

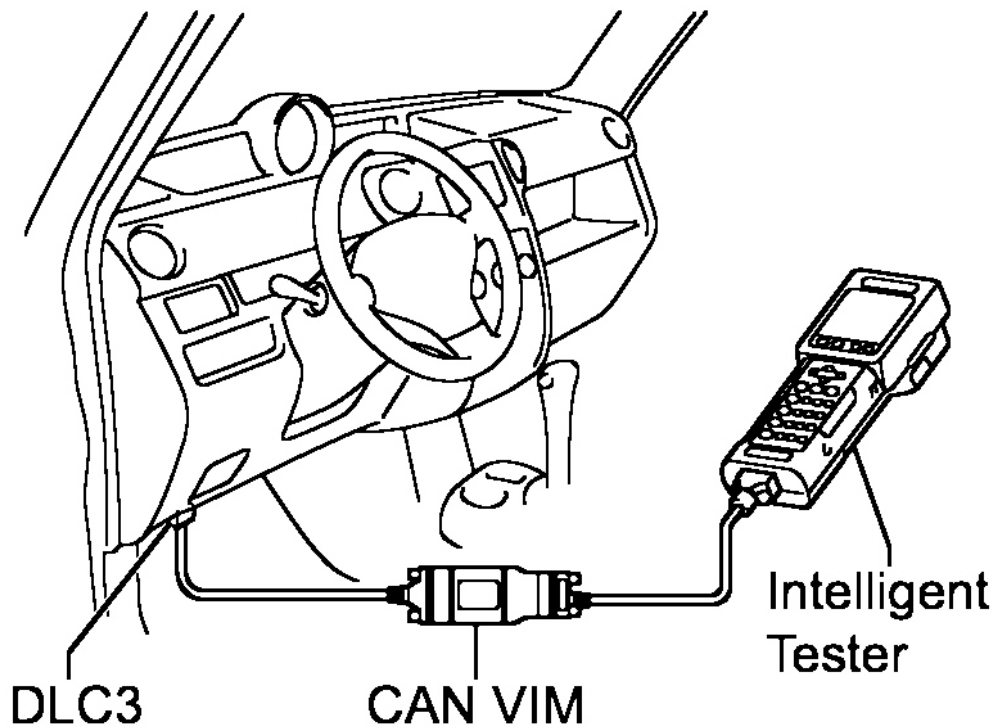
2006 ENGINE**Engine Mechanical (1NZ-FE) - xB****ENGINE****ON-VEHICLE INSPECTION****1. INSPECT AIR CLEANER FILTER ELEMENT**

- a. Remove the air filter.
- b. Visually check that the air filter is not excessively damaged or oily.

If necessary, replace the air filter.

2. INSPECT IGNITION TIMING

- a. Warm up the engine.
- b. When using the intelligent tester or OBD II scan tool:
 1. Connect the intelligent tester or OBD II scan tool to the DLC3.



Y

H101086E01

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

2. Enter DATA LIST MODE on the intelligent tester or OBD II scan tool.

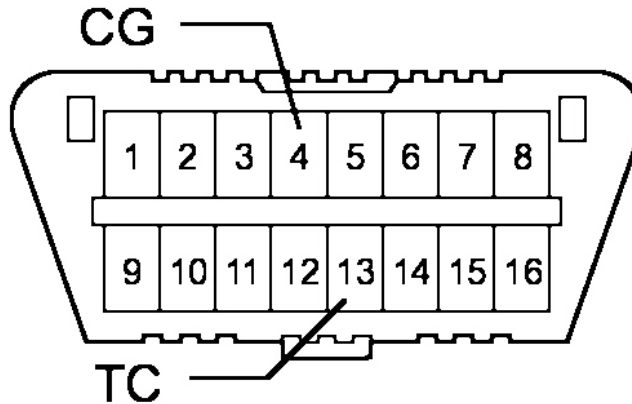
Standard ignition timing: 8 to 12° BTDC @ idle

HINT:

Refer to the intelligent tester or OBD II scan tool operator's manual if you need help to select the DATA LIST.

- c. When not using the intelligent tester or OBD II scan tool:
 1. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

DLC3



Y

B105749E08

Fig. 2: Identifying DLC3 Terminals

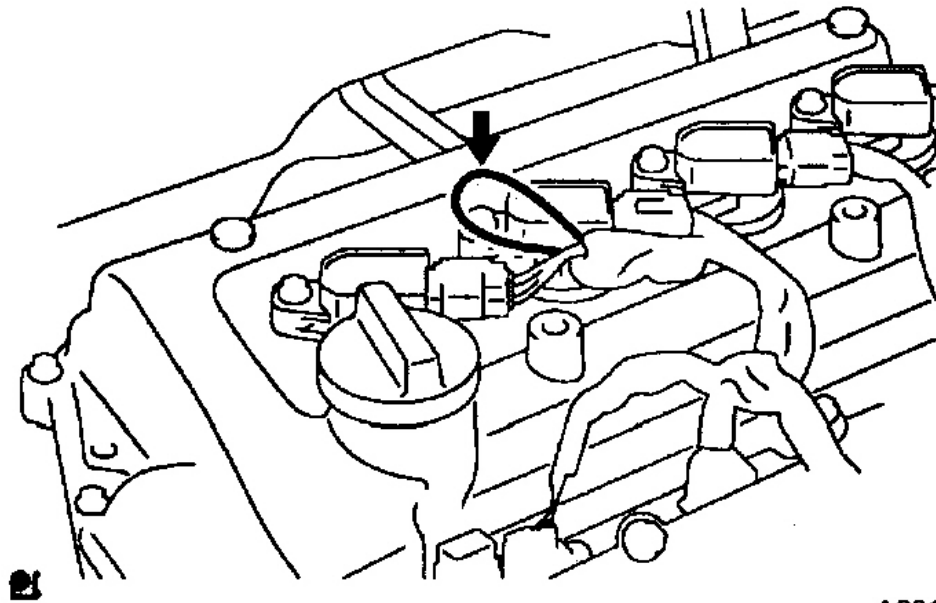
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09843-18040

NOTE:

- Confirm the terminal numbers before connecting them. Connection with a wrong terminal could damage the engine.
- Turn OFF all electrical systems before connecting the terminals.
- Perform this inspection after the cooling fan motor is turned OFF.

2. Remove the No. 2 cylinder head cover.
3. Pull out the wire harness as shown in the illustration.



A081883E01

Fig. 3: Pulling Out Wire Harness

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

4. Connect the clip of the timing light to the engine.

NOTE:

- Use a timing light which can detect the first signal.
- After checking, be sure to tape the wire harness.

5. Check the ignition timing.

Standard ignition timing: 8 to 12° BTDC @ idle**NOTE:****When checking the ignition timing, shift the transmission to the park or neutral position.****HINT:**

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

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

Standard ignition timing: 0 to 14° BTDC @ idle

8. Confirm that ignition timing advances when the engine RPM is increased.
9. Remove the timing light.

3. INSPECT ENGINE IDLE SPEED

- a. Warm up the engine.
- b. When using the intelligent tester or OBD II scan tool:
 1. Connect the intelligent tester or OBD II scan tool to the DLC3.
 2. Enter DATA LIST MODE on the intelligent tester or OBD II scan tool.

Standard idle speed**IDLE SPEED SPECIFICATION**

Transmission	Specified Condition
M/T	600 to 700 RPM
A/T	650 to 750 RPM

NOTE:

- When checking the idle speed, the transmission is in the park or neutral position.
- Check the idle speed with the cooling fan OFF.
- Switch off all accessories and air conditioning before connecting the intelligent tester or OBD II scan tool.

HINT:

Refer to the intelligent tester or OBD II scan tool operator's manual if you need help to select the DATA LIST.

- c. When not using the intelligent tester or OBD II scan tool:
 1. Using SST, connect the tachometer test lead to terminal 9 (TAC) of the DLC3.

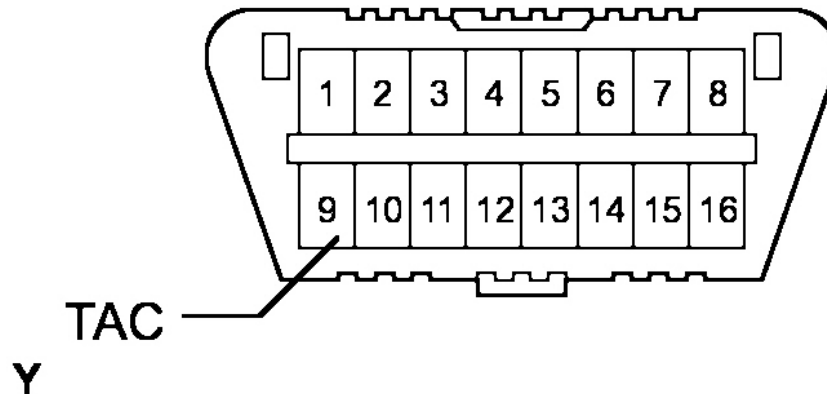
SST 09843-18040

2. Check the idle speed.

Standard idle speed**IDLE SPEED SPECIFICATION**

Transmission	Specified Condition
M/T	600 to 700 RPM
A/T	650 to 750 RPM

DLC3



B105749E09

Fig. 4: Identifying DLC3 Terminals

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

NOTE:

- When checking the idle speed, the transmission is in the park or neutral position.
- Check the idle speed with cooling fan OFF.
- Switch off all accessories and air conditioning before connecting the test lead to the terminal.

4. INSPECT COMPRESSION

- a. Warm up and stop the engine.
- b. Disconnect the injector connectors.
- c. Remove the ignition coils.
- d. Remove the spark plugs.
- e. Inspect cylinder compression pressure.
 1. Connect SST (attachment) to a compression gauge.

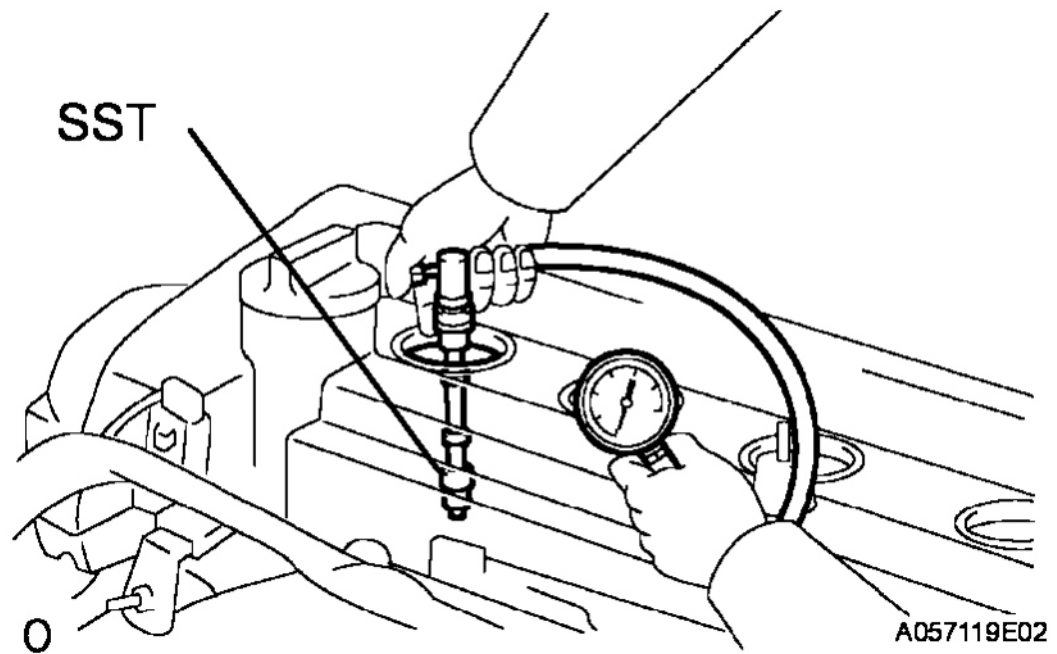


Fig. 5: Checking Cylinder Compression Pressure
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09992-00500

2. Install the compression gauge with SST into the spark plug hole.
3. Fully open the throttle.
4. While cranking the engine, measure the compression pressure.

Standard compression pressure: 1,471 kPa (15.0 kgf/cm² , 213 psi)

Minimum pressure: 1,079 kPa (11.0 kgf/cm² , 156 psi)

Difference between each cylinder: 98 kPa (1.0 kgf/cm² , 14 psi)

NOTE:

- Always use a fully charged battery to obtain an engine speed of 250 RPM or more.
- Check other cylinder's compression pressure in the same way.
- This measurement must be done in as short a time as possible.

5. If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the spark plug hole and check 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 sticking or seated improperly, or there may be leakage past the cylinder head gasket.

5. INSPECT CO/HC

- a. Start the engine.
- b. Run the engine at 2,500 RPM for approximately 180 seconds.
- c. Insert CO/HC meter testing probe at least 40 cm (1.3 ft.) into tailpipe during idling.
- d. Immediately check CO/HC concentration at idle and 2,500 RPM.

HINT:

When performing the 2 mode (2,500 RPM and idle) test, check that the CO/HC concentration complies with local regulations.

- e. If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
 1. Check the heated oxygen sensor operation (see **DTC P0130 OXYGEN SENSOR CIRCUIT MALFUNCTION (BANK 1 SENSOR 1); DTC P2195 OXYGEN SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1); DTC P2196 OXYGEN SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)**).
 2. See the table below for possible causes, and then inspect the applicable causes and repair it if necessary.

CO AND HC PROBLEM CAUSES CHART

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignition: ○ Incorrect timing ○ Plugs are contaminated, plugs are shorted or plug gaps are incorrect 2. Incorrect valve clearance 3. Leaks in intake and exhaust valves 4. Leaks in cylinders
Low	High	Rough idle (Fluctuating HC)	1. Vacuum leaks: ○ Ventilation hoses ○ Intake manifold ○ Throttle body

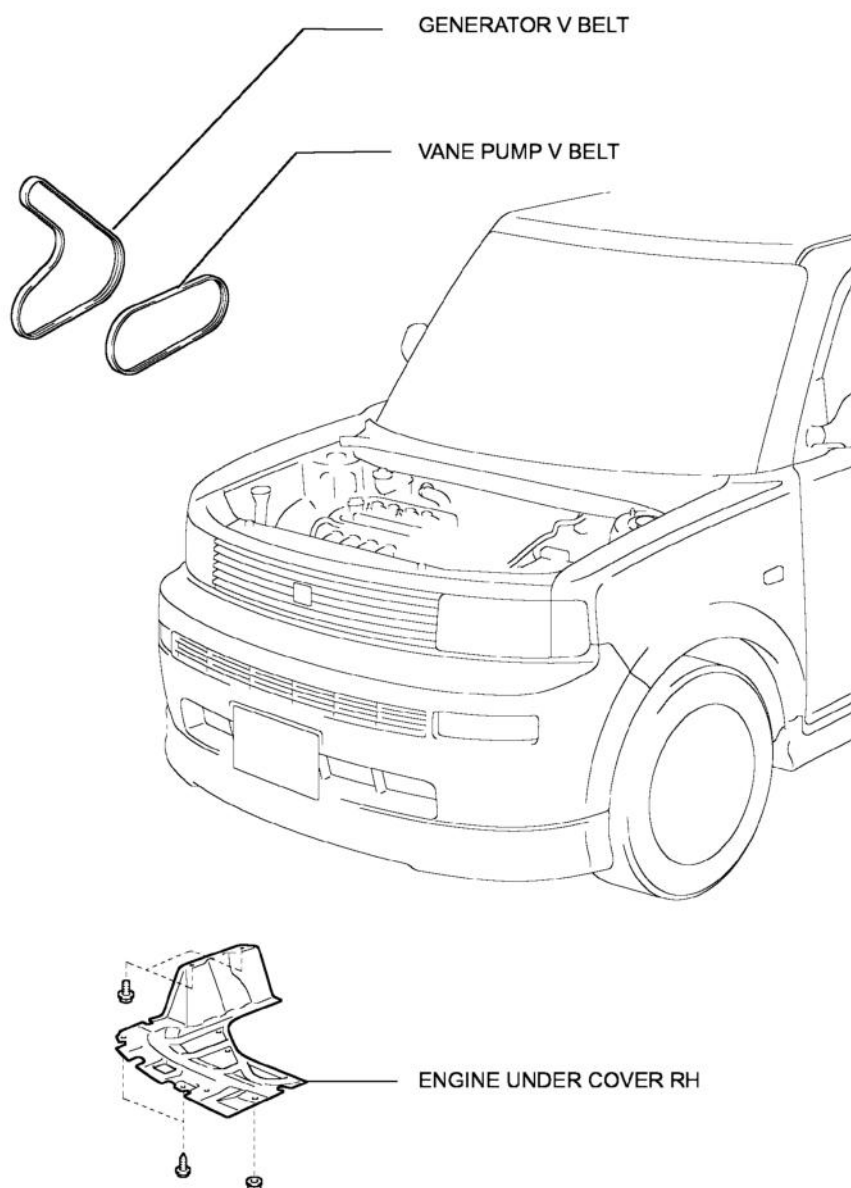
2006 Scion xB

2006 ENGINE Engine Mechanical (1NZ-FE) - xB

		reading)	○ IAC valve ○ Brake booster line
			2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged ventilation valve 3. Faulty SFI system: ○ Faulty pressure regulator ○ Defective ETC sensor ○ Defective mass air flow meter ○ Faulty ECM ○ Faulty injectors ○ Faulty throttle position sensor

DRIVE BELT

COMPONENTS



P

A117419ED1

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

ON-VEHICLE INSPECTION

1. CHECK DRIVE BELT TENSION

- Using a belt tension gauge, measure the belt tension.

Belt tension gauge:

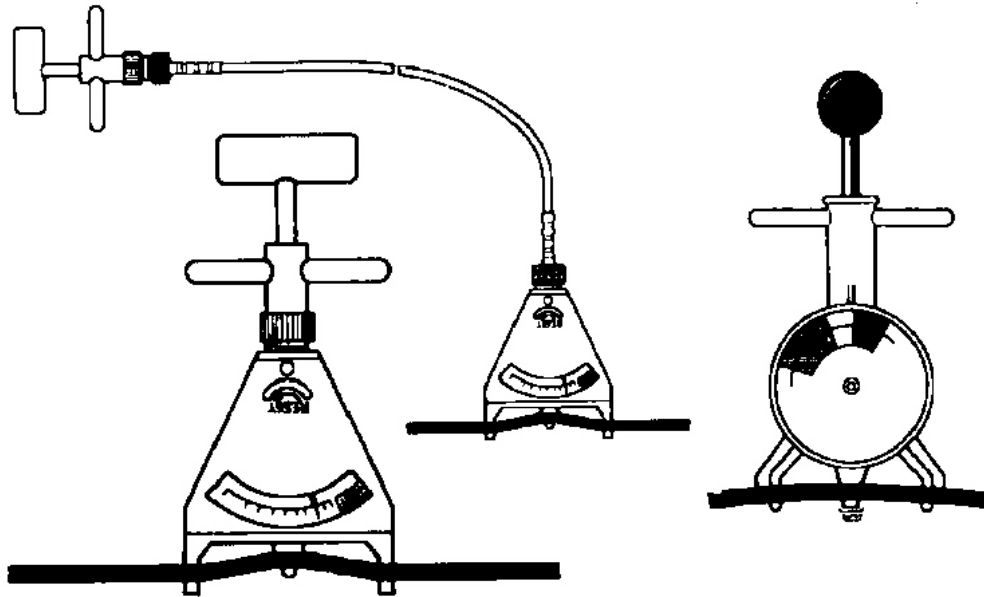
DENSO BTG-20 (95506-00020)

Boroughs No. BT-33-73F

Standard drive belt tension

DRIVE BELT TENSION SPECIFICATION

Item	Specified Condition
Crankshaft pulley to cooler compressor or generator	New belt: 121 to 143 lbf
	Used belt: 55 to 88 lbf
Vane pump	New belt: 99 to 121 lbf
	Used belt: 55 to 77 lbf



A087786E01

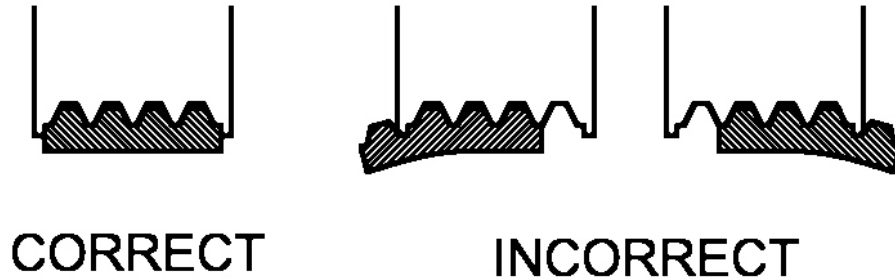
Fig. 7: Checking Drive Belt Tension

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

HINT:

- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hands to confirm that the belt has not slipped out of the groove on the bottom of the crankshaft pulley.
- A "new belt" is a belt which has been used less than 5 minutes on a running engine.

- A "used belt" is a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for approximately 5 minutes and then recheck the tension.



P

A122295E01

Fig. 8: Identifying Drive Belt Grooves
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Reference:

Check drive belt deflection.

1. When not using a belt tension gauge, measure the belt deflection.

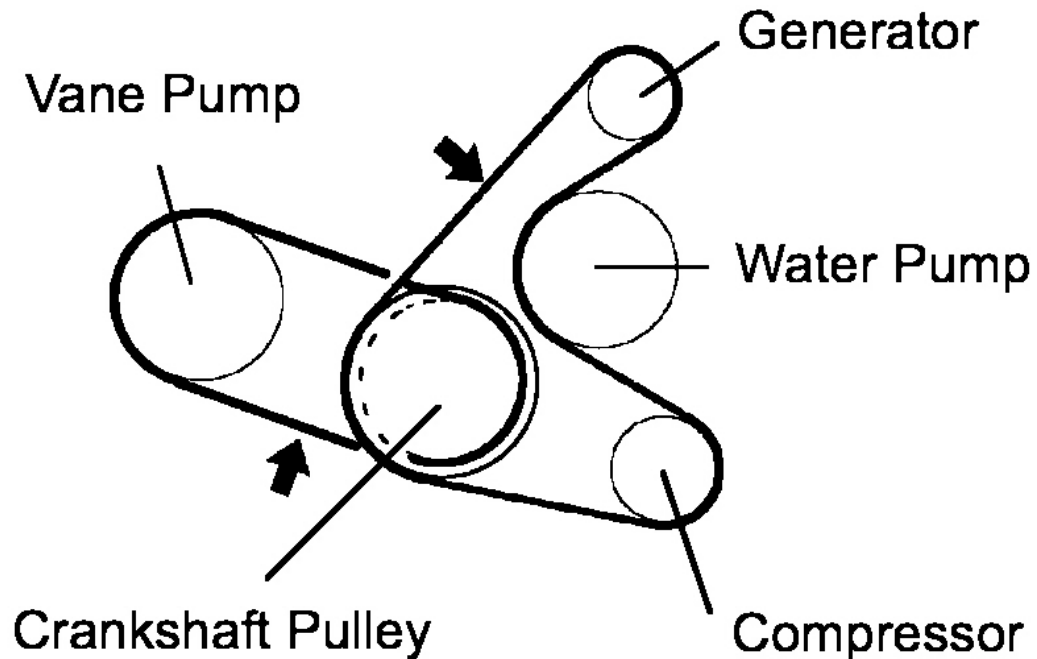
Pressing force: 98 N (10 kgf, 22 lbf)

Standard belt deflection

DRIVE BELT DEFLECTION SPECIFICATION

Item	Specified Condition
Belt (for water pump and generator)	New belt: 7.0 to 8.5 mm (0.28 to 0.33 in.)
	Used belt: 11.0 to 13.0 mm (0.43 to 0.51 in.)
Belt (for vane pump)	New belt: 8.0 to 10.0 mm (0.31 to 0.39 in.)
	Used belt: 11.0 to 13.0 mm (0.43 to 0.51 in.)

← Measure Point for Belt Deflection



A117292E01

Fig. 9: Identifying Drive Belt Deflection Measuring Points
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Check the drive belt deflection at the specified point.
- When installing a new belt, set its tension value as specified.
- When inspecting a belt which has been used over 5 minutes, apply the specification of "Used Belt".
- When reinstalling a belt which has been used over 5 minutes, adjust its deflection and tension to the intermediate value of each specification of "Used Belt".
- Belt tension and deflection should be checked after 2 revolutions of engine cranking.

- When using a belt tension gauge, confirm the accuracy by using a master gauge first.

REMOVAL

1. REMOVE GENERATOR V BELT

- Loosen bolts A and B.
- Release the belt tension and remove the belt.

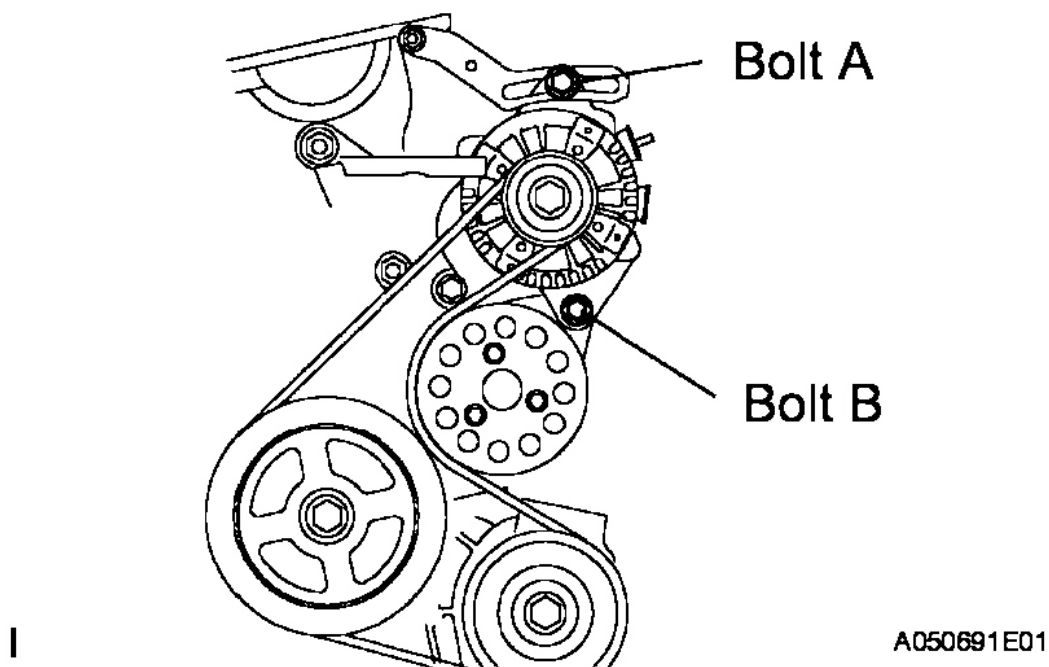


Fig. 10: Removing Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE ENGINE UNDER COVER RH

3. REMOVE VANE PUMP V BELT

- Loosen bolts A and B.
- Release the belt tension, and remove the belt.

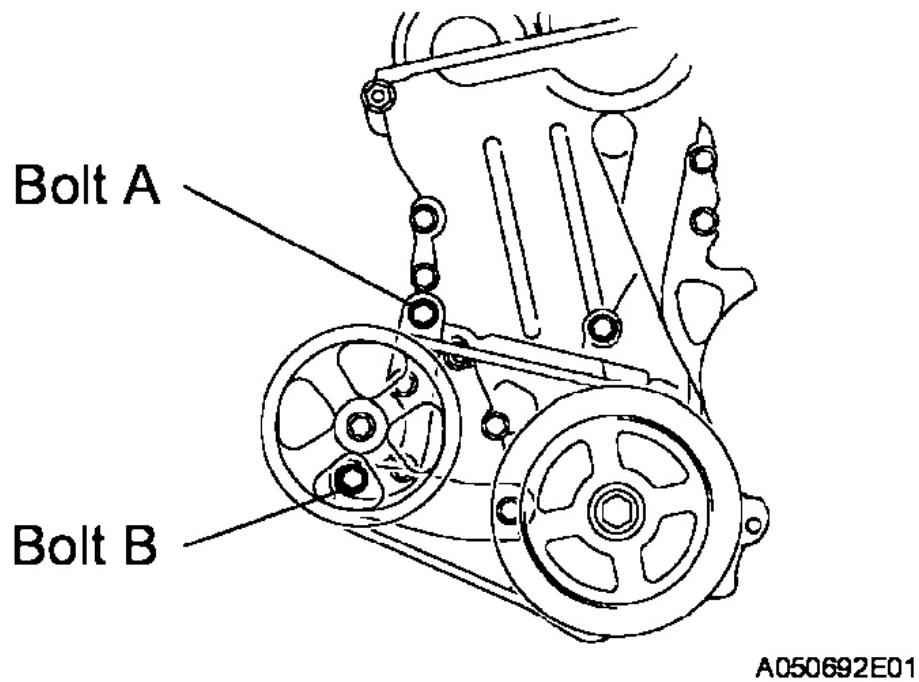


Fig. 11: Removing Vane Pump V Belt

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

INSTALLATION

1. INSTALL VANE PUMP V BELT

- Temporarily install the belt on each pulley.

2. INSTALL GENERATOR V BELT

- Temporarily install the belt on each pulley.

3. ADJUST GENERATOR V BELT

- Insert the adjusting bar between the engine RH mount bracket and generator. Push the bar towards the vehicle front to adjust the belt tension.

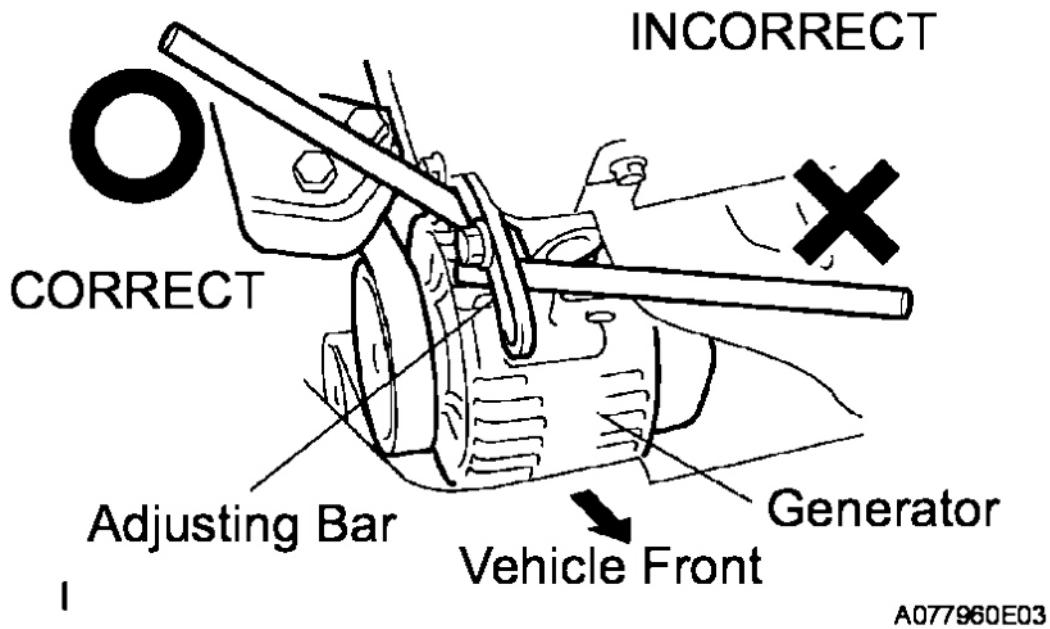


Fig. 12: Adjusting Generator V Belt

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

NOTE: Do not insert the bar between the oil control valve and generator. It could damage the oil control valve.

- b. First tighten bolt A, and then tighten bolt B.

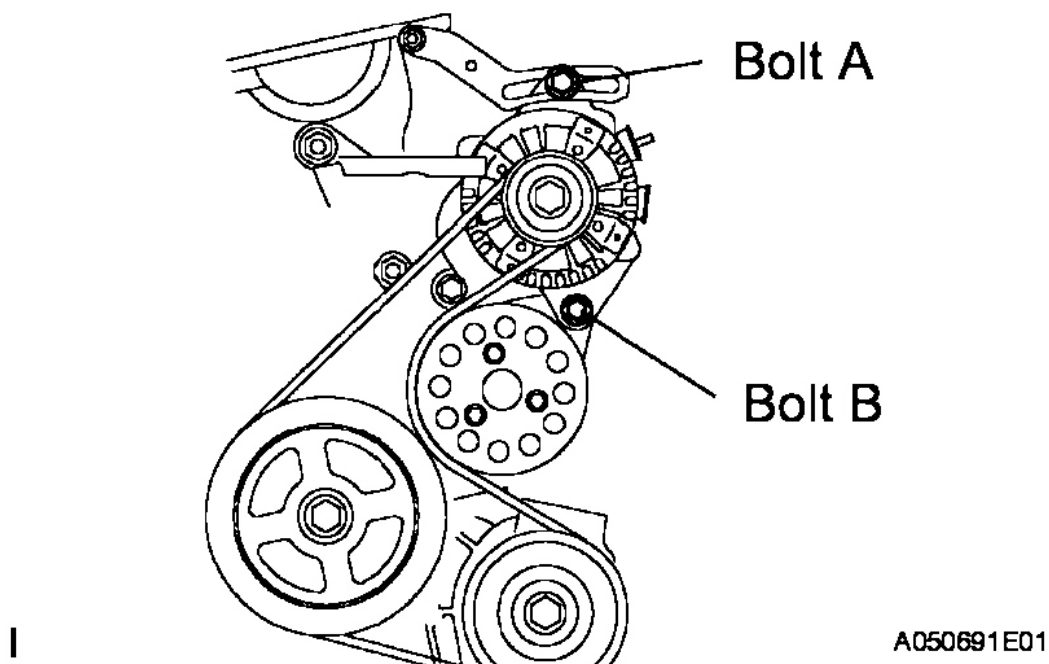


Fig. 13: Tightening Bolts

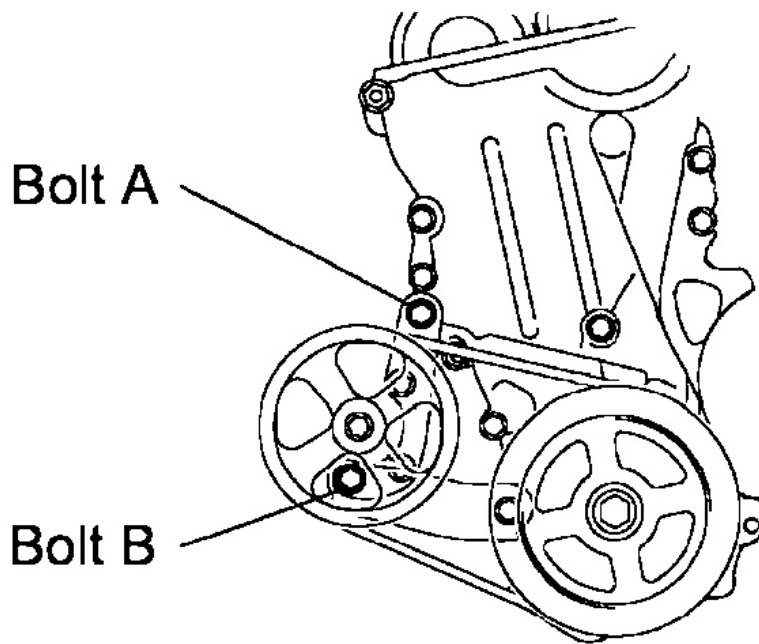
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 18.5 N*m (189 kgf*cm, 14 ft.*lbf) for bolt A

54 N*m (550 kgf*cm, 40 ft.*lbf) for bolt B

4. ADJUST VANE PUMP V BELT

- a. Using the bar, adjust the belt tension.
- b. First tighten bolt B, and then tighten bolt A.



A050692E01

Fig. 14: Tightening Bolts

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

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

5. CHECK DRIVE BELT TENSION (See ON-VEHICLE INSPECTION)
6. INSTALL ENGINE UNDER COVER RH

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 NO. 2 CYLINDER HEAD COVER
 - a. Remove the 4 nuts and cylinder head cover.

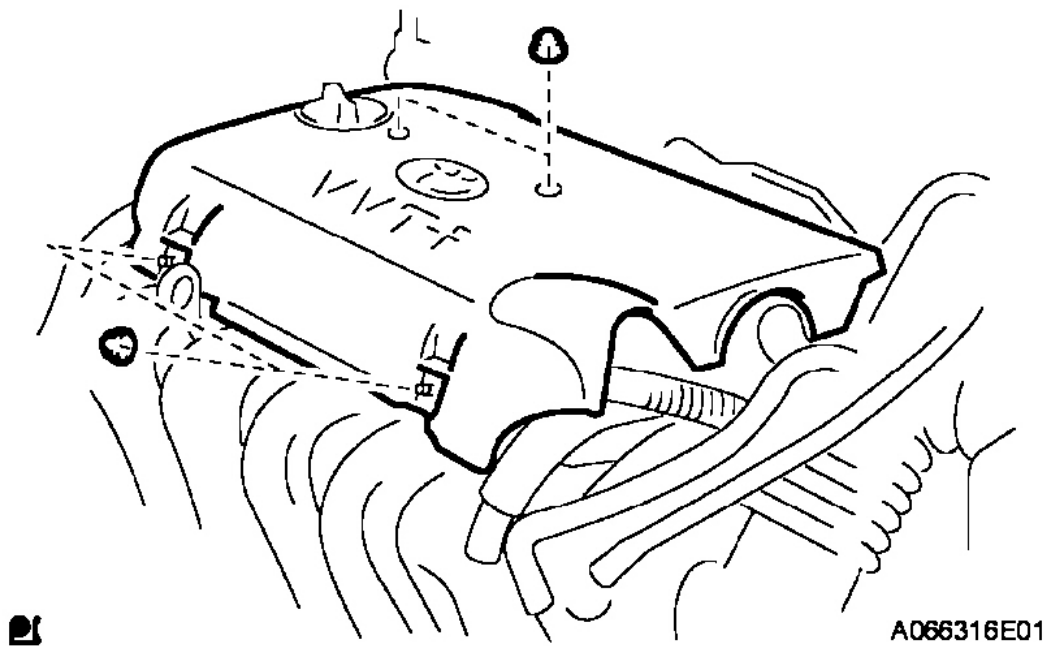


Fig. 15: Removing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE IGNITION COIL

- a. Remove the 4 bolts and pull out the 4 ignition coils.

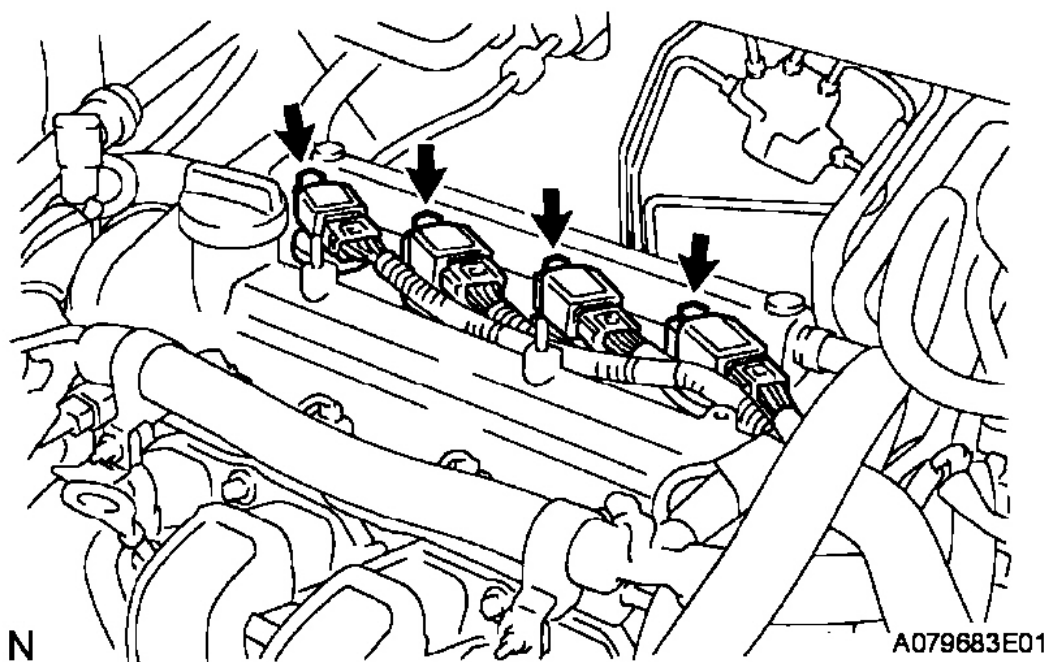


Fig. 16: Removing Ignition Coil

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

4. DISCONNECT VENTILATION HOSE

- a. Disconnect the ventilation hose from the cylinder head cover.

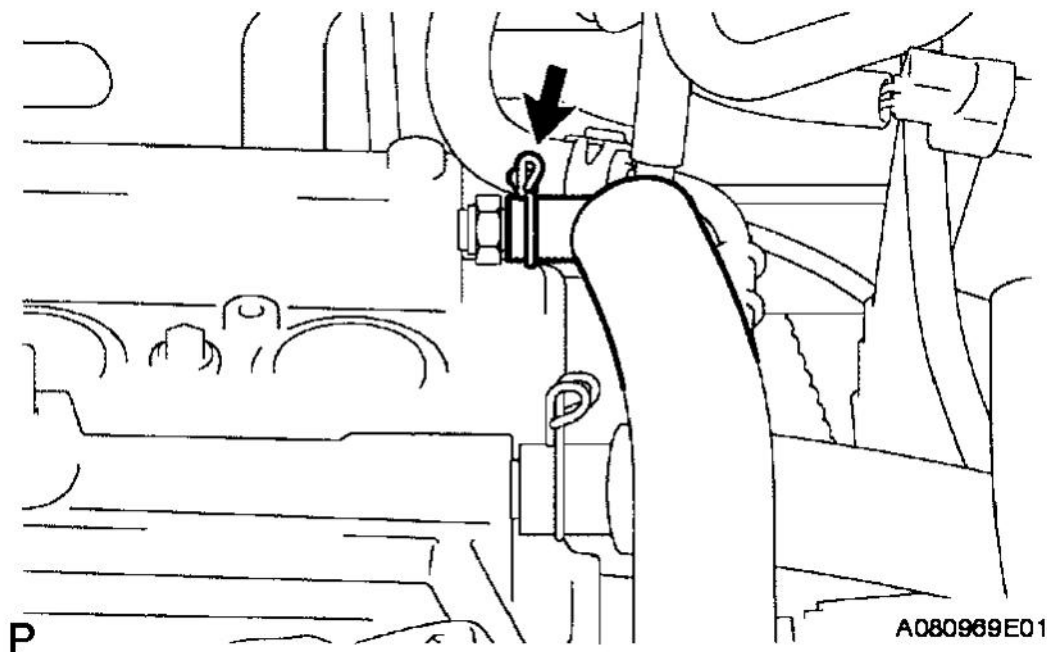


Fig. 17: Disconnecting Ventilation Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **DISCONNECT NO. 2 VENTILATION HOSE**
 - a. Disconnect the ventilation hose from the cylinder head cover.

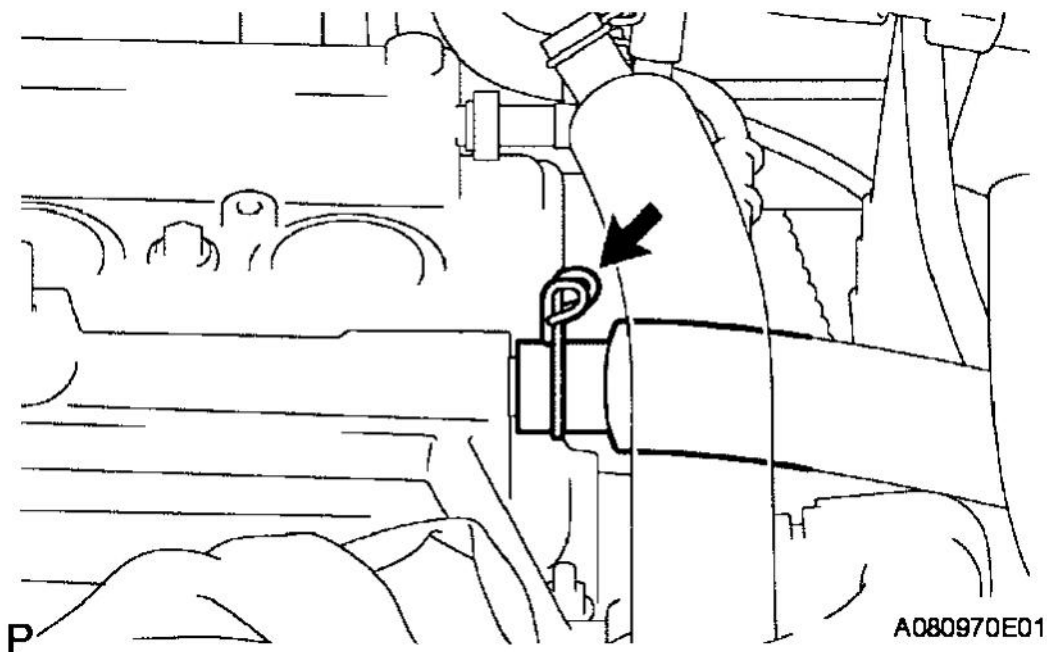


Fig. 18: Disconnecting No 2 Ventilation Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE CYLINDER HEAD COVER

- a. Remove the 9 bolts, 2 nuts and cylinder head cover.

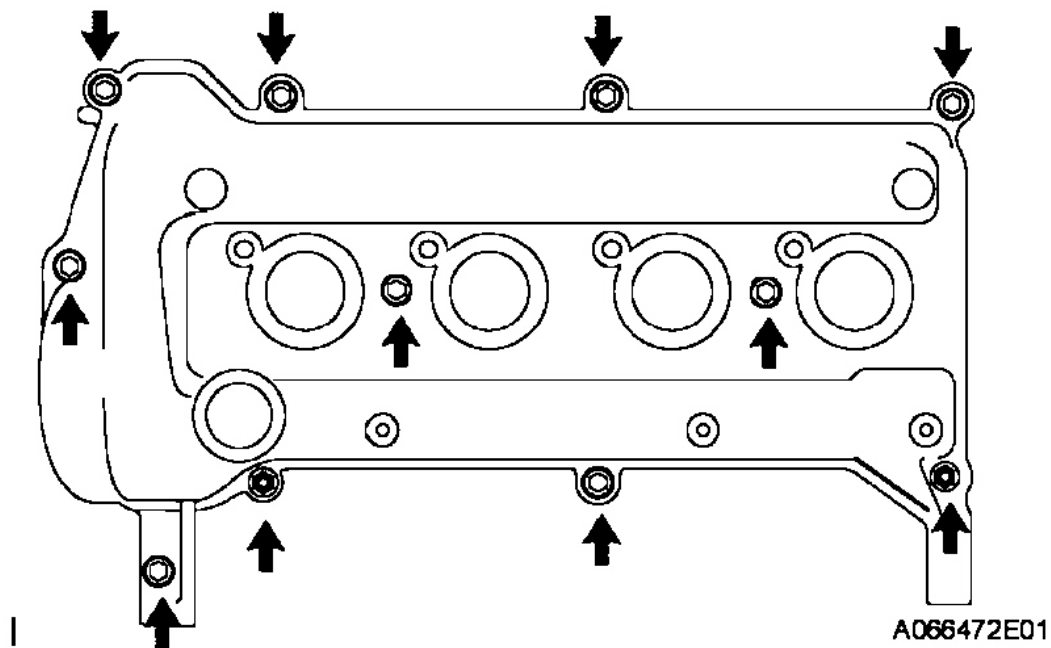


Fig. 19: Removing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **REMOVE ENGINE UNDER COVER RH**
8. **INSPECT VALVE CLEARANCE**

HINT:

Inspect and adjust the valve clearance when the engine is cold.

- a. Set the No. 1 cylinder to TDC/compression.
 1. Turn the crankshaft pulley until its timing notch and the timing mark 0 of the chain cover are aligned.
 2. Check that both timing marks on the camshaft timing sprocket and camshaft timing gear are facing upward as shown in the illustration.

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

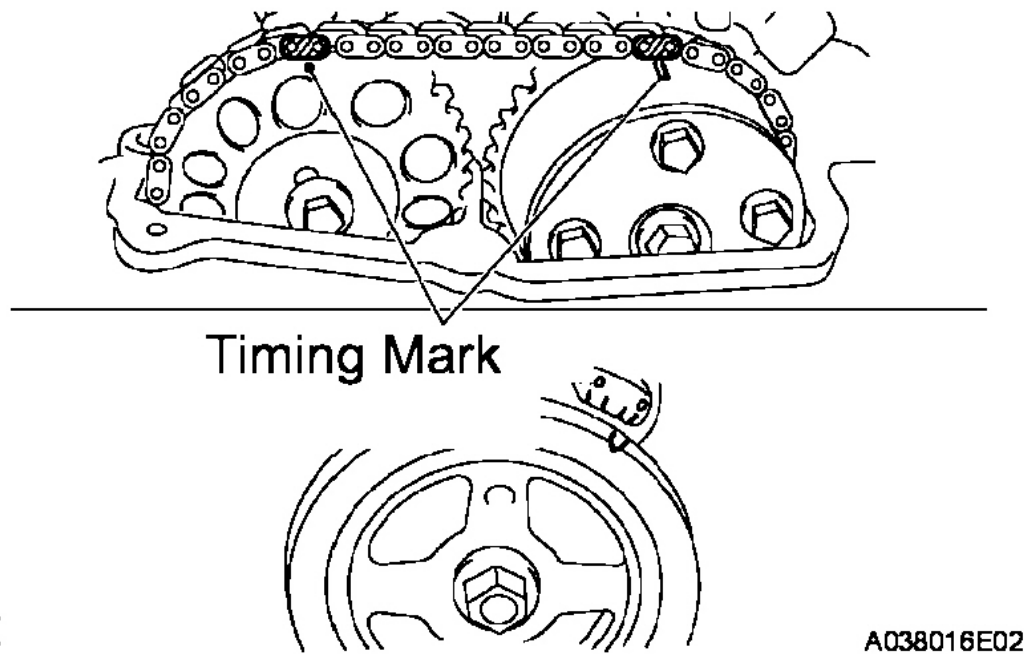


Fig. 20: Aligning Crankshaft Pulley Timing Notch And Timing Mark 0 Of Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check the valves indicated in the illustration.
1. Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Standard valve clearance (Cold)

VALVE CLEARANCE SPECIFICATION

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

No. 1 Cylinder TDC/Compression

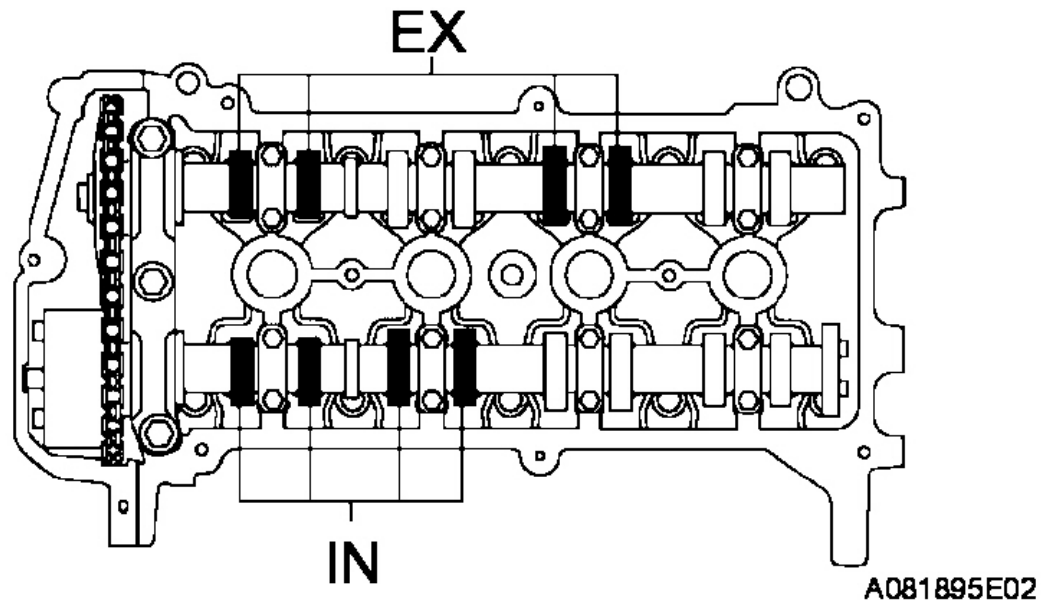


Fig. 21: Identifying Valves For Measuring Clearance (No 1 Cylinder TDC/Compression)

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 adjusting shim.
- c. Turn the crankshaft 1 complete revolution until its timing notch and the timing mark 0 of the chain cover are aligned.
- d. Check the valves indicated in the illustration.
 1. Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

Standard valve clearance (Cold)

VALVE CLEARANCE SPECIFICATION

Item	Specified Condition
Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)

No. 4 Cylinder TDC/Compression

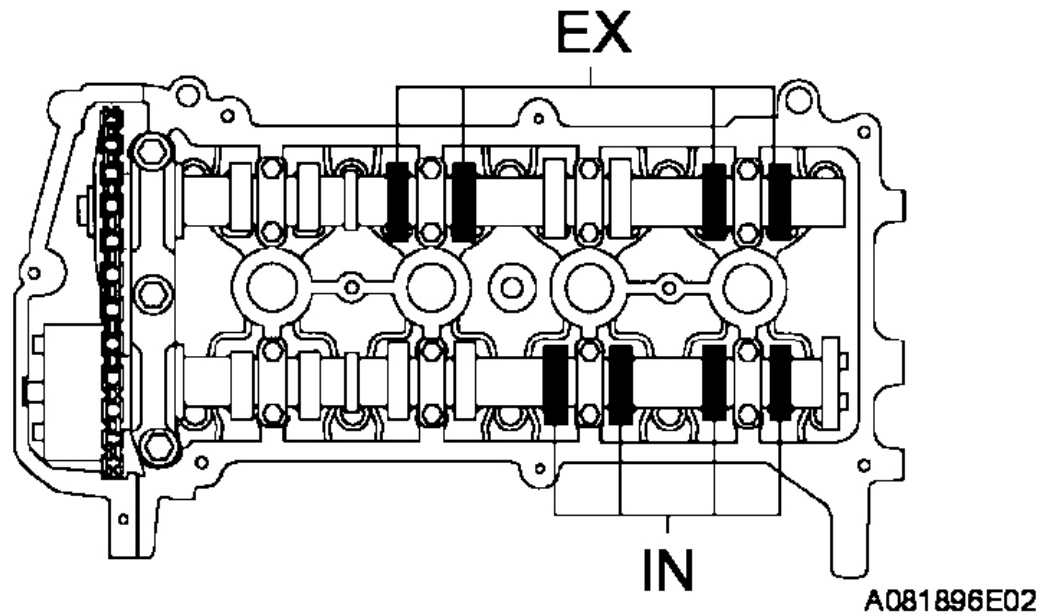


Fig. 22: Identifying Valves For Measuring Clearance (No 4 Cylinder TDC/Compression)

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 adjusting shim.

9. ADJUST VALVE CLEARANCE

- a. Rotate the crankshaft pulley.

NOTE: When rotating the camshaft with the timing chain removed, rotate the crankshaft damper counterclockwise 40° from the TDC and align its timing notch with the matchmark of the timing chain cover to prevent the pistons from coming into contact with the valves.

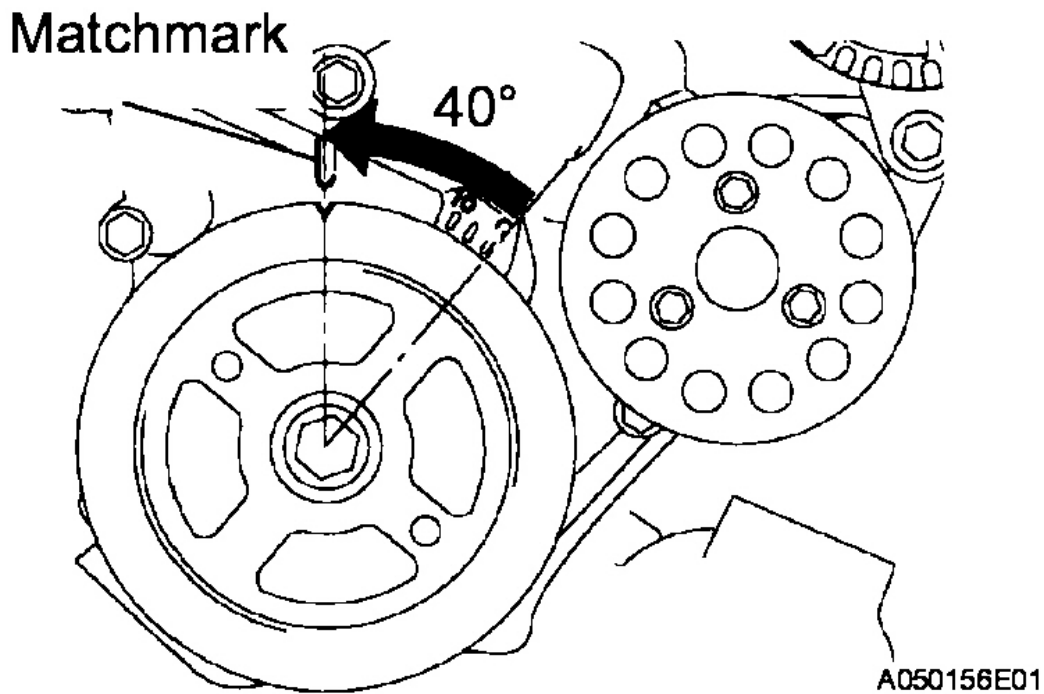
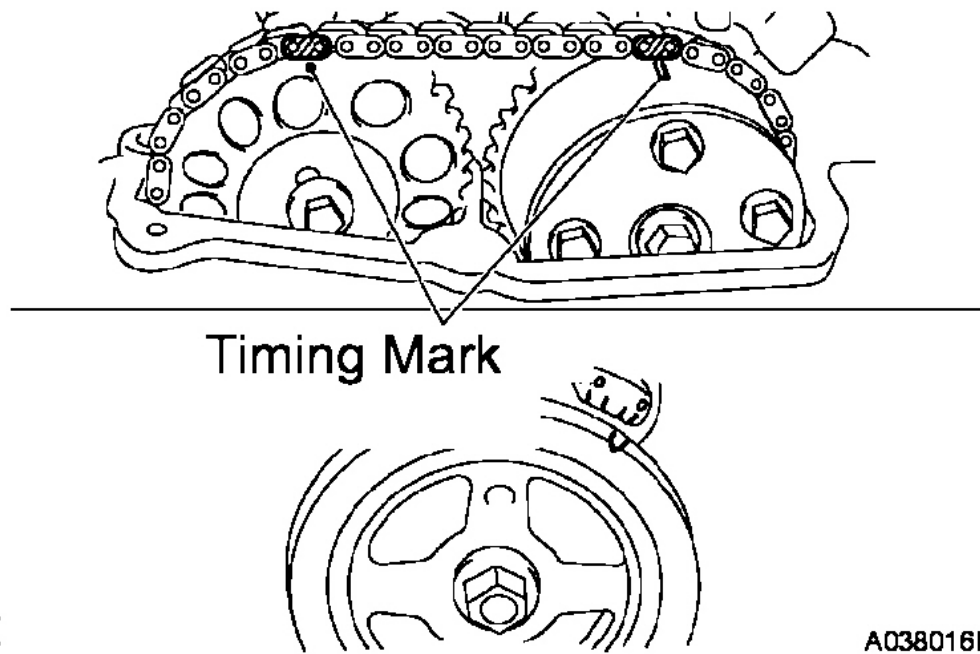


Fig. 23: Rotating Crankshaft Pulley

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

- b. Set the No. 1 cylinder to the TDC/compression.
 1. Turn the crankshaft pulley until its timing notch and timing mark 0 of the chain cover are aligned.
 2. Check that both timing marks on the camshaft timing sprocket and valve timing controller assembly are facing upward as shown in the illustration.

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



I

A038016E02

Fig. 24: Identifying Valves For Measuring Clearance (No 1 Cylinder TDC/Compression)

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

- c. Put paint marks on the timing chain where the timing marks of the camshaft timing sprocket and the camshaft timing gear are located.

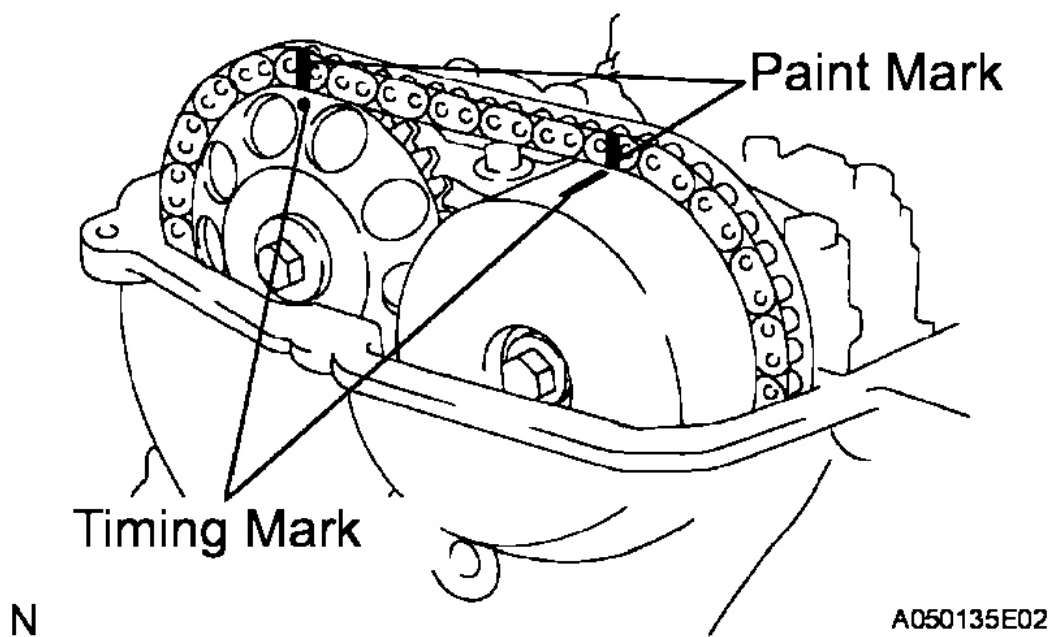


Fig. 25: Putting Paint Marks On Timing Chain

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

- d. Using an 8 mm hexagon wrench, remove the screw plug.

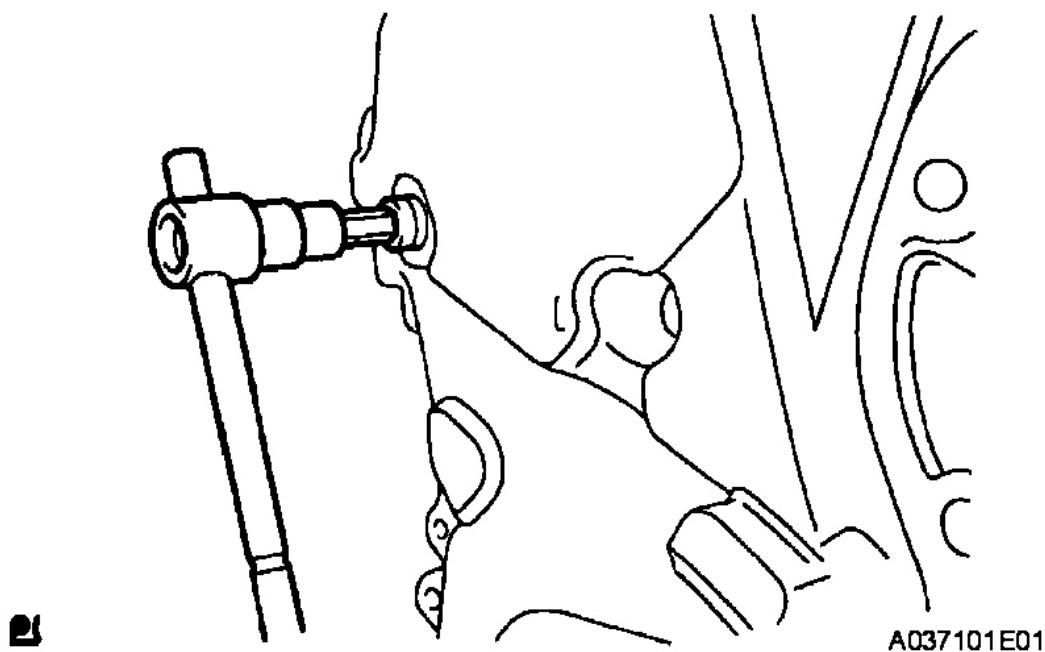


Fig. 26: Removing Screw Plug

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

- e. Insert a screwdriver into the service hole of the chain tensioner to hold the stopper plate of the chain tensioner at an upward position.
- f. Using a wrench, rotate the No. 2 camshaft clockwise to push in the plunger of the chain tensioner.

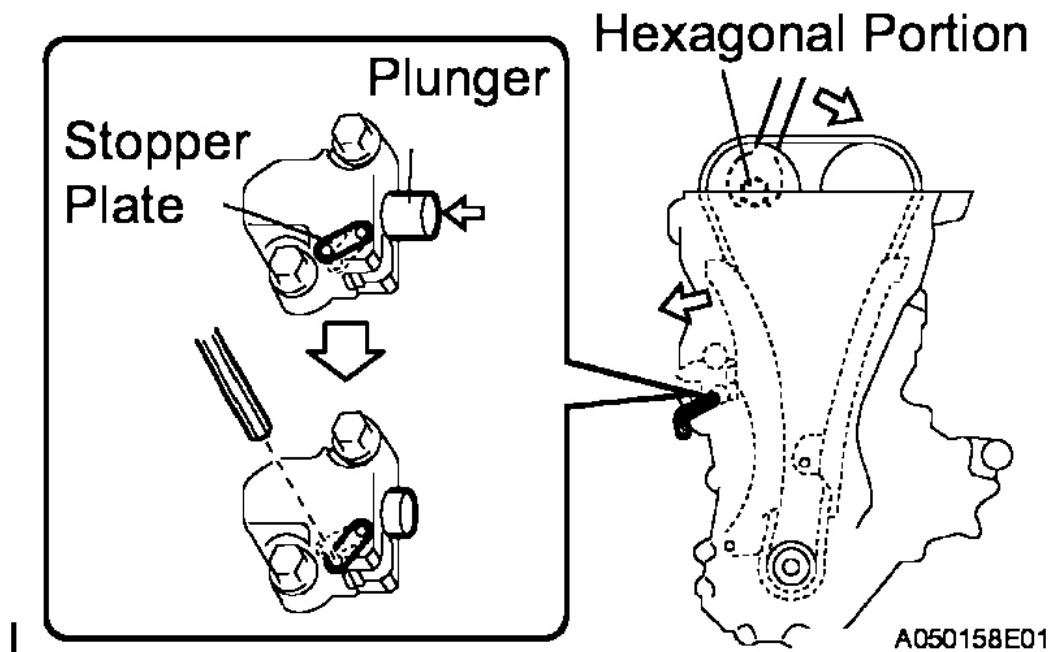


Fig. 27: Inserting Screwdriver Into Service Hole Of Chain Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the screwdriver from the service hole, and then align the hole of the stopper plate with the service hole and insert a 2 to 3 mm (0.08 to 0.12 in.) diameter bar into the holes to hold the stopper plate.

HINT:

- Fix the stopper plate in place using the bar while rotating the camshaft right and left slightly.
 - Hold the bar with tape so that the bar does not come off.
- h. Using SST, hold the camshaft with a wrench on the hexagonal lobe, and remove the bolt.

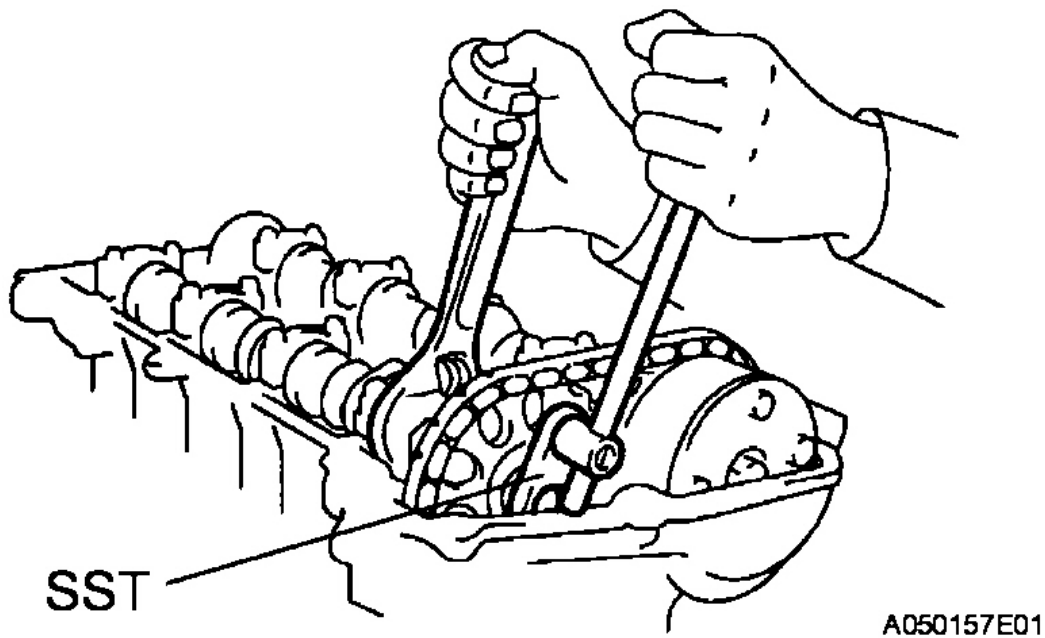


Fig. 28: Removing Bolt

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

SST 09023-38400

- i. Using several steps, uniformly loosen and remove the 11 bearing cap bolts in the sequence shown in the illustration. Then remove the 5 bearing caps.

NOTE: Loosen each bolt uniformly, keeping the camshaft level.

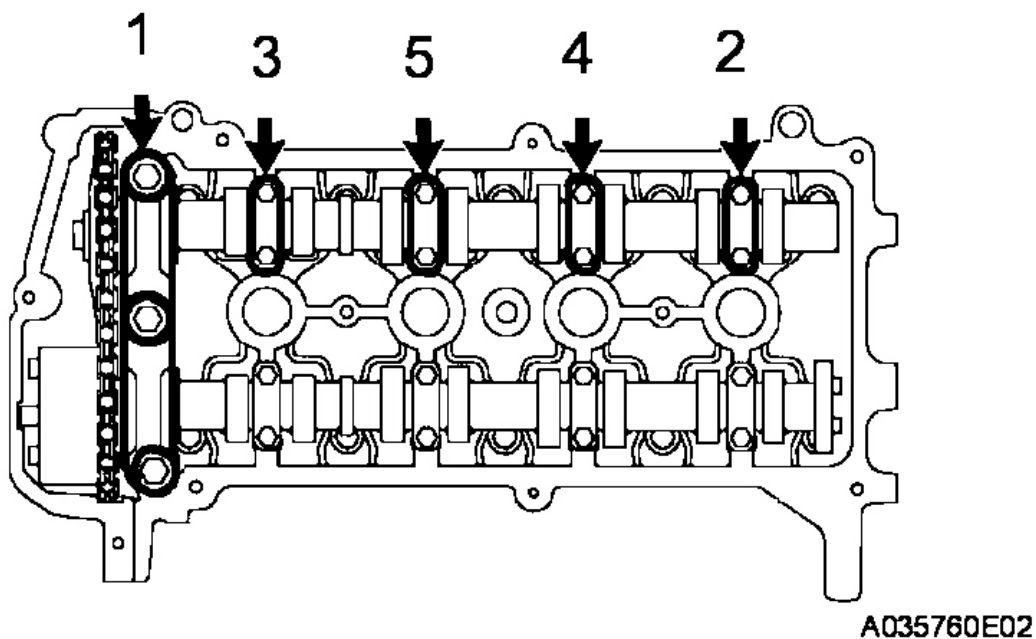
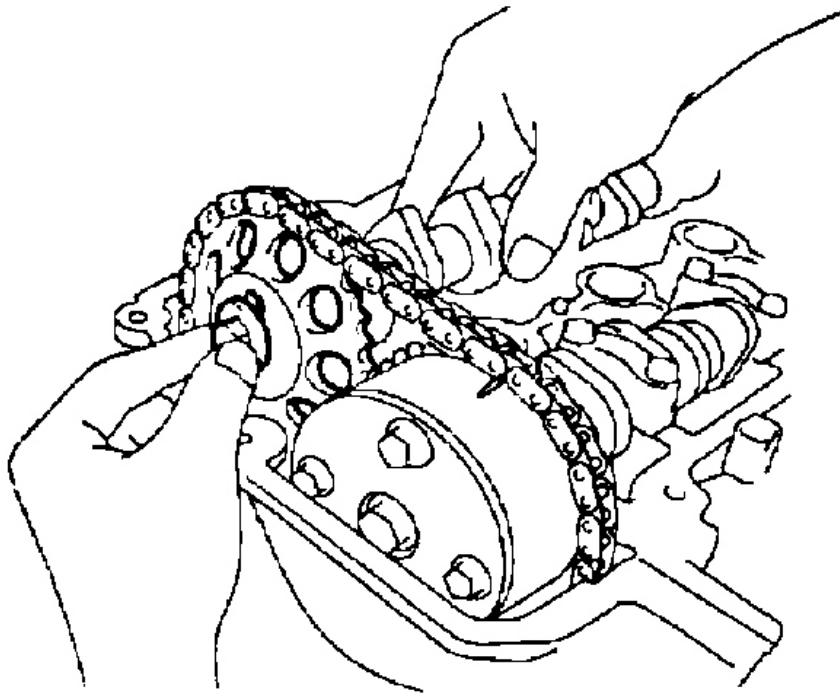


Fig. 29: Identifying Bearing Cap Bolts Loosening Sequence

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

- j. Remove the flange bolt with the No. 2 camshaft lifted up. Then detach the No. 2 camshaft and the camshaft timing sprocket.



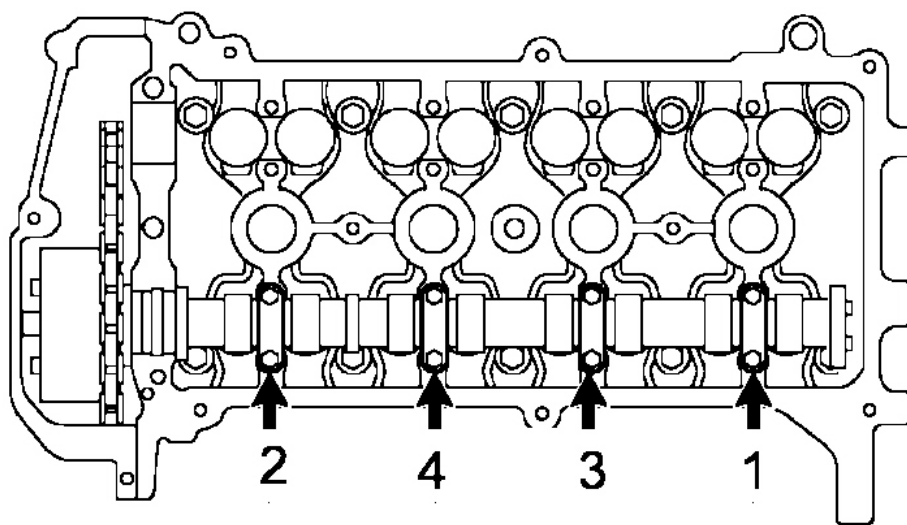
A037148E01

Fig. 30: Removing Flange Bolt

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

- k. Using several steps, uniformly loosen and remove the 8 bearing cap bolts in the sequence shown in the illustration. Then remove the 4 bearing caps.

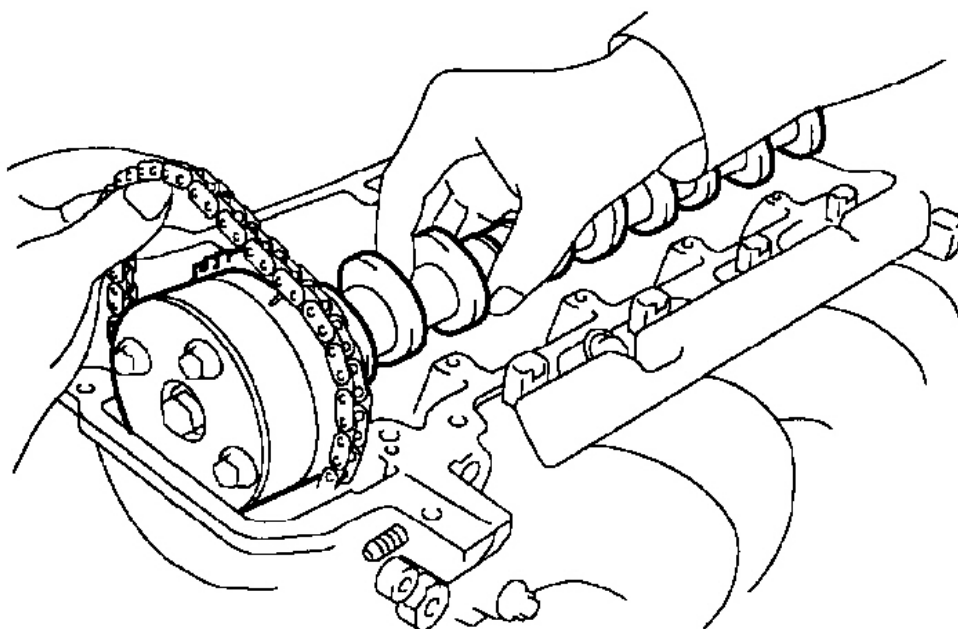
NOTE: Loosen each bolt uniformly, keeping the camshaft level.



A035766E02

Fig. 31: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Hold the timing chain by hand, and remove the camshaft and the camshaft timing gear assembly.

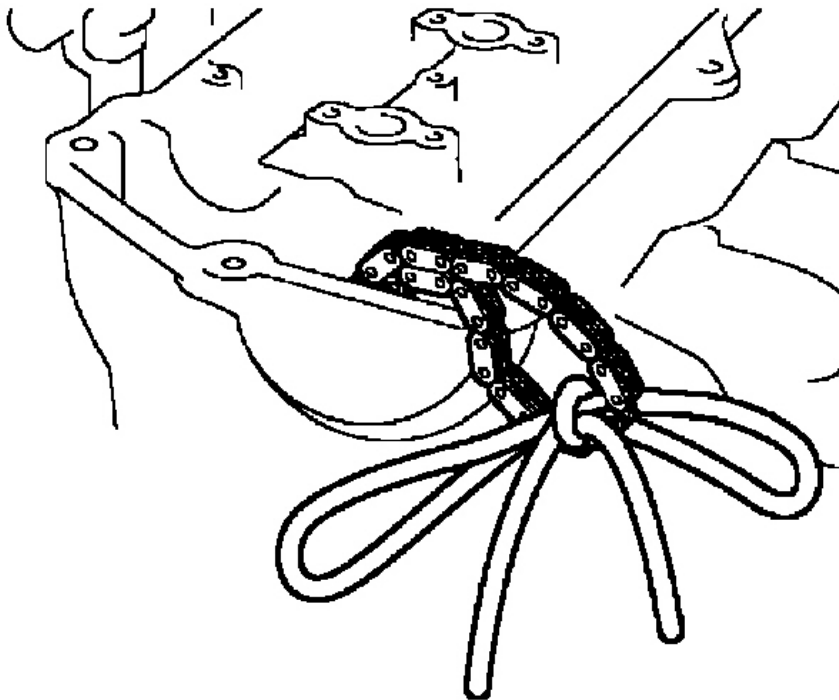


A035767E01

Fig. 32: Removing Camshaft And Camshaft Timing Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- m. Tie the timing chain with a string as shown in the illustration.

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



A035227E01

Fig. 33: Tying Timing Chain With String

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

- n. Remove the valve lifters.
- o. Using a micrometer, measure the thickness of the removed lifter.
- p. Calculate the thickness of a new lifter so that the valve clearance comes within the specified value.

LIFTER THICKNESS REFERENCE

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

New lifter thickness**LIFTER THICKNESS SPECIFICATION**

Item	Thickness
Intake	$A = B + (C - 0.20 \text{ mm (0.008 in.)})$
Exhaust	$A = B + (C - 0.30 \text{ mm (0.012 in.)})$

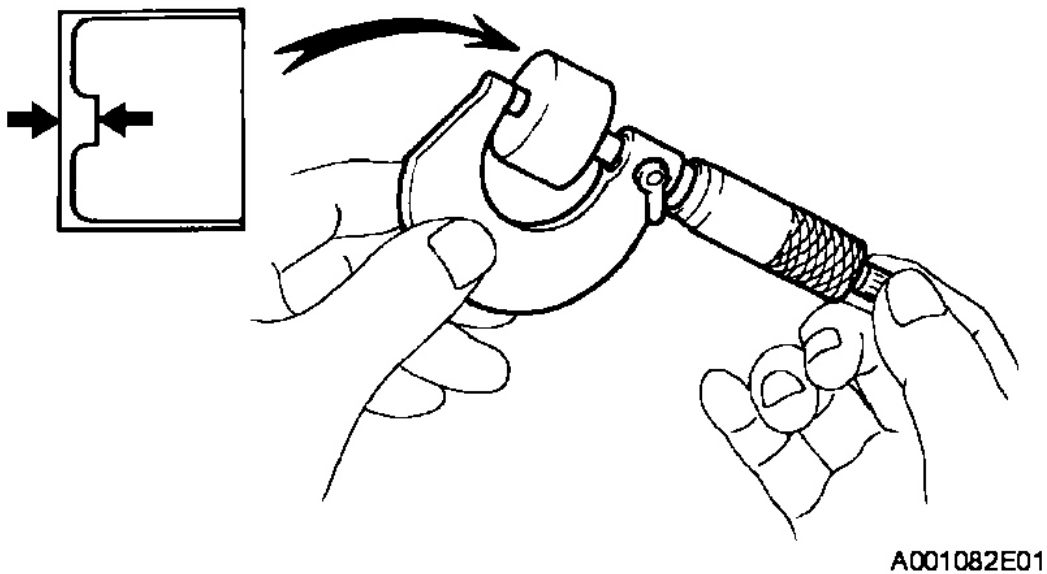


Fig. 34: Checking Thickness Of Removed Lifter
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

EXAMPLE: (Intake)

Measured valve clearance = 0.40 mm (0.0158 in.)

0.40 mm (0.0158 in.) - 0.20 mm (0.0079 in.) = 0.20 mm (0.0079 in.)

(Measured - Specification = Excess clearance)

Used lifter measurement = 5.25 mm (0.2067 in.)

0.20 mm (0.0079 in.) + 5.25 mm (0.2067 in.) = 5.45 mm (0.2146 in.)

(Excess clearance + Used lifter = Ideal new lifter)

Closest new lifter = 5.45 mm (0.2146 in.)

Select No. 46 lifter (5.46 mm (0.2150 in.))

HINT:

- Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm

(0.1992 in.) to 5.740 mm (0.2260 in.).

- Refer to the **NEW LIFTER THICKNESS TABLE** below.

1. Valve lifter selection chart (intake)

Measured Clearance mm (in.)

Installed Lifter Thickness mm (in.)

	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2058)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2078)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	
0.000 - 0.030 (0.0000 - 0.0012)																												
0.031 - 0.050 (0.0012 - 0.0020)									06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24
0.051 - 0.070 (0.0020 - 0.0028)								06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26
0.071 - 0.090 (0.0028 - 0.0035)						06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28
0.091 - 0.110 (0.0036 - 0.0043)					06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30
0.111 - 0.130 (0.0044 - 0.0051)				06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32
0.131 - 0.149 (0.0052 - 0.0059)			06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34
0.150 - 0.250 (0.0059 - 0.0098)																												
0.251 - 0.270 (0.0099 - 0.0106)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46
0.271 - 0.290 (0.0107 - 0.0114)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48
0.291 - 0.310 (0.0115 - 0.0122)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.311 - 0.330 (0.0122 - 0.0130)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52
0.331 - 0.350 (0.0130 - 0.0138)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54
0.351 - 0.370 (0.0138 - 0.0146)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56
0.371 - 0.390 (0.0146 - 0.0154)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58
0.391 - 0.410 (0.0154 - 0.0161)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60
0.411 - 0.430 (0.0162 - 0.0169)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62
0.431 - 0.450 (0.0170 - 0.0177)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64
0.451 - 0.470 (0.0178 - 0.0185)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66
0.471 - 0.490 (0.0185 - 0.0193)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68
0.491 - 0.510 (0.0193 - 0.0201)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70
0.511 - 0.530 (0.0201 - 0.0209)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72
0.531 - 0.550 (0.0209 - 0.0217)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74
0.551 - 0.570 (0.0217 - 0.0224)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74
0.571 - 0.590 (0.0225 - 0.0232)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74
0.591 - 0.610 (0.0233 - 0.0240)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74
0.611 - 0.630 (0.0241 - 0.0248)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74
0.631 - 0.650 (0.0248 - 0.0256)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74
0.651 - 0.670 (0.0256 - 0.0264)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.671 - 0.690 (0.0264 - 0.0272)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.691 - 0.710 (0.0272 - 0.0280)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.711 - 0.730 (0.0280 - 0.0287)	58	60	62	64	66	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.731 - 0.750 (0.0288 - 0.0295)	60	62	64	66	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.751 - 0.770 (0.0296 - 0.0303)	62	64	66	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.771 - 0.790 (0.0304 - 0.0311)	64	66	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.791 - 0.810 (0.0311 - 0.0319)	66	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.811 - 0.830 (0.0319 - 0.0327)	68	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.831 - 0.850 (0.0327 - 0.0335)	70	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.851 - 0.870 (0.0335 - 0.0343)	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.871 - 0.890 (0.0343 - 0.0350)	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.891 - 0.910 (0.0351 - 0.0358)	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
0.911 - 0.930 (0.0359 - 0.0366)	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74

T

A116/33E01

Fig. 35: Intake Valve Lifter Selection Chart (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Valve lifter selection chart (intake) (continued).

2006 Scion xB

2006 ENGINE Engine Mechanical (1NZ-FE) - xB

Measured Clearance mm (in.)

Installed Lifter Clearance mm (in.)

	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 - 0.030 (0.0000 - 0.0012)	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.031 - 0.050 (0.0012 - 0.0020)	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58
0.051 - 0.070 (0.0020 - 0.0028)	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.071 - 0.090 (0.0028 - 0.0035)	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.091 - 0.110 (0.0036 - 0.0043)	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64
0.111 - 0.130 (0.0044 - 0.0061)	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.131 - 0.149 (0.0062 - 0.0069)	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.150 - 0.250 (0.0069 - 0.0098)																												
0.251 - 0.270 (0.0099 - 0.0106)	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74	
0.271 - 0.290 (0.0107 - 0.0114)	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74	74	
0.291 - 0.310 (0.0115 - 0.0122)	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74	74	74	
0.311 - 0.330 (0.0122 - 0.0130)	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	
0.331 - 0.350 (0.0130 - 0.0138)	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	
0.351 - 0.370 (0.0138 - 0.0146)	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	
0.371 - 0.390 (0.0146 - 0.0154)	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	
0.391 - 0.410 (0.0154 - 0.0161)	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.411 - 0.430 (0.0162 - 0.0169)	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.431 - 0.450 (0.0170 - 0.0177)	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.451 - 0.470 (0.0178 - 0.0185)	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.471 - 0.490 (0.0185 - 0.0193)	68	70	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.491 - 0.510 (0.0193 - 0.0201)	70	72	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.511 - 0.530 (0.0201 - 0.0209)	72	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.531 - 0.550 (0.0209 - 0.0217)	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
0.551 - 0.570 (0.0217 - 0.0224)	74	74	74																									
0.571 - 0.590 (0.0225 - 0.0232)	74																											

T

A116/34E01

Fig. 36: Intake Valve Lifter Selection Chart (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

New lifter thickness

LIFTER THICKNESS SPECIFICATION

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 mm (0.1992 in.)	30	5.300 mm (0.2087 in.)	54	5.540 mm (0.2181 in.)

2006 Scion xB**2006 ENGINE Engine Mechanical (1NZ-FE) - xB**

08	5.080 mm (0.2000 in.)	32	5.320 mm (0.2094 in.)	56	5.560 mm (0.2189 in.)
10	5.100 mm (0.2008 in.)	34	5.340 mm (0.2102 in.)	58	5.580 mm (0.2197 in.)
12	5.120 mm (0.2016 in.)	36	5.360 mm (0.2110 in.)	60	5.600 mm (0.2205 in.)
14	5.140 mm (0.2024 in.)	38	5.380 mm (0.2118 in.)	62	5.620 mm (0.2213 in.)
16	5.160 mm (0.2031 in.)	40	5.400 mm (0.2126 in.)	64	5.640 mm (0.2220 in.)
18	5.180 mm (0.2039 in.)	42	5.420 mm (0.2134 in.)	66	5.660 mm (0.2228 in.)
20	5.200 mm (0.2047 in.)	44	5.440 mm (0.2142 in.)	68	5.680 mm (0.2236 in.)
22	5.220 mm (0.2055 in.)	46	5.460 mm (0.2150 in.)	70	5.700 mm (0.2244 in.)
24	5.240 mm (0.2063 in.)	48	5.480 mm (0.2157 in.)	72	5.720 mm (0.2252)
26	5.260 mm (0.2071 in.)	50	5.500 mm (0.2165 in.)	74	5.740 mm (0.2260)
28	5.280 mm (0.2079 in.)	52	5.520 mm (0.2173 in.)	-	-

Standard intake valve clearance (Cold): 0.15 to 0.25 mm (0.006 to 0.010 in.)

EXAMPLE:

The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0158 in.).

Replace the 5.250 mm (0.2067 in.) lifter with a new No. 46 lifter.

3. Valve lifter selection chart (exhaust).

	Measured Clearance mm (in.)																												
	Installed Lifter Thickness mm (in.)																												
	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)		
0.031 - 0.050 (0.0012 - 0.0020)																06	06	06	06	06	06	08	08	10	10	12	12	14	
0.051 - 0.070 (0.0020 - 0.0028)															06	06	06	06	06	06	08	08	10	10	12	12	14	14	16
0.071 - 0.090 (0.0028 - 0.0035)													06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18
0.091 - 0.110 (0.0036 - 0.0043)											06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.111 - 0.130 (0.0044 - 0.0051)									06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.131 - 0.150 (0.0052 - 0.0059)								06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.151 - 0.170 (0.0059 - 0.0067)						06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.171 - 0.190 (0.0067 - 0.0075)						06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.191 - 0.210 (0.0075 - 0.0083)				06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.211 - 0.230 (0.0083 - 0.0091)			06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.231 - 0.249 (0.0091 - 0.0098)		06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	10	10	12	12	14	14	16	18	20
0.250 - 0.350 (0.0098 - 0.0138)																													
0.351 - 0.370 (0.0138 - 0.0146)	12	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	36	36	38	38	40	40	42	42	44	44	46	48
0.371 - 0.390 (0.0146 - 0.0154)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.391 - 0.410 (0.0154 - 0.0161)	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.411 - 0.430 (0.0162 - 0.0169)	18	20	22	24	26	28	30	30	32	32	34	34	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.431 - 0.450 (0.0170 - 0.0177)	20	22	24	26	28	30	30	32	32	34	34	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.451 - 0.470 (0.0178 - 0.0185)	22	24	26	28	30	30	32	32	34	34	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.471 - 0.490 (0.0185 - 0.0193)	24	26	28	30	30	32	32	34	34	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.491 - 0.510 (0.0193 - 0.0201)	26	28	30	30	32	32	34	34	36	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.511 - 0.530 (0.0201 - 0.0209)	28	30	32	32	34	34	36	36	36	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.531 - 0.550 (0.0209 - 0.0217)	30	32	34	34	36	36	36	36	36	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.551 - 0.570 (0.0217 - 0.0224)	32	34	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.571 - 0.590 (0.0225 - 0.0232)	34	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	38	38	40	40	42	42	44	44	46	46	48
0.591 - 0.610 (0.0233 - 0.0240)	36	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	40	40	42	42	44	44	46	46	48	48
0.611 - 0.630 (0.0241 - 0.0248)	38	40	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
0.631 - 0.650 (0.0248 - 0.0256)	40	42	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
0.651 - 0.670 (0.0256 - 0.0264)	42	44	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
0.671 - 0.690 (0.0264 - 0.0272)	44	46	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
0.691 - 0.710 (0.0272 - 0.0280)	46	48	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
0.711 - 0.730 (0.0280 - 0.0287)	48	50	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
0.731 - 0.750 (0.0288 - 0.0295)	50	52	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
0.751 - 0.770 (0.0296 - 0.0303)	52	54	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
0.771 - 0.790 (0.0304 - 0.0311)	54	56	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
0.791 - 0.810 (0.0311 - 0.0319)	56	58	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
0.811 - 0.830 (0.0319 - 0.0327)	58	60	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
0.831 - 0.850 (0.0327 - 0.0335)	60	62	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
0.851 - 0.870 (0.0335 - 0.0343)	62	64	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
0.871 - 0.890 (0.0343 - 0.0350)	64	66	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
0.891 - 0.910 (0.0351 - 0.0358)	66	68	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
0.911 - 0.930 (0.0359 - 0.0366)	68	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72</				

T

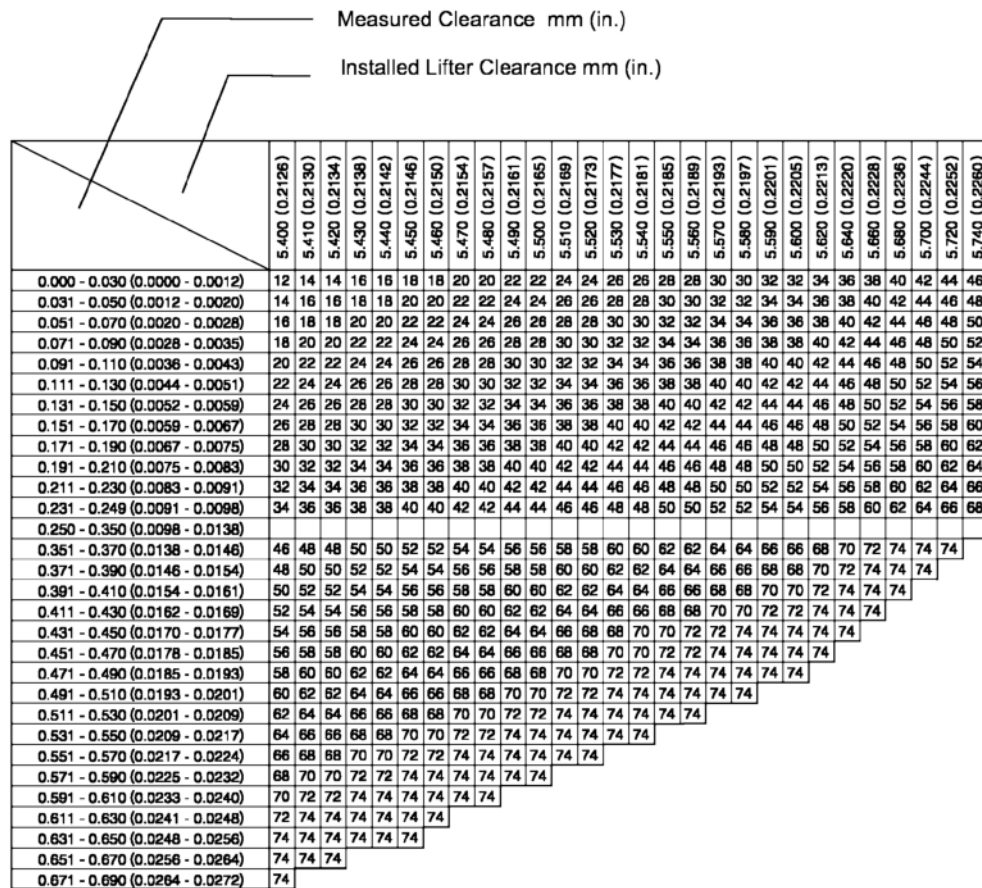
A118/35ED1

Fig. 37: Exhaust Valve Lifter Selection Chart (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Valve selection chart (exhaust) (continued).

2006 Scion xB

2006 ENGINE Engine Mechanical (1NZ-FE) - xB



T

A116/36E01

Fig. 38: Exhaust Valve Lifter Selection Chart (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

New lifter thickness

LIFTER THICKNESS SPECIFICATION

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 mm (0.1992)	30	5.300 mm (0.2087)	54	5.540 mm (0.2181)

2006 Scion xB**2006 ENGINE Engine Mechanical (1NZ-FE) - xB**

	in.)		in.)		in.)
08	5.080 mm (0.2000 in.)	32	5.320 mm (0.2094 in.)	56	5.560 mm (0.2189 in.)
10	5.100 mm (0.2008 in.)	34	5.340 mm (0.2102 in.)	58	5.580 mm (0.2197 in.)
12	5.120 mm (0.2016 in.)	36	5.360 mm (0.2110 in.)	60	5.600 mm (0.2205 in.)
14	5.140 mm (0.2024 in.)	38	5.380 mm (0.2118 in.)	62	5.620 mm (0.2213 in.)
16	5.160 mm (0.2031 in.)	40	5.400 mm (0.2126 in.)	64	5.640 mm (0.2220 in.)
18	5.180 mm (0.2039 in.)	42	5.420 mm (0.2134 in.)	66	5.660 mm (0.2228 in.)
20	5.200 mm (0.2047 in.)	44	5.440 mm (0.2142 in.)	68	5.680 mm (0.2236 in.)
22	5.220 mm (0.2055 in.)	46	5.460 mm (0.2150 in.)	70	5.700 mm (0.2244 in.)
24	5.240 mm (0.2063 in.)	48	5.480 mm (0.2157 in.)	72	5.720 mm (0.2252 in.)
26	5.260 mm (0.2071 in.)	50	5.500 mm (0.2165 in.)	74	5.740 mm (0.2260 in.)
28	5.280 mm (0.2079 in.)	52	5.520 mm (0.2173 in.)	-	-

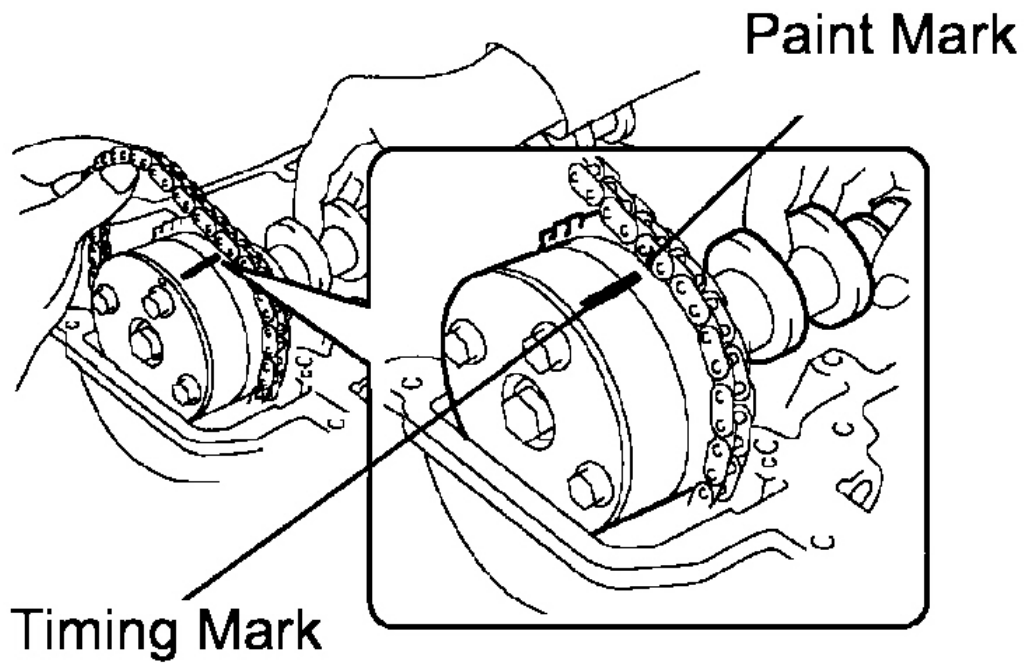
Standard exhaust valve clearance (Cold): 0.25 to 0.35 mm (0.010 to 0.014 in.)

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. 48 lifter.

- r. Reinstall the valve lifters.
- s. Apply a light coat of engine oil to the camshaft journals.
- t. Install the timing chain onto the camshaft timing gear with the paint mark and the timing mark aligned as shown in the illustration.



A081898E01

Fig. 39: Installing Timing Chain Onto Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- u. Examine the front marks and numbers, and tighten the bolts in the sequence shown in the illustration.

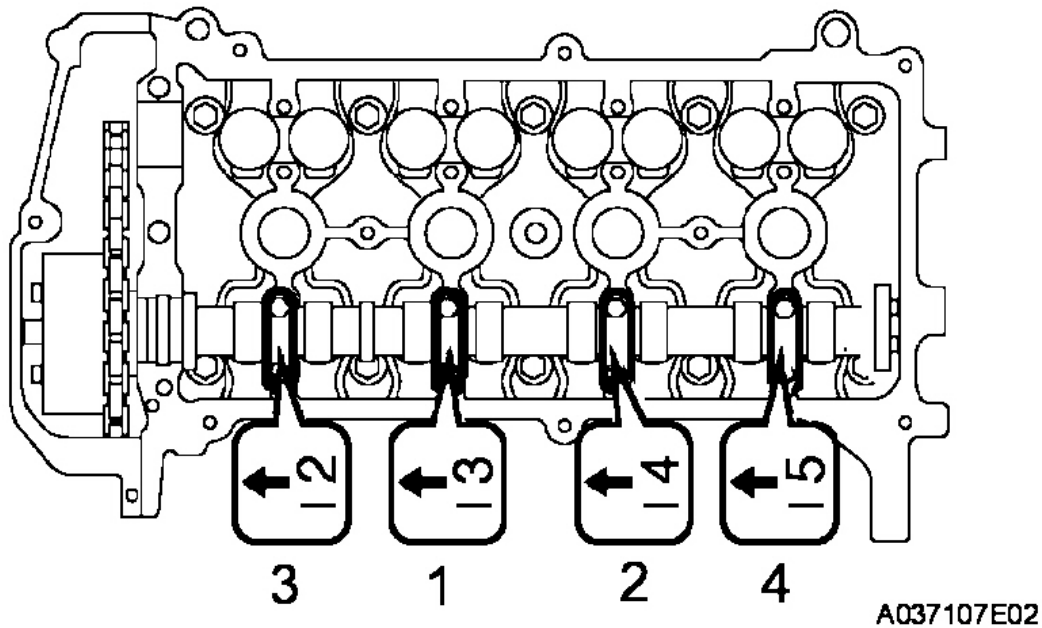
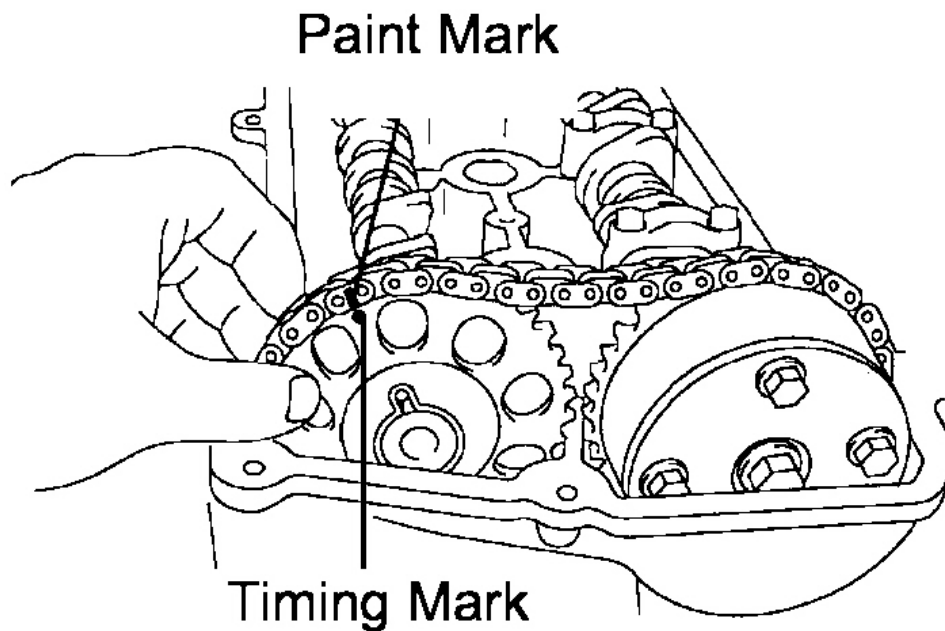


Fig. 40: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 13 N*m (133 kgf*cm, 9 ft.*lbf)

NOTE: Tighten each bolt uniformly, keeping the camshaft level.

- v. Hold the timing chain, and align the timing mark on the camshaft timing sprocket with the paint mark of the timing chain.

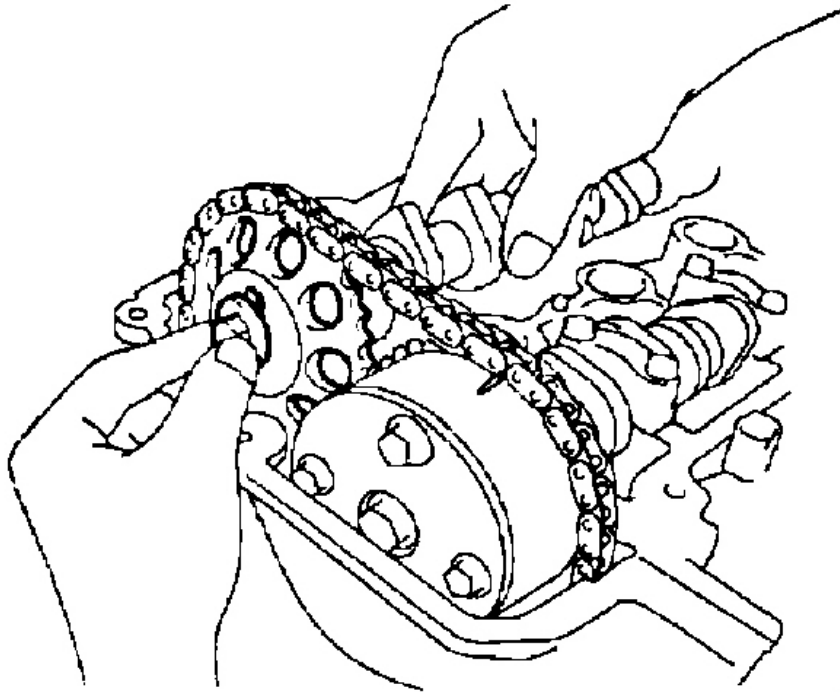


A081897E01

Fig. 41: Aligning Timing Mark On Camshaft Timing Sprocket With Paint Mark Of Timing Chain

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

- w. Align the alignment pin hole on the camshaft timing sprocket with the alignment pin of the camshaft, and install the sprocket into the camshaft.
- x. Temporarily install the timing sprocket bolt.



A037148E01

Fig. 42: Installing Timing Sprocket Bolt

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

- y. Examine the front marks and numbers, and tighten the bolts in the sequence shown in the illustration.

Torque: 13 N*m (129 kgf*cm, 9 ft.*lbf)

NOTE: Tighten each bolt uniformly, keeping the camshaft level.

