

2007 ENGINE**2AZ-FE Engine Mechanical - tC****ENGINE****ON-VEHICLE INSPECTION**

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

If necessary, replace the air filter.

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

HINT:

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

7. **INSPECT IGNITION TIMING**

NOTE:

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

- a. Warm up and stop the engine.
- b. When using the intelligent tester:
 1. Connect the intelligent tester to the DLC3.
 2. Allow the engine to idle.
 3. Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
 4. Read IGN ADVANCE to check the ignition timing.

Standard ignition timing:

5 to 15° BTDC at idle

5. Check that the ignition timing advances immediately when the engine speed is increased.
6. Turn the ignition switch OFF.
7. Disconnect the intelligent tester from the DLC3.

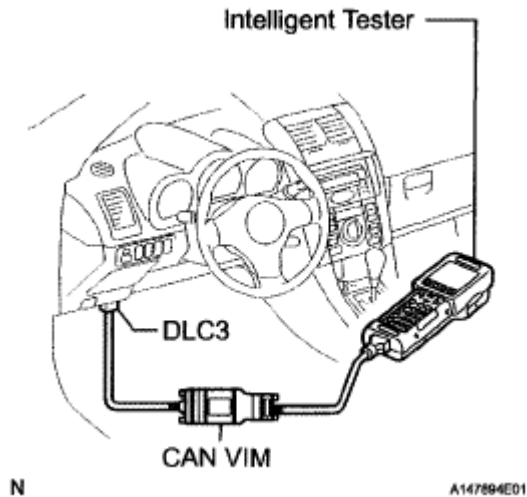


Fig. 1: Connecting Intelligent Tester To DLC3

- c. When not using the intelligent tester:
 1. Remove the No. 1 engine cover (see **REMOVAL**).
 2. Open the IG cover located in the right of the No. 4 ignition coil.
 3. Pull out the wire harness as shown in the illustration.

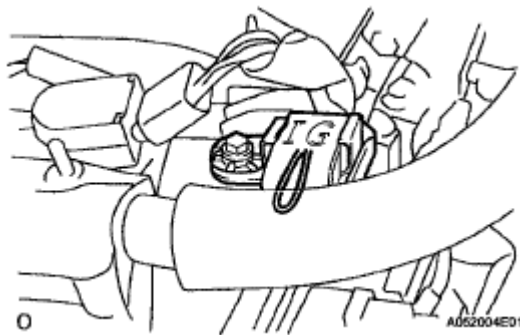


Fig. 2: Identifying Wire Harness

4. Connect the timing light to the wire harness.

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

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

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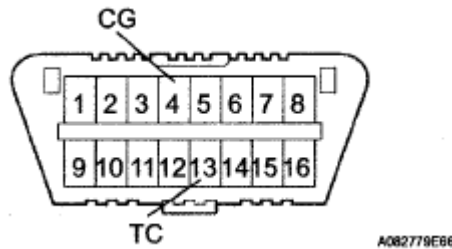


Fig. 3: Connecting Terminals 13 (TC) And 4 (CG) Of DLC3

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

Standard ignition timing:

8 to 12° BTDC at idle

HINT:

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

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

Standard ignition timing:

5 to 15° BTBC

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

8. INSPECT ENGINE IDLE SPEED

a. With intelligent tester:

1. Turn OFF all the accessories and air conditioning.
2. Move the shift lever to P or neutral.
3. Connect the intelligent tester to the DLC3.
4. Warm up the engine.
5. Select the tester menus: DIAGNOSIS, ENHANCED OBD II and DATA LIST.
6. Read ENGINE SPEED to check the idle speed while the radiator-cooling fan is not rotating.

