

2008 ENGINE**2AZ-FE Engine Mechanical - tC****ENGINE****ON-VEHICLE INSPECTION**

1. **INSPECT ENGINE COOLANT**
2. **INSPECT ENGINE OIL**
3. **INSPECT BATTERY**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**
 - a. Remove the air cleaner cap sub-assembly.
 - b. Remove the air filter element.
 - c. Visually check that the air filter is not excessively damaged or oily.

If necessary, replace the air filter.

5. **INSPECT SPARK PLUG**
6. **INSPECT FAN AND GENERATOR V BELT**

HINT:

You do not need to check the belt deflection because the auto tensioner has been adopted.

7. **INSPECT IGNITION TIMING**

NOTE:

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

- a. Warm up and stop the engine.
- b. When using the intelligent tester:
 1. Connect the intelligent tester to the DLC3.

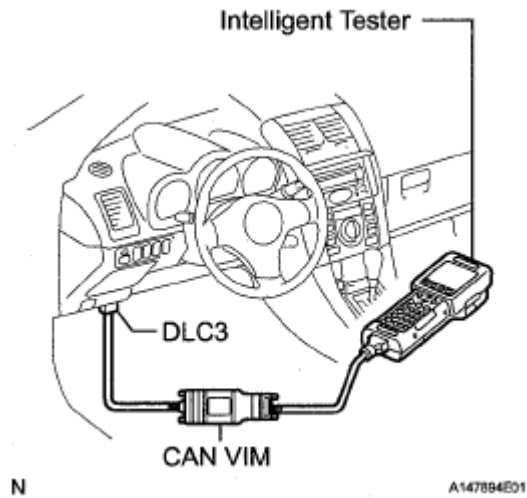


Fig. 1: Identifying Intelligent Tester To DLC3
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Allow the engine to idle.
3. Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
4. Read IGN ADVANCE to check the ignition timing.

Standard ignition timing: 5 to 15° BTDC at idle

5. Check that the ignition timing advances immediately when the engine speed is increased.
 6. Turn the ignition switch OFF.
 7. Disconnect the intelligent tester from the DLC3.
- c. When not using the intelligent tester:
1. Remove the No. 1 engine cover (see **REMOVAL**).
 2. Open the IG cover located in the right of the No. 4 ignition coil.
 3. Pull out the wire harness as shown in the illustration.

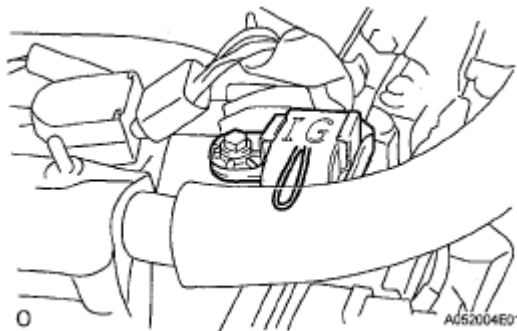


Fig. 2: Identifying Wire Harness
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Connect the timing light to the wire harness.

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

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

SST 09843-18040

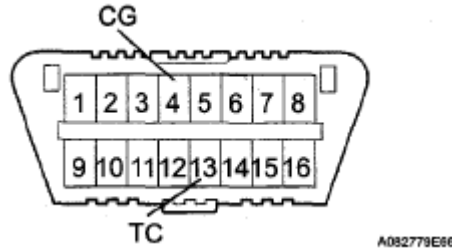


Fig. 3: Identifying Terminals 13 (TC) And 4 (CG) Of DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Allow the engine to idle and check the ignition timing.

Standard ignition timing: 8 to 12° BTDC at idle

HINT:

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

7. Remove the SST from the DLC3.
8. Allow the engine to idle and check the ignition timing.

Standard ignition timing: 5 to 15° BTBC

9. Check that the ignition timing advances immediately when the engine speed is increased.
10. Turn the ignition switch OFF.
11. Remove the timing light.
12. Close the IG cover.
13. Install the No. 1 engine cover (see **INSPECTION**).

8. INSPECT ENGINE IDLE SPEED

- a. With intelligent tester:

1. Turn OFF all the accessories and air conditioning.
2. Move the shift lever to P or neutral.
3. Connect the intelligent tester to the DLC3.

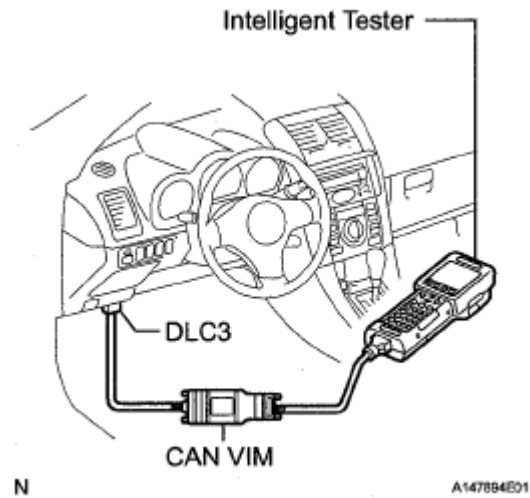


Fig. 4: Connecting Intelligent Tester To DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Warm up the engine.
5. Select the tester menus: DIAGNOSIS, ENHANCED OBD II and DATA LIST.
6. Read ENGINE SPEED to check the idle speed while the radiator-cooling fan is not rotating.

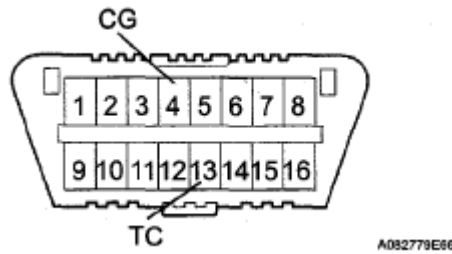
Standard idle speed

STANDARD IDLE SPEED

Item	Specified Condition
A/T vehicle	610 to 710 rpm
M/T vehicle	650 to 750 rpm

7. Turn the ignition switch OFF.
 8. Disconnect the tester from the DLC3.
- b. Without intelligent tester:
1. Turn OFF all the accessories and air conditioning.
 2. Move the shift lever to P or neutral.
 3. Connect the SST to 9 (TAC) of the DLC3 terminal, and then connect a tachometer to the SST.

SST 09843-18030

**Fig. 5: Identifying DLC3**

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

4. Warm up the engine.
5. Check the idle speed while the radiator-cooling fan is not rotating.

Standard idle speed

STANDARD IDLE SPEED

Item	Specified Condition
A/T vehicle	610 to 710 rpm
M/T vehicle	650 to 750 rpm

6. Turn the ignition switch OFF.
7. Remove the tachometer and disconnect the SST from the DLC3.

9. INSPECT COMPRESSION

- a. Warm up and stop the engine.
- b. Remove the No. 1 engine cover (see **REMOVAL**).
- c. Remove the 4 ignition coils (See **REMOVAL**).
- d. Remove the 4 spark plugs.
- e. Disconnect the 4 fuel injector connectors.
- f. Set SST and a compression gauge.

SST 09992-00500

- g. Insert the compression gauge into the spark plug hole.
- h. While cranking the engine, measure the compression pressure.

Standard compression pressure: 1,300 kPa (13.3 kgf/cm² , 189 psi)

Minimum pressure: 1,000 kPa (10.2 kgf/cm² , 145 psi)

Standard difference between each cylinder: 100 kPa (1.0 kgf/cm² , 14 psi)

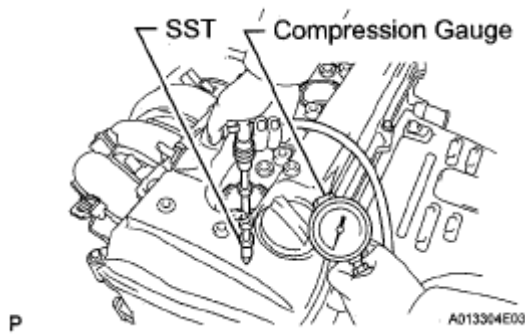


Fig. 6: Measuring Compression Pressure

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

NOTE:

- Always use a fully charged battery to obtain an engine speed of 250 rpm or more.
- Check the other cylinders' compression pressures in the same way.
- This measurement must be done as quickly as possible.

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.

10. INSPECT CO/HC

HINT:

The ECM properly controls the CO/HC concentration in the emission gas.

- a. Start and warm up the engine.
- b. Run the engine at 2,500 rpm for approximately 180 seconds.
- c. Insert the CO/HC meter testing probe at least 40 cm (1.3 ft.) into the tailpipe while idling.
- d. Inspect the CO/HC concentration while idling and/or at 2,500 rpm.

If the CO/HC concentration is not as specified, perform troubleshooting in the order given below.

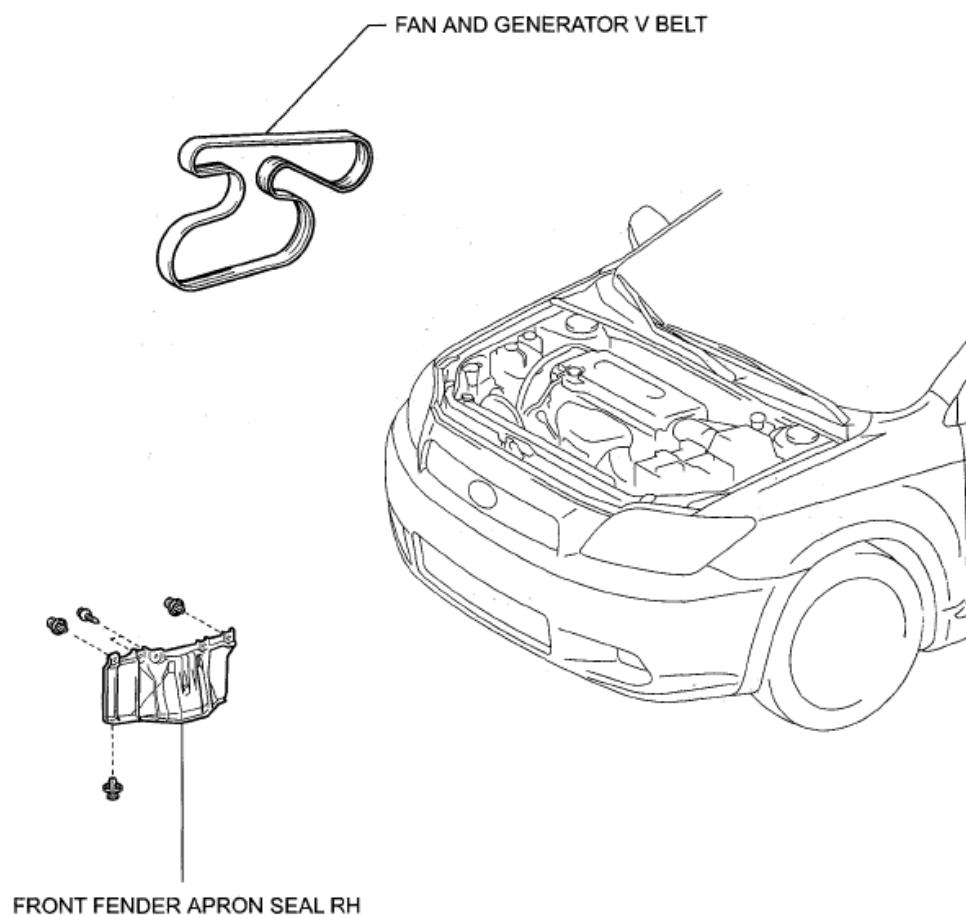
1. See the table below for possible causes, and then inspect and repair the applicable causes if necessary.

CO/HC POSSIBLE CAUSES REFERENCE

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignition: ○ Incorrect timing ○ 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 leakage: ○ Ventilation hoses ○ Intake manifold ○ Throttle body ○ Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve Faulty SFI system: ○ Faulty pressure regulator ○ Faulty engine coolant temperature sensor ○ Faulty mass air flow meter ○ Faulty ECM ○ Faulty injectors ○ Faulty throttle body

DRIVE BELT

COMPONENTS



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Fig. 7: Identifying Drive Belt Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE FRONT FENDER APRON SEAL RH** (See **REMOVAL**)
2. **REMOVE FAN AND GENERATOR V BELT**
 - a. Using SST, loosen the V-ribbed belt tensioner arm clockwise, then remove the fan and generator V belt.

SST 09249-63010

NOTE:

- Be sure to connect SST and the tools so that they are in line when using.
- When retracting the tensioner, turn it clockwise slowly in 3 seconds or more. Do not apply force rapidly.
- After the tensioner is retracted all the way, do not apply force any more than necessary.

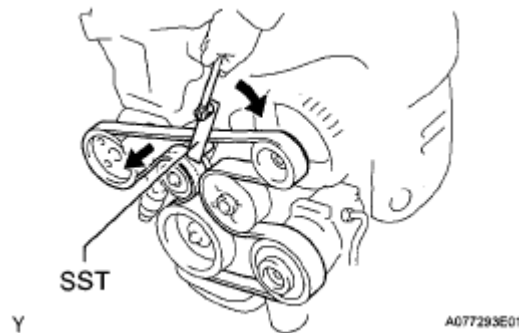


Fig. 8: Identifying Fan And Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION**1. INSTALL FAN AND GENERATOR V BELT**

- a. Using SST, loosen the V-ribbed belt tensioner arm clockwise, then install the fan and generator V belt.

SST 09249-63010

NOTE:

- Be sure to connect SST and the tools so that they are in line when using.
- When retracting the tensioner, turn it clockwise slowly in 3 seconds or more. Do not apply force rapidly.
- After the tensioner is retracted all the way, do not apply force any more than necessary.

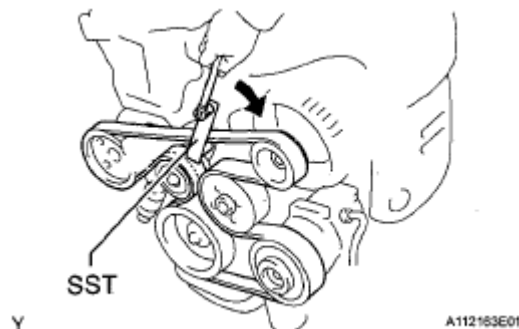


Fig. 9: Identifying Fan And Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FRONT FENDER APRON SEAL RH (See INSTALLATION)

VALVE CLEARANCE

ADJUSTMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION: Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER RH
4. REMOVE ENGINE UNDER COVER LH
5. REMOVE FRONT FENDER APRON SEAL RH
6. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)
7. REMOVE FAN AND GENERATOR V BELT (See REMOVAL)
8. REMOVE VANE PUMP ASSEMBLY
9. REMOVE ENGINE MOUNTING INSULATOR RH (See REMOVAL)
10. REMOVE IGNITION COIL ASSEMBLY (See REMOVAL)
11. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See REMOVAL)
12. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See REMOVAL)
13. CHECK VALVE CLEARANCE
 - a. Check only the valves indicated.
 1. Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Standard valve clearance (cold)

STANDARD VALVE CLEARANCE (COLD)

Item	Standard Condition
Intake	0.19 to 0.29 mm (0.0075 to 0.0114 in.)
Exhaust	0.30 to 0.40 mm (0.0118 to 0.0158 in.)

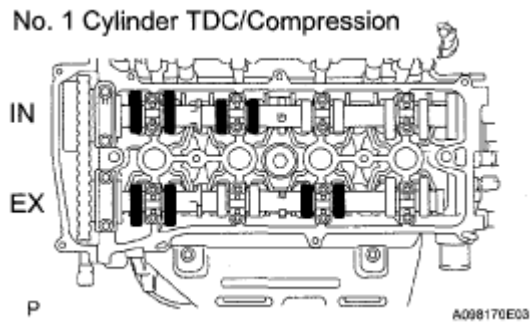


Fig. 10: Identifying No. 1 Cylinder TDC/Compression
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Record any out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve clearance lifters.
- b. Turn the crankshaft 1 revolution (360°) and set the No. 4 cylinder to the TDC/compression.
- c. Check only the valves indicated.
 1. Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Standard valve clearance (cold)

STANDARD VALVE CLEARANCE (COLD)

Item	Standard Condition
Intake	0.19 to 0.29 mm (0.0075 to 0.0114 in.)
Exhaust	0.30 to 0.40 mm (0.0118 to 0.0158 in.)

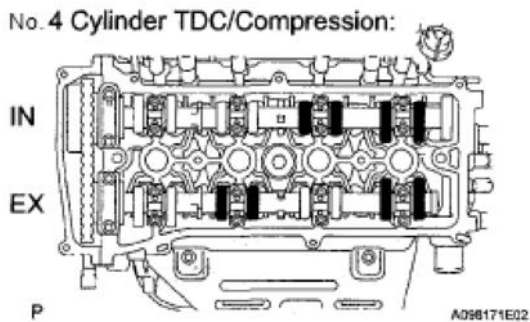


Fig. 11: Identifying No. 4 Cylinder TDC/Compression
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

14. ADJUST VALVE CLEARANCE

- a. Remove the No. 2 camshaft (see **REMOVAL**).
- b. Remove the camshaft (see **REMOVAL**).
- c. Remove the valve lifters.

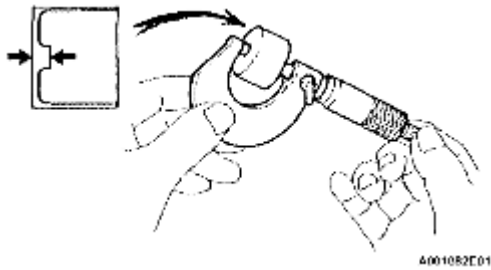
- d. Using a micrometer, measure the thickness of the removed valve lifters.
- e. Calculate the thickness of a new lifter so that the valve clearance comes within the specified values.

New lifter thickness**NEW LIFTER THICKNESS**

Item	Specification
Intake	$A = B + (C - 0.24 \text{ mm (0.0095 in.)})$
Exhaust	$A = B + (C - 0.35 \text{ mm (0.0138 in.)})$

NEW LIFTER THICKNESS

A	New lifter thickness
B	Used lifter thickness
C	Measured valve clearance

**Fig. 12: Measuring Thickness Of Removed Valve Lifters**

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

EXAMPLE (Intake):

Measured intake valve clearance = 0.40 mm (0.0158 in.)

 $0.40 \text{ mm (0.0158 in.)} - 0.24 \text{ mm (0.0095 in.)} = 0.16 \text{ mm (0.0063 in.)}$

(Measured - Specification = Excess clearance)

Used lifter measurement = 5.250 mm (0.2067 in.)

 $0.16 \text{ mm (0.0063 in.)} + 5.250 \text{ mm (0.2067 in.)} = 5.410 \text{ mm (0.2130 in.)}$

(Excess clearance + Used lifter = Ideal new lifter)

Closest new lifter = 5.410 mm (0.2130 in.)

Select No. 42 lifter

- f. Select a new lifter with a thickness as close as possible to the calculated values.

HINT:

Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 to 5.740 mm (0.1992 to 0.2260 in.).

- g. Install the selected valve lifter.

Valve Lifter Selection Chart (Intake)

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Fig. 13: Valve Lifter Selection Chart (Intake)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

New Lifter Thickness

NEW LIFTER THICKNES

2008 Scion tC

2008 ENGINE 2AZ-FE Engine Mechanical - tC

Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)	-	-

Standard intake valve clearance (cold): 0.19 to 0.29 mm (0.008 to 0.011 in.)

EXAMPLE:

The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).

Replace the 5.250 mm (0.2067 in.) lifter with a new No. 42 lifter.

Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)	Lifter No.	Thickness mm (in.)
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
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24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)	-	-

Standard exhaust valve clearance (cold): 0.30 to 0.40 mm (0.012 to 0.016 in.)

EXAMPLE:

The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).

Replace the 5.340 mm (0.2102 in.) lifter with a new No. 4 lifter.

15. INSTALL CAMSHAFT

- Apply a light coat of engine oil to the journal portion of the camshaft.
- Install the timing chain onto the camshaft timing gear with the paint mark aligned with the timing mark in the camshaft timing gear as shown in the illustration.

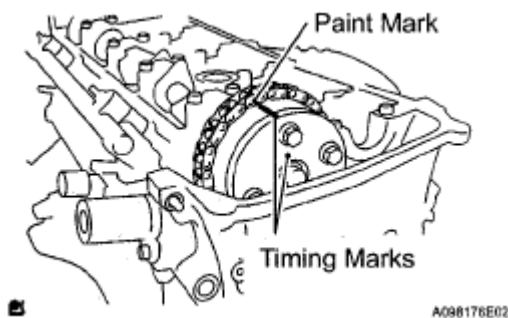


Fig. 15: Identifying Paint And Timing Marks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps into the cylinder head.

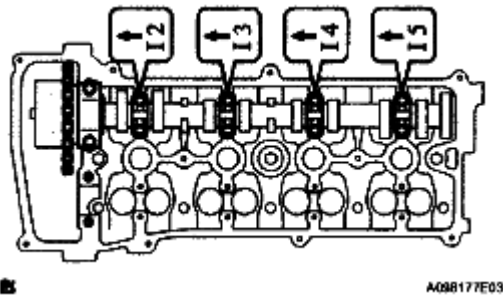


Fig. 16: Identifying Bearing Cap Numbers

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

- d. Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- e. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

29.5 N*m (301 kgf*cm, 22 ft.*lbf) for No. 1 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf) for No. 3 bearing cap

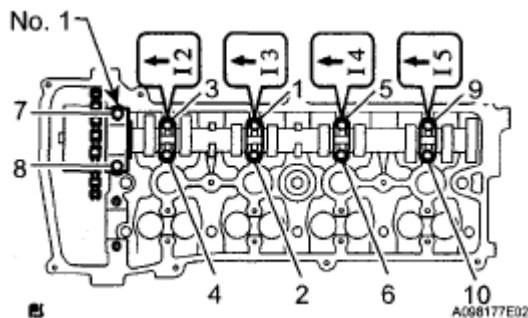


Fig. 17: Tightening Sequence Of Bearing Cap Bolts In Sequence

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

16. INSTALL NO. 2 CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the No. 2 camshaft.
- b. Put the No. 2 camshaft on the cylinder head with the paint mark of the chain aligned with the timing mark in the camshaft timing sprocket.

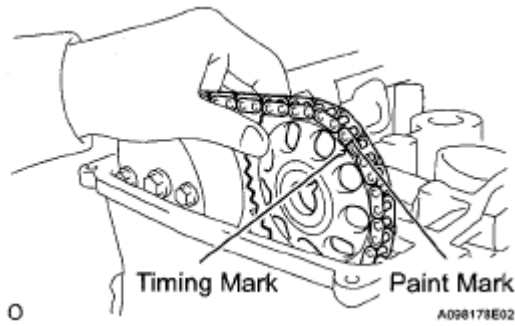


Fig. 18: Identifying Paint And Timing Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. While holding the No. 2 camshaft by hand, temporarily tighten the camshaft timing sprocket set bolt.

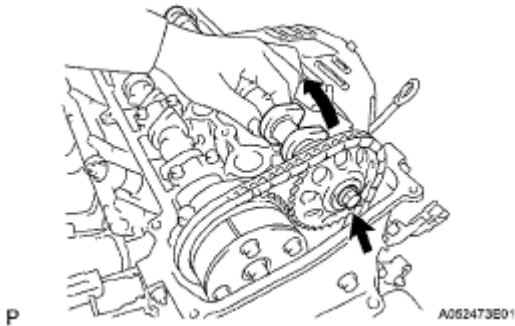


Fig. 19: Tightening Camshaft Timing Sprocket Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.

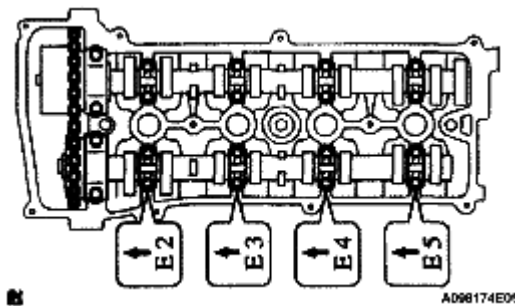


Fig. 20: Identifying Front Marks And Numbers Order
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- f. Using several steps, uniformly tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque:

29.5 N*m (301 kgf*cm, 22 ft.*lbf) for No. 1 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf) for No. 3 bearing cap

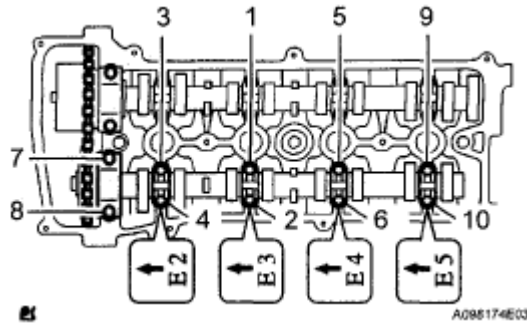


Fig. 21: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. While holding the camshaft with a wrench, tighten the camshaft timing sprocket set bolt.

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

NOTE: Be careful not to damage the valve lifter.

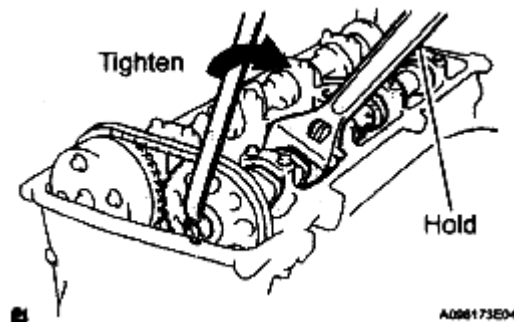
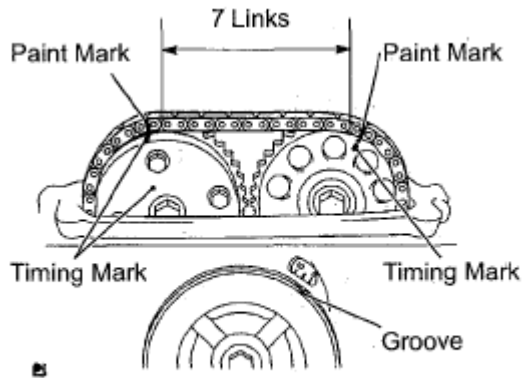


Fig. 22: Tightening Camshaft Timing Sprocket Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Check that the paint marks on the chain and camshaft timing gear and sprocket are aligned. Also, check that the crankshaft pulley groove is aligned with the timing mark "0" of the timing chain cover.

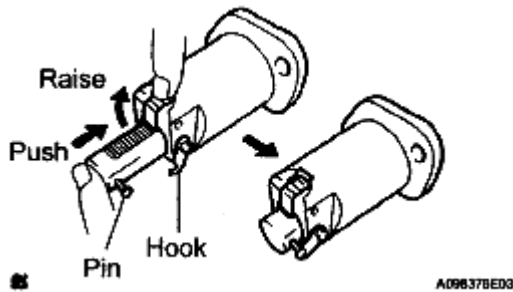


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Fig. 23: Aligning Paint Marks On Chain, Camshaft Timing Gear And Sprocket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. INSTALL NO. 1 CHAIN TENSIONER

- a. Release the ratchet pawl, then fully push in the plunger and hook the hook to the pin so that the plunger is in the position shown in the illustration.



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Fig. 24: Pushing In Plunger And Hook To Pin
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

NOTE: When installing the chain tensioner, set the hook again if the hook releases the plunger.

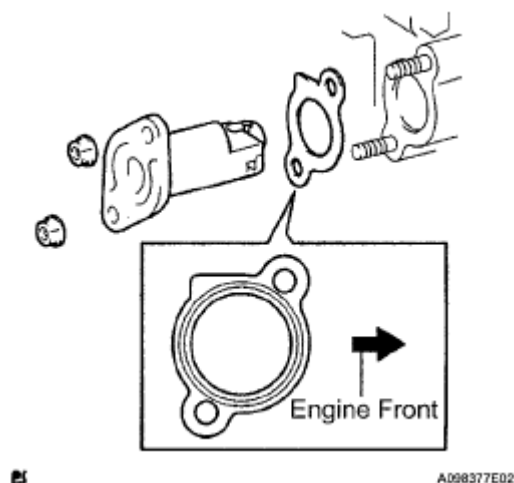


Fig. 25: Identifying Gasket And Chain Tensioner With Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.

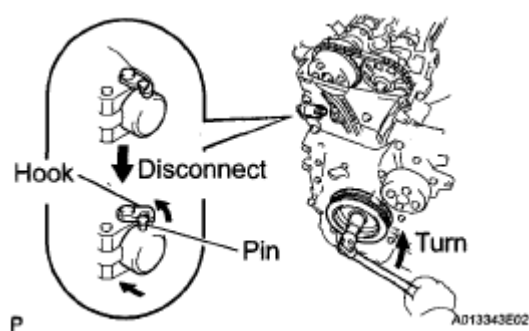


Fig. 26: Identifying Plunger Knock Pin
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Turn the crankshaft clockwise, then check that the plunger is extended.

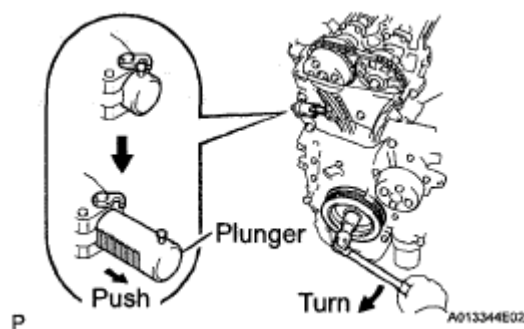


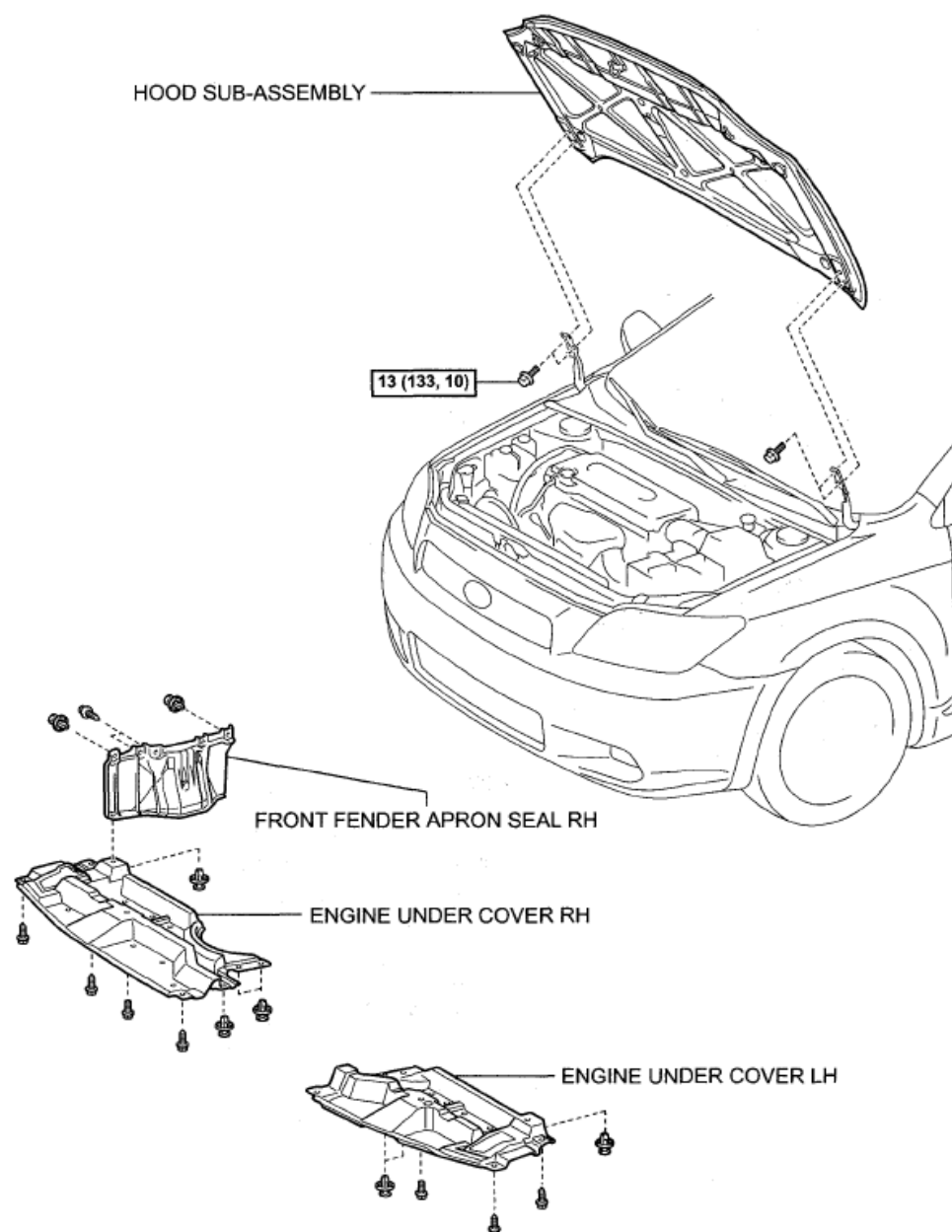
Fig. 27: Turning Crankshaft Clockwise
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See INSTALLATION)
19. **INSTALL IGNITION COIL ASSEMBLY** (See INSTALLATION)
20. **INSTALL ENGINE MOUNTING INSULATOR RH** (See INSTALLATION)
21. **INSTALL VANE PUMP ASSEMBLY**
22. **INSTALL FAN AND GENERATOR V BELT** (See INSTALLATION)
23. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
24. **CHECK FOR ENGINE OIL LEAKS**
25. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
26. **INSTALL FRONT FENDER APRON SEAL RH**
27. **INSTALL ENGINE UNDER COVER LH**
28. **INSTALL ENGINE UNDER COVER RH**
29. **INSTALL FRONT WHEEL RH**
30. **PERFORM INITIALIZATION**
 - a. Perform initialization (see INITIALIZATION).

NOTE: Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

TIMING CHAIN

COMPONENTS



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

A114140E05

Fig. 28: Identifying Timing Chain Replacement Components With Torque Specifications (1 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

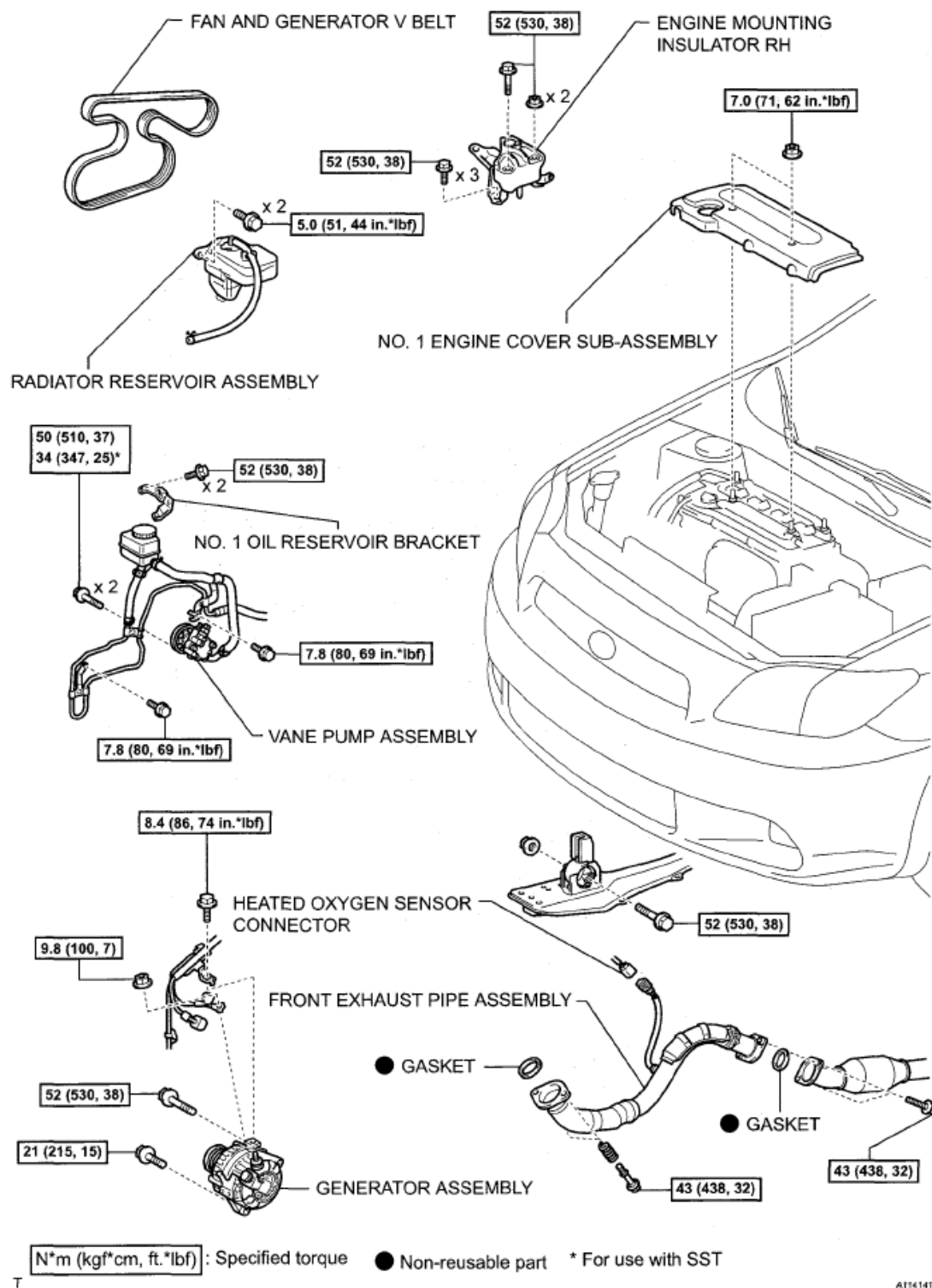
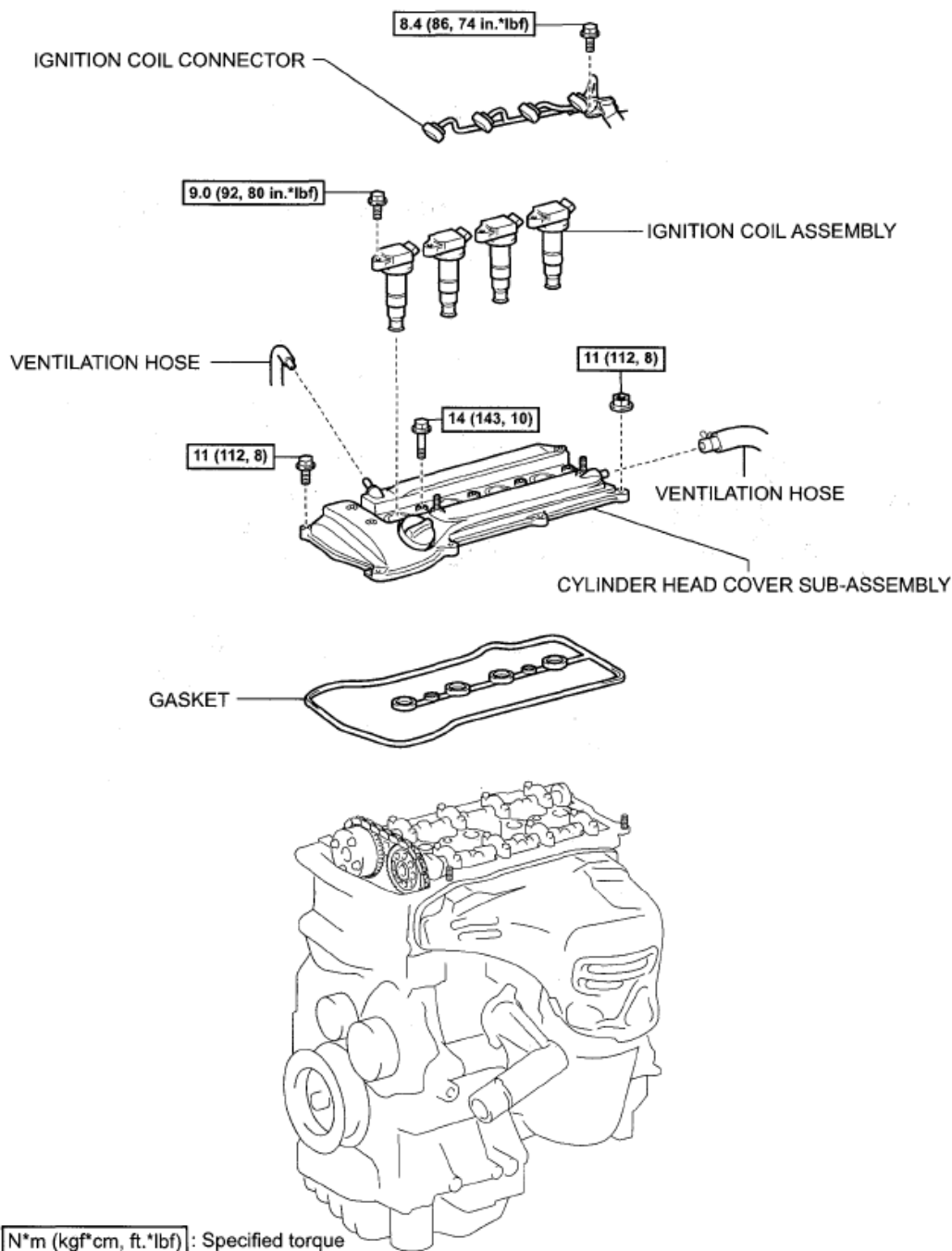


Fig. 29: Identifying Timing Chain Replacement Components With Torque Specifications (2 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A114142E02

Fig. 30: Identifying Timing Chain Replacement Components With Torque Specifications (3 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

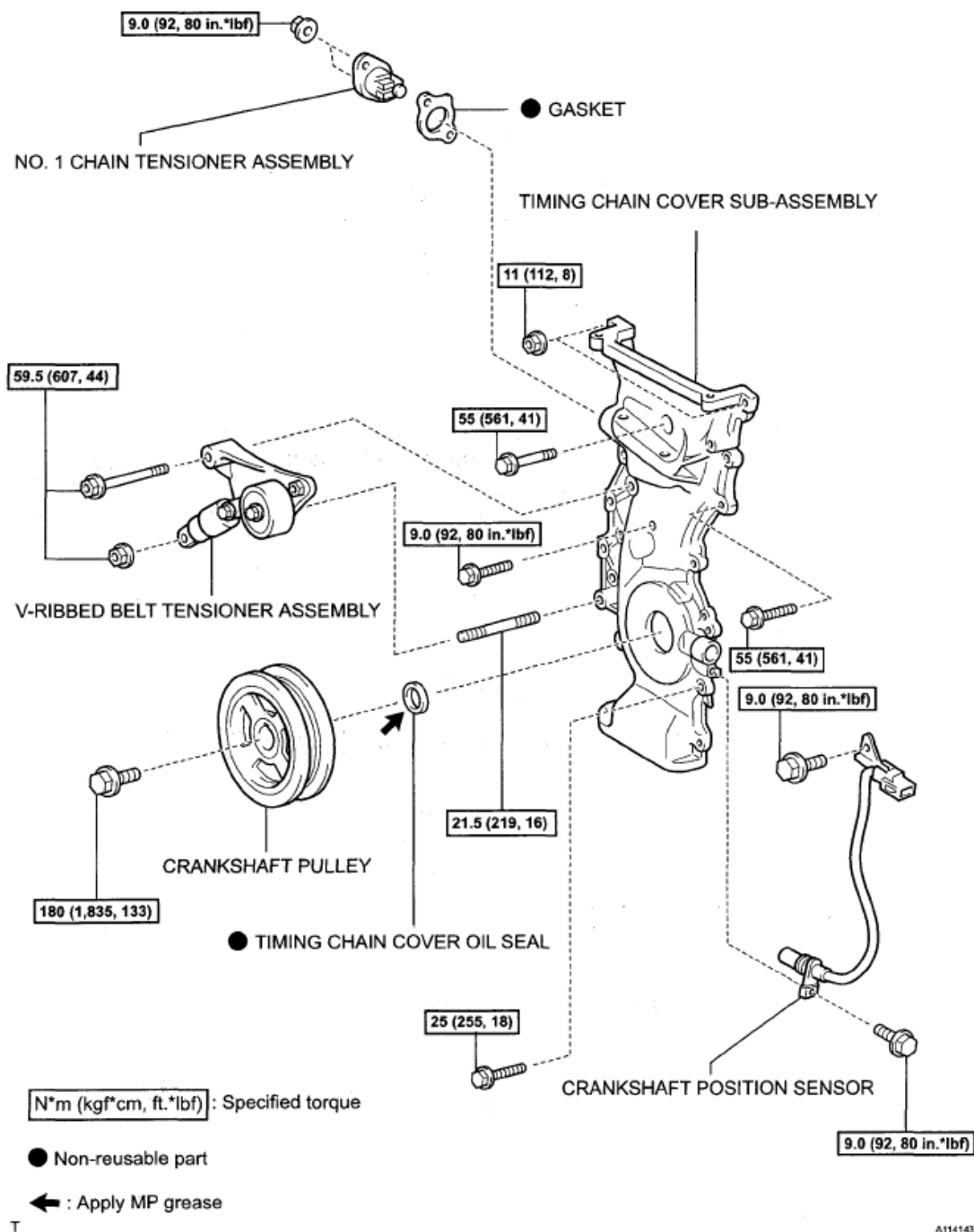


Fig. 31: Identifying Timing Chain Replacement Components With Torque Specifications (4 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

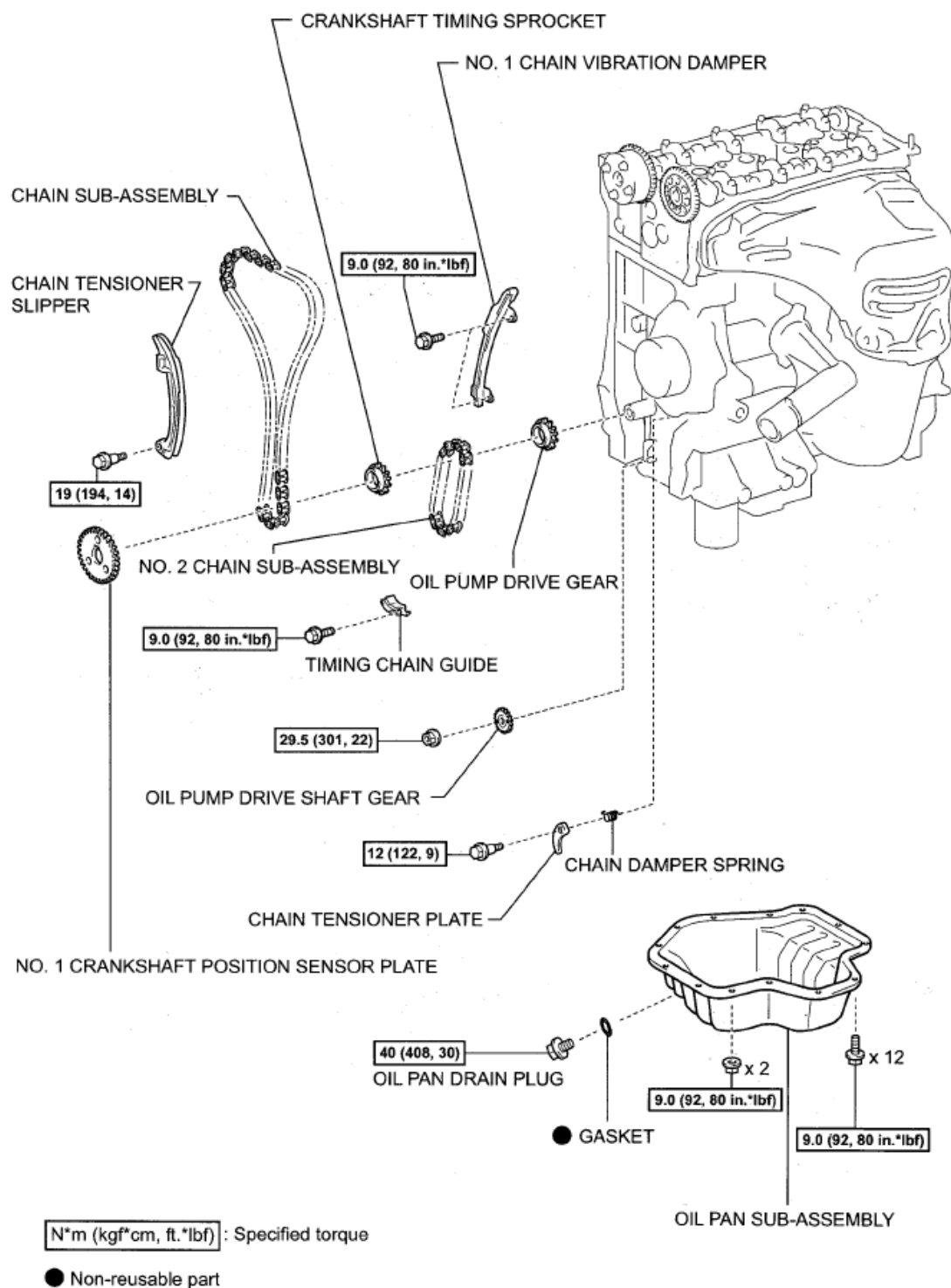


Fig. 32: Identifying Timing Chain Replacement Components With Torque Specifications (5 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION: Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

- 2. REMOVE HOOD SUB-ASSEMBLY**
- 3. REMOVE FRONT WHEEL RH**
- 4. REMOVE ENGINE UNDER COVER RH**
- 5. REMOVE ENGINE UNDER COVER LH**
- 6. REMOVE FRONT FENDER APRON SEAL RH**
- 7. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY**
 - a. Remove the 2 nuts and cover.

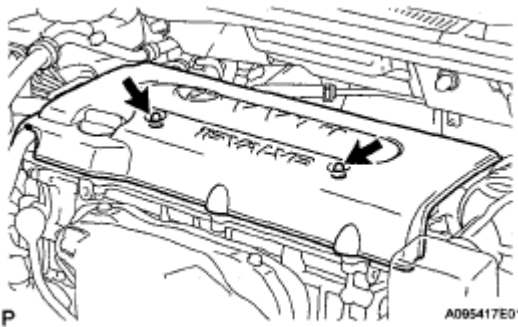


Fig. 33: Identifying Cover With Nuts

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

- 8. DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
- 9. REMOVE FRONT EXHAUST PIPE ASSEMBLY (See REMOVAL)**
- 10. REMOVE FAN AND GENERATOR V BELT (See REMOVAL)**
- 11. REMOVE GENERATOR ASSEMBLY (See REMOVAL)**
- 12. REMOVE VANE PUMP ASSEMBLY**
- 13. REMOVE ENGINE MOUNTING INSULATOR RH**
 - a. Remove the bolt and radiator reservoir.

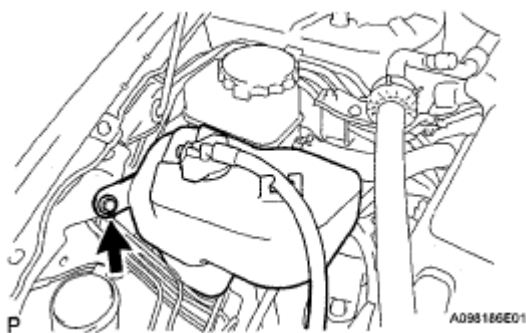


Fig. 34: Identifying Radiator Reservoir With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Separate the vane pump oil reservoir from the No. 1 oil reservoir bracket.

NOTE: Do not disconnect the 2 oil reservoir hoses.

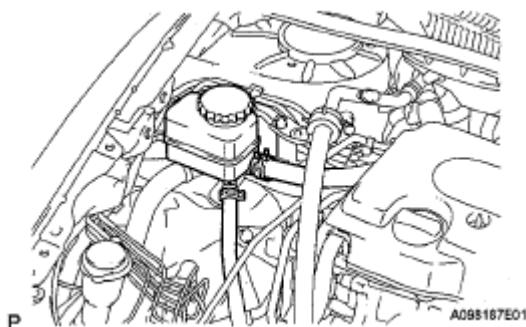


Fig. 35: Identifying Vane Pump Oil Reservoir
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2 bolts.

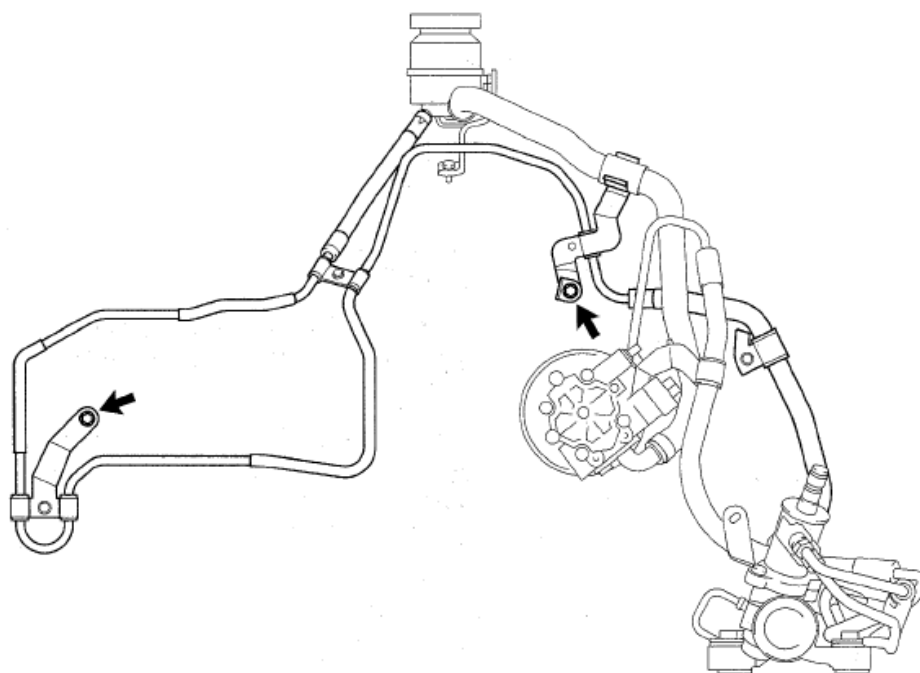


Fig. 36: Identifying Bolts

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

- d. Remove the 2 bolts and No. 1 oil reservoir bracket.

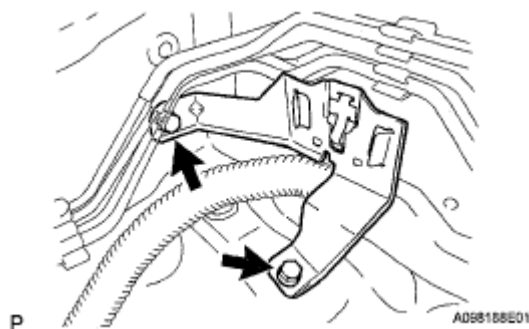


Fig. 37: Identifying No. 1 Oil Reservoir Bracket With Bolts

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

- e. Remove the bolt of the wire harness protector.
- f. Disconnect the 2 clamps of the engine wire.

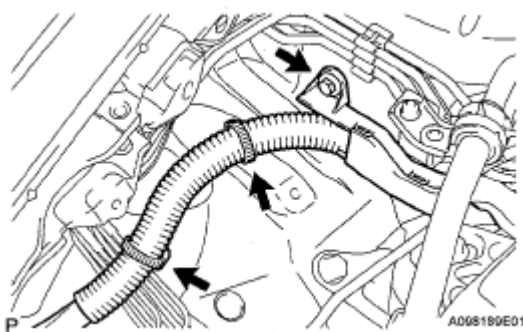


Fig. 38: Identifying Wire Harness Protector Bolt And Engine Wire Clamps
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Place a transmission jack underneath the engine, then put a wooden block on the jack.

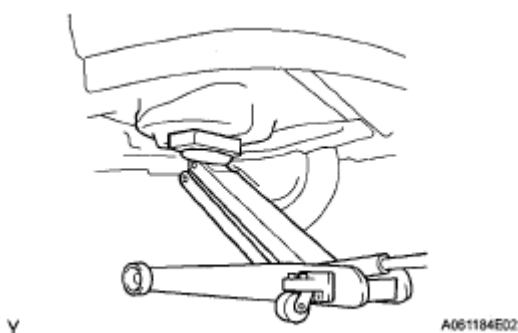


Fig. 39: Placing Transmission Jack Underneath Engine
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Remove the bolt, nut and front engine mounting insulator from the front engine mounting bracket.