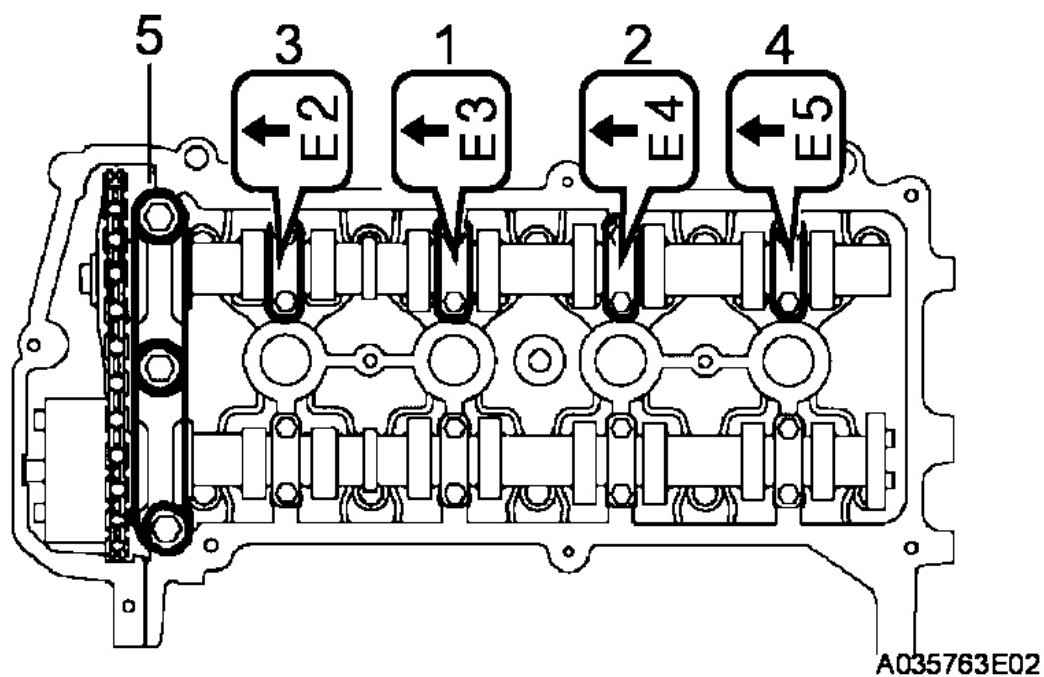


Fig. 43: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- z. Install the No. 1 bearing cap.

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

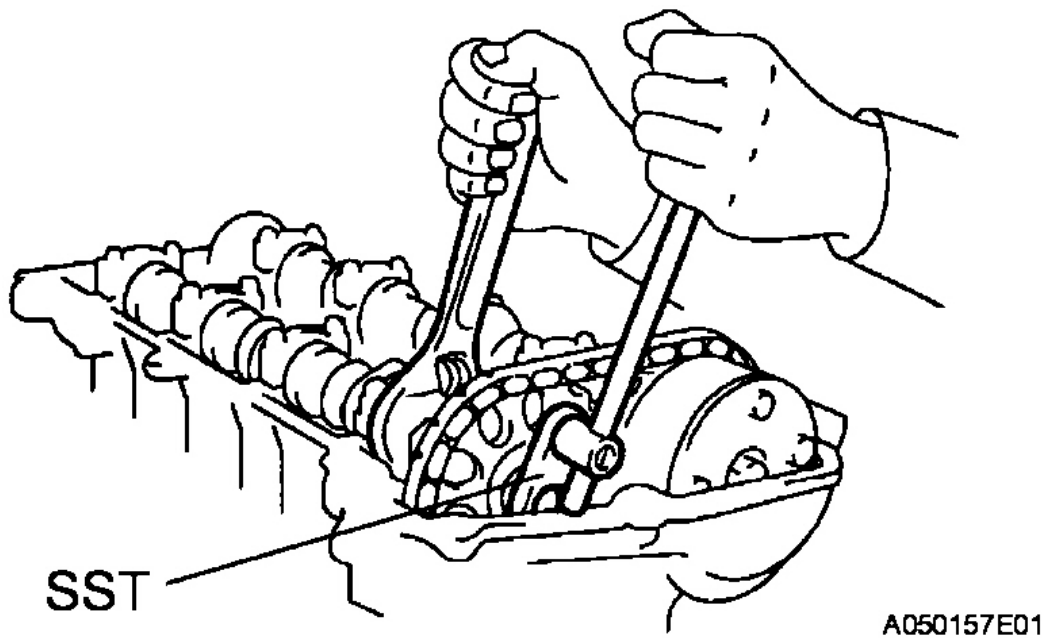


Fig. 44: Installing Bolt

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

(aa) Using SST, hold the camshaft with a wrench on the hexagon lobe, and install the bolt.

SST 09023-38400

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

(ab) Remove the bar from the timing chain tensioner.

(ac) Turn the crankshaft pulley until its timing notch and the timing mark 0 of the chain cover are aligned.

(ad) Check that all the pairs of the timing marks are aligned.

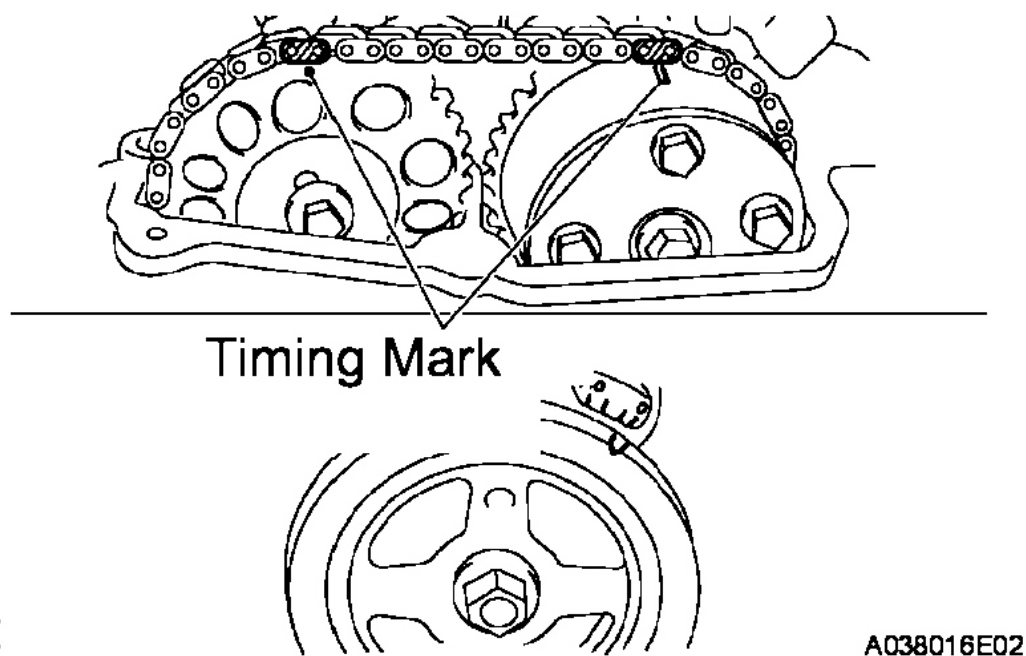


Fig. 45: Aligning Crankshaft Pulley Timing Notch And Timing Mark 0 Of Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

(ae) Apply seal packing to 2 or 3 threads of the screw plug end.

Seal packing: Part No. 08833-00070 or equivalent

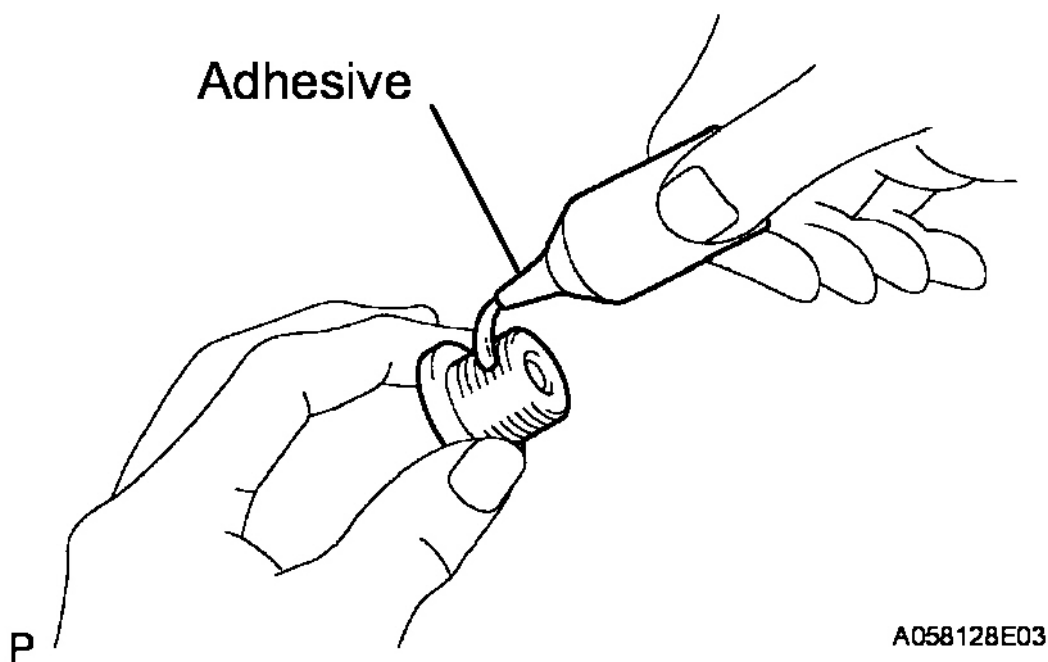


Fig. 46: Applying Seal Packing To Threads Of Screw Plug End
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

(af) Using an 8 mm hexagon wrench, install the screw plug.

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

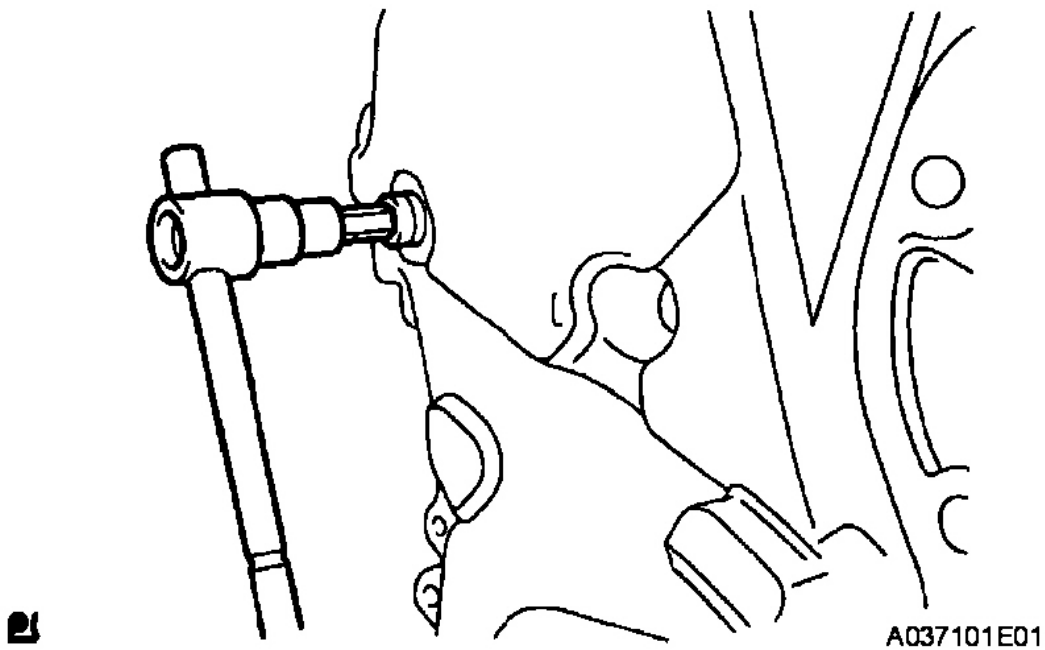


Fig. 47: Installing Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL CYLINDER HEAD COVER

- a. Apply seal packing to the 2 locations shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

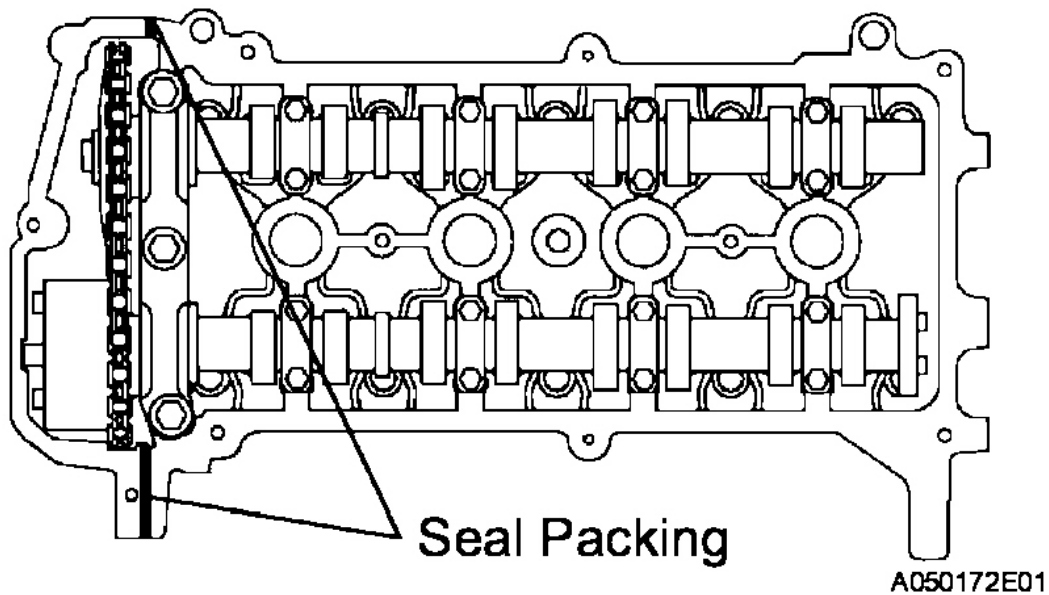


Fig. 48: Identifying Seal Packing Application Area
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installation.

- b. Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts.
- c. Using several steps, uniformly tighten the bolts and nuts in the sequence shown in the illustration.

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

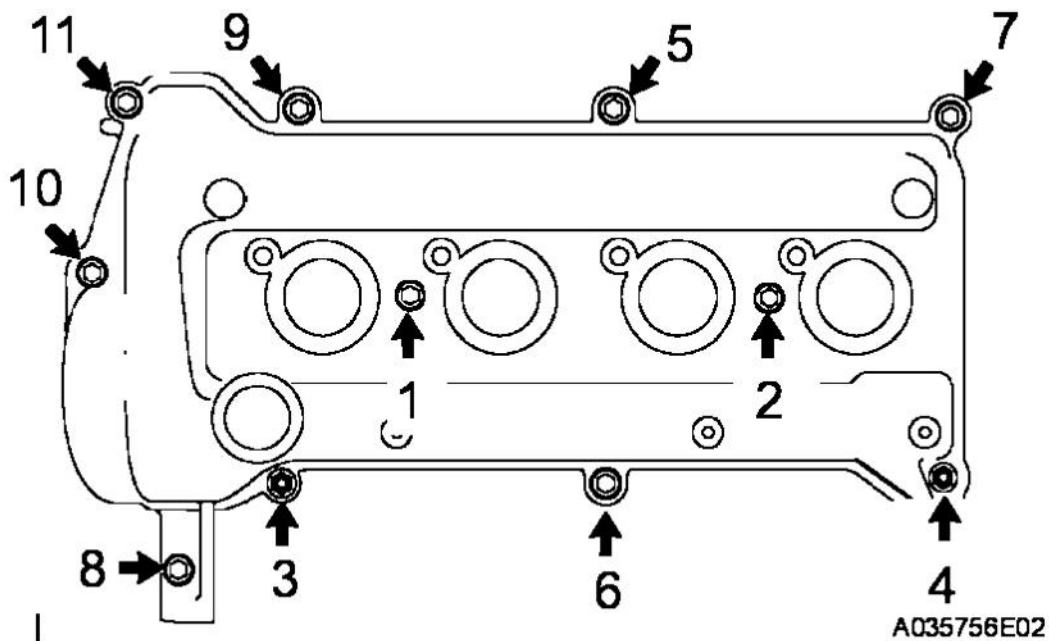


Fig. 49: Installing Cylinder Head Cover

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

11. INSTALL IGNITION COIL

- a. Install the 4 ignition coils with the 4 bolts.

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

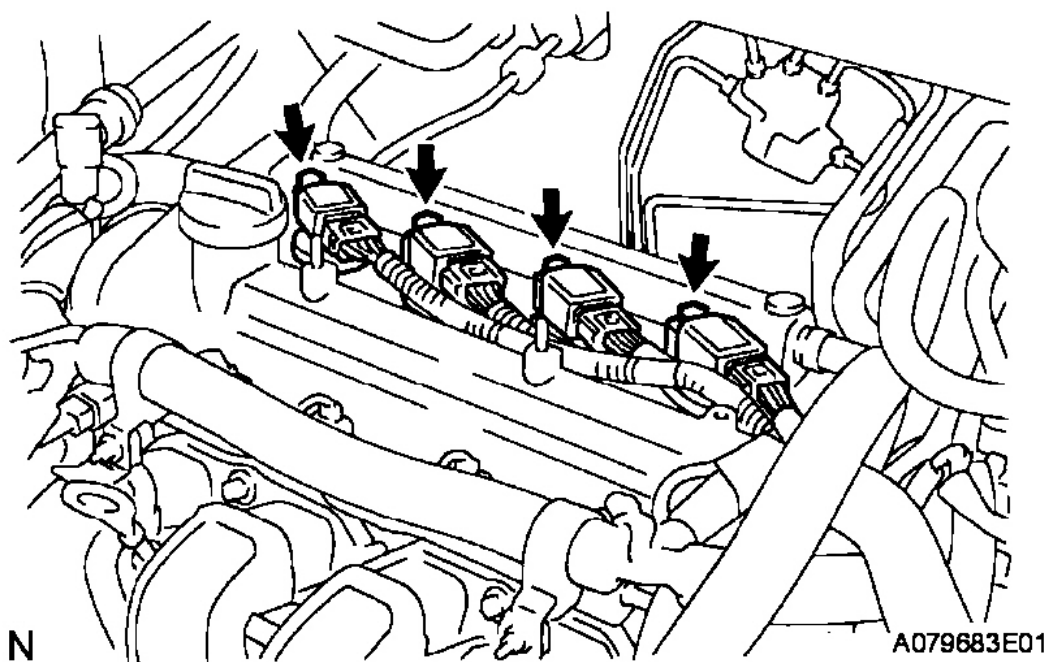


Fig. 50: Installing Ignition Coils

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

12. INSTALL NO. 2 CYLINDER HEAD COVER

- a. Install the head cover with the 4 nuts.

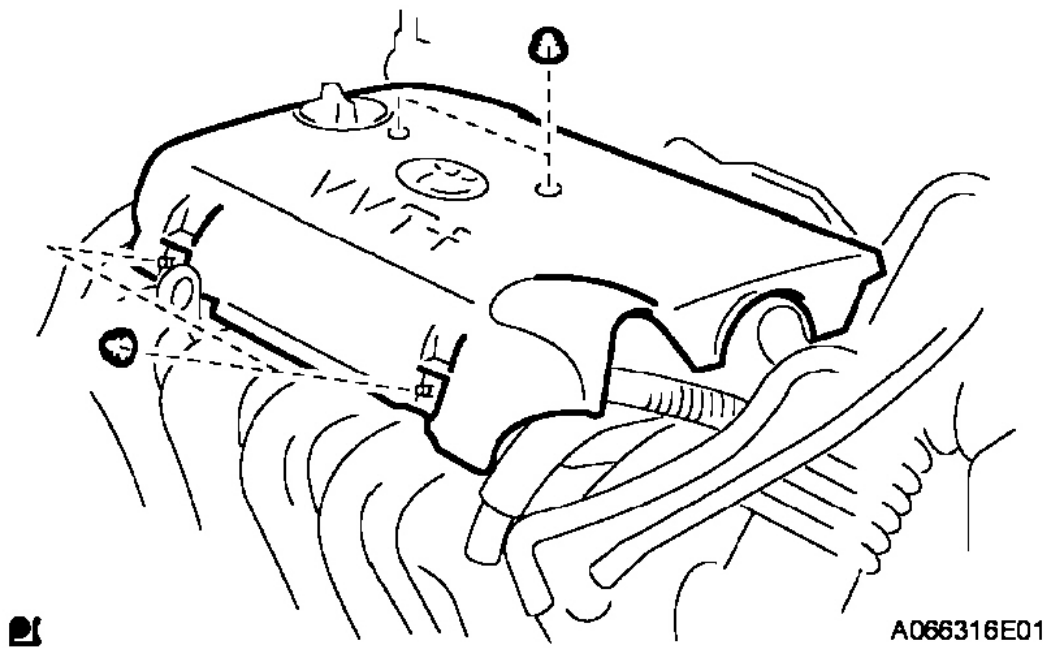


Fig. 51: Installing No 2 Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

13. INSPECT ENGINE OIL LEAKS
14. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

TIMING CHAIN

COMPONENTS

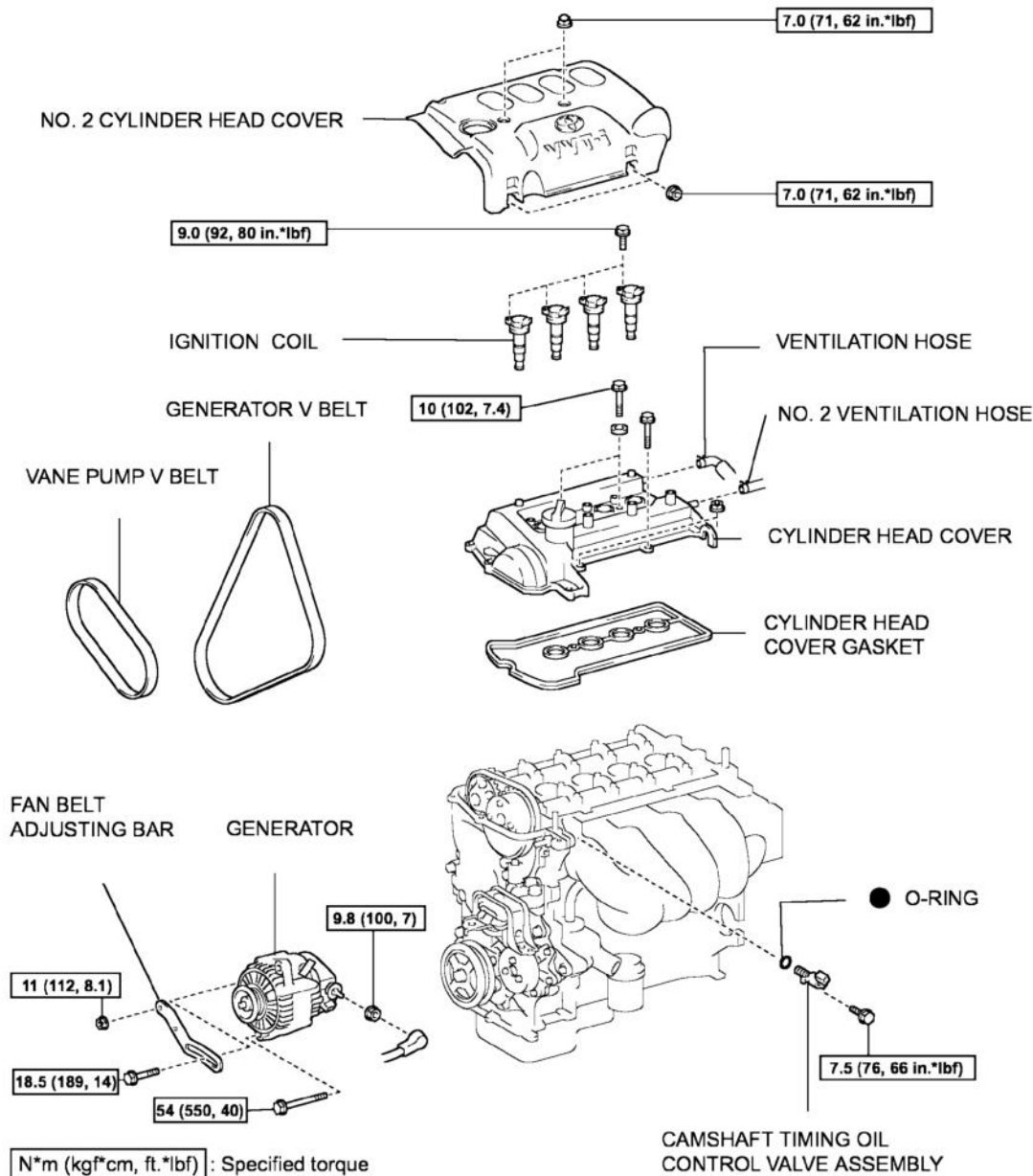


Fig. 52: Identifying Timing Chain Components (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

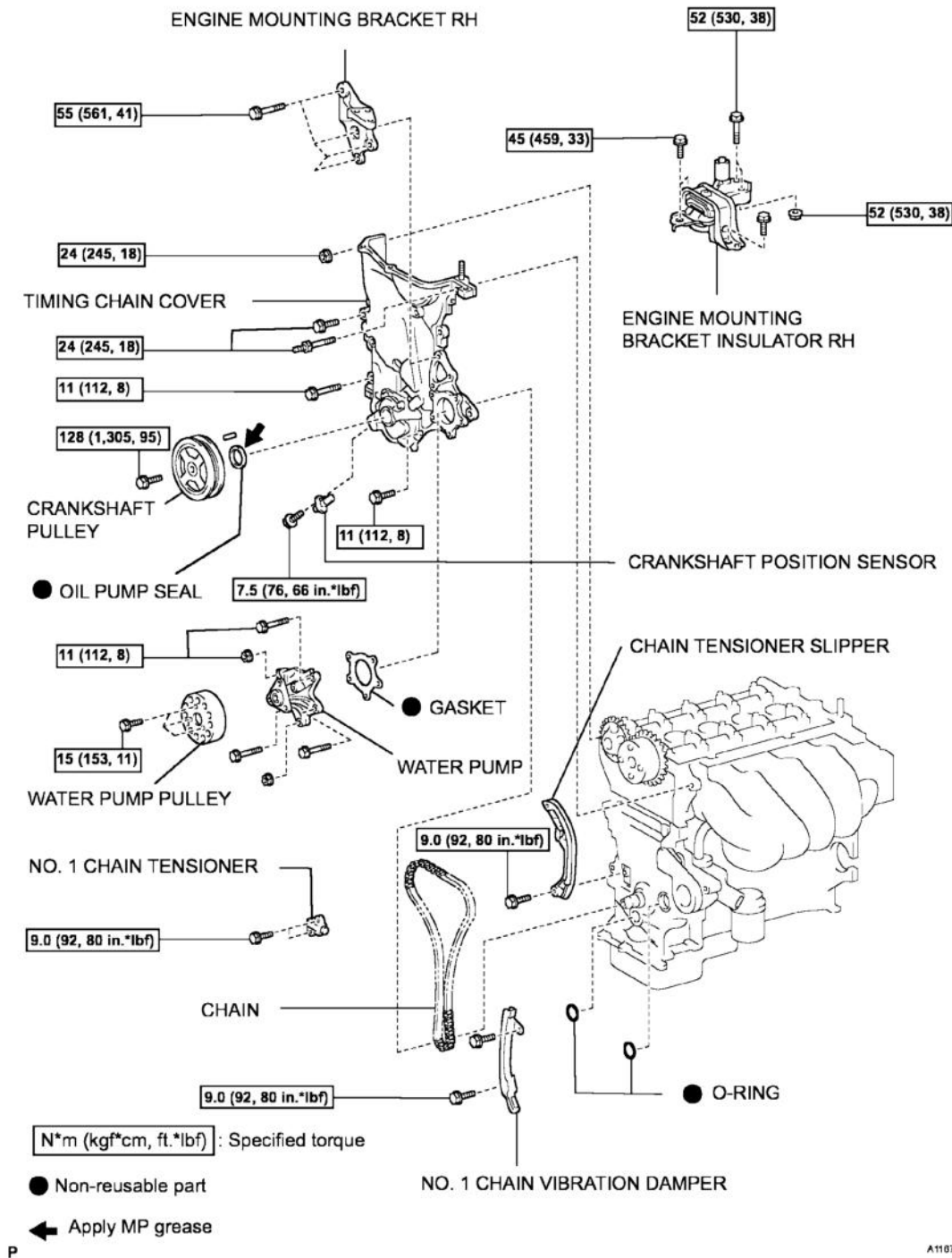


Fig. 53: Identifying Timing Chain Components (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 FRONT WHEEL RH

3. REMOVE NO. 2 CYLINDER HEAD COVER

- a. Remove the 4 nuts and No. 2 cylinder head cover.

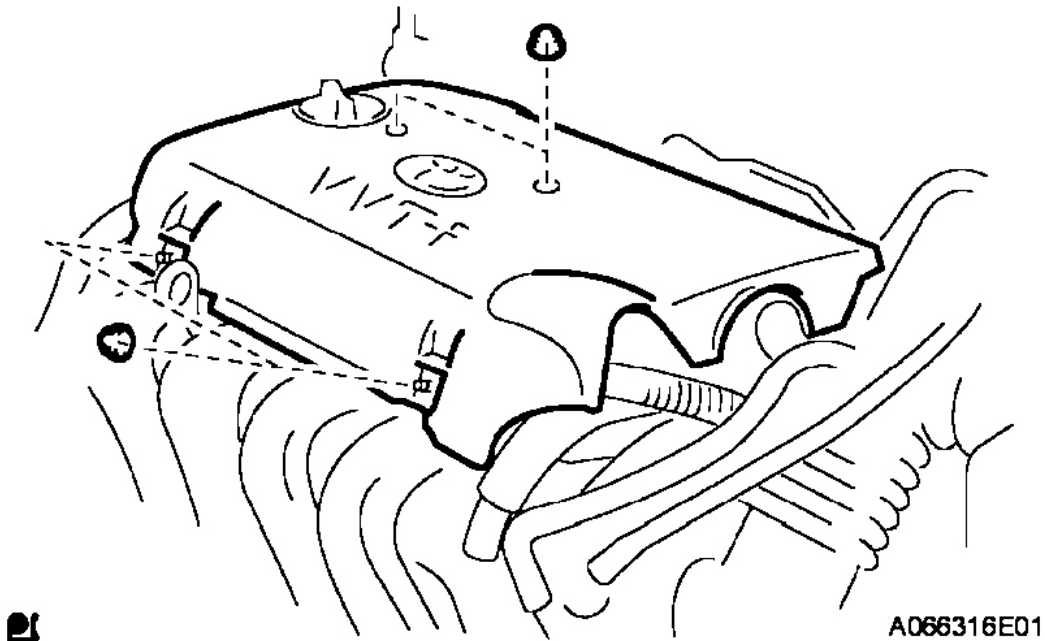


Fig. 54: Removing No 2 Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE IGNITION COIL

- a. Remove the 4 bolts and pull out the 4 ignition coils.

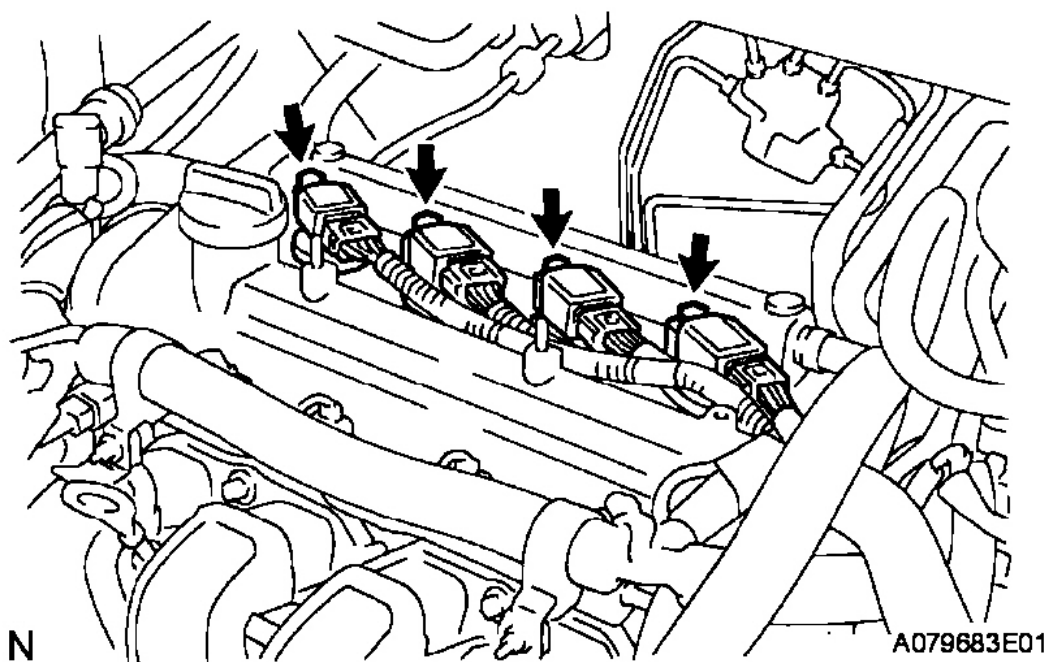


Fig. 55: Removing Ignition Coil

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

5. REMOVE VENTILATION HOSE

- a. Disconnect the ventilation hose from the cylinder head cover.

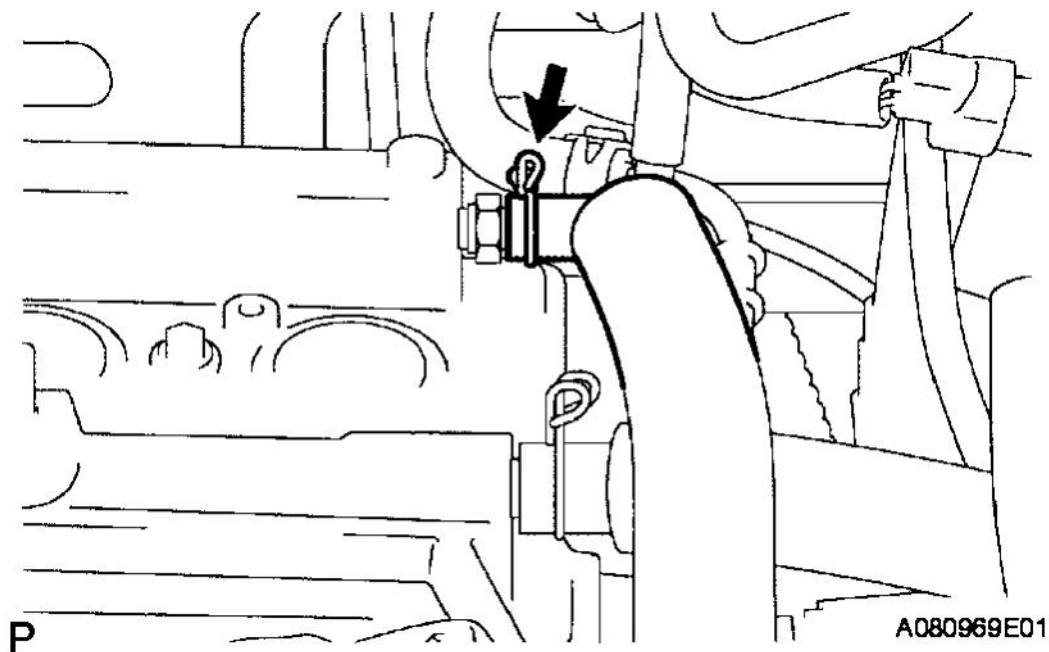


Fig. 56: Removing Ventilation Hose

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

6. REMOVE NO. 2 VENTILATION HOSE

- a. Disconnect the No. 2 ventilation hose from the cylinder head cover.

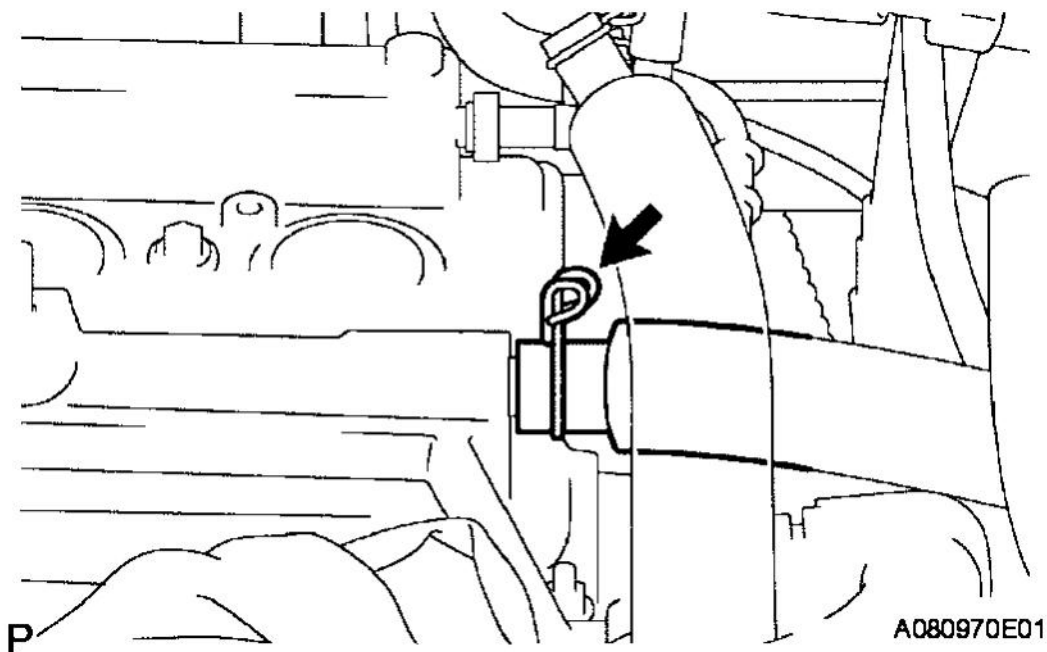


Fig. 57: Removing No 2 Ventilation Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE CYLINDER HEAD COVER

- a. Remove the 9 bolts, 2 nuts and cylinder head cover.

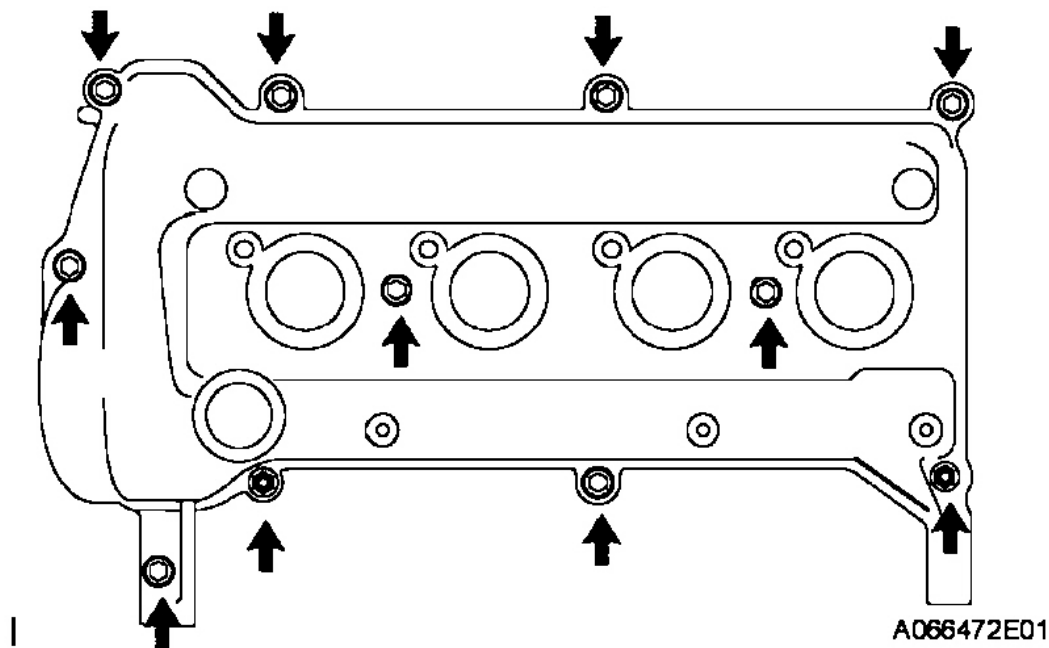


Fig. 58: Removing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE GENERATOR V BELT** (See REMOVAL)
9. **REMOVE GENERATOR** (See REMOVAL)
10. **REMOVE ENGINE UNDER COVER RH**
11. **DRAIN ENGINE OIL** (See REPLACEMENT)
12. **DRAIN ENGINE COOLANT** (See ON-VEHICLE INSPECTION)
13. **REMOVE VANE PUMP V BELT** (See REMOVAL)
14. **REMOVE WATER PUMP PULLEY** (See DISASSEMBLY)
15. **REMOVE WATER PUMP** (See DISASSEMBLY)
16. **REMOVE CRANKSHAFT PULLEY**
 - a. Set the No. 1 cylinder to the TDC/compression.
 1. Turn the crankshaft pulley until its timing notch and the timing mark 0 of the chain cover are aligned.
 2. Check that both timing marks on the camshaft timing sprocket and the camshaft timing gear are facing upward as shown in the illustration.

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

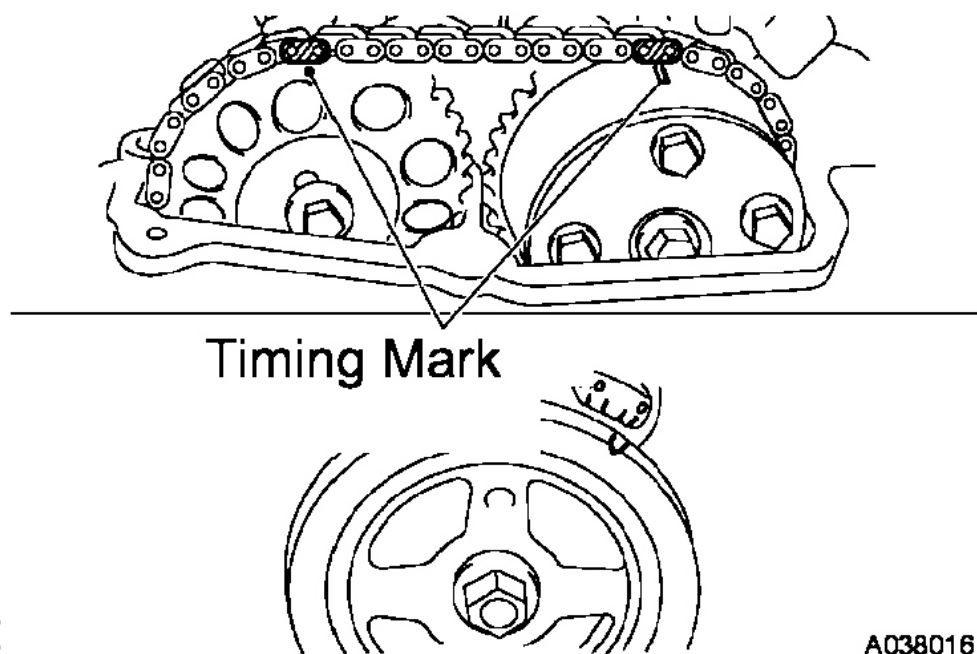
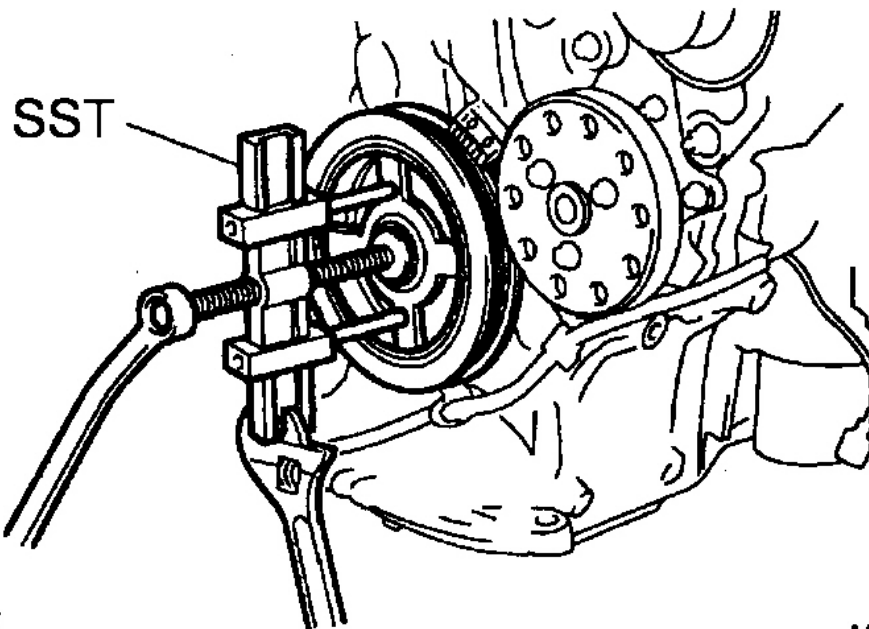
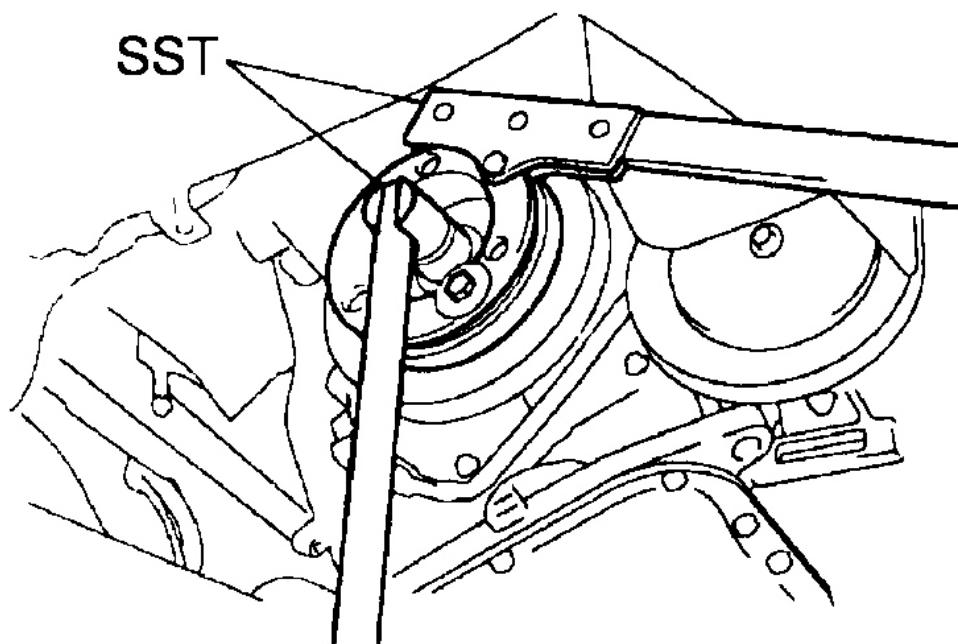


Fig. 59: Aligning Crankshaft Pulley Timing Notch And Timing Mark 0 Of Chain Cover
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the pulley bolt.



A050168E01

Fig. 60: Removing Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09213-58012 (91111-50845), 09330-00021

If necessary, remove the pulley with SST.

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

17. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- a. Disconnect the oil control valve connector.
- b. Remove the bolt, oil control valve and O-ring.

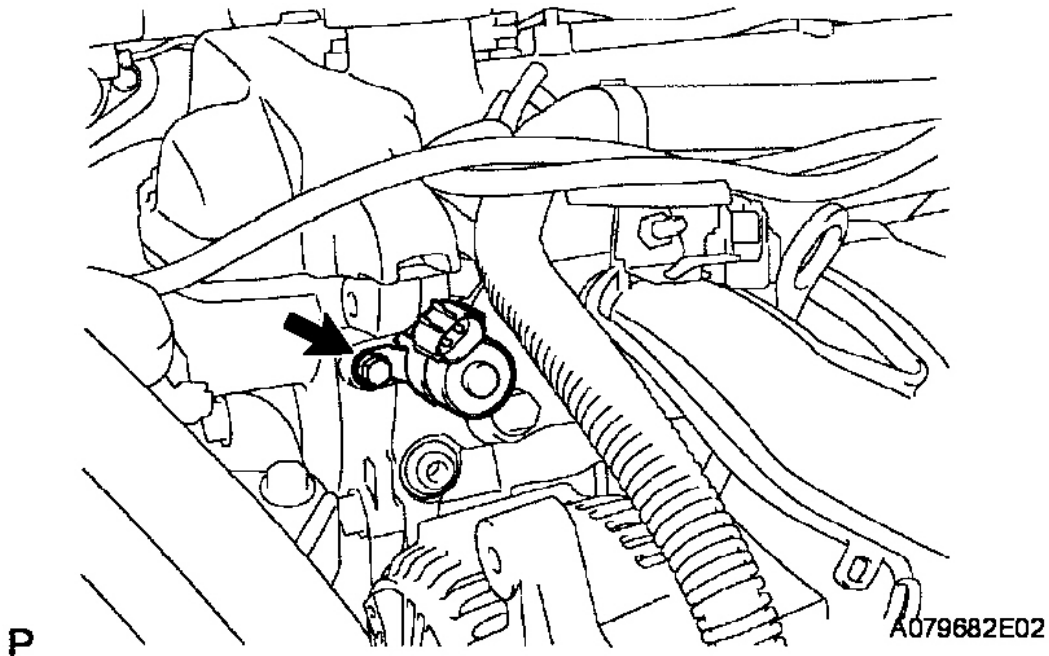
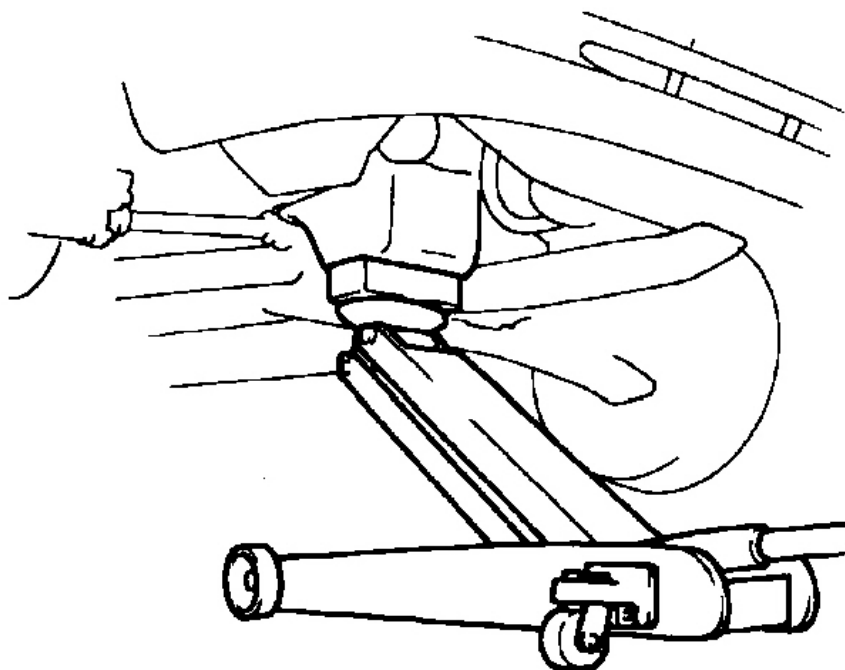


Fig. 61: Removing Camshaft Timing Oil Control Valve Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. REMOVE CRANKSHAFT POSITION SENSOR (See REMOVAL)

19. REMOVE ENGINE MOUNTING BRACKET INSULATOR RH

- a. Place a wooden block on a jack underneath the engine.



A001045E01

Fig. 62: Placing Wooden Block On A Jack Underneath Engine
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the bolt which is used to fix the liquid tube to the mounting insulator RH.
- c. Remove the 5 bolts and nut, and then remove the mounting insulator RH.

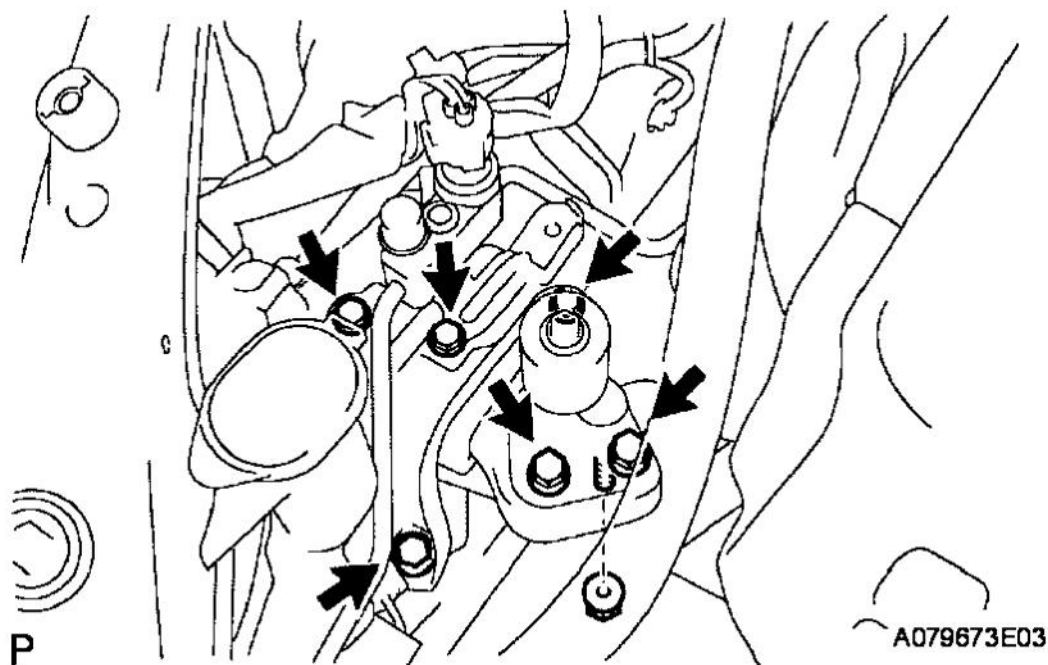


Fig. 63: Removing Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE ENGINE MOUNTING BRACKET RH

- a. Remove the 4 bolts and mounting bracket RH.

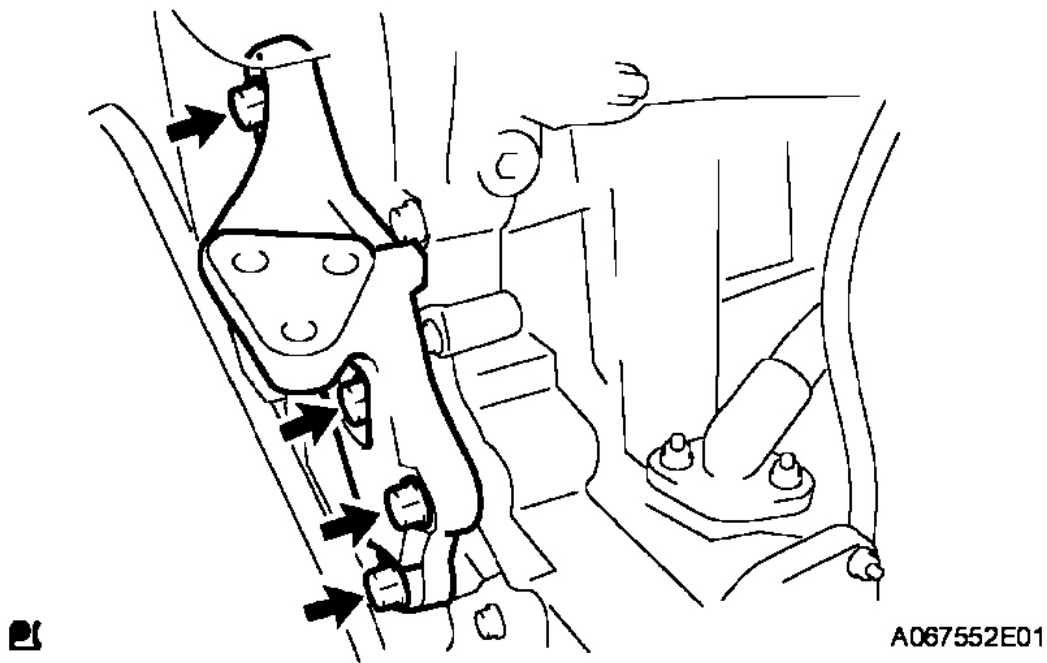


Fig. 64: Removing Engine Mounting Bracket RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE TIMING CHAIN COVER** (See DISASSEMBLY)
22. **REMOVE OIL PUMP SEAL** (See REPLACEMENT)
23. **REMOVE NO. 1 CHAIN TENSIONER**
 - a. Remove the 2 bolts and chain tensioner.

NOTE:

- Do not rotate the crankshaft with the chain tensioner removed.
- When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC and align the oil jet hole with the paint mark to prevent the pistons from coming into contact with the valves.

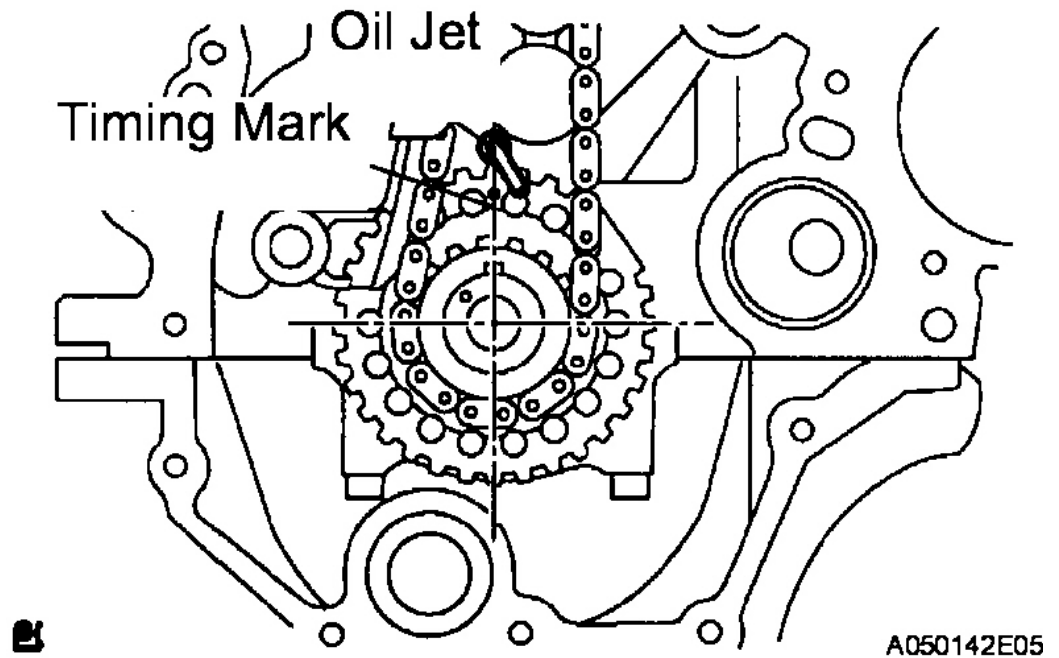


Fig. 65: Aligning Oil Jet Hole With Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **REMOVE CHAIN TENSIONER SLIPPER**
 - a. Remove the bolt and tensioner slipper.
25. **REMOVE NO. 1 CHAIN VIBRATION DAMPER**
 - a. Remove the 2 bolts and chain vibration damper.
26. **REMOVE CHAIN**

INSPECTION

1. INSPECT CHAIN

- a. Using a spring scale, pull the timing chain with a force of 140 N (14.3 kgf, 31.5 lbf) and measure the length of it.

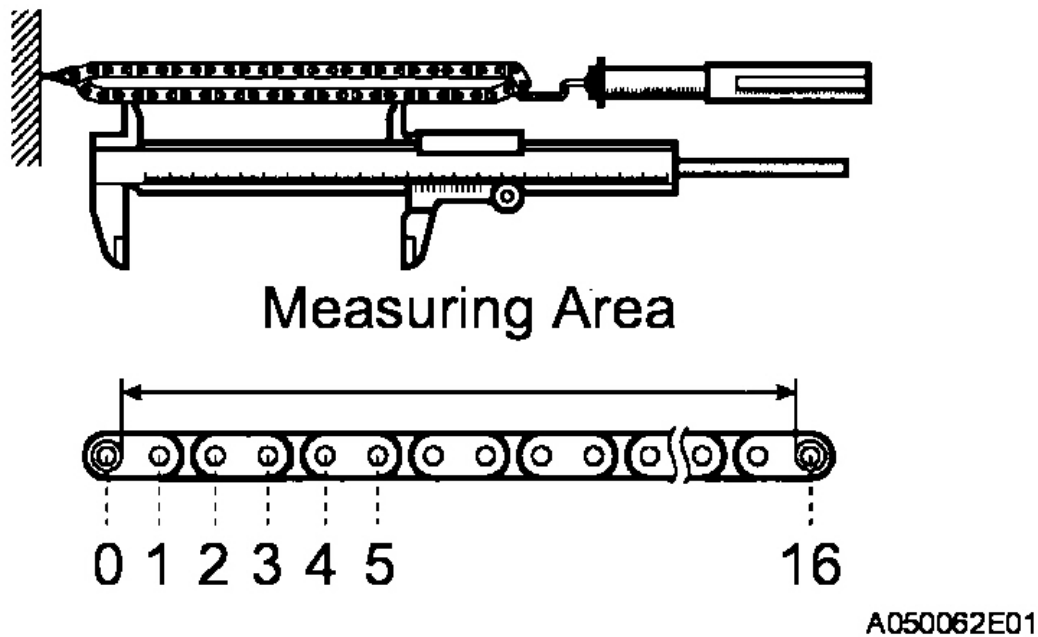


Fig. 66: Checking Timing Chain Length

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

Maximum chain elongation: 123.2 mm (4.850 in.)

If the elongation is greater than the maximum, replace the chain.

HINT:

Perform the same measurements by pulling at 3 or more random places to obtain the average length.

2. INSPECT NO. 1 CHAIN TENSIONER

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

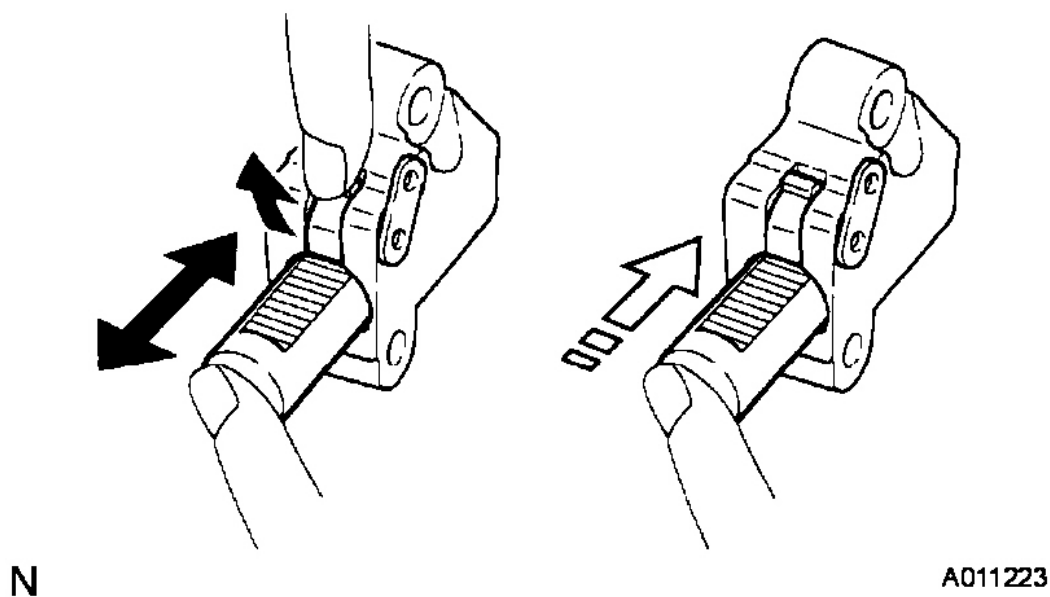
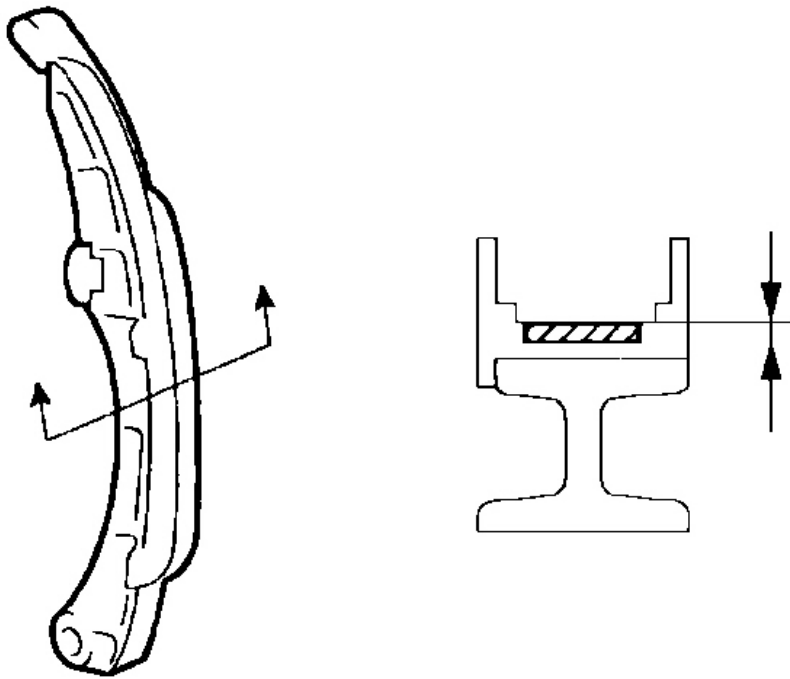


Fig. 67: Inspecting No 1 Chain Tensioner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT CHAIN TENSIONER SLIPPER

- a. Measure the chain tensioner slipper wear.



A037065E01

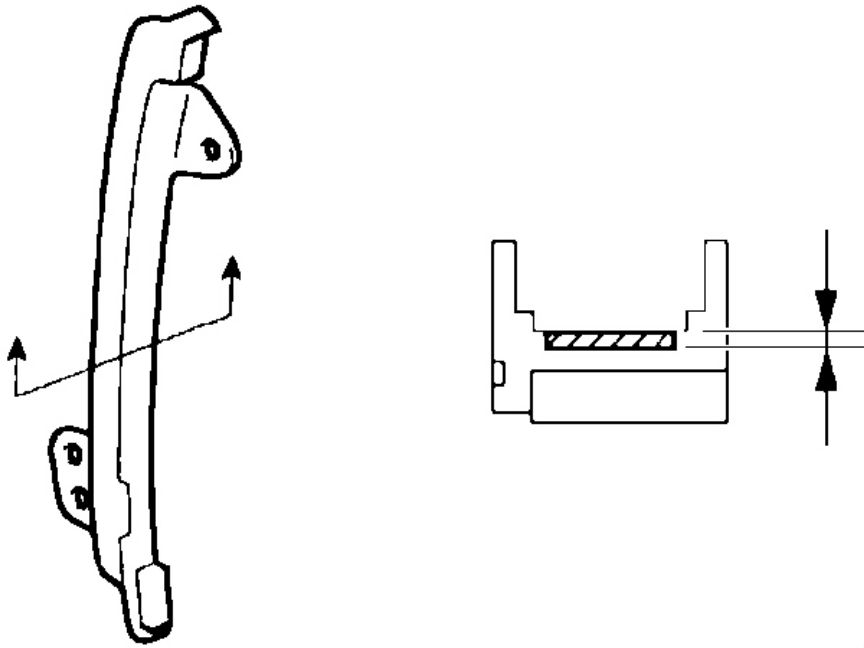
Fig. 68: Identifying Chain Tensioner Slipper Wear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear: 1.0 mm (0.039 in.)

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

4. INSPECT NO. 1 CHAIN VIBRATION DAMPER

- a. Measure the vibration damper wear.



A037066E01

Fig. 69: Identifying Vibration Damper Wear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than the maximum, replace the damper.

INSTALLATION

1. INSTALL CHAIN

- a. Set the position of the No. 1 cylinder to 20° ATDC.

NOTE: To prevent the pistons from hitting against valves, the following procedures must be performed in the order below.

1. Set the crankshaft between 40 to 140° ATDC.
 2. Set the cams of the intake and exhaust timing sprockets to 20° ATDC.
 3. Reset the crankshaft to 20° ATDC.
- b. Install the chain vibration damper with the 2 bolts.

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

- c. Align the timing mark of the camshaft timing sprocket, camshaft timing gear and crankshaft timing sprocket with each mark plate (colored in yellow) of the timing chain.

HINT:

To prevent the exhaust camshaft from springing back, turn it using a wrench and set it at the mark on the chain.

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

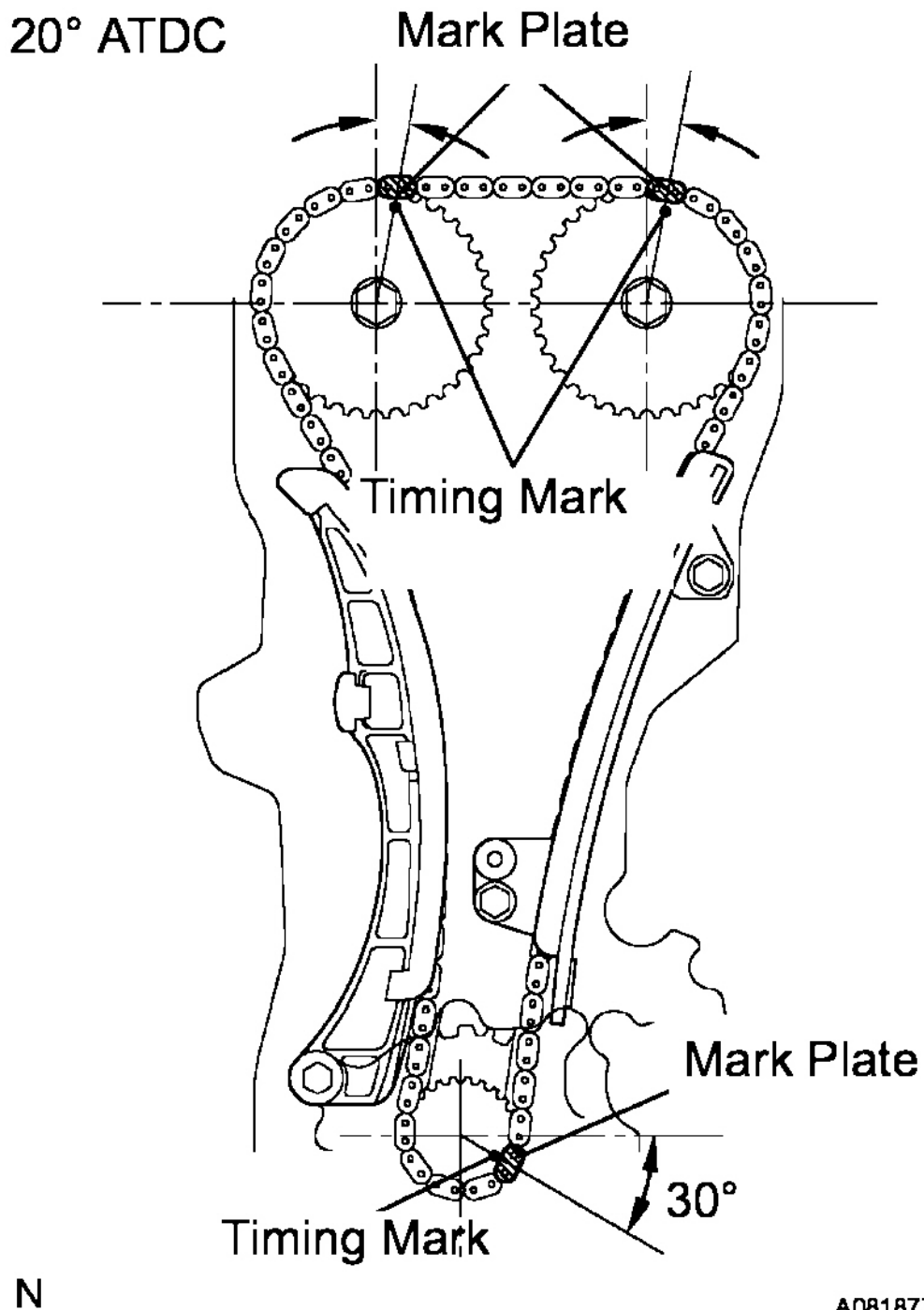


Fig. 70: Aligning Timing Mark Of Camshaft And Crankshaft Timing Sprocket With Each Mark Plate Of Timing Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- e. Install the chain tensioner with the 2 bolts.
 1. While rotating the stopper plate of the chain tensioner upward as shown in the illustration, push in the plunger of the tensioner.
 2. While rotating the stopper plate of the tensioner downward, insert a 2.5 mm (0.098 in.) diameter bar into the holes of the stopper plate and the tensioner to hold the stopper plate.
 3. Install the chain tensioner with the 2 bolts.

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

4. Remove the bar from the chain tensioner.
- f. Check the tension between the intake and exhaust camshaft timing sprockets.

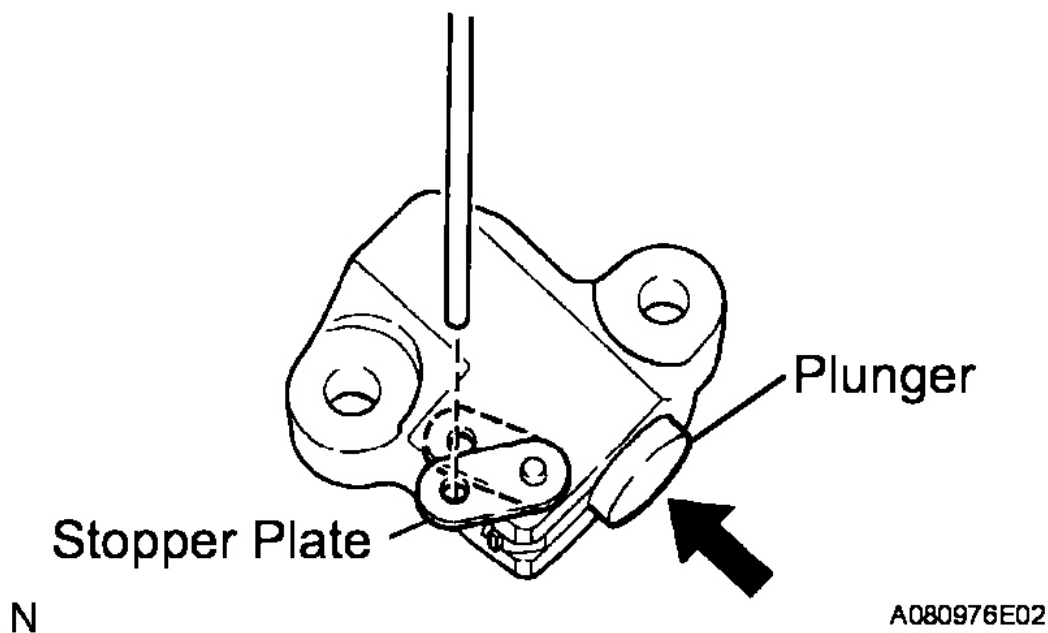


Fig. 71: Installing Chain Tensioner

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

2. **INSTALL OIL PUMP SEAL** (See REPLACEMENT)
3. **INSTALL TIMING CHAIN COVER** (See REASSEMBLY)
4. **INSTALL WATER PUMP** (See REASSEMBLY)
5. **INSTALL ENGINE MOUNTING BRACKET RH**
 - a. Install the mounting bracket RH with the 4 bolts.

Torque: 55 N*m (561 kgf*cm, 41 ft.*lbf)

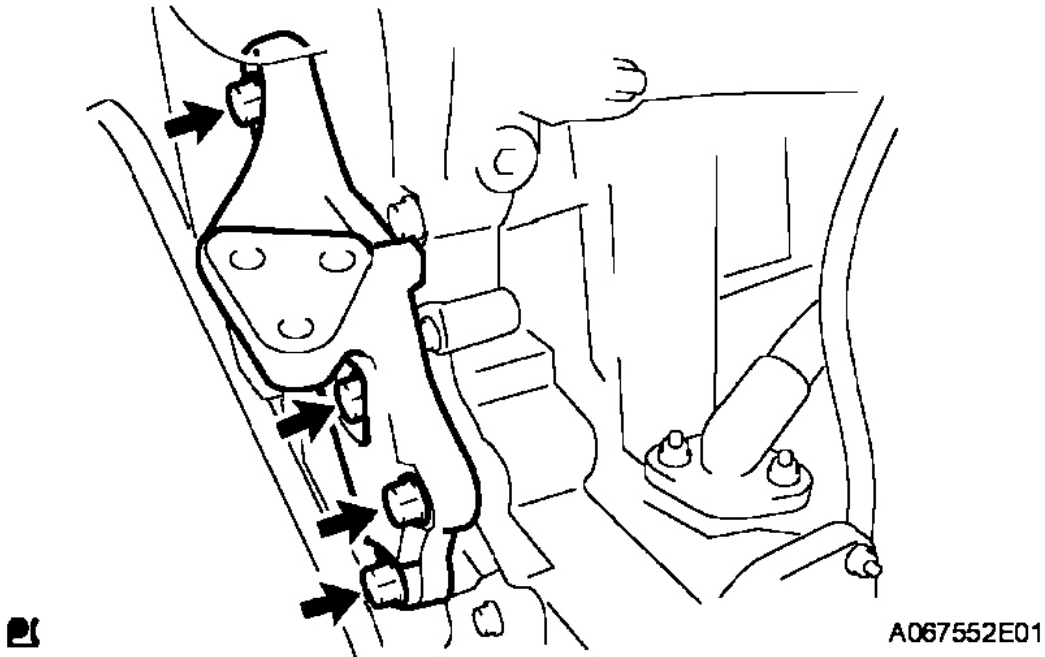


Fig. 72: Installing Engine Mounting Bracket RH
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL ENGINE MOUNTING INSULATOR RH

- a. Install the mounting insulator with the 5 bolts and nut.

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

52 N*m (530 kgf*cm, 38 ft.*lbf) for bolt B and nut

- b. Install the liquid tube with the bolt.

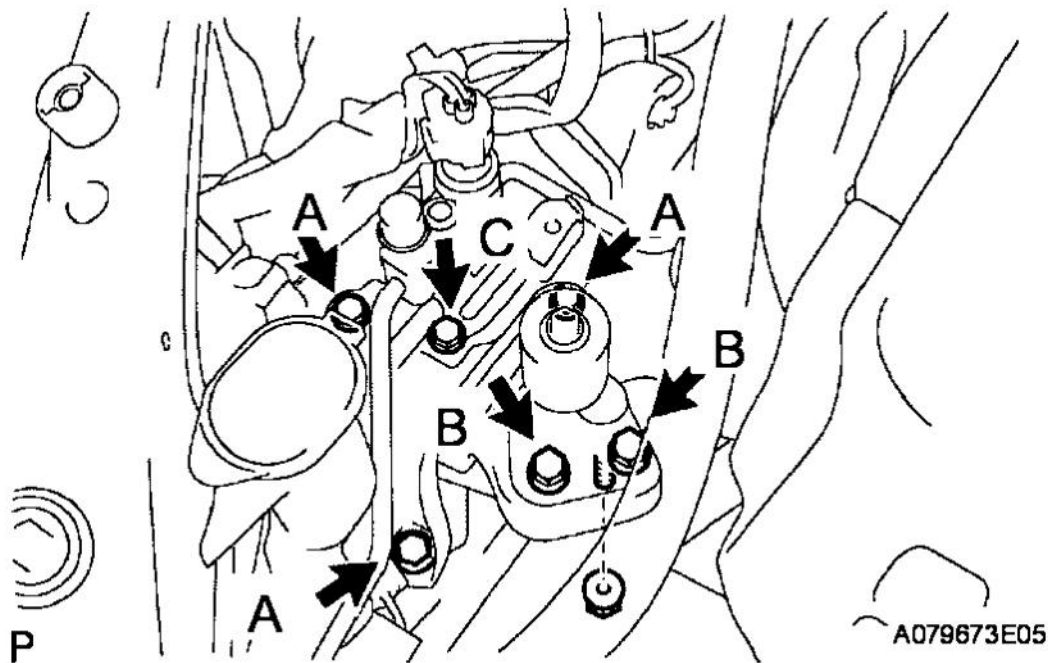


Fig. 73: Installing Engine Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 9.8 N*m (100 kgf*cm, 7 ft.*lbf) for bolt C

7. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- a. Apply a light coat of engine oil to a new O-ring, and install it onto the camshaft timing oil control valve.
- b. Install the camshaft timing oil control valve with the bolt.

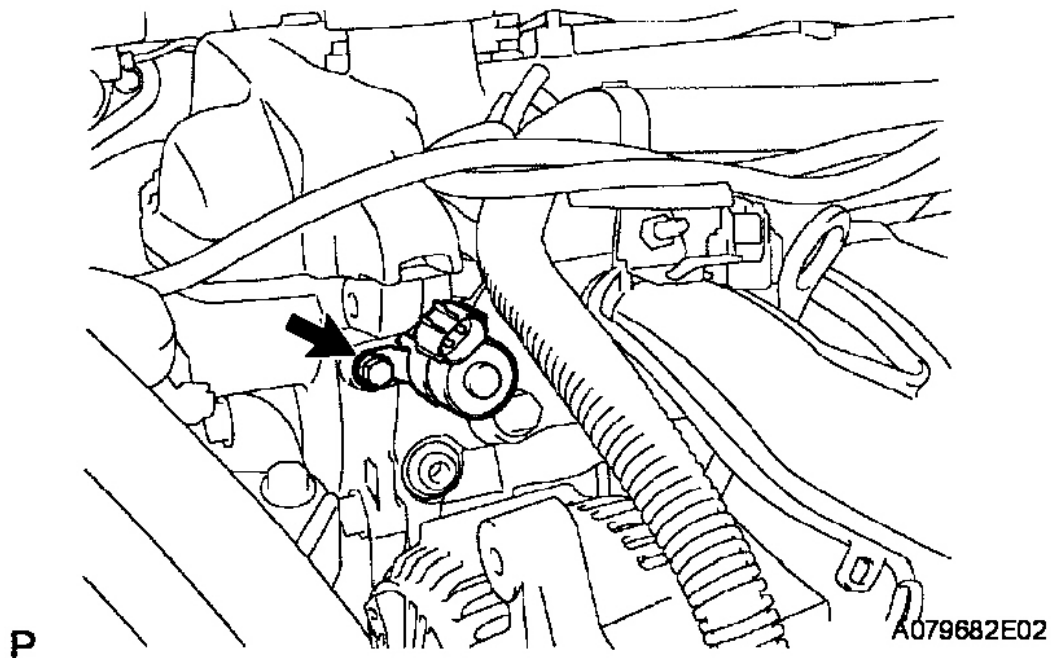


Fig. 74: Installing Camshaft Timing Oil Control Valve Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

NOTE: Be careful not to twist an O-ring.

8. **INSTALL CRANKSHAFT POSITION SENSOR (See INSTALLATION)**
9. **INSTALL WATER PUMP PULLEY (See REASSEMBLY)**
10. **INSTALL CRANKSHAFT PULLEY**
 - a. Align the pin hole of the crankshaft pulley with the pin position and install the crankshaft pulley.
 - b. Using SST, install the pulley bolt.

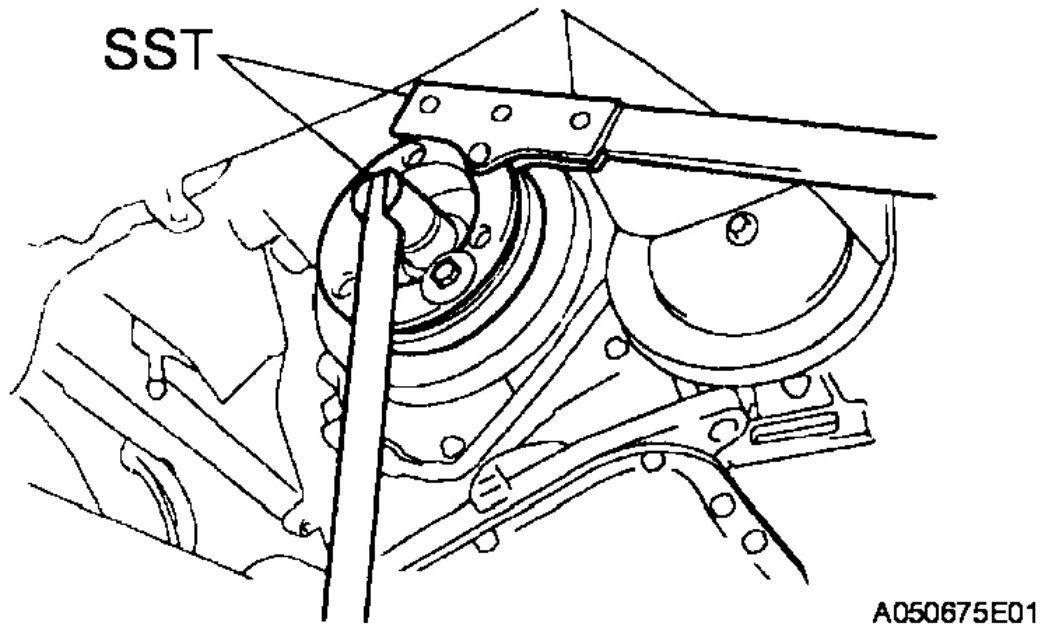


Fig. 75: Installing Crankshaft Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09330-00021, 09213-58012 (91111-50845)

Torque: 128 N*m (1,305 kgf*cm, 95 ft.*lbf)

11. INSTALL CYLINDER HEAD COVER

- a. Apply seal packing to the 2 locations shown in the illustration.

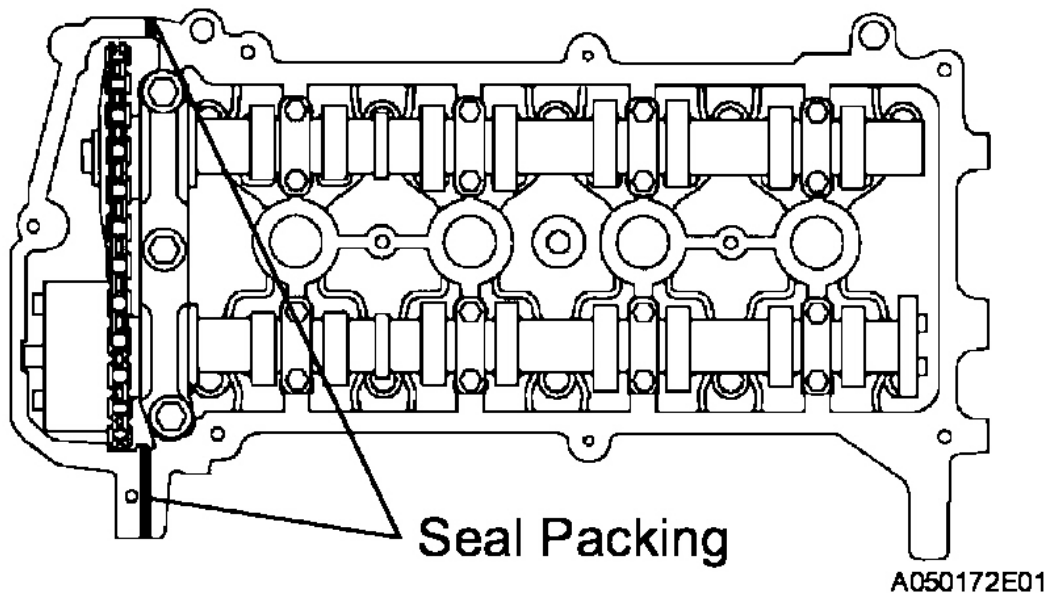


Fig. 76: Identifying Seal Packing Application Area
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00080 or equivalent

NOTE:

- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes of applying seal packing.
- Do not start the engine for at least 2 hours after installation.

- b. Install the head cover with the 9 bolts, 2 seal washers and 2 nuts.
- c. Using several steps, uniformly tighten the bolts and nuts in the sequence shown in the illustration.

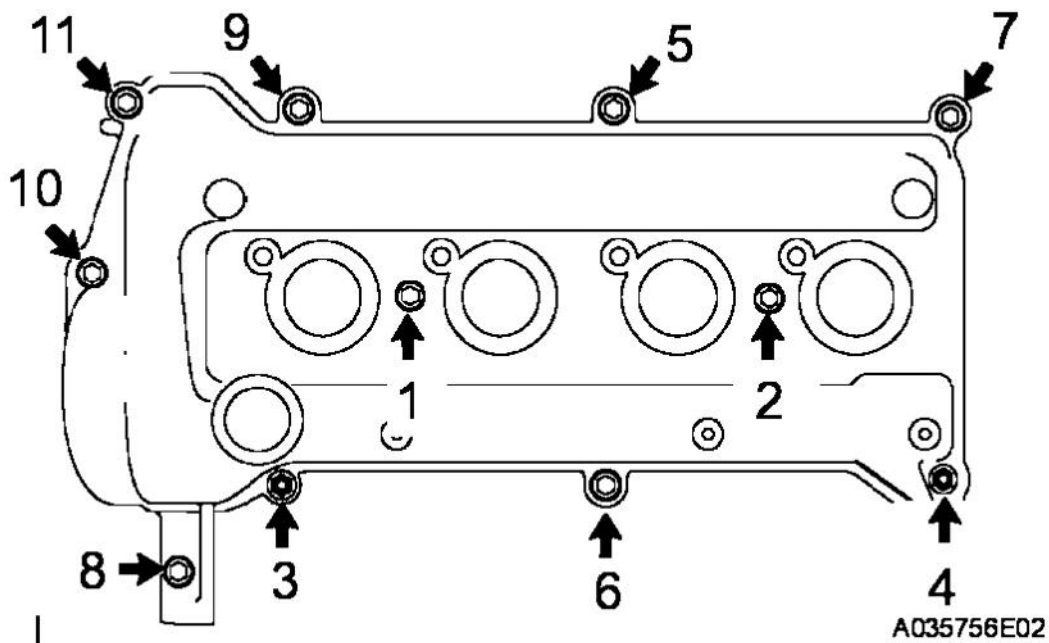


Fig. 77: Installing Head Cover

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

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

12. CONNECT NO. 2 VENTILATION HOSE

- a. Connect the No. 2 ventilation hose to the cylinder head cover.

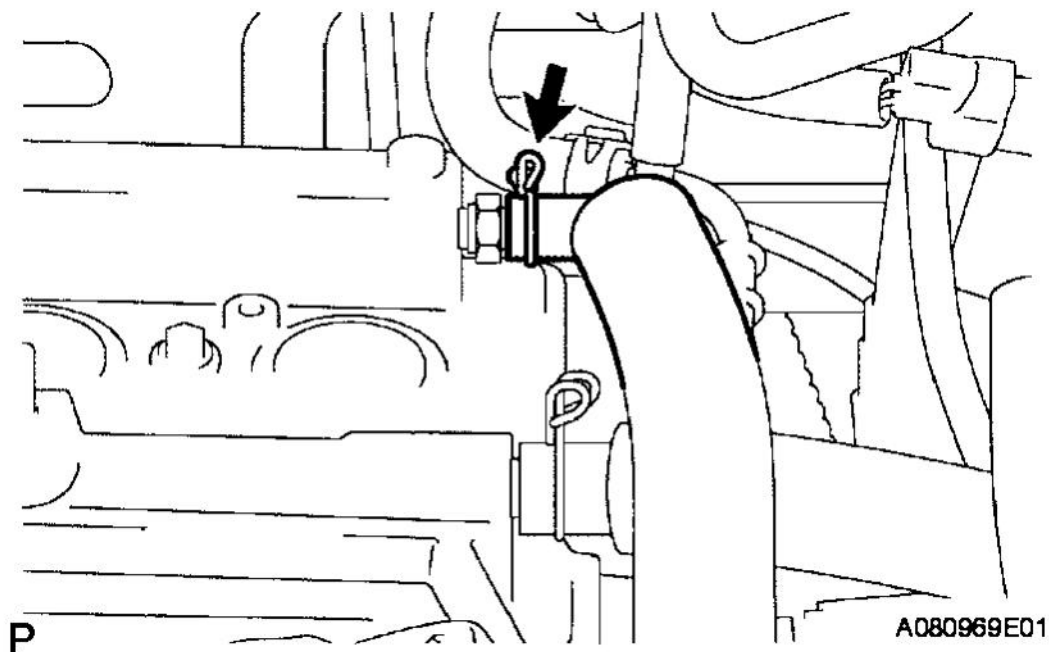


Fig. 78: Connecting No 2 Ventilation Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. CONNECT VENTILATION HOSE

- a. Connect the ventilation hose to the cylinder head cover.

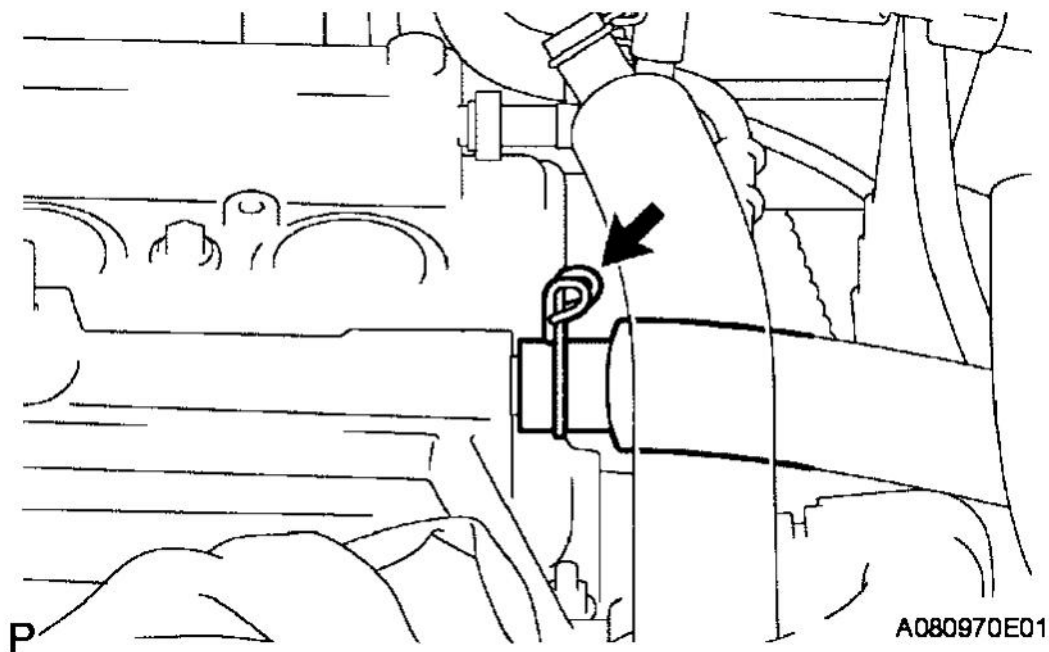


Fig. 79: Connecting Ventilation Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSTALL IGNITION COIL

- a. Install the 4 ignition coils with the 4 bolts.

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

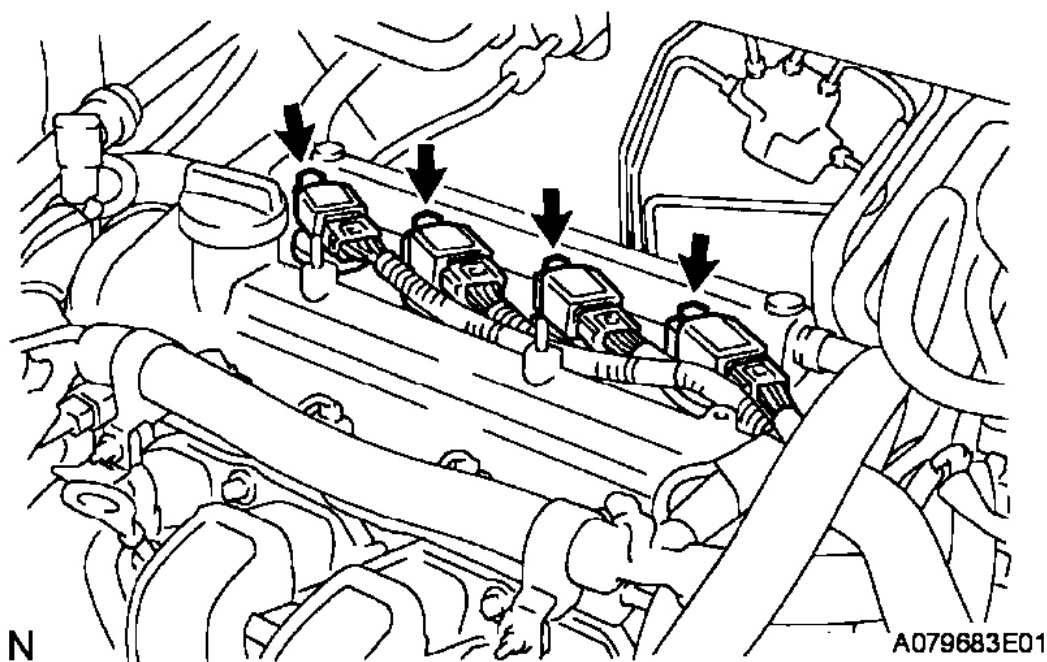


Fig. 80: Installing Ignition Coil

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

15. INSTALL NO. 2 CYLINDER HEAD COVER

- a. First tighten the nuts labeled A, and then tighten the nuts labeled B.

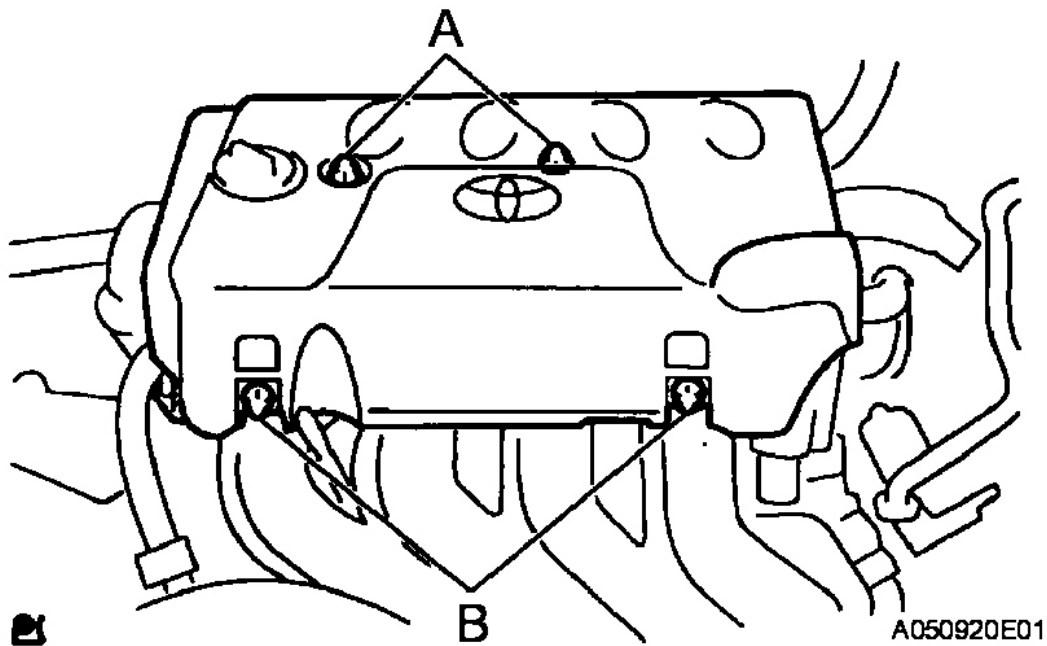


Fig. 81: Installing No 2 Cylinder Head Cover
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

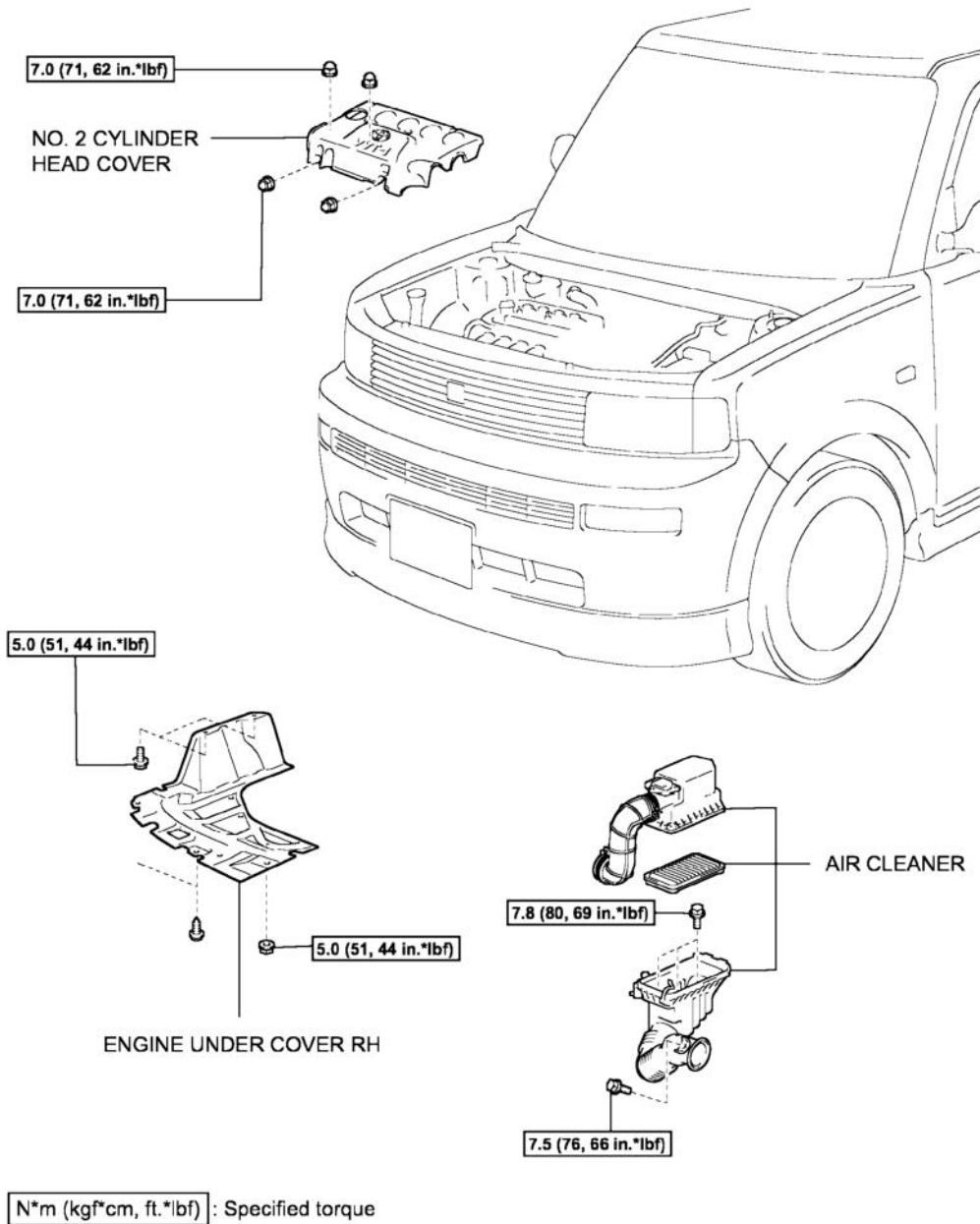
16. **INSTALL GENERATOR (See REASSEMBLY)**
17. **INSTALL VANE PUMP V BELT (See REMOVAL)**
18. **INSTALL GENERATOR V BELT (See REMOVAL)**
19. **ADJUST GENERATOR V BELT (See REMOVAL)**
20. **ADJUST VANE PUMP V BELT (See REMOVAL)**
21. **INSPECT DRIVE BELT TENSION (See ON-VEHICLE INSPECTION)**
22. **INSTALL OIL PAN DRAIN PLUG**
 - a. Install the drain plug with a new gasket.

