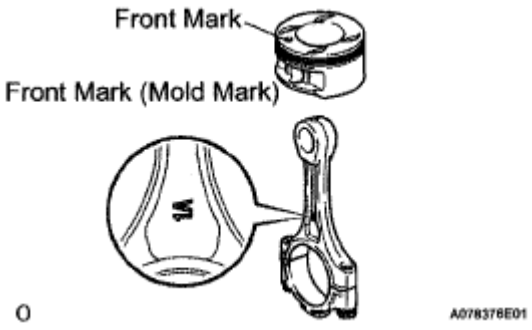


Fig. 303: Identifying Front Marks Of Piston And Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

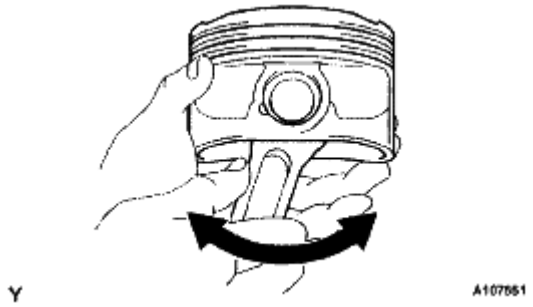


Fig. 304: Identifying Fitting Condition Between Piston And Piston Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

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

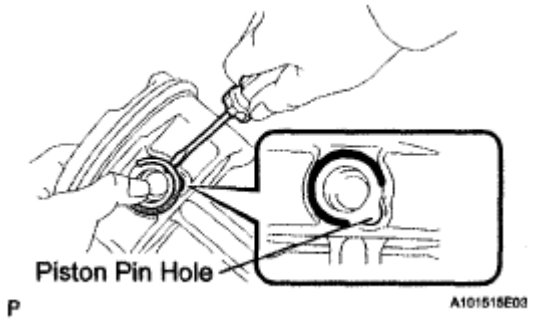


Fig. 305: Installing Piston Pin Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL PISTON RING SET**
   a. Install the oil ring expander by hand.
   b. Using a piston ring expander, install the oil ring side rail.
   c. Using a piston ring expander, install the 2 compression rings.

HINT:

The No. 2 compression ring is installed with code mark "2R" facing upward as shown in the illustration.

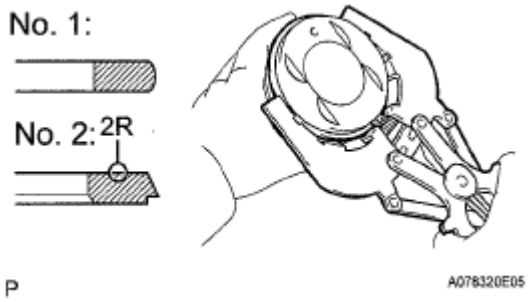


Fig. 306: Identifying Compression Rings Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Position the piston rings so that the ring ends are arranged as shown in the illustration.

NOTE: Do not align the ring ends.

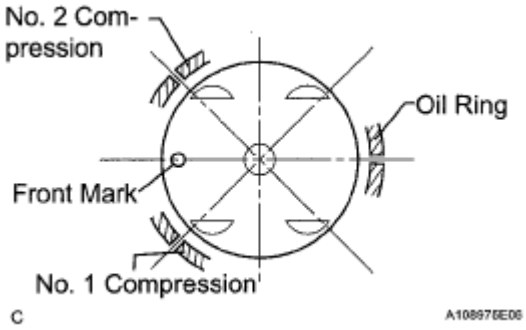


Fig. 307: Identifying Piston Rings Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL CONNECTING ROD BEARING**
   a. Align the key of the bearing with the keyway of the connecting rod or connecting cap.

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

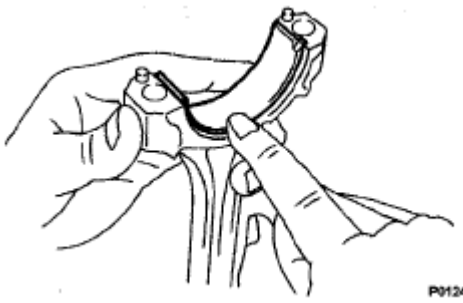


Fig. 308: Identifying Key Of Bearing With Keyway Of Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL CRANKSHAFT BEARING**

a. Clean each main journal and the bearing.

HINT:

Main bearings come in widths of 22.4 mm (0.882 in.) and 19.0 mm (0.748 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 2 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 3 and No. 4 positions.

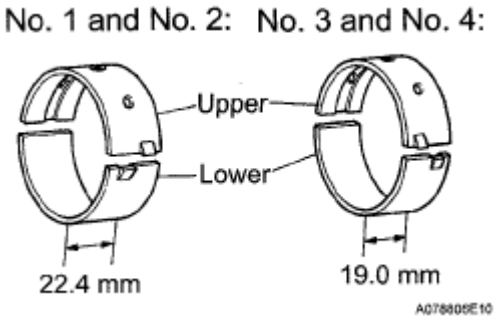


Fig. 309: Identifying Upper And Lower Bearings Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Align the key of the bearing with the keyway of the cylinder block, and push in the 4 upper bearings.

NOTE: Do not apply engine oil to the bearing and its contact surface.

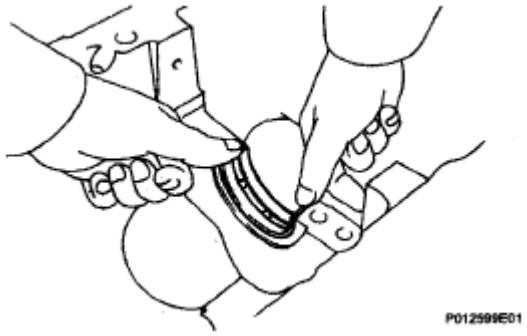


Fig. 310: Identifying Bearing Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Align the key of the bearing with the keyway of the main bearing cap, and push in the 4 lower bearings.

NOTE: Do not apply engine oil to the bearing and its contact surface.

HINT:

A number is marked on each main bearing cap to indicate the installation position.

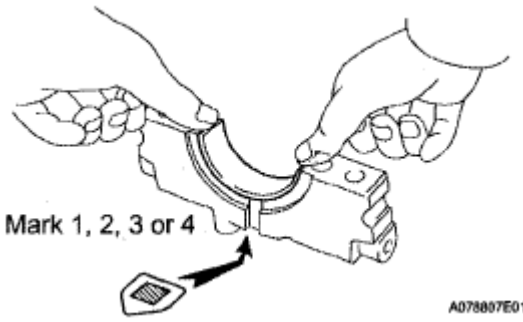


Fig. 311: Identifying Bearing Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL CRANKSHAFT THRUST WASHER SET**
   a. Install the 2 thrust washers under the No. 2 journal position of the cylinder block with the oil grooves facing outward.

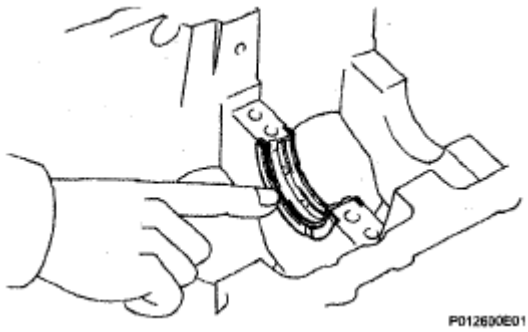


Fig. 312: Identifying Thrust Washers On No. 2 Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the 2 thrust washers on the No. 2 bearing cap with the grooves facing outward.

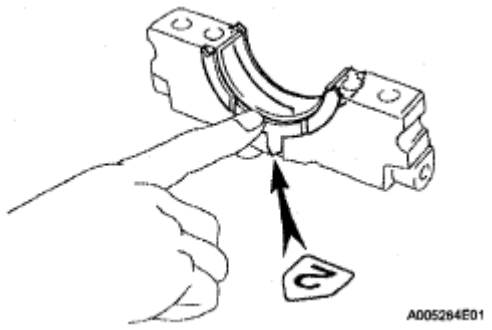


Fig. 313: Identifying Thrust Washers On Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL CRANKSHAFT**
    a. Apply engine oil to the upper bearing and install the crankshaft on the cylinder block.
    b. Examine the front marks and numbers and install the bearing caps on the cylinder block.
    c. Apply a light coat of engine oil to the threads of the bearing cap bolts.
    d. Temporarily install the 8 main bearing cap bolts to the inside positions.

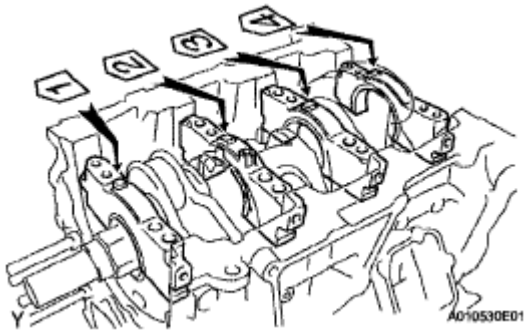


Fig. 314: Identifying Main Bearing Cap Bolts To Inside Positions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    e. Install the main bearing cap by hand until clearance between the cylinder block and the bearing cap becomes 6 mm (0.23 in.) or less.

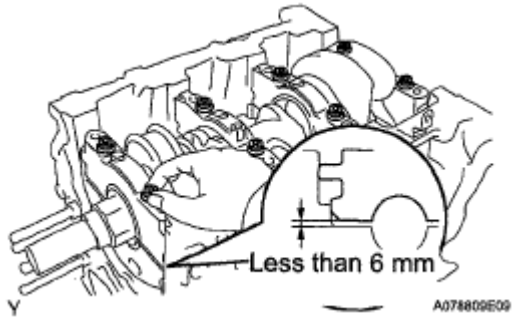


Fig. 315: Identifying Clearance Between Cylinder Block And Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    f. Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.

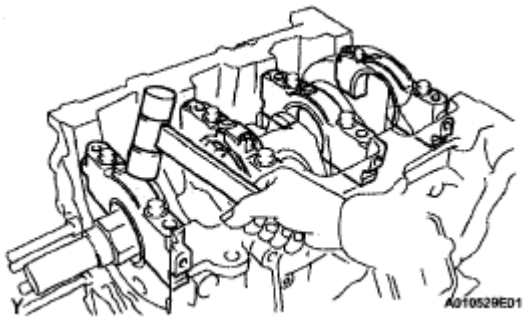


Fig. 316: View Of Tapping Main Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Apply a light coat of engine oil to the threads of the main bearing cap bolts.
h. Using several steps, install and tighten the 16 main bearing cap bolts uniformly in the sequence shown in the illustration.

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

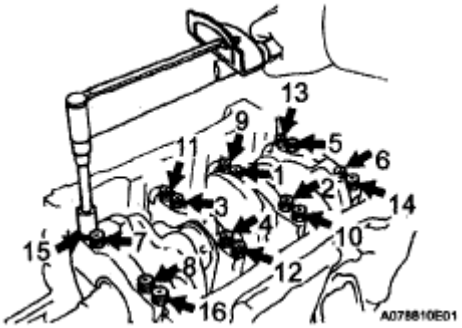


Fig. 317: Tightening Main Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Mark the front side of the bearing cap bolts with paint.
j. Retighten the bearing cap bolts by 90° in the same sequence as step (h).

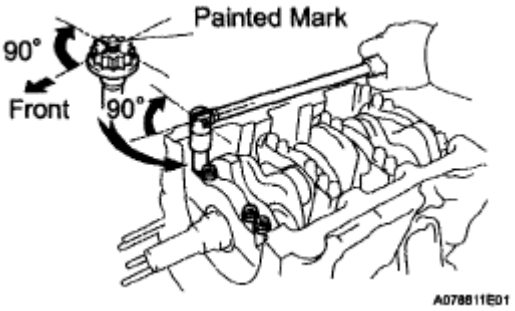


Fig. 318: Retightening Main Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

k. Check that each painted mark is now at 90° angle to the front.

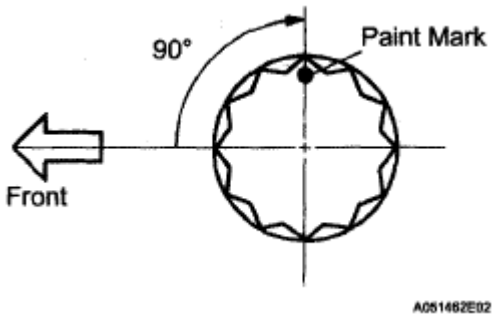


Fig. 319: Identifying Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

l. Check that the crankshaft turns smoothly.

m. Using several steps, install and tighten the 8 main bearing cap bolts and 8 new seal washers uniformly in the sequence shown in the illustration.

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

HINT:

Use the short bolt for the marked position (arrow).

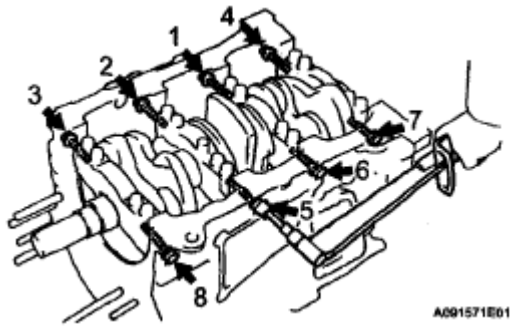


Fig. 320: Identifying Main Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD**

a. Apply engine oil to the cylinder walls, the pistons, and the surfaces of the connecting rod bearings.

b. Check the position of the piston ring ends.

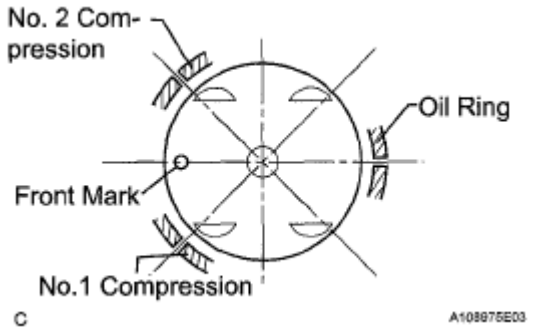


Fig. 321: Identifying Piston Ring Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

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

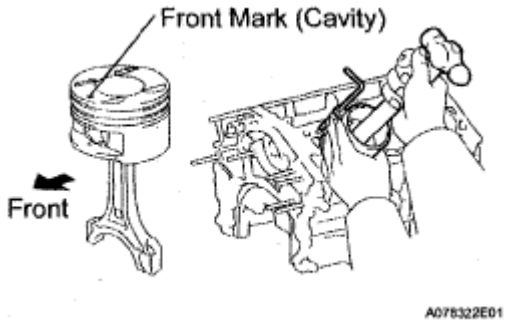


Fig. 322: Identifying Correctly Numbered Piston Using Piston Ring Compressor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Check that the protrusion of the connecting rod cap is facing the correct direction.

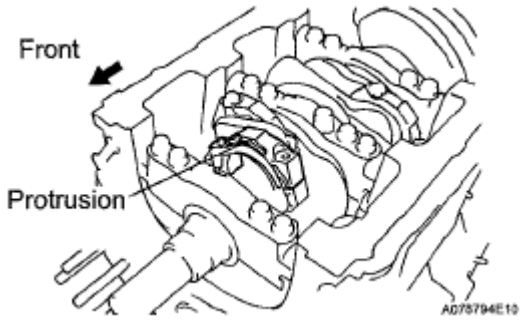


Fig. 323: Identifying Connecting Rod Cap Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

f. Tighten the bolts in several steps to the specified torque.

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

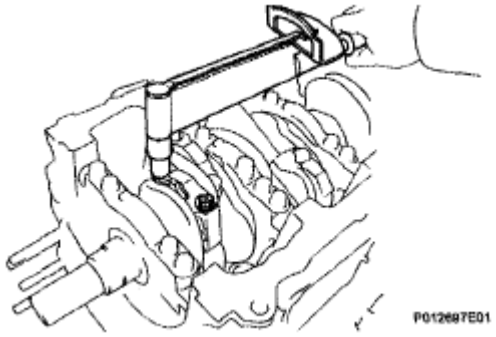


Fig. 324: Identifying Tightening Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Mark the front side of each connecting cap bolt with paint.
h. Retighten the cap bolts by 90° as shown in the illustration.

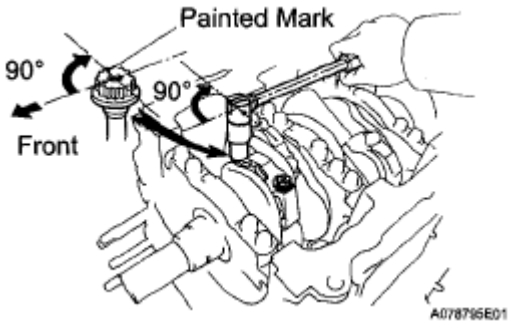


Fig. 325: Retightening Connecting Rod Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Check that the crankshaft turns smoothly.

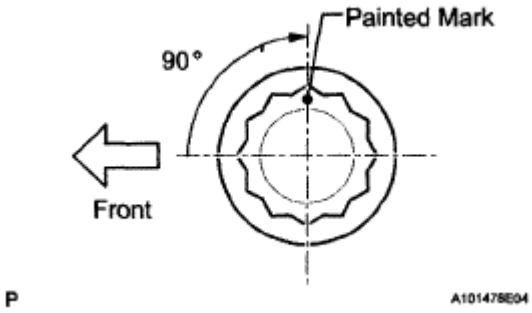


Fig. 326: Checking Crankshaft Turning Smoothly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **INSTALL NO. 3 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
    a. Using a 10 mm socket hexagon wrench, install a new gasket and the screw plug.

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

Back Side:

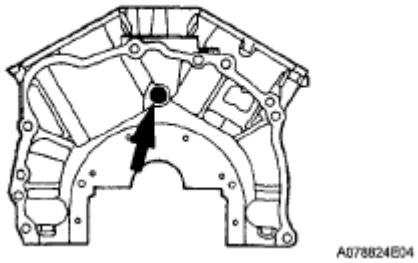


Fig. 327: Locating Screw Plug On No. 3 Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **INSTALL NO. 2 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
    a. Using a 10 mm socket hexagon wrench, install a new gasket and the screw plug.

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

Left Side:

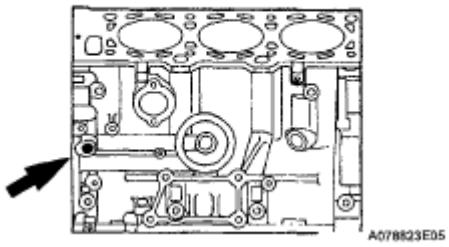


Fig. 328: Locating Screw Plug On No. 2 Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **INSTALL NO. 1 CYLINDER BLOCK WITH HEAD STRAIGHT SCREW PLUG**
    a. Using a 10 mm socket hexagon wrench, install a new gasket and the screw plug.

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

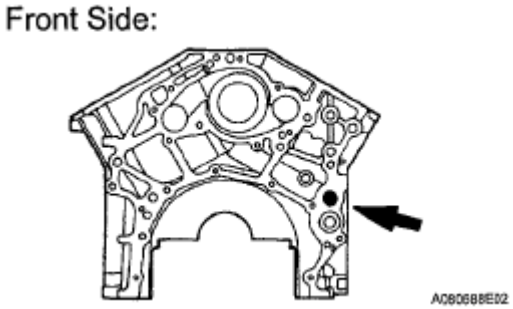


Fig. 329: Locating Screw Plug On No. 1 Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL WATER SEAL PLATE**
    a. Remove any old seal packing from the contact surface.
    b. Apply a continuous bead of seal packing (Diameter 4 to 5 mm (0.16 to 0.20 in.)) as shown in the illustration.

       Seal packing: Toyota Genuine Seal Packing Black, Three Bond 1324 or equivalent

       NOTE:
       - **Remove any oil from the contact surface.**
       - **Install the seal plate within 3 minutes after applying seal packing.**
       - **Do not expose the seal to engine oil within 2 hours after installing.**

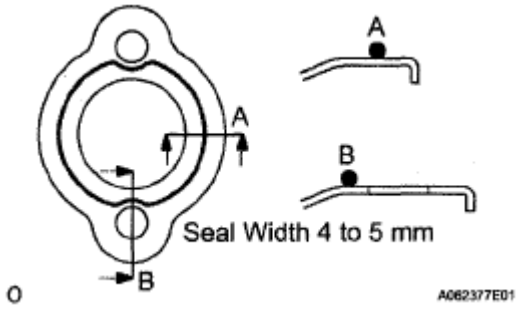


Fig. 330: Identifying Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Install the seal plate with the 2 nuts.

       Torque: 18 N*m (184 kgf*cm, 13 ft.*lbf)

16. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
    a. Apply adhesive to 2 or 3 threads of the drain cock end.

Adhesive: Toyota Genuine Seal Packing Black, Three Bond 1324 or equivalent

b. After applying the specified torque, rotate the drain cock clockwise as shown in the illustration.

Torque: 39 N*m (398 kgf*cm, 29 ft.*lbf)

NOTE:

- **Install the drain cock within 3 minutes after applying adhesive.**
- **Do not expose the seal to coolant within 1 hour after installing.**
- **Do not rotate the drain cock more than 1 revolution (360°) after tightening the drain cock to the specified torque.**
- **Do not loosen the drain cock after setting it correctly.**

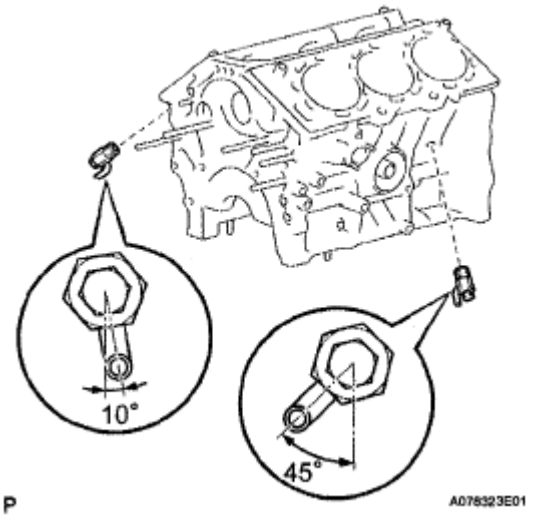


Fig. 331: Identifying Drain Cock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FRONT CRANKSHAFT OIL SEAL

COMPONENTS

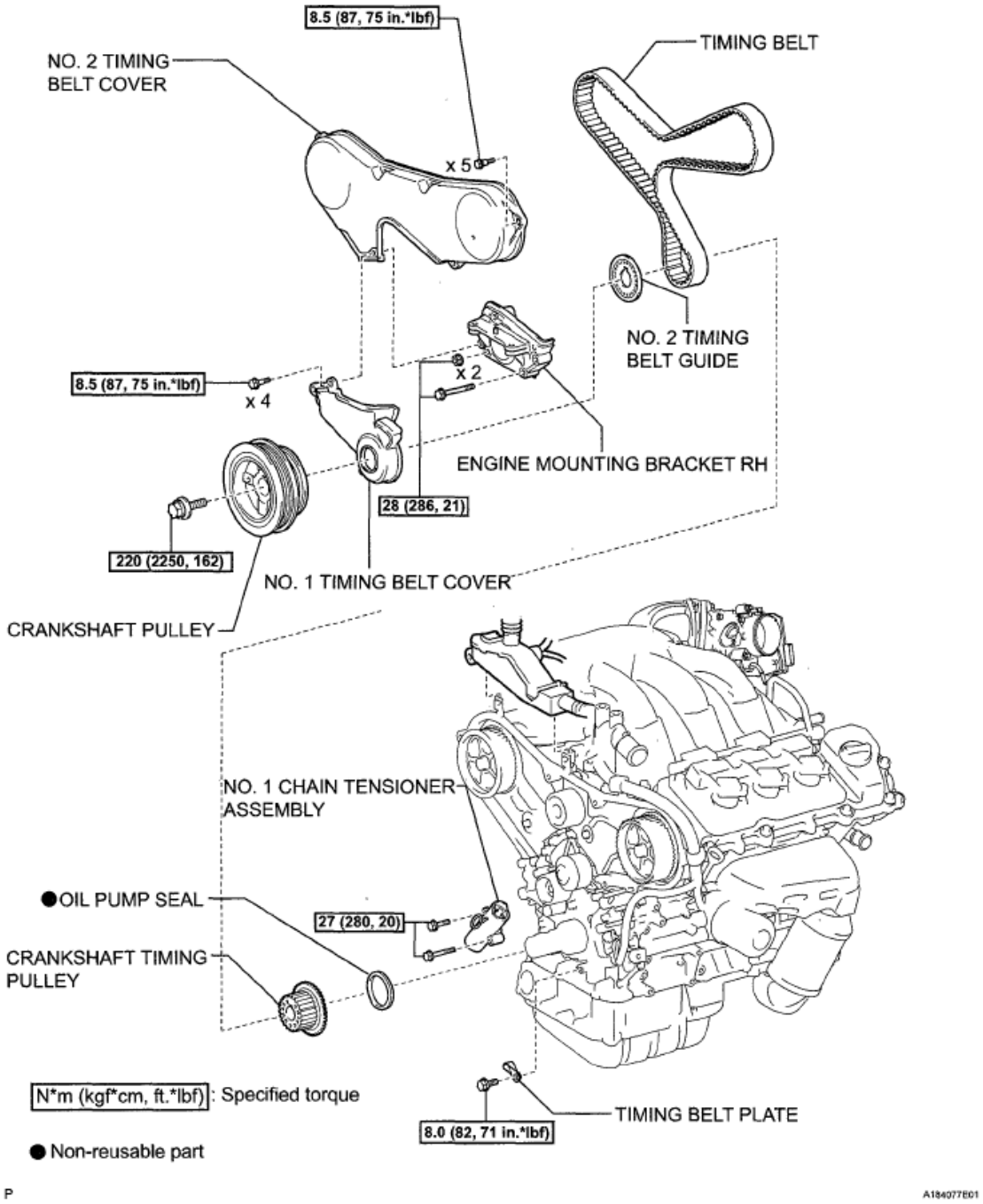


Fig. 332: Identifying Front Crankshaft Oil Seal Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE TIMING BELT**

   HINT:

See **REMOVAL**.

2. **REMOVE CRANKSHAFT TIMING PULLEY**
   a. Remove the bolt and the timing belt plate.
   b. Install the pulley bolt to the crankshaft.
   c. Using SST, remove the crankshaft timing pulley.

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05011)

NOTE:
- **Do not scratch the sensor part of the crankshaft timing pulley.**
- **Before using SST, apply lubricating oil to the threads and tip of the center bolt 150.**

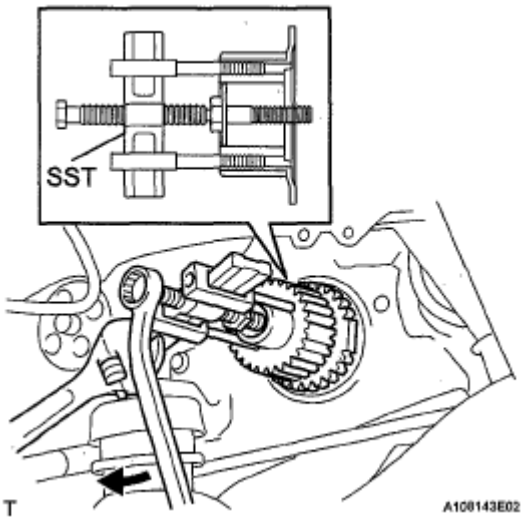


Fig. 333: Identifying Crankshaft Timing Pulley With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE OIL PUMP SEAL**
   a. Using a knife, cut off the oil seal lip.
   b. Using a screwdriver with its tip taped, pry out the oil seal.

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

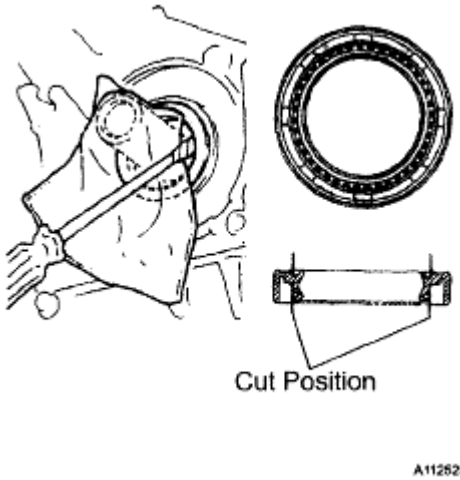


Fig. 334: View Of Prying Out Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL OIL PUMP SEAL**
   a. Apply MP grease to a new oil seal lip.

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

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

SST 09223-00010

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

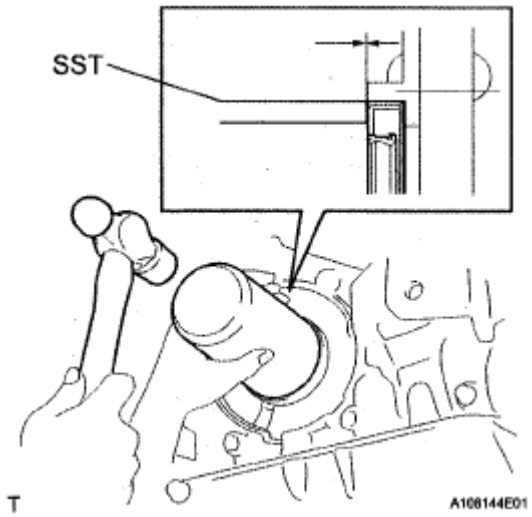


Fig. 335: View Of Tapping Oil Seal With SST And Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL CRANKSHAFT TIMING PULLEY**
   a. Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.

NOTE: Do not scratch the sensor area of the crankshaft timing pulley.

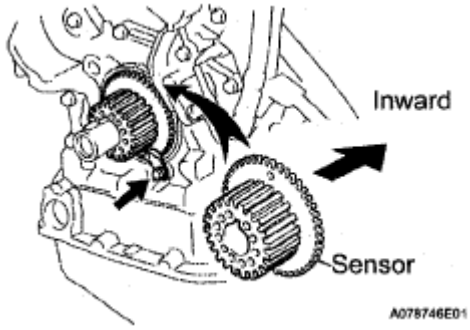


Fig. 336: Identifying Keyway Of Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the timing belt plate with the bolt.

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

3. **INSTALL TIMING BELT**

HINT:

See **INSTALLATION**.

4. **INSPECT FOR OIL LEAK**

REAR CRANKSHAFT OIL SEAL

COMPONENTS

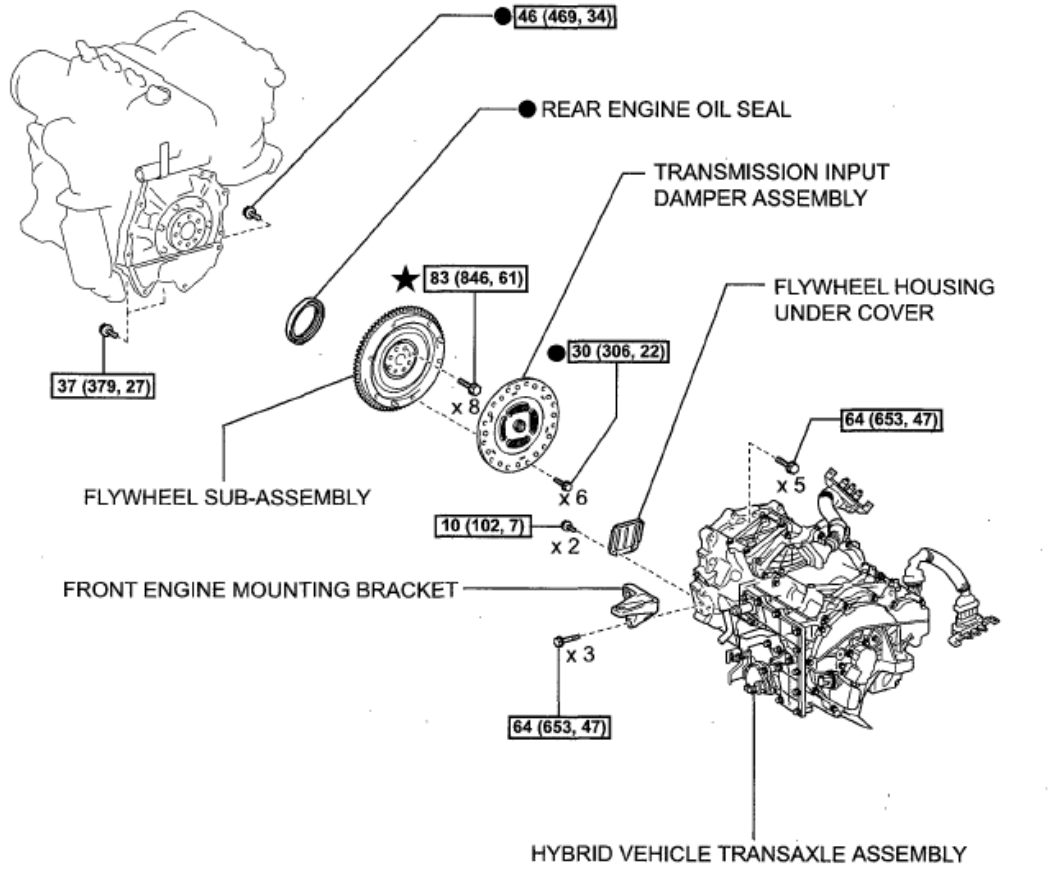


Fig. 337: Identifying Rear Crankshaft Oil Seal Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE HYBRID VEHICLE TRANSAXLE ASSEMBLY**

   HINT:

   See **REMOVAL** .

2. **REMOVE TRANSMISSION INPUT DAMPER ASSEMBLY**
   a. Using SST, hold the crankshaft.

      SST 09213-54015 (91651-60855), 09330-00021

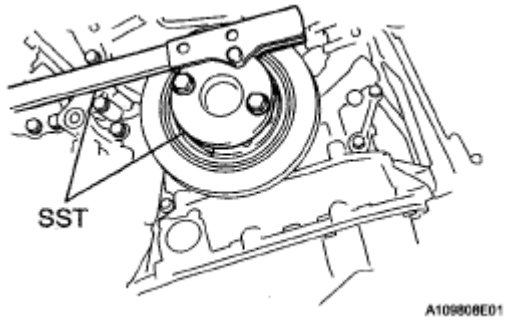


Fig. 338: Identifying Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 6 bolts and transmission input damper from the flywheel.

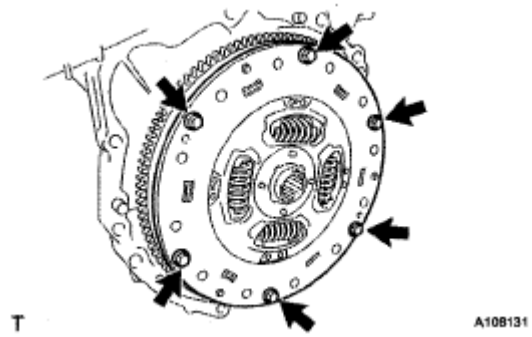


Fig. 339: Locating Flywheel
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE FLYWHEEL SUB-ASSEMBLY**
   a. Using SST, hold the crankshaft.

   SST 09213-54015 (91651-60855), 09330-00021

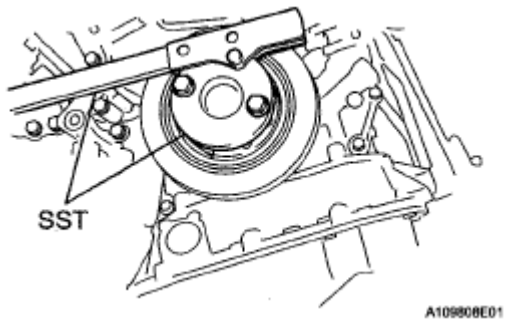


Fig. 340: Identifying Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Remove the 8 bolts and flywheel.

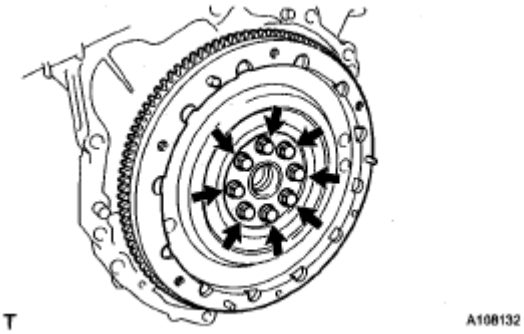


Fig. 341: Locating Flywheel Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE REAR ENGINE OIL SEAL**
   a. Using a knife, cut off the oil seal lip.
   b. Using a screwdriver with its tip taped, pry out the oil seal.

NOTE: After the removal, check that the crankshaft is not damaged. If it is damaged, smooth the surface with 400-grit sandpaper.

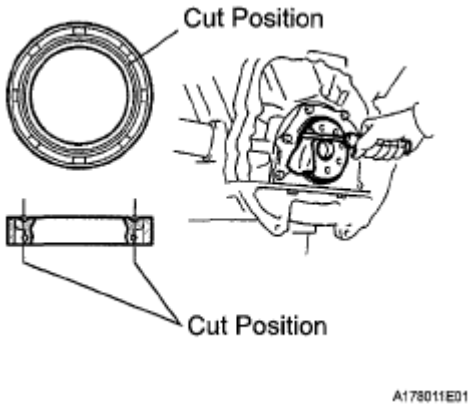


Fig. 342: View Of Prying Out Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

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

NOTE: Keep the lip free from foreign objects.

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

SST 09223-15030, 09950-70010 (09951-07100)

NOTE:

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

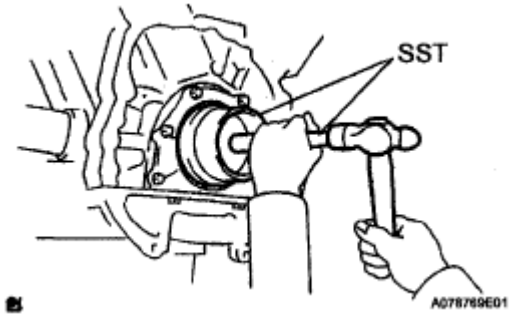


Fig. 343: View Of Tapping Engine Rear Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL FLYWHEEL SUB-ASSEMBLY**
   a. Using SST, hold the crankshaft.

      SST 09213-54015 (91651-60855), 09330-00021

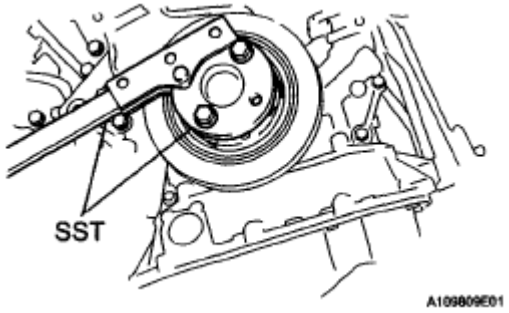


Fig. 344: View Of Holding Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Clean the bolts and bolt holes.
   c. Apply adhesive to 2 or 3 threads of the bolts.

      Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

   d. Install the flywheel on the crankshaft.
   e. Using several steps, install and tighten the 8 bolts uniformly in the sequence shown in the illustration.

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

NOTE: Do not start the engine within 1 hour after installing.

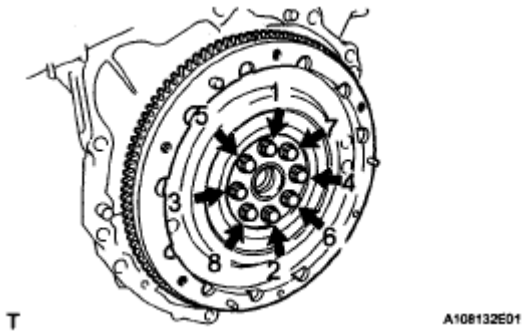


Fig. 345: Identifying Flywheel Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL TRANSMISSION INPUT DAMPER ASSEMBLY**
   a. Using SST, hold the crankshaft.

      SST 09213-54015 (91651-60855), 09330-00021

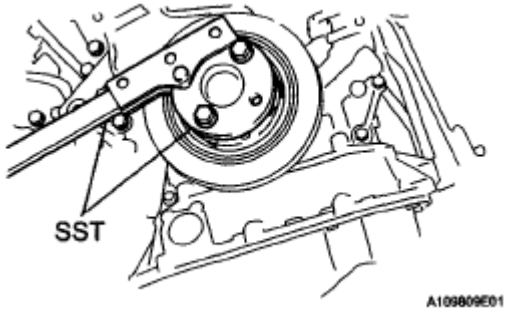


Fig. 346: View Of Holding Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the new 6 bolts and transmission input damper.

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

      HINT:

      Take care not to insert the transmission input damper in a wrong direction.

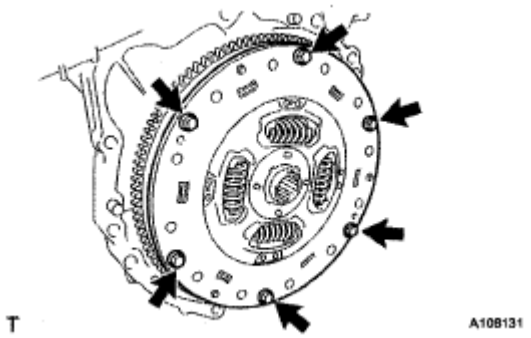


Fig. 347: Locating Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL HYBRID VEHICLE TRANSAXLE ASSEMBLY**

   HINT:

   See **INSTALLATION** .