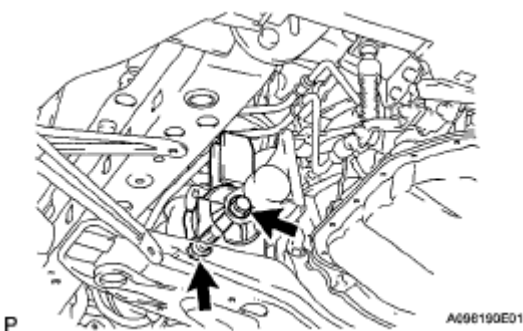


Fig. 40: Identifying Front Engine Mounting Insulator With Bolt And Nut
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Remove the 4 bolts, 2 nuts and engine mounting insulator RH.

NOTE: Do not apply excessive force to the return tube when removing the engine mounting insulator RH.

HINT:

Keep clearance by lowering the engine using the transmission jack when removing the engine mounting insulator RH.

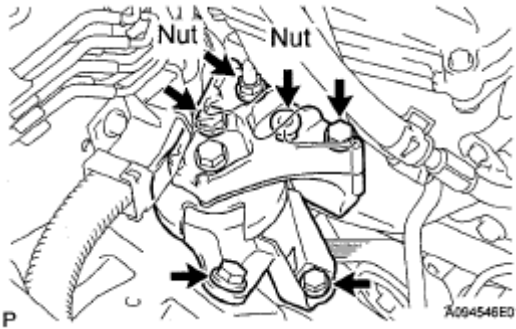


Fig. 41: Identifying Engine Mounting Insulator RH With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE IGNITION COIL ASSEMBLY** (See **REMOVAL**)
15. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Disconnect the 2 ventilation hoses from the cylinder head cover.

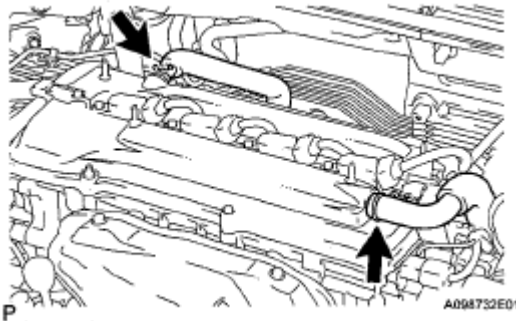


Fig. 42: Identifying Ventilation Hoses From Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disconnect the clamp of the engine wire (labeled A).
 - c. Remove the bolt, then disconnect the engine wire (labeled B).

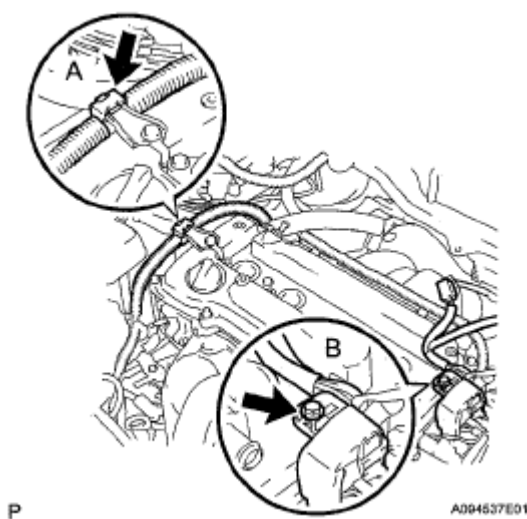


Fig. 43: Identifying Clamp Of Engine Wire And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 8 bolts, 2 nuts and cylinder head cover.

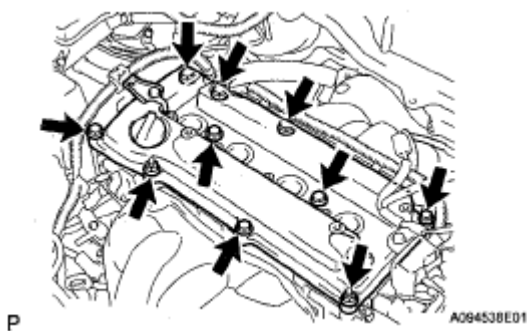


Fig. 44: Identifying Bolts, Nuts And Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

- a. Lift the engine upward using the transmission jack.

NOTE: Do not lift the engine more than necessary.

- b. Remove the bolt, nut and V-ribbed belt tensioner.

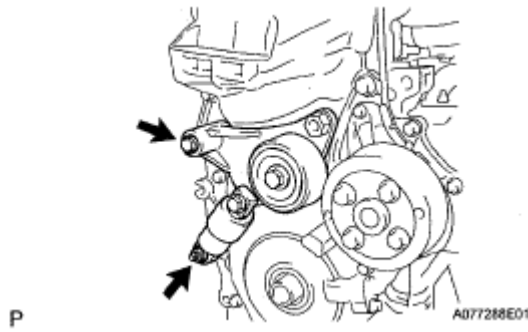


Fig. 45: Identifying V-Ribbed Belt Tensioner With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE CRANKSHAFT POSITION SENSOR** (See **REMOVAL**)

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

- a. Install the No. 1 and No. 2 engine hangers with the bolts.

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

Parts No.

PARTS NO. REFERENCE

Item	Part No.
No. 1 engine hanger	12281-28010
No. 2 engine hanger	12282-28010
Bolt	91512-61020

No. 1 Engine Hanger

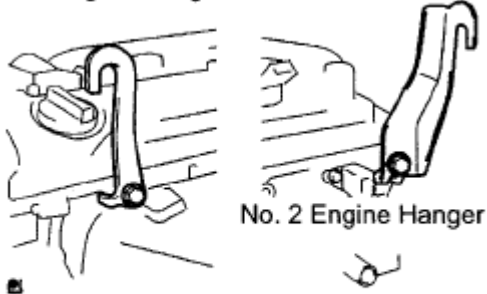


Fig. 46: Identifying No. 1 And No. 2 Engine Hangers With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a chain block and sling device, hold the engine.
- c. Remove the 12 bolts and 2 nuts.

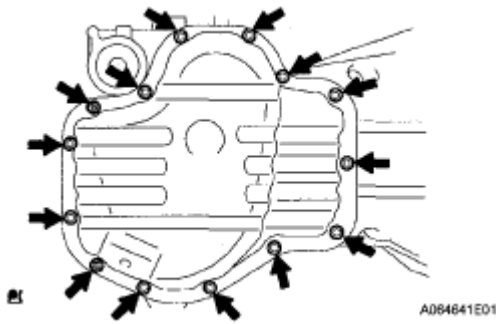


Fig. 47: Identifying Oil Pan Bolts And Nuts

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

- d. Insert the blade of SST between the crankcase, chain cover and oil pan, then cut off the applied sealer and remove the oil pan.

SST 09032-00100

NOTE: Be careful not to damage the contact surface of the crankcase, chain cover and oil pan.

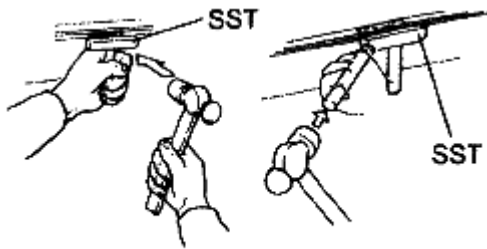


Fig. 48: Removing Oil Pan

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

19. SET NO. 1 CYLINDER TO TDC/COMPRESSION

- a. Turn the crankshaft pulley until its groove and the timing mark "0" of the timing chain cover are aligned.
- b. Check that each timing mark of the camshaft timing gears is aligned with each timing mark located on the No. 1 and No. 2 bearing caps as shown in the illustration.

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

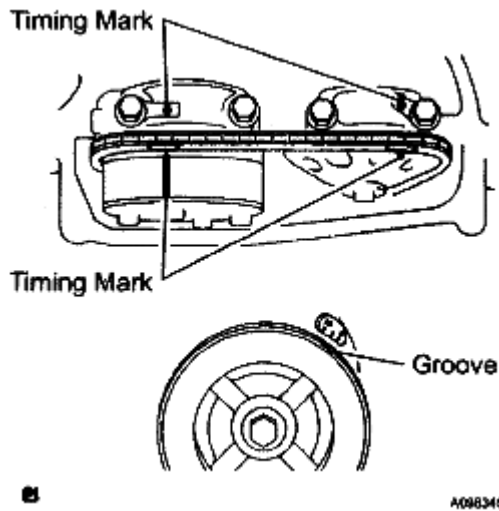


Fig. 49: Identifying Timing Mark Of Camshaft Timing Gear And Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE CRANKSHAFT PULLEY

- a. Using SST, fix the pulley and loosen the pulley bolt.

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

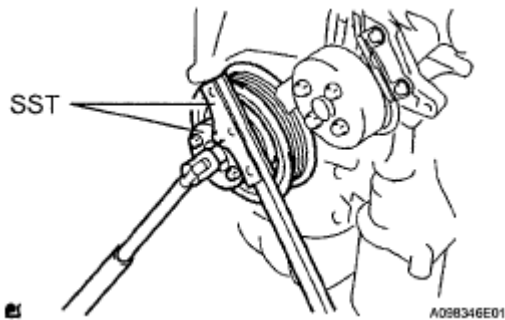


Fig. 50: Identifying Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

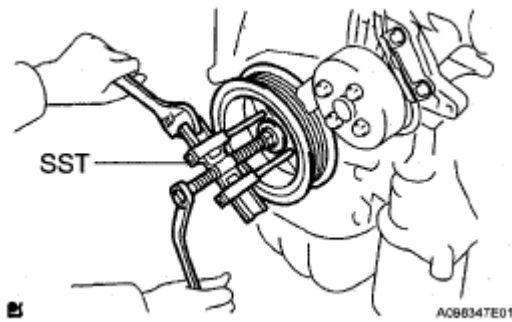


Fig. 51: Identifying Crankshaft Pulley

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

21. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Remove the bolt.
- b. Disconnect the wire harness protector clamp.

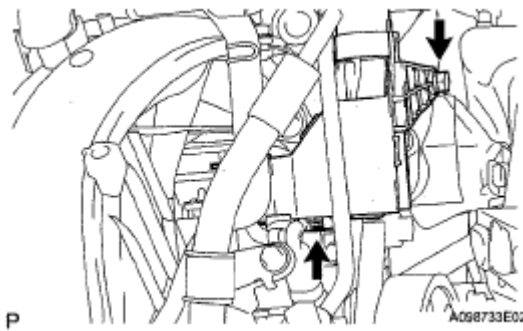


Fig. 52: Identifying Wire Harness Protector Clamp And Bolt

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

- c. Remove the 2 nuts, chain tensioner and gasket.

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

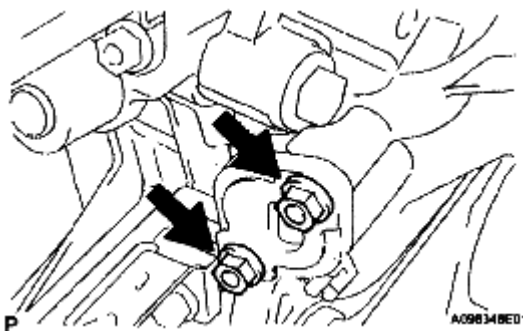


Fig. 53: Identifying Chain Tensioner Nuts And Gasket

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

22. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

- a. Using an E10 "TORX" socket, remove the stud bolt for the V-ribbed belt tensioner.

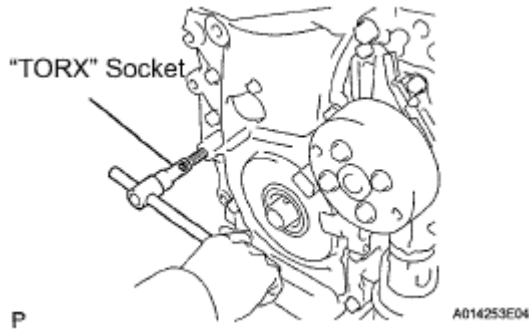


Fig. 54: Identifying Stud Bolt For V-Ribbed Belt Tensioner
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 14 bolts and 2 nuts.
- c. Remove the timing chain cover by prying the portions between the timing chain cover, cylinder head and cylinder block with a screwdriver.

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

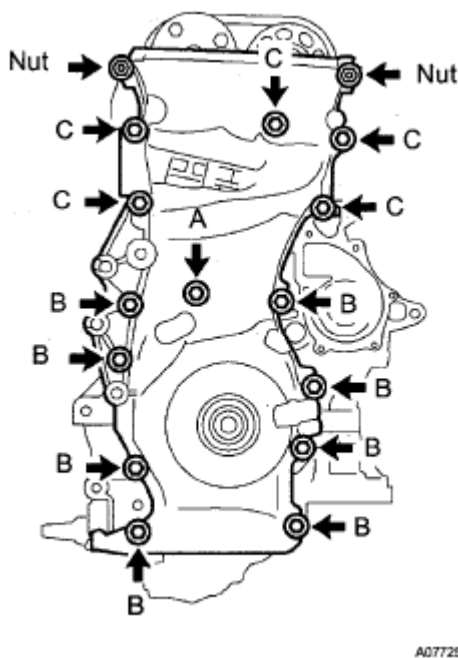


Fig. 55: Identifying Timing Chain Cover With Bolts And Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE

24. REMOVE TIMING CHAIN GUIDE

- a. Remove the bolt and timing chain guide.

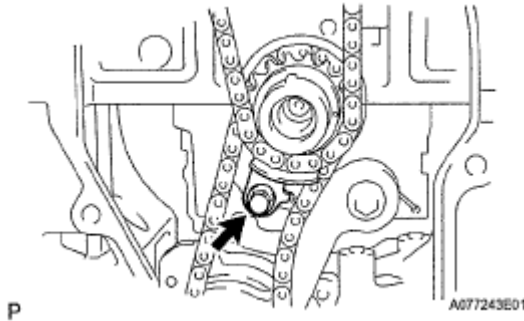


Fig. 56: Identifying Timing Chain Guide Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. REMOVE CHAIN TENSIONER SLIPPER

- a. Remove the bolt and chain tensioner slipper.

26. REMOVE CHAIN SUB-ASSEMBLY**27. REMOVE NO. 1 CHAIN VIBRATION DAMPER**

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

28. REMOVE CRANKSHAFT TIMING SPROCKET**29. REMOVE NO. 2 CHAIN SUB-ASSEMBLY**

- a. Turn the crankshaft by 90° counterclockwise to align the adjusting hole of the oil pump drive shaft gear with the groove of the oil pump.

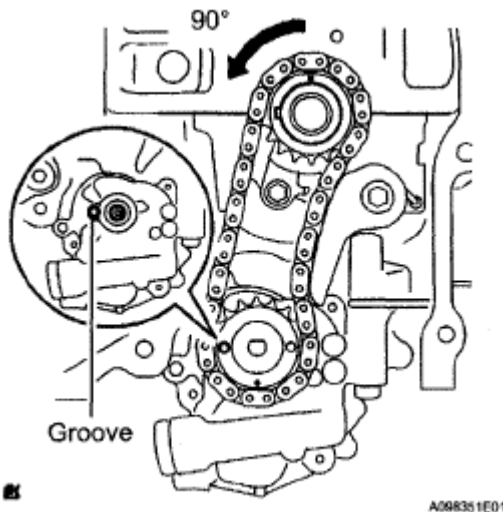


Fig. 57: Aligning Adjusting Hole With Groove Of Oil Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Insert a 4 mm diameter bar into the adjusting hole of the oil pump drive shaft gear to lock the gear

in position, then remove the nut.

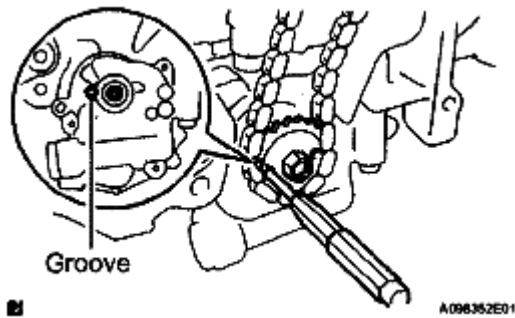


Fig. 58: Inserting 4 mm Diameter Bar Into Adjusting Hole To Lock Gear In Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the bolt, chain tensioner plate and spring.

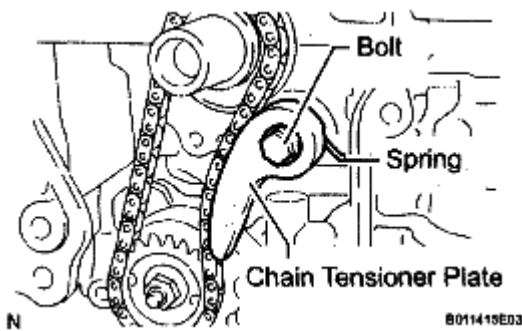


Fig. 59: Identifying Bolt, Chain Tensioner Plate And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the oil pump drive gear, oil pump drive shaft gear and No. 2 chain.

INSPECTION

1. INSPECT NO. 1 CHAIN TENSIONER

- Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.
- Release the ratchet pawl, then check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

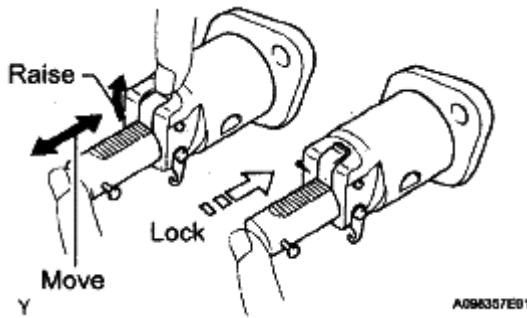


Fig. 60: Inspecting No. 1 Chain Tensioner
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT CHAIN SUB-ASSEMBLY

- a. Using vernier calipers, measure the length of the 16 links with the chain fully stretched.

Maximum chain elongation: 122.6 mm (4.827 in.)

If the chain elongation is greater than the maximum, replace the chain sub-assembly.

HINT:

Take the same measurements by pulling at 3 or more places selected at random.

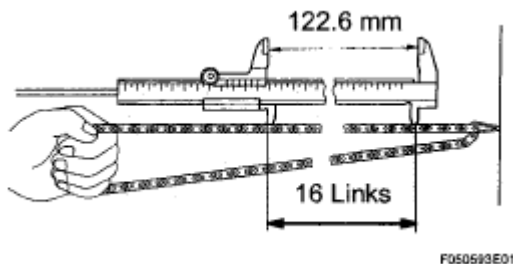


Fig. 61: Measuring Length Of Chain
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT CHAIN TENSIONER SLIPPER

- a. Using vernier calipers, measure the tensioner slipper wear.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the chain tensioner slipper.

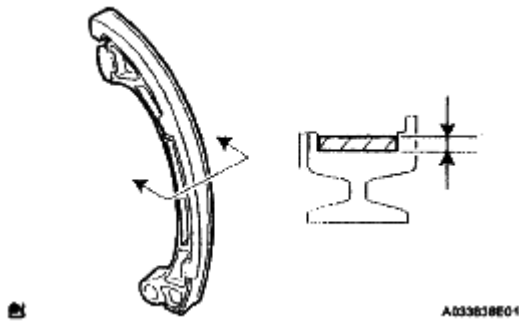


Fig. 62: Measuring Tensioner Slipper Wear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT NO. 1 CHAIN VIBRATION DAMPER

- a. Using vernier calipers, measure the vibration damper wear.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the No. 1 chain vibration damper.

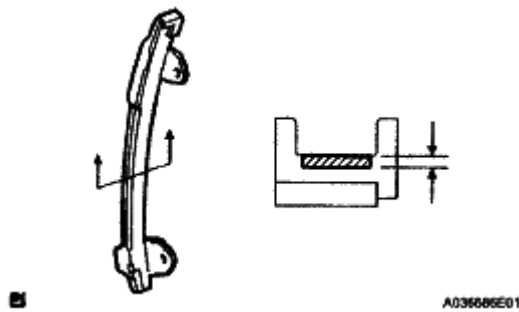


Fig. 63: Measuring Vibration Damper Wear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSPECT CRANKSHAFT TIMING SPROCKET

- a. Wrap the chain around the timing sprocket.
- b. Using vernier calipers, measure the timing gear diameter with the chain.

Minimum gear diameter (with chain): 51.6 mm (2.031 in.)

NOTE: Vernier calipers must be in contact with the chain rollers when measuring.

If the gear diameter is less than the minimum, replace the chain sub-assembly and crankshaft timing sprocket.

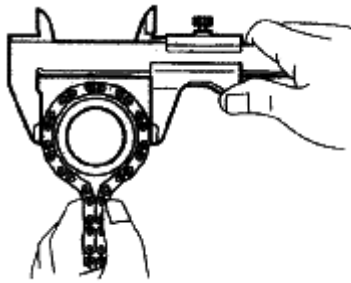


Fig. 64: Measuring Timing Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSPECT OIL PUMP DRIVE GEAR

- a. Wrap the chain around the drive gear.
- b. Using vernier calipers, measure the drive gear diameter with the chain.

Minimum gear diameter (with chain): 48.2 mm (1.898 in.)

NOTE: Vernier calipers must be in contact with the chain rollers when measuring.

If the gear diameter is less than the minimum, replace the No. 2 chain sub-assembly and oil pump drive gear.

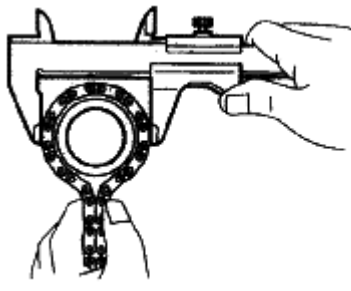


Fig. 65: Measuring Drive Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSPECT OIL PUMP DRIVE SHAFT GEAR

- a. Wrap the chain around the drive shaft gear.
- b. Using vernier calipers, measure the drive shaft gear diameter with the chain.

Minimum gear diameter (with chain): 48.2 mm (1.898 in.)

NOTE: Vernier calipers must be in contact with the chain rollers when measuring.

If the gear diameter is less than the minimum, replace the No. 2 chain sub-assembly and oil pump drive shaft gear.

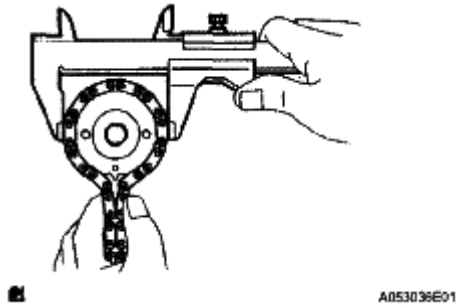


Fig. 66: Measuring Drive Shaft Gear Diameter With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. REMOVE TIMING CHAIN COVER OIL SEAL

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

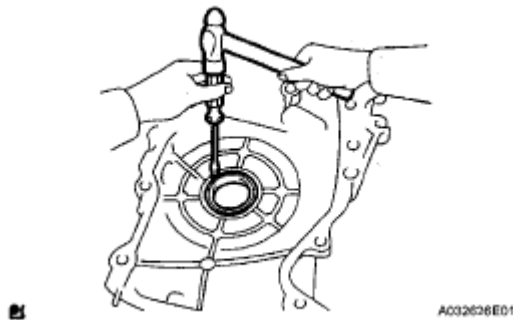


Fig. 67: Identifying Timing Chain Cover Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL TIMING CHAIN COVER OIL SEAL

- Place the oil seal retainer on wooden blocks.
- Using SST and a hammer, tap in the oil seal until its surface is flush with the timing gear case edge.

SST 09223-22010

NOTE:

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

HINT:

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

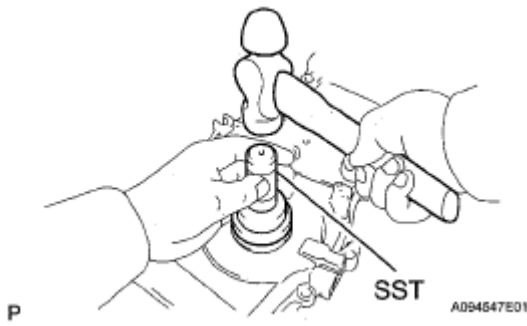


Fig. 68: Tapping In Oil Seal Using SST And Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL NO. 2 CHAIN SUB-ASSEMBLY

- a. Set the crankshaft key in the left horizontal position.

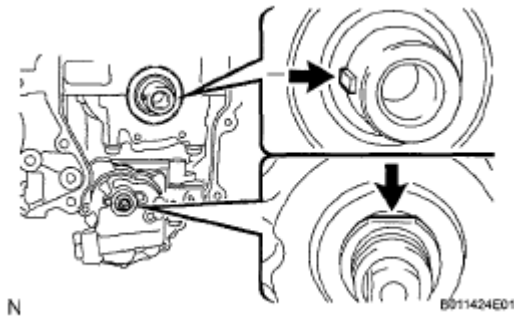


Fig. 69: Setting Crankshaft Key In Left Horizontal Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Turn the cutout of the drive shaft to the top.
- c. Align the yellow mark links with the timing marks of the each gear as shown in the illustration.

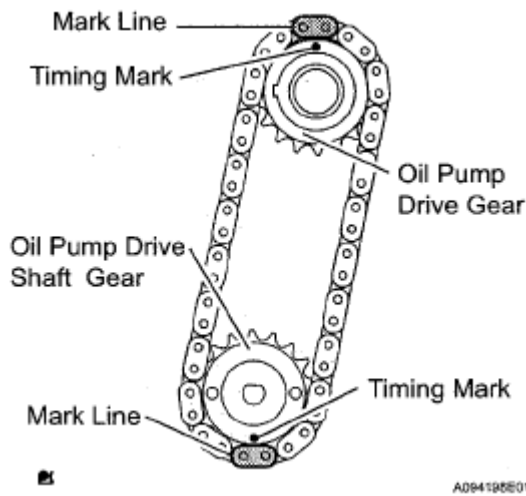


Fig. 70: Aligning Yellow Mark Links With Timing Marks Of Each Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the gears onto the crankshaft and oil pump shaft with the chain wrapped on the gears.
- e. Temporarily tighten the oil pump drive shaft gear with the nut.
- f. Insert the damper spring into the adjusting hole, then install the chain tensioner plate with the bolt.

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

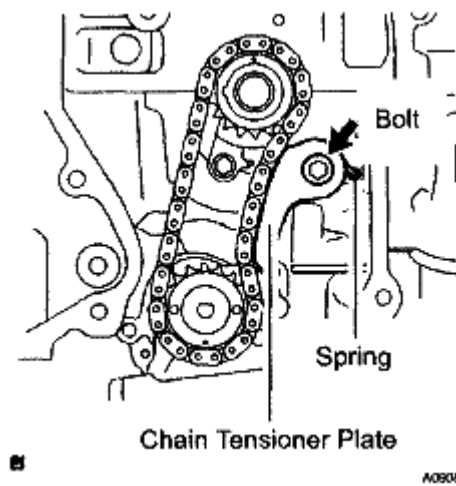


Fig. 71: Identifying Chain Tensioner Plate With Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Align the adjusting hole of the oil pump drive shaft gear with the groove of the oil pump.
- h. Insert a 4 mm diameter bar into the adjusting hole of the oil pump drive shaft gear to lock the gear in position, then tighten the nut.

Torque: 29.5 N*m (301 kgf*cm, 22 ft.*lbf)

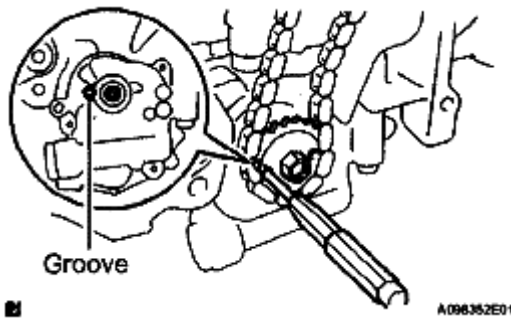


Fig. 72: Inserting Diameter Bar Into Adjusting Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Turn the crankshaft clockwise by 90° to position the crankshaft key upward.

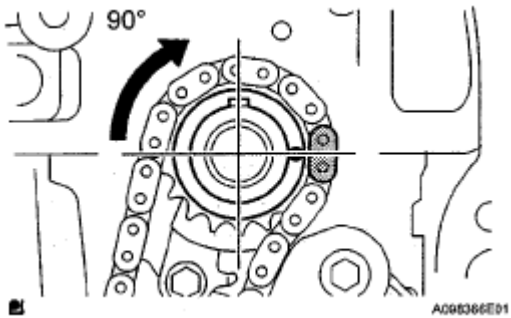


Fig. 73: Turning Crankshaft Clockwise To Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CRANKSHAFT TIMING SPROCKET

3. INSTALL NO. 1 CHAIN VIBRATION DAMPER

- a. Install the chain vibration damper with the 2 bolts.

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

4. INSTALL CHAIN SUB-ASSEMBLY

- a. Set the No. 1 cylinder to TDC/compression.
 1. Turn the camshafts with a wrench in the hexagonal lobe to align the timing marks of the camshaft timing gear with each timing mark located on the No. 1 and No. 2 bearing caps as shown in the illustration.

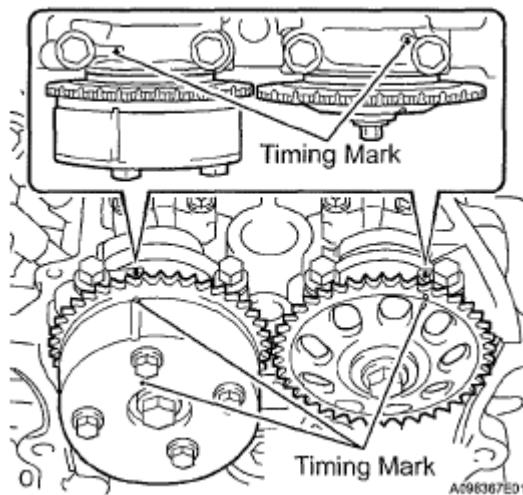


Fig. 74: Aligning Timing Marks With Each Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Using the crankshaft pulley bolt, turn the crankshaft to position the key on the crankshaft upward.

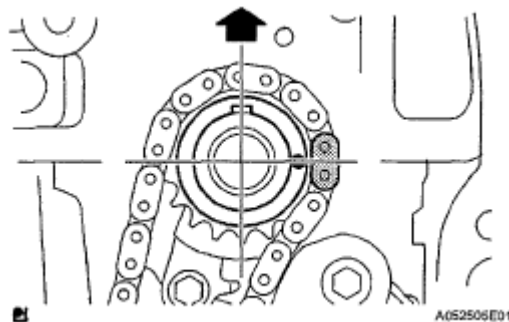


Fig. 75: Turning Crankshaft To Position Key On Crankshaft Upward
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the chain onto the crankshaft timing sprocket with the gold or orange mark link aligned with the timing mark on the crankshaft timing gear.

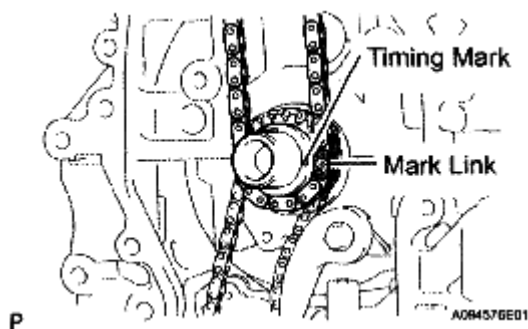


Fig. 76: Identifying Timing Mark On Crankshaft

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

- c. Using SST and a hammer, tap in the crankshaft timing sprocket.

SST 09309-37010

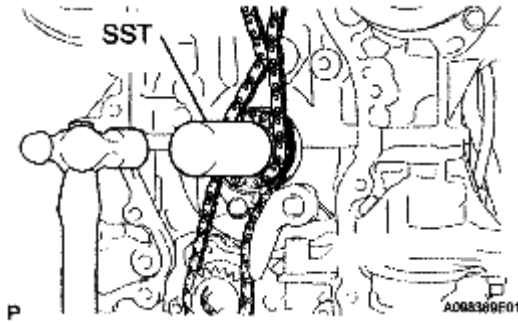


Fig. 77: Tapping In Crankshaft Timing Sprocket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Align the gold or yellow links with each timing mark located on the camshaft timing gear and sprocket, then install the chain.

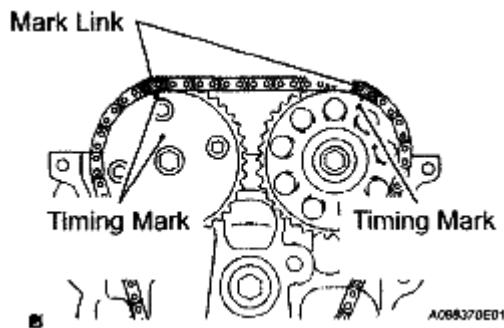


Fig. 78: Identifying Mark Link And Timing Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL CHAIN TENSIONER SLIPPER

- a. Install the chain tensioner slipper with the bolt.

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

6. INSTALL TIMING CHAIN GUIDE

- a. Install the timing chain guide with the bolt.

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

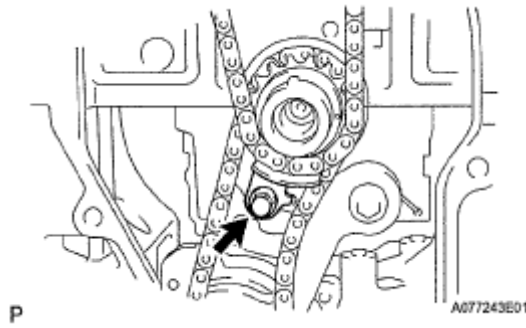


Fig. 79: Identifying Timing Chain Guide With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE

- a. Install the sensor plate with the "F" mark facing forward.

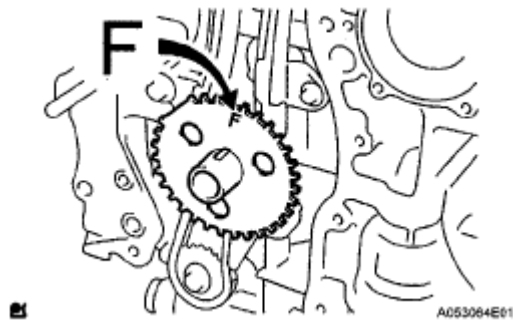


Fig. 80: Identifying Sensor Plate With "F" Mark Facing Forward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.
- b. Apply of seal packing (Diameter 2.0 mm (0.079 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 chain cover within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the chain cover.

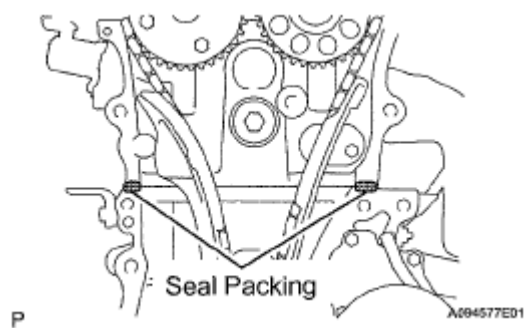


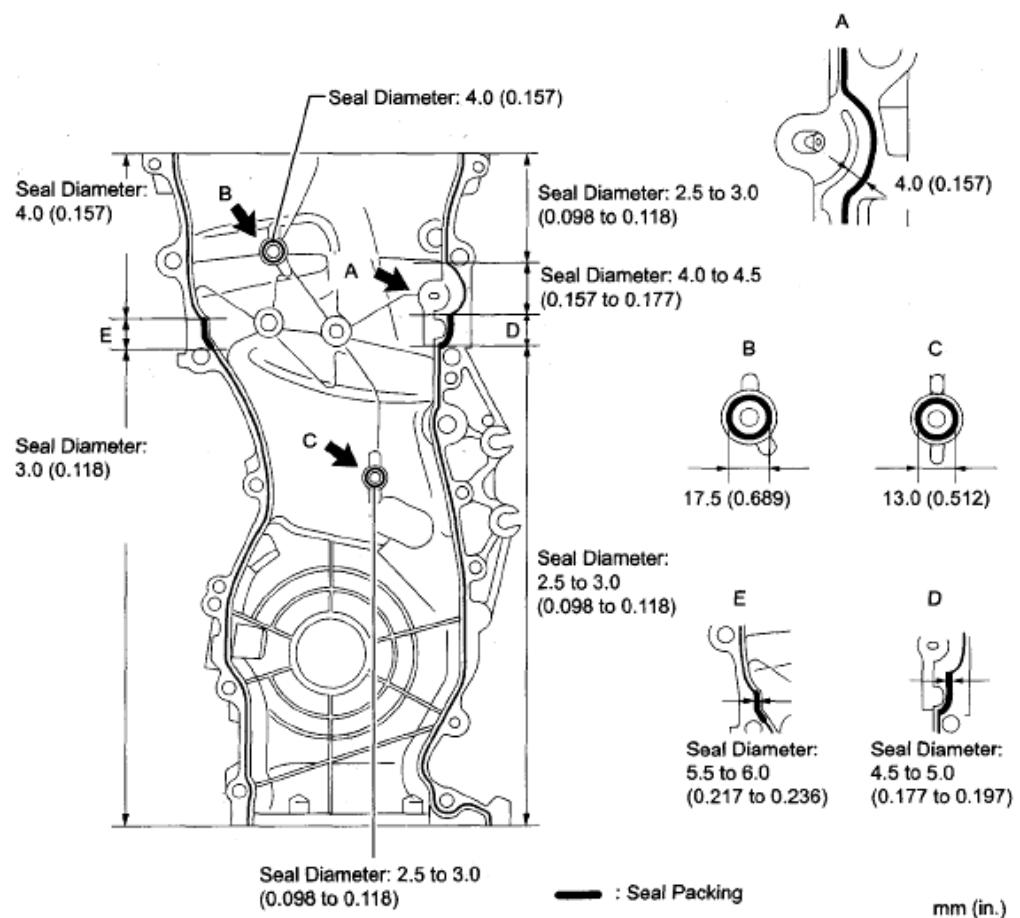
Fig. 81: Identifying Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a continuous bead of seal packing 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 chain cover within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the chain cove



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Fig. 82: Applying Continuous Bead Of Seal Packing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the timing chain cover with the 14 bolts and 2 nuts.

Torque:

9.0 N*m (92 kgf*cm, 80 in.*lbf) for bolt A

25 N*m (255 kgf*cm, 18 ft.*lbf) for bolt B

55 N*m (561 kgf*cm, 41 ft.*lbf) for bolt C

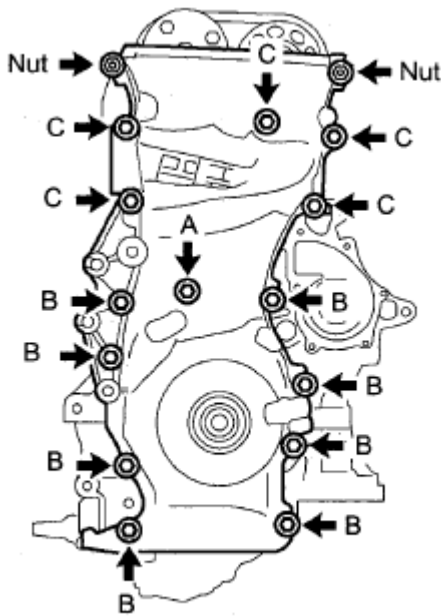
11 N*m (112 kgf*cm, 8 ft.*lbf) for nut

HINT:

Bolt length:

BOLT LENGTH

Bolt A	30 mm (1.18 in.) length for 10 mm head
Bolt B	30 mm (1.18 in.) length for 12 mm head
Bolt C	40 mm (1.57 in.) length for 14 mm head
Bolt D	65 mm (2.56 in.) length for 14 mm head



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Fig. 83: Identifying Timing Chain Cover Bolts And Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using an E10 "torx" socket, install the stud bolt for the V-ribbed belt tensioner.

Torque: 21.5 N*m (219 kgf*cm, 16 ft.*lbf)

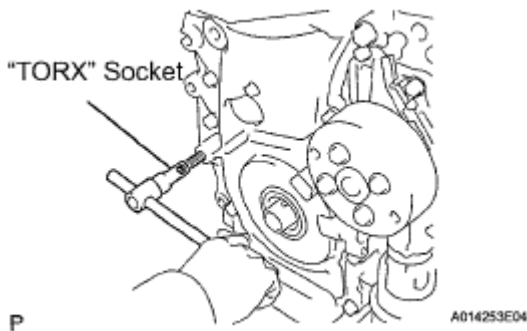


Fig. 84: Identifying Stud Bolt For V-Ribbed Belt Tensioner
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

- a. Release the ratchet pawl, then fully push in the plunger and hook the hook to the pin so that the

plunger is in the position shown in the illustration.

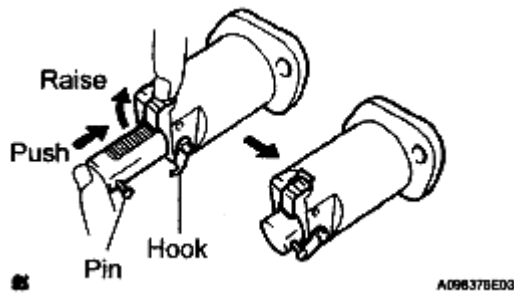


Fig. 85: Pushing In Plunger And Hook To Pin

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

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

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

NOTE: When installing the chain tensioner, set the hook again if the hook releases the plunger.

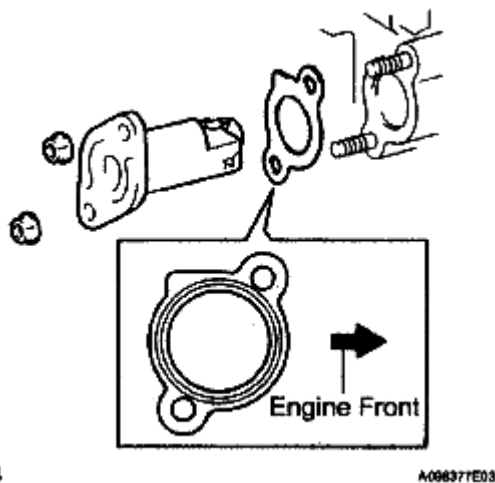


Fig. 86: Identifying Gasket And Chain Tensioner With Nuts

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

10. INSTALL CRANKSHAFT PULLEY

- a. Using SST, fix the pulley in place and tighten the bolt.

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

Torque: 180 N*m (1,835 kgf*cm, 133 ft.*lbf)

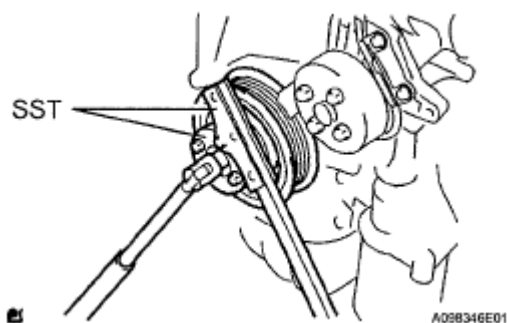


Fig. 87: Identifying Pulley Bolt

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

- b. Turn the crankshaft counterclockwise, then disconnect the plunger knock pin from the hook.

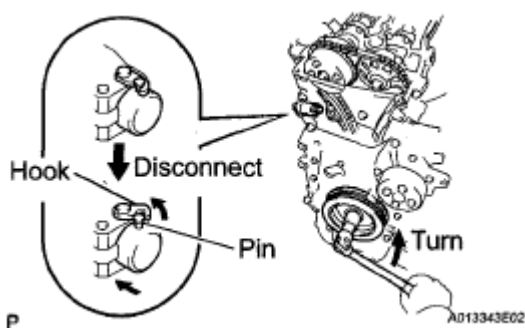


Fig. 88: Identifying Plunger Knock Pin From Hook

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

- c. Turn the crankshaft clockwise, then check that the plunger is extended.

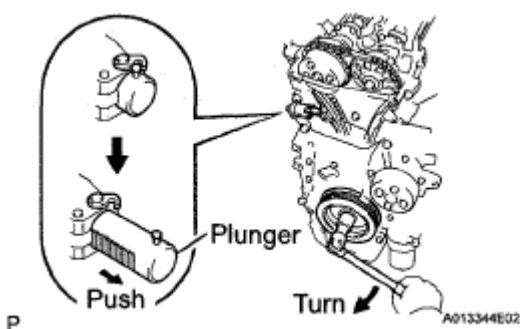


Fig. 89: Turning Crankshaft Clockwise

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

- d. Connect the wire harness protector clamp.

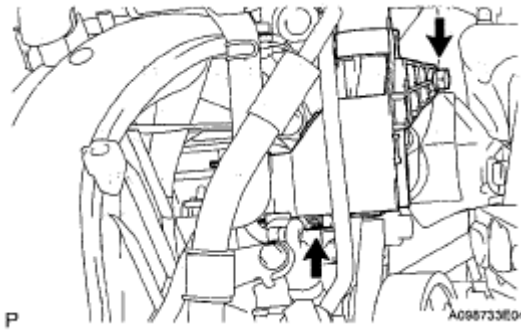


Fig. 90: Identifying Wire Harness Protector Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the bolt.

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

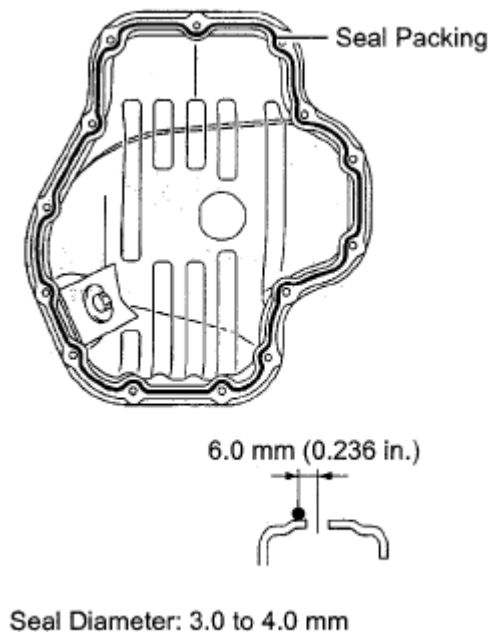
11. INSTALL OIL PAN SUB-ASSEMBLY

- Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and oil pan.
- Apply a continuous bead of seal packing (Diameter 3.0 to 4.0 mm (0.118 to 0.157 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 pan within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the oil pan.



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Fig. 91: Applying Continuous Bead Of Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil pan to the cylinder block.
- d. Uniformly tighten the 12 bolts and 2 nuts in the sequence shown in the illustration.

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

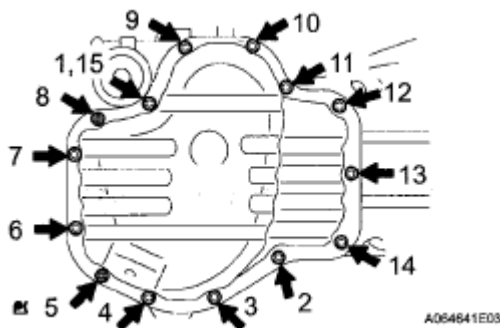


Fig. 92: Identifying Oil Pan Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Place a transmission jack underneath the engine, then put a wooden block on the jack.

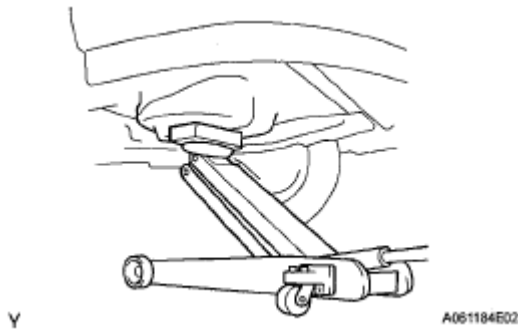


Fig. 93: Identifying Transmission Jack

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

- f. Remove the chain block and sling device.
- g. Remove the No. 1 and No. 2 engine hangers.
12. **INSTALL CRANKSHAFT POSITION SENSOR** (See INSTALLATION)
13. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY**
 - a. Install the V-ribbed belt tensioner with the bolt and nut.

Torque: 59.5 N*m (607 kgf*cm, 44 ft.*lbf)

NOTE: Do not lift the engine more than necessary.

14. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Remove any old packing material from the contact surface.

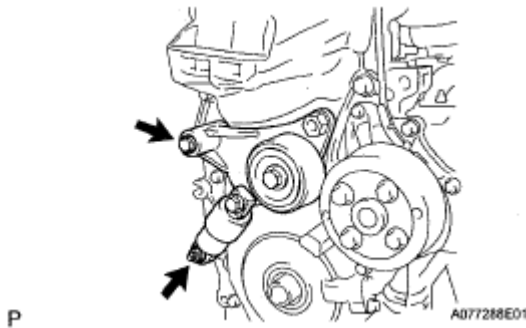


Fig. 94: Identifying V-Ribbed Belt Tensioner With Bolt And Nut

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

- b. Apply seal packing to the 2 locations 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 pan within 3 minutes of applying seal packing.

- Do not add engine oil for at least 2 hours after installing the oil pan.

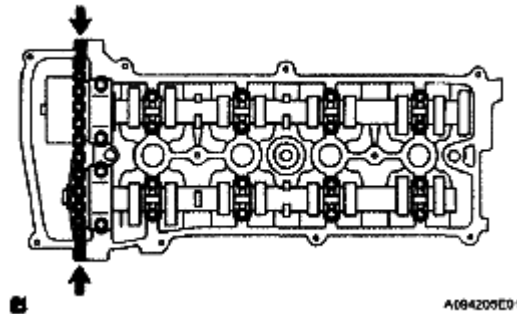


Fig. 95: Applying Seal Packing Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the cylinder head cover with the 8 bolts and 2 nuts.

Torque:

11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt A

14 N*m (143 kgf*cm, 10 ft.*lbf) for bolt B

11 N*m (112 kgf*cm, 8 ft.*lbf) for nut

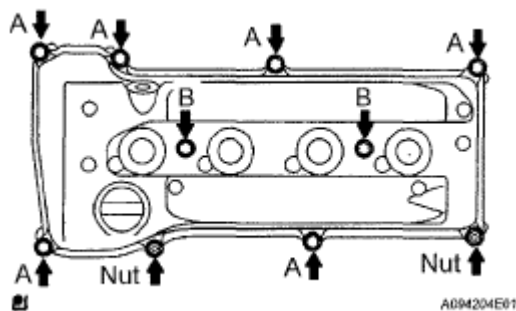


Fig. 96: Identifying Cylinder Head Cover With 8 Bolts And 2 Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the engine wire with the bolt (labeled A).

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

- e. Connect the clamp of the engine wire (labeled B).

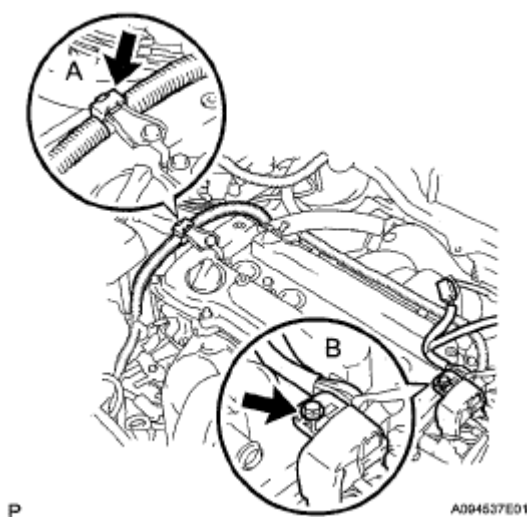


Fig. 97: Identifying Clamp Of Engine Wire And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Connect the 2 ventilation hoses to the cylinder head cover.

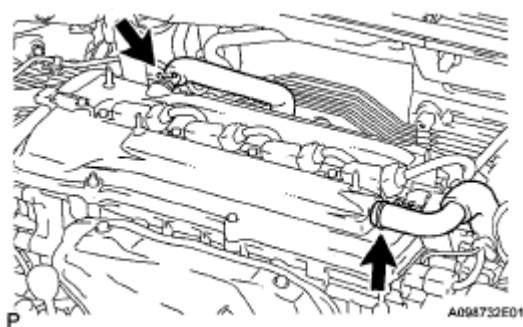


Fig. 98: Identifying Ventilation Hoses To Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL IGNITION COIL ASSEMBLY** (See **INSTALLATION**)
16. **INSTALL ENGINE MOUNTING INSULATOR RH**
a. Install the engine mounting insulator RH with the 4 bolts and 2 nuts.

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

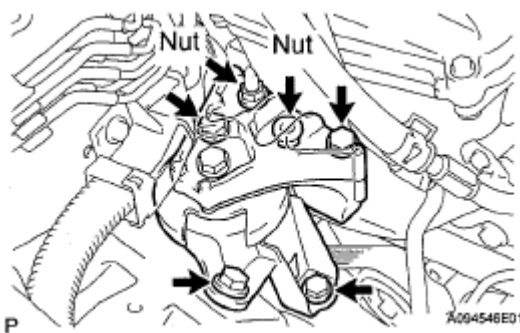


Fig. 99: Identifying Engine Mounting Insulator RH With Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

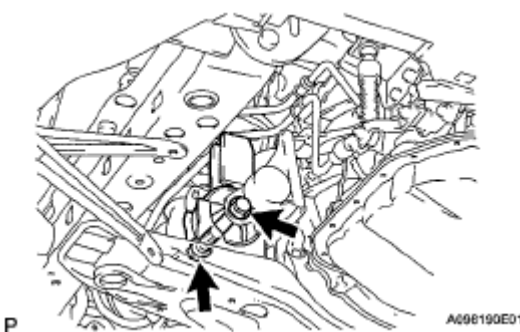


Fig. 100: Identifying Front Engine Mounting Insulator With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Connect the 2 clamps of the engine wire.

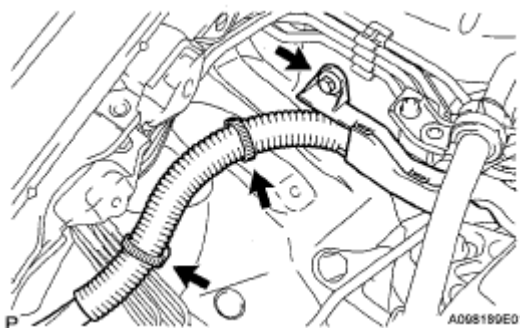


Fig. 101: Identifying Engine Wire Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the wire harness protector with the bolt.
e. Install the No. 1 oil reservoir bracket with the 2 bolts.

Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)

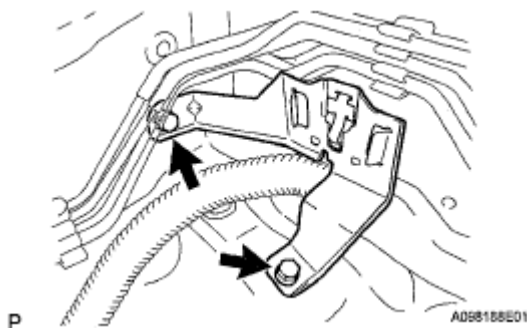


Fig. 102: Identifying No. 1 Oil Reservoir Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Install the return tube with the 2 bolts.

Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)

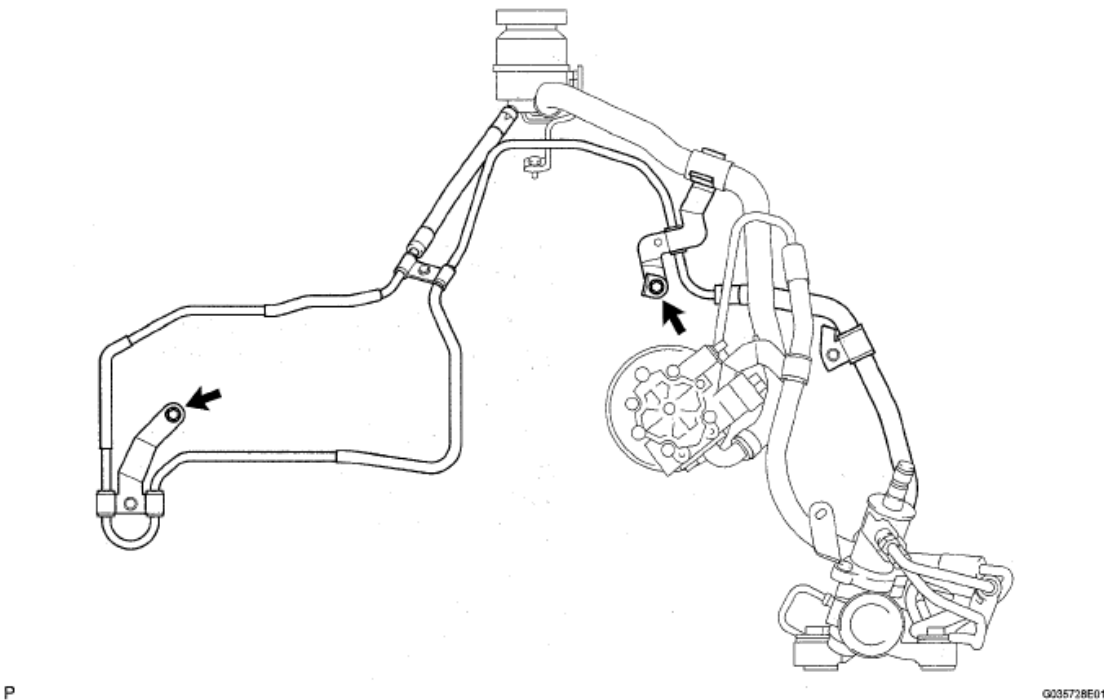


Fig. 103: Identifying Return Tube Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Install the vane pump oil reservoir onto the No. 1 oil reservoir bracket.