Torque: 37.5 N*m (383 kgf*cm, 28 ft.*lbf)

23. **ADD ENGINE OIL (See REPLACEMENT)**
24. **CHECK FOR ENGINE OIL LEAKS**
25. **ADD COOLANT (See ON-VEHICLE INSPECTION)**
26. **CHECK FOR ENGINE COOLANT LEAKS (See ON-VEHICLE INSPECTION)**
27. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

CYLINDER HEAD

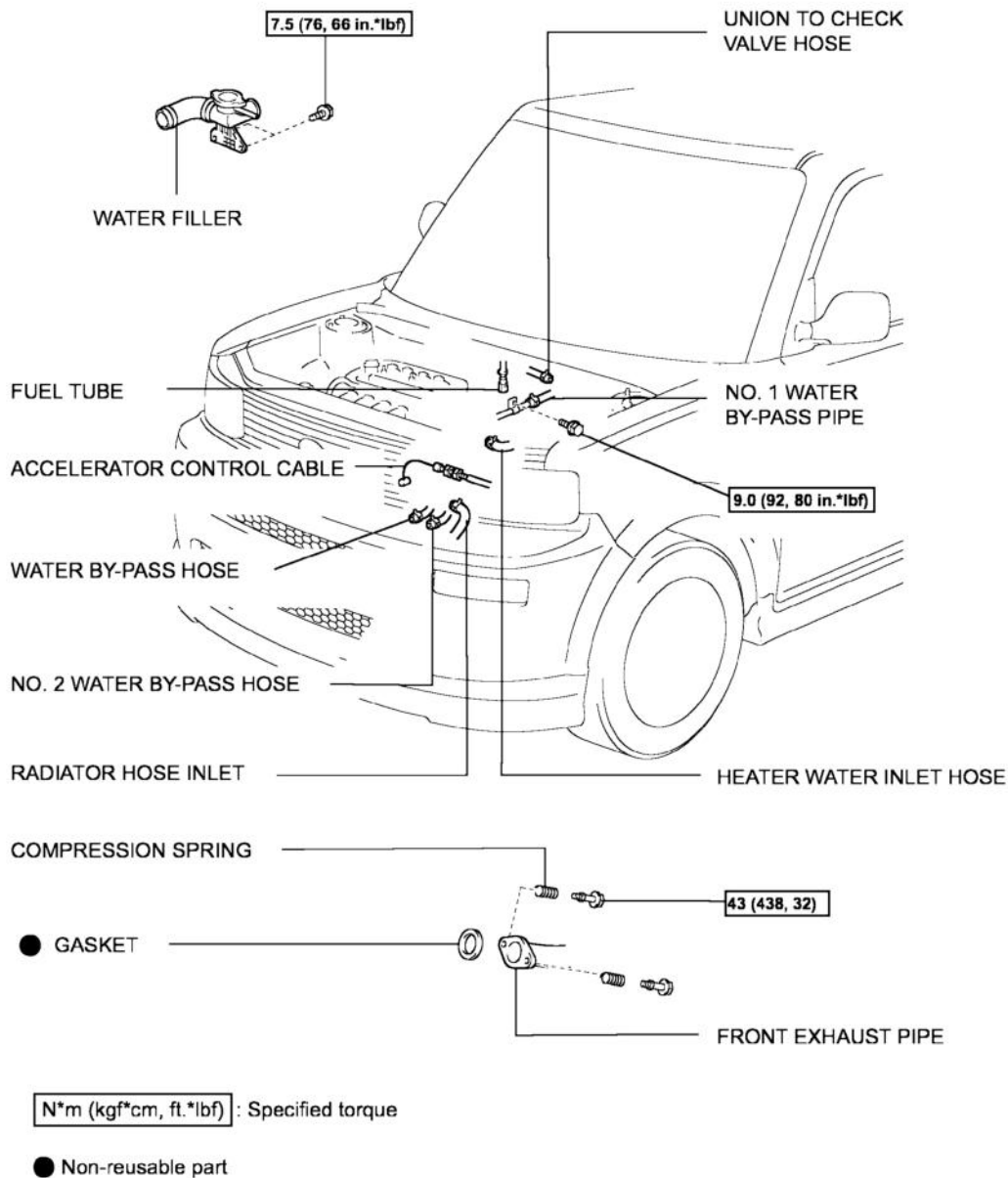
COMPONENTS



P

A120908ED1

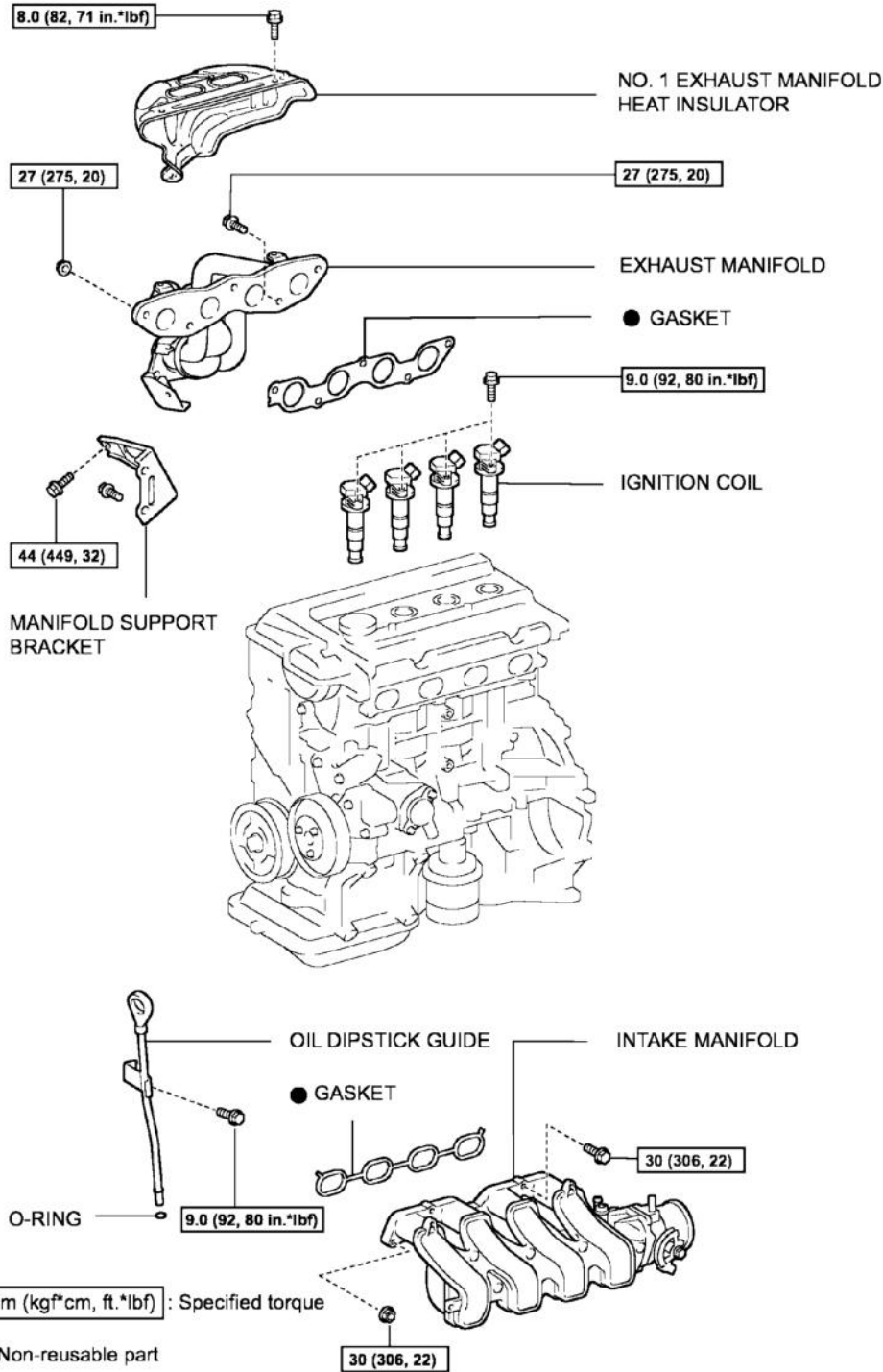
Fig. 82: Identifying Cylinder Head (1 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



P

A120809E01

Fig. 83: Identifying Cylinder Head (2 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A11B049E01

Fig. 84: Identifying Cylinder Head (3 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

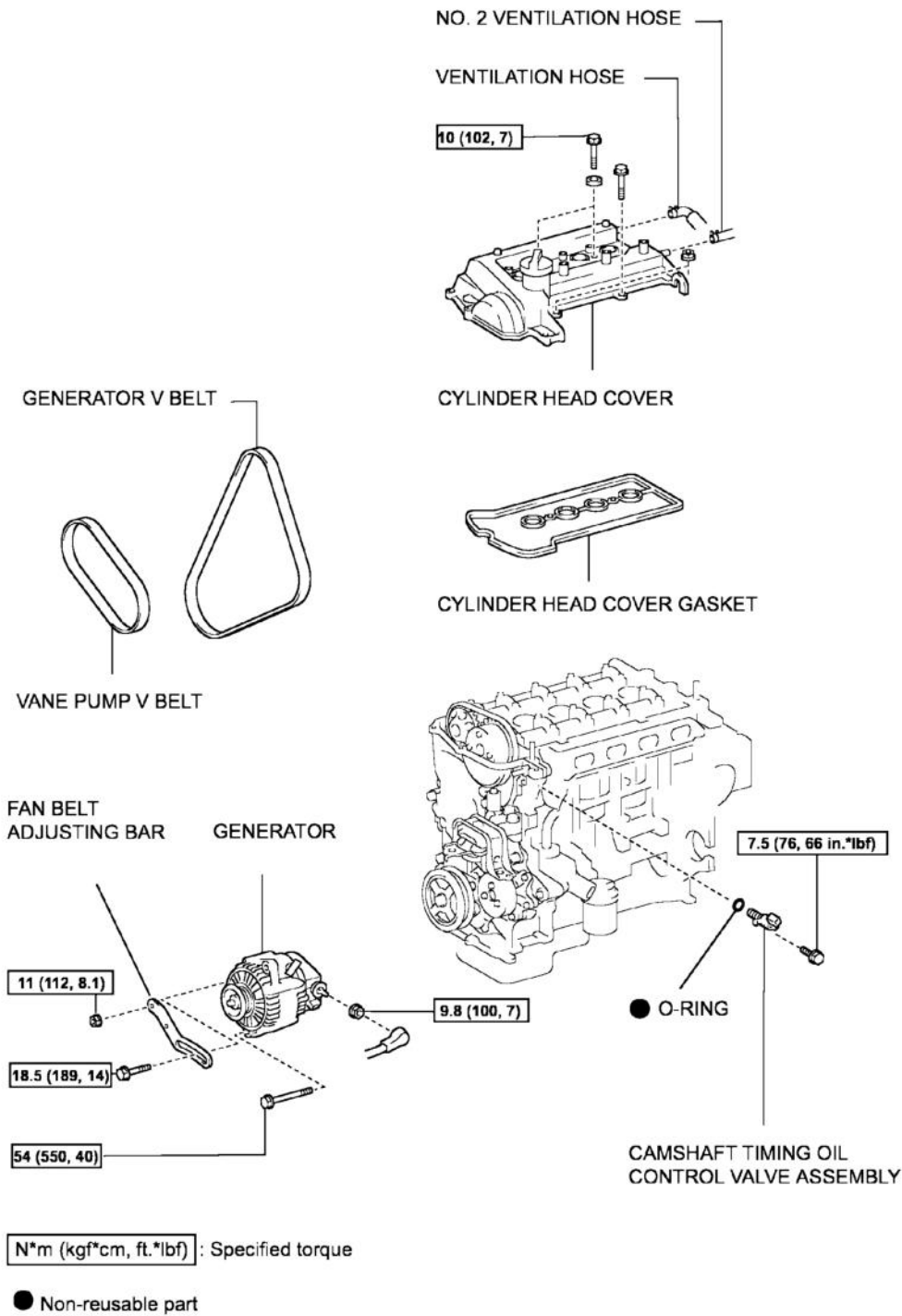


Fig. 85: Identifying Cylinder Head (4 Of 7)

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

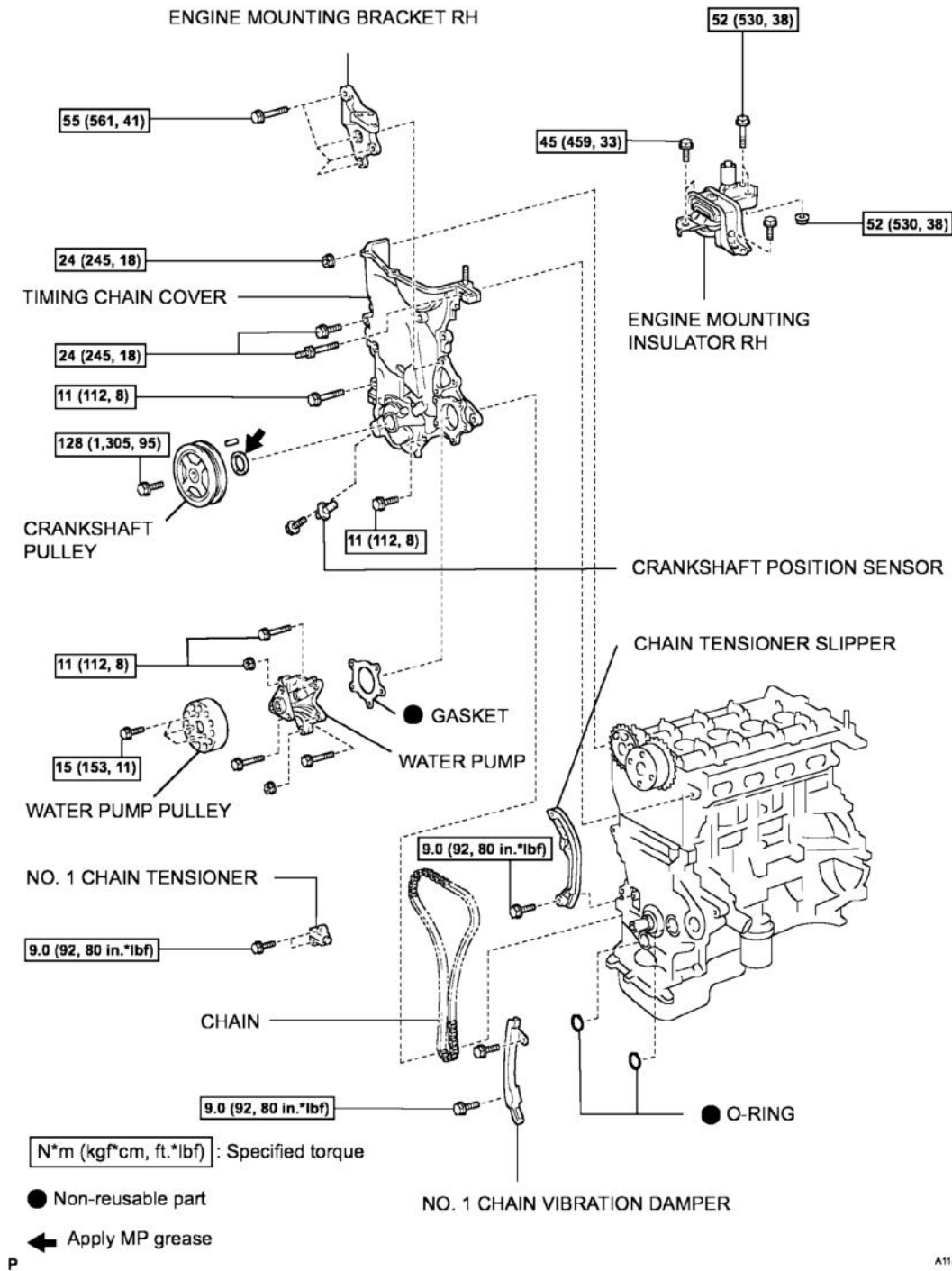
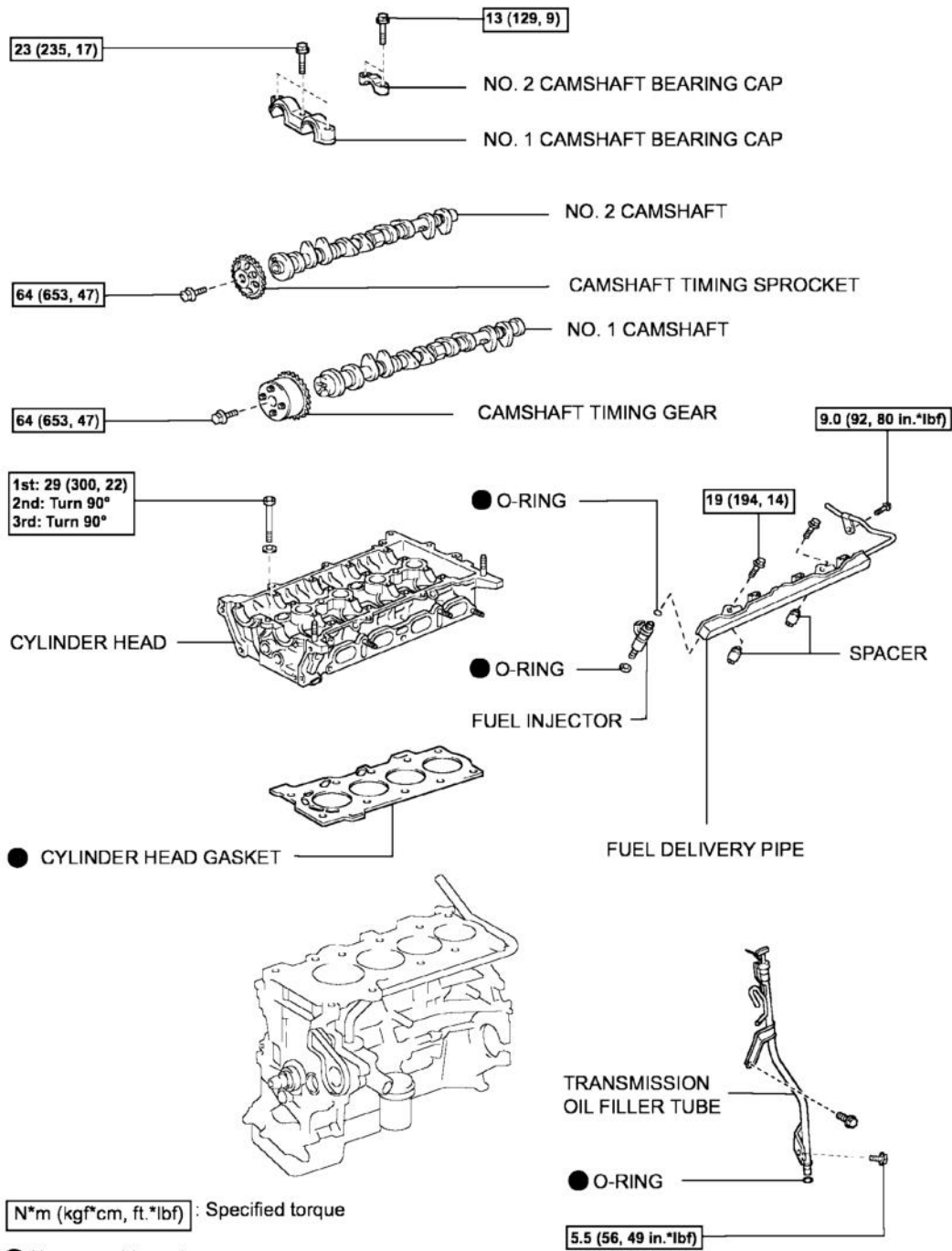


Fig. 86: Identifying Cylinder Head (5 Of 7)

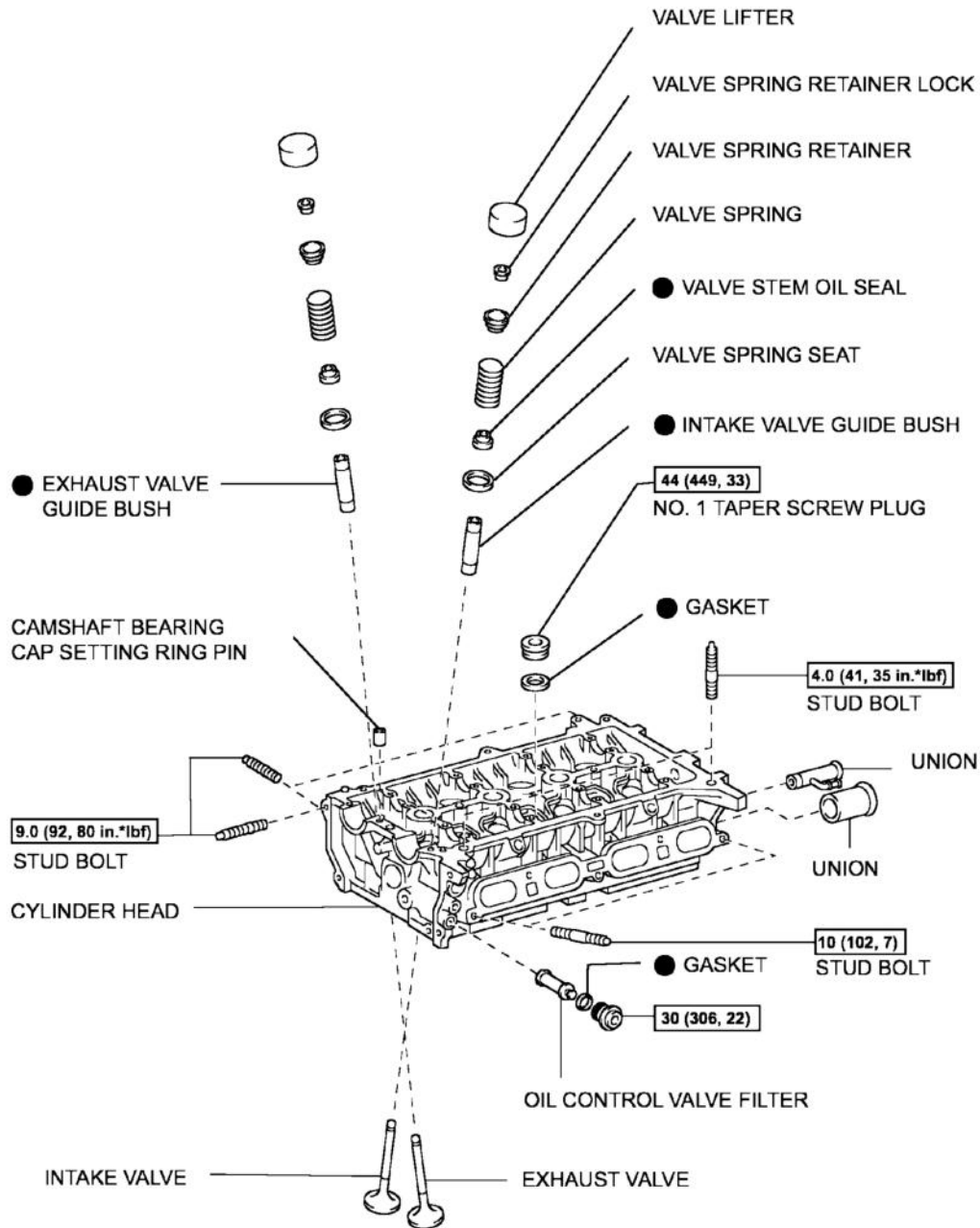
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A118057ED1

Fig. 87: Identifying Cylinder Head (6 Of 7)

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



A116722E01

Fig. 88: Identifying Cylinder Head (7 Of 7)
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 AIR CLEANER (See REMOVAL)**
4. **REMOVE NO. 2 CYLINDER HEAD COVER (See REMOVAL)**
5. **REMOVE FRONT WHEEL RH**
6. **REMOVE ENGINE UNDER COVER RH**
7. **DRAIN ENGINE OIL**
8. **DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
9. **DISCONNECT ENGINE WIRE**
10. **DISCONNECT ACCELERATOR CONTROL CABLE (See REMOVAL)**
11. **DISCONNECT FUEL TUBE (See REMOVAL)**
12. **DISCONNECT UNION TO CHECK VALVE HOSE**
 - a. Disconnect the union to check valve hose for the brake booster.
13. **DISCONNECT RADIATOR HOSE INLET**
 - a. Disconnect the radiator hose inlet from the union.

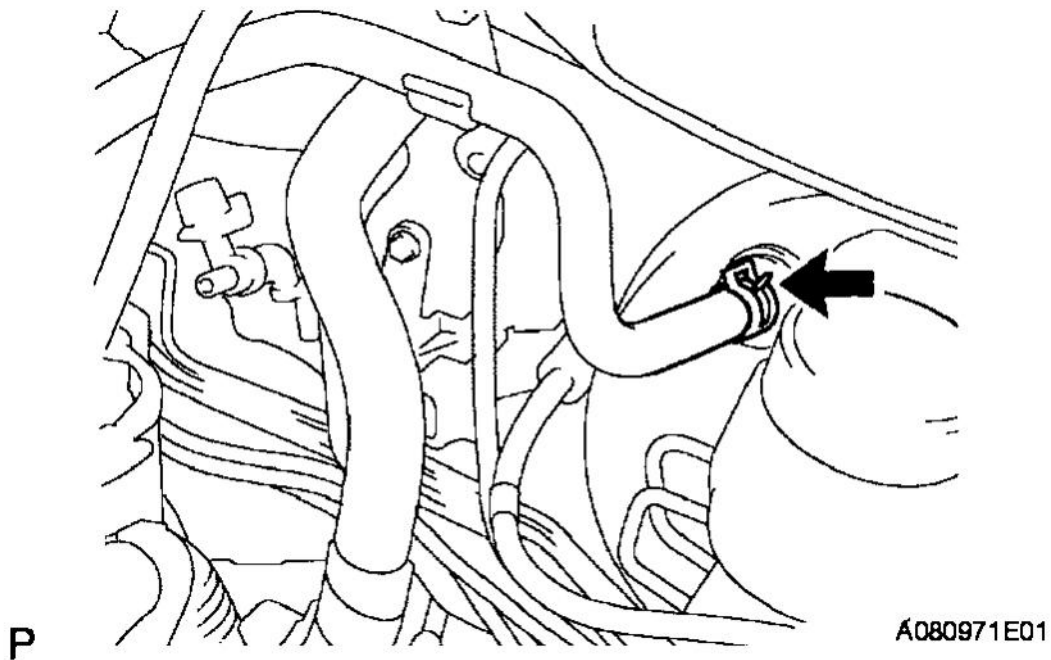


Fig. 89: Disconnecting Radiator Hose Inlet From Union
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. DISCONNECT NO. 1 WATER BYPASS PIPE

- a. Remove the bolt and disconnect the water bypass pipe.

15. DISCONNECT HEATER WATER INLET HOSE

- a. Disconnect the heater water inlet hose from the No. 2 water bypass pipe.

16. REMOVE WATER FILLER

- a. Disconnect the radiator inlet hose.
- b. Disconnect the No. 3 radiator hose.
- c. Disconnect the radiator reservoir hose.
- d. Remove the 2 bolts and water filler.

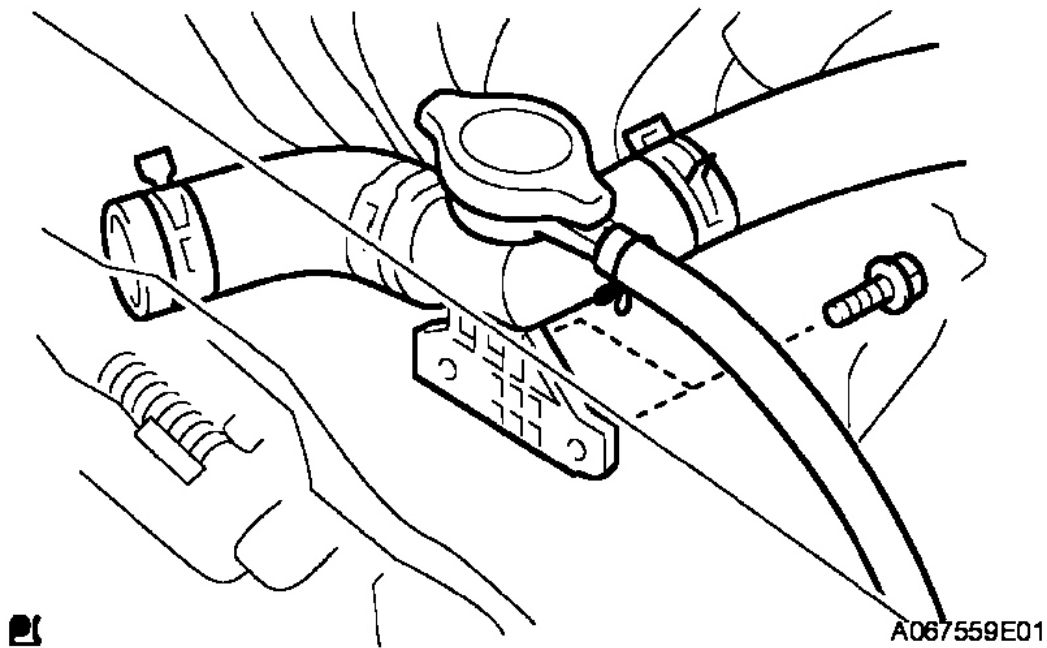


Fig. 90: Removing Water Filler

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

17. DISCONNECT FRONT EXHAUST PIPE

- a. Remove the 2 bolts and 2 compression springs which are installed on the front side of the exhaust pipe.

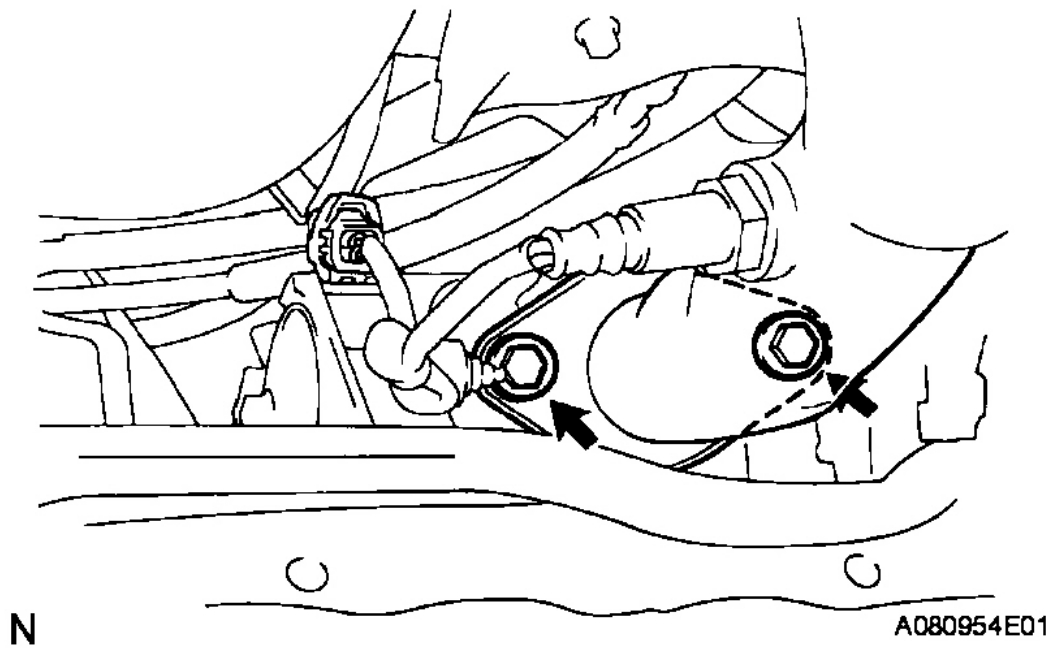


Fig. 91: Disconnecting Front Exhaust Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**
 - a. Remove the 4 bolts and exhaust manifold heat insulator.
19. **REMOVE MANIFOLD SUPPORT BRACKET**
 - a. Remove the 3 bolts and manifold support bracket.

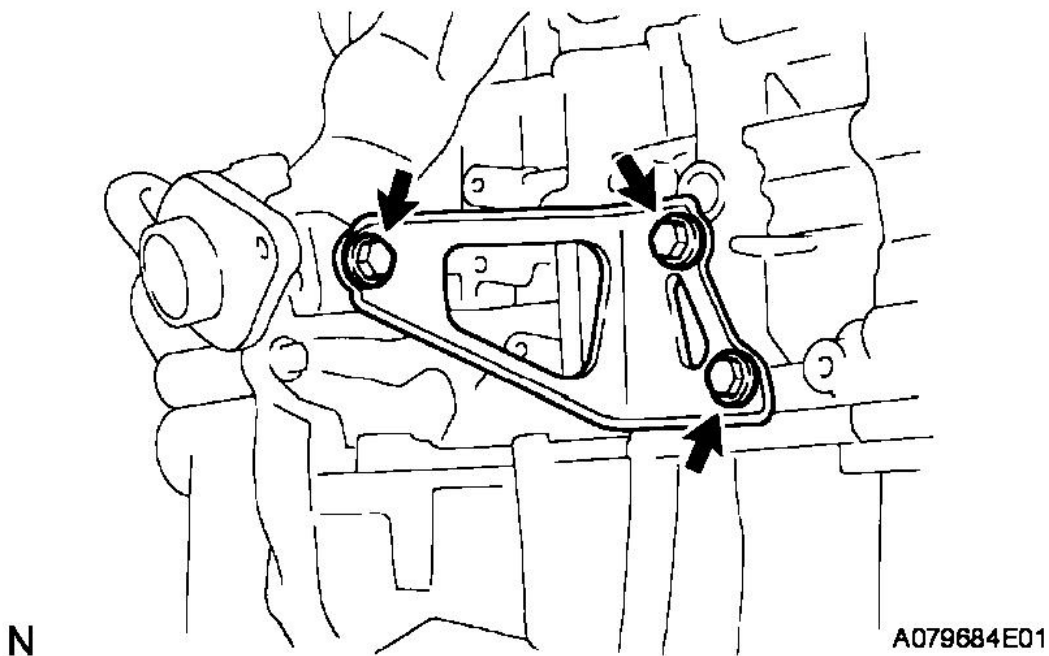


Fig. 92: Removing Manifold Support Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE EXHAUST MANIFOLD

- a. Remove the 3 bolts, 2 nuts, exhaust manifold and gasket.

21. REMOVE INTAKE MANIFOLD

- a. Using several steps, remove the 3 bolts and 2 nuts in the sequence shown in the illustration. Then remove the intake manifold.
- b. Remove the gasket from the intake manifold.

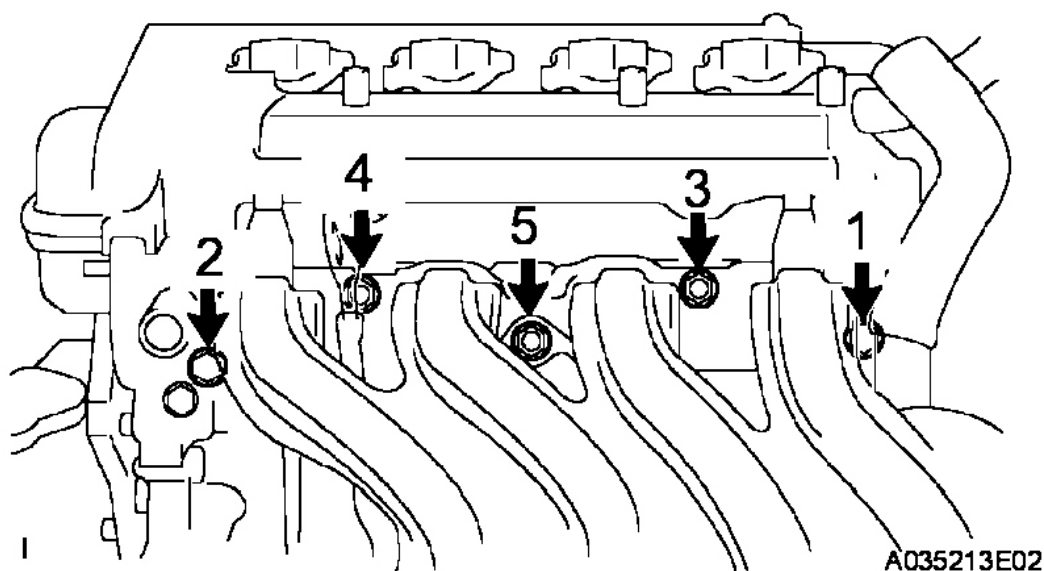


Fig. 93: Removing Intake Manifold

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

22. REMOVE OIL DIPSTICK GUIDE

- a. Remove the bolt and dipstick guide.

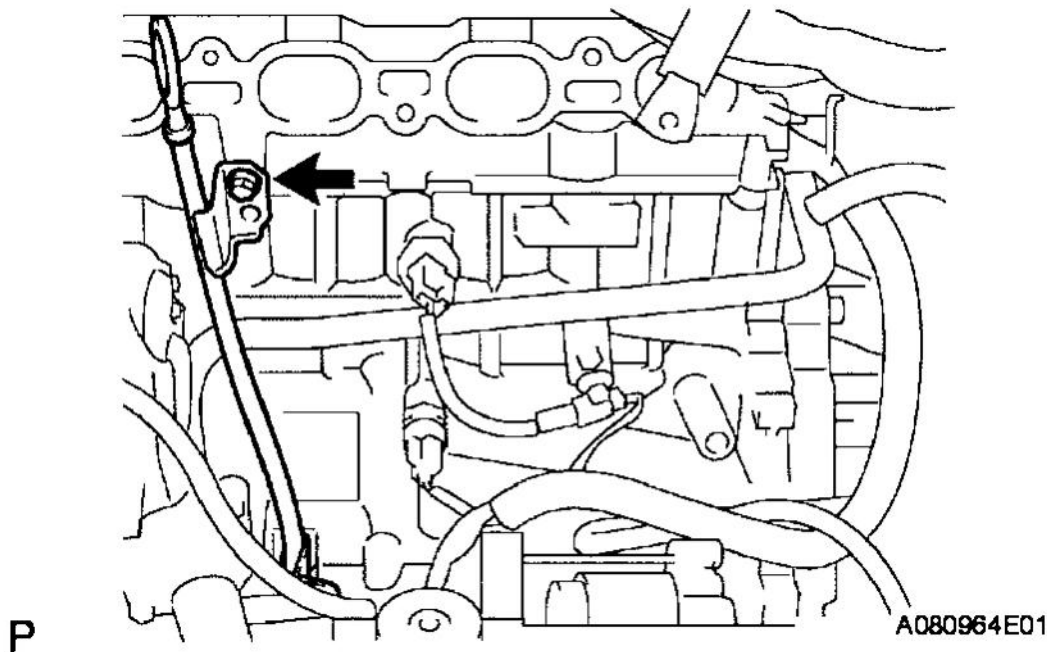
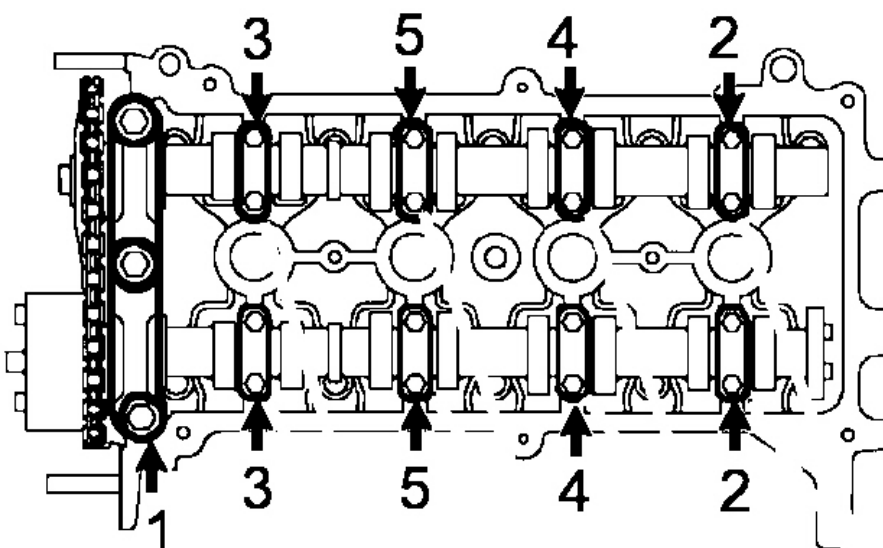


Fig. 94: Removing Oil Dipstick Guide

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

23. REMOVE IGNITION COIL (See REMOVAL)
24. REMOVE GENERATOR V BELT (See REMOVAL)
25. REMOVE VANE PUMP V BELT (See REMOVAL)
26. REMOVE GENERATOR (See REMOVAL)
27. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See REMOVAL)
28. DISCONNECT VENTILATION HOSE (See REMOVAL)
29. DISCONNECT NO. 2 VENTILATION HOSE (See REMOVAL)
30. REMOVE CYLINDER HEAD COVER (See REMOVAL)
31. REMOVE WATER PUMP PULLEY (See DISASSEMBLY)
32. REMOVE TIMING CHAIN COVER (See DISASSEMBLY)
33. REMOVE WATER PUMP (See DISASSEMBLY)
34. REMOVE CRANKSHAFT PULLEY (See REMOVAL)
35. REMOVE CRANKSHAFT POSITION SENSOR (See REMOVAL)
36. REMOVE ENGINE MOUNTING INSULATOR RH (See REMOVAL)
37. REMOVE ENGINE MOUNTING BRACKET RH (See REMOVAL)
38. REMOVE NO. 1 CHAIN TENSIONER (See REMOVAL)
39. REMOVE CHAIN TENSIONER SLIPPER (See REMOVAL)

40. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** (See REMOVAL)
41. **REMOVE CHAIN**
42. **REMOVE FUEL DELIVERY PIPE** (See DISASSEMBLY)
43. **REMOVE FUEL INJECTOR** (See DISASSEMBLY)
44. **REMOVE CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the 19 bearing cap bolts in the sequence shown in the illustration, and then remove the 9 bearing caps, and the No. 1 and No. 2 camshafts.



A035758E02

Fig. 95: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Loosen each bolt uniformly, keeping the camshaft level.

45. **REMOVE CAMSHAFT TIMING GEAR**
 - a. Turn the camshaft timing gear at the most advanced angle (see DISASSEMBLY).
 - b. Remove the flange bolt and camshaft timing gear.

NOTE:

- Be careful not to remove the other 4 bolts.
- If reusing the camshaft timing gear, unlock the lock pin inside the camshaft timing gear first.

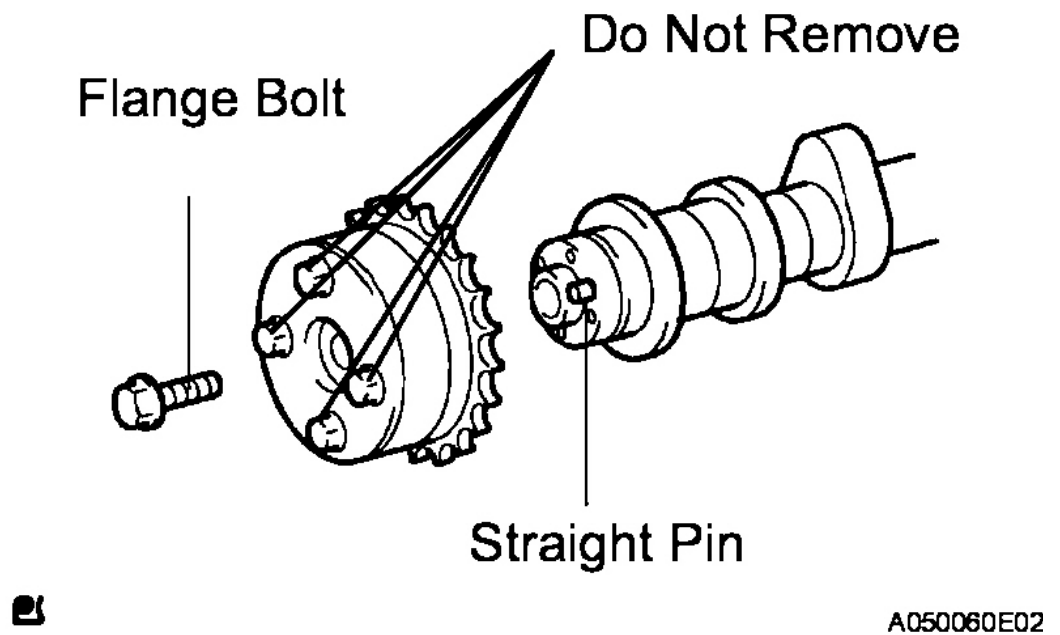


Fig. 96: Removing Flange Bolt And Camshaft Timing Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. REMOVE CAMSHAFT TIMING SPROCKET

- a. Clamp the camshaft in a vise.
- b. Remove the flange bolt and camshaft timing sprocket.

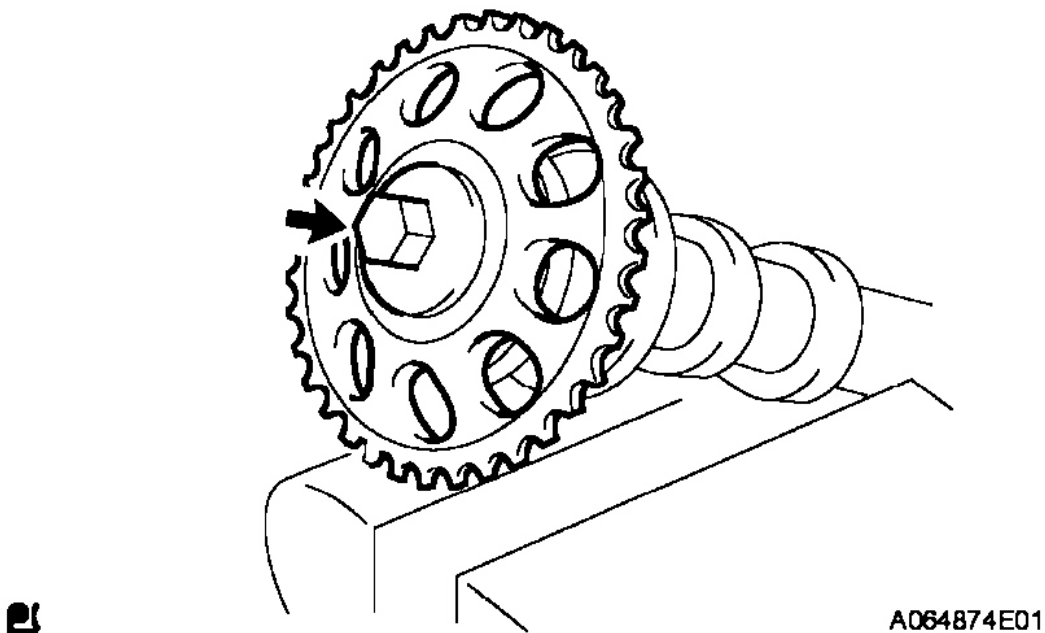


Fig. 97: Removing Flange Bolt And Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the camshaft.

47. REMOVE CYLINDER HEAD

- a. Using several steps, uniformly loosen and remove the 10 cylinder head bolts with an 8 mm bi-hexagon wrench in the sequence shown in the illustration.

Remove the 10 cylinder head bolts and plate washers.

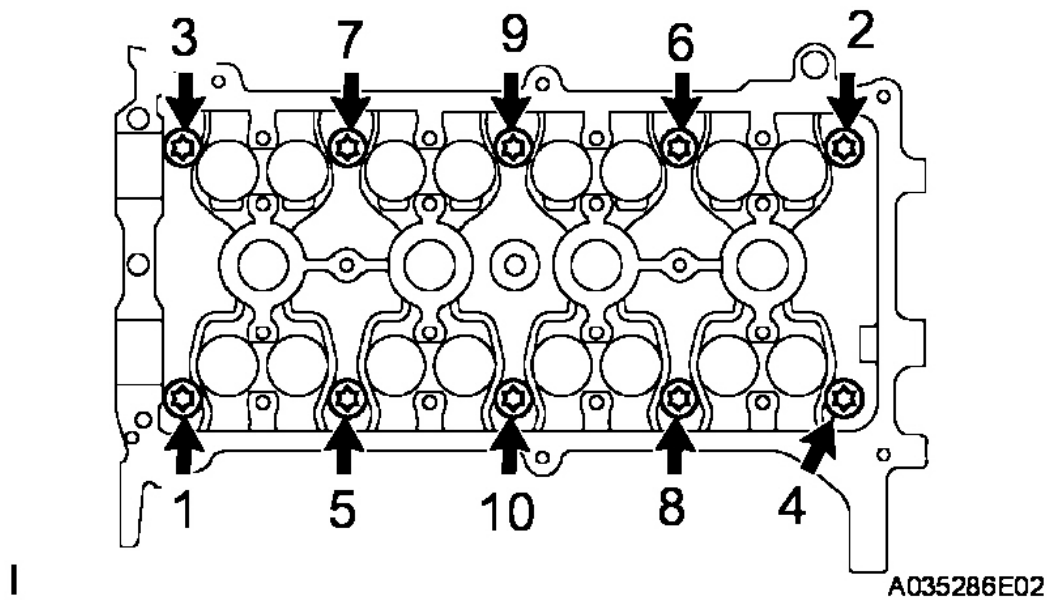


Fig. 98: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

48. REMOVE CYLINDER HEAD GASKET

DISASSEMBLY

1. REMOVE NO. 1 TAPER SCREW PLUG

- a. Using a 10 mm hexagon wrench, remove the taper screw plug and gasket.

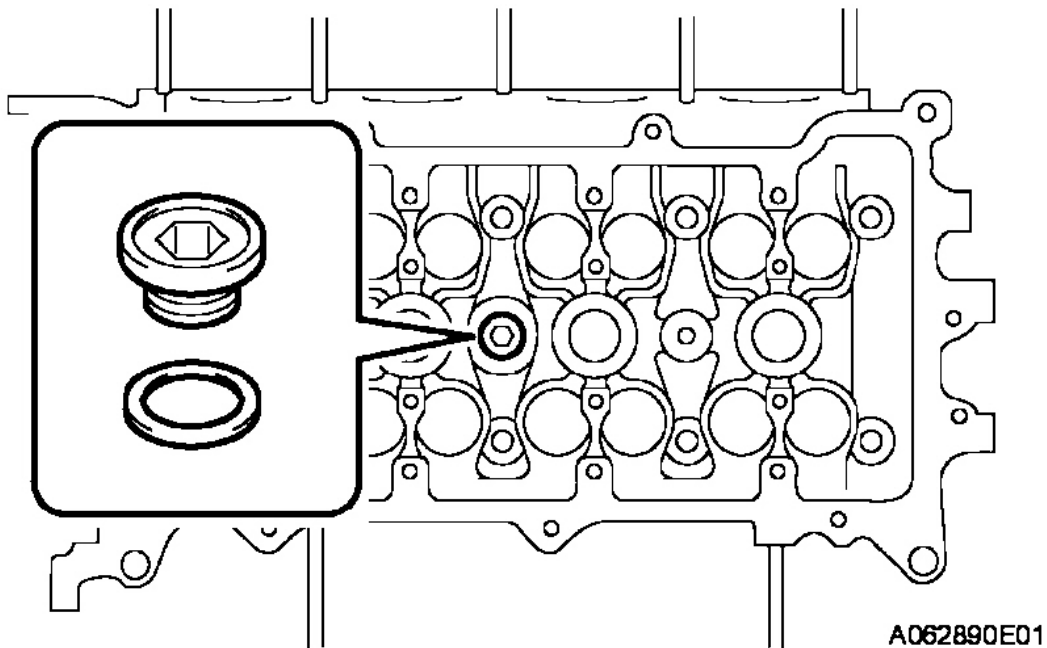


Fig. 99: Removing Taper Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

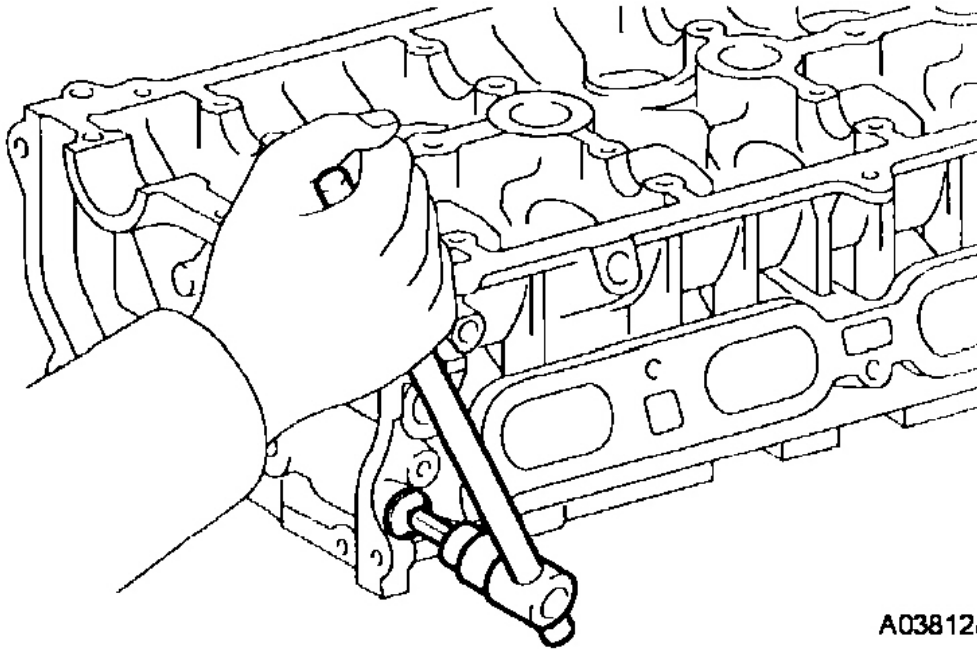
2. REMOVE VALVE LIFTER

HINT:

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

3. REMOVE OIL CONTROL VALVE FILTER

- Using an 8 mm hexagon wrench, remove the taper screw plug.
- Remove the filter and gasket.



A038128E01

Fig. 100: Removing Taper Screw Plug

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

4. REMOVE INTAKE VALVE

- a. Using SST, compress the valve spring and remove the 2 retainer locks, valve, retainer and valve spring.

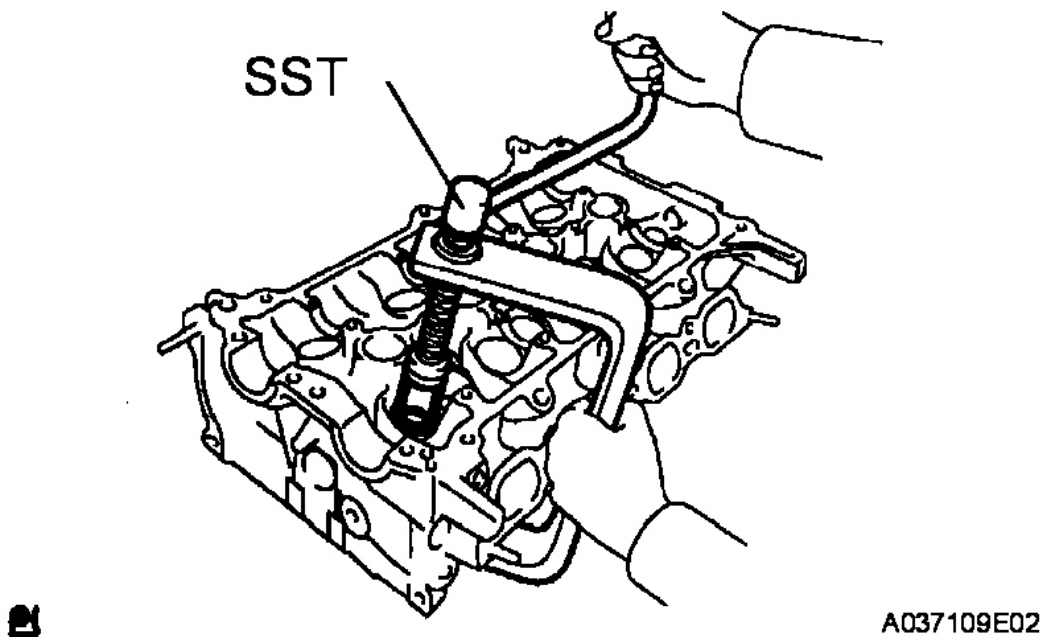


Fig. 101: Removing Retainer Locks, Valve, Retainer And Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09202-70020 (09202-00010)

HINT:

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

5. REMOVE EXHAUST VALVE

- Using SST, compress the valve spring and remove the 2 retainer locks, valve, retainer and valve spring.

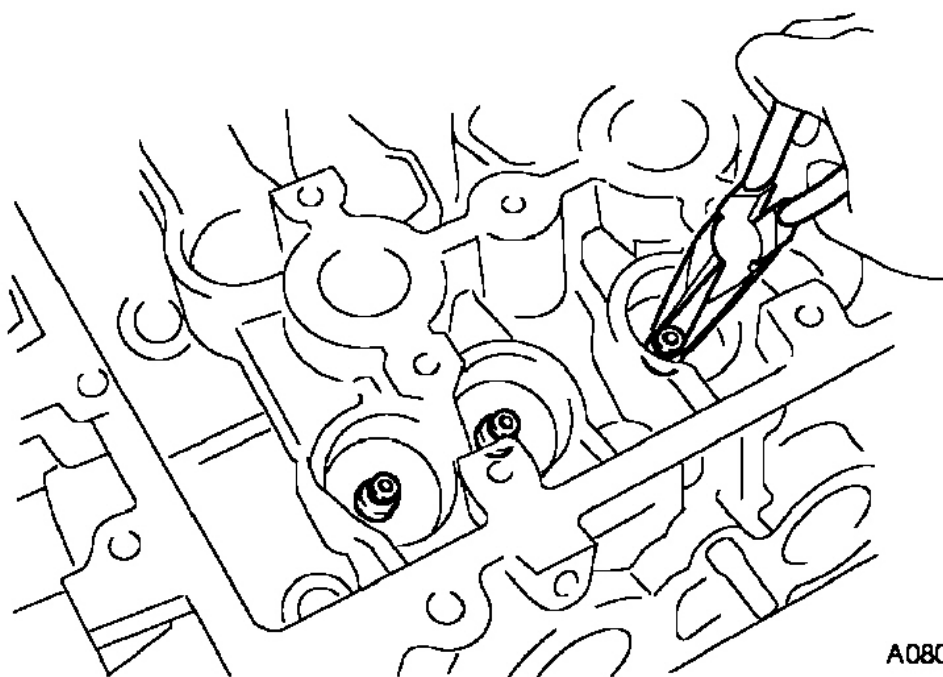
SST 09202-70020 (09202-00010)

HINT:

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

6. REMOVE VALVE STEM OIL SEAL

- Using needle-nose pliers, remove the oil seal.



A080961E01

Fig. 102: Removing Valve Stem Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE VALVE SPRING SEAT

- a. Using compressed air and a magnetic finger, remove the valve spring seat.

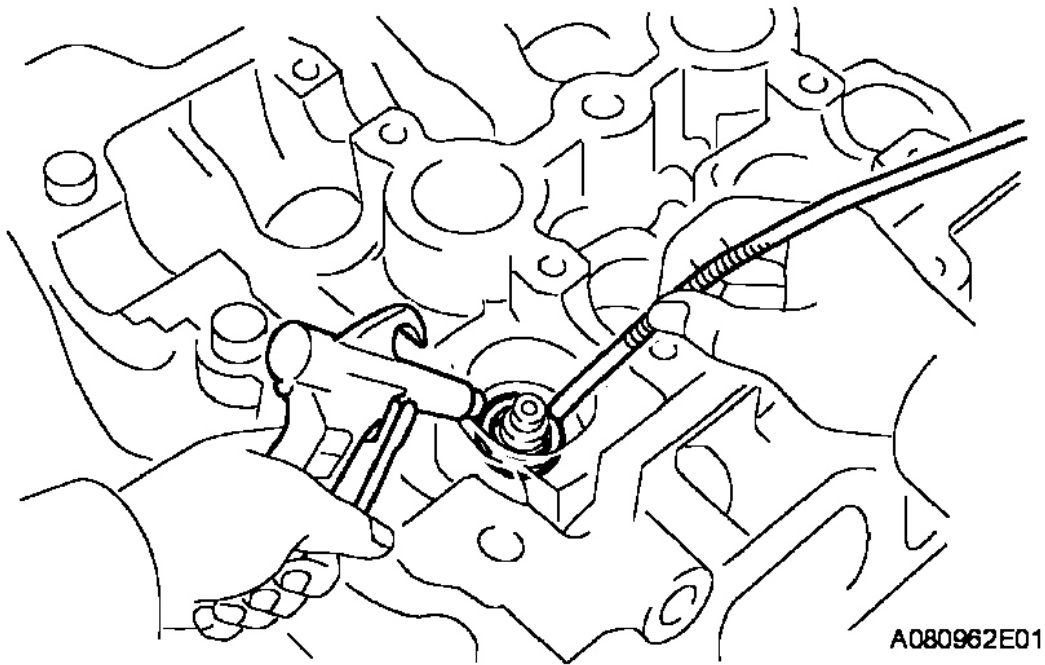


Fig. 103: Removing Valve Spring Seat

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

HINT:

Keep the valve seats in the correct order so they can be returned to the original locations when reassembling.

8. **REMOVE UNION**
9. **REMOVE STUD BOLT**
 - a. Using E5 and E7 "Torx" sockets, remove the 7 stud bolts.
10. **REMOVE CAMSHAFT BEARING CAP SETTING RING PIN**

INSPECTION

1. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage

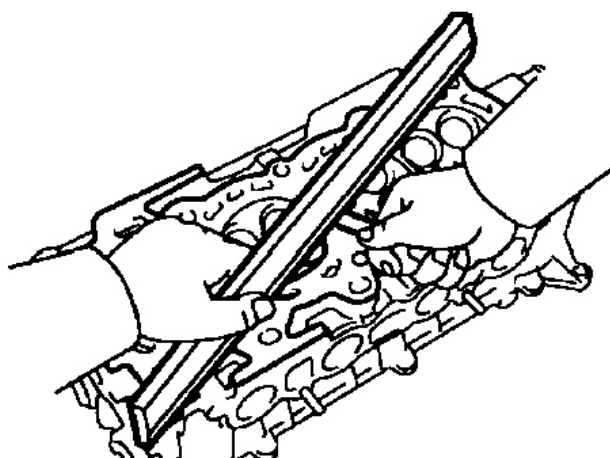
CYLINDER HEAD WARPAGE SPECIFICATION

--	--

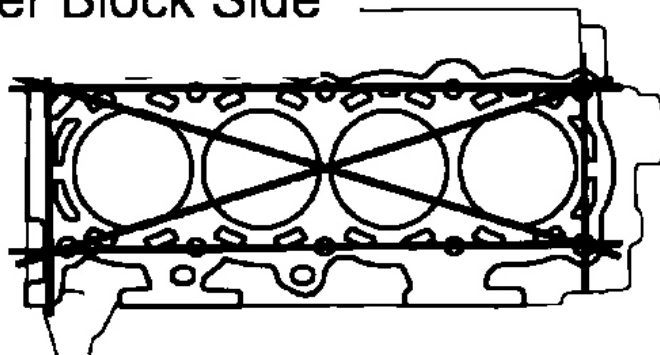
2006 Scion xB

2006 ENGINE Engine Mechanical (1NZ-FE) - xB

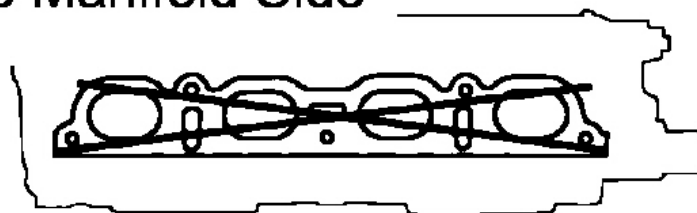
Surface	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.10 mm (0.0039 in.)
Exhaust manifold side	0.10 mm (0.0039 in.)



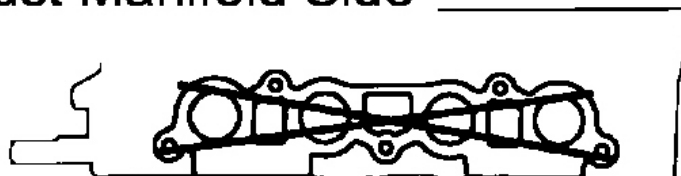
Cylinder Block Side



Intake Manifold Side



Exhaust Manifold Side



A050931E01

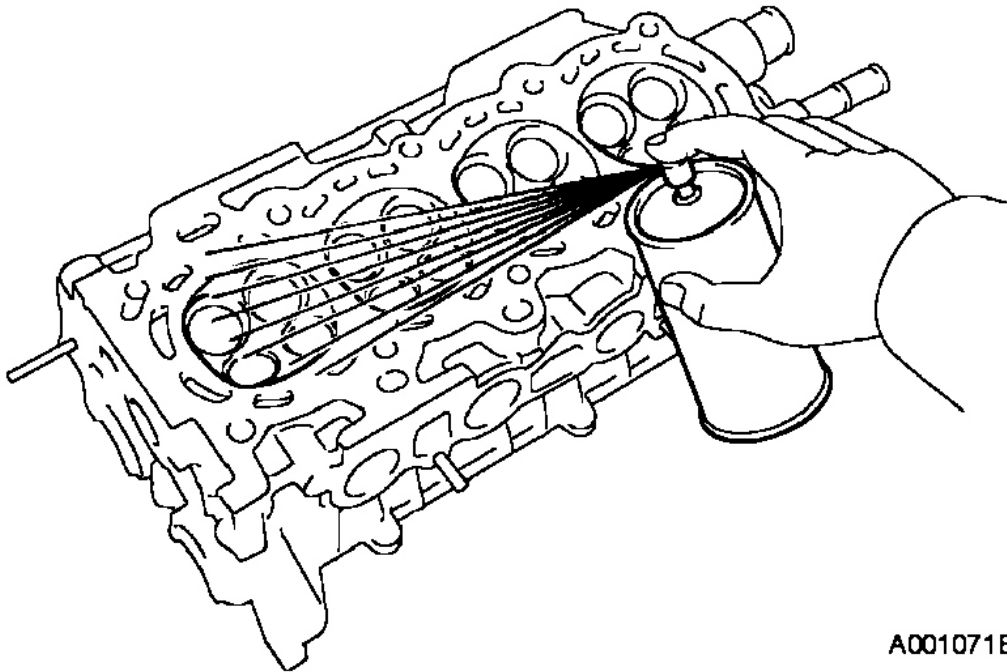
Fig. 104: Checking Cylinder Head For Flatness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

2. INSPECT CYLINDER HEAD FOR CRACKS

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

If cracked, replace the cylinder head.



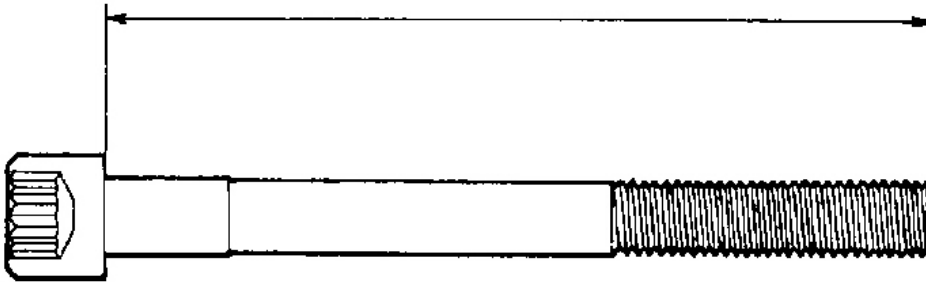
A001071E01

Fig. 105: Inspecting Cylinder Head For Cracks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT CYLINDER HEAD SET BOLT

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

Underhead Length



A098332E01

Fig. 106: Identifying Length Of Head Bolt

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

Standard length: 142.8 to 144.2 mm (5.622 to 5.677 in.)

Maximum length: 147.1 mm (5.791 in.)

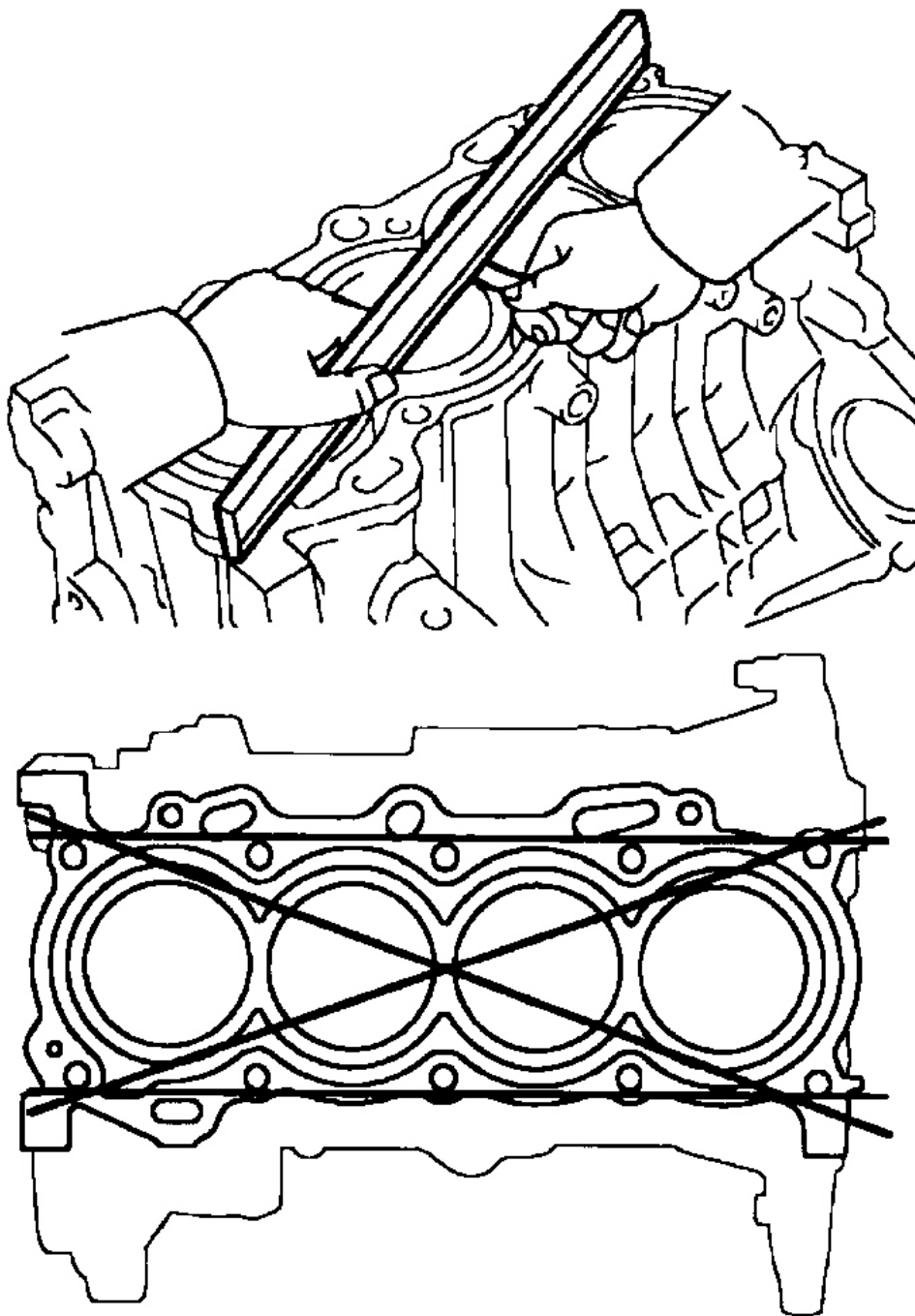
If the length is greater than the maximum, replace the bolt.

4. INSPECT CYLINDER BLOCK FOR FLATNESS

- a. Using a precision straightedge and feeler gauge, measure the surface which is in contact with the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

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



A037353E01

Fig. 107: Checking Cylinder Block For Flatness

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

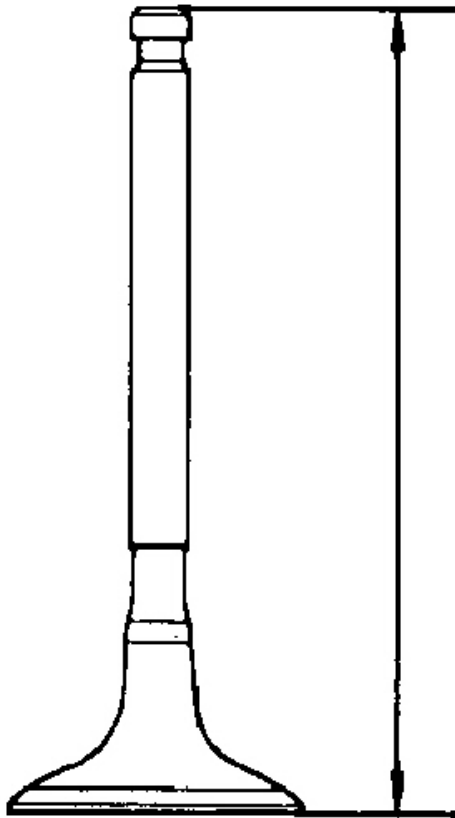
5. INSPECT INTAKE VALVE

- a. Check the overall valve length.

Standard overall length: 89.25 mm (3.5138 in.)

Minimum overall length: 88.75 mm (3.4941 in.)

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



EM02534 E06

Fig. 108: Identifying Overall Intake Valve 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: 4.970 to 4.985 mm (0.1957 to 0.1963 in.)

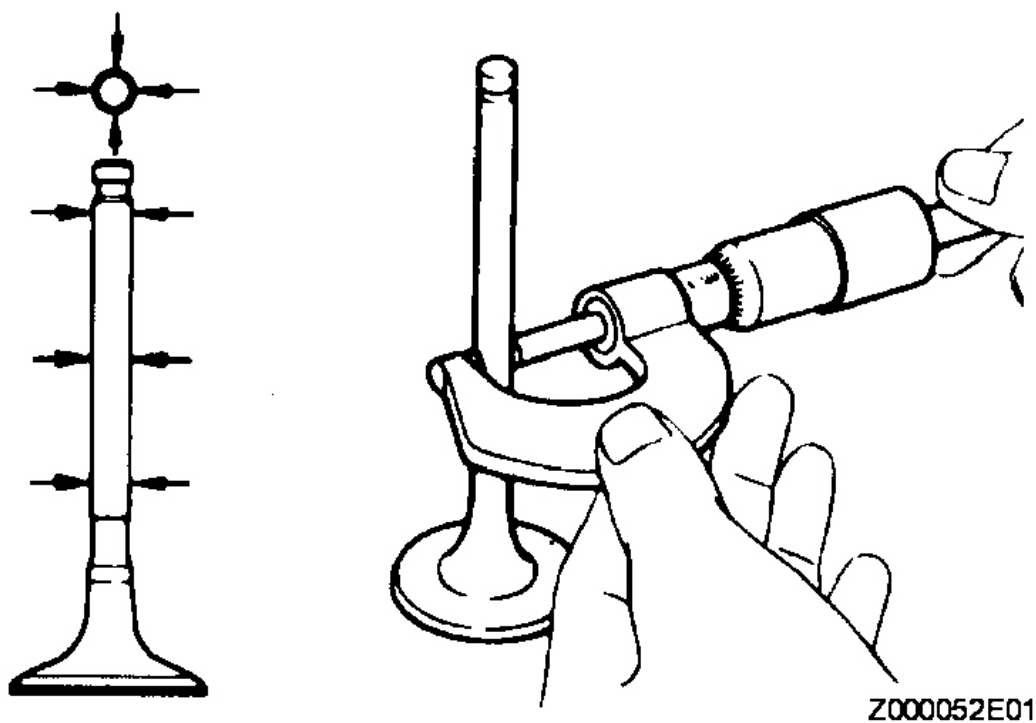
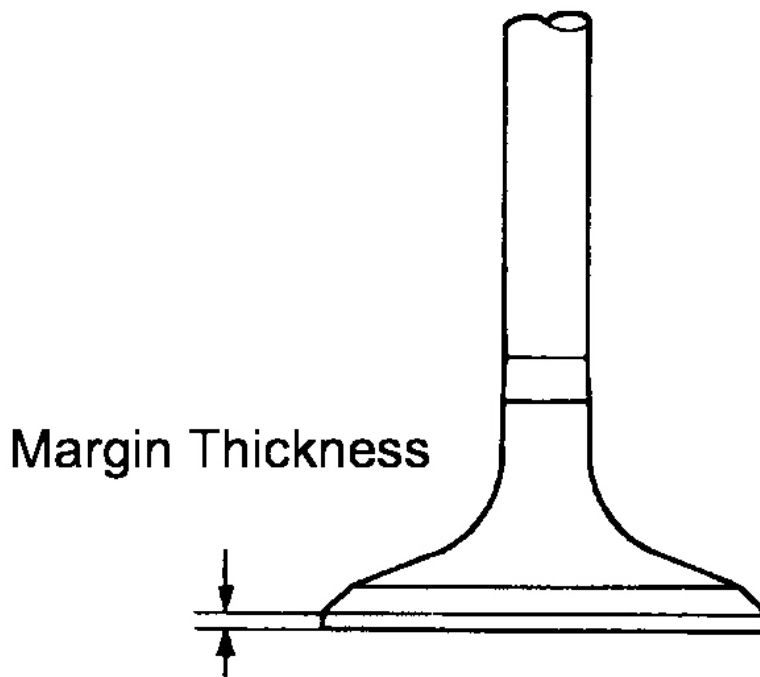


Fig. 109: Checking Diameter Of Valve Stem

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

- c. Check the valve head margin thickness.



EM00181E03

Fig. 110: Identifying Valve Head Margin Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.7 mm (0.028 in.)

If the margin thickness is less than the minimum, replace the valve.

6. INSPECT EXHAUST VALVE

- a. Check the overall valve length.

Standard overall length: 87.90 mm (3.4606 in.)

Minimum overall length: 87.40 mm (3.4409 in.)

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

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

Standard valve stem diameter: 4.965 to 4.980 mm (0.1955 to 0.1961 in.)

- c. Check the valve head margin thickness.

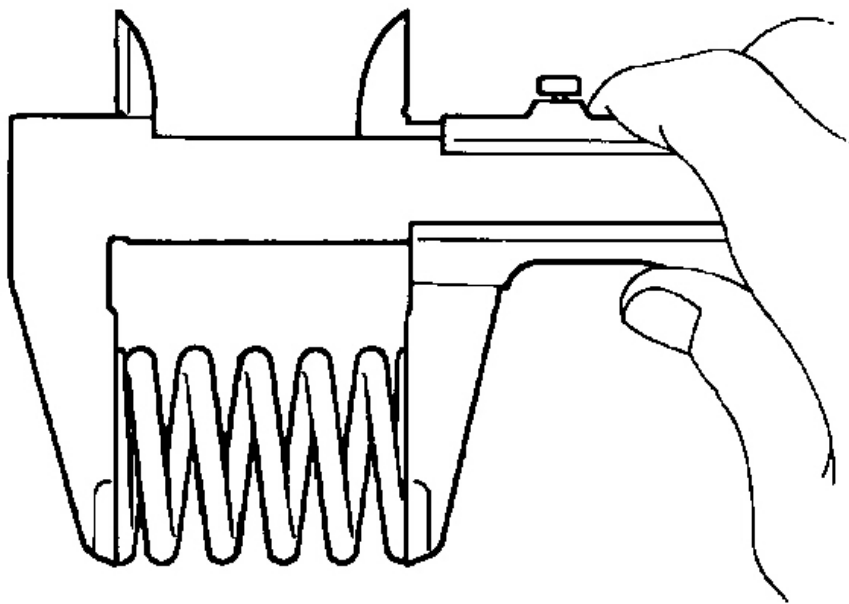
Standard margin thickness: 1.15 mm (0.045 in.)

Minimum margin thickness: 0.7 mm (0.028 in.)

If the margin thickness is less than the minimum, replace the valve.

7. INSPECT VALVE SPRING

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



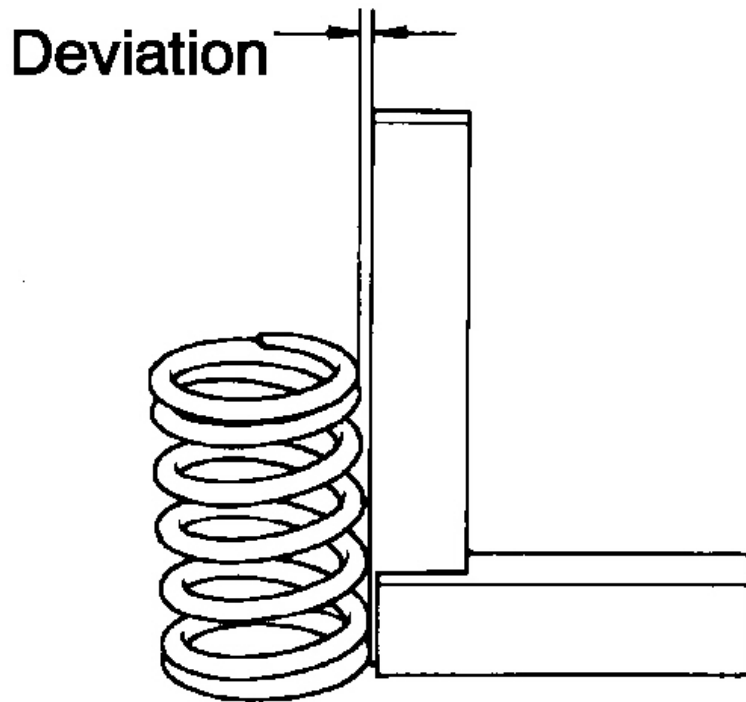
EM00801E01

Fig. 111: Checking Free Length Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard free length: 45.05 to 45.15 mm (1.774 to 1.778 in.)

If the free length is not as specified, replace the spring.

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



EM00988E01

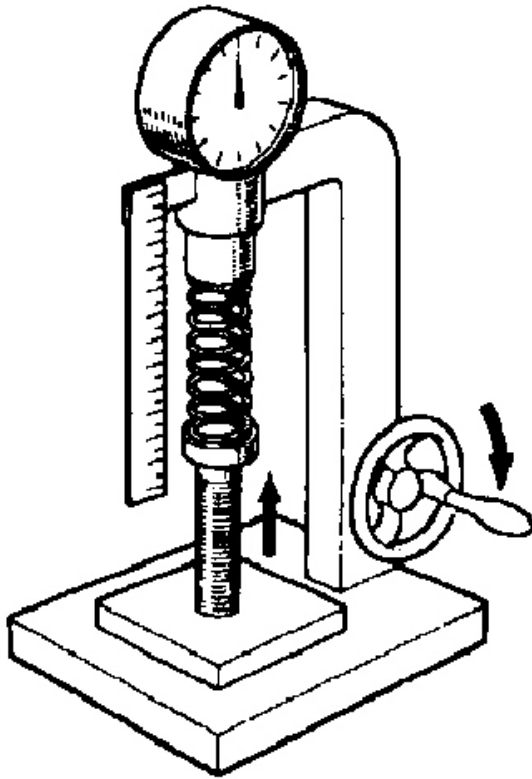
Fig. 112: Checking Deviation Of Valve Spring

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

Maximum deviation: 1.6 mm (0.063 in.)**Maximum angle (reference): 2°**

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

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



EM00281E01

Fig. 113: Checking Tension Of Valve Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard installed tension: 149 to 165 N (15.2 to 16.8 kgf, 33.5 to 37.1 lbf)

at 32.5 mm (1.280 in.)

Maximum working tension: 286 to 316 N (29.1 to 32.2 kgf, 64.2 to 71.0 lbf)

at 23.9 mm (0.941 in.)

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

8. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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

Bush inside diameter: 5.010 to 5.030 mm (0.1972 to 0.1980 in.)

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

Standard oil clearance

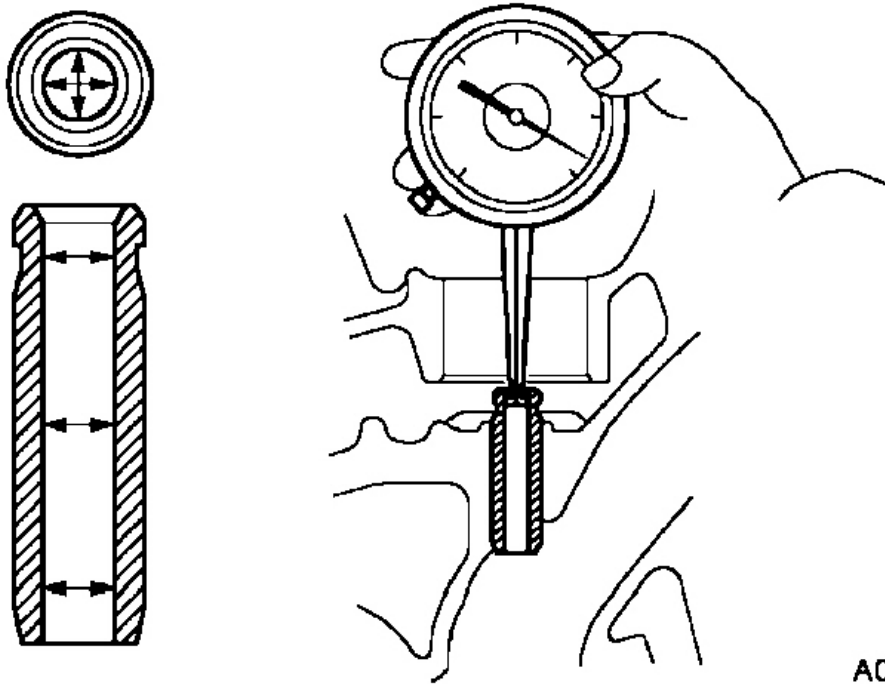
GUIDE BUSH INSIDE DIAMETER SPECIFICATION

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

Maximum oil clearance

GUIDE BUSH INSIDE DIAMETER SPECIFICATION

Guide Bush	Specified Condition
Intake	0.08 mm (0.0032 in.)
Exhaust	0.10 mm (0.0039 in.)



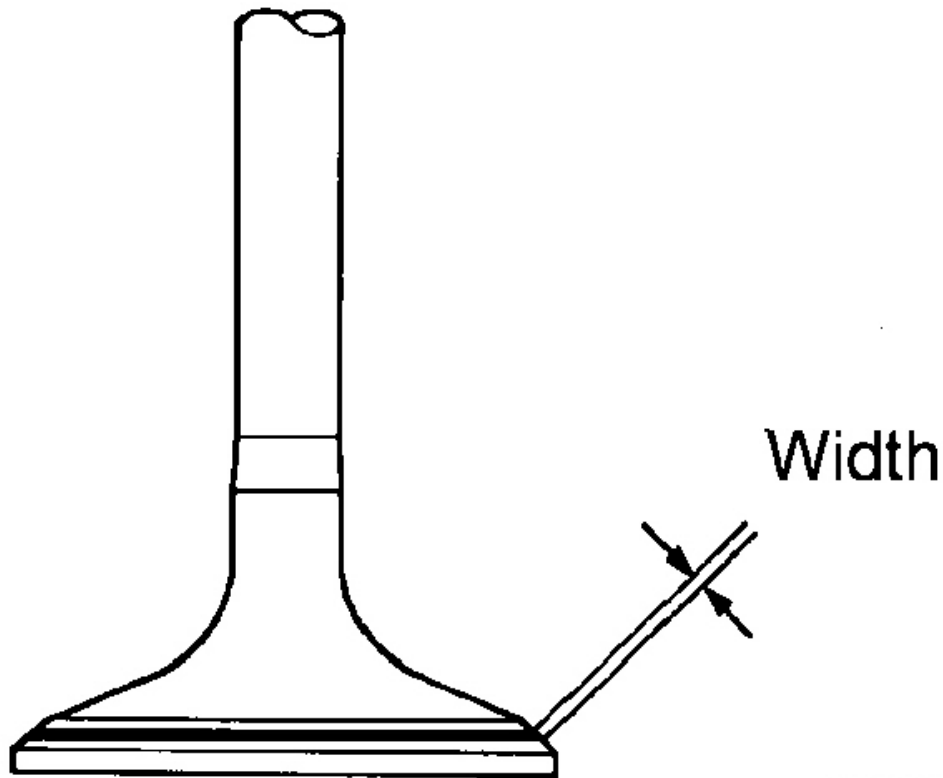
A001478E01

Fig. 114: Checking Inside Diameter Of Guide Bush
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the clearance is greater than the maximum, replace the valve and guide bush (see **REPLACEMENT**).

9. INSPECT INTAKE VALVE SEAT

- a. Apply a light coat of Prussian blue (or white lead) to the valve face.
- b. Lightly press the valve against the seat.
- c. Check the valve face and seat according to 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 seat.
 3. Check that the seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).



A050036E01

Fig. 115: Identifying Valve Face Width
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REPAIR INTAKE VALVE SEAT

- a. If the seating is too high on the valve face, use 20° and 45° cutters to correct the seat.

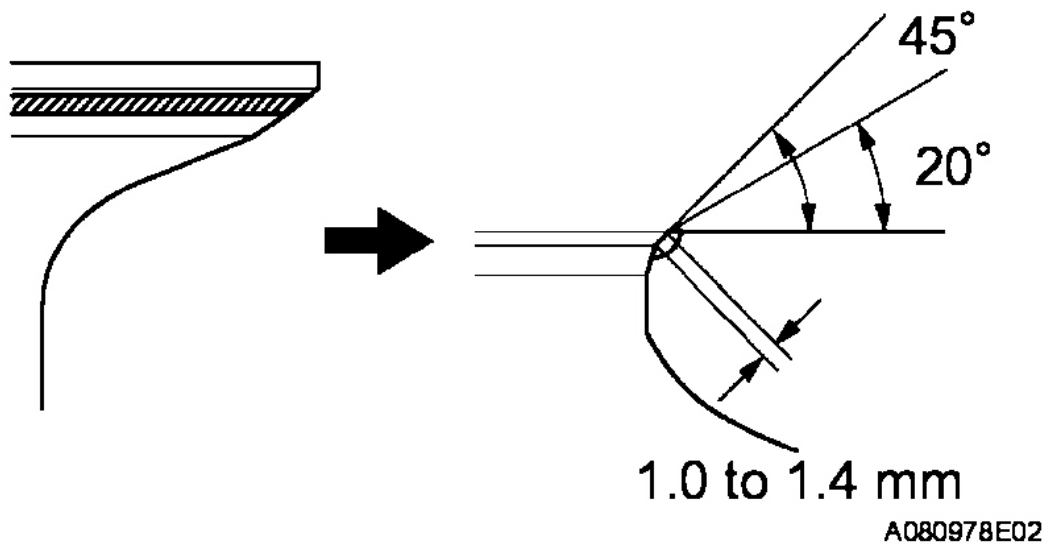


Fig. 116: Identifying Cutters Angle For Repairing Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.
- c. Hand-lap the valve and valve seat with an abrasive compound.
- d. Recheck the valve seating position.

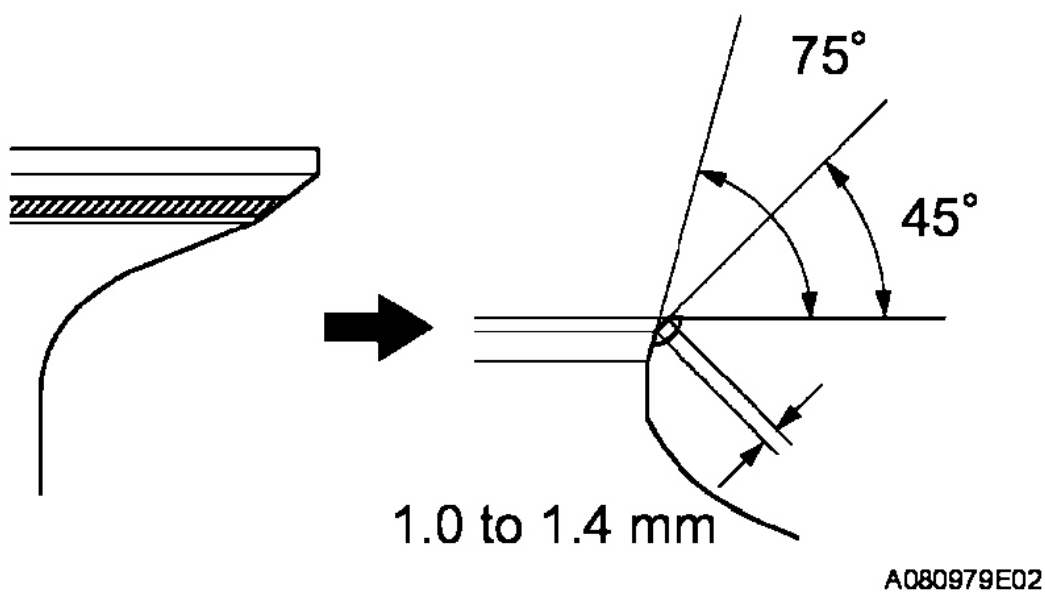


Fig. 117: Identifying Cutters Angle For Repairing Intake Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REPAIR EXHAUST VALVE SEAT

- a. If the seating is too high on the valve face, use 20° and 45° cutters to correct the seat.

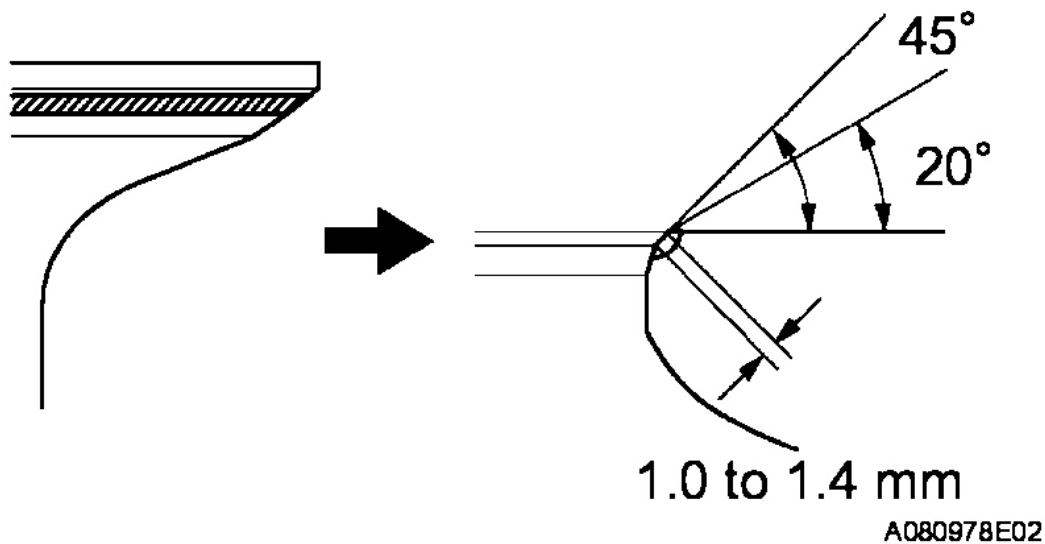


Fig. 118: Identifying Cutters Angle For Repairing Exhaust Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.
- c. Hand-lap the valve and valve seat with an abrasive compound.
- d. Recheck the valve seating position.

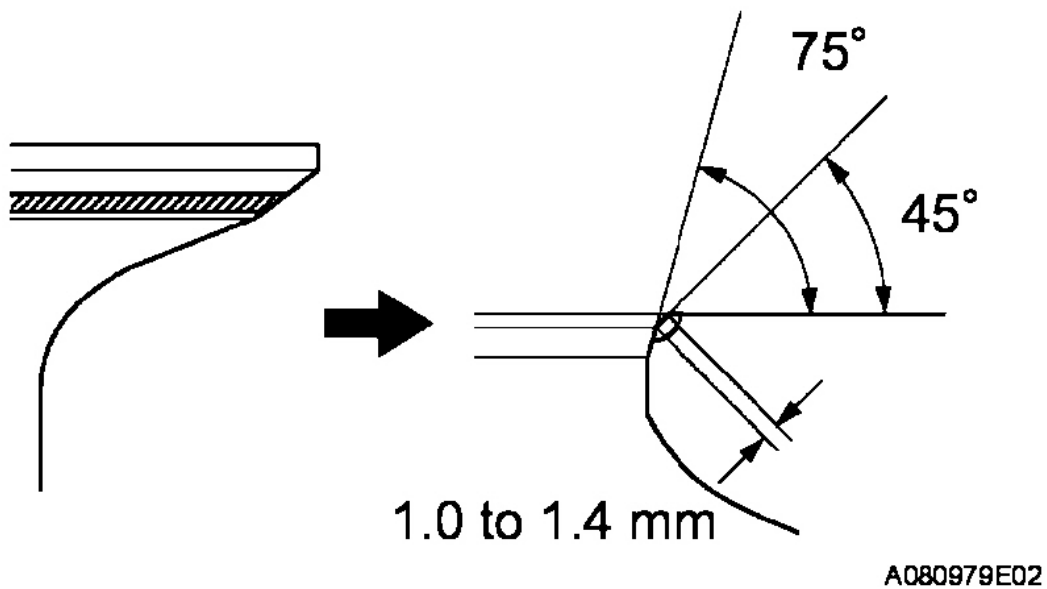


Fig. 119: Identifying Cutters Angle For Repairing Exhaust Valve Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSPECT VALVE LIFTER

- Using a micrometer, measure the lifter diameter.

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

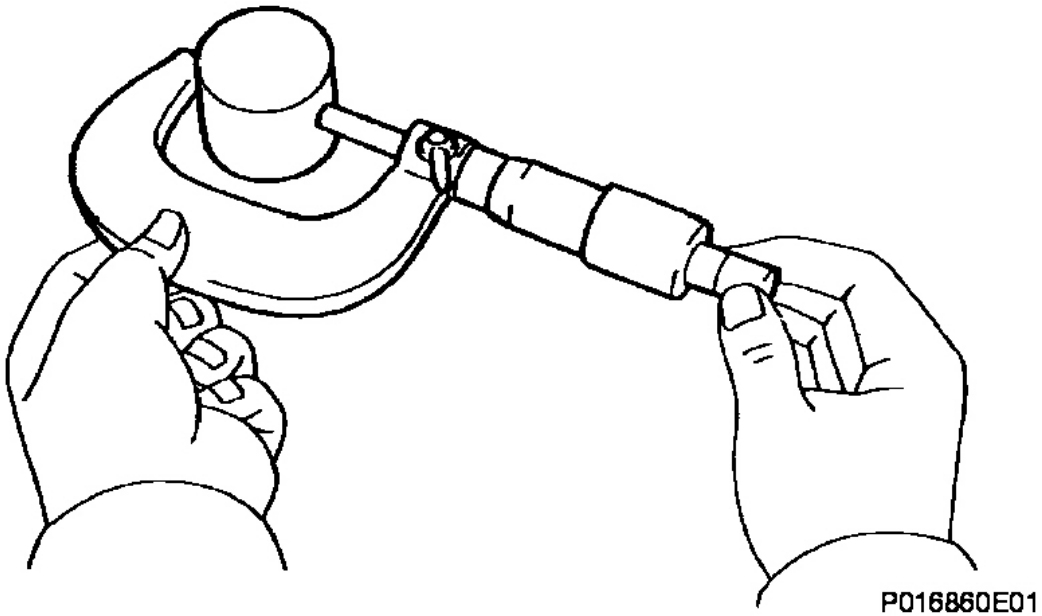


Fig. 120: Checking Lifter Diameter

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

13. INSPECT VALVE LIFTER OIL CLEARANCE

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

Standard lifter bore diameter: 31.000 to 31.025 mm (1.2205 to 1.2215 in.)

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

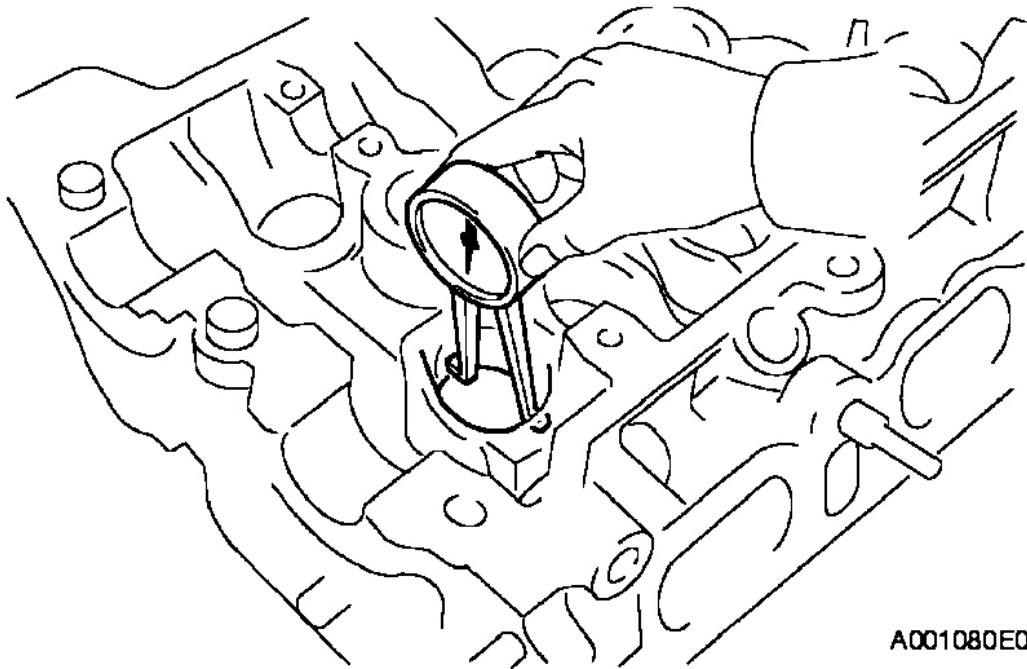


Fig. 121: Checking Lifter Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance: 0.024 to 0.059 mm (0.0009 to 0.0023 in.)

Maximum oil clearance: 0.1 mm (0.0039 in.)

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

14. INSPECT CAMSHAFT TIMING GEAR OPERATION

- a. Check the lock of the camshaft timing gear.
 1. Clamp the camshaft in a vise, and check 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 tape as shown in the illustration.

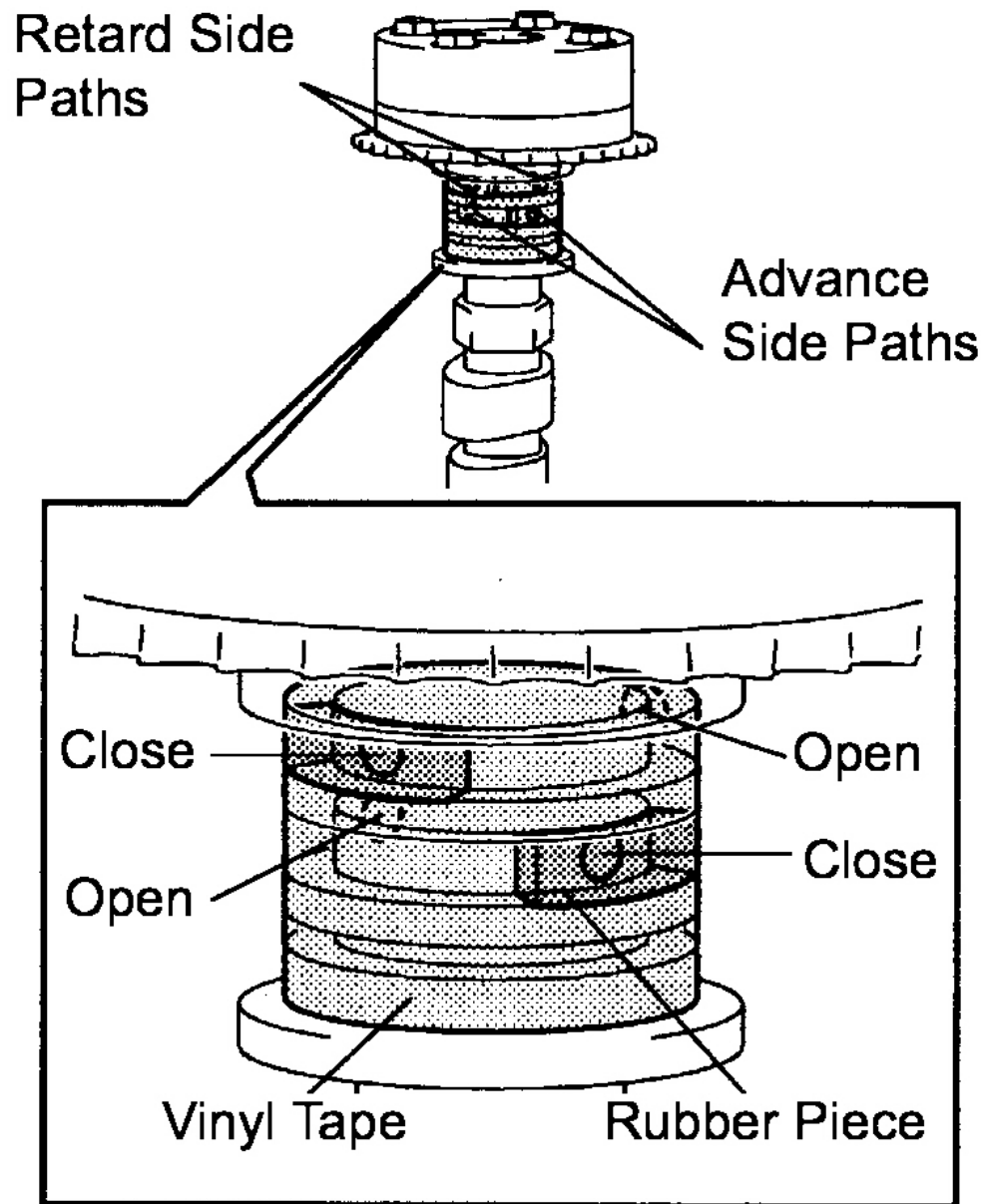
HINT:

One of the 2 grooves located on the cam journal is for retarding cam timing (upper) and the

other is for advancing cam timing (lower).

Each groove has 2 oil paths. Plug one of the oil paths for each groove with rubber pieces before wrapping the cam journal with the tape.

2. Puncture the tape for the advance oil path and for the retard oil path on the opposite side from the advance oil path.



A051761E02

Fig. 122: Covering Oil Paths Of Cam Journal With Tape
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Apply air pressure into the 2 broken tape paths (the advance side path and retard side path) with about 150 kPa (1.5 kgf/cm², 22 psi).

NOTE: Cover the paths with cloth or equivalent to prevent oil from splashing.

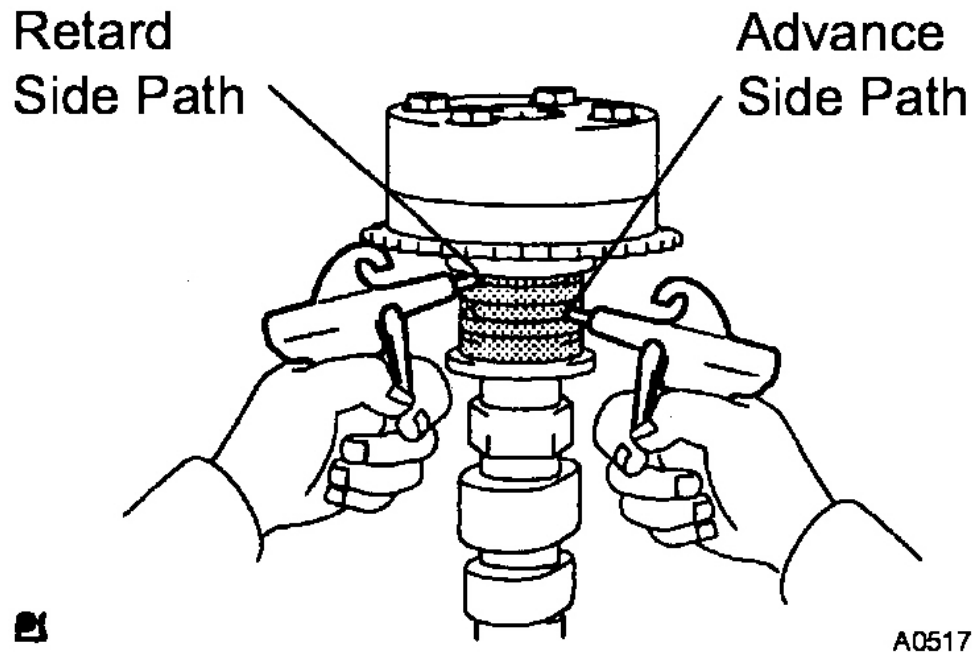


Fig. 123: Applying Air Pressure Into Broken Tape Paths
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Confirm if the camshaft timing gear assembly revolves in the timing advance direction when reducing the air pressure of the timing retard path.

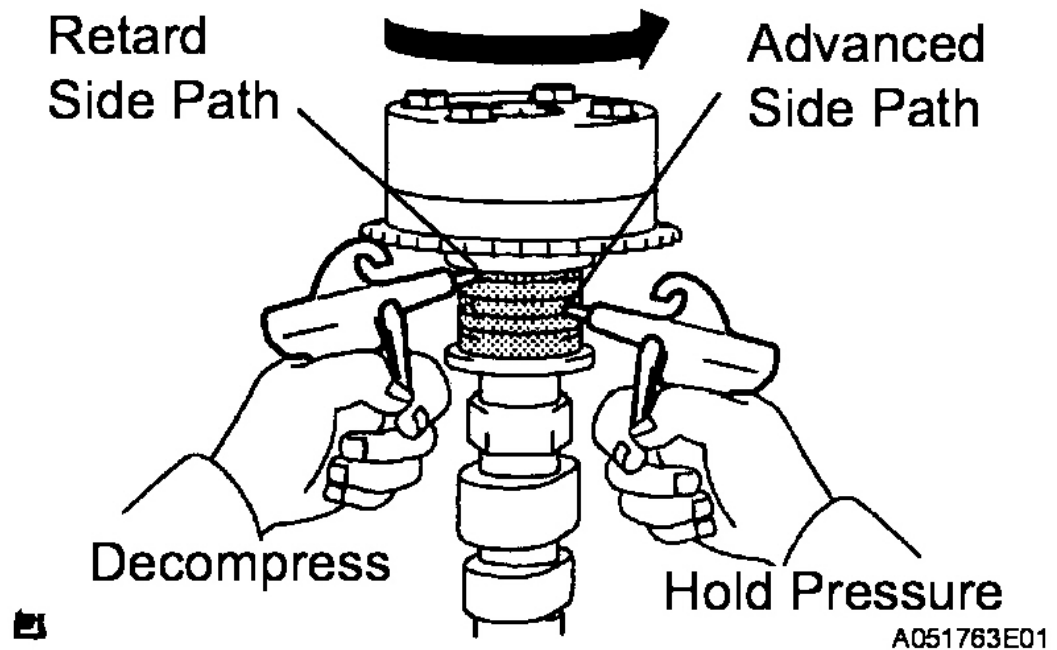


Fig. 124: Confirming Camshaft Timing Gear Revolves While Reducing Air Pressure Of Timing Retard Path

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

HINT:

The lock pin is released, and the camshaft timing gear revolves in the advance direction.

5. When the camshaft timing gear reaches the most advanced position, remove the air pressure of the timing retard side path, and then release the air pressure of the timing advance side path.

NOTE: The camshaft timing gear assembly occasionally shifts to the retard side abruptly if the air compression of the advanced side path is released first. This often results in the breakage of the lock pin.

c. Check smooth revolution.

1. Except the position where the lock pin meets at the most retarded angle, let the valve timing controller assembly turn back and forth.

Check the movable range and that there is no disturbance.

Standard condition: Smooth movable range is about 22.5°

NOTE: Be sure to perform this check by hand, instead of air pressure.

d. Check the lock in the most retarded position.