ENGINE ASSEMBLY

COMPONENTS

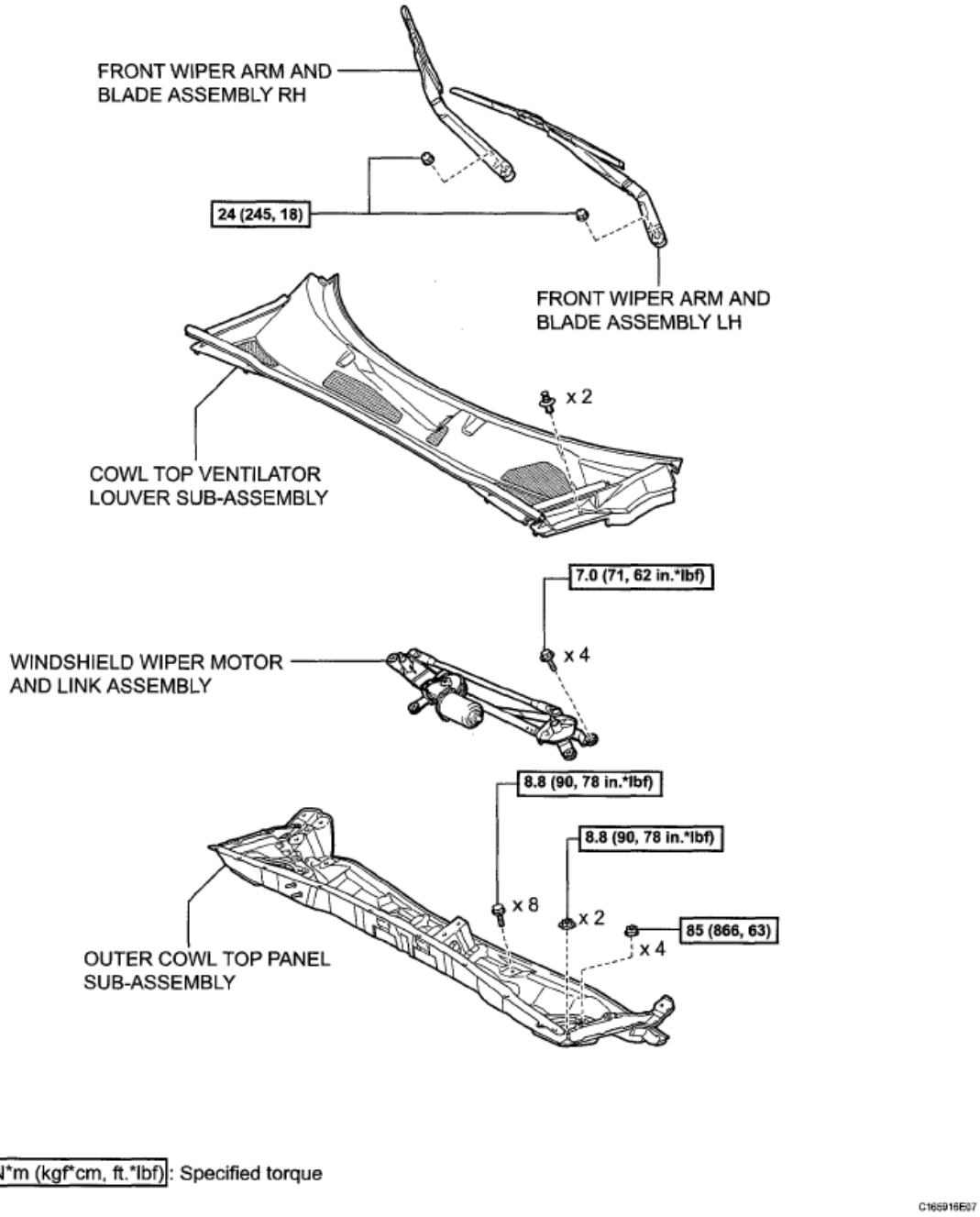


Fig. 348: Identifying Engine Assembly Replacement Components With Torque Specifications (1 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

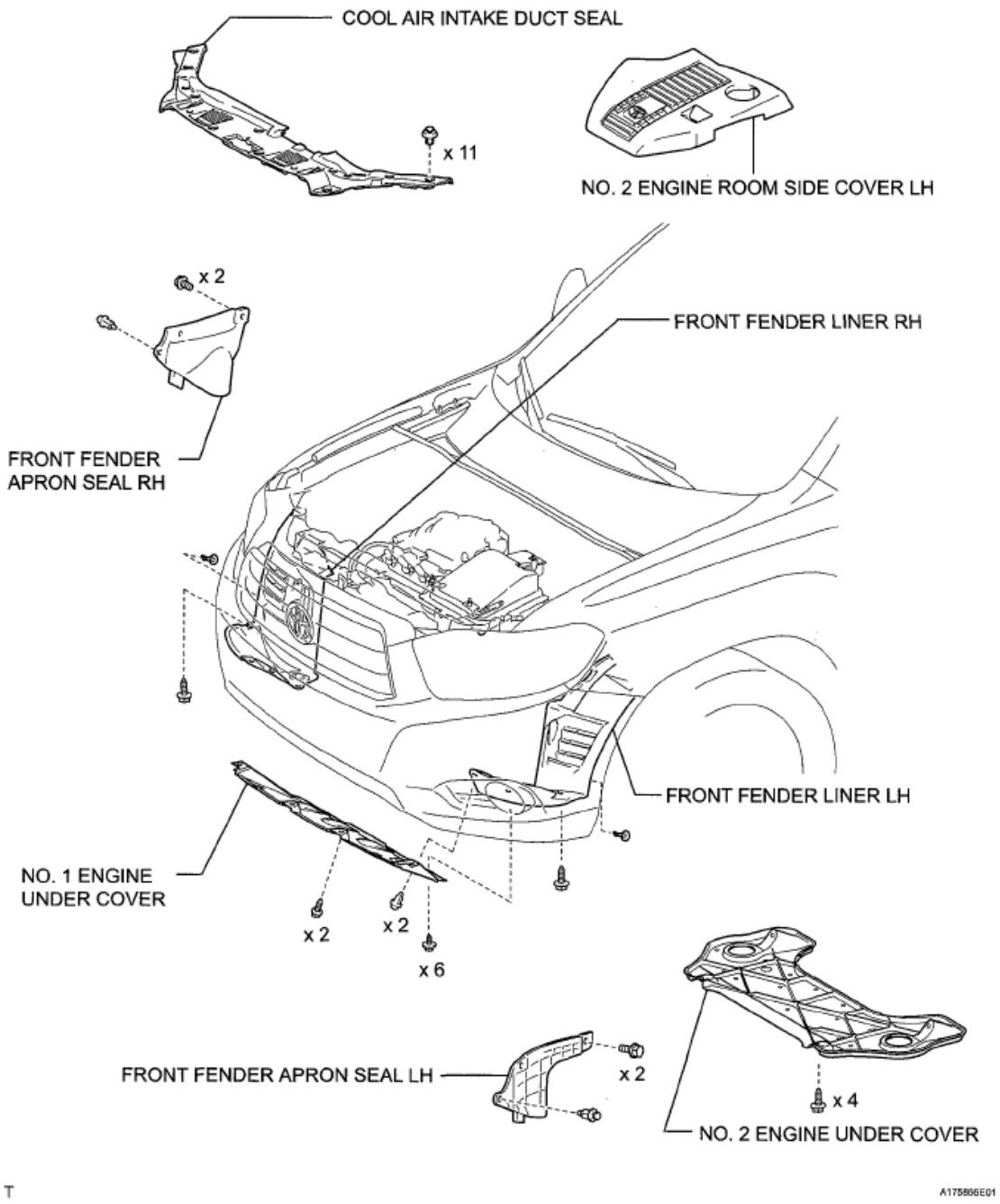


Fig. 349: Identifying Engine Assembly Replacement Components (2 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

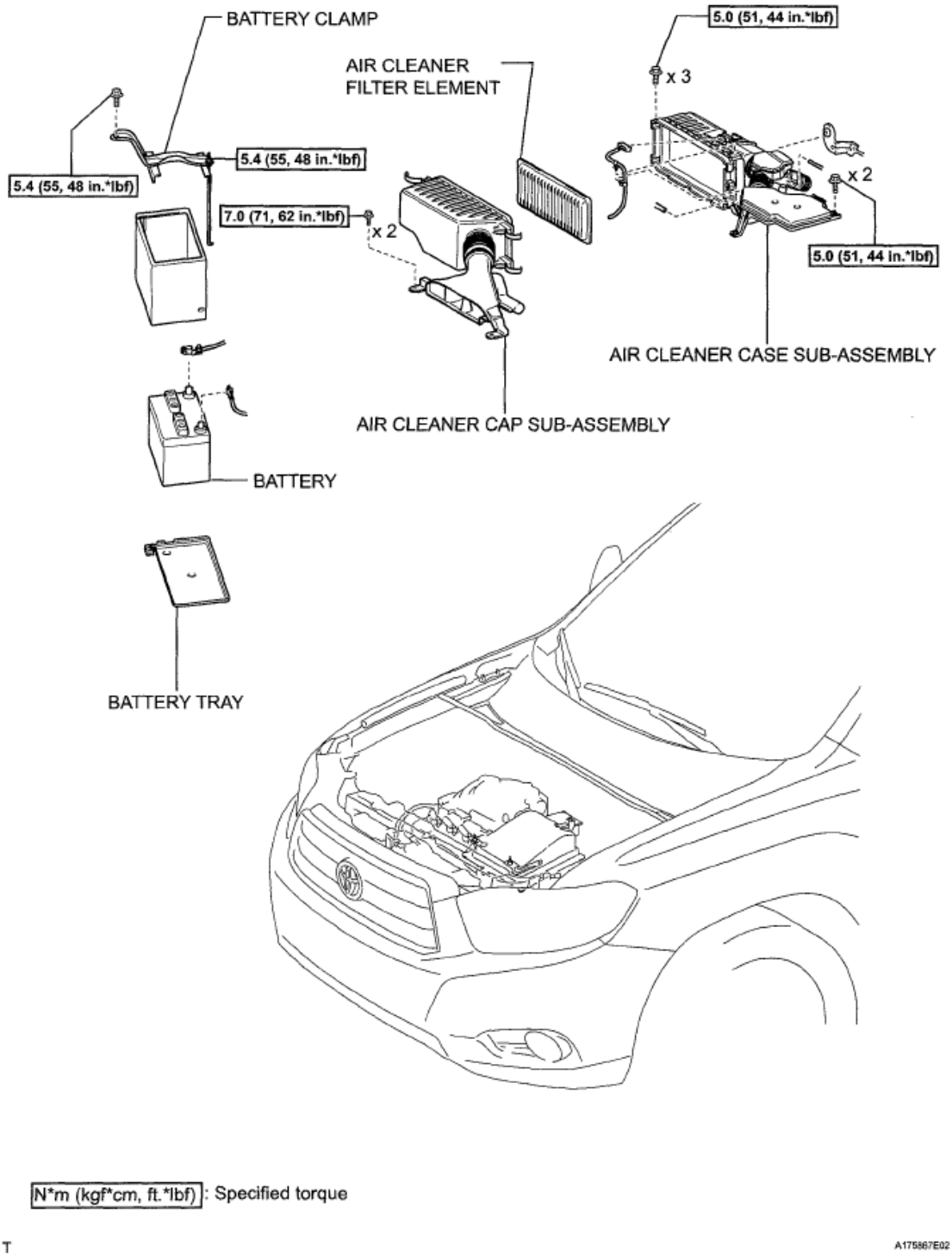


Fig. 350: Identifying Engine Assembly Replacement Components With Torque Specifications (3 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

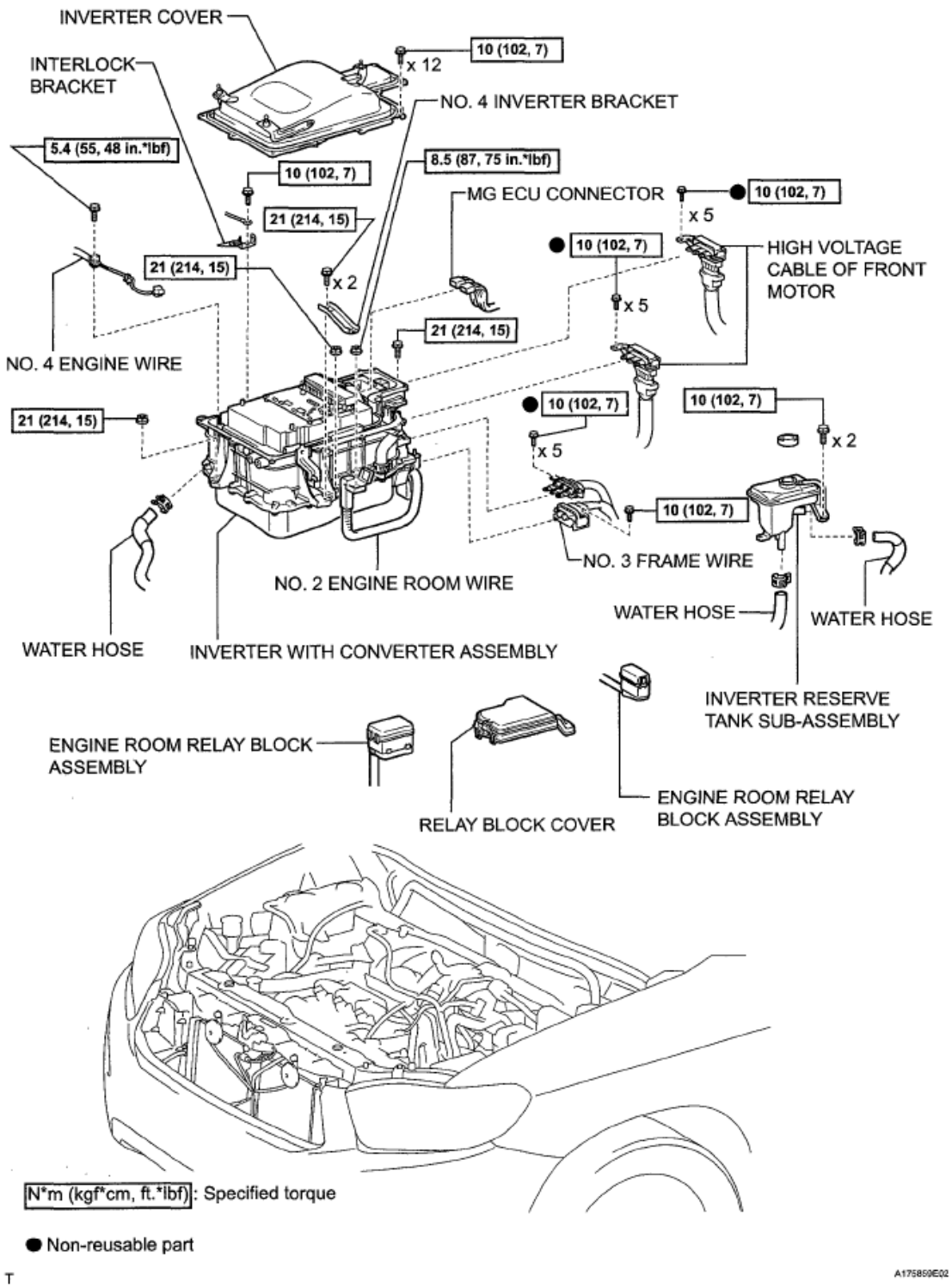


Fig. 351: Identifying Engine Assembly Replacement Components With Torque Specifications (4 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

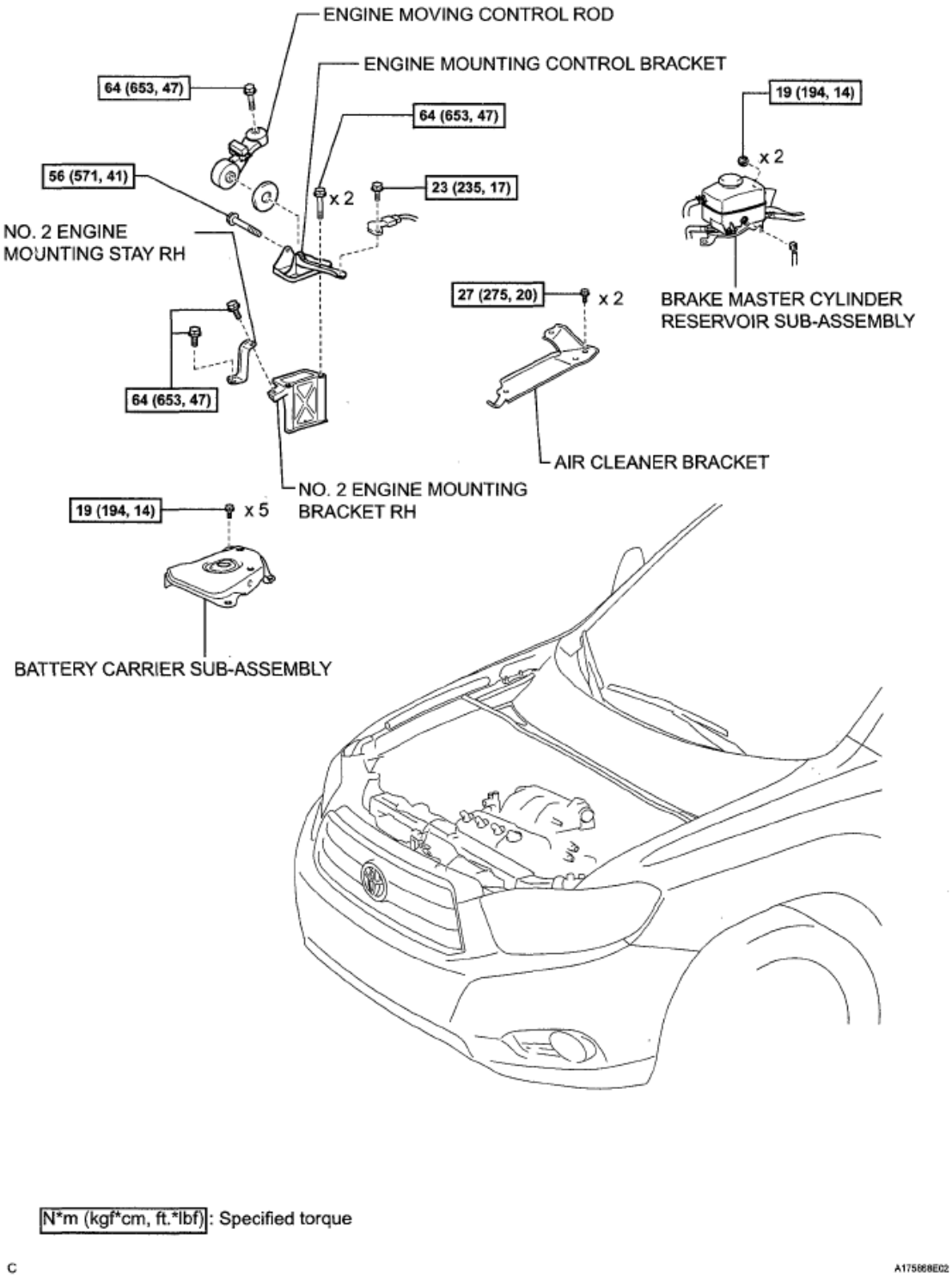


Fig. 352: Identifying Engine Assembly Replacement Components With Torque Specifications (5 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

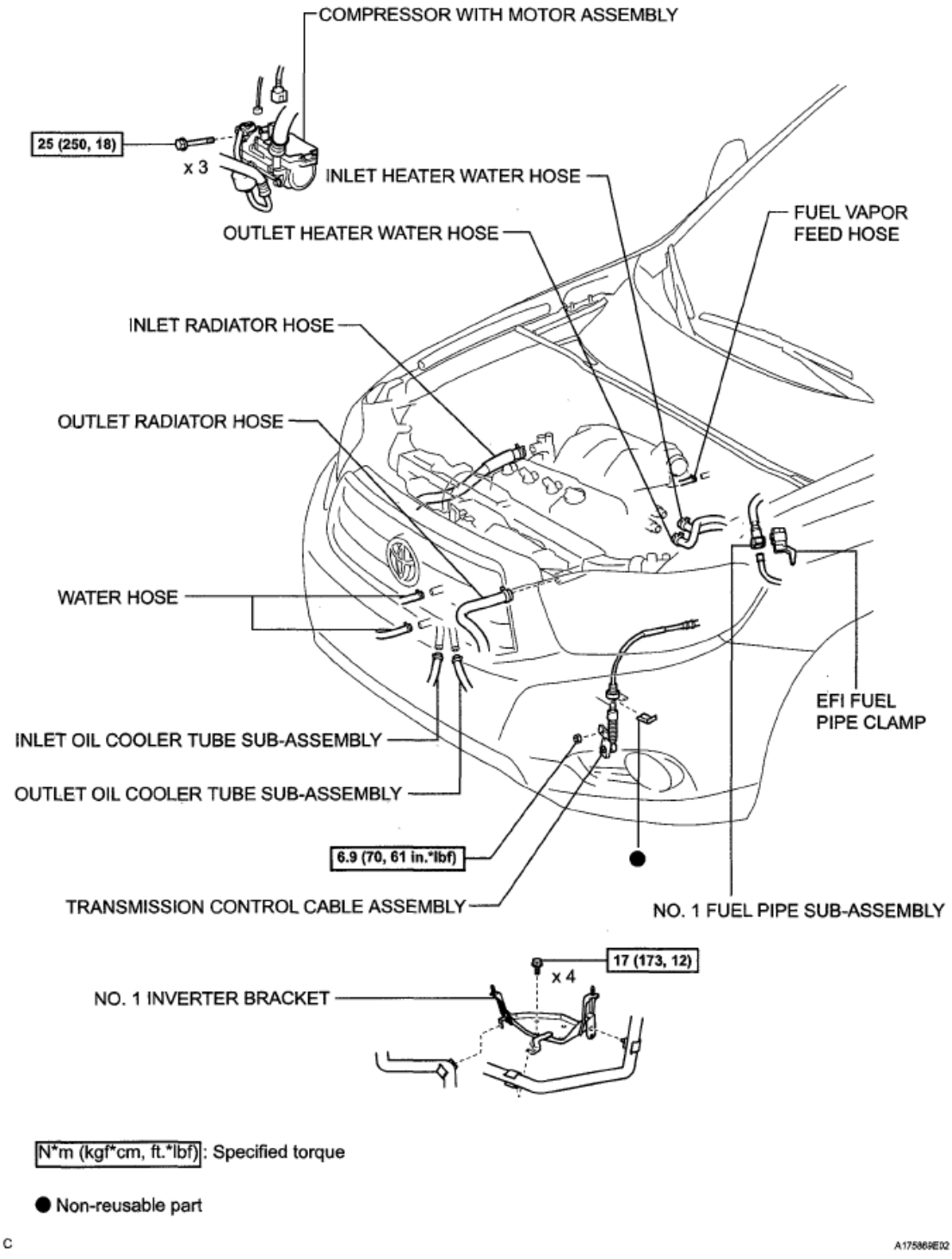


Fig. 353: Identifying Engine Assembly Replacement Components With Torque Specifications (6 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

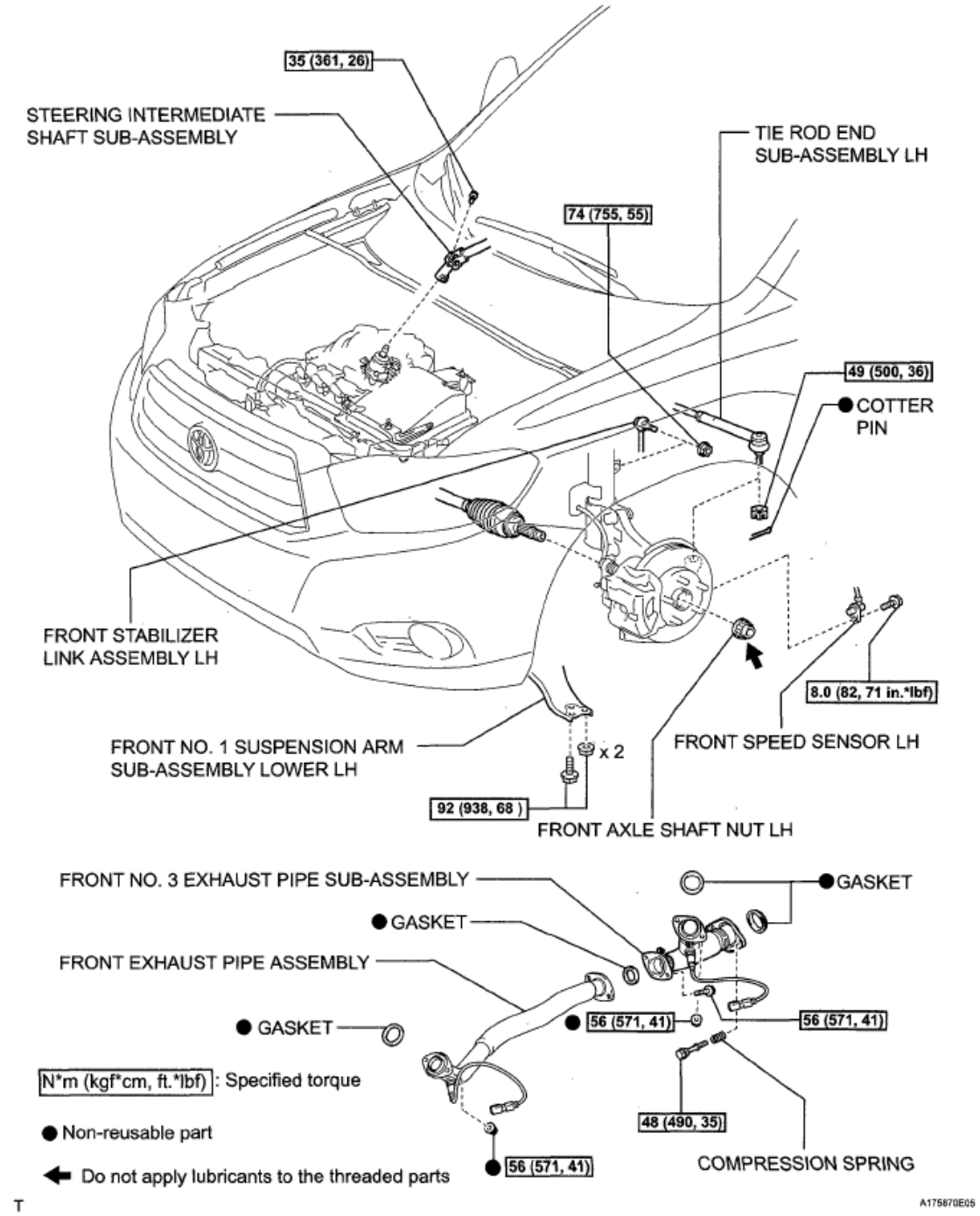


Fig. 354: Identifying Engine Assembly Replacement Components With Torque Specifications (7 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

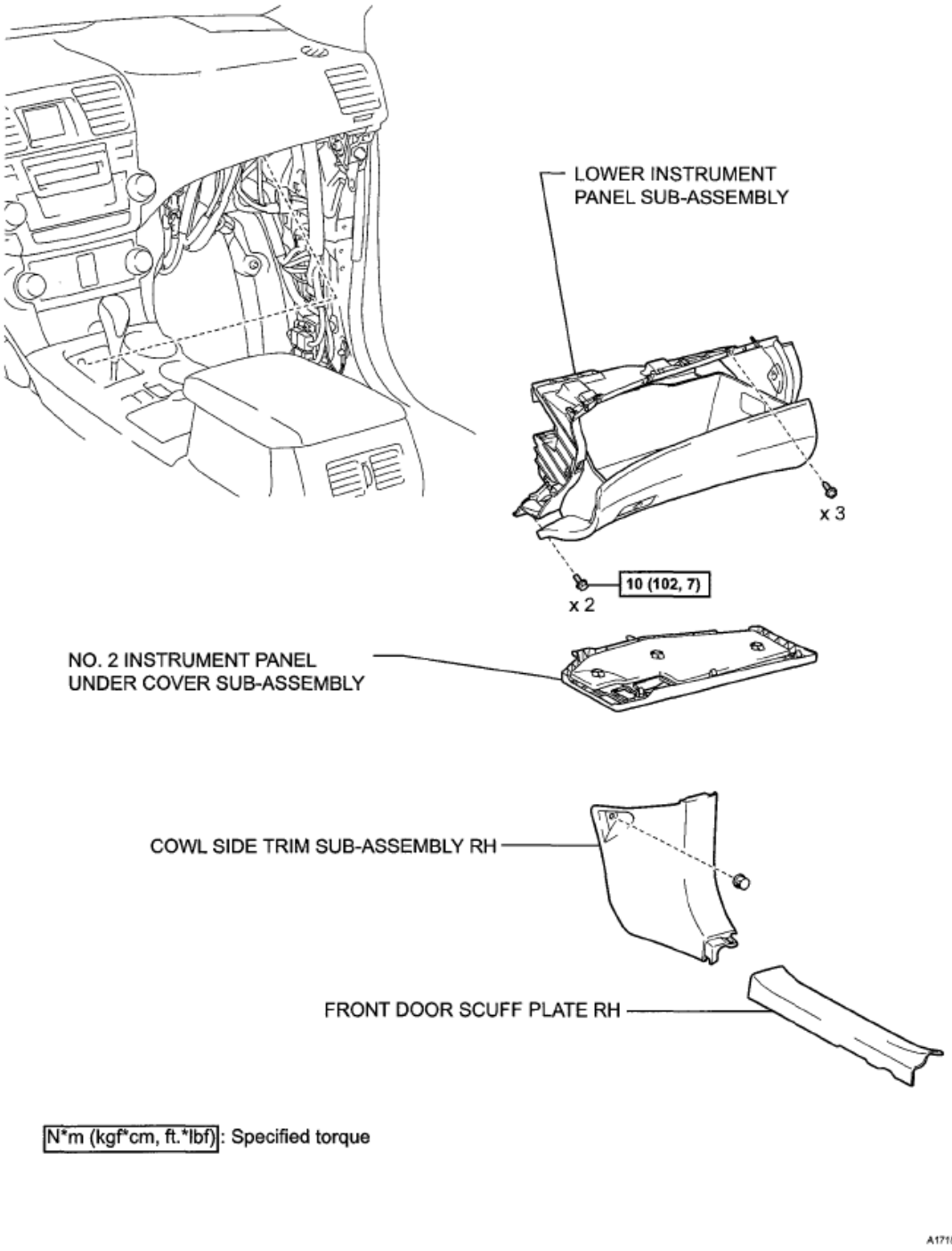


Fig. 355: Identifying Engine Assembly Replacement Components With Torque Specification (8 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

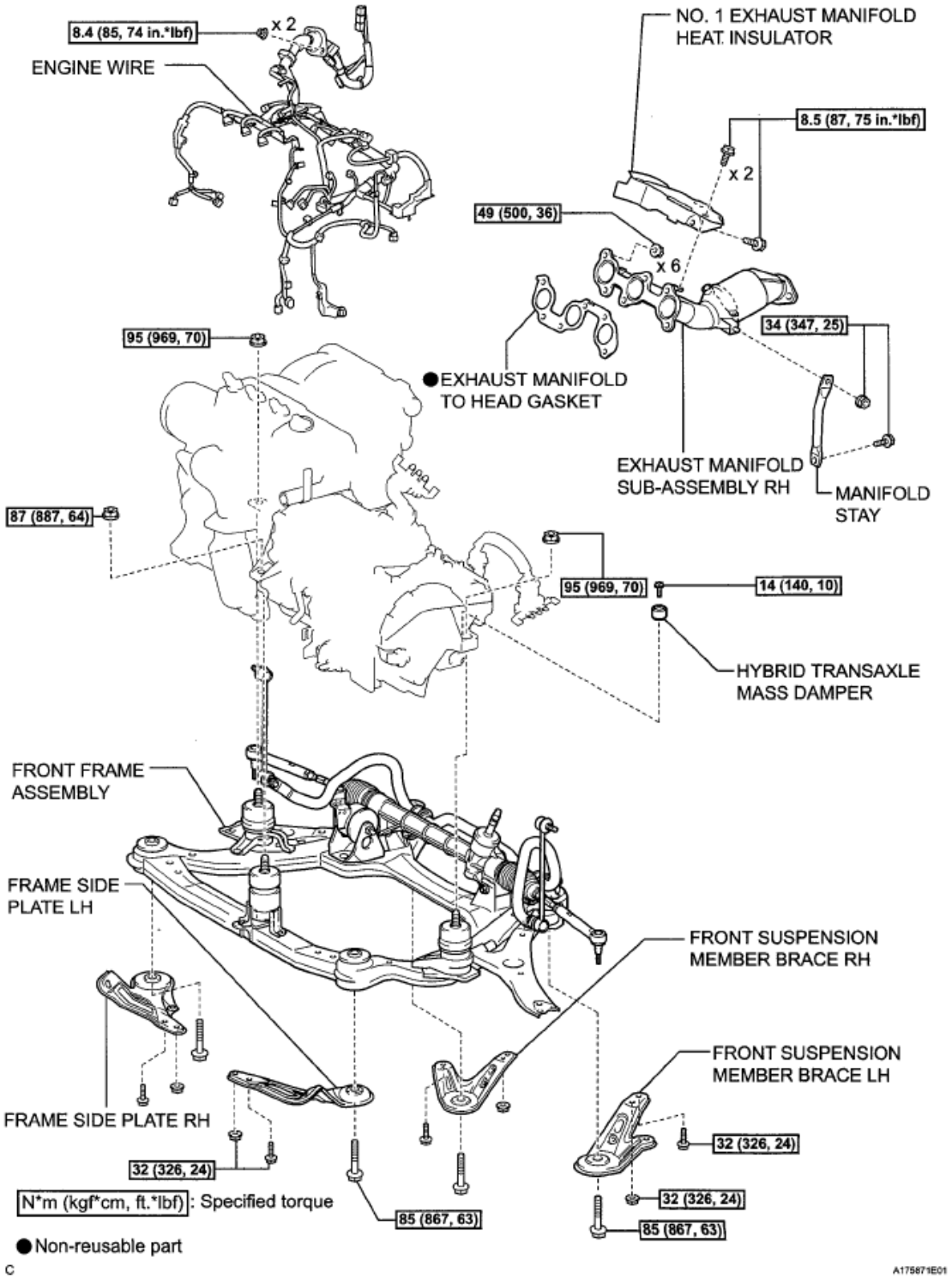


Fig. 356: Identifying Engine Assembly Replacement Components With Torque Specifications (9 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

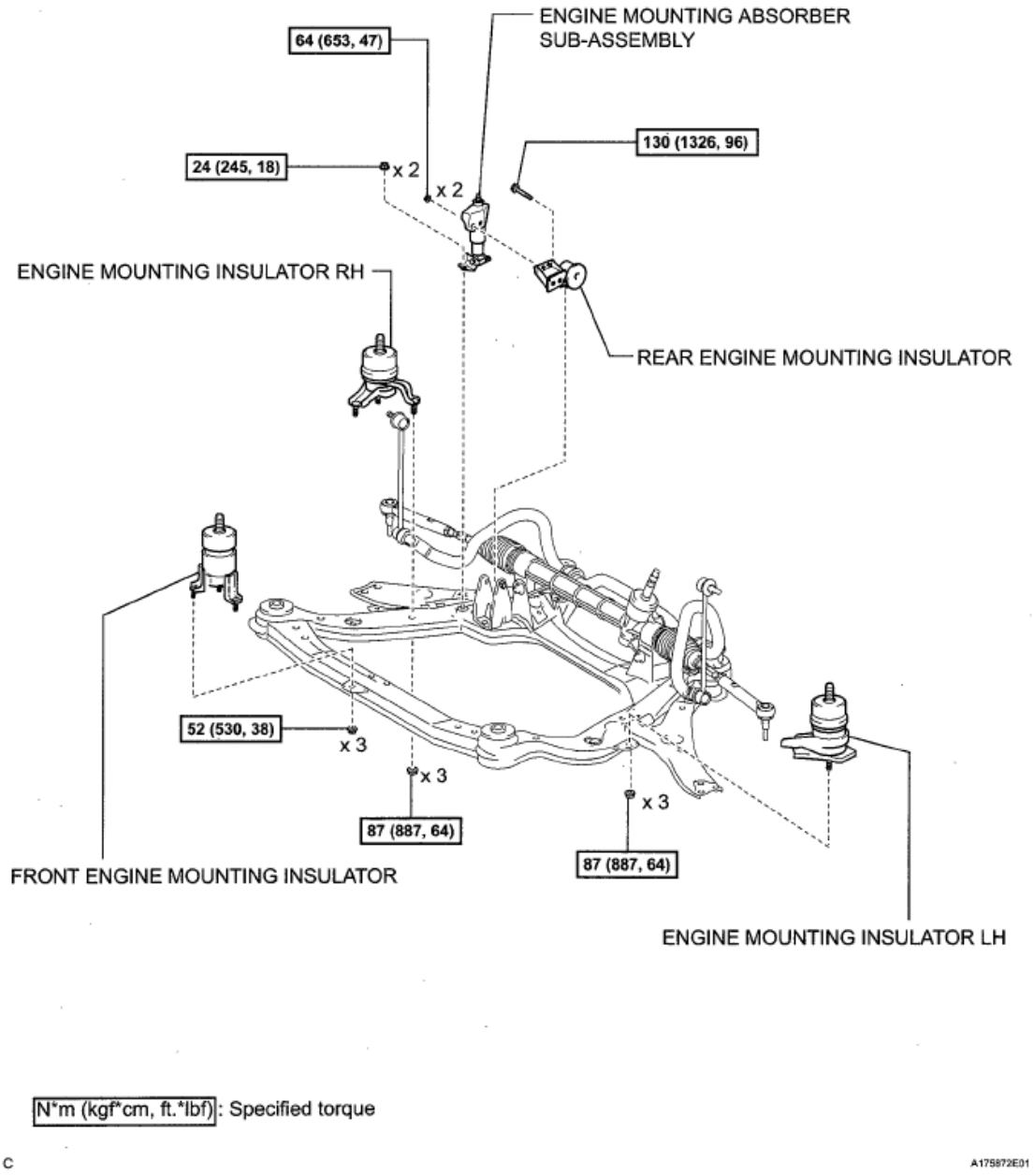


Fig. 357: Identifying Engine Assembly Replacement Components With Torque Specifications (10 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

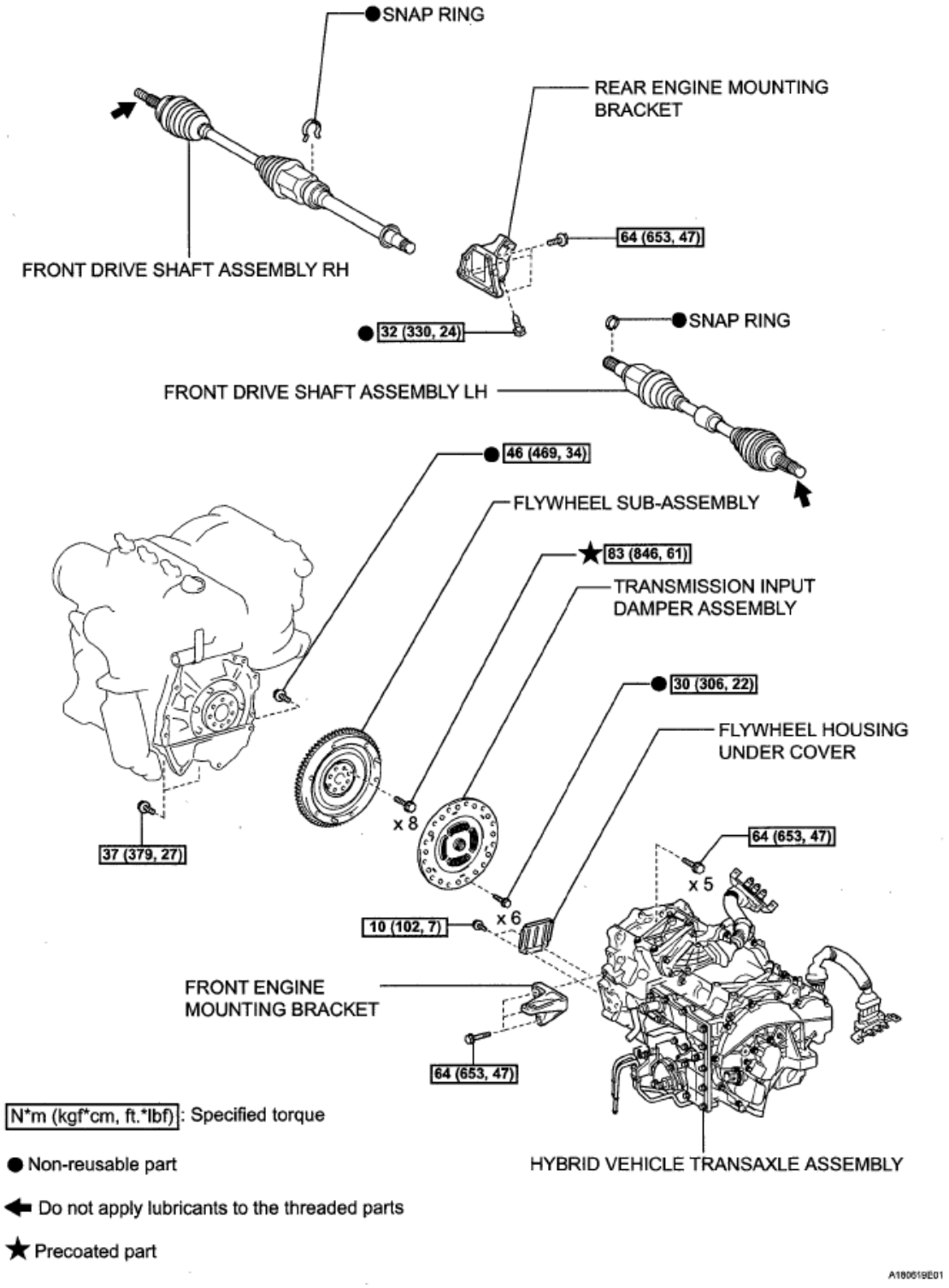


Fig. 358: Identifying Engine Assembly Replacement Components With Torque Specifications (11 Of 11)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **PRECAUTION**
   a. Check for DTCs (See **PRECAUTION**).

   NOTE: Confirm the P0AA6 (Hybrid Battery Voltage System Isolation Fault) is not output before doing removal or installation work inside the battery. If the DTC is output, perform troubleshooting procedures first.

2. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
4. **REMOVE HOOD TO COWL TOP SEAL** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
8. **DISCHARGE FUEL SYSTEM PRESSURE**

   HINT:

   See **PRECAUTION** .

9. **REMOVE SERVICE PLUG GRIP** (See **REMOVAL**)
10. **REMOVE NO. 2 ENGINE ROOM SIDE COVER LH**
    a. Remove the engine room side cover.
11. **REMOVE COOL AIR INTAKE DUCT SEAL**
    a. Remove the 11 clips and cool air intake duct seal.
12. **REMOVE FRONT WHEELS**
13. **REMOVE NO. 1 ENGINE UNDER COVER**
    a. Remove the 6 bolts, 2 screws, 2 clips and No. 1 engine under cover.

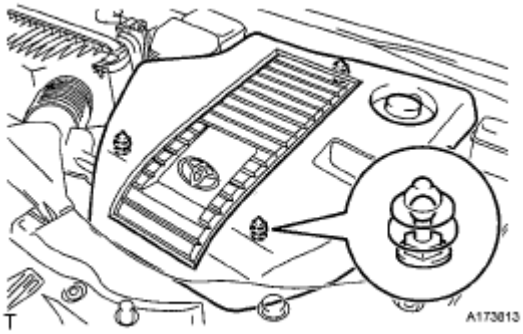


Fig. 359: Identifying Engine Under Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **SEPARATE FRONT FENDER LINER LH**

a. Remove the screw and clip, and separate the front fender liner.

15. **SEPARATE FRONT FENDER LINER RH**

HINT:

Perform the same procedure as above on the opposite side.

16. **REMOVE FRONT FENDER APRON SEAL LH**
    a. Remove the 2 bolts, clip and fender apron seal LH.

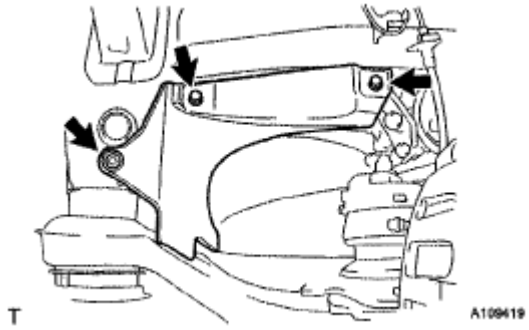


Fig. 360: Locating Bolts, Clip And Fender Apron Seal LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

Perform the same procedure as above on the opposite side.