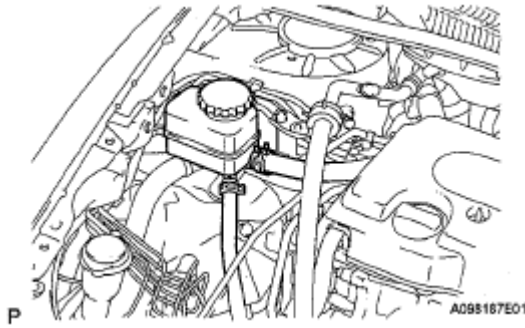


Fig. 104: Identifying Vane Pump Oil Reservoir Onto No. 1 Oil Reservoir Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Install the radiator reservoir with the bolt.

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

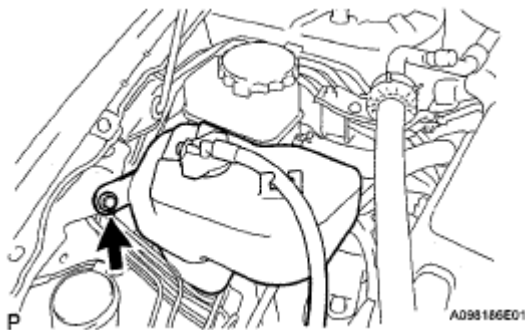


Fig. 105: Identifying Radiator Reservoir With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **INSTALL VANE PUMP ASSEMBLY**
18. **INSTALL GENERATOR ASSEMBLY** (See INSTALLATION)
19. **INSTALL FAN AND GENERATOR V BELT** (See INSTALLATION)
20. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** (See INSTALLATION)
21. **ADD ENGINE OIL** (See REPLACEMENT)
22. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
23. **CHECK FOR ENGINE OIL LEAKS**
24. **CHECK FOR EXHAUST GAS LEAKS**
25. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY**
 - a. Install the engine cover with the 2 nuts.

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

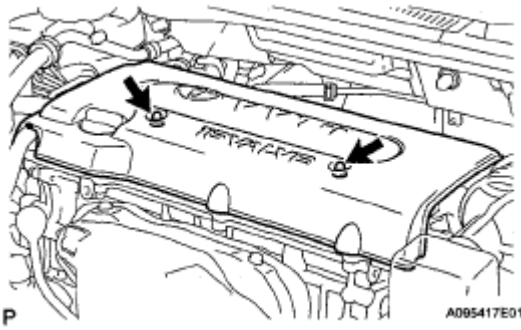


Fig. 106: Identifying Cover With Nuts

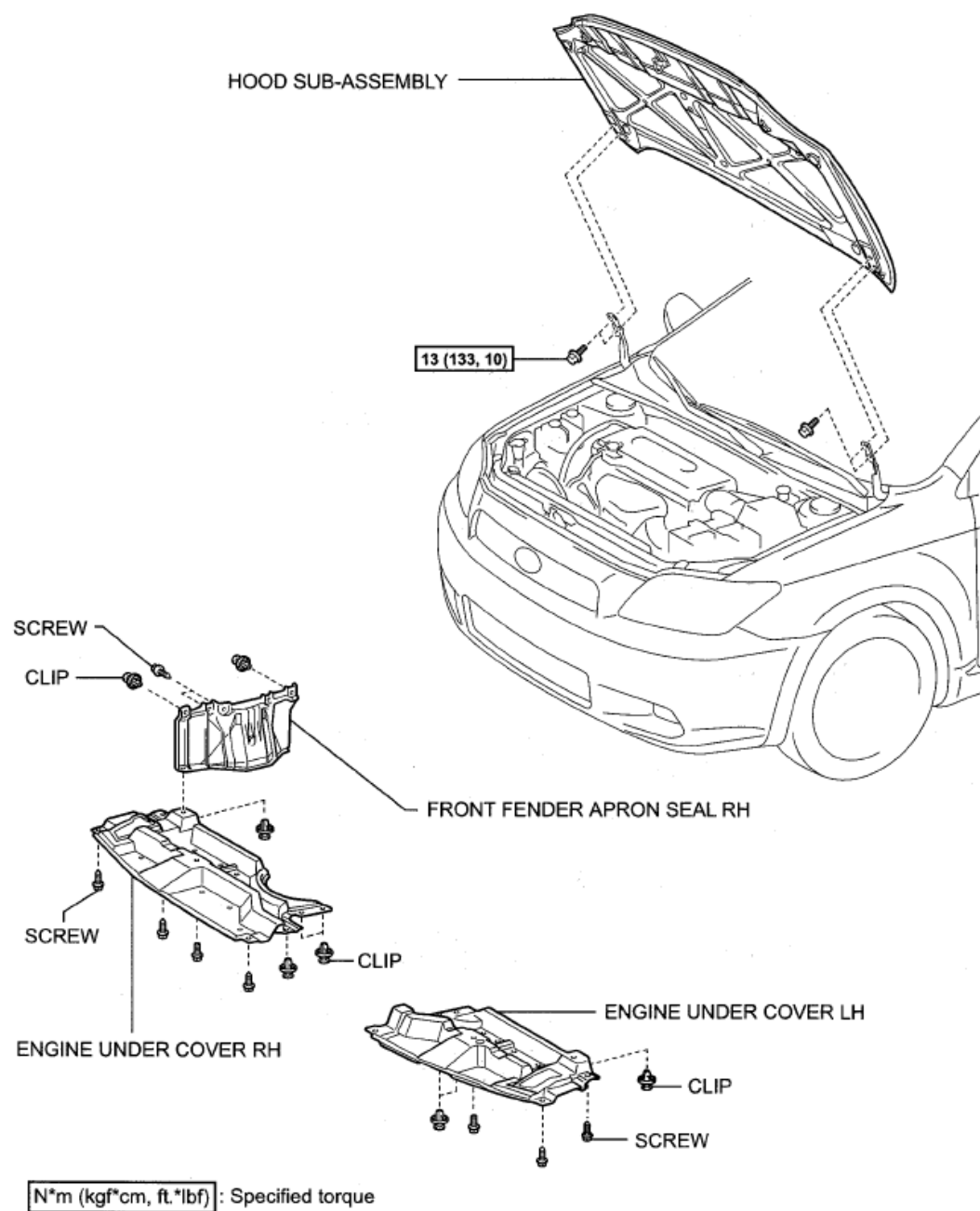
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. INSTALL FRONT FENDER APRON SEAL RH
27. INSTALL ENGINE UNDER COVER LH
28. INSTALL ENGINE UNDER COVER RH
29. INSTALL FRONT WHEEL RH
30. INSTALL HOOD SUB-ASSEMBLY
31. PERFORM INITIALIZATION
 - a. Perform initialization (see **INITIALIZATION**).

NOTE: Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

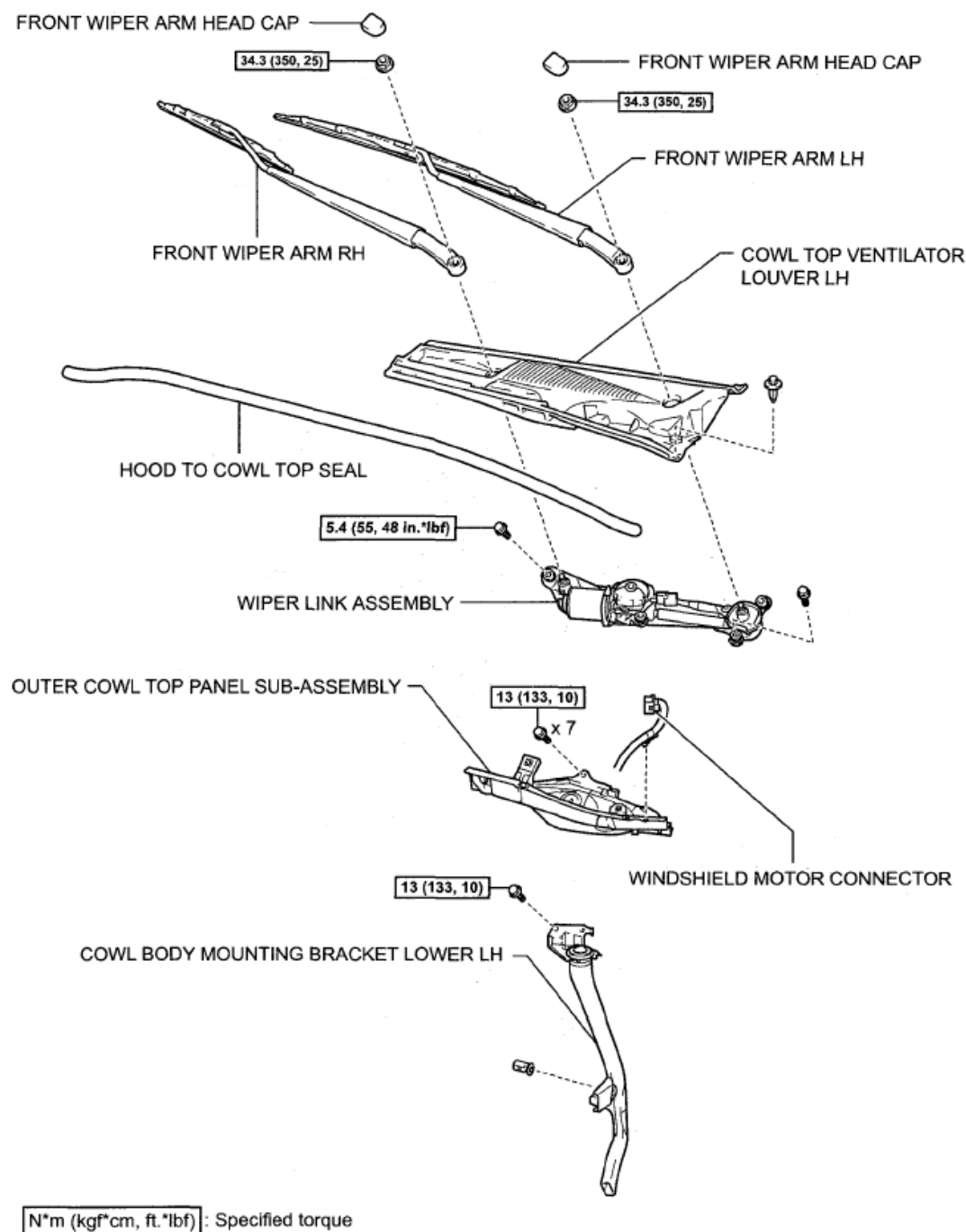
CYLINDER HEAD

COMPONENTS



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Fig. 107: Identifying Cylinder Head Replacement Components With Torque Specification (1 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 108: Identifying Cylinder Head Replacement Components With Torque Specifications (2 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

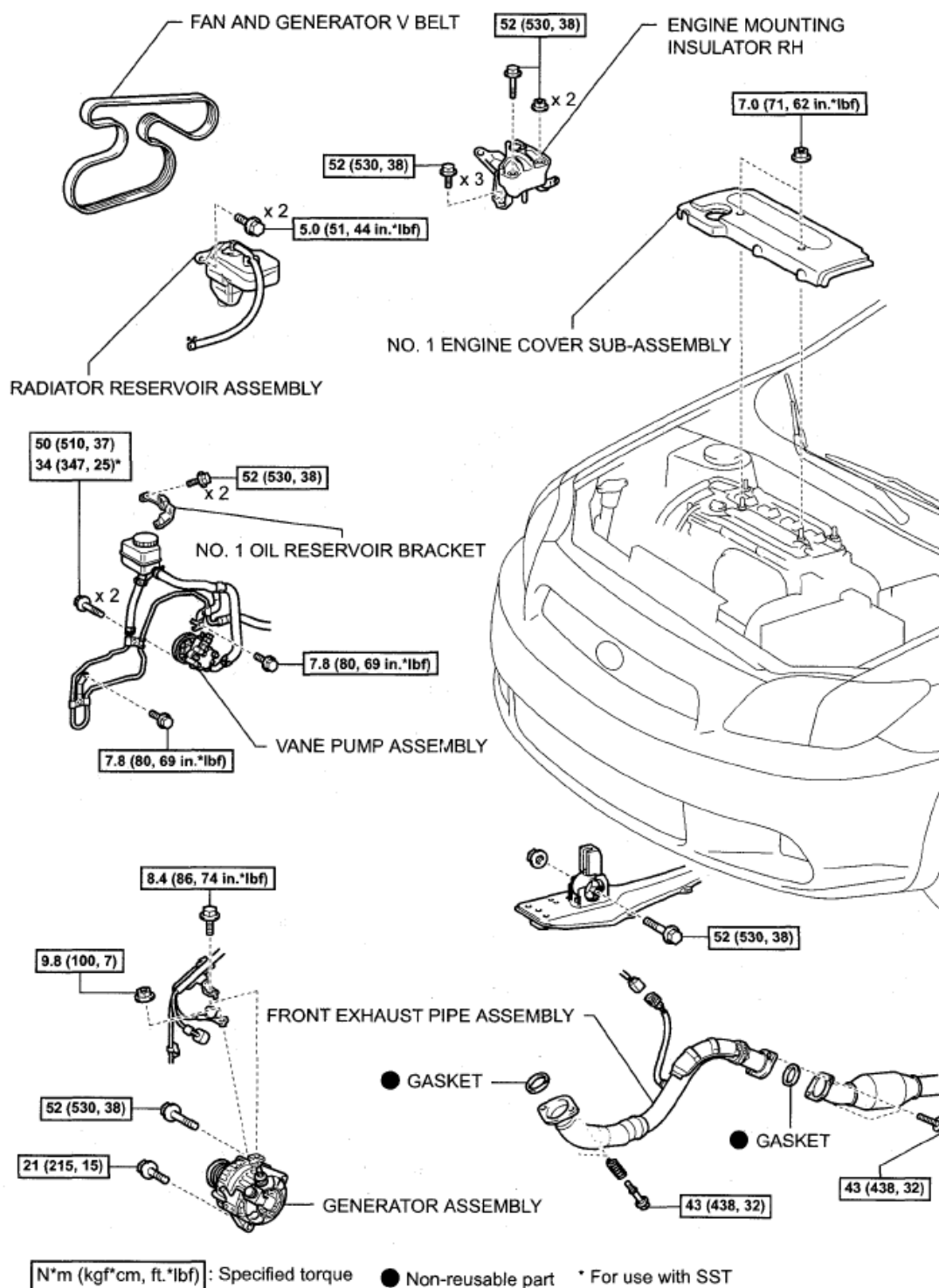
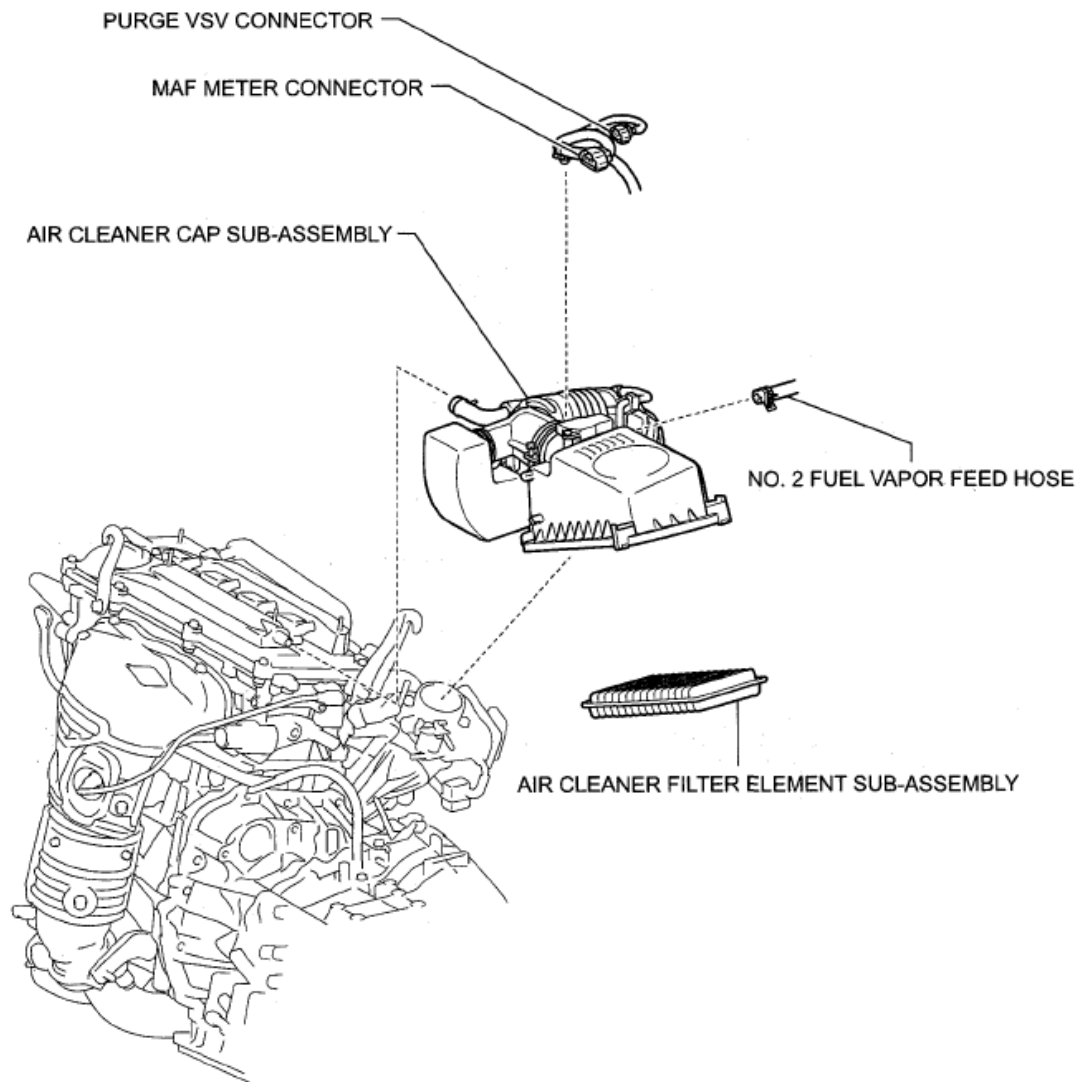


Fig. 109: Identifying Cylinder Head Replacement Components With Torque Specifications (3 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 110: Identifying Cylinder Head Replacement Components (4 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

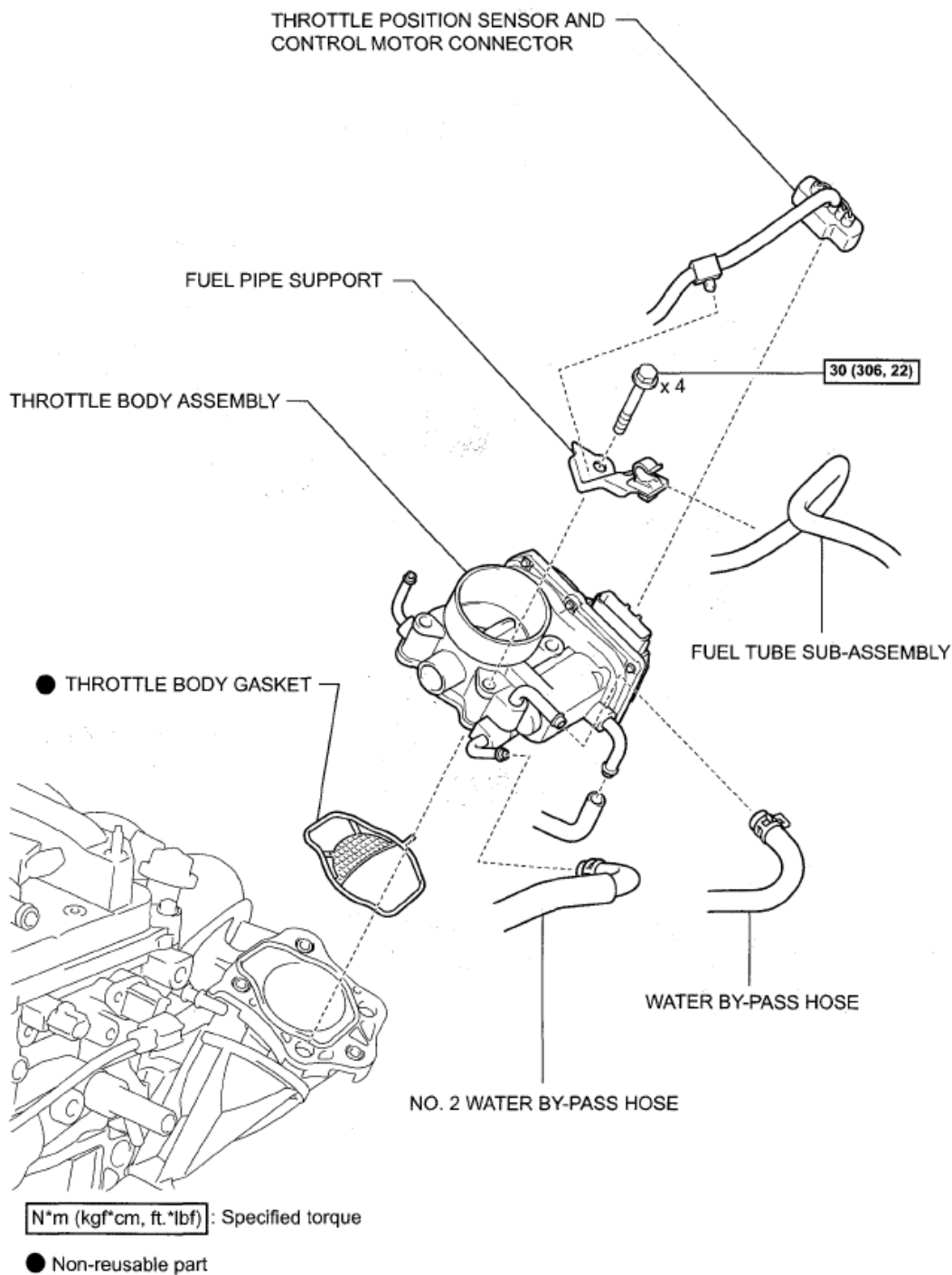


Fig. 111: Identifying Cylinder Head Replacement Components With Torque Specification (5 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

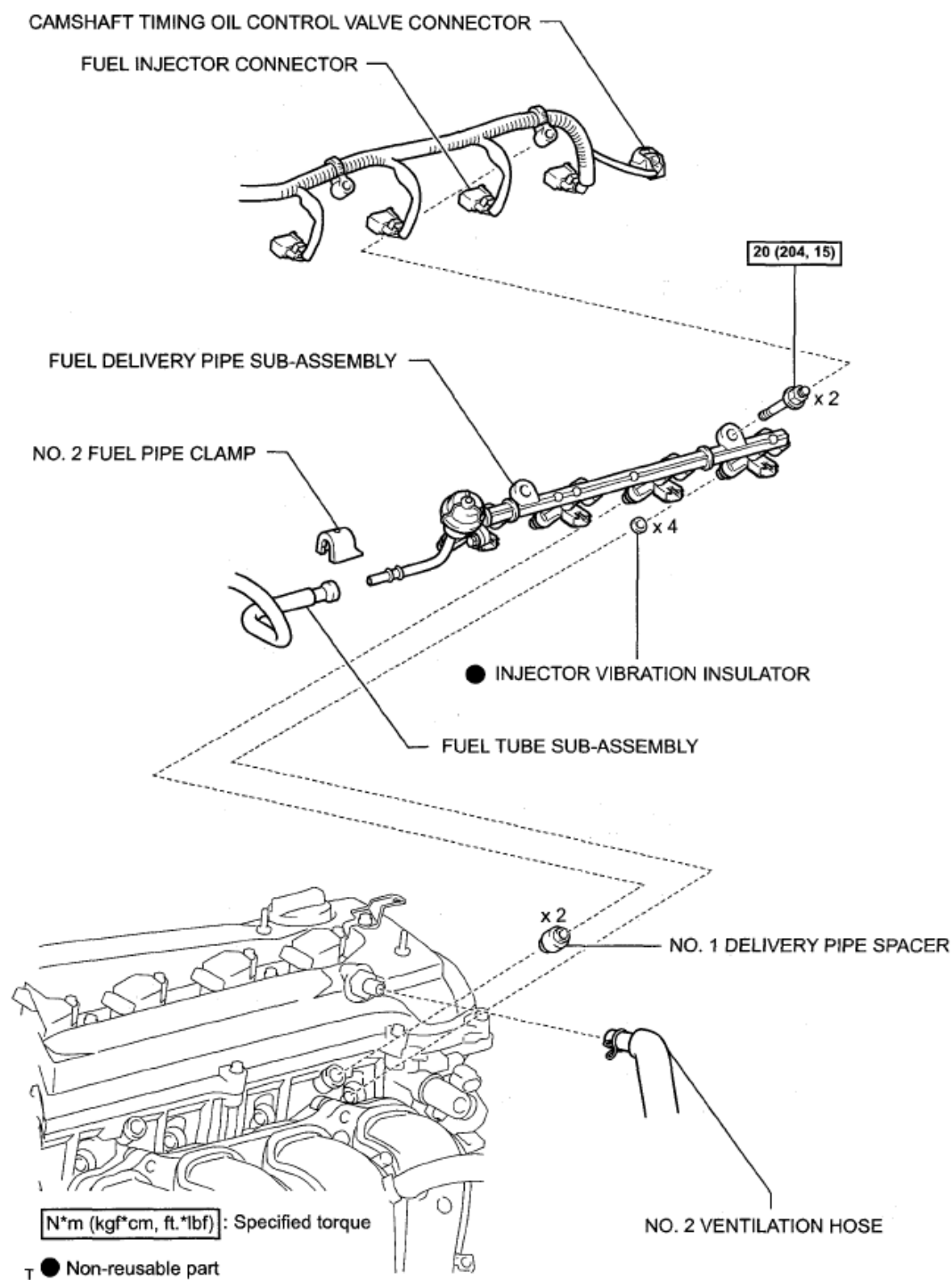


Fig. 112: Identifying Cylinder Head Replacement Components With Torque Specification (6 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

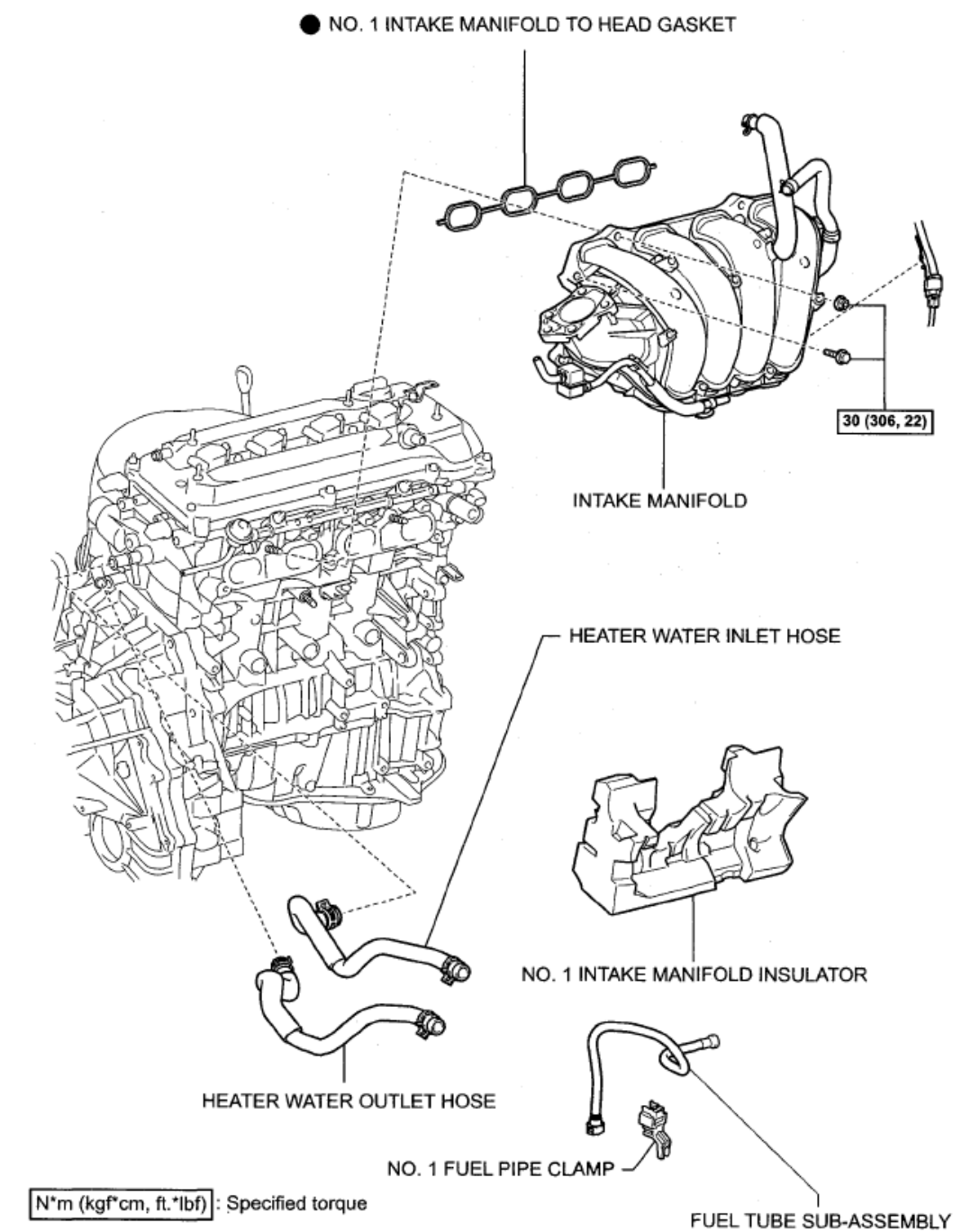


Fig. 113: Identifying Cylinder Head Replacement Components With Torque Specification (7 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

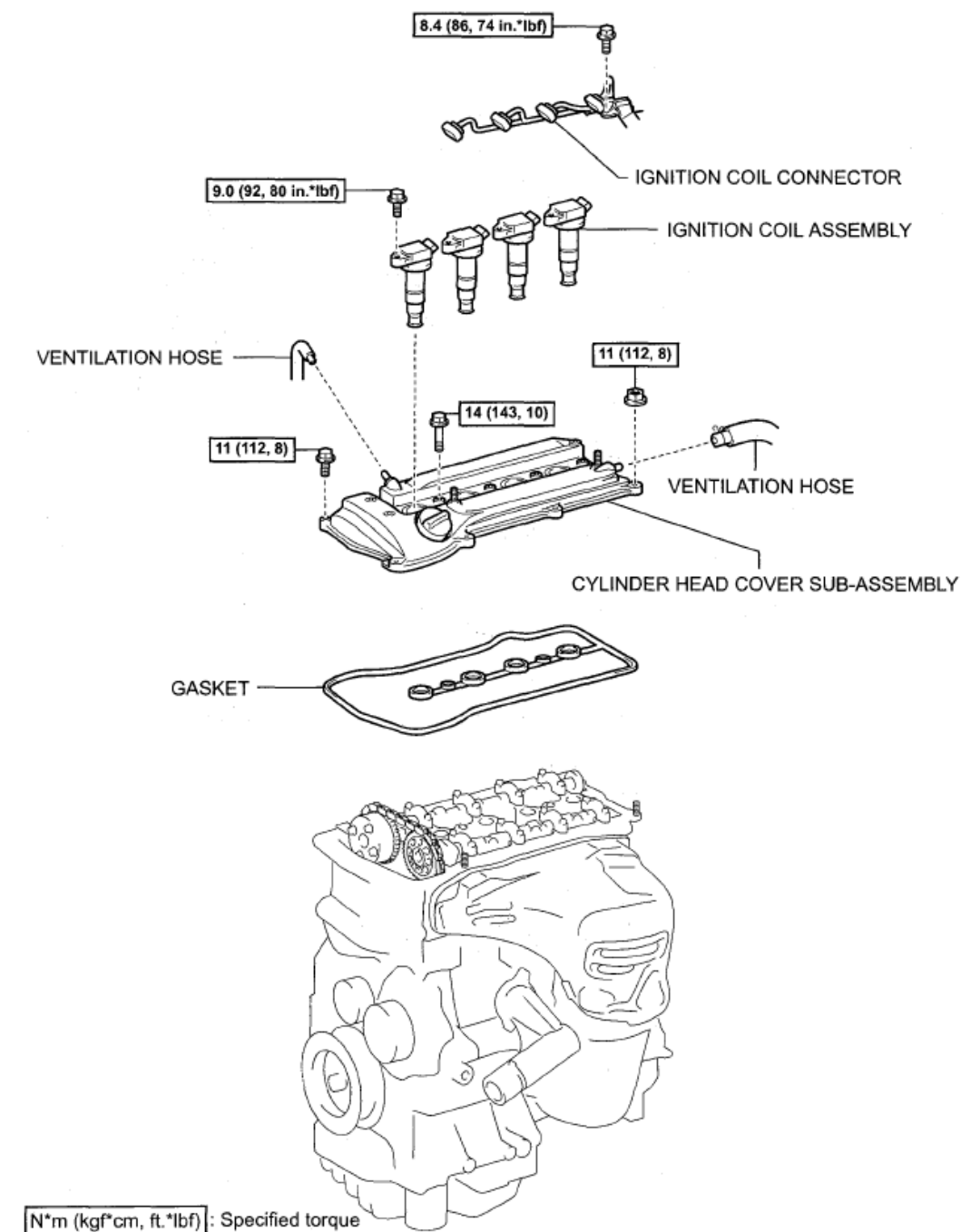


Fig. 114: Identifying Cylinder Head Replacement Components With Torque Specifications (8 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

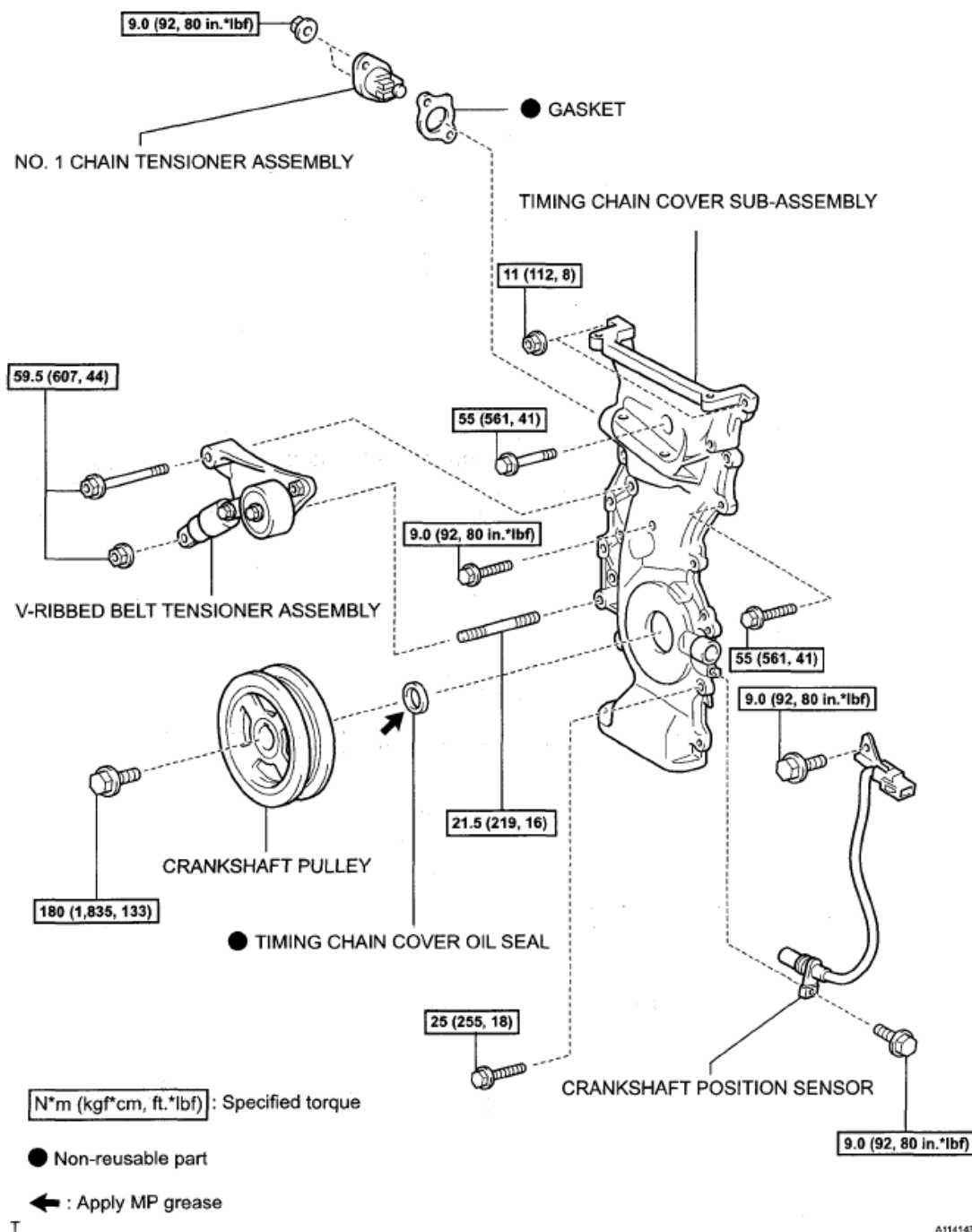


Fig. 115: Identifying Cylinder Head Replacement Components With Torque Specifications (9 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

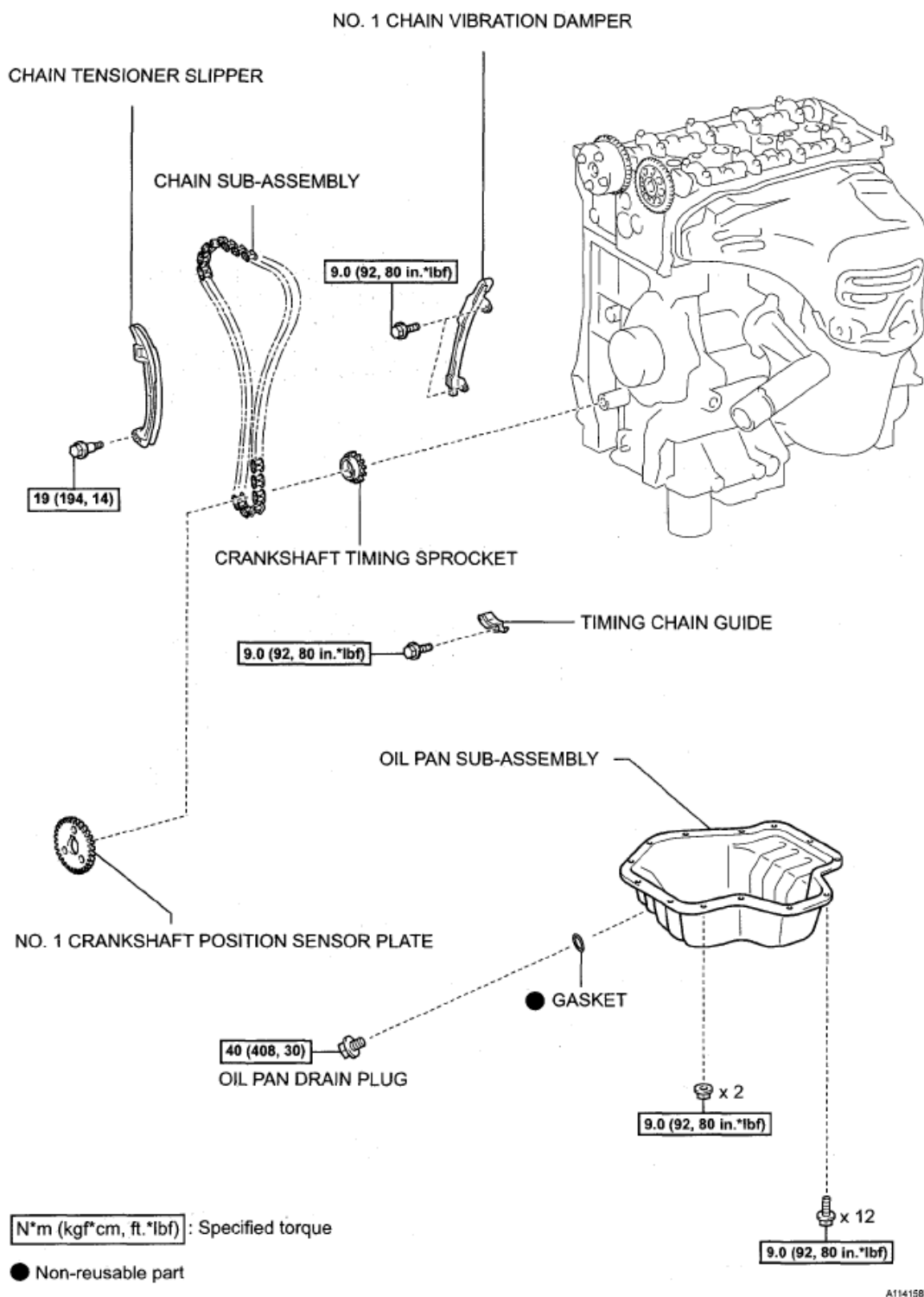
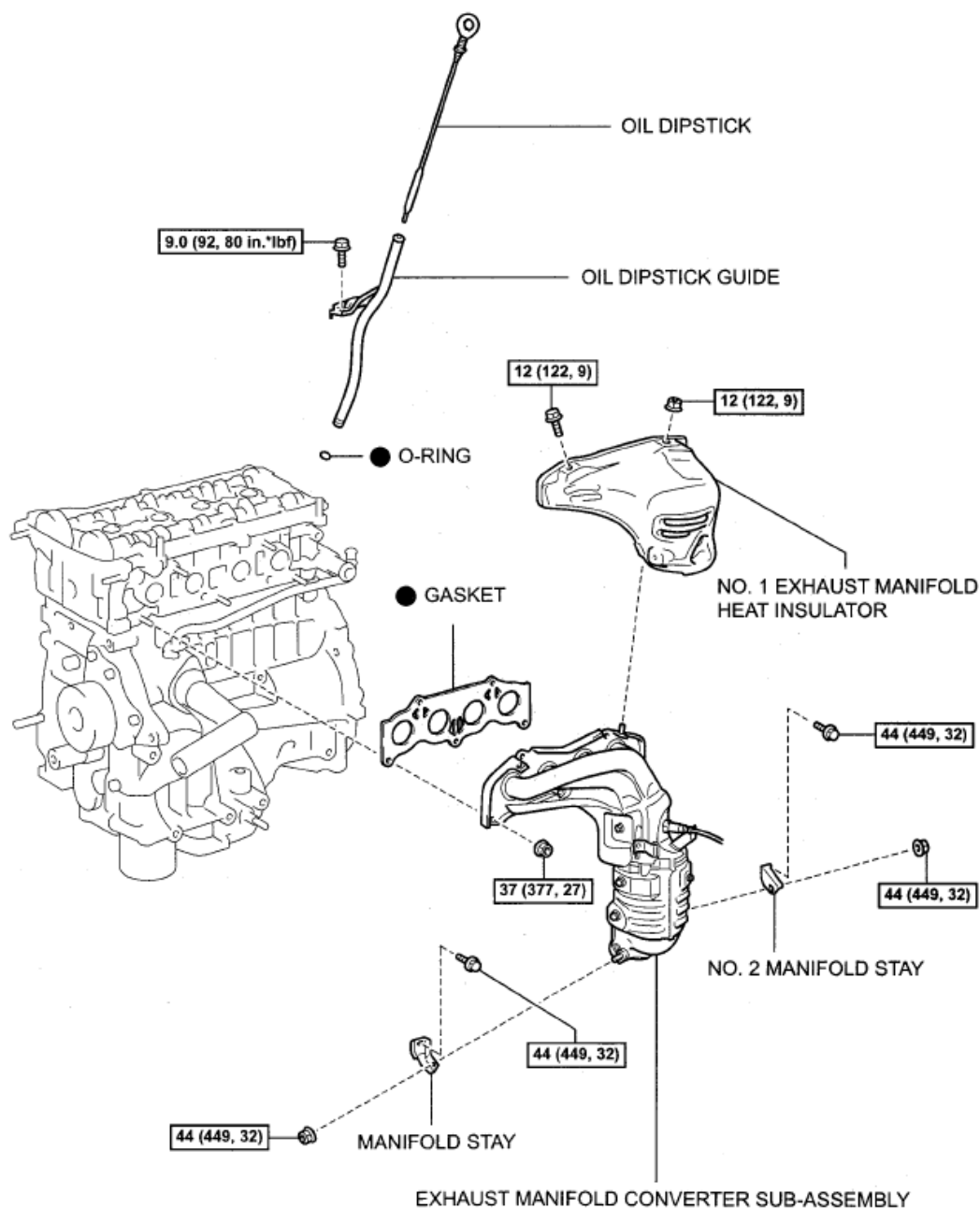


Fig. 116: Identifying Cylinder Head Replacement Components With Torque Specifications (10 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

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Fig. 117: Identifying Cylinder Head Replacement Components With Torque Specifications (11 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

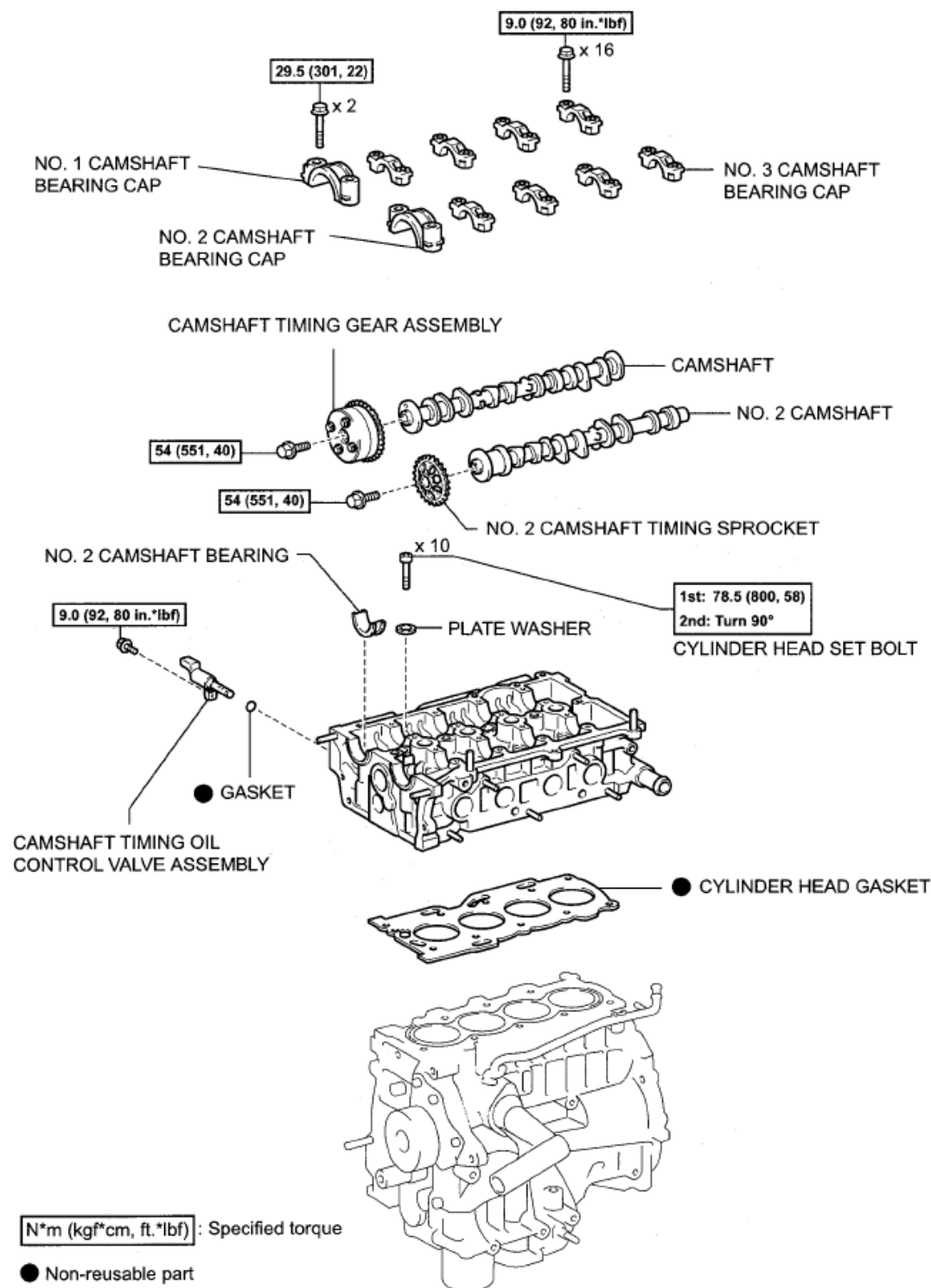


Fig. 118: Identifying Cylinder Head Replacement Components With Torque Specifications (12 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

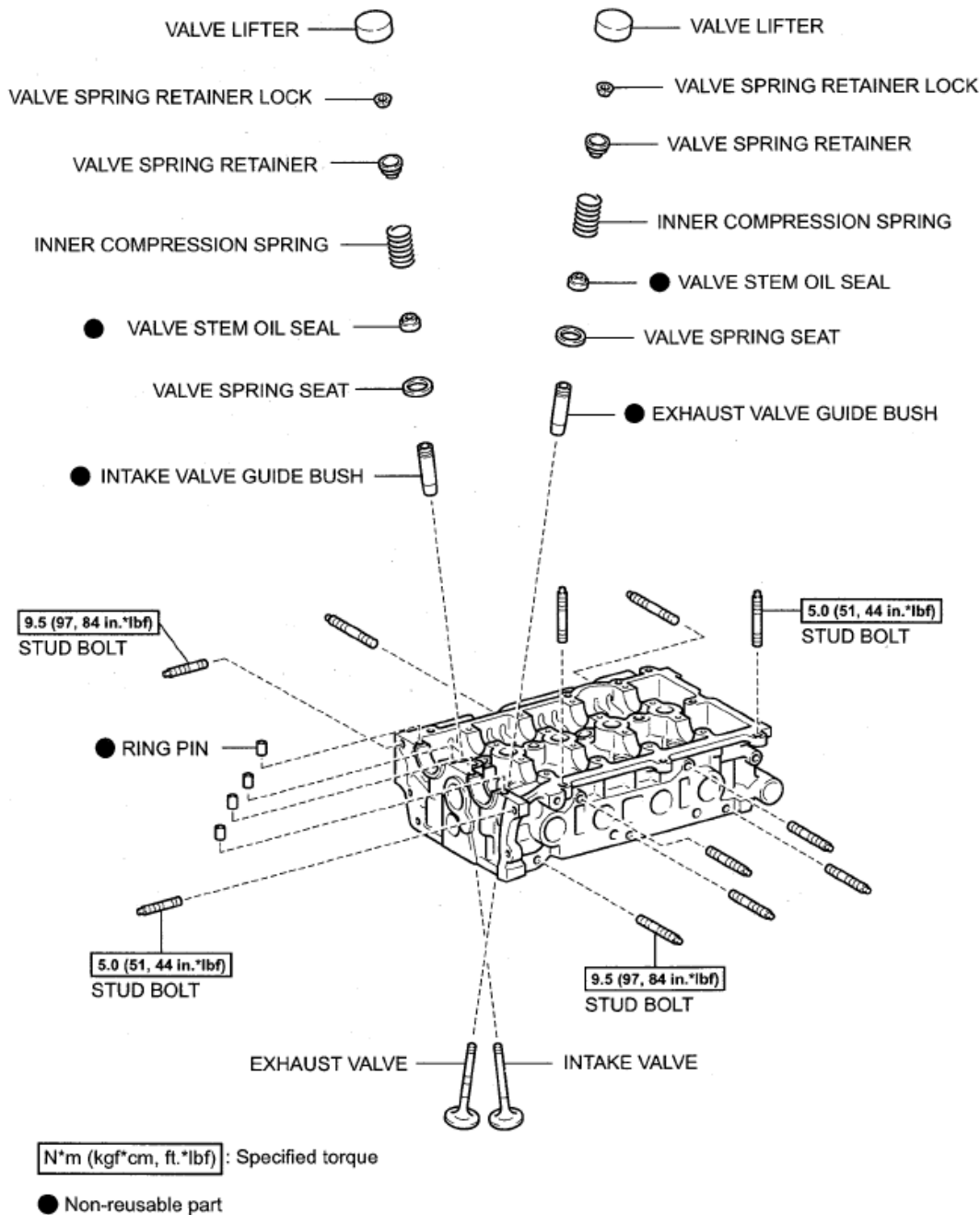


Fig. 119: Identifying Cylinder Head Replacement Components With Torque Specifications (13 Of 13)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **DISCHARGE FUEL SYSTEM PRESSURE** (See **REMOVAL**)
2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION: Wait at least 90 seconds after disconnecting the cable from the

negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

3. **REMOVE HOOD SUB-ASSEMBLY**
4. **REMOVE FRONT WHEEL RH**
5. **REMOVE ENGINE UNDER COVER RH**
6. **REMOVE ENGINE UNDER COVER LH**
7. **REMOVE FRONT FENDER APRON SEAL RH**
8. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)**
9. **REMOVE FRONT WIPER ARM HEAD CAP**
10. **REMOVE FRONT WIPER ARM LH**
11. **REMOVE FRONT WIPER ARM RH**
12. **REMOVE HOOD TO COWL TOP SEAL**
13. **REMOVE COWL TOP VENTILATOR LOUVER LH**
14. **REMOVE WIPER LINK ASSEMBLY**
15. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY**
16. **REMOVE COWL BODY MOUNTING BRACKET LOWER LH**
17. **DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
18. **DRAIN ENGINE OIL (See REPLACEMENT)**
19. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY (See REMOVAL)**
20. **REMOVE THROTTLE BODY ASSEMBLY (See REMOVAL)**
21. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY (See REMOVAL)**
22. **REMOVE INTAKE MANIFOLD**
 - a. Disconnect the 2 water by-pass hoses from the throttle body.
 - b. Remove the 5 bolts, 2 nuts, intake manifold and gasket.

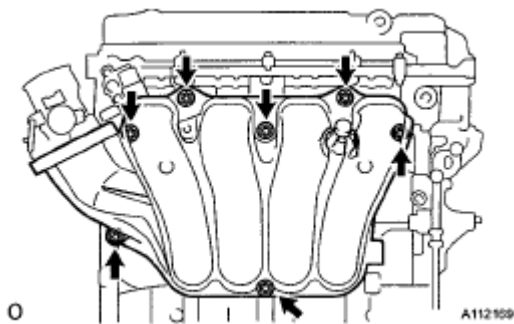


Fig. 120: Identifying Intake Manifold Bolts And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR (See REMOVAL)**
24. **REMOVE FRONT EXHAUST PIPE ASSEMBLY (See REMOVAL)**

25. REMOVE OIL DIPSTICK**26. REMOVE OIL DIPSTICK GUIDE**

- a. Remove the bolt and guide.
- b. Remove the O-ring from the guide.

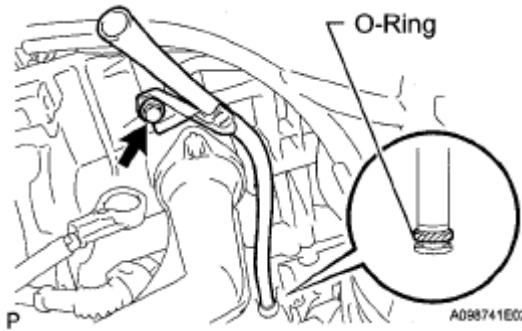


Fig. 121: Identifying Oil Dipstick Guide O-Ring And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. REMOVE MANIFOLD STAY

- a. Remove the bolt, nut and stay.