1. Confirm that the camshaft timing gear assembly is locked at the most retarded position.

15. INSPECT CAMSHAFT TIMING GEAR

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

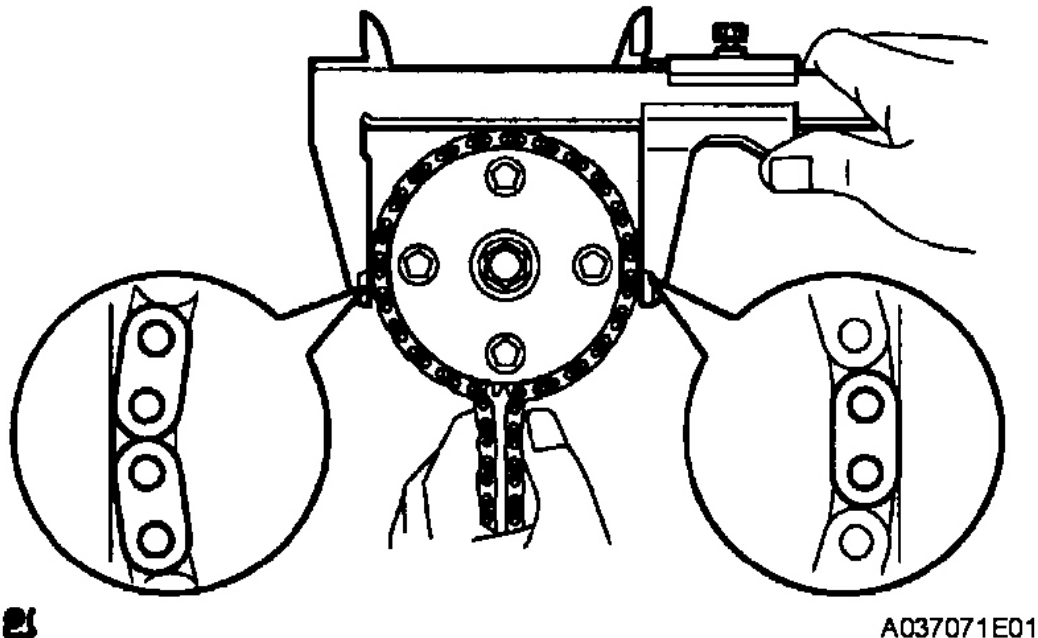


Fig. 125: Checking Diameter Of Timing Gear With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Minimum gear diameter (w/chain): 96.2 mm (3.787 in.)

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

NOTE: Vernier caliper must come into contact with the chain link for measuring.

16. INSPECT CAMSHAFT TIMING SPROCKET

- a. Wrap the chain around the timing sprocket.

- b. Using a vernier caliper, measure the diameter of the timing gear with the chain.

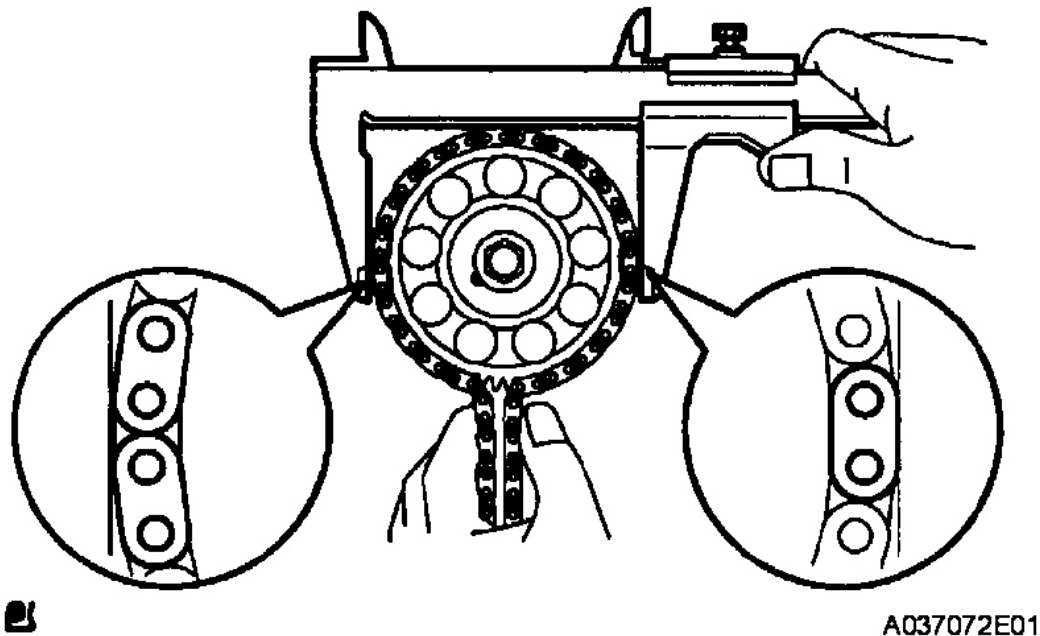


Fig. 126: Checking Diameter Of Timing Gear With Chain
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

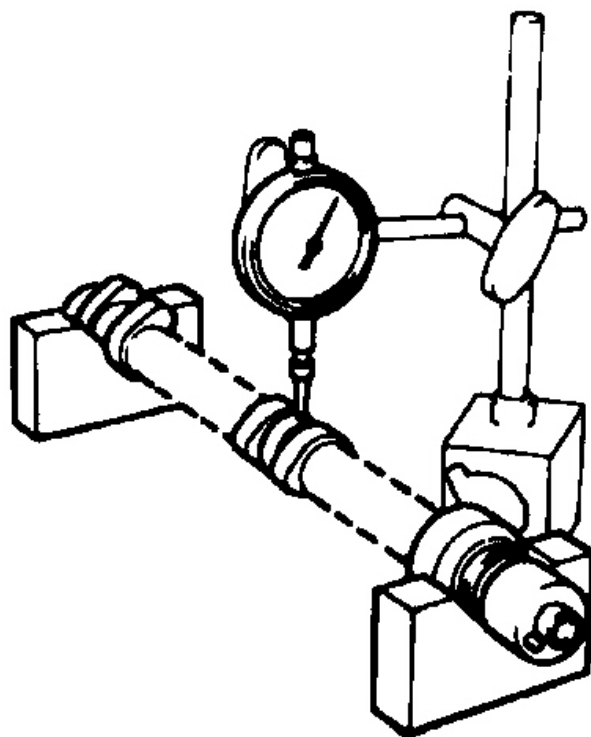
Minimum gear diameter (w/chain): 96.2 mm (3.787 in.)

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

NOTE: Vernier caliper must come into contact with the chain link for measuring.

17. 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.



EM01628E01

Fig. 127: Checking Circle Runout At Center Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum circle runout: 0.03 mm (0.0012 in.)

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

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

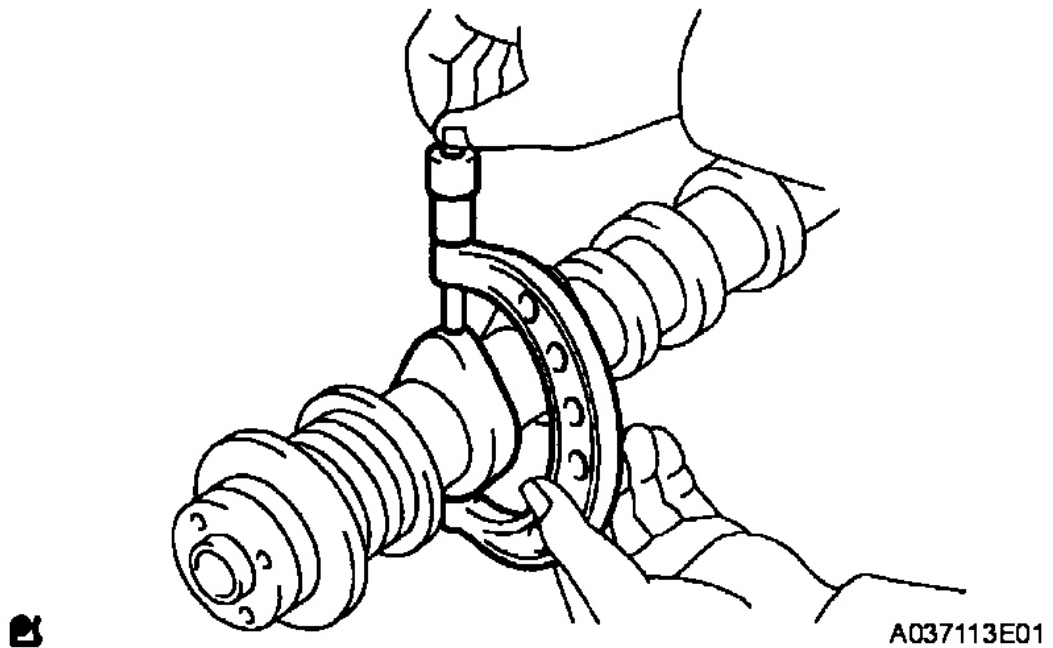


Fig. 128: Checking Cam Lobe Height

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

Standard cam lobe height: 44.617 to 44.717 mm (1.7566 to 1.7605 in.)

Minimum cam lobe height: 44.47 mm (1.7508 in.)

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

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

Standard journal diameter

JOURNAL DIAMETER SPECIFICATION

Journal	Specified Condition
No.1 journal	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other journals	22.949 to 22.965 mm (0.9035 to 0.9041 in.)

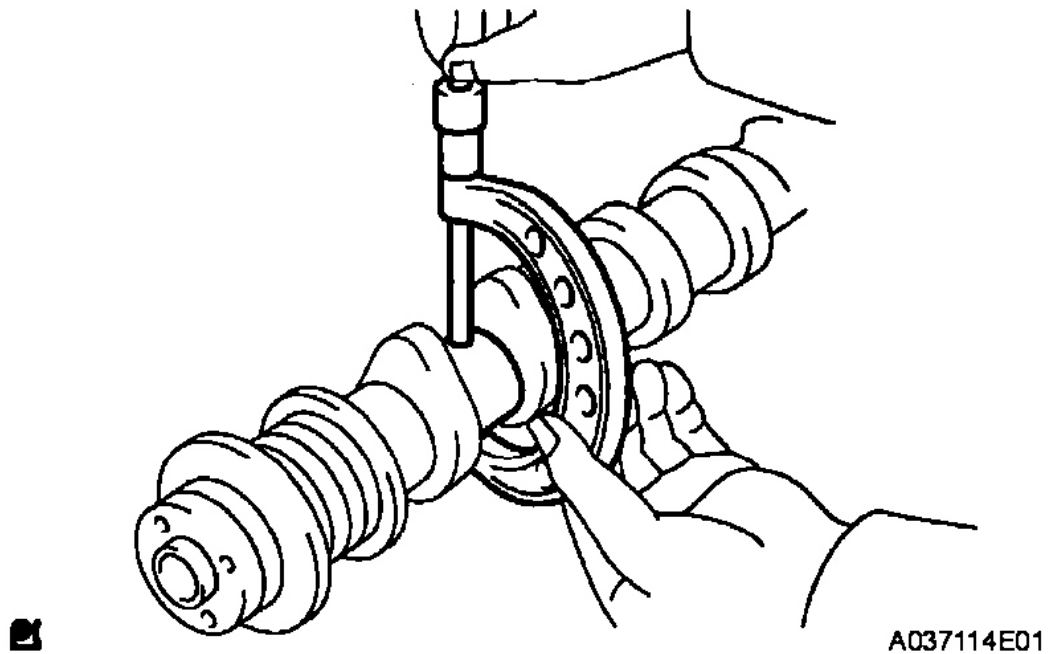


Fig. 129: Checking Journal Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

18. 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 camshaft.

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

Standard cam lobe height: 44.666 to 44.766 (1.7585 to 1.7624 in.)

Minimum cam lobe height: 44.52 mm (1.7528 in.)

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

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

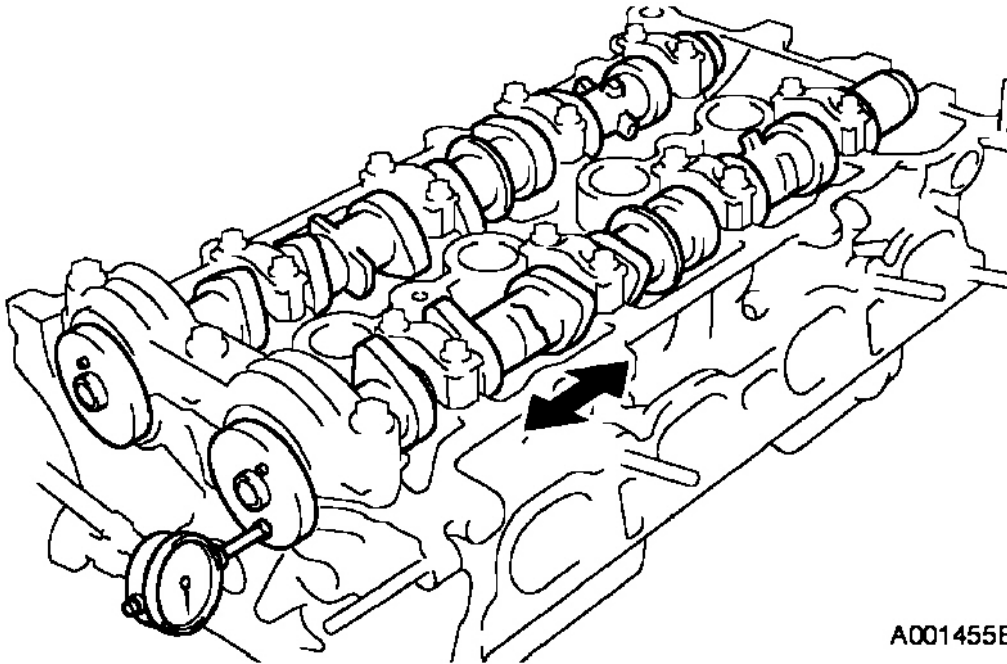
Standard journal diameter**JOURNAL DIAMETER SPECIFICATION**

Journal	Specified Condition
No.1 journal	34.449 to 34.465 mm (1.3563 to 1.3569 in.)
Other journals	22.949 to 22.965 mm (0.9035 to 0.9041 in.)

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

19. INSPECT CAMSHAFT THRUST CLEARANCE

- a. Install the camshafts.
- b. Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.



A001455E01

Fig. 130: Checking Camshaft Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance: 0.040 to 0.095 mm (0.0016 to 0.0037 in.)

Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and the cylinder head together.

20. INSPECT CAMSHAFT OIL CLEARANCE

- a. Clean the bearing caps and the camshaft journals.
- b. Place the camshafts on the cylinder head.
- c. Lay a strip of Plastigage across each of the camshaft journals.
- d. Install the bearing caps.

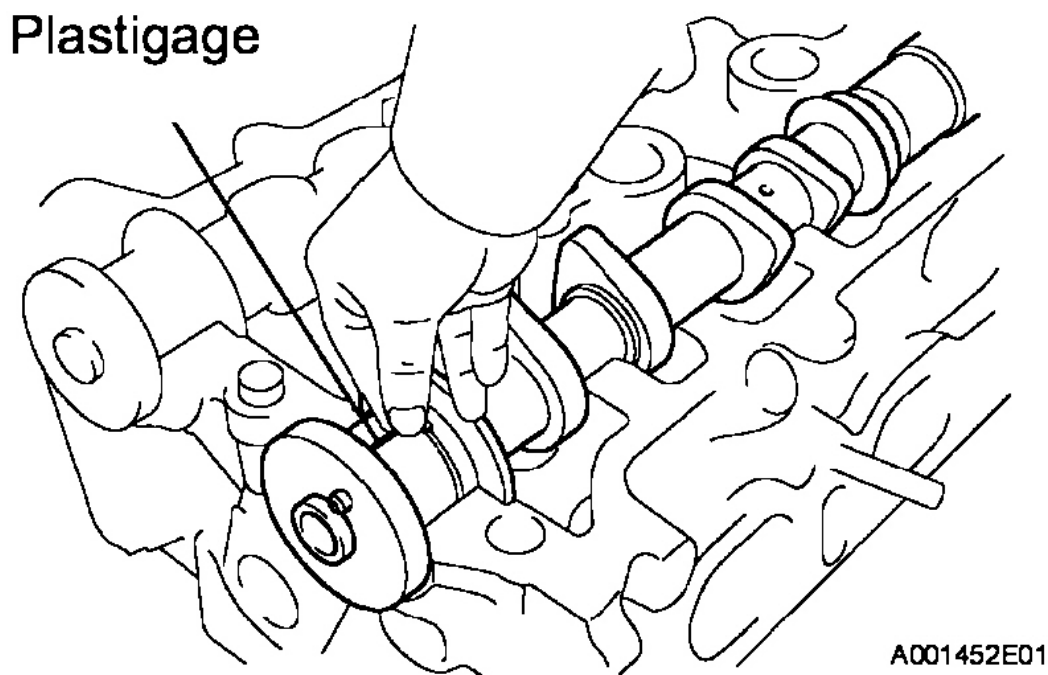


Fig. 131: Laying Strip Of Plastigage Across Each Of Camshaft Journals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 23 N*m (235 kgf*cm, 17 ft.*lbf) for No. 1

13 N*m (129 kgf*cm, 9 ft.*lbf) for No. 2

NOTE: Do not turn the camshaft.

- e. Remove the bearing caps.
- f. Measure the Plastigage at its widest point.

Standard oil clearance: 0.040 to 0.095 mm (0.0016 to 0.0037 in.)

Maximum oil clearance: 0.115 mm (0.0045 in.)

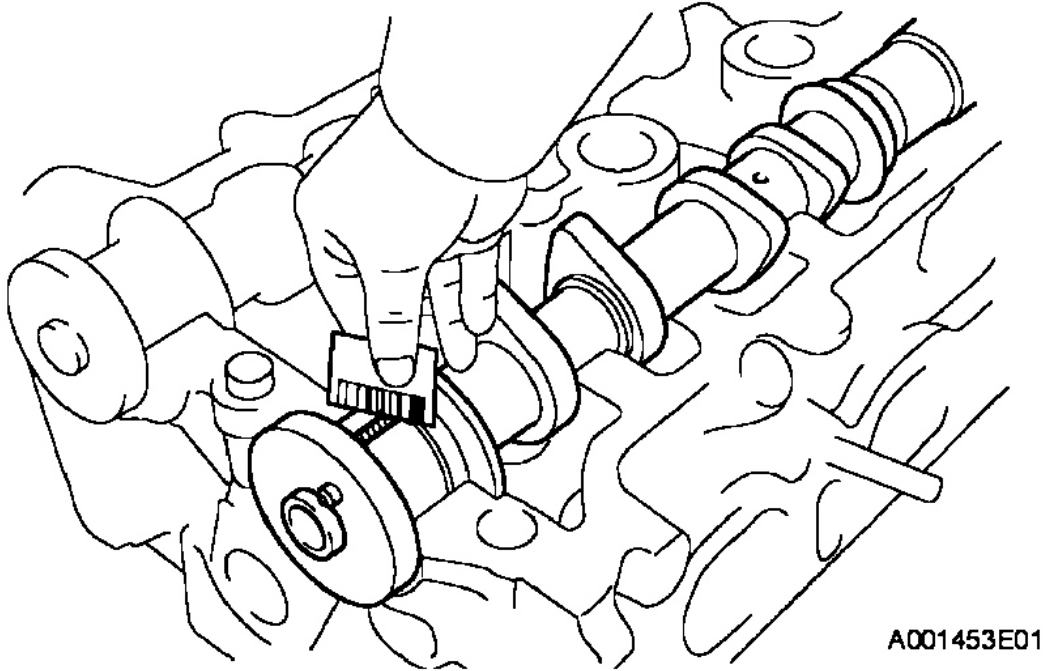


Fig. 132: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the oil clearance is greater than the maximum, replace the camshaft. If necessary, replace the bearing caps and the cylinder head together.

NOTE: **Completely remove the Plastigage.**

REPLACEMENT

1. REPLACE INTAKE VALVE GUIDE BUSH

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

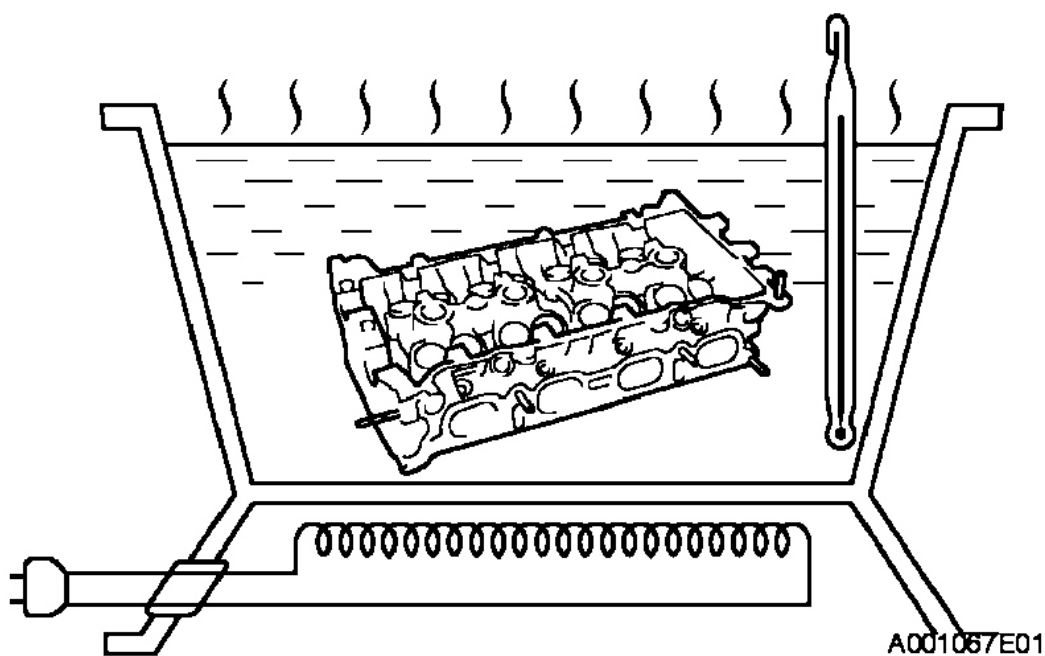


Fig. 133: Heating Cylinder Head

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

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

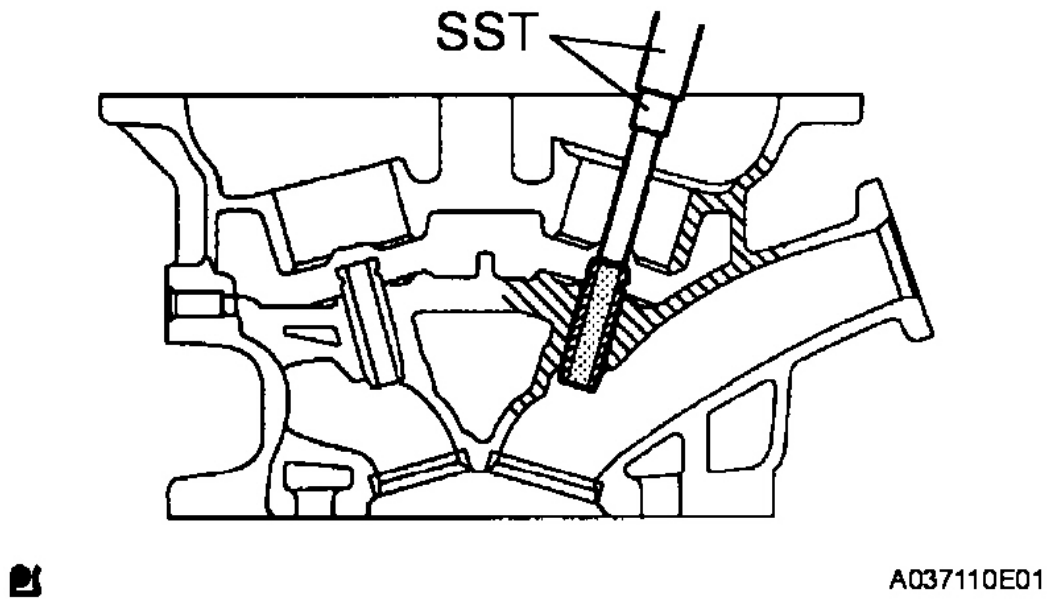


Fig. 134: Removing Guide Bush

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

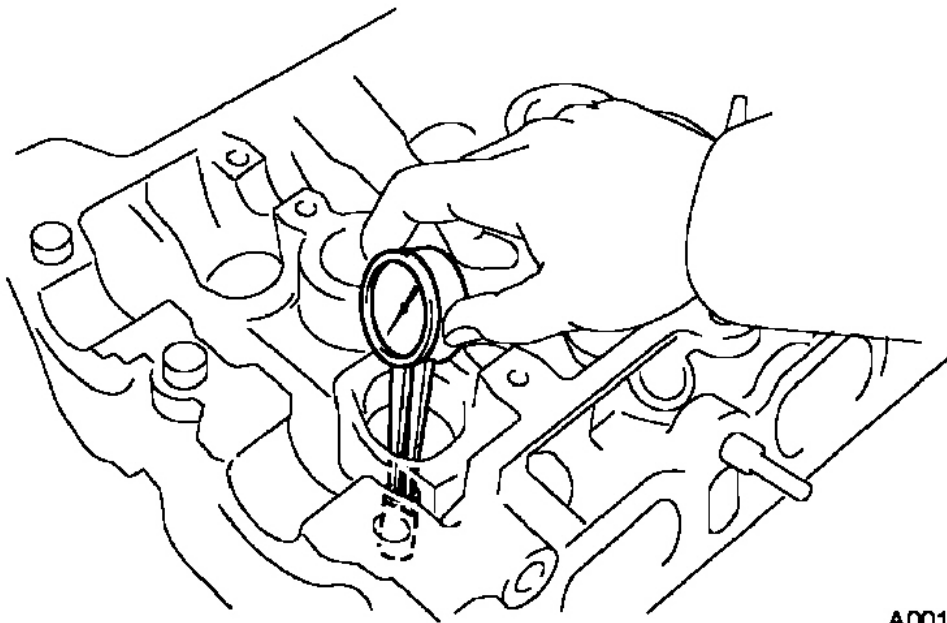
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

- c. Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Standard bore diameter

BUSH BORE DIAMETER SPECIFICATION

Bush size	Specified Condition
STD	9.685 to 9.706 mm (0.3813 to 0.3821 in.)
O/S 0.05	9.735 to 9.756 mm (0.3833 to 0.3841 in.)



A001445E01

Fig. 135: Checking Bush Bore Diameter Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the bush bore diameter of the cylinder head is greater than 9.706 mm (0.3821 in.), machine the bush bore to a dimension of 9.735 to 9.756 mm (0.3833 to 0.3841 in.).

If the bush bore diameter of the cylinder head is greater than 9.755 mm (0.3841 in.), replace the cylinder head.

- d. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- e. Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

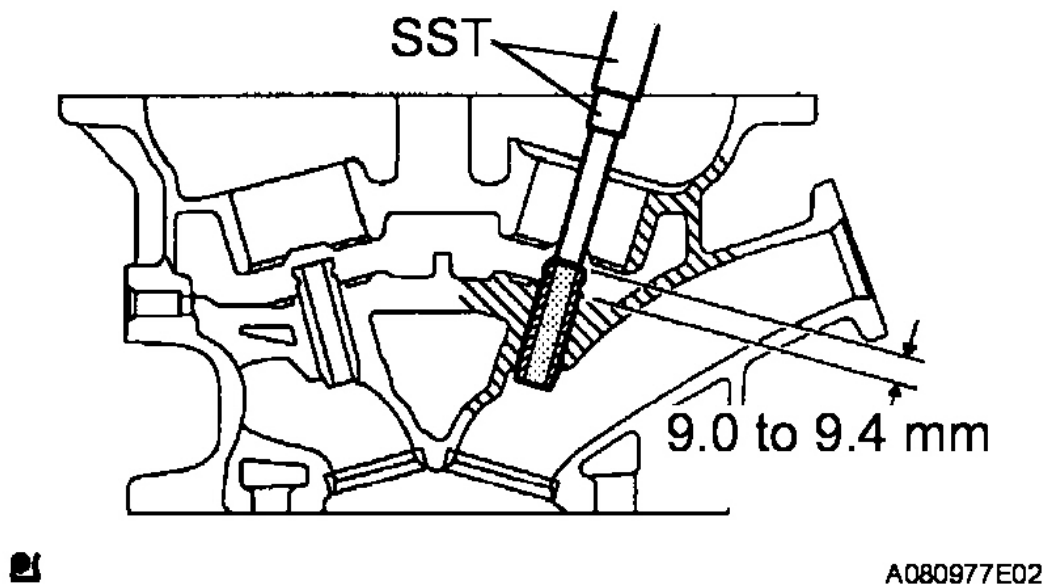


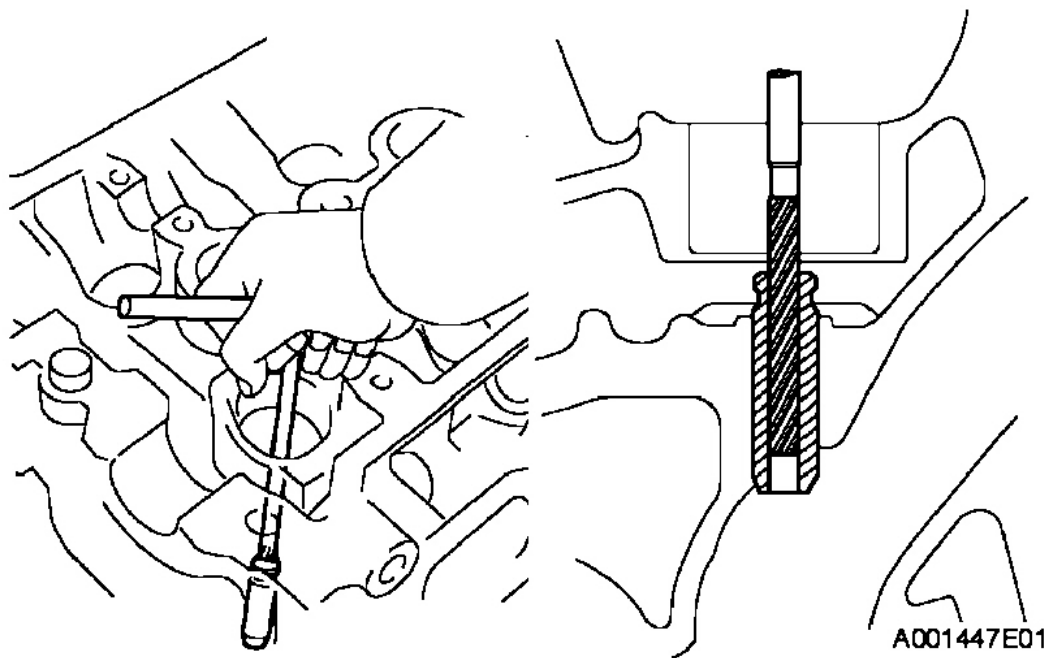
Fig. 136: Installing New Guide Bush

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

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

Standard protrusion height: 9.0 to 9.4 mm (0.354 to 0.370 in.)

- f. Using a sharp 5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and the valve stem.

**Fig. 137: Reaming Guide Bush**

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

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

2. REPLACE EXHAUST VALVE GUIDE BUSH

- Heat the cylinder head to 80 to 100°C (176 to 212°F).
- Using SST and a hammer, tap out the guide bush.

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

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

Standard bore diameter

BUSH BORE DIAMETER SPECIFICATION

Bush size	Specified Condition
STD	9.685 to 9.706 mm (0.3813 to 0.3821 in.)
O/S 0.05	9.735 to 9.756 mm (0.3833 to 0.3841 in.)

If the bush bore diameter of the cylinder head is greater than 9.706 mm (0.3821 in.), machine the bush bore to a dimension of 9.735 to 9.756 mm (0.3833 to 0.3841 in.).

If the bush bore diameter of the cylinder head is greater than 9.755 mm (0.3841 in.), replace the cylinder head.

- d. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- 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: 9.0 to 9.4 mm (0.354 to 0.370 in.)

- f. Using a sharp 5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.

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

REASSEMBLY

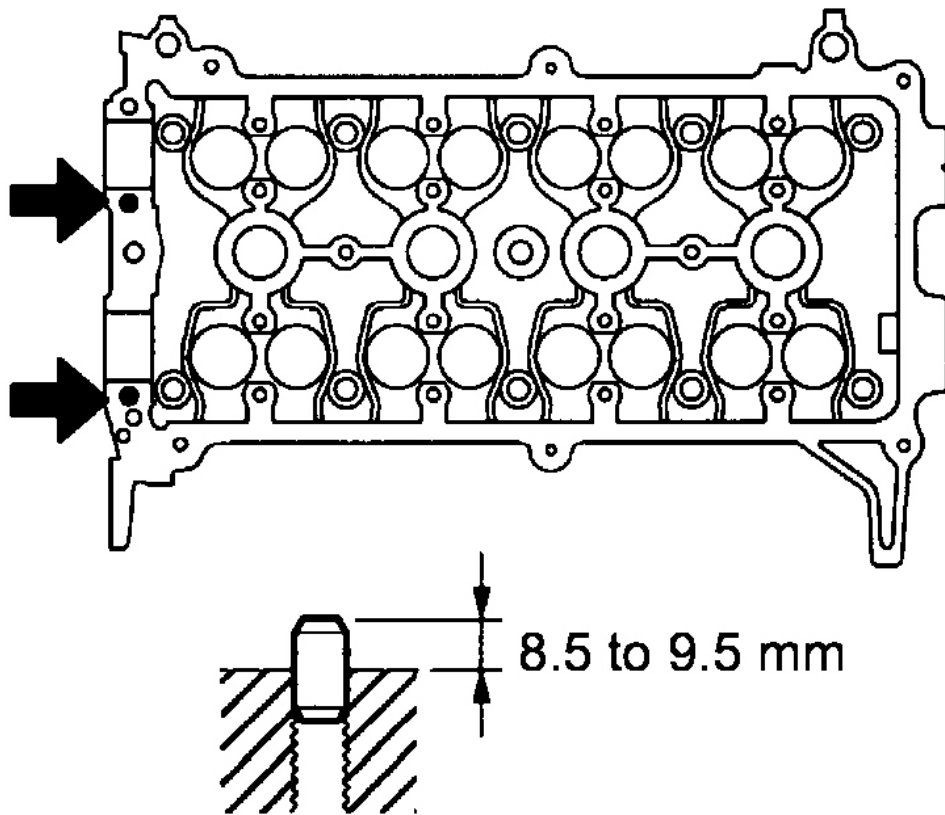
1. INSTALL CAMSHAFT BEARING CAP SETTING RING PIN

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

Standard protrusion height: 8.5 to 9.5 mm (0.335 to 0.374 in.)

2. INSTALL STUD BOLT

- a. Using E5 and E7 "Torx" sockets, install the 7 stud bolts.



A080980E03

Fig. 138: Installing Camshaft Bearing Cap Setting Ring Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 10 N*m (102 kgf*cm, 7.4 ft.*lbf) for bolt A

4.0 N*m (41 kgf*cm, 35 in.*lbf) for bolt B

10 N*m (102 kgf*cm, 7.4 ft.*lbf) for bolt C

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

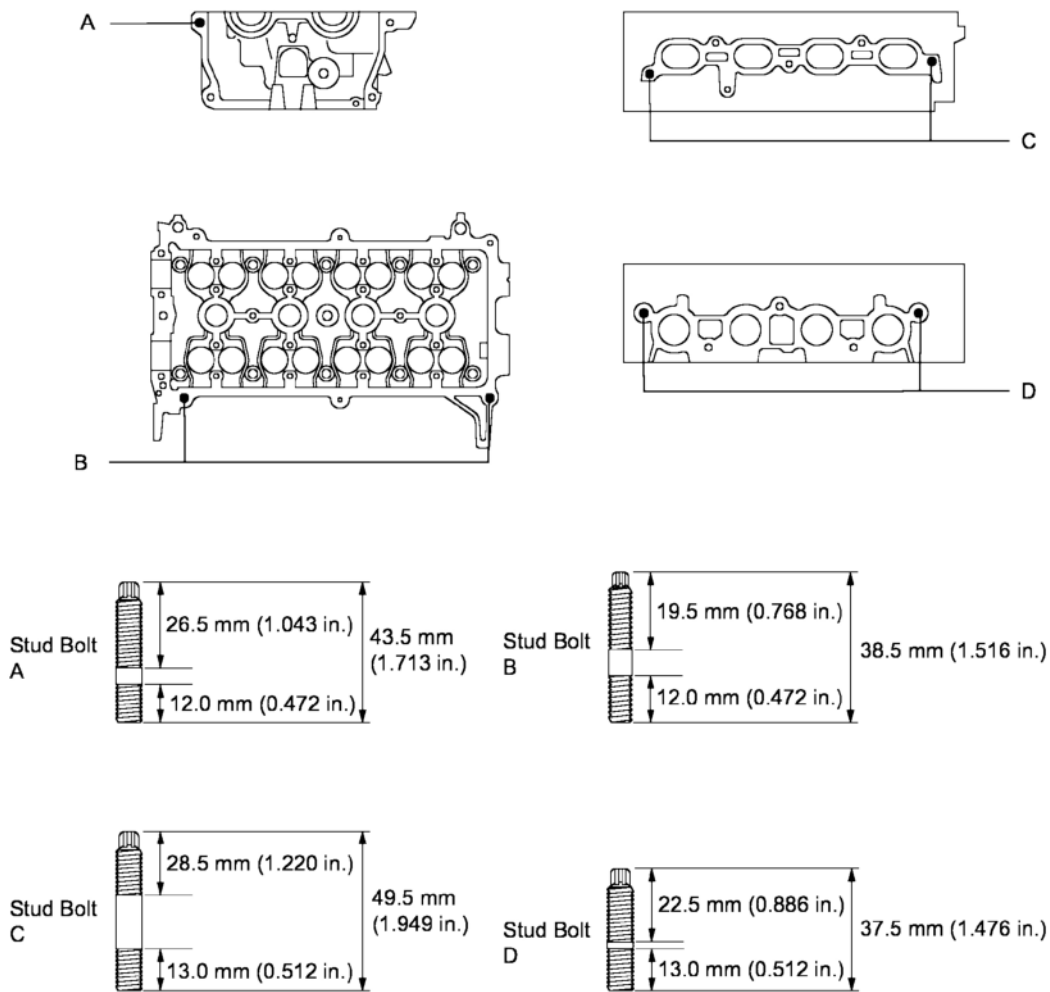
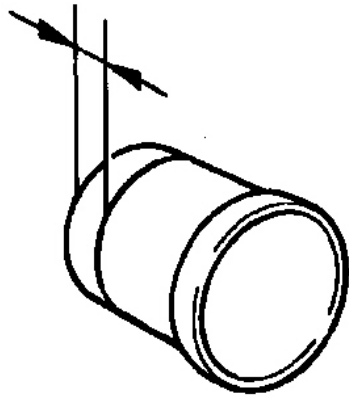


Fig. 139: Identifying Stud Bolts Dimension
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL UNION

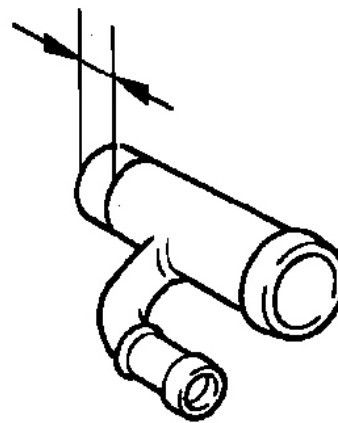
- Mark the standard position away from the edge onto 2 new water hose unions as shown in the illustration.

15 mm (0.59 in.)



N

18 mm (0.70 in.)



A050177E02

Fig. 140: Marking Standard Position Away From Edge Onto New Water Hose Unions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Apply adhesive to the water hose union hole of the cylinder head.

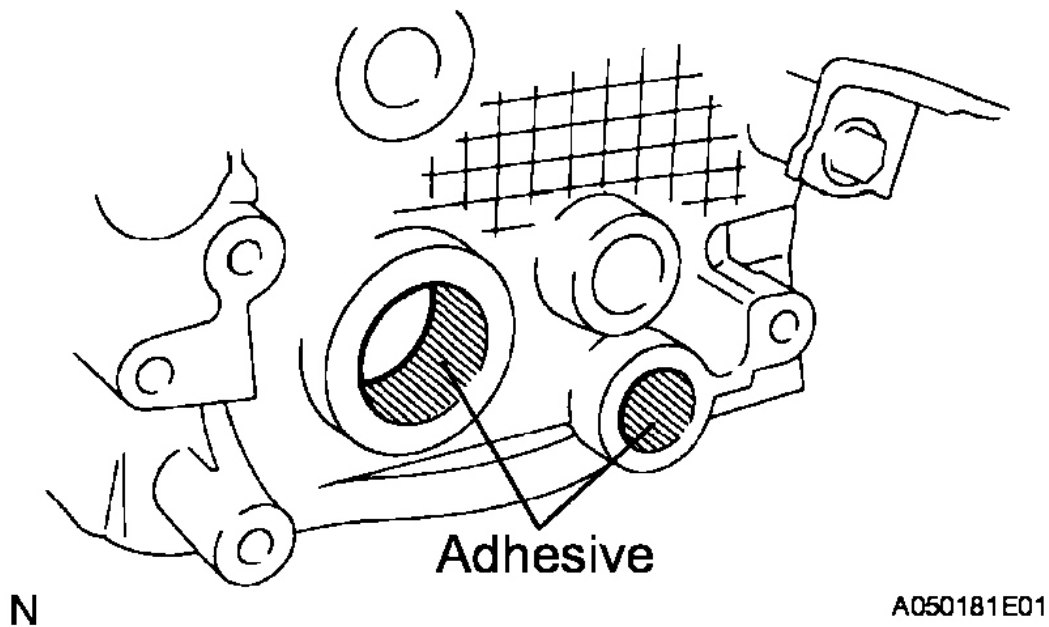


Fig. 141: Applying Adhesive To Water Hose Union Hole Of Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- c. Using a press, press in the water hose union until the marks come to the same level as the cylinder head surface.

Standard protrusion

WATER HOSE UNION PROTRUSION SPECIFICATION

Union	Specified Condition
A	29 mm (1.14 in.)
B	44 mm (1.73 in.)

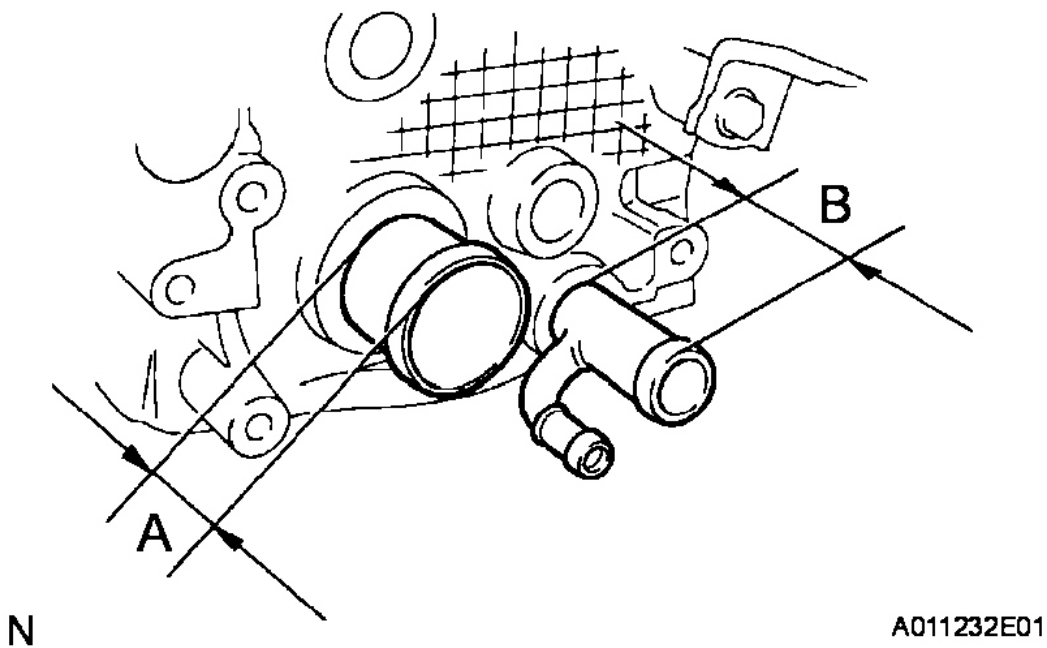


Fig. 142: Pressing In Water Hose Union

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

NOTE:

- Install the water hose union within 3 minutes of applying adhesive.
- Do not expose the water hose union to engine coolant for at least one hour after installation.

4. INSTALL VALVE STEM OIL SEAL

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

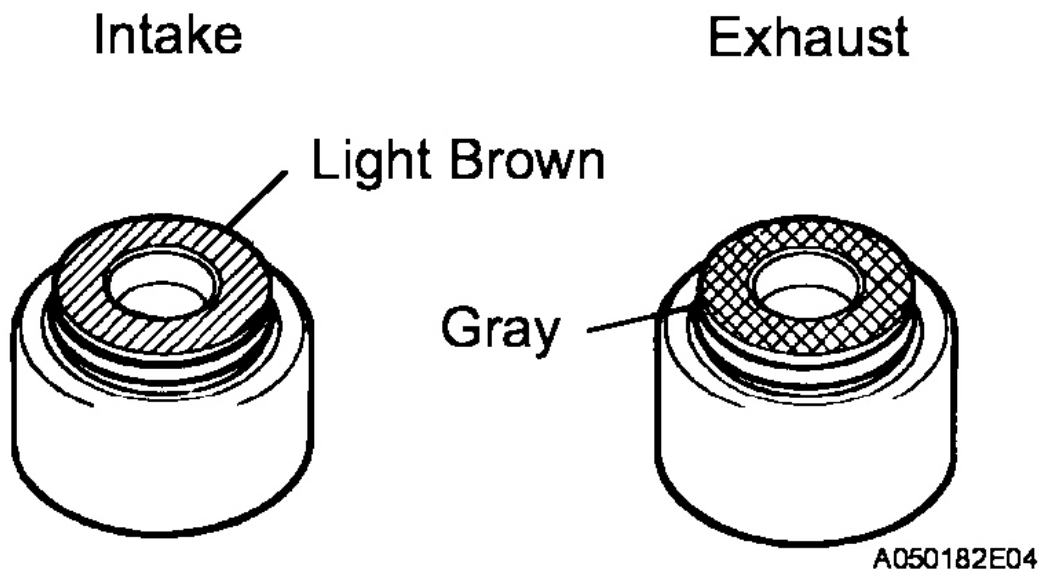


Fig. 143: Identifying Valve Stem Oil Seal

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

NOTE: Installing the oil seals for the intake and exhaust onto the opposite valve guide bush may cause failures.

HINT:

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

- b. Using SST, push in a new oil seal.

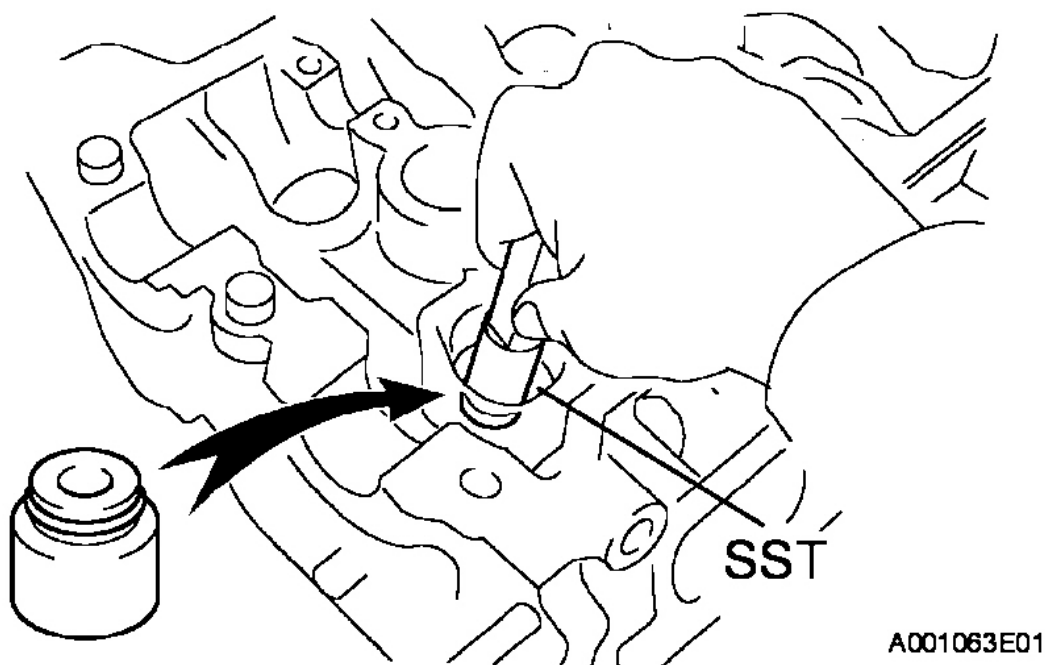


Fig. 144: Installing Valve Stem Oil Seal

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

SST 09201-41020

5. INSTALL INTAKE VALVE

- a. Install the valve, spring seat, valve spring and spring retainer.

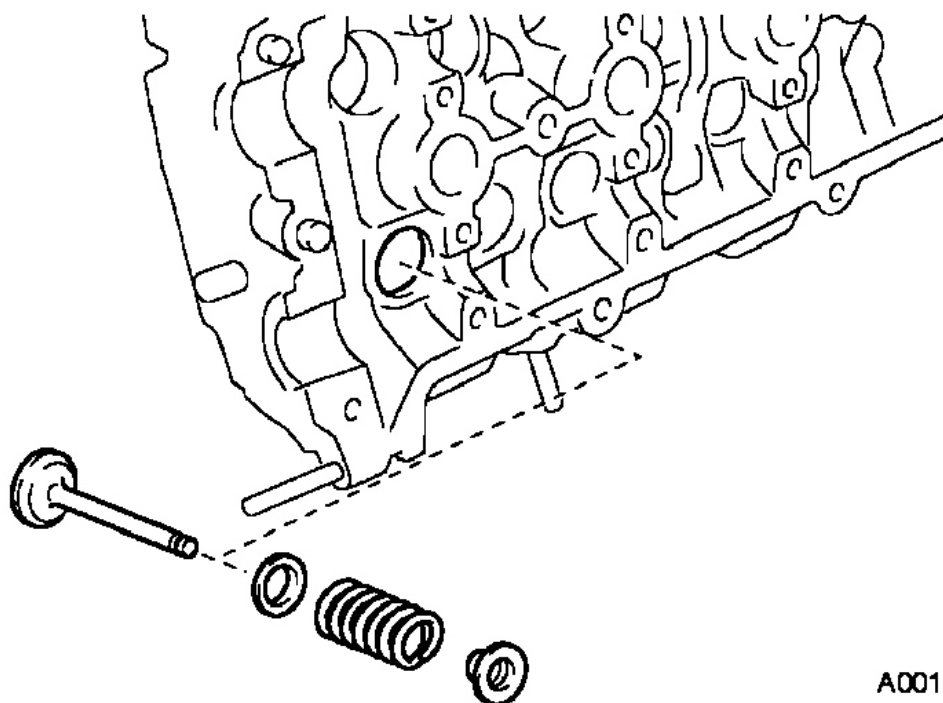


Fig. 145: Installing Valve, Spring Seat, Valve Spring And Spring Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

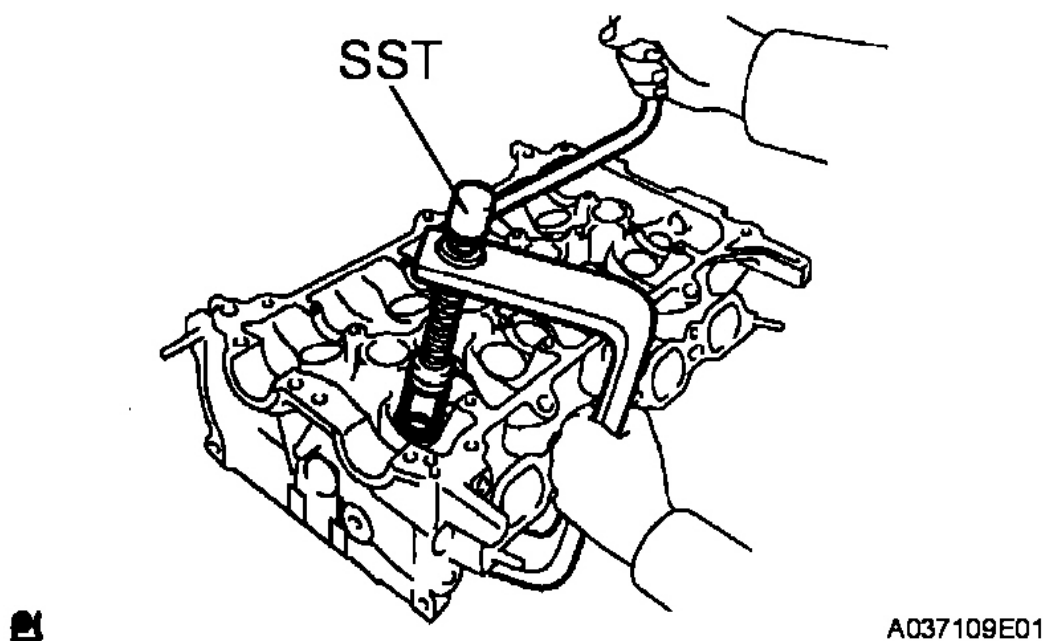


Fig. 146: Compressing Valve Spring

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

SST 09202-70020 (09202-00010)

- c. Using a plastic-faced hammer and the valve stem (not in use) with the tip wrapped in tape, lightly tap the valve stem tip to ensure a proper fit.

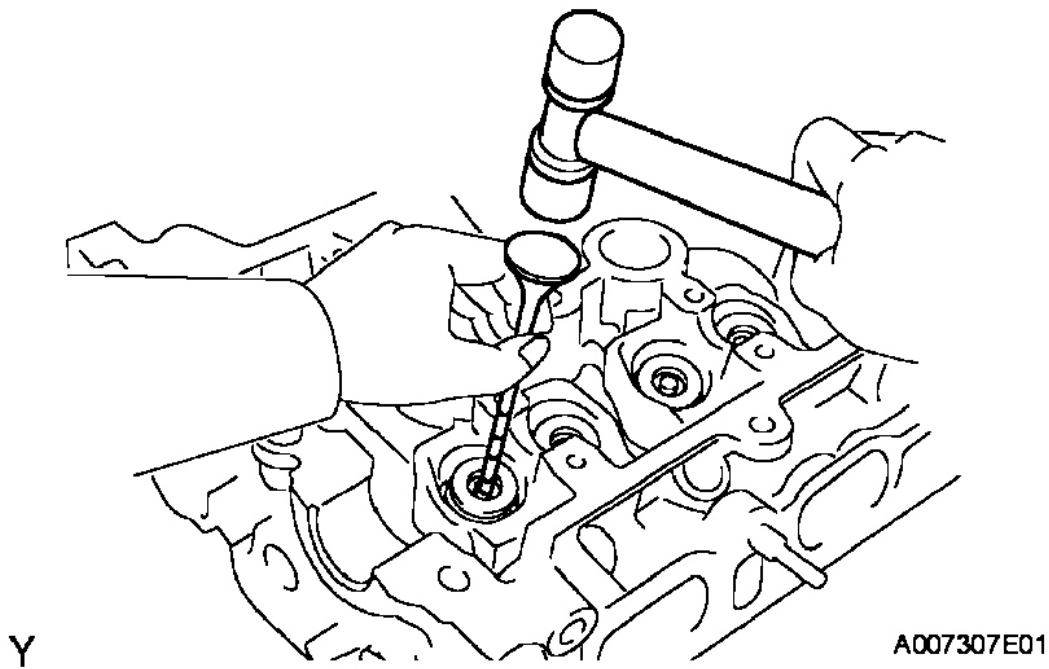


Fig. 147: Tapping Valve Stem Tip

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

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

6. INSTALL EXHAUST VALVE

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

SST 09202-70020 (09202-00010)

- Using a plastic-faced hammer and the valve stem (not in use) with the tip wrapped in tape, lightly tap the valve stem tip to ensure a proper fit.

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

7. INSTALL OIL CONTROL VALVE FILTER

- Using an 8 mm hexagon wrench, install the filter with a new gasket and the plug.

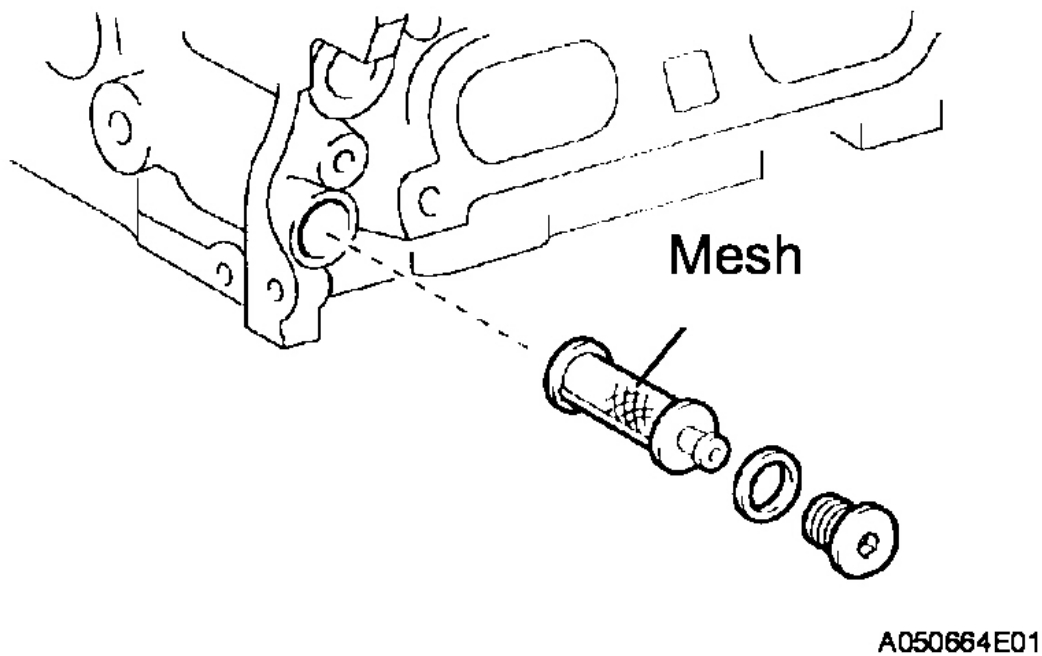


Fig. 148: Installing Oil Control Valve Filter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

8. INSTALL VALVE LIFTER

- a. Apply a light coat of engine oil to the valve lifter.
- b. Install the valve lifter.
- c. Check that the valve lifter rotates smoothly by hand.

9. INSTALL NO. 1 TAPER SCREW PLUG

- a. Using a 10 mm hexagon wrench, install the taper screw plug with a new gasket.

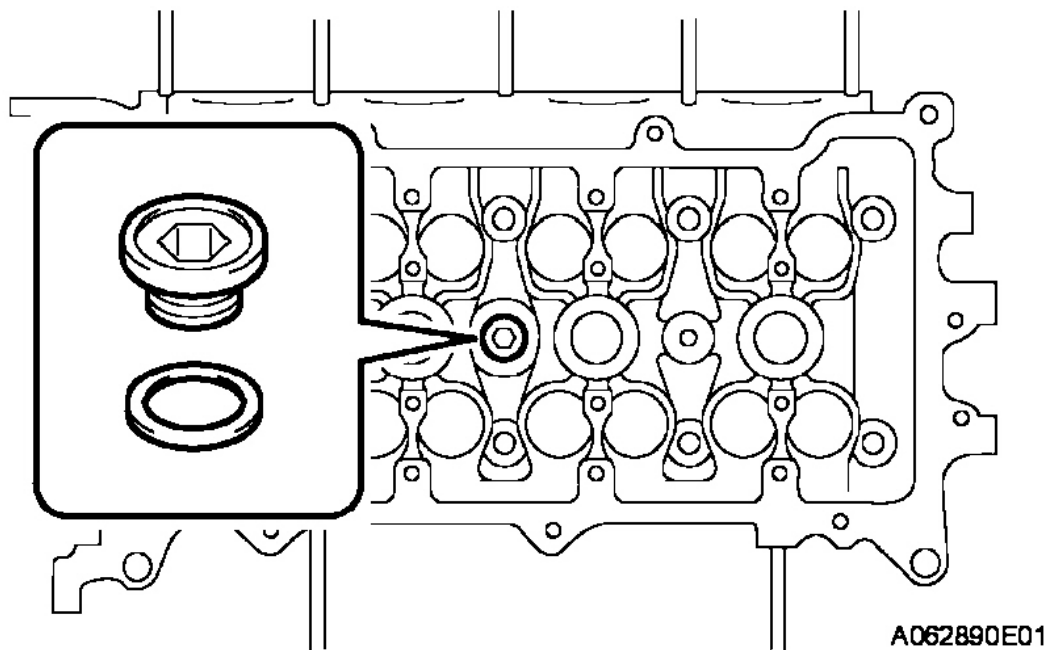


Fig. 149: Installing Taper Screw Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

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

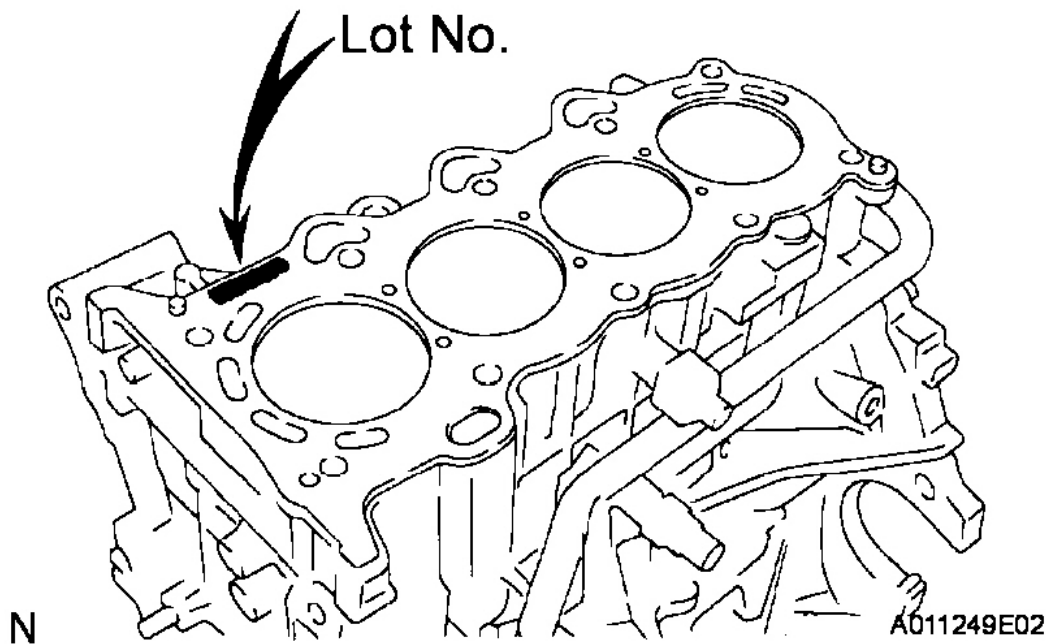


Fig. 150: Placing New Cylinder Head Gasket On Cylinder Block With Lot No Stamp Facing Upward

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

NOTE:

- Remove any oil from the contact surface.
- Be careful of the mounting orientation.
- Place the cylinder head on the gasket gently so as not to damage the gasket at the bottom part of the head.

2. INSTALL CYLINDER HEAD

HINT:

The cylinder head bolts are tightened in 2 successive steps.

- a. Apply seal packing as shown in the illustration.

Seal packing: Part No. 08826-00100

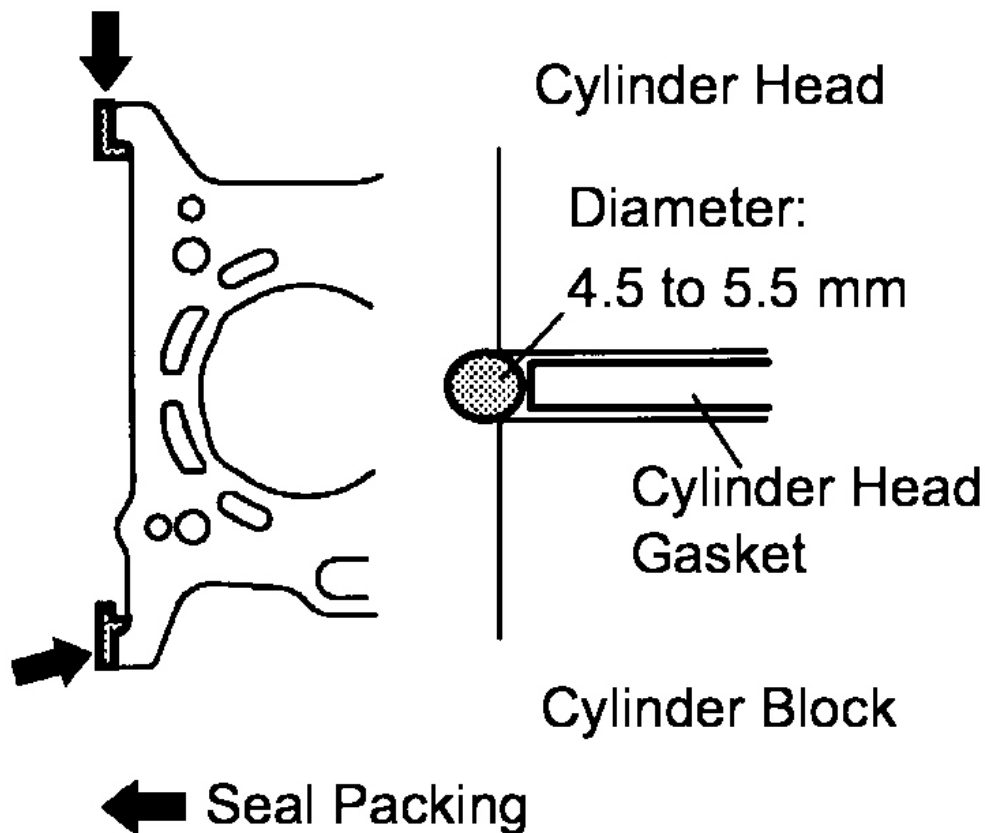
Standard seal diameter: 4.5 to 5.5 mm (0.177 to 0.217 in.)

NOTE:

- Remove any oil from the contact surface.

- Install the cylinder head within 3 minutes of applying seal packing.

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



A073748E02

Fig. 151: Identifying Seal Packing Application Area
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

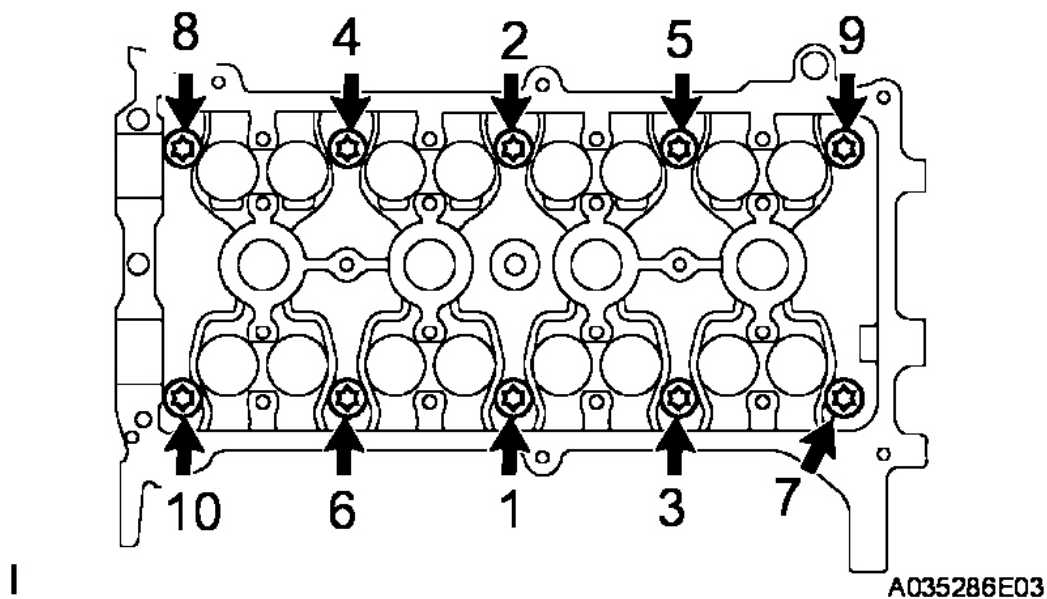


Fig. 152: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 29 N*m (300 kgf*cm, 22 ft.*lbf)

- d. Mark the front of the cylinder head bolt with paint.
- e. Retighten the cylinder head bolts by an additional 90°, and then another additional 90°, as shown in the illustration.

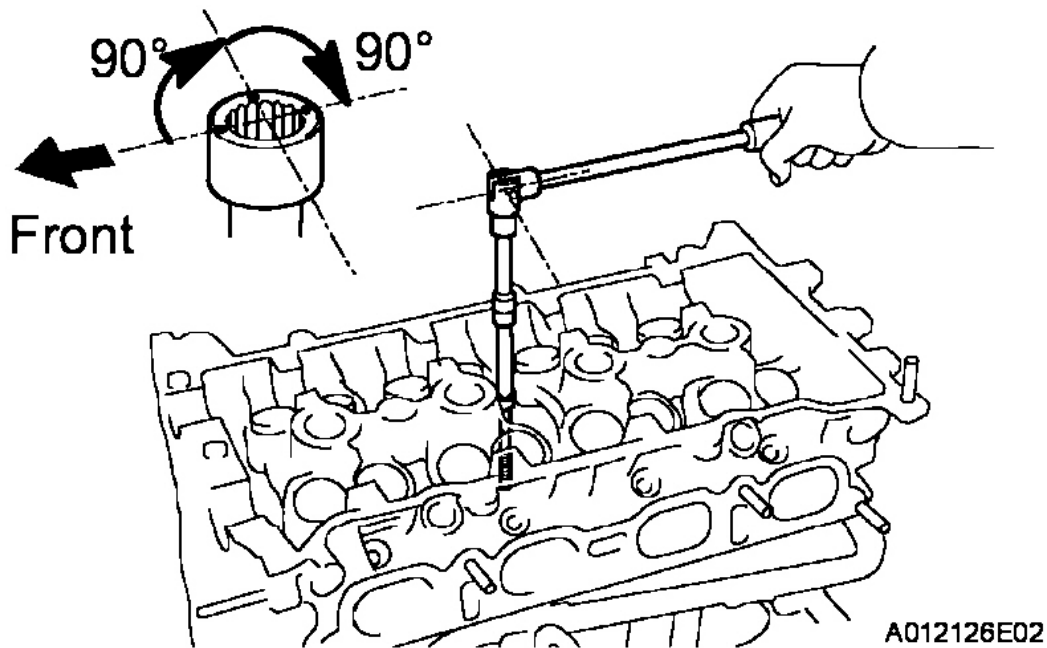


Fig. 153: Retightening Cylinder Head Bolts

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

- f. Check that the paint mark is now 180° opposite to the front.

3. INSTALL CAMSHAFT TIMING GEAR

- Put the camshaft timing gear assembly and the camshaft together with the straight pin off the groove, as shown in the illustration.
- Turn the camshaft timing gear assembly clockwise while pushing it lightly towards the camshaft. Push further at the position where the pin fits into the groove.

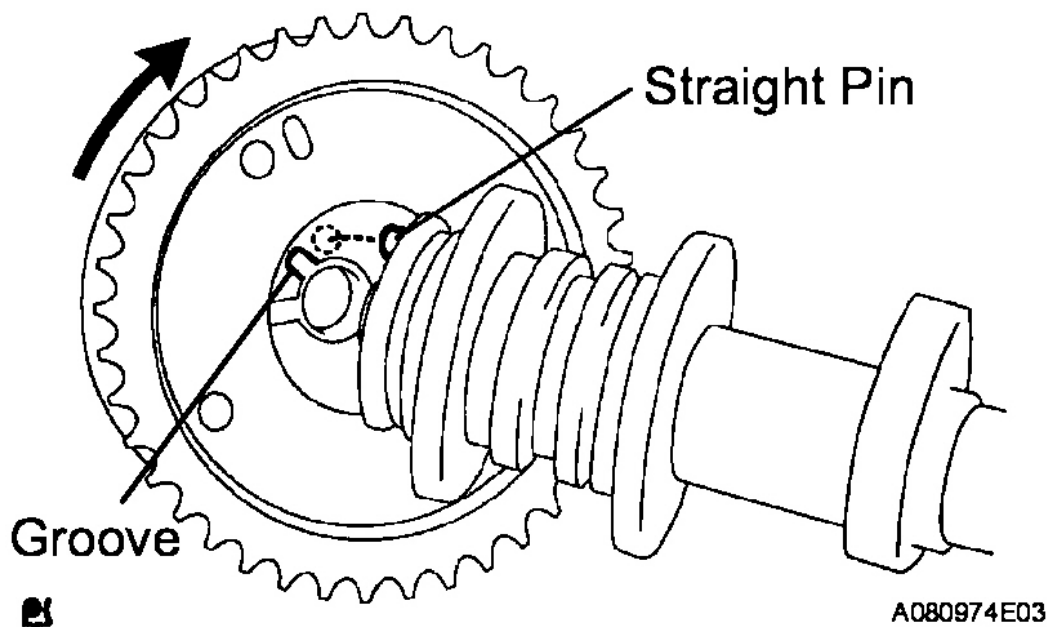


Fig. 154: Installing Camshaft Timing Gear

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

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

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

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

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

4. INSTALL CAMSHAFT TIMING SPROCKET

- a. Clamp the camshaft in a vise.
- b. Align the knock pin hole of the camshaft timing sprocket with the knock pin of the camshaft, and install the camshaft timing sprocket.

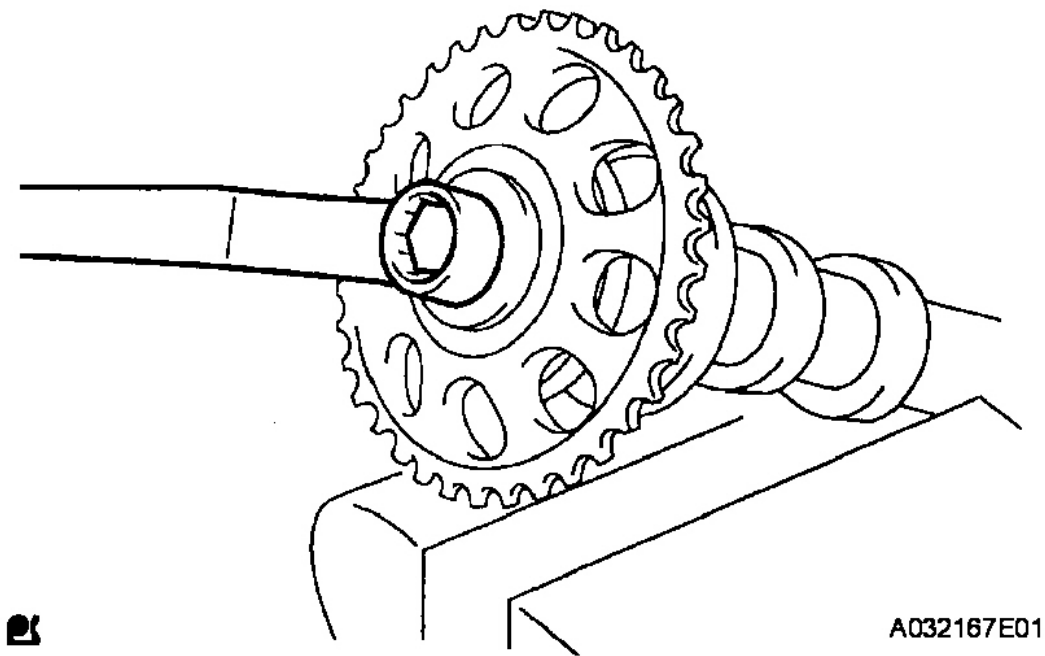


Fig. 155: Installing Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be careful not to damage the camshaft.

5. INSTALL CAMSHAFT

- a. Apply a light coat of engine oil to the camshaft journals.
- b. Place the camshaft on the cylinder head with the timing mark on the camshaft timing gear facing upward.
- c. Examine the front marks and numbers, and tighten the bolts in the sequence shown in the illustration.

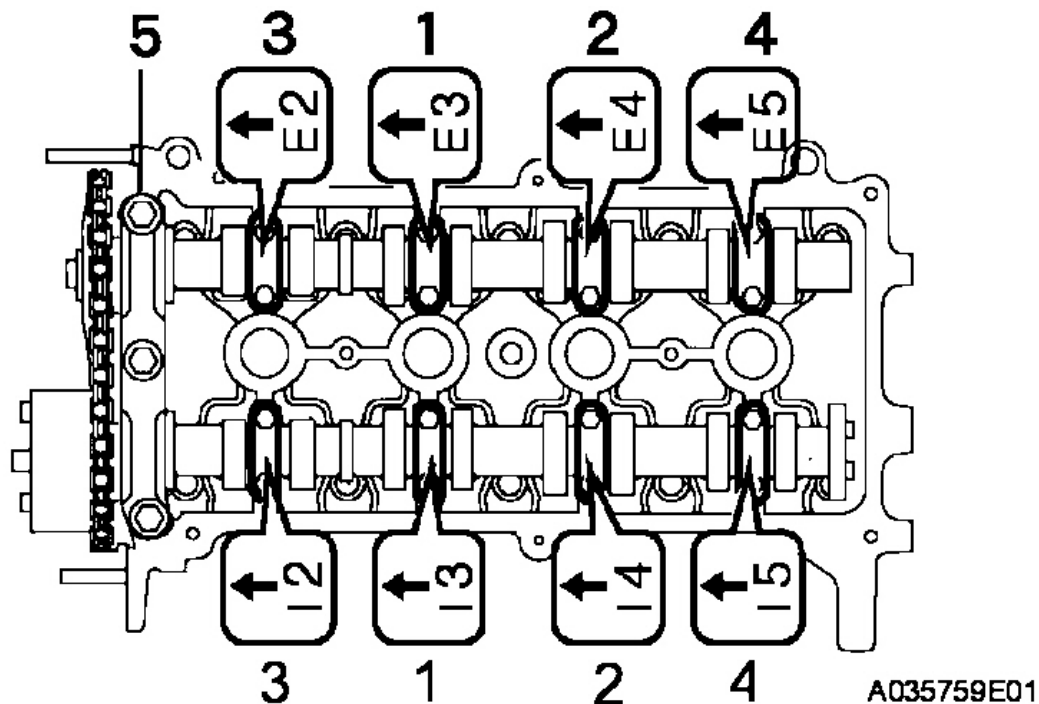


Fig. 156: Identifying Bolts Tightening Sequence

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

Torque: 13 N*m (129 kgf*cm, 9 ft.*lbf)

NOTE: Tighten each bolt uniformly, keeping the camshaft level.

- d. Install the No. 1 bearing cap.

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

6. INSTALL FUEL INJECTOR (See REASSEMBLY)
7. INSTALL FUEL DELIVERY PIPE (See REASSEMBLY)
8. INSTALL CHAIN (See INSTALLATION)
9. INSTALL OIL PUMP SEAL (See REPLACEMENT)
10. INSTALL TIMING CHAIN COVER (See REASSEMBLY)
11. INSTALL WATER PUMP (See REASSEMBLY)
12. INSTALL ENGINE MOUNTING BRACKET RH (See INSTALLATION)
13. INSTALL ENGINE MOUNTING INSULATOR RH (See INSTALLATION)
14. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See INSTALLATION)

15. **INSTALL CRANKSHAFT POSITION SENSOR (See INSTALLATION)**
16. **INSTALL WATER PUMP PULLEY (See REASSEMBLY)**
17. **INSTALL CRANKSHAFT PULLEY (See INSTALLATION)**
18. **INSTALL CYLINDER HEAD COVER (See INSTALLATION)**
19. **INSTALL IGNITION COIL (See INSTALLATION)**
20. **INSTALL NO. 2 CYLINDER HEAD COVER (See INSTALLATION)**
21. **INSTALL GENERATOR (See REASSEMBLY)**
22. **INSTALL VANE PUMP V BELT (See REMOVAL)**
23. **INSTALL GENERATOR V BELT (See REMOVAL)**
24. **ADJUST GENERATOR V BELT (See REMOVAL)**
25. **ADJUST VANE PUMP V BELT (See REMOVAL)**
26. **INSPECT DRIVE BELT DEFLECTION AND TENSION (See ON-VEHICLE INSPECTION)**
27. **INSTALL CAMSHAFT TIMING CONTROL VALVE ASSEMBLY (See REASSEMBLY)**
28. **CONNECT NO. 2 VENTILATION HOSE (See INSTALLATION)**
29. **CONNECT VENTILATION HOSE (See INSTALLATION)**
30. **INSTALL IGNITION COIL (See INSTALLATION)**
31. **INSTALL OIL DIPSTICK GUIDE**
 - a. Apply engine oil to a new O-ring and install it to the dipstick guide.
 - b. Install the dipstick guide with the bolt.

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

32. **INSTALL INTAKE MANIFOLD**
 - a. Install a new gasket onto the intake manifold.
 - b. Install the intake manifold with the 3 bolts and 2 nuts. Using several steps, uniformly tighten the bolts and nuts in the sequence shown in the illustration.

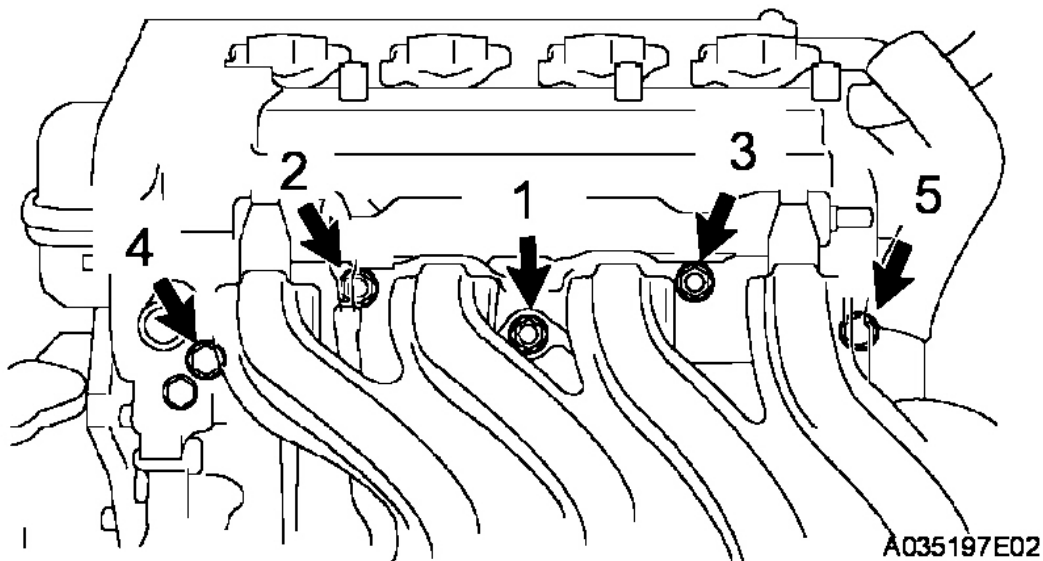


Fig. 157: Identifying Intake Manifold Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

33. **INSTALL EXHAUST MANIFOLD (See INSTALLATION)**
34. **INSTALL MANIFOLD SUPPORT BRACKET**
 - a. Install the manifold support bracket with the 3 bolts.

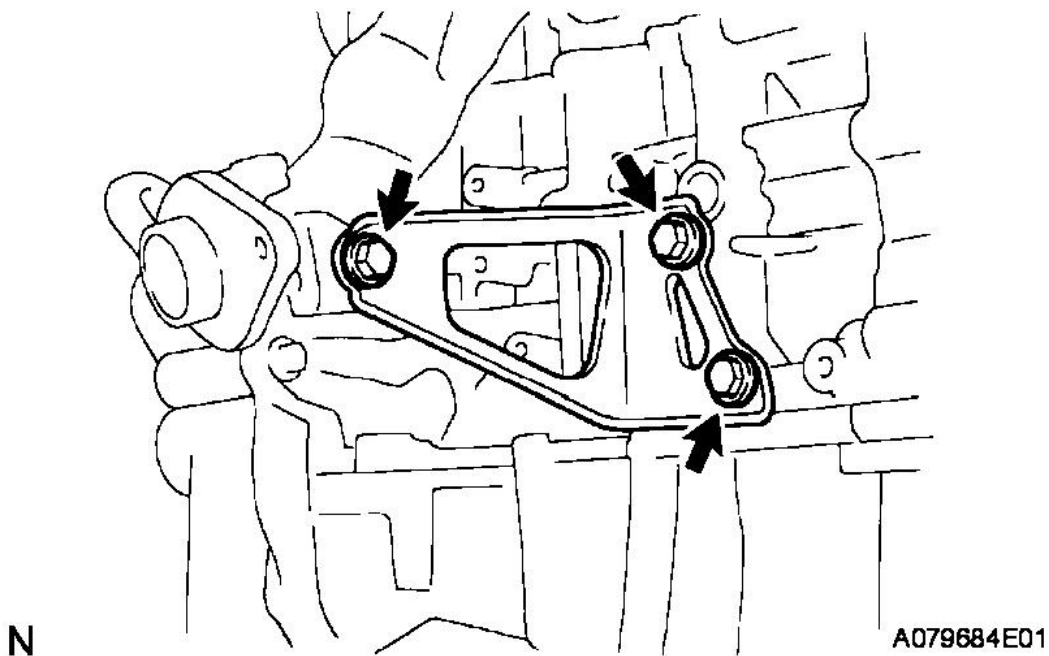


Fig. 158: Installing Manifold Support Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

35. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Install the No. 1 exhaust manifold heat insulator with the 4 bolts.

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

36. INSTALL FRONT EXHAUST PIPE

- a. Place a new gasket on the exhaust manifold.
- b. Install the 2 compression springs and 2 bolts.

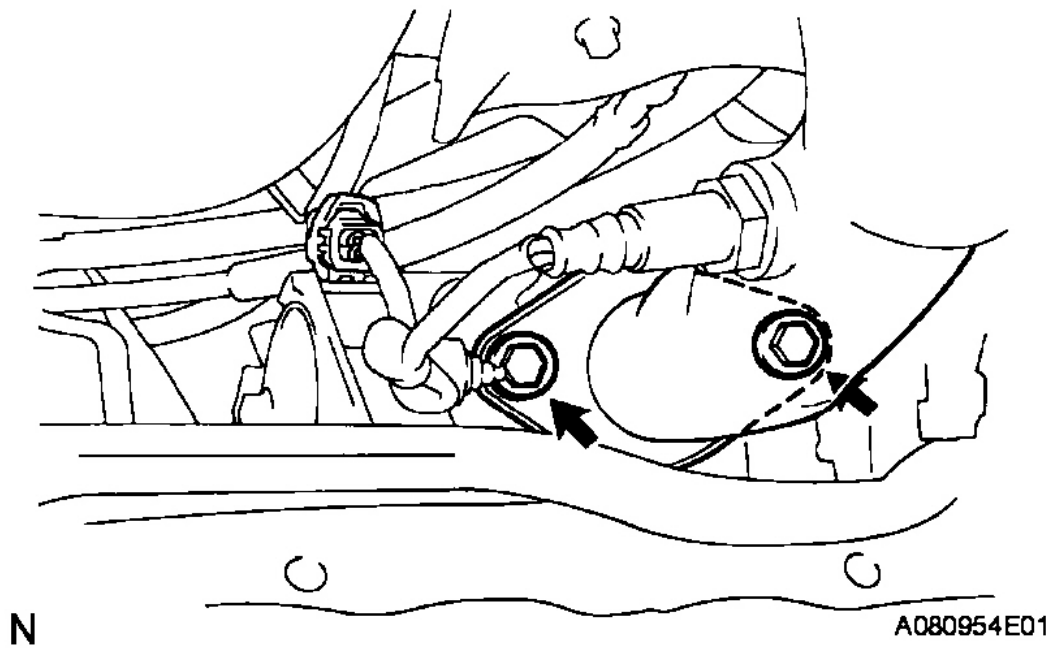


Fig. 159: Installing Bolts

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

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

37. INSTALL WATER FILLER

- a. Install the water filler with the 2 bolts.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

- b. Connect the radiator reservoir tank hose.
- c. Connect the No. 3 radiator hose.
- d. Connect the radiator inlet hose.

38. INSTALL NO. 1 WATER BYPASS PIPE

- a. Install the water bypass pipe with the bolt.

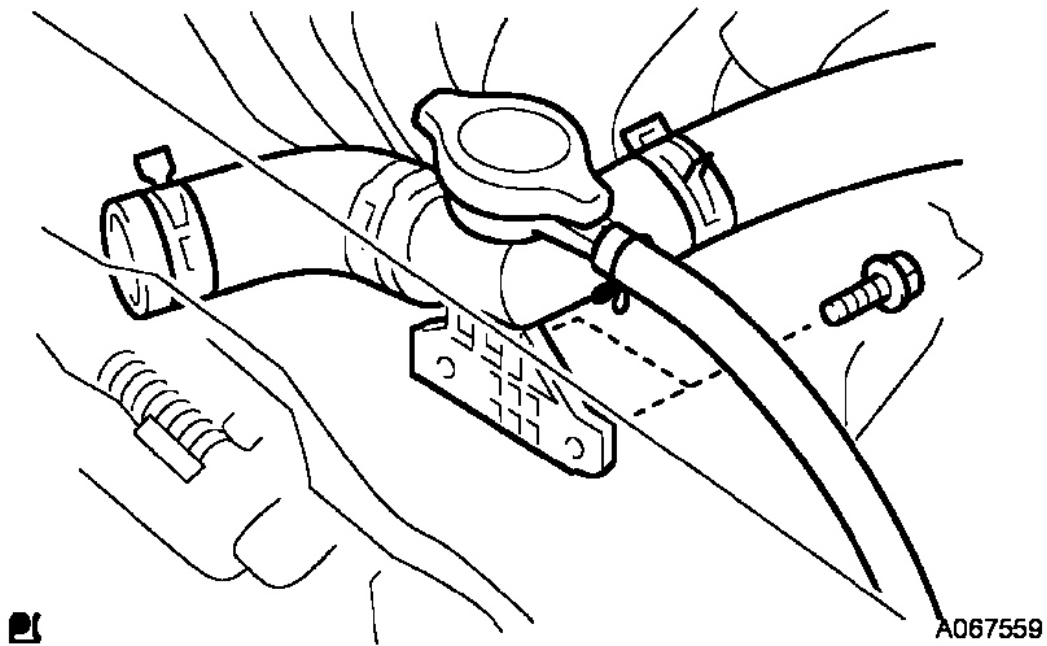


Fig. 160: Installing Water Filler
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

39. CONNECT RADIATOR HOSE INLET

- a. Connect the radiator hose inlet to the union.

40. CONNECT UNION TO CHECK VALVE HOSE

- a. Connect the union to check valve hose to the brake booster.

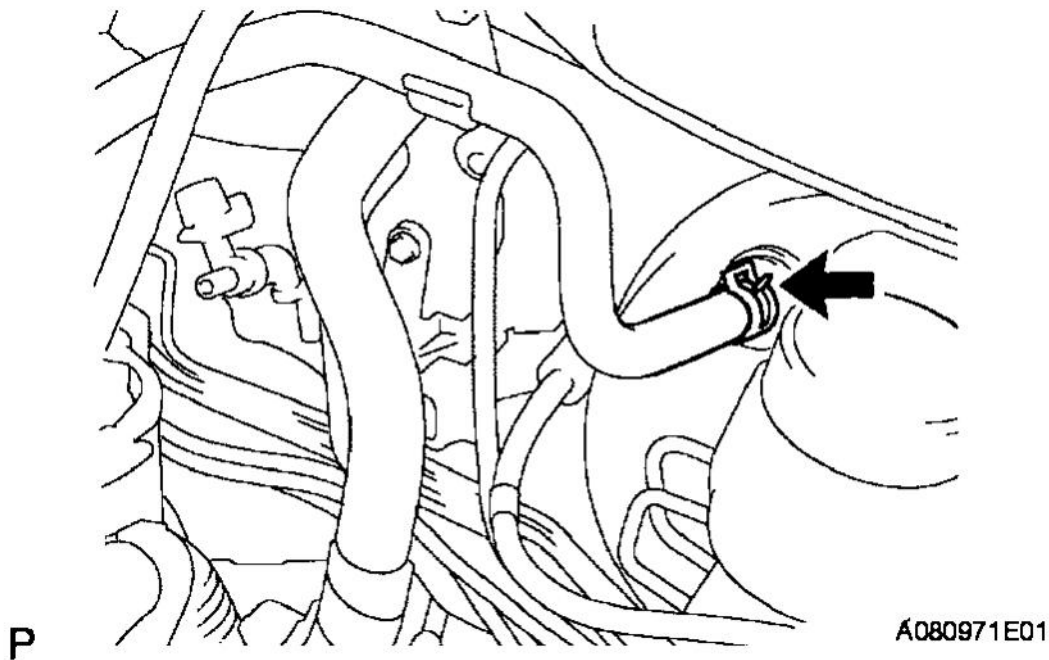
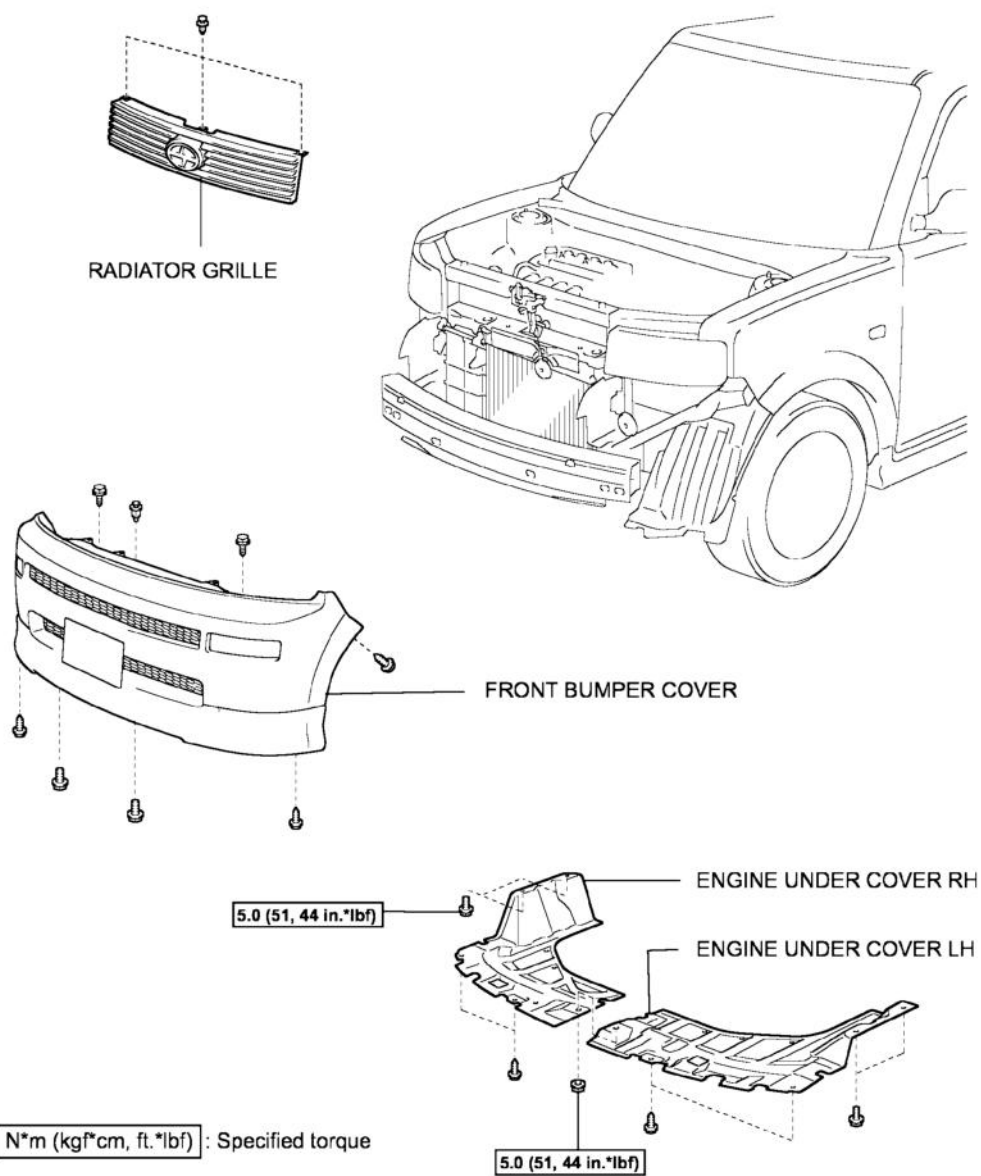


Fig. 161: Connecting Union To Check Valve Hose To Brake Booster
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. CONNECT FUEL TUBE (See INSTALLATION)
42. INSTALL ACCELERATOR CONTROL CABLE (See INSTALLATION)
43. CONNECT ENGINE WIRE
44. INSTALL AIR CLEANER (See INSTALLATION)
45. INSTALL OIL PAN DRAIN PLUG
46. ADD ENGINE OIL (See REPLACEMENT)
47. CHECK FOR ENGINE OIL LEAKS
48. ADD COOLANT (See ON-VEHICLE INSPECTION)
49. CHECK FOR ENGINE COOLANT LEAKS (See ON-VEHICLE INSPECTION)
50. CHECK FOR FUEL LEAKS (See ON-VEHICLE INSPECTION)
51. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

ENGINE ASSEMBLY

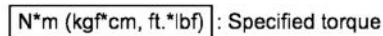
COMPONENTS



P

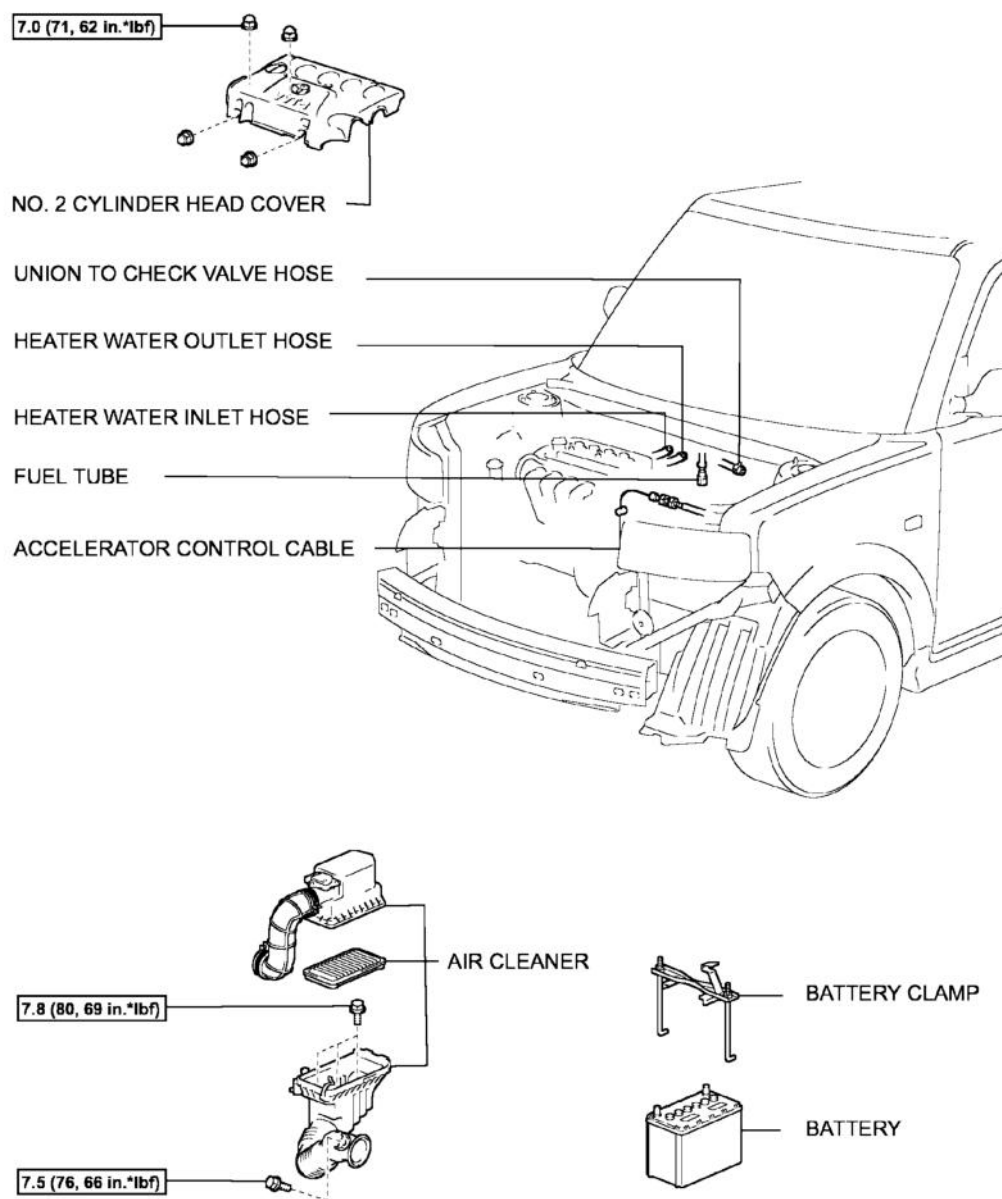
A120926E01

Fig. 162: Identifying Engine Assembly Components (1 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A120976E01

© 2011 Mitchell Repair Information Company, LLC.