18. **REMOVE NO. 2 ENGINE UNDER COVER**
    a. Remove the 4 bolts and No. 2 engine under cover.
19. **DRAIN COOLANT (for Engine)** (See **REPLACEMENT**)
20. **DRAIN COOLANT (for Inverter)** (See **REPLACEMENT**)
21. **DRAIN ENGINE OIL** (See **REPLACEMENT**)
22. **DRAIN HYBRID TRANSAXLE FLUID** (See **REPLACEMENT**)
23. **REMOVE BATTERY**
    a. Disconnect the battery terminal.

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

    b. Remove the bolt and battery clamp.
    c. Remove the battery and battery tray.
24. **REMOVE BATTERY CARRIER SUB-ASSEMBLY**

a. Remove the 5 bolts and battery carrier.

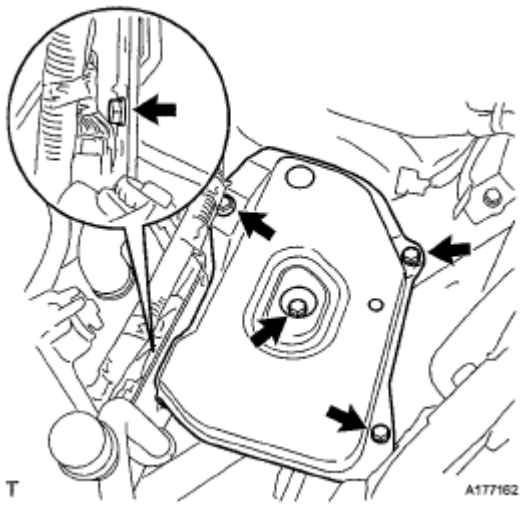


Fig. 361: Locating Battery Carrier Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY**
    a. Remove the 2 bolts, 4 clamps and air cleaner cap sub-assembly.

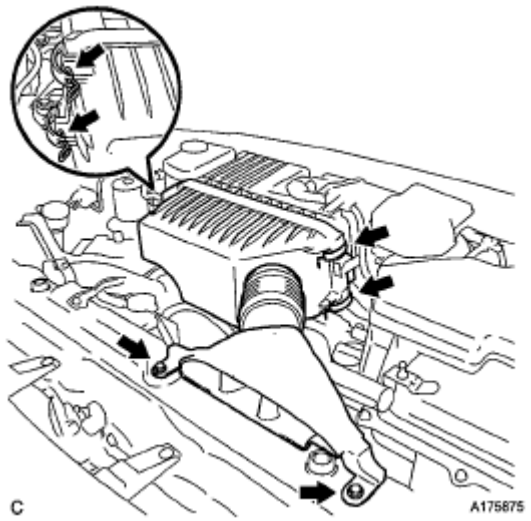


Fig. 362: Locating Air Cleaner Cap Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the air cleaner filter element from the air cleaner case.
26. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
27. **DISCONNECT NO. 1 CIRCUIT BREAKER SENSOR** (See **REMOVAL**)
28. **DISCONNECT NO. 2 ENGINE ROOM WIRE** (See **REMOVAL**)

29. **REMOVE INVERTER RESERVE TANK SUB-ASSEMBLY** (See **REMOVAL**)
30. **DISCONNECT WATER HOSE** (See **REMOVAL**)
31. **REMOVE INVERTER COVER** (See **REMOVAL**)
32. **CHECK TERMINAL VOLTAGE** (See **REMOVAL**)
33. **SEPARATE NO. 4 ENGINE WIRE** (See **REMOVAL**)
34. **DISCONNECT HIGH VOLTAGE CABLE OF FRONT MOTOR** (See **REMOVAL**)
35. **DISCONNECT MG ECU CONNECTOR** (See **REMOVAL**)
36. **DISCONNECT NO. 3 FRAME WIRE** (See **REMOVAL**)
37. **INSTALL INVERTER COVER** (See **REMOVAL**)
38. **SEPARATE ENGINE ROOM RELAY BLOCK ASSEMBLY** (See **REMOVAL**)
39. **REMOVE NO. 4 INVERTER BRACKET** (See **REMOVAL**)
40. **REMOVE INVERTER WITH CONVERTER ASSEMBLY** (See **REMOVAL**)
41. **SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY**
    a. Disconnect the connector.
    b. Remove the 2 nuts and separate the brake master cylinder reservoir.

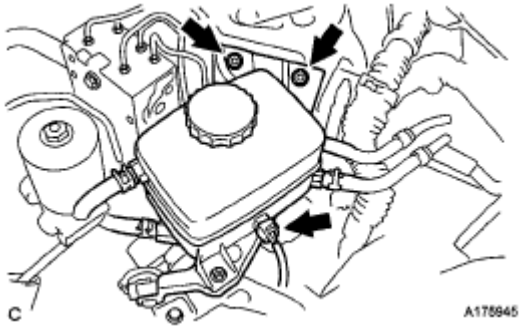


Fig. 363: Locating Brake Master Cylinder Reservoir Connector With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. **REMOVE AIR CLEANER BRACKET**
    a. Remove the 2 bolts and air cleaner bracket.

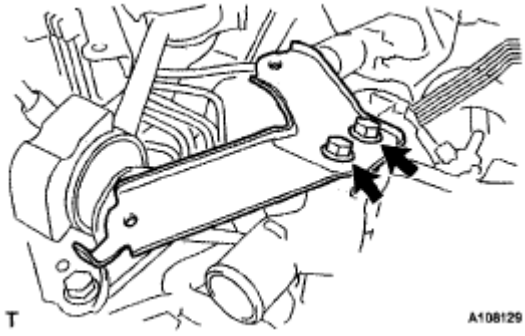


Fig. 364: Locating Bolts And Air Cleaner Bracket

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

43. **REMOVE NO. 2 ENGINE MOUNTING STAY RH**
    a. Remove the 2 bolts and the No. 2 engine mounting stay RH.

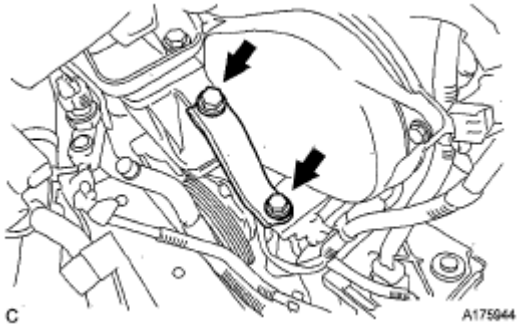


Fig. 365: Locating No. 2 Engine Mounting Stay RH Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. **REMOVE ENGINE MOVING CONTROL ROD**
    a. Remove the 2 bolts and the engine moving control rod.

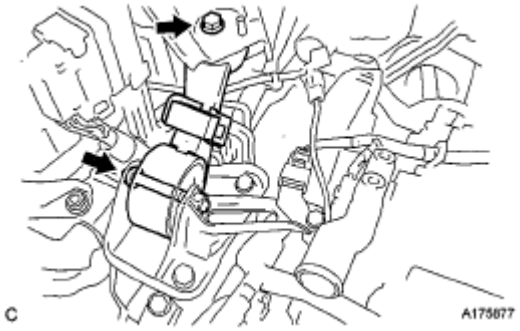


Fig. 366: Locating Engine Moving Control Rod Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **REMOVE ENGINE MOUNTING CONTROL BRACKET**
    a. Remove the 3 bolts and the engine mounting control bracket.

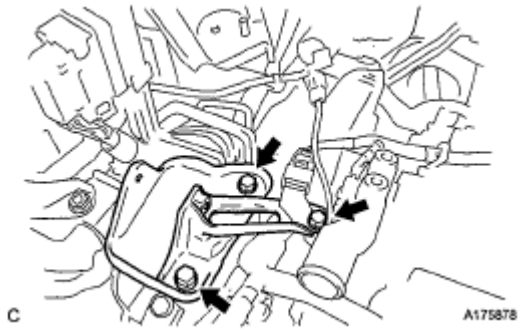


Fig. 367: Locating Engine Mounting Control Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. **REMOVE NO. 2 ENGINE MOUNTING BRACKET RH**
47. **SEPARATE COMPRESSOR WITH MOTOR ASSEMBLY**
    a. Disconnect the 2 connectors.
    b. Remove the 3 bolts and compressor with motor assembly.

    HINT:

    Disconnect the compressor assembly together with the low-pressure and high-pressure hoses, then secure it to the vehicle side with rope.

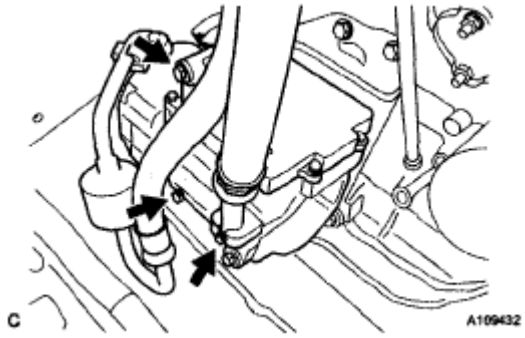


Fig. 368: Locating Bolts And Compressor W/ Motor Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **REMOVE NO. 1 INVERTER BRACKET**
    a. Separate the 3 hose clamps.
    b. Remove the 4 bolts, harness clamp and No. 1 inverter bracket.

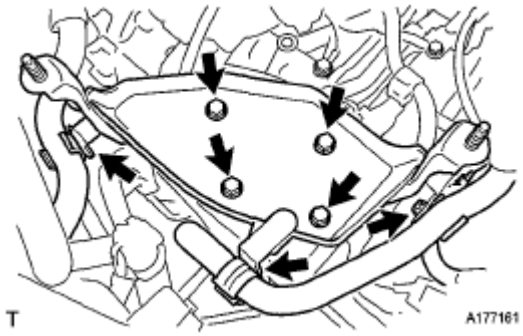


Fig. 369: Locating Bolts, Harness Clamp And No. 1 Inverter Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. **SEPARATE TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Remove the nut and separate the control shaft lever from the position sensor.
    b. Remove the clip and disconnect the control cable from the bracket.

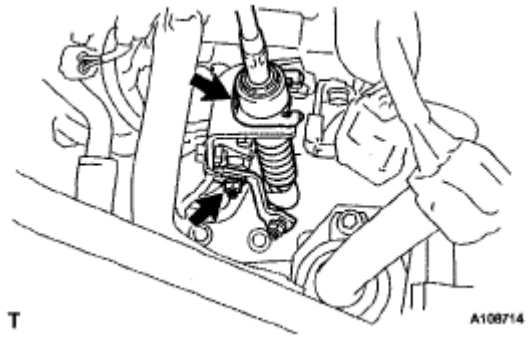


Fig. 370: Locating Control Cable And New Clip To Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Separate the control cable from the cable bracket.

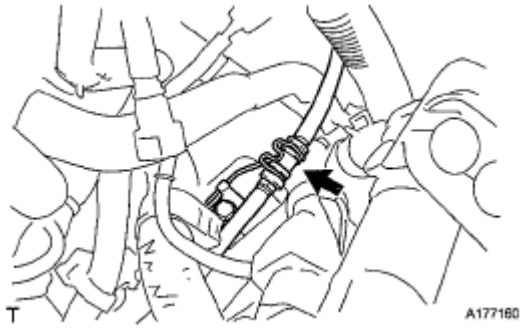


Fig. 371: Locating Control Cable From Cable Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. **DISCONNECT FUEL VAPOR FEED HOSE**

51. **DISCONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY**

a. Remove the EFI fuel pipe clamp.

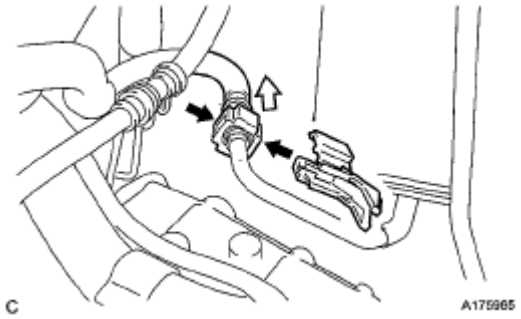


Fig. 372: Locating EFI Fuel Pipe Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- **Remove any dirt and foreign objects on the fuel tube connector before performing this work.**
- **Do not allow any scratches or foreign objects on the parts when disconnecting, as the fuel tube connector has the O-rings that seal the pipe.**

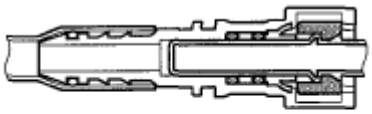


Fig. 373: [Identifying Fuel Tube Connector]
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tube.**
- **If the fuel tube connector and pipe are stuck, push and pull them to release.**

52. **DISCONNECT INLET HEATER WATER HOSE**

a. Using pliers, grip the claws of the clip and slide the clip to disconnect the inlet heater water hose.

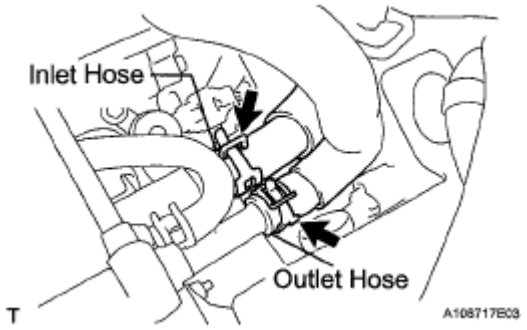


Fig. 374: Locating Inlet And Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. **DISCONNECT OUTLET HEATER WATER HOSE**

    HINT:

    Disconnect the outlet heater water hose using the same procedure as for the heater inlet water hose.

54. **DISCONNECT INLET RADIATOR HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to disconnect the inlet radiator hose.

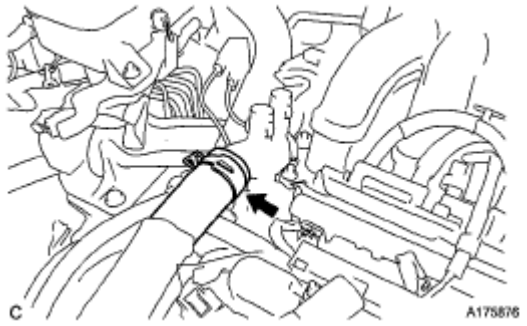


Fig. 375: Locating Inlet Radiator Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. **DISCONNECT OUTLET RADIATOR HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to disconnect the outlet radiator hose.

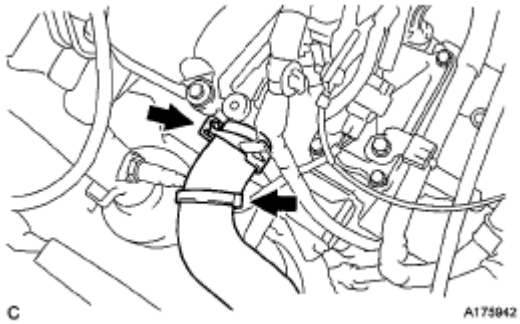


Fig. 376: Locating Outlet Radiator Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. **DISCONNECT INLET OIL COOLER TUBE SUB-ASSEMBLY**
    a. Using pliers, grip the claws of the clip and slide the clip to disconnect the inlet oil cooler tube.
57. **DISCONNECT OUTLET OIL COOLER TUBE SUB-ASSEMBLY**

    HINT:

    Disconnect the outlet oil cooler tube using the same procedure as for the inlet oil cooler tube.

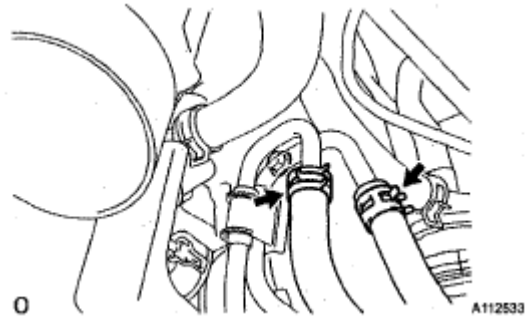


Fig. 377: Locating Oil Cooler Inlet Tube Sub-Assembly (W/ Oil Cooler)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. **DISCONNECT WATER HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to disconnect the water hose.

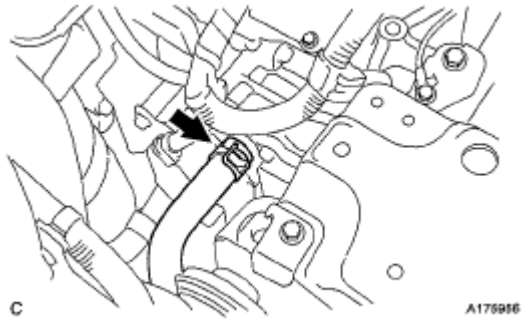


Fig. 378: Locating Water Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using pliers, grip the claws of the clip and slide the clip to disconnect the water hose.

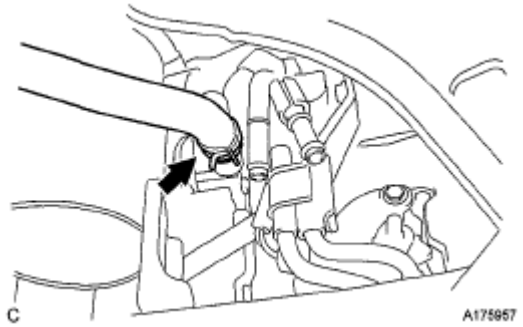


Fig. 379: Locating Water Hose Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. **REMOVE FRONT DOOR SCUFF PLATE RH** (See **REMOVAL**)
60. **REMOVE COWL SIDE TRIM SUB-ASSEMBLY RH** (See **REMOVAL**)
61. **REMOVE NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY** (See **REMOVAL**)
62. **REMOVE LOWER INSTRUMENT PANEL SUB-ASSEMBLY** (See **REMOVAL**)
63. **SEPARATE ENGINE WIRE**
    a. Disconnect the connector and clamp from the junction block.

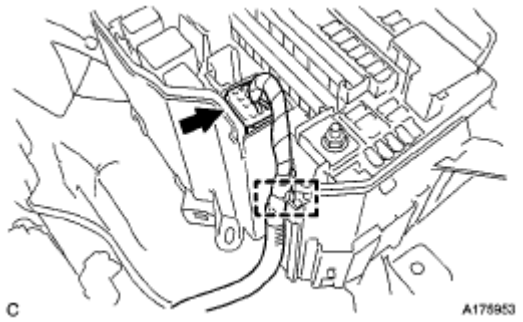


Fig. 380: Identifying Connector And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the bolt and clamp.

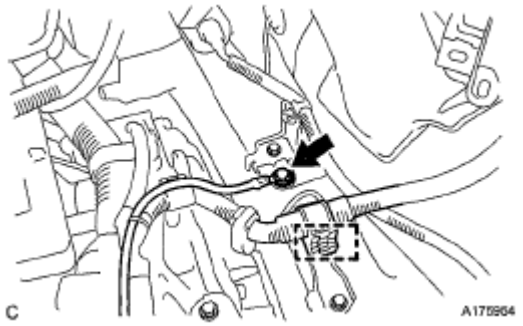


Fig. 381: Locating Bolt And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Separate the clamp and wire harness protector.

Fig. 382: Identifying Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Disconnect the 6 connectors from the ECM.
e. Remove the 2 nuts and pull out the engine wire harness.

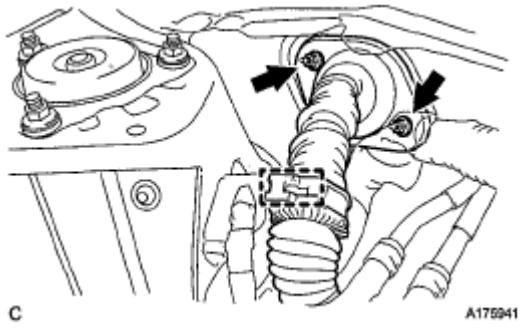


Fig. 383: Locating Engine Wire Harness Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Disconnect the 2 connectors.

64. **REMOVE FRONT EXHAUST PIPE ASSEMBLY**

a. Disconnect the heated oxygen sensor connector.

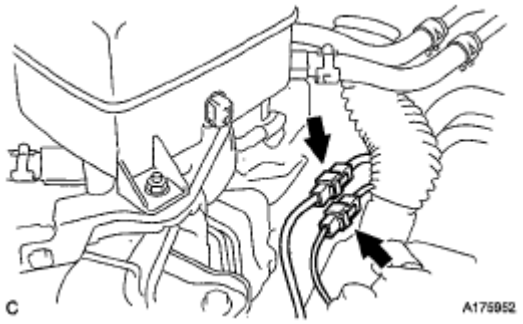


Fig. 384: Locating Heated Oxygen Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 bolts, 2 nuts and front exhaust pipe assembly.

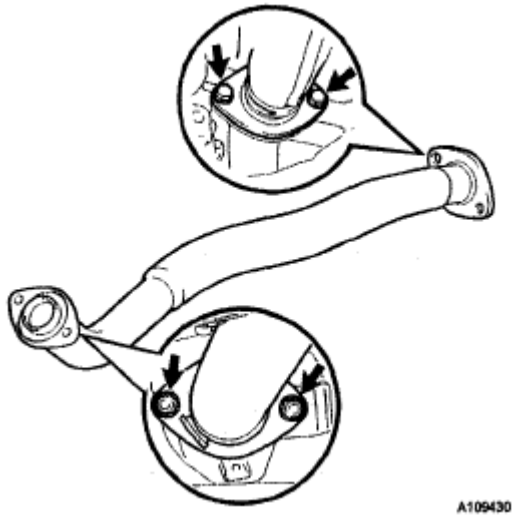


Fig. 385: Locating Gaskets And Exhaust Pipe Front, Bolts Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 2 gaskets.

65. **REMOVE FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY**
    a. Disconnect the heated oxygen sensor connector.
    b. Remove the 2 bolts, 2 nuts and front No. 3 exhaust pipe sub-assembly.

Fig. 386: Locating Gaskets And Exhaust Pipe Front With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 2 gaskets.

66. **SECURE STEERING WHEEL** (See **REMOVAL**)
67. **SEPARATE FRONT STABILIZER LINK ASSEMBLY LH** (See **REMOVAL**)
68. **SEPARATE FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure as above on the opposite side.

69. **REMOVE FRONT AXLE SHAFT NUT LH** (See **REMOVAL**)
70. **REMOVE FRONT AXLE SHAFT NUT RH**

HINT:

Perform the same procedure as above on the opposite side.

71. **SEPARATE FRONT SPEED SENSOR LH** (See **REMOVAL**)
72. **SEPARATE FRONT SPEED SENSOR RH**

HINT:

Perform the same procedure as above on the opposite side.

73. **SEPARATE TIE ROD END SUB-ASSEMBLY LH** (See **REMOVAL**)
74. **SEPARATE TIE ROD END SUB-ASSEMBLY RH**

HINT:

Perform the same procedure as above on the opposite side.

75. **SEPARATE FRONT LOWER SUSPENSION ARM LH** (See **REMOVAL**)
76. **SEPARATE FRONT LOWER SUSPENSION ARM RH**

HINT:

Perform the same procedure as above on the opposite side.

77. **SEPARATE FRONT AXLE ASSEMBLY LH** (See **REMOVAL**)
78. **SEPARATE FRONT AXLE ASSEMBLY RH**

HINT:

Perform the same procedure as above on the opposite side.

79. **SEPARATE STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY** (See **REMOVAL**)
80. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**
    a. Set the engine lifter.
    b. Remove the 6 bolts and 2 nuts, then remove the frame side plates RH and LH.

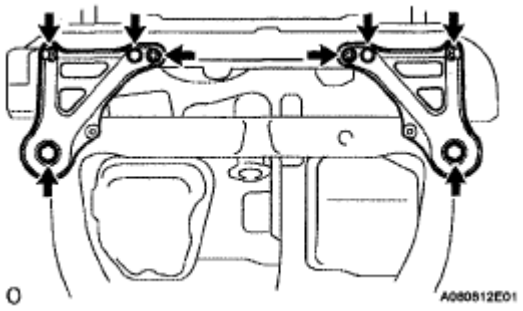


Fig. 387: Locating Bolts And Nuts, Frame Side Rail Plates RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Remove the 6 bolts and 2 nuts, then remove the front suspension member brace RH and LH.

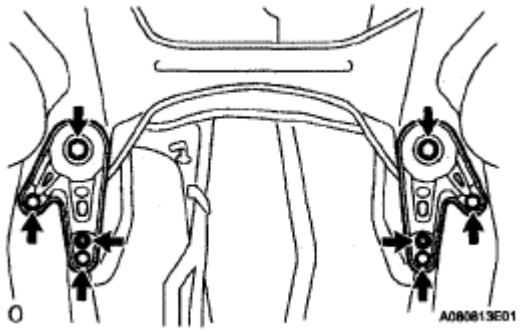


Fig. 388: Locating Bolts And Nuts, Front Suspension Member Brace Rear RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Carefully remove the engine assembly from the vehicle.
e. Install the No. 2 engine hanger in the correct direction shown in the illustration.

Torque: 20 N*m (200 kgf*cm, 14 ft.*lbf)

HINT:

Part No. is shown in the table below.

TORQUE SPECIFICATION

No. 2 engine hanger	12282-20020
Bolt	91641-80825

f. Attach the engine sling and hang the engine assembly with the chain block.

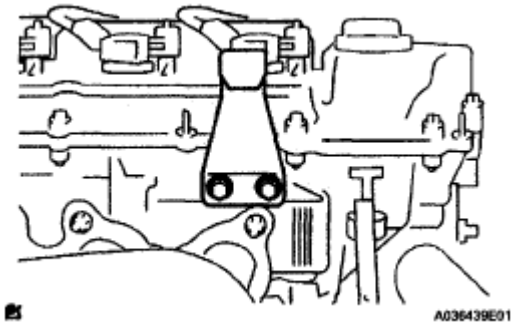


Fig. 389: Identifying Engine Hanger
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

81. **REMOVE ENGINE WIRE**
82. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** (See **REMOVAL**)
83. **REMOVE MANIFOLD STAY** (See **REMOVAL**)
84. **REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH** (See **REMOVAL**)
85. **REMOVE HYBRID TRANSAXLE MASS DAMPER**
    a. Remove the bolt and transaxle mass damper.

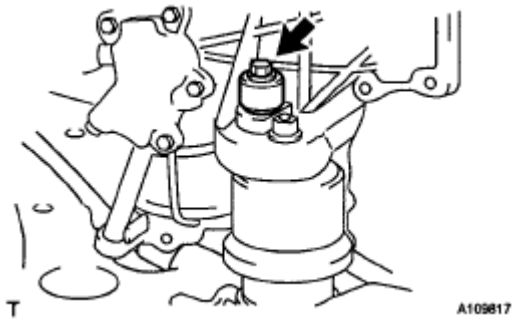


Fig. 390: Locating Bolt And Transaxle Mass Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

86. **REMOVE ENGINE MOUNTING ABSORBER SUB-ASSEMBLY**
    a. Remove the 2 bolts, 2 nuts and engine mounting absorber sub-assembly.

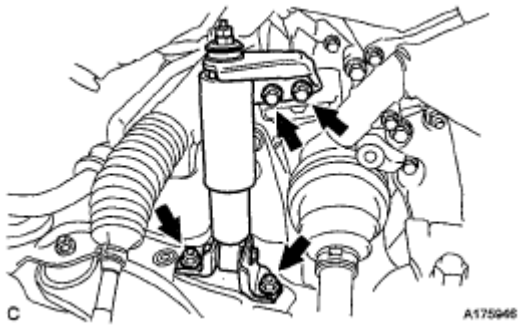


Fig. 391: Locating Engine Mounting Absorber Sub-Assembly Nuts And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

87. **REMOVE REAR ENGINE MOUNTING INSULATOR**
    a. Remove the 3 bolts and rear engine mounting insulator.

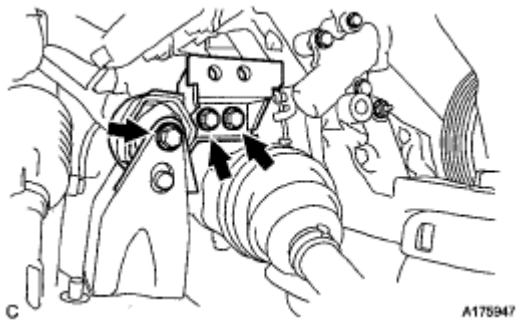


Fig. 392: Locating Rear Engine Mounting Insulator Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

88. **REMOVE FRONT FRAME ASSEMBLY**
    a. Remove the nut and separate the front engine mounting insulator.

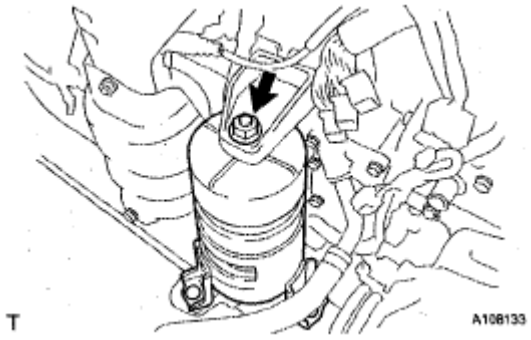


Fig. 393: Locating Engine Mounting Insulator FR With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

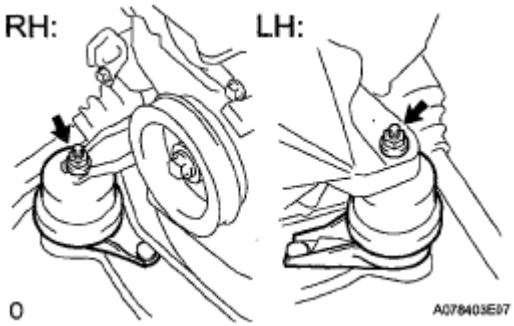


Fig. 394: Locating Engine Mounting Insulators RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

89. **REMOVE FRONT ENGINE MOUNTING INSULATOR**

a. Remove the 3 nuts and front engine mounting insulator.

HINT:

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

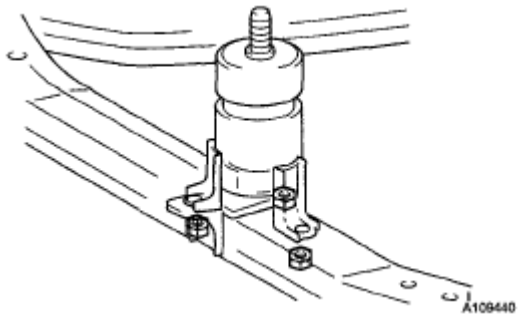


Fig. 395: Identifying Front Engine Mounting Insulator Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

90. **REMOVE ENGINE MOUNTING INSULATOR LH**
    a. Remove the 3 nuts and engine mounting insulator LH.

    HINT:

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

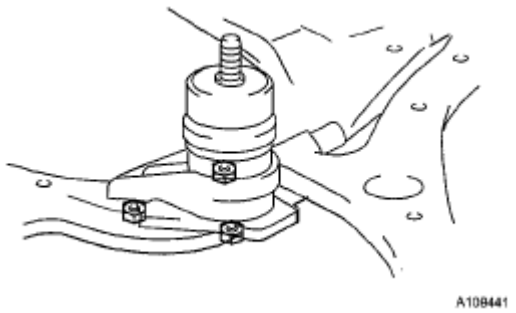


Fig. 396: Identifying Engine Mounting Insulator LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

91. **REMOVE ENGINE MOUNTING INSULATOR RH**
    a. Remove the 3 nuts and engine mounting insulator RH.

    HINT:

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

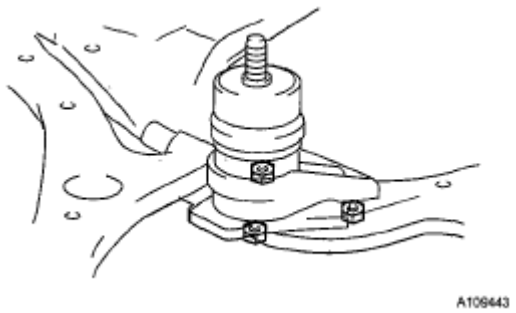


Fig. 397: Identifying Engine Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

92. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** (See **REMOVAL**)
93. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** (See **REMOVAL**)
94. **REMOVE FLYWHEEL HOUSING UNDER COVER** (See **REMOVAL**)
95. **REMOVE FRONT ENGINE MOUNTING BRACKET** (See **REMOVAL**)
96. **REMOVE HYBRID VEHICLE TRANSAXLE ASSEMBLY** (See **REMOVAL**)
97. **REMOVE REAR ENGINE MOUNTING BRACKET**

a. Remove the 3 bolts and rear engine mounting bracket.

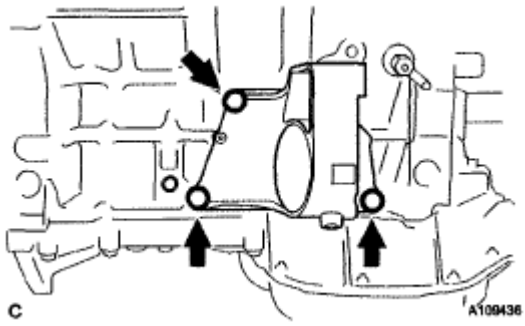


Fig. 398: Locating Engine Mounting Bracket Rear, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

98. **REMOVE TRANSMISSION INPUT DAMPER ASSEMBLY** (See **REMOVAL**)
99. **REMOVE FLYWHEEL SUB-ASSEMBLY** (See **REMOVAL**)

INSTALLATION

1. **INSTALL FLYWHEEL SUB-ASSEMBLY** (See **INSTALLATION**)
2. **INSTALL TRANSMISSION INPUT DAMPER ASSEMBLY** (See **INSTALLATION**)
3. **INSTALL REAR ENGINE MOUNTING BRACKET**
   a. Install the 3 bolts and rear engine mounting bracket.

   Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

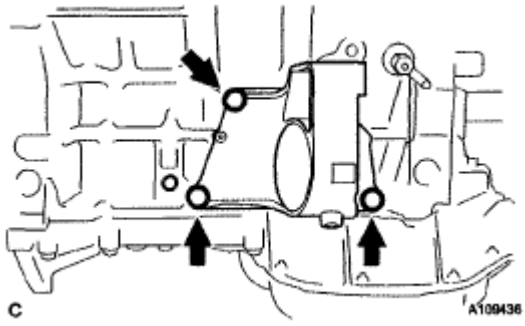


Fig. 399: Locating Engine Mounting Bracket Rear, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL HYBRID VEHICLE TRANSAXLE ASSEMBLY** (See **INSTALLATION**)
5. **INSTALL FRONT ENGINE MOUNTING BRACKET** (See **INSTALLATION**)
6. **INSTALL FLYWHEEL HOUSING UNDER COVER** (See **INSTALLATION**)
7. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** (See **INSTALLATION**)
8. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** (See **INSTALLATION**)

9. **TEMPORARILY TIGHTEN ENGINE MOUNTING INSULATOR LH**
   a. Temporarily install the engine mounting insulator LH with the 3 nuts.

      HINT:

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

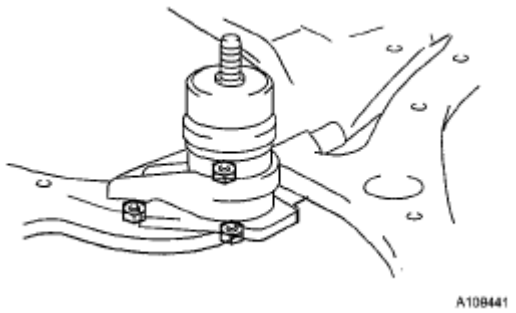


Fig. 400: Identifying Engine Mounting Insulator LH With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **TEMPORARILY TIGHTEN ENGINE MOUNTING INSULATOR RH**
    a. Temporarily install the engine mounting insulator RH with the 3 nuts.

       HINT:

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

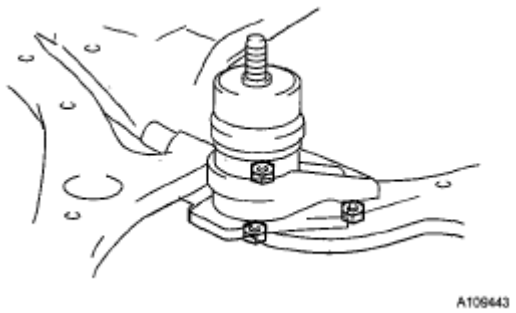


Fig. 401: Identifying Engine Mounting Insulator RH With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **TEMPORARILY TIGHTEN FRONT ENGINE MOUNTING INSULATOR**
    a. Temporarily install the front engine mounting insulator with the 3 nuts.

       HINT:

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

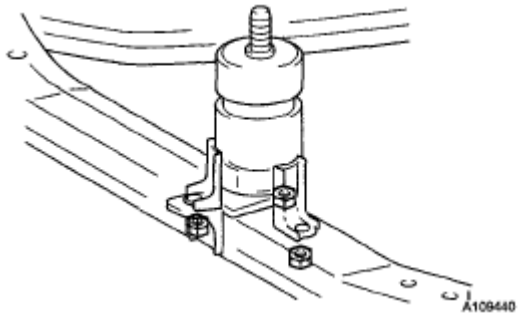


Fig. 402: Identifying Front Engine Mounting Insulator With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **INSTALL FRONT FRAME ASSEMBLY**
    a. Install the engine mounting insulators RH and LH with the 2 nuts.

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

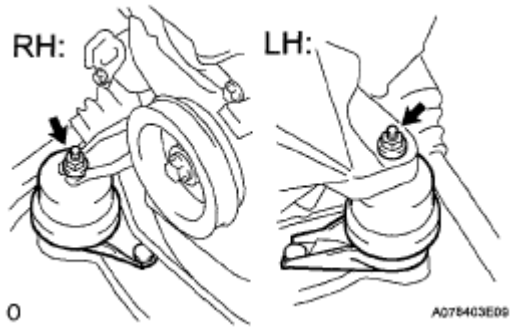


Fig. 403: Locating Engine Mounting Insulators RH And LH With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

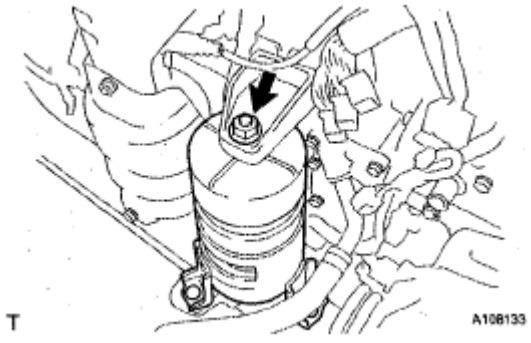


Fig. 404: Locating Engine Mounting Insulator FR With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **FULLY TIGHTEN ENGINE MOUNTING INSULATOR LH**
    a. Install the engine mounting insulator LH by tightening the 3 nuts.

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

       HINT:

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

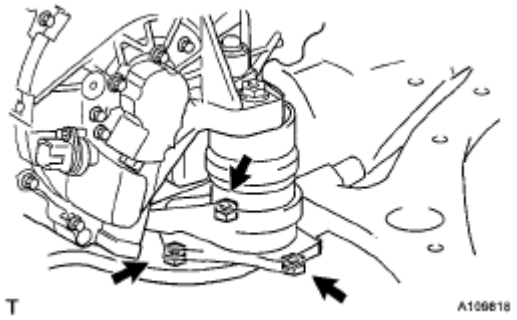


Fig. 405: Locating Engine Mounting Insulator LH Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **FULLY TIGHTEN ENGINE MOUNTING INSULATOR RH**
    a. Install the engine mounting insulator RH by tightening the 3 nuts.

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

       HINT:

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

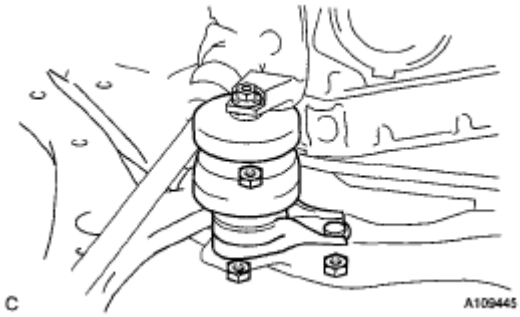


Fig. 406: Locating Engine Mounting Insulator RH Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **FULLY TIGHTEN FRONT ENGINE MOUNTING INSULATOR**
    a. Install the front engine mounting insulator by tightening the 3 nuts.

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

HINT:

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

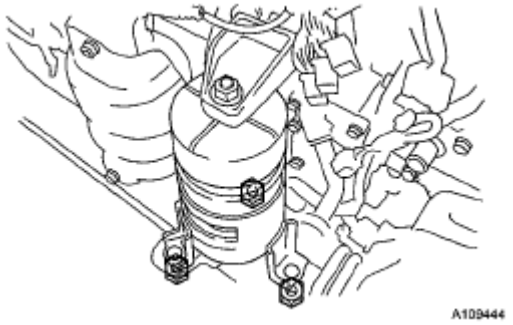


Fig. 407: Identifying Front Engine Mounting Insulator Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **INSTALL REAR ENGINE MOUNTING INSULATOR**
    a. Install the rear engine mounting insulator with the 3 bolts.

    Torque: Bolt A

    130 N*m (1326 kgf*cm, 96 ft.*lbf)

    Bolt B

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

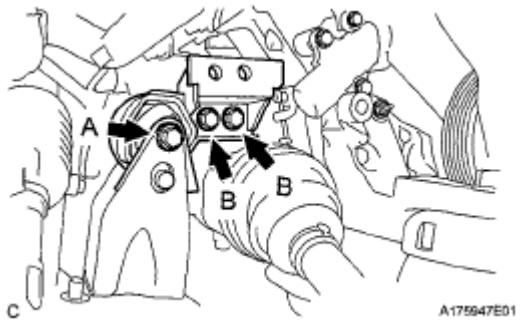


Fig. 408: Locating Rear Engine Mounting Insulator With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **INSTALL ENGINE MOUNTING ABSORBER SUB-ASSEMBLY**
    a. Install the engine mounting absorber sub-assembly with the 2 bolts and 2 nuts.

    Torque: Bolt

64 N*m (653 kgf*cm, 47 ft.*lbf)

Nut

24 N*m (245 kgf*cm, 18 ft.*lbf)

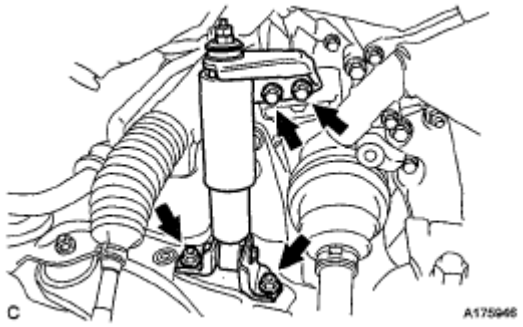


Fig. 409: Locating Engine Mounting Absorber Sub-Assembly With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **INSTALL HYBRID TRANSAXLE MASS DAMPER**
    a. Install the bolt and transaxle mass damper.