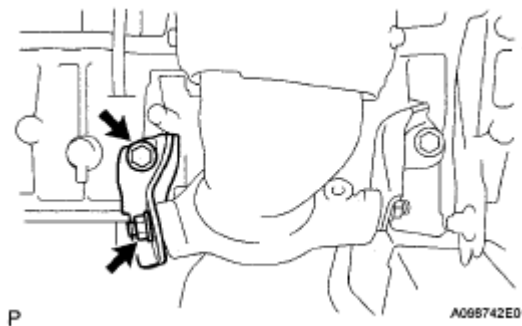


Fig. 122: Identifying Stay With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. REMOVE NO. 2 MANIFOLD STAY

- a. Remove the bolt, nut and stay.

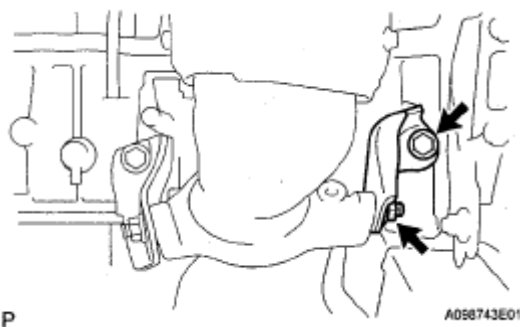


Fig. 123: Identifying Stay With Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Disconnect the air fuel ratio sensor connector.

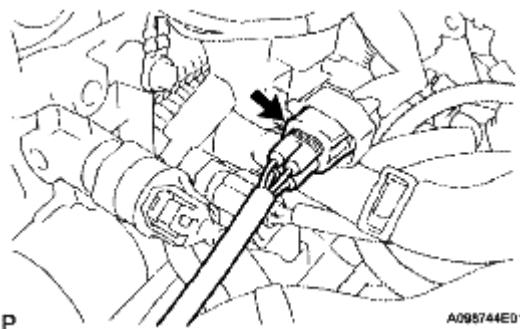


Fig. 124: Identifying Air-Fuel Ratio Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 3 bolts, nut and heat insulator.

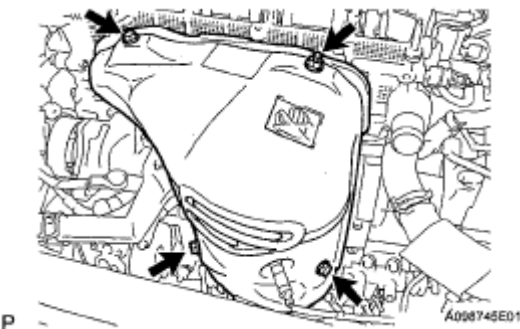


Fig. 125: Identifying Heat Insulator Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Remove the 5 nuts, manifold converter and gasket.

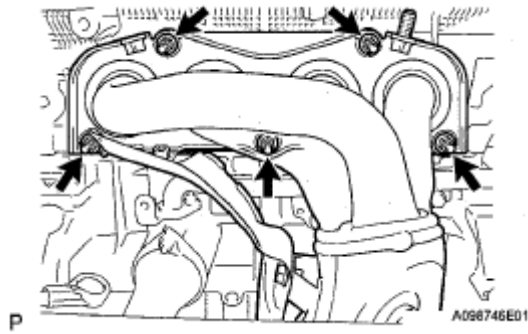


Fig. 126: Identifying Manifold Converter Nuts And Gasket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. REMOVE FAN AND GENERATOR V BELT (See REMOVAL)
32. REMOVE GENERATOR ASSEMBLY (See REMOVAL)
33. REMOVE VANE PUMP ASSEMBLY
34. REMOVE ENGINE MOUNTING INSULATOR RH (See REMOVAL)
35. REMOVE IGNITION COIL ASSEMBLY (See REMOVAL)
36. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See REMOVAL)
37. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY (See REMOVAL)
38. REMOVE CRANKSHAFT POSITION SENSOR (See REMOVAL)
39. REMOVE OIL PAN SUB-ASSEMBLY (See REMOVAL)
40. SET NO. 1 CYLINDER TO TDC/COMPRESSION
 - a. Turn the crankshaft pulley until its groove and the timing mark "0" of the timing chain cover are aligned.
 - b. Check that each timing mark of the camshaft timing gears is aligned with each timing mark located on the No. 1 and No. 2 bearing caps as shown in the illustration.

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

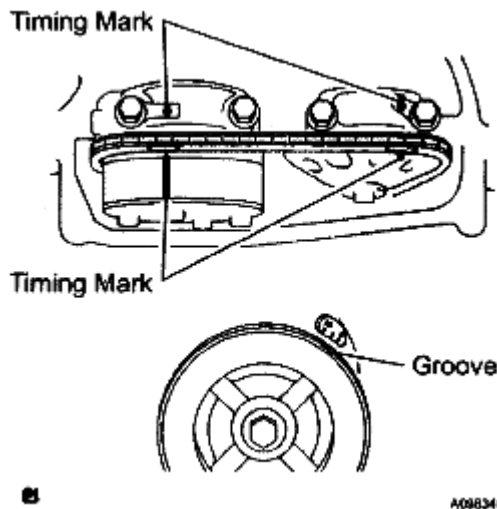


Fig. 127: Identifying Timing Mark Of Camshaft Timing Gear And Sprocket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. REMOVE NO. 2 CAMSHAFT

- a. Place paint marks on the chain and camshaft timing gears.

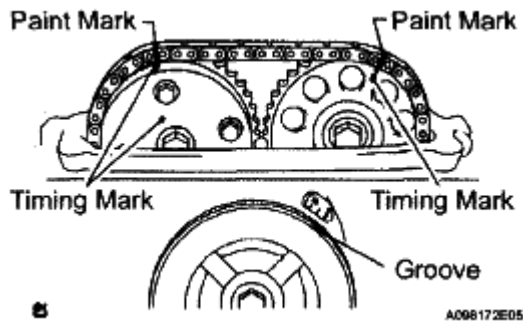


Fig. 128: Identifying Timing Marks On Chain And Camshaft Timing Gears
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the bolt.
- c. Disconnect the wire harness protector clamp.

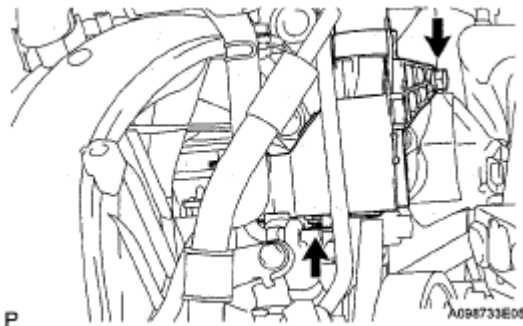


Fig. 129: Identifying Wire Harness Protector Clamp
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 2 nuts, tensioner and gasket.

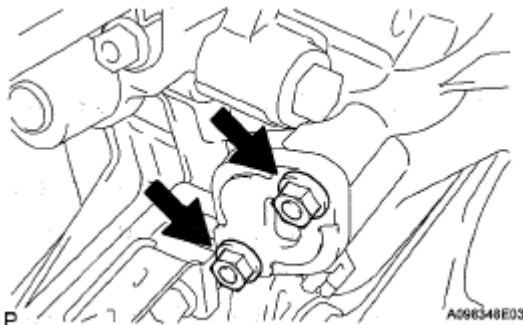
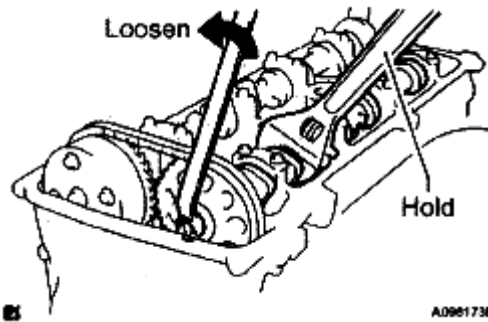


Fig. 130: Identifying Nuts

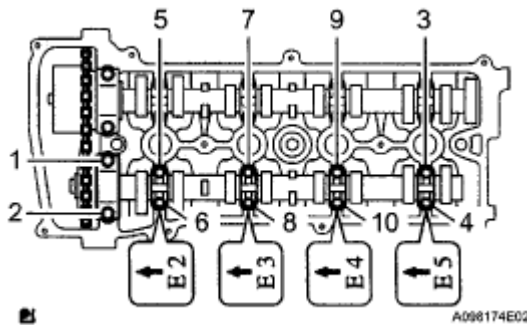
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. While holding the camshaft with a wrench, loosen the camshaft timing set bolt.

**Fig. 131: Identifying Camshaft Timing Set Bolt**

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

- f. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.

**Fig. 132: Identifying Bearing Cap Bolts In Sequence**

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

- g. Remove the 5 bearing caps.
 h. While holding the No. 2 camshaft by hand, remove the camshaft timing sprocket set bolt.

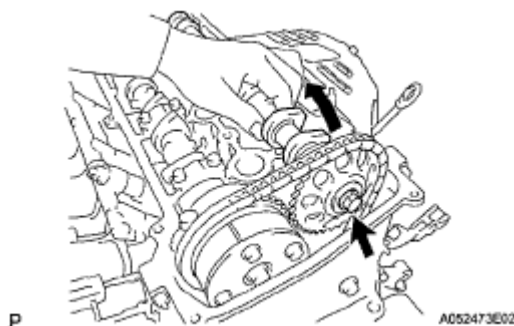


Fig. 133: Identifying Camshaft Timing Sprocket Set Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Remove the camshaft timing sprocket from the No. 2 camshaft with the timing chain wrapped on the sprocket.
- j. Remove the camshaft timing sprocket from the timing chain.

42. REMOVE CAMSHAFT

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

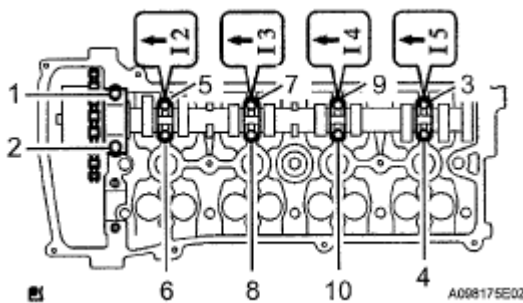


Fig. 134: Identifying Bearing Cap Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the camshaft and camshaft timing gear while holding the timing chain by hand.
- d. Tie the timing chain with a string as shown in the illustration.

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

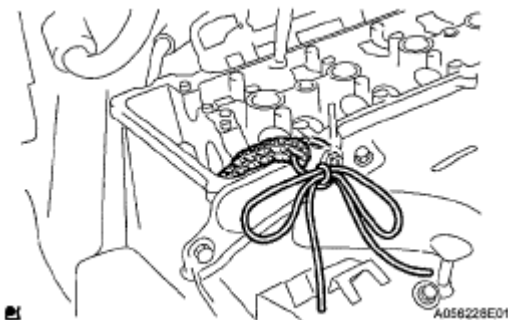


Fig. 135: Tying Timing Chain With String
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. REMOVE CRANKSHAFT PULLEY (See REMOVAL)
44. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY (See REMOVAL)
45. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE
46. REMOVE TIMING CHAIN GUIDE (See REMOVAL)

47. **REMOVE CHAIN TENSIONER SLIPPER** (See REMOVAL)
48. **REMOVE CHAIN SUB-ASSEMBLY**
49. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** (See REMOVAL)
50. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See REMOVAL)
51. **REMOVE CAMSHAFT TIMING GEAR ASSEMBLY**
 - a. Clamp the camshaft in a vise, and make sure that the camshaft timing gear does not rotate.
 - b. Cover all the oil ports with vinyl tape except the advance side port shown in the illustration.

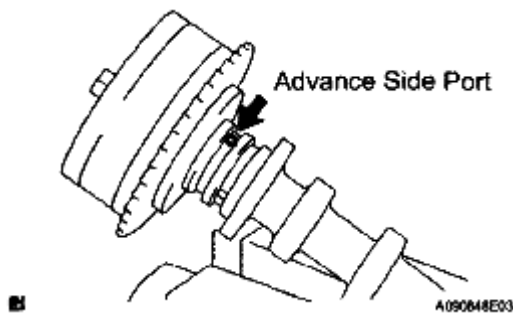


Fig. 136: Identifying Advance Side Port

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

- c. Apply air pressure of 100 kPa (1.0 kgf/cm² , 14 psi) to the oil path, then turn the camshaft timing gear to the advance direction (counterclockwise) by hand.

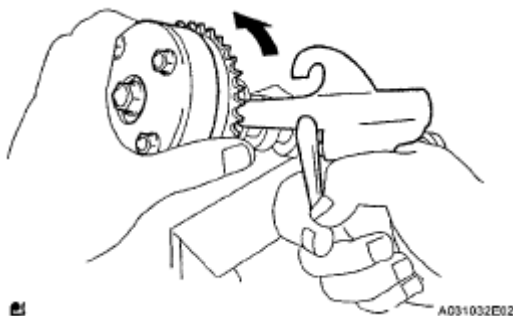


Fig. 137: Applying Air Pressure To Oil Path

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

CAUTION: Cover the paths with a shop rag to avoid oil splashes.

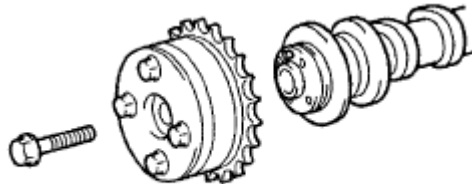
HINT:

Depending on the air pressure, the camshaft timing gear will turn to the advance angle side without applying force by hand. Also, under the condition that the pressure can hardly be applied because of air leakage from the port, there may be the case that the lock pin can hardly be released.

- d. Remove the flange bolt of the camshaft timing gear.

NOTE:

- Be sure not to remove the other 4 bolts.
- When reusing the camshaft timing gear, release the straight pin lock first, then install the gear.



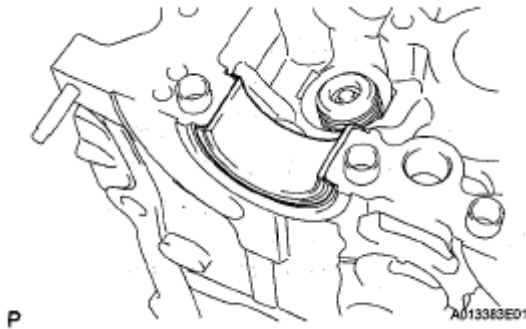
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Fig. 138: Identifying Flange Bolt Of Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the camshaft bearing.



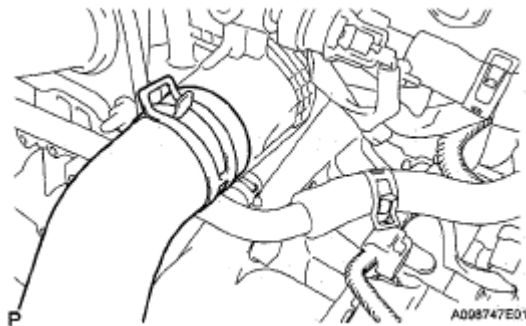
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Fig. 139: Identifying Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. REMOVE CYLINDER HEAD SUB-ASSEMBLY

- a. Disconnect the radiator hose inlet.



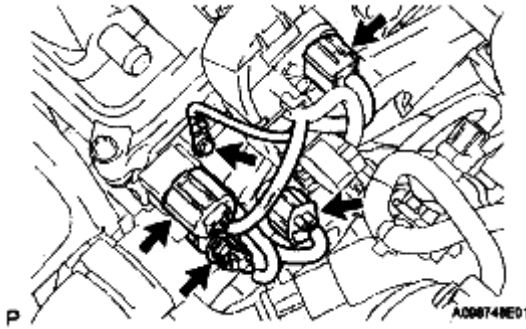
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Fig. 140: Identifying Radiator Hose Inlet

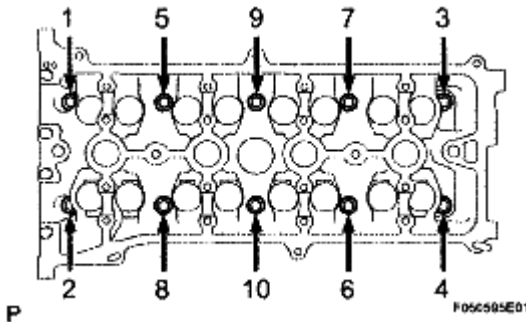
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disconnect the radio setting condenser connector.

**Fig. 141: Identifying Camshaft Position Sensor Connector**

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

- c. Disconnect the engine oil pressure switch connector.
 d. Disconnect the engine coolant temperature sensor connector.
 e. Disconnect the camshaft position sensor connector.
 f. Remove the bolt and ground cable.
 g. Using several steps, uniformly loosen and remove the 10 cylinder head bolts and 10 plate washers with a 10 mm bi-hexagon wrench in the sequence shown in the illustration.

**Fig. 142: Identifying Cylinder Head Bolts In Sequence And Plate Washers**

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

NOTE:

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

54. REMOVE CYLINDER HEAD GASKET**DISASSEMBLY**

1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifters in the correct order.

2. REMOVE INTAKE VALVE

- a. Place the cylinder head on wooden blocks.
- b. Using SST, compress the spring, then remove the 2 retainer locks.

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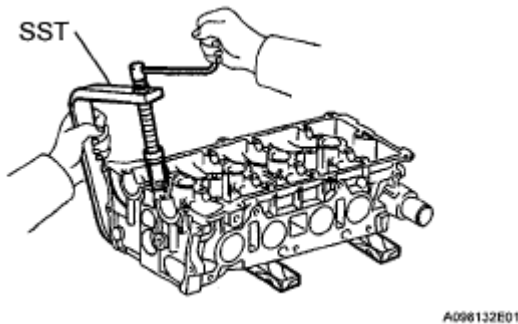


Fig. 143: Compressing Spring

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

- c. Remove the retainer, spring and valve from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE EXHAUST VALVE

- a. Place the cylinder head on wooden blocks.
- b. Using SST, compress the spring, then remove the 2 retainer locks.

SST 09202-70020(09202-00010)

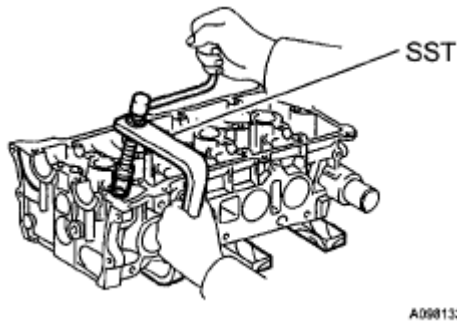


Fig. 144: Compressing Spring
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the retainer, spring and valve from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

4. REMOVE VALVE SPRING SEAT

5. REMOVE VALVE STEM OIL SEAL

- a. Using needle-nose pliers, remove the 16 oil seals.



Fig. 145: Identifying Oil Seals Using Needle-Nose Pliers
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE RING PIN

- a. Remove the 4 ring pins.

7. REMOVE STUD BOLT

- a. Using E5 and E7 "TORX" socket wrenches, remove the 11 stud bolts.

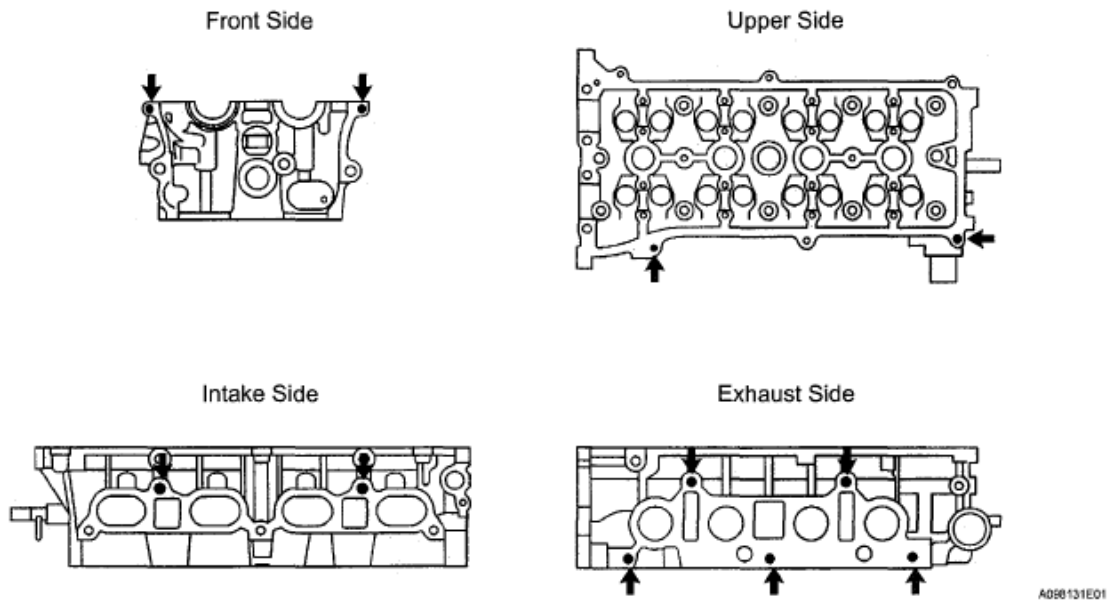


Fig. 146: Identifying Stud Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT CYLINDER HEAD FOR WARPAGE

- Using a precision straightedge and a feeler gauge, measure the surface that is in contact with the cylinder block and the manifolds for warpage.

Maximum warpage: 0.08 mm (0.0032 in.)

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

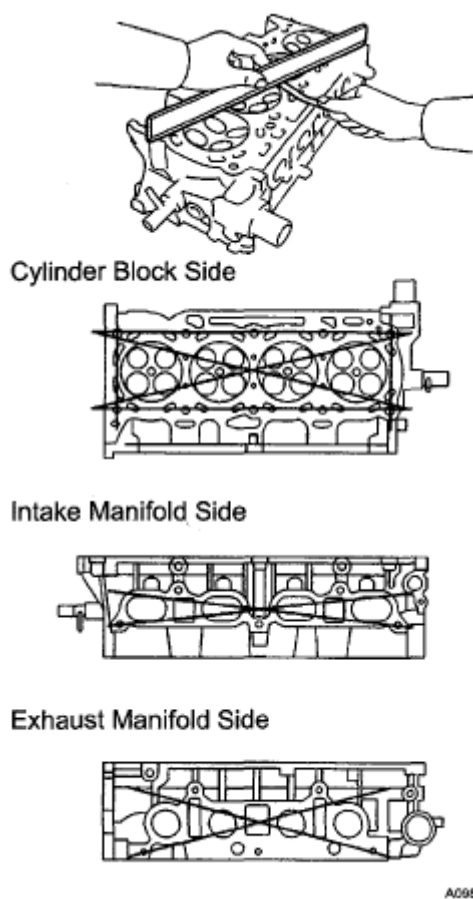


Fig. 147: Inspecting Cylinder Head For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT CYLINDER HEAD FOR CRACKS

- a. Using a dye penetrate, inspect the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.

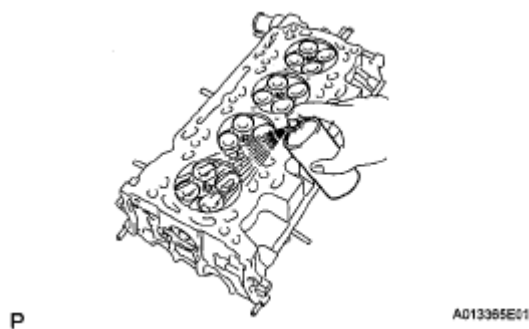


Fig. 148: Inspecting Cylinder Head For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT VALVE SEAT

- a. Apply a light coat of Prussian blue to the valve face.
- b. Lightly press the valve against the seat.

NOTE: **Do not turn the valve.**

- c. Check the valve face and seat in accordance with the following procedure.
 1. If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 2. If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the valve seat (see **REPAIR**).
 3. Check that the seat contact is in the middle of the valve face with a width of between 1.0 to 1.4 mm (0.039 to 0.055 in.).

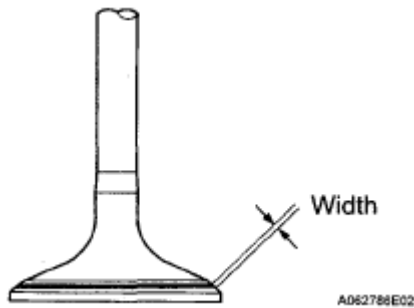


Fig. 149: Identifying Seat Contact Width

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

4. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

- a. Check the lock of the camshaft timing.
 1. Clamp the camshaft in a vise, and confirm that the camshaft timing gear is locked.

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

- b. Release the lock pin.
 1. Cover the 4 oil paths of the cam journal with vinyl tape as shown in the illustration.

HINT:

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

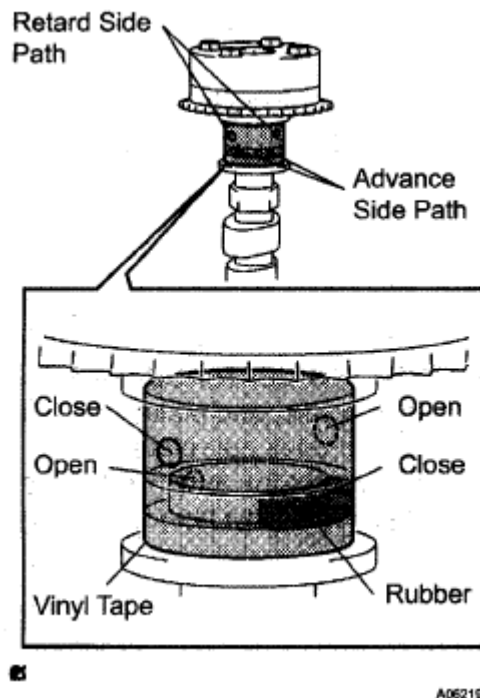


Fig. 150: Covering Oil Paths Of Cam Journal With Vinyl Tape
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Break through the tape of the advance side path and the retard side path on the opposite side of the groove.
3. Apply approximately 200 kPa (2.0 kgf/cm² , 28 psi) of air pressure to the paths whose tape was broken in the procedure above.

CAUTION: Some oil spraying will occur. Contain the spray with a shop rag.

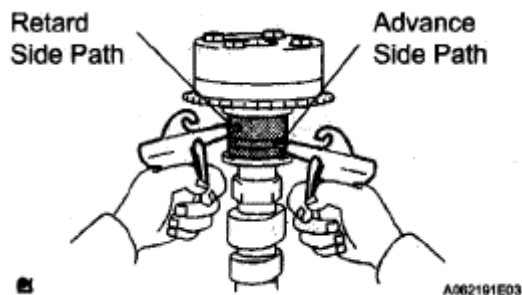


Fig. 151: Identifying Air Pressure Retard And Advance Side Path
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Check that the camshaft timing gear revolves in the advance direction when weakening the air pressure of the retard side path.

OK: Gear rotates in advance direction.

HINT:

This operation releases the lock pin for the extreme retard position.

5. When the camshaft timing gear reaches the extreme advance position, remove the air gun from the retard side path and advance side path, in that order.

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

- c. Check for smooth rotation.

1. Rotate the camshaft timing gear within its movable range several times, but do not turn it to the extreme retard position. Check that the gear rotates smoothly.

OK: Gear rotates in advance direction.

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

- d. Check the lock in the extreme retard position.

1. Confirm that the camshaft timing gear is locked at the extreme retard position.

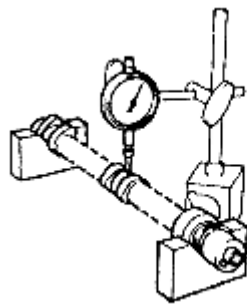
5. INSPECT CAMSHAFT

- a. Inspect the camshaft for runout.

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

Maximum circle runout: 0.03 mm (0.0012 in.)

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



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Fig. 152: Inspecting Camshaft For Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Inspect the cam lobes.

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

Standard cam lobe height: 46.495 to 46.595 mm (1.8305 to 1.8345 in.)

Minimum cam lobe height: 46.385 mm (1.8262 in.)

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

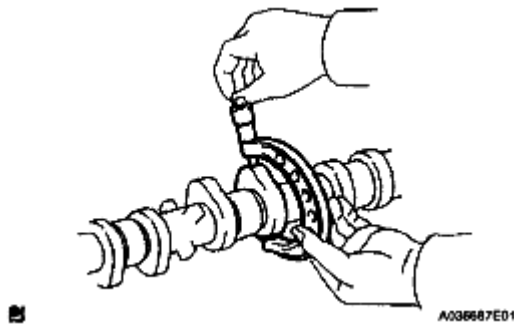


Fig. 153: Measuring Cam Lobes

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

c. Inspect the camshaft journals.

1. Using a micrometer, measure the journal diameter.

Standard journal diameter

STANDARD JOURNAL DIAMETER

Journal Position	Specified Condition
No. 1	35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other	22.959 to 22.975 mm (0.9039 to 0.9045 in.)

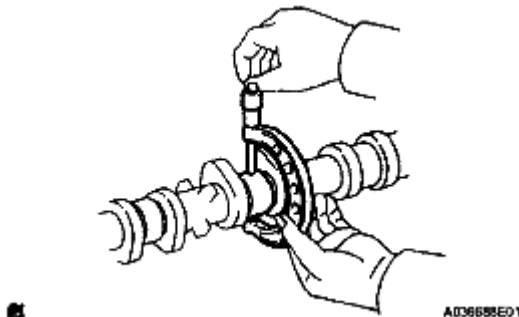


Fig. 154: Measuring Camshaft Journals

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

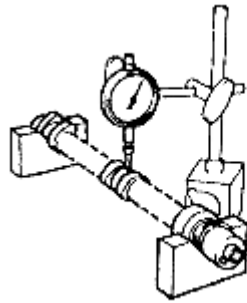
If the journal diameter is not as specified, check the oil clearance.

6. INSPECT NO. 2 CAMSHAFT

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

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than the maximum, replace the No. 2 camshaft.



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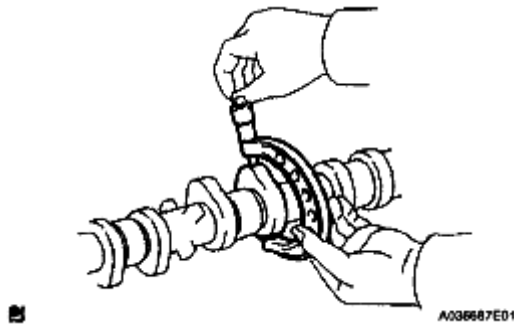
Fig. 155: Inspecting Camshaft For Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Inspect the cam lobes.
 1. Using a micrometer, measure the cam lobe height.

Standard cam lobe height: 45.983 to 46.083 mm (1.8104 to 1.8143 in.)

Minimum cam lobe height: 45.873 mm (1.8060 in.)

If the cam lobe height is less than the minimum, replace the No. 2 camshaft.



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Fig. 156: Identifying Cam Lobes
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Inspect the camshaft journals.
 1. Using a micrometer, measure the journal diameter.

Standard journal diameter**STANDARD JOURNAL DIAMETER**

Journal Position	Specified Condition
No. 1	35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other	22.959 to 22.975 mm (0.9039 to 0.9045 in.)

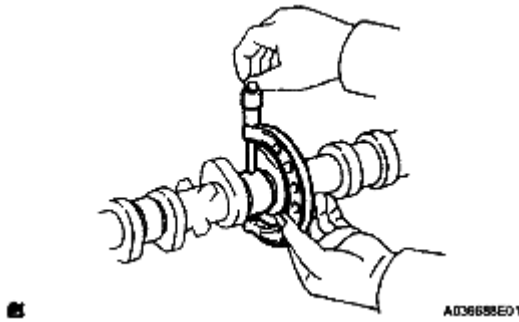


Fig. 157: Identifying Camshaft Journals
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

7. INSPECT CAMSHAFT THRUST CLEARANCE

- Install the 2 camshafts (see **INSTALLATION**).
- Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance**STANDARD THRUST CLEARANCE**

Item	Standard Condition
Intake	0.040 to 0.095 mm (0.0016 to 0.0037 in.)
Exhaust	0.080 to 0.135 mm (0.0032 to 0.0053 in.)

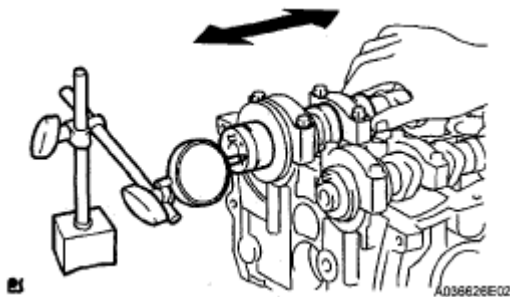


Fig. 158: Measuring Thrust Clearance
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum thrust clearance**MAXIMUM THRUST CLEARANCE**

Item	Standard Condition
Intake	0.11 mm (0.0043 in.)
Exhaust	0.15 mm (0.0059 in.)

- If the thrust clearance is greater than the maximum, replace the cylinder head.
- If damage is found on the camshaft thrust surfaces, replace the camshaft.

8. INSPECT CAMSHAFT OIL CLEARANCE

- Clean the 10 bearing caps and camshaft journals.
- Place the 2 camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.

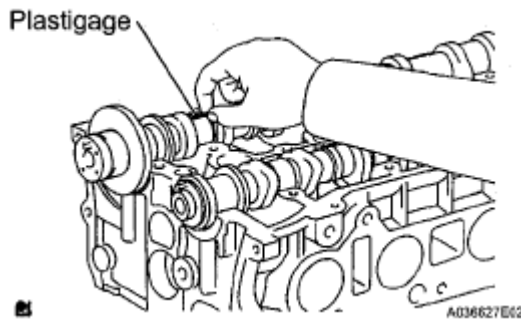


Fig. 159: Laying Strip Of Plastigage Across Each Of Camshaft Journals
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

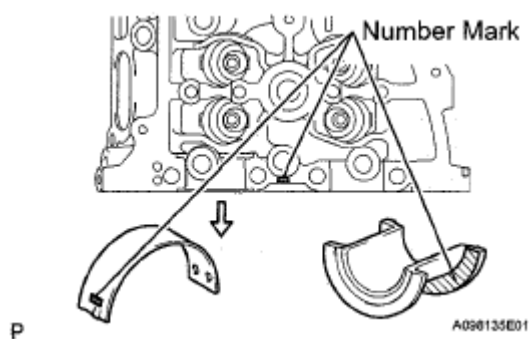
- Install the 10 bearing caps (see INSTALLATION).

NOTE: **Do not turn the camshaft.**

- Remove the 10 bearing caps (see REMOVAL and REMOVAL).
- Measure the Plastigage at its widest point.

Standard oil clearance**STANDARD OIL CLEARANCE**

Item	Standard Condition
Intake No. 1 journal	0.007 to 0.038 mm (0.0003 to 0.0015 in.)
Exhaust No. 1 journal	0.040 to 0.079 mm (0.0016 to 0.0031 in.)
Other journal	0.025 to 0.062 mm (0.0010 to 0.0024 in.)

**Fig. 160: Identifying Number Marks**

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

Maximum oil clearance**MAXIMUM OIL CLEARANCE**

Item	Standard Condition
Intake No. 1 journal	0.07 mm (0.0028 in.)
Other journal	0.10 mm (0.0039 in.)

NOTE: Completely remove the Plastigage after the measurement.

If the oil clearance is greater than the maximum, replace the cylinder head sub-assembly or the camshaft.

If the oil clearance on the No. 1 journal is greater than the maximum, choose a new bearing and install it.

Standard cylinder head journal bore diameter**STANDARD CYLINDER HEAD JOURNAL BORE DIAMETER**

Mark	Standard Condition
Mark 1	40.000 to 40.008 mm (1.5748 to 1.5751 in.)
Mark 2	40.009 to 40.017 mm (1.5752 to 1.5755 in.)
Mark 3	40.018 to 40.025 mm (1.5755 to 1.5758 in.)

Standard bearing center wall thickness**STANDARD BEARING CENTER WALL THICKNESS**

Mark	Standard Condition
Mark 1	2.000 to 2.004 mm (0.0787 to 0.0789 in.)
Mark 2	2.005 to 2.008 mm (0.0789 to 0.0791 in.)
Mark 3	2.009 to 2.012 mm (0.0791 to 0.0792 in.)

Standard camshaft journal diameter: 35.971 to 35.985 mm (1.4162 to 1.4167 in.)

9. INSPECT VALVE LIFTER

- a. Using a micrometer, measure the lifter diameter.

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

If the diameter is not as specified, replace the valve lifter.

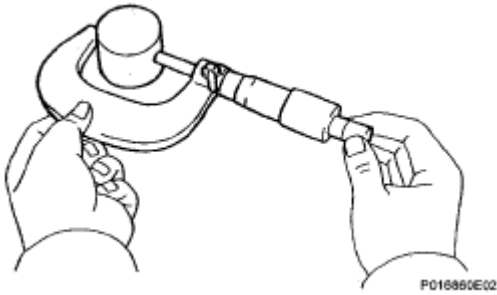


Fig. 161: Measuring Lifter Diameter

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

10. INSPECT VALVE LIFTER OIL CLEARANCE

- a. Using a caliper gauge, measure the valve lifter bore diameter of the cylinder head.

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

If the diameter is not as specified, replace the cylinder head sub-assembly.

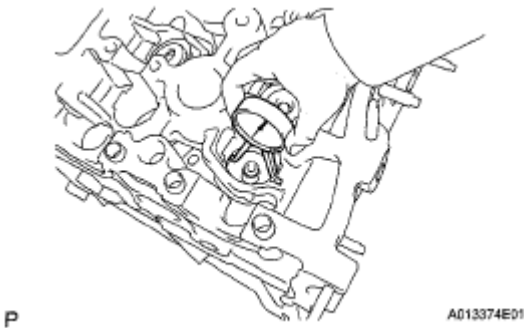


Fig. 162: Measuring Valve Lifter Bore Diameter Of Cylinder Head

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

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

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

Maximum oil clearance: 0.079 mm (0.0031 in.)

If the oil clearance is greater than the maximum, replace the valve lifter. If necessary, replace the

cylinder head sub-assembly.

11. INSPECT INNER COMPRESSION SPRING

- a. Using vernier calipers, measure the free length of the valve spring.

Standard free length: 4.7 mm (0.185 in.)

If the length is not as specified, replace the inner compression spring.

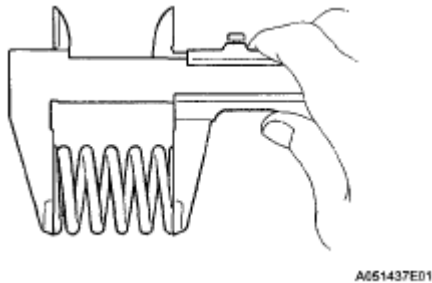


Fig. 163: Measuring Free Length Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a steel square, measure the deviation of the inner compression spring.

Maximum deviation: 1.6 mm (0.063 in.)

Maximum angle (Reference): 2°

If the deviation is greater than the maximum, replace the inner compression spring.

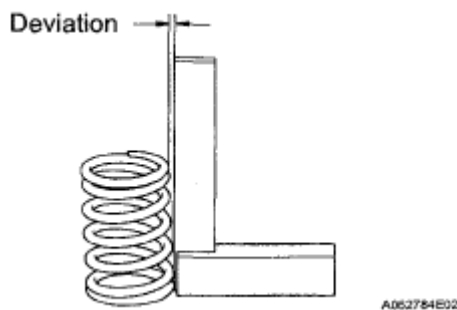


Fig. 164: Measuring Deviation Of Inner Compression Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSPECT INTAKE VALVE

- a. Using vernier calipers, measure the valve overall length.

Standard overall length: 101.71 mm (4.0043 in.)

Minimum overall length: 101.21 mm (3.9846 in.)

If the overall length is less than the minimum, replace the intake valve.

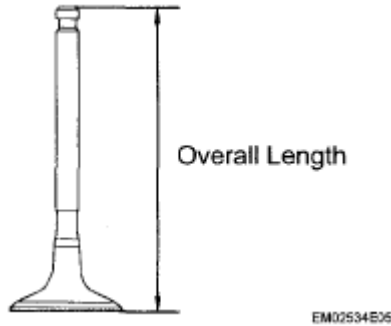


Fig. 165: Measuring Valve Overall Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

If the diameter is not as specified, replace the intake valve.

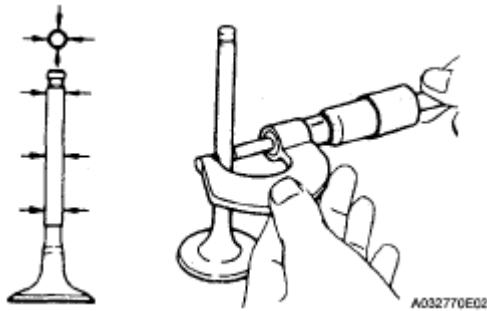


Fig. 166: Measuring Diameter Of Valve Stem
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.50 mm (0.0197 in.)

If the diameter is not as specified, replace the intake valve.

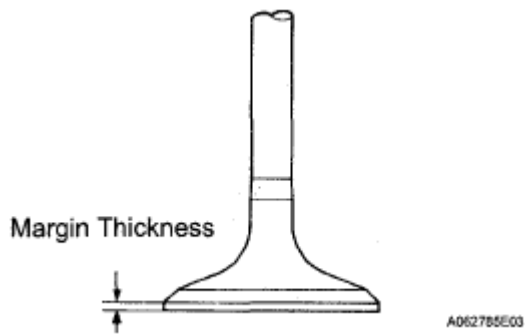


Fig. 167: Measuring Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSPECT EXHAUST VALVE

- a. Using vernier calipers, measures the valve overall length.

Standard overall length: 101.15 mm (3.9823 in.)

Minimum overall length: 100.70 mm (3.9646 in.)

If the overall length is less than the minimum, replace the exhaust valve.

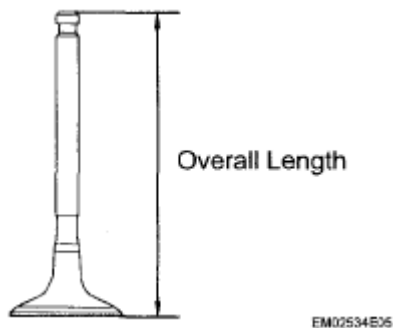


Fig. 168: Measuring Valve Overall Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard valve stem diameter: 5.465 to 5.480 mm (0.2152 to 0.2158 in.)

If the overall length is less than the minimum, replace the exhaust valve.

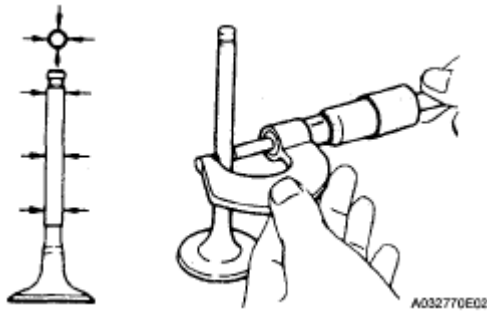


Fig. 169: Measuring Diameter Of Valve Stem

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

- c. Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.50 mm (0.0197 in.)

If the overall length is less than the minimum, replace the exhaust valve.

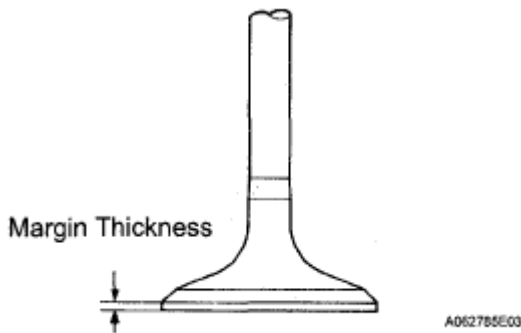


Fig. 170: Measuring Valve Head Margin Thickness

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

14. INSPECT INTAKE VALVE GUIDE BUSH

- a. Using a caliper gauge, measure the inside diameter of the guide bush.

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

If the inside diameter is not as specified, replace the intake valve guide bush.

- b. Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

Standard oil clearance: 0.025 to 0.060 mm (0.0010 to 0.0024 in.)

Maximum oil clearance: 0.08 mm (0.0032 in.)

If the clearance is greater than the maximum, replace the valve and intake guide bush.

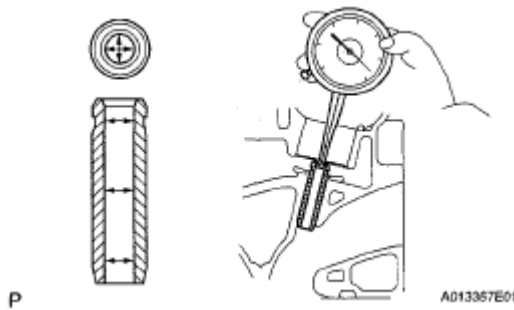


Fig. 171: Inspecting Intake Valve Guide Bush

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

15. INSPECT EXHAUST VALVE GUIDE BUSH

- a. Using a caliper gauge, measure the inside diameter of the guide bush.

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

If the inside diameter is not as specified, replace the exhaust valve guide bush.

- b. Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

Standard oil clearance: 0.030 to 0.065 mm (0.0012 to 0.0026 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than the maximum, replace the valve and exhaust valve guide bush.

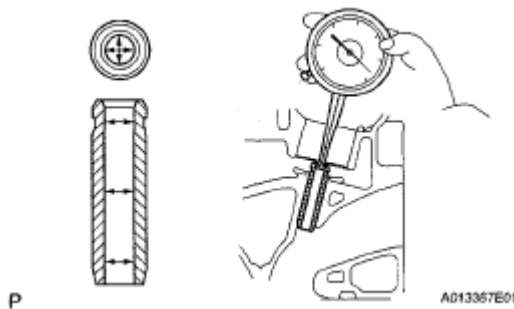


Fig. 172: Inspecting Exhaust Valve Guide Bush

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

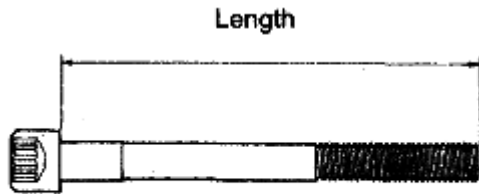
16. INSPECT CYLINDER HEAD SET BOLT

- a. Using vernier calipers, measure the length of the head bolts from the seat to the end.

Standard bolt length: 161.3 to 162.7 mm (6.350 to 6.406 in.)

Maximum bolt length: 164.2 mm (6.465 in.)

If the bolt length is greater than the maximum, replace the cylinder head set bolt.



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Fig. 173: Measuring Length Of Head Bolts From Seat To End
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. REMOVE INTAKE VALVE GUIDE BUSH

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

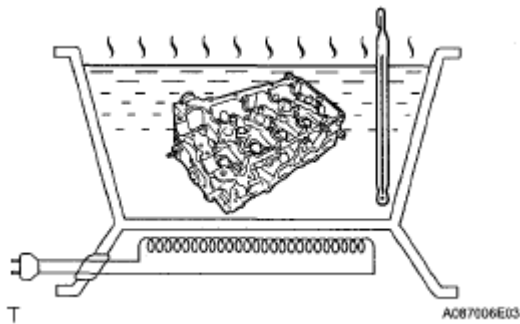
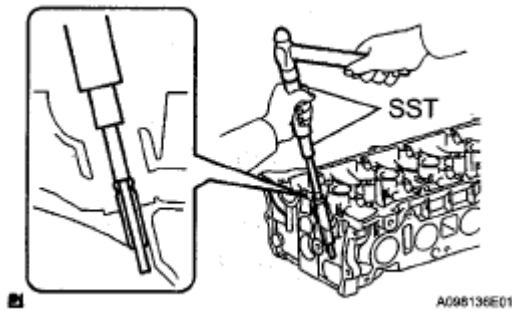


Fig. 174: Heating Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.

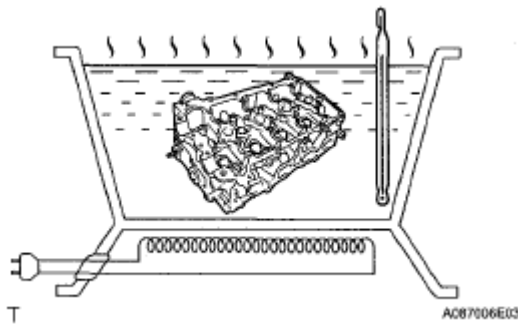
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

**Fig. 175: Tapping Out Guide Bush**

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

2. REMOVE EXHAUST VALVE GUIDE BUSH

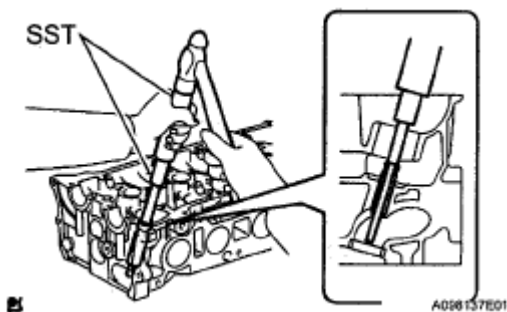
- a. Heat the cylinder head to 80 to 100°C (176 to 212°F).

**Fig. 176: Heating Cylinder Head**

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

- b. Place the cylinder head on wooden blocks.
- c. Using SST and a hammer, tap out the guide bush.

SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

**Fig. 177: Tapping Out Guide Bush**

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

3. INSTALL INTAKE VALVE GUIDE BUSH

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

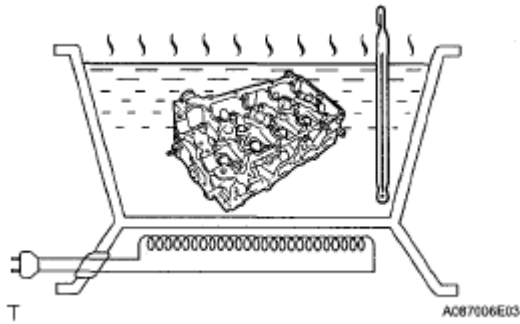


Fig. 178: Heating Cylinder Head

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

- b. Place the cylinder head on wooden blocks.
c. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Standard diameter: 10.285 to 10.306 mm (0.4049 to 0.4058 in.)

- d. Install the STD bush if the diameter is within the specified diameter.

Standard diameter: 10.333 to 10.344 mm (0.4068 to 0.4072 in.)

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

SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

Standard protrusion height: 9.6 to 10 mm (0.3780 to 0.3937 in.)

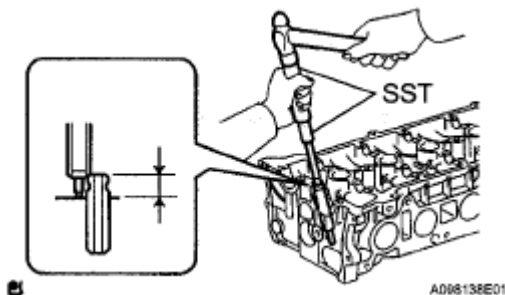


Fig. 179: Tapping Guide Bush

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

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

Standard oil clearance: 0.025 to 0.060 mm (0.0010 to 0.0024 in.)

4. INSTALL EXHAUST VALVE GUIDE BUSH

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

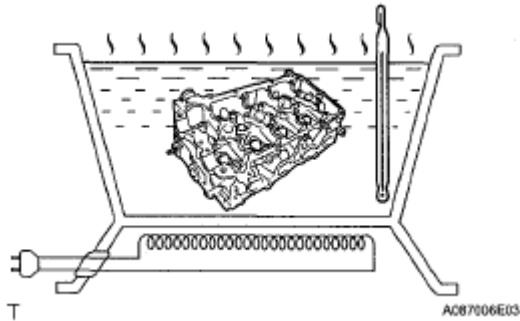


Fig. 180: Heating Cylinder Head

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

- b. Place the cylinder head on wooden blocks.
- c. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Standard diameter: 10.285 to 10.306 mm (0.4049 to 0.4058 in.)

- d. Install the STD bush if the diameter is within the specified diameter.

Standard diameter: 10.333 to 10.344 mm (0.4068 to 0.4072 in.)

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

SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

Standard protrusion height: 9.6 to 10.0 mm (0.3780 to 0.3937 in.)

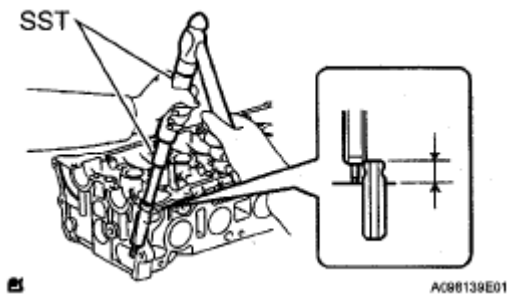


Fig. 181: Tapping Guide Bush

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

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

Standard oil clearance: 0.030 to 0.065 mm (0.0012 to 0.0026 in.)

REASSEMBLY

1. INSTALL INTAKE VALVE

- Place the cylinder head on wooden blocks.
- Install the valve, spring and retainer onto the cylinder head.
- Using SST, compress the spring, and place the 2 retainer locks around the valve stem.

SST 09202-70020 (09202-00010)

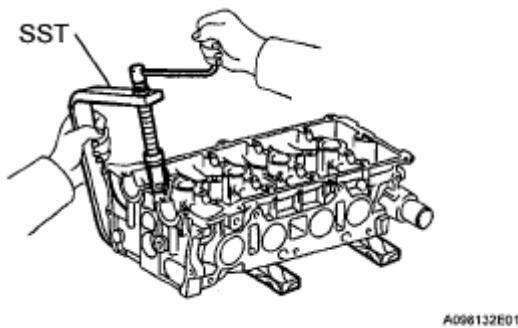


Fig. 182: Compressing Spring

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

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

NOTE: Be careful not to damage the valve stem tip.

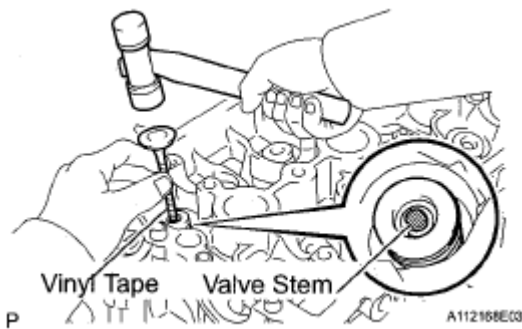


Fig. 183: Tapping Installed Valve To Fit Into Place

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

2. INSTALL EXHAUST VALVE

- Place the cylinder head on wooden blocks.
- Install the valve, spring and retainer onto the cylinder head.

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

SST 09202-70020 (09202-00010)

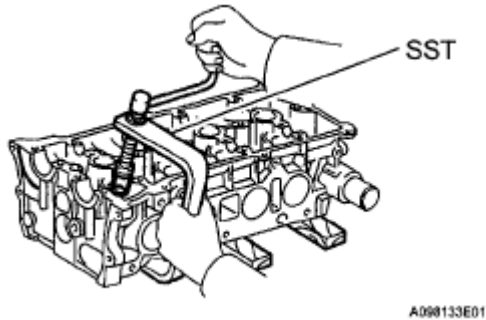


Fig. 184: Compressing Spring

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

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

NOTE: Be careful not to damage the valve stem tip.

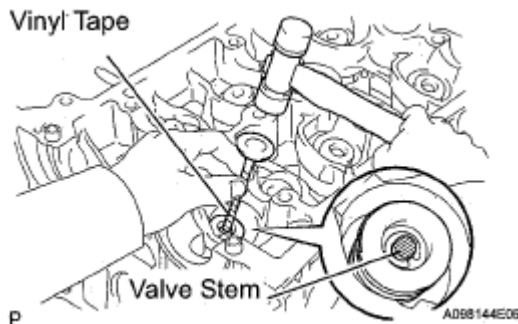


Fig. 185: Tapping Installed Valve To Fit Into Place

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

3. INSTALL VALVE LIFTER

- a. Assemble the valve lifter and the tip of the valve stem with a light coat of engine oil applied.

NOTE: Install the valve lifters in their original places.

4. INSTALL STUD BOLT

- a. Using E5 and E7 "torx" socket Wrenches, install the 11 stud bolts.