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

P

A120079ED1

Fig. 164: Identifying Engine Assembly Components (3 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Non-reusable part

P

A117416E01

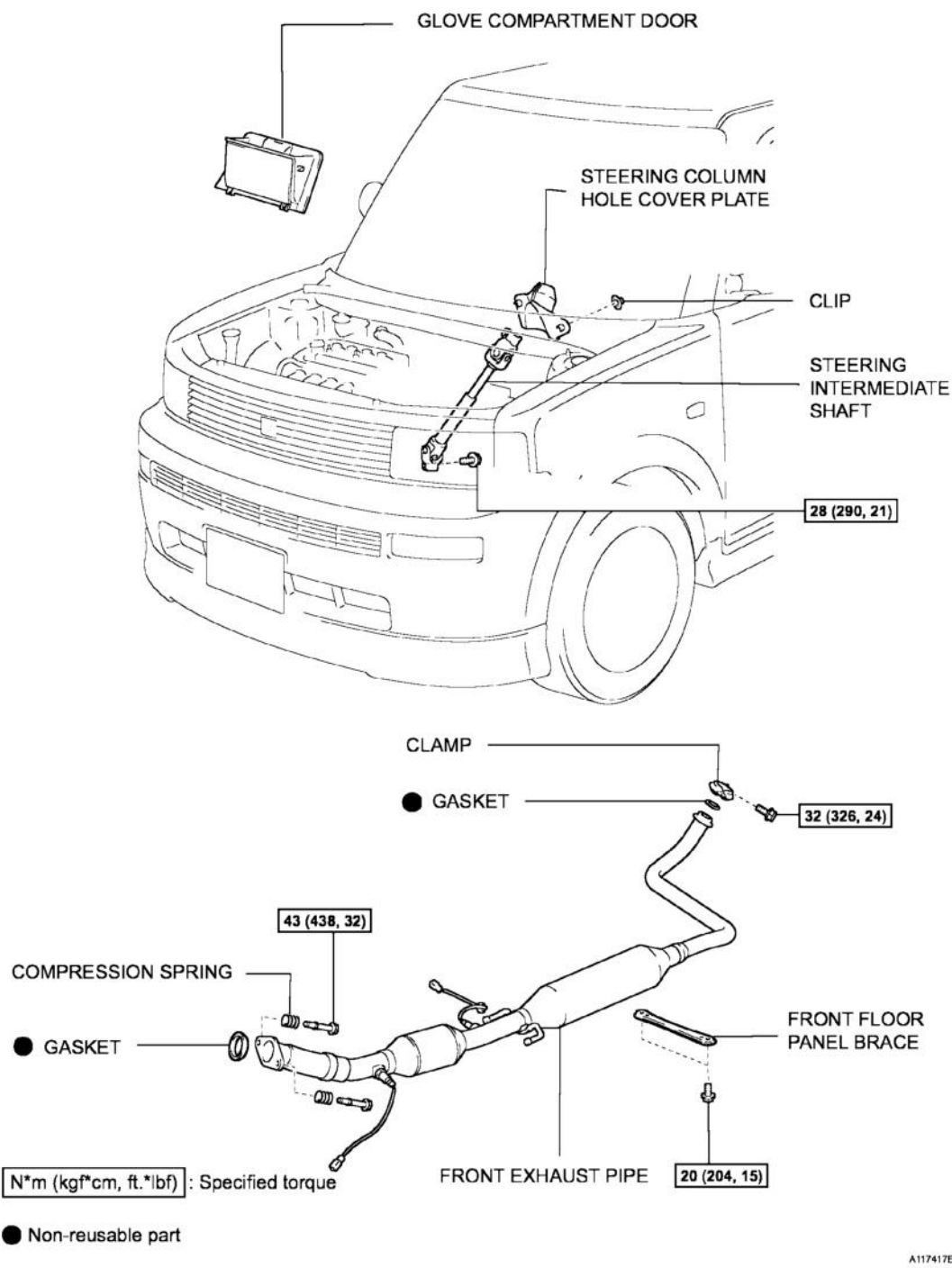
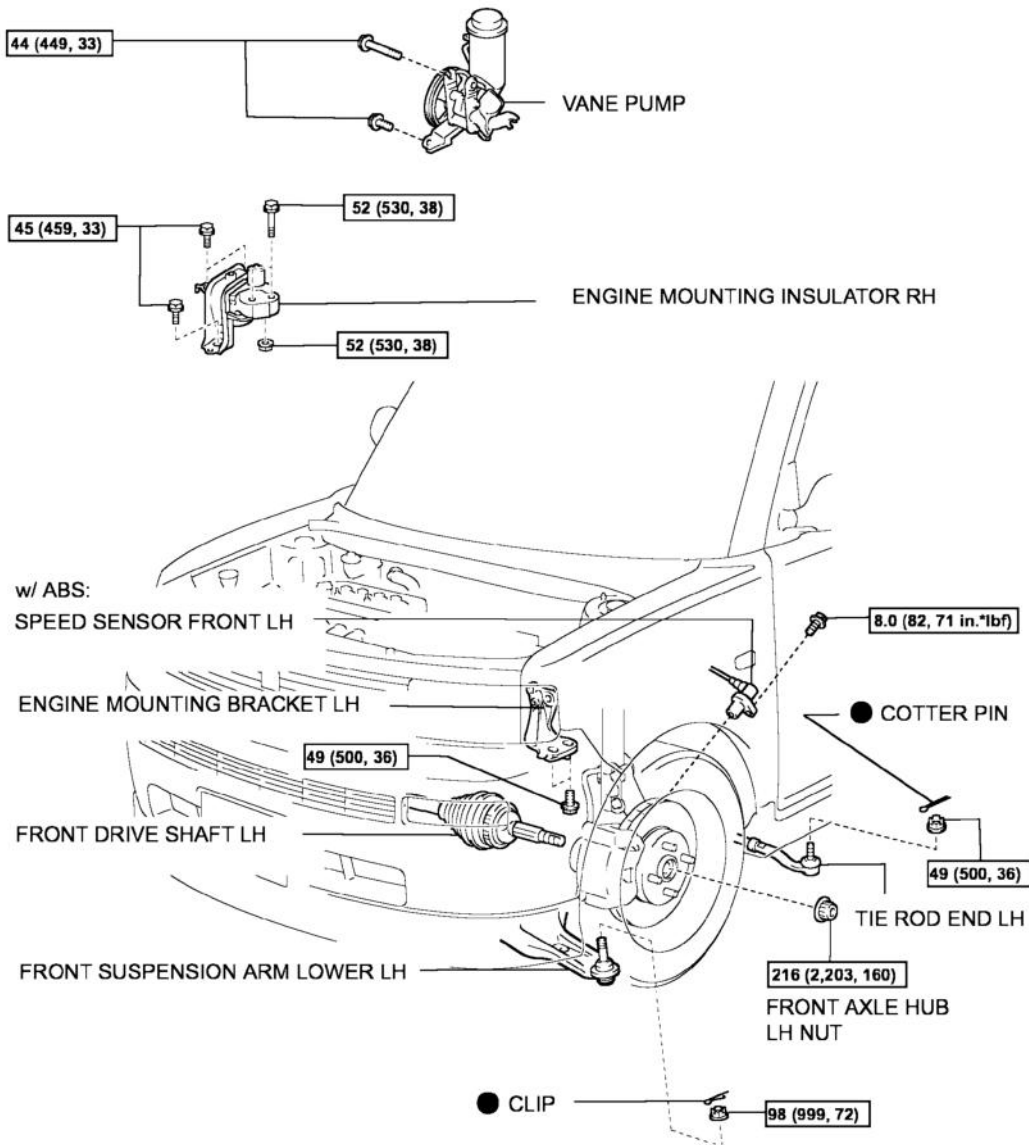


Fig. 166: Identifying Engine Assembly Components (5 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



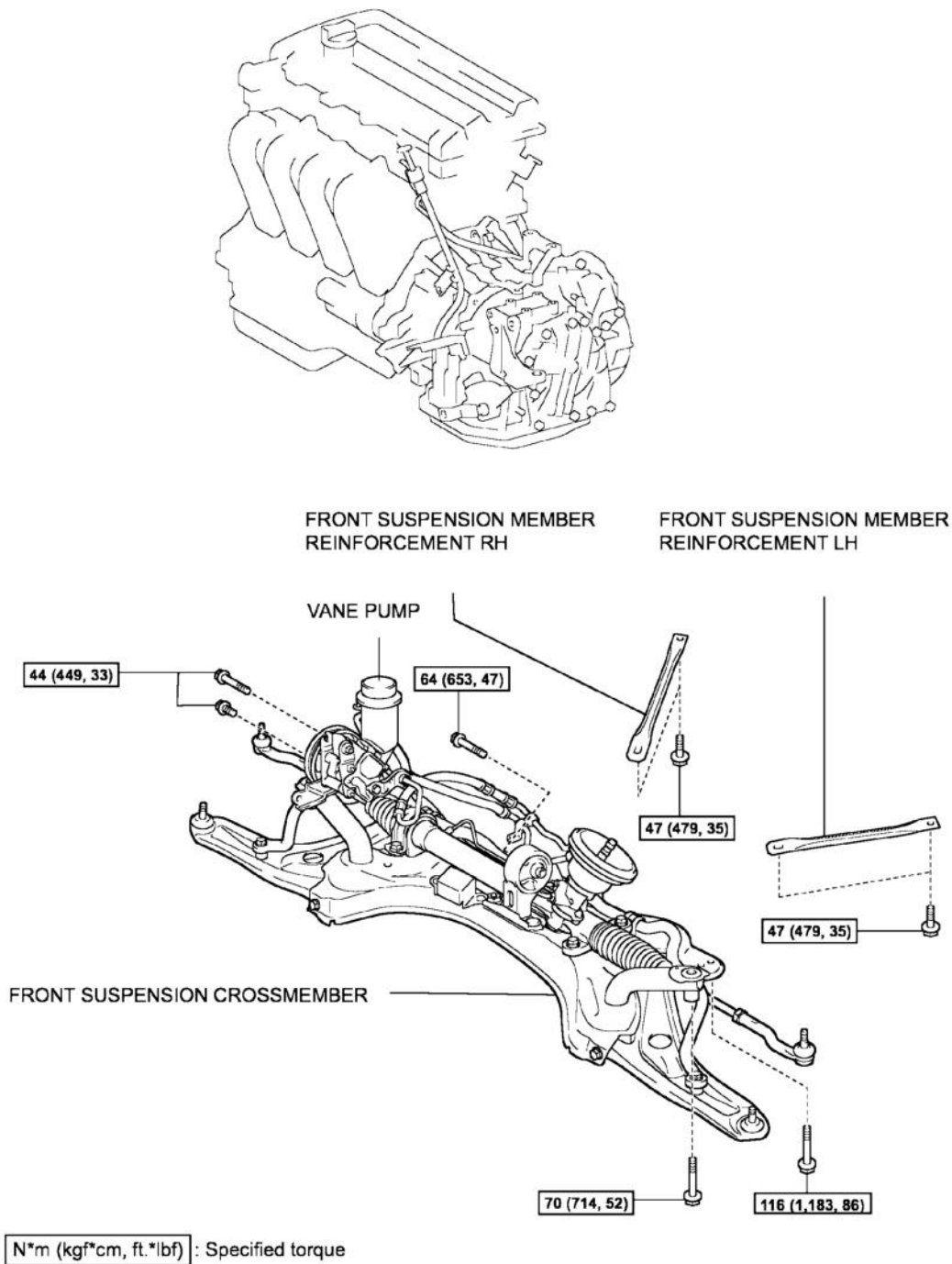
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

P

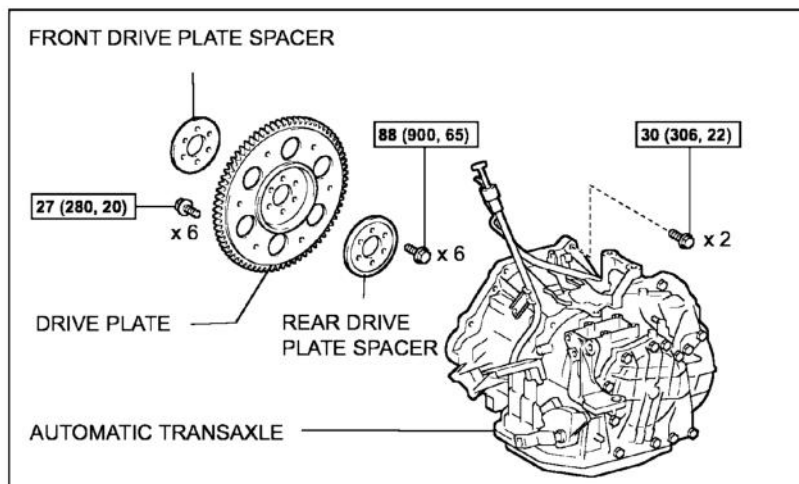
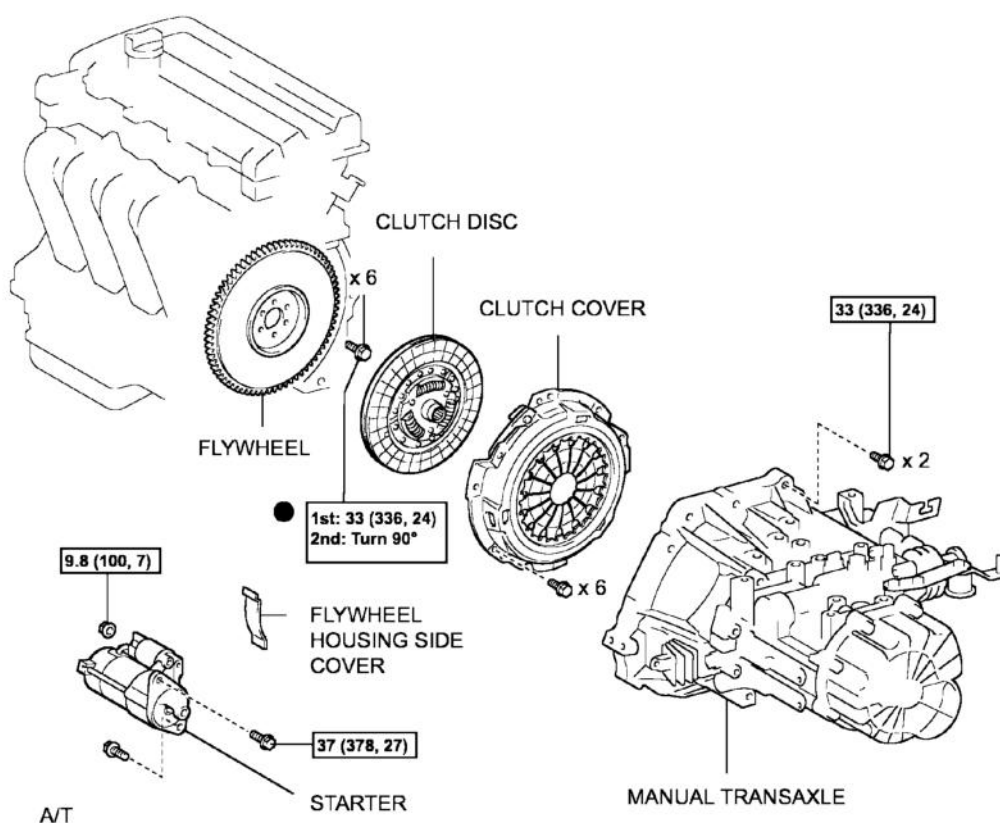
A117418E01

Fig. 167: Identifying Engine Assembly Components (6 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A116714ED1

Fig. 168: Identifying Engine Assembly Components (7 Of 9)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



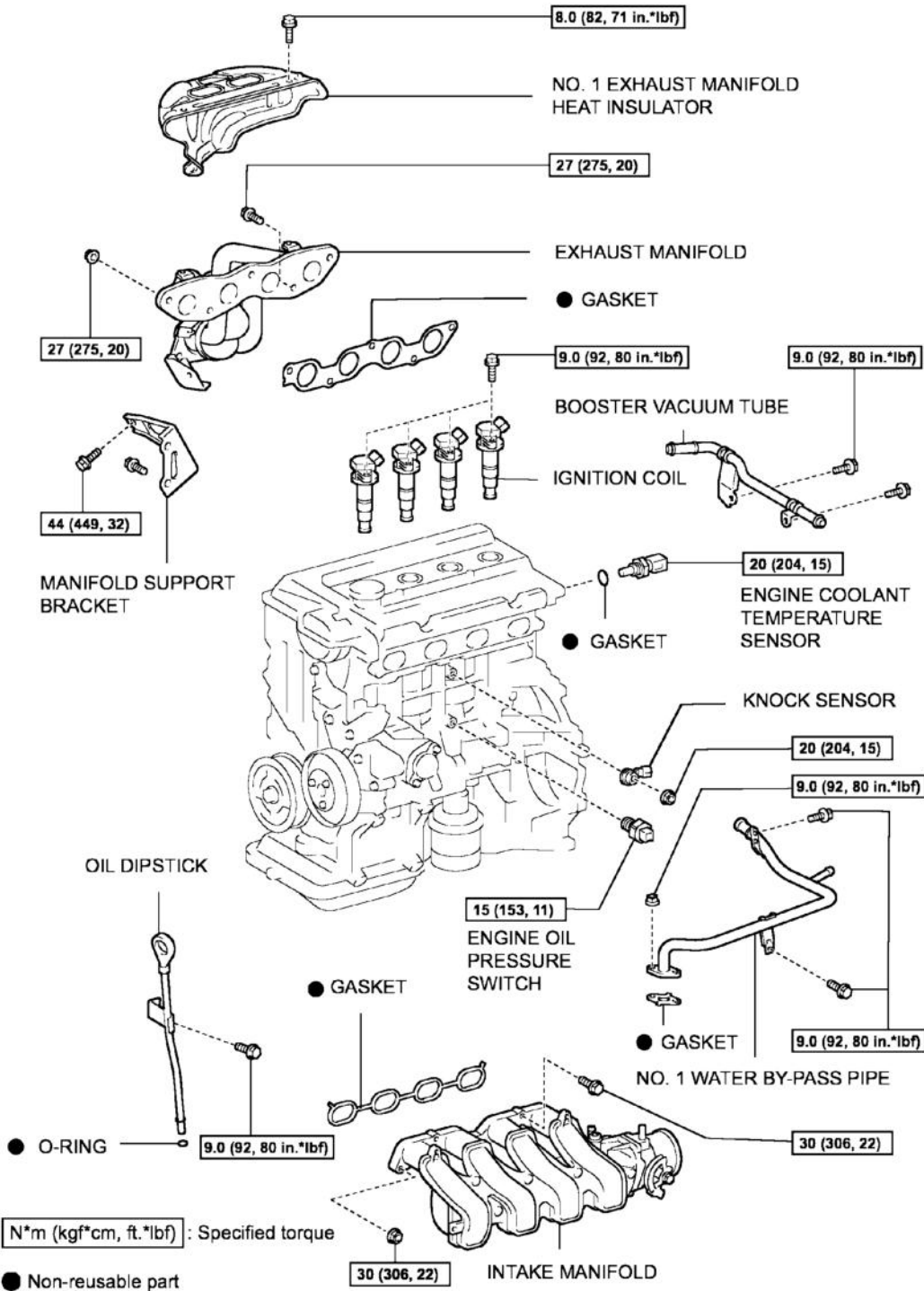
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

P

A116715E01

Fig. 169: Identifying Engine Assembly Components (8 Of 9)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A118718E01

Fig. 170: Identifying Engine Assembly Components (9 Of 9)
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 ENGINE UNDER COVER RH**
4. **REMOVE ENGINE UNDER COVER LH**
5. **DRAIN ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
6. **DISCONNECT RADIATOR HOSE INLET**
7. **DISCONNECT RADIATOR HOSE OUTLET**
8. **DISCONNECT OIL COOLER INLET HOSE (for Automatic Transaxle)**
9. **DISCONNECT OIL COOLER OUTLET HOSE (for Automatic Transaxle)**
10. **REMOVE RADIATOR GRILLE (See REMOVAL)**
11. **REMOVE FRONT BUMPER COVER (See REMOVAL)**
12. **DISCONNECT HOOD LOCK (See REMOVAL)**
13. **REMOVE HOOD LOCK SUPPORT BRACE (See REMOVAL)**
14. **REMOVE RADIATOR SUPPORT OPENING COVER (See REMOVAL)**
15. **REMOVE UPPER RADIATOR SUPPORT (See REMOVAL)**
16. **REMOVE RADIATOR (See REMOVAL)**
17. **REMOVE FRONT WHEEL**
18. **REMOVE NO. 2 CYLINDER HEAD COVER**
 - a. Remove the 4 nuts and No. 2 cylinder head cover.

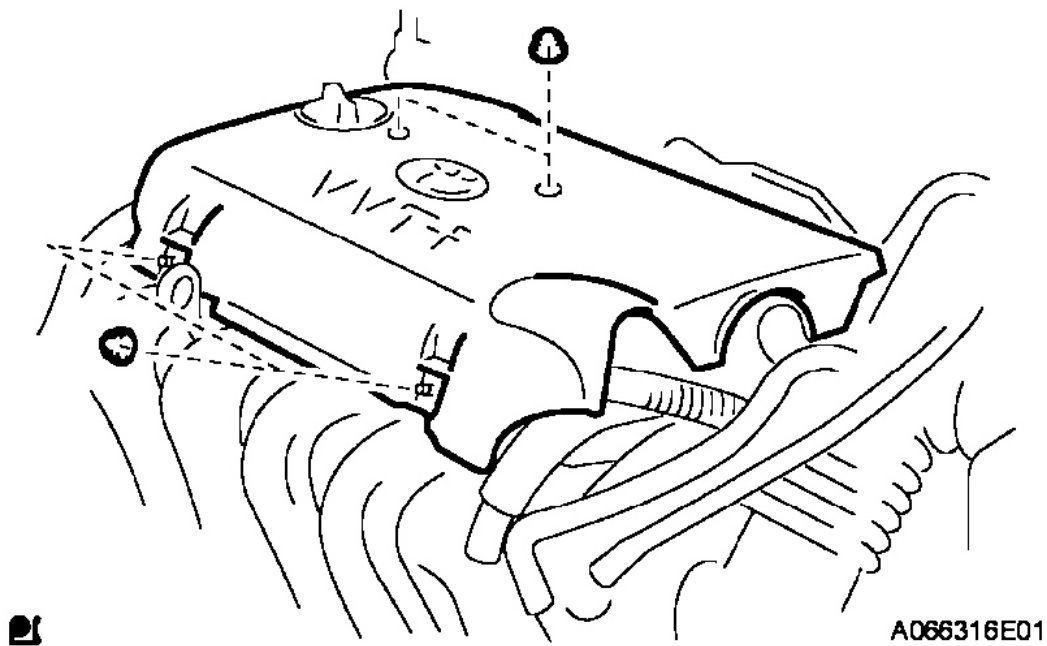


Fig. 171: Removing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE BATTERY**
20. **REMOVE AIR CLEANER (See REMOVAL)**
21. **DISCONNECT FUEL TUBE (See REMOVAL)**
22. **DISCONNECT ACCELERATOR CONTROL CABLE (See REMOVAL)**
23. **DISCONNECT TRANSMISSION CONTROL CABLE (for Manual Transaxle) (See REMOVAL)**
24. **DISCONNECT TRANSMISSION CONTROL CABLE (for Automatic Transaxle) (See REMOVAL)**
25. **DISCONNECT CLUTCH RELEASE CYLINDER (for Manual Transaxle) (See REMOVAL)**
26. **DISCONNECT UNION TO CHECK VALVE HOSE**
 - a. Disconnect the union to check valve hose for the brake booster.

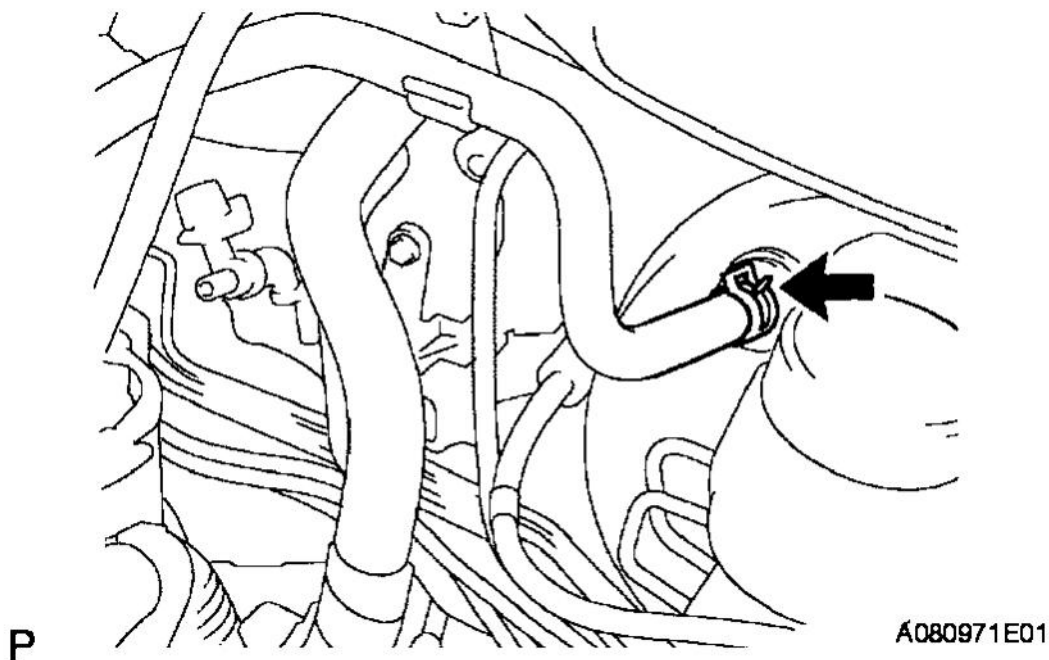


Fig. 172: Disconnecting Union To Check Valve Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. DISCONNECT HEATER WATER INLET HOSE

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

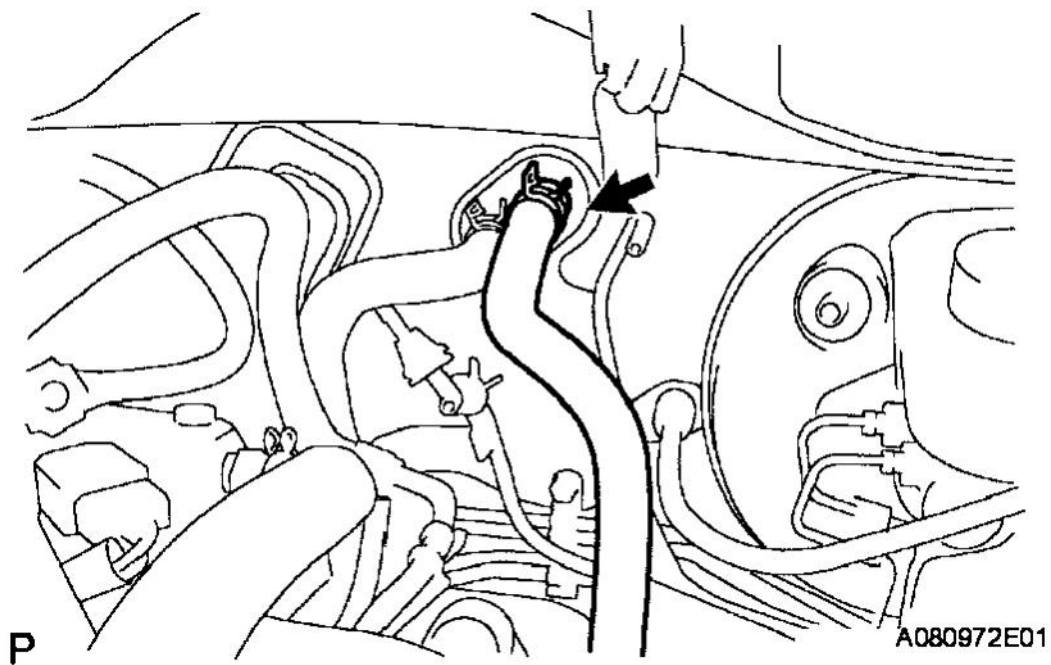


Fig. 173: Disconnecting Heater Water Inlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. DISCONNECT HEATER WATER OUTLET HOSE

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

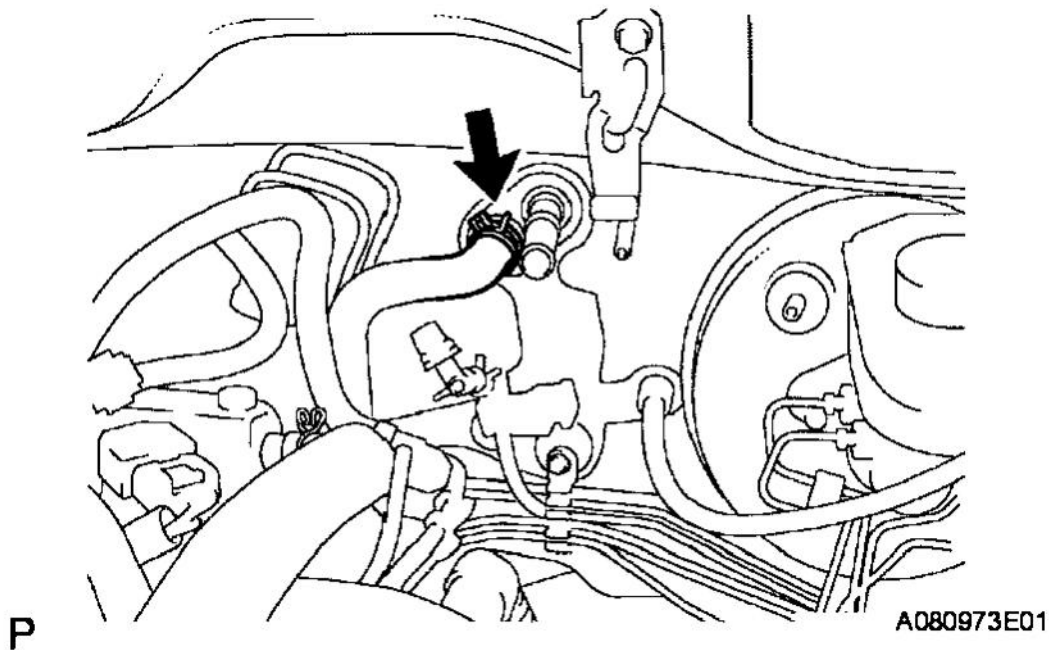


Fig. 174: Disconnecting Heater Water Outlet Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. DISCONNECT ENGINE WIRE

- a. Remove the glove compartment door.
- b. Disconnect the engine wire harness from the ECM and junction block.
- c. Pull out the engine wire.
- d. Disconnect the engine wire from the engine room junction block.
- e. Remove the body ground.

30. REMOVE GENERATOR V BELT (See REMOVAL)

31. REMOVE COOLER COMPRESSOR (See REMOVAL)

32. REMOVE FRONT FLOOR PANEL BRACE (See REMOVAL)

33. REMOVE FRONT EXHAUST PIPE (See REMOVAL)

34. DISCONNECT STEERING INTERMEDIATE SHAFT (See REMOVAL)

35. REMOVE FRONT AXLE HUB LH NUT

- a. Remove the clip and nut.
- b. Using SST and a hammer, unstake the lock nut.

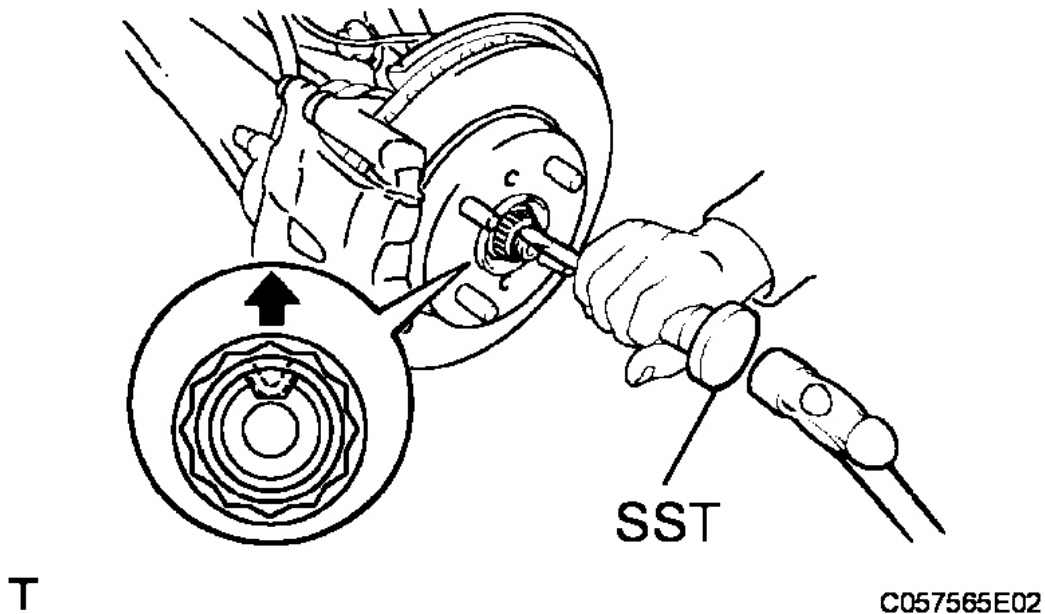


Fig. 175: Unstaking Lock Nut

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

SST 09930-00010

NOTE:

- When removing the nut, unstake the lock nut completely.
- Do not damage the threads of the drive shaft.
- Do not use SST with the tip sharpened.
- Set SST to the groove with the flat face facing upward.

- c. Using a 30 mm socket wrench, remove the lock nut.

HINT:

Perform the same procedure as above on the opposite side.

36. DISCONNECT SPEED SENSOR FRONT LH (w/ABS)

- a. Remove the bolt and disconnect the speed sensor from the steering knuckle.

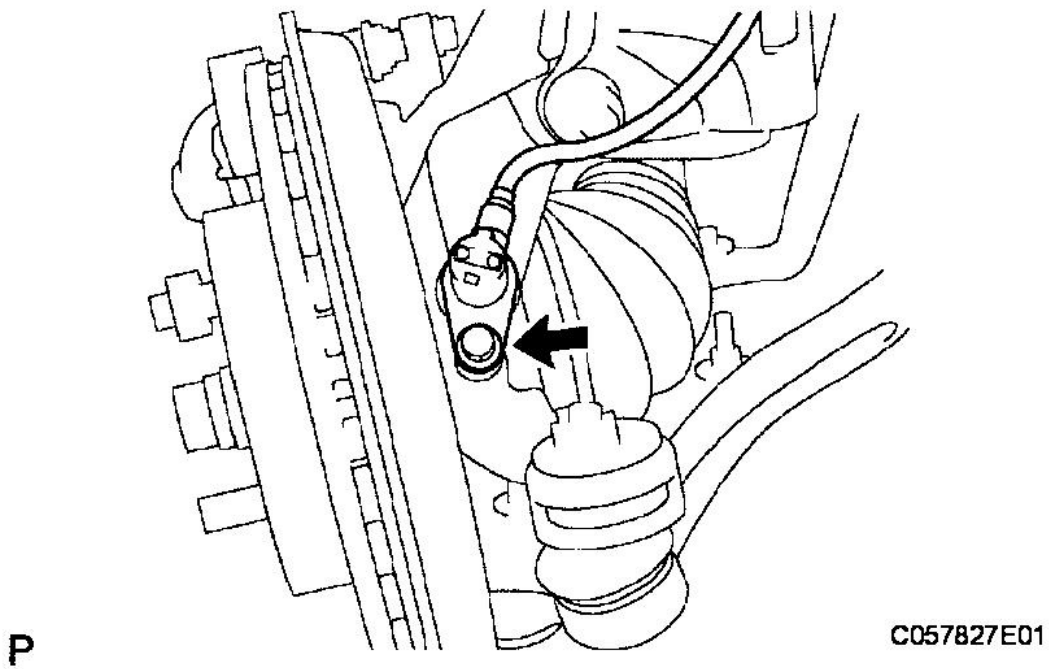


Fig. 176: Disconnecting Speed Sensor Front LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Perform the same procedure as above on the opposite side.

37. DISCONNECT TIE ROD END LH

- a. Using SST, disconnect the tie rod end from the steering knuckle.

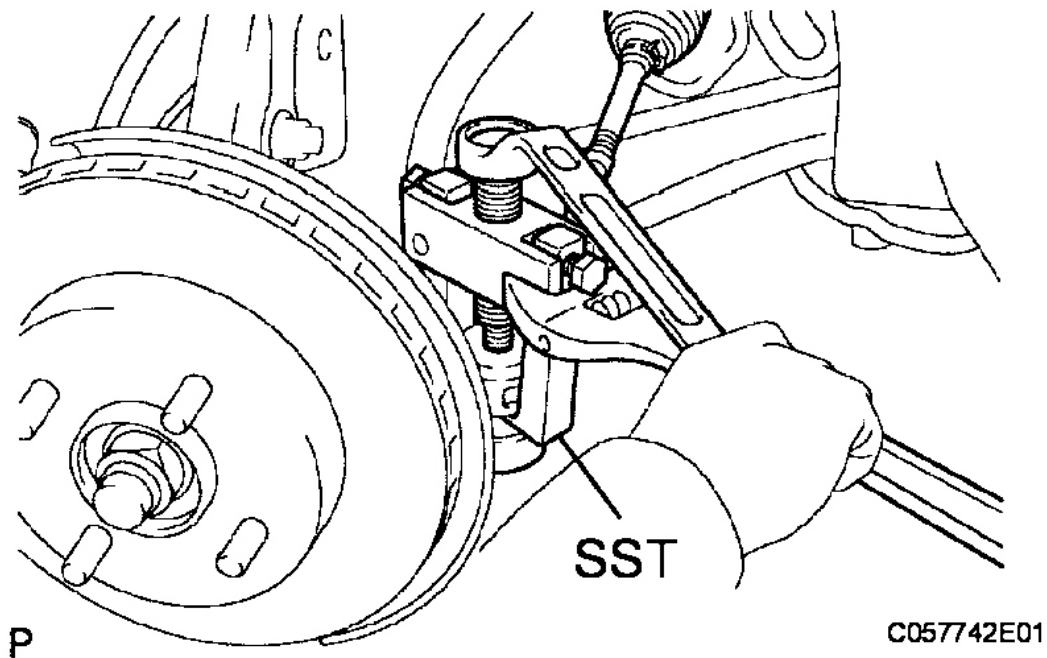


Fig. 177: Disconnecting Tie Rod End LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09628-62011

NOTE: Do not damage the dust cover of the ball joint.

HINT:

Perform the same procedure as above on the opposite side.

38. DISCONNECT FRONT SUSPENSION ARM LOWER LH

- a. Using SST, disconnect the front suspension arm lower from the steering knuckle.

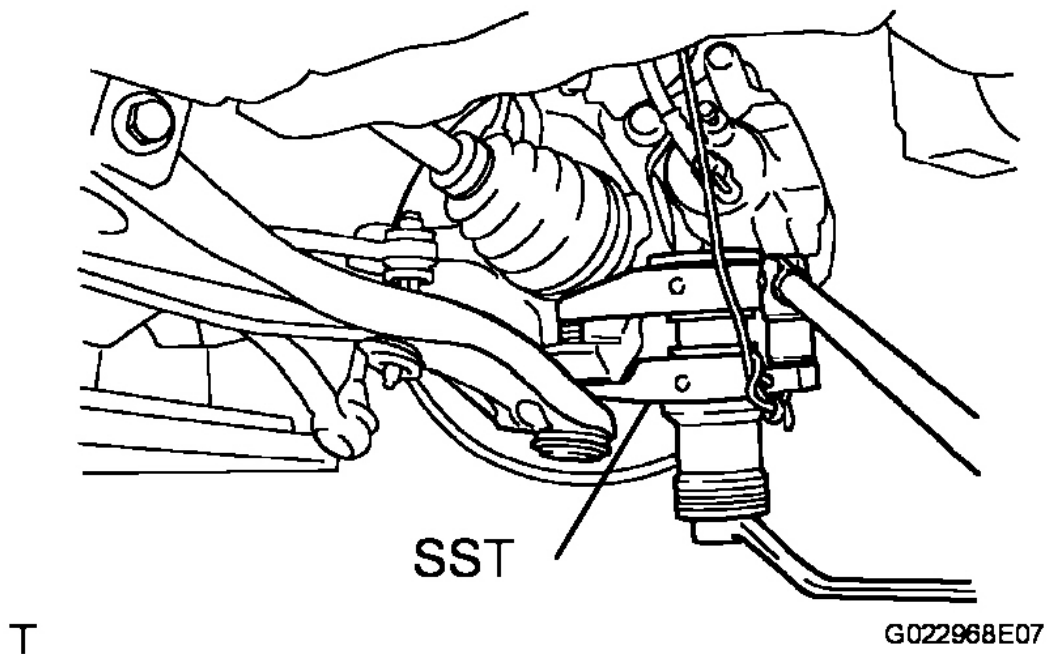


Fig. 178: Disconnecting Front Suspension Arm Lower LH
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09628-00011

HINT:

Perform the same procedure as above on the opposite side.

39. DISCONNECT FRONT DRIVE SHAFT LH

- Using a plastic-faced hammer, detach the drive shaft from the axle hub by tapping the drive shaft.

HINT:

Perform the same procedure as above on the opposite side.

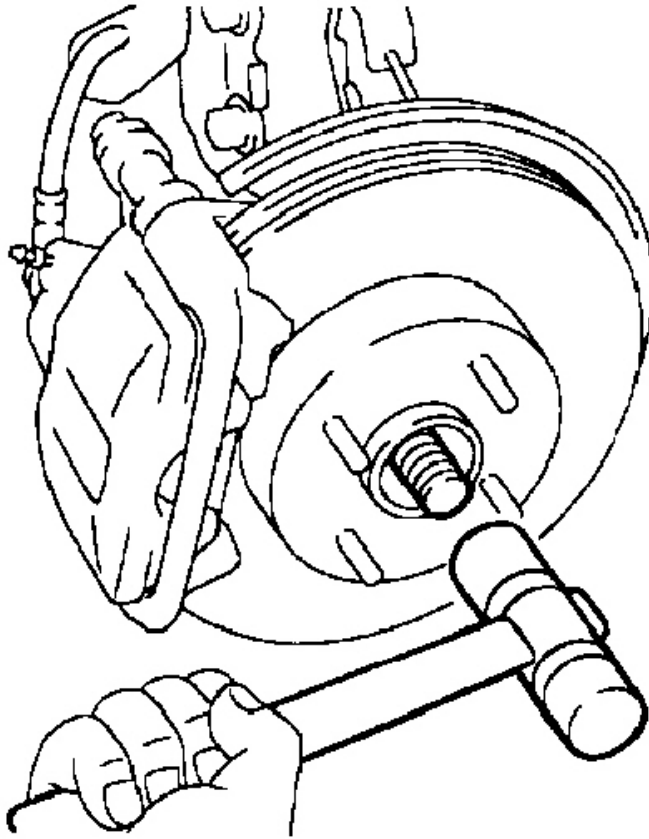
**F006479E01**

Fig. 179: Disconnecting Front Drive Shaft LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. REMOVE ENGINE AND TRANSAXLE ASSEMBLY

- a. Set the engine lifter.
- b. Remove the bolt which is used to fix the liquid tube to the engine mounting insulator RH.
- c. Remove the 5 bolts, nut and engine mounting insulator RH.

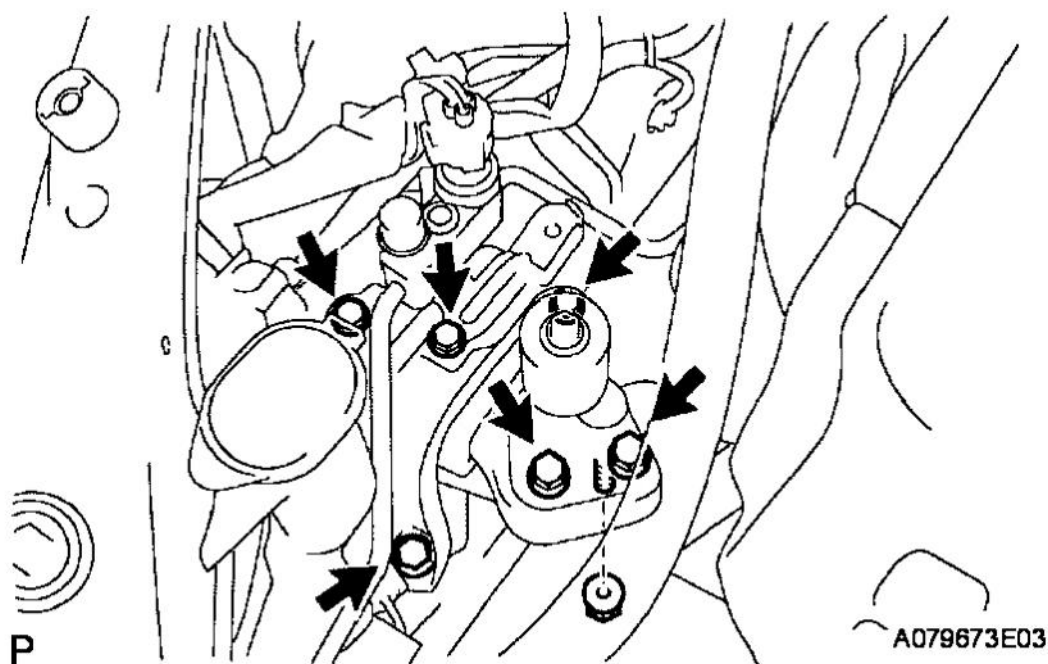


Fig. 180: Removing Engine Mounting Insulator RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 2 bolts and detach the engine mounting bracket from the engine mounting insulator LH.

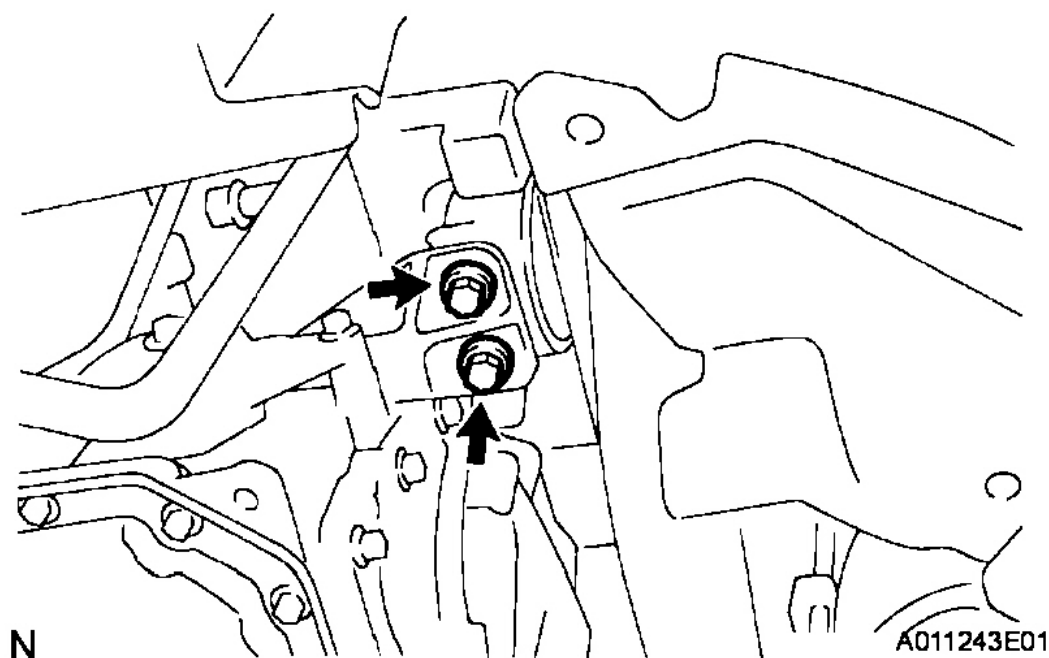


Fig. 181: Removing Engine Mounting Bracket

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

- e. Remove the engine together with the transaxle.
 - 1. Remove the 8 bolts shown in the illustration.
 - 2. Carefully remove the engine assembly from the vehicle.

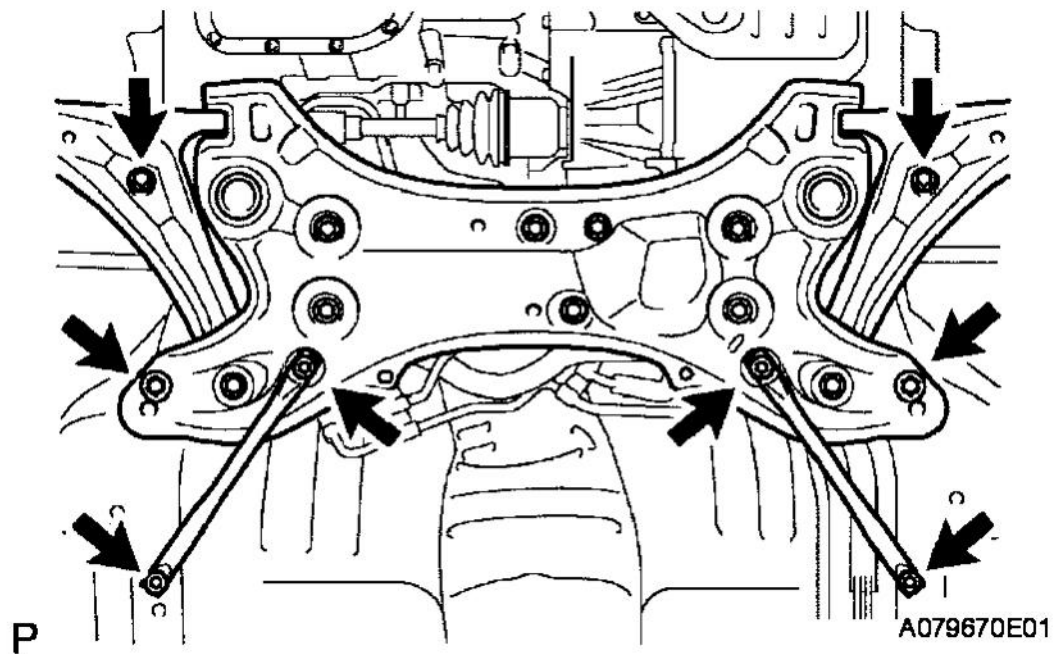


Fig. 182: Removing Bolts

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

- f. Install the 2 engine hangers as shown in the illustration.

Part No.

HANGER AND BOLT SPECIFICATION

Item	Part
No. 1 engine hanger	12281-21010
Bolt	91642-81025

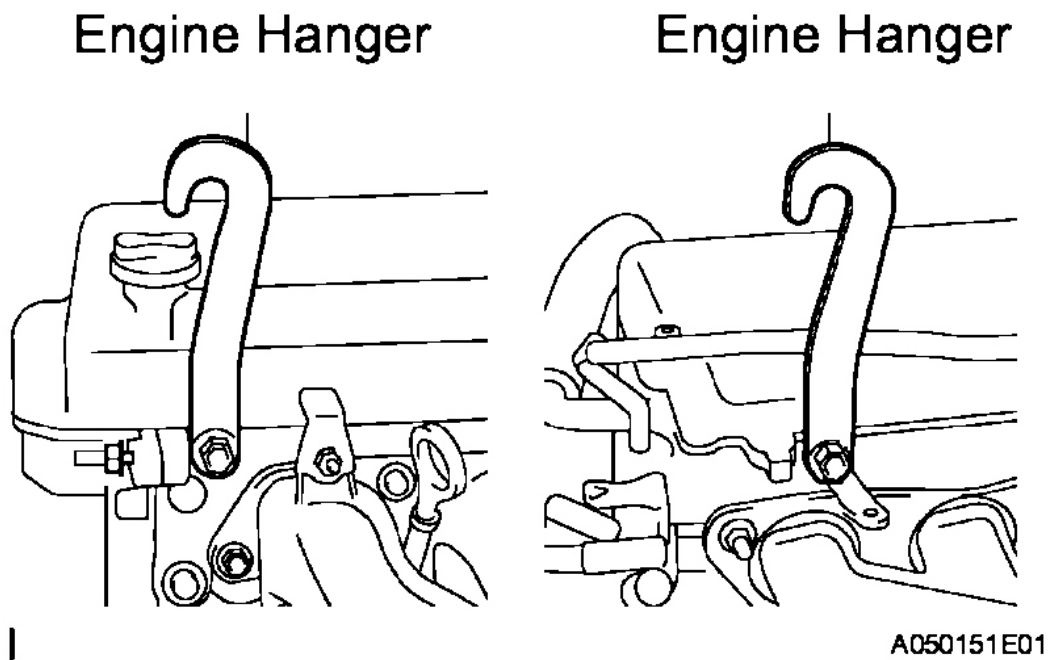


Fig. 183: Installing Engine Hangers

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

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

- g. Attach the engine sling device and hang the engine with the chain block.
- 41. **REMOVE VANE PUMP V BELT (See REMOVAL)**
- 42. **REMOVE VANE PUMP**
 - a. Disconnect the power steering oil pressure sensor harness.
 - b. Remove the 2 bolts and vane pump assembly.
- 43. **REMOVE FRONT SUSPENSION CROSSMEMBER**
 - a. Remove the through bolt.

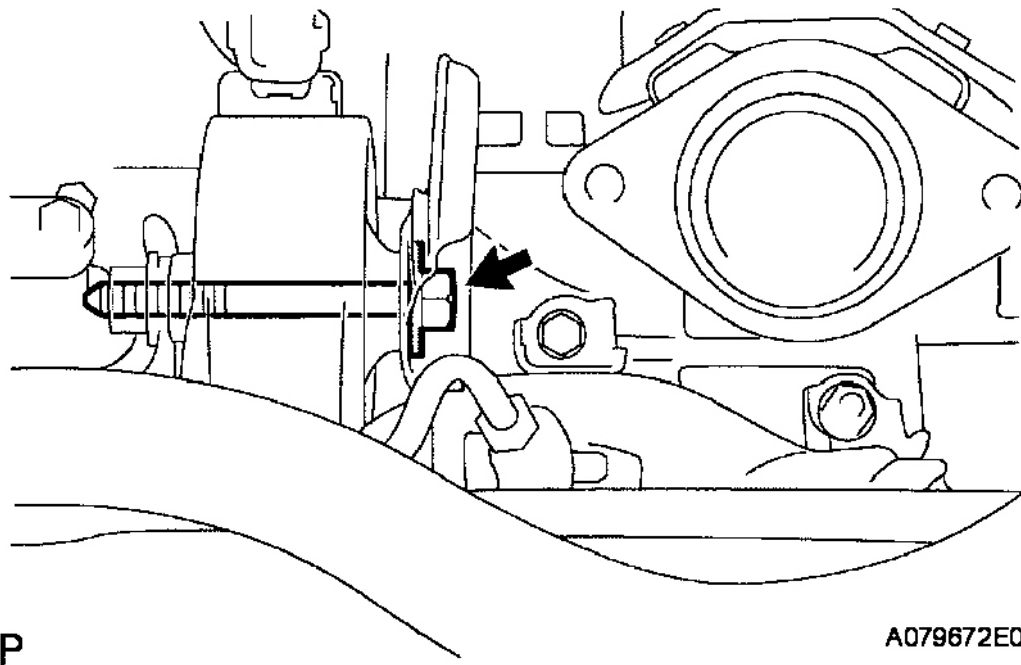


Fig. 184: Removing Through Bolt

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

- b. Separate the engine and the transaxle assembly from the suspension crossmember.
- 44. **REMOVE STARTER (See REMOVAL)**
- 45. **REMOVE GENERATOR (See REMOVAL)**
- 46. **REMOVE MANUAL TRANSAXLE (for Manual Transaxle) (See REMOVAL)**
- 47. **REMOVE AUTOMATIC TRANSAXLE (for Automatic Transaxle) (See REMOVAL)**
- 48. **REMOVE CLUTCH COVER (for Manual Transaxle) (See REMOVAL)**
- 49. **REMOVE CLUTCH DISC (for Manual Transaxle)**
- 50. **REMOVE FLYWHEEL (for Manual Transaxle)**
 - a. Hold the crankshaft pulley with SST, and then remove the 6 bolts and flywheel.

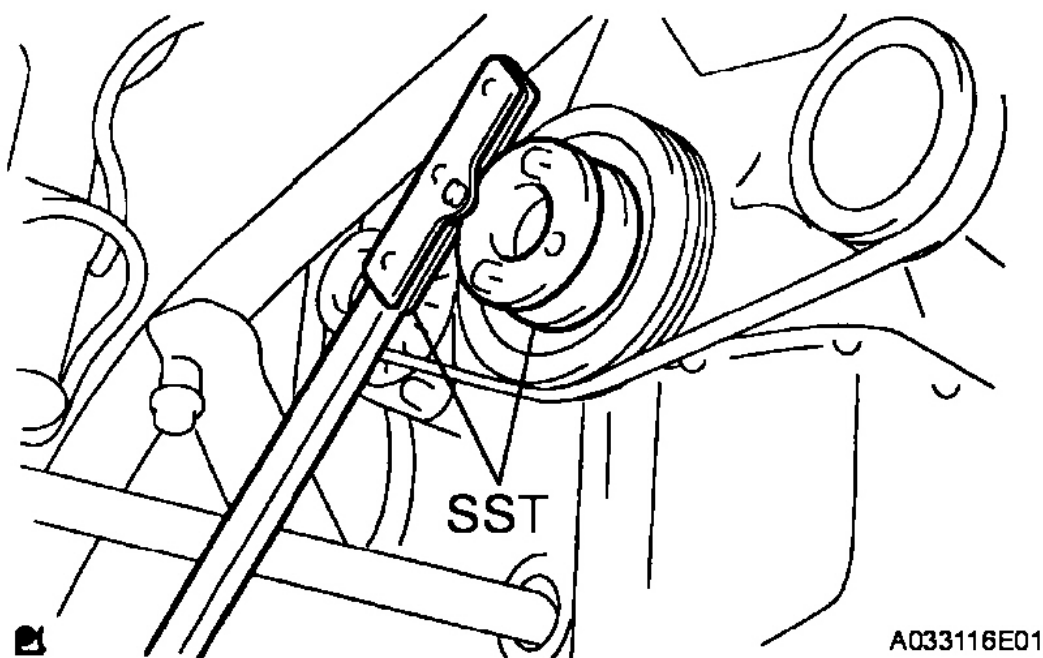


Fig. 185: Removing Bolts And Flywheel

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

SST 09213-58012 (91111-50845), 09330-00021

51. REMOVE DRIVE PLATE (for Automatic Transaxle)

- a. Hold the crankshaft pulley with SST, and then remove the 6 bolts and drive plate.

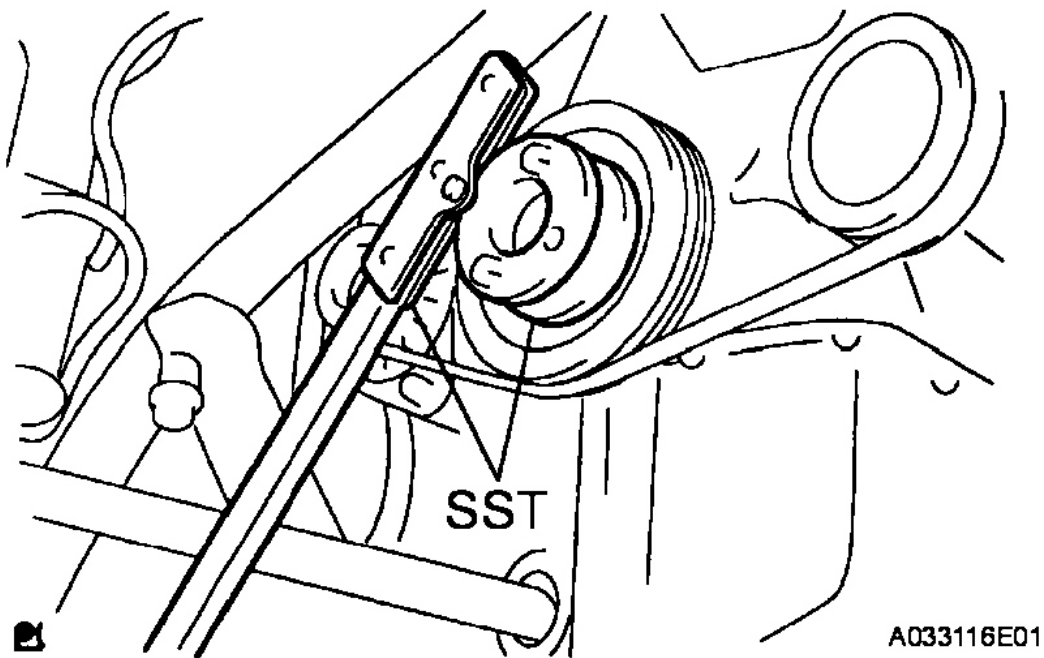


Fig. 186: Removing Drive Plate

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

SST 09213-58012 (91111-50845), 09330-00021

52. **REMOVE VENTILATION HOSE** (See REMOVAL)
53. **REMOVE NO. 2 VENTILATION HOSE** (See REMOVAL)
54. **REMOVE INTAKE MANIFOLD**
 - a. Using several steps, remove the 3 bolts and 2 nuts in the sequence shown in the illustration. Then remove the intake manifold.
 - b. Remove the gasket from the intake manifold.

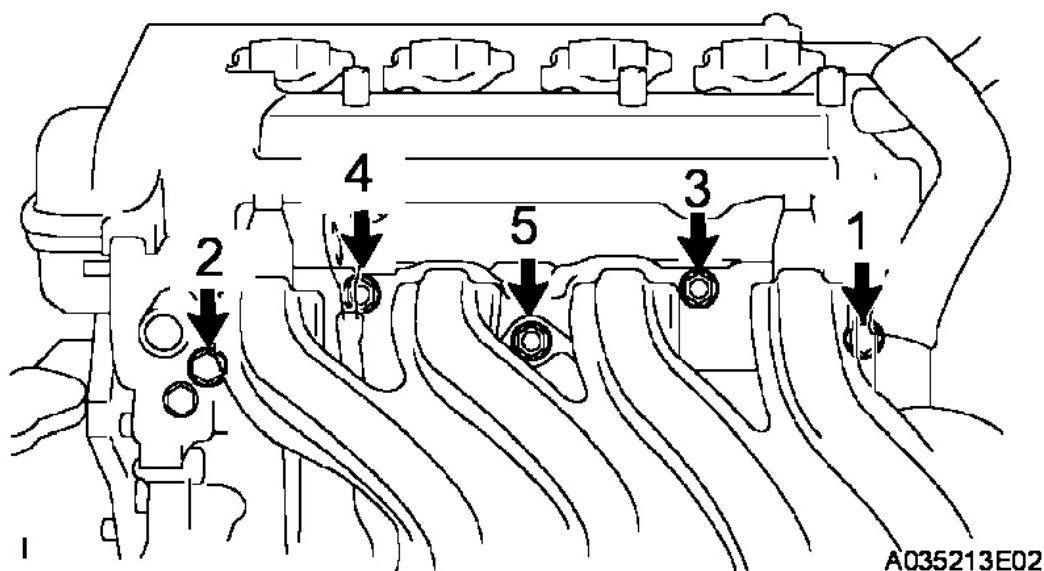


Fig. 187: Identifying Intake Manifold Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. REMOVE BOOSTER VACUUM TUBE

- a. Remove the 2 bolts and booster vacuum tube.

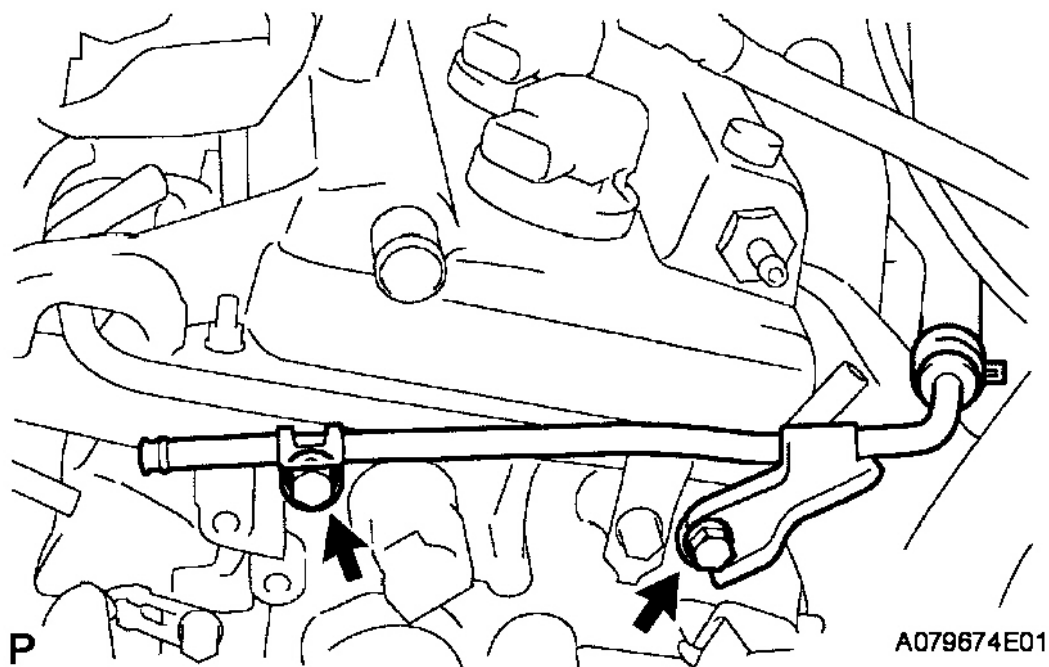


Fig. 188: Removing Booster Vacuum Tube

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

56. REMOVE MANIFOLD SUPPORT BRACKET

- a. Remove the 3 bolts and manifold support bracket.

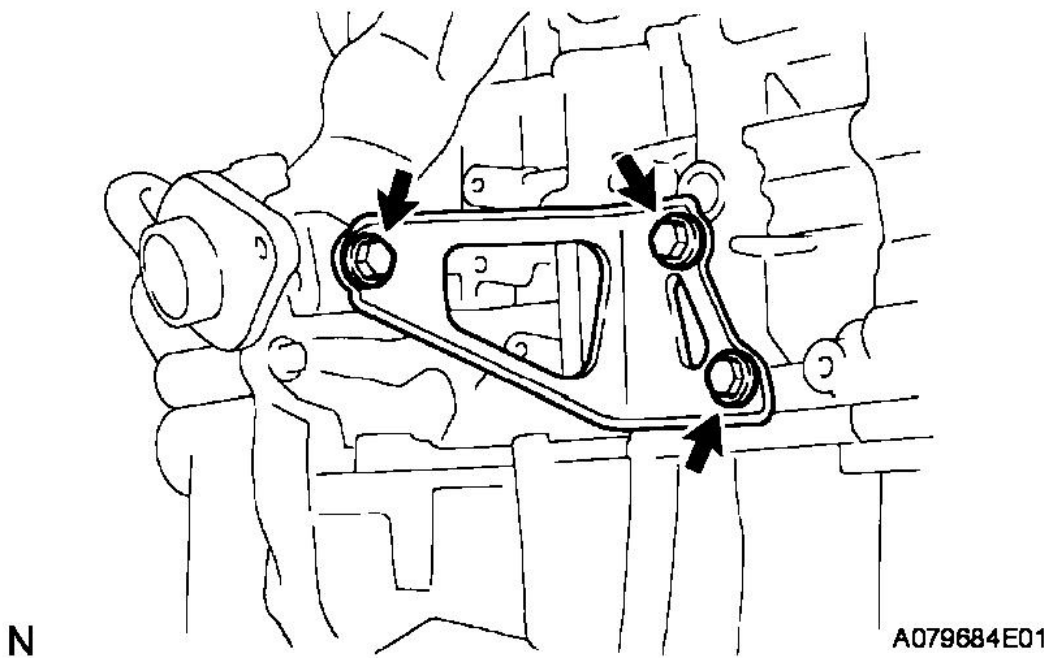
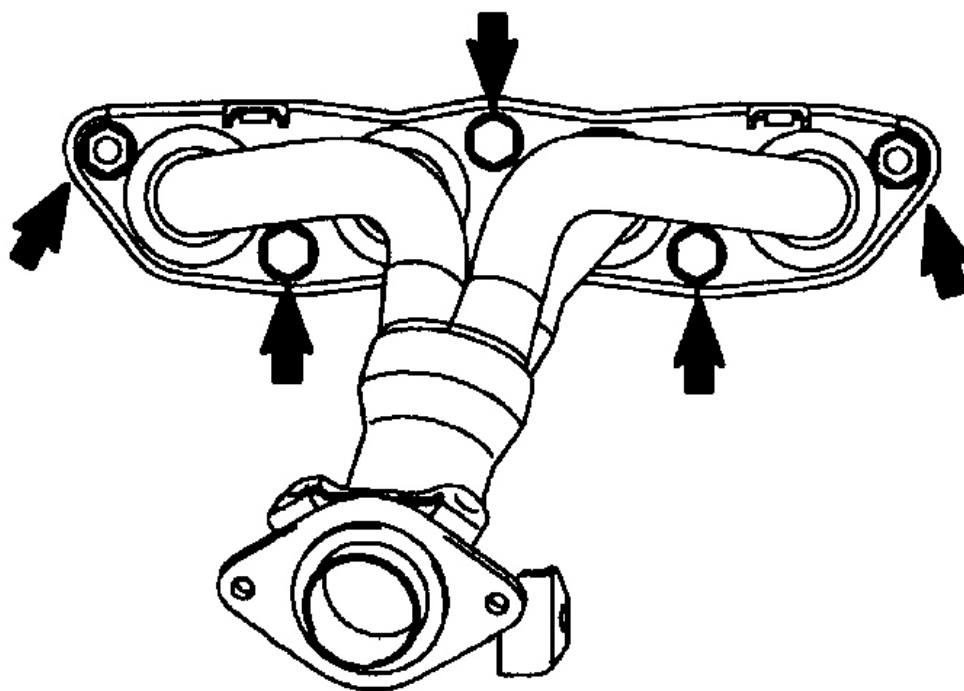


Fig. 189: Removing Manifold Support Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**
 - a. Remove the 4 bolts and exhaust manifold heat insulator.
58. **REMOVE EXHAUST MANIFOLD**
 - a. Remove the 3 bolts, 2 nuts and exhaust manifold.



A080959E01

Fig. 190: Removing Exhaust Manifold
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. REMOVE IGNITION COIL

- a. Remove the 4 bolts and pull out the 4 ignition coils.

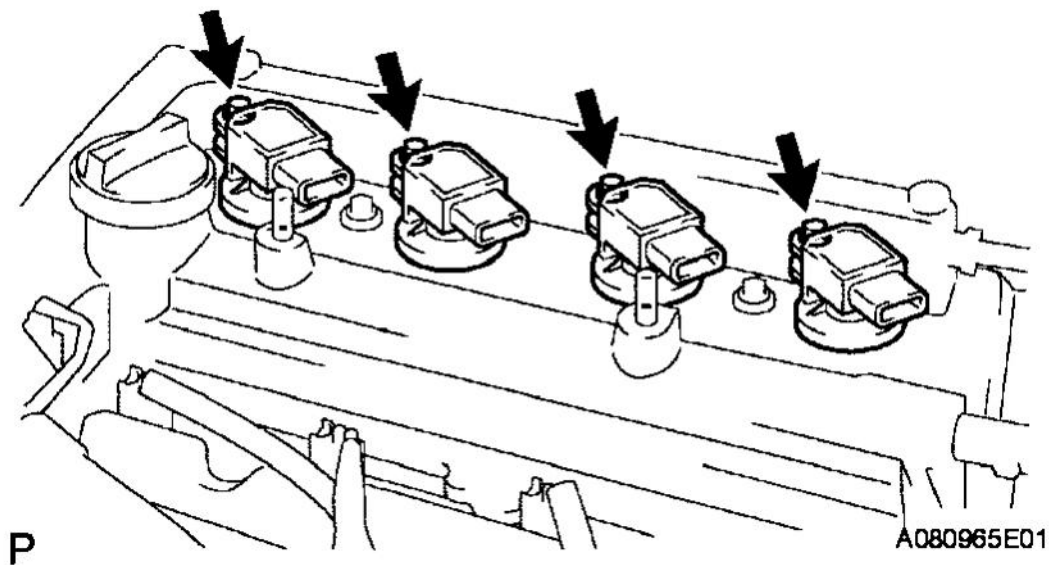


Fig. 191: Removing Ignition Coils

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

60. REMOVE NO. 1 WATER BYPASS PIPE

- a. Remove the 2 nuts and 2 bolts, and then remove the water bypass pipe.

61. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

- a. Using SST, remove the sensor.

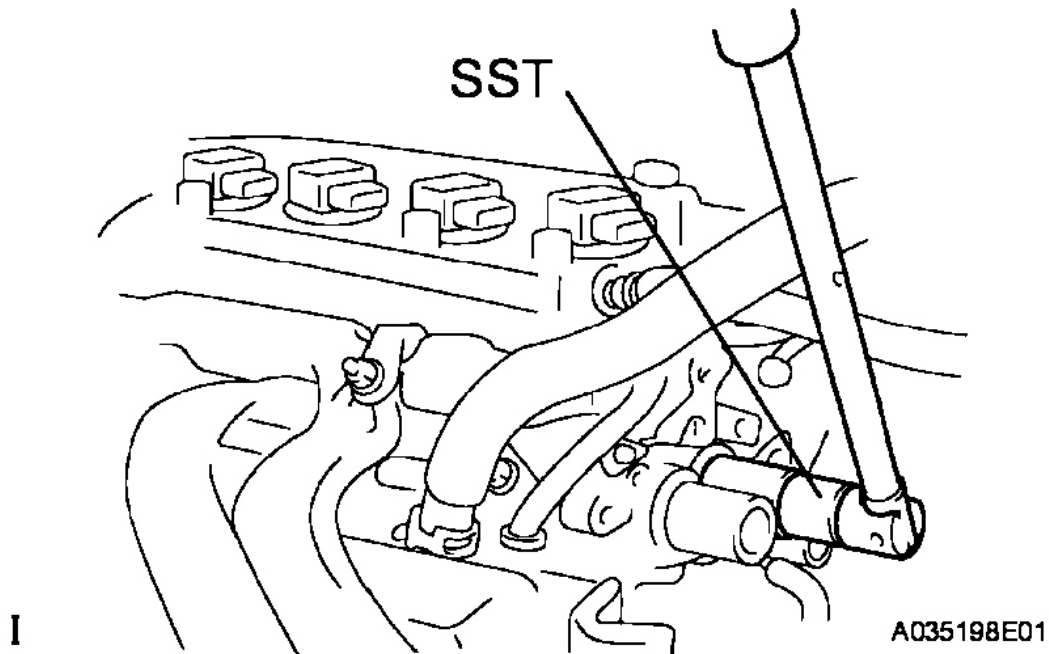


Fig. 192: Removing Engine Coolant Temperature Sensor
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09817-33190

62. REMOVE KNOCK SENSOR

- a. Remove the bolt and sensor.

63. REMOVE ENGINE OIL PRESSURE SWITCH

- a. Using SST, remove the switch.

SST 09268-46021

INSPECTION

1. INSPECT INTAKE MANIFOLD

- a. Using a precision straightedge and feeler gauge, measure the surface contacting the cylinder head for warpage.

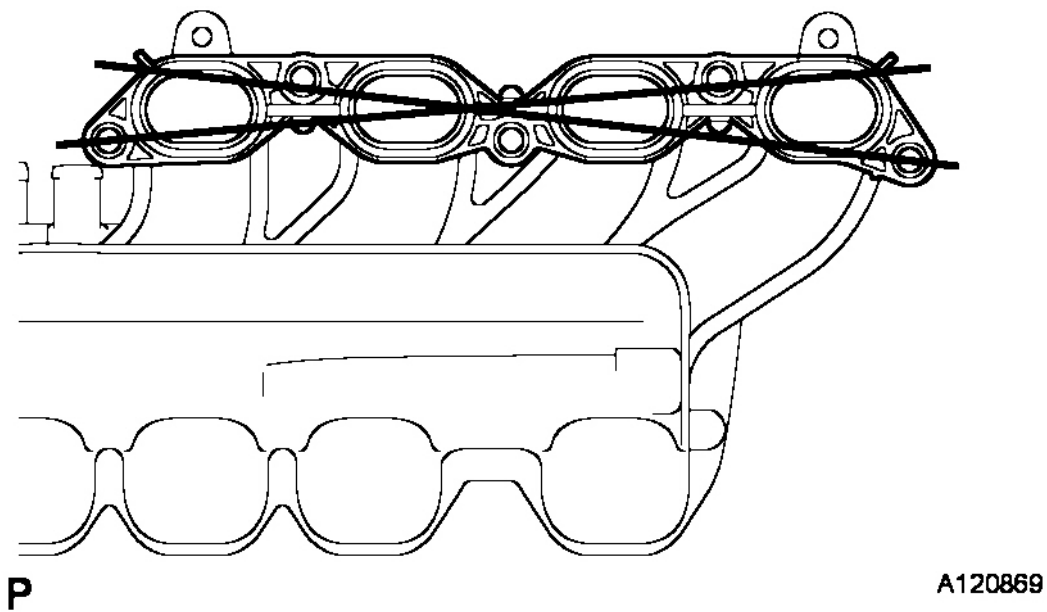


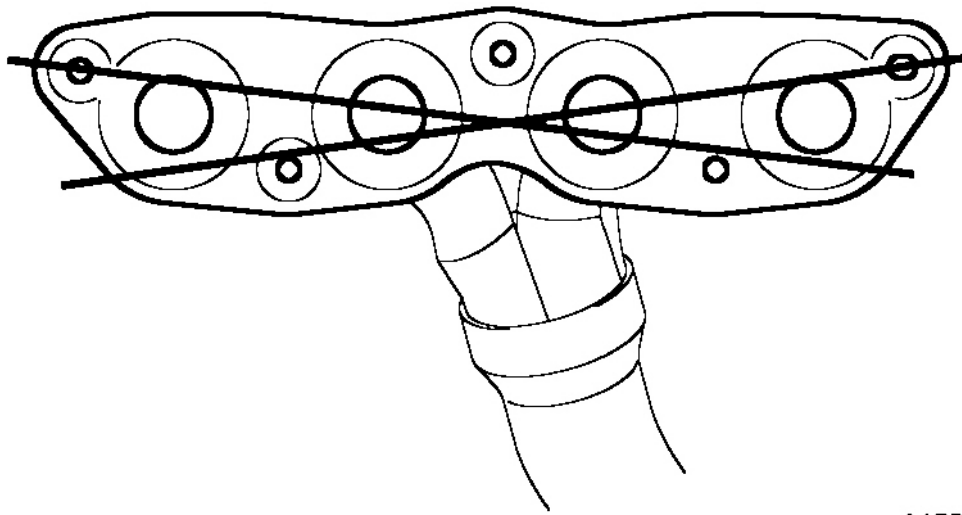
Fig. 193: Inspecting Intake Manifold Surface Contacting Cylinder Head For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage: 0.10 mm (0.004 in.)

If the warpage is greater than the maximum, replace the manifold.

2. INSPECT EXHAUST MANIFOLD

- a. Using a precision straightedge and feeler gauge, measure the surface contacting the cylinder head for warpage.



P

A120870

Fig. 194: Inspecting Exhaust Manifold Surface Contacting Cylinder Head For Warpage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum warpage: 0.70 mm (0.028 in.)

If the warpage is greater than the maximum, replace the manifold.

INSTALLATION

1. **INSTALL OIL PRESSURE SWITCH (See ON-VEHICLE INSPECTION)**
2. **INSTALL KNOCK SENSOR (See INSTALLATION)**
3. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR**
 - a. Install a new gasket onto the sensor.
 - b. Using SST, install the temperature sensor in place.

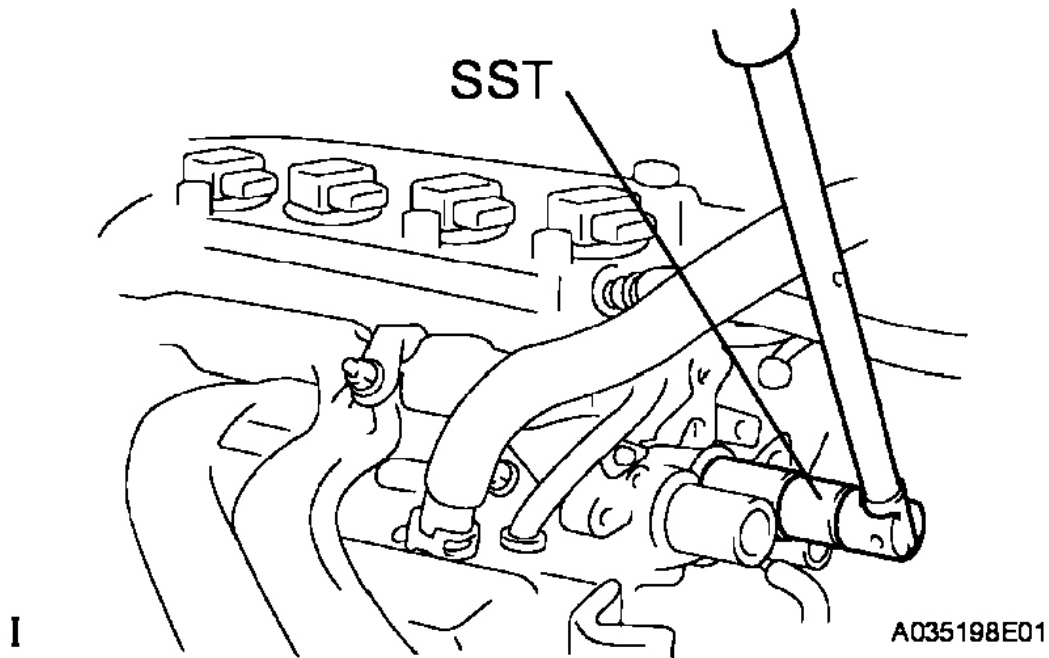


Fig. 195: Installing Temperature Sensor
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09817-33190

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

4. INSTALL NO. 1 WATER BYPASS PIPE

- a. Install a new gasket and the water bypass pipe with the 2 bolts and 2 nuts.

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

5. INSTALL IGNITION COIL

- a. Install the 4 ignition coils with the 4 bolts.

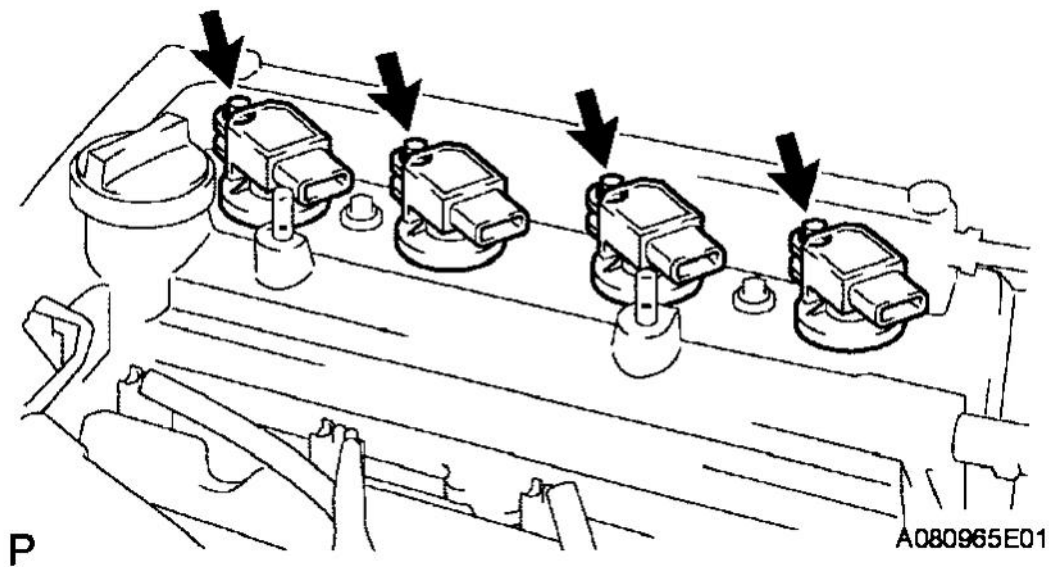


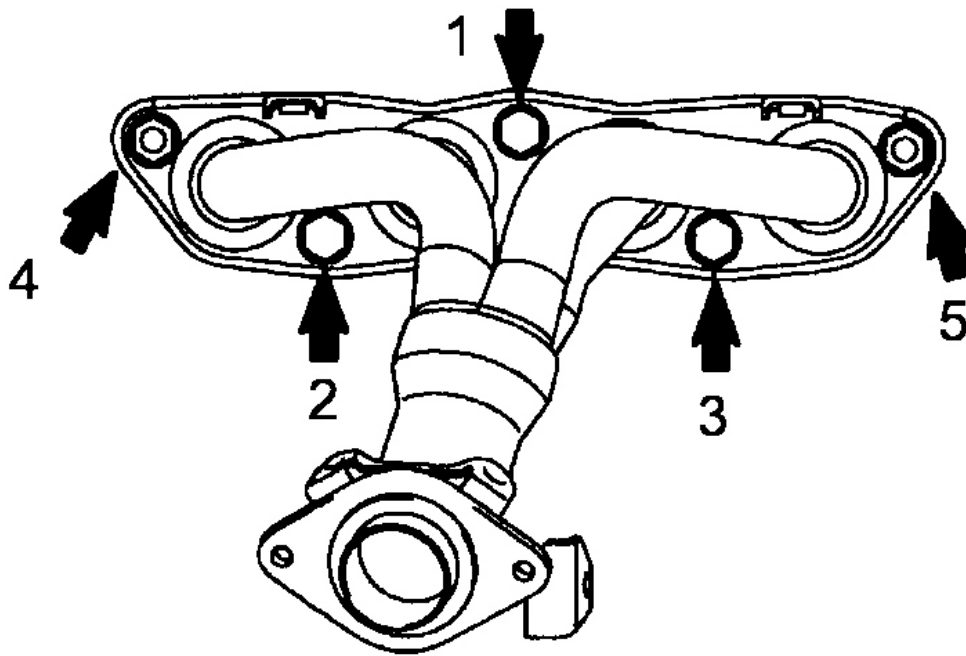
Fig. 196: Installing Ignition Coils

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

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

6. INSTALL EXHAUST MANIFOLD

- a. Using several steps, install a new exhaust manifold gasket and the exhaust manifold with the 3 bolts and 2 nuts in the sequence shown in the illustration.



A080959E02

Fig. 197: Identifying Exhaust Manifold Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

7. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Install the exhaust manifold heat insulator with the 4 bolts.

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

8. INSTALL MANIFOLD SUPPORT BRACKET

- a. Install the manifold support bracket with the 3 bolts.

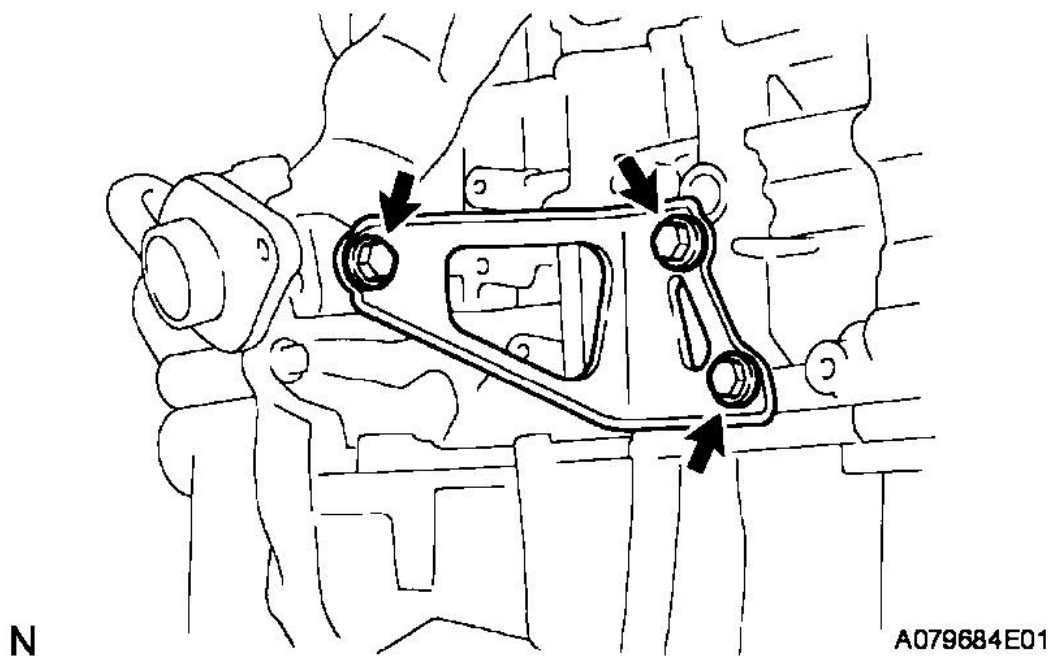


Fig. 198: Installing Manifold Support Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

9. INSTALL BOOSTER VACUUM TUBE

- a. Install the booster vacuum tube with the 2 bolts.

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

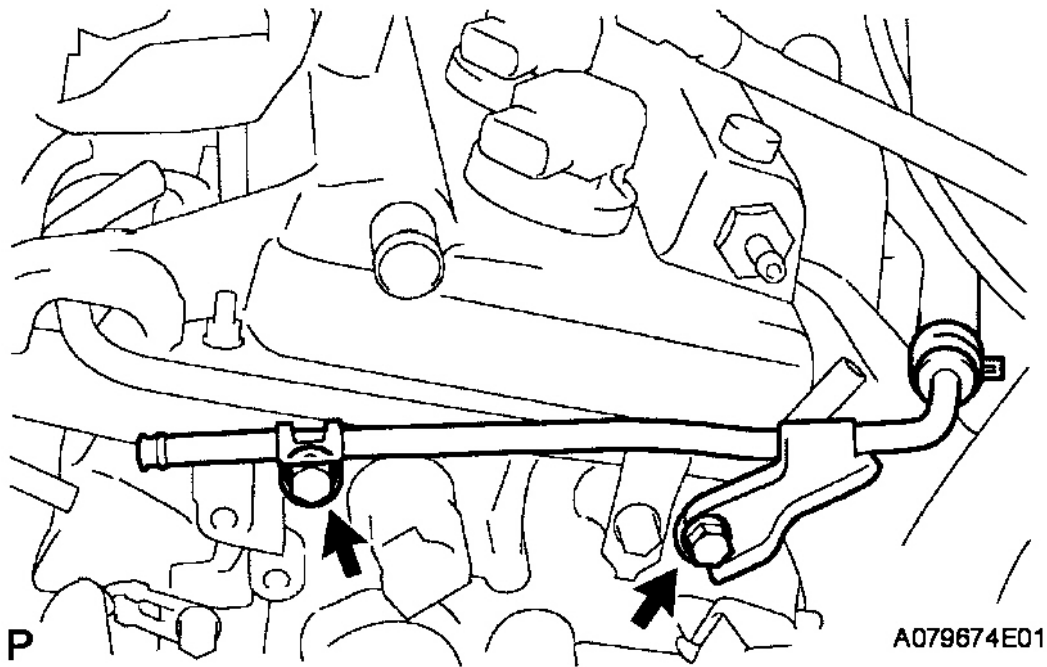


Fig. 199: Installing Booster Vacuum Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL INTAKE MANIFOLD

- a. Install a new gasket onto the intake manifold.
- b. Install the intake manifold with the 3 bolts and 2 nuts. Using several steps, uniformly tighten the bolts and nuts in the sequence shown in the illustration.

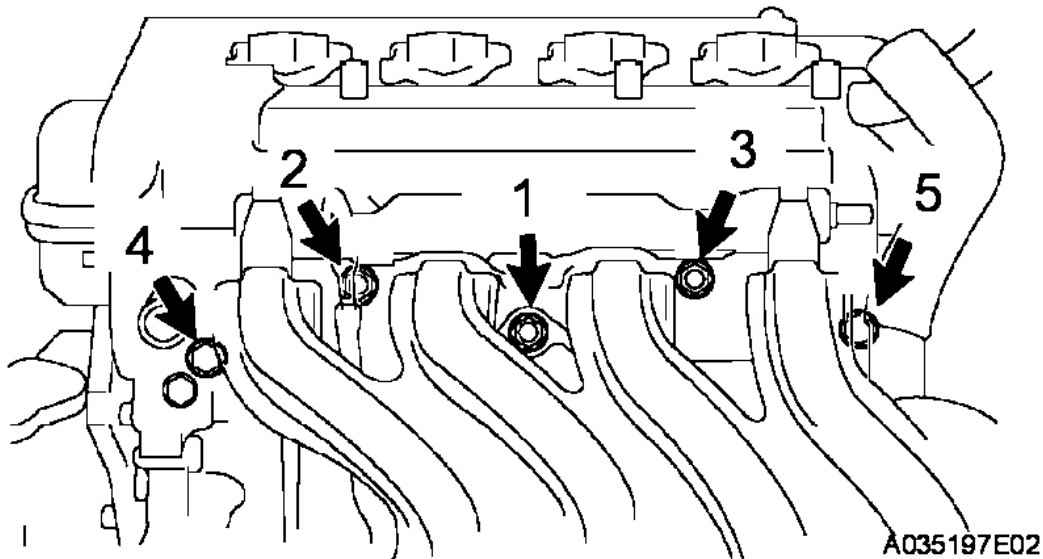


Fig. 200: Identifying Intake Manifold Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

11. **CONNECT NO. 2 VENTILATION HOSE (See INSTALLATION)**
12. **CONNECT VENTILATION HOSE (See INSTALLATION)**
13. **INSTALL DRIVE PLATE (for Automatic Transaxle)**
 - a. Hold the crankshaft pulley with SST.

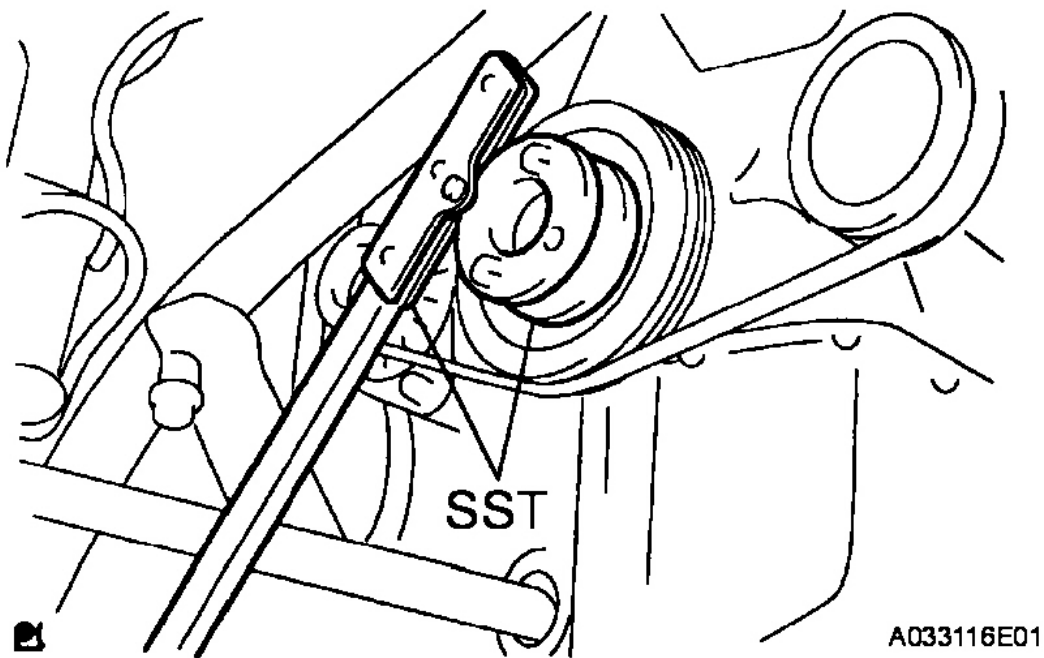


Fig. 201: Installing Drive Plate

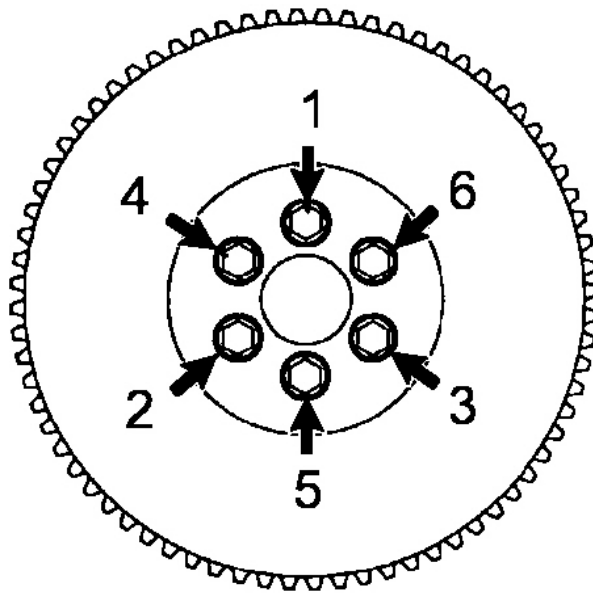
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09213-58012 (91111-50845), 09330-00021

- b. Install the drive plate.
 - 1. Clean the bolt and bolt hole.
 - 2. Apply adhesive to the bolts.

Adhesive: Part No. 0933-00070, THREE BOND or equivalent

- 3. Using several steps, uniformly install and tighten the 6 bolts in the sequence shown in the illustration.



A050929E02

Fig. 202: Identifying Drive Plate Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 88 N*m (900 kgf*cm, 65 ft.*lbf)

14. INSTALL FLYWHEEL (for Manual Transaxle)

- a. Hold the crankshaft pulley with SST.

SST 09213-58012 (91111-50845), 09330-00021

- b. Install the flywheel.
 1. Clean the bolt hole.
 2. Apply adhesive to the bolts.

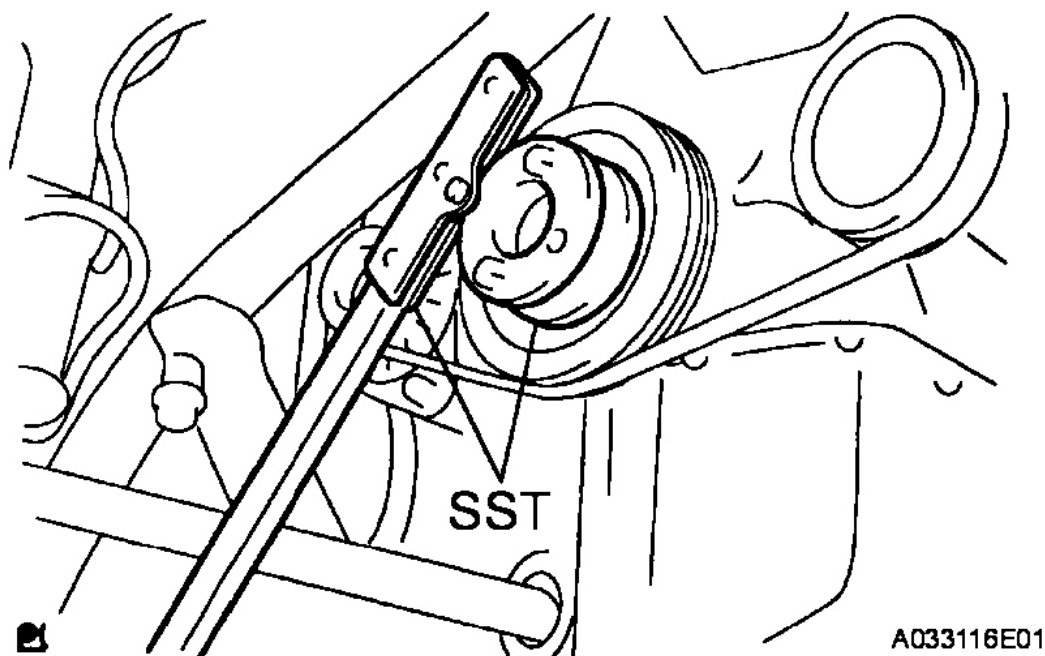
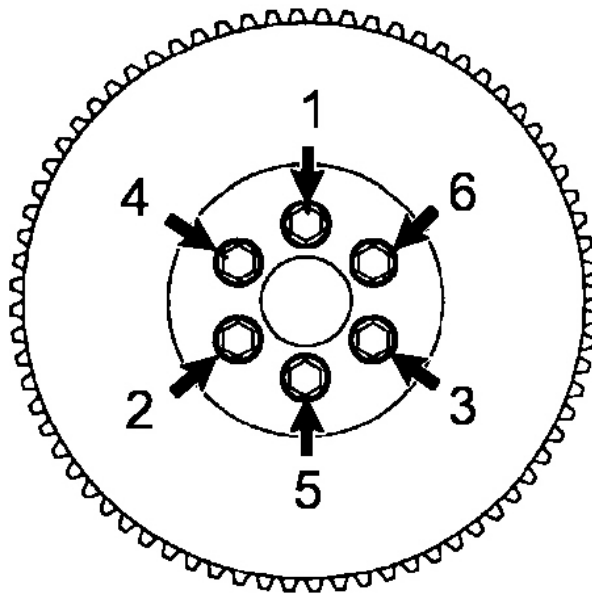


Fig. 203: Holding Crankshaft Pulley With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Adhesive: Part No. 0933-00070, THREE BOND or equivalent

3. Using several steps, uniformly install and tighten the 6 bolts in the sequence shown in the illustration.



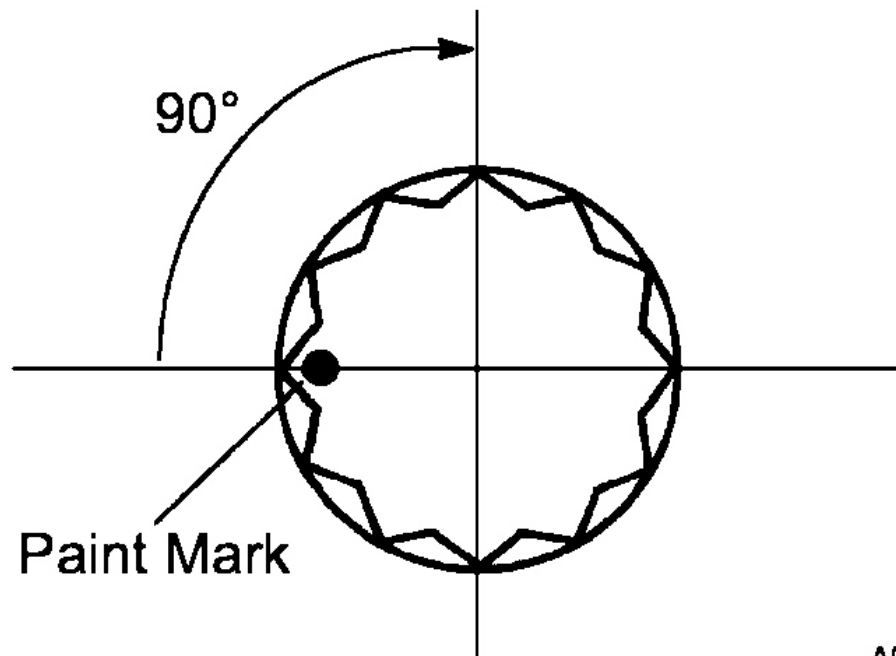
A050929E02

Fig. 204: Identifying Flywheel Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Do not reuse the flywheel bolt. It may cause breakage of the flywheel bolt.

4. Mark the flywheel bolt with paint.
5. Retighten the flywheel bolts by an additional 90°.
6. Check that the paint mark is at a 90° position from the original location.



A050153E02

Fig. 205: Identifying Retightening Angle Of Flywheel Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL CLUTCH DISC** (for Manual Transaxle) (See INSTALLATION)
16. **INSTALL CLUTCH COVER** (for Manual Transaxle) (See INSTALLATION)
17. **INSTALL MANUAL TRANSAXLE** (for Manual Transaxle) (See INSTALLATION)
18. **INSTALL AUTOMATIC TRANSAXLE** (for Automatic Transaxle) (See INSTALLATION)
19. **INSTALL GENERATOR** (See REASSEMBLY)
20. **INSTALL STARTER** (See INSTALLATION)
21. **INSTALL FRONT SUSPENSION CROSSMEMBER**
 - a. Fasten the bolt to secure the engine and transaxle assembly to the suspension crossmember.

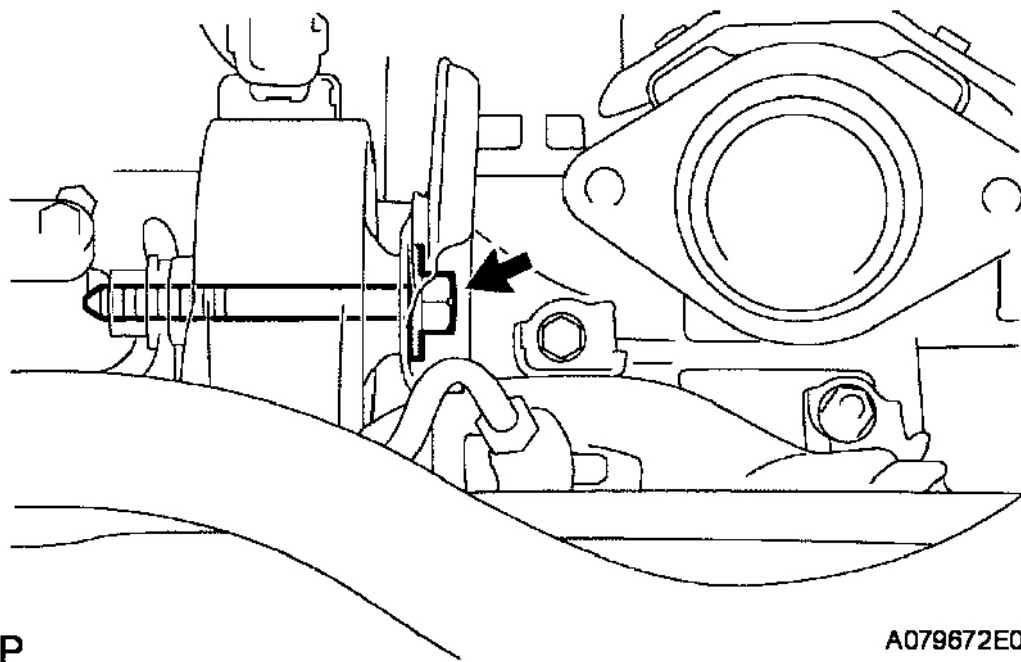


Fig. 206: Fastening Bolt To Secure Engine And Transaxle Assembly To Suspension Crossmember

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

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

22. INSTALL VANE PUMP

- a. Install the vane pump assembly with the 2 bolts.

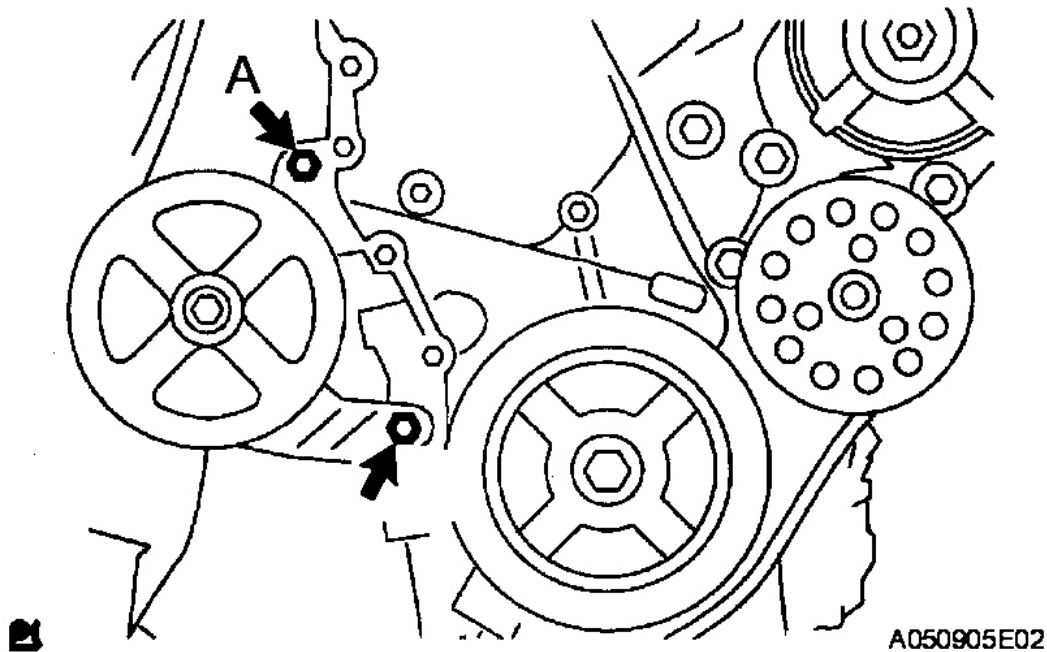


Fig. 207: Installing Vane Pump

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

Torque: 44 N*m (449 kgf*cm, 33 ft.*lbf)

HINT:

Temporarily tighten bolt A so that the V belt can be adjusted in a later step.

23. INSTALL VANE PUMP V BELT

- a. Temporarily install the V belt on each pulley.

24. ADJUST VANE PUMP V BELT (See REMOVAL)

25. INSTALL ENGINE AND TRANSAXLE ASSEMBLY

- a. Set the engine together with the transaxle on the engine lifter.
- b. Install the engine together with the transaxle onto the engine compartment.
- c. Temporarily install the suspension crossmember with the 8 bolts.

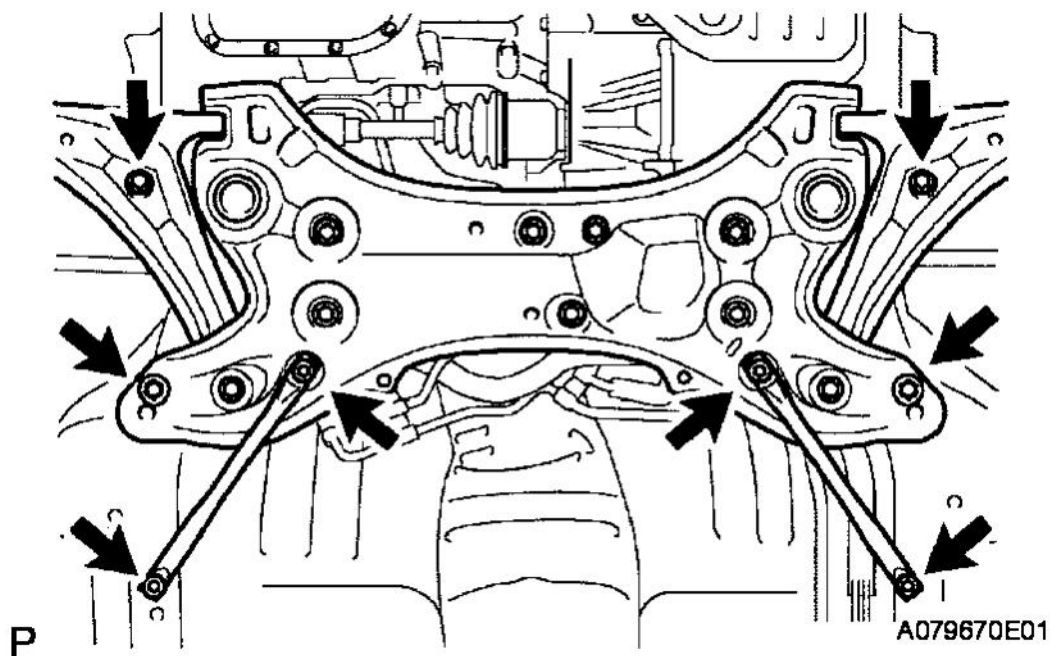


Fig. 208: Installing Suspension Crossmember

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

- d. Install the engine mounting bracket LH onto the engine mounting insulator LH with the 2 bolts.

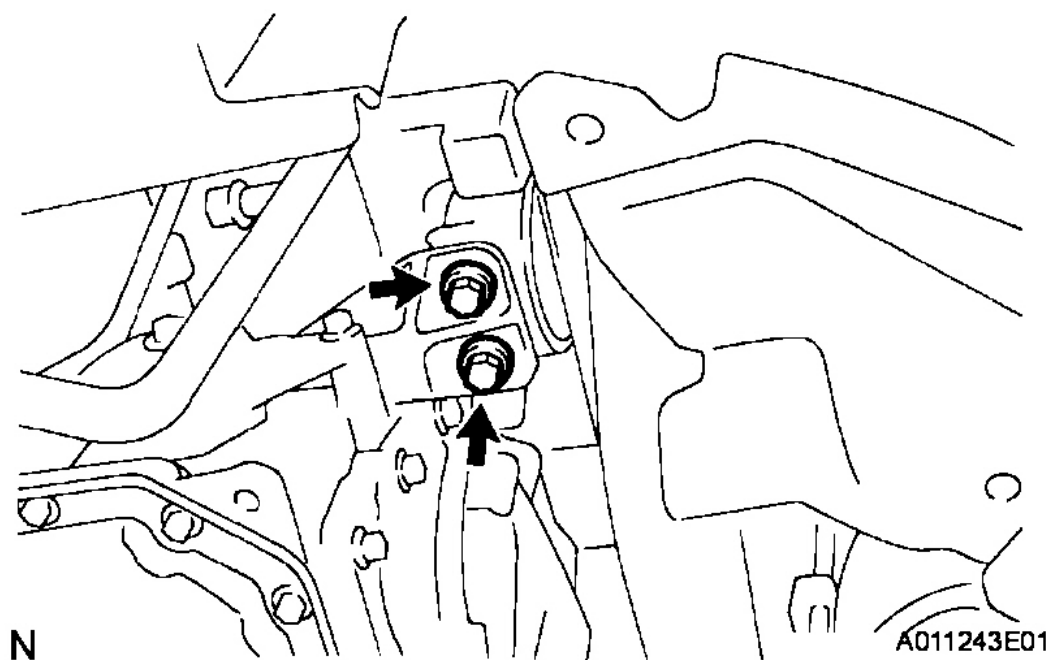


Fig. 209: Installing Engine Mounting Bracket LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- e. Install the engine mounting insulator RH with the 5 bolts and nut.