    Torque: 14 N*m (138 kgf*cm, 10 ft.*lbf)

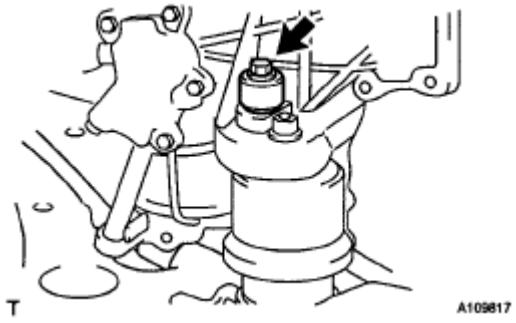


Fig. 410: Locating Bolt And Transaxle Mass Damper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH** (See **INSTALLATION**)
20. **INSTALL MANIFOLD STAY** (See **INSTALLATION**)
21. **INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** (See **INSTALLATION**)
22. **INSTALL ENGINE WIRE**
23. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**
    a. Set the engine assembly with transaxle on the engine lifter.
    b. Install the engine assembly to the vehicle.
    c. Install the frame side plates RH and LH with the 6 bolts and 2 nuts.

Torque: Bolt A

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

Bolt B

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

Nut C

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

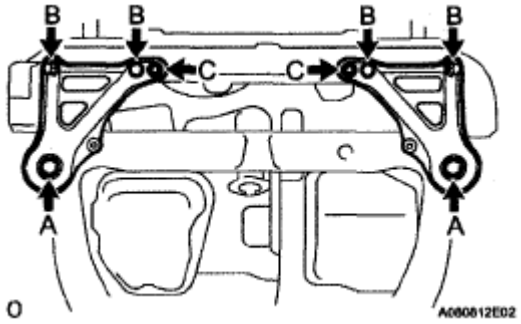


Fig. 411: Locating Frame Side Rail Plate RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Torque: Bolt A

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

Bolt B

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

Nut C

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

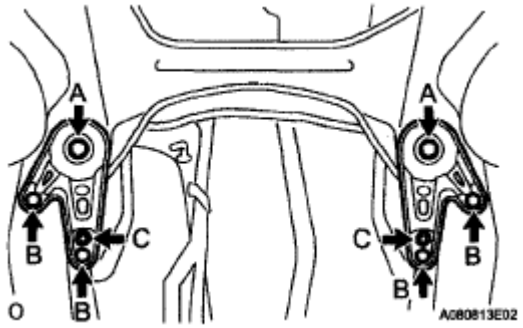


Fig. 412: Locating Front Suspension Member Brace Rear RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **CONNECT STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY** (See **INSTALLATION**)
25. **INSTALL FRONT AXLE ASSEMBLY LH** (See **INSTALLATION**)
26. **INSTALL FRONT AXLE ASSEMBLY RH**

    HINT:

    Perform the same procedure as above on the opposite side.

27. **INSTALL FRONT LOWER SUSPENSION ARM LH** (See **INSTALLATION**)
28. **INSTALL FRONT LOWER SUSPENSION ARM RH**

    HINT:

    Perform the same procedure as above on the opposite side.

29. **CONNECT TIE ROD END SUB-ASSEMBLY LH** (See **INSTALLATION**)
30. **CONNECT TIE ROD END SUB-ASSEMBLY RH**

    HINT:

    Perform the same procedure as above on the opposite side.

31. **INSTALL FRONT SPEED SENSOR LH** (See **INSTALLATION**)
32. **INSTALL FRONT SPEED SENSOR RH**

    HINT:

    Perform the same procedure as above on the opposite side.

33. **INSTALL FRONT AXLE SHAFT NUT LH** (See **INSTALLATION**)
34. **INSTALL FRONT AXLE SHAFT NUT RH**

    HINT:

Perform the same procedure as above on the opposite side.

35. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** (See **INSTALLATION**)
36. **INSTALL FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure as above on the opposite side.

37. **INSTALL FRONT NO. 3 EXHAUST PIPE SUB-ASSEMBLY**
    a. Using vernier calipers, measure the free length of the compression spring.

    Minimum length: 41.5 mm (1.634 in.)

    HINT:

    If the free length is less than the minimum, replace the compression spring.

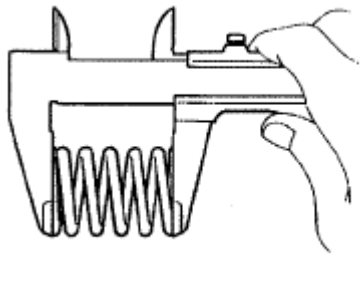


Fig. 413: View Of Measuring Compression Springs With Vernier Calipers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Install a new gasket to the front No. 3 exhaust pipe as shown in the illustration.

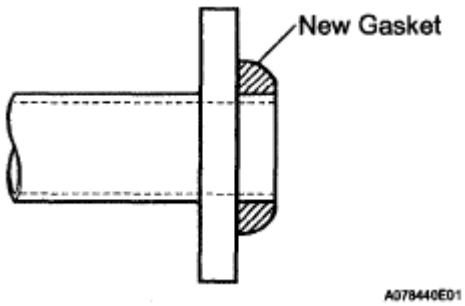


Fig. 414: Identifying Gasket On Exhaust Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Install 2 new gaskets and the front No. 3 exhaust pipe with the 2 bolts and 2 new nuts.

Torque: Bolt

48 N*m (490 kgf*cm, 35 ft.*lbf)

Nut

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

d. Connect the heated oxygen sensor connector.

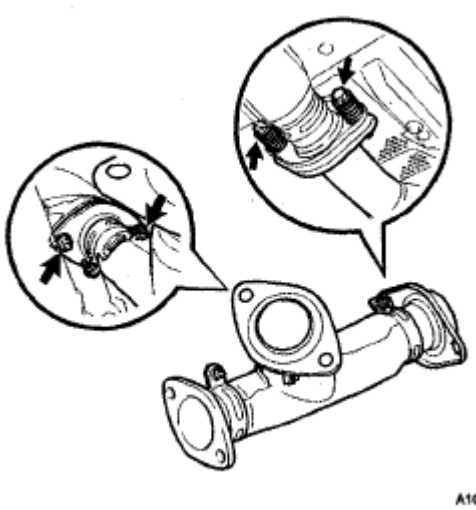


Fig. 415: Locating Gaskets And Exhaust Pipe Front With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **INSTALL FRONT EXHAUST PIPE ASSEMBLY**
    a. Install 2 new gaskets and the front No. 3 exhaust pipe with the 2 bolts and 2 new nuts.

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

    b. Connect the heated oxygen sensor connector.

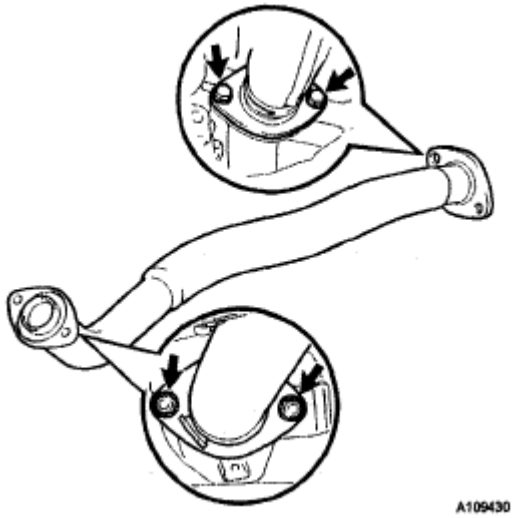


Fig. 416: Locating Gaskets And Exhaust Pipe Front, Bolts Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **CONNECT ENGINE WIRE**
    a. Connect the connector and clamp.

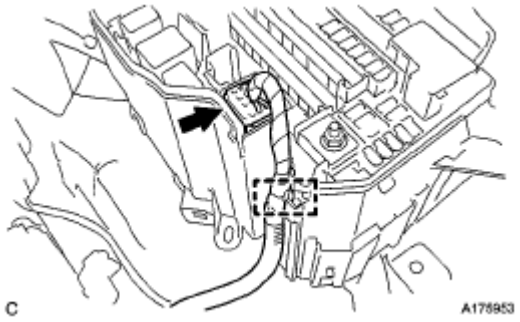


Fig. 417: Locating Connector And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Install the ground cable and clamp.

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

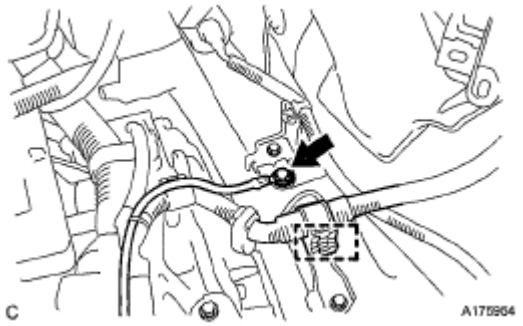


Fig. 418: Locating Ground Cable And Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the clamp and wire harness protector.

Fig. 419: Identifying Clamp And Wire Harness Protector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the 2 nuts and pull in the engine wire harness.

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

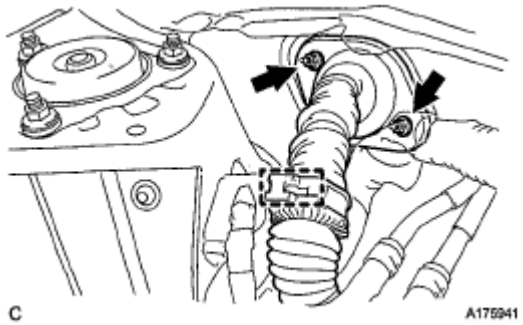


Fig. 420: Locating Engine Wire Harness Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Connect the 6 connectors to the ECM.
f. Connect the 2 connectors.

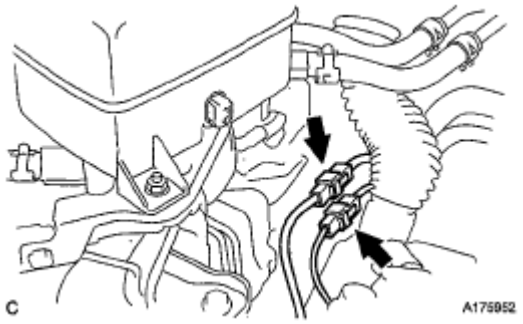


Fig. 421: Locating Connectors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **INSTALL LOWER INSTRUMENT PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
41. **INSTALL NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY** (See **INSTALLATION**)
42. **INSTALL COWL SIDE TRIM SUB-ASSEMBLY RH** (See **INSTALLATION**)
43. **INSTALL FRONT DOOR SCUFF PLATE RH** (See **INSTALLATION**)
44. **CONNECT WATER HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to connect the water inlet hose.

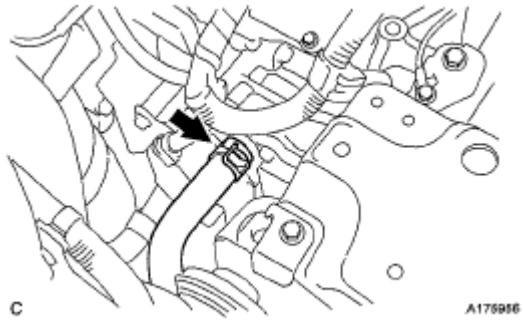


Fig. 422: Locating Water Hose Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using pliers, grip the claws of the clip and slide the clip to connect the water inlet hose.

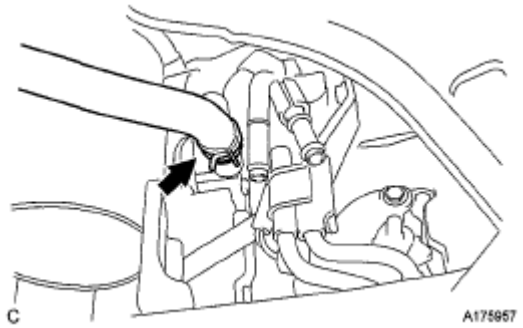


Fig. 423: Locating Water Inlet Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **CONNECT INLET OIL COOLER TUBE SUB-ASSEMBLY**
    a. Using pliers, grip the claws of the clip and slide the clip to connect the inlet oil cooler tube.

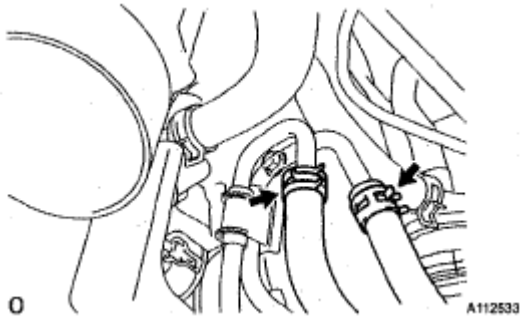


Fig. 424: Locating Oil Cooler Inlet Tube Sub-Assembly (W/ Oil Cooler)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. **CONNECT OUTLET OIL COOLER TUBE SUB-ASSEMBLY**

    HINT:

    Connect the outlet oil cooler tube using the same procedure as for the inlet oil cooler tube.

47. **CONNECT INLET RADIATOR HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to connect the inlet radiator hose.

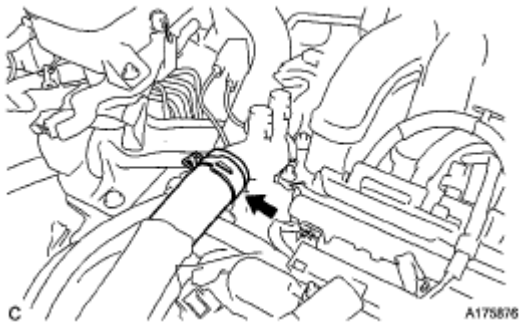


Fig. 425: Locating Inlet Radiator Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **CONNECT OUTLET RADIATOR HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to connect the outlet radiator hose.

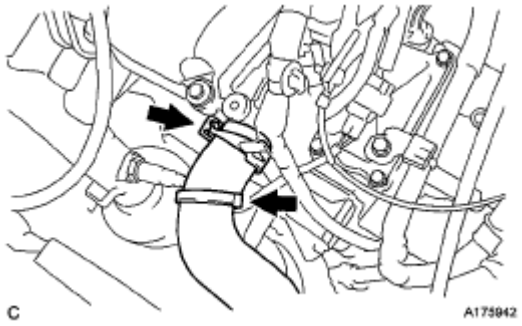


Fig. 426: Locating Outlet Radiator Hose Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. **CONNECT INLET HEATER WATER HOSE**
    a. Using pliers, grip the claws of the clip and slide the clip to connect the inlet heater water hose.

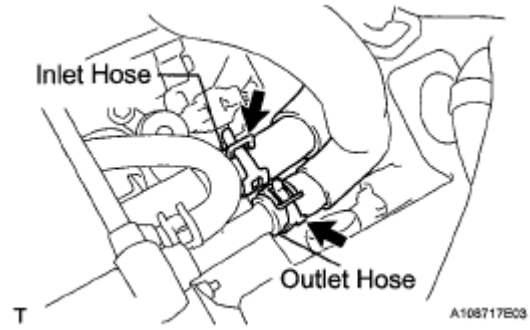


Fig. 427: Locating Inlet And Outlet Heater Water Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. **CONNECT OUTLET HEATER WATER HOSE**

    HINT:

    Connect the outlet heater water hose using the same procedure as for the inlet heater water hose.

51. **CONNECT NO. 1 FUEL PIPE SUB-ASSEMBLY**
    a. Align the connector with the pipe, then push in the connector to the pipe until it makes a "click" sound to connect the fuel tube sub-assembly to the fuel delivery pipe.
    b. Install the EFI fuel pipe clamp.

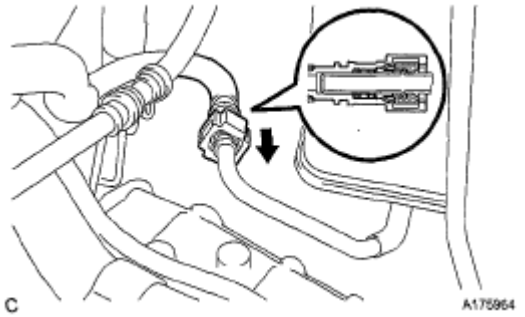


Fig. 428: Locating EFI Fuel Pipe Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Install the control cable to the transaxle with the bolt.

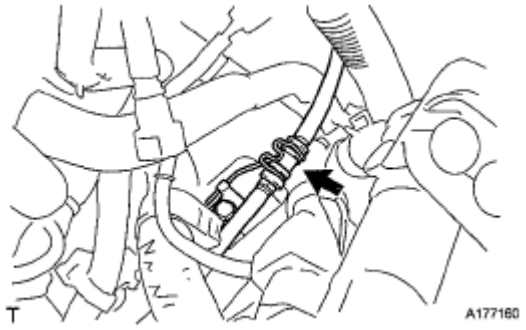


Fig. 429: Locating Transmission Control Cable With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Install the control shaft lever with the nut.

Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)

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

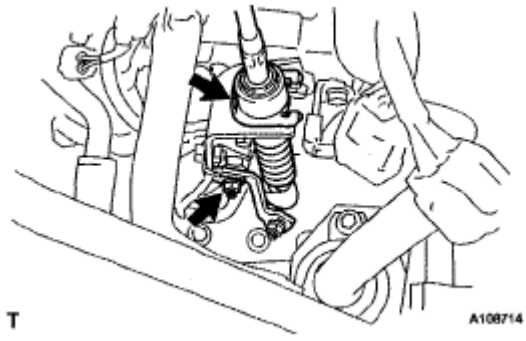


Fig. 430: Locating Control Cable And New Clip To Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. **INSTALL NO. 1 INVERTER BRACKET**
    a. Install the 4 bolts and No. 1 inverter bracket.

    Torque: 17 N*m (173 kgf*cm, 12 ft.*lbf)

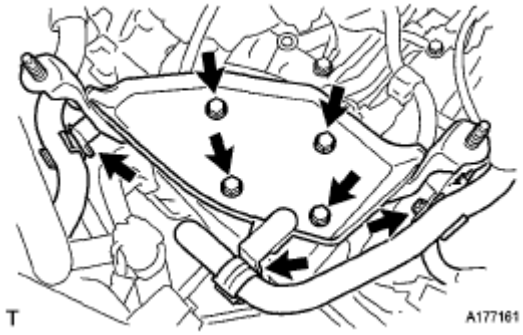


Fig. 431: Locating No. 1 Inverter Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Install the harness clamp and hose clamp.

54. **INSTALL COMPRESSOR WITH MOTOR ASSEMBLY**
    a. Temporarily install the compressor with motor assembly with the 3 bolts.
    b. Install the compressor with motor assembly by tightening the 3 bolts in the order shown in the illustration.

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

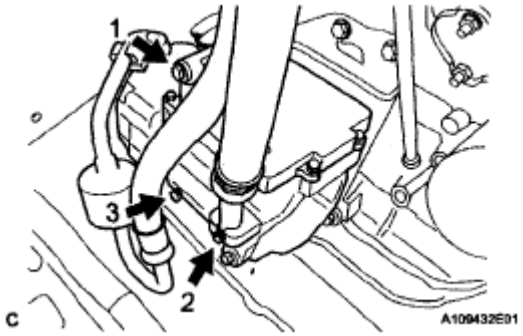


Fig. 432: Locating Compressor Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Connect the 2 connectors.

55. **INSTALL NO. 2 ENGINE MOUNTING BRACKET RH**
56. **INSTALL ENGINE MOUNTING CONTROL BRACKET**
    a. Install the 3 bolts and engine mounting control bracket.

    Torque: Bolt A

64 N*m (653 kgf*cm, 47 ft.*lbf)

Bolt B

23 N*m (235 kgf*cm, 17 ft.*lbf)

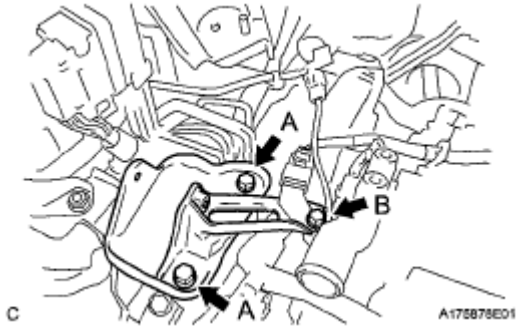


Fig. 433: Locating Engine Mounting Control Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. **INSTALL ENGINE MOVING CONTROL ROD**
    a. Install the 2 bolts and engine moving control rod.

Torque: Bolt A

64 N*m (653 kgf*cm, 47 ft.*lbf)

Bolt B

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

HINT:

First tighten bolt A.

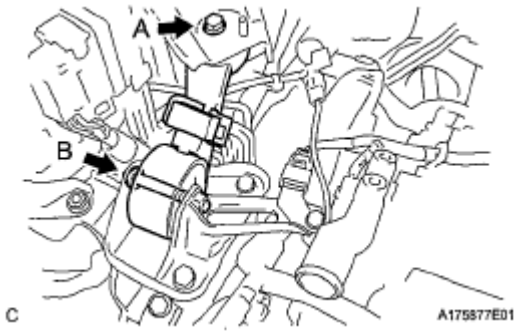


Fig. 434: Locating Engine Moving Control Rod Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

    Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

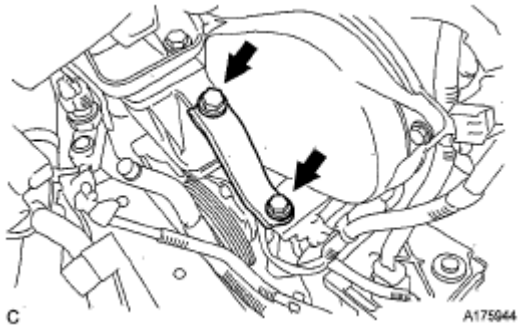


Fig. 435: Locating No. 2 Engine Mounting Stay Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. **INSTALL AIR CLEANER BRACKET**
    a. Install the 2 bolts and air cleaner bracket.

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

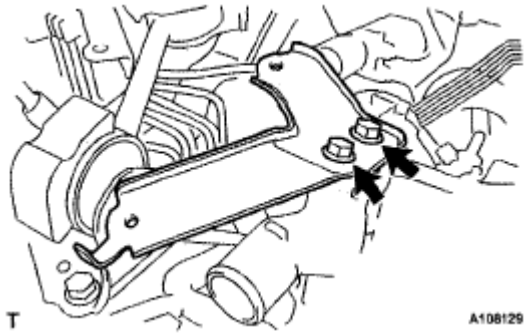


Fig. 436: Locating Bolts And Air Cleaner Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY**
    a. Install the 2 nuts and brake master cylinder reservoir.

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

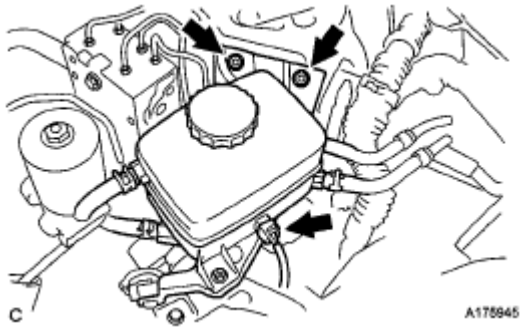


Fig. 437: Locating Brake Master Cylinder Reservoir Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Connect the connector.

61. **INSTALL INVERTER WITH CONVERTER ASSEMBLY** (See **INSTALLATION**)
62. **INSTALL NO. 4 INVERTER BRACKET** (See **INSTALLATION**)
63. **INSTALL ENGINE ROOM RELAY BLOCK ASSEMBLY** (See **INSTALLATION**)
64. **REMOVE INVERTER COVER** (See **INSTALLATION**)
65. **CONNECT NO. 3 FRAME WIRE** (See **INSTALLATION**)
66. **CONNECT MG ECU CONNECTOR** (See **INSTALLATION**)
67. **CONNECT HIGH VOLTAGE CABLE OF FRONT MOTOR** (See **INSTALLATION**)
68. **CONNECT NO. 4 ENGINE WIRE** (See **INSTALLATION**)
69. **CHECK HIGH VOLTAGE CABLE CONNECTION** (See **INSTALLATION**)
70. **INSTALL INVERTER COVER** (See **INSTALLATION**)
71. **CONNECT WATER HOSE** (See **INSTALLATION**)
72. **INSTALL INVERTER RESERVE TANK SUB-ASSEMBLY** (See **INSTALLATION**)
73. **CONNECT NO. 2 ENGINE ROOM WIRE** (See **INSTALLATION**)
74. **CONNECT NO. 1 CIRCUIT BREAKER SENSOR** (See **INSTALLATION**)
75. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
76. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY**
    a. Install the air cleaner filter element to the air cleaner case.
    b. Install the 2 bolts, 4 clamps and air cleaner cap sub-assembly.

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

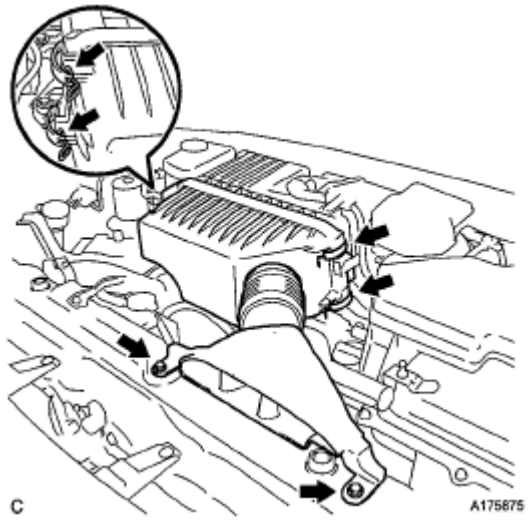


Fig. 438: Locating Air Cleaner Cap Sub-Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

77. **INSTALL BATTERY CARRIER SUB-ASSEMBLY**
    a. Install the 5 bolts and battery carrier.

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

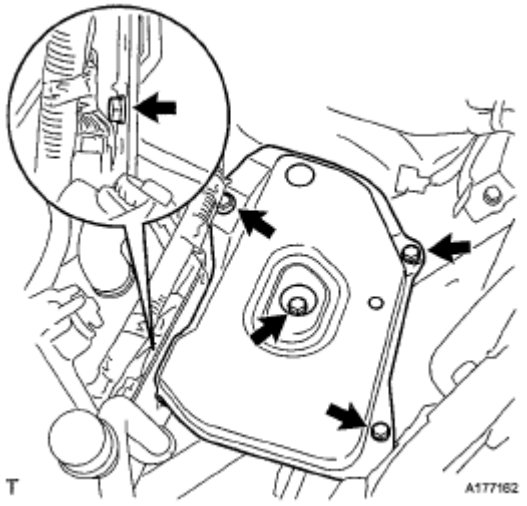


Fig. 439: Locating Battery Carrier Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

78. **INSTALL SERVICE PLUG GRIP** (See **INSTALLATION**)
79. **INSTALL BATTERY**
    a. Install the battery clamp and battery.

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

b. Connect the cable to the battery terminal.

Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

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

80. **INSTALL FRONT WHEELS**

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

81. **ADD AND INSPECT HYBRID TRANSAXLE FLUID** (See **REPLACEMENT**)
82. **ADD ENGINE OIL**
83. **INSPECT FOR FUEL LEAK** (See **ON-VEHICLE INSPECTION**)
84. **ADD COOLANT (for Inverter)** (See **REPLACEMENT**)
85. **ADD COOLANT (for Engine)** (See **REPLACEMENT**)
86. **INSPECT FOR OIL LEAK**
87. **INSPECT FOR COOLANT LEAKS (for Inverter)** (See **ON-VEHICLE INSPECTION**)
88. **INSPECT FOR COOLANT LEAKS (for Engine)** (See **ON-VEHICLE INSPECTION**)
89. **INSPECT FOR EXHAUST GAS LEAK** (See **ON-VEHICLE INSPECTION**)
90. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

HINT:

See **ADJUSTMENT** .

91. **INSTALL NO. 2 ENGINE UNDER COVER**
    a. Install the 2 bolts and No. 2 engine under cover.
92. **INSTALL FRONT FENDER APRON SEAL LH**
    a. Install the 2 bolts, clip and fender apron seal LH.

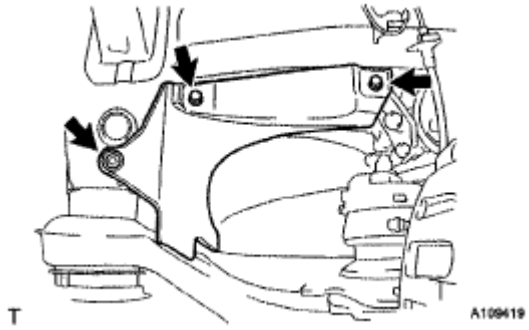


Fig. 440: Locating Bolts, Clip And Fender Apron Seal LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

93. **INSTALL FRONT FENDER APRON SEAL RH**

HINT:

Perform the same procedure as above on the opposite side.

94. **INSTALL FRONT FENDER LINER LH**
    a. Install the front fender liner with the screw and clip.
95. **INSTALL FRONT FENDER LINER RH**

HINT:

Perform the same procedure as above on the opposite side.

96. **INSTALL NO. 1 ENGINE UNDER COVER**
    a. Install the 6 bolts, 2 screws, 2 clips and No. 1 engine under cover.
97. **INSPECT STEERING WHEEL CENTER POINT**
98. **INSPECT IGNITION TIMING** (See **ON-VEHICLE INSPECTION**)
99. **INSPECT ENGINE IDLE SPEED** (See **ON-VEHICLE INSPECTION**)
100. **INSPECT CO/HC** (See **ON-VEHICLE INSPECTION**)
101. **CHECK ABS SPEED SENSOR SIGNAL**

HINT:

See **TEST MODE PROCEDURE** .

102. **INSTALL NO. 2 ENGINE ROOM SIDE COVER LH**
    a. Fit the clips and install the No. 2 engine room side cover LH.

NOTE:

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

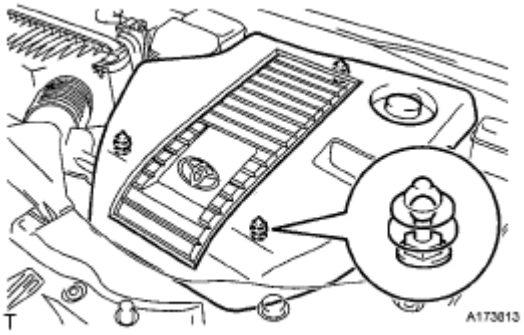


Fig. 441: Identifying No. 2 Engine Room Side Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

103. **INSTALL COOL AIR INTAKE DUCT SEAL**
    a. Install the cool air intake duct seal with the 11 clips.
104. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
105. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
106. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
107. **INSTALL HOOD TO COWL TOP SEAL** (See **INSTALLATION**)
108. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
109. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)

ENGINE UNIT

COMPONENTS

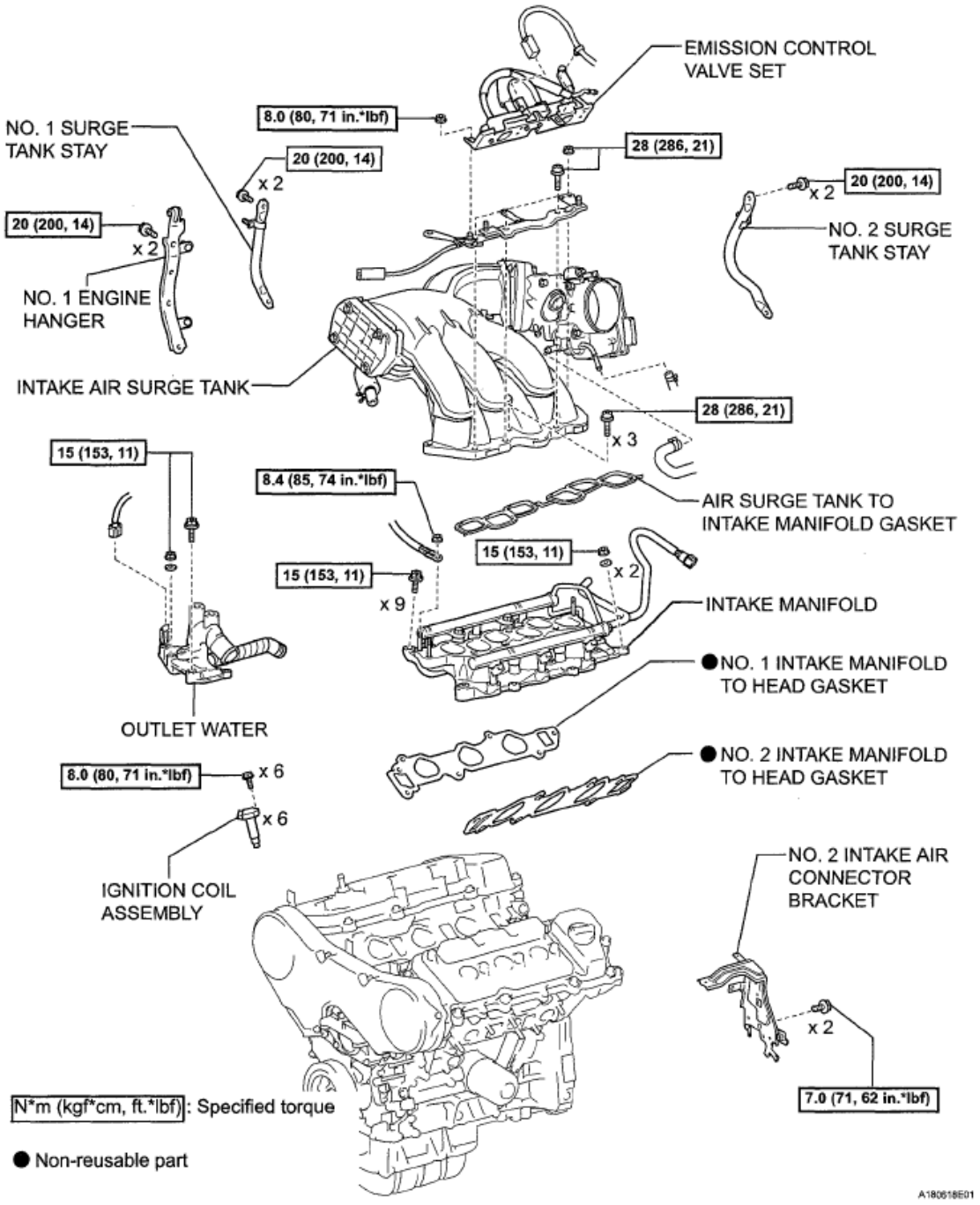


Fig. 442: Identifying Engine Unit Replacement Components With Torque Specifications (1 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

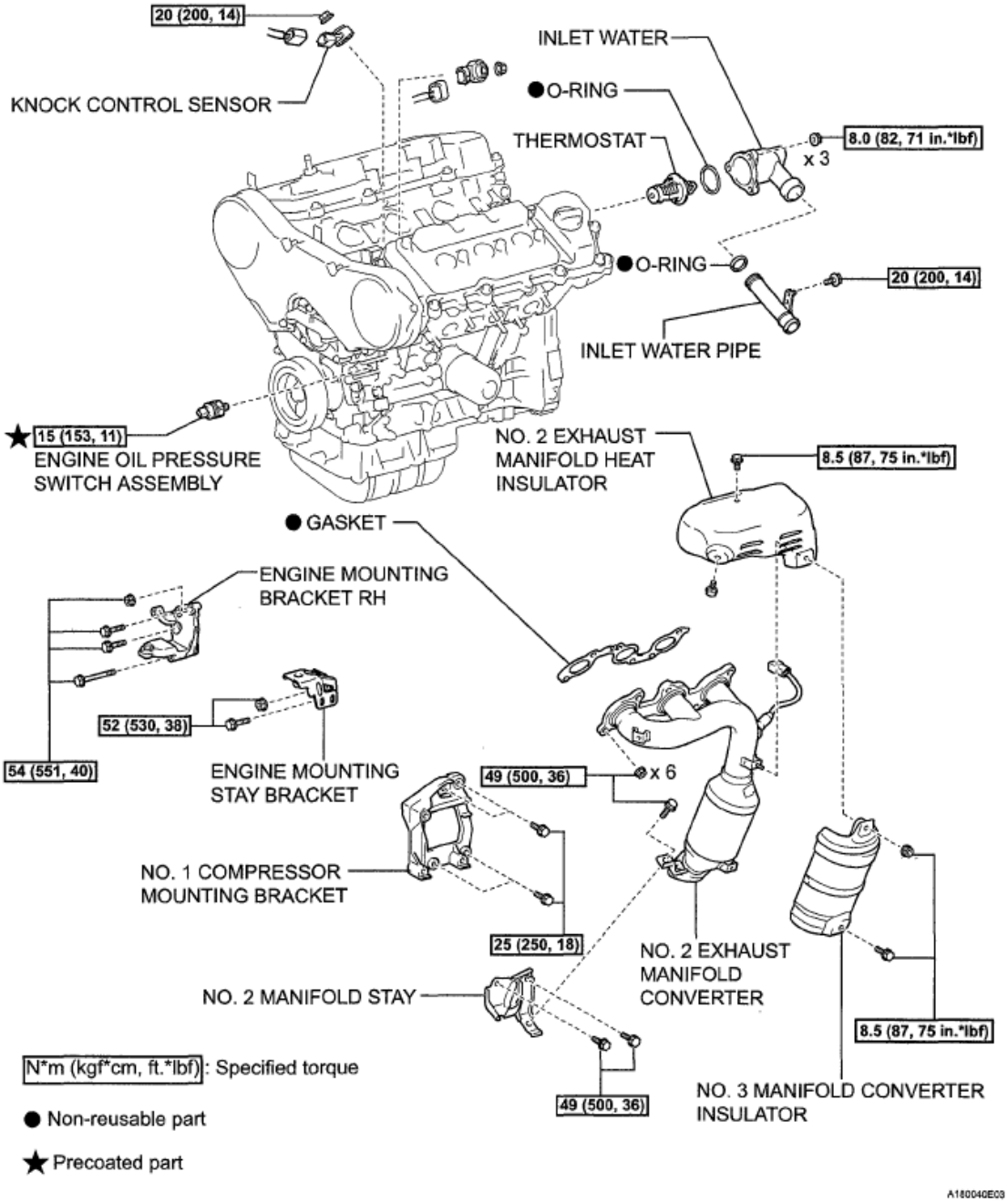


Fig. 443: Identifying Engine Unit Replacement Components With Torque Specifications (2 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

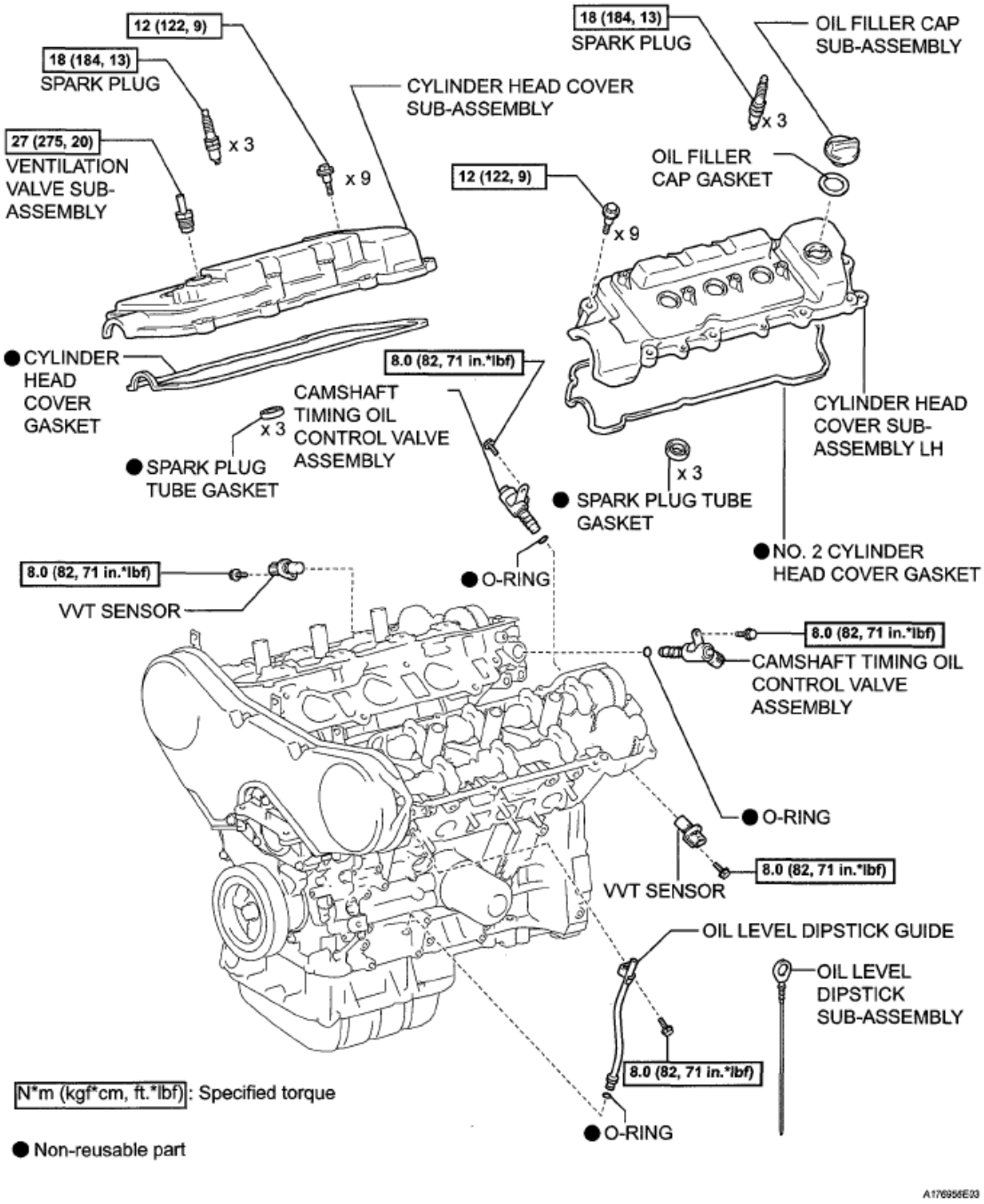


Fig. 444: Identifying Engine Unit Replacement Components With Torque Specifications (3 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