Standard idle speed

ENGINE IDLE STANDARD SPEED CHART

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

7. Turn the ignition switch OFF.
8. Disconnect the tester from the DLC3.

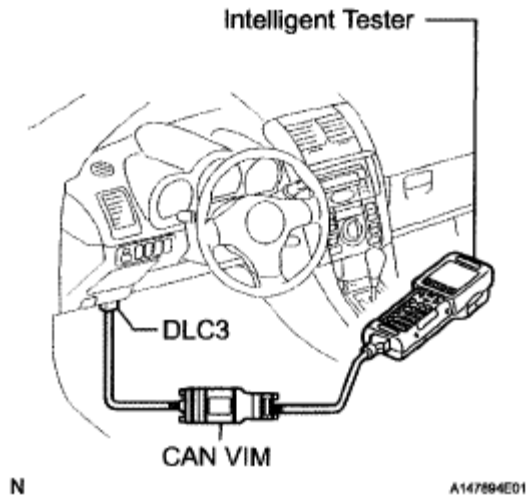


Fig. 4: Connecting Intelligent Tester To DLC3

b. Without intelligent tester:

1. Turn OFF all the accessories and air conditioning.
2. Move the shift lever to P or neutral.
3. Connect the SST to 9 (TAC) of the DLC3 terminal, and then connect a tachometer to the SST.

SST 09843-18030

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

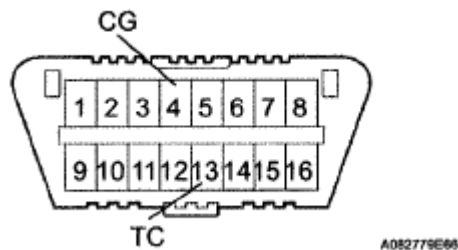


Fig. 5: Connecting Terminals 13 (TC) And 4 (CG) Of DLC3

Standard idle speed**STANDARD IDLE SPEED CHART**

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

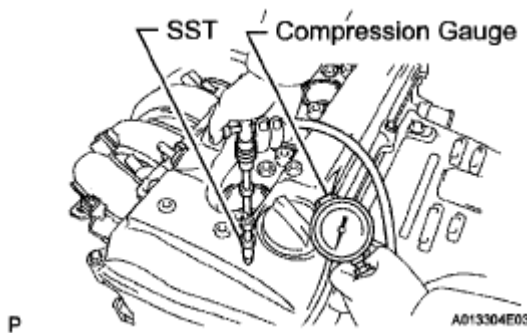
6. Turn the ignition switch OFF.
7. Remove the tachometer and disconnect the SST from the DLC3.

9. INSPECT COMPRESSION

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

SST 09992-00500

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

**Fig. 6: Inserting Compression Gauge Into Spark Plug Hole**

Standard compression pressure:

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

1,000 kPa (10.2 kgf/cm² , 145 psi) Standard difference between each cylinder:

100 kPa (1.0 kgf/cm² , 14 psi)

NOTE:

- **Always use a fully charged battery to obtain an engine speed of**

250 rpm or more.

- **Check the other cylinders' compression pressures in the same way.**
- **This measurement must be done as quickly as possible.**

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

HINT:

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

10. INSPECT CO/HC

HINT:

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

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

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

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

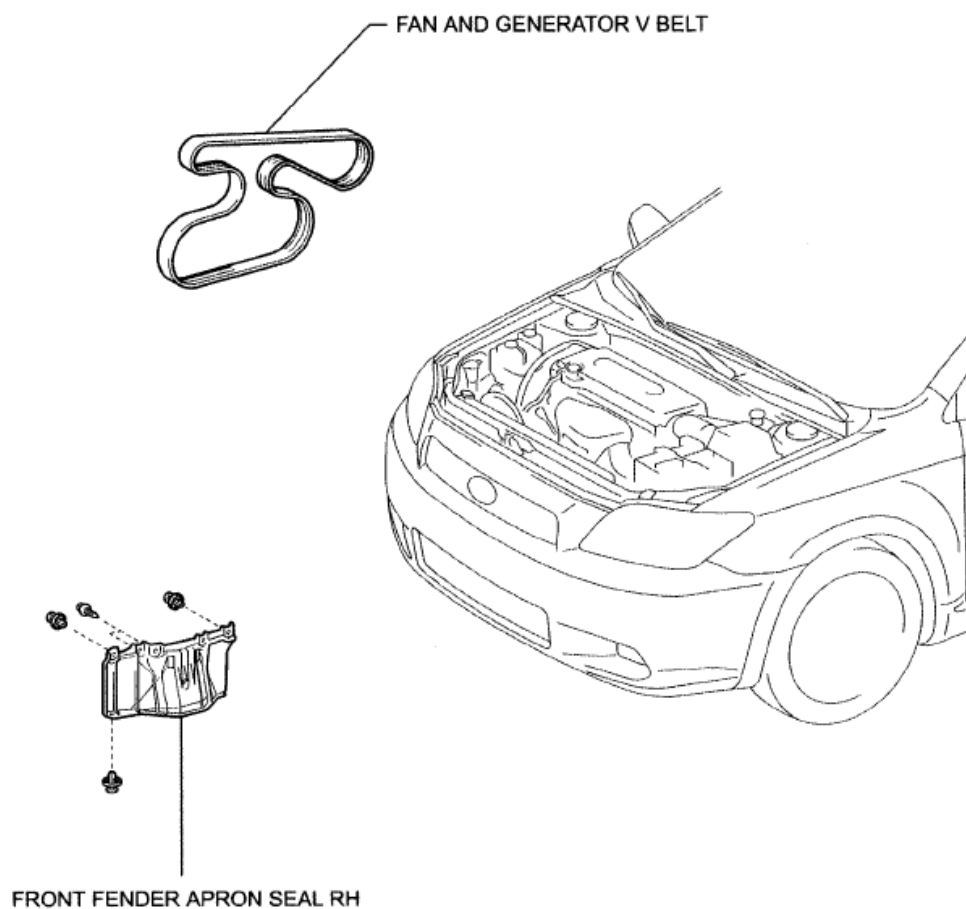
CAUSES REFERENCE CHART

CO	HC	Problems	Causes
Normal	High	Rough idle	- Faulty ignition: - Incorrect timing - Fouled, shorted or improperly gapped plugs - Incorrect valve clearance - Leaks in intake and exhaust valves - Leaks in cylinders
Low	High	Rough idle (Fluctuating HC	- Vacuum leakage: - Ventilation hoses - Intake manifold

		reading)	○ Throttle body ○ Brake booster line
			2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve Faulty SFI system: ○ Faulty pressure regulator ○ Faulty engine coolant temperature sensor ○ Faulty mass air flow meter ○ Faulty ECM ○ Faulty injectors ○ Faulty throttle body

DRIVE BELT

COMPONENTS



T

A112170E01

Fig. 7: Identifying Drive Belt Components**REMOVAL**

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

SST 09249-63010**NOTE:**

- **Be sure to connect SST and the tools so that they are in line**

when using.

- When retracting the tensioner, turn it clockwise slowly in 3 seconds or more. Do not apply force rapidly.
- After the tensioner is retracted all the way, do not apply force any more than necessary.

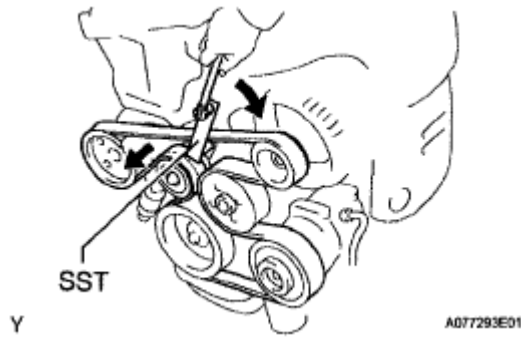


Fig. 8: Locating V-Ribbed Belt Tensioner Arm

INSTALLATION

1. INSTALL FAN AND GENERATOR V BELT

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

SST 09249-63010

NOTE:

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

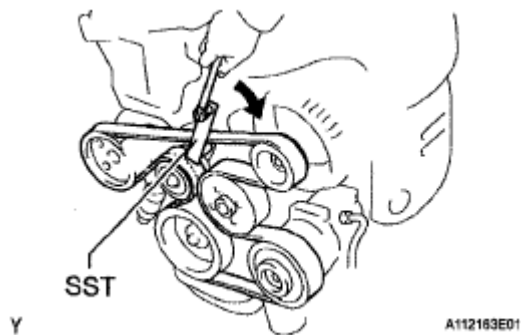


Fig. 9: Locating V-Ribbed Belt Tensioner Arm

2. INSTALL FRONT FENDER APRON SEAL RH (See INSTALLATION)**VALVE CLEARANCE****ADJUSTMENT****1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

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

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

Standard valve clearance (cold)**STANDARD VALVE CLEARANCE SPECIFICATIONS (COLD)**

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

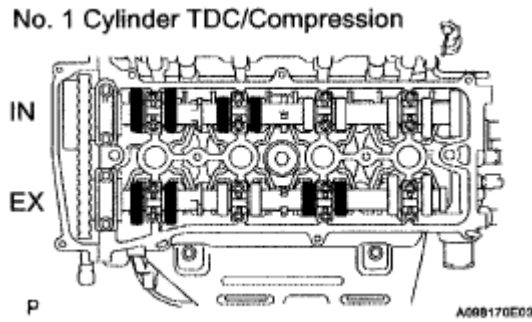


Fig. 10: Identifying Valve Position Of Cylinder (No.1)

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

Standard valve clearance (cold)

STANDARD VALVE CLEARANCE SPECIFICATIONS (COLD)

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

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

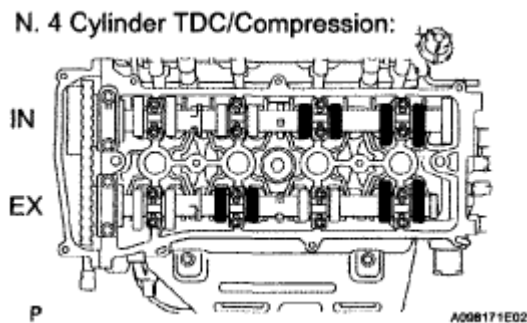


Fig. 11: Identifying Valve Position Of Cylinder (No.4)

14. ADJUST VALVE CLEARANCE

- a. Remove the No. 2 camshaft (see **REMOVAL**).
- b. Remove the camshaft (see **REMOVAL**).
- c. Remove the valve lifters.
- d. Using a micrometer, measure the thickness of the removed valve lifters.

- e. Calculate the thickness of a new lifter so that the valve clearance comes within the specified values.

New lifter thickness

NEW LIFTER THICKNESS SPECIFICATION CHART

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

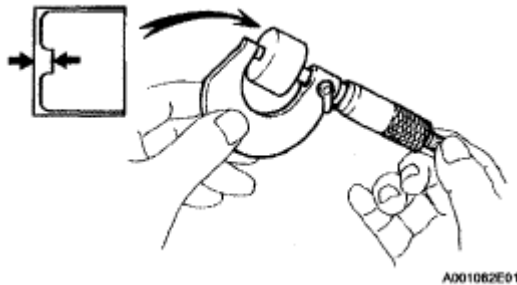


Fig. 12: Measuring Thickness Of Valve Lifters

VALVE LIFTER THICKNESS CHART

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

EXAMPLE (Intake):

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

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

(Measured - Specification = Excess clearance)

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

(Excess clearance + Used lifter = Ideal new lifter)

Closest new lifter = 5.410 mm (0.2130 in.)

Select No. 42 lifter

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

HINT:

g. Install the selected valve lifter.

[illegible]

New Lifter Thickness**VALVE LIFTER THICKNESS CHART**

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

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

The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.). Replace the 5.250 mm (0.2067 in.) lifter with a new No. 42 lifter.