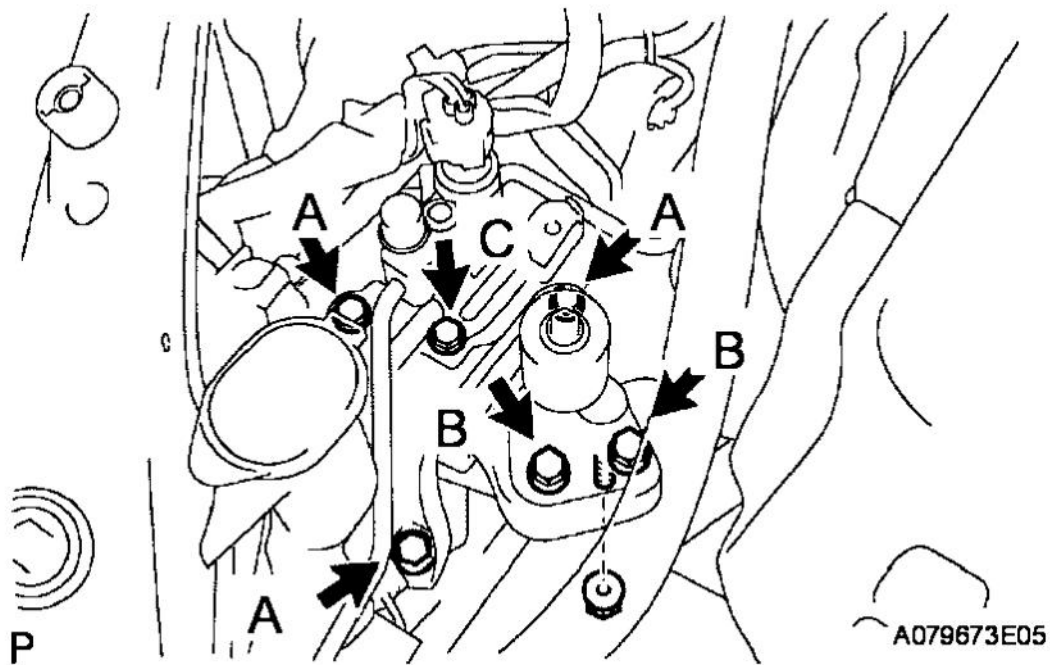


Fig. 210: Installing Engine Mounting Insulator RH
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

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

- f. Install the liquid tube with the bolt.

Torque: 9.8 N*m (100 kgf*cm, 7.2 in.*lbf) for bolt C

- g. Insert SST to the positioning holes on the right-hand crossmember and on the right-hand of the vehicle.

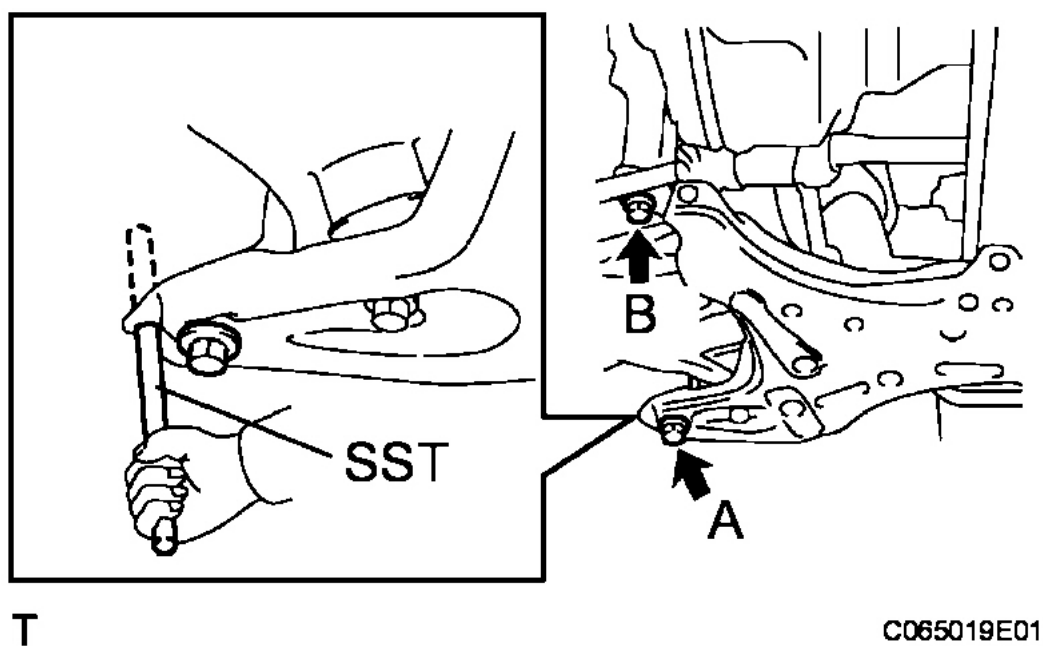
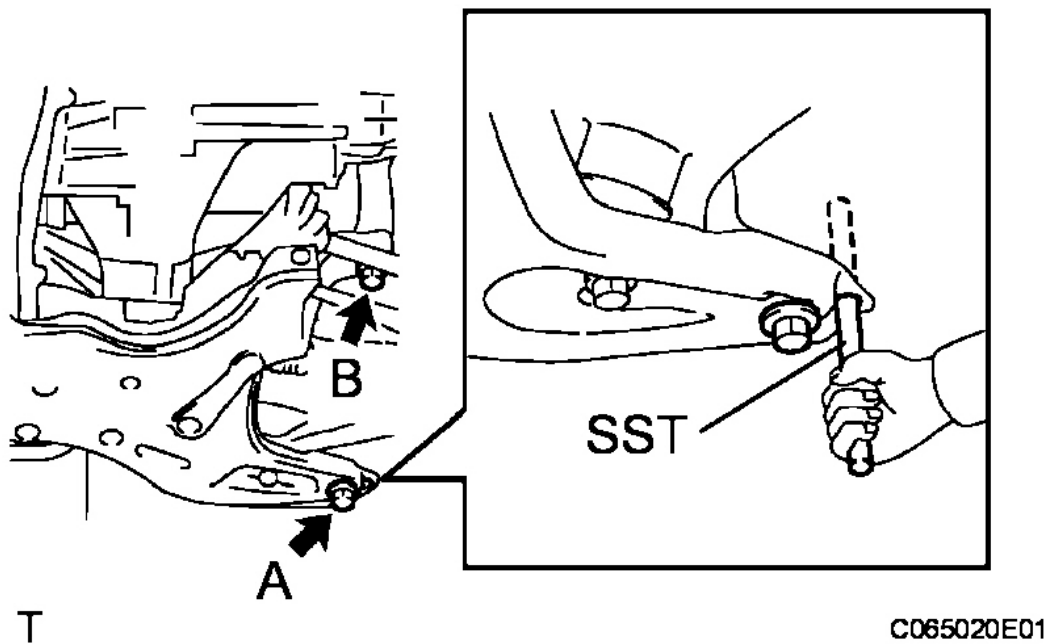


Fig. 211: Tightening Bolts

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

SST 09670-00010

- h. Temporarily tighten bolt A, and then tighten bolt B.
- i. Insert SST into the positioning holes on the left hand crossmember and on the left-hand of the vehicle.

**Fig. 212: Tightening Bolts**

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

SST 09670-00010

- j. Temporarily tighten bolt A, and then tighten bolt B.
- k. Insert SST into the positioning holes on the right hand crossmember and the right-hand of the vehicle, and then tighten the bolts to the specified torque.

SST 09670-00010

Torque: 116 N*m (1,183 kgf*cm, 86 ft.*lbf) for bolt A

70 N*m (714 kgf*cm, 52 ft.*lbf) for bolt B

- l. Insert SST into the positioning holes on the left hand crossmember and the left-hand of the vehicle, and then tighten the bolts to the specified torque.

SST 09670-00010

Torque: 116 N*m (1,183 kgf*cm, 86 ft.*lbf) for bolt A

70 N*m (714 kgf*cm, 52 ft.*lbf) for bolt B

- m. Tighten the 4 bolts shown in the illustration.

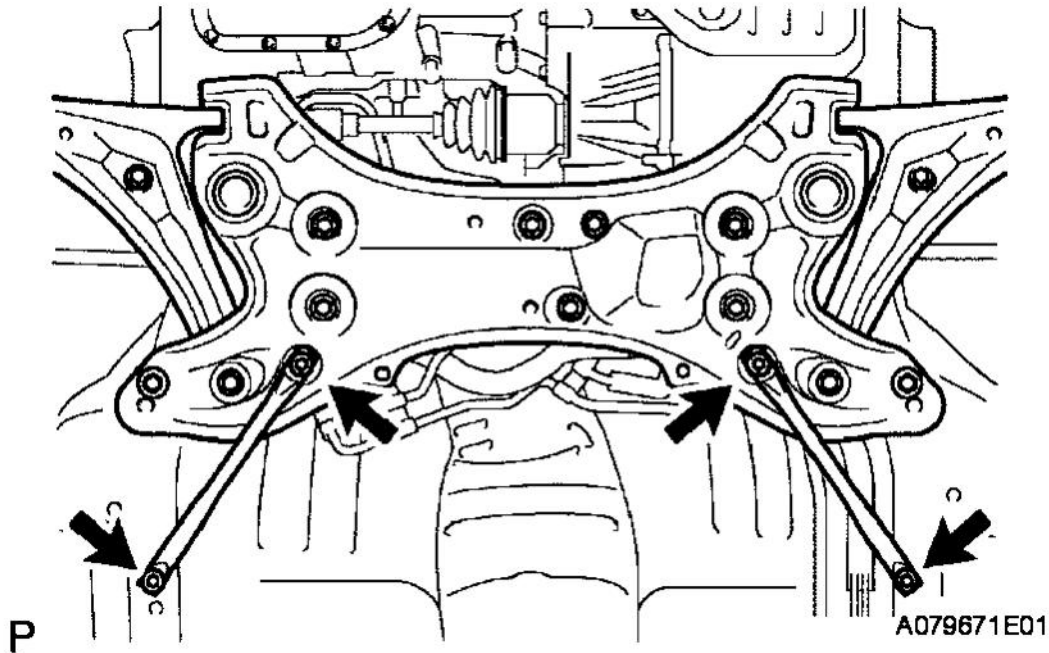


Fig. 213: Installing Front Suspension Arm Lower
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)

26. INSTALL FRONT SUSPENSION ARM LOWER LH

- a. Install the front suspension arm lower to the steering knuckle with the nut.

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

- b. Install a new clip.

HINT:

Perform the same procedure as above on the opposite side.

27. INSTALL TIE ROD END LH

- a. Connect the tie rod end to the steering knuckle with the nut.

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

- b. Install a new cotter pin.

NOTE:

- Be careful of the threads and taper portions of the tie rod end to prevent contact with oils.
- After tightening the castle nut, turn it clockwise less than 60° to align the pin holes for the cotter pin.

HINT:

Perform the same procedure as above on the opposite side.

28. CONNECT SPEED SENSOR FRONT LH (w/ABS)

- a. Install the speed sensor with the bolt.

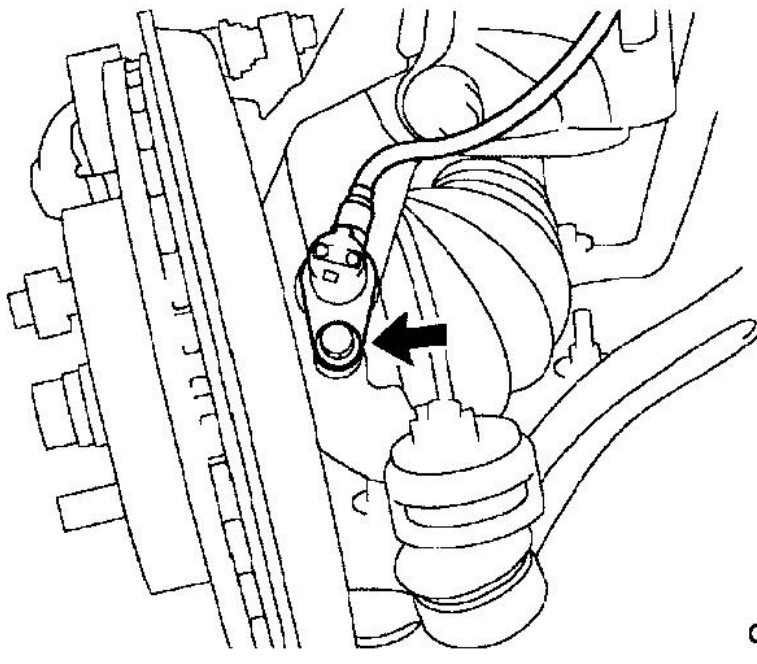


Fig. 214: Installing Speed Sensor

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

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

HINT:

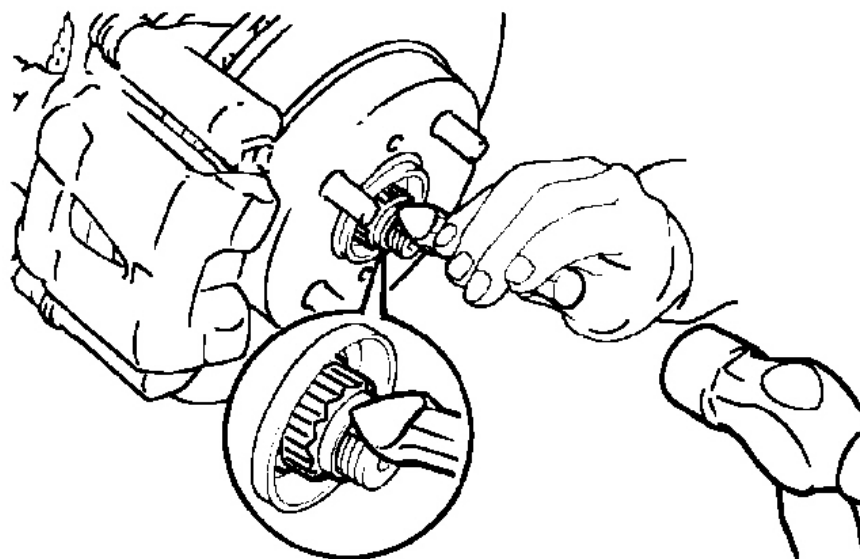
Perform the same procedure as above on the opposite side.

29. INSTALL FRONT AXLE HUB LH NUT

- a. Using a 30 mm socket wrench, install the new hub nut.

Torque: 216 N*m (2,203 kgf*cm, 160 ft.*lbf)

- b. Using a chisel and hammer, stake the hub nut.

**T**

C057566E01

Fig. 215: Staking Front Axle Hub Nut

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

HINT:

Perform the same procedure as above on the opposite side.

30. **INSTALL STEERING INTERMEDIATE SHAFT** (See INSTALLATION)
31. **INSTALL FRONT EXHAUST PIPE** (See INSTALLATION)
32. **INSTALL FRONT FLOOR PANEL BRACE** (See INSTALLATION)
33. **INSTALL COOLER COMPRESSOR** (See INSTALLATION)
34. **INSTALL GENERATOR V BELT**
 - a. Temporarily install the V belt on each pulley.
35. **ADJUST GENERATOR V BELT** (See REMOVAL)
36. **INSTALL CLUTCH RELEASE CYLINDER (for Automatic Transaxle)** (See INSTALLATION)

37. **CONNECT TRANSMISSION CONTROL CABLE (for Automatic Transaxle) (See INSTALLATION)**
38. **CONNECT TRANSMISSION CONTROL CABLE (for Manual Transaxle) (See INSTALLATION)**
39. **CONNECT FUEL TUBE (See INSTALLATION)**
40. **INSTALL AIR CLEANER (See INSTALLATION)**
41. **INSTALL BATTERY**
42. **INSTALL NO. 2 CYLINDER HEAD COVER**
 - a. First tighten the nuts labeled A, and then tighten the nuts labeled B.

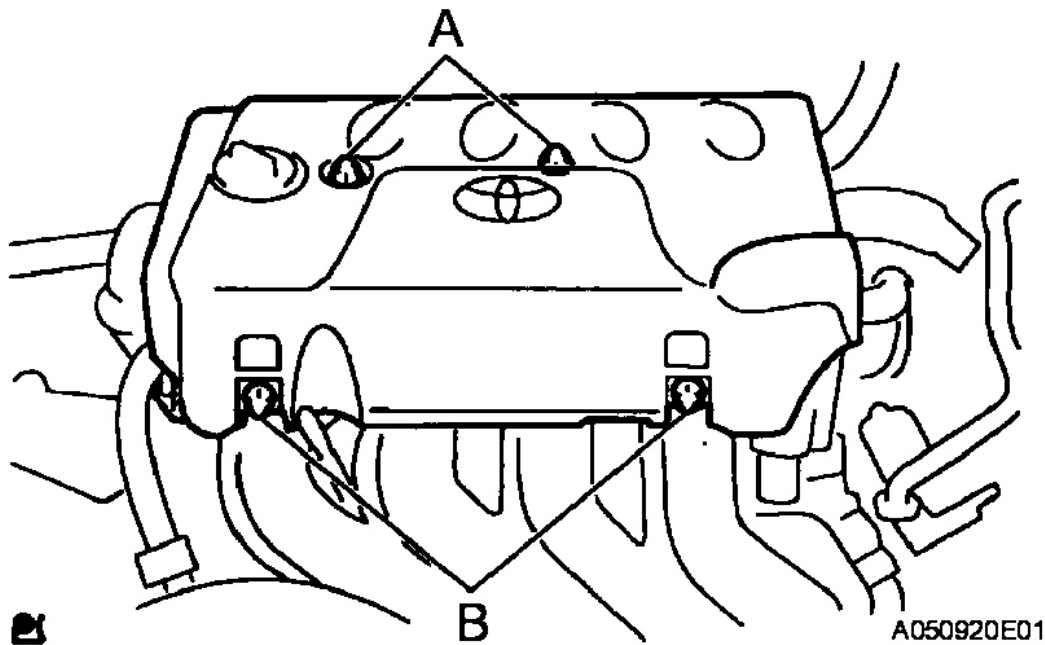


Fig. 216: Installing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

43. **INSTALL RADIATOR (See INSTALLATION)**
44. **INSTALL UPPER RADIATOR SUPPORT (See INSTALLATION)**
45. **INSTALL RADIATOR SUPPORT OPENING COVER**
46. **INSTALL HOOD LOCK SUPPORT BRACE (See INSTALLATION)**
47. **CONNECT HOOD LOCK (See INSTALLATION)**
48. **INSTALL FRONT BUMPER COVER (See INSTALLATION)**

49. **INSTALL RADIATOR GRILLE (See INSTALLATION)**
50. **CONNECT OIL COOLER OUTLET HOSE (for Automatic Transaxle)**
51. **CONNECT OIL COOLER INLET HOSE (for Automatic Transaxle)**
52. **CONNECT RADIATOR HOSE OUTLET**
53. **REMOVE RADIATOR HOSE INLET**
54. **ADD ENGINE OIL (See REPLACEMENT)**
55. **ADD ENGINE COOLANT (See ON-VEHICLE INSPECTION)**
56. **CHECK FOR ENGINE OIL LEAKS**
57. **CHECK FOR ENGINE COOLANT LEAKS (See ON-VEHICLE INSPECTION)**
58. **CHECK FOR FUEL LEAKAGE (See ON-VEHICLE INSPECTION)**
59. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

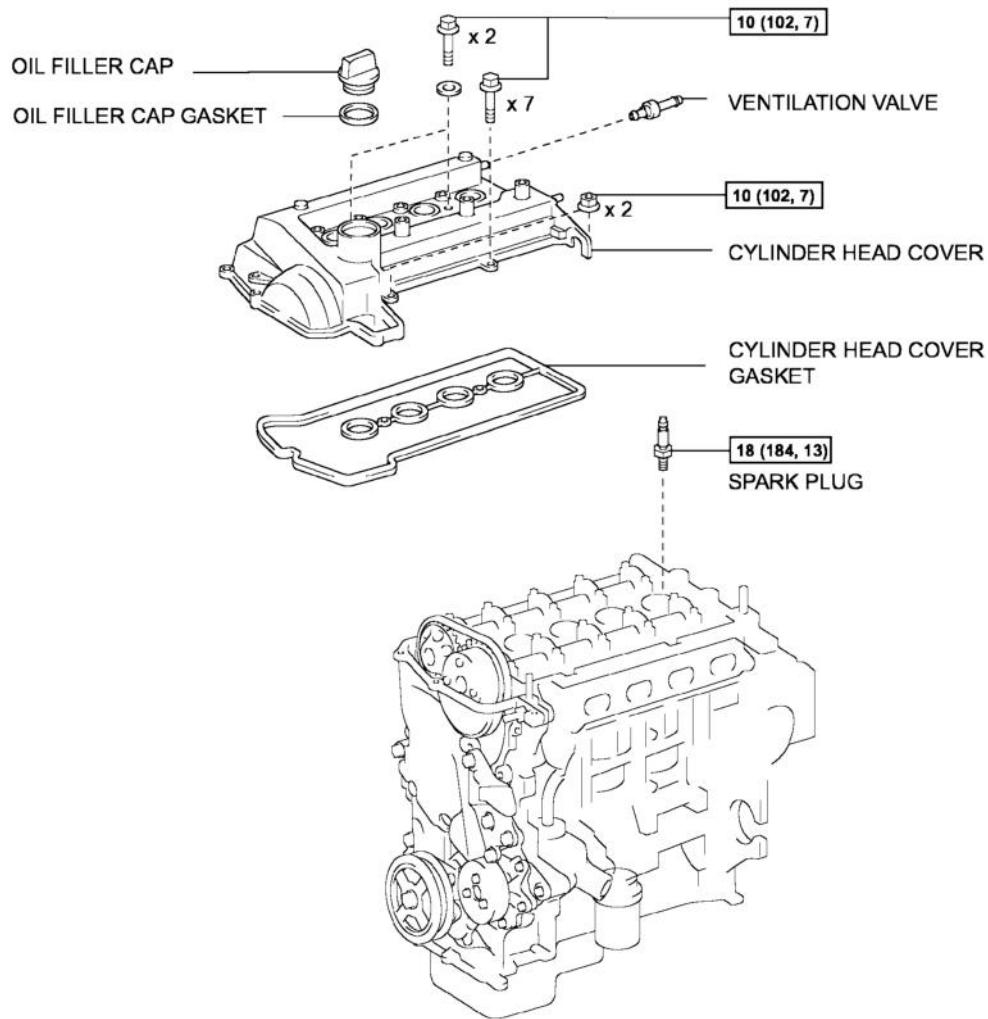
HINT:

Inspect and adjust front wheel alignment (see FRONT WHEEL ALIGNMENT).

60. **INSPECT IGNITION TIMING (See ON-VEHICLE INSPECTION)**
61. **INSPECT ENGINE IDLE SPEED (See ON-VEHICLE INSPECTION)**
62. **INSPECT CO/HC (See ON-VEHICLE INSPECTION)**
63. **INSPECT ABS SPEED SENSOR SIGNAL**
64. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

ENGINE UNIT

COMPONENTS



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

Y

A11671BE02

Fig. 217: Identifying Engine Unit Components (1 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

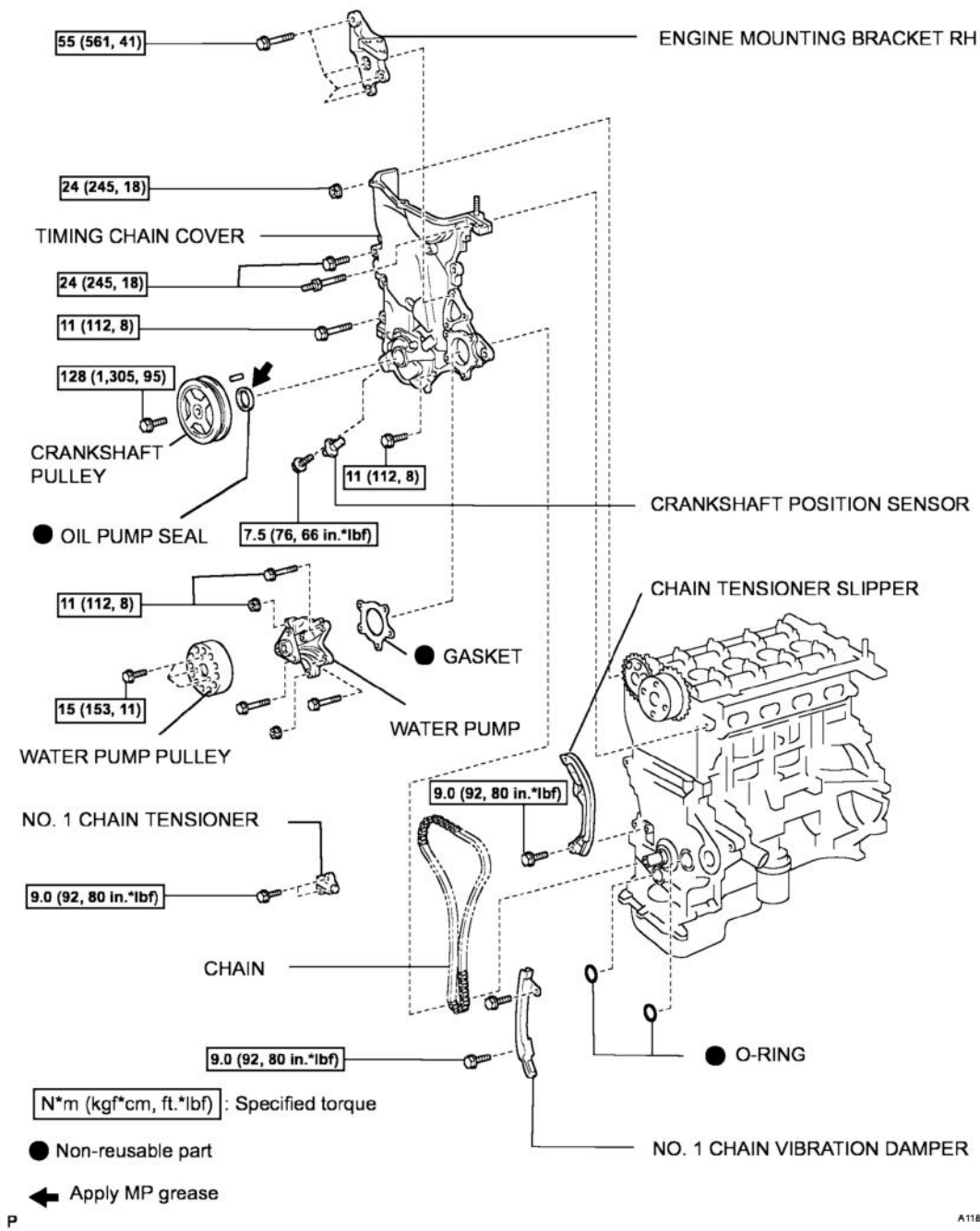
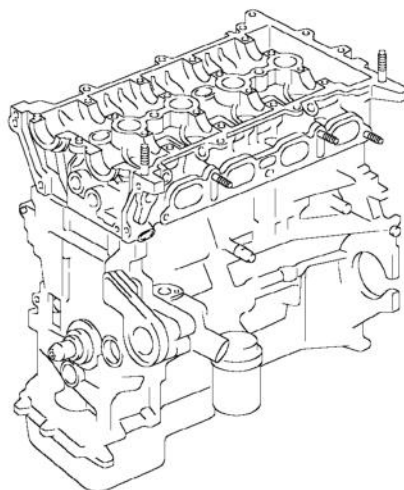
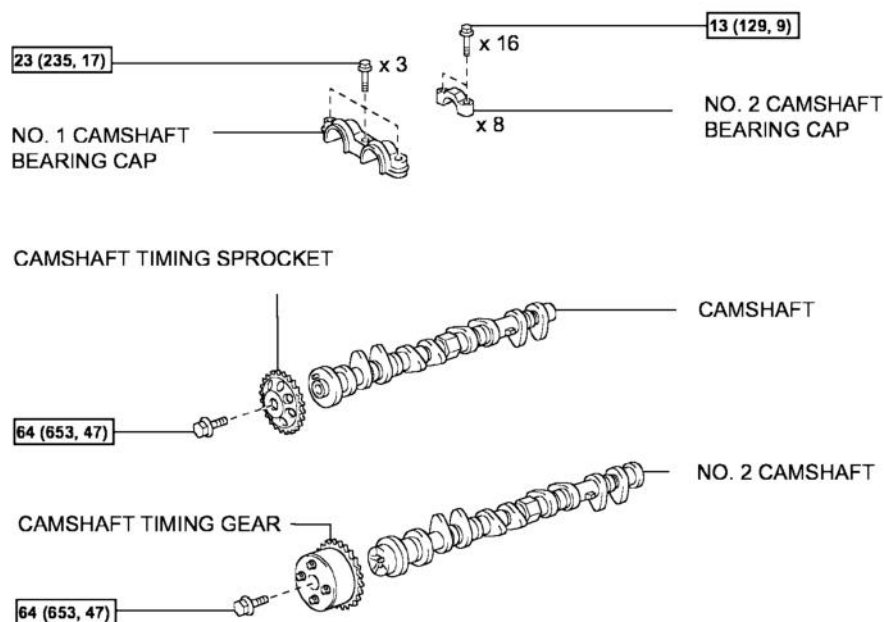


Fig. 218: Identifying Engine Unit Components (2 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

Y

A11B716E01

Fig. 219: Identifying Engine Unit Components (3 Of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

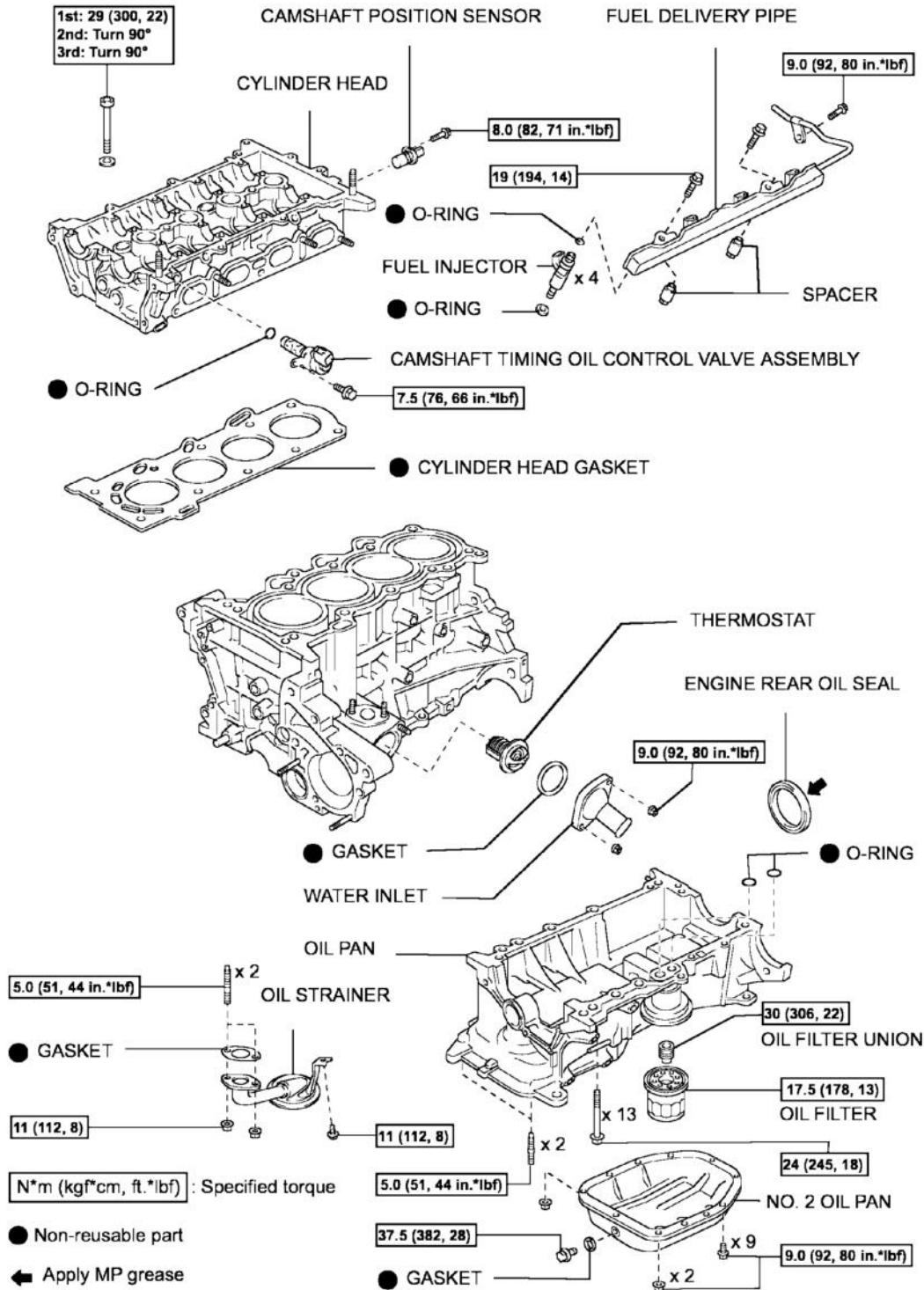


Fig. 220: Identifying Engine Unit Components (4 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



A116723ED1

DISASSEMBLY

1. REMOVE SPARK PLUG

- a. Using a 16 mm plug wrench, remove the 4 spark plugs.

2. REMOVE THERMOSTAT

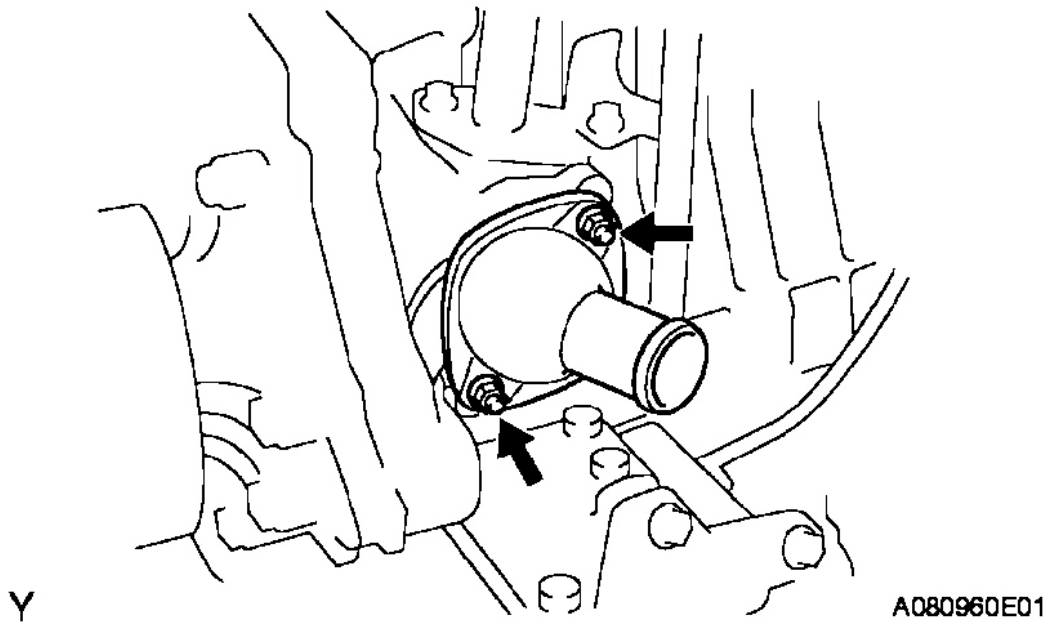


Fig. 222: Removing Thermostat

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

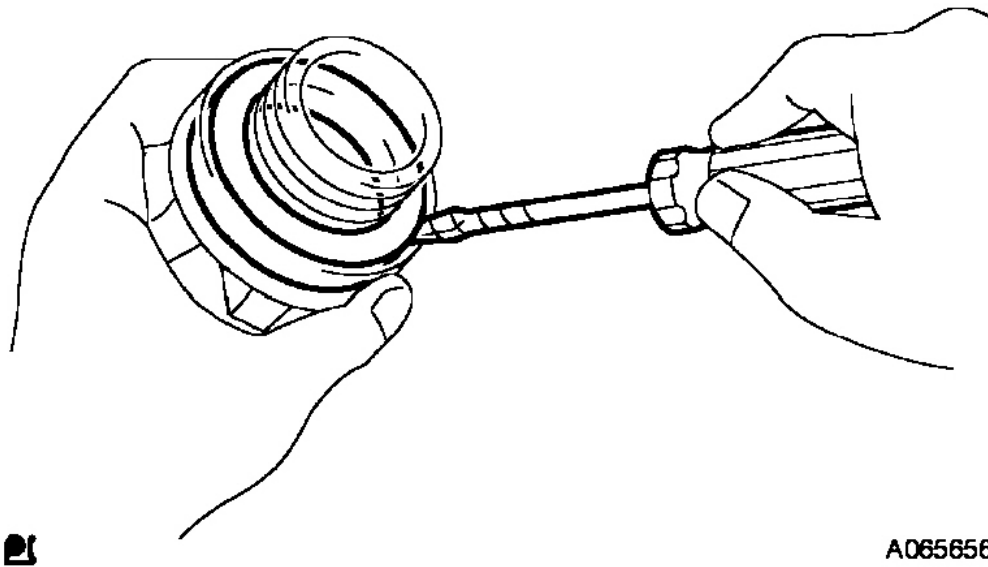
- a. Remove the 2 nuts and water inlet.
- b. Remove the thermostat.
- c. Remove the gasket from the thermostat.

3. REMOVE OIL FILLER CAP

- a. Remove the oil filler cap from the cylinder head cover.

4. REMOVE OIL FILLER CAP GASKET

- a. Using a screwdriver, remove the gasket from the oil filler cap.



A065656E01

Fig. 223: Removing Oil Filler Cap Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Tape the screwdriver tip before use.

5. REMOVE CRANKSHAFT POSITION SENSOR

- a. Remove the bolt and crankshaft position sensor.

6. REMOVE VENTILATION VALVE

- a. Remove the ventilation valve from the cylinder head cover.

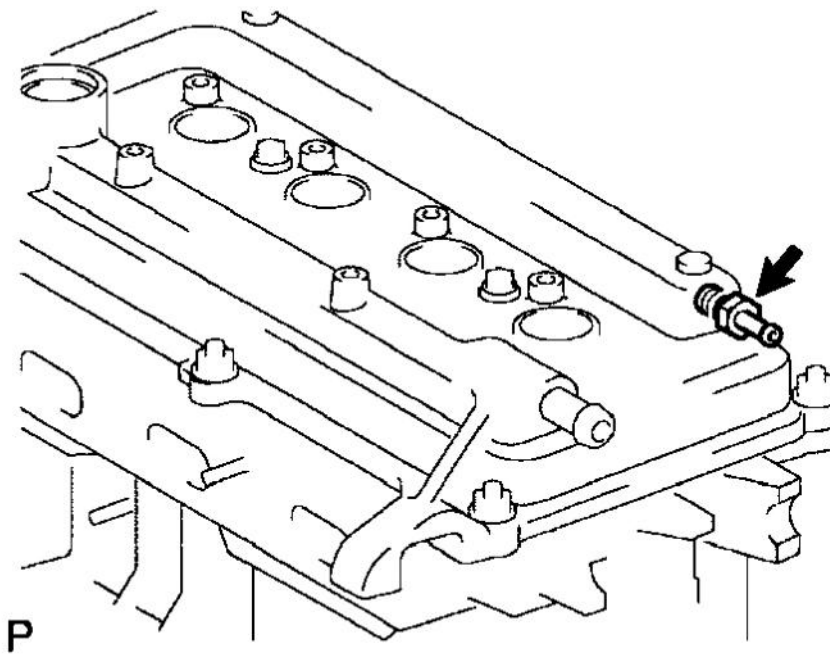


Fig. 224: Removing Ventilation Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE CYLINDER HEAD COVER

- a. Remove the 9 bolts, 2 nuts and cylinder head cover.

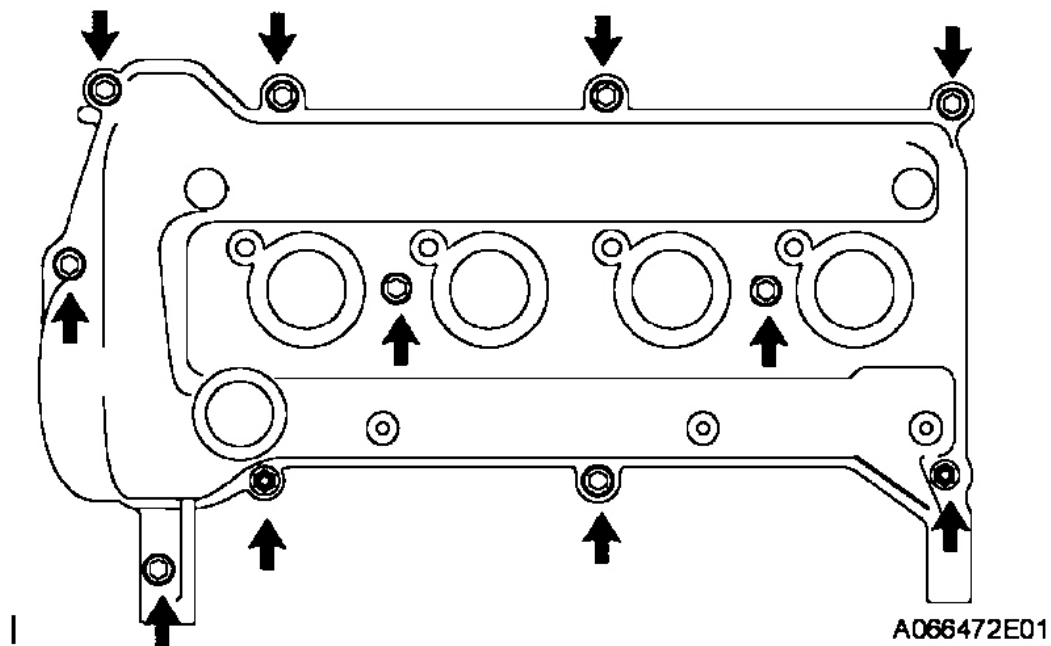


Fig. 225: Removing Cylinder Head Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE CYLINDER HEAD COVER GASKET

- a. Remove the gasket from the cylinder head cover.

9. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

- a. Remove the bolt and oil control valve.

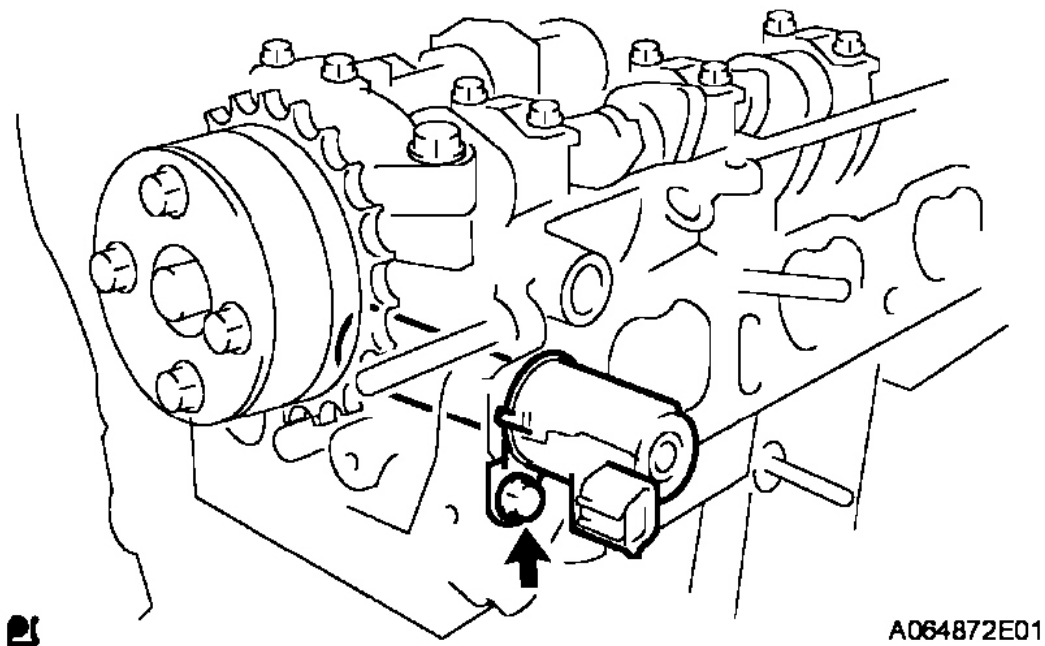


Fig. 226: Removing Oil Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REMOVE OIL DIPSTICK GUIDE

- a. Remove the bolt and dipstick guide.

11. REMOVE WATER PUMP PULLEY

- a. Using SST, hold the pump pulley and remove the 3 bolts and pump pulley.

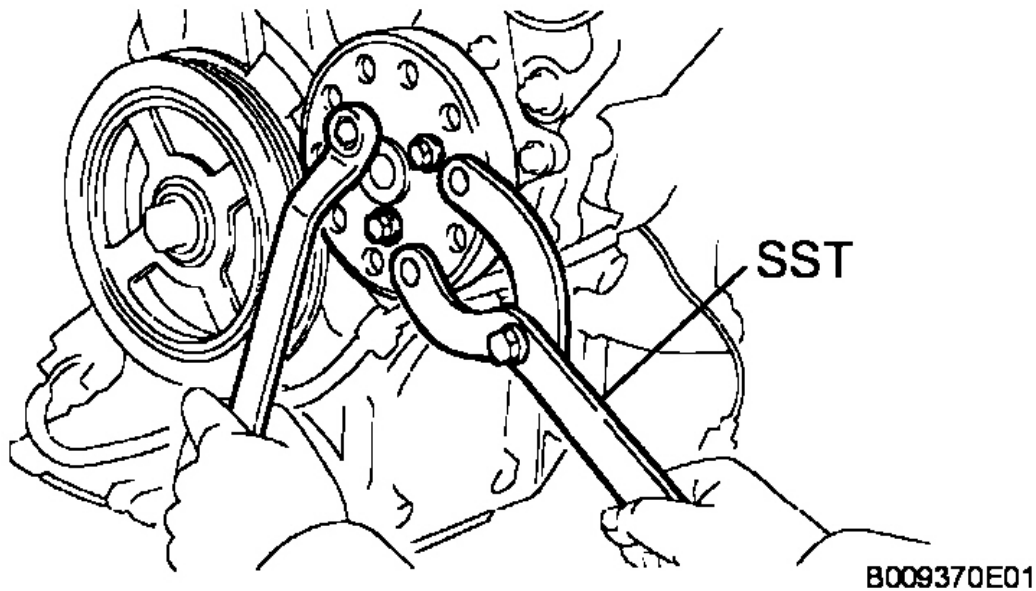


Fig. 227: Removing Water Pump Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09960-10010 (09962-01000, 09963-00600)

12. REMOVE CRANKSHAFT PULLEY

- a. Set the No. 1 cylinder to TDC/compression.
 1. Turn the crankshaft pulley until its timing notch and the timing mark 0 of the chain cover are aligned.
 2. Check that both timing marks on the camshaft timing sprocket and the camshaft timing gear are facing upward as shown in the illustration.

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

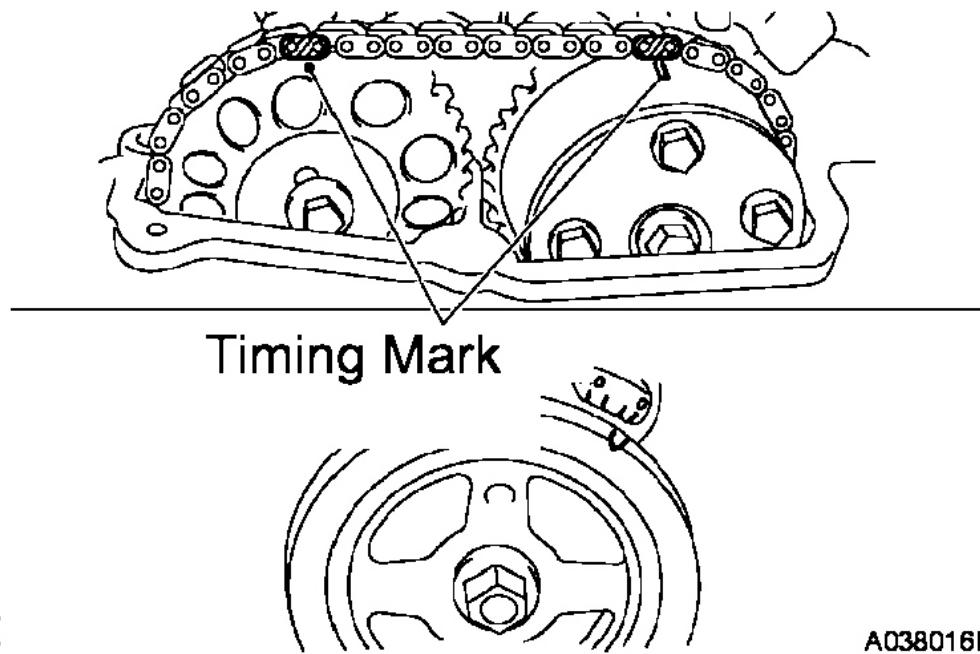


Fig. 228: Aligning Crankshaft Pulley Timing Notch And Timing Mark 0 Of Chain Cover

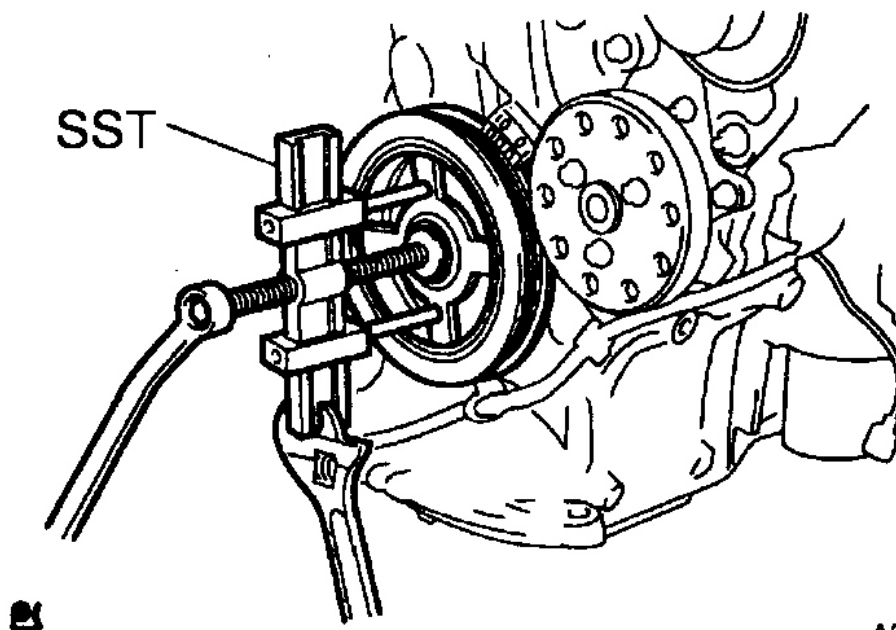
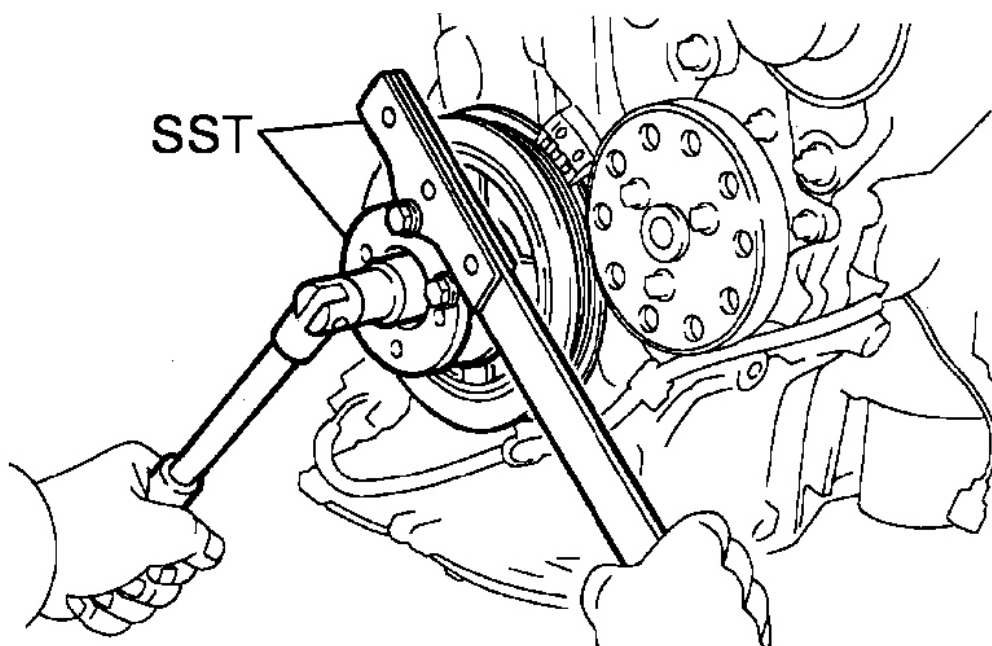
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the pulley bolt.

SST 09213-58012 (91111-50845), 09330-00021

If necessary, remove the pulley with SST.

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

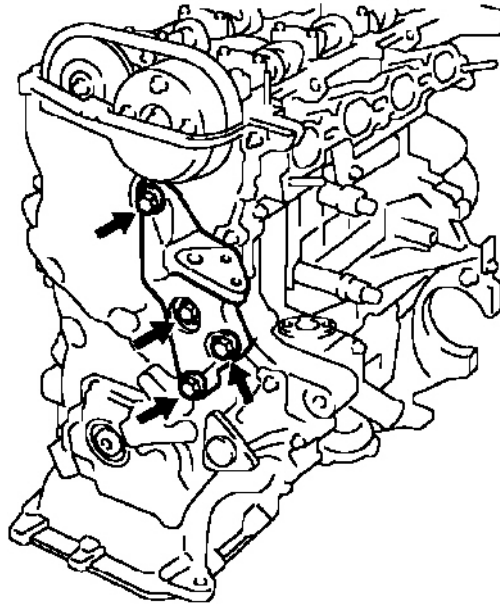


A050677E01

Fig. 229: Removing Pulley Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE ENGINE MOUNTING BRACKET RH

- a. Remove the 4 bolts and engine mounting bracket RH.



Y

A080957E01

Fig. 230: Removing Engine Mounting Bracket RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. REMOVE WATER PUMP

- a. Remove the 3 bolts and 2 nuts.
- b. Remove the water pump and gasket.

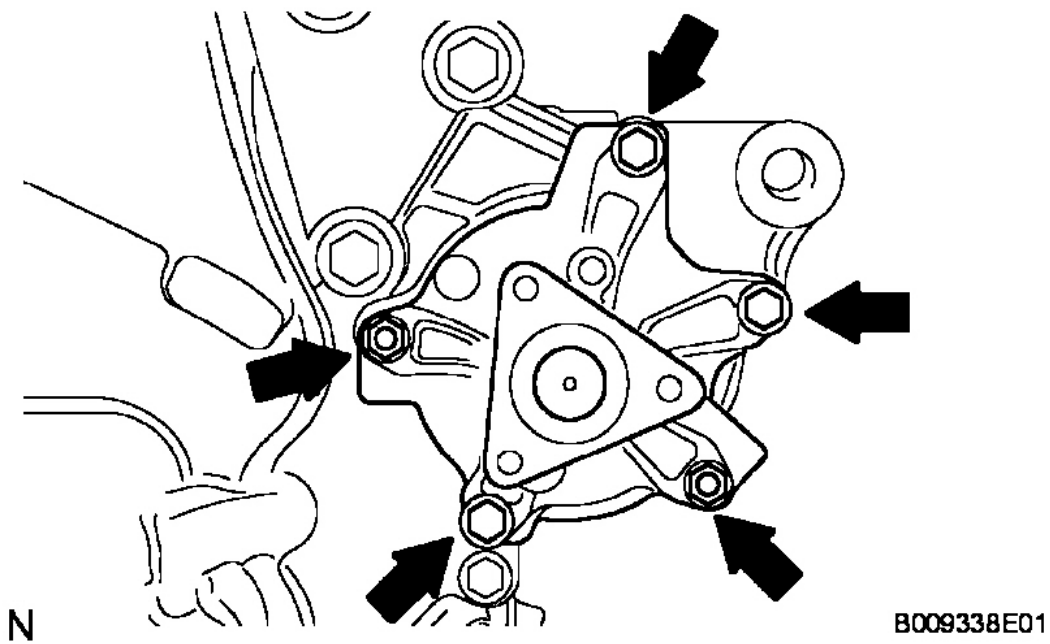
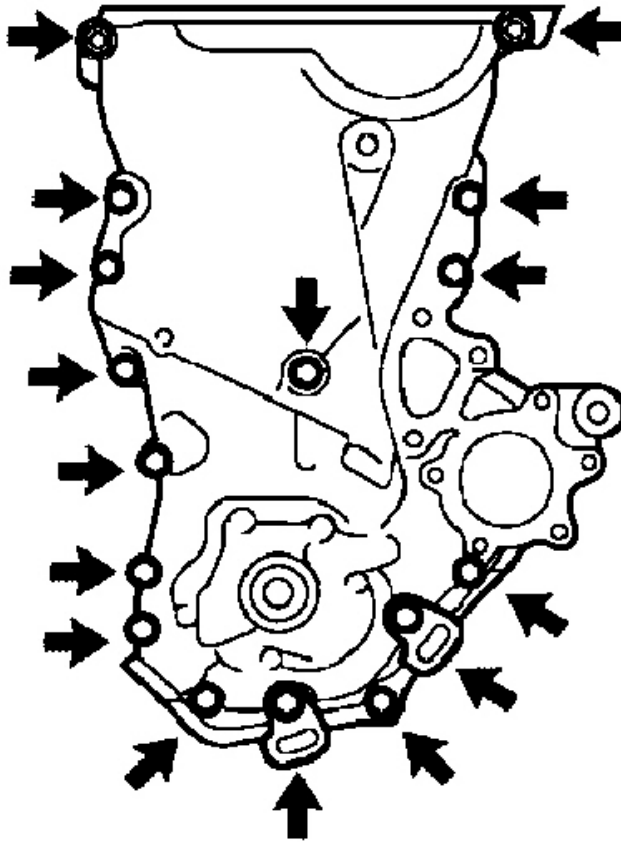


Fig. 231: Removing Water Pump

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

15. REMOVE TIMING CHAIN COVER

- a. Remove the 15 bolts and nut.
- b. Using a screwdriver with the tip wrapped in tape, remove the chain cover by prying between the cylinder head and cylinder block.



A066477E01

Fig. 232: Removing Timing Chain Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- c. Remove the 2 O-rings from the cylinder block and No. 1 oil pan.
 - d. Using an 8 mm hexagon wrench, remove the screw plug from the oil pump.
16. **REMOVE OIL PUMP SEAL** (See **REPLACEMENT**)
17. **REMOVE NO. 1 CHAIN TENSIONER**

NOTE:

- When rotating the camshaft with the timing chain removed, rotate the crankshaft counterclockwise 40° from the TDC and align the oil jet hole with the paint mark to prevent the pistons from coming into contact with the valves.

- Do not rotate the crankshaft with the chain tensioner removed.

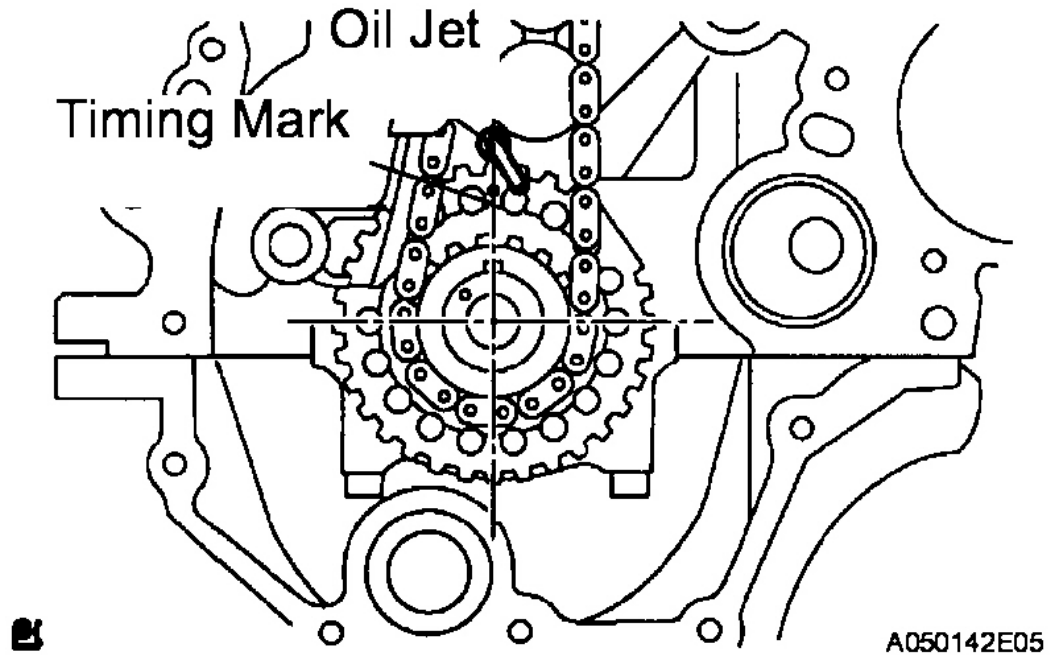


Fig. 233: Aligning Oil Jet Hole With Paint Mark
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- While rotating the stopper plate of the chain tensioner upward with a screwdriver, push in the plunger of the tensioner as shown in the illustration.
- While rotating the stopper plate of the tensioner downward, insert a 2.5 mm (0.098 in.) diameter bar into the holes of the stopper plate and the tensioner to hold the stopper plate.
- Remove the 2 bolts and chain tensioner.

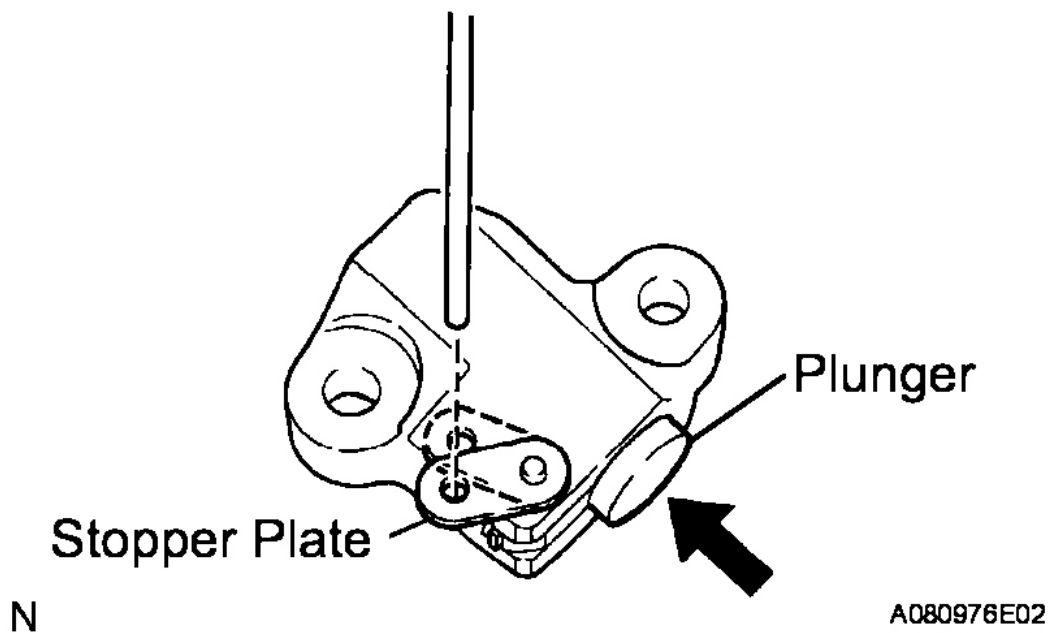


Fig. 234: Inserting Bar Into Holes Of Stopper Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. REMOVE CHAIN TENSIONER SLIPPER

- a. Remove the bolt and chain tensioner slipper.

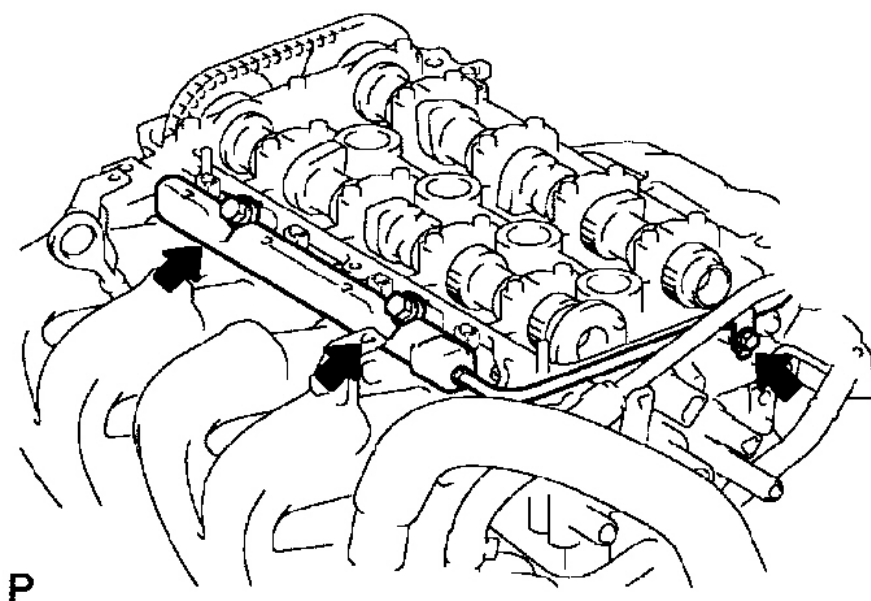
19. REMOVE NO. 1 CHAIN VIBRATION DAMPER

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

20. REMOVE CHAIN

21. REMOVE FUEL DELIVERY PIPE

- a. Remove the 3 bolts and fuel delivery pipe together with the 4 fuel injectors.



A067561E01

Fig. 235: Removing Fuel Delivery Pipe

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

22. REMOVE FUEL INJECTOR

- a. Pull out the 4 injectors from the delivery pipe.

23. REMOVE CAMSHAFT POSITION SENSOR

- a. Remove the bolt and camshaft position sensor.

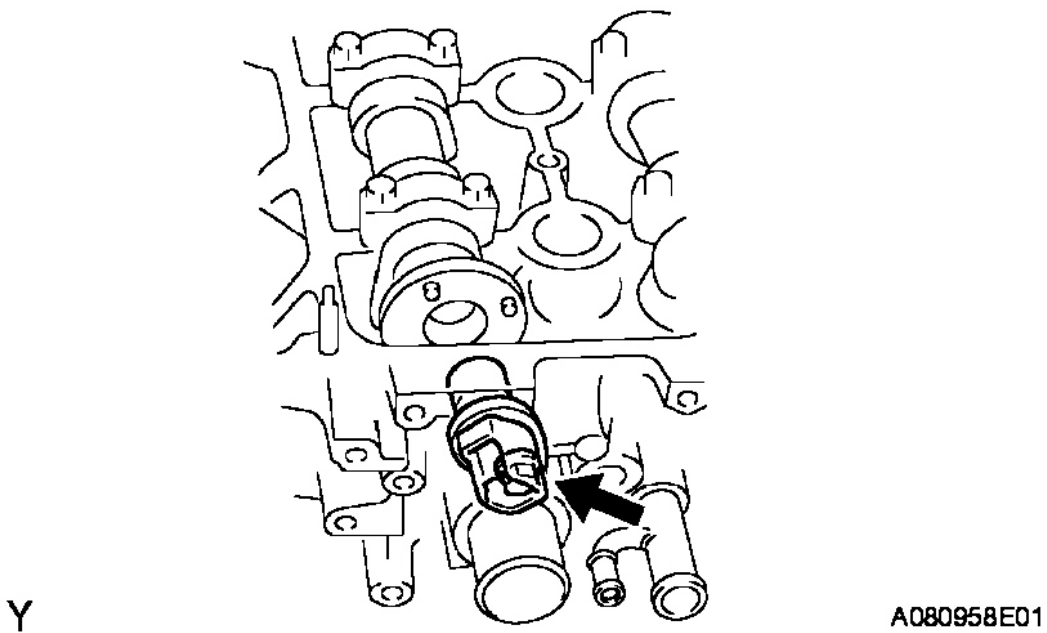


Fig. 236: Removing Camshaft Position Sensor
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. REMOVE NO. 2 CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 11 bearing cap bolts in the sequence shown in the illustration, and then remove the 5 bearing caps and No. 2 camshaft.

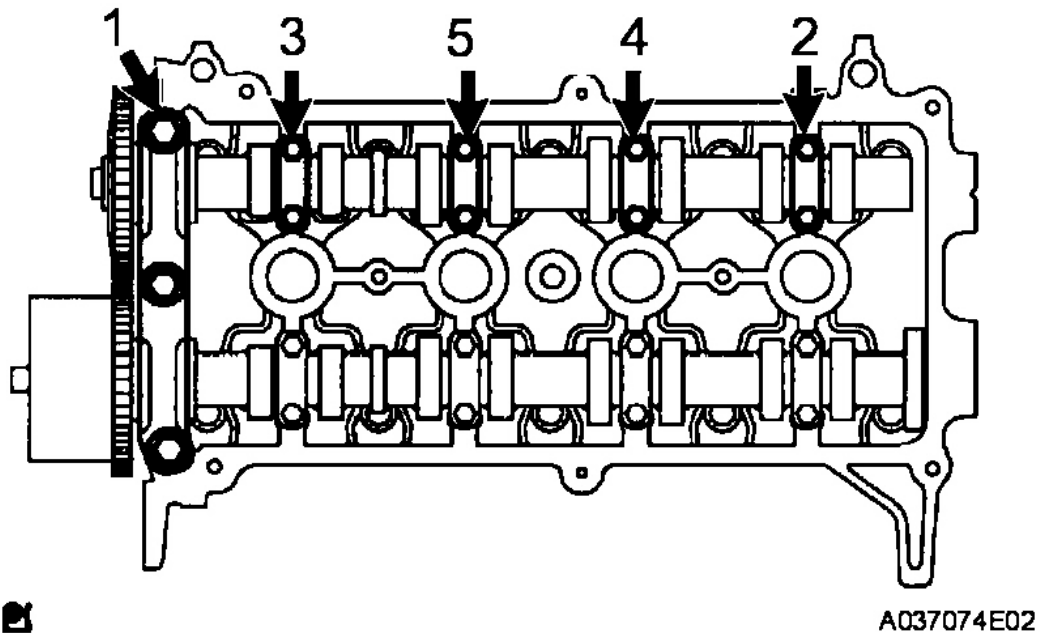


Fig. 237: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Loosen each bolt uniformly, keeping the camshaft level.

25. REMOVE CAMSHAFT TIMING SPROCKET

- a. Clamp the camshaft in a vise.
- b. Remove the flange bolt and camshaft timing sprocket.

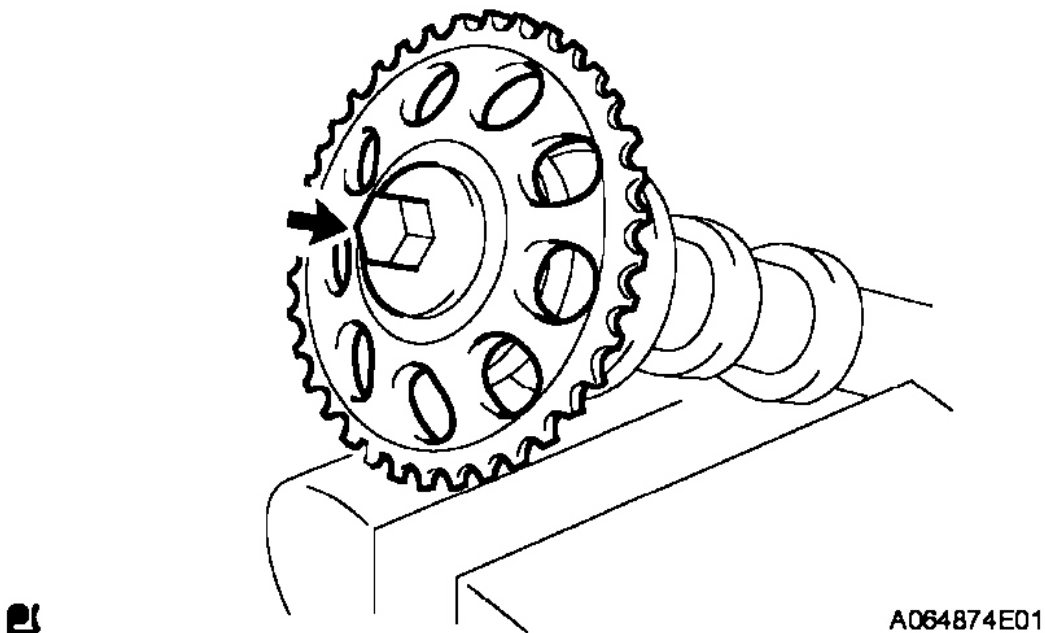


Fig. 238: Removing Flange Bolt And Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the camshaft.

26. REMOVE CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 8 bearing cap bolts in the sequence shown in the illustration, and then remove the 4 bearing caps and camshaft.

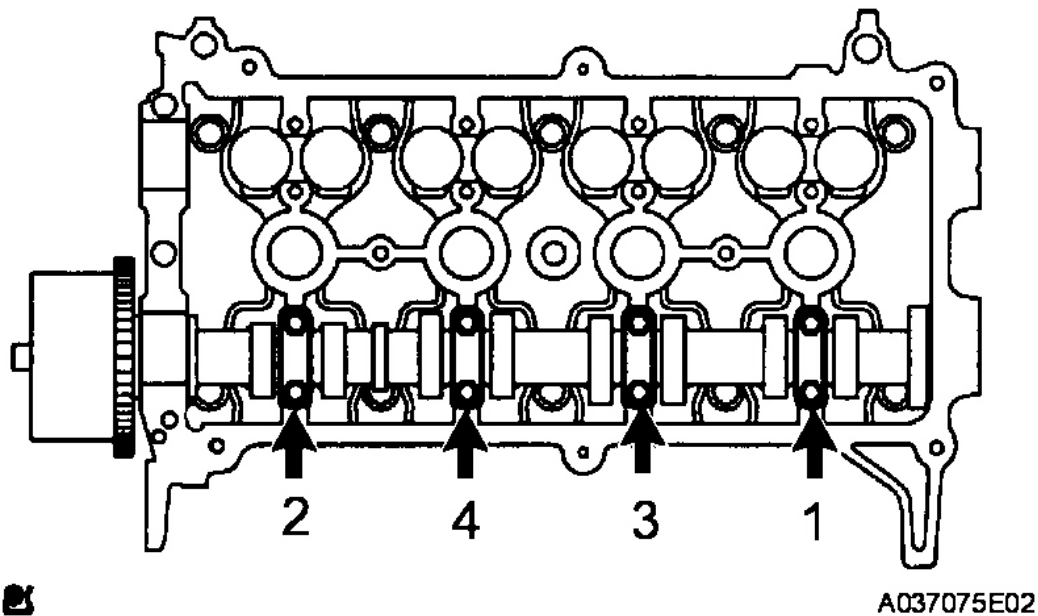


Fig. 239: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Loosen each bolt uniformly, keeping the camshaft level.

27. REMOVE CAMSHAFT TIMING GEAR

- Turn the valve timing controller assembly at the most advanced angle (see **DISASSEMBLY**).
- Remove the flange bolt and camshaft timing gear.

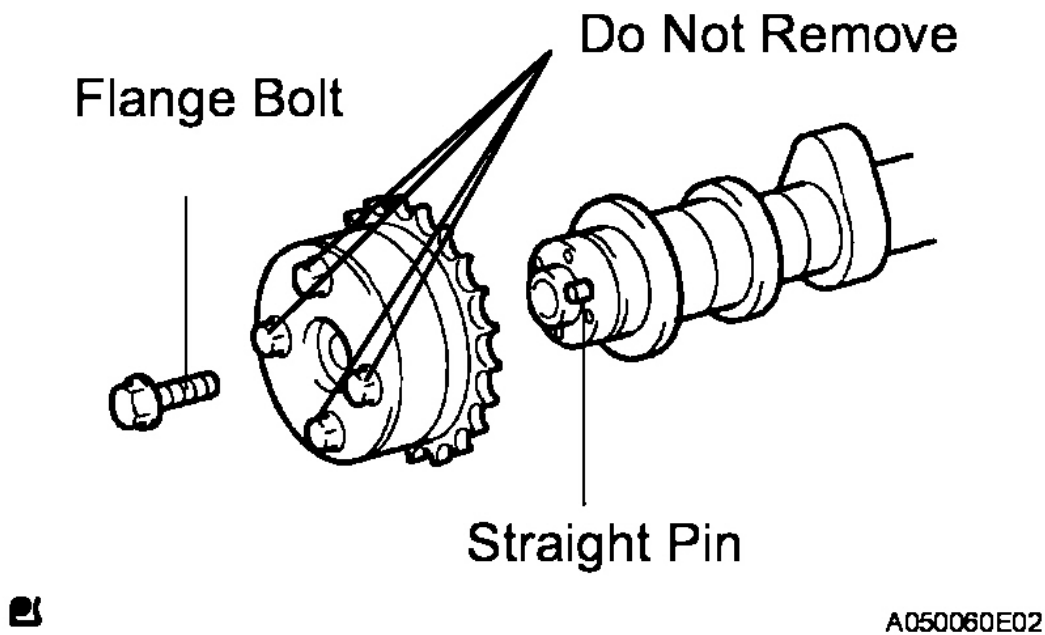


Fig. 240: Removing Flange Bolt And Camshaft Timing Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Be careful not to remove the other 4 bolts.
- If reusing the camshaft timing gear, unlock the lock pin inside the camshaft timing gear first.

28. REMOVE CYLINDER HEAD

- a. Using several steps, uniformly loosen and remove the 10 cylinder head bolts with an 8 mm bi-hexagon wrench in the sequence shown in the illustration.

Remove the 10 cylinder head bolts and plate washers.

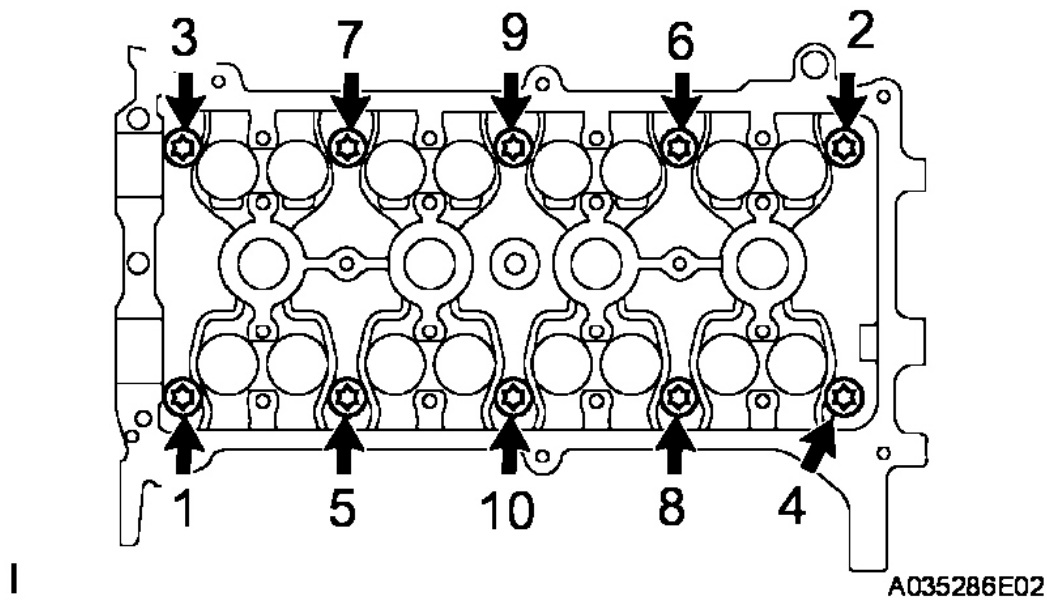


Fig. 241: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

29. REMOVE CYLINDER HEAD GASKET

30. REMOVE OIL FILTER

- a. Using SST, remove the oil filter.

SST 09228-06501

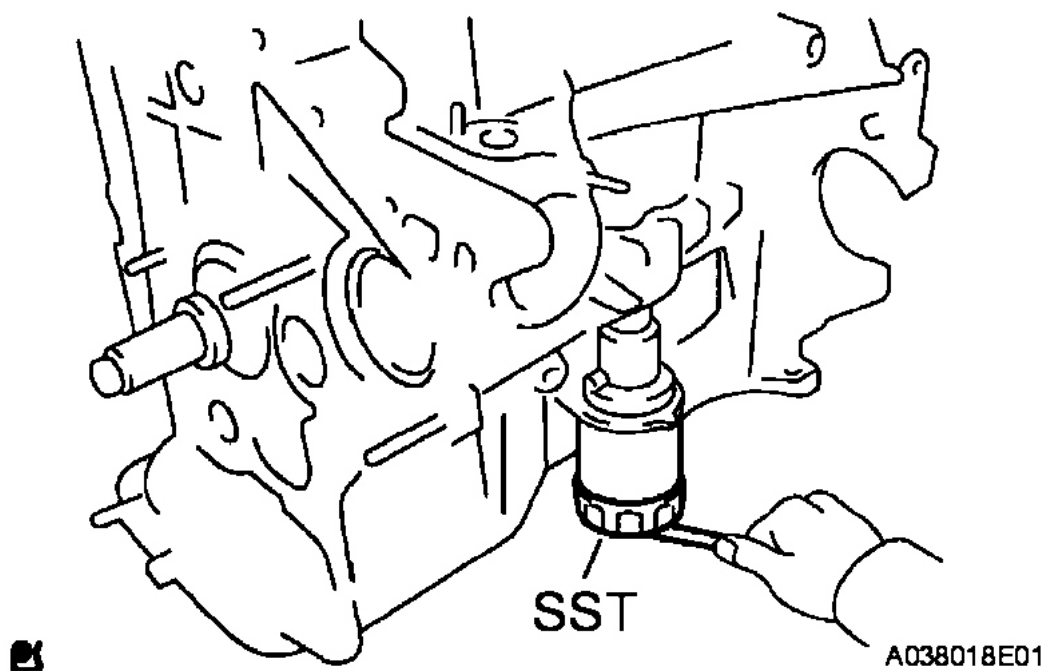


Fig. 242: Removing Oil Filter

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

31. REMOVE OIL FILTER UNION

- a. Using a 12 mm hexagon wrench, remove the oil filter union.

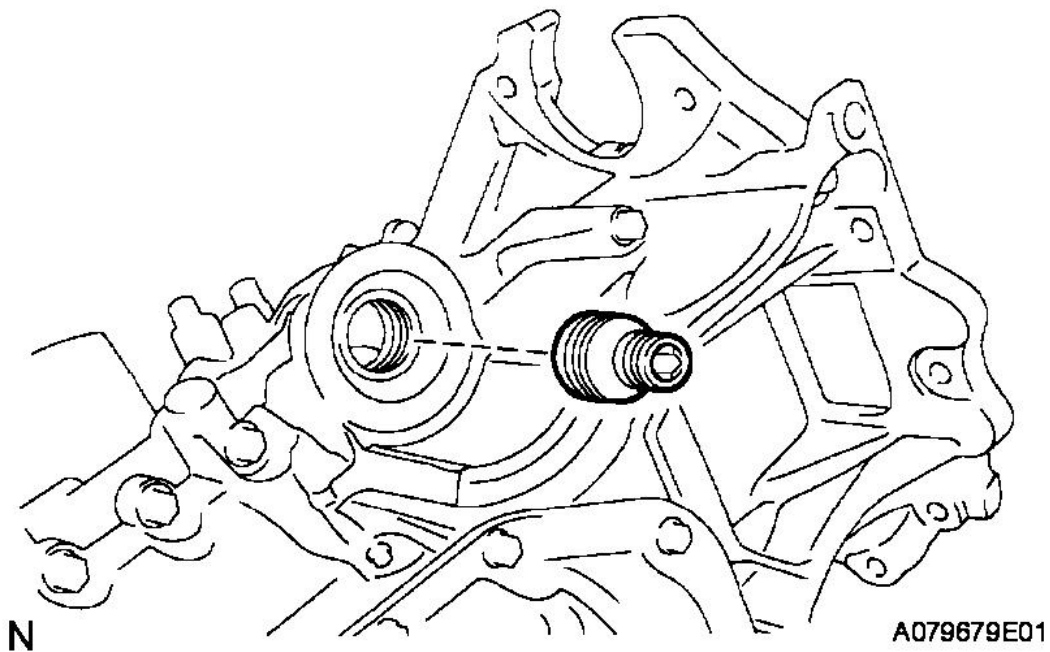


Fig. 243: Removing Oil Filter Union

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

32. **REMOVE ENGINE REAR OIL SEAL (See DISASSEMBLY)**
33. **REMOVE NO. 2 OIL PAN**
 - a. Remove the oil pan drain plug and gasket.
 - b. Remove the 9 bolts and 2 nuts.

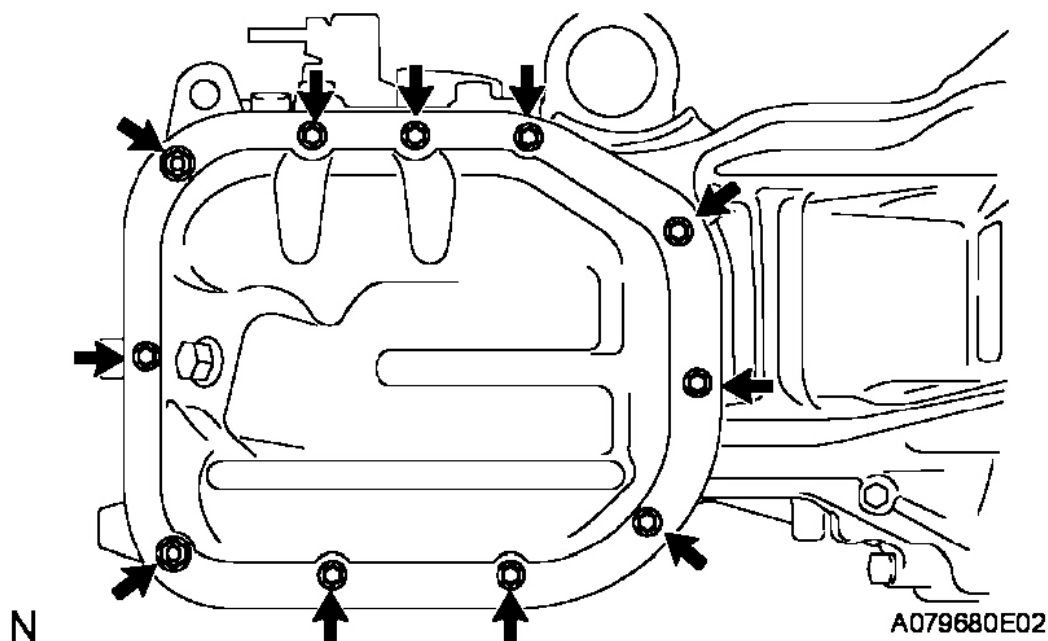


Fig. 244: Removing Oil Pan

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

- c. Insert the blade of SST between the oil pan and No. 2 oil pan, cut off the applied sealer and remove the No. 2 oil pan.

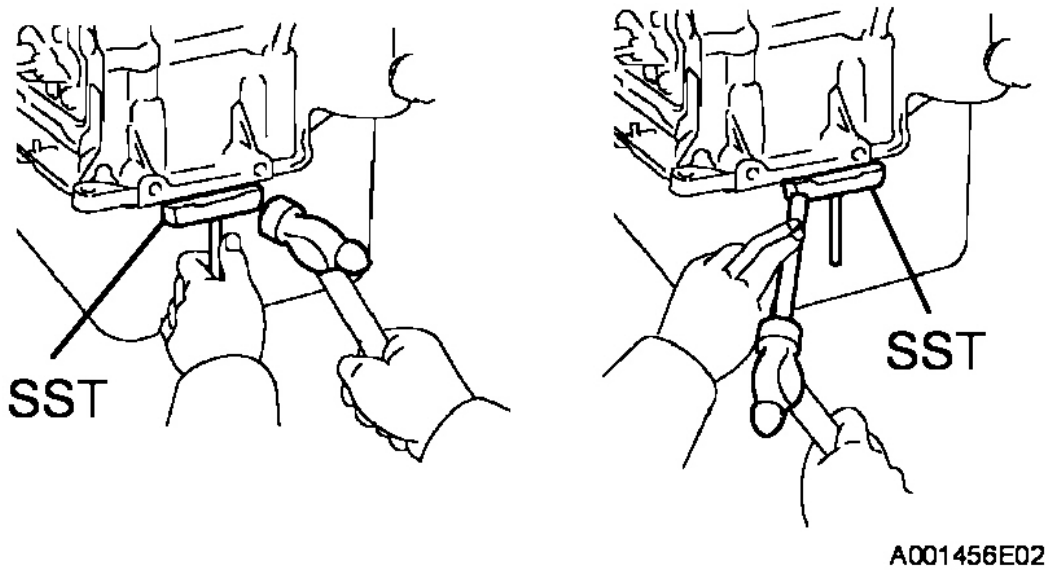


Fig. 245: Cutting Off Applied Sealer

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

SST 09032-00100

NOTE: Be careful not to damage the oil pan and No. 2 oil pan.

34. REMOVE OIL STRAINER

- a. Remove the bolt and 2 nuts.
- b. Remove the oil strainer and gasket.

35. REMOVE OIL PAN

- a. Loosen and remove the 13 bolts uniformly in several steps.

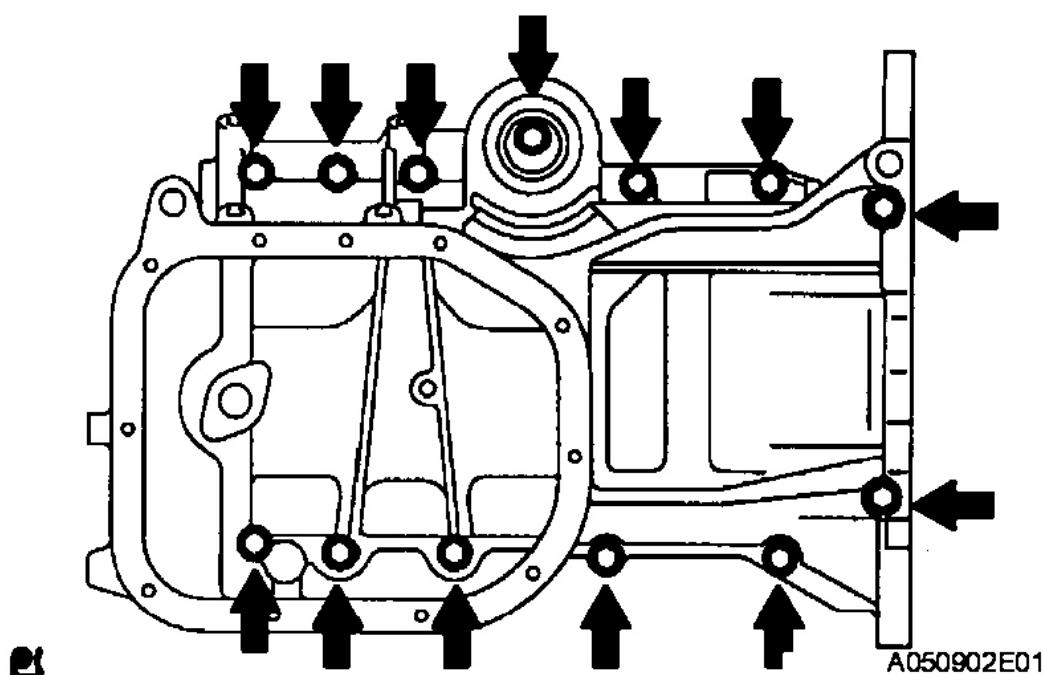


Fig. 246: Removing Oil Pan Bolts

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

- b. Using a screwdriver, remove the oil pan by prying between the cylinder block and oil pan.

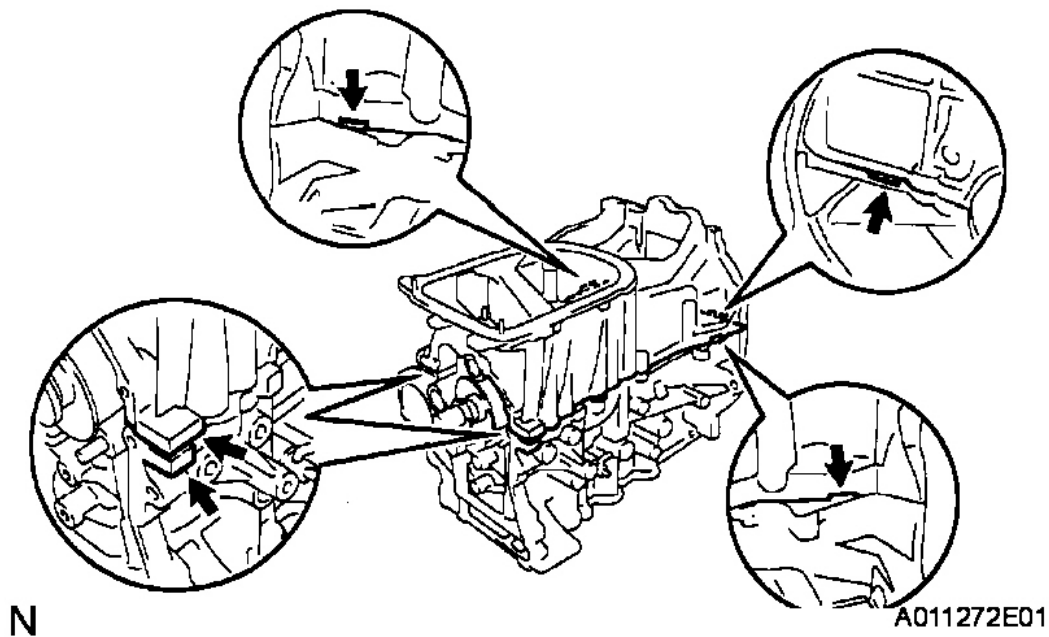


Fig. 247: Removing Oil Pan

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

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

- c. Remove the 2 O-rings from the cylinder block.
- d. Remove the 4 stud bolts.

36. INSPECT CONNECTING ROD THRUST CLEARANCE

- a. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.



Fig. 248: Checking Connecting Rod Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard thrust clearance: 0.16 to 0.36 mm (0.0063 to 0.0142 in.)

Maximum thrust clearance: 0.36 mm (0.0142 in.)

If the thrust clearance is greater than the maximum, replace the connecting rod.

37. INSPECT CONNECTING ROD OIL CLEARANCE

- a. Check that the matchmarks on the connecting rod and cap are aligned to ensure the correct reassembly.
- b. Using SST, remove the 2 connecting rod cap bolts.

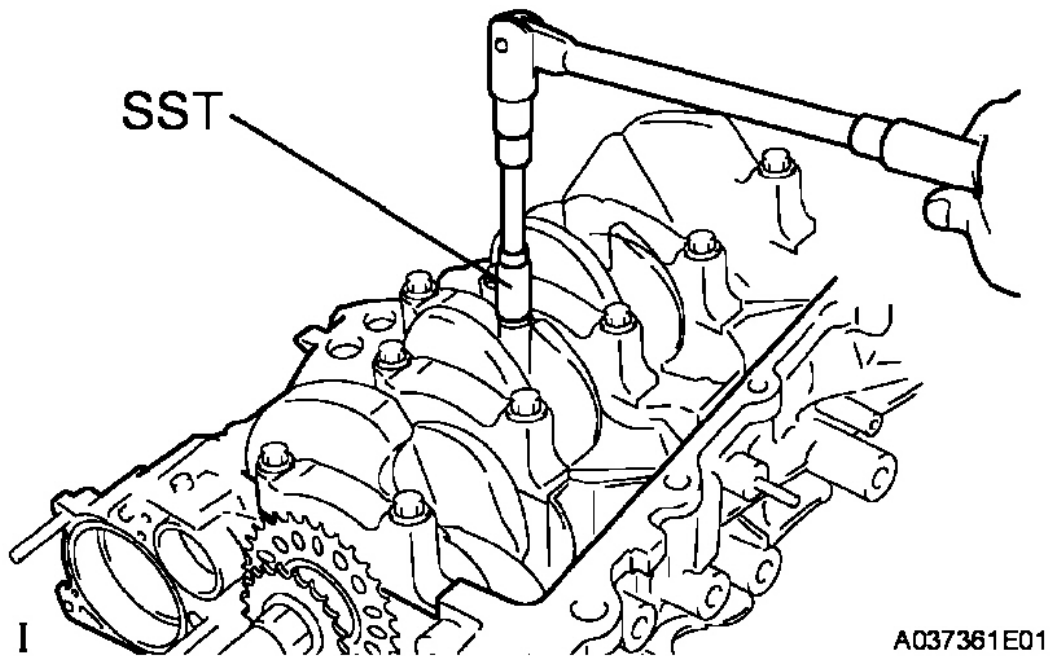


Fig. 249: Removing Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09205-16010

- c. Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.
- d. Clean the crank pin and bearing.
- e. Check the crank pin and bearing for pitting and scratches.
- f. Lay a strip of Plastigage across the crank pin.

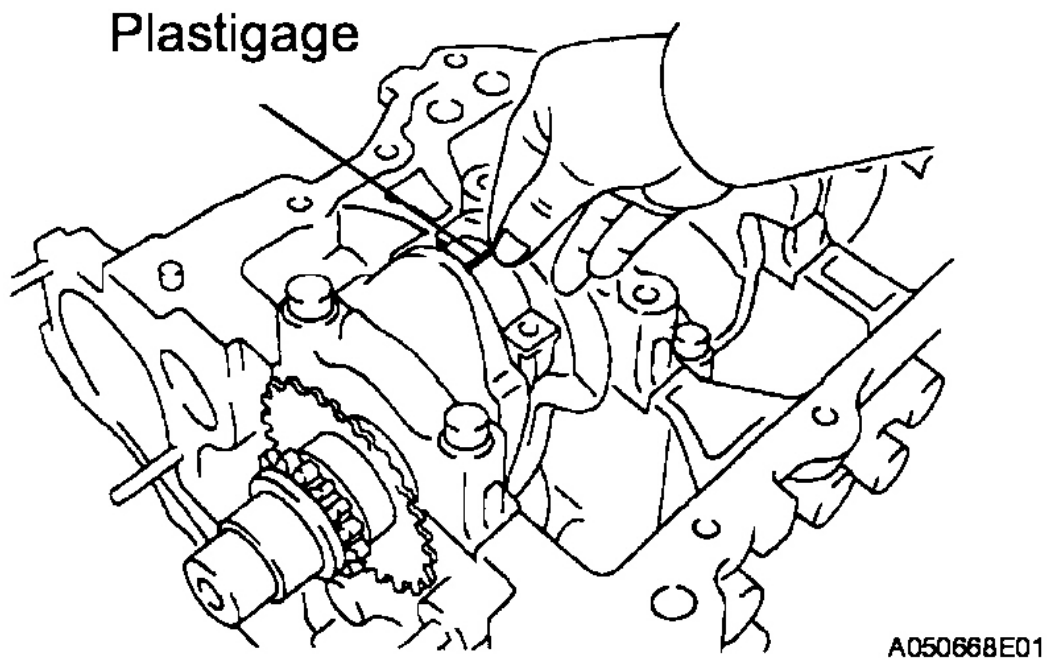
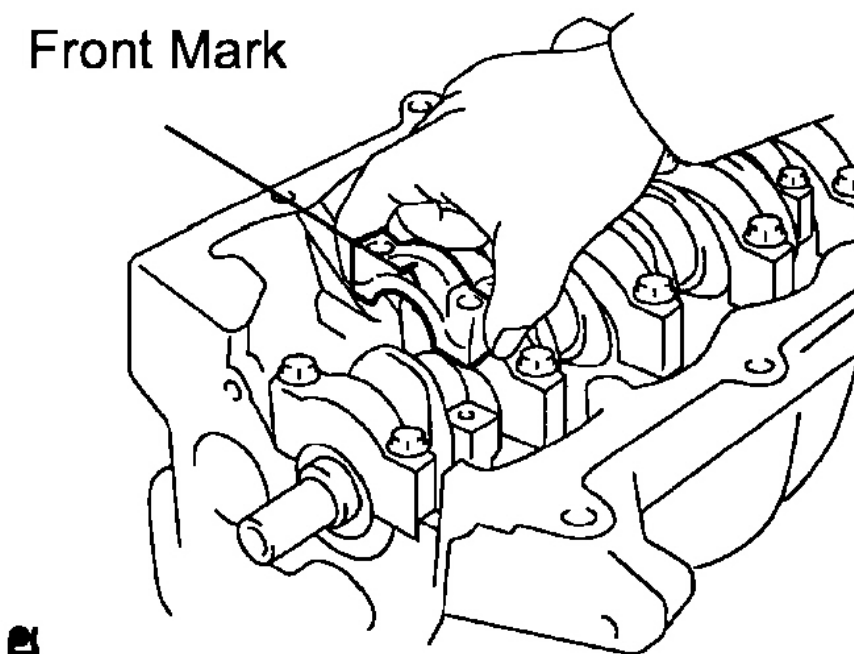


Fig. 250: Laying Strip Of Plastigage Across Crank Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Match together the connecting rod and cap in the correct combination. Then install the cap onto the connecting rod, making sure that the front mark on the cap is correctly oriented.
- h. Apply a light coat of engine oil to the threads of the connecting rod cap bolts.

Front Mark



A050673E01

Fig. 251: Installing Cap Onto Connecting Rod

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

- i. Using SST, tighten the bolts in several steps by the specified torque.

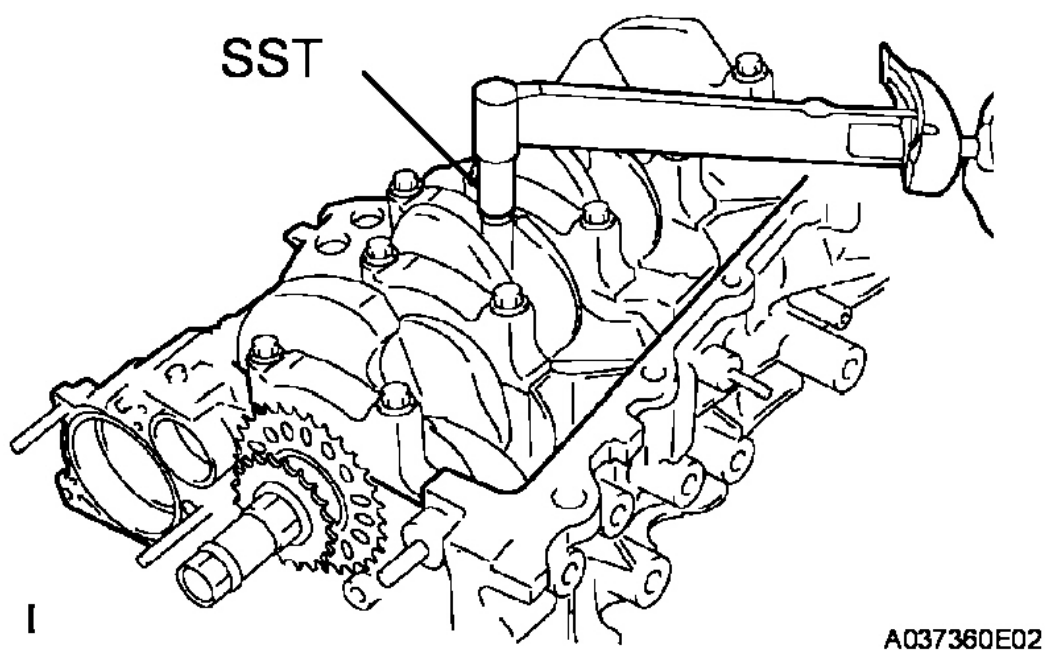


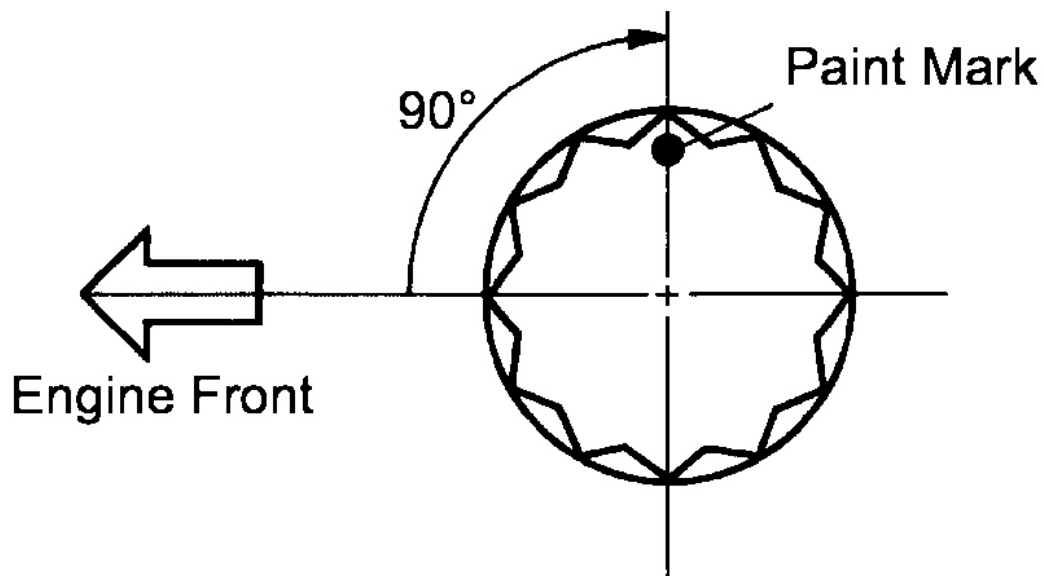
Fig. 252: Tightening Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09205-16010

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

NOTE: Do not turn the crankshaft.

- j. Mark the front of the connecting cap bolts with paint.
- k. Retighten the cap bolts by 90° as shown in the illustration.