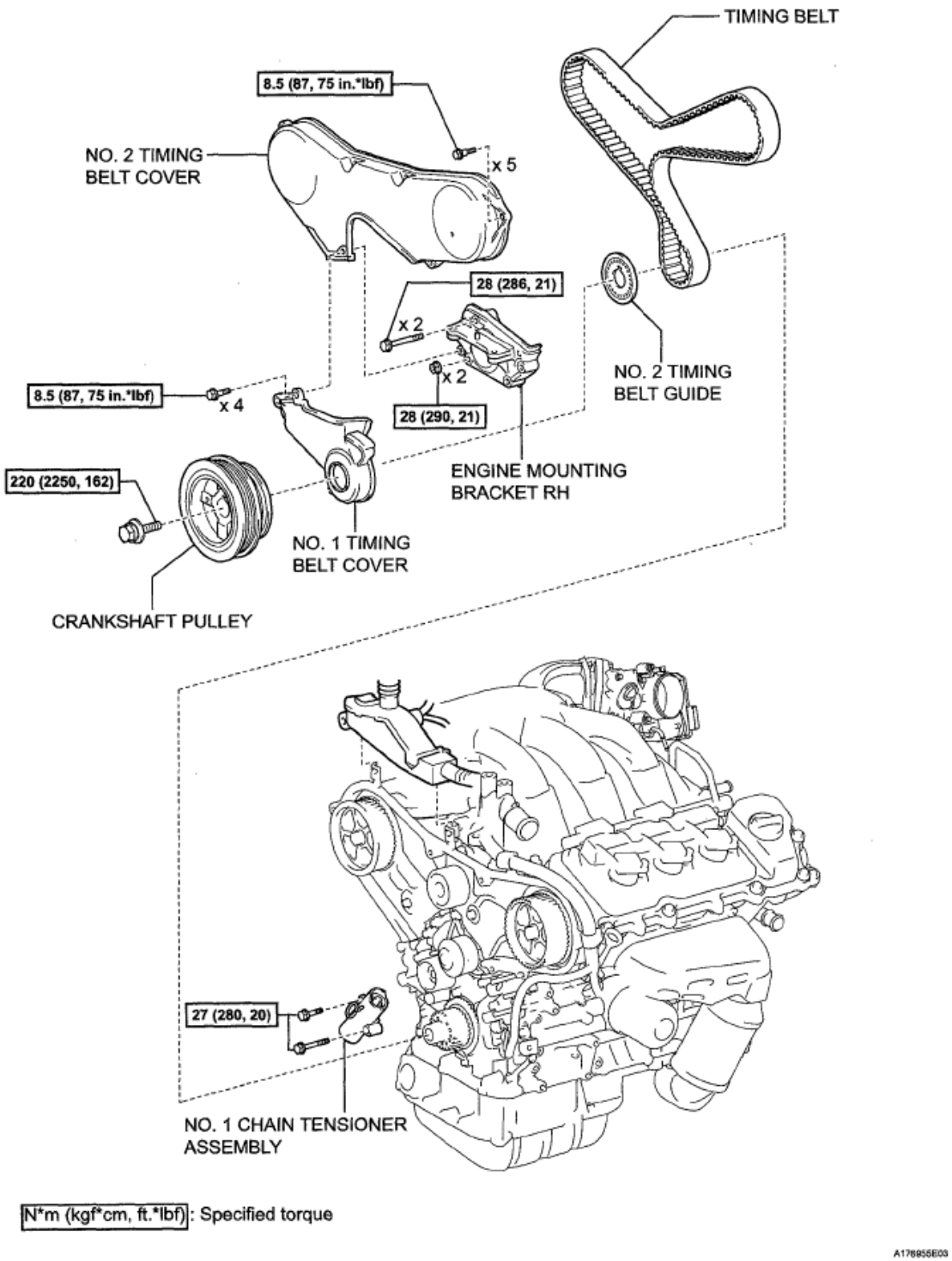


Fig. 445: Identifying Engine Unit Replacement Components With Torque Specifications (4 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

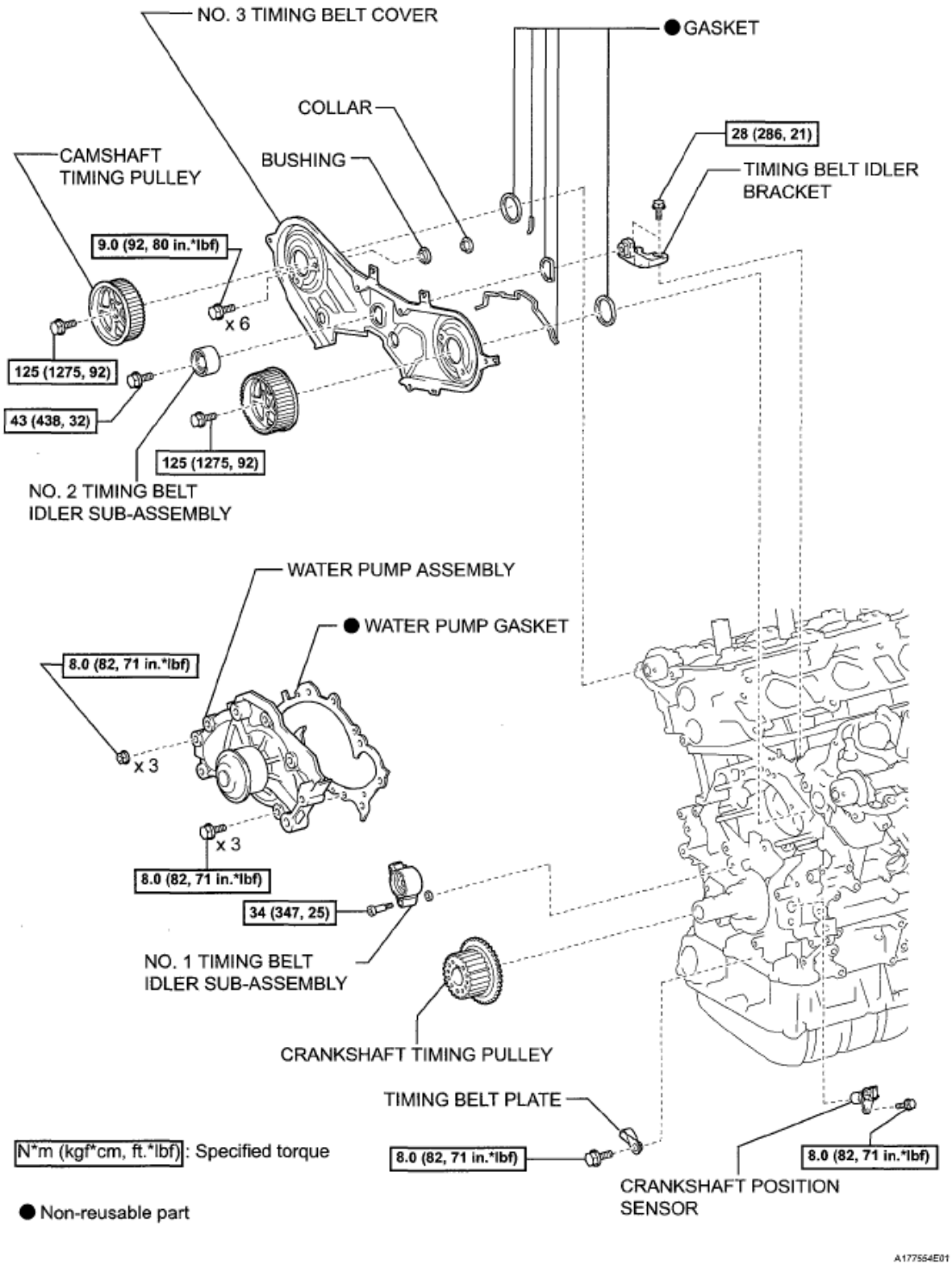


Fig. 446: Identifying Engine Unit Replacement Components With Torque Specifications (5 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

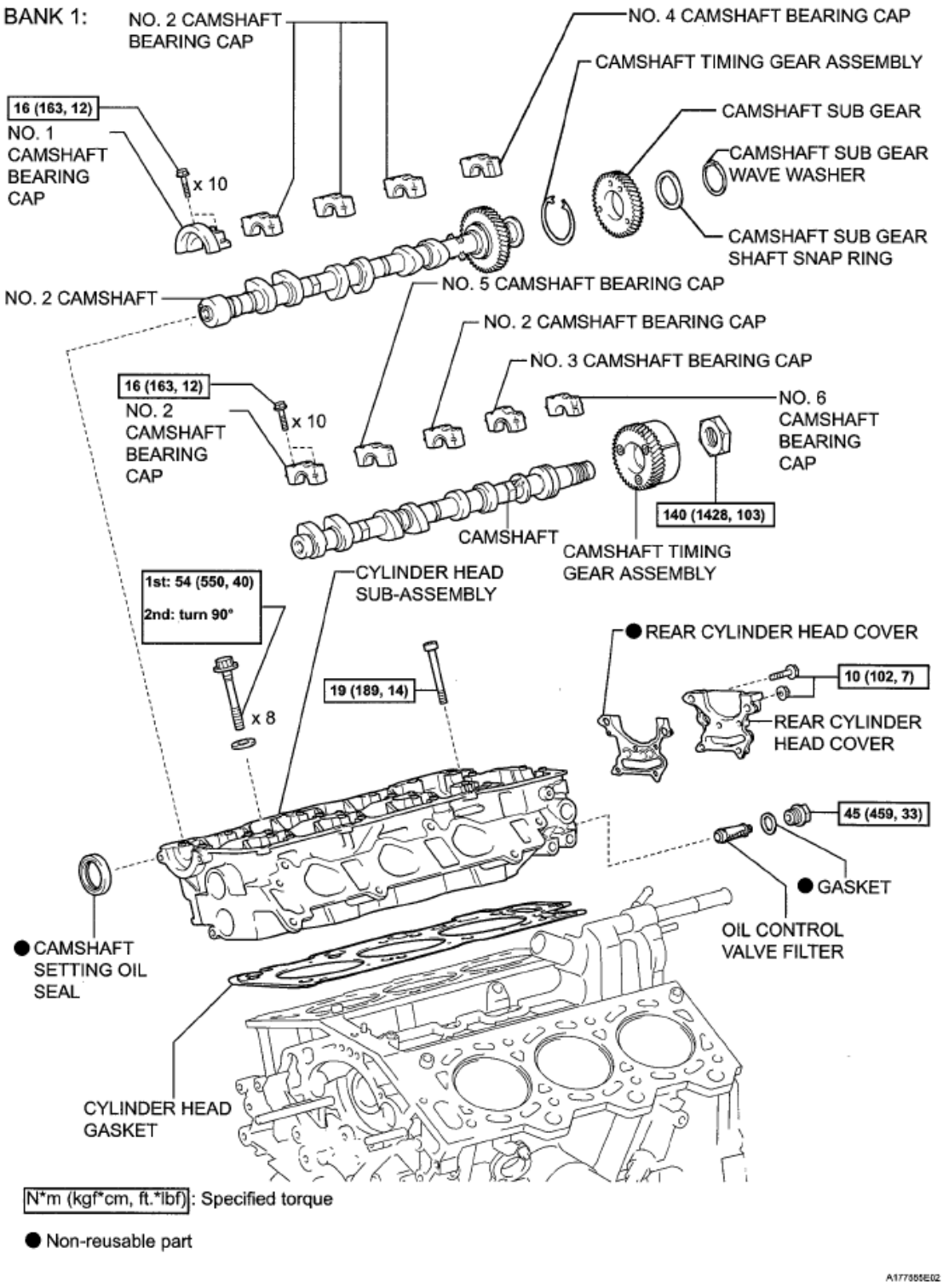


Fig. 447: Identifying Engine Unit Replacement Components With Torque Specifications (6 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

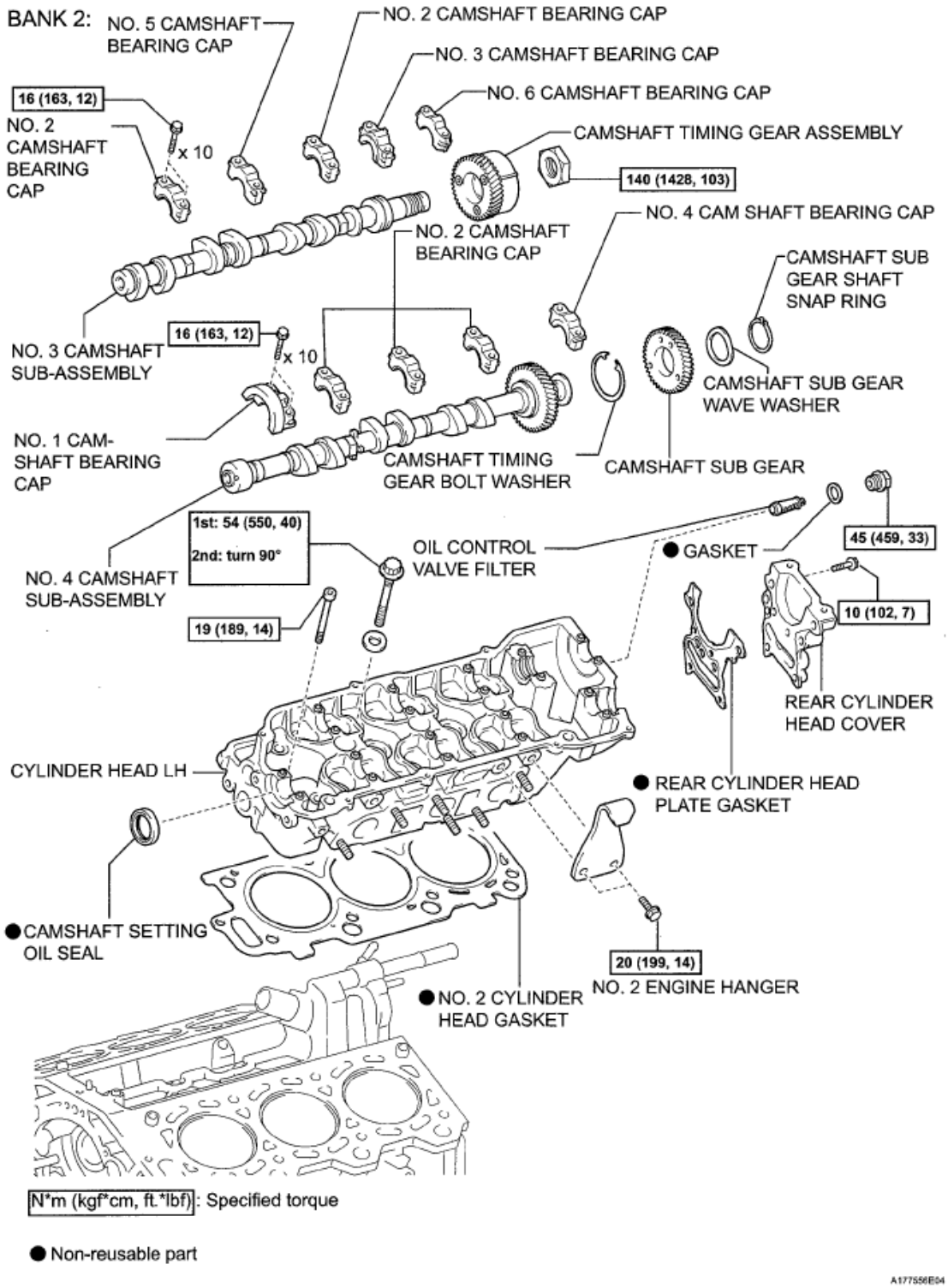


Fig. 448: Identifying Engine Unit Replacement Components With Torque Specifications (7 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

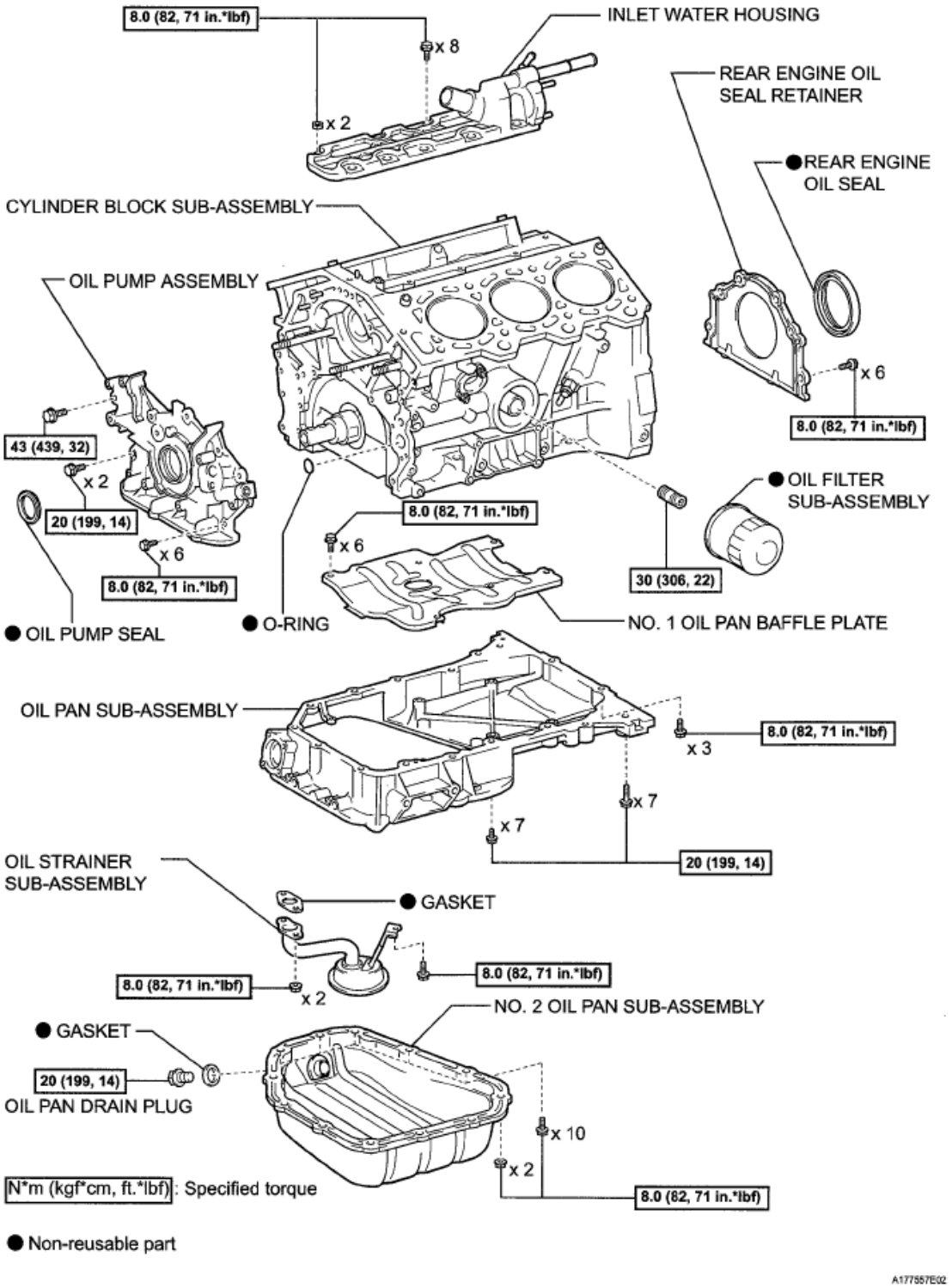


Fig. 449: Identifying Engine Unit Replacement Components With Torque Specifications (8 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **INSTALL ENGINE STAND**
2. **REMOVE NO. 2 ENGINE HANGER**
   a. Remove the 2 bolts and No. 2 engine hanger.

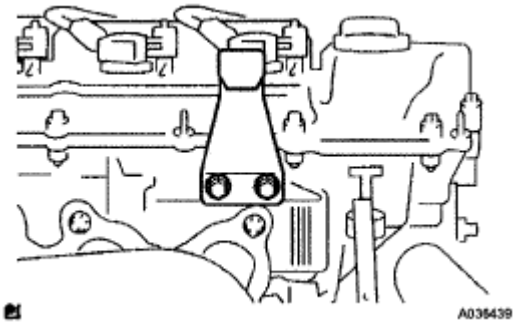


Fig. 450: Identifying Engine Hanger
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE EMISSION CONTROL VALVE SET** (See **REMOVAL**)
4. **REMOVE INTAKE AIR SURGE TANK** (See **REMOVAL**)
5. **REMOVE INTAKE MANIFOLD** (See **REMOVAL**)
6. **REMOVE OUTLET WATER** (See **REMOVAL**)
7. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
8. **REMOVE NO. 3 MANIFOLD CONVERTER INSULATOR** (See **REMOVAL**)
9. **REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR** (See **REMOVAL**)
10. **REMOVE NO. 2 EXHAUST MANIFOLD CONVERTER** (See **REMOVAL**)
11. **REMOVE NO. 2 MANIFOLD STAY**
    a. Remove the 2 bolts and No. 2 manifold stay.
12. **REMOVE ENGINE MOUNTING BRACKET RH**
    a. Remove the 3 bolts and engine mounting bracket RH.

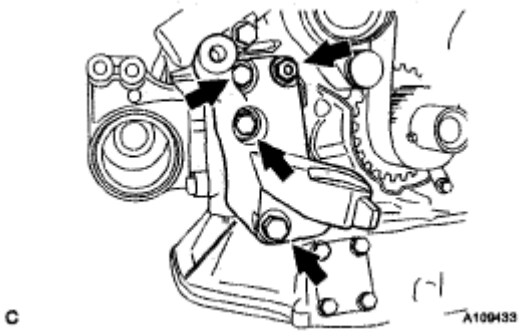


Fig. 451: Locating Engine Mounting Bracket RH, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE ENGINE MOUNTING STAY BRACKET**
    a. Remove the bolt, nut and engine mounting stay bracket.

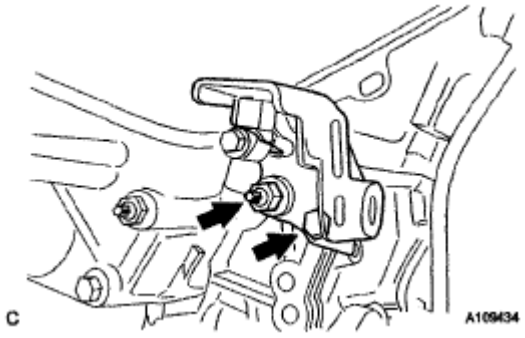


Fig. 452: Locating Engine Mounting Stay Bracket, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET**
    a. Remove the 4 bolts and No. 1 compressor mounting bracket.

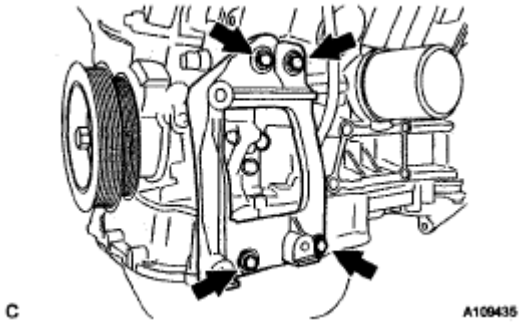


Fig. 453: Locating Compressor Mounting Bracket, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **REMOVE NO. 2 INTAKE AIR CONNECTOR BRACKET**
    a. Remove the 2 bolts and No. 2 intake air connector bracket.

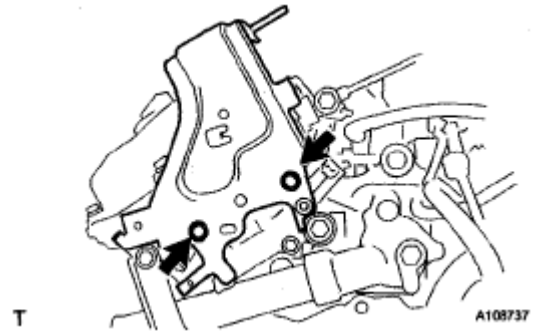


Fig. 454: Locating Intake Air Connector Bracket, Bolts And Nuts

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

16. **REMOVE INLET WATER PIPE** (See **REMOVAL**)
17. **REMOVE INLET WATER** (See **REMOVAL**)
18. **REMOVE THERMOSTAT** (See **REMOVAL**)
19. **REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY**
    a. Using a 24 mm deep socket wrench, remove the oil pressure switch.

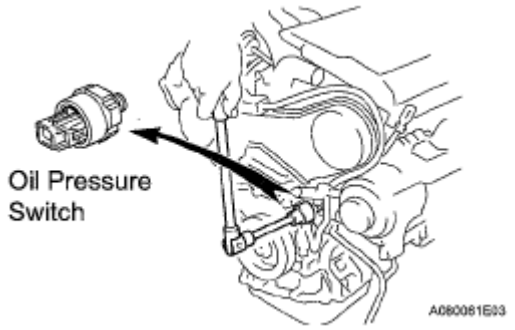


Fig. 455: Removing Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE KNOCK CONTROL SENSOR** (See **REMOVAL**)

DISASSEMBLY

1. **REMOVE SPARK PLUG**
    a. Remove the 6 spark plugs.
2. **REMOVE VENTILATION VALVE SUB-ASSEMBLY**
    a. Remove the ventilation valve sub-assembly.

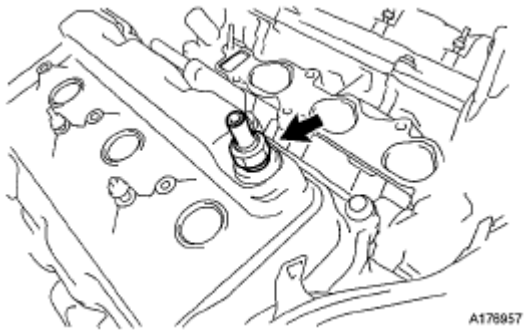


Fig. 456: Locating Ventilation Valve Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE OIL FILLER CAP SUB-ASSEMBLY**
    a. Remove the oil filler cap sub-assembly.

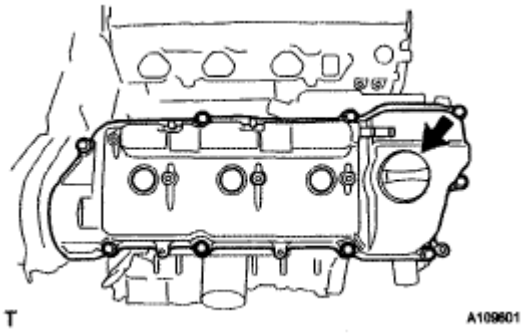


Fig. 457: Locating Oil Filler Cap Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE OIL FILLER CAP GASKET**
   a. Remove the oil filler cap gasket.
5. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
   a. Remove the 9 bolts and cylinder head cover sub-assembly.

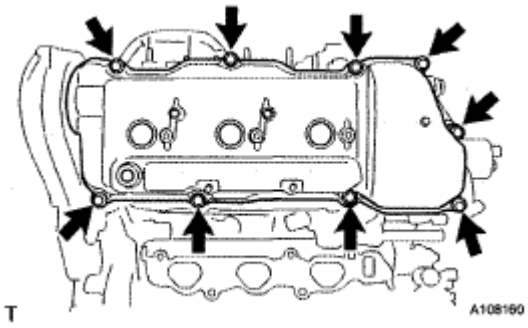


Fig. 458: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **REMOVE CYLINDER HEAD COVER GASKET**
   a. Remove the cylinder head cover gasket.
7. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH**
   a. Remove the 9 bolts and cylinder head cover sub-assembly LH.

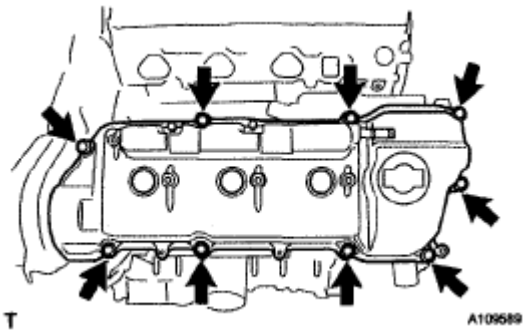


Fig. 459: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE NO. 2 CYLINDER HEAD COVER GASKET**
   a. Remove the cylinder head cover gasket No. 2.
9. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**
   a. Remove the 2 bolts and 2 camshaft timing oil control valve assemblies from the cylinder heads.
   b. Remove the O-ring from each camshaft timing oil control valve assembly.

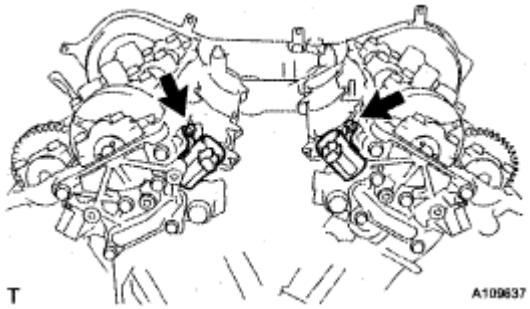


Fig. 460: Locating O-Rings And Camshaft Timing Oil Control Valves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **REMOVE VVT SENSOR**
    a. Remove the 2 bolts and 2 VVT sensors.

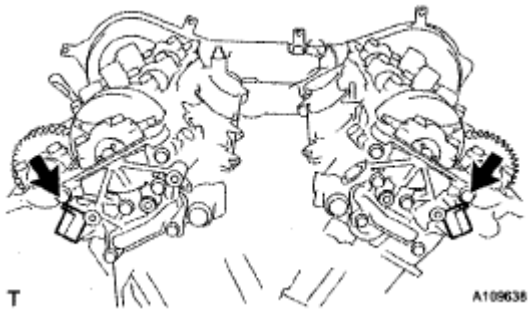


Fig. 461: Locating VVT Sensors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **REMOVE OIL LEVEL DIPSTICK SUB-ASSEMBLY**
    a. Remove the oil level dipstick sub-assembly from the oil level dipstick guide.
12. **REMOVE OIL LEVEL DIPSTICK GUIDE**
    a. Remove the bolt and oil level dipstick guide.
    b. Remove the O-ring from the oil level dipstick guide.
13. **REMOVE CRANKSHAFT PULLEY**
    a. Using SST, loosen the pulley bolt.

SST 09213-54015 (91651-60855), 09330-00021

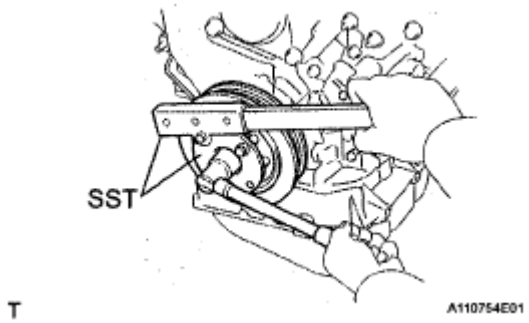


Fig. 462: Loosening Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

NOTE: Before using SST, apply lubricating oil on the threads and tip of the SST center bolt.

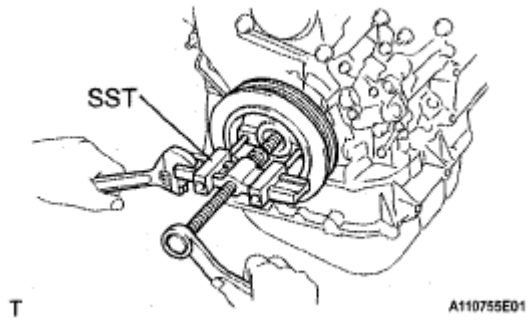


Fig. 463: Removing Crankshaft Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE NO. 1 TIMING BELT COVER**
    a. Remove the 4 bolts and No. 1 timing belt cover.

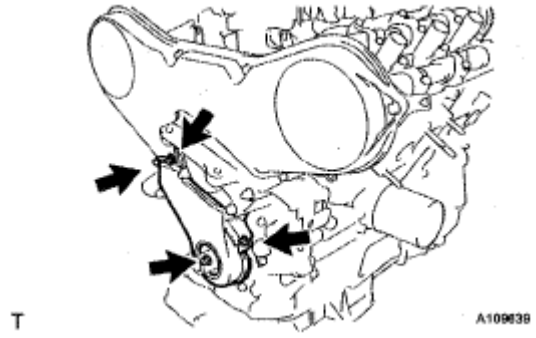


Fig. 464: Locating Crankshaft Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **REMOVE NO. 2 TIMING BELT COVER**
    a. Remove the 5 bolts and No. 2 timing belt cover.

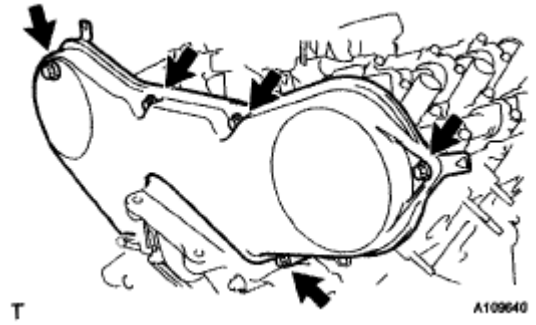


Fig. 465: Locating Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE ENGINE MOUNTING BRACKET RH**
    a. Remove the 2 bolts, 2 nuts, and engine mounting bracket RH from the water pump assembly.

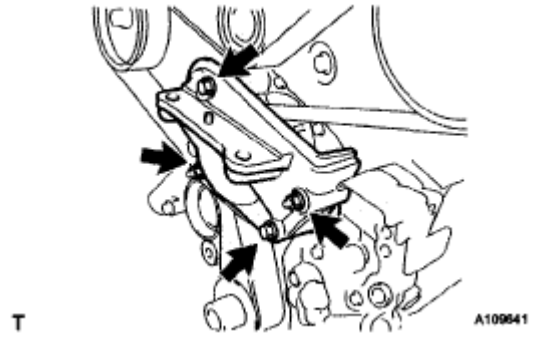


Fig. 466: Locating Engine Mounting Bracket RH, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE NO. 2 TIMING BELT GUIDE**

a. Remove the No. 2 timing belt guide from the crankshaft.

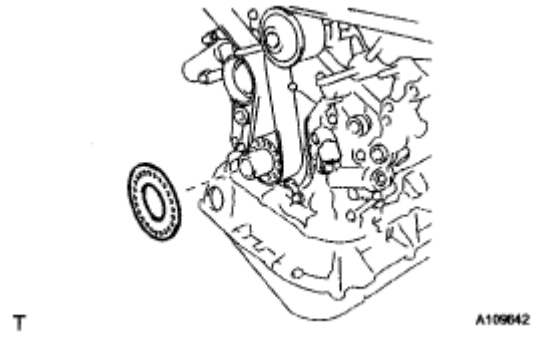


Fig. 467: Identifying Crankshaft Pulley Bolt And Washer To Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **REMOVE TIMING BELT**
    a. Set the No. 1 cylinder to TDC/compression.
        1. Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
        2. Turn the crankshaft clockwise, and align the timing marks of the crankshaft timing pulley with the oil pump body.

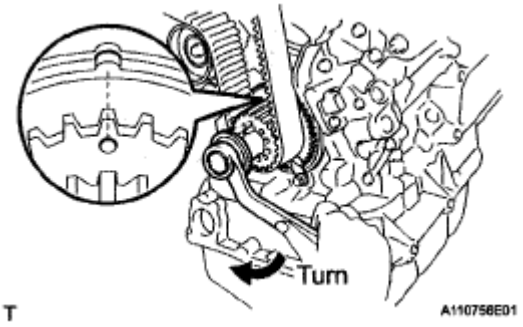


Fig. 468: Identifying Timing Marks Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

        3. Check that timing marks of the camshaft timing pulleys and No. 3 timing belt cover are aligned.

           HINT:

           If not, turn the crankshaft 1 revolution (360°).

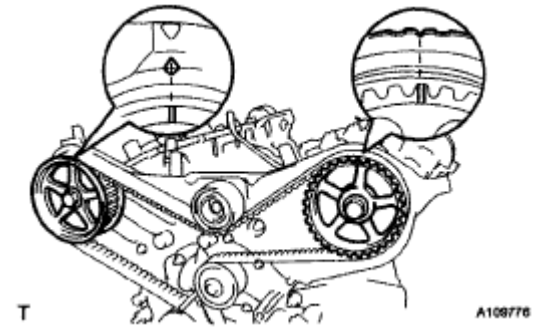


Fig. 469: Identifying Timing Marks Of Camshaft Timing Pulleys
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Remove the crankshaft pulley bolt.

b. If reusing the timing belt, check that there are 4 installation marks on the timing belt as shown in the illustration.
   1. If the installation marks have disappeared, put new installation marks on the timing belt before removing.

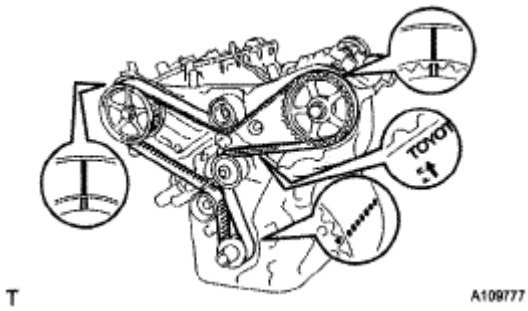


Fig. 470: Identifying Mark On Timing Belt With Timing Mark Of Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Set the No. 1 cylinder to approximately 60° BTDC/compression.
   1. Turn the crankshaft counterclockwise by approximately 60°.

NOTE:

- **Be sure to set the timing pulley at the correct angle in order to prevent it from being damaged when the timing belt is removed.**
- **If the timing belt is removed when the crankshaft timing pulley is not installed at the correct angle, the piston head or valve head may come into contact with the pulley and damage it. Make sure that the timing pulley is installed at the correct angle.**

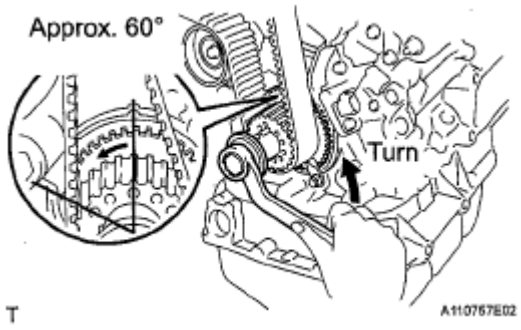


Fig. 471: Identifying Timing Mark With Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the timing belt tensioner.

NOTE: Do not reinstall the tensioner with its plunger extended.

e. Remove the timing belt in the following order.

TIMING BELT REFERENCE

1st	No. 1 idler pulley
2nd	RH camshaft timing pulley
3rd	No. 2 idler pulley
4th	LH camshaft timing pulley
5th	Water pump pulley
6th	Crankshaft timing pulley

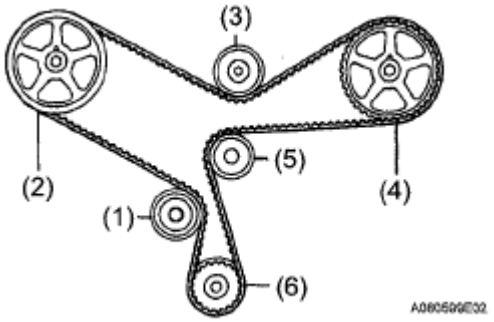


Fig. 472: Identifying Timing Belt Installing Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not turn the crankshaft or camshaft timing pulley with the timing belt removed. If turned, the piston head or valve head may come into contact with the crankshaft or timing pulley and damage them.

19. **REMOVE NO. 1 TIMING BELT IDLER SUB-ASSEMBLY**

a. Using a 10 mm socket hexagon wrench, remove the pivot bolt, timing belt idler No. 1 and distributor drive gear plate washer.

20. **REMOVE NO. 2 TIMING BELT IDLER SUB-ASSEMBLY**
    a. Remove the bolt and No. 2 timing belt idler sub-assembly.
21. **REMOVE CRANKSHAFT POSITION SENSOR**
    a. Remove the bolt and crankshaft position sensor.
22. **REMOVE CAMSHAFT TIMING PULLEY**
    a. Using SST, remove the bolt and the RH timing pulley.

SST 09960-10010 (09962-01000, 09963-01000)

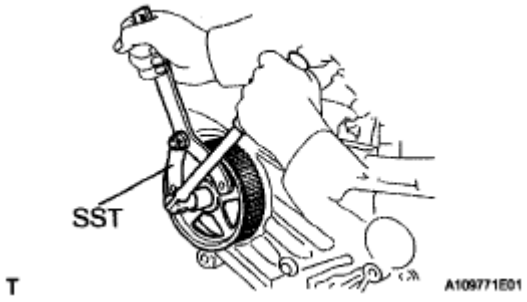


Fig. 473: Removing RH Camshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, remove the bolt and the LH timing pulley.

SST 09960-10010 (09962-01000, 09963-01000)

HINT:

Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when reassembling.

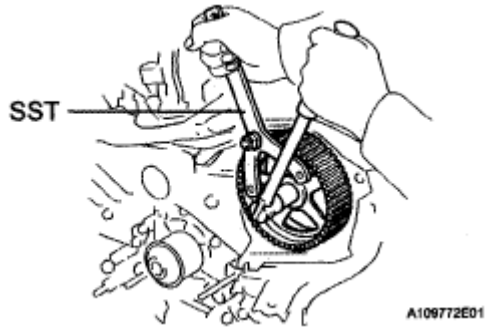


Fig. 474: Removing LH Camshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE NO. 3 TIMING BELT COVER**
    a. Remove the 6 bolts and No. 3 timing belt cover.
    b. Remove the 6 collars and 6 bushings from the No. 3 timing belt cover.

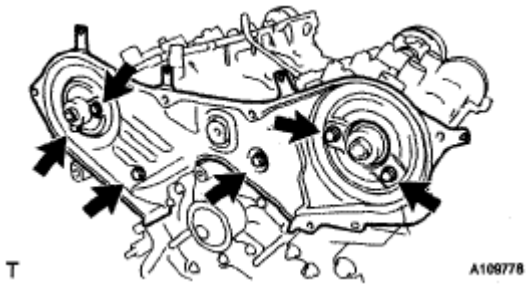


Fig. 475: Locating Timing Belt Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **REMOVE TIMING BELT IDLER BRACKET**
    a. Remove the 2 bolts and timing belt idler bracket.
25. **REMOVE CRANKSHAFT TIMING PULLEY**
    a. Remove the bolt and the timing belt plate.
    b. Install the pulley bolt to the crankshaft.
    c. Using SST, remove the crankshaft timing pulley.

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05011)

NOTE:

- **Do not scratch the sensor part of the crankshaft timing pulley.**
- **Before using SST, apply lubricating oil to the threads and tip of the SST center bolt.**

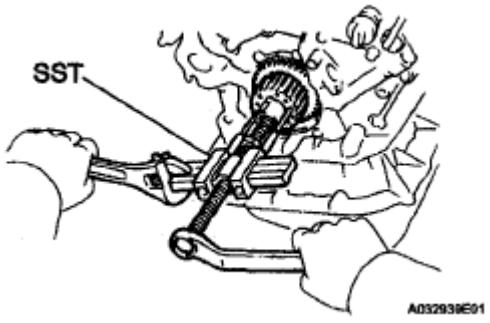


Fig. 476: Removing Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **REMOVE WATER PUMP ASSEMBLY**
    a. Remove the 3 bolts and 3 nuts, then remove the water pump and the gasket.