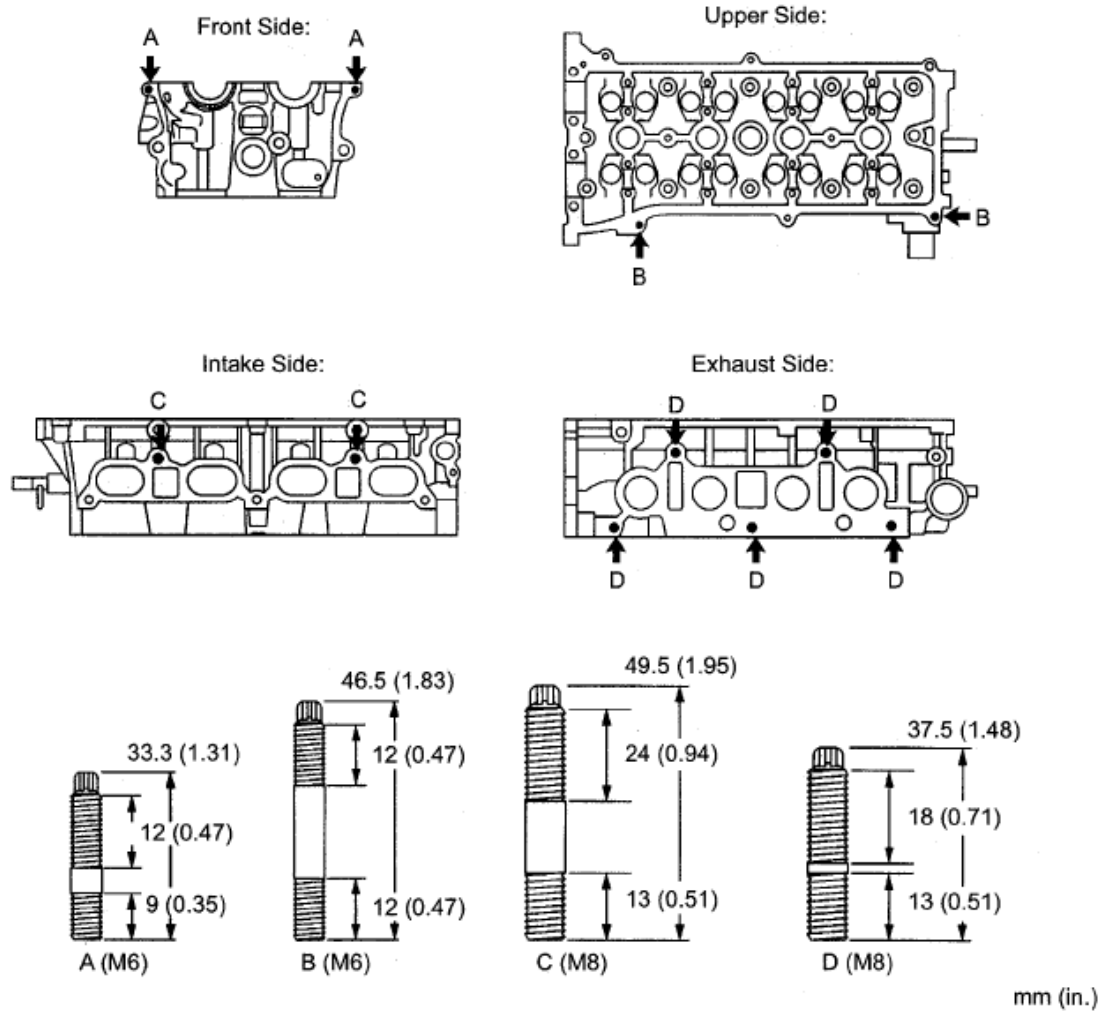
Torque:

5.0 N*m (51 kgf*cm, 44 in.*lbf) for bolt A

5.0 N*m (51 kgf*cm, 44 in.*lbf) for bolt B

9.5 N*m (97 kgf*cm, 84 in.*lbf) for bolt C

9.5 N*m (97 kgf*cm, 84 in.*lbf) for bolt D



A09B141E02

Fig. 186: Identifying Stud Bolts

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

5. INSTALL VALVE SPRING SEAT

6. INSTALL RING PIN

- Using a plastic-faced hammer, tap in 4 new ring pins to the specified protrusion height.

protrusion height: 3.0 mm (0.12 in.)

Upper Side:

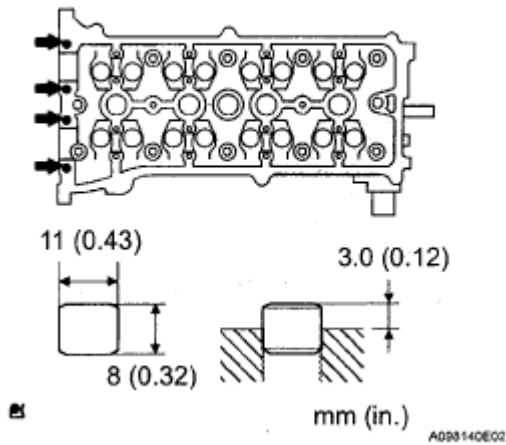


Fig. 187: Tapping Ring Pins To Protrusion Height
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

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

NOTE:

- Remove any oil from contact surface.
- Be careful of the installation direction.
- Place the cylinder head gently in order to avoid damaging the gasket.

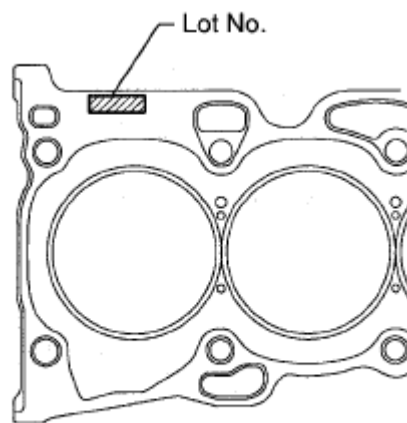


Fig. 188: Identifying Lot No. Stamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

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

- Apply a light coat of engine oil to the threads and under the heads of the cylinder set head bolts.
- Using several steps, uniformly install and tighten the 10 cylinder head set bolts and plate washers with a 10 mm bi-hexagon wrench in the order shown in the illustration.

Torque: 78.5 N*m (800 kgf*cm, 58 ft.*lbf)

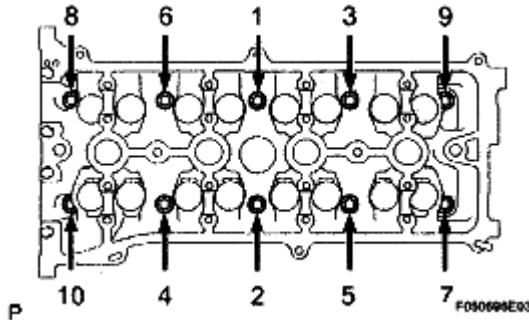


Fig. 189: Tightening Cylinder Head Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Mark the front of the cylinder head bolts with paint.
- Retighten the cylinder head bolts by 90° as shown in the illustration.

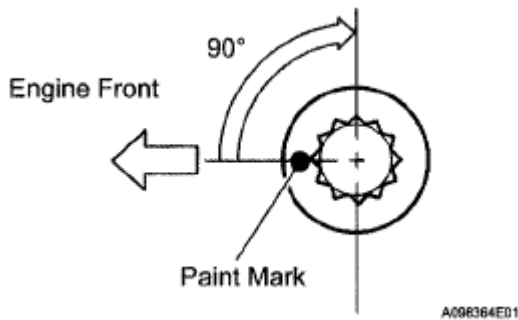


Fig. 190: Tightening Cylinder Head Bolts An Additional 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Check that the paint mark is now at a 90° angle to the front.
- Connect the ground cable with the bolt.

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

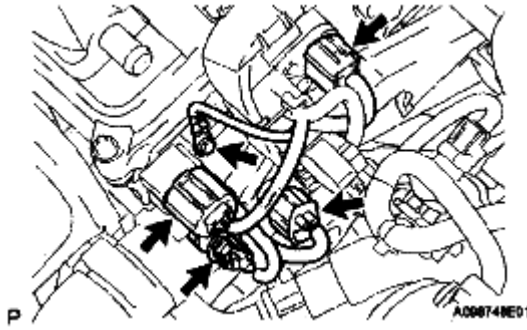


Fig. 191: Identifying Ground Cable Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Connect the camshaft position sensor connector.
- h. Connect the engine coolant temperature sensor connector.
- i. Connect the engine oil pressure switch connector.
- j. Connect the radio setting condenser connector.
- k. Connect the heater water inlet hose.
- l. Connect the radiator hose inlet.

3. INSTALL NO. 2 CAMSHAFT BEARING

- a. Clean the contact surfaces of the bearing and the cylinder head.
- b. Install the No. 2 camshaft bearing onto the cylinder head.

NOTE: Do not apply engine oil to the bearing its contact surface.

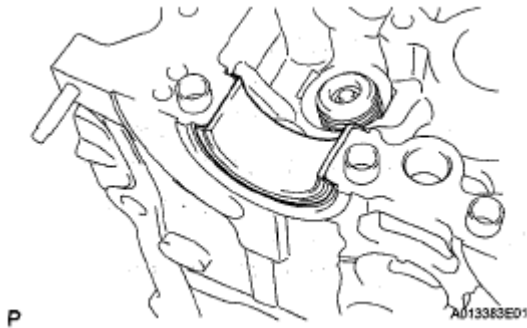


Fig. 192: Identifying Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

- a. Put the camshaft timing gear and camshaft together with the straight pin off the key groove.
- b. Turn the camshaft timing gear as shown in the illustration while pushing it gently against the camshaft. Push further at the position where the pin fits into the groove.

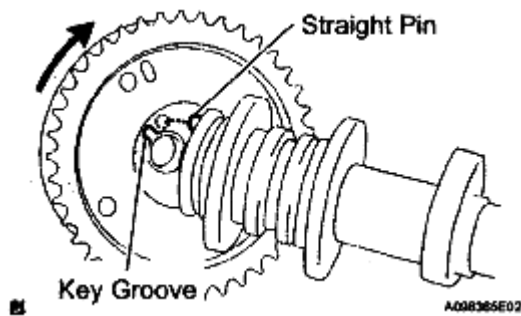


Fig. 193: Turning Camshaft Timing Gear

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

NOTE: Be sure not to turn the camshaft timing gear to the retard angle side (the right angle).

- c. Check that there is no clearance between the gear fringe and camshaft.
- d. Tighten the flange bolt with the camshaft timing gear fixed in place.

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

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

5. INSTALL NO. 2 CAMSHAFT TIMING SPROCKET

- a. Clamp the camshaft in a vise, then install the camshaft timing sprocket with the bolt.

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

NOTE: Do not damage the camshaft.

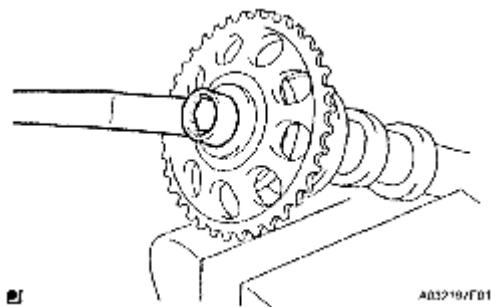


Fig. 194: Identifying Camshaft Timing Sprocket

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

6. INSTALL CAMSHAFT

- a. Apply a light coat of engine oil to the journal portion of the camshaft.
- b. Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing the directions shown in

the illustration.

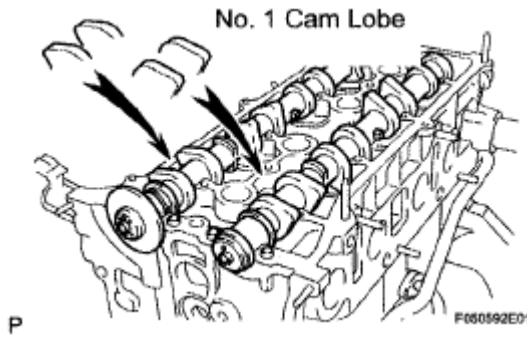


Fig. 195: Identifying No. 1 Cam Lobes

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

- c. Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.

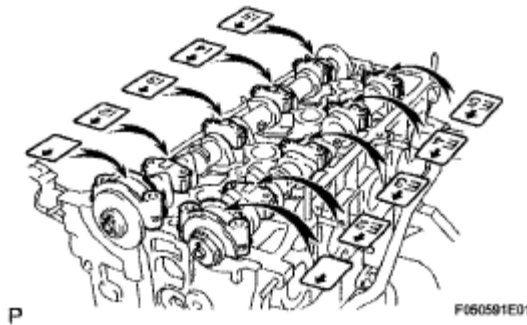


Fig. 196: Identifying Front Marks And Numbers Order

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

- d. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- e. Using several steps, uniformly tighten the 20 bearing cap bolts in the sequence shown in the illustration.

Torque:

29.5 N*m (301 kgf*cm, 22 ft.*lbf) for No. 1 and No. 2 bearing cap

9.0 N*m (92 kgf*cm, 80 in.*lbf) for No. 3 bearing cap

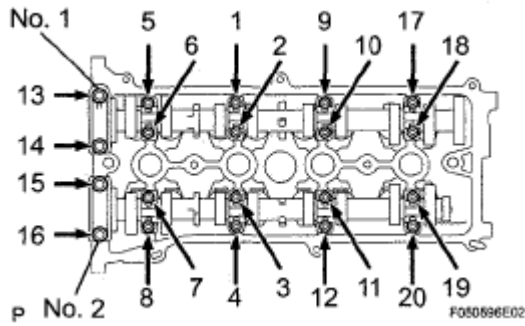


Fig. 197: Tightening Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Tighten the bolts after deciding the position in the thrust direction of the camshaft by the No. 1 and No. 2 bearing caps.
- Install the camshaft with the timing mark of the camshaft timing gear on top.

7. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

8. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

- a. Install a new gasket onto the cylinder head.
- b. Temporarily tighten the exhaust manifold converter with the 5 nuts.
- c. Tighten the 5 nuts in the sequence shown in the illustration.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

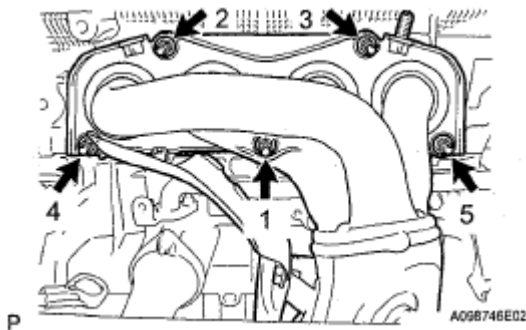


Fig. 198: Tightening Exhaust Manifold Converter Sub-Assembly Nuts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Install the exhaust manifold heat insulator with the 3 bolts and nut.

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

- b. Connect the air fuel ratio sensor connector.

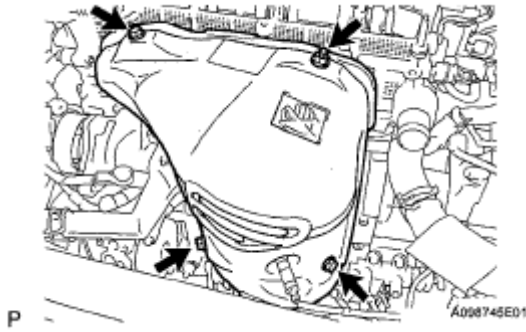


Fig. 199: Identifying No. 1 Exhaust Manifold Heat Insulator Bolts And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL NO. 2 MANIFOLD STAY

- a. Install the stay with the bolt and nut.

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

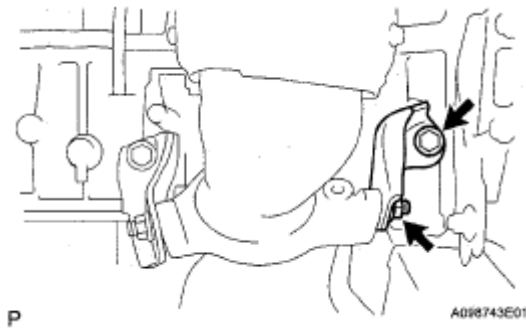


Fig. 200: Identifying No. 2 Manifold Stay Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL MANIFOLD STAY

- a. Install the stay with the bolt and nut.

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

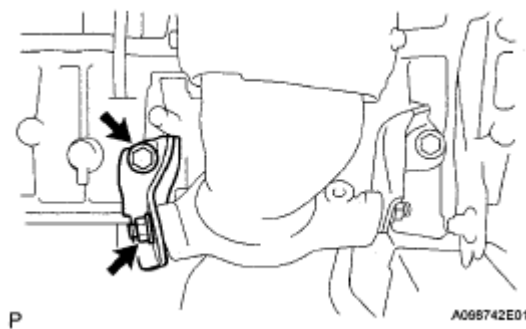


Fig. 201: Identifying Stay With Bolt And Nut

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

12. INSTALL OIL DIPSTICK GUIDE

- a. Apply a light coat of engine oil to a new O-ring and install it onto the guide.
- b. Install the guide with the bolt.

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

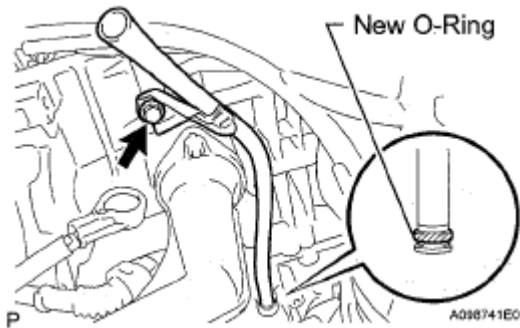


Fig. 202: Identifying Oil Dipstick Guide O-ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL OIL DIPSTICK

- a. Apply a light coat of engine oil to the O-ring.
- b. Install the dipstick to the guide.

14. **INSTALL NO. 1 CHAIN VIBRATION DAMPER** (See INSTALLATION)
15. **INSTALL CHAIN SUB-ASSEMBLY**
16. **INSTALL CHAIN TENSIONER SLIPPER** (See INSTALLATION)
17. **INSTALL TIMING CHAIN GUIDE** (See INSTALLATION)
18. **INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE** (See INSTALLATION)
19. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** (See INSTALLATION)
20. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See INSTALLATION)
21. **INSTALL CRANKSHAFT PULLEY** (See INSTALLATION)
22. **INSTALL OIL PAN SUB-ASSEMBLY** (See INSTALLATION)
23. **INSTALL CRANKSHAFT POSITION SENSOR** (See INSTALLATION)
24. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** (See INSTALLATION)
25. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See INSTALLATION)
26. **INSTALL IGNITION COIL ASSEMBLY** (See INSTALLATION)
27. **INSTALL ENGINE MOUNTING INSULATOR RH** (See INSTALLATION)
28. **INSTALL VANE PUMP ASSEMBLY**
29. **INSTALL GENERATOR ASSEMBLY** (See INSTALLATION)
30. **INSTALL FAN AND GENERATOR V BELT** (See INSTALLATION)
31. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** (See INSTALLATION)

32. **INSTALL NO. 1 INTAKE MANIFOLD INSULATOR** (See INSTALLATION)
33. **INSTALL INTAKE MANIFOLD** (See INSTALLATION)
34. **INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY** (See INSTALLATION)
35. **INSTALL THROTTLE BODY ASSEMBLY** (See INSTALLATION)
36. **INSTALL AIR CLEANER ASSEMBLY** (See INSTALLATION)
37. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
38. **ADD ENGINE COOLANT** (See ON-VEHICLE INSPECTION)
39. **ADD ENGINE OIL** (See REPLACEMENT)
40. **CHECK FOR FUEL LEAKAGE** (See ON-VEHICLE INSPECTION)
41. **CHECK FOR ENGINE COOLANT LEAKS**
 - a. Check for the engine coolant leaks (see ON-VEHICLE INSPECTION).
42. **CHECK FOR ENGINE OIL LEAKS**
43. **CHECK FOR EXHAUST GAS LEAKS**
44. **CHECK IGNITION TIMING** (See ENGINE)
45. **INSPECT ENGINE IDLING SPEED** (See ON-VEHICLE INSPECTION)
46. **INSPECT COMPRESSION** (See ON-VEHICLE INSPECTION)
47. **INSPECT CO/HC** (See ON-VEHICLE INSPECTION)
48. **INSTALL COWL BODY MOUNTING BRACKET LOWER LH**
49. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY**
50. **INSTALL WIPER LINK ASSEMBLY** (See INSTALLATION)
51. **INSTALL COWL TOP VENTILATOR LOUVER LH**
52. **INSTALL HOOD TO COWL TOP SEAL**
53. **INSTALL FRONT WIPER ARM LH** (See INSTALLATION)
54. **INSTALL FRONT WIPER ARM RH** (See INSTALLATION)
55. **INSTALL FRONT WIPER ARM HEAD CAP**
56. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
57. **INSTALL FRONT FENDER APRON SEAL RH**
58. **INSTALL ENGINE UNDER COVER LH**
59. **INSTALL ENGINE UNDER COVER RH**
60. **INSTALL FRONT WHEEL RH** (See INSTALLATION)
61. **INSTALL HOOD SUB-ASSEMBLY**
 - a. Install and adjust the hood (See ADJUSTMENT).
62. **PERFORM INITIALIZATION**
 - a. Perform initialization (see INITIALIZATION).

NOTE: Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

REPAIR

1. REPAIR VALVE SEATS

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

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

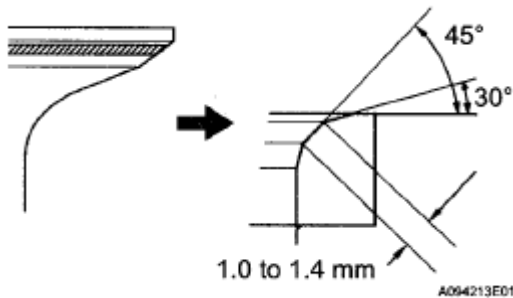


Fig. 203: Identifying Valve Seats (Too High)

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

- b. If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.

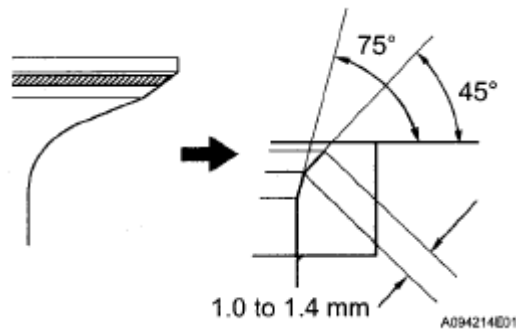


Fig. 204: Identifying Valve Seats (Too Low)

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

- c. Lap the valve and valve seat by hand with an abrasive compound.
d. Recheck the valve seating position.

ENGINE ASSEMBLY

COMPONENTS

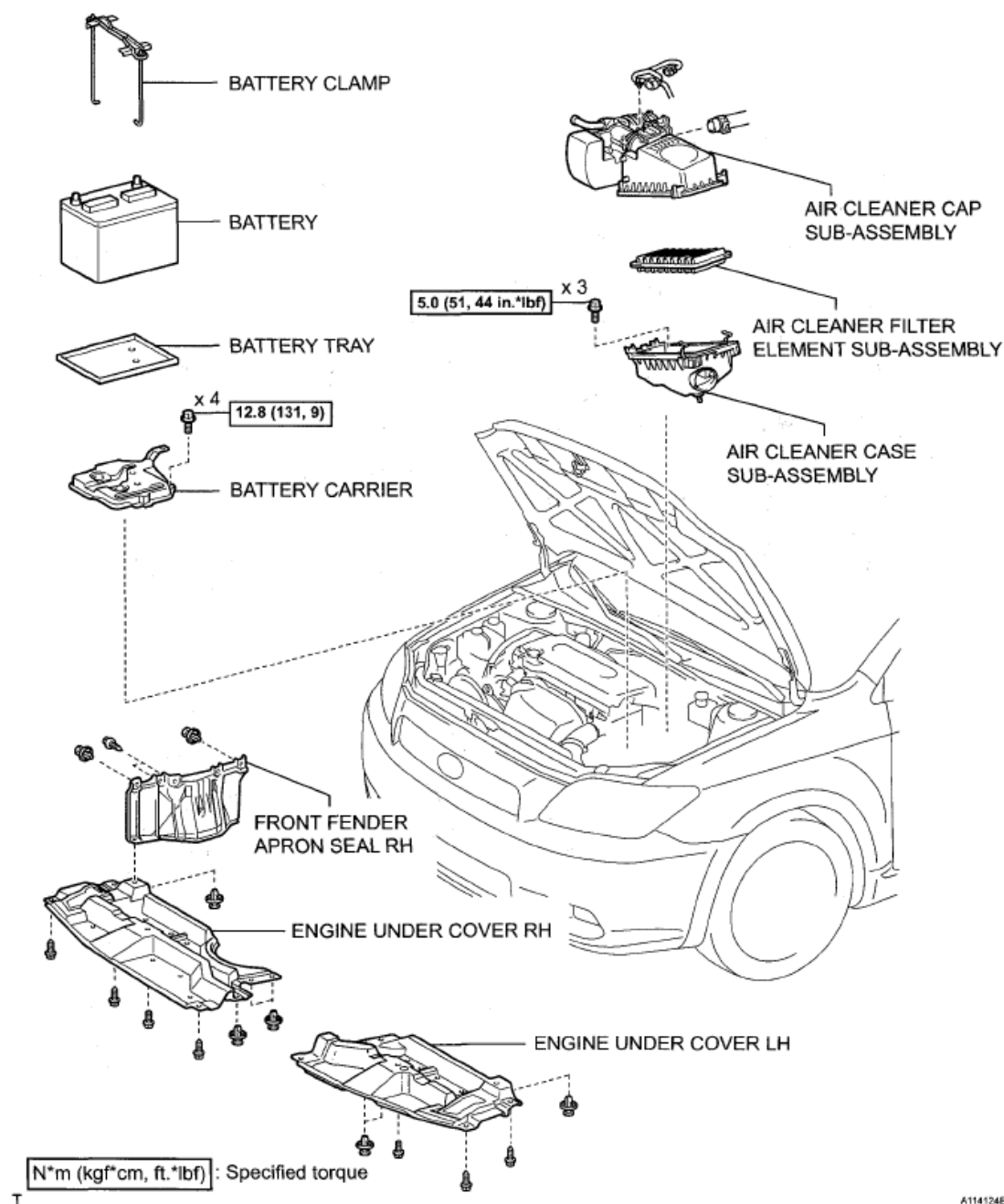
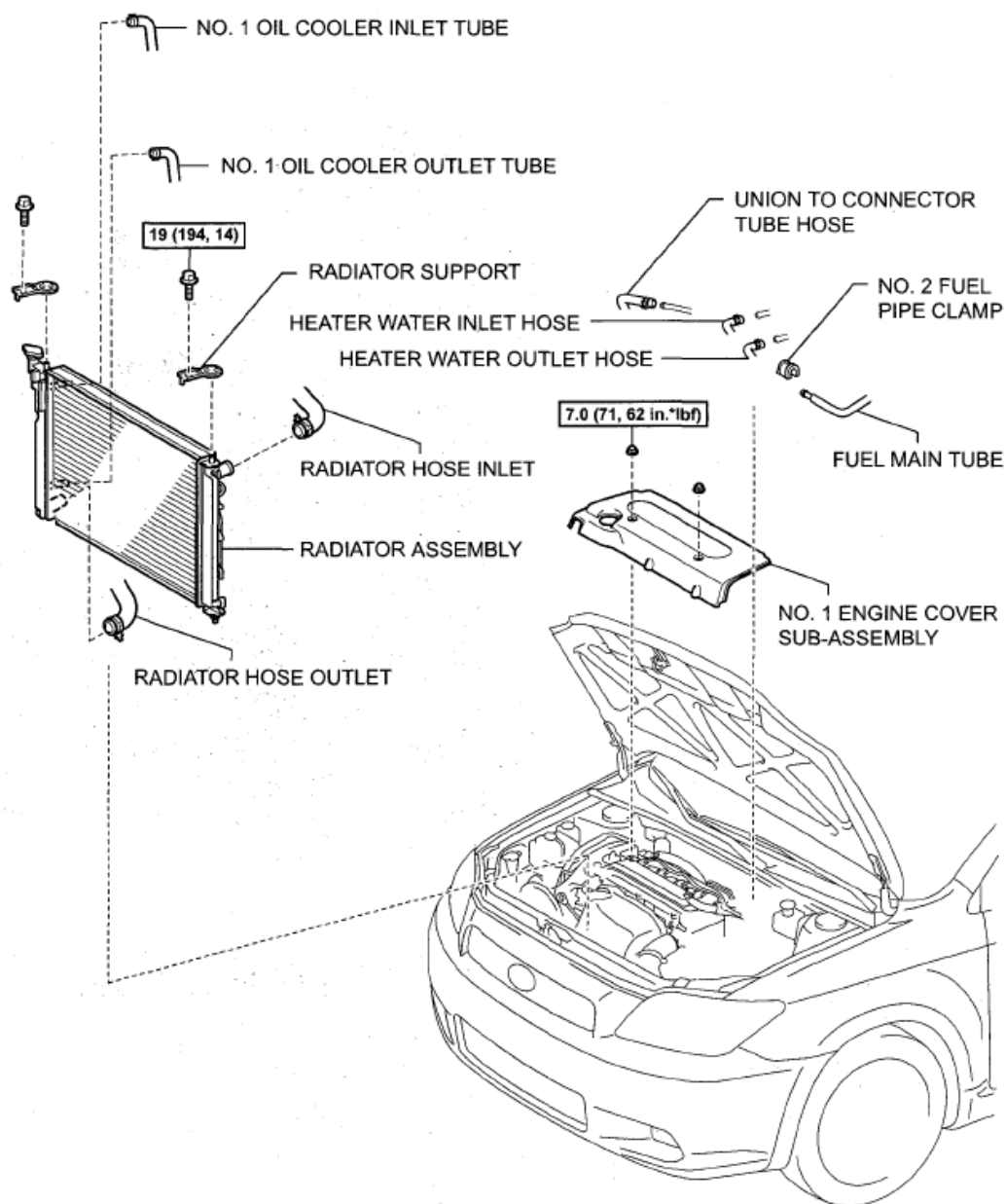


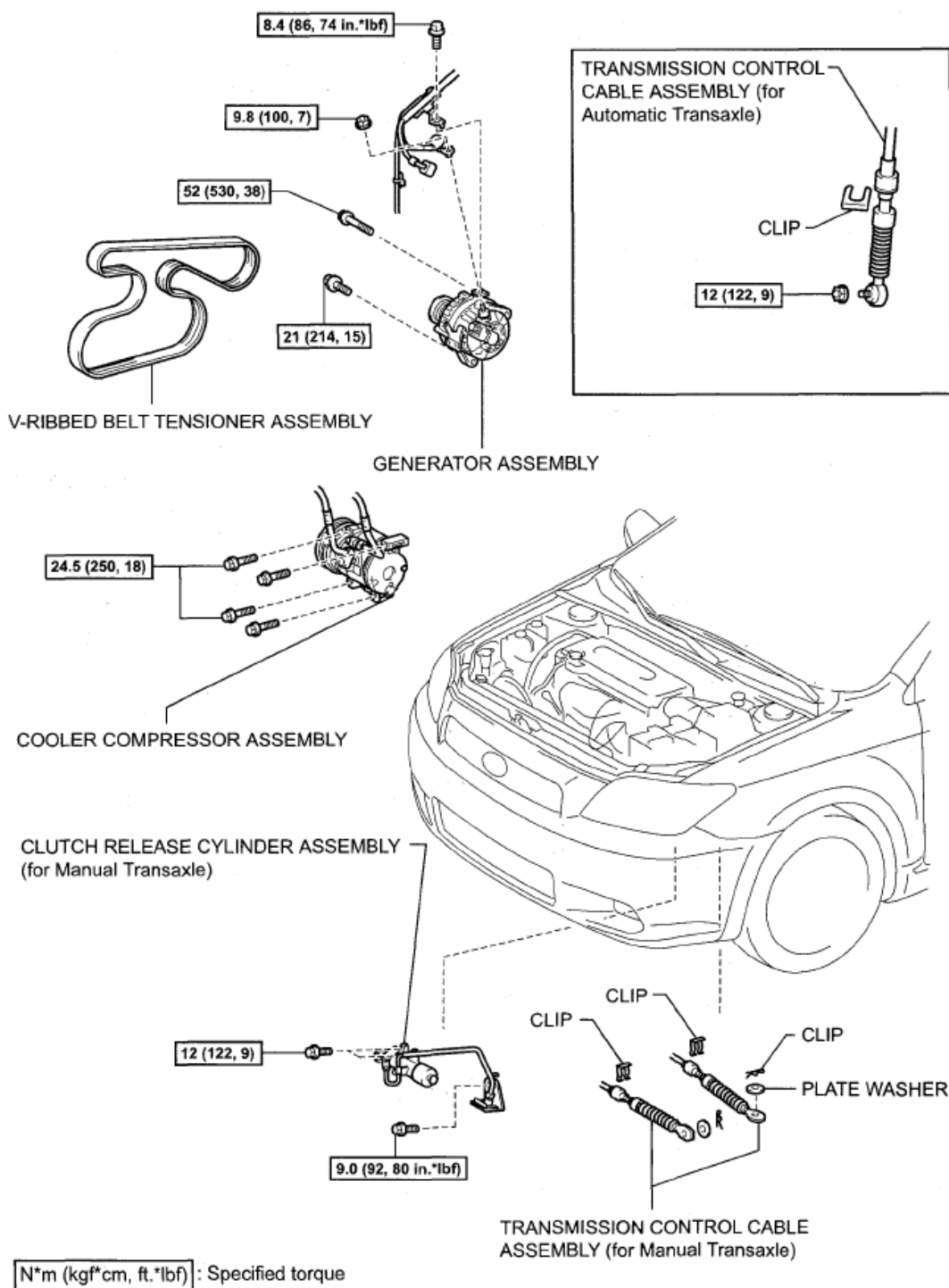
Fig. 205: Identifying Engine Assembly Replacement Components With Torque Specifications (1 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

A114126E02

Fig. 206: Identifying Engine Assembly Replacement Components With Torque Specifications (2 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A114128E02

Fig. 207: Identifying Engine Assembly Replacement Components With Torque Specifications (3 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

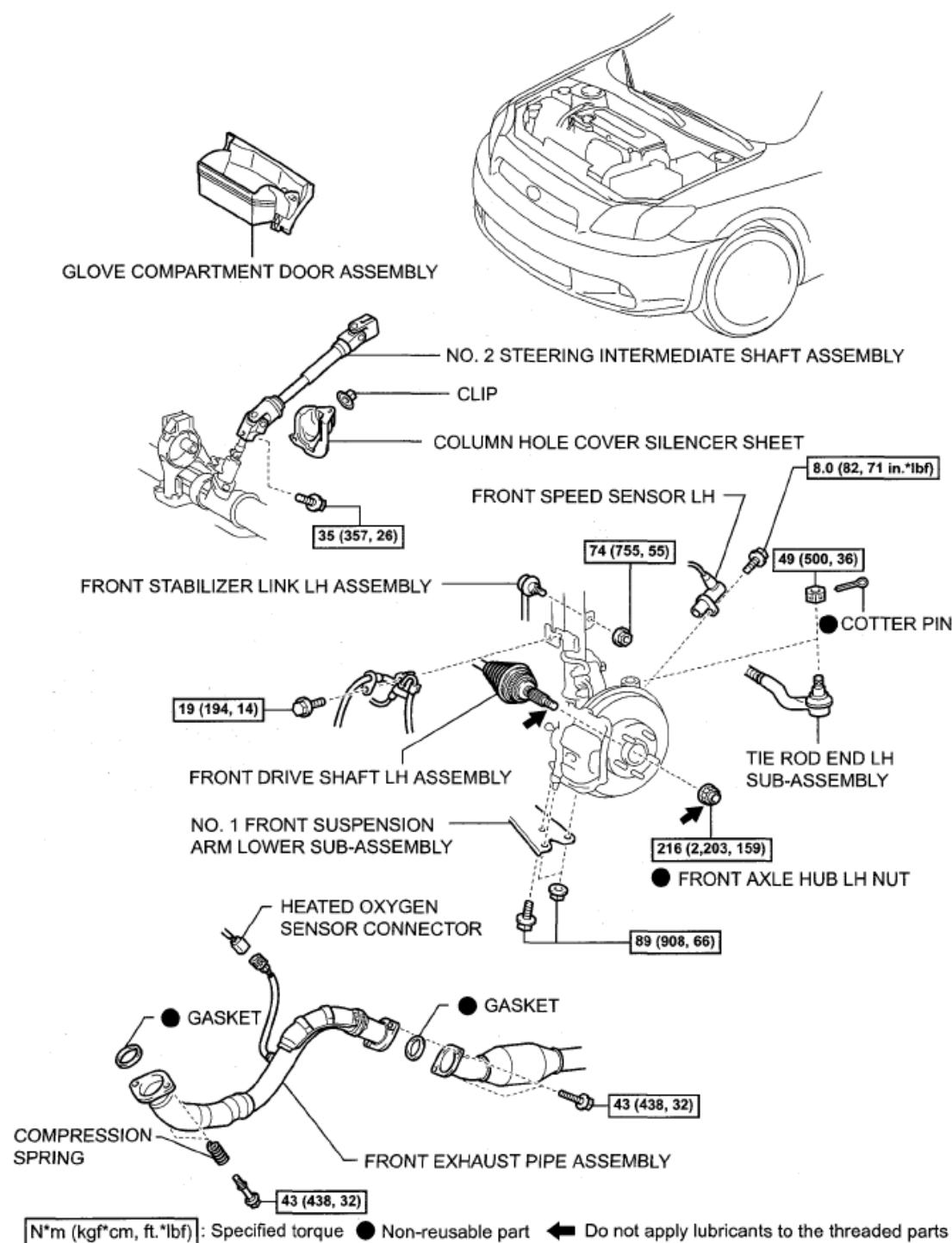


Fig. 208: Identifying Engine Assembly Replacement Components With Torque Specifications (4 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

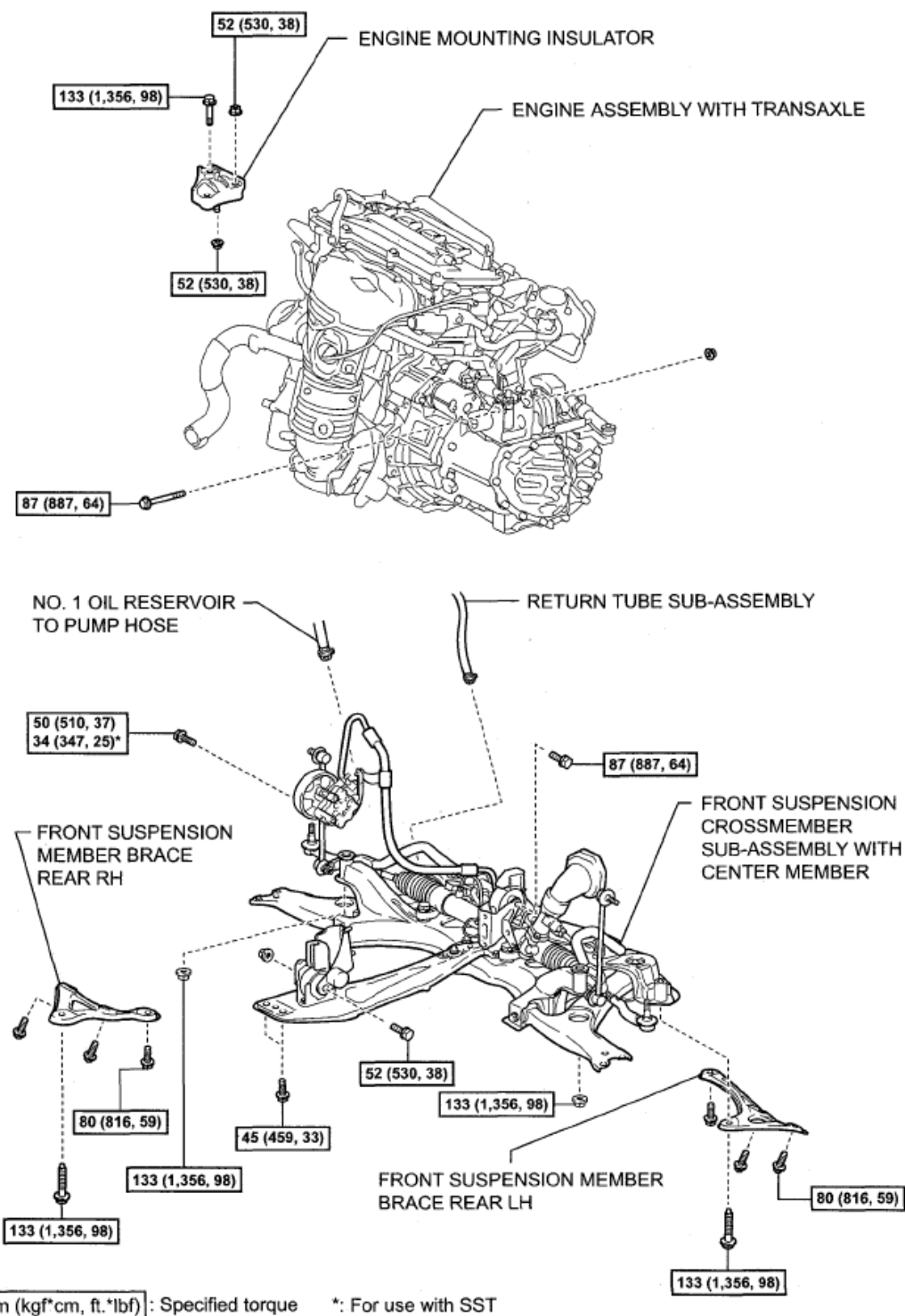
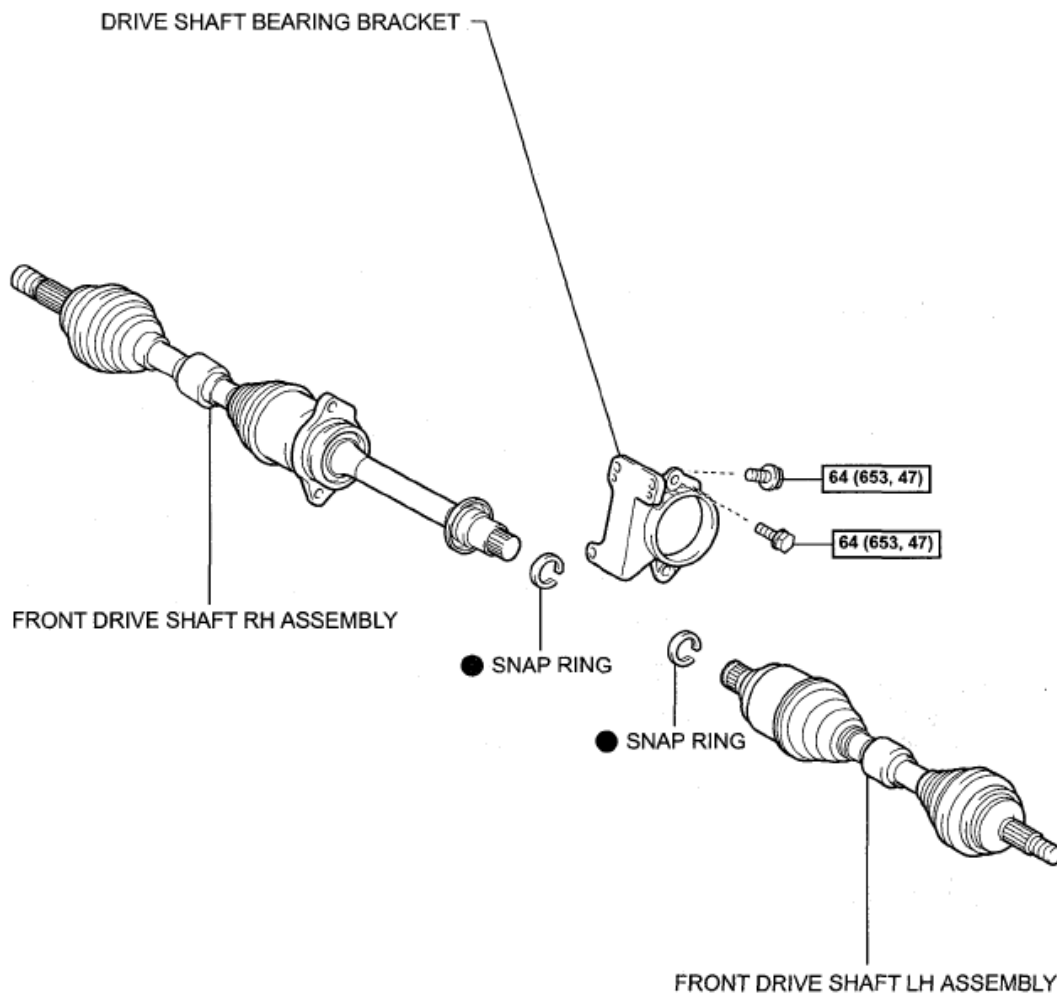


Fig. 209: Identifying Engine Assembly Replacement Components With Torque Specifications (5 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



$\boxed{\text{N}\cdot\text{m (kgf}\cdot\text{cm, ft.}\cdot\text{lbf)}}$: Specified torque

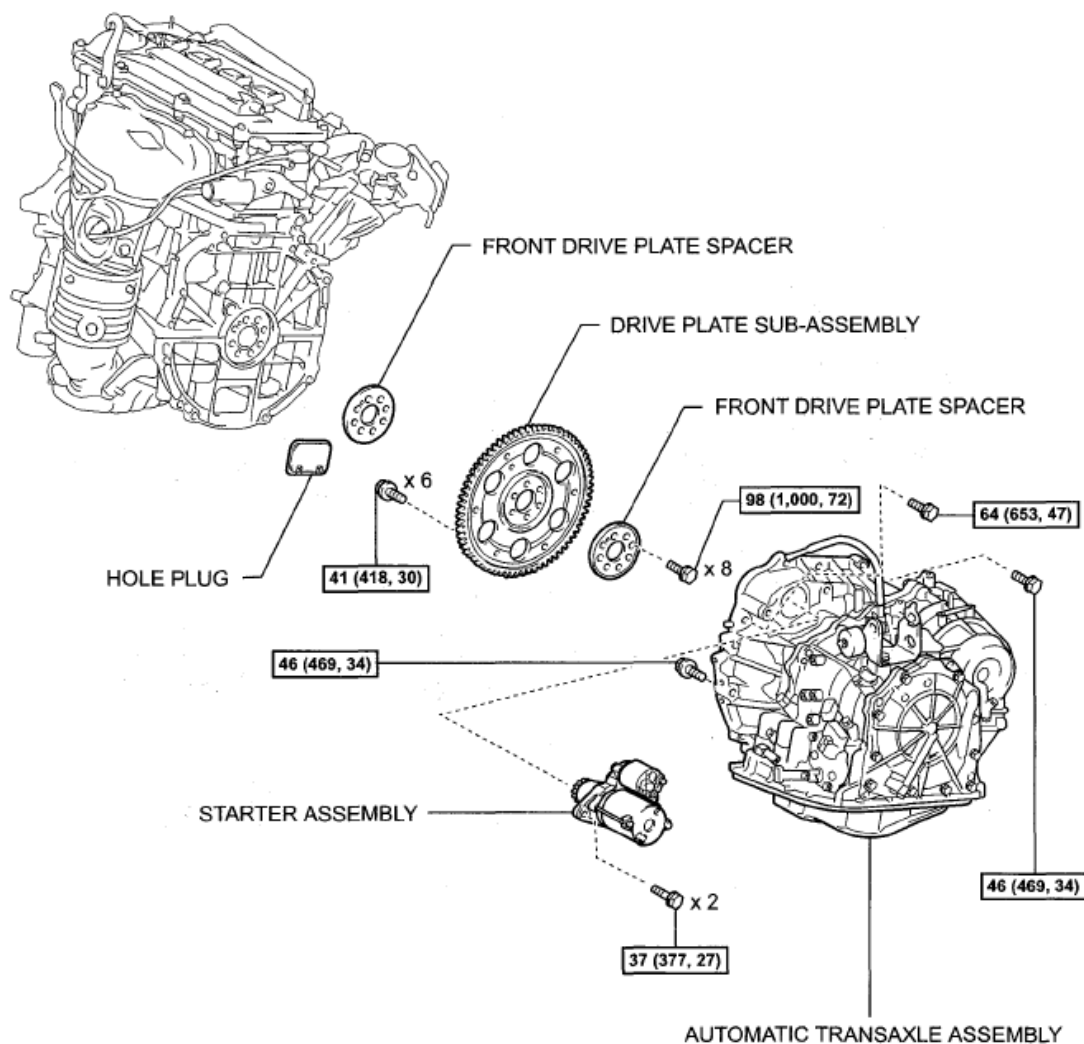
● Non-reusable part

T

A114129E01

Fig. 210: Identifying Engine Assembly Replacement Components With Torque Specifications (6 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Automatic Transaxle:

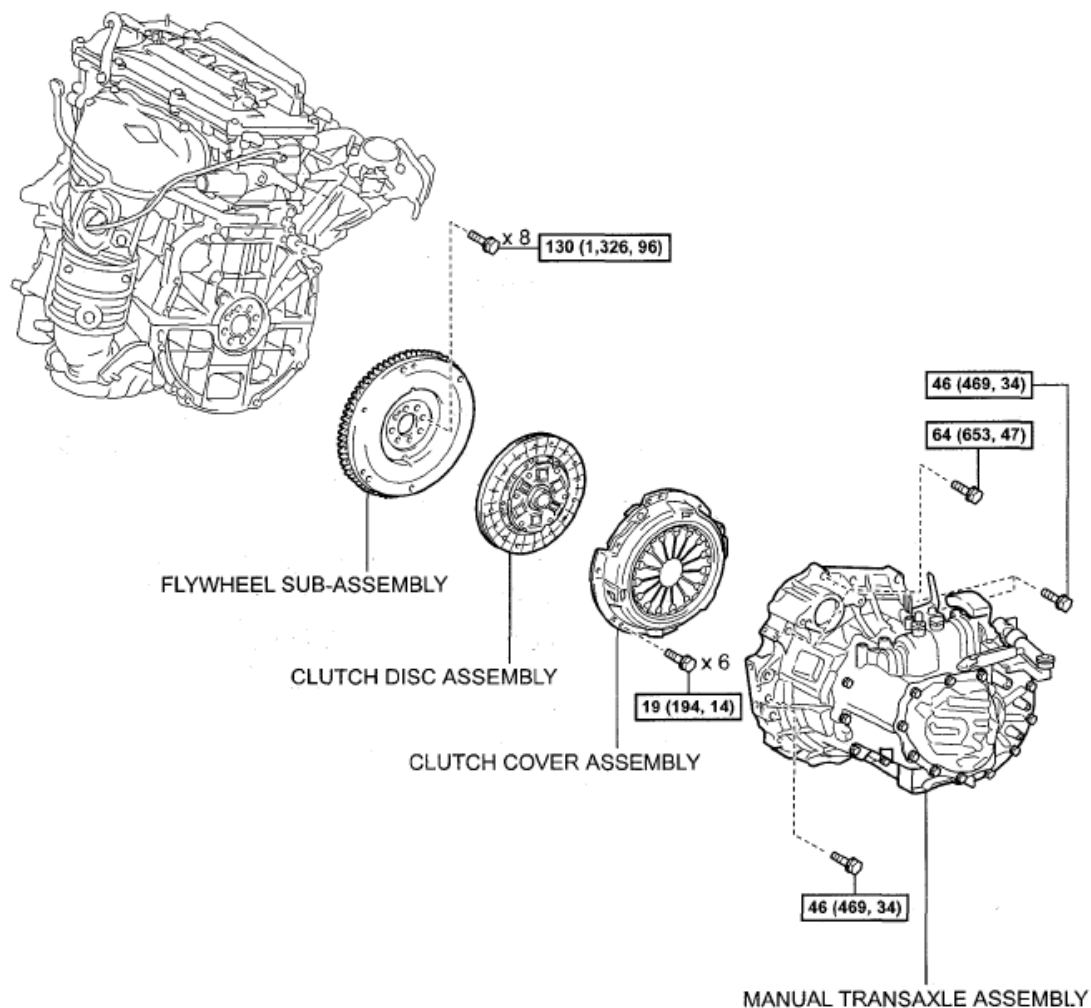


T $\boxed{\text{N*m (kgf*cm, ft.*lbf)}}$: Specified torque

A114130E01

Fig. 211: Identifying Engine Assembly Replacement Components With Torque Specifications (7 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

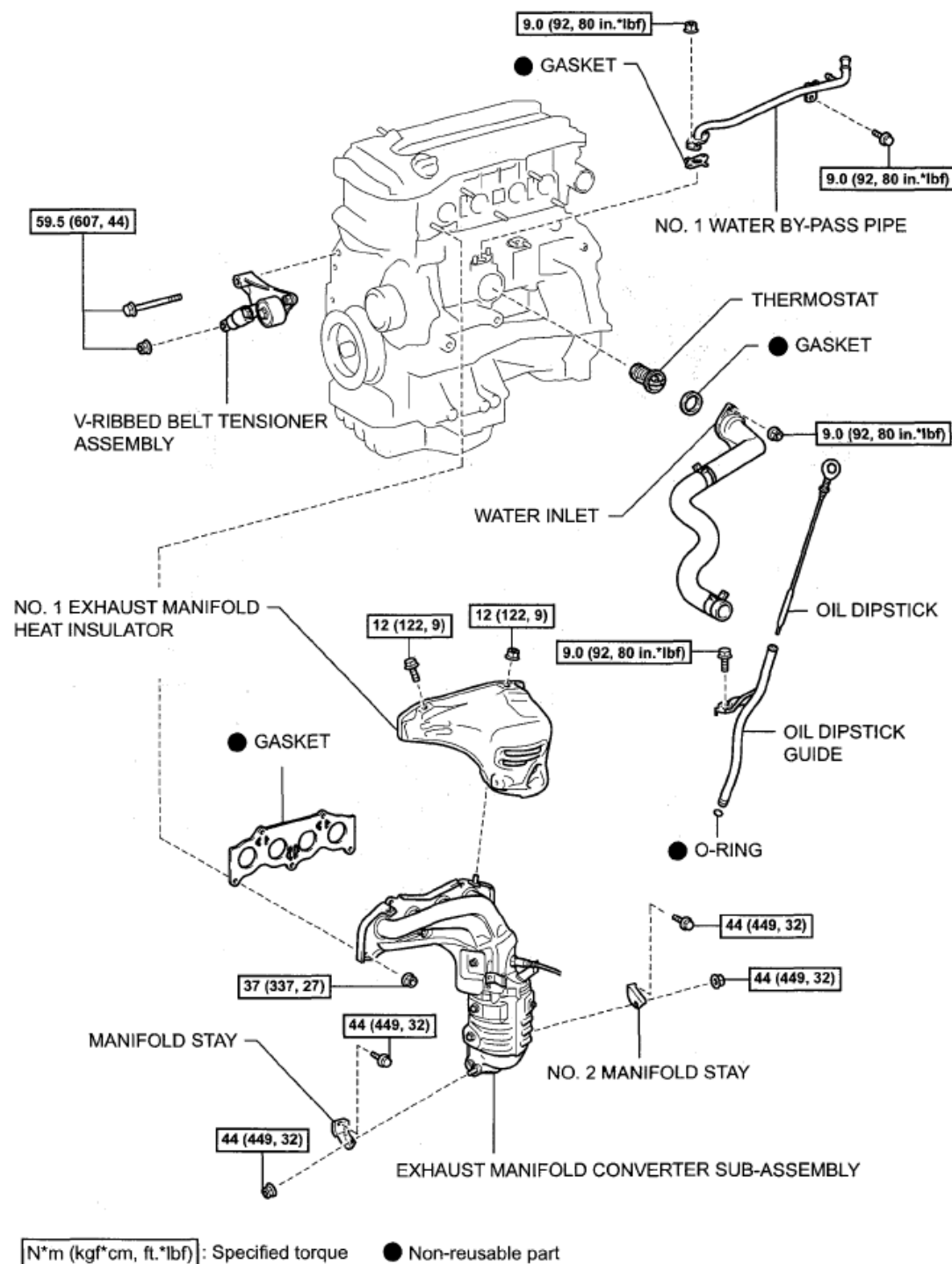
Manual Transaxle:



T $\text{N}\cdot\text{m}$ (kgf·cm, ft.·lbf) : Specified torque

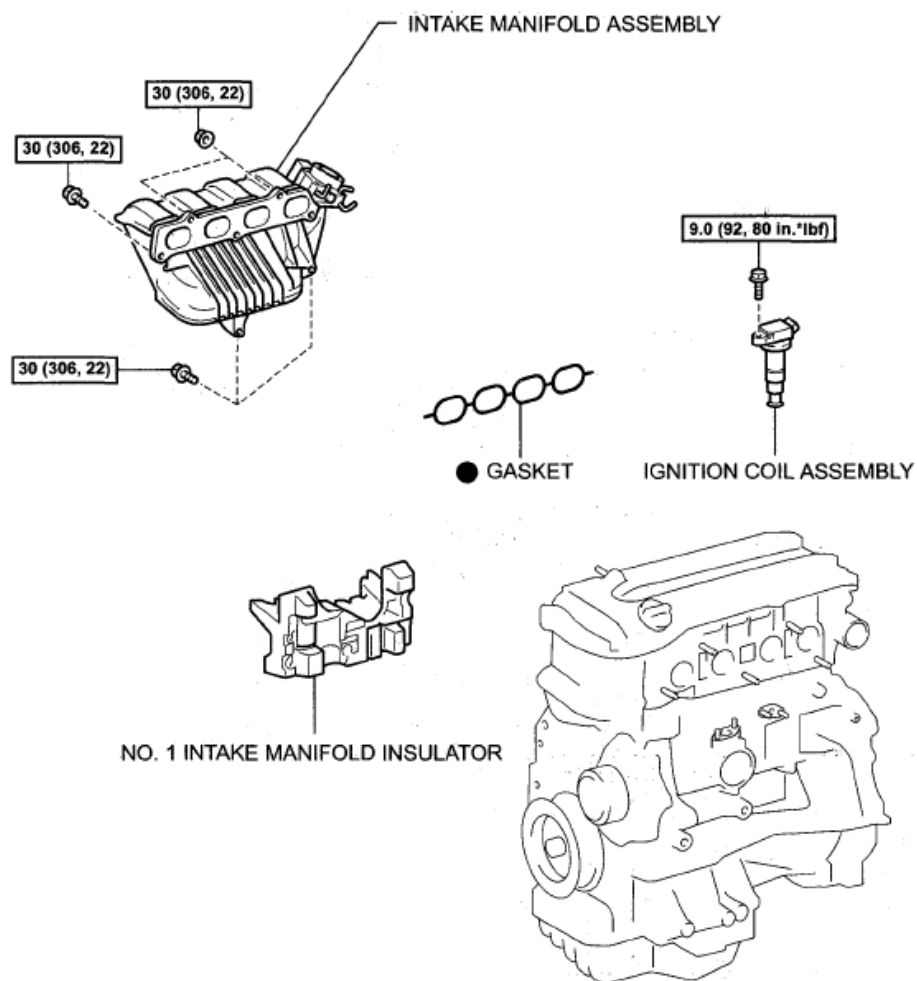
A154129E01

Fig. 212: Identifying Engine Assembly Replacement Components With Torque Specifications (8 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A114132E03

Fig. 213: Identifying Engine Assembly Replacement Components With Torque Specifications (9 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

● Non-reusable part

A154133E01

Fig. 214: Identifying Engine Assembly Replacement Components With Torque Specifications (10 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

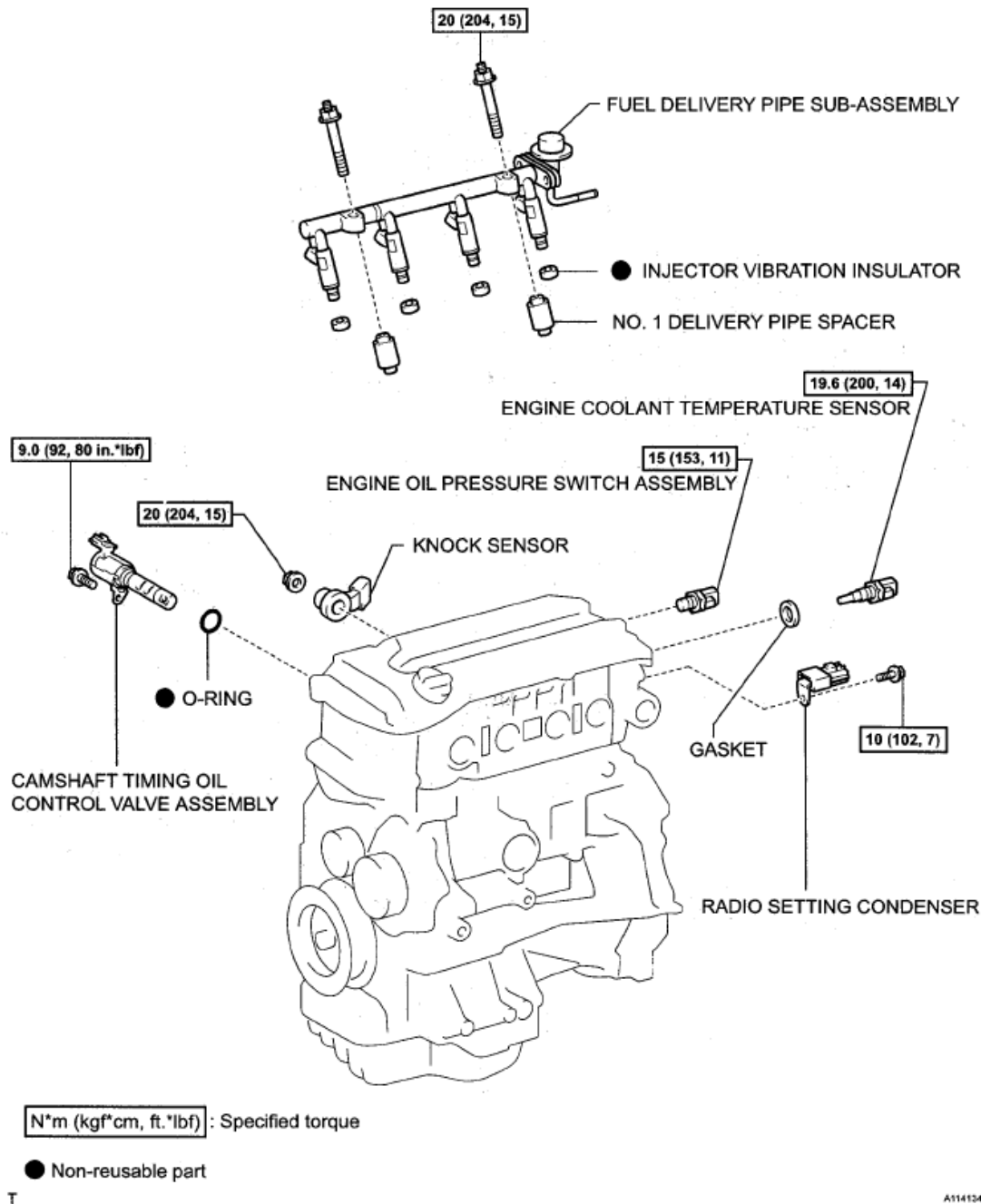


Fig. 215: Identifying Engine Assembly Replacement Components With Torque Specifications (11 Of 11)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **DISCHARGE FUEL SYSTEM** (See **REMOVAL**)
2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION: Wait at least 90 seconds after disconnecting the cable from the

negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

3. REMOVE BATTERY

- a. Loosen the 2 nuts and remove the battery clamp.