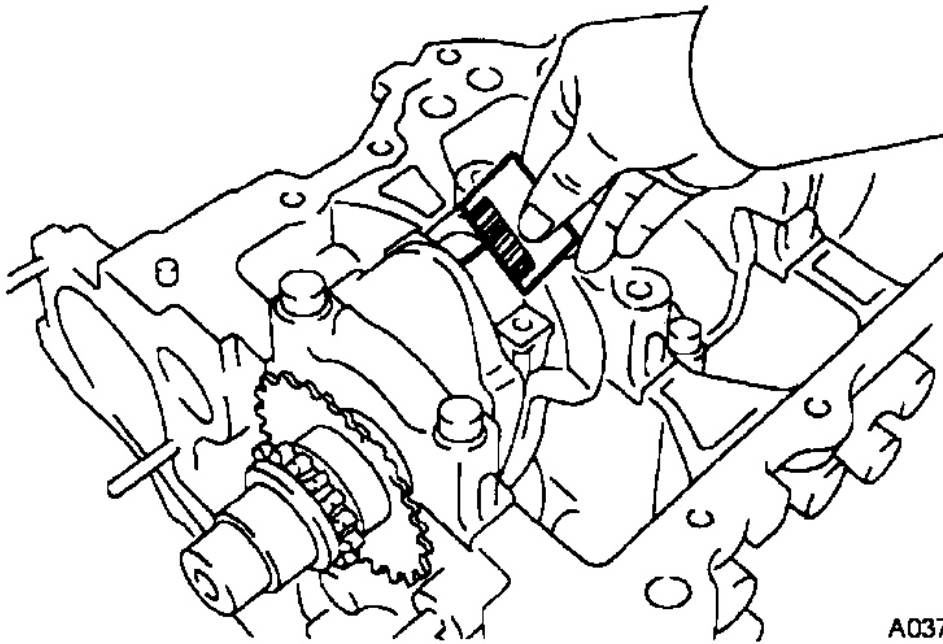


A050671E02

Fig. 253: Identifying Retightening Angle Of Connecting Rod Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- l. Remove the 2 bolts, connecting rod cap and lower bearing.
- m. Measure the Plastigage at its widest point.



A037349E01

Fig. 254: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard oil clearance: 0.016 to 0.040 mm (0.0006 to 0.0016 in.)

Maximum oil clearance: 0.06 mm (0.0024 in.)

NOTE: Completely remove the Plastigage.

- n. If the oil clearance is greater than the maximum, select and replace the bearing. If necessary, use an undersized bearing.

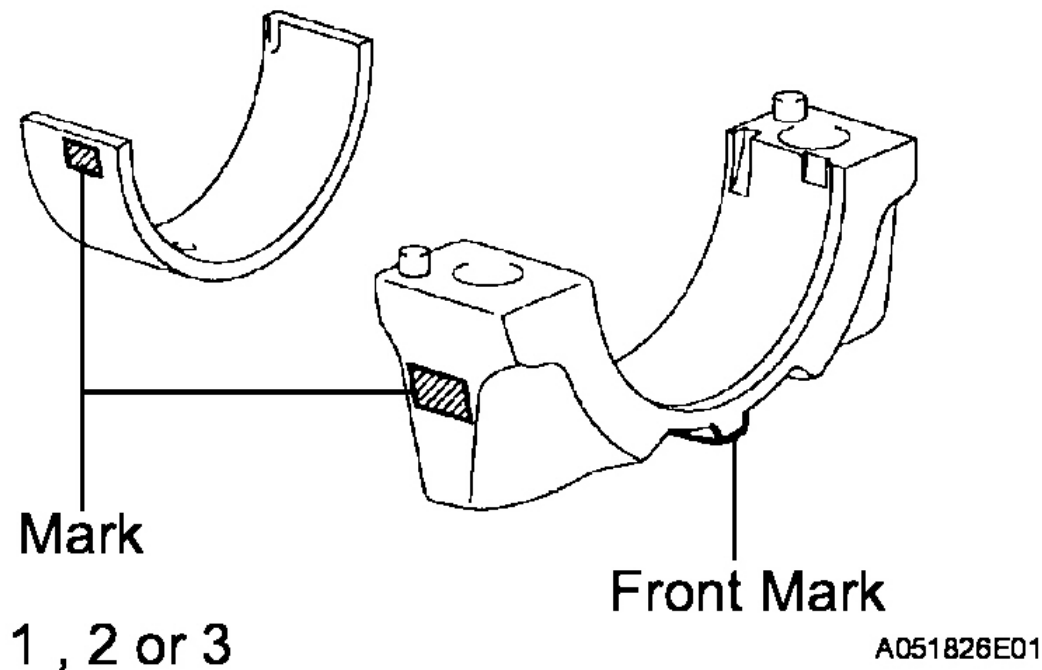


Fig. 255: Identifying Mark On Connecting Rod Cap And Bearing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reference

CONNECTING ROD EXTERNAL DIAMETER AND CENTER BEARING THICKNESS SPECIFICATION

Number Mark	Connecting Rod External Diameter	Center Bearing Thickness	Oil Clearance
1	43.000 to 43.008 mm (1.6929 to 1.6932 in.)	1.491 to 1.494 mm (0.0587 to 0.0588 in.)	0.012 to 0.034 mm (0.0005 to 0.0013 in.)
2	43.008 to 43.016 mm (1.6932 to 1.6935 in.)	1.494 to 1.497 mm (0.0588 to 0.0589 in.)	0.014 to 0.036 mm (0.0006 to 0.0014 in.)
3	43.016 to 43.024 mm (1.6935 to 1.6939 in.)	1.497 to 1.500 mm (0.0589 to 0.0591 in.)	0.016 to 0.038 mm (0.0006 to 0.0015 in.)
U/S 0.25	43.000 to 43.024 mm (1.6929 to 1.6939 in.)	1.608 to 1.614 mm (0.0633 to 0.0635 in.)	0.016 to 0.040 mm (0.0006 to 0.0016 in.)

38. REMOVE PISTON WITH CONNECTING ROD

- Using a ridge reamer, remove all carbon from the top of the cylinder.
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

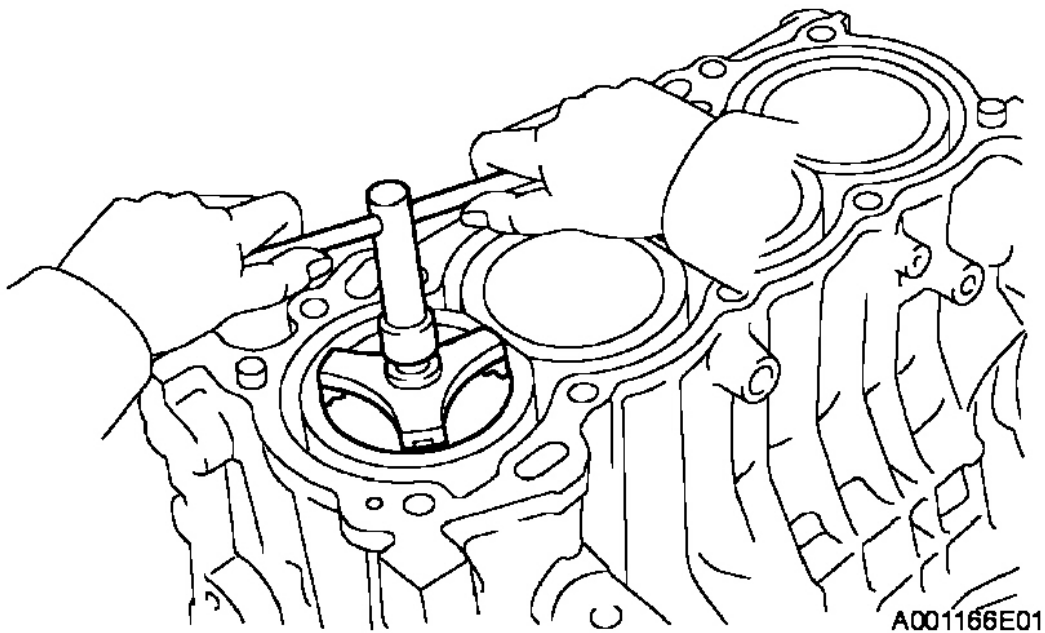


Fig. 256: Removing All Carbon From Top Of Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

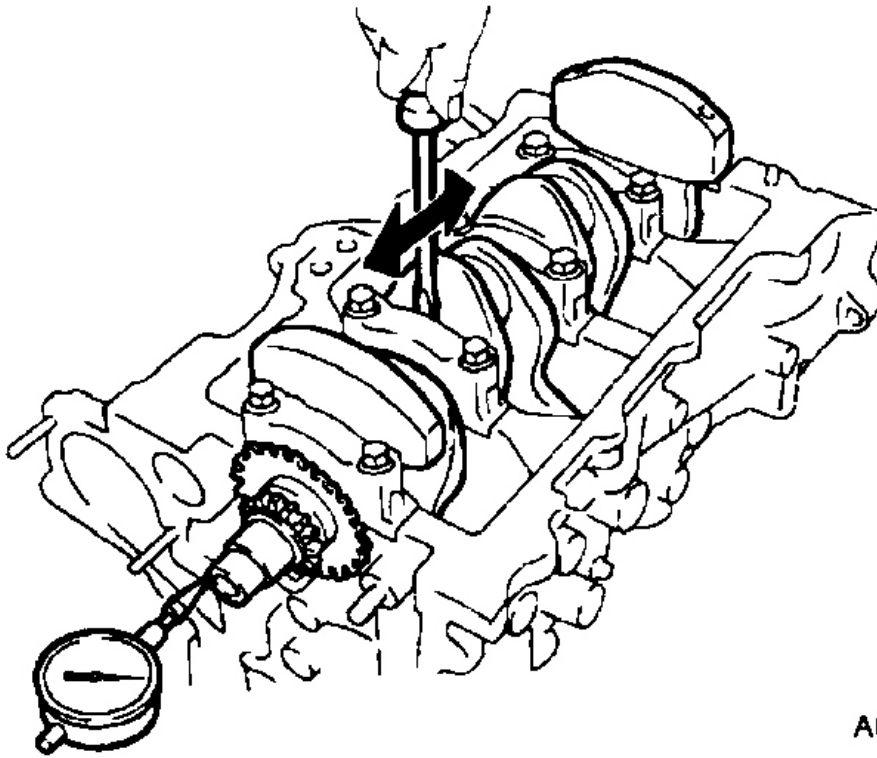
HINT:

- Keep the bearing, connecting rod and cap together.
- Keep the piston and the connecting rod assemblies in the correct order so that they can be returned to the original locations when reassembling.

39. REMOVE CONNECTING ROD BEARING

40. INSPECT CRANKSHAFT THRUST CLEARANCE

- a. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.



A037350E01

Fig. 257: Checking Crankshaft Thrust Clearance

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

Standard thrust clearance: 0.09 to 0.19 mm (0.0035 to 0.0075 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than the maximum, replace the thrust washers as a set. Check the crankshaft and block for wear, and repair or replace if necessary.

HINT:

Thrust washer thickness: 2.43 to 2.48 mm (0.0957 to 0.0976 in.)

41. REMOVE CRANKSHAFT AND INSPECT OIL CLEARANCE

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

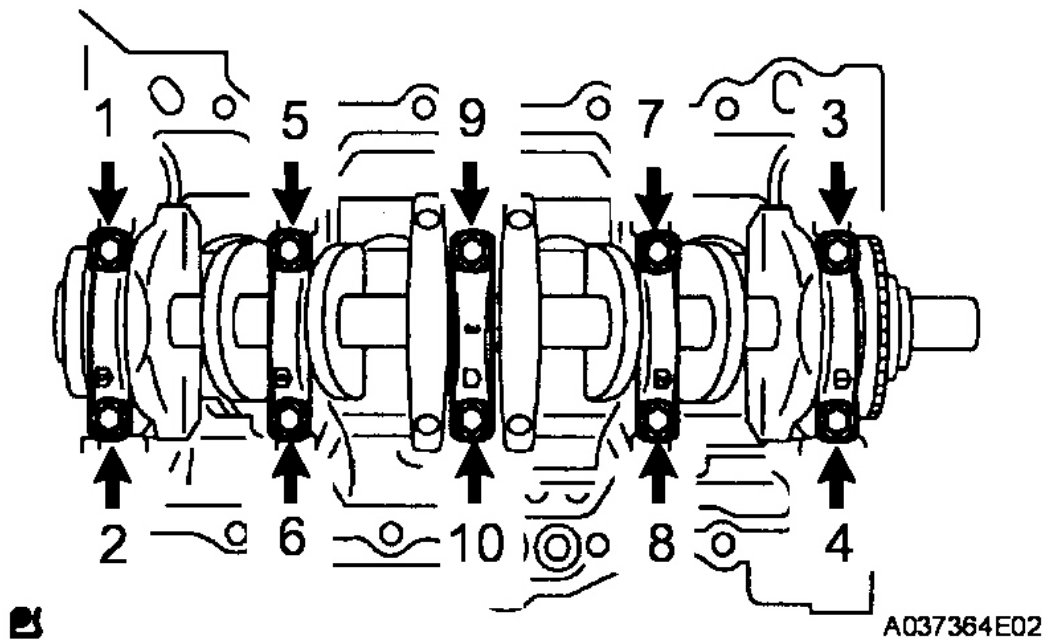


Fig. 258: Identifying Bearing Cap Bolts Loosening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09011-38121

- b. Remove the 5 bearing caps and crankshaft.
- c. Clean each main journal and bearing.
- d. Install the upper bearing with the oil groove onto the cylinder block, and the lower bearing onto the bearing cap.

NOTE: Do not apply engine oil to the contact surfaces of the cylinder block or the backside of the bearing.

HINT:

The mass production parts do not have claws as marks. If reusing the mass production parts, measure the clearance of both sides with the bearing in the center of the bearing cap.

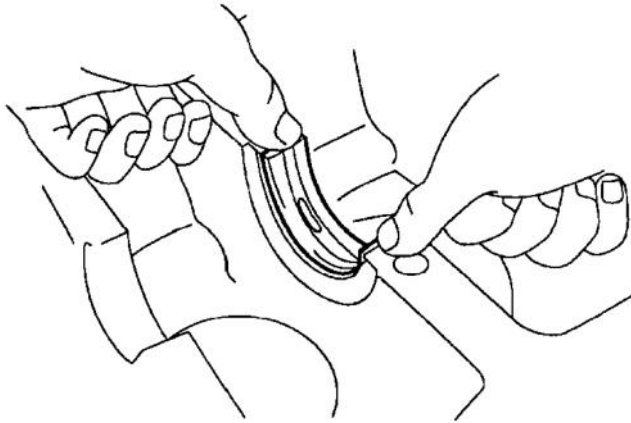
Standard clearance:

A - B = within 0.8 mm (0.032 in.)

C - D = within 0.4 mm (0.016 in.)

- e. Install the crankshaft onto the cylinder block.

Upper Bearing



Lower Bearing

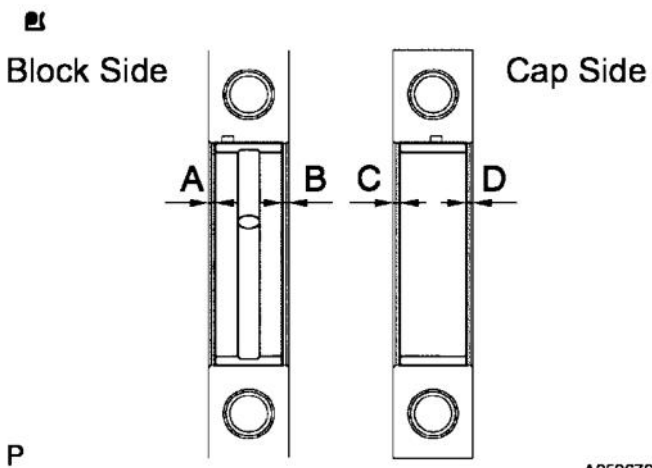
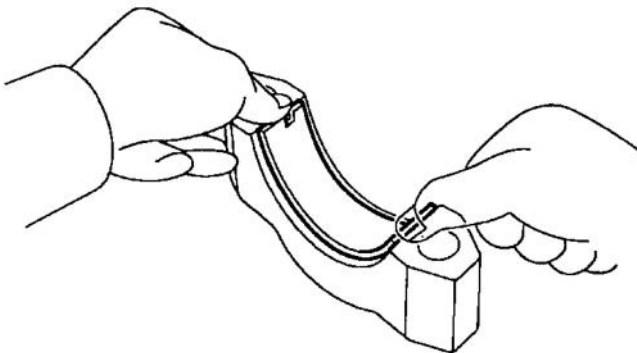


Fig. 259: Installing Upper Bearing Onto Cylinder Block And Lower Bearing Onto Bearing Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Lay a strip of Plastigage across each journal.

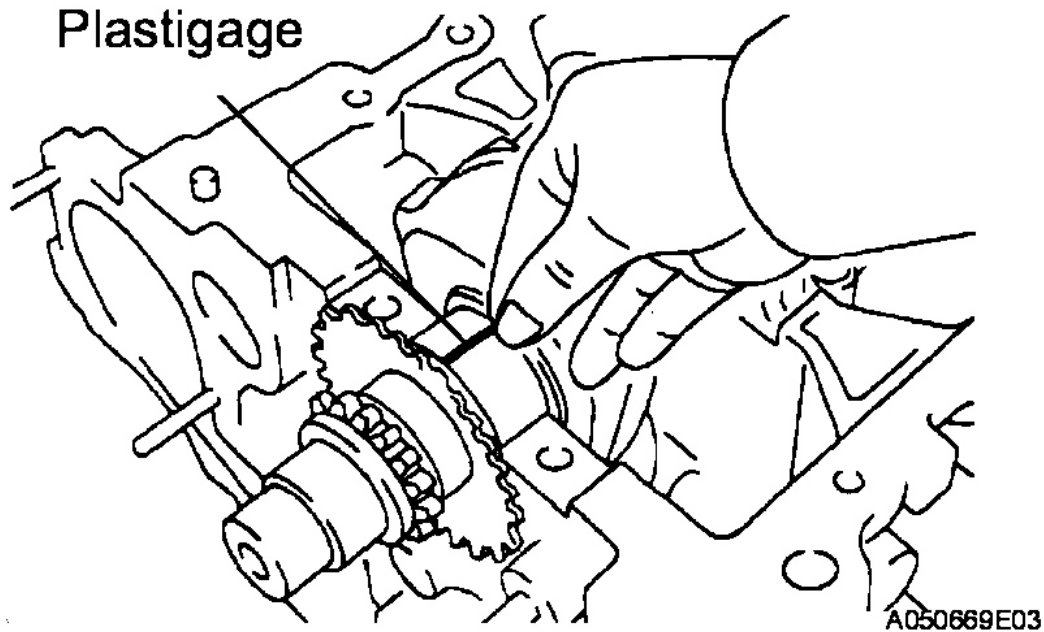
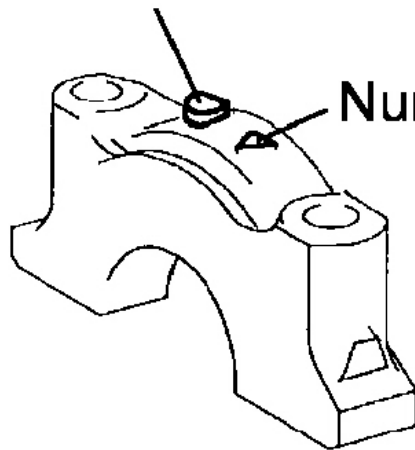


Fig. 260: Laying Strip Of Plastigage Across Each Journal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

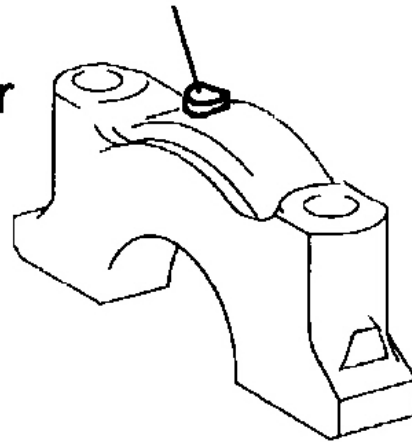
- g. Check the front marks and numbers and install the bearing caps onto the cylinder block.
h. Apply a light coat of engine oil to the threads of the bearing cap bolts.

Front Mark

Front Mark and Number



No. 3



No. 1, 2, 4, 5

A050917E03

Fig. 261: Identifying Front Marks And Numbers On Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Using SST, tighten the bolts in several steps by the specified torque in the sequence shown in the illustration.

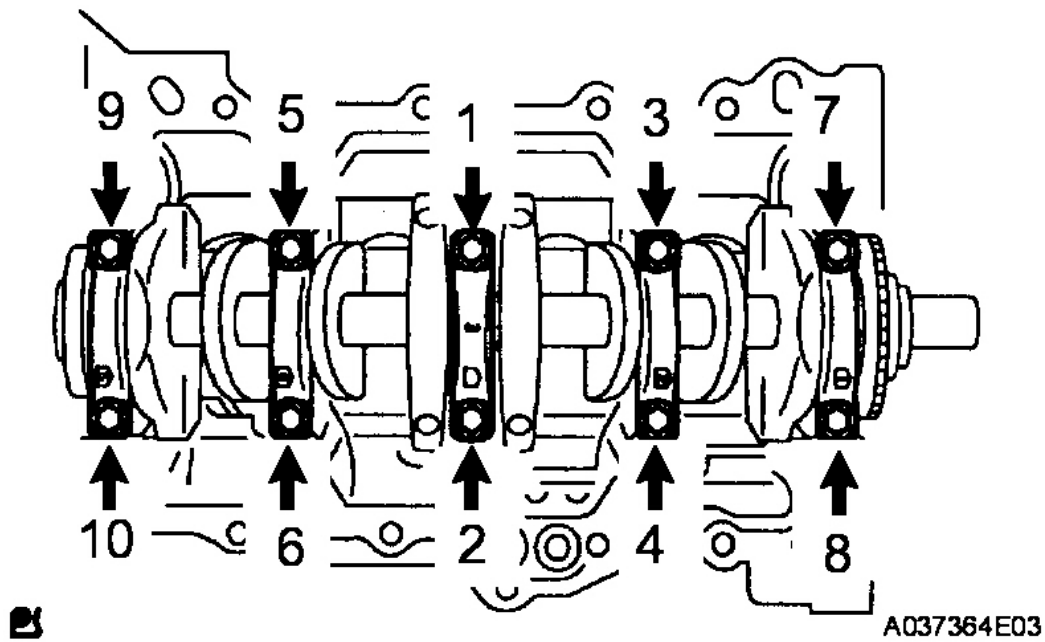


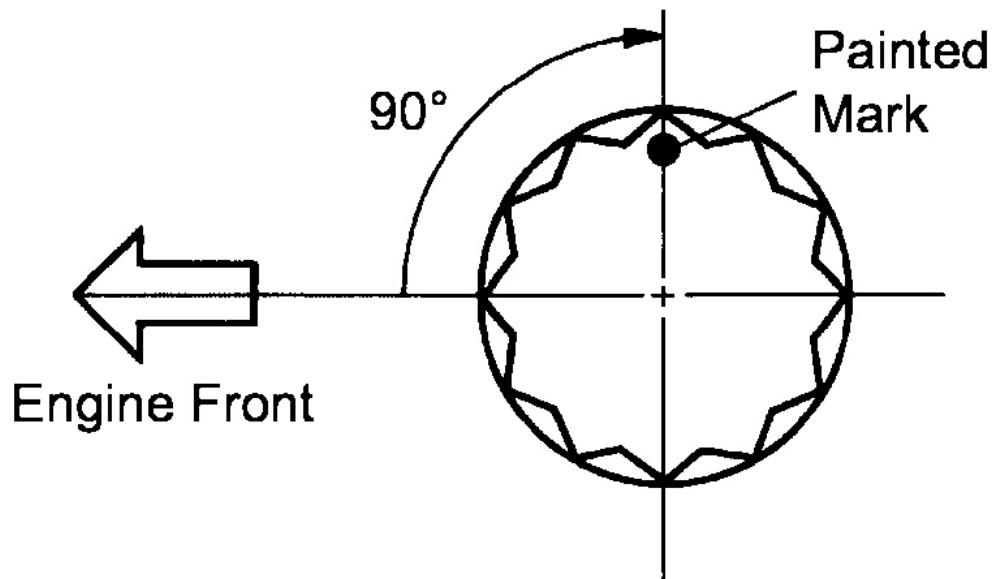
Fig. 262: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09011-38121

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

NOTE: Do not turn the crankshaft.

- j. Mark the front of the bearing cap bolts with paint.
- k. Retighten the bearing cap bolts by 90° in the same sequence.
- l. Check that the painted mark is now at a 90° angle to the front.



A050671E04

Fig. 263: Identifying Retightening Angle Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Do not turn the crankshaft.

- m. Remove the bearing cap.
- n. Measure the Plastigage at its widest point.

Standard oil clearance: 0.010 to 0.023 mm (0.0004 to 0.0009 in.)

Maximum oil clearance: 0.07 mm (0.0028 in.)

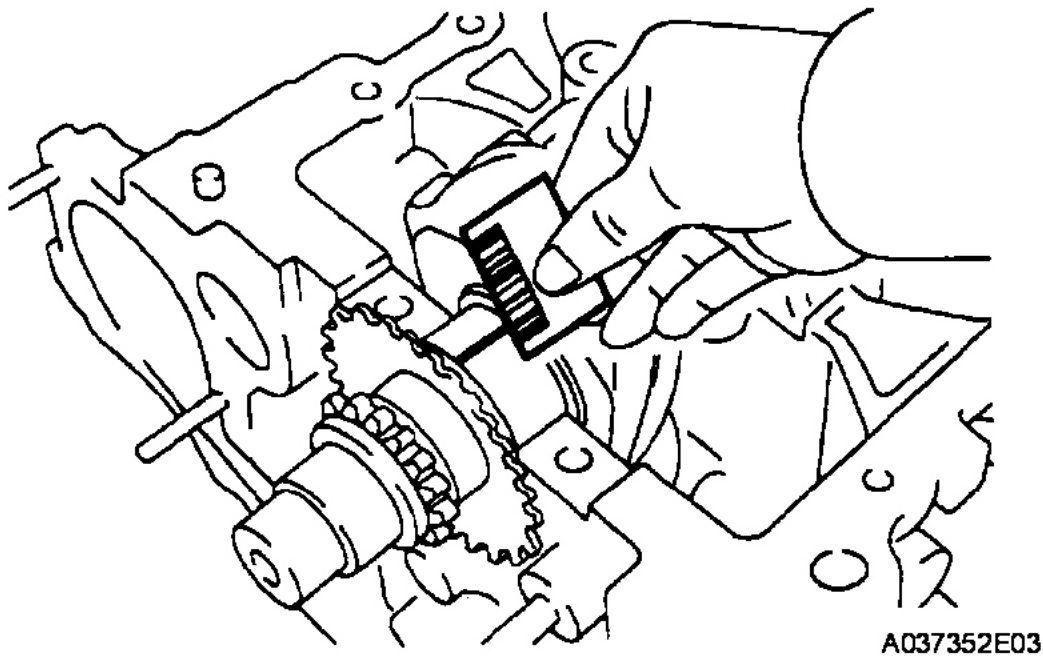


Fig. 264: Measuring Plastigage At Its Widest Point
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Completely remove the Plastigage.

HINT:

- If the oil clearance is greater than the maximum, select and replace the bearing. If necessary, use an undersized bearing.
- To select the correct bearing size, calculate the bearing number by adding together the numbers imprinted on the cylinder block and crank journal.

Example:

Imprinted number on the cylinder block is 3.

Imprinted number on the crank journal is 5. $3 + 5 = 8$ Select the bearing with the bearing number 3.

Standard cylinder block diameter

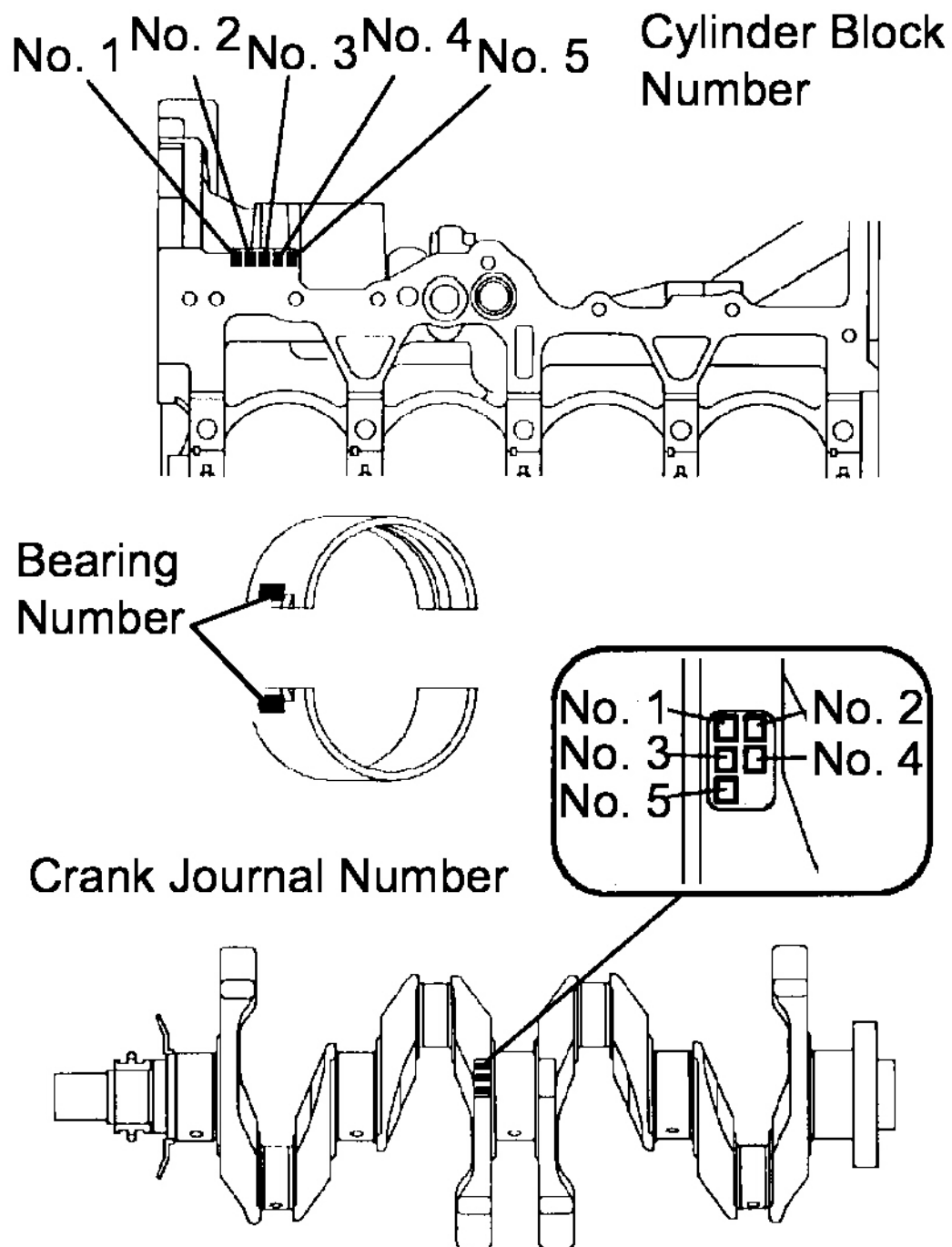
CYLINDER BLOCK DIAMETER SPECIFICATION

Number	Specified Condition
--------	---------------------

2006 Scion xB

2006 ENGINE Engine Mechanical (1NZ-FE) - xB

0	50.000 to 50.003 mm (1.9685 to 1.9686 in.)
1	50.003 to 50.005 mm (1.9686 to 1.9687 in.)
2	50.005 to 50.007 mm (1.9687 to 1.9688 in.)
3	50.007 to 50.010 mm (1.9688 to 1.9689 in.)
4	50.010 to 50.012 mm (1.9689 to 1.9690 in.)
5	50.012 to 50.014 mm (1.9690 to 1.9691 in.)
6	50.014 to 50.016 mm (1.9691 to 1.9691 in.)



A091934E01

Fig. 265: Identifying Cylinder Block Number, Bearing Number And Crank Journal Number

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

Standard crankshaft journal diameter

CRANKSHAFT JOURNAL DIAMETER SPECIFICATION

Number	Specified Condition
0	45.998 to 46.000 mm (1.8109 to 1.8110 in.)
1	45.996 to 45.998 mm (1.8109 to 1.8109 in.)
2	45.994 to 45.996 mm (1.8108 to 1.8109 in.)
3	45.992 to 45.994 mm (1.8107 to 1.8108 in.)
4	45.990 to 45.992 mm (1.8106 to 1.8107 in.)
5	45.988 to 45.990 mm (1.8106 to 1.8106 in.)

Reference

CENTER BEARING THICKNESS SPECIFICATION

Cylinder Block Number + Crank Journal Number	Bearing Number	Center Bearing Thickness	Oil Clearance
0 to 2	1	1.992 to 1.995 mm (0.0784 to 0.0785 in.)	0.010 to 0.023 mm (0.0004 to 0.0009 in.)
3 to 5	2	1.995 to 1.998 mm (0.0785 to 0.0787 in.)	Same as above
6 to 8	3	1.998 to 2.001 mm (0.0787 to 0.0788 in.)	Same as above
9 to 11	4	2.001 to 2.004 mm (0.0788 to 0.0789 in.)	Same as above
-	U/S 0.25	2.111 to 2.117 mm (0.0831 to 0.0834 in.)	Same as above

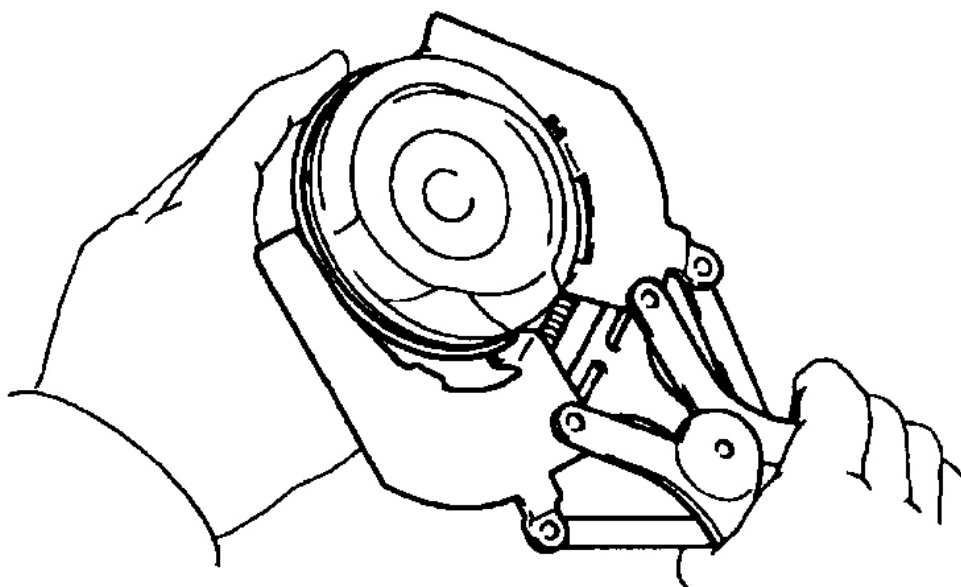
42. REMOVE CRANKSHAFT BEARING

43. REMOVE PISTON RING SET

HINT:

Keep the piston rings in the correct combination and correct order so that they can be returned to the original locations when reassembling.

- Using a piston ring expander, remove the 2 compression rings.
- Remove the 2 side rails and oil ring by hand.



A037363E01

Fig. 266: Removing Compression Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. REMOVE PISTON PIN

- a. Using SST, press out the piston pin from the piston.

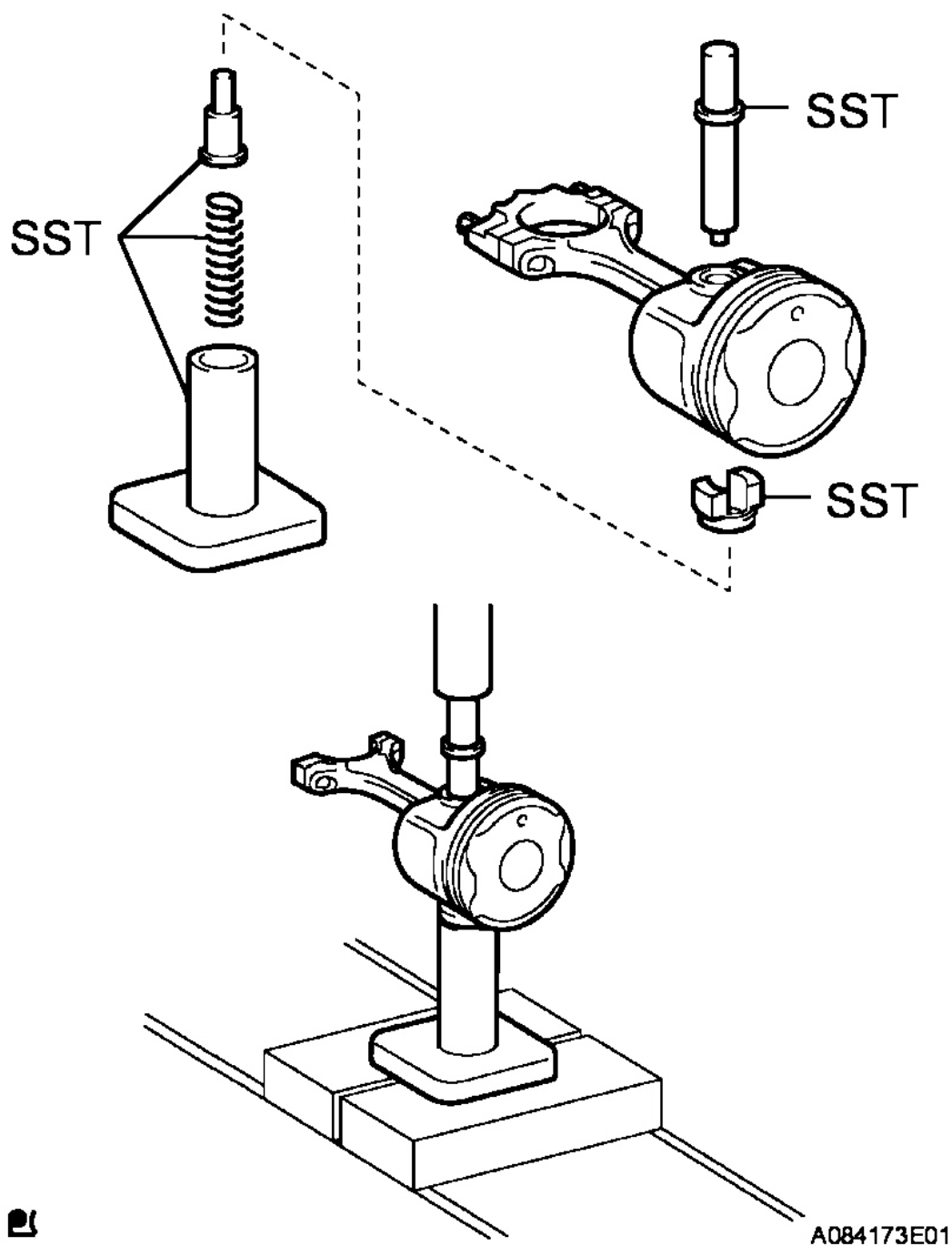


Fig. 267: Removing Piston Pin

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

SST 09221-25026 (09221-00021, 09221-00030, 09221-00190, 09221-00141, 09221-00150)

NOTE: **Keep the pistons, pins, rings, connecting rods and bearings in the correct order so that they can be returned to the original locations when reassembling.**

45. REMOVE CYLINDER BLOCK WATER DRAIN COCK

46. REMOVE STUD BOLT

- a. Using an E5 "Torx" wrench, remove the 6 stud bolts.

47. REMOVE STRAIGHT PIN

48. REMOVE END PLATE STRAIGHT PIN

49. REMOVE TIGHT PLUG

INSPECTION

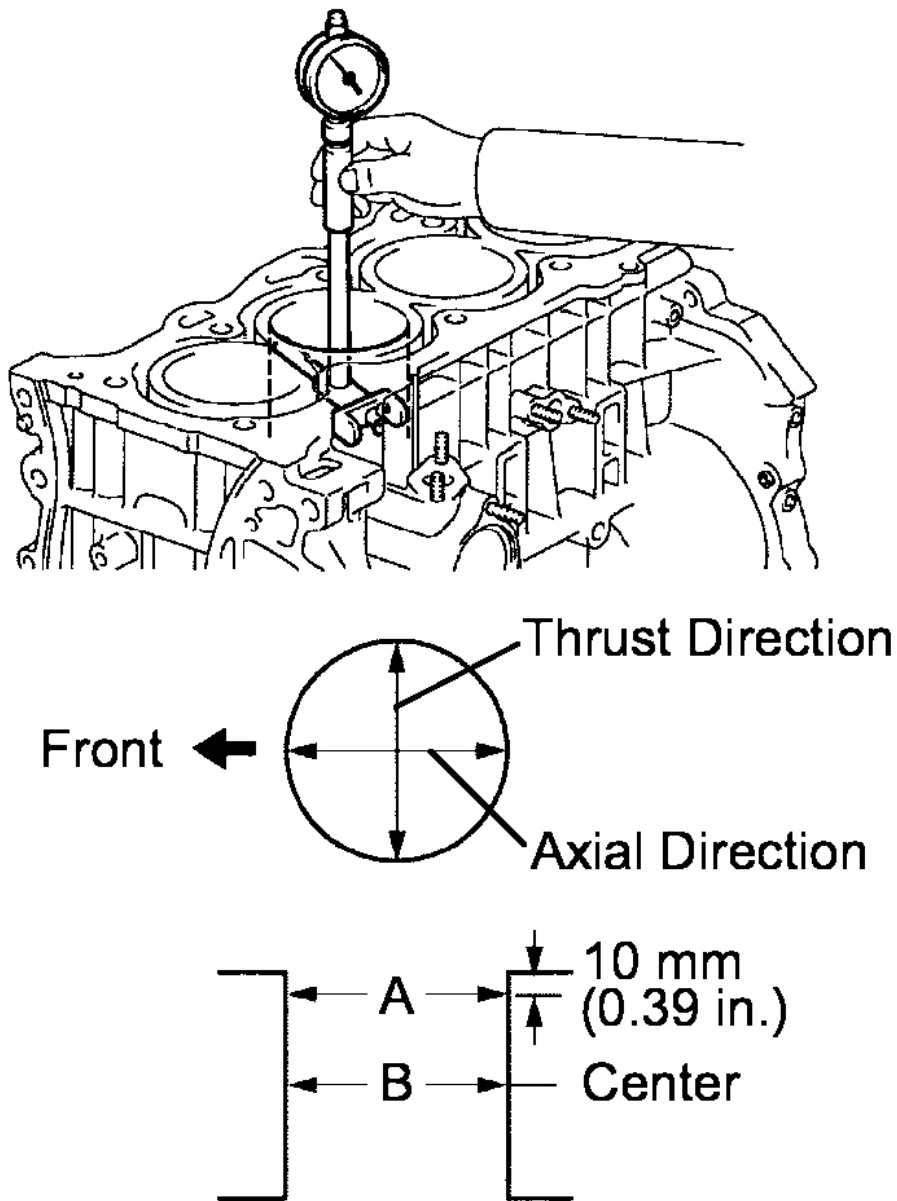
1. INSPECT CYLINDER BLOCK FOR FLATNESS (See INSPECTION)

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.
- b. Calculate the average of the thrust diameter and axial diameter at the "A" position in the illustration.
- c. Calculate the average of thrust diameter and axial diameter at the "B" position in the illustration.

Standard diameter: 75.000 to 75.013 mm (2.9528 to 2.9533 in.)

If the value obtained in the step above is not within the range of the standard diameter, replace the cylinder block.



P

A094566E02

Fig. 268: Checking Cylinder Bore Diameter
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT PISTON WITH PIN

- Using a micrometer, measure the piston diameter at right angles to the piston pin center line, and at a position 27 mm (1.06 in.) from the top of the piston head.

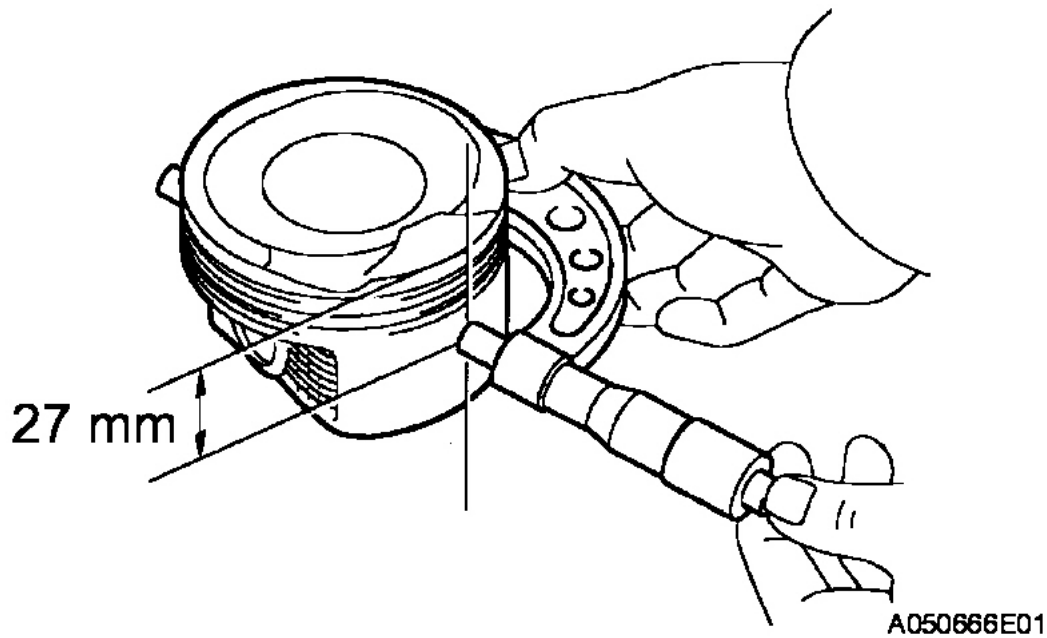


Fig. 269: Checking Piston Diameter

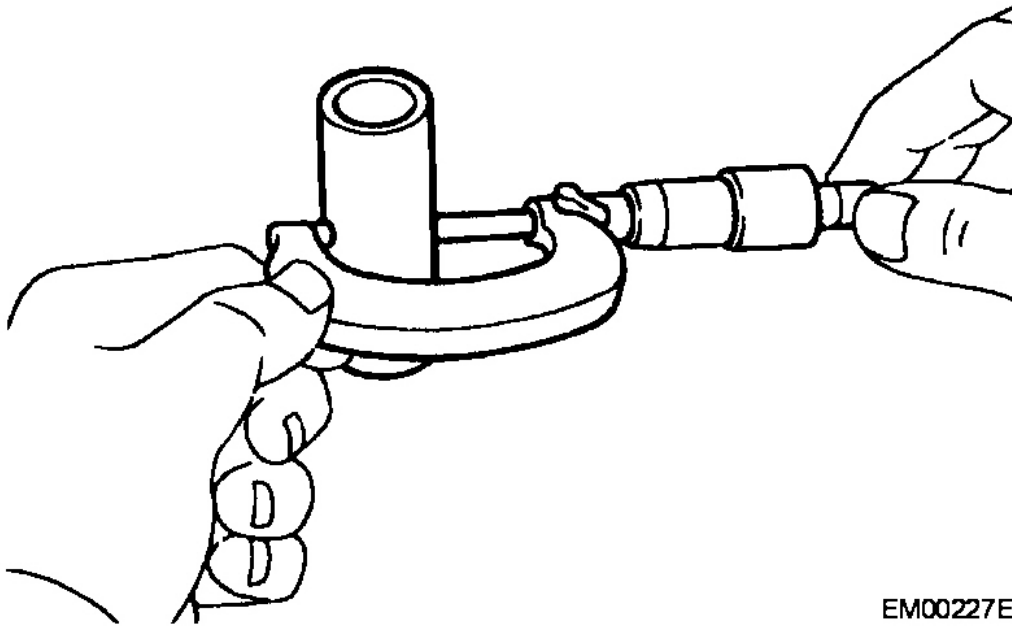
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard piston diameter: 74.945 to 74.955 mm (2.9506 to 2.9510 in.)

- b. Using a caliper gauge, measure the piston pin hole diameter of the piston.

Standard piston pin hole diameter: 18.013 to 18.016 mm (0.7092 to 0.7093 in.) at 20°C (68°F)

- c. Using a micrometer, measure the piston pin diameter.



EM00227E01

Fig. 270: Checking Piston Pin Diameter

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

Standard piston pin diameter: 18.001 to 18.004 mm (0.7087 to 0.7088 in.)

- d. Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance: 0.009 to 0.015 mm (0.0004 to 0.0006 in.)**Maximum oil clearance: 0.050 mm (0.0020 in.)**

If the clearance is greater than the maximum, replace the bush. If necessary, replace both the piston and piston pin together.

4. INSPECT PISTON CLEARANCE

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance: 0.055 to 0.078 mm (0.0022 to 0.0031 in.)**Maximum oil clearance: 0.08 mm (0.0032 in.)**

If the oil clearance is greater than the maximum, replace all 4 pistons. If necessary, replace the cylinder block.

5. INSPECT CONNECTING ROD

- a. Using a caliper gauge, measure the internal diameter of the connecting rod.

Standard connecting rod inside diameter: 17.965 to 17.985 mm (0.7073 to 0.7081 in.)

If the diameter is greater than the maximum, replace the connecting rod.

- b. Using a rod aligner and feeler gauge, check the connecting rod alignment.
 1. Check for misalignment.

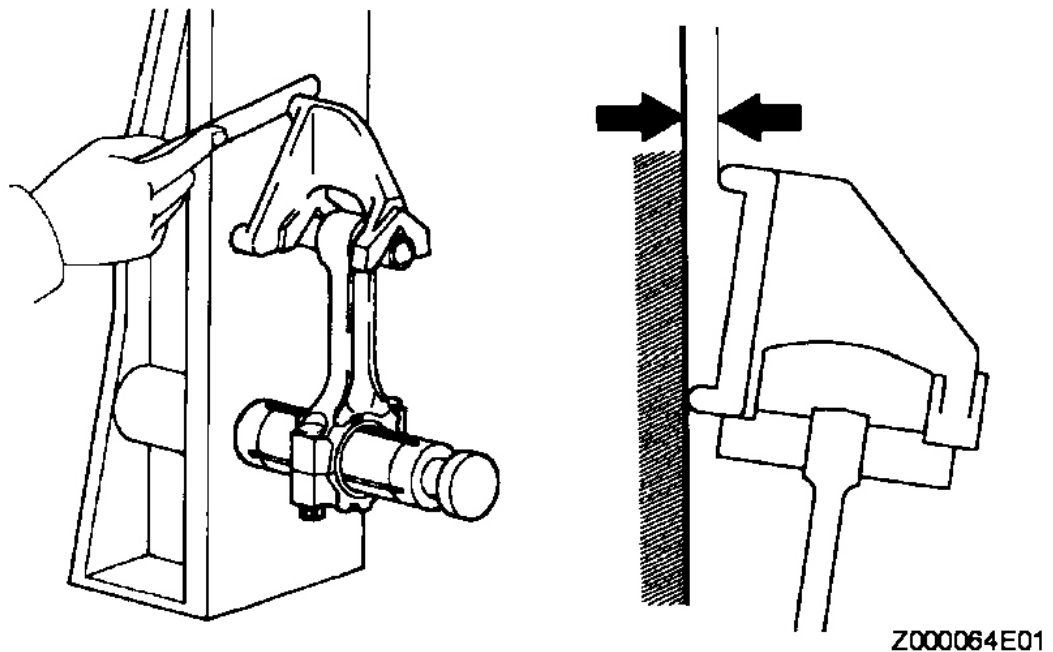
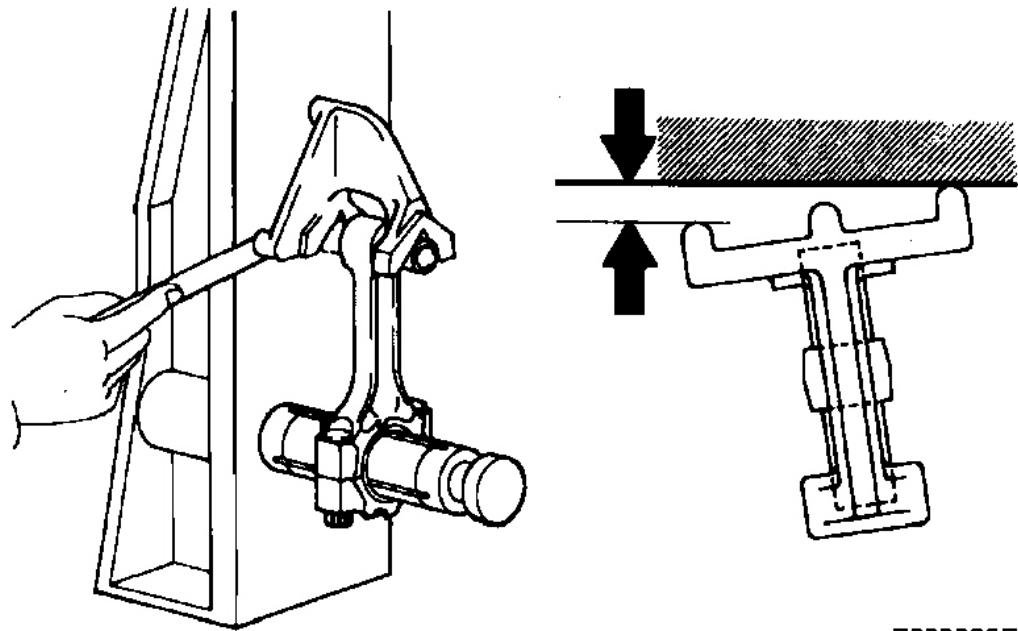


Fig. 271: Inspecting Connecting Rod For Misalignment
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 assembly.

2. Check for twist.



Z000065E01

Fig. 272: Inspecting Connecting Rod For Twist
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum twist: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod assembly.

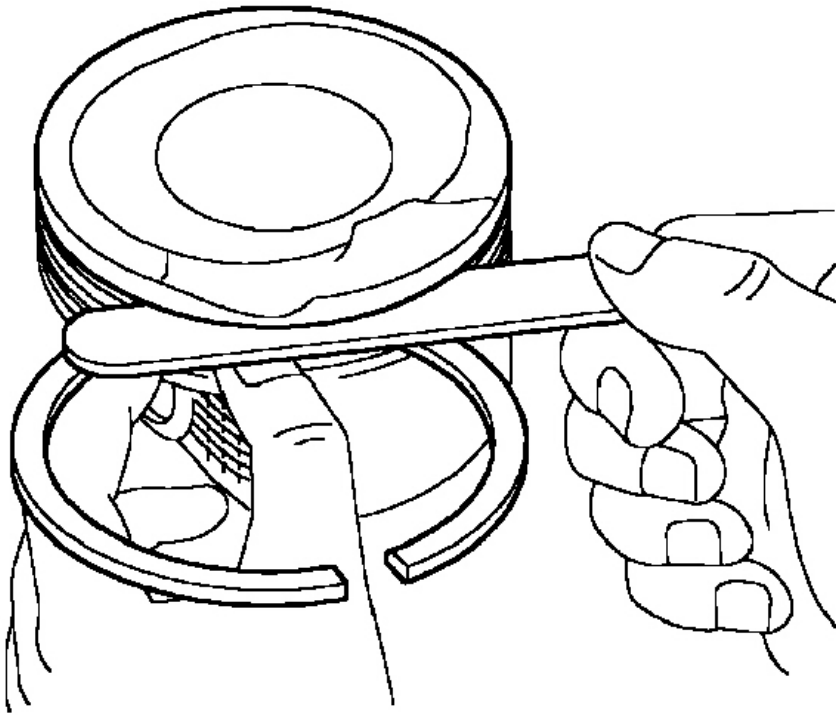
6. INSPECT RING GROOVE CLEARANCE

- Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

Standard ring groove clearance

RING GROOVE CLEARANCE SPECIFICATION

Item	Specified Condition
No. 1 ring	0.02 to 0.04 mm (0.0008 to 0.0016 in.)
No. 2 ring	0.01 to 0.03 mm (0.0004 to 0.0012 in.)
Oil ring	0.01 to 0.03 mm (0.0004 to 0.0012 in.)



A001171E02

Fig. 273: Checking Clearance Between New Piston Ring And Wall Of Ring Groove
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the clearance is not as specified, replace the piston.

7. 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.

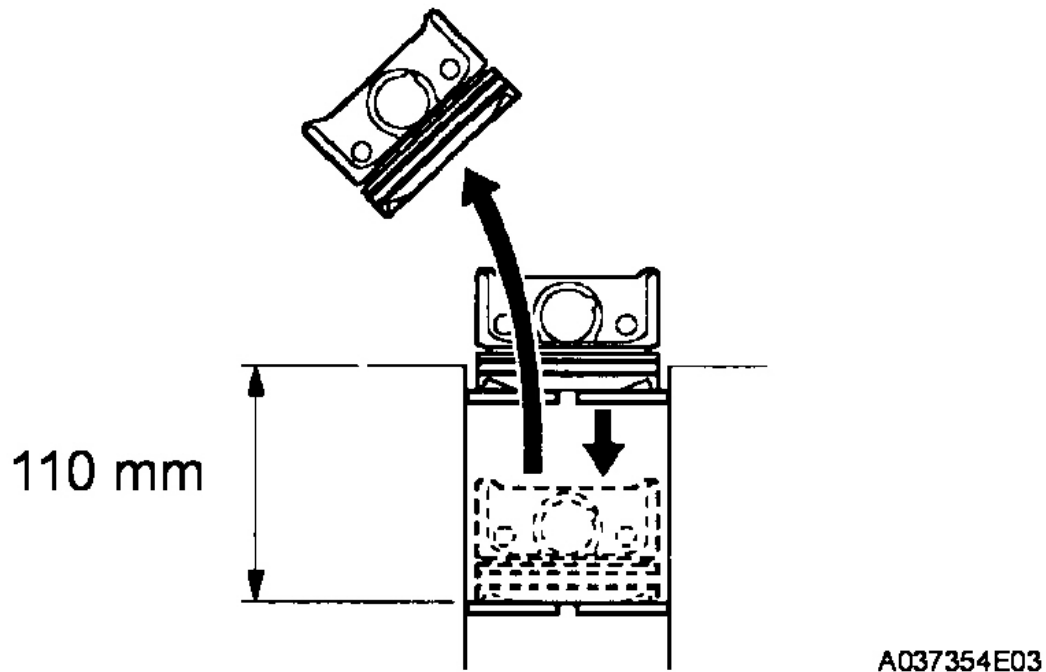


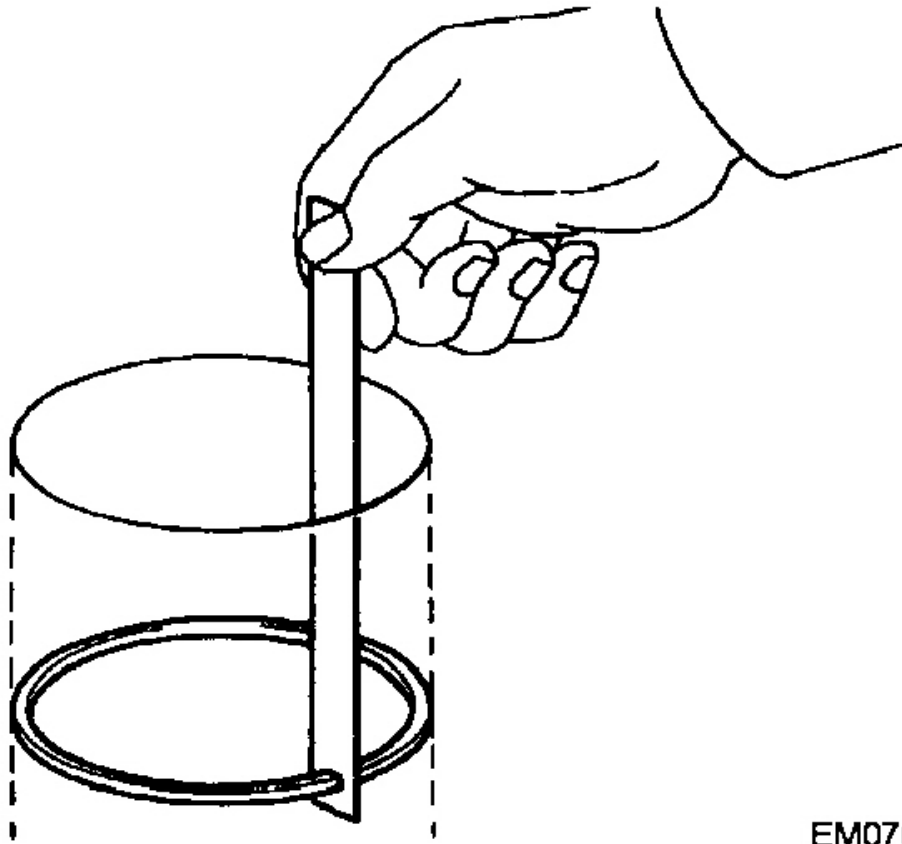
Fig. 274: Pushing Piston Ring
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a feeler gauge, measure the end gap.

Standard end gap

RING END GAP SPECIFICATION

Item	Standard	Maximum
No. 1 ring	0.25 to 0.35 mm (0.0098 to 0.0138 in.)	0.91 mm (0.0358 in.)
No. 2 ring	0.35 to 0.50 mm (0.0138 to 0.0197 in.)	1.06 mm (0.0417 in.)
Oil ring	0.10 to 0.35 mm (0.0039 to 0.0138 in.)	0.82 mm (0.0323 in.)



EM07639E01

Fig. 275: Checking Ring End Gap

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

If the end gap is greater than the maximum, replace the piston ring and oil ring.

8. INSPECT CONNECTING ROD BOLT

- a. Using a vernier caliper, measure the tension portion diameter of the bolt.

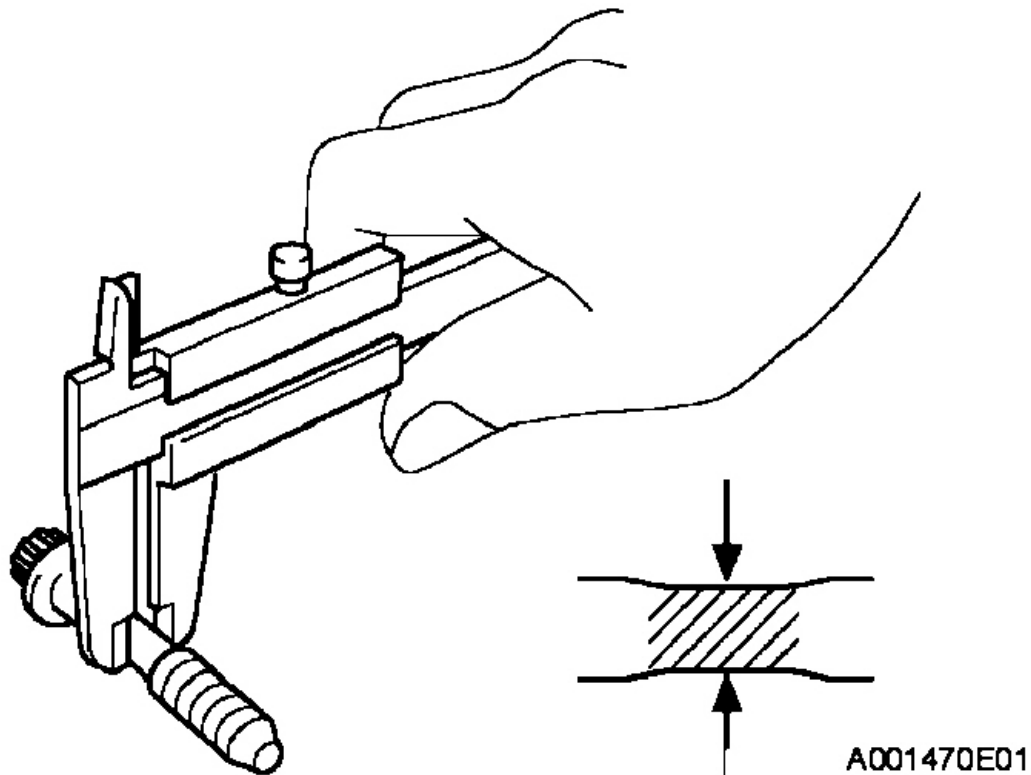


Fig. 276: Checking Tension Portion Diameter Of Connecting Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter: 6.6 to 6.7 mm (0.260 to 0.264 in.)

Minimum diameter: 6.4 mm (0.252 in.)

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

9. INSPECT CRANKSHAFT

- a. Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

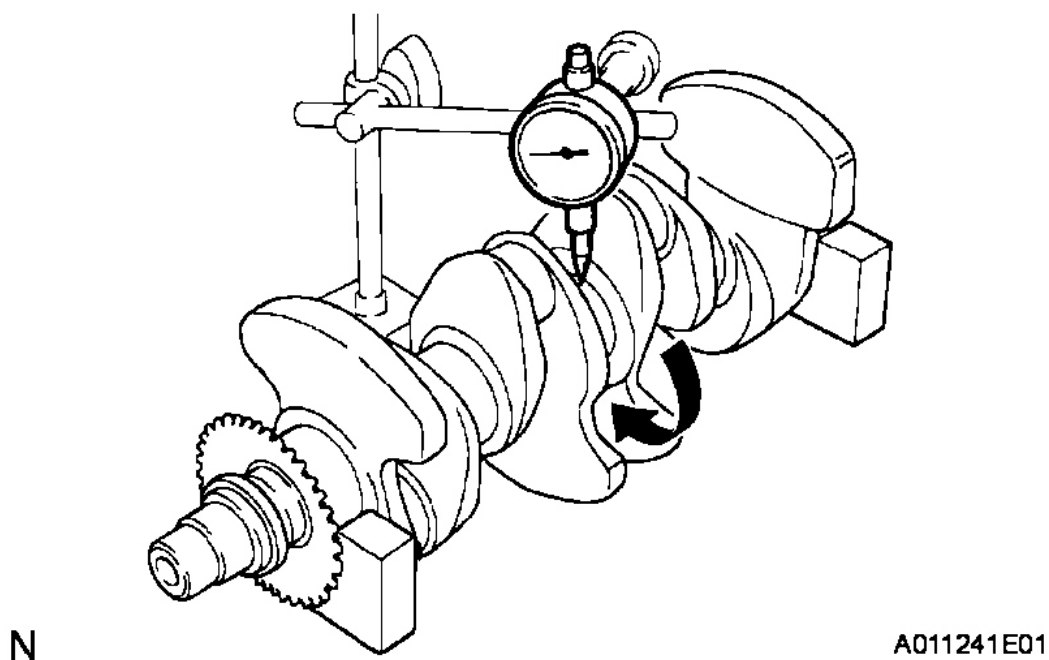
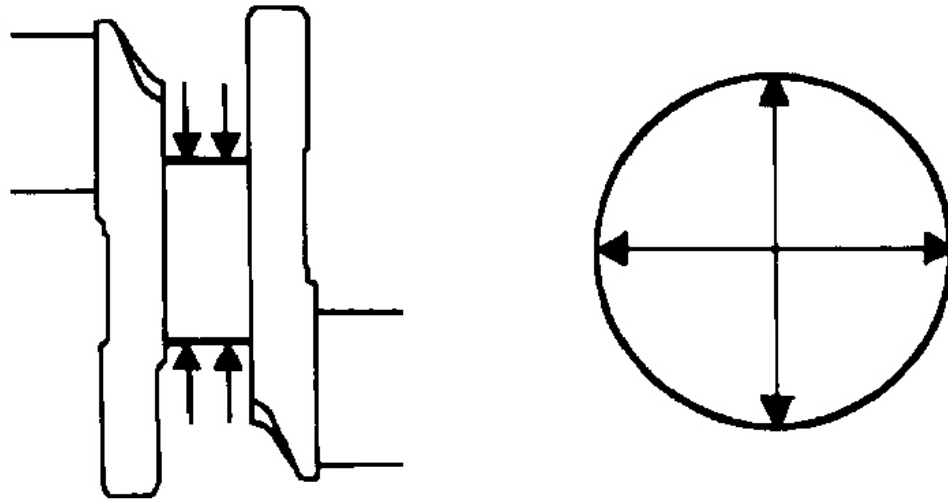


Fig. 277: Checking Crankshaft Circle Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Maximum circle runout: 0.03 mm (0.0012 in.)

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

- b. Inspect the diameter.
 1. Using a micrometer, measure the diameter of each main journal as illustrated.



A037157E01

Fig. 278: Identifying Main Journal

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

Standard diameter: 45.988 to 46.000 mm (1.8106 to 1.8110 in.)

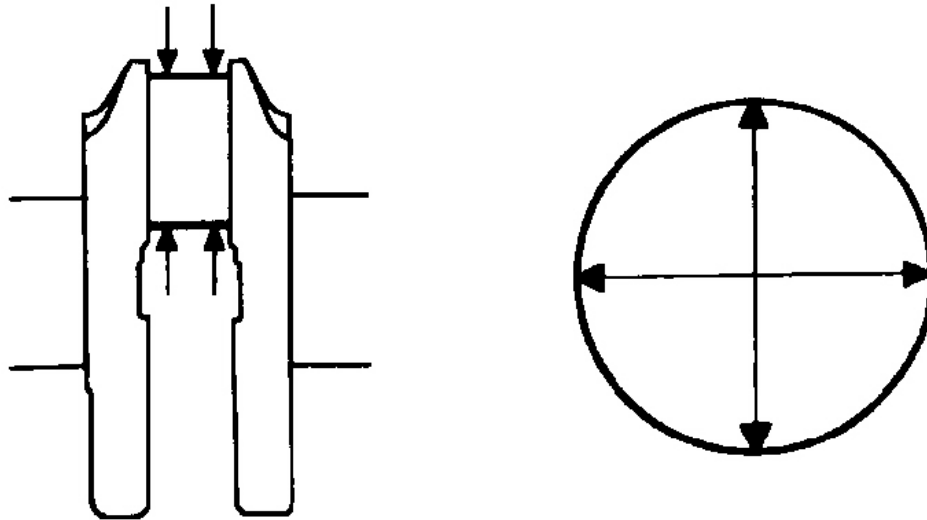
If the diameter is not as specified, replace the crankshaft.

2. Calculate the taper and distortion of the main journal.

Maximum taper and distortion: 0.02 mm (0.0008 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

3. Using a micrometer, measure the diameter of each crank pin as illustrated.



ZF06928E01

Fig. 279: Identifying Main Journal

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

Standard diameter: 39.992 to 40.000 mm (1.5745 to 1.5748 in.)

If the diameter is not as specified, replace the crankshaft.

4. Calculate the taper and distortion of the crank in.

Maximum taper and distortion: 0.02 mm (0.0008 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

- c. Wrap the chain around the timing sprocket as shown in the illustration.
- d. Using a vernier caliper, measure the timing sprocket diameter with the chain wrapped.

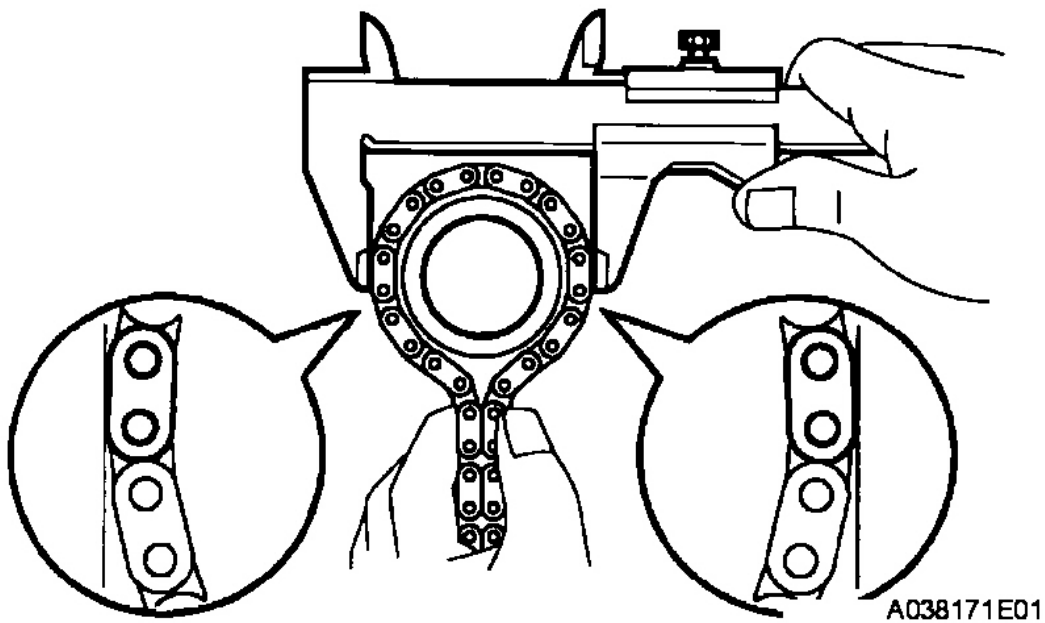


Fig. 280: Checking Timing Sprocket Diameter

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

Standard sprocket diameter (w/chain): 51.72 mm (2.0362 in.)

Minimum sprocket diameter (w/chain): 50.5 mm (1.988 in.)

NOTE: When measuring the diameter, the vernier caliper must be in contact with the chain roller.

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

10. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- a. Using a vernier caliper, measure the tension portion diameter of the bolt.

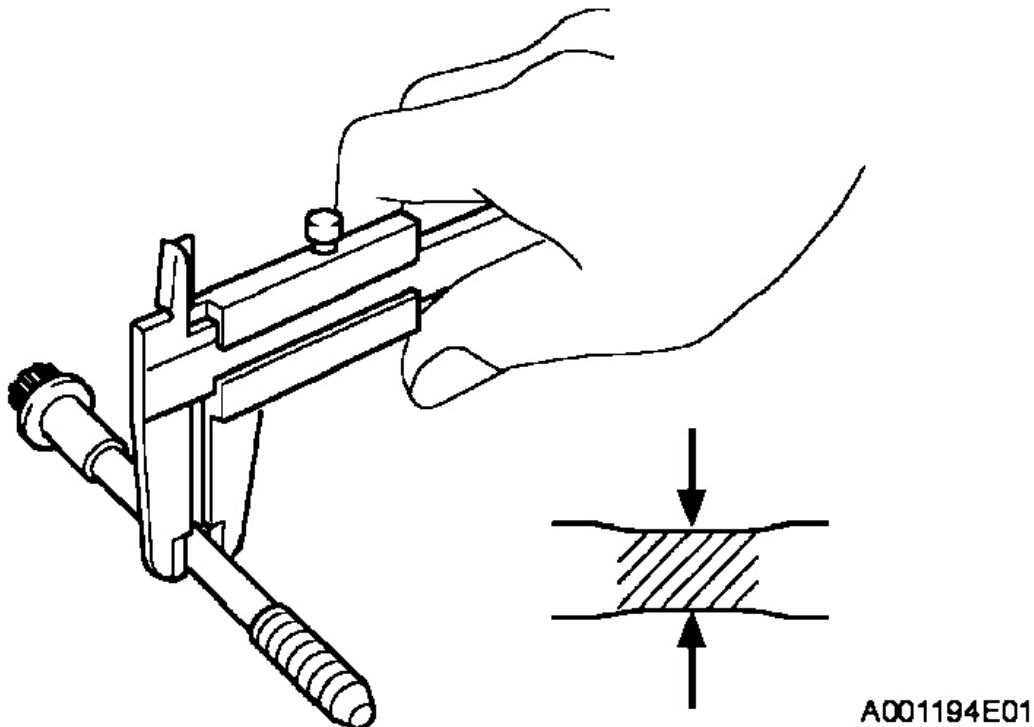


Fig. 281: Checking Tension Portion Diameter Of Crankshaft Bearing Cap Set Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard diameter: 7.3 to 7.5 mm (0.287 to 0.295 in.)

Minimum diameter: 7.2 mm (0.283 in.)

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

REPLACEMENT

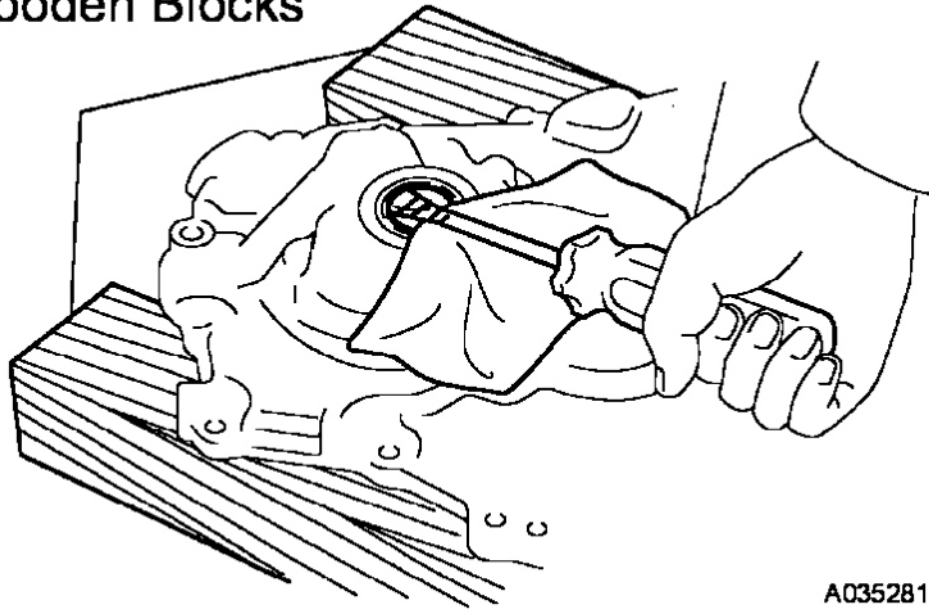
1. REPLACE OIL PUMP SEAL

HINT:

There are 2 ways to remove the oil seal: remove it with the timing chain cover removed, or remove it with the timing chain cover installed.

- a. If the timing chain cover is removed:
 1. Using a screwdriver, remove the oil seal.

Wooden Blocks



A035281E02

Fig. 282: Removing Oil Pump Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Tape the screwdriver tip before use.

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

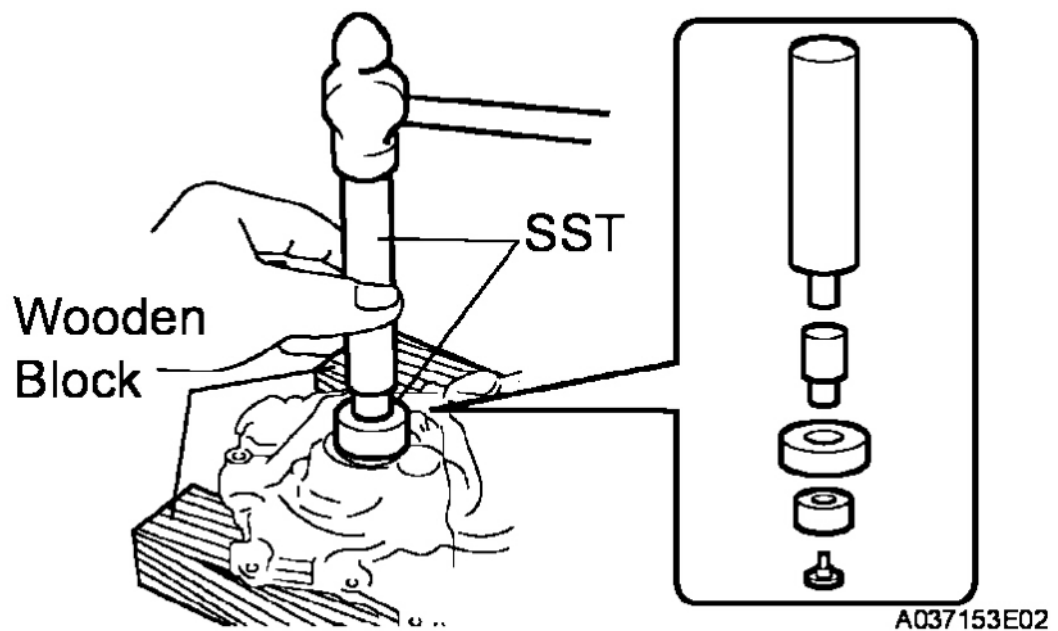


Fig. 283: Installing Oil Pump Seal

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

SST 09950-60010 (09951-00250, 09951- 00380, 09952-06010), 09950-70010 (09951-07100)

NOTE:

- Be careful not to tap the oil seal at an angle.
- Keep the lip free of foreign objects.

3. Apply multi-purpose grease to the lip of the oil seal.
- b. If the timing chain cover is installed:
 1. Using a knife, cut off the lip of the oil seal.
 2. Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

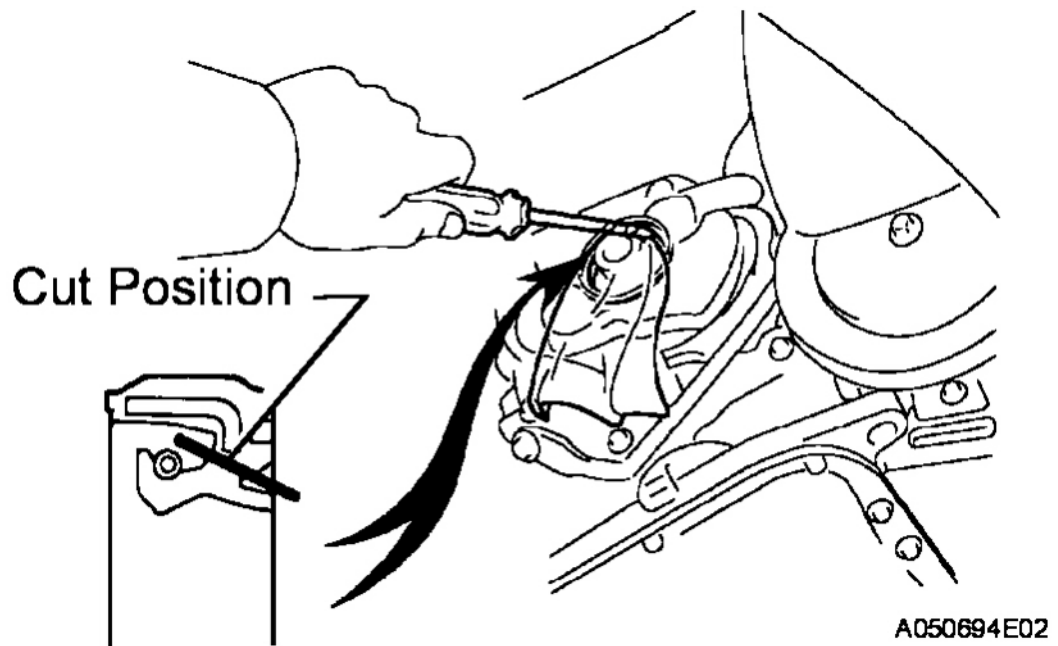


Fig. 284: Removing Oil Seal

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

NOTE: After removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400-grit sandpaper.

3. Apply multi-purpose grease to the lip of a new oil seal.

NOTE: Keep the lip free of foreign objects.

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

SST 09223-22010

NOTE:

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

2. REPLACE ENGINE REAR OIL SEAL

- a. Using a knife, cut off the lip of the oil seal.
- b. Using a screwdriver with the tip wrapped in tape, pry out the oil seal.

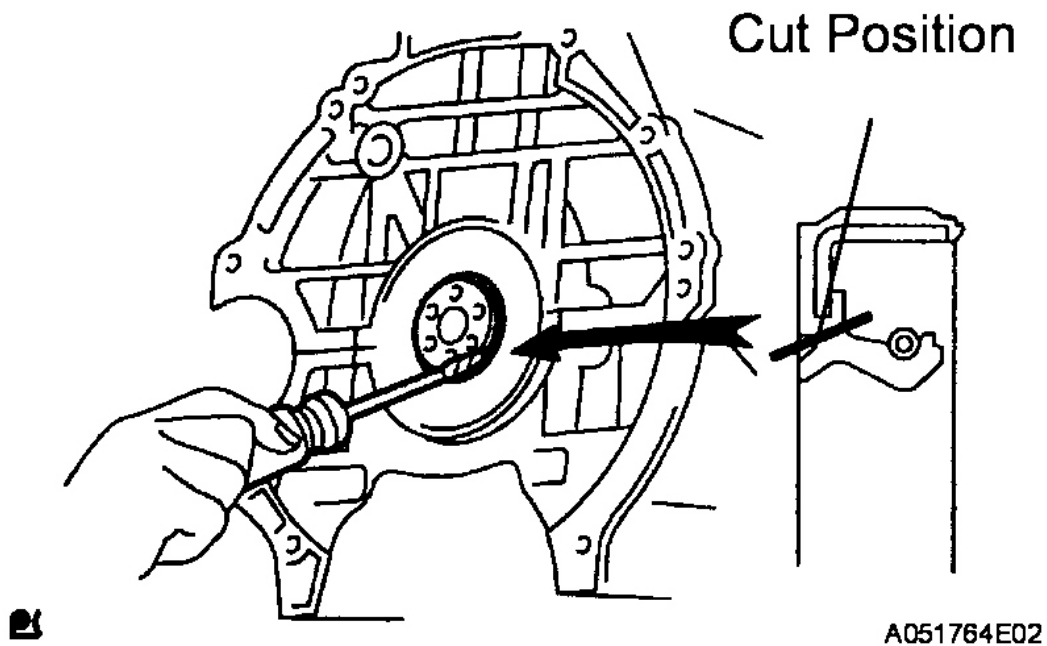


Fig. 285: Removing Engine Rear Oil Seal

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

NOTE: After removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400-grit sandpaper.

- c. Apply multi-purpose grease to the lip of a new oil seal.

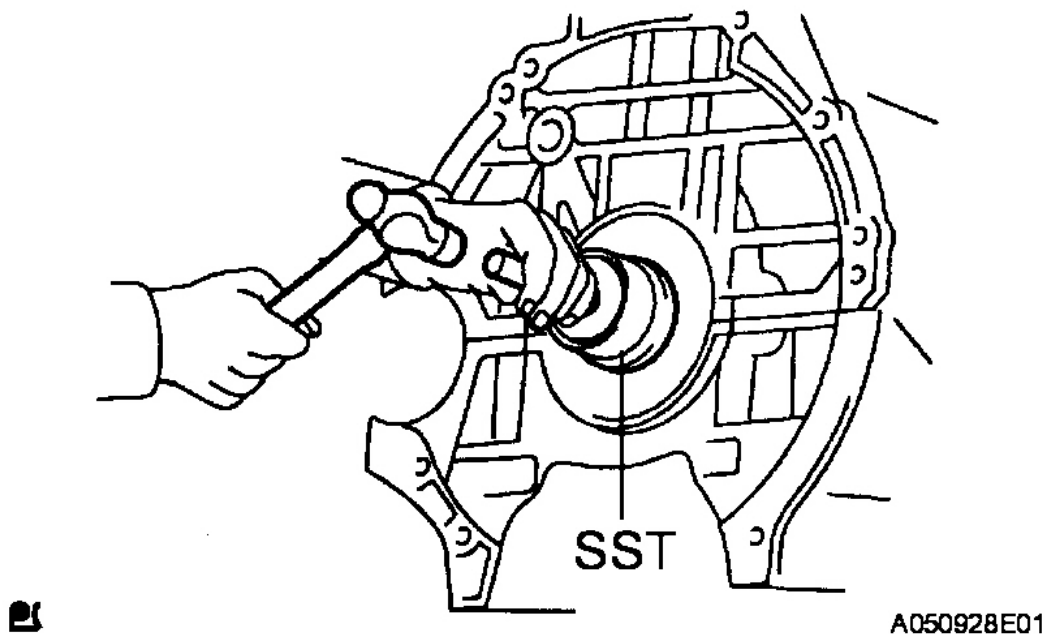


Fig. 286: Installing Engine Rear Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Keep the lip free of foreign materials.

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

SST 09223-56010

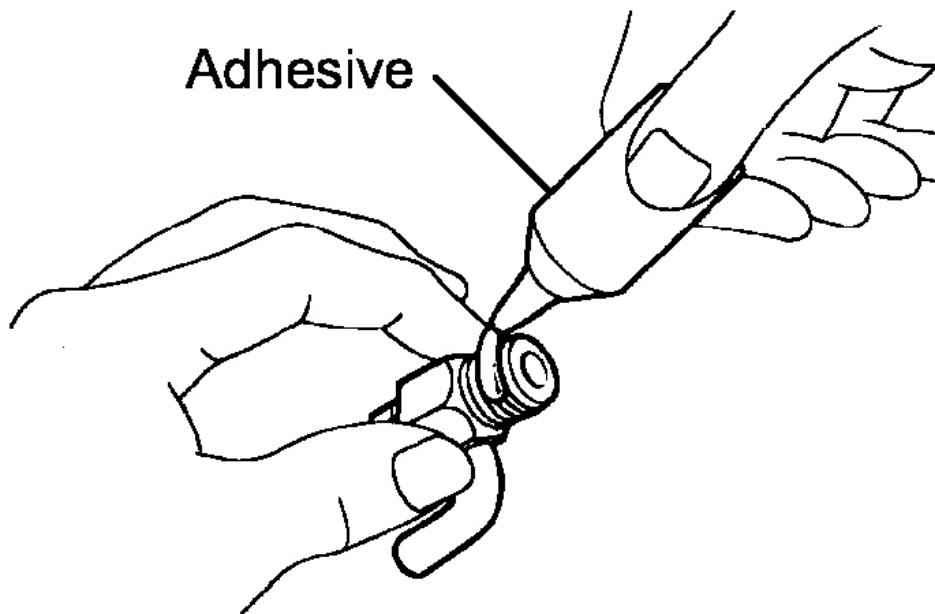
NOTE:

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

REASSEMBLY

1. INSTALL CYLINDER BLOCK WATER DRAIN COCK

- a. Apply adhesive to 2 or 3 threads of the drain union, and install it within 3 minutes.



A054747E04

Fig. 287: Applying Adhesive To Threads Of Drain Union
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00100

- b. After applying the specified torque, rotate the drain union clockwise until its drain port faces downward.

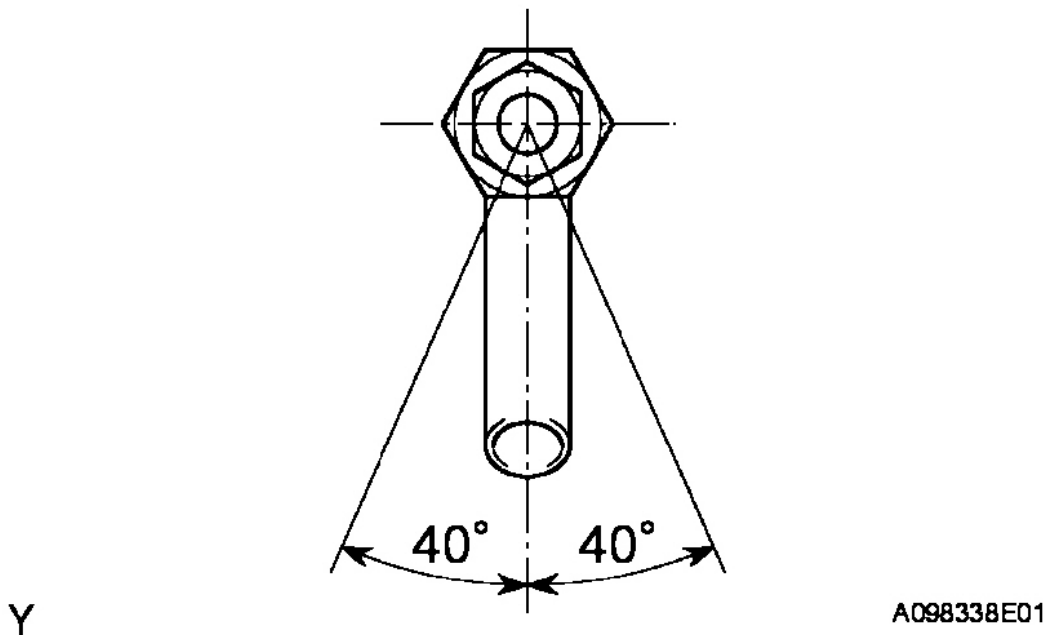


Fig. 288: Rotating Drain Union Clockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- Install the water drain cock within 3 minutes of applying adhesive.
- Do not add coolant for at least 1 hour after installation.
- Do not rotate the drain union more than 360° in this step, and never loosen it after setting the union correctly.
- The pipe of the drain cock should be within 40° of the vertical position.

2. INSTALL TIGHT PLUG

- a. Apply adhesive to new tight plugs.

Adhesive: Part No. 08826-00070, THREE BOND 1324 or equivalent.

- b. Using SST, tap in the tight plugs as shown in the illustration.

SST 09950-60010 (09951-00180), 09950-70010 (09951-07100)

Standard depth: 0.2 to 1.2 mm (0.008 to 0.047 in.)

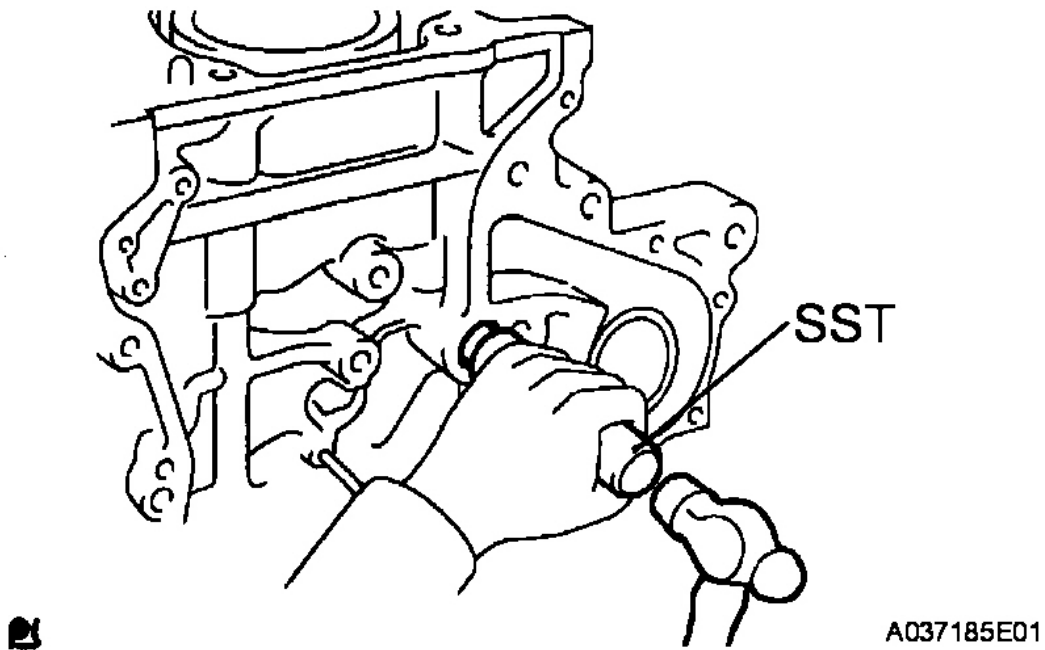


Fig. 289: Installing Tight Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

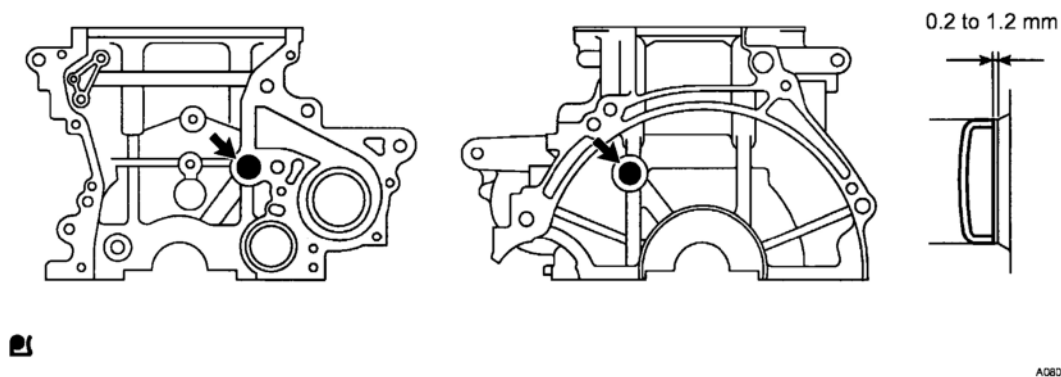


Fig. 290: Identifying Tight Plug Depth
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL CYLINDER HEAD SET STRAIGHT PIN

- a. Using a plastic-faced hammer, tap in the straight pin.

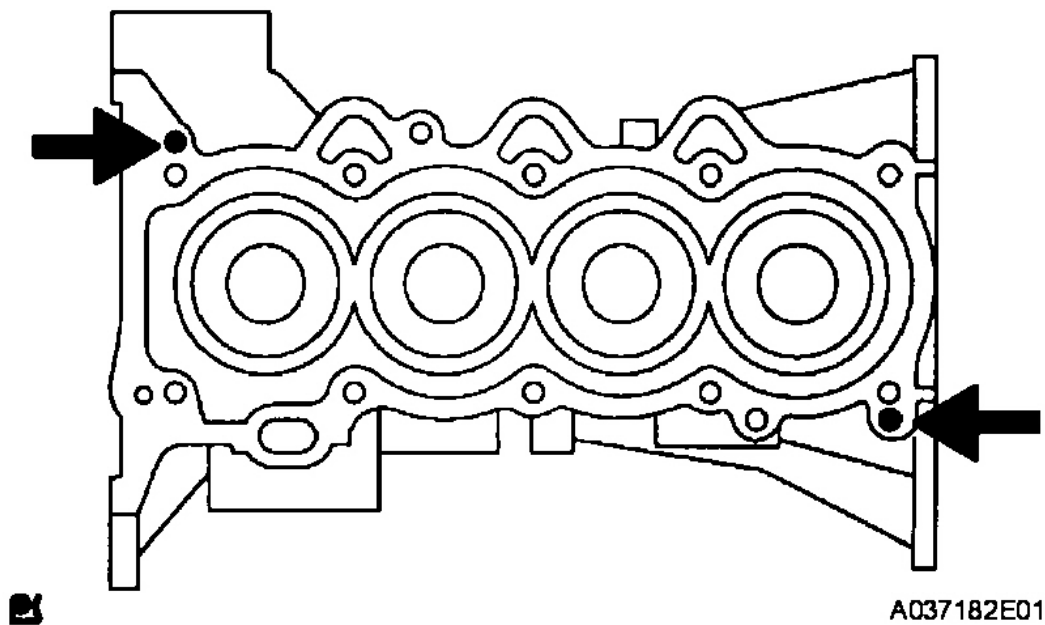


Fig. 291: Installing Cylinder Head Set Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard protrusion: 8.5 to 9.5 mm (0.335 to 0.374 in.)

4. INSTALL STRAIGHT PIN

- a. Using a plastic-faced hammer, tap in the straight pin.

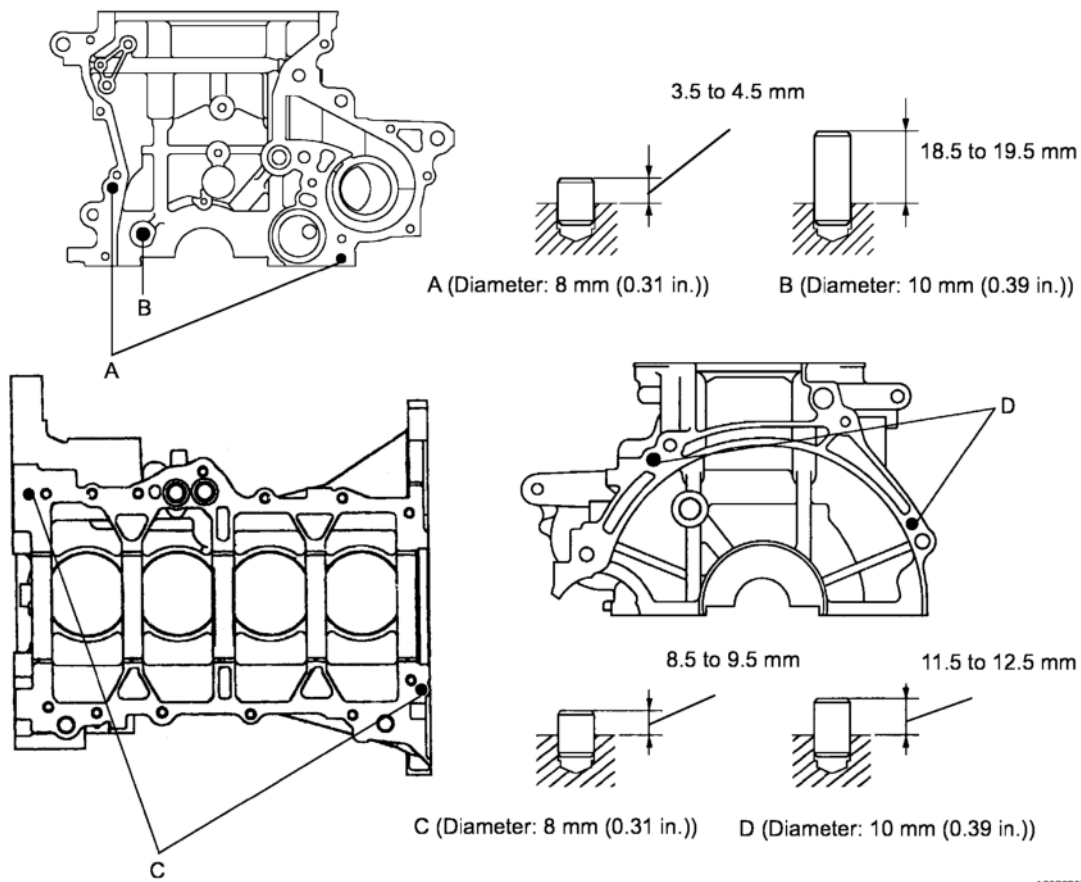
Standard protrusion:

3.5 to 4.5 mm (0.138 to 0.177 in.) for pin A

18.5 to 19.5 mm (0.728 to 0.768 in.) for pin B

8.5 to 9.5 mm (0.335 to 0.374 in.) for pin C

11.5 to 12.5 mm (0.453 to 0.492 in.) for pin D



A082928E03

Fig. 292: Identifying Cylinder Head Set Straight Pin Diameters
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL STUD BOLT

- Using an E5 "Torx" socket, install the 6 stud bolts.

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

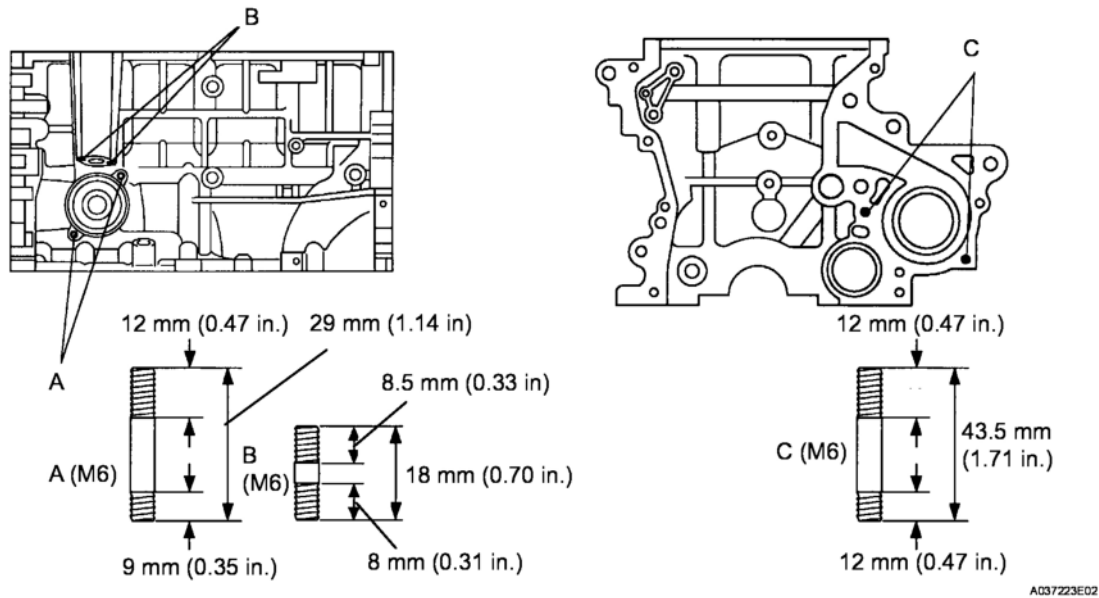


Fig. 293: Identifying Stud Bolt Diameters
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL CRANKSHAFT

- Install the upper bearing with the oil groove onto the cylinder block, and the lower bearing onto the bearing cap.

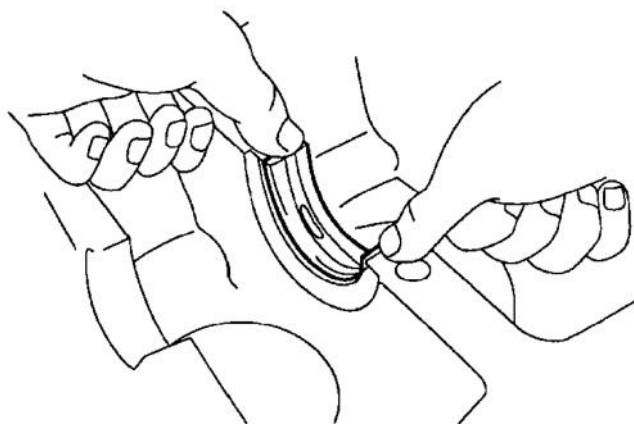
NOTE: Do not apply engine oil to the contact surface of the cylinder block or the backside of the bearing.

HINT:

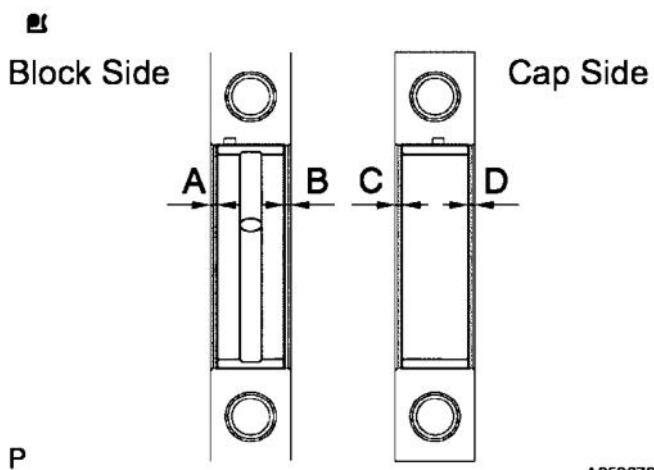
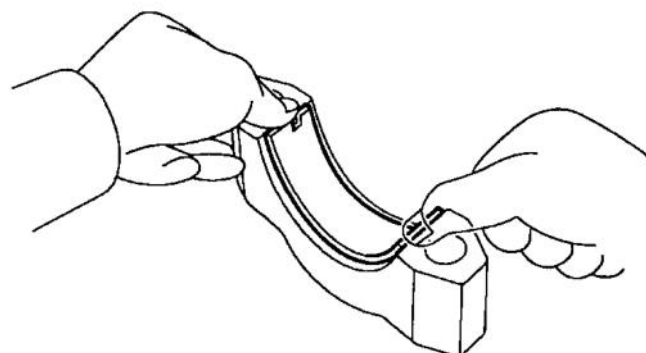
Mass production parts do not have claws as marks.

If reusing the mass production parts, measure the clearance of both sides with the bearing in the center of the bearing cap.