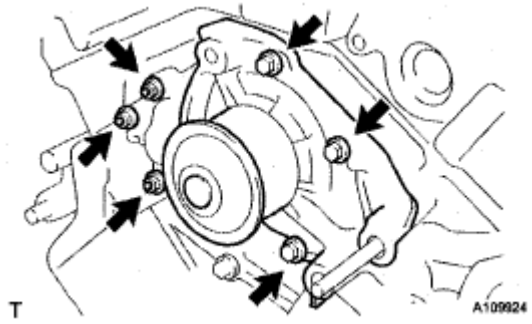


Fig. 477: Locating Water Pump, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **REMOVE CAMSHAFT**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Align the timing marks (2-dot mark) of the camshaft drive and the driven gears by turning the camshaft with a wrench.

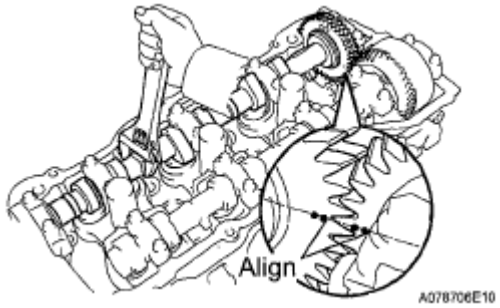


Fig. 478: Identifying Timing Marks Of Camshaft Drive
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

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

Recommended service bolt:

SERVICE BOLT THREAD DIAMETER SPECIFICATION

Thread diameter	6.0 mm (0.236 in.)
Thread pitch	1.0 mm (0.039 in.)
Bolt length	16 to 20 mm (0.63 to 0.79 in.)

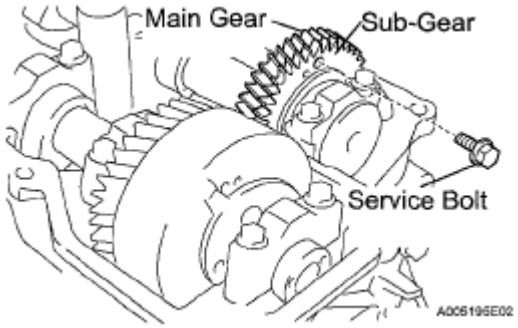


Fig. 479: Identifying Sub-Gear, Main Gear With Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

c. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

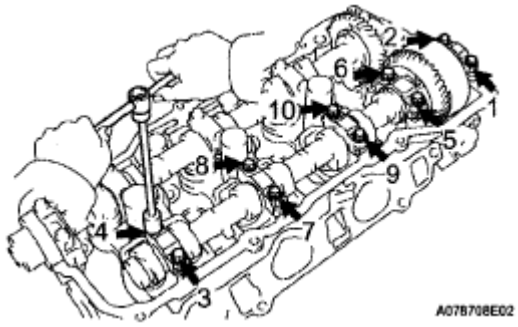


Fig. 480: Removing Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. **REMOVE NO. 2 CAMSHAFT**

a. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

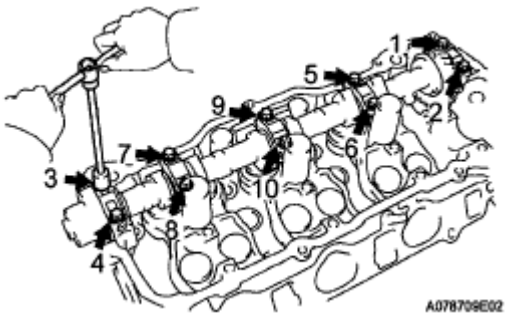


Fig. 481: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the oil seal from the No. 2 camshaft.

29. **REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Align the timing marks (1-dot mark) of the camshaft drive and the driven gears by turning the camshaft with a wrench.

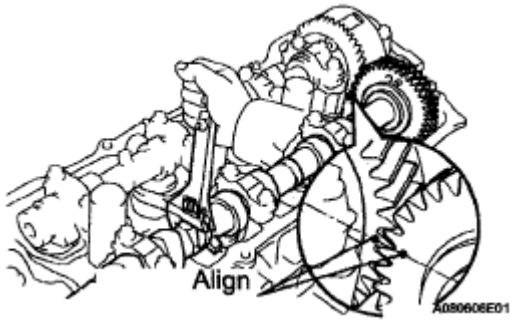


Fig. 482: Identifying Timing Marks (1-Dot Mark) Of Camshaft Drive And Driven Gears
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

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

Recommended service bolt:

SERVICE BOLT THREAD DIAMETER SPECIFICATION

Thread diameter	6.0 mm (0.236 in.)
Thread pitch	1.0 mm (0.039 in.)

Bolt length	16 to 20 mm (0.63 to 0.79 in.)

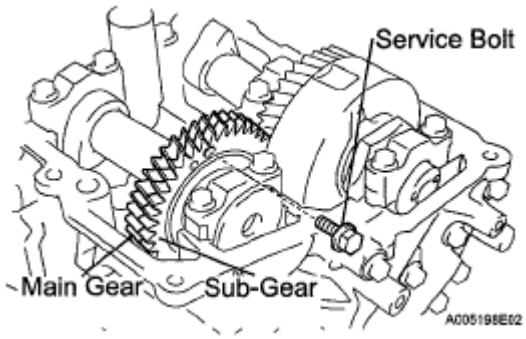


Fig. 483: Identifying Sub-Gear, Main Gear With Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

c. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

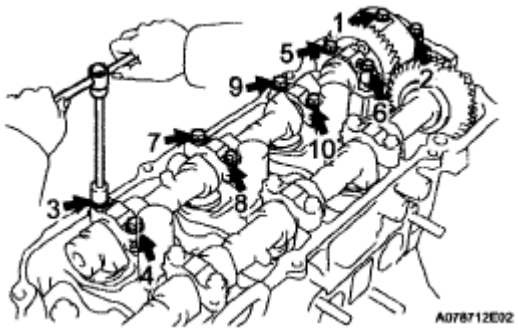


Fig. 484: Removing Bearing Cap Bolts With Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. **REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY**

a. Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTE:

- **Do not pry out the camshaft.**
- **Do not damage the portion of the cylinder head which receives the shaft thrust.**

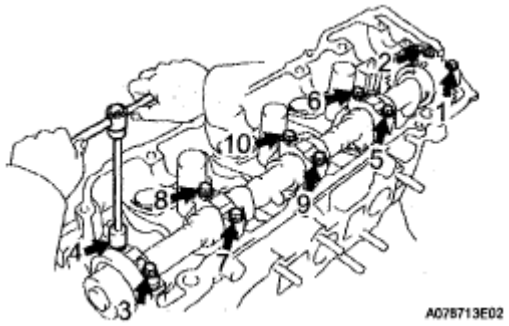


Fig. 485: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the oil seal from the No. 4 camshaft.

31. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
    a. Clamp the camshaft in a vise on the hexagonal lobe.
    b. Check that the VVT-i does not turn.

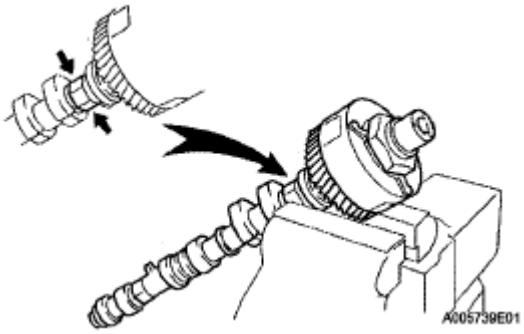


Fig. 486: View Of Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Cover all the oil ports with vinyl tape except the port on the advance angle side (nearest to the convex portion) shown in the illustration.

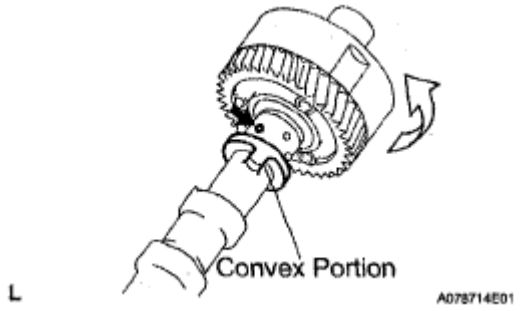


Fig. 487: Identifying All Oil Ports With Vinyl Tape Except Port On Advance Angle Side
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply about 100 kPa (1 kgf/cm^2 , 14 psi) of air pressure to the port on the advance angle side.

NOTE: Cover the ports with a shop rag or piece of cloth when applying pressure to keep oil from splashing.

HINT:

This operation releases the lock pin for the most retard angle lock.

e. Turn the VVT-i to the advance angle side (the white arrow marked direction in the illustration) by hand.

Standard: The VVT-i turns.

HINT:

Depending on the air pressure, the VVT-i will turn to the advance angle side without applying force by hand. Also, if the pressure can be hardly applied because of the air leakage from the port, it might be difficult to get the lock-pin to release.

f. Check that the VVT-i moves freely within about 30° range. Do not move the VVT-i unit to the most retard angle position as the lock-pin will be engaged again.

Standard: Smooth movable range is about 30°

g. Turn the VVT-i by hand and lock it at the most retard angle position.

32. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**

NOTE: Do not remove or install the camshaft timing gear (VVT-i) unless the VVT-i or the camshaft needs to be replaced.

a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

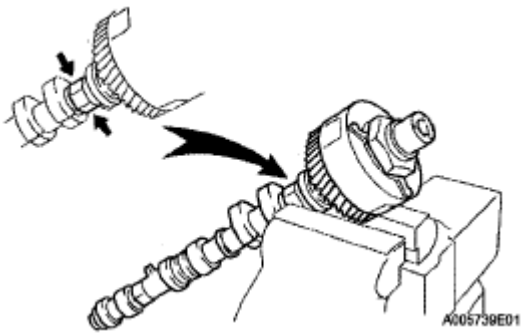


Fig. 488: View Of Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTE:

- **Remove it with the lock-pin engaged and locked at the most retard angle position.**
- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

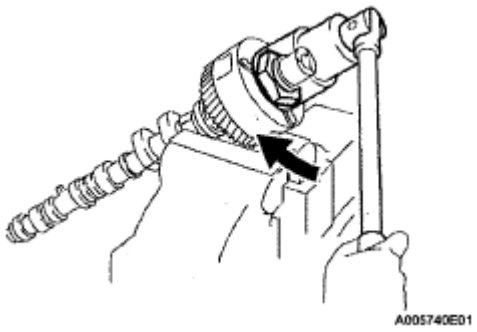


Fig. 489: Identifying Lock Nut With Turning
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the camshaft VVT-i.

NOTE: Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT-i, tap it lightly using a plastic-faced hammer and then remove it.

33. **REMOVE CAMSHAFT SUB GEAR**
    a. Clamp the camshaft in a vise on the hexagonal lobe.

NOTE: Do not damage the camshaft.

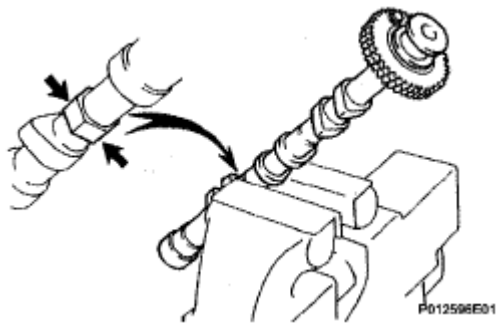


Fig. 490: Identifying Camshaft Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, turn the sub-gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

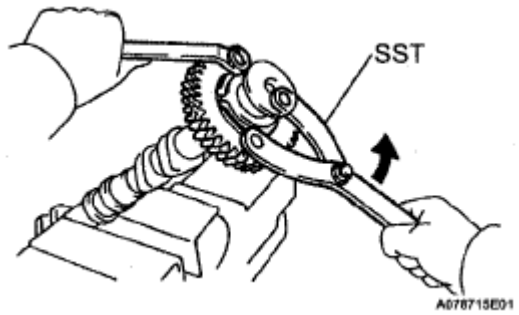


Fig. 491: Removing Service Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using snap ring pliers, remove the snap ring.

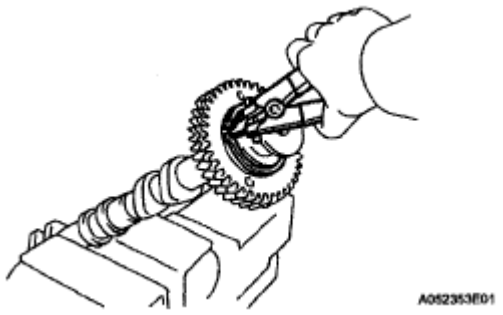


Fig. 492: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the wave washer, camshaft sub-gear and camshaft gear bolt washer.

HINT:

Arrange the camshaft sub-gears and gear bolt washers (RH and LH sides) so that they can be returned to the original locations when reassembling.

34. **REMOVE NO. 2 ENGINE HANGER**
    a. Remove the 2 bolts and No. 2 engine hanger from the cylinder head.
35. **REMOVE REAR CYLINDER HEAD COVER**
    a. Remove the 12 bolts, nut and rear cylinder head cover from the cylinder head.

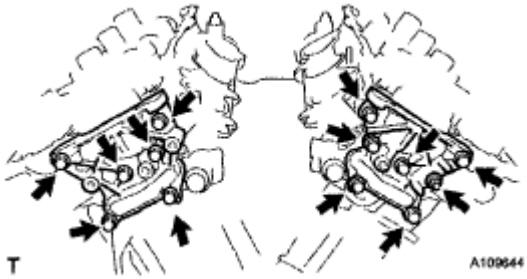


Fig. 493: Locating Cylinder Head Cover Rear Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **REMOVE OIL CONTROL VALVE FILTER**
    a. Remove the plug, gasket and valve filter.

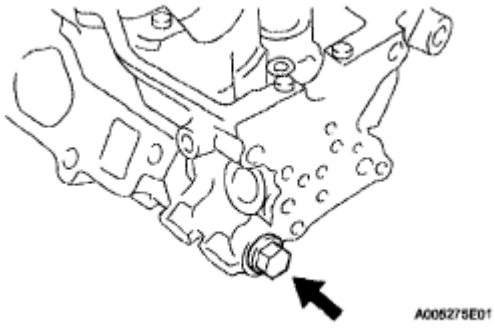


Fig. 494: Locating Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **REMOVE CYLINDER HEAD SUB-ASSEMBLY**
    a. Using an 8 mm socket hexagon wrench, remove the hexagon bolt.

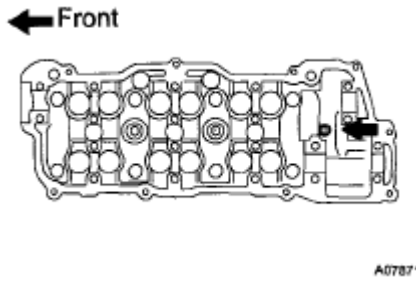


Fig. 495: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTE:

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

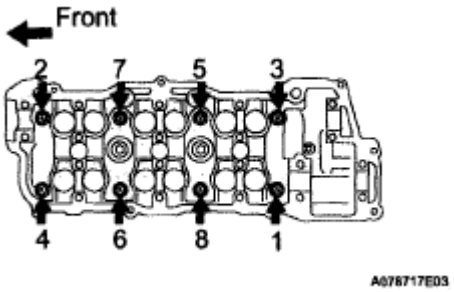


Fig. 496: Locating Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **REMOVE CYLINDER HEAD GASKET**
    a. Remove the cylinder head gasket from the cylinder block.
39. **REMOVE CYLINDER HEAD LH**
    a. Using an 8 mm socket hexagon wrench, remove the hexagon bolt.

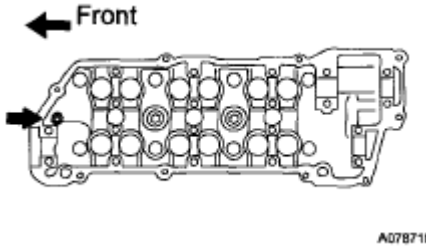


Fig. 497: Locating Hexagon Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using several steps, loosen the 8 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTE:

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

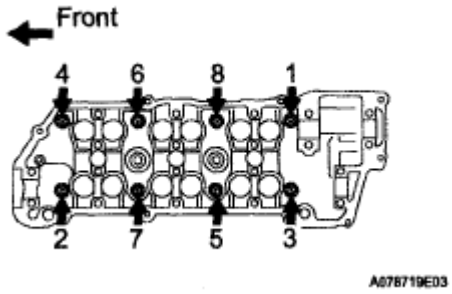


Fig. 498: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **REMOVE NO. 2 CYLINDER HEAD GASKET**
    a. Remove the No. 2 cylinder head gasket from the cylinder block.
41. **REMOVE INLET WATER HOUSING**
    a. Remove the 8 bolts and 2 nuts, then remove the inlet water housing.

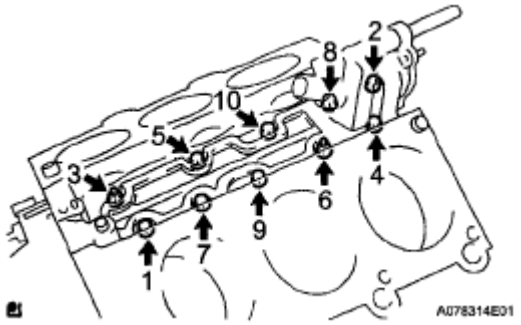


Fig. 499: Locating Water Housing Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. **REMOVE OIL FILTER SUB-ASSEMBLY**
    a. Using SST, remove the oil filter.

    SST 09228-07501

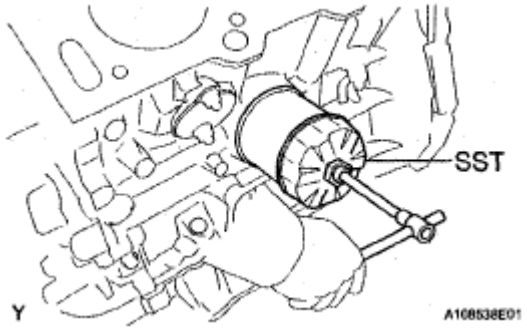


Fig. 500: Removing Oil Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 12 mm socket hexagon wrench, remove the oil filter union.

43. **REMOVE OIL PAN DRAIN PLUG**
    a. Remove the oil pan drain plug and gasket.
44. **REMOVE NO. 2 OIL PAN SUB-ASSEMBLY**
    a. Remove the 10 bolts and 2 nuts.

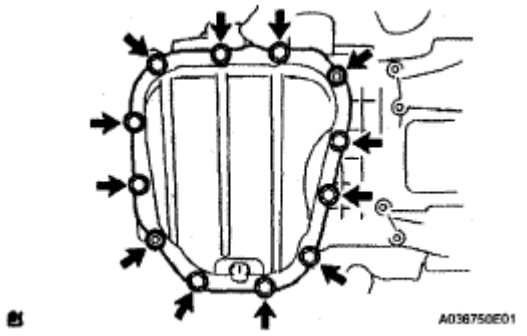


Fig. 501: Locating Oil Pan With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- **Be careful not to damage the contact surfaces of the oil pans.**

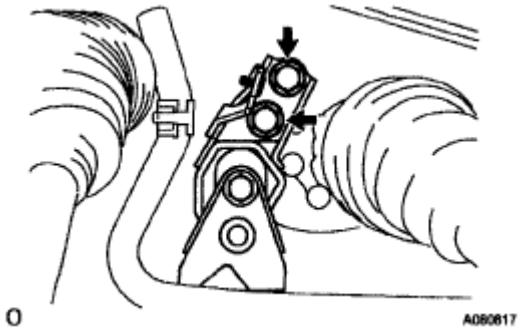


Fig. 502: Installing Engine Mounting Insulator RR With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **REMOVE OIL STRAINER SUB-ASSEMBLY**
    a. Remove the bolt and 2 nuts, then remove the oil strainer and the gasket.

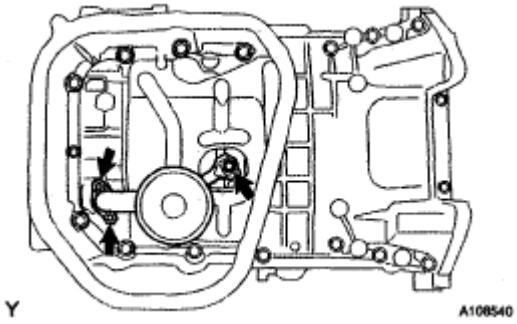


Fig. 503: Locating Oil Strainer With Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. **REMOVE OIL PAN SUB-ASSEMBLY**
    a. Loosen and remove the 17 bolts uniformly.

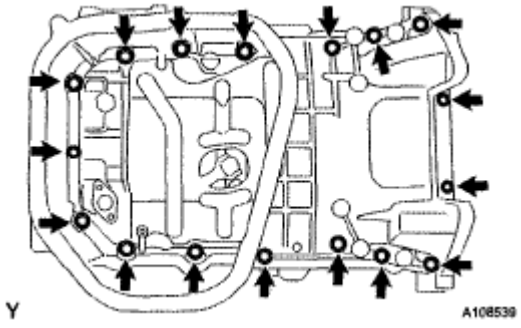


Fig. 504: Locating Oil Pan Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using a screwdriver, remove the oil pan by prying between the cylinder block and the oil pan.

NOTE: Do not damage the contact surfaces of the oil pan and cylinder block.

47. **REMOVE NO. 1 OIL PAN BAFFLE PLATE**
    a. Remove the 6 bolts and the No. 1 oil pan baffle plate from the oil pan.

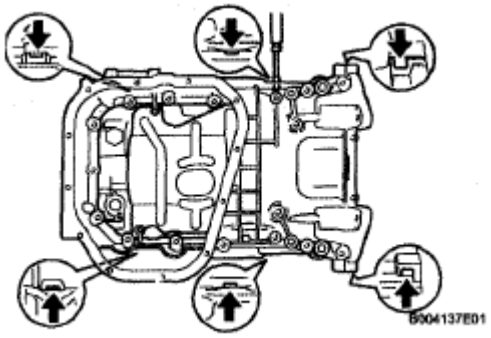


Fig. 505: Locating Bolts And Oil Pan Baffle Plate From Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **REMOVE REAR ENGINE OIL SEAL RETAINER**
    a. Remove the 6 bolts.
    b. Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and the main bearing cap.

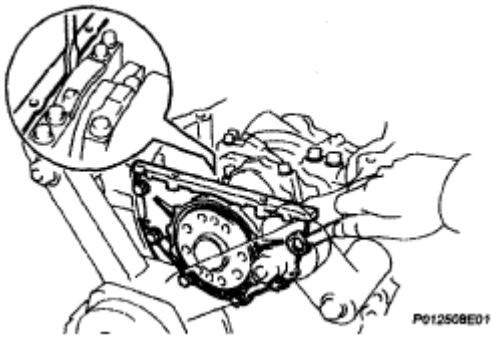


Fig. 506: View Of Prying Oil Seal Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. **REMOVE REAR ENGINE OIL SEAL**
    a. Using a screwdriver and a hammer, tap out the oil seal.

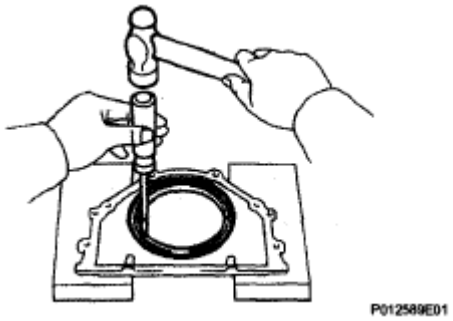


Fig. 507: View Of Tapping Engine Rear Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. **REMOVE OIL PUMP ASSEMBLY**
    a. Remove the 9 bolts.

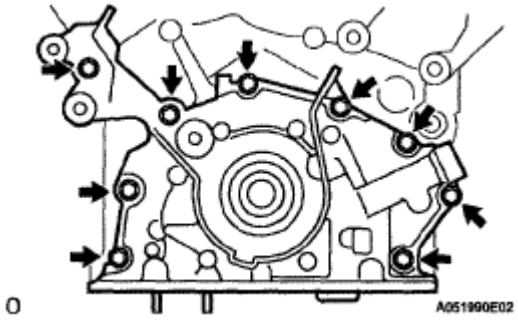


Fig. 508: Locating Oil Pump Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using a screwdriver, remove the oil pump by prying between the oil pump and the main bearing cap.
    c. Remove the O-ring.
51. **REMOVE OIL PUMP SEAL**
    a. Using a screwdriver, pry out the oil seal.

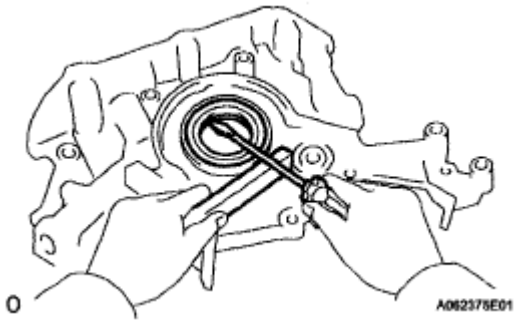


Fig. 509: View Of Prying Out Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. **REMOVE SPARK PLUG TUBE GASKET**
    a. Bend up the tab on the ventilation baffle plate which prevents the gasket from slipping out.

NOTE: Do not damage the baffle plate of the cylinder head cover.

    b. Using a screwdriver and a hammer, tap out the gasket.

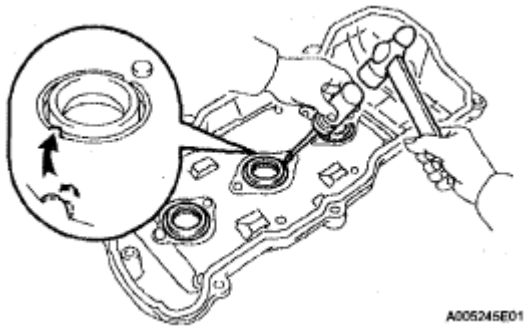


Fig. 510: View Of Tapping Spark Plug Tube Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Using needle-nose pliers, pry out the gasket.

NOTE: Do not damage the cylinder head cover.

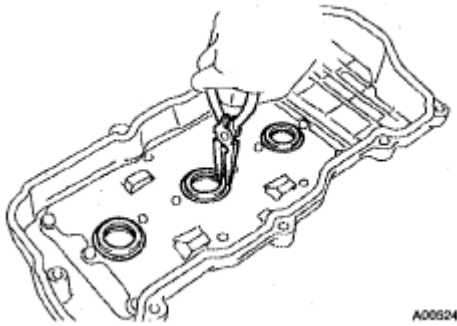


Fig. 511: View Of Prying Out Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT CAMSHAFT**
    a. Inspect camshaft for runout.
        1. Place the camshaft on V-blocks.
        2. Using a dial indicator, measure the runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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

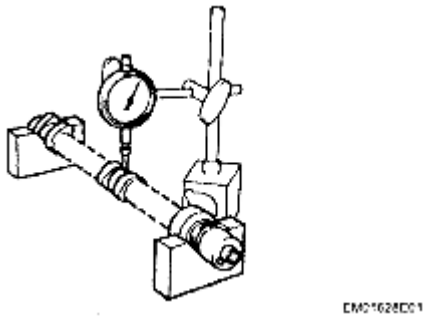


Fig. 512: Identifying Camshaft For Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Inspect cam lobes.
   1. Using a micrometer, measure the cam lobe height.

      Standard cam lobe height

STANDARD CAM LOBE HEIGHT SPECIFICATION

Intake	Exhaust
43.132 to 43.232 mm (1.6981 to 1.7020 in.)	43.010 to 43.110 mm (1.6933 to 1.6972 in.)

Minimum cam lobe height

MINIMUM CAM LOBE HEIGHT SPECIFICATION

Intake	Exhaust
42.98 mm (1.6921 in.)	42.86 mm (1.6874 in.)

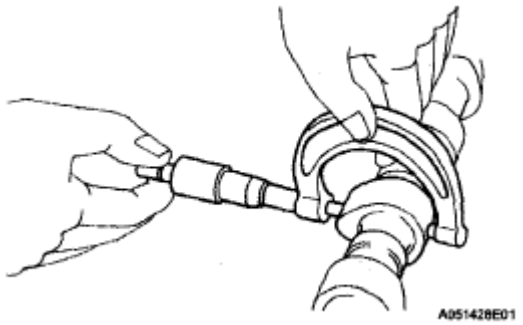


Fig. 513: View Of Measuring Cam Lobe Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

c. Inspect camshaft journals.

1. Using a micrometer, measure the journal diameter.

   Journal diameter: 26.959 to 26.975 mm (1.0614 to 1.0620 in.)

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

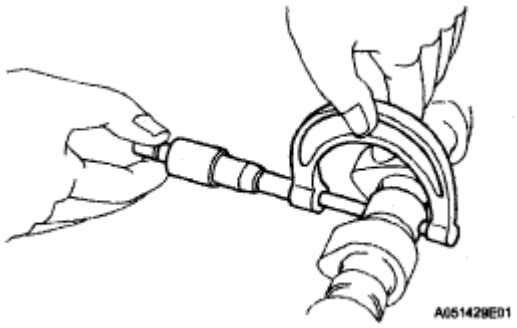


Fig. 514: View Of Measuring Journal Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT CAMSHAFT TIMING GEAR ASSEMBLY**
   a. Clamp the camshaft in a vise on the hexagonal lobe.

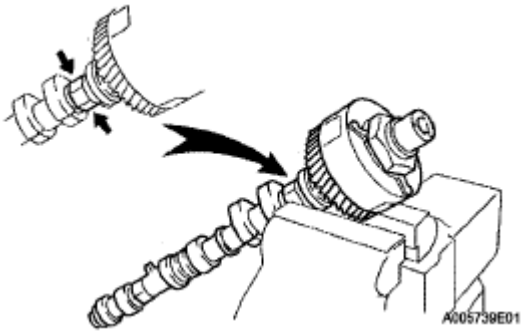


Fig. 515: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Check that the VVT-i does not turn.
   c. Cover all the oil ports with vinyl tape except the port on the advance angle side (nearest to the convex portion) shown in the illustration.

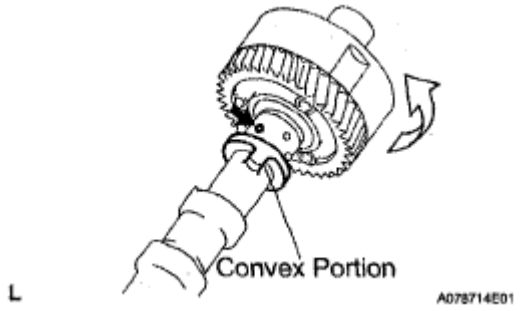


Fig. 516: Identifying All Oil Ports With Vinyl Tape Except Port On Advance Angle Side
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply about 100 kPa (1 kgf/cm^2 , 14 psi) of air pressure to the port on the advance angle side.
e. Turn the VVT-i to the advance angle side (the white arrow marked direction in the illustration) by hand.
f. Check that the VVT-i moves freely within about 30° range. Do not move the VVT-i unit to the most retard angle position as the lock-pin will be engaged again.
g. Turn the VVT-i by hand and lock it at the most retard angle position.

3. **INSPECT CYLINDER HEAD SET BOLT**
   a. Using vernier calipers, measure the tension portion diameter of the bolt.

   Standard outside diameter: 8.95 to 9.05 mm (0.3524 to 0.3563 in.)

   Minimum outside diameter: 8.75 mm (0.3445 in.)

   If the diameter is less than the minimum, replace the bolt.

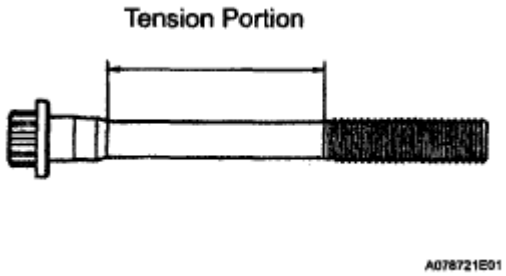


Fig. 517: Identifying Tension Portion Diameter Of Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT TIMING BELT**

NOTE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the**

mounting bolt of the camshaft timing pulley.

Check the belt for any defects, as shown in the illustration. Also, check the points below.

a. If there is premature parting:
   - Check for proper installation.
   - Check the timing cover gasket for damage and proper installation.

b. If the belt teeth are cracked or damaged, check if either camshaft is locked.

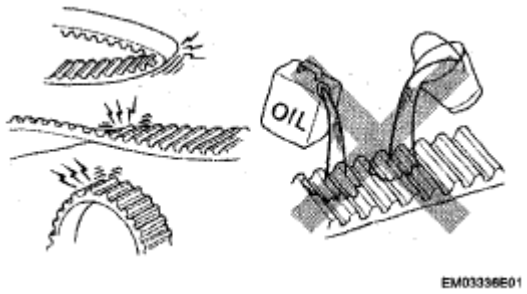


Fig. 518: Identifying Timing Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. If there is noticeable wear or cracks on the belt face, check if there are nicks on the side of the idler pulley lock and water pump.

d. If there is wear or damage to only one side of the belt, check the belt guide and the alignment of each pulley.

e. If there is noticeable wear on the belt teeth:
   - Check the timing cover for damage.
   - Check that the gasket has been installed correctly.
   - Check for foreign objects on the pulley teeth. If there is any trouble in the belt condition, replace the timing belt.

5. **INSPECT CAMSHAFT GEAR BACKLASH**

a. Install the camshaft timing gear assembly.

b. Install the camshafts to the cylinder head.

NOTE:
- **Install without valves and sub-gear.**
- **Install with its timing mark matched.**

c. Set the dial indicator to the teeth of the intake camshaft at a right angle (90°).

d. Measure the backlash of the camshaft timing gear at least 4 positions.

Standard backlash: 0.020 to 0.200 mm (0.0008 to 0.0079 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

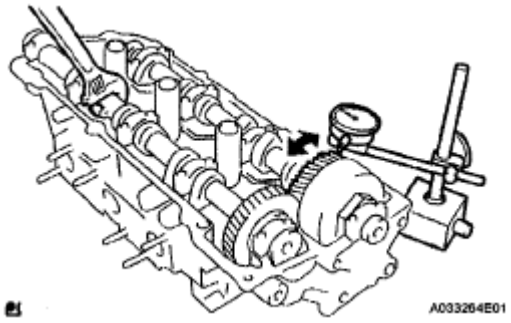


Fig. 519: Identifying Dial Indicator To Teeth Of Intake Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSPECT CAMSHAFT THRUST CLEARANCE**
   a. Install the camshafts.
   b. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

      Standard thrust clearance: 0.040 to 0.090 mm (0.0016 to 0.0035 in.)

      Maximum thrust clearance: 0.12 mm (0.0047 in.)

      If the thrust clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head together.

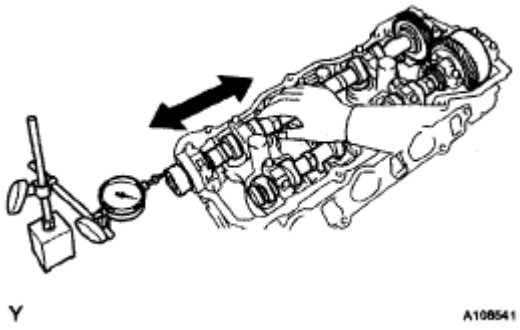


Fig. 520: Measuring Thrust Clearance Using Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSPECT CAMSHAFT OIL CLEARANCE**
   a. Clean the bearing caps and camshaft journals.
   b. Place the camshafts on the cylinder head.
   c. Lay a strip of Plastigage across each of the camshaft journal.

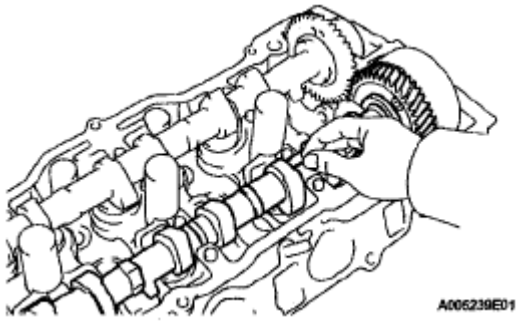


Fig. 521: Inspecting Camshaft Oil Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the bearing caps.

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

NOTE: Do not turn the camshaft.

e. Remove the bearing caps.
f. Measure the Plastigage at its widest point.

Standard oil clearance

STANDARD OIL CLEARANCE SPECIFICATION

Intake #4, #5 journals	Other journals
0.025 to 0.057 mm (0.0010 to 0.0022 in.)	0.025 to 0.062 mm (0.0010 to 0.0024 in.)

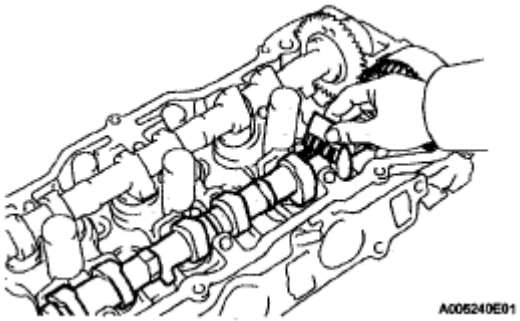


Fig. 522: Measuring Plastigage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head together.

NOTE: Completely remove the Plastigage.

REASSEMBLY

1. **INSTALL SPARK PLUG TUBE GASKET**
   a. Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

      SST 09950-60010 (09951-00430), 09950-70010 (09951-07100)

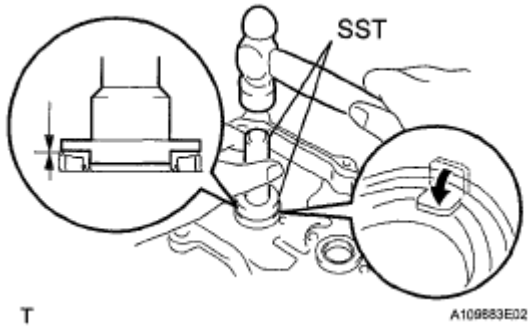


Fig. 523: View Of Tapping Spark Plug Tube Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Return the ventilation plate tab to its original position.
   c. Apply a light coat of MP grease to the gasket lip.
2. **INSTALL REAR ENGINE OIL SEAL**
   a. Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

      SST 09223-15030, 09950-70010 (09951-07100)

NOTE:
- **Do not tap the oil seal at an angle.**
- **Keep the lip free of foreign objects.**

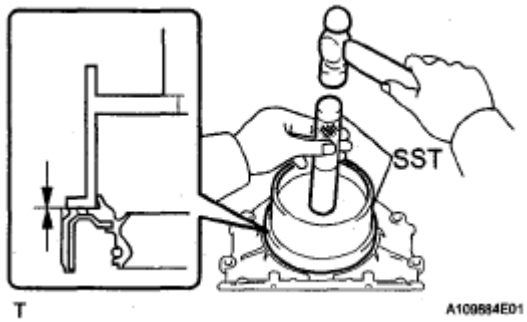


Fig. 524: View Of Tapping Engine Rear Oil Seal

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

b. Apply MP grease to the oil seal lip.

3. **INSTALL REAR ENGINE OIL SEAL RETAINER**
   a. Remove any old packing material from the contact surface.
   b. Apply a continuous bead of seal packing (Diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

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

      NOTE:
      - **Remove any oil from the contact surface.**
      - **Install the oil seal retainer within 3 minutes after applying seal packing.**
      - **Do not expose the seal to engine oil within 2 hours after installing.**

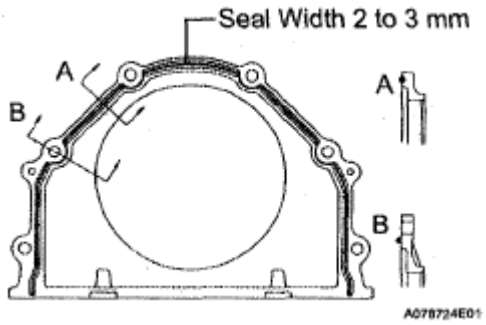


Fig. 525: Identifying Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Install the oil seal retainer with the 6 bolts. Tighten the bolts uniformly in several steps.

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

4. **INSTALL OIL PUMP SEAL**
   a. Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.

      SST 09223-00010

      NOTE:
      - **Do not tap the oil seal at an angle.**
      - **Keep the lip free of foreign objects.**

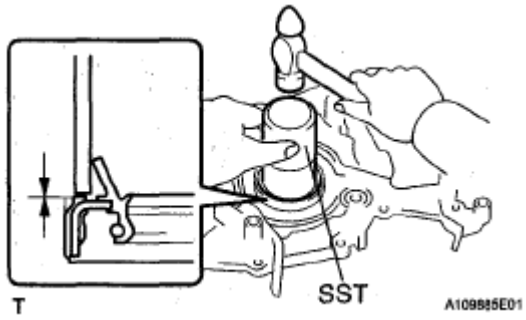


Fig. 526: View Of Tapping Oil Pump Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Apply MP grease to the oil seal lip.

5. **INSTALL OIL PUMP ASSEMBLY**
   a. Remove any old packing material from the contact surface.
   b. Apply a light coat of engine oil to a new O-ring and place it on the cylinder block.

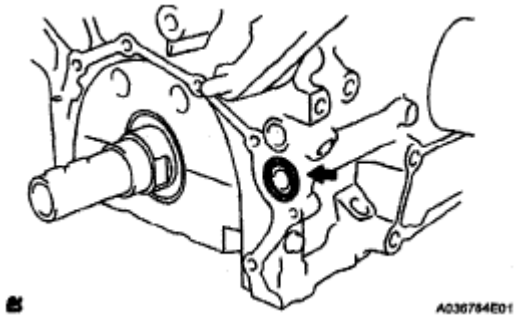


Fig. 527: Locating O-Ring On Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Apply a continuous bead of seal packing (Diameter 2 to 3 mm (0.08 to 0.12 in.)) as shown in the illustration.

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

NOTE:

- **Remove any oil from contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pump within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

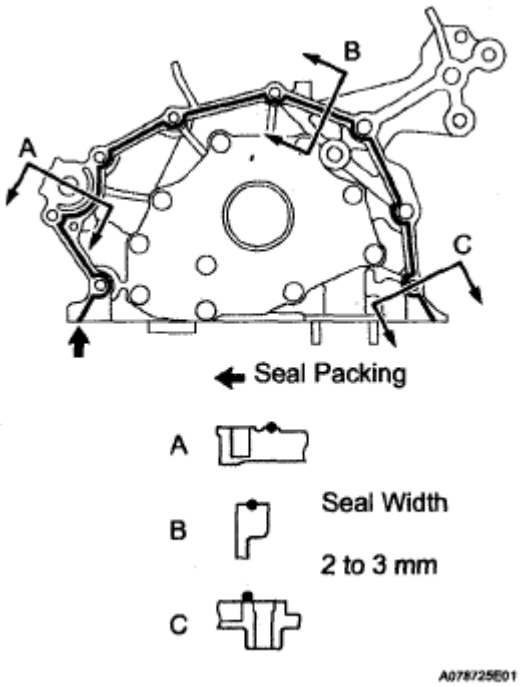


Fig. 528: View Of Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Align the key of the oil pump drive gear with the keyway located on the crankshaft, and slide the oil pump into place.