4. REMOVE BATTERY TRAY

5. REMOVE FRONT WHEEL

6. REMOVE ENGINE UNDER COVER RH

7. REMOVE ENGINE UNDER COVER LH

8. REMOVE FRONT FENDER APRON SEAL RH (See REMOVAL)

9. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)

10. DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)

11. DRAIN AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle) (See REMOVAL)

12. DRAIN TRANSAXLE OIL (for Manual Transaxle) (See REMOVAL)

13. DISCONNECT RADIATOR HOSE INLET

14. DISCONNECT RADIATOR HOSE OUTLET

15. DISCONNECT NO. 1 OIL COOLER INLET TUBE (for Automatic Transaxle)

16. DISCONNECT NO. 1 OIL COOLER OUTLET TUBE (for Automatic Transaxle)

17. REMOVE RADIATOR ASSEMBLY (See REMOVAL)

18. REMOVE AIR CLEANER ASSEMBLY

- a. Remove the air cleaner cap and element (see REMOVAL).
- b. Remove the clamp of the engine wire.
- c. Remove the 3 bolts from the air cleaner case.

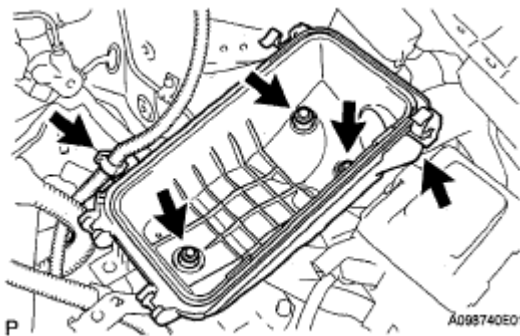


Fig. 216: Identifying Air Cleaner Case Bolts

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

- d. Disconnect the air cleaner case from the No. 1 air cleaner inlet.

19. REMOVE BATTERY CARRIER

- a. Disconnect the clamp of the engine wire.
- b. Remove the 4 bolts and battery carrier.

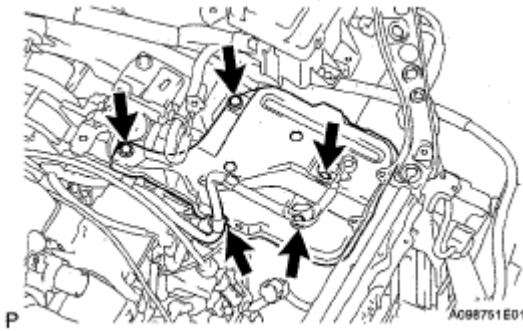


Fig. 217: Identifying Battery Carrier Bolts

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

20. **DISCONNECT FUEL MAIN TUBE** (See **REMOVAL**)
21. **DISCONNECT UNION TO CONNECTOR TUBE HOSE**
 - a. Disconnect the union to connector tube hose from the booster vacuum tube.

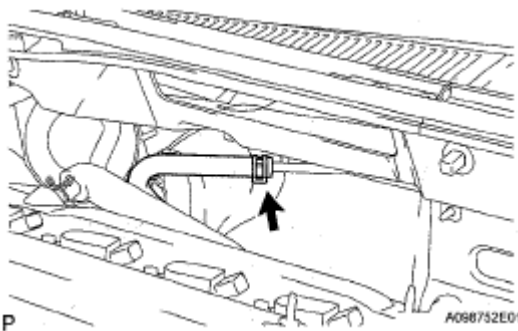


Fig. 218: Disconnecting Union To Connector Tube Hose

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

22. **DISCONNECT HEATER WATER INLET HOSE**
 - a. Disconnect the heater water inlet hose from the booster vacuum tube.

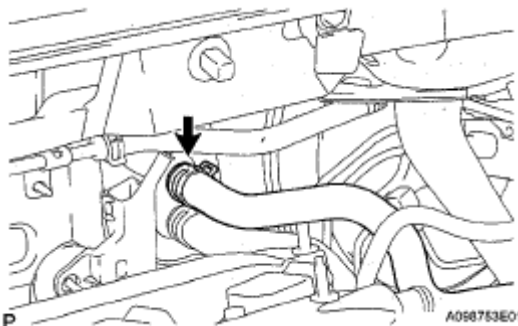


Fig. 219: Disconnecting Heater Water Inlet Hose

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

23. DISCONNECT HEATER WATER OUTLET HOSE

- a. Disconnect the heater water outlet hose from the air conditioner tube.

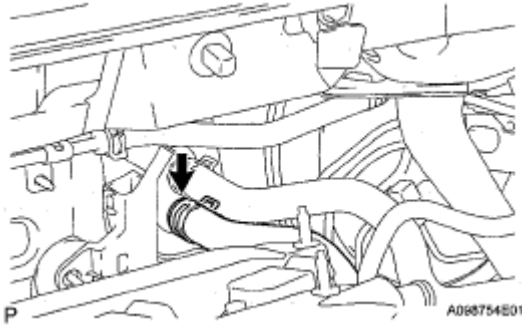


Fig. 220: Disconnecting Heater Water Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle) (See REMOVAL)**
25. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle) (See REMOVAL)**
26. **REMOVE CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle) (See REMOVAL)**
27. **REMOVE FAN AND GENERATOR V BELT (See REMOVAL)**
28. **REMOVE GENERATOR ASSEMBLY (See REMOVAL)**
29. **REMOVE COOLER COMPRESSOR ASSEMBLY**

HINT:

Disconnect the compressor together with the low-pressure and high-pressure hoses, then secure it to the vehicle side using rope.

30. **REMOVE GLOVE COMPARTMENT DOOR ASSEMBLY (See REMOVAL)**
31. **DISCONNECT ENGINE WIRE**
 - a. Disconnect the engine wire from the ECM and junction block.
 - b. Pull out the engine wire.
 - c. Remove the engine room relay block cover.
 - d. Remove the 2 claws and 2 connectors, and push the engine wire harness up.

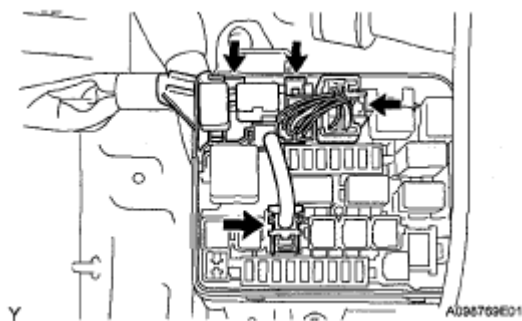


Fig. 221: Identifying Engine Wire Harness Connectors And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the 2 clamps of the engine wire.

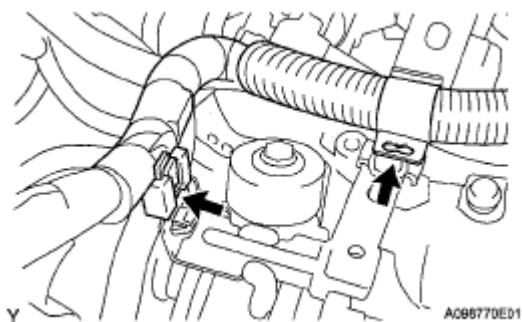


Fig. 222: Identifying Clamps Of Engine Wire
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Remove the nut from the battery positive (+) terminal to disconnect the engine wire.

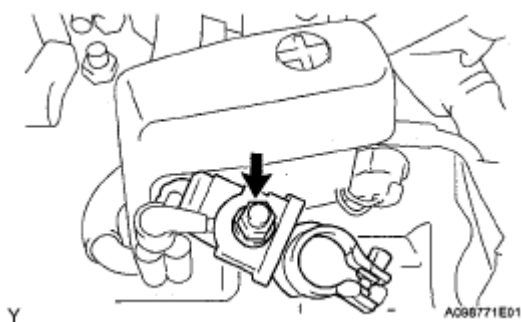


Fig. 223: Identifying Engine Wire To Battery Positive Terminal With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the bolt and ground cable.

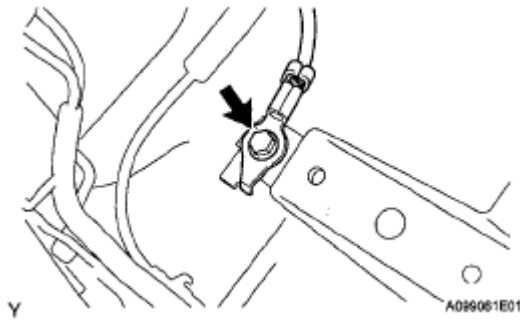


Fig. 224: Identifying Ground Cable With Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. REMOVE FRONT EXHAUST PIPE ASSEMBLY (See REMOVAL)
33. REMOVE COLUMN HOLE COVER SILENCER SHEET (See REMOVAL)
34. REMOVE NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY (See REMOVAL)
35. REMOVE FRONT AXLE HUB NUT (See REMOVAL)
36. DISCONNECT FRONT STABILIZER LINK ASSEMBLY LH (See REMOVAL)
37. DISCONNECT FRONT STABILIZER LINK ASSEMBLY RH (See REMOVAL)
38. DISCONNECT FRONT SPEED SENSOR LH (See REMOVAL)
39. DISCONNECT FRONT SPEED SENSOR RH (See REMOVAL)
40. SEPARATE TIE ROD END LH SUB-ASSEMBLY (See REMOVAL)
41. REMOVE TIE ROD END RH SUB-ASSEMBLY (See REMOVAL)
42. SEPARATE FRONT NO. 1 SUSPENSION ARM SUB-ASSEMBLY LOWER LH (See REMOVAL)
43. SEPARATE FRONT NO. 1 SUSPENSION ARM SUB-ASSEMBLY LOWER RH (See REMOVAL)
44. REMOVE FRONT AXLE HUB LH SUB-ASSEMBLY (See REMOVAL)
45. REMOVE FRONT AXLE HUB RH SUB-ASSEMBLY (See REMOVAL)
46. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE
 - a. Disconnect the No. 1 pump hose.

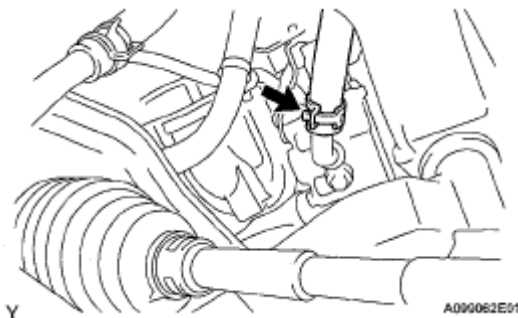


Fig. 225: Identifying No. 1 Pump Hose
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disconnect the return tube.

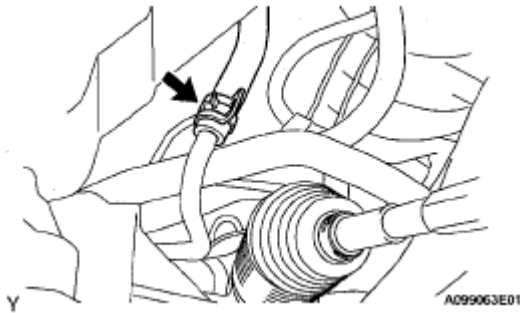


Fig. 226: Identifying Return Tube

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

- c. Set the engine lifter.
d. Remove the 2 bolts, 2 nuts and engine mounting insulator RH.

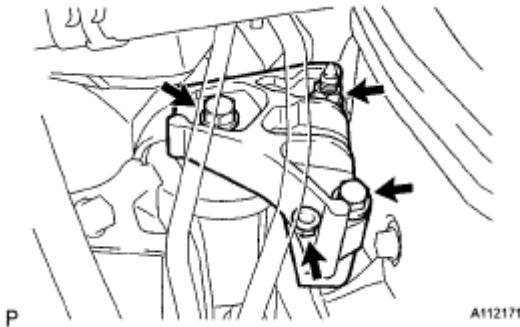


Fig. 227: Identifying Engine Mounting Insulator RH Bolts And Nuts

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

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

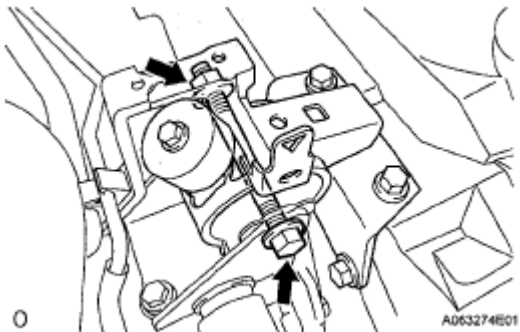


Fig. 228: Identifying Engine Mounting Insulator LH With Through Bolt And Nut

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

- f. Remove the 8 bolts and front suspension member brace rear RH and LH.

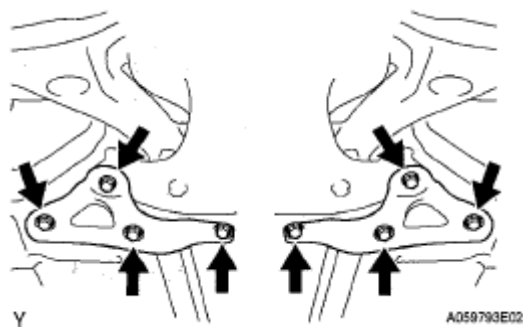


Fig. 229: Identifying Front Suspension Member Brace Rear RH And LH Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the 2 bolts and 2 nuts shown in the illustration.

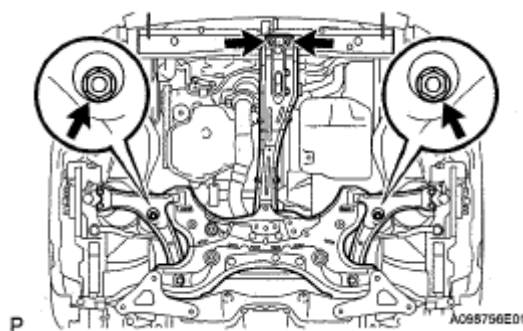


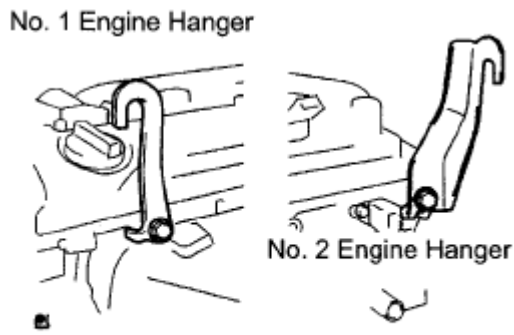
Fig. 230: Identifying Suspension Crossmember With 2 Bolts And 2 Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Carefully remove the engine with transaxle from the vehicle.
i. Install the No. 1 and No. 2 engine hangers with the bolts as shown in the illustration.

Parts No.

PARTS NO. REFERENCE

Item	Part No.
No. 1 Engine hanger	12281-28010
No. 2 Engine hanger	12282-28010
Bolt	91512-61020



A09B047E01

Fig. 231: Identifying No. 1 And No. 2 Engine Hangers With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- j. Attach the sling device and the engine with the chain block.
- 47. **REMOVE VANE PUMP ASSEMBLY**
- 48. **REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY WITH CENTER MEMBER**
 - a. Remove the through bolt, nut and engine mounting insulator FR from the engine mounting bracket FR.

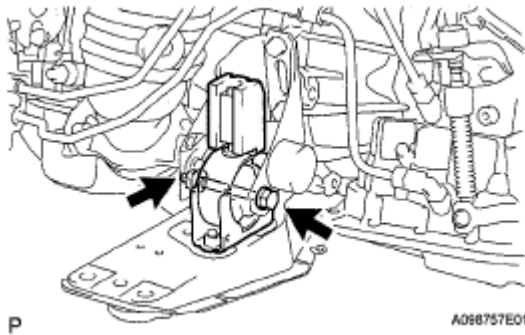


Fig. 232: Identifying Front Engine Mounting Bracket Bolt And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the through bolt and engine mounting insulator RR from the engine mounting bracket RR.

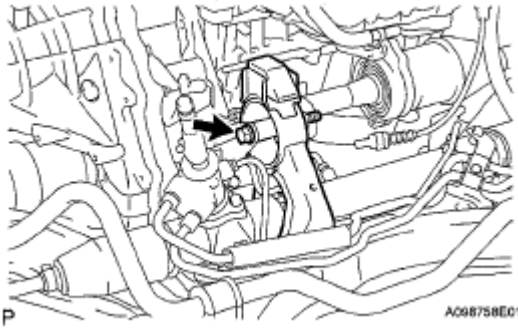


Fig. 233: Identifying Rear Engine Mounting Insulator Through Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Separate the engine and transaxle assembly from the suspension crossmember and the engine mounting member.
- 49. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** (See **REMOVAL**)
- 50. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** (See **REMOVAL**)
- 51. **REMOVE STARTER ASSEMBLY** (See **REMOVAL**)
- 52. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY** (See **REMOVAL**)
- 53. **REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY** (for Automatic Transaxle)
- 54. **REMOVE DRIVE PLATE SUB-ASSEMBLY** (for Automatic Transaxle)
 - a. Using SST, hold the crankshaft.

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

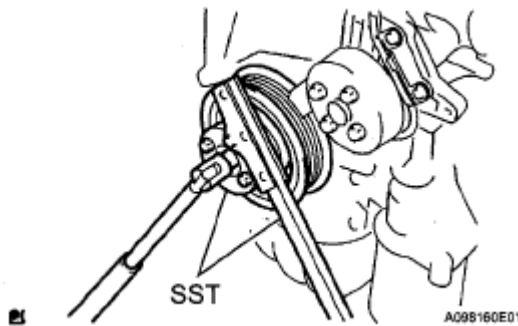


Fig. 234: Identifying Crankshaft Using SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

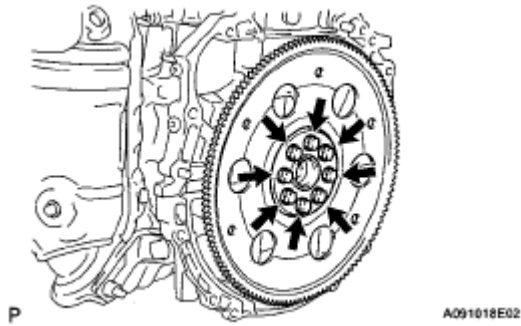


Fig. 235: Identifying Drive Plate And Front Spacer Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. **REMOVE MANUAL TRANSAXLE ASSEMBLY** (See **REMOVAL**)
56. **REMOVE CLUTCH COVER ASSEMBLY (for Manual Transaxle)** (See **REMOVAL**)
57. **REMOVE CLUTCH DISC ASSEMBLY (for Manual Transaxle)** (See **REMOVAL**)
58. **REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)**
 - a. Using SST, hold the crankshaft.

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

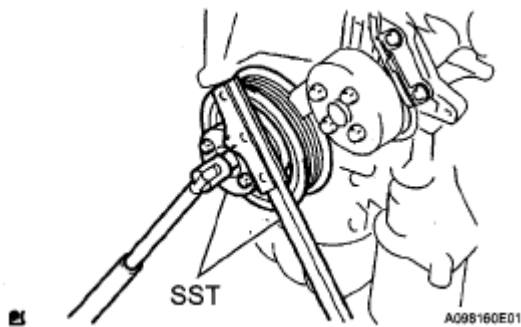


Fig. 236: Identifying Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 8 bolts and flywheel.

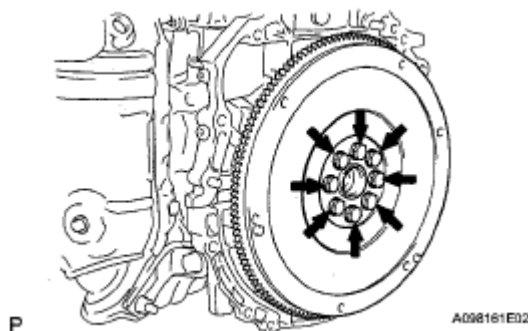


Fig. 237: Identifying And Flywheel Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. REMOVE DRIVE SHAFT BEARING BRACKET

- a. Remove the 3 bolts and drive shaft bearing bracket.

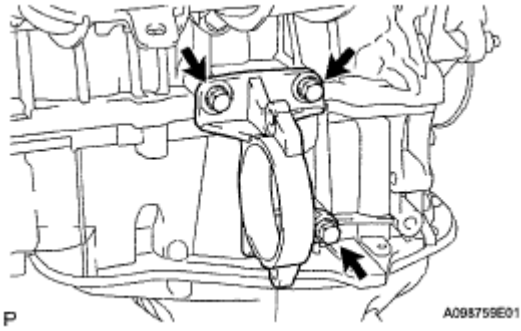


Fig. 238: Identifying Drive Shaft Bearing Bracket (For 2WD)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. REMOVE OIL DIPSTICK

61. REMOVE OIL DIPSTICK GUIDE (See REMOVAL)

62. REMOVE MANIFOLD STAY (See REMOVAL)

63. REMOVE NO. 2 MANIFOLD STAY (See REMOVAL)

64. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR (See REMOVAL)

65. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY (See REMOVAL)

66. REMOVE WATER INLET (See REMOVAL)

67. REMOVE THERMOSTAT

68. REMOVE NO. 1 WATER BY-PASS PIPE

- a. Remove the bolt, 2 nuts and water by-pass pipe.
- b. Remove the gasket from the cylinder block.

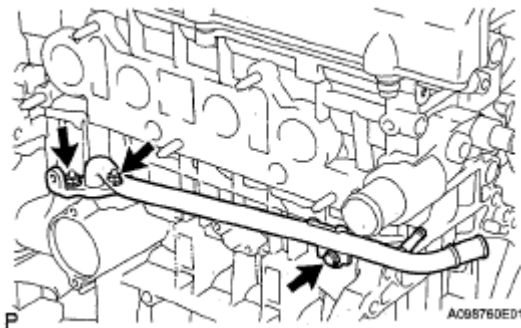


Fig. 239: Identifying Water By-Pass Pipe Bolt And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

69. **REMOVE INTAKE MANIFOLD ASSEMBLY** (See REMOVAL)
70. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR** (See REMOVAL)
71. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** (See REMOVAL)
72. **REMOVE IGNITION COIL ASSEMBLY** (See REMOVAL)
73. **REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY** (See REMOVAL)
74. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See REMOVAL)
75. **REMOVE KNOCK SENSOR** (See REMOVAL)
76. **REMOVE RADIO SETTING CONDENSER**
 - a. Remove the bolt and condenser.

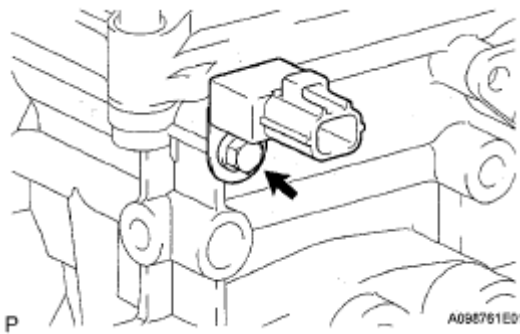


Fig. 240: Identifying Condenser With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

77. **REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY**
78. **REMOVE ENGINE COOLANT TEMPERATURE SENSOR** (See REMOVAL)
79. **REPLACE PARTIAL ENGINE ASSEMBLY**

INSTALLATION

1. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR** (See INSTALLATION)
2. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY**
3. **INSTALL RADIO SETTING CONDENSER**
 - a. Install the condenser with the bolt.

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

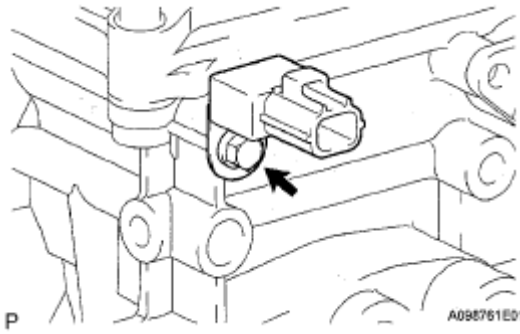


Fig. 241: Identifying Condenser With Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL KNOCK SENSOR (See INSTALLATION)
5. INSTALL CAMSHAFT TIMING CONTROL VALVE ASSEMBLY (See INSTALLATION)
6. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY (See INSTALLATION)
7. INSTALL IGNITION COIL ASSEMBLY (See INSTALLATION)
8. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See INSTALLATION)
9. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR (See INSTALLATION)
10. INSTALL INTAKE MANIFOLD ASSEMBLY (See INSTALLATION)
11. INSTALL NO. 1 WATER BY-PASS PIPE
 - a. Install a new gasket and the water by-pass pipe with the bolt and 2 nuts.

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

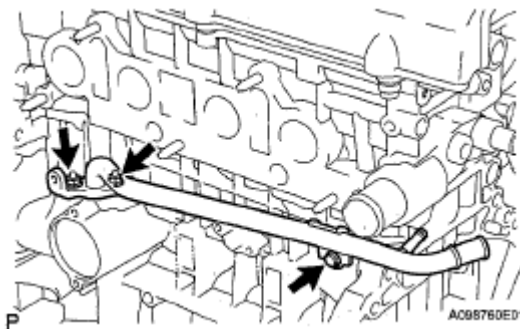


Fig. 242: Identifying No. 1 Water By-Pass Pipe Bolt And Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL THERMOSTAT (See INSTALLATION)
13. INSTALL WATER INLET (See INSTALLATION)
14. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY (See INSTALLATION)
15. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR (See INSTALLATION)
16. INSTALL NO. 2 MANIFOLD STAY (See INSTALLATION)
17. INSTALL MANIFOLD STAY (See INSTALLATION)

18. **INSTALL OIL DIPSTICK GUIDE** (See **INSTALLATION**)
19. **INSTALL OIL DIPSTICK** (See **INSTALLATION**)
20. **INSTALL DRIVE SHAFT BEARING BRACKET**
 - a. Install the drive shaft bearing bracket with the 3 bolts.

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

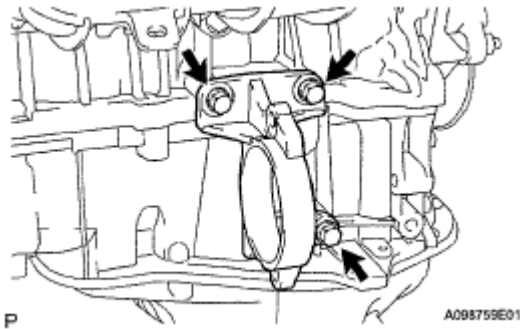


Fig. 243: Identifying Drive Shaft Baring Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transaxle)**
 - a. Clean the 8 bolts and 8 bolt holes.
 - b. Apply adhesive to 2 or 3 threads of the 8 bolts.

Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- c. Using SST, hold the crankshaft.

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

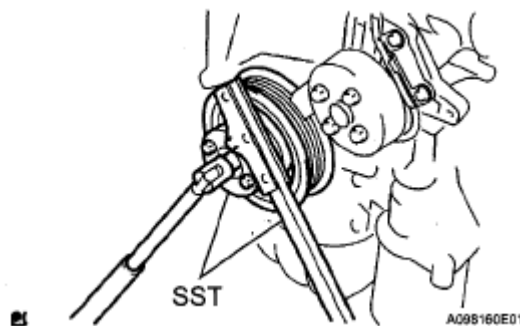


Fig. 244: Identifying Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Torque: 130 N*m (1,326 kgf*cm, 96 ft.*lbf)

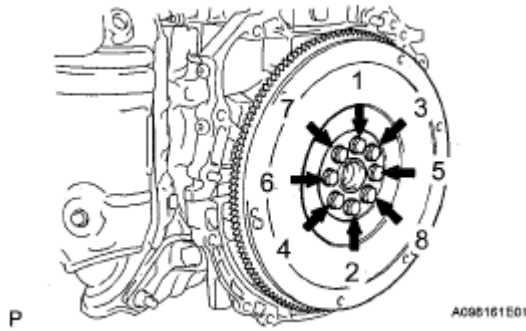


Fig. 245: Identifying Flywheel Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. **INSTALL CLUTCH DISC ASSEMBLY (for Manual Transaxle) (See INSTALLATION)**
23. **INSTALL CLUTCH COVER ASSEMBLY (for Manual Transaxle) (See INSTALLATION)**
24. **INSTALL MANUAL TRANSAXLE ASSEMBLY (for Manual Transaxle) (See INSTALLATION)**
25. **INSTALL DRIVE PLATE SUB-ASSEMBLY (for Automatic Transaxle)**
 - a. Clean the 8 bolts and 8 bolt holes.
 - b. Apply adhesive to 2 or 3 threads of the 8 bolts.

Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- c. Using SST, hold the crankshaft.

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

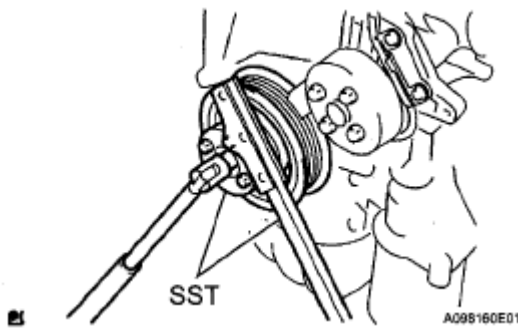


Fig. 246: Holding Crankshaft Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the front spacer, drive plate and rear spacer onto the crankshaft.
- e. Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: 98 N*m (1,000 kgf*cm, 72 ft.*lbf)

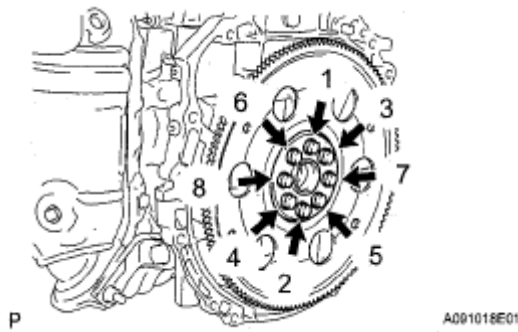


Fig. 247: Identifying Drive Plate Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY (for Automatic Transaxle) (See INSTALLATION)**
27. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY (See INSTALLATION)**
28. **INSTALL STARTER ASSEMBLY (See INSTALLATION)**
29. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH (See INSTALLATION)**
30. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH (See INSTALLATION)**
31. **INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY WITH CENTER MEMBER**
 - a. Attach the engine and transaxle assembly to the suspension crossmember and engine mounting member.
 - b. Install the through bolt which is used to secure the rear engine mounting insulator, into the rear engine mounting bracket.

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

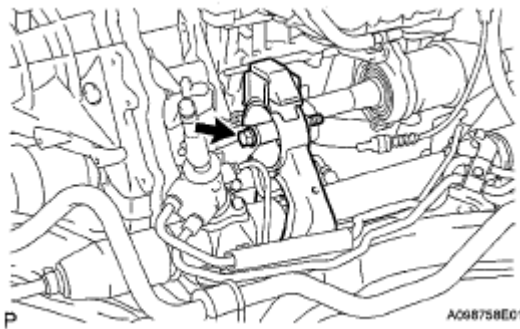


Fig. 248: Identifying Rear Engine Mounting Insulator Through Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the bolt which is used to secure the front engine mounting bracket.

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

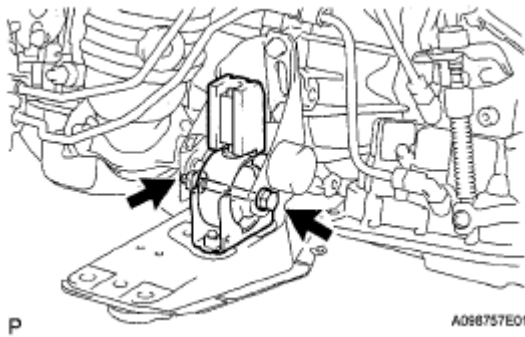


Fig. 249: Identifying Front Engine Mounting Bracket Bolt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. INSTALL VANE PUMP ASSEMBLY

33. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

- a. Set the engine assembly with transaxle on the engine lifter.
- b. Temporarily install the suspension crossmember with the 2 bolts and 2 nuts.

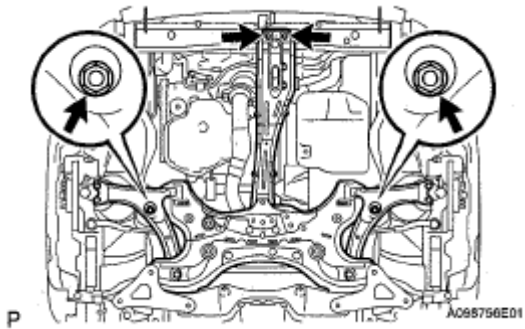


Fig. 250: Identifying Suspension Crossmember With 2 Bolts And 2 Nuts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

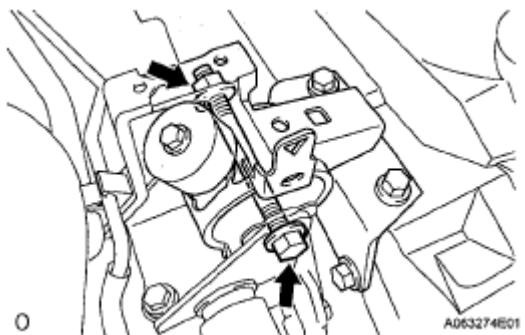


Fig. 251: Identifying Engine Mounting Insulator LH With Through Bolt And Nut

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

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

Torque:

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

113 N*m (1,152 kgf*cm, 83 ft.*lbf) for bolt A

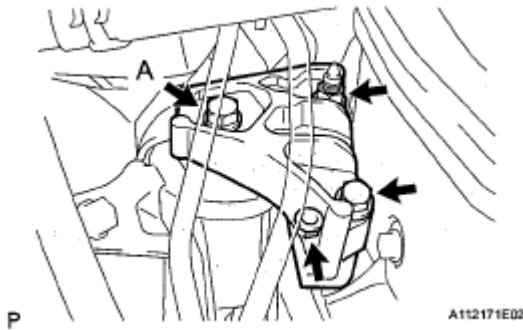


Fig. 252: Identifying Engine Mounting Insulator RH With 2 Bolts And 2 Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Tighten the 2 bolts and 2 nuts.

Torque:

45 N*m (459 kgf*cm, 33 ft.*lbf) for bolt

133 N*m (1,356 kgf*cm, 98 ft.*lbf) for nut

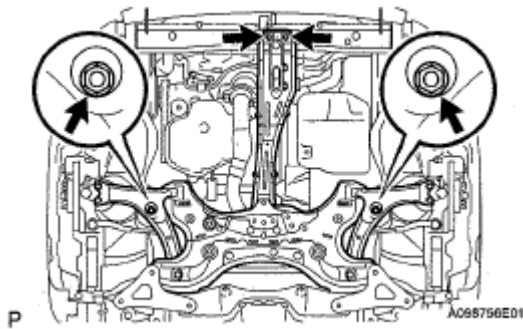


Fig. 253: Identifying Suspension Crossmember With 2 Bolts And 2 Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Install the front suspension member brace rear RH and LH with the 8 bolts.

Torque:

133 N*m (1,356 kgf*cm, 98 ft.*lbf) for bolt A

80 N*m (816 kgf*cm, 59 ft.*lbf) for bolt B

NOTE: When installing the crossmember, check that the positioning holes on the crossmember and vehicle are aligned with each other.

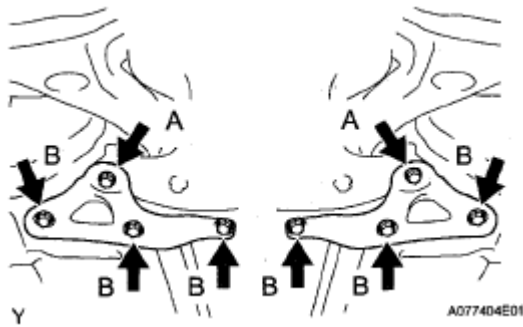


Fig. 254: Identifying Front Suspension Member Brace Rear RH And LH With 8 Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Connect the return tube.

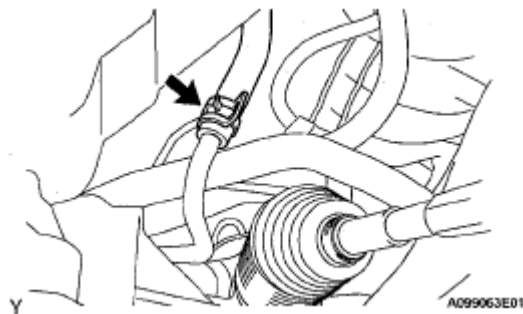


Fig. 255: Identifying Return Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Connect the oil reservoir to No. 1 pump hose.

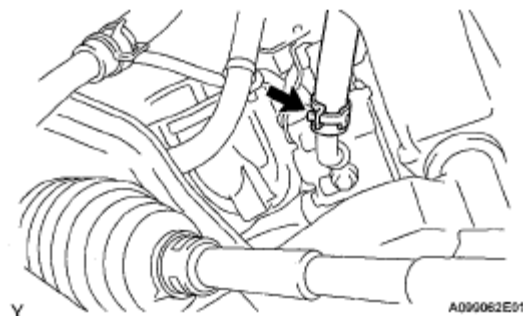


Fig. 256: Identifying Oil Reservoir To No. 1 Pump Hose

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

- i. Remove the No. 1 and No. 2 engine hangers.

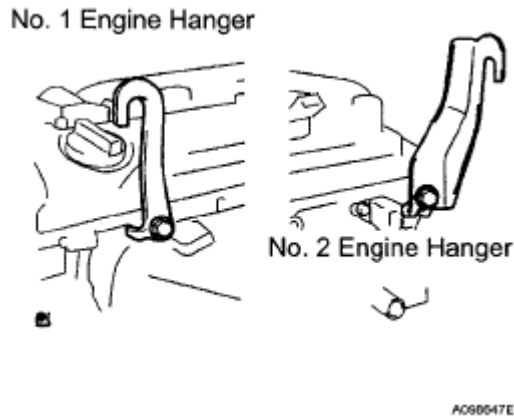


Fig. 257: Identifying No. 1 And No. 2 Engine Hangers With Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. INSTALL FRONT AXLE HUB SUB-ASSEMBLY (See INSTALLATION)
35. INSTALL FRONT AXLE HUB HOLE SNAP RING (See INSTALLATION)
36. CONNECT FRONT NO. 1 SUSPENSION ARM LOWER SUB-ASSEMBLY LH (See INSTALLATION)
37. CONNECT FRONT NO. 1 SUSPENSION ARM LOWER SUB-ASSEMBLY RH (See INSTALLATION)
38. INSTALL TIE ROD END SUB-ASSEMBLY LH (See INSTALLATION)
39. INSTALL TIE ROD END SUB-ASSEMBLY RH (See INSTALLATION)
40. INSTALL FRONT SPEED SENSOR LH (See INSTALLATION)
41. INSTALL FRONT SPEED SENSOR RH (See INSTALLATION)
42. INSTALL FRONT STABILIZER LINK ASSEMBLY LH (See INSTALLATION)
43. INSTALL FRONT STABILIZER LINK ASSEMBLY RH (See INSTALLATION)
44. INSTALL FRONT AXLE HUB NUT LH (See INSTALLATION)
45. INSTALL FRONT AXLE HUB NUT RH (See INSTALLATION)
46. CONNECT NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY (See INSTALLATION)
47. INSTALL COLUMN HOLE COVER SILENCER SHEET
48. INSTALL FRONT EXHAUST PIPE ASSEMBLY (See INSTALLATION)
49. CONNECT ENGINE WIRE
 - a. Install the ground cable with the bolt.

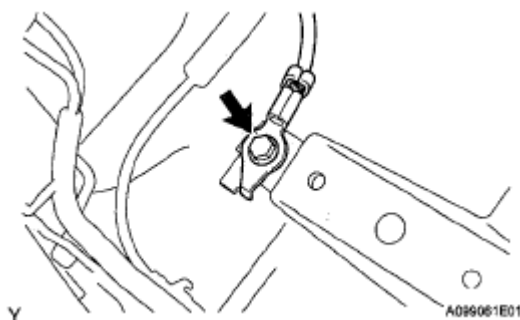


Fig. 258: Identifying Ground Cable With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the engine wire to the battery positive terminal with the nut.

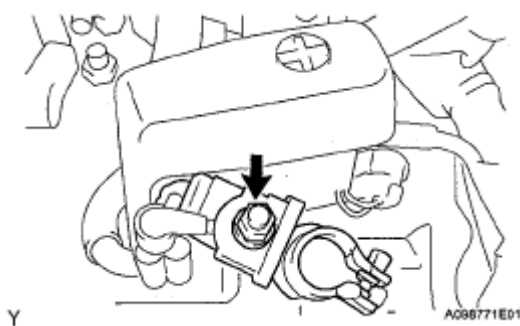


Fig. 259: Identifying Engine Wire To Battery Positive Terminal With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the 2 clamps of the engine wire.

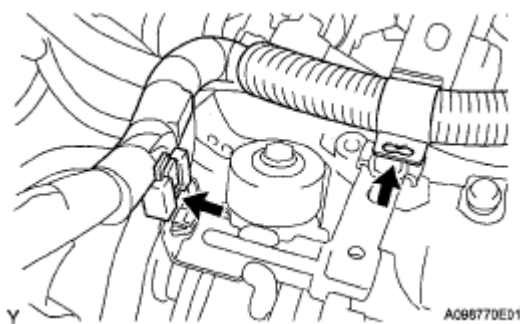


Fig. 260: Identifying Engine Wire Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the engine wire harness with the 2 claws.

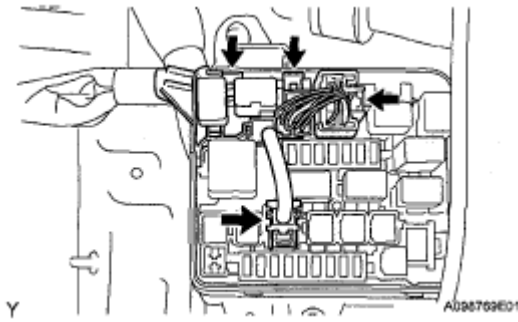


Fig. 261: Identifying Engine Wire Harness With 2 Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Connect the 2 connectors.
- 50. **INSTALL GLOVE COMPARTMENT DOOR ASSEMBLY** (See INSTALLATION)
- 51. **INSTALL COOLER COMPRESSOR ASSEMBLY** (See INSTALLATION)
- 52. **INSTALL GENERATOR ASSEMBLY** (See INSTALLATION)
- 53. **INSTALL FAN AND GENERATOR V BELT** (See INSTALLATION)
- 54. **INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY (for Manual Transaxle)** (See INSTALLATION)
- 55. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Manual Transaxle)** (See INSTALLATION)
- 56. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY (for Automatic Transaxle)** (See INSTALLATION)
- 57. **CONNECT HEATER WATER OUTLET HOSE**
 - a. Connect the heater outlet hose to the air conditioner tube.

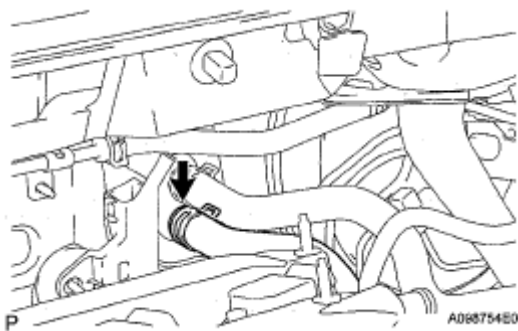


Fig. 262: Identifying Heater Water Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 58. **CONNECT HEATER WATER INLET HOSE**
 - a. Connect the heater inlet hose to the air conditioner tube.

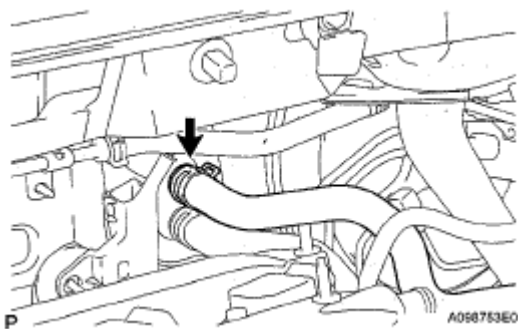


Fig. 263: Identifying Heater Water Inlet Hose

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

59. CONNECT UNION TO CONNECTOR TUBE HOSE

- a. Connect the union to connector tube to the booster vacuum tube.

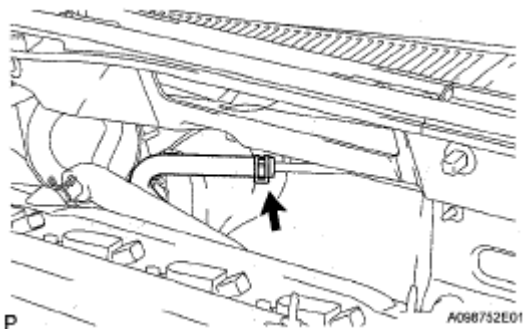


Fig. 264: Identifying Union To Connector Tube Hose

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

60. CONNECT FUEL MAIN TUBE (See INSTALLATION)

61. INSTALL BATTERY CARRIER

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

Torque: 12.8 N*m (131 kgf*cm, 9 ft.*lbf)

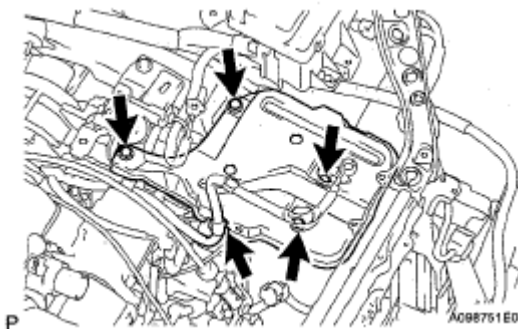


Fig. 265: Identifying Battery Carrier Bolts

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

- b. Connect the clamp of the engine wire.

62. INSTALL AIR CLEANER CASE SUB-ASSEMBLY

- a. Connect the air cleaner case to the No. 1 air cleaner inlet.
- b. Install the air cleaner case with the 3 bolts.

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

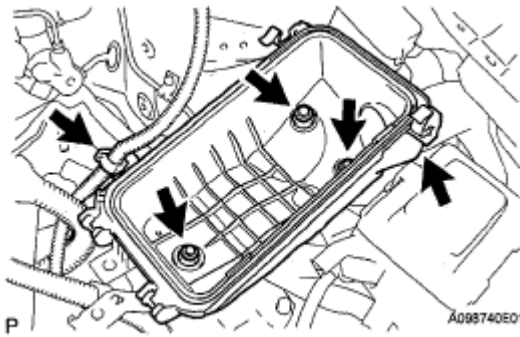


Fig. 266: Identifying Air Cleaner Case Bolts

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

- c. Connect the clamp of the engine wire.

63. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY (See INSTALLATION)

64. INSTALL AIR CLEANER CAP SUB-ASSEMBLY (See INSTALLATION)

65. INSTALL RADIATOR ASSEMBLY (See INSTALLATION)

66. CONNECT NO. 1 OIL COOLER OUTLET TUBE (for Automatic Transaxle)

67. CONNECT NO. 1 OIL COOLER INLET TUBE (for Automatic Transaxle)

68. CONNECT RADIATOR HOSE OUTLET

69. CONNECT RADIATOR HOSE INLET

70. INSTALL BATTERY TRAY

71. INSTALL BATTERY

72. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

73. ADD MANUAL TRANSAXLE OIL (See INSTALLATION)

74. ADD AUTOMATIC TRANSAXLE FLUID (See INSTALLATION)

75. ADD ENGINE COOLANT (See ON-VEHICLE INSPECTION)

76. CHECK FOR FUEL LEAKAGE (See ON-VEHICLE INSPECTION)

77. CHECK FOR ENGINE COOLANT LEAKS

- a. Check for the engine coolant leaks (See ON-VEHICLE INSPECTION).