Measured clearance mm (in.)	Installed lifter thickness mm (in.)	Lifter thickness (mm)																																																																																																																																																																																																																																																																																																																																																																																																										
		0.000	0.030	0.060	0.090	0.120	0.150	0.180	0.210	0.240	0.270	0.300	0.330	0.360	0.390	0.420	0.450	0.480	0.510	0.540	0.570	0.600	0.630	0.660	0.690	0.720	0.750	0.780	0.810	0.840	0.870	0.900	0.930	0.960	0.990	1.020	1.050	1.080	1.110	1.140	1.170	1.200	1.230	1.260	1.290	1.320	1.350	1.380	1.410	1.440	1.470	1.500	1.530	1.560	1.590	1.620	1.650	1.680	1.710	1.740	1.770	1.800	1.830	1.860	1.890	1.920	1.950	1.980	2.010	2.040	2.070	2.100	2.130	2.160	2.190	2.220	2.250	2.280	2.310	2.340	2.370	2.400	2.430	2.460	2.490	2.520	2.550	2.580	2.610	2.640	2.670	2.700	2.730	2.760	2.790	2.820	2.850	2.880	2.910	2.940	2.970	3.000	3.030	3.060	3.090	3.120	3.150	3.180	3.210	3.240	3.270	3.300	3.330	3.360	3.390	3.420	3.450	3.480	3.510	3.540	3.570	3.600	3.630	3.660	3.690	3.720	3.750	3.780	3.810	3.840	3.870	3.900	3.930	3.960	3.990	4.020	4.050	4.080	4.110	4.140	4.170	4.200	4.230	4.260	4.290	4.320	4.350	4.380	4.410	4.440	4.470	4.500	4.530	4.560	4.590	4.620	4.650	4.680	4.710	4.740	4.770	4.800	4.830	4.860	4.890	4.920	4.950	4.980	5.010	5.040	5.070	5.100	5.130	5.160	5.190	5.220	5.250	5.280	5.310	5.340	5.370	5.400	5.430	5.460	5.490	5.520	5.550	5.580	5.610	5.640	5.670	5.700	5.730	5.760	5.790	5.820	5.850	5.880	5.910	5.940	5.970	6.000	6.030	6.060	6.090	6.120	6.150	6.180	6.210	6.240	6.270	6.300	6.330	6.360	6.390	6.420	6.450	6.480	6.510	6.540	6.570	6.600	6.630	6.660	6.690	6.720	6.750	6.780	6.810	6.840	6.870	6.900	6.930	6.960	6.990	7.020	7.050	7.080	7.110	7.140	7.170	7.200	7.230	7.260	7.290	7.320	7.350	7.380	7.410	7.440	7.470	7.500	7.530	7.560	7.590	7.620	7.650	7.680	7.710	7.740	7.770	7.800	7.830	7.860	7.890	7.920	7.950	7.980	8.010	8.040	8.070	8.100	8.130	8.160	8.190	8.220	8.250	8.280	8.310	8.340	8.370	8.400	8.430	8.460	8.490	8.520	8.550	8.580	8.610	8.640	8.670	8.700	8.730	8.760	8.790	8.820	8.850	8.880	8.910	8.940	8.970	9.000	9.030	9.060	9.090	9.120	9.150	9.180	9.210	9.240	9.270	9.300	9.330	9.360	9.390	9.420	9.450	9.480	9.510	9.540	9.570	9.600	9.630	9.660	9.690	9.720	9.750	9.780	9.810	9.840	9.870	9.900	9.930	9.960	9.990	10.020	10.050	10.080	10.110	10.140	10.170	10.200	10.230	10.260	10.290	10.320	10.350	10.380	10.410	10.440	10.470	10.500	10.530	10.560	10.590	10.620	10.650	10.680	10.710	10.740	10.770	10.800	10.830	10.860	10.890	10.920	10.950	10.980	11.010	11.040	11.070	11.100	11.130	11.160	11.190	11.220	11.250	11.280	11.310	11.340	11.370	11.400	11.430	11.460	11.490	11.520	11.550	11.580	11.610	11.640	11.670	11.700	11.730	11.760	11.790	11.820

LIFTER THICKNESS CHART

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

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

EXAMPLE:

The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 5.340 mm (0.2102 in.) lifter with a new No. 4 lifter.