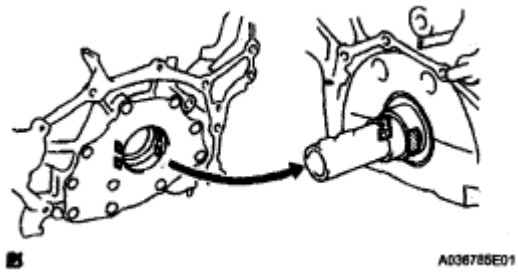


Fig. 529: Identifying Key Of Oil Pump Drive Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Install the oil pump with the 9 bolts. Tighten the bolts uniformly in several steps.

Torque: Bolt A

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

Bolt B

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

Bolt C

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

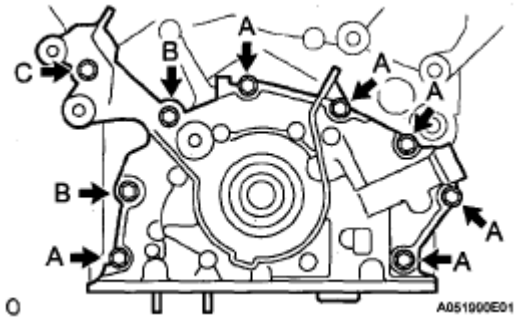


Fig. 530: Locating Oil Pump With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL NO. 1 OIL PAN BAFFLE PLATE**

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

7. **INSTALL OIL PAN SUB-ASSEMBLY**
   a. Remove any old seal packing from the contact surface.
   b. Apply a continuous bead of seal packing (Diameter 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.

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

      NOTE:
      - **Remove any oil from the contact surface.**
      - **Apply seal packing to the outer side of the bolt holes in the region "X".**
      - **Apply seal packing to the inner side of the bolt holes in the region "Y".**
      - **Install the oil pan within 3 minutes after applying seal packing.**
      - **Do not expose the seal to engine oil within 2 hours after installing.**

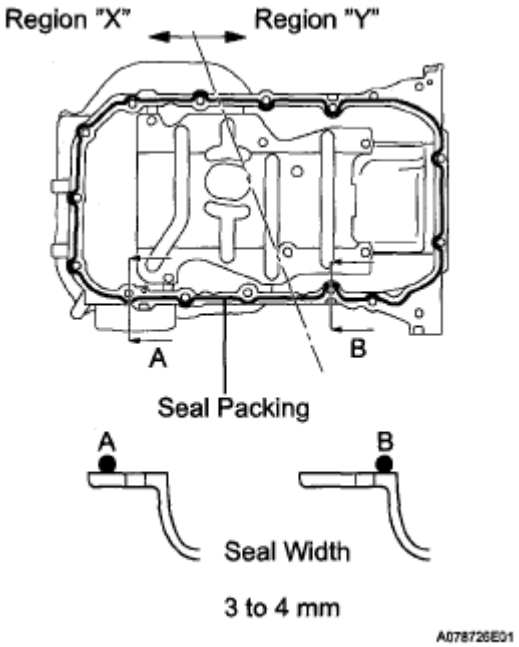


Fig. 531: Identifying Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the oil pan No. 1 with the 17 bolts. Tighten the bolts uniformly in several steps.

Torque: 10 mm Bolt A

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

12 mm Bolt B

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

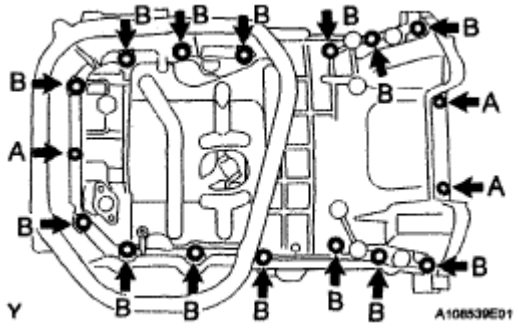


Fig. 532: Locating Oil Pan Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL OIL STRAINER SUB-ASSEMBLY**
   a. Install a new gasket and the oil strainer with the bolt and 2 nuts.

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

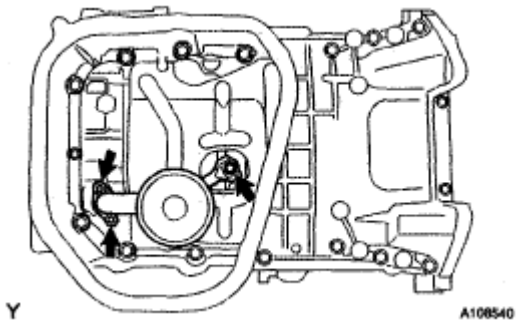


Fig. 533: Locating Oil Strainer With Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL NO. 2 OIL PAN SUB-ASSEMBLY**
   a. Remove any old seal packing from the contact surface.
   b. Apply a continuous bead of seal packing (Diameter 4 to 5 mm (0.16 to 0.20 in.)) as shown in the illustration.

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

NOTE:

- **Remove any oil from the contact surface.**
- **Apply seal packing to the inner side of the bolt holes.**
- **Install the oil pan within 3 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

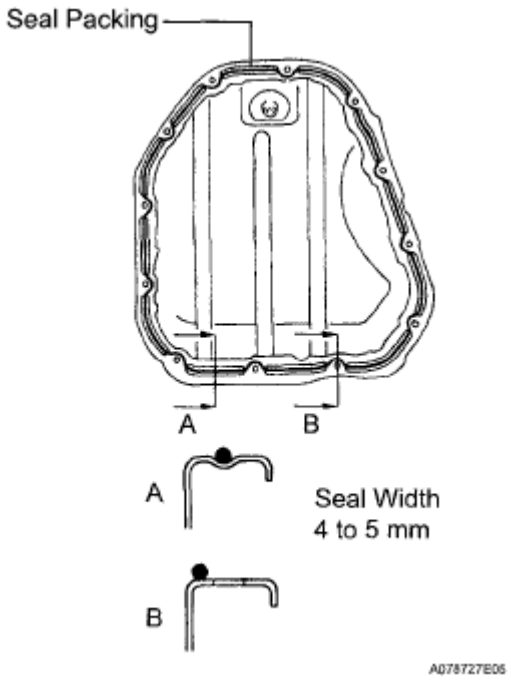


Fig. 534: Identifying Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the oil pan No. 2 with the 10 bolts and 2 nuts.

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

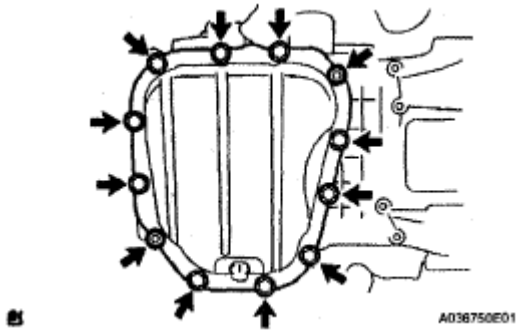


Fig. 535: Locating Oil Pan With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL OIL PAN DRAIN PLUG**
    a. Install the drain plug with a new gasket.

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

11. **INSTALL OIL FILTER SUB-ASSEMBLY**
    a. Using a 12 mm socket hexagon wrench, install the oil filter union.

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

b. Check and clean the oil filter installation surface.
c. Apply clean engine oil to the gasket of a new oil filter.
d. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
e. Using SST, tighten it an additional 3/4 turn.

SST 09228-07501

12. **INSTALL INLET WATER HOUSING**
    a. Remove any old packing material from the contact surface.
    b. Apply a continuous bead of seal packing (Diameter 3 to 5 mm (0.12 to 0.20 in.)) as shown in the illustration.

Seal packing: Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent

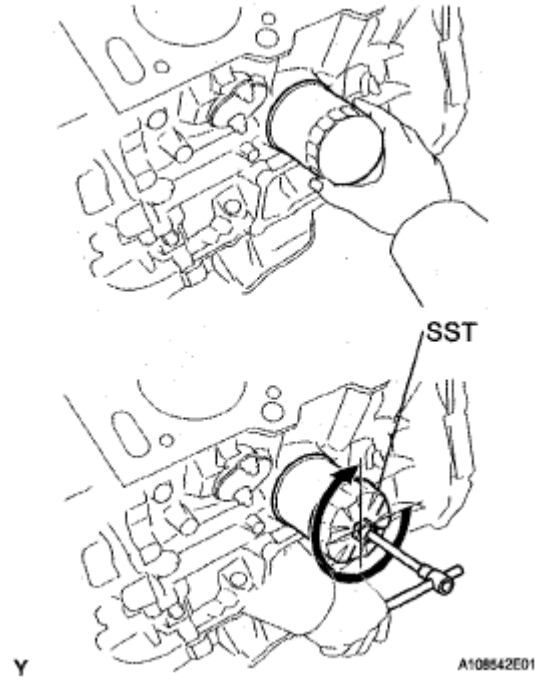


Fig. 536: Installing Water Inlet Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **Remove any oil from the contact surface.**
- **Install the inlet water housing within 3 minutes after applying seal packing.**
- **Do not expose the seal to coolant within 2 hours after installing.**

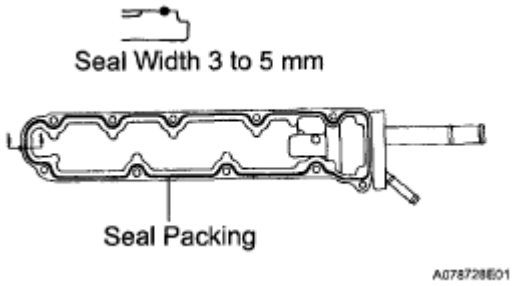


Fig. 537: Identifying Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the inlet water housing with the 8 bolts and 2 nuts. Using several steps, tighten the bolts and nuts uniformly in the sequence shown in the illustration.

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

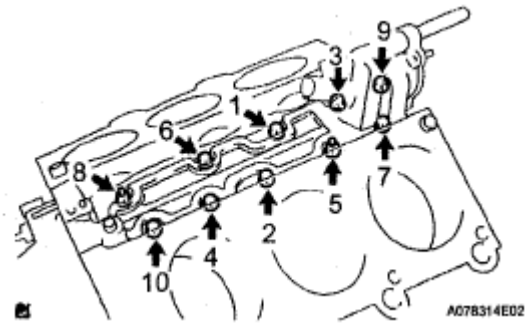


Fig. 538: Identifying Water Inlet Housing Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **INSTALL CYLINDER HEAD GASKET**
    a. Place a new cylinder head gasket on the cylinder block with the R mark upward.

NOTE:

- **Remove any oil from the contact surface.**
- **Be sure to install the gasket in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

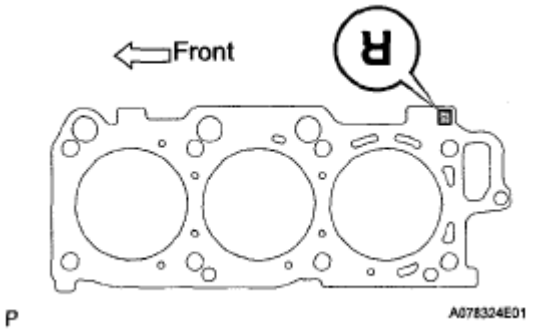


Fig. 539: Identifying Cylinder Block With R Mark Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **INSTALL CYLINDER HEAD SUB-ASSEMBLY**
    a. Apply a light coat of engine oil to the threads of the cylinder head bolts.
    b. Install the plate washers to the cylinder head bolts.
    c. Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

    Torque: 54 N*m (550 kgf*cm, 40 ft.*lbf)

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

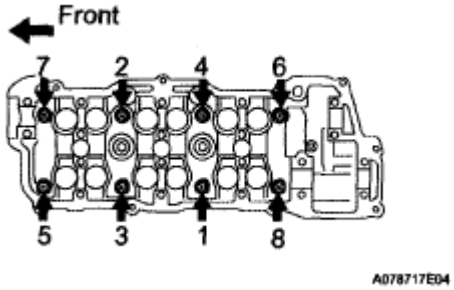


Fig. 540: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    d. Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

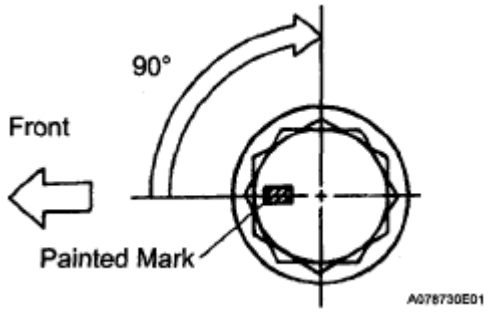


Fig. 541: Identifying Cylinder Head Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Retighten the cylinder head bolts by 90° in the same sequence as step (c).
f. Check that each painted mark is now at a 90° angle to the front.
g. Using an 8 mm socket hexagon wrench, install the hexagon bolt.

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

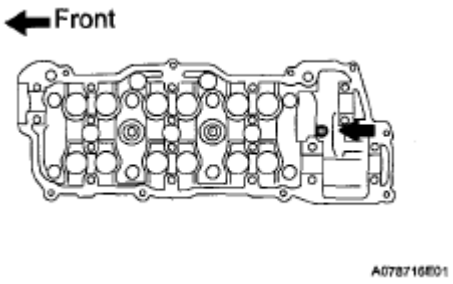


Fig. 542: Identifying Hexagon Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL NO. 2 CYLINDER HEAD GASKET**
    a. Place a new cylinder head gasket on the cylinder block with the L mark upward.

NOTE:

- **Remove any oil from the contact surface.**
- **Be sure to install the gasket in the correct direction.**
- **Place the cylinder head on the gasket carefully in order not to damage the gasket at the bottom part of the head.**

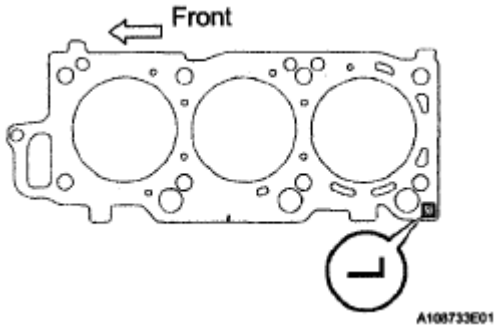


Fig. 543: Identifying Cylinder Block With L Mark Upward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **INSTALL CYLINDER HEAD LH**
    a. Apply a light coat of engine oil to the threads of the cylinder head bolts.
    b. Install the plate washers to the cylinder head bolts.
    c. Using several steps, install and tighten the 8 cylinder head bolts uniformly in the sequence shown in the illustration.

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

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

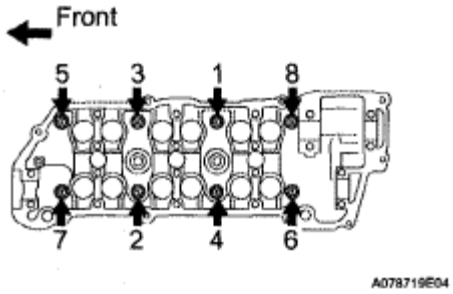


Fig. 544: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    d. Mark the front side of each cylinder head bolt head with paint as shown in the illustration.

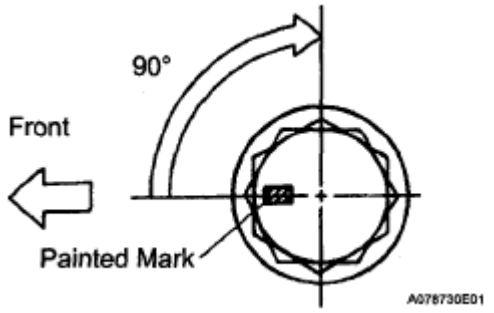


Fig. 545: Identifying Cylinder Head Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Retighten the cylinder head bolts by 90° in the same sequence as step (c).
f. Check that each painted mark is now at a 90° angle to the front.
g. Using an 8 mm socket hexagon wrench, install the hexagon bolt.

Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)

17. **INSTALL OIL CONTROL VALVE FILTER**
    a. Check that no foreign objects are on the mesh part of the filter.
    b. Assemble the valve filter and the plug.

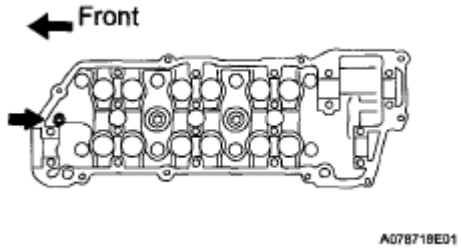


Fig. 546: Locating Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the plug with a new gasket.

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

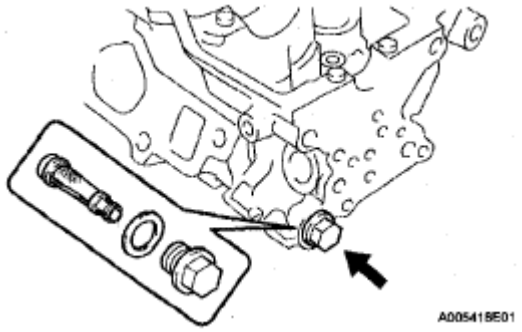


Fig. 547: Locating Plug With Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **INSTALL REAR CYLINDER HEAD COVER**
    a. Install the rear cover and a new gasket with the 12 bolts and nut.

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

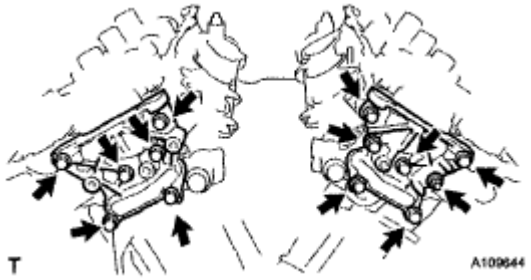


Fig. 548: Locating Cylinder Head Cover Rear Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **INSTALL NO. 2 ENGINE HANGER**
    a. Install the 2 bolts and No. 2 engine hanger.

       Torque: 20 N*m (214 kgf*cm, 15 ft.*lbf)

20. **INSTALL CAMSHAFT SUB GEAR**
    a. Clamp the camshaft in a vise on the hexagonal lobe.

       NOTE: Do not damage the camshaft.

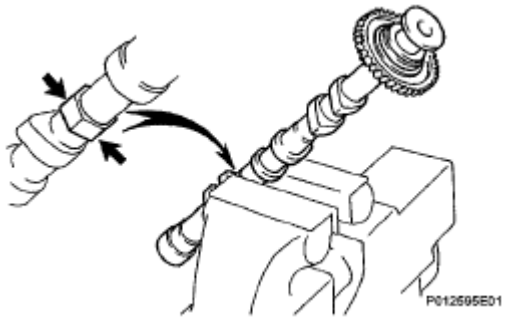


Fig. 549: Identifying Camshaft In A Vise On Hexagonal Lobe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the camshaft gear bolt washer and the camshaft sub-gear.

HINT:

Attach the pins on the gears to the gear bolt washer ends.

c. Install the wave washer.

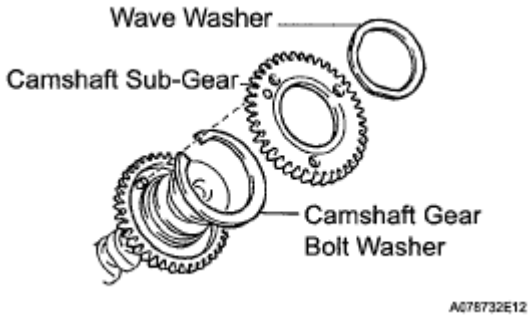


Fig. 550: Identifying Wave Washer, Camshaft Sub-Gear And Camshaft Gear Bolt Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using snap ring pliers, install the snap ring.

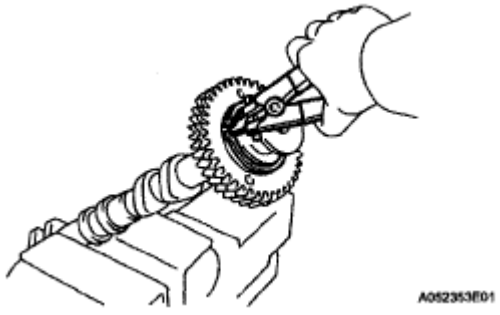


Fig. 551: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using SST, align the holes of the camshaft main gear and sub-gear by turning the camshaft sub-gear counterclockwise, and temporarily install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

f. Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

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

NOTE: Do not damage the camshaft journals.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installing the service bolt.

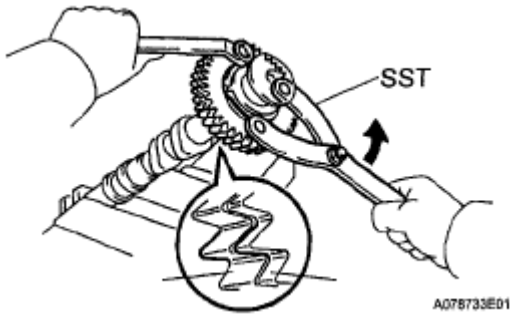


Fig. 552: Aligning Gear Teeth Of Main Gear And Sub Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **INSTALL CAMSHAFT TIMING GEAR ASSEMBLY**

a. Align the alignment pin with the groove and install VVT-i on the camshaft.

NOTE: Install it with the lock-pin engaged and locked at the most retard angle position.

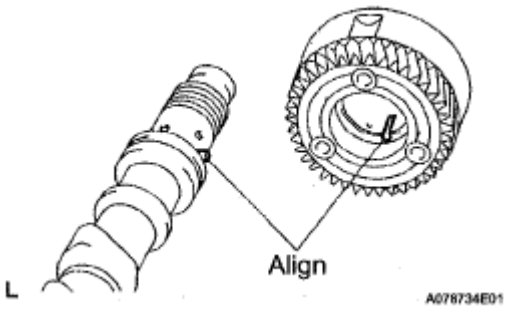


Fig. 553: Identifying Alignment Pin With Alignment Pin Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Apply engine oil to the nut, the mounting surface of VVT-i and the screw threads.

NOTE:

- **Be sure to apply the oil, otherwise the specified torque cannot be obtained.**
- **New nuts must be used when replacing the VVT-i unit.**

c. Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N*m (1530 kgf*cm, 111 ft.*lbf)

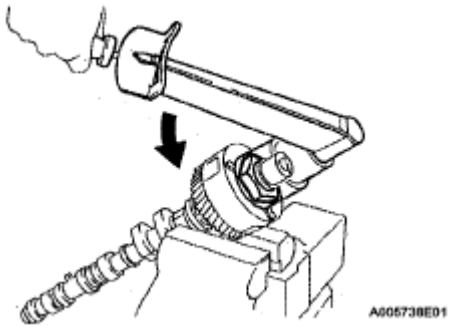


Fig. 554: Installing And Tightening Lock Nut By Turning Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **The lock nut has left-hand threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

22. **INSTALL NO. 2 CAMSHAFT**

NOTE: **Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.**

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Place the No. 2 camshaft at a 90° angle of the timing mark (2-dot mark) on the cylinder head.

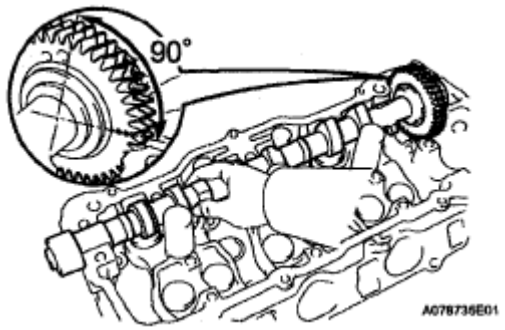


Fig. 555: Placing Camshaft At 90 Degrees Angle Of Timing Mark On Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply MP grease to a new oil seal lip.
d. Install the oil seal to the camshaft.

NOTE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

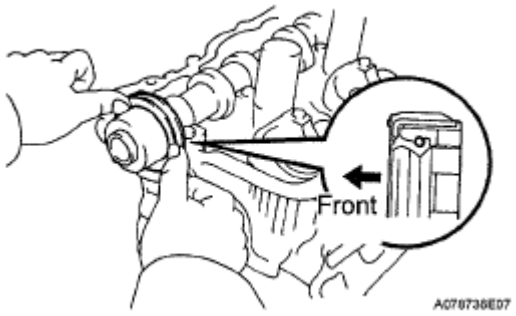


Fig. 556: Installing Oil Seal To Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove any old packing material from the contact surface.
f. Apply seal packing to the No. 1 bearing cap as shown in the illustration.

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

NOTE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

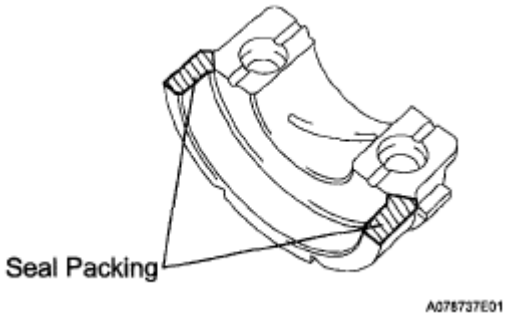


Fig. 557: Identifying Seal Packing To No 1 Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Install the 5 bearing caps in their proper locations.

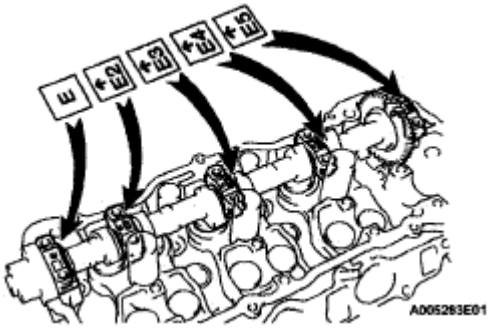


Fig. 558: Identifying Bearing Cap Proper Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Apply a light coat of engine oil to the threads of the bearing cap bolts.
i. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

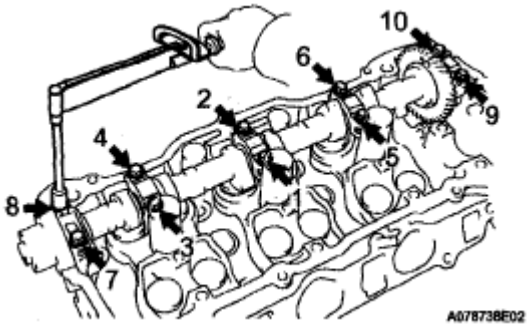


Fig. 559: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **INSTALL CAMSHAFT**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Align the tinning marks (2-dot mark) of the camshaft drive gear with the mark on the driven gear.

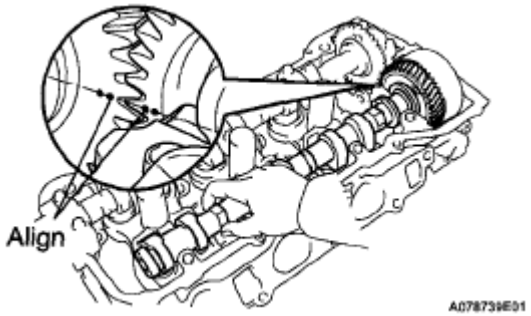


Fig. 560: Aligning Timing Marks Of Camshaft Drive Gear With Mark On Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Place the camshaft on the cylinder head.
d. Install the 5 bearing caps in their proper locations.

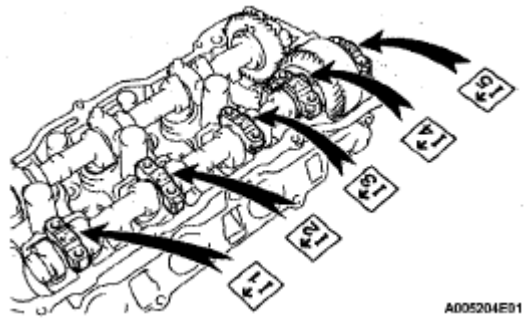


Fig. 561: Identifying Bearing Cap Proper Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Apply a light coat of engine oil to the threads of the bearing cap bolts.
f. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

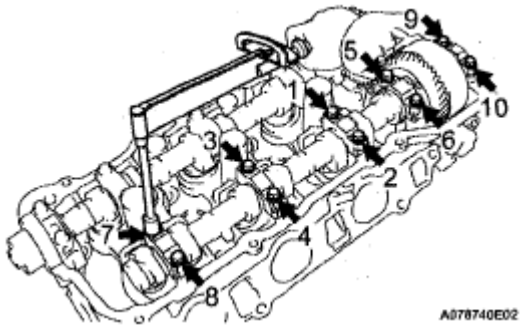


Fig. 562: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the service bolt.

24. **INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Place the No. 4 camshaft at a 90° angle of the timing mark (1-dot mark) on the cylinder head.

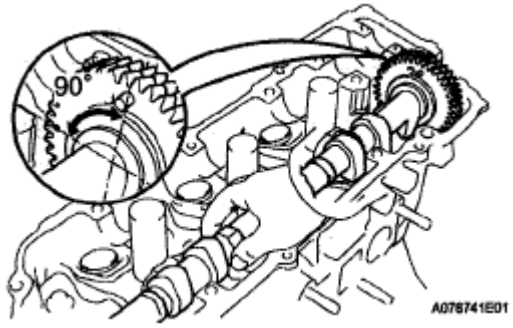


Fig. 563: Placing Camshaft At 90 Degrees Angle Of Timing Mark On Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply MP grease to a new oil seal lip.
d. Install the oil seal to the camshaft.

NOTE:
- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

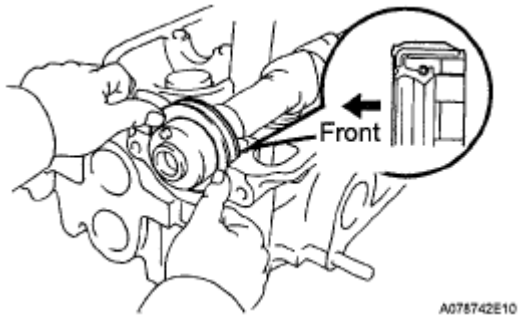


Fig. 564: Installing Oil Seal To Camshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove any old packing material from the contact surface.
f. Apply seal packing to the No. 1 bearing cap as shown in the illustration.

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

NOTE:

- **Install the No. 1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

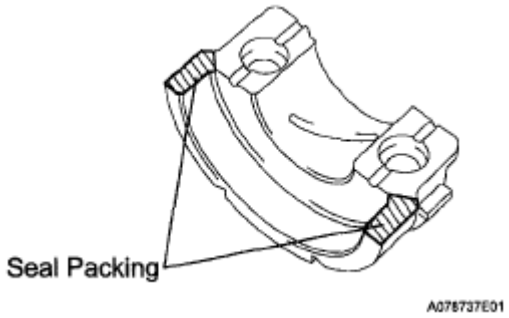


Fig. 565: Identifying Seal Packing To No 1 Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Install the 5 bearing caps in their proper locations.

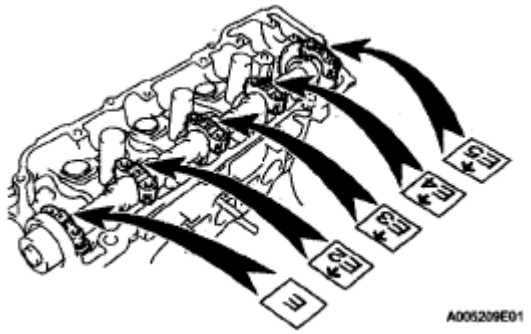


Fig. 566: Identifying Bearing Cap Proper Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Apply a light coat of engine oil to the threads of the bearing cap bolts.
i. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

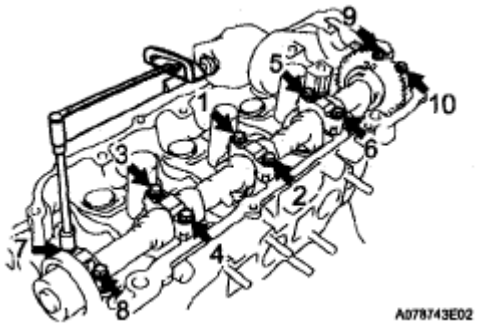


Fig. 567: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY**

NOTE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

a. Apply new engine oil to the thrust portion and journal of the camshaft.
b. Align the timing marks (1 -dot mark) of the camshaft drive gear with the mark on the driven gear.

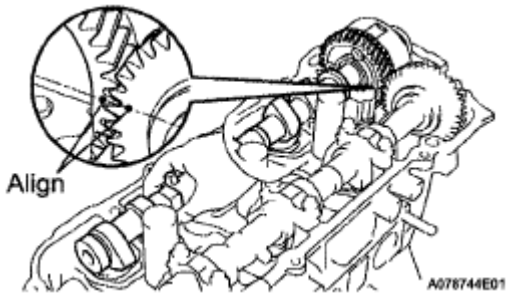


Fig. 568: Aligning Timing Marks Of Camshaft Drive Gear With Mark On Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Place the camshaft on the cylinder head.
d. Install the 5 bearing caps in their proper locations.

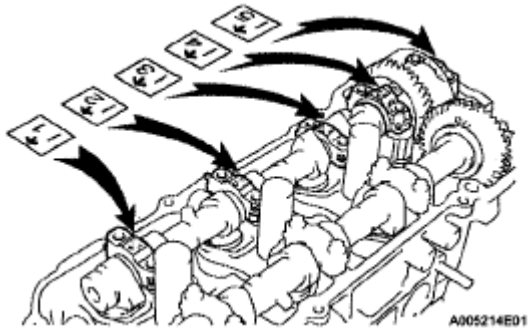


Fig. 569: Identifying Bearing Cap Proper Installation Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Apply a light coat of engine oil to the threads of the bearing cap bolts.
f. Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

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

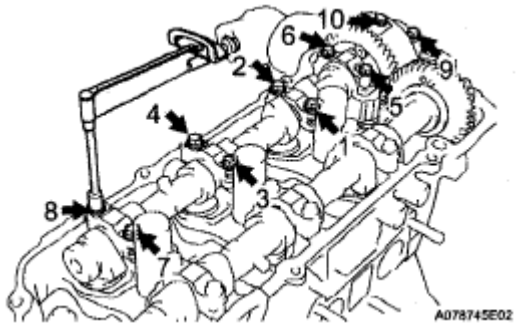


Fig. 570: Tightening Bearing Cap Bolts With Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the service bolt.

26. **INSTALL WATER PUMP ASSEMBLY**

a. Install a new gasket and the water pump with the 3 bolts and 3 nuts.

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

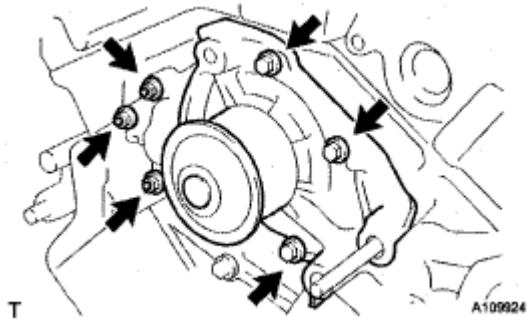


Fig. 571: Locating Water Pump With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **INSTALL CRANKSHAFT TIMING PULLEY**

a. Align the keyway of the timing pulley with the key located on the crankshaft and slide the timing pulley into place.

NOTE: Do not scratch the sensor area of the crankshaft timing pulley.

b. Install the timing belt plate with the bolt.

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

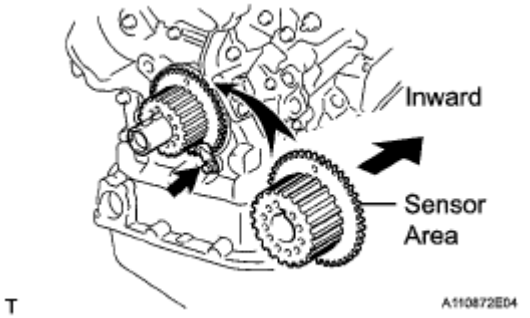


Fig. 572: Locating Timing Belt Plate With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. **INSTALL OIL LEVEL DIPSTICK GUIDE**

a. Apply a light coat of engine oil to a new O-ring and install it to the level dipstick guide.
b. Install the level dipstick guide.

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

29. **INSTALL OIL LEVEL DIPSTICK SUB-ASSEMBLY**
    a. Install the oil level dipstick sub-assembly.
30. **INSTALL TIMING BELT IDLER BRACKET**

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

31. **INSTALL NO. 3 TIMING BELT COVER**
    a. Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:

If a trace of water is found in the visual check, repair it with seal packing when the crack length is within 2 to 3 cm (0.79 to 1.18 in.). Replace the gasket when the crack length is 3 to 4 cm (1.18 to 1.57 in.) and more.

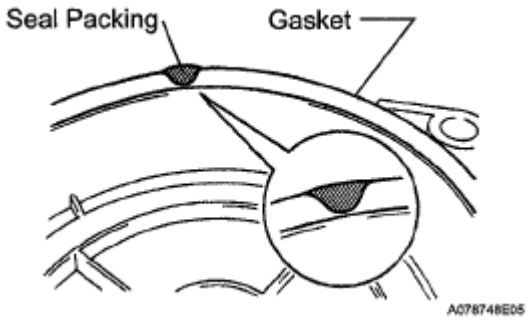


Fig. 573: Identifying Seal Packing To Damaged Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. If the timing belt cover gasket is needed to repair, follow the procedure below.
        1. Repair the cracks and breaks by applying the seal packing to the damaged area.

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

NOTE: When applying the seal packing, apply it as wide and high as possible to fill the surface area of the gasket.

    c. If the timing belt cover gasket is needed to replace, follow the procedure below.
        1. Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTE: Do not damage the timing belt cover.

        2. Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

NOTE:

- **Affix the gasket in the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

GASKET THICKNESS SPECIFICATION

Gasket	D	E	F	G
Length	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

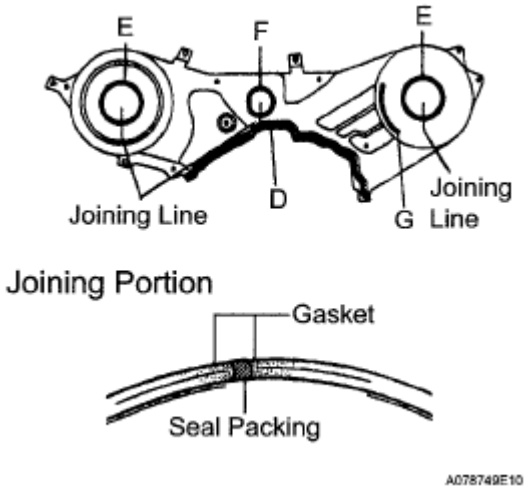


Fig. 574: Identifying Seal Packing Applying Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. If there is a gap on the joint of the gasket, apply seal packing to close the gap.

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

NOTE: **When applying the seal packing, apply it as wide and high as possible to fill the surface area of the gasket.**

d. Install the timing belt cover with the 6 bolts.

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

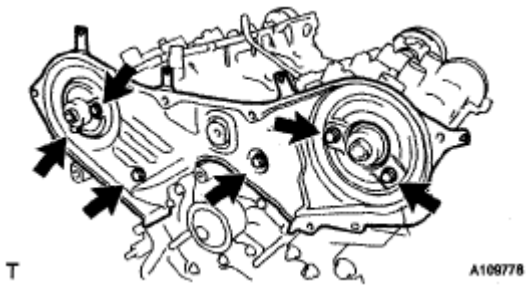


Fig. 575: Locating Timing Belt Cover

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

32. **INSTALL CAMSHAFT TIMING PULLEY**

a. Paying attention to the direction of the belt guide, install the camshaft timing pulley and tighten the bolt temporarily.

HINT:

- Face the belt guide of the RH timing pulley toward the front of the engine.
- Face the belt guide of the LH timing pulley toward the rear of the engine.

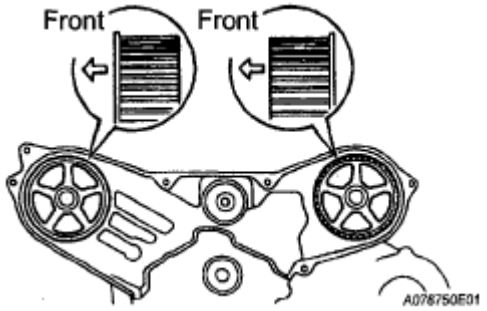


Fig. 576: Identifying Camshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, tighten the RH pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 125 N*m (1275 kgf*cm, 92 ft.*lbf)

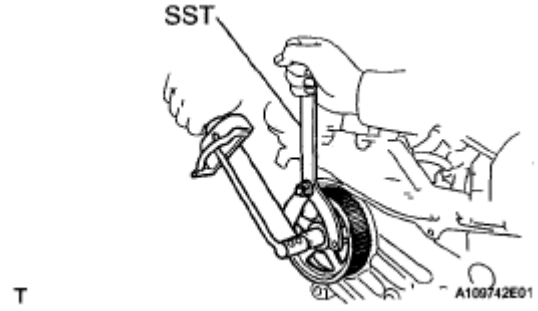


Fig. 577: Tightening RH Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using SST, tighten the LH pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

Torque: 125 N*m (1275 kgf*cm, 92 ft.*lbf)

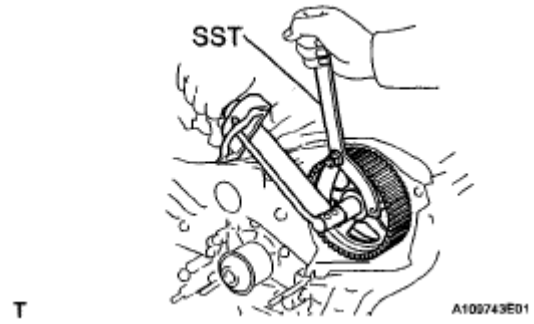


Fig. 578: Tighten LH Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. **INSTALL CRANKSHAFT POSITION SENSOR**
    a. Install the crankshaft position sensor with the bolt.

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

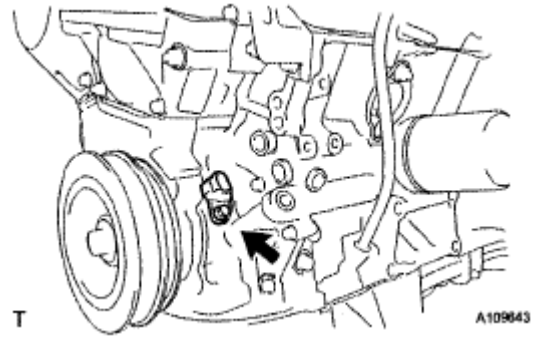


Fig. 579: Locating Crankshaft Position Sensor With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **INSTALL NO. 2 TIMING BELT IDLER SUB-ASSEMBLY**

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

35. **INSTALL NO. 1 TIMING BELT IDLER SUB-ASSEMBLY**
    a. Using a 10 mm socket hexagon wrench, install the plate washer and No. 1 timing belt idler with the pivot bolt.

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

36. **INSTALL TIMING BELT**
    a. Remove any oil or water on the pulleys, and keep them clean.

    NOTE:

    - **If there is a trace of water and/or oil on the timing belt, repair the leakage and install a new timing belt.**

- **Wipe only the pulleys. Do not use any cleaning agent.**

b. Inspect the idler pulleys.
   1. Check that the idler pulley turns smoothly.
   2. Visually check the seal portion of the idler pulley for oil leakage.

c. Inspect the water pump.
   1. Turn the pulley, and check that the water pump bearing moves smoothly and does not make any noise.
   2. Visually check the drain hole for coolant leakage.