78. CHECK FOR MANUAL TRANSAXLE OIL LEAKS

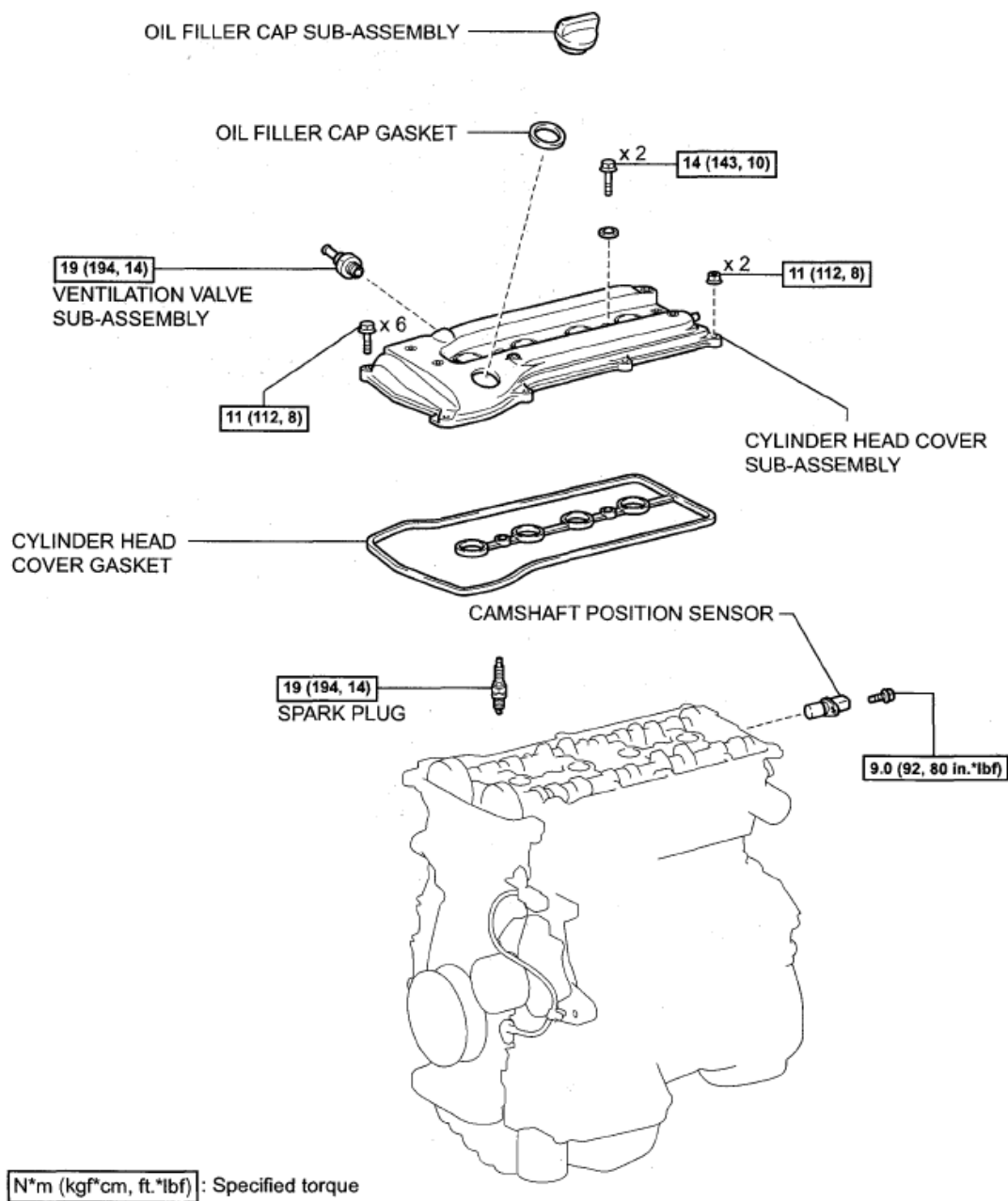
79. CHECK FOR AUTOMATIC TRANSAXLE FLUID LEAKS

80. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See INSTALLATION)
81. **INSTALL FRONT FENDER APRON SEAL RH** (See INSTALLATION)
82. **INSTALL ENGINE UNDER COVER LH**
83. **INSTALL ENGINE UNDER COVER RH**
84. **INSTALL FRONT WHEEL** (See INSTALLATION)
85. **PERFORM INITIALIZATION**
 - a. Perform initialization (see INITIALIZATION).

NOTE: Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

ENGINE UNIT

COMPONENTS



A114135E03

Fig. 267: Identifying Engine Unit Replacement Components With Torque Specifications (1 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

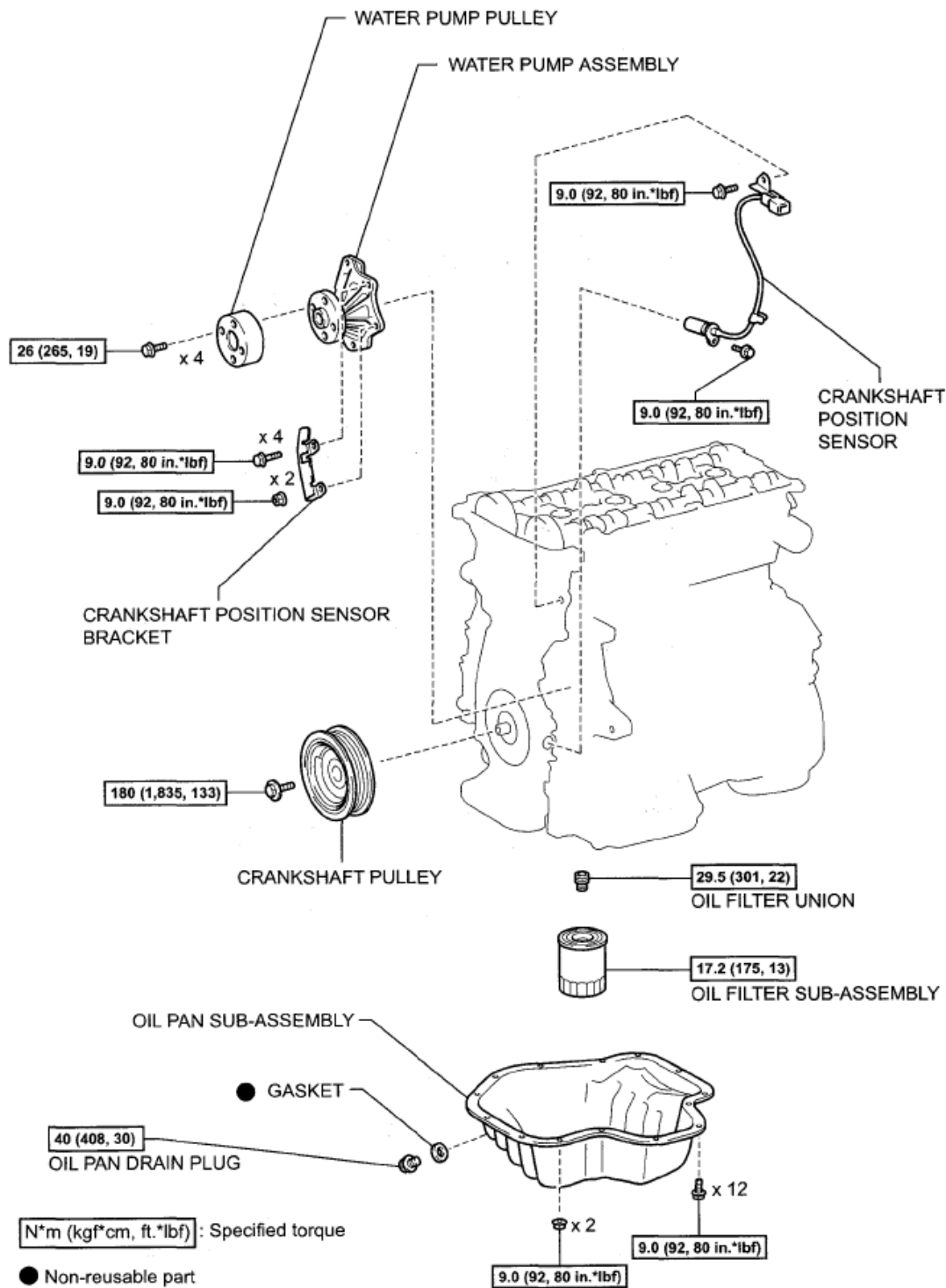


Fig. 268: Identifying Engine Unit Replacement Components With Torque Specifications (2 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

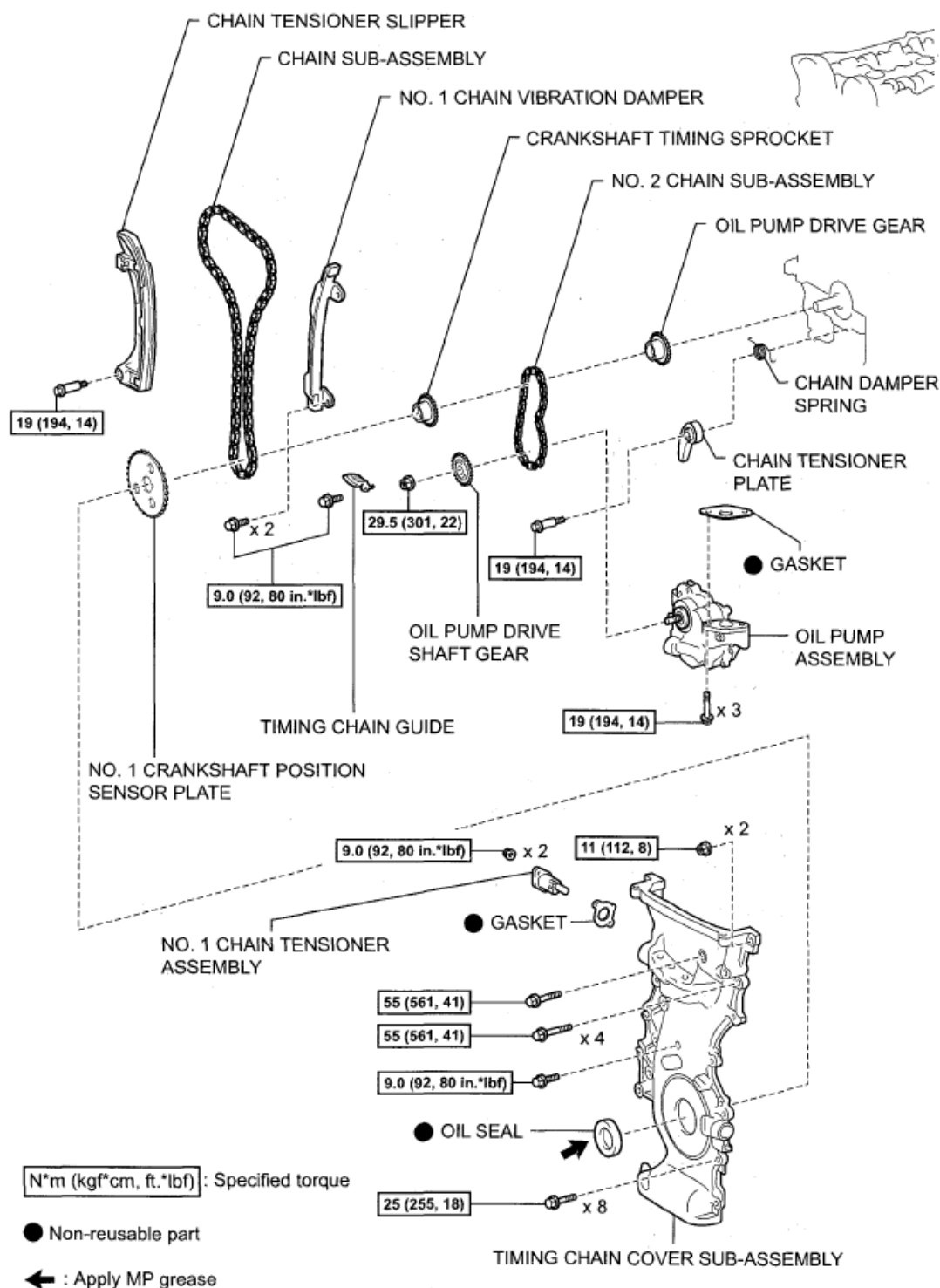


Fig. 269: Identifying Engine Unit Replacement Components With Torque Specifications (3 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

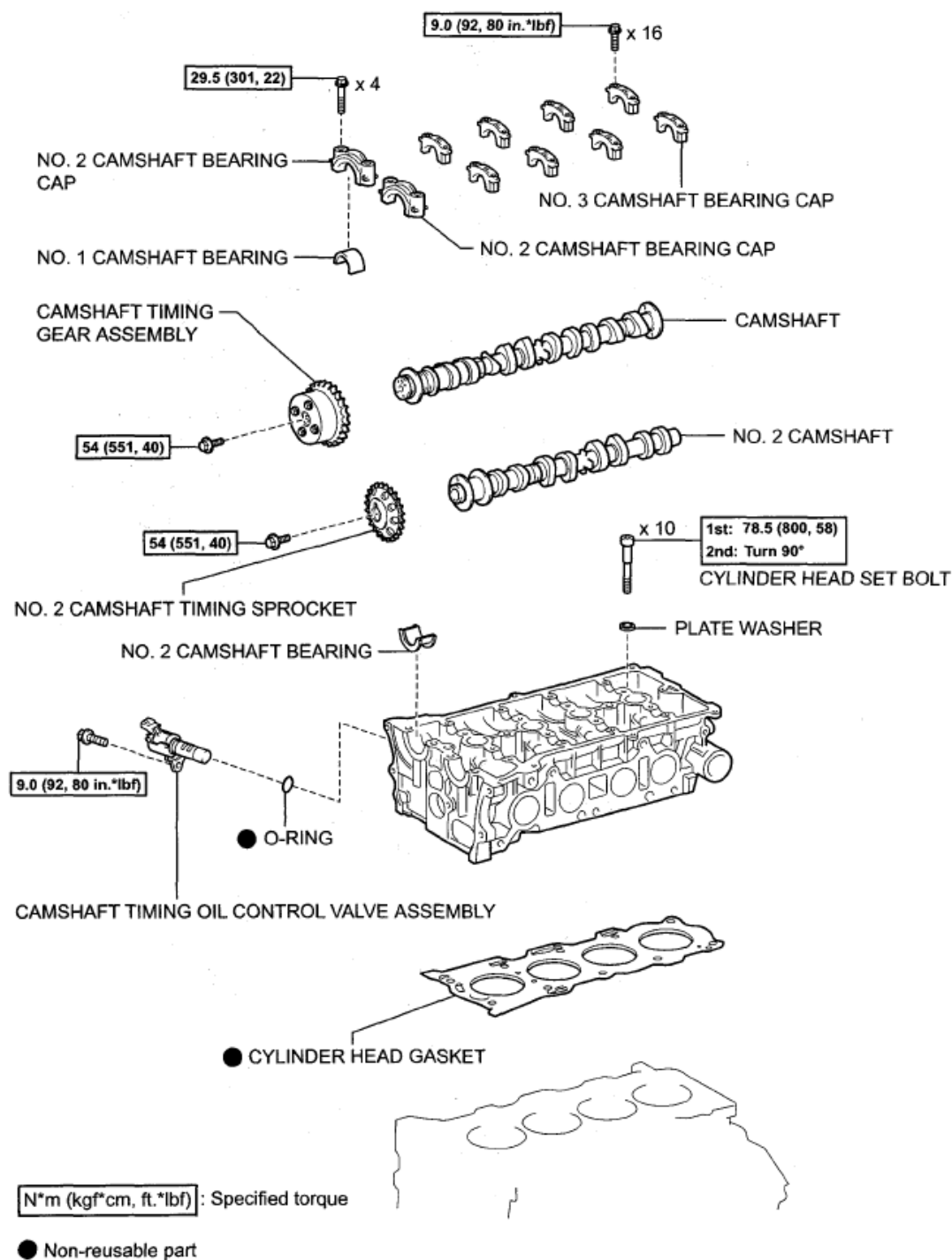
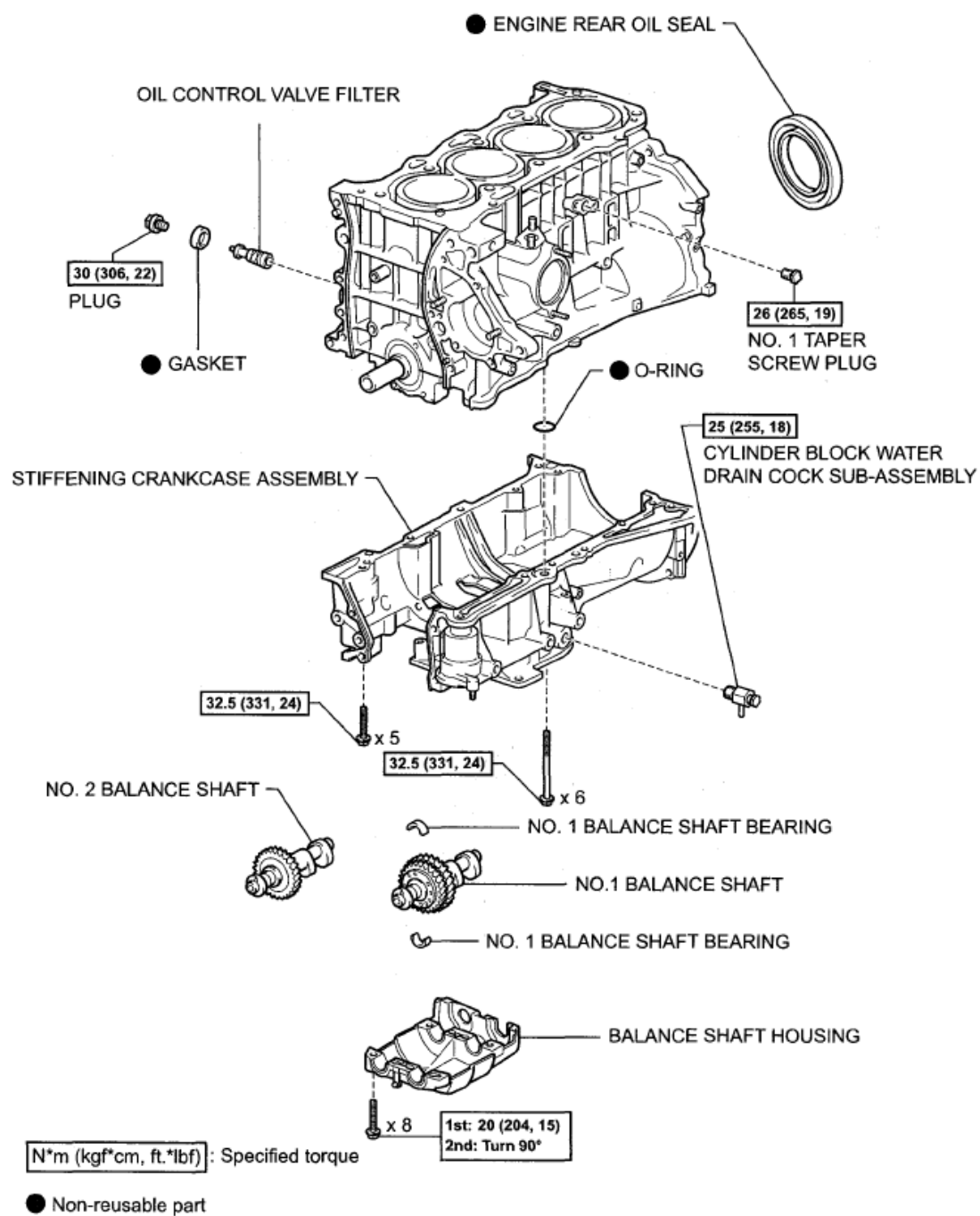


Fig. 270: Identifying Engine Unit Replacement Components With Torque Specifications (4 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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A114139E03

Fig. 271: Identifying Engine Unit Replacement Components With Torque Specifications (5 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

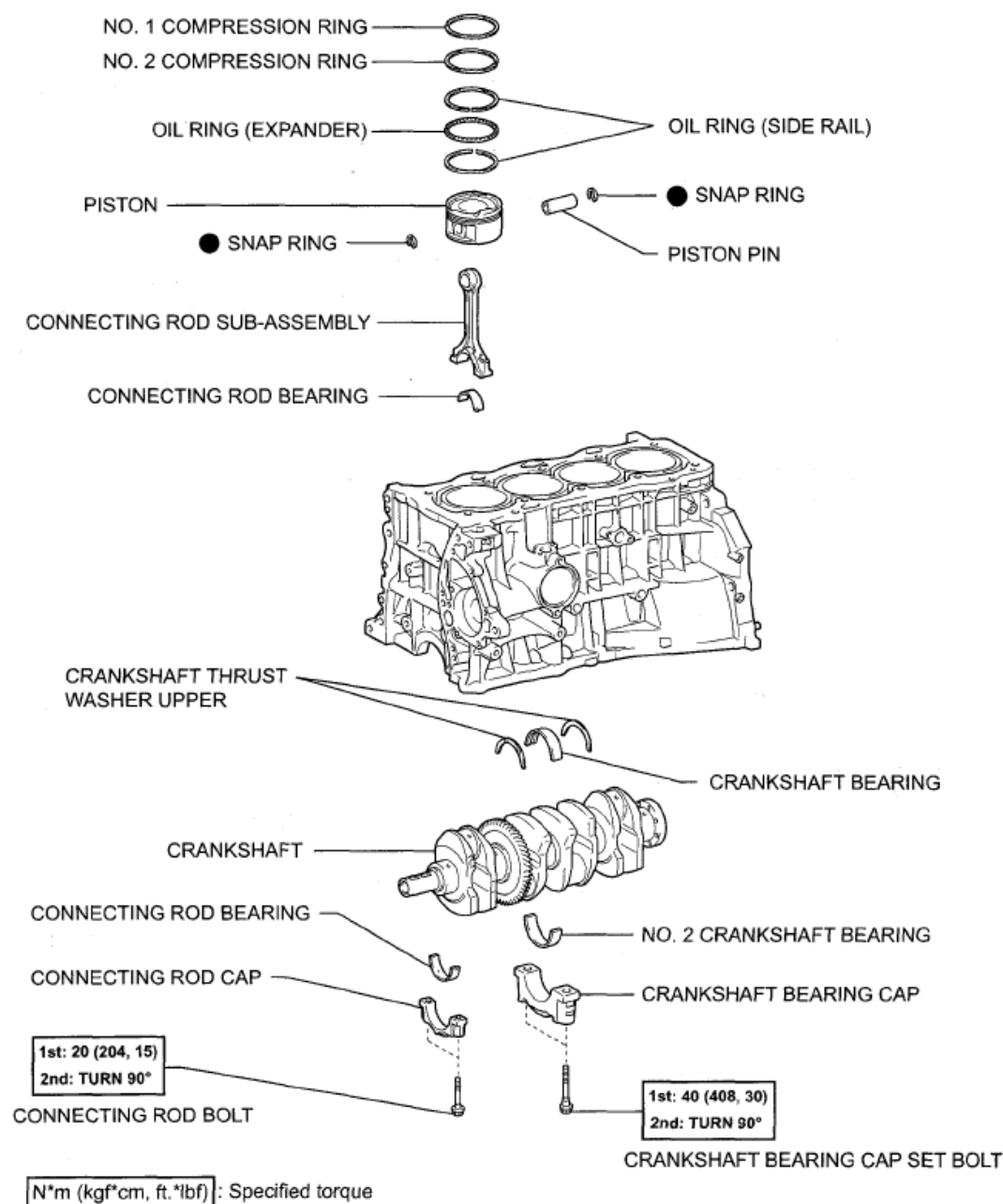


Fig. 272: Identifying Engine Unit Replacement Components With Torque Specifications (6 Of 6)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE SPARK PLUG
2. REMOVE OIL FILLER CAP SUB-ASSEMBLY
3. REMOVE OIL FILLER CAP GASKET

4. **REMOVE VENTILATION VALVE SUB-ASSEMBLY**
5. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See REMOVAL)
6. **REMOVE CYLINDER HEAD COVER GASKET**
7. **REMOVE OIL FILTER SUB-ASSEMBLY** (See REPLACEMENT)
8. **REMOVE OIL FILTER UNION**
 - a. Using a 12 mm socket hexagon wrench, remove the oil filter union.
9. **REMOVE CAMSHAFT POSITION SENSOR** (See REMOVAL)
10. **REMOVE CRANKSHAFT POSITION SENSOR** (See REMOVAL)
11. **REMOVE WATER PUMP PULLEY** (See REMOVAL)
12. **REMOVE WATER PUMP ASSEMBLY** (See REMOVAL)
13. **REMOVE OIL PAN DRAIN PLUG**
 - a. Remove the oil pan drain plug and gasket.
14. **REMOVE OIL PAN SUB-ASSEMBLY** (See REMOVAL)
15. **REMOVE CRANKSHAFT PULLEY** (See REMOVAL)
16. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** (See REMOVAL)
17. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** (See REMOVAL)
18. **REMOVE TIMING CHAIN COVER OIL SEAL** (See REPLACEMENT)
19. **REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE**
20. **REMOVE TIMING CHAIN GUIDE** (See REMOVAL)
21. **REMOVE CHAIN TENSIONER SLIPPER** (See REMOVAL)
22. **REMOVE CHAIN SUB-ASSEMBLY**
23. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** (See REMOVAL)
24. **REMOVE CRANKSHAFT TIMING SPROCKET**
25. **REMOVE NO. 2 CHAIN SUB-ASSEMBLY** (See REMOVAL)
26. **REMOVE OIL PUMP DRIVE GEAR**
27. **REMOVE OIL PUMP ASSEMBLY** (See REMOVAL)
28. **REMOVE CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the 20 bearing cap bolts in the sequence shown in the illustration.

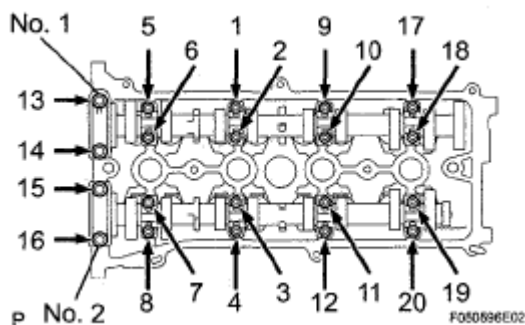


Fig. 273: Identifying Bearing Cap Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 10 bearing caps, then remove the camshaft and No. 2 camshaft.
- 29. **REMOVE CYLINDER HEAD SUB-ASSEMBLY** (See **REMOVAL**)
- 30. **REMOVE CYLINDER HEAD GASKET**
- 31. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
- 32. **REMOVE OIL CONTROL VALVE FILTER**
 - a. Using a 6 mm socket hexagon wrench, remove the plug and gasket.

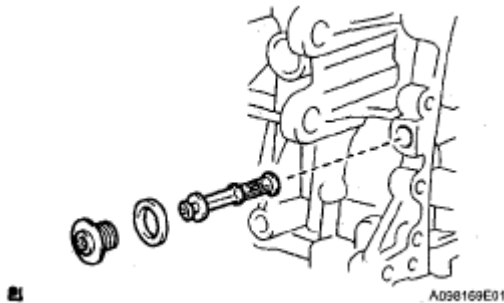


Fig. 274: Identifying Plug And Gasket
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the oil control valve filter.
- 33. **REMOVE NO. 1 TAPER SCREW PLUG**
 - a. Remove the plug from the cylinder block.

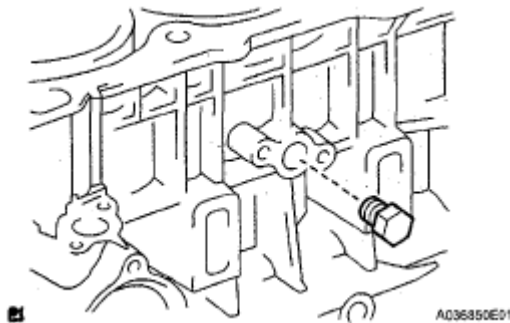


Fig. 275: Identifying Plug From Cylinder Block
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 34. **INSPECT BALANCE SHAFT THRUST CLEARANCE**
 - a. Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance: 0.05 to 0.09 mm (0.0020 to 0.0035 in.)

Maximum thrust clearance: 0.09 mm (0.0035 in.)

If the thrust clearance is greater than the maximum, replace the balance shaft housing and bearings. If necessary, replace the balance shaft.

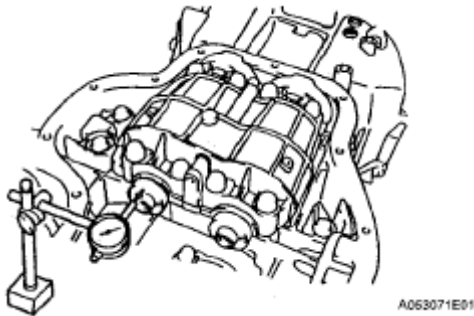


Fig. 276: Inspecting Balance Shaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. INSPECT BALANCE SHAFT OIL CLEARANCE

- a. Using several steps, uniformly loosen and remove the 8 bolts in the sequence shown in the illustration.

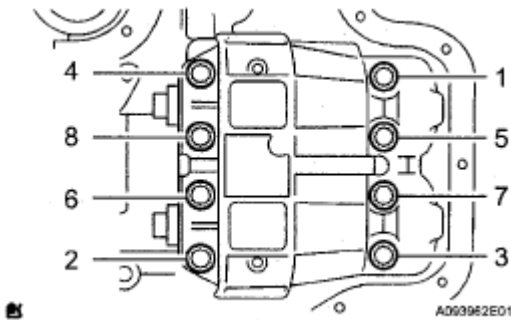


Fig. 277: Identifying Balance Shaft Oil Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the balance shaft housing from the crankcase.

HINT:

Keep the lower bearing and balance shaft housing together.

- c. Lift out the No. 1 and No. 2 balance shafts.

HINT:

Keep the upper bearing with the crankcase.

- d. Clean each bearing and journal.
- e. Check each bearing and journal for pitting and scratches.

If a bearing or journal is damaged, replace the bearings. If necessary, replace the balance shaft.

- f. Place the No. 1 and No. 2 balance shafts onto the crankcase.
- g. Lay a strip of Plastigage across each journal.

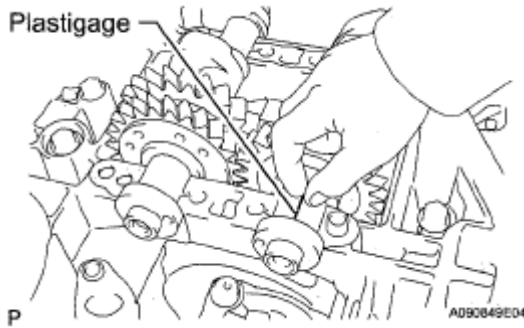


Fig. 278: Laying Plastigage Across Each Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Install the balance shaft housing.
- i. Apply a light coat of engine oil on the threads and under the heads of the bolts.
- j. Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: 21.6 N*m (220 kgf*cm, 16 ft.*lbf)

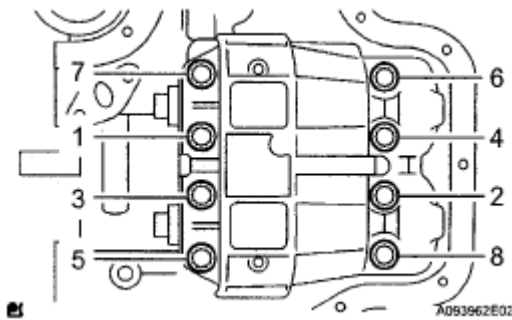


Fig. 279: Identifying Balance Shaft Oil Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- k. Mark the front of the bolts with paint.
- l. Retighten the bolts 90° as shown in the illustration.

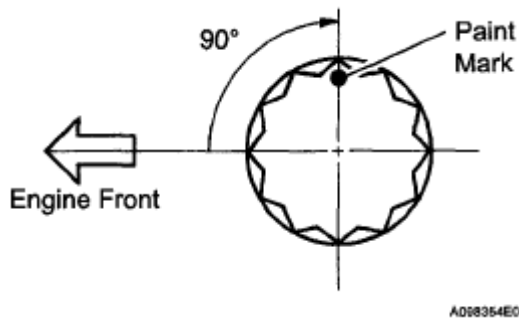


Fig. 280: Tightening Bolts And Additional 90°
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- m. Check that the paint mark is now at a 90° angle to the front.
- n. Remove the balance shaft housing from the crankcase.
- o. Measure the Plastigage at its widest point.

Standard oil clearance: 0.004 to 0.049 mm (0.0002 to 0.0019 in.)

Maximum oil clearance: 0.049 mm (0.0019 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is greater than the maximum, replace the bearing. If necessary, replace the balance shaft.

HINT:

If replacing a bearing, select a new one with the same number.

Standard balance shaft housing journal bore diameter

STANDARD BALANCE SHAFT HOUSING JOURNAL BORE DIAMETER

Item	Specified Condition
Mark 1	26.000 to 26.006 mm (1.0236 to 1.0239 in.)
Mark 2	26.007 to 26.012 mm (1.0239 to 1.0214 in.)
Mark 3	26.013 to 26.018 mm (1.0241 to 1.0243 in.)

Standard balance shaft journal diameter: 22.985 to 23.000 mm (0.9049 to 0.9055 in.)

Standard bearing center wall thickness

STANDARD BEARING CENTER WALL THICKNESS

Item	Specified Condition
Mark 1	1.486 to 1.489 mm (0.0585 to 0.0586 in.)

Mark 2	1.490 to 1.492 mm (0.0587 to 0.0587 in.)
Mark 3	1.493 to 1.495 mm (0.0588 to 0.0589 in.)

36. REMOVE BALANCE SHAFT

37. REMOVE NO. 1 BALANCE SHAFT BEARING

38. REMOVE ENGINE REAR OIL SEAL

- Using a knife, cut off the lip of the oil seal.
- Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

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

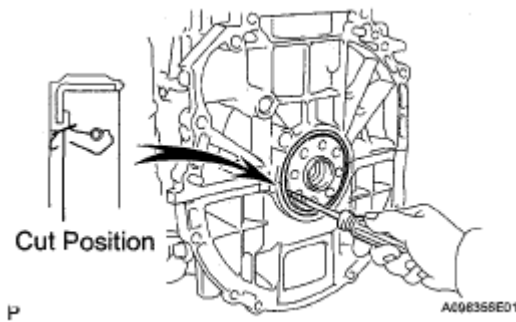


Fig. 281: Identifying Prying Out Oil Seal Using Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. REMOVE STIFFENING CRANKCASE ASSEMBLY

- Using several steps, uniformly loosen and remove the 11 bolts in the sequence shown in the illustration.
- Remove the crankcase by prying the portions between the crankcase and cylinder block.

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

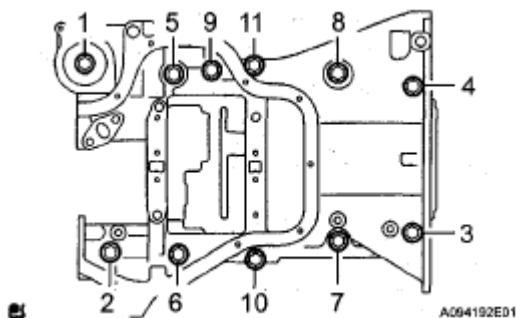


Fig. 282: Identifying Crankcase Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

40. 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: 0.160 to 0.362 mm (0.0063 to 0.0143 in.)

Maximum thrust clearance: 0.362 mm (0.0143 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod. If necessary, replace the crankshaft.

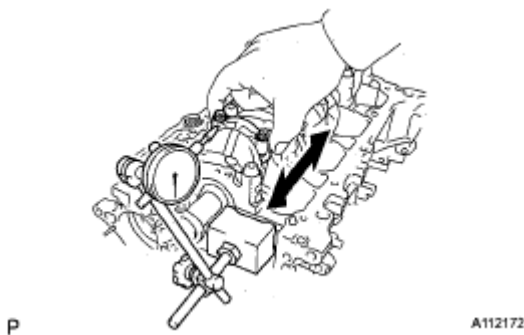


Fig. 283: Measuring Thrust Clearance While Moving Connecting Rod Back And Forth
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. INSPECT CONNECTING ROD OIL CLEARANCE

NOTE: Do not turn the crankshaft during the measurement.

- a. Using marking paint, write the matched cylinder number on each connecting rod and cap.

HINT:

The matchmarks in the connecting rods and caps are for ensuring correct reassembly.

- b. Using a 12 mm socket wrench, remove the 2 bolts and connecting rod cap.

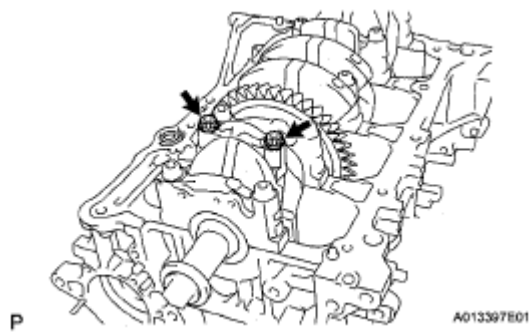


Fig. 284: Identifying And Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clean the crank pin and bearing.
- d. Check the crank pin and bearing for pitting and scratches.
- e. Lay a strip of Plastigage on the crank pin.

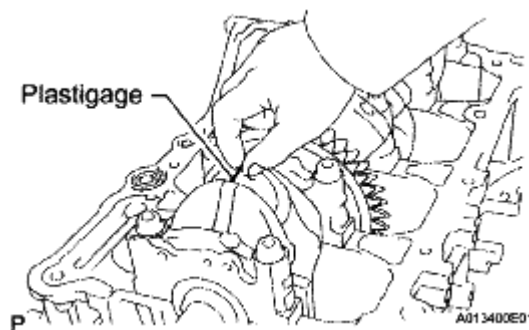


Fig. 285: Laying Plastigage On Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Check that the front mark of the connecting rod cap is facing in the correct direction.
- g. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.
- h. Using a 12 mm socket wrench, tighten the bolts in several passes to the specified torque.

Torque: 24.5 N*m (250 kgf*cm, 18 ft.*lbf)

- i. Mark the front of the connecting rod bolts with paint.
- j. Retighten the cap bolts 90° as shown in the illustration.

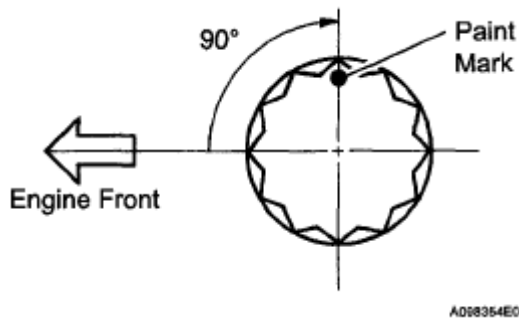


Fig. 286: Tightening Cap Bolts An Additional 90°
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- k. Check that the crankshaft turns smoothly.
- l. Using a 12 mm socket wrench, remove the 2 bolts and connecting rod cap.
- m. Measure the Plastigage at its widest point.

Standard oil clearance: 0.024 to 0.048 mm (0.0009 to 0.0019 in.)

Maximum oil clearance: 0.08 mm (0.0032 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is greater than the maximum, replace the connecting rod bearing. If necessary, grind or replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number as marked on the connecting rod.

There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Standard connecting rod large end bore diameter

STANDARD CONNECTING ROD LARGE END BORE DIAMETER

Mark	Specified Condition
Mark 1	51.000 to 51.007 mm (2.0079 to 2.0082 in.)
Mark 2	51.008 to 51.013 mm (2.0082 to 2.0084 in.)
Mark 3	51.014 to 51.020 mm (2.0084 to 2.0087 in.)

Standard connecting rod bearing thickness

STANDARD CONNECTING ROD BEARING THICKNESS

Mark	Specified Condition
Mark 1	1.485 to 1.488 mm (0.0585 to 0.0586 in.)

Mark 2	1.489 to 1.491 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.494 mm (0.0587 to 0.0588 in.)

Standard crankshaft pin diameter**STANDARD CRANKSHAFT PIN DIAMETER**

Mark	Specified Condition
-	47.990 to 48.000 (1.8894 to 1.8898 in.)

42. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

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

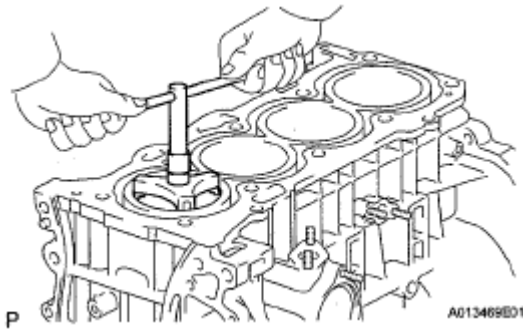


Fig. 287: Removing All Carbon From Top Of Cylinder
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. 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.

43. REMOVE CONNECTING ROD BEARING**44. REMOVE PISTON RING SET**

- a. Using a piston ring expander, remove the 2 compression rings.
- b. Remove the 2 side rails and expander by hand.

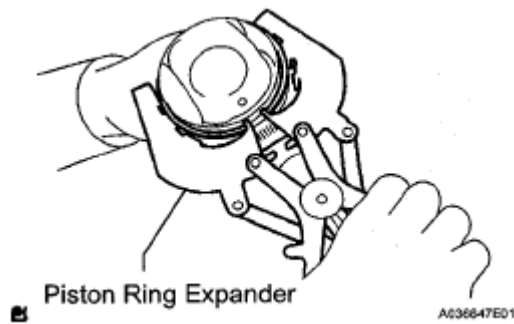


Fig. 288: Identifying Piston Ring Set
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. REMOVE PISTON PIN HOLE SNAP RING

- a. Using a small screwdriver, pry out the 2 snap rings.

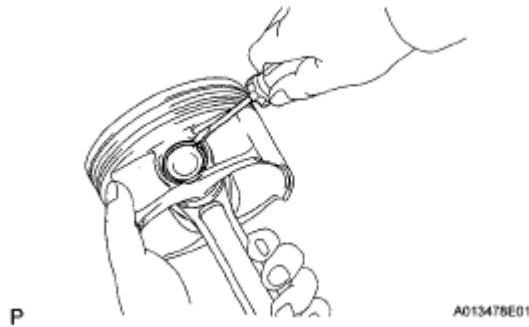


Fig. 289: Prying Out Snap Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. REMOVE PISTON

- a. Gradually heat the piston up to 80 to 90°C (176 to 194°F).

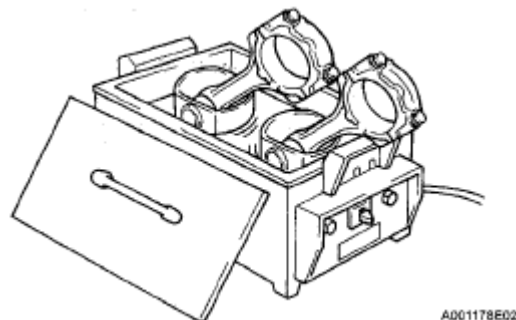


Fig. 290: Heating Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a plastic hammer and brass bar, lightly tap out the piston pin, then remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the piston, pin, ring, connecting rod and bearings in the correct order.

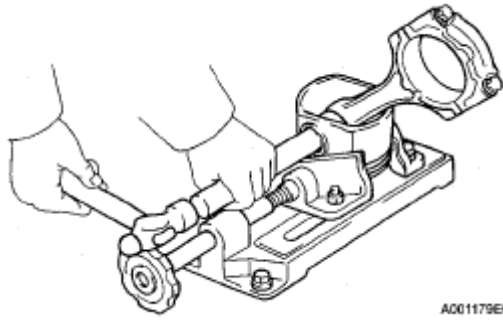


Fig. 291: Tapping Out Piston Pin And Removing Connecting Rod
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. INSPECT CRANKSHAFT THRUST CLEARANCE

- 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 0.0095 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.

HINT:

The thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

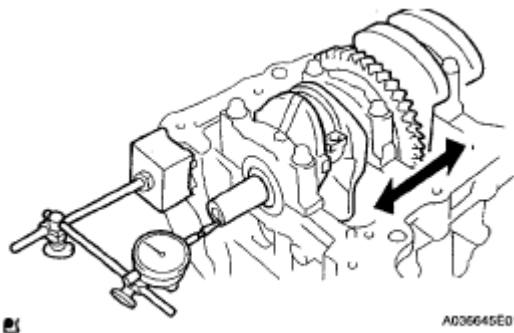


Fig. 292: Measuring Thrust Clearance While Prying Crankshaft Back
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. INSPECT CRANKSHAFT OIL CLEARANCE

NOTE: Do not turn the crankshaft during the measurement.

- a. Clean each main journal and bearing.
- b. Check each main journal and bearing for pitting and scratches.
- c. Install the upper bearing with an oil groove onto the cylinder block.

NOTE: Do not apply engine oil to the bearing or its contact surface.

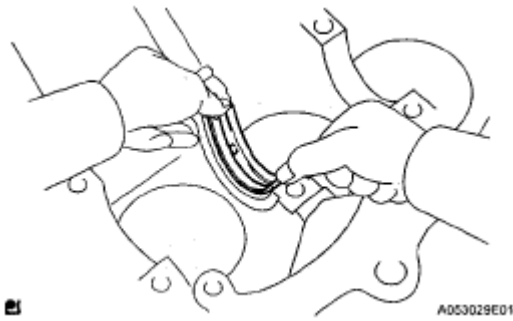


Fig. 293: Installing Upper Bearing With Oil Groove Onto Cylinder Block
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the lower bearing onto the bearing cap.

NOTE: Do not apply engine oil to the bearing or its contact surface.

- e. Place the crankshaft onto the cylinder block.

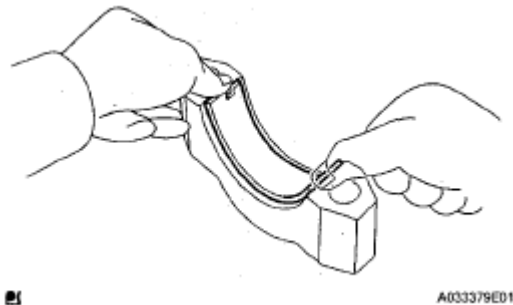


Fig. 294: Installing Lower Bearing Onto Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Lay a strip of Plastigage across each journal.

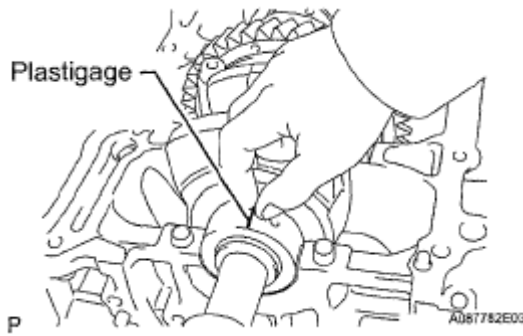


Fig. 295: Laying Strip Of Plastigage Across Each Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Examine the front marks and numbers and install the bearing caps onto the cylinder block in the order shown in the illustration.

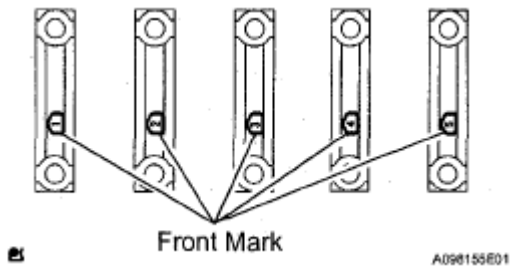


Fig. 296: Identifying Front Marks And Numbers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
i. Using several steps, uniformly install and tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

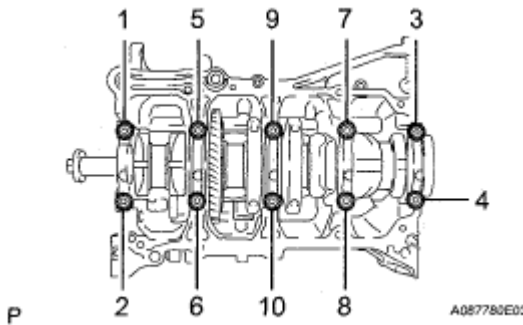


Fig. 297: Identifying Bearing Cap Bolts In Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. Mark the front of the bearing cap bolts with paint.

- k. Retighten the 10 bearing cap bolts by 90°.

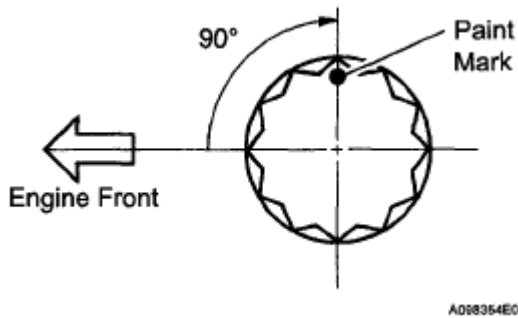


Fig. 298: Tightening Bearing Cap Bolts An Additional 90°
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- l. Check that the paint marks are at a 90° angle to the front.
- m. Remove the bearing caps.
- n. Measure the Plastigage at its widest point.

Standard oil clearance: 0.017 to 0.040 mm (0.0007 to 0.0016 in.)

Maximum oil clearance: 0.050 mm (0.0020 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is greater than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

STANDARD BEARINGS SIZES REFERENCE

Cylinder block + Crankshaft	0 to 2	3 to 5	6 to 8	9 to 11
Use bearing	"1"	"2"	"3"	"4"

EXAMPLE

- Imprinted number on the cylinder block is 3.
- Imprinted number on the crankshaft is 4. $3 + 4 = 7$

Select the bearing marked "7".

Standard cylinder block journal bore diameter**STANDARD CYLINDER BLOCK JOURNAL BORE DIAMETER**

Mark	Specified Condition
0	59.000 to 59.002 mm (2.3228 to 2.3229 in.)
1	59.003 to 59.004 mm (2.3230 to 2.3230 in.)
2	59.005 to 59.006 mm (2.3230 to 2.3231 in.)
3	59.007 to 59.009 mm (2.3231 to 2.3232 in.)
4	59.010 to 59.011 mm (2.3232 to 2.3233 in.)
5	59.012 to 59.013 mm (2.3233 to 2.3234 in.)
6	59.014 to 59.016 mm (2.3234 to 2.3235 in.)

Standard crankshaft journal diameter**STANDARD CRANKSHAFT JOURNAL DIAMETER**

Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

Standard bearing center wall thickness**STANDARD BEARING CENTER WALL THICKNESS**

Mark	Specified Condition
1	1.993 to 1.996 mm (0.0785 to 0.0786 in.)
2	1.997 to 1.999 mm (0.0786 to 0.0787 in.)
3	2.000 to 2.002 mm (0.0787 to 0.0788 in.)
4	2.003 to 2.005 mm (0.0789 to 0.0789 in.)

49. REMOVE CRANKSHAFT

- a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.

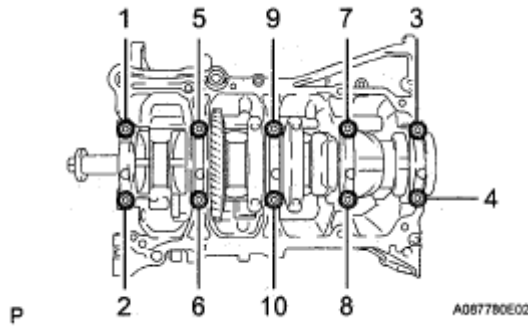


Fig. 299: Identifying Bearing Cap Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 5 bearing caps from the cylinder block.
- c. Remove the crankshaft from the cylinder block.

50. REMOVE CRANKSHAFT THRUST WASHER UPPER

51. REMOVE CRANKSHAFT BEARING

HINT:

Arrange the bearings in the correct order.

52. REMOVE NO. 2 CRANKSHAFT BEARING

HINT:

Arrange the bearings in the correct order.

53. REMOVE STUD BOLT

- a. Remove the 8 stud bolts.

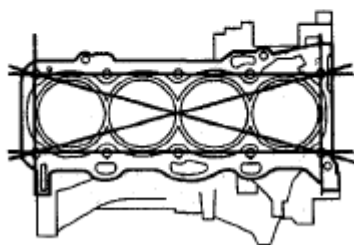
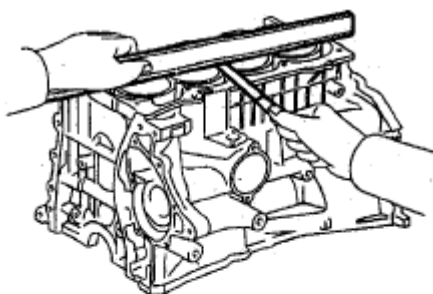
INSPECTION

1. INSPECT CYLINDER BLOCK FOR WARPAGE

- a. Using a precision straightedge and feeler gauge, measure the warpage of the surface that is in contact with the cylinder head gasket.

Maximum warpage: 0.05 mm (0.0020 in.)

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



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Fig. 300: Identifying Cylinder Block For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT CYLINDER BORE

- a. Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

Standard diameter: 88.500 to 88.513 mm (3.4843 to 3.4848 in.)

Maximum diameter: 88.633 mm (3.4895 in.)

If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.

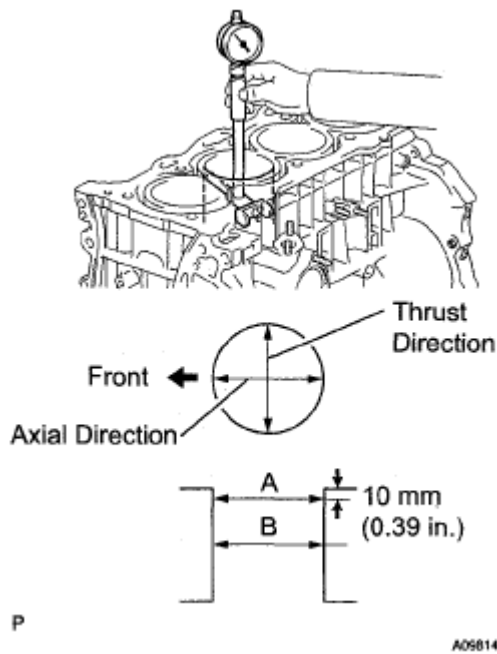


Fig. 301: Measuring Cylinder Bore Diameter At Positions A And B
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT PISTON

- a. Using a micrometer, measure the piston diameter at right angles to the piston pin hole, and at the piston 30.3 mm (1.193 in.) from the piston head.

Standard piston diameter: 88.439 to 88.449 mm (3.4819 to 3.4822 in.)

If the diameter is not as specified, replace the piston.

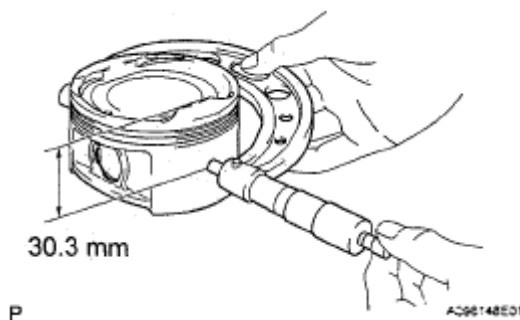


Fig. 302: Inspecting Piston
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT PISTON OIL CLEARANCE

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance: 0.051 to 0.074 mm (0.0020 to 0.0029 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than the maximum, replace all the pistons. If necessary, replace the cylinder block.

5. INSPECT RING GROOVE CLEARANCE

- a. Using a feeler gauge, measure the clearance between the new piston ring and wall of the ring groove.

Standard ring groove clearance**STANDARD RING GROOVE CLEARANCE**

Item	Specified Condition
No. 1 ring	0.17 to 0.22 mm (0.0067 to 0.0087 in.)
No. 2 ring	0.17 to 0.21 mm (0.0067 to 0.0083 in.)
Oil ring	0.21 to 0.29 mm (0.0083 to 0.0114 in.)

If the groove clearance is not as specified, replace the piston.

6. 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.

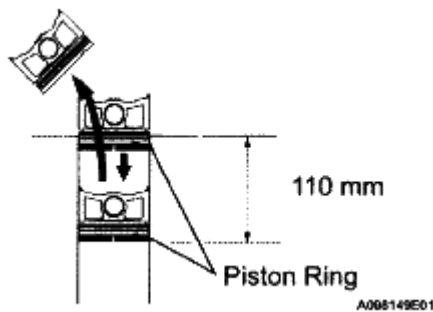


Fig. 303: Identifying Piston Ring End Gap
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

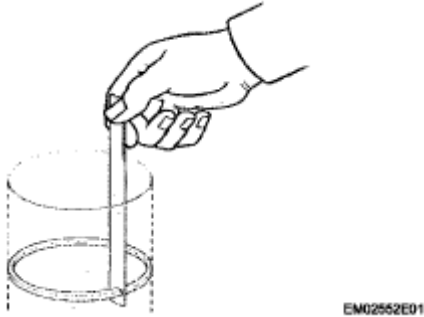
- b. Using a feeler gauge, measure the end gap.

Standard end gap**STANDARD END GAP**

Item	Specified Condition
No. 1 ring	0.22 to 0.32 mm (0.0087 to 0.0126 in.)
No. 2 ring	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
Oil ring	0.10 to 0.35 mm (0.0039 to 0.0138 in.)

Maximum end gap**MAXIMUM END GAP**

Item	Specified Condition
No. 1 ring	0.89 mm (0.0350 in.)
No. 2 ring	1.35 mm (0.0531 in.)
Oil ring	0.73 mm (0.0287 in.)

**Fig. 304: Identifying 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.

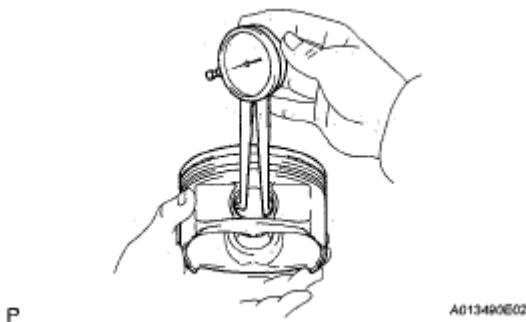
7. INSPECT PISTON PIN OIL CLEARANCE

- a. Using a caliper gauge, measure the piston pin bore diameter.

Standard piston pin bore diameter: 22.001 to 22.010 mm (0.8662 to 0.8665 in.)

STANDARD PISTON PIN BORE DIAMETER

Item	Specified Condition
A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
B	22.005 to 22.007 mm (0.8663 to 0.8664 in.)
C	22.008 to 22.010 mm (0.8665 to 0.8665 in.)

**Fig. 305: Identifying Piston Pin Bore Diameter**

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

If the diameter is not as specified, replace the piston.