Upper Bearing



Lower Bearing



A050870E01

Fig. 294: Installing Upper Bearing Onto Cylinder Block And Lower Bearing Onto Bearing Cap

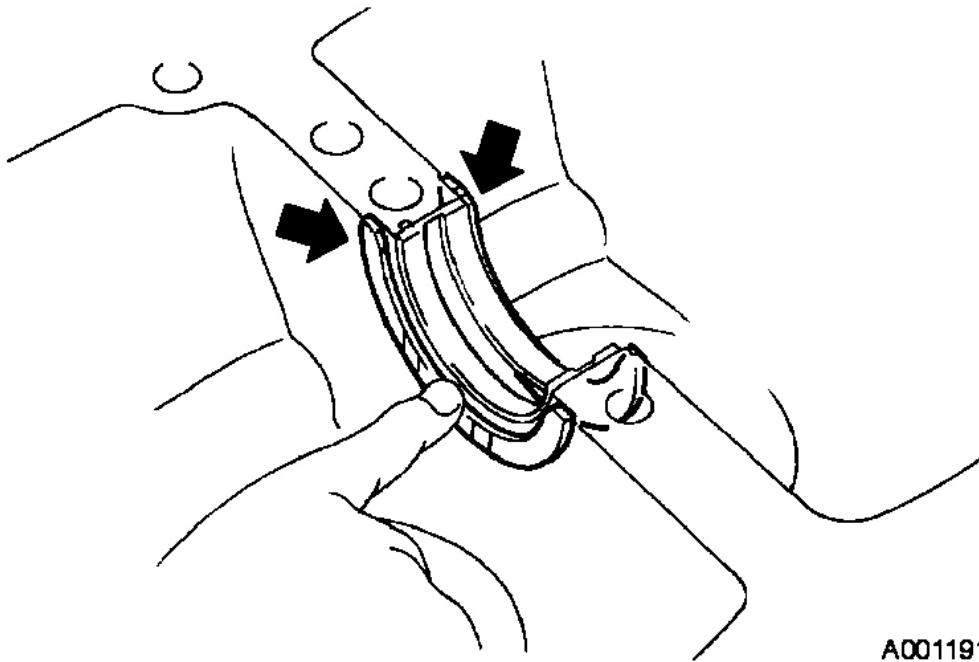
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard clearance:

A - B = within 0.8 mm (0.032 in.)

C - D = within 0.4 mm (0.016 in.)

- b. Install the 2 thrust washers onto the No. 3 journal position of the cylinder block with the oil grooves facing outward.
- c. Apply engine oil to the upper bearing and install the crankshaft onto the cylinder block.



A001191E02

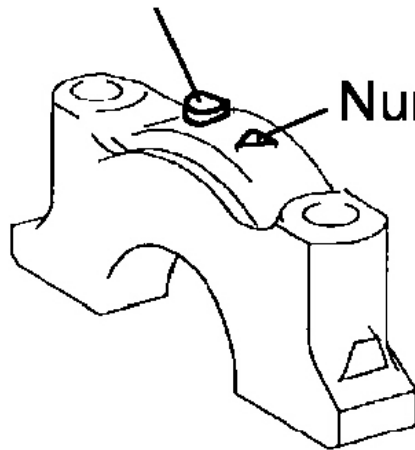
Fig. 295: Installing Thrust Washers

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

- d. Check the front marks and numbers and install the bearing caps onto the cylinder block.
- e. Apply a light coat of engine oil to the threads of the bearing cap bolts.

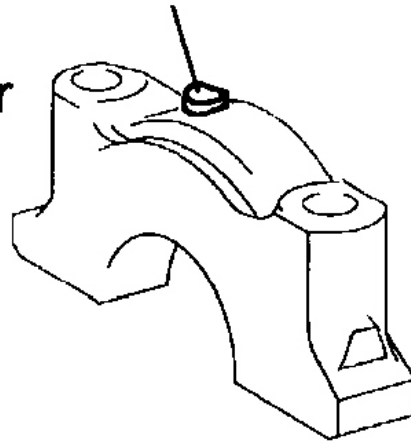
Front Mark

Front Mark and Number



Number

No. 3



No. 1, 2, 4, 5

A050917E02

Fig. 296: Identifying Front Marks And Numbers On Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Using SST, tighten the bolts in several steps by the specified torque in the sequence shown in the illustration.

SST 09011-38121

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf)

NOTE: Check that the crankshaft turns smoothly.

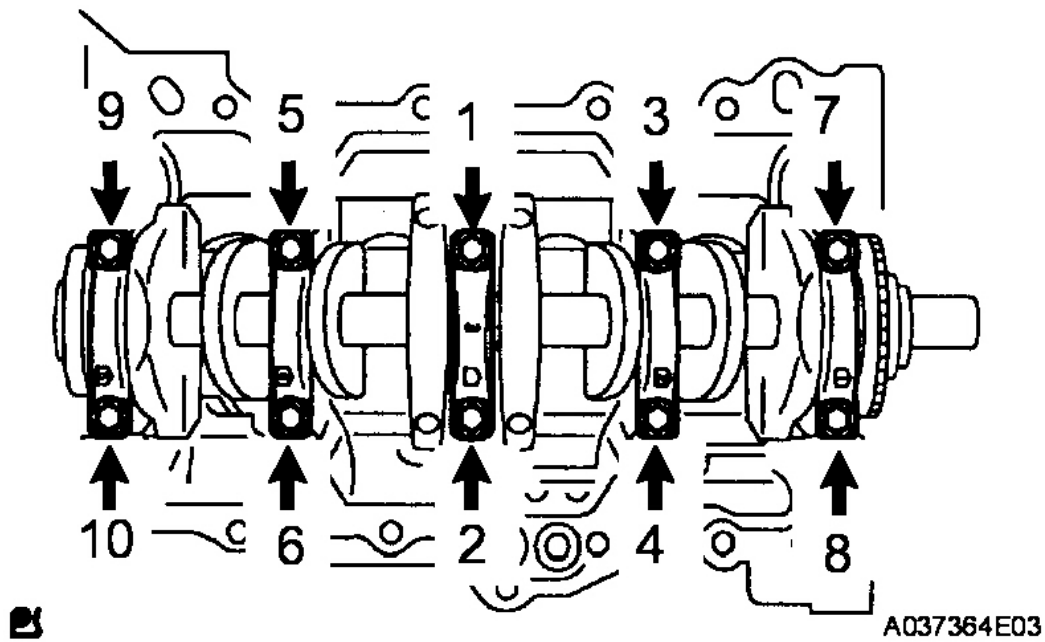
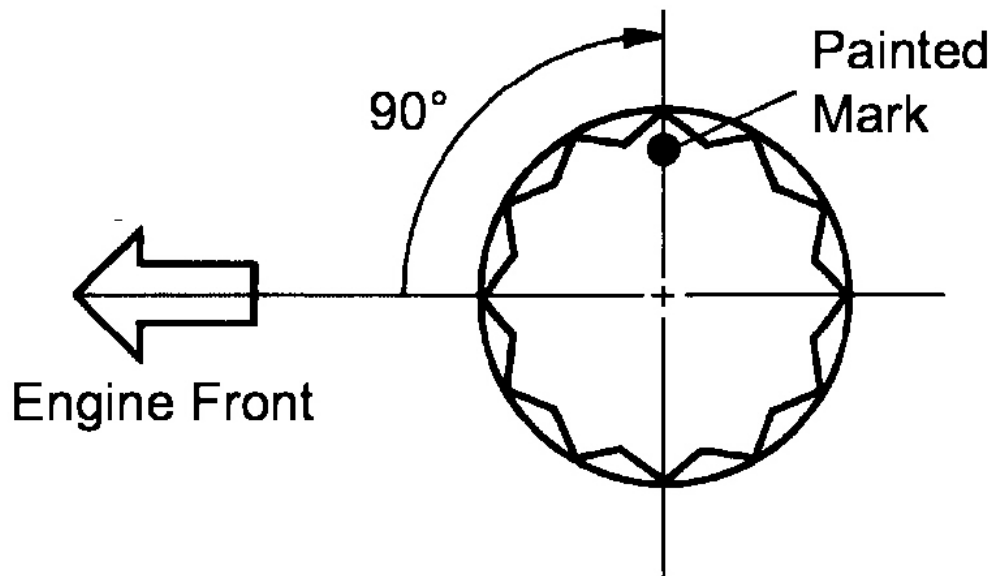


Fig. 297: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Mark the front of the bearing cap bolts with paint.
- h. Retighten the bearing cap bolts by 90° in the same sequence.
- i. Check that the painted mark is now at a 90° angle to the front.

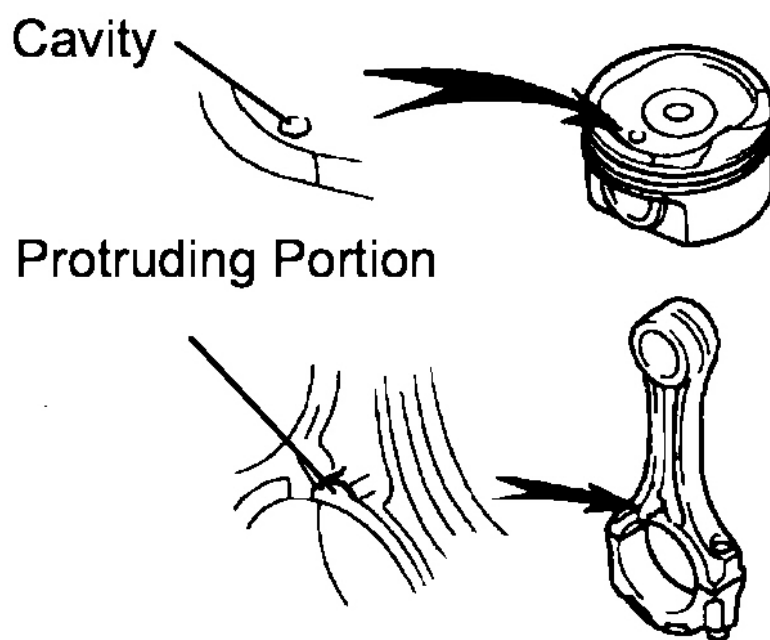


A050671E04

Fig. 298: Identifying Retightening Angle Of Bearing Cap Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL PISTON PIN

- a. Coat the inner surface of the connecting rod bore and piston pin with engine oil.
- b. Align the cavity of the piston with the protruding portion of the connecting rod.



A084120E02

Fig. 299: Aligning Cavity Of Piston With Protruding Portion Of Connecting Rod
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST, push in the piston pin.

SST 09221-25026 (09221-00021, 09221-00030, 09221-00190, 09221-00141, 09221-00150)

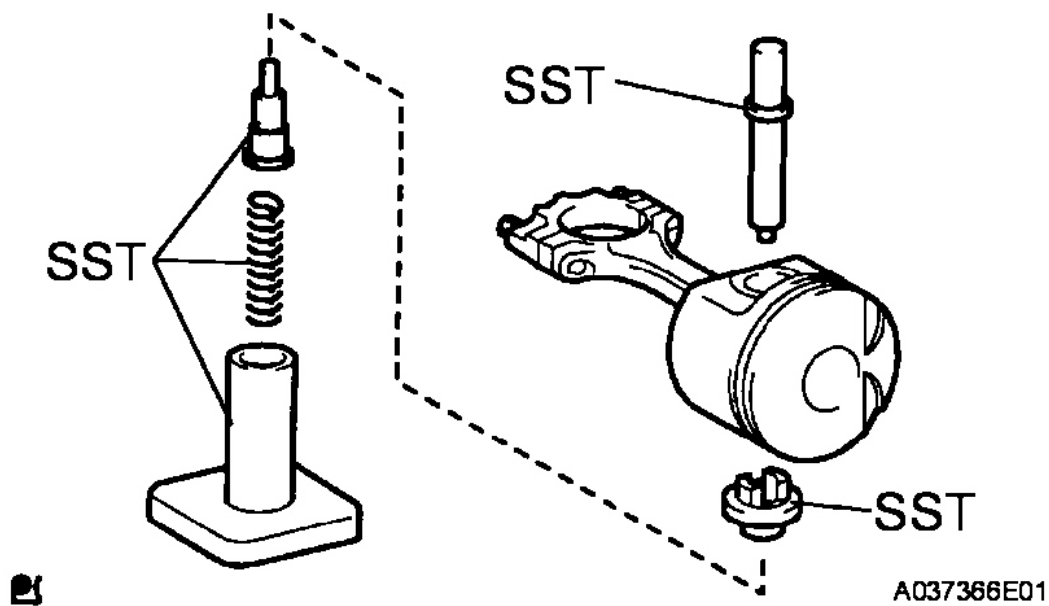


Fig. 300: Installing Piston Pin

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

NOTE: Keep the pistons, pins, rings, connecting rods and bearings in the correct order so that they can be returned to the original locations when reassembling.

8. INSTALL CONNECTING ROD BEARING

- a. Align the bearing claw with the grooves of the connecting rod and connecting rod cap.

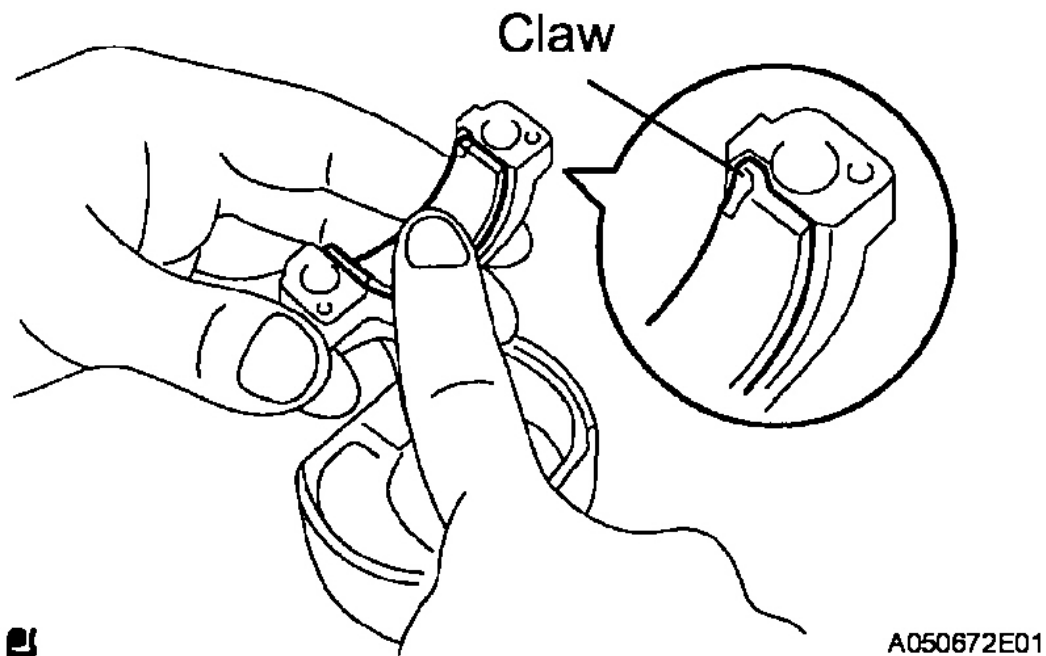


Fig. 301: Aligning Bearing Claw With Grooves Of Connecting Rod And Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Clean the backside of the bearing and the bearing surface of the connecting rod, and keep them free of oils.

9. INSTALL PISTON RING SET

HINT:

If reusing the piston rings, install them onto the matched pistons with the surfaces facing correctly.

- Install the oil ring expander and 2 side rails by hand.
- Using a piston ring expander, install the 2 compression rings.

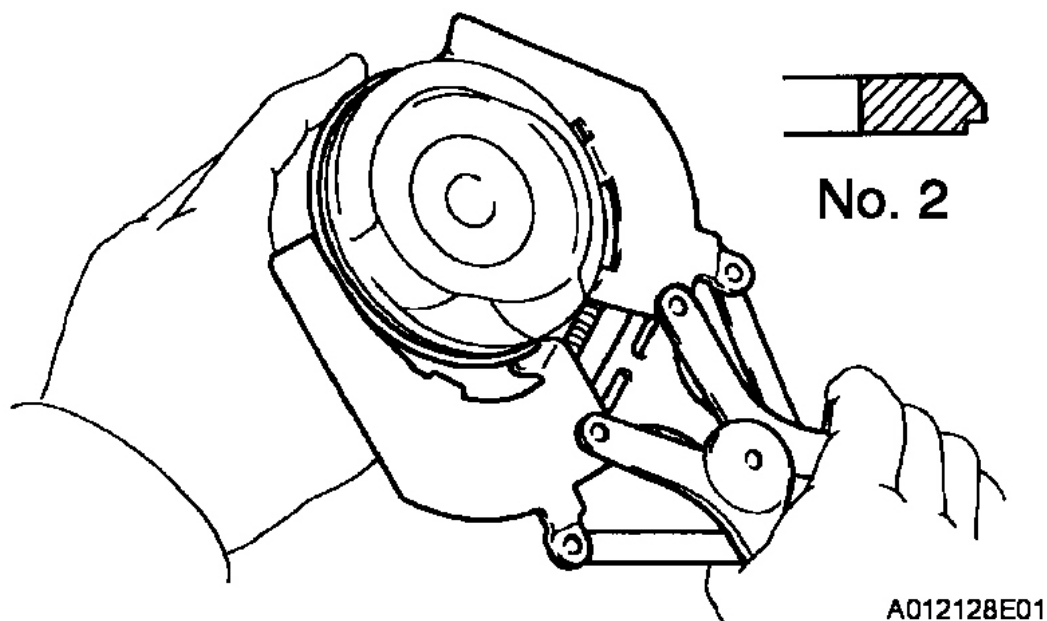


Fig. 302: Installing Piston Ring Set

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.

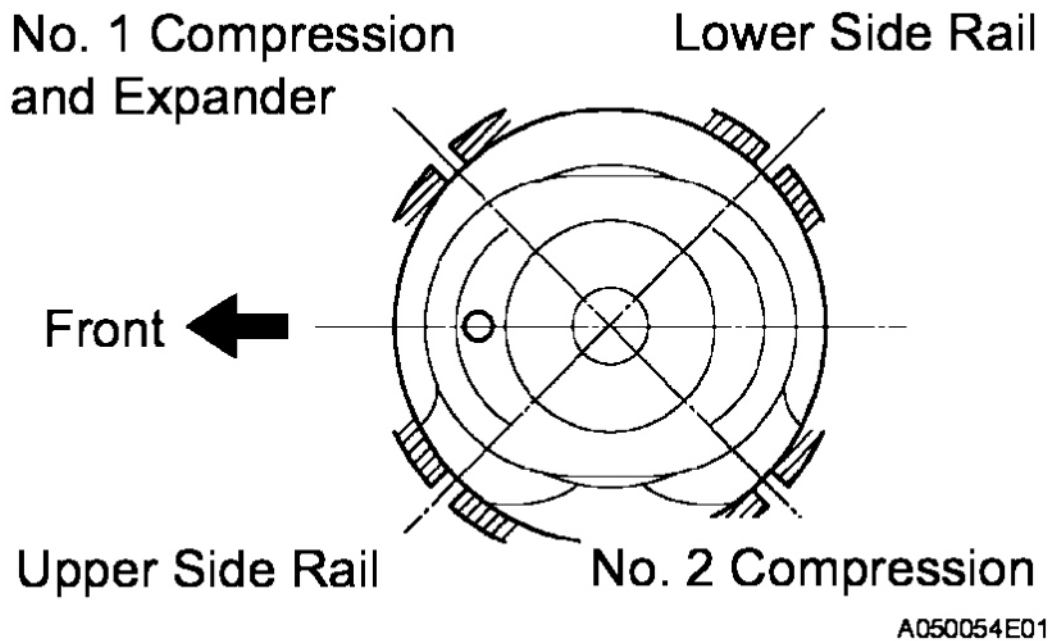


Fig. 303: Identifying Ring Ends

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

10. INSTALL PISTON WITH CONNECTING ROD

- Apply engine oil to the cylinder walls, pistons, and the surfaces of the connecting rod bearings.
- Check the position of the piston ring ends.
- Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark on the piston facing forward.

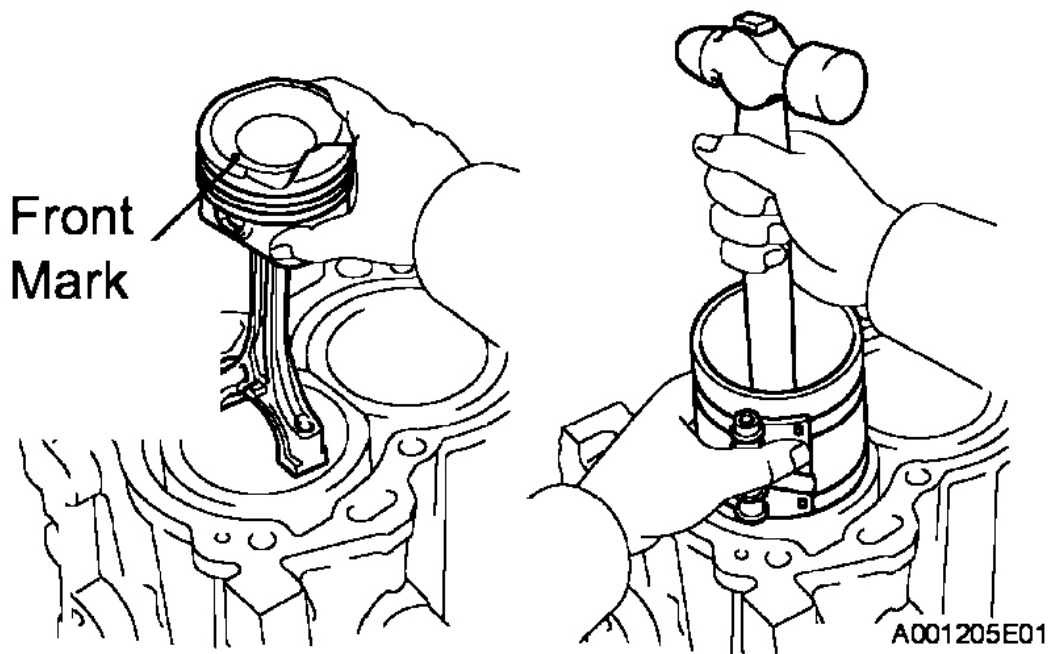


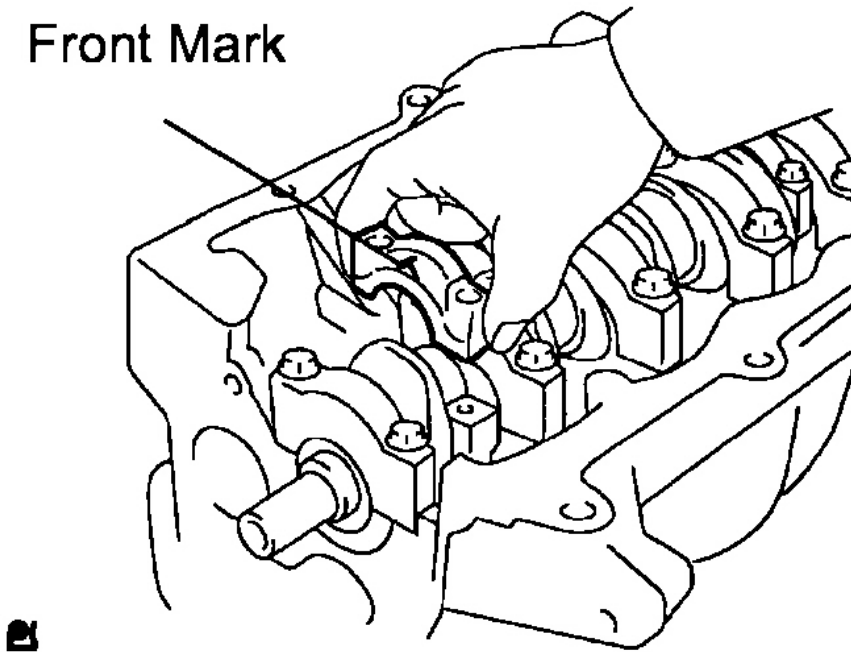
Fig. 304: Identifying Front Mark On Piston

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

NOTE:

- Clean the backside of the bearing and the bearing surface of the connecting rod cap, and keep them free of oils.
 - Match the numbered connecting rod cap with the correct connecting rod.
- d. Match the connecting rod and cap together in the correct combination. Then install the cap onto the connecting rod, making sure that the front mark on the cap is correctly oriented.
- e. Apply a light coat of engine oil to the threads of the connecting rod cap bolts.

Front Mark



A050673E01

Fig. 305: Identifying Front Mark On Connecting Rod Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Using SST, tighten the bolts in several steps by the specified torque.

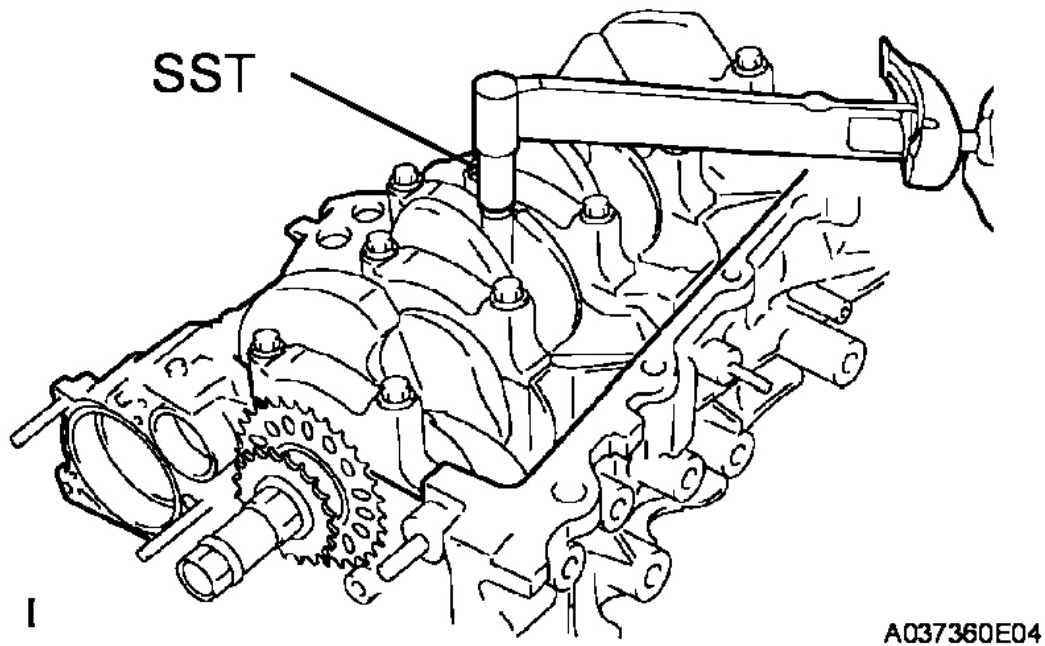
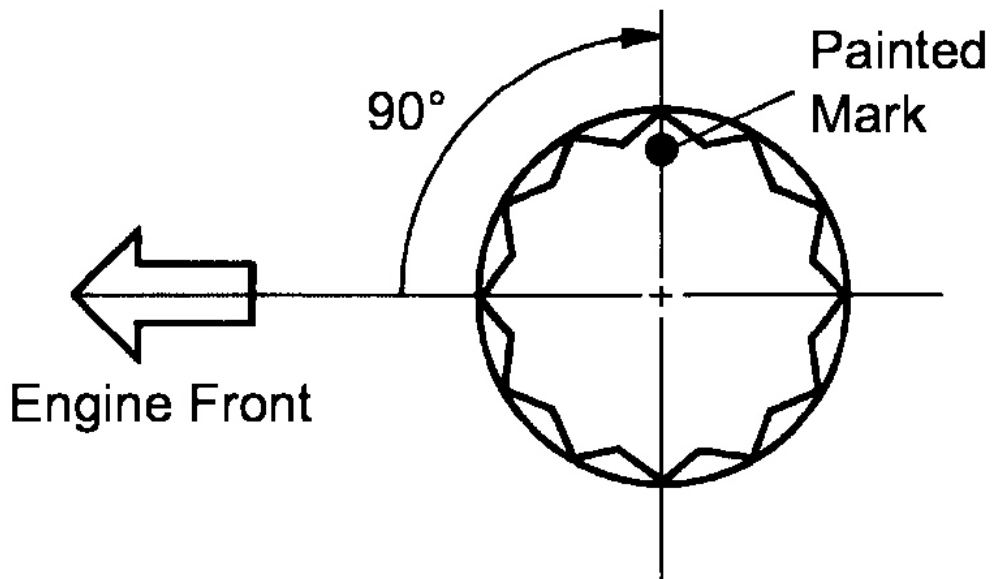


Fig. 306: Tightening Connecting Rod Cap Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09205-16010

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

- g. Mark the front of the connecting cap bolts with paint.
- h. Retighten the cap bolts by 90° as shown.
- i. Check that the crankshaft turns smoothly.

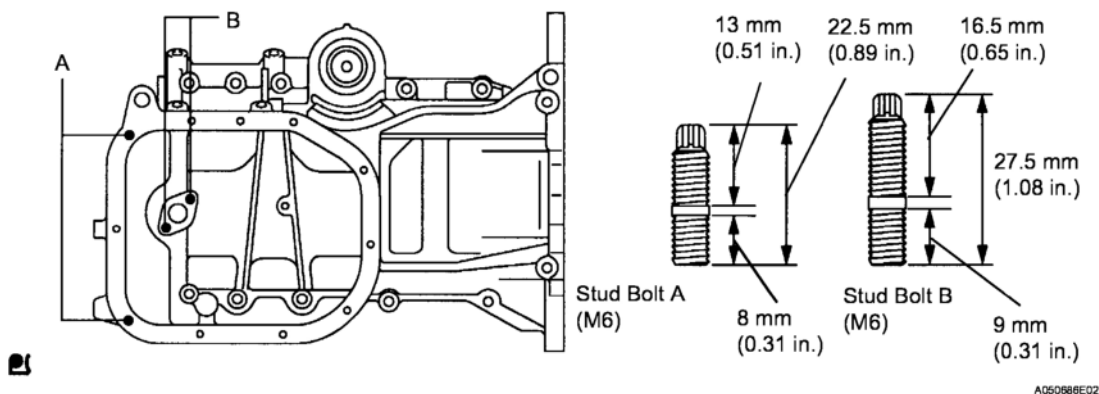


A050671E04

Fig. 307: Identifying Retightening Angle Of Connecting Rod Cap Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL STUD BOLT

- a. Using an E5 "Torx" socket, install the 4 stud bolts.

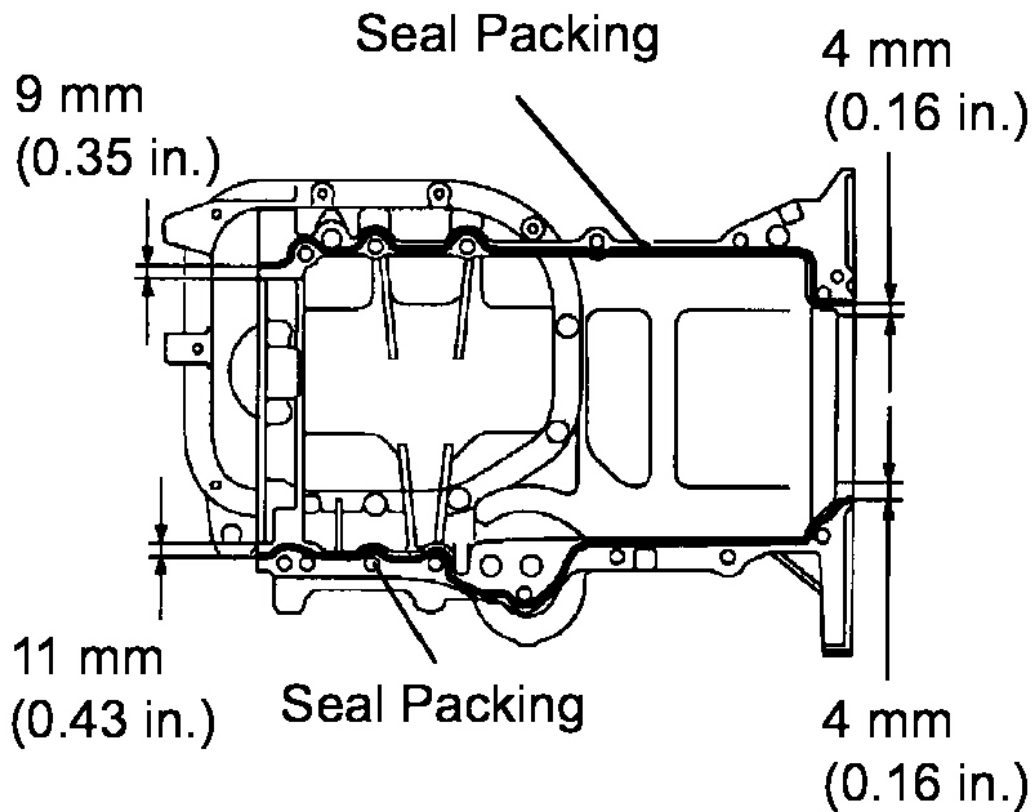


A050688E02

Fig. 308: Identifying Stud Bolt Dimension
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL OIL PAN

- a. Apply a continuous line of seal packing to the oil pan mating surface as shown in the illustration.



A120012E01

Fig. 309: Applying Continuous Line Of Seal Packing To Oil Pan Mating Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00080 or equivalent

Standard seal diameter: 2.0 mm to 3.0 mm (0.079 to 0.118 in.)

NOTE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes of applying seal packing.
- Do not expose the seal to engine oil for at least 2 hours after installation.

- b. Install 2 new O-rings onto the cylinder block.
- c. Using several steps, install and uniformly tighten the 13 bolts in the sequence shown in the illustration.



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

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf)

HINT:

Each bolt length is as follows:

49 mm (1.93 in.) for bolt A

88 mm (3.47 in.) for bolt B

144 mm (5.67 in.) for bolt C

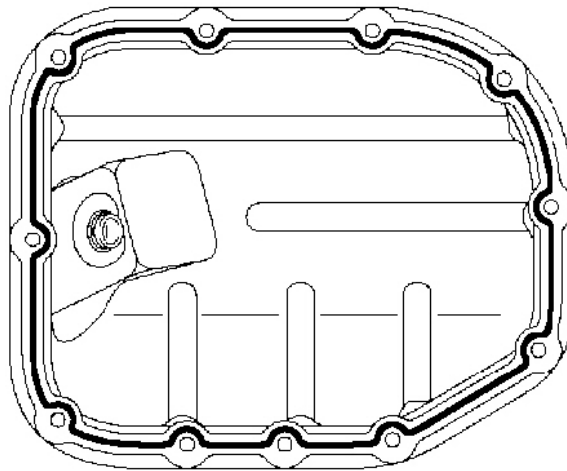
13. INSTALL OIL STRAINER

- a. Install a new gasket and the oil strainer with the 2 nuts and bolt.

Torque: 11 N*m (112 kgf*cm, 8.1 ft.*lbf)

14. INSTALL NO. 2 OIL PAN

- a. Apply a continuous line of seal packing to the oil pan mating surface as shown in the illustration.



N

Seal Diameter: 2.5 to 3.5 mm

A081876E03

Fig. 311: Applying Continuous Line Of Seal Packing To Oil Pan Mating Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00080 or equivalent

Standard seal diameter: 2.5 mm to 3.5 mm (0.098 to 0.14 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes of applying seal packing.**
- **Do not expose the seal to engine oil for at least 2 hours after installation.**
- **Do not start the engine within 2 hours of installation.**

- b. Install the No. 2 oil pan with the 9 bolts and 2 nuts.

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

- c. Install the drain plug with a new gasket.

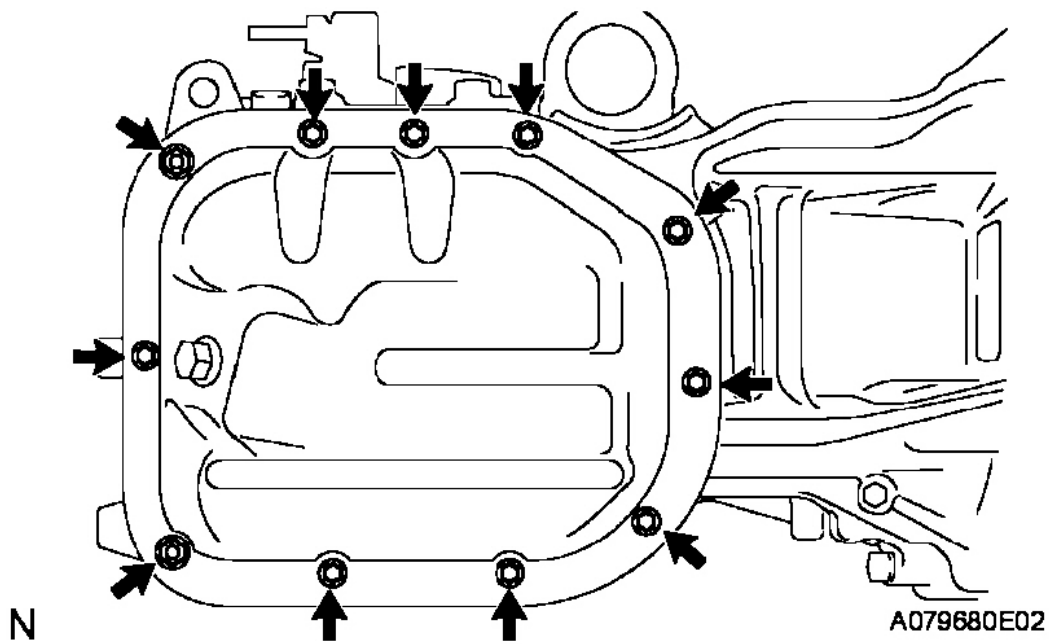


Fig. 312: Tightening Oil Pan Bolts

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

Torque: 37.5 N*m (382 kgf*cm, 28 ft.*lbf)

15. INSTALL OIL FILTER UNION

- a. Using a 12 mm hexagon wrench, install the oil filter union.

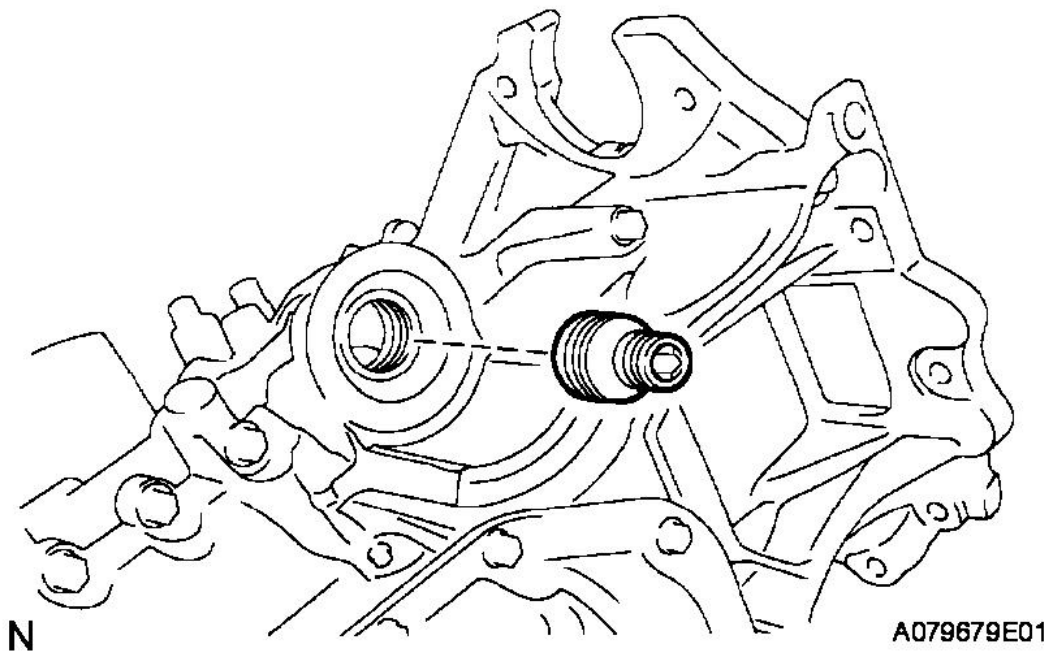


Fig. 313: Installing Oil Filter Union

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

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

16. INSTALL OIL FILTER

- a. Check and clean the oil filter installation surface.
- b. Apply clean engine oil to the gasket of the new oil filter.
- c. Lightly screw the oil filter into place, and tighten it until the gasket comes into contact with the seat.
- d. Using SST, tighten it an additional 3/4 turn.

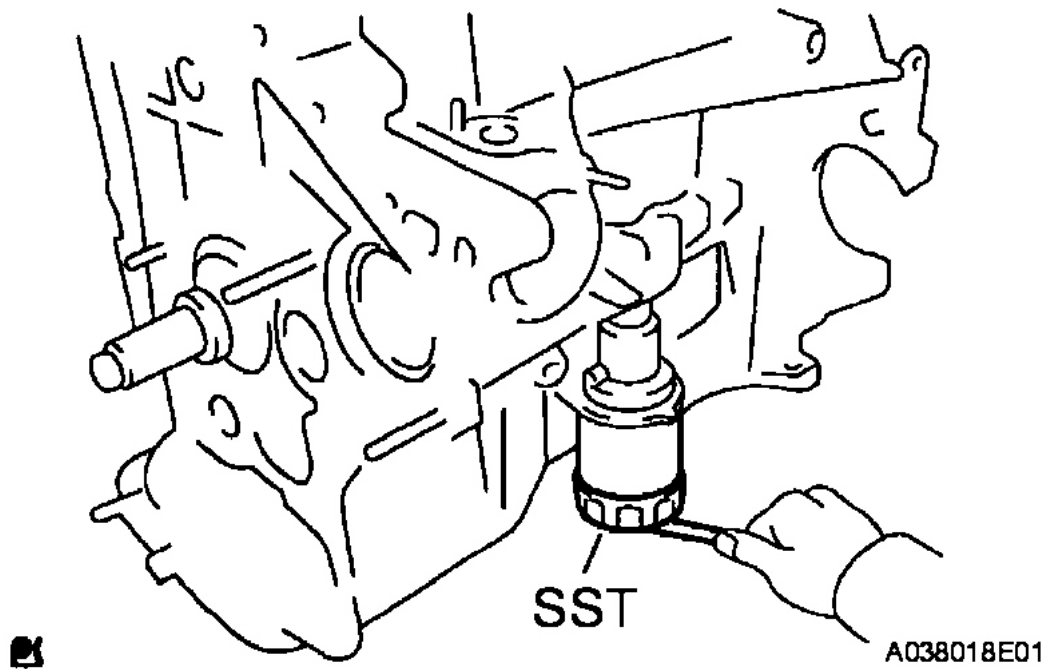


Fig. 314: Installing Oil Filter

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

SST 09228-06501

If using a torque wrench, tighten to the specified torque.

Torque: 17.5 N*m (178 kgf*cm, 13 ft.*lbf)

17. INSTALL CYLINDER HEAD GASKET

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

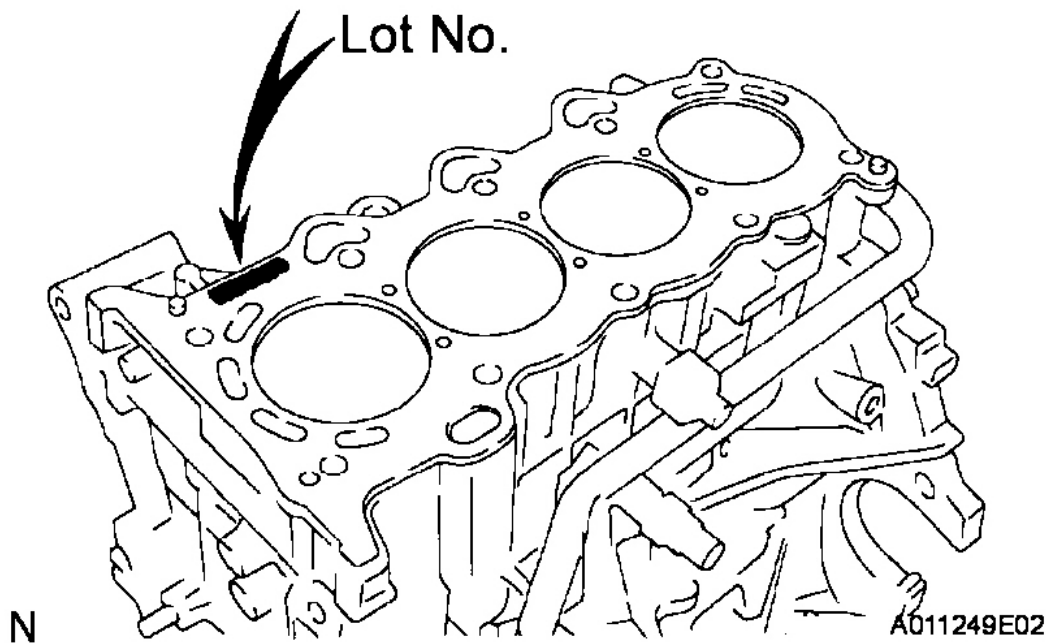


Fig. 315: Placing New Cylinder Head Gasket On Cylinder Block With Lot No Stamp Facing Upward

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

NOTE:

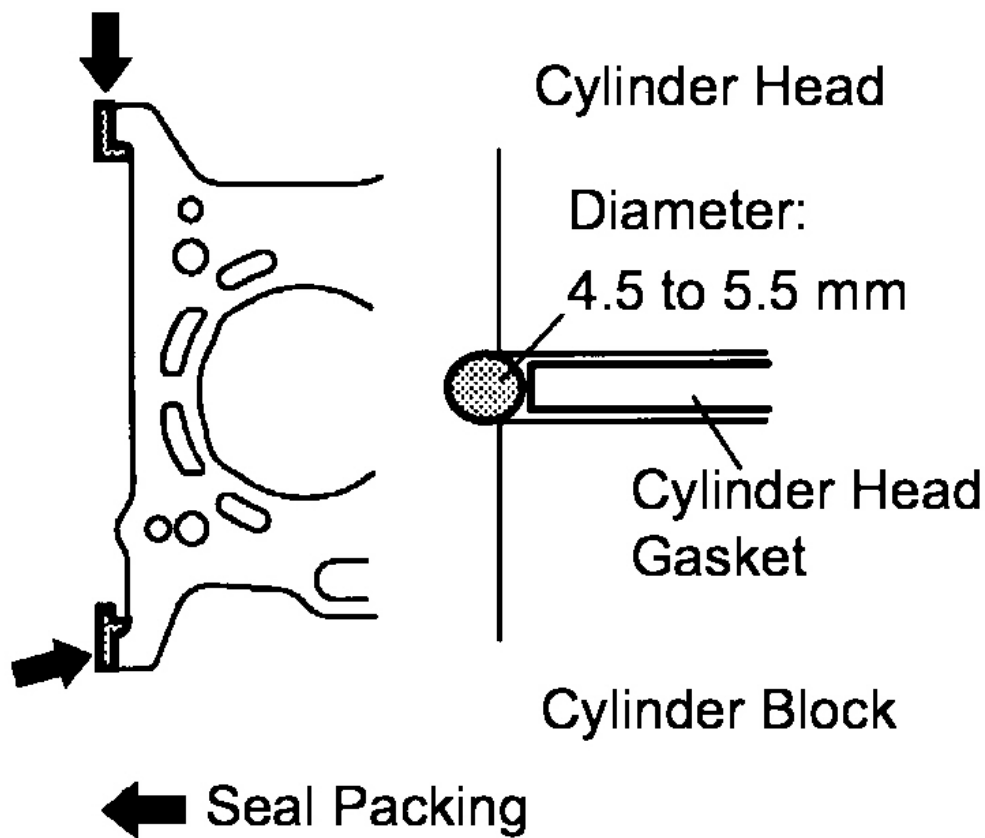
- Remove any oil from the contact surface.
- Pay attention to the mounting orientation of the cylinder head gasket.
- Place the cylinder head on the cylinder block gently in order not to damage the gasket at the bottom part of the head.

18. INSTALL CYLINDER HEAD

HINT:

The cylinder head bolts are tightened in 2 successive steps.

- a. Apply seal packing as shown in the illustration.



A073748E02

Fig. 316: Identifying Seal Packing Application Area
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00080 or equivalent

Standard seal diameter: 3.5 mm to 4.5 mm (0.177 to 0.217 in.)

NOTE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes of applying seal packing.**

- b. Apply a light coat of engine oil to the threads of the cylinder head bolts.
- c. Using several steps, install and uniformly tighten the 10 cylinder head bolts and plate washers with an 8 mm bi-hexagon wrench in the sequence shown in the illustration.

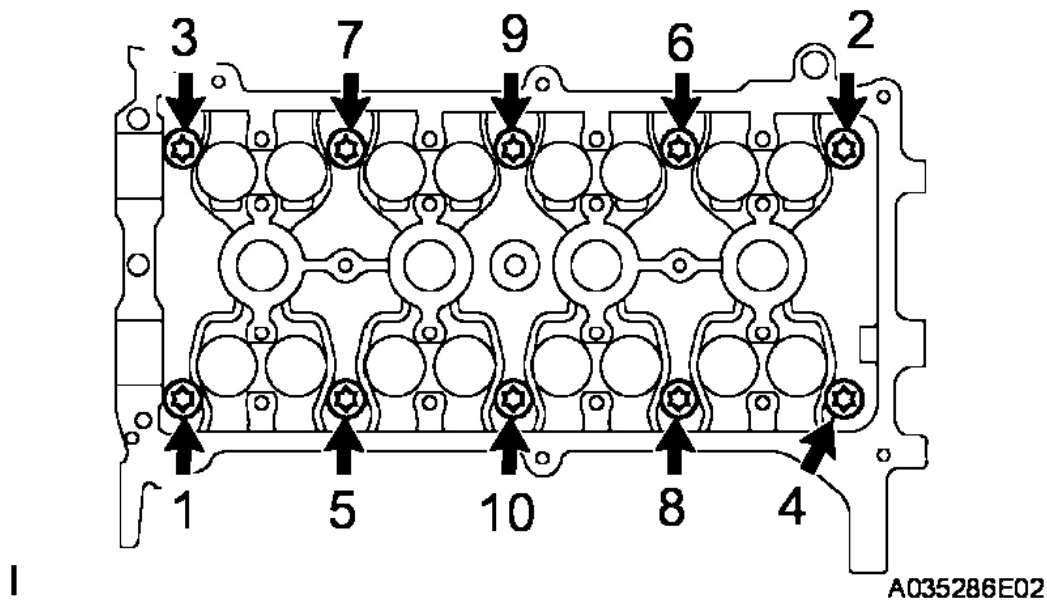


Fig. 317: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 29 N*m (300 kgf*cm, 22 ft.*lbf)

- d. Mark the front of the cylinder head bolt with paint.
- e. Retighten the cylinder head bolts by an additional 90° and then another 90°, as shown in the illustration.

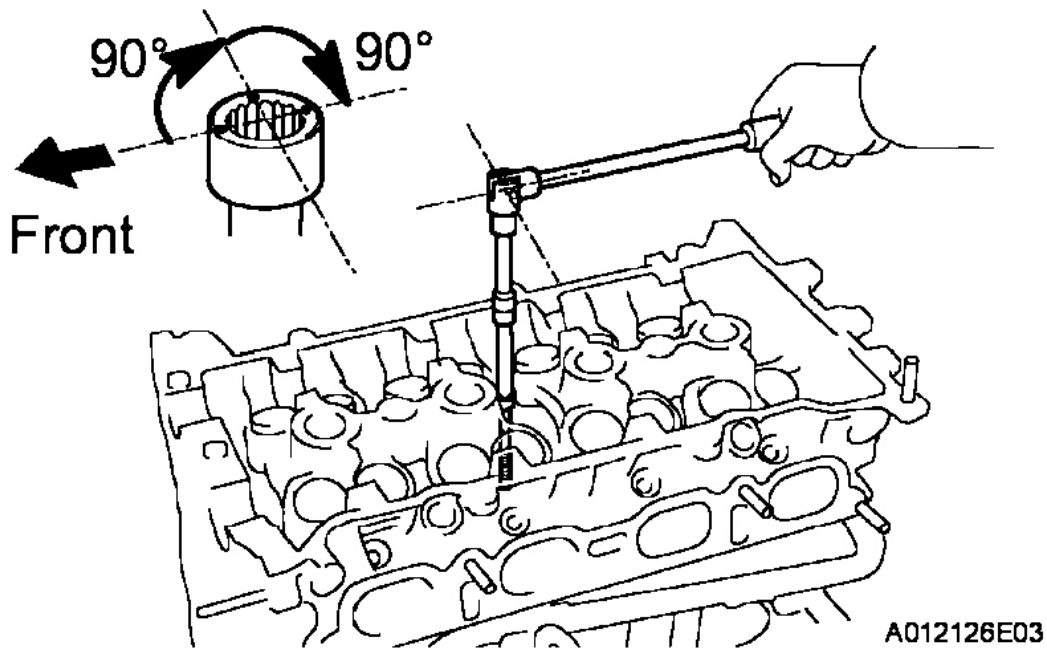


Fig. 318: Retightening Cylinder Head Bolts

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

- f. Check that the painted mark is now at a 180° angle to the front.
- 19. **INSTALL ENGINE REAR OIL SEAL** (See DISASSEMBLY)
- 20. **INSTALL CAMSHAFT TIMING GEAR**
 - a. Put the camshaft timing gear assembly and the camshaft together with the straight pin of the groove.
 - b. Turn the camshaft timing gear assembly clockwise while pushing it lightly towards the camshaft. Push further at the position where the pin fits into the groove.

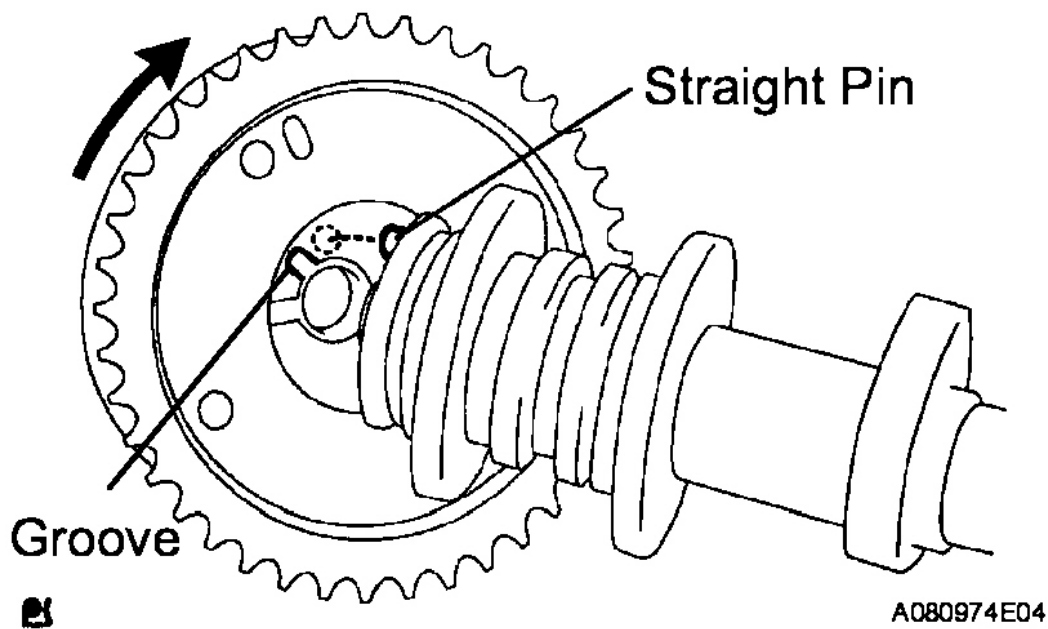


Fig. 319: Installing Camshaft Timing Gear

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

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

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

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

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

21. INSTALL CAMSHAFT

- a. Apply a light coat of engine oil to the camshaft journals.
- b. Place the camshaft on the cylinder head with the timing mark on the camshaft timing gear facing upward.
- c. Examine the front marks and numbers, and tighten the bolts in the sequence shown in the illustration.

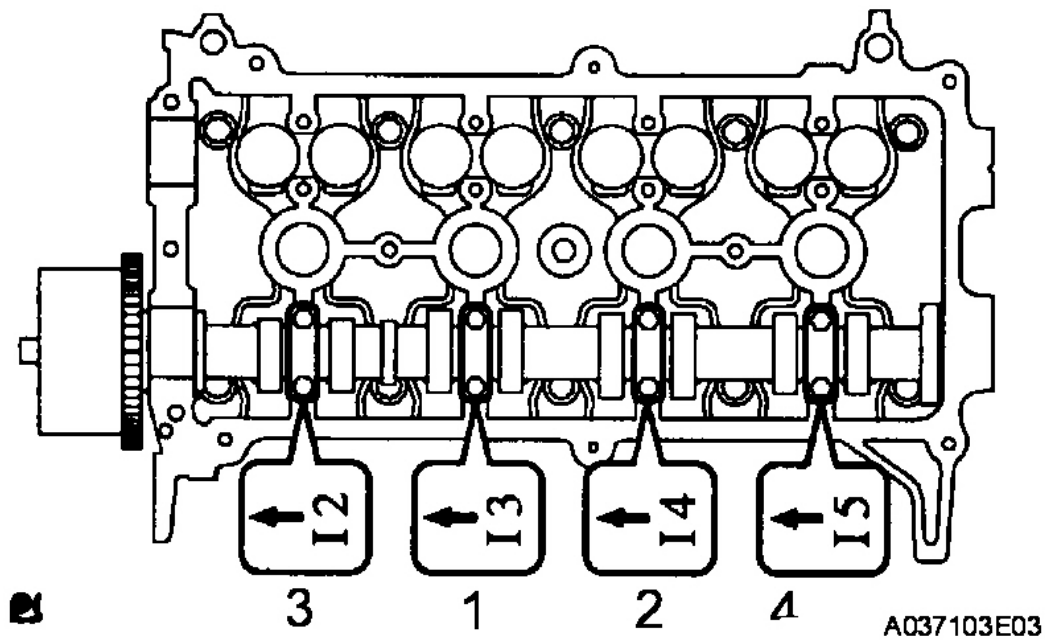


Fig. 320: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 13 N*m (129 kgf*cm, 9 ft.*lbf)

NOTE: Tighten each bolt uniformly, keeping the camshaft level.

22. INSTALL CAMSHAFT TIMING SPROCKET

- Clamp the camshaft in a vise.
- Align the knock pin hole of the camshaft timing sprocket with the knock pin of the camshaft, and install the camshaft timing sprocket.

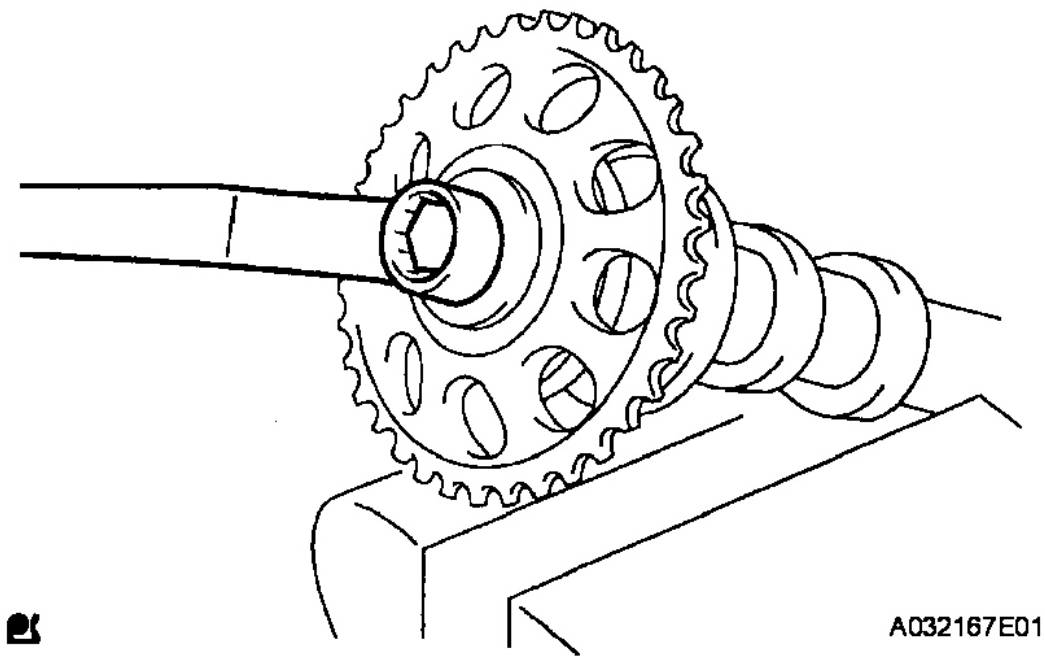


Fig. 321: Installing Camshaft Timing Sprocket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE: Be careful not to damage the camshaft.

23. INSTALL NO. 2 CAMSHAFT

- a. Apply a light coat of engine oil to the camshaft journals.
- b. Place the camshaft on the cylinder head with the timing mark on the camshaft timing gear facing upward.
- c. Examine the front marks and numbers, and tighten the bolts in the sequence shown in the illustration.

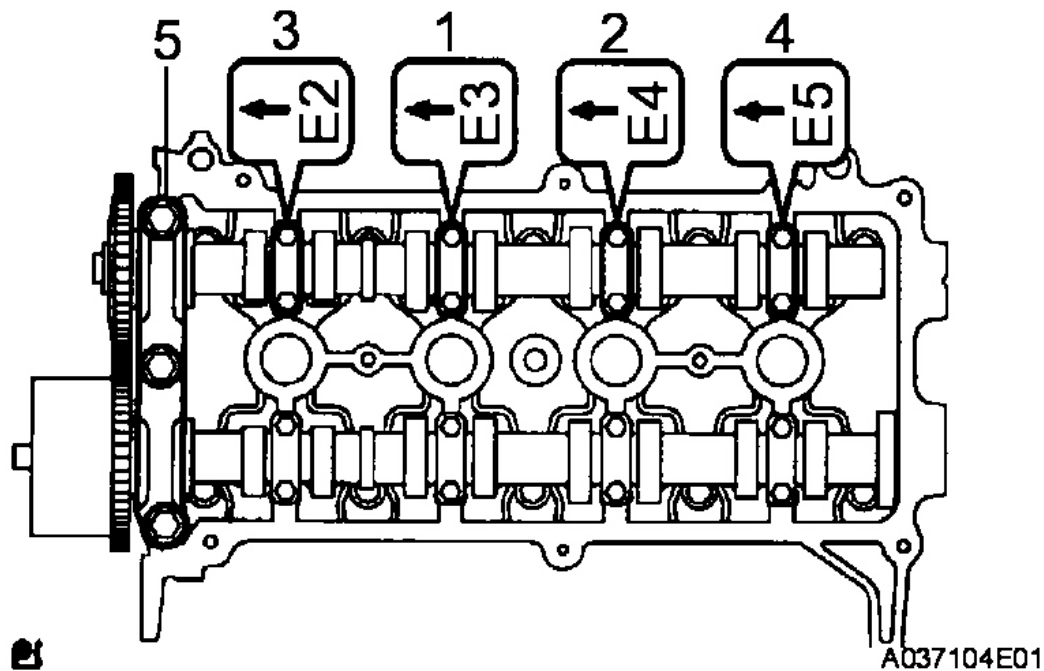


Fig. 322: Identifying Bearing Cap Bolts Tightening Sequence
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 13 N*m (133 kgf*cm, 9 ft.*lbf)

NOTE: Tighten each bolt uniformly, keeping the camshaft level.

- d. Install the No. 1 bearing cap.

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

24. INSTALL CAMSHAFT POSITION SENSOR

- a. Apply engine oil to the O-ring.

NOTE: If the O-ring is damaged, replace the camshaft position sensor.

- b. Install the camshaft position sensor with the bolt.

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

25. INSTALL CHAIN

- a. Set the position of the No. 1 cylinder to 20° ATDC.

NOTE: To prevent the pistons from hitting against valves, the following procedures must be performed in the order below.

1. Set the crankshaft between 40 to 140° ATDC.
 2. Set the cams of the intake and exhaust timing sprockets to 20° ATDC.
 3. Reset the crankshaft to 20° ATDC.
- b. Install the chain vibration damper with the 2 bolts.

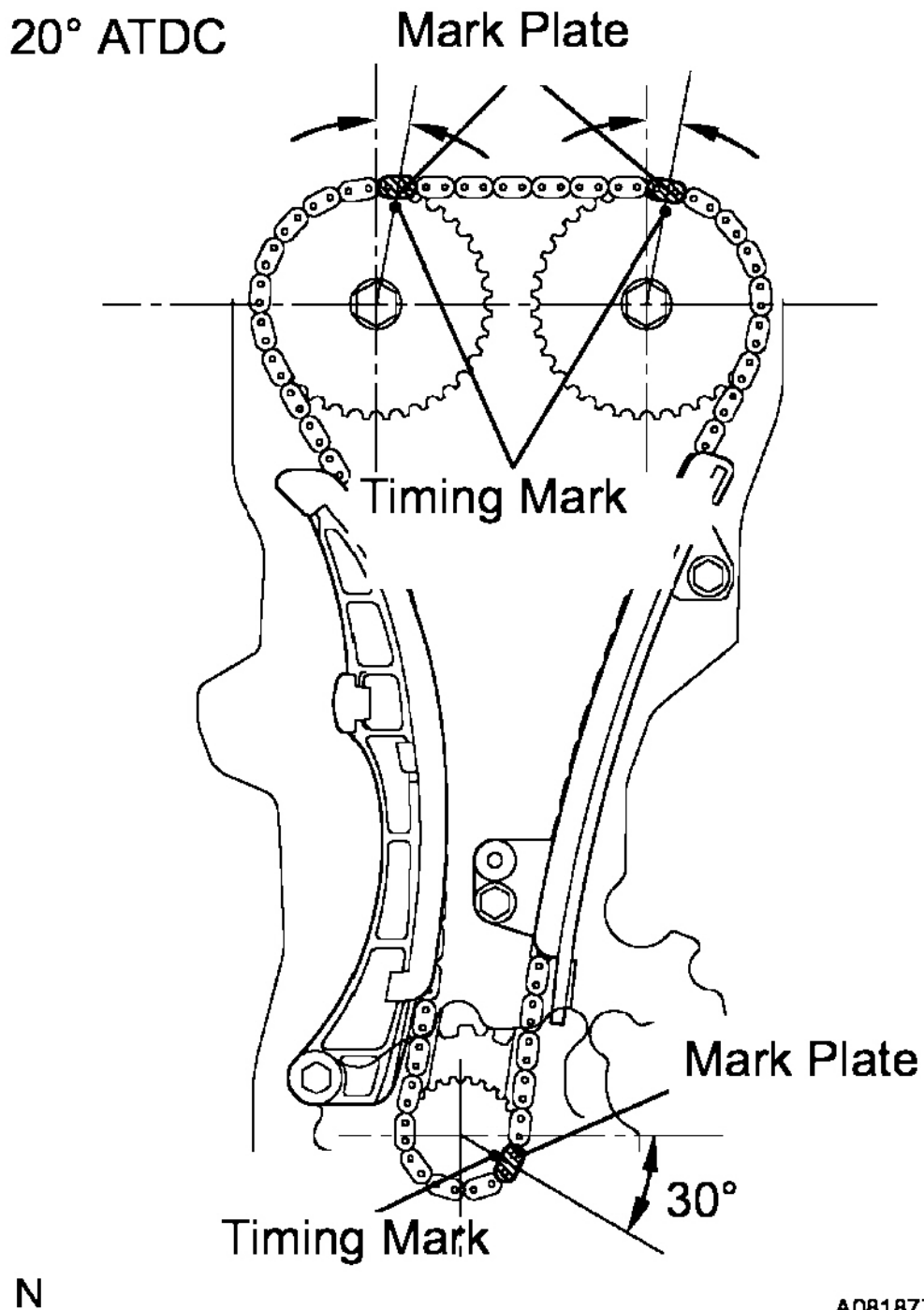
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

- c. Align the matchmarks of the camshaft timing sprocket, camshaft timing gear and crankshaft timing sprocket with each mark plate (colored in yellow) of the timing chain.

HINT:

To prevent the exhaust camshaft from springing back, turn it using a wrench and set it at the mark on the chain.

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



N

A081877E03

Fig. 323: Aligning Matchmarks Of Camshaft And Crankshaft Timing Sprocket With Mark Plate Of Timing Chain
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- e. While rotating the stopper plate of the chain tensioner upward as shown in the illustration, push in the plunger of the tensioner.
- f. While rotating the stopper plate of the tensioner downward, insert a 2.5 mm (0.098 in.) diameter bar into the holes of the stopper plate and the tensioner to hold the stopper plate.
- g. Install the chain tensioner with the 2 bolts.

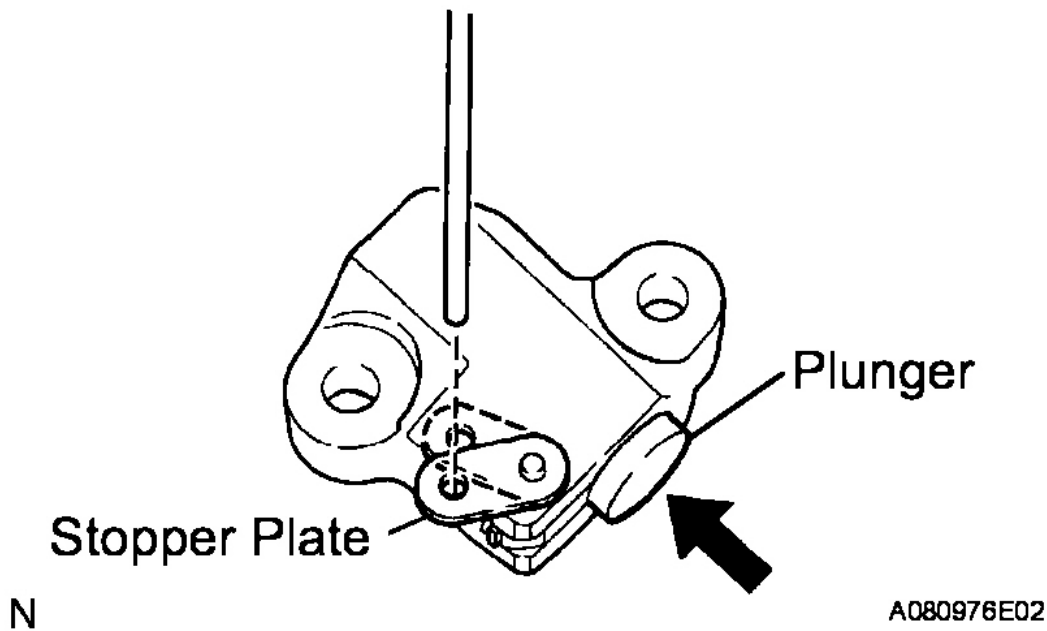


Fig. 324: Inserting Bar Into Holes Of Stopper Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- h. Remove the bar from the chain tensioner.
 - i. Check the tension between the intake and exhaust camshaft timing sprocket.
26. **INSTALL OIL PUMP SEAL (See REPLACEMENT)**
27. **INSTALL TIMING CHAIN COVER**
- a. Install 2 new O-rings onto the 2 locations as shown in the illustration.
 - b. Remove any old packing material from the contact surface.

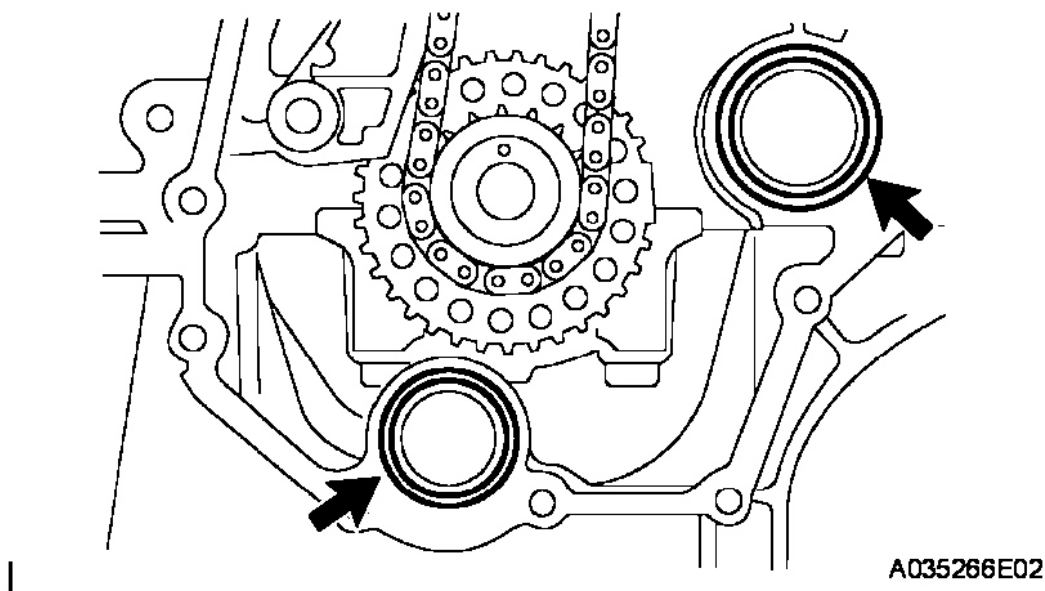


Fig. 325: Installing O-Rings

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

- c. Apply seal packing to the oil pump assembly, cylinder head and cylinder block as shown in the illustration below.



- **Remove any oil from the contact surface.**
- **Install the oil pump within 3 minutes of applying seal packing.**

- Do not expose the seal to engine oil for at least 2 hours after installation.
 - Do not start the engine for at least 2 hours after installation.
- d. Align the keyway of the oil pump drive rotor with the rectangular portion of the crankshaft, and slide the oil pump into place.

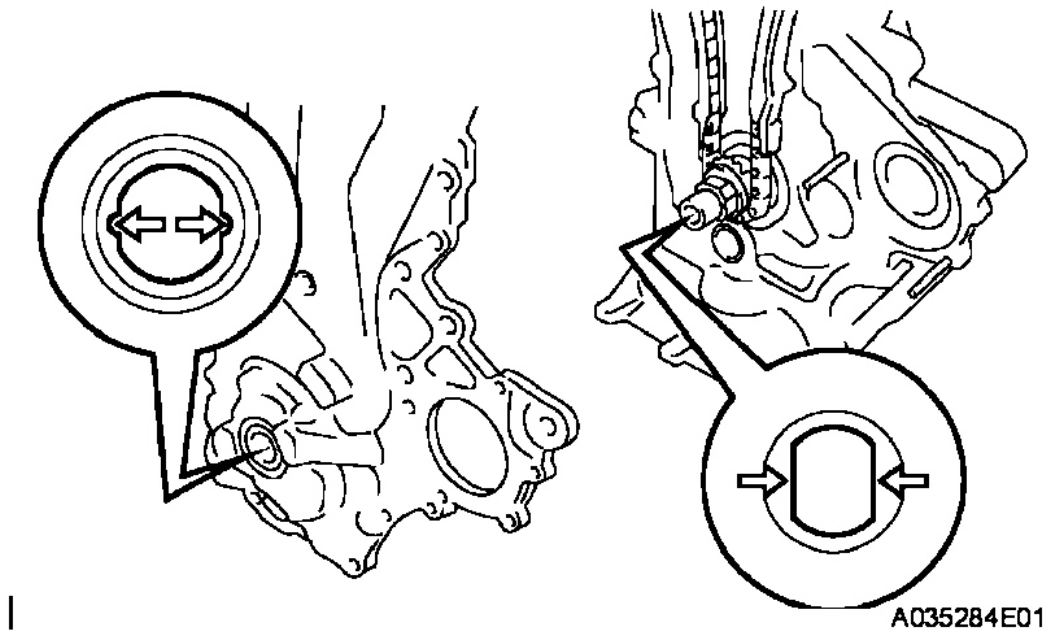


Fig. 327: Aligning Keyway Of Oil Pump Drive Rotor With Rectangular Portion Of Crankshaft

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

- e. Install the oil pump assembly with the 15 bolts and nut. Uniformly tighten the bolts and nut in several steps.

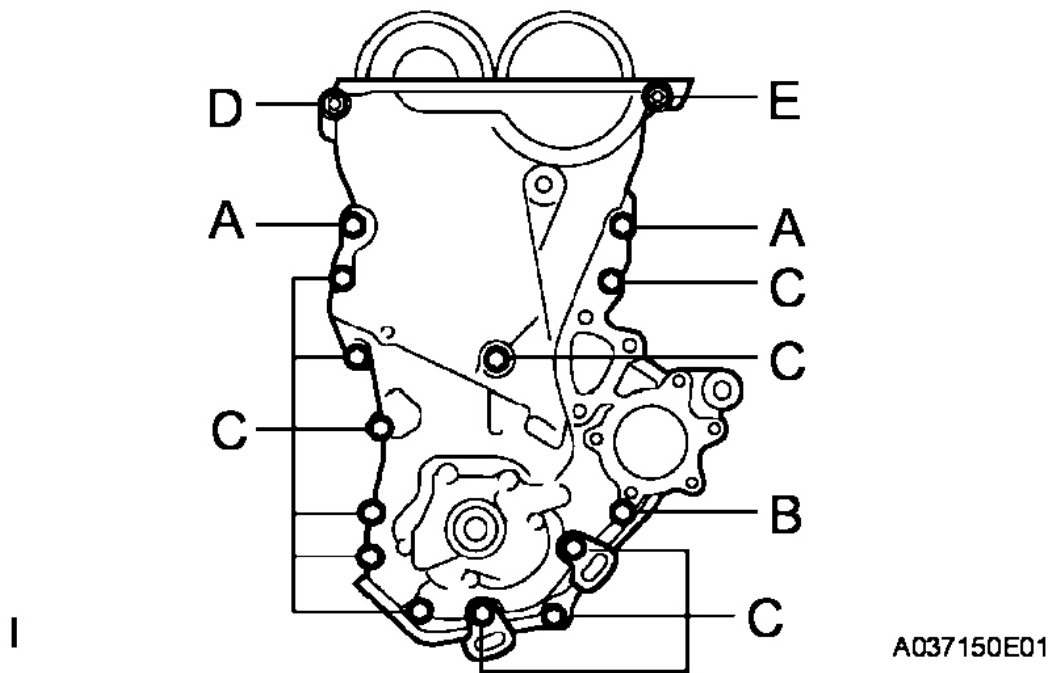


Fig. 328: Installing Oil Pump Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf) for bolt A

11 N*m (112 kgf*cm, 8.1 ft.*lbf) for bolt B

11 N*m (112 kgf*cm, 8.1 ft.*lbf) for bolt C

24 N*m (245 kgf*cm, 18 ft.*lbf) for nut D

24 N*m (245 kgf*cm, 18 ft.*lbf) for bolt E

NOTE:

- Pay attention not to disturb the seal packing.
- After installing the timing chain case, install the mounting bracket and water pump within 15 minutes.

HINT:

Each bolt length is as follows:

30 mm (1.18 in.) for bolt A

35 mm (1.38 in.) for bolt B

20 mm (0.79 in.) for bolt C

20 to 14 mm (0.79 to 0.55 in.) for bolt E

28. INSTALL WATER PUMP

- a. Install a new gasket and the water pump with the 3 bolts and 2 nuts.

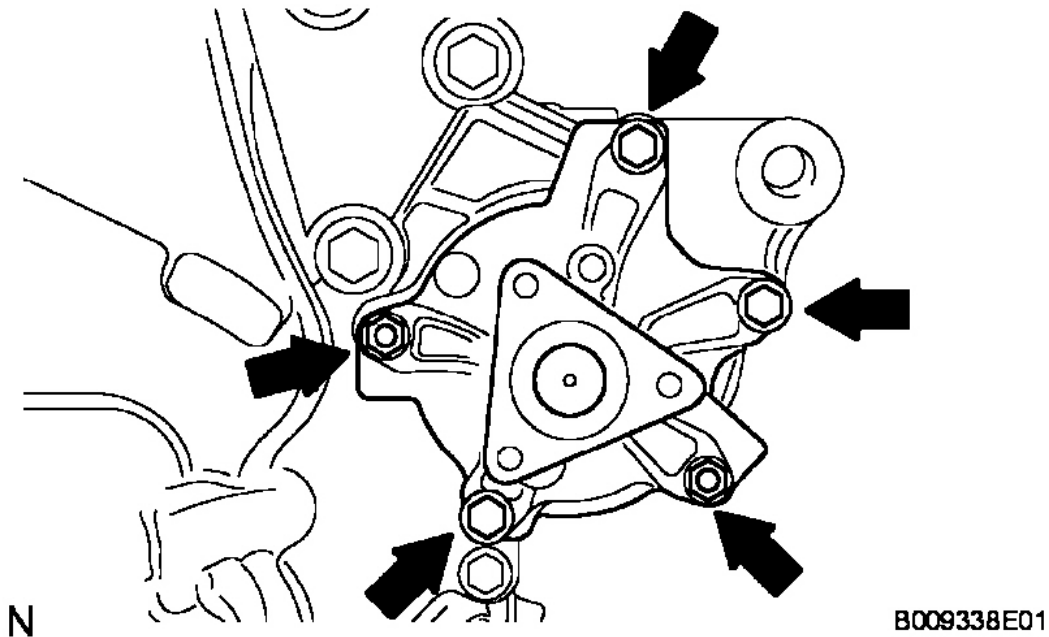


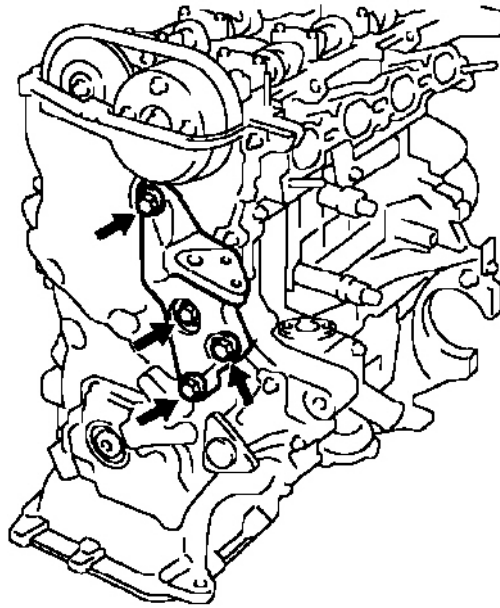
Fig. 329: Installing Water Pump

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

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

29. INSTALL ENGINE MOUNTING BRACKET RH

- a. Install the engine mounting bracket RH with the 4 bolts.



Y

A080957E01

Fig. 330: Installing Engine Mounting Bracket RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 55 N*m (561 kgf*cm, 41 ft.*lbf)

30. INSTALL WATER PUMP PULLEY

- a. Using SST, install the pump pulley with the 3 bolts.

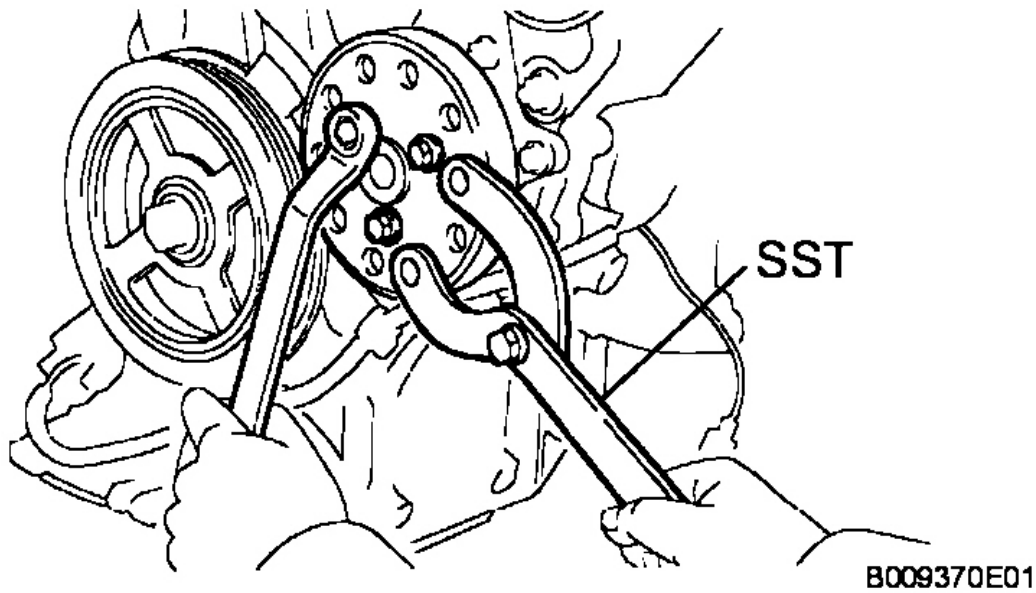


Fig. 331: Installing Water Pump Pulley
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SST 09960-10010 (09962-01000, 09963-00600)

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

31. INSTALL CRANKSHAFT PULLEY

- a. Align the pin hole of the crankshaft pulley with the pin position, and install the crankshaft pulley.
- b. Using SST, install the pulley bolt.

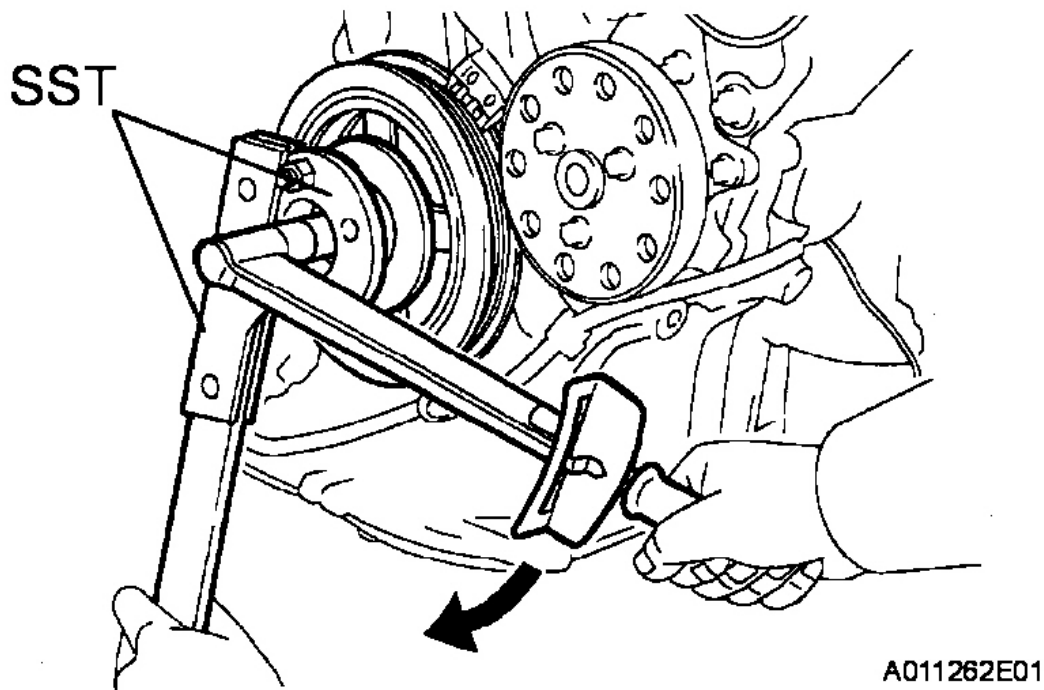


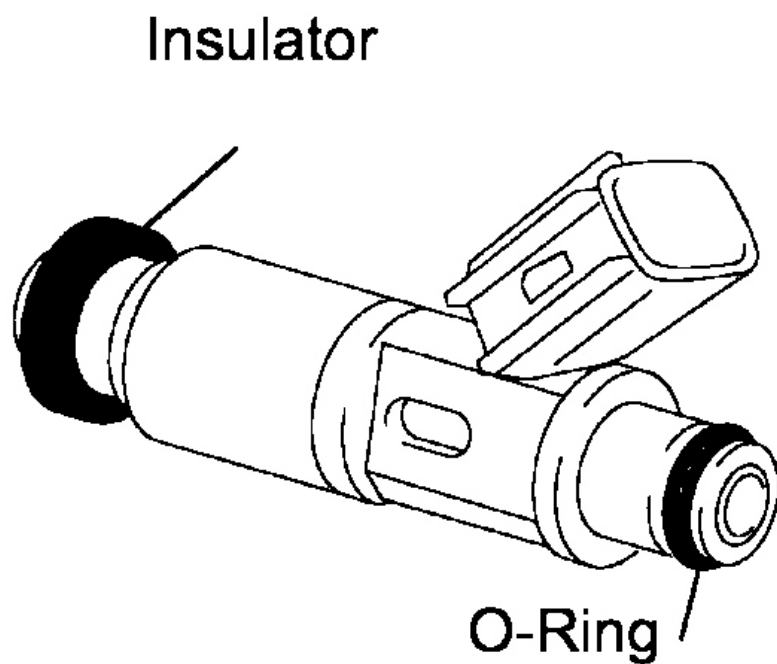
Fig. 332: Installing Crankshaft Pulley

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

SST 09330-00021, 09213-58012 (91111-50845)

Torque: 128 N*m (1,305 kgf*cm, 95 ft.*lbf)

32. **INSPECT VALVE CLEARANCE** (See ADJUSTMENT)
33. **ADJUST VALVE CLEARANCE** (See ADJUSTMENT)
34. **INSTALL FUEL INJECTOR**
 - a. Install new insulators onto each fuel injector.
 - b. Apply a light coat of spindle oil or gasoline to new O-Rings and install them onto each fuel injector.
 - c. Apply a light coat of spindle oil or gasoline to the place where a delivery pipe comes into contact with the O-ring.



A050145E01

Fig. 333: Installing O-Rings Onto Fuel Injector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. While turning the injector clockwise and counterclockwise, install it to the delivery pipe.

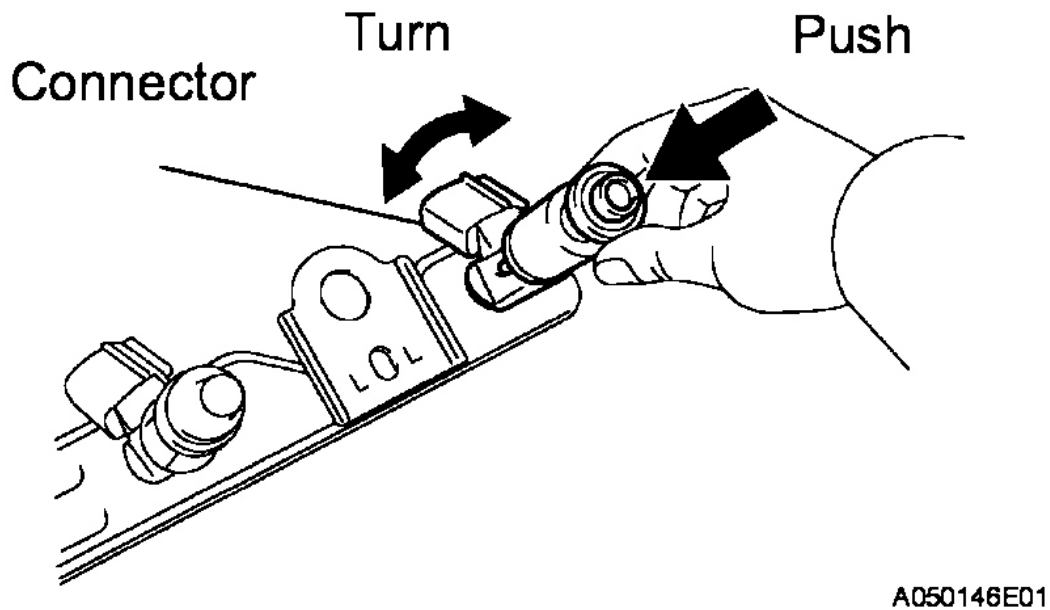


Fig. 334: Installing Fuel Injector To Delivery Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Be careful not to twist the O-ring.
- After installing the fuel injectors, check that they turn smoothly. If not, reinstall it with a new O-ring.

35. INSTALL FUEL DELIVERY PIPE

- a. Install the 2 spacers onto the cylinder head.
- b. Install the fuel delivery pipe and 4 fuel injectors together.

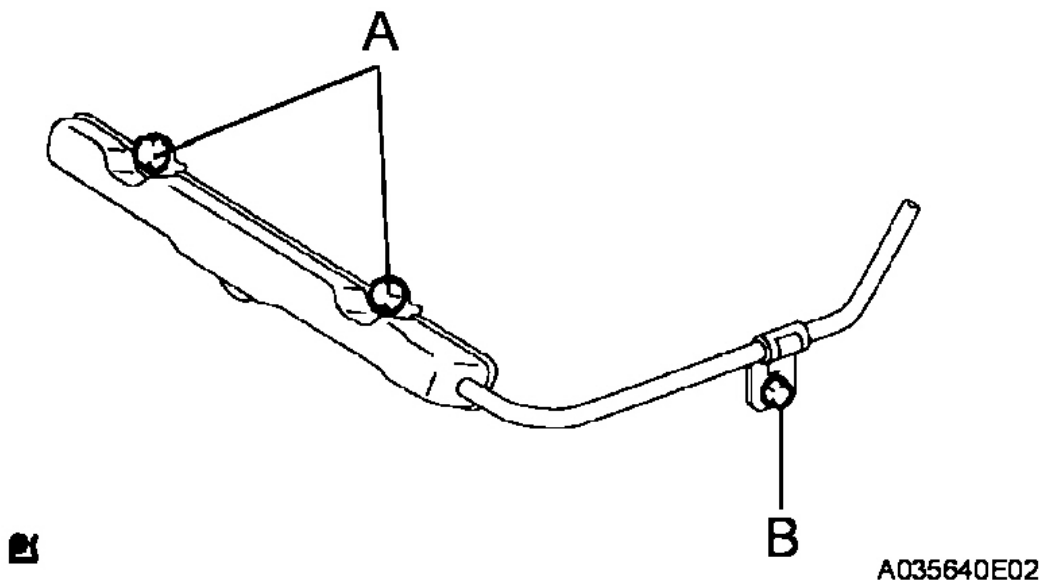


Fig. 335: Identifying Fuel Delivery Pipe
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

NOTE:

- Be careful not to drop the fuel injectors when installing the fuel delivery pipe.
- Check that the fuel injectors rotate smoothly after installing the fuel delivery pipe.

36. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

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

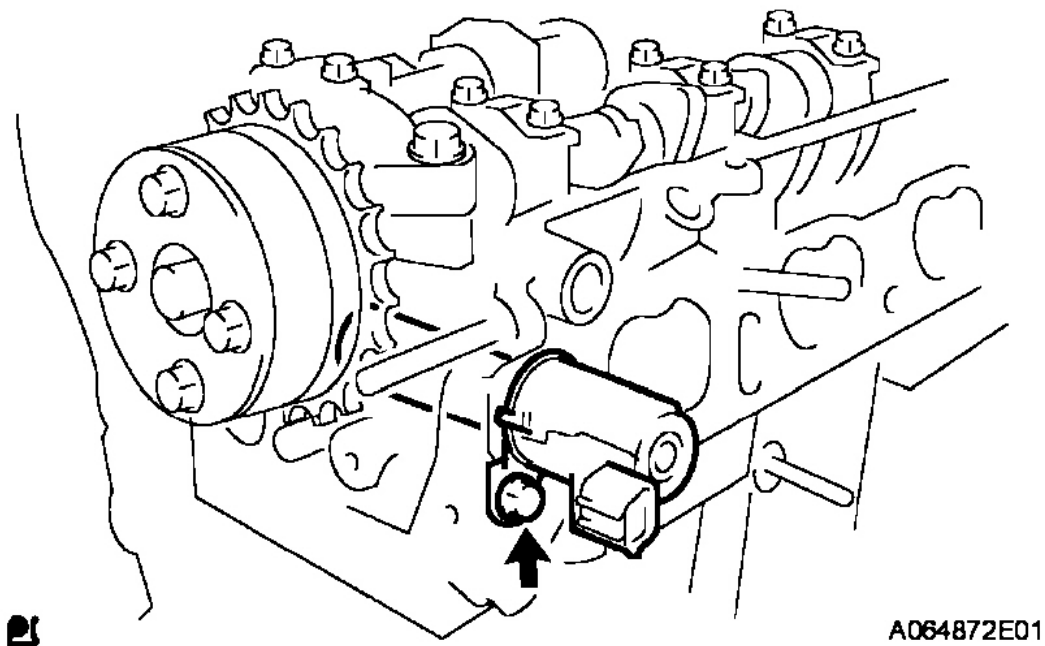


Fig. 336: Installing Camshaft Timing Oil Control Valve Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

NOTE: Be careful not to twist the O-ring.

37. INSTALL CYLINDER HEAD COVER

- a. Install the gasket onto the cylinder head cover.
- b. Apply seal packing to the 2 locations as shown in the illustration.

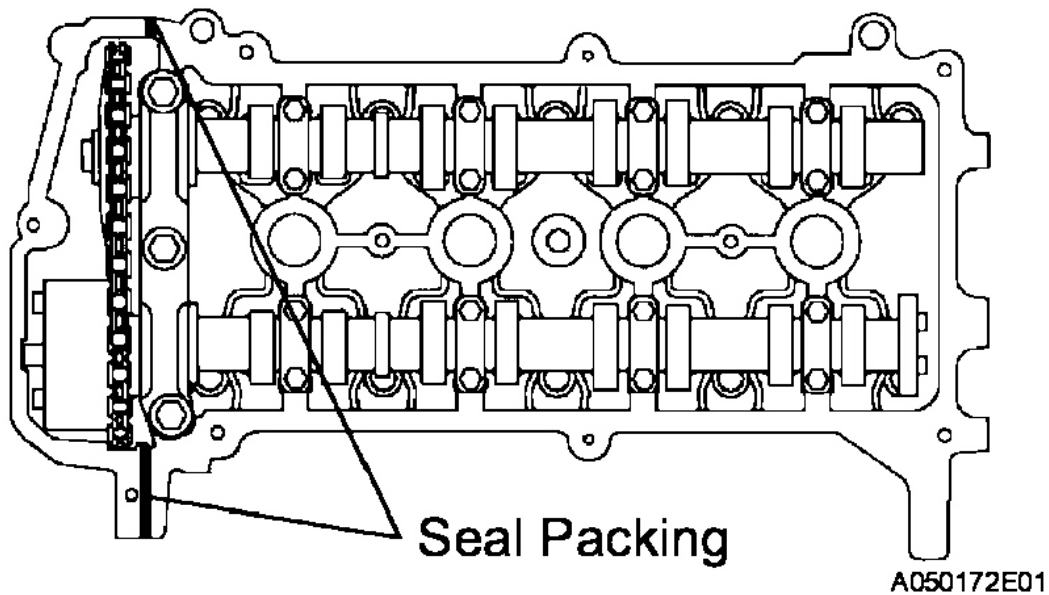


Fig. 337: Identifying Seal Packing Application Area
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Seal packing: Part No. 08826-00080 or equivalent

NOTE:

- Remove any oil from the contact surface.
 - Install the cylinder head cover within 3 minutes of applying seal packing.
 - Do not start the engine for at least 2 hours after installation.
- c. Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts.
 - d. Using several steps, uniformly tighten the bolts and nuts in the sequence shown in the illustration.

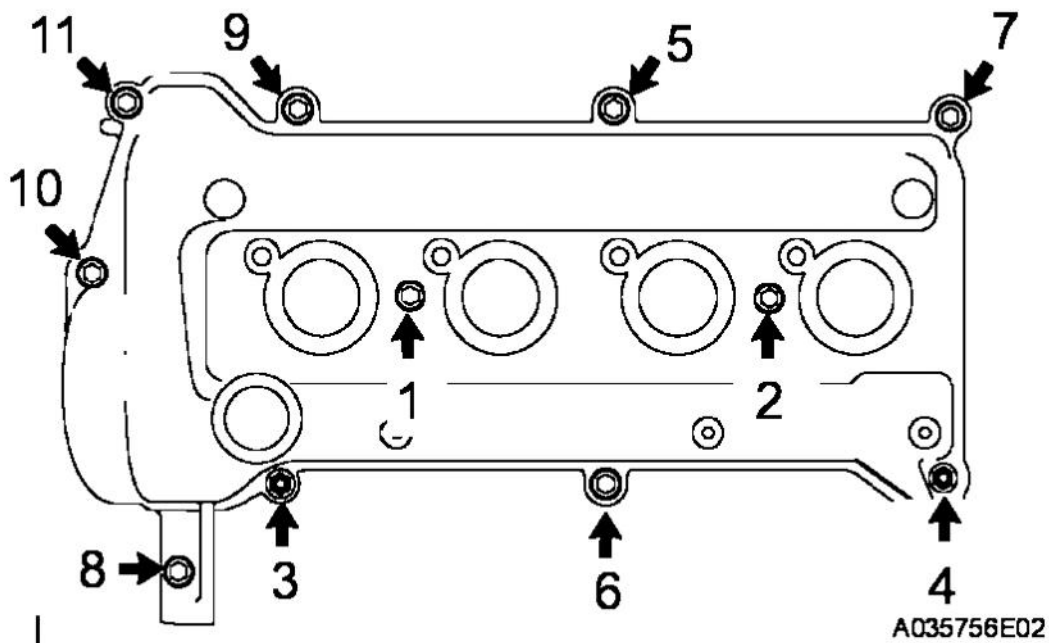


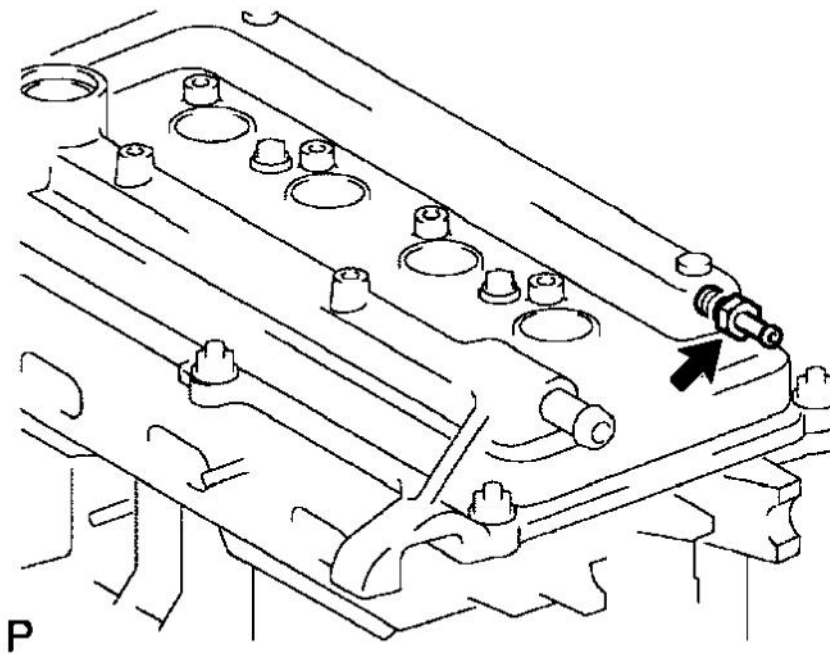
Fig. 338: Installing Cylinder Head Cover

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

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

38. INSTALL VENTILATION VALVE

- a. Install the ventilation valve onto the cylinder head cover.



A080963E02

Fig. 339: Installing Ventilation Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

39. INSTALL OIL DIPSTICK GUIDE

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

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

40. INSTALL CRANKSHAFT POSITION SENSOR

- Apply a light coat of engine oil to the O-ring on the crankshaft position sensor.

NOTE: If the O-ring is damaged, replace the crankshaft position sensor.

- Install the crankshaft position sensor with the bolt.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

41. INSTALL OIL FILLER CAP

- Install a new gasket and the oil filler cap.

42. INSTALL THERMOSTAT

- a. Install a new gasket onto the thermostat.
- b. Install the thermostat with the jiggle valve facing upward.

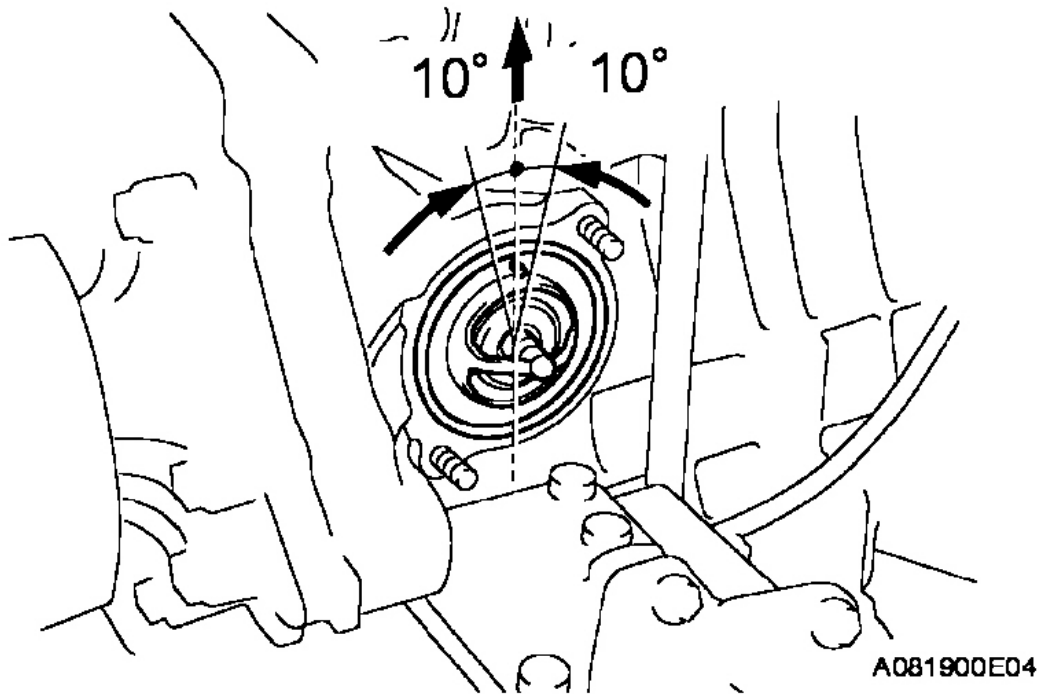


Fig. 340: Identifying Jiggle Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

The jiggle valve may be set within 10° on either side as shown in the illustration.

- c. Install the water inlet with the 2 nuts.

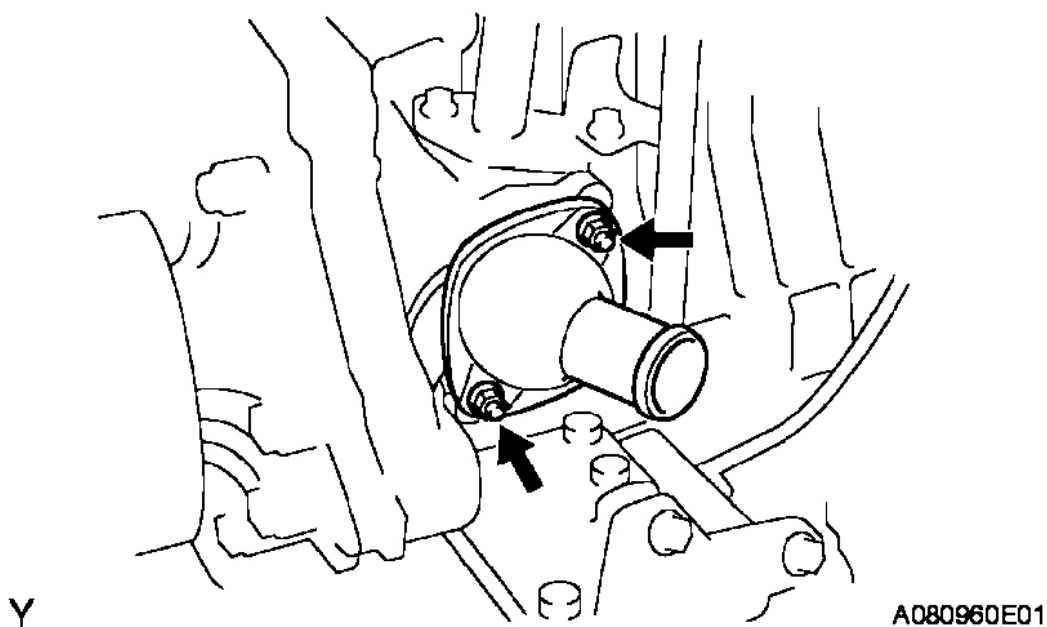


Fig. 341: Installing Thermostat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

43. INSTALL SPARK PLUG

- a. Using a 16 mm plug wrench, install the 4 spark plugs.

Torque: 18 N*m (184 kgf*cm, 13 ft.*lbf)