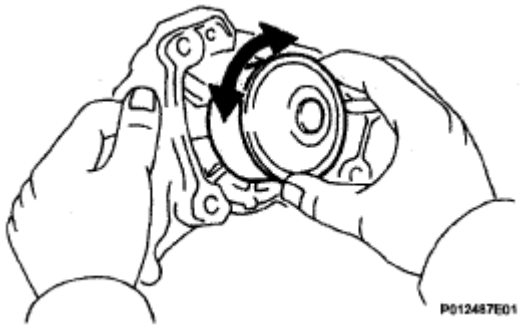


Fig. 580: Checking Water Pump Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Temporarily install the crankshaft pulley bolt and washer to the crankshaft.
e. Turn the crankshaft counterclockwise by approximately 60°.

NOTE: To prevent contacting the piston head and the valve head, set the crankshaft pulley at 60° BTDC/compression position.

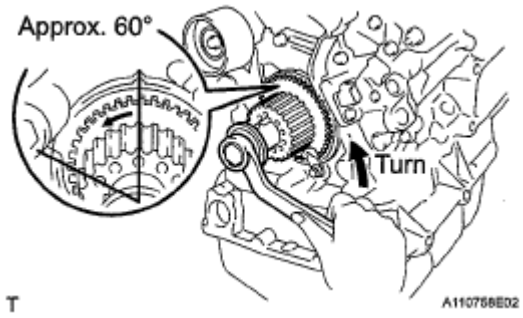


Fig. 581: Turning Crankshaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using SST, turn the crankshaft pulley, and align the timing marks of the timing pulley with the No. 3 timing belt cover.

SST 09960-10010 (09962-01000, 09963-01000)

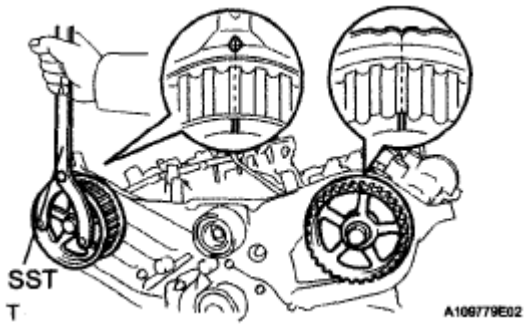


Fig. 582: Aligning Timing Marks Of Timing Pulley With No.3 Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Turn the crankshaft, and align the timing marks of the crankshaft timing pulley with the oil pump body.

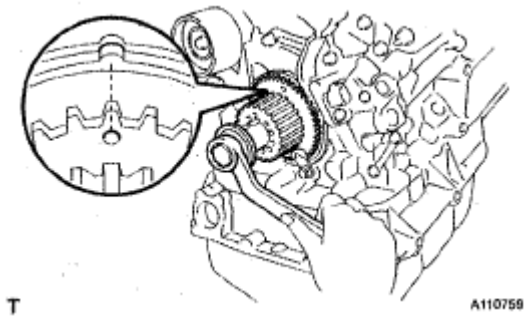


Fig. 583: Aligning Timing Marks Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Face the front mark on the timing belt forward.
i. Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.

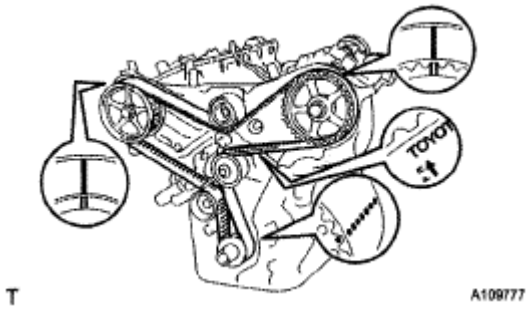


Fig. 584: Identifying Mark On Timing Belt With Timing Mark Of Crankshaft Timing Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Align the installation marks on the timing belt with the timing marks of the camshaft timing

pulleys.

k. Install the timing belt in the following order.

TIMING BELT REFERENCE

1st	Crankshaft timing pulley
2nd	Water pump pulley
3rd	LH camshaft timing pulley
4th	No. 2 idler pulley
5th	RH camshaft timing pulley
6th	No. 1 idler pulley

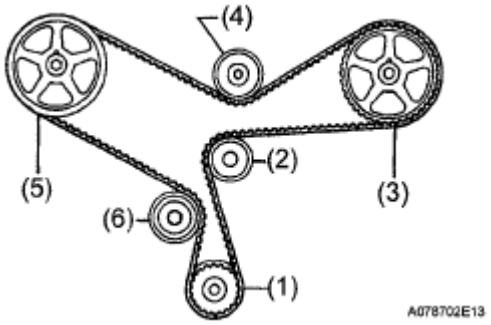


Fig. 585: Identifying Timing Belt Installing Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**

a. Set the timing belt tensioner upright on the press.

b. Slowly press in the push rod.

NOTE: Do not apply pressure more than 9.8 kN (1000 kgf, 2205 lbf) to the rod.

c. Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.

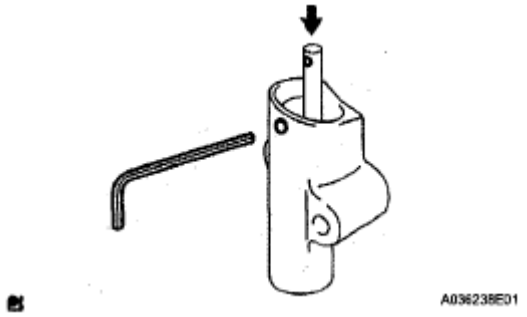


Fig. 586: View Of Holes Of Push Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Release the press.

e. Temporarily install the tensioner with the 2 bolts. Alternately tighten the 2 bolts.

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

NOTE: Be sure to tighten the bolts equally. Installing the tensioner at an angle may cause improper operation.

f. Remove the 1.5 mm hexagon wrench from the tensioner.

g. Turn the crankshaft 2 revolutions slowly, and align the timing mark of the crankshaft timing pulley with the oil pump body.

NOTE: Always turn the crankshaft clockwise.

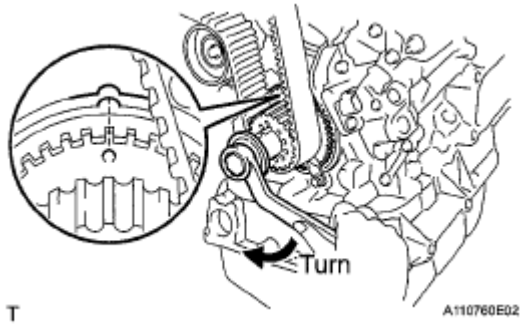


Fig. 587: Identifying Timing Mark Of Crankshaft Timing Pulley With Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Check the timing marks of the RH and LH timing pulleys are aligned with the timing marks of the No. 3 timing belt cover as shown in the illustration.

HINT:

If the marks do not align, remove the timing belt and reinstall it.

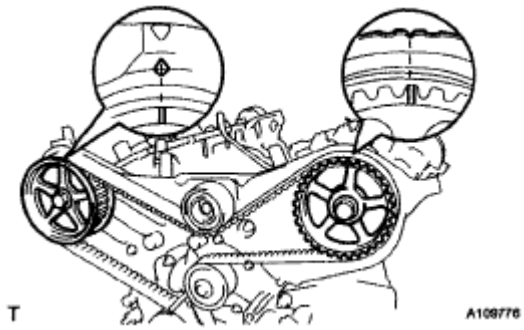


Fig. 588: Identifying Timing Marks Of Camshaft Timing Pulleys
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Remove the crankshaft pulley bolt.

38. **INSTALL NO. 2 TIMING BELT GUIDE**

a. Install the timing belt guide with the cup side facing toward the engine front.

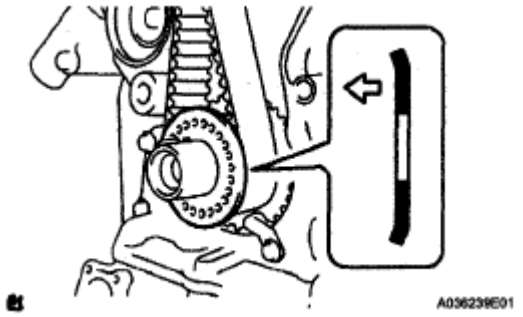


Fig. 589: Identifying Timing Belt Guide Installing Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **INSTALL ENGINE MOUNTING BRACKET RH**

a. Install the 2 bolts, 2 nuts and engine mounting bracket RH.

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

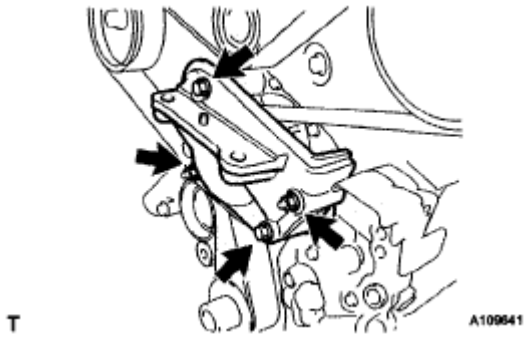


Fig. 590: Locating Engine Mounting Bracket RH, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **INSTALL NO. 2 TIMING BELT COVER**

a. Visually check for cracks and breaks on the gasket of the timing belt cover.

If a trace of water is found in the visual check, replace the timing belt cover.

b. Install the timing belt cover with the 5 bolts.

Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

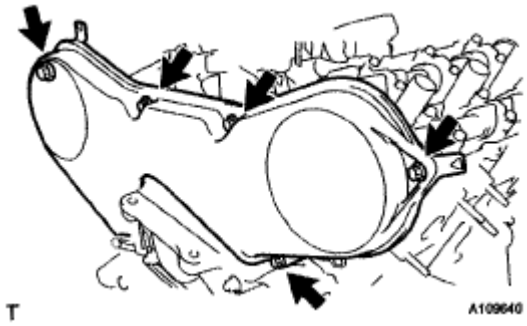


Fig. 591: Locating Timing Belt Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. **INSTALL NO. 1 TIMING BELT COVER**
    a. Visually check for cracks and breaks on the gasket of the timing belt cover. If a trace of water is found in the visual check, replace the timing belt cover.
    b. Install the timing belt cover with the 4 bolts.

       Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

42. **INSTALL CRANKSHAFT PULLEY**
    a. Align the keyway of the pulley with the key located on the crankshaft and slide the pulley into place.

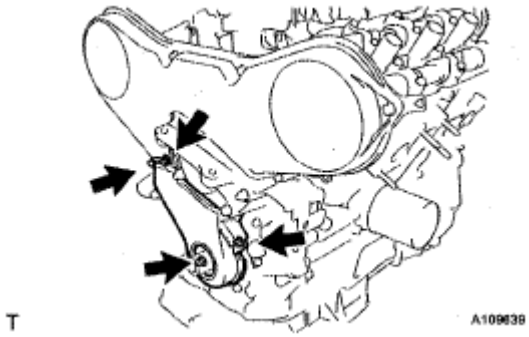


Fig. 592: Locating Crankshaft Pulley With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Using SST, install the pulley bolt.

       SST 09213-54015 (91651-60855), 09330-00021

       Torque: 220 N*m (2243 kgf*cm, 162 ft.*lbf)

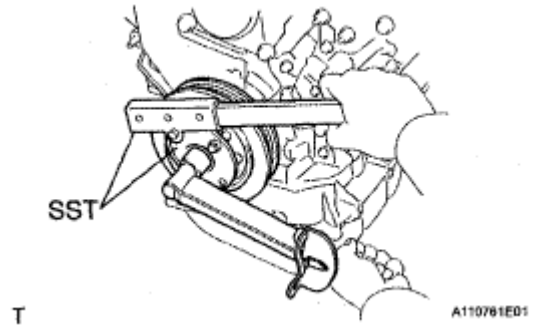


Fig. 593: Identifying Pulley Bolt Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. **INSTALL VVT SENSOR**
    a. Install the 2 VVT sensors with the 2 bolts.

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

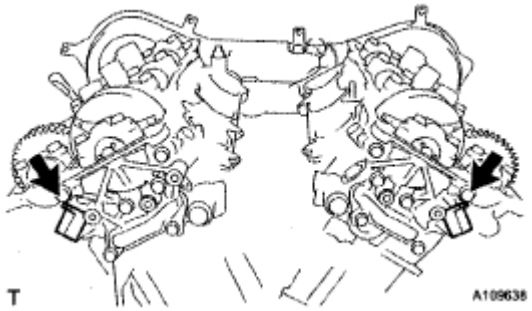


Fig. 594: Locating VVT Sensors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. **INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY**
    a. Install 2 new O-rings and 2 camshaft timing oil control valves with the 2 bolts.

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

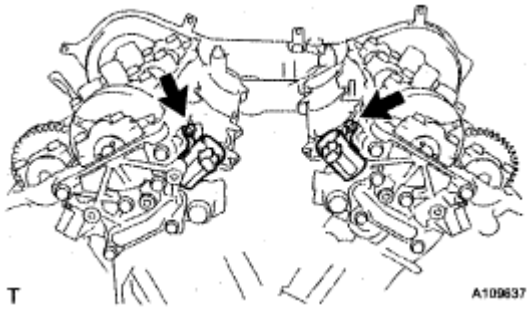


Fig. 595: Locating O-Rings And Camshaft Timing Oil Control Valves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **INSPECT VALVE CLEARANCE**

a. Turn the crankshaft pulley, and align the timing notch with the timing mark "0" of the No. 1 timing belt cover.

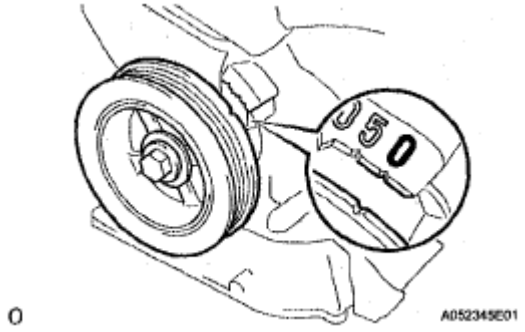


Fig. 596: Identifying Timing Notch With Timing Mark "0" Of No 1 Timing Belt Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Check that the valve lifters on the No. 1 cylinder (IN and EX) are both loose.

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

c. Check the valves indicated in the illustration.

1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

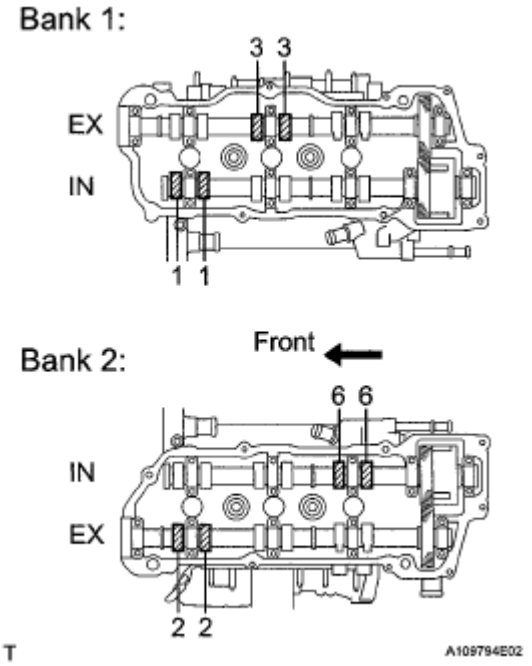


Fig. 597: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

d. Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration.

1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

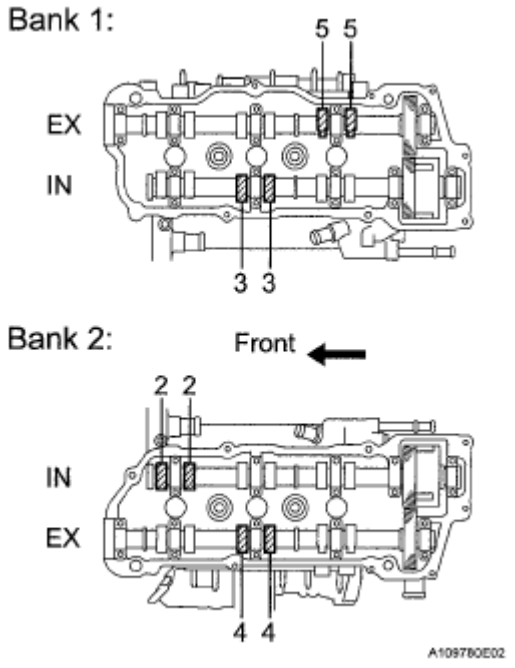


Fig. 598: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

e. Turn the crankshaft 2/3 of a revolution (240°), and check the valves indicated in the illustration.

1. Using a feeler gauge, measure the clearance between the valve lifter and the camshaft.

Valve clearance (Cold): Intake: 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

Exhaust: 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

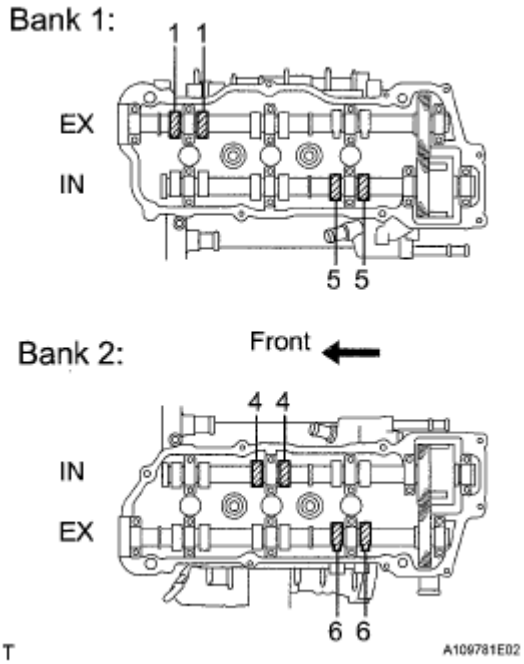


Fig. 599: Identifying Intake And Exhaust Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Record out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

46. **ADJUST VALVE CLEARANCE**
   a. Turn the camshaft so that the cam lobe faces upward.
   b. Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

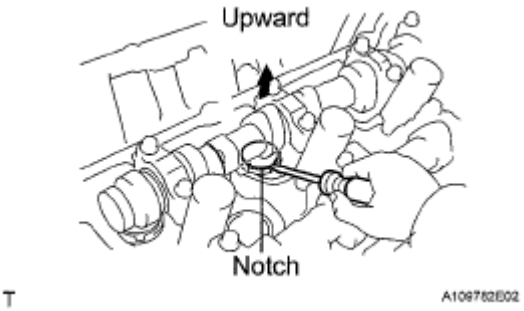


Fig. 600: Identifying Valve Lifter With Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55040 (09248-05410, 09248-05420)

HINT:

- Apply SST (B) at a slight angle on the side marked with "9" or "7" at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side at a slight angle.

TOOL REFERENCE

SST A	09248-05410
SST B	09248-05420

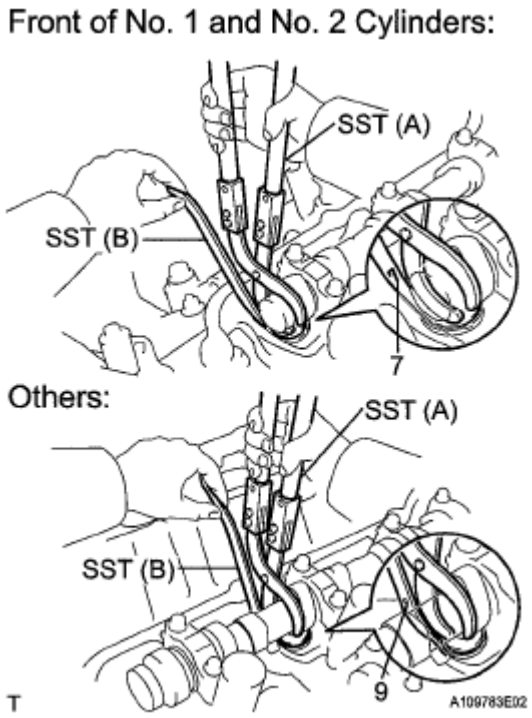


Fig. 601: View Of Pressing Down Valve Lifter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a screwdriver and magnetic pick-up tool, remove the adjusting shim.

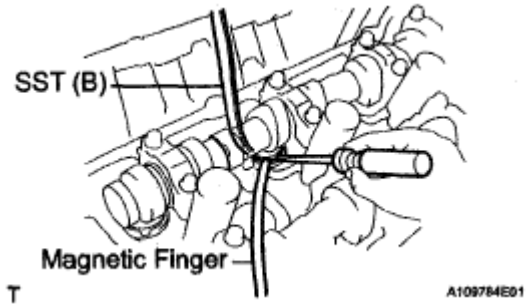


Fig. 602: Identifying Adjusting Shim Using Screwdriver And Magnetic Finger
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a micrometer, measure the thickness of the removed shim.

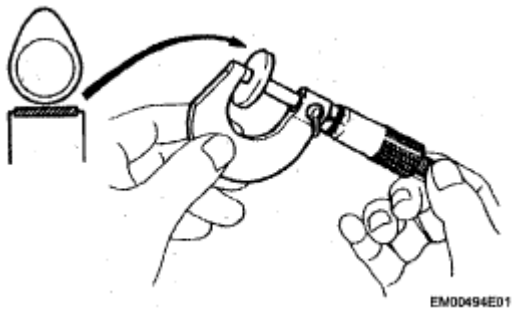


Fig. 603: Measuring Thickness Of Removed Shim
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Calculate the thickness of a new shim so the valve clearance comes within the specified value.

SHIM THICKNESS SPECIFICATION

A	Thickness of new shim
B	Thickness of used shim
C	Measured valve clearance

Specified value (Cold): Intake A = B + (C - 0.20 mm (0.0079 in.))

Exhaust A = B + (C - 0.30 mm (0.0118 in.))

g. Select a new shim with a thickness as close as possible to the calculated values.

EXAMPLE (Intake):

Measured valve clearance = 0.45 mm (0.0177 in.)

0.45 mm (0.0177 in.) - 0.20 mm (0.0079 in.) = 0.25 mm (0.0098 in.)

(Measured - Specification = Excess clearance)

Used shim measurement = 2.80 mm (0.1102 in.)

0.25 mm (0.0098 in.) + 2.80 mm (0.1102 in.) = 3.05 mm (0.1201 in.)

(Excess clearance + Used shim = Ideal new shim)

Closest new shim = 3.05 mm (0.1201 in.)

Select No. 12 shim

HINT:

- Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).
- Refer to the new shim thickness table below.

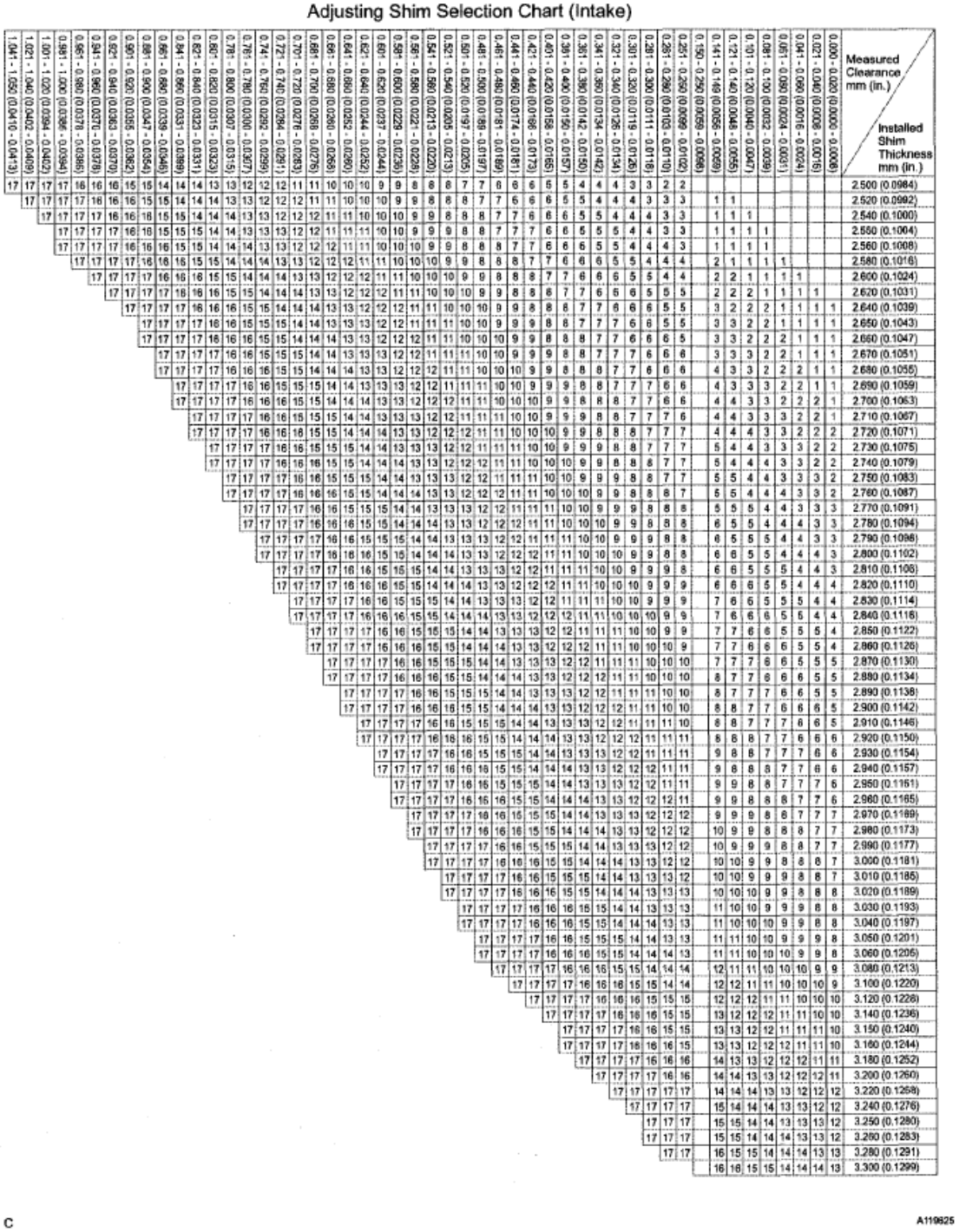


Fig. 604: Adjusting Shim Selection Chart (Intake Valve)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Intake valve clearance (Cold): 0.15 to 0.25 mm (0.0059 to 0.0098 in.)

EXAMPLE:

The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 12 shim.

New shim thickness mm (in.)

SHIM THICKNESS SPECIFICATION

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)	-	-

HINT:

New shims have the thickness in millimeters imprinted on the face.

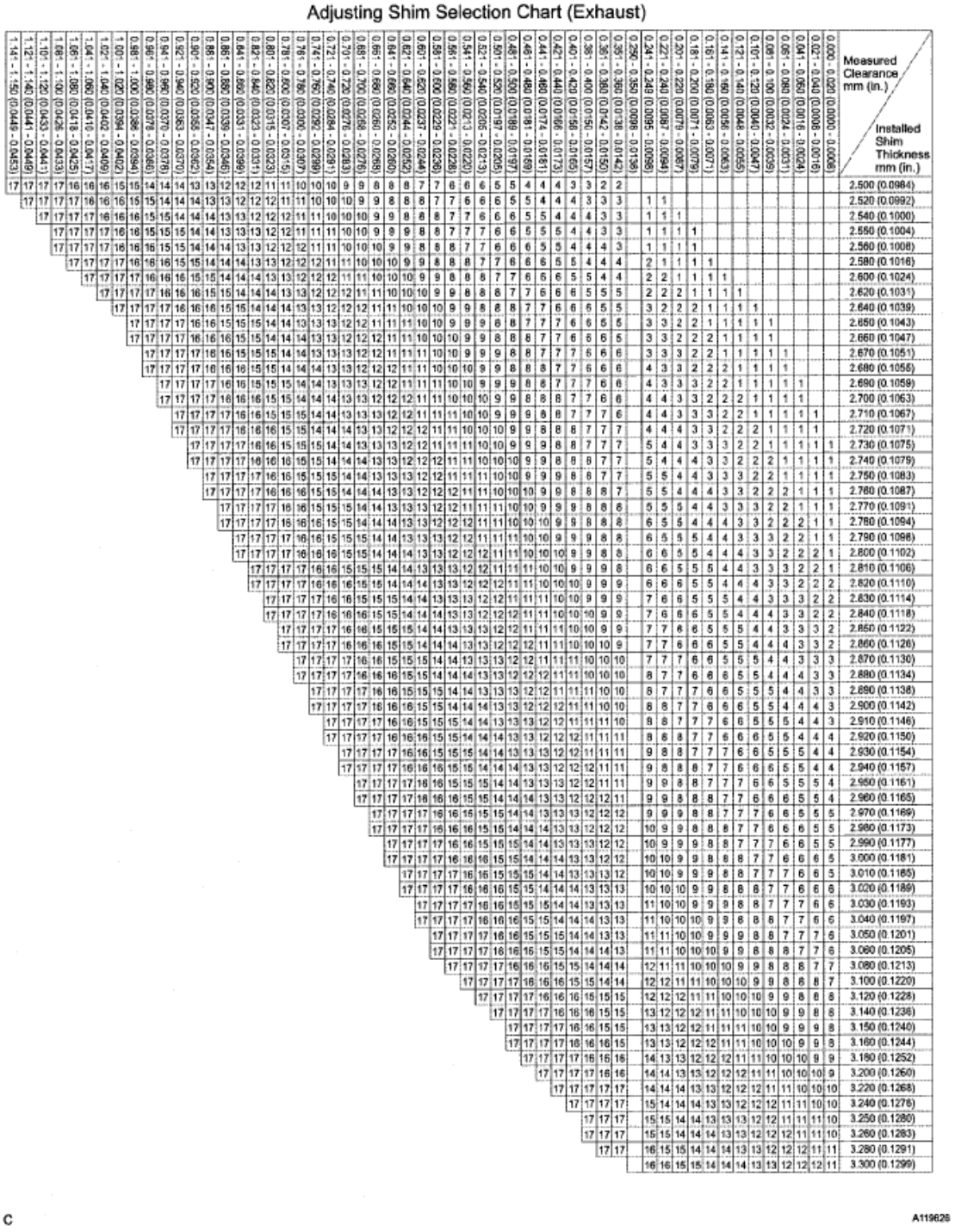


Fig. 605: Adjusting Shim Selection Chart (Exhaust Valve)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Exhaust valve clearance (Cold): 0.25 to 0.35 mm (0.0098 to 0.0138 in.)

EXAMPLE:

The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 10 shim.

New shim thickness mm (in.)

SHIM THICKNESS SPECIFICATION

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)	-	-

HINT:

New shims have the thickness in millimeters imprinted on the face.

h. Place a new adjusting shim on the valve lifter with imprinted number facing down.

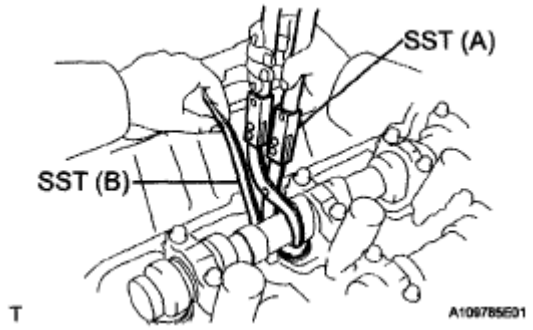


Fig. 606: Adjusting Shim On Valve Lifter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Press down the valve lifter with SST (A), and remove SST (B).

SST 09248-55040 (09248-05410, 09248-05420)

j. Recheck the valve clearance.

47. **INSTALL NO. 2 CYLINDER HEAD COVER GASKET**
    a. Install a new No. 2 cylinder head cover gasket to the cylinder head cover sub-assembly LH.
48. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH**

a. Apply seal packing to the cylinder head as shown in the illustration.

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

NOTE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine within 2 hours after installing.**

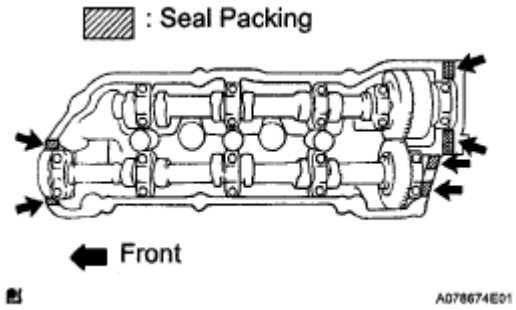


Fig. 607: Locating Seal Packing To Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.

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

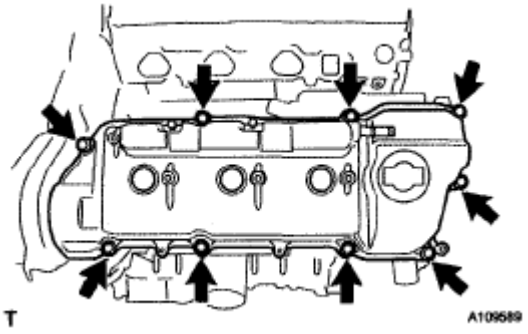


Fig. 608: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. **INSTALL CYLINDER HEAD COVER GASKET**
    a. Install a new cylinder head cover gasket to the cylinder head cover sub-assembly.
50. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
    a. Apply seal packing to the cylinder head as shown in the illustration.

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

NOTE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes after applying seal packing.**
- **Do not start the engine within 2 hours after installing.**

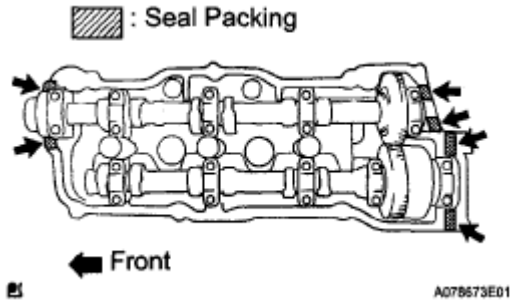


Fig. 609: Locating Seal Packing To Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the cylinder head cover with the 9 bolts. Tighten the bolts uniformly in several steps.

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

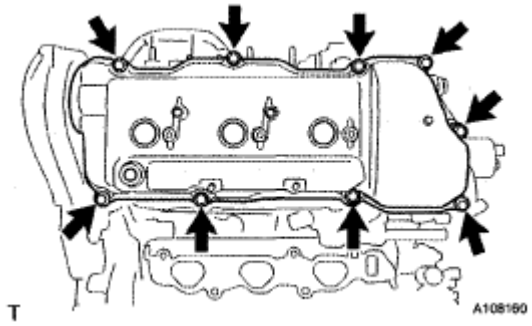


Fig. 610: Locating Cylinder Head Cover With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

51. **INSTALL OIL FILLER CAP GASKET**
    a. Install the oil filler cap gasket to the oil filler cap sub-assembly.
52. **INSTALL OIL FILLER CAP SUB-ASSEMBLY**
    a. Install the oil filler cap sub-assembly to the cylinder head cover sub-assembly LH.

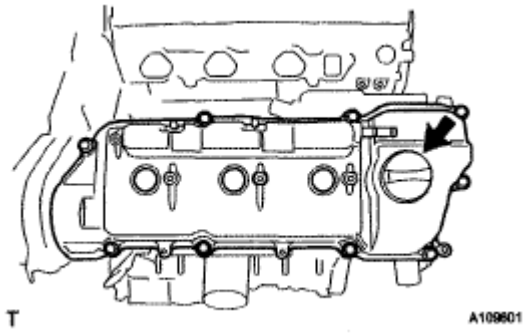


Fig. 611: Locating Oil Filler Cap Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. **INSTALL VENTILATION VALVE SUB-ASSEMBLY**
    a. Install the ventilation valve sub-assembly to the cylinder head cover sub-assembly.

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

54. **INSTALL SPARK PLUG**
    a. Install the spark plug.

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

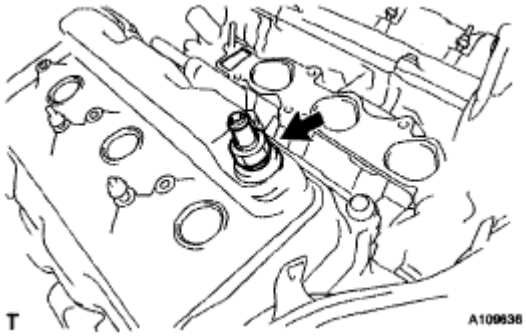


Fig. 612: Locating Spark Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL KNOCK CONTROL SENSOR** (See **INSTALLATION**)
2. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY**
    a. Apply adhesive to 2 or 3 threads of the oil pressure switch.

       Adhesive: Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

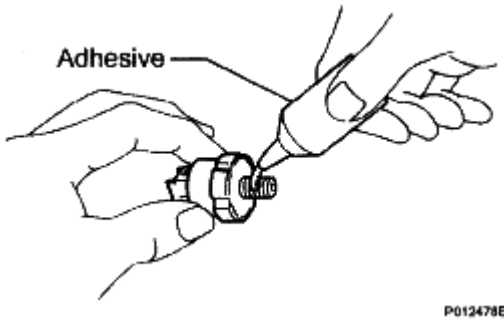


Fig. 613: Applying Adhesive To Threads Of Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a 24 mm deep socket wrench, install the oil pressure switch.

Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

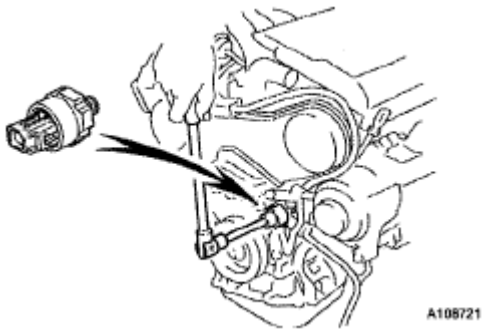


Fig. 614: Installing Oil Pressure Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL THERMOSTAT** (See **INSTALLATION**)
4. **INSTALL INLET WATER** (See **INSTALLATION**)
5. **INSTALL INLET WATER PIPE** (See **INSTALLATION**)
6. **INSTALL NO. 2 INTAKE AIR CONNECTOR BRACKET**
   a. Install the No. 2 intake air connector bracket with the 2 bolts. Using several steps, tighten the bolts uniformly in the sequence shown in the illustration.

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

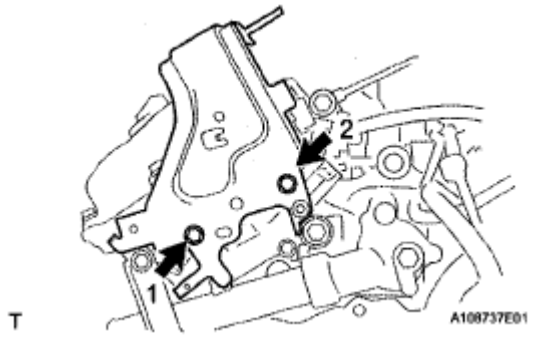


Fig. 615: Locating Intake Air Connector Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET**
   a. Temporarily install the No. 1 mounting bracket with the 4 bolts.
   b. Install the mounting bracket by tightening the 4 bolts in the order shown in the illustration.

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

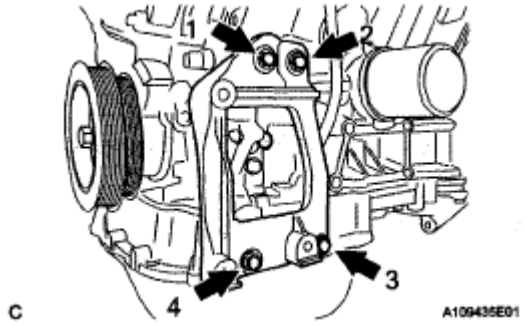


Fig. 616: Locating Mounting Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL ENGINE MOUNTING STAY BRACKET**
   a. Install the engine mounting stay bracket with the bolt and nut.

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

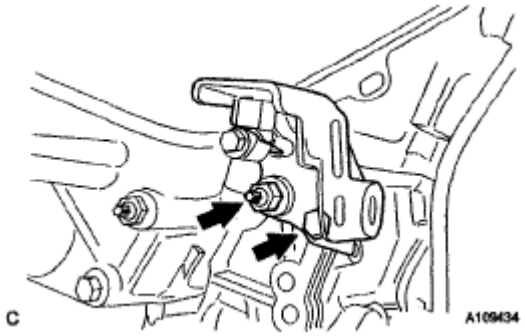


Fig. 617: Locating Engine Mounting Stay Bracket, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL ENGINE MOUNTING BRACKET RH**
   a. Install the 3 bolts and engine mounting bracket RH.

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

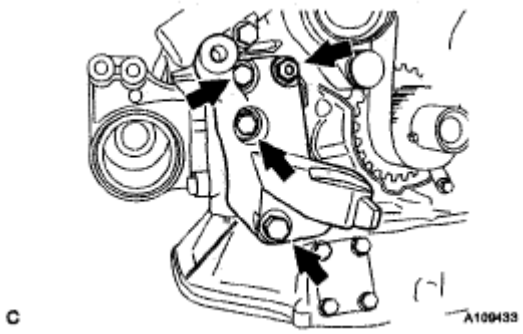


Fig. 618: Locating Engine Mounting Bracket RH, Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL NO. 2 MANIFOLD STAY**
    a. Install the 2 bolts and No. 2 manifold stay.

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

11. **INSTALL NO. 2 EXHAUST MANIFOLD CONVERTER** (See **INSTALLATION**)
12. **INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR** (See **INSTALLATION**)
13. **INSTALL NO. 3 MANIFOLD CONVERTER INSULATOR** (See **INSTALLATION**)
14. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
15. **INSTALL OUTLET WATER** (See **INSTALLATION**)
16. **INSTALL INTAKE MANIFOLD** (See **INSTALLATION**)
17. **INSTALL INTAKE AIR SURGE TANK** (See **INSTALLATION**)
18. **INSTALL EMISSION CONTROL VALVE SET** (See **INSTALLATION**)

19. **INSTALL NO. 2 ENGINE HANGER**
    a. Install the No. 2 engine hanger with the 2 bolts in the correct direction shown in the illustration.

    Torque: 20 N*m (200 kgf*cm, 14 ft.*lbf)

    HINT:

    Part No. is shown in the table below.

TORQUE SPECIFICATION

No. 2 engine hanger	12282-20020
Bolt	91641-80825

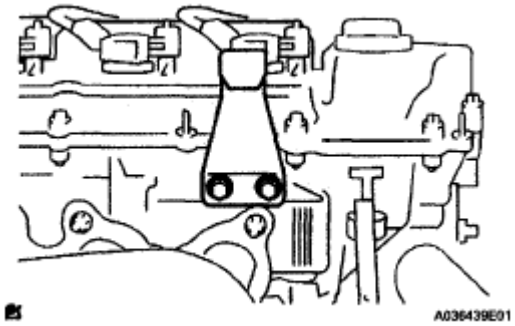


Fig. 619: Identifying Engine Hanger
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE ENGINE STAND**