- b. Using a micrometer, measure the piston pin diameter.

Standard piston pin diameter: 21.997 to 22.006 mm (0.8660 to 0.8664 in.)

STANDARD PISTON PIN DIAMETER

Item	Specified Condition
A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)

If the diameter is not as specified, replace the piston pin.

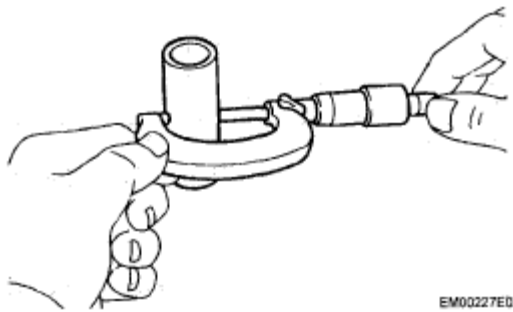


Fig. 306: Identifying Piston Pin Diameter

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

- c. Using a caliper gauge, measure the connecting rod small end bore diameter.

Standard connecting rod small end bore diameter: 22.005 to 22.014 mm (0.8663 to 0.8667 in.)

STANDARD CONNECTING ROD SMALL END BORE DIAMETER

Item	Specified Condition
A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
B	22.009 to 22.011 mm (0.8665 to 0.8666 in.)
C	22.012 to 22.014 mm (0.8666 to 0.8667 in.)

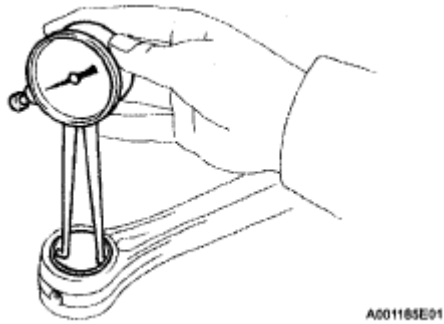


Fig. 307: Identifying Connecting Rod Small End Bore Diameter
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the diameter is not as specified, replace the connecting rod.

- d. Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Standard oil clearance: 0.001 to 0.007 mm (0.00004 to 0.0003 in.)

Maximum oil clearance: 0.013 mm (0.0005 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

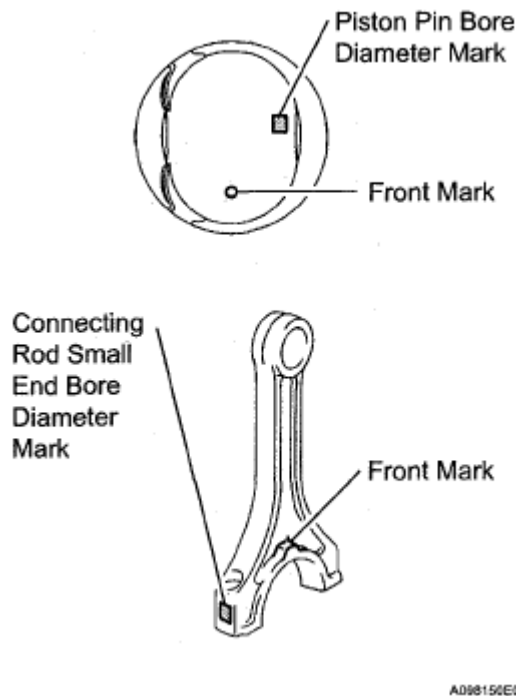


Fig. 308: Identifying Piston Pin Bore Diameter Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

Standard oil clearance: 0.005 to 0.011 mm (0.0002 to 0.0004 in.)

Maximum oil clearance: 0.017 mm (0.0007 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the connecting rod and piston pin as a set.

8. INSPECT CONNECTING ROD SUB-ASSEMBLY

- a. Using a connecting 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 the misalignment is greater than the maximum, replace the connecting rod.

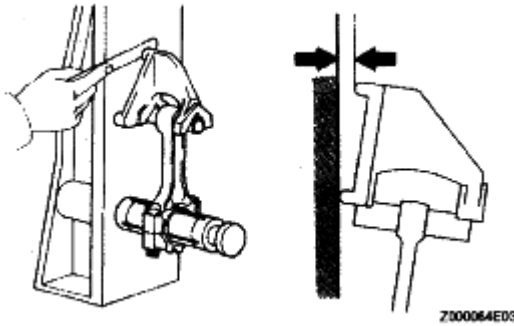


Fig. 309: Identifying Connecting Rod Alignment
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 2. Check for twist.

Maximum twist: 0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod.

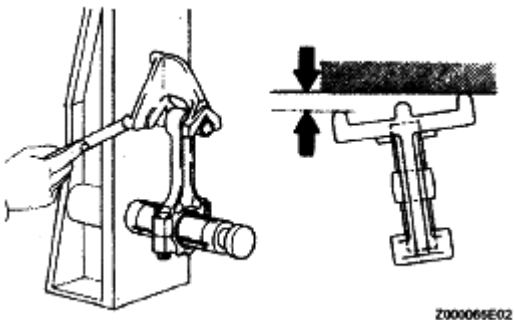


Fig. 310: Checking For Twist

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

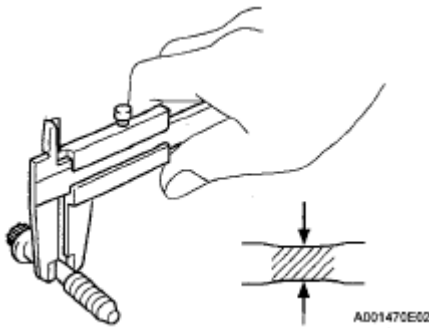
9. INSPECT CONNECTING ROD BOLT

- 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.)

Maximum diameter: 7.0 mm (0.276 in.)

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

**Fig. 311: Identifying Tension Portion Diameter Of Bolt**

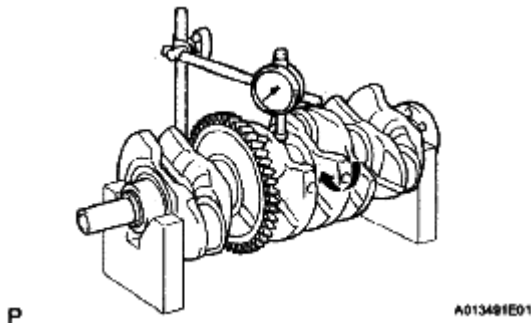
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSPECT CRANKSHAFT

- a. Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

Maximum taper and distortion: 0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

**Fig. 312: Measuring Circle Runout**

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

- b. Using a micrometer, measure the diameter of each main journal.

Standard diameter: 54.998 to 55.000 mm (2.1649 to 2.1654 in.)

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

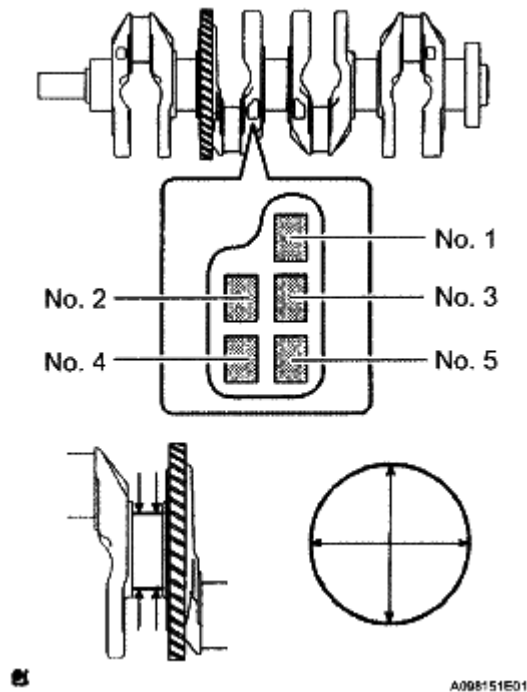


Fig. 313: Measuring Diameter Of Each Main Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion: 0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

Standard diameter (Reference)

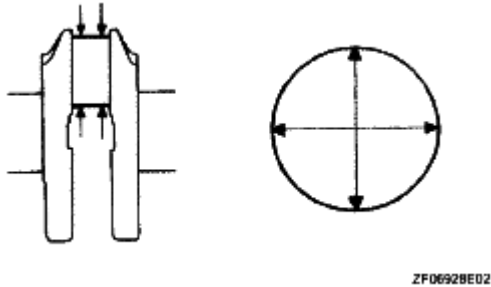
STANDARD DIAMETER REFERENCE

Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.998 to 54.990 mm (2.1649 to 2.1650 in.)

- d. Using a micrometer, measure the diameter of each crank pin.

Standard diameter: 47.990 to 48.000 mm (1.8894 to 1.8898 in.)

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



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Fig. 314: Measuring Diameter Of Each Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Inspect each crank pin for taper and distortion as shown in the illustration.

Maximum taper and distortion: 0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

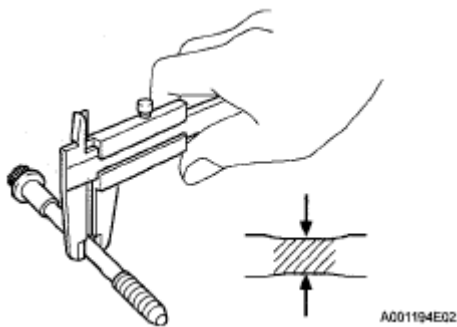
11. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- a. Using vernier calipers, measure the tension portion diameter of the bolts.

Standard diameter: 7.5 to 7.6 mm (0.295 to 0.299 in.)

Minimum diameter: 7.5 mm (0.295 in.)

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



A001194E02

Fig. 315: Measuring Crankshaft Bearing Cap Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. REPLACE TIMING CHAIN COVER OIL SEAL

HINT:

There are 2 methods to replace the oil seal.

- a. If the timing chain cover is removed from the cylinder block:

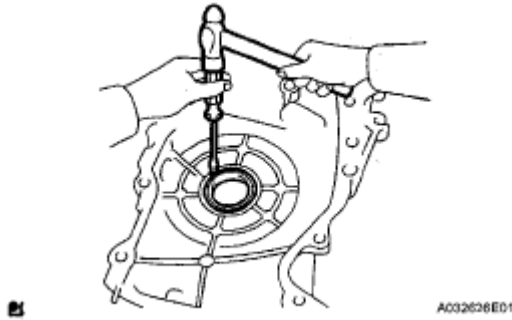


Fig. 316: Identifying Timing Chain Cover Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Using a screwdriver and hammer, tap out the oil seal.
2. Apply multi-purpose grease to the lip of a new oil seal.

NOTE: Keep the lip free of foreign objects.

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

SST 09223-22010

NOTE: Wipe any extra grease off the crankshaft.

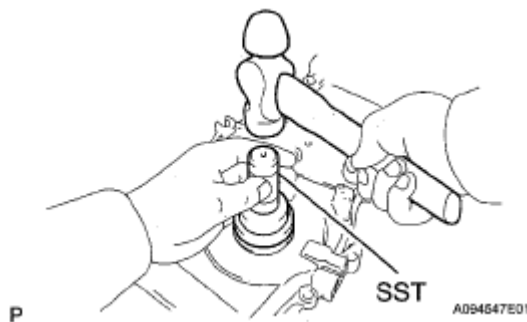


Fig. 317: Tapping In New Oil Seal Using SST And Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. If the timing chain cover oil seal is installed to the cylinder block:
 1. Remove the front wheel RH.

2. Remove the front fender apron seal RH (See **REMOVAL**).
3. Remove fan and generator V belt (see **REMOVAL**).
4. Remove the crankshaft pulley (see **REMOVAL**).
5. Using a knife, cut off the lip of the oil seal.
6. Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

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

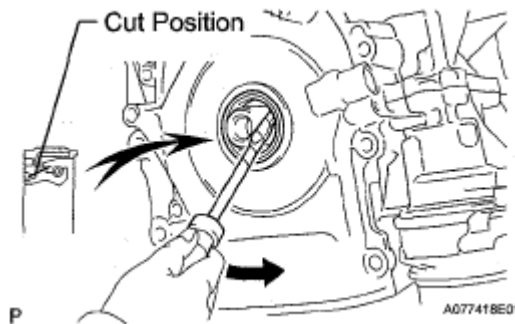


Fig. 318: Prying Out Oil Seal

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

7. Apply multi-purpose grease to the lip of a new oil seal.

NOTE: Keep the lip free of foreign objects.

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

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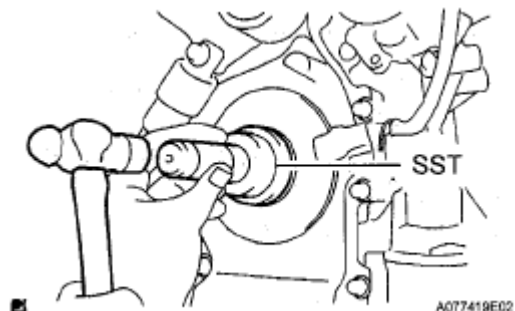


Fig. 319: Tapping In New Oil Seal Using SST And Hammer

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

9. Install the crankshaft pulley (see **INSTALLATION**).
10. Install the fan and generator V belt (see **INSTALLATION**).

11. Install the front fender apron seal (see **INSTALLATION**).

12. Install the front wheel RH (see **INSTALLATION**).

2. REPLACE ENGINE REAR OIL SEAL

a. If the engine is installed to the vehicle, perform the following procedures.

1. Remove the automatic transaxle assembly (for automatic transaxle) (see **REMOVAL**).

2. Remove the drive plate sub-assembly (for automatic transaxle) (see **REMOVAL**).

3. Remove the manual transaxle assembly (for manual transaxle) (see **MANUAL TRANSAXLE ASSEMBLY**).

4. Remove the clutch cover assembly (for manual transaxle) (see **REMOVAL**).

5. Remove the clutch disc assembly (for manual transaxle).

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

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

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

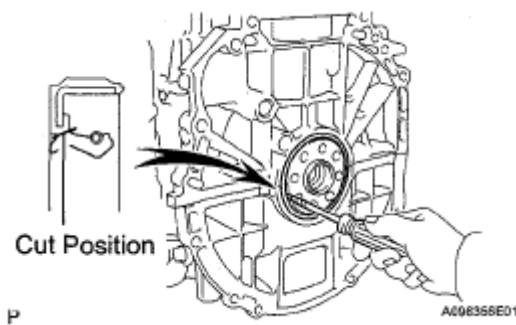


Fig. 320: Prying Out Oil Seal Using Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply multi-purpose grease to the lip of a new oil seal.

CAUTION: Keep the lip free of foreign objects.

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

SST 09223-15030, 09950-70010 (09951-07100)

NOTE: Wipe any extra grease off the crankshaft.

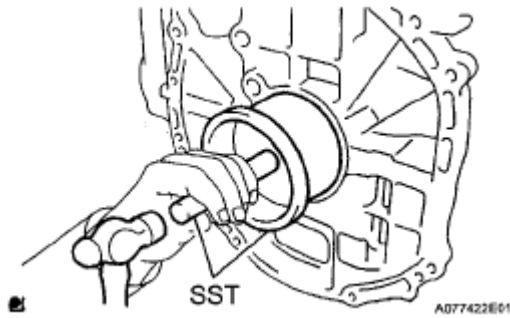


Fig. 321: Identifying Tapping In New Oil Seal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. If the engine is installed to the vehicle, perform the following procedures.
 1. Install the drive plate sub-assembly (for automatic transaxle) (see **INSTALLATION**)
 2. Install the automatic transaxle assembly (for automatic transaxle) (See **INSTALLATION**).
 3. Install the clutch disc assembly (for manual transaxle) (see **INSTALLATION**).
 4. Install the clutch cover assembly (for manual transaxle) (see **INSTALLATION**).
 5. Install the manual transaxle assembly (for manual transaxle) (See **INSTALLATION**).

REASSEMBLY

1. INSTALL TIGHT PLUG

- a. Apply adhesive around the new tight plugs.

Adhesive: Toyota Genuine Adhesive 1324, Three bond 1324 or equivalent

- b. Using SST, install the 2 tight plugs.

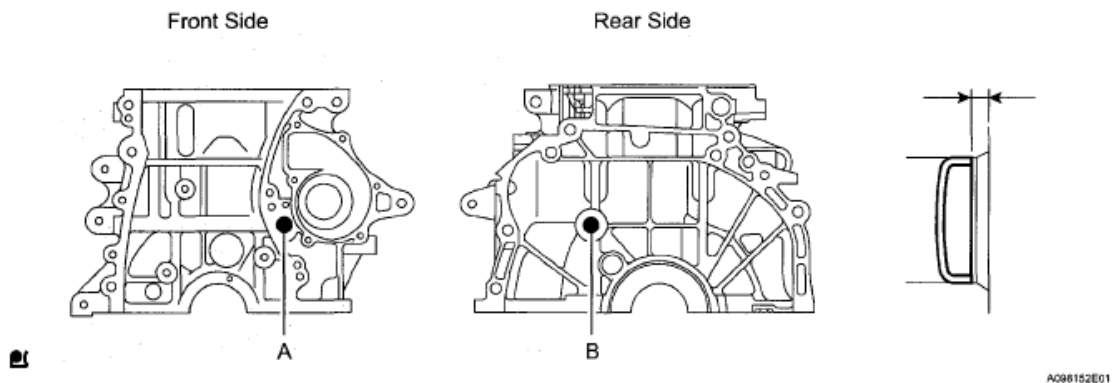


Fig. 322: Identifying Front And Rear Side
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09950-60010 (09951-00200), 09950-70010 (09951-07100)

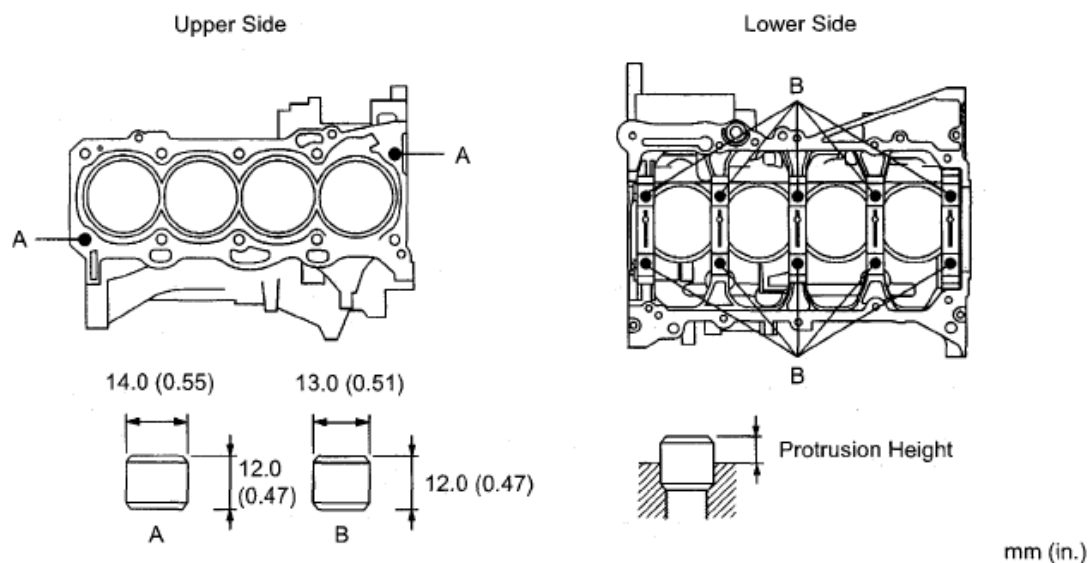
Standard depth

STANDARD DEPTH

Item	Specified Condition
A	1.7 to 2.7 mm (0.067 to 0.106 in.)
B	2.2 to 3.2 mm (0.087 to 0.126 in.)

2. INSTALL RING PIN

- a. Using a plastic hammer, install 12 new ring pins.



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Fig. 323: Identifying Ring Pins

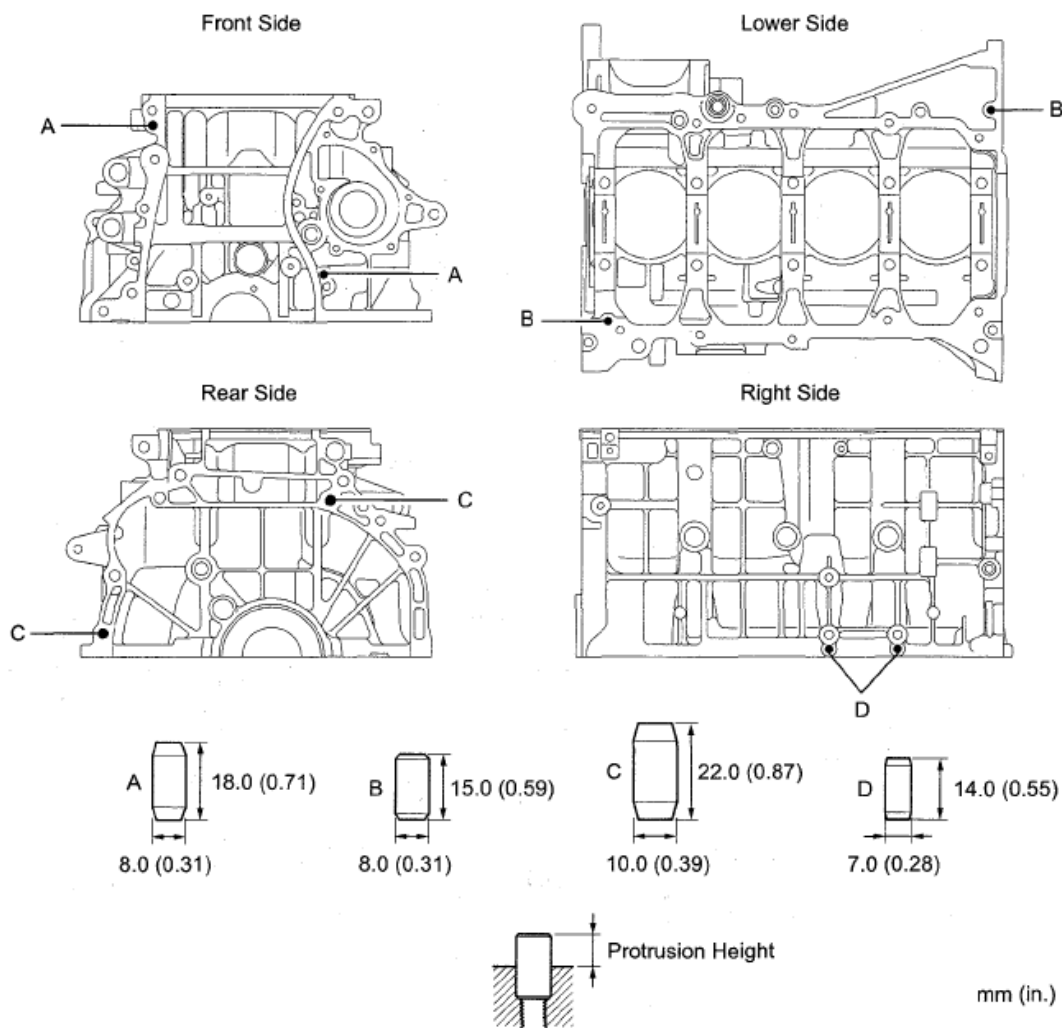
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion height**STANDARD PROTRUSION HEIGHT**

Item	Specified Condition
A	6.0 mm (0.236 in.)
B	5.0 mm (0.197 in.)

3. INSTALL STRAIGHT PIN

- a. Using a plastic hammer, install 8 new straight pins.



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Fig. 324: Identifying Straight Pins

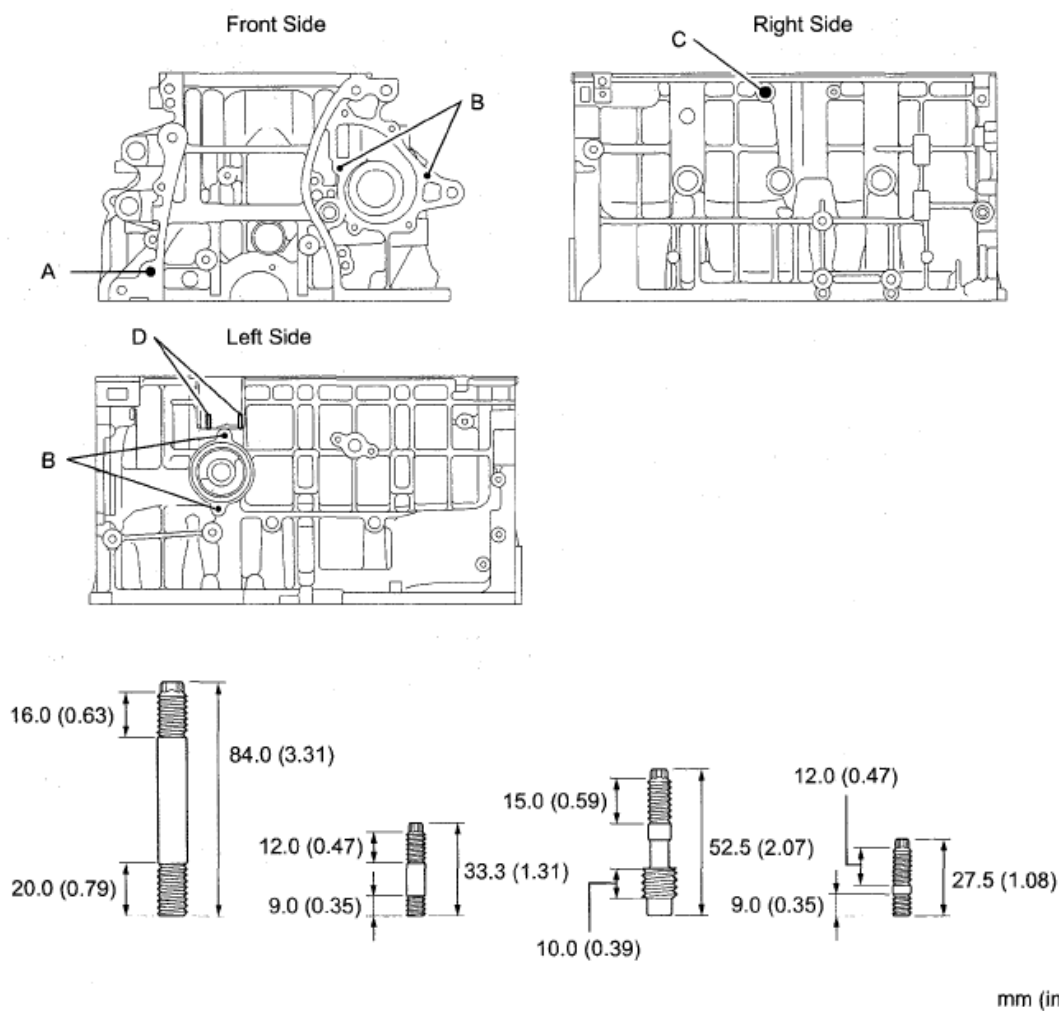
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion height**STANDARD PROTRUSION HEIGHT**

Item	Specified Condition
A	8.0 mm (0.315 in.)
B	7.5 mm (0.295 in.)
C	12.0 mm (0.472 in.)
D	5.0 mm (0.197 in.)

4. INSTALL STUD BOLT

- a. Install the 8 stud bolts into the cylinder block.



P

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Fig. 325: Identifying Stud Bolts

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

Torque**STUD BOLT TORQUE REFERENCE**

Item	Specified Condition
A	5.0 N*m (51 kgf*cm, 44 in.*lbf)
B	21.5 N*m (219 kgf*cm, 16 ft.*lbf)
C	5.0 N*m (51 kgf*cm, 44 in.*lbf)
D	9.5 N*m (97 kgf*cm, 84 in.*lbf)

5. INSTALL PISTON

- Using a small screwdriver, install a new snap ring onto one end of the piston pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

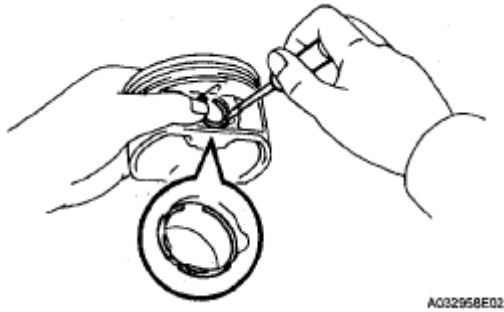


Fig. 326: Installing Snap Ring

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

- b. Gradually heat the piston up to 80 to 90°C (176 to 194°F).
- c. Align the front marks of the piston and connecting rod, then push in the piston pin with your thumb until the pin comes into contact with the snap pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

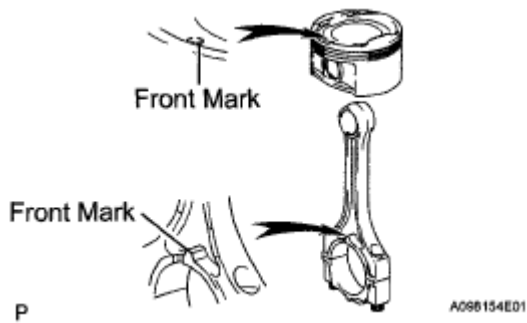


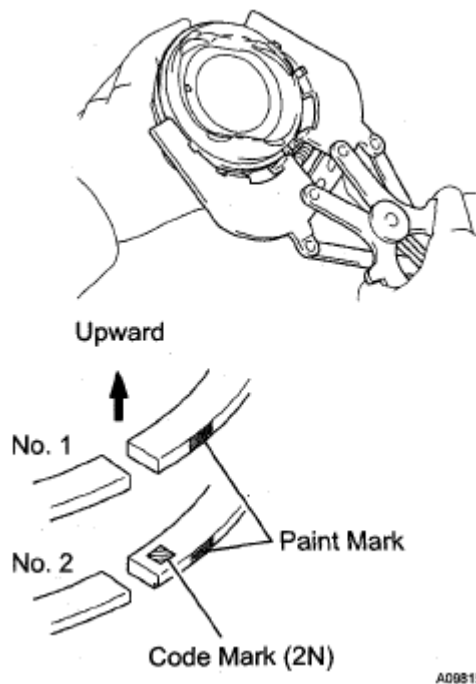
Fig. 327: Aligning Front Marks Of Piston And Connecting Rod

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

6. INSTALL PISTON RING SET

- a. Install the expander and 2 side rails by hand.
- b. Using a piston ring expander, install the 2 compression rings with the paint mark as shown in the illustration.

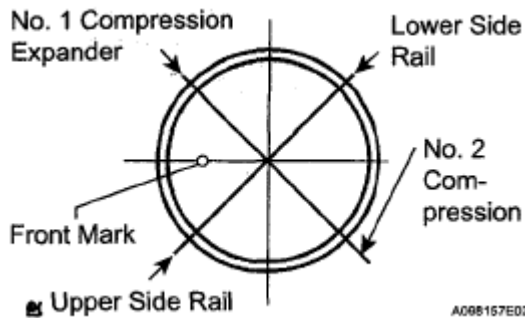
NOTE: Install No. 2 compression ring with the cord mark (2N) facing upward.



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Fig. 328: Identifying Compression Rings With Paint Mark
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Position the piston rings so that the ring ends are as shown in the illustration.



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Fig. 329: Identifying Piston Rings End Positions
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL CRANKSHAFT BEARING

- a. Install the upper bearing with an oil groove onto the cylinder block.

NOTE: Do not apply engine oil to the bearing or its contact surface.

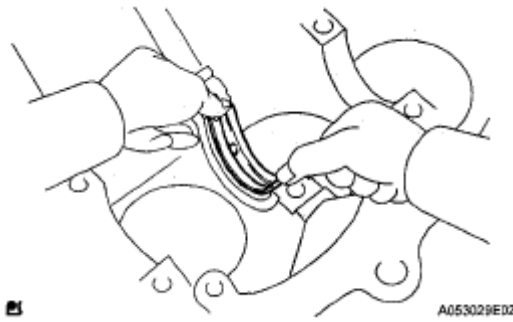


Fig. 330: Identifying Crankshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL NO. 2 CRANKSHAFT BEARING

- a. Install the lower bearing onto the bearing cap.

NOTE: Do not apply engine oil to the bearing or its contact surface.

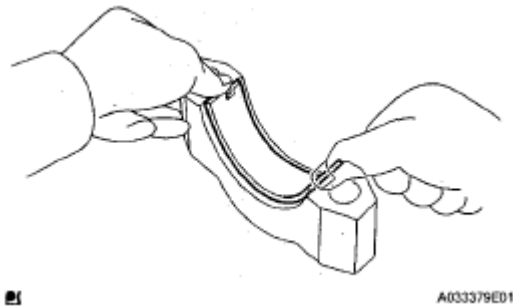


Fig. 331: Identifying Lower Bearing Onto Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL CRANKSHAFT THRUST WASHER UPPER

- a. Install the 2 thrust washers onto the No. 3 journal position of the cylinder block with the oil groove facing outward.

10. INSTALL CRANKSHAFT

- a. Apply engine oil to the upper bearing, and install the crankshaft onto the cylinder block.

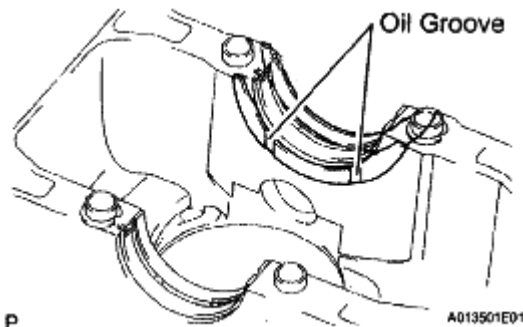


Fig. 332: Identifying Cylinder Block With Oil Grooves
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Examine the front marks and numbers and install the bearing caps onto the cylinder block in the order shown in the illustration.

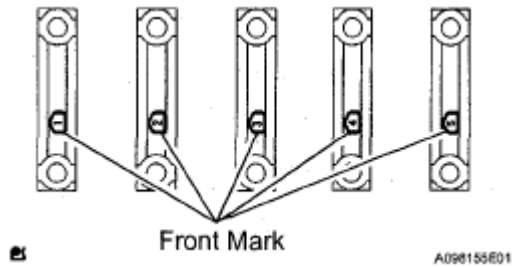


Fig. 333: Identifying Front Marks And Numbers
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.
- d. Using several steps, uniformly install and tighten the 10 bearing cap bolts in the sequence shown in the illustration.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

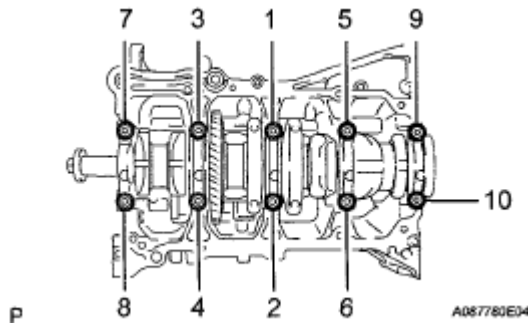


Fig. 334: Identifying Bearing Cap Bolts In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Mark the front of the bearing cap bolts with paint.
- f. Retighten the 8 bearing cap bolts by 90° in the same sequence.

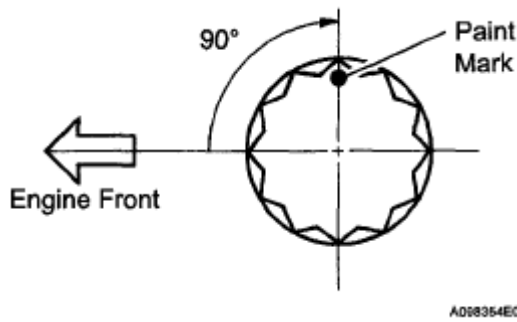


Fig. 335: Retightening Bearing Cap Bolts An Additional 90°
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Check that the paint marks are now at a 90° angle to the front.
- h. Check that the crankshaft turns smoothly.

11. INSTALL CONNECTING ROD BEARING

- a. Align the bearing claw with the oil groove of the connecting rod or connecting rod cap.

NOTE: Do not apply engine oil to the bearing or its contact surface.

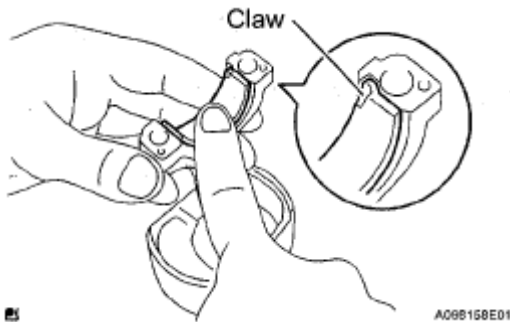


Fig. 336: Aligning Bearing Claw With Oil Groove Of Connecting Rod Cap And Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- a. Apply engine oil to the cylinder walls, pistons, and surfaces of connecting rod bearings.
- b. Check the position of the piston ring ends.
- c. Using a piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

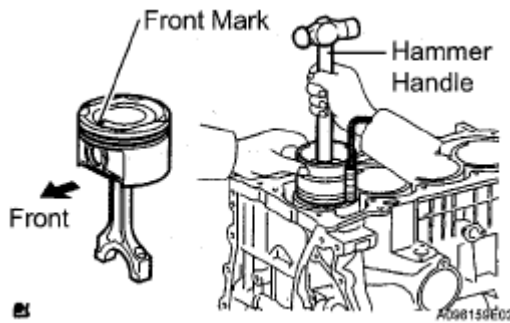


Fig. 337: Connecting Rod Assemblies Into Each Cylinder
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Check that the front mark of the connecting rod cap is facing in the correct direction.

NOTE: Match the numbered connecting rod cap with the connecting rod.

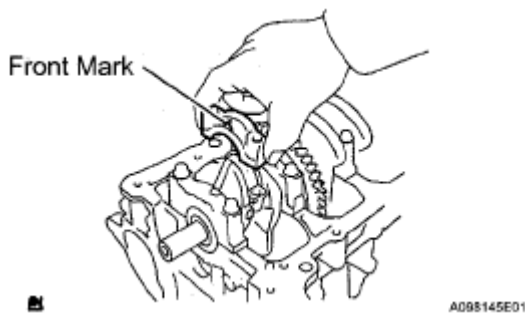


Fig. 338: Identifying Front Mark Of Connecting Rod Cap
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.
 f. Using a 12 mm socket wrench, tighten the bolts in several passes to the specified torque.

Torque: 24.5 N*m (250 kgf*cm, 18 ft.*lbf)

- g. Mark the front of the connecting rod bolts with paint.
 h. Retighten the cap bolts 90° as shown in the illustration.

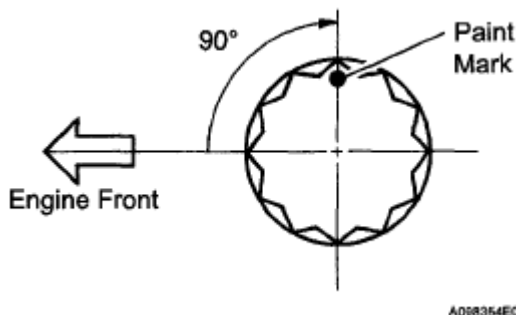


Fig. 339: Retightening Cap Bolts An Additional 90°
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Check that the crankshaft turns smoothly.

13. INSTALL BALANCE SHAFT

- a. Rotate the No. 1 driven gear of the No. 1 balance shaft in the rotating direction until it hits the stopper.

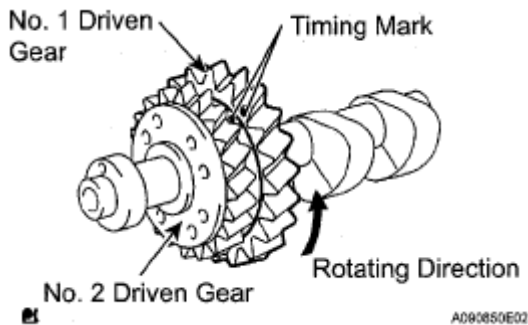


Fig. 340: Identifying No. 1 Driven Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Confirm that the matchmarks on the No. 1 and No. 2 driven gears are aligned.
- c. Align the matchmarks of the No. 1 and No. 2 balance shafts as shown in the illustration.

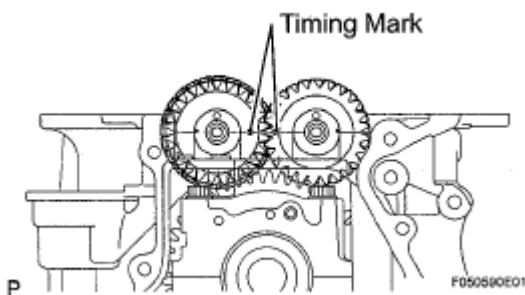


Fig. 341: Identifying Matchmarks Of No. 1 And No. 2 Balance Shafts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Place the No. 1 and No. 2 balance shafts onto the crankcase.
- e. Apply a light coat of engine oil to the threads and under the heads of the bolts.
- f. Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: 21.6 N*m (224 kgf*cm, 16 ft.*lbf)

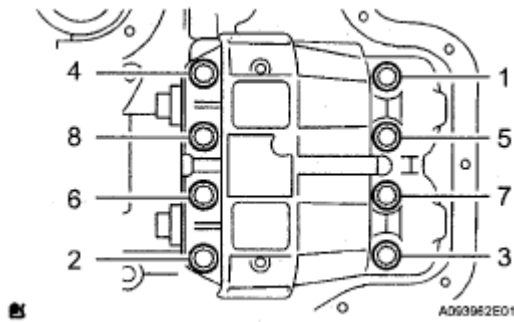


Fig. 342: Identifying Bolts In Sequence

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

- g. Mark the front of the bolts with paint.
- h. Retighten the bolts 90° as shown in the illustration.

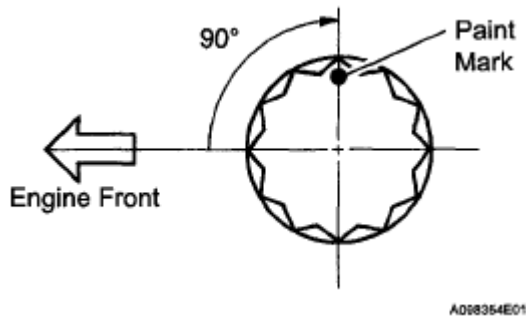


Fig. 343: Retightening Bolts An Additional 90°

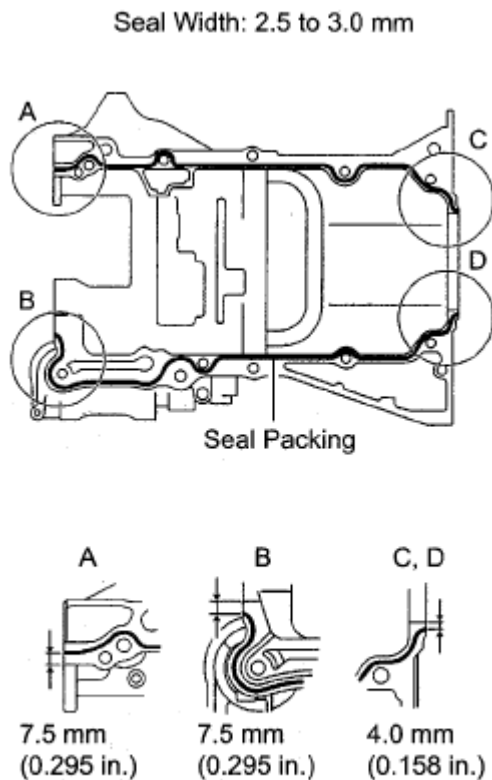
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Check that the paint mark is now at a 90° angle to the front.

14. INSTALL STIFFENING CRANKCASE ASSEMBLY

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and crankcase.
- b. Apply a continuous bead of seal packing (Diameter 2.5 to 3.0 mm (0.098 to 0.118 in.)) as shown in the illustration.

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



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Fig. 344: Applying Continuous Bead Of Seal Packing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Remove any oil from the contact surface,
- Install the crankcase within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the crankcase.

c. Place a new O-ring on the cylinder block as shown in the illustration.

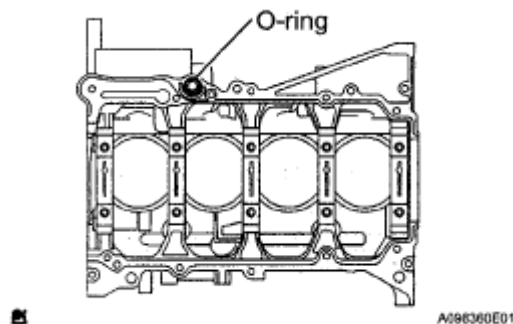


Fig. 345: Identifying New O-Ring On Cylinder Block

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

- d. With the No. 1 crank pin of the crankshaft placed at the 6 o'clock position, install the No. 1 and No. 2 balance shafts and align the adjusting holes as shown in the illustration.

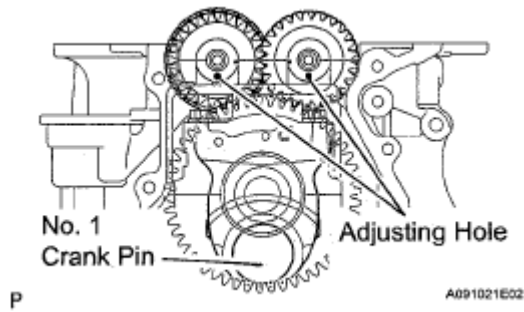


Fig. 346: Identifying Balance Shafts And Align Adjusting Holes
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Temporarily install the crankcase with the 11 bolts.

HINT:

- Bolt length: 112 mm (4.41 in.) for A of 12 mm head
- 35 mm (1.38 in.) for B of 12 mm head

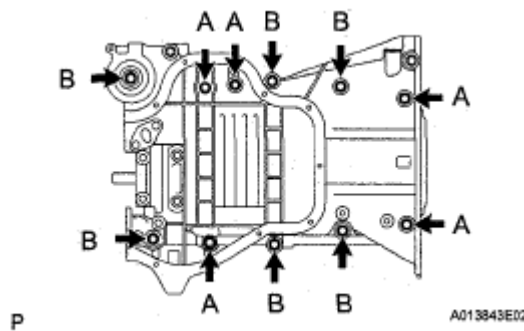


Fig. 347: Identifying Crankcase Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Uniformly tighten the bolts.

Torque: 32.5 N*m (331 kgf*cm, 24 ft.*lbf)

- g. Confirm that the timing marks of the balance shafts are aligned when the key groove is placed at the 6 o'clock position, as shown in the illustration.

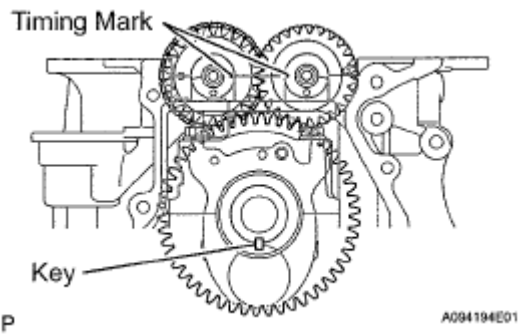


Fig. 348: Identifying Timing Marks Of Balance Shafts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL ENGINE REAR OIL SEAL** (See **REPLACEMENT**)

16. **INSTALL NO. 1 TAPER SCREW PLUG**

- a. Apply adhesive to 2 or 3 threads of the plug, and install it.

Torque: 26 N*m (265 kgf*cm, 19 ft.*lbf)

Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

HINT:

- Install the plug within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the plug.

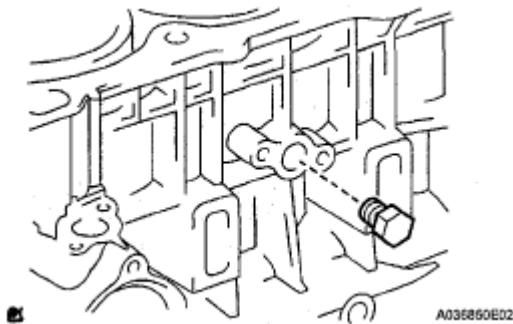


Fig. 349: Identifying No. 1 Taper Screw Plug
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **INSTALL OIL CONTROL VALVE FILTER**

- a. Check that there is no foreign objects on the mesh part of the oil control valve filter.
- b. Using a 6 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the plug.

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

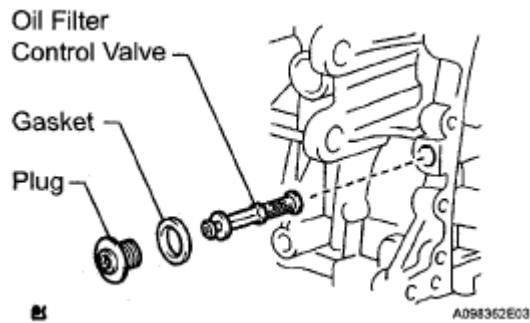


Fig. 350: Identifying New Gasket And Oil Control Valve Filter With Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

- a. Apply adhesive to 2 or 3 threads of the drain cock.

Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- b. After tightening the drain cock to the specified torque, turn the drain cock clockwise as shown in the illustration.

Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)

NOTE:

- Install the drain cock within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the drain cock.
- Do not turn the drain cock by more than 1 revolution (360°) after tightening the drain cock to the specified torque.
- Do not loosen the drain cock after setting it correctly.

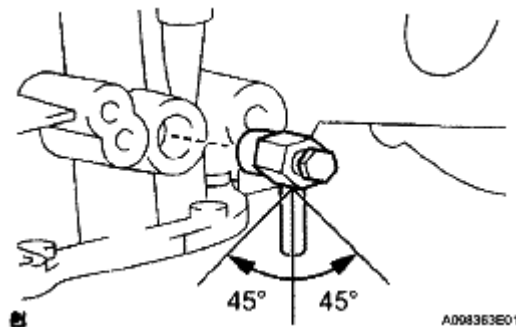


Fig. 351: Identifying Drain Cock
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. INSTALL CYLINDER HEAD GASKET

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

NOTE:

- Remove any oil from the contact surface.
- Be careful of the installation direction.
- Place the cylinder head gently in order to avoid damaging the gasket with the bottom part of the head.

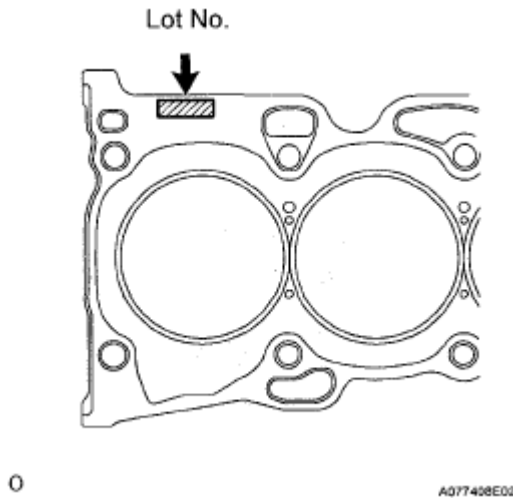


Fig. 352: Identifying New Gasket On Cylinder Block Surface With Lot No. Stamp Upward
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. INSTALL CYLINDER HEAD SUB-ASSEMBLY

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

- Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.
- Using several steps, uniformly install and tighten the 10 cylinder head bolts and plate washers with a 10 mm bi-hexagon wrench in the sequence shown in the illustration.

Torque: 78.5 N*m (800 kgf*cm, 58 ft.*lbf)

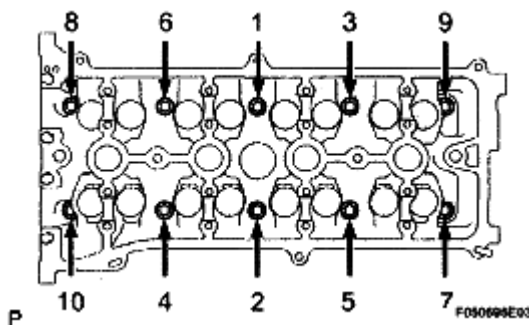


Fig. 353: Tightening Cylinder Head Bolts And Plate Washer In Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Mark the front of the cylinder head bolts with paint.

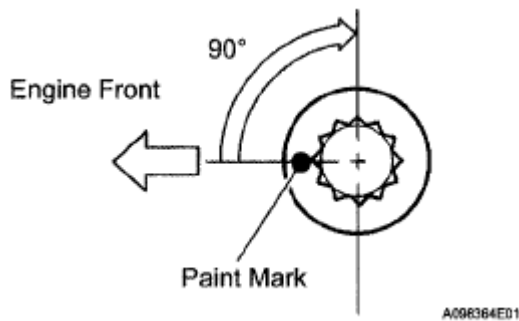


Fig. 354: Identifying Paint Mark On Cylinder Head Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Retighten the cylinder head bolts so that the paint marks are at a 90° angle to the front.

21. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- Apply a light coat of engine oil to a new O-ring, then install it onto the camshaft timing oil control valve.
- Install the camshaft timing oil control valve with the bolt.

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

22. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY (See INSTALLATION)

23. INSTALL NO. 2 CAMSHAFT TIMING SPROCKET (See INSTALLATION)

24. INSTALL NO. 2 CAMSHAFT BEARING (See INSTALLATION)

25. INSTALL NO. 1 CAMSHAFT BEARING

- Clean the contact surfaces of the bearing and the No. 1 bearing cap.
- Align the bearing claw with the claw groove of the No. 1 bearing cap and push in the bearing.

NOTE: Do not apply engine oil to the bearing and its contact surface.

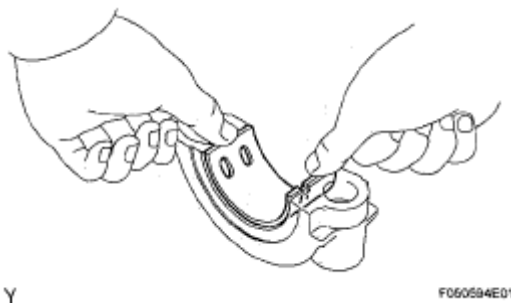


Fig. 355: Identifying No. 1 Camshaft Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **INSTALL CAMSHAFT** (See INSTALLATION)
27. **INSTALL OIL PUMP ASSEMBLY** (See INSTALLATION)
28. **INSTALL CHAIN SUB-ASSEMBLY** (See INSTALLATION)
29. **INSTALL CRANKSHAFT TIMING SPROCKET**
30. **INSTALL NO. 1 CHAIN VIBRATION DAMPER** (See INSTALLATION)
31. **INSTALL CHAIN SUB-ASSEMBLY** (See INSTALLATION)
32. **INSTALL CHAIN TENSIONER SLIPPER** (See INSTALLATION)
33. **INSTALL TIMING CHAIN GUIDE** (See INSTALLATION)
34. **INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1** (See INSTALLATION)
35. **INSTALL TIMING CHAIN COVER OIL SEAL** (See REPLACEMENT)
36. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY** (See INSTALLATION)
37. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See INSTALLATION)
38. **INSTALL CRANKSHAFT PULLEY** (See INSTALLATION)
39. **INSTALL OIL PAN SUB-ASSEMBLY** (See INSTALLATION)
40. **INSTALL OIL PAN DRAIN PLUG**

- a. Place a new gasket on the oil pan drain plug, then install it onto the oil pan.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

41. **INSTALL WATER PUMP ASSEMBLY** (See INSTALLATION)
42. **INSTALL WATER PUMP PULLEY** (See INSTALLATION)
43. **INSTALL CRANKSHAFT POSITION SENSOR** (See INSTALLATION)
44. **INSTALL CAMSHAFT POSITION SENSOR** (See INSTALLATION)
45. **INSTALL OIL FILTER UNION**

- a. Using a 12 mm socket hexagon wrench, install the oil filter union.

Torque: 29.5 N*m (301 kgf*cm, 22 ft.*lbf)

46. **INSTALL OIL FILTER SUB-ASSEMBLY** (See REPLACEMENT)
47. **SET NO. 1 CYLINDER TO TDC/COMPRESSION** (See REMOVAL)
48. **CHECK VALVE CLEARANCE** (See VALVE CLEARANCE)
49. **ADJUST VALVE CLEARANCE** (See ADJUSTMENT)
50. **INSTALL CAMSHAFT** (See ADJUSTMENT)
51. **INSTALL NO. 2 CAMSHAFT** (See ADJUSTMENT)
52. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY** (See ADJUSTMENT)
53. **INSTALL CYLINDER HEAD GASKET**
 - a. Install the gasket onto the cylinder head cover.
54. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See INSTALLATION)
55. **INSTALL VENTILATION VALVE SUB-ASSEMBLY**

- a. Apply adhesive to the threads of the ventilation valve.

Adhesive: Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

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

56. INSTALL OIL FILLER CAP SUB-ASSEMBLY

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