15. INSTALL CAMSHAFT

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

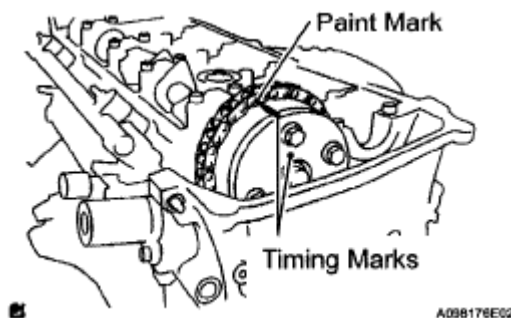


Fig. 15: Identifying Timing Mark And Paint Mark

- Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps into the cylinder head.
- Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

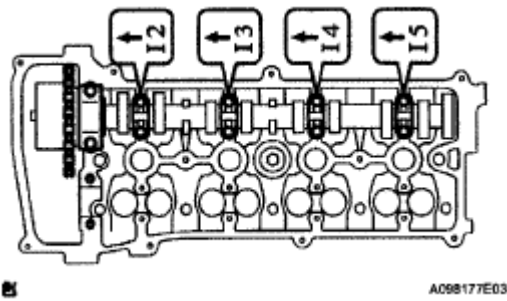


Fig. 16: Identifying Bearing Caps Into Cylinder Head Front Mark And Number

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

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

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

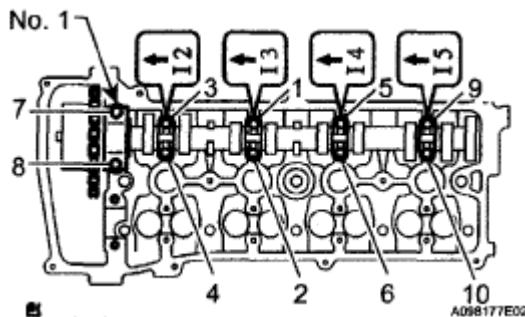


Fig. 17: Identifying Bearing Cap Bolts In Sequence

16. INSTALL NO. 2 CAMSHAFT

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

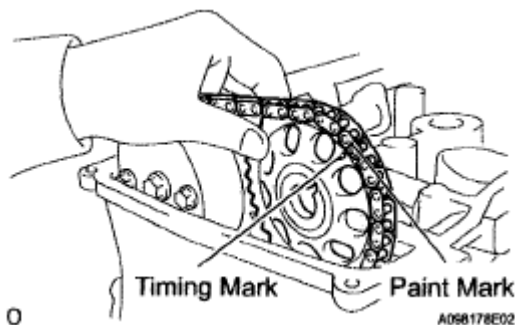


Fig. 18: Identifying Timing Mark In Camshaft Timing Sprocket

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

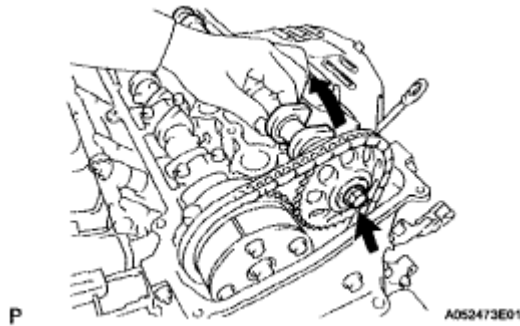


Fig. 19: Locating Camshaft Timing Sprocket Set Bolt

- d. Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.
- e. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

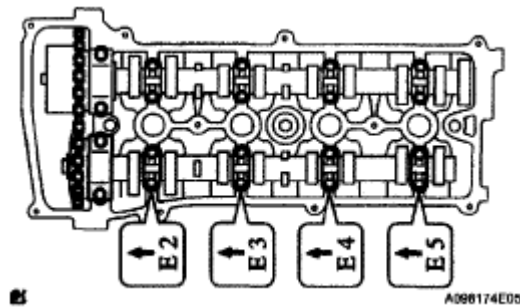


Fig. 20: Identifying Marks On Bearing Caps Onto Cylinder Head

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

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

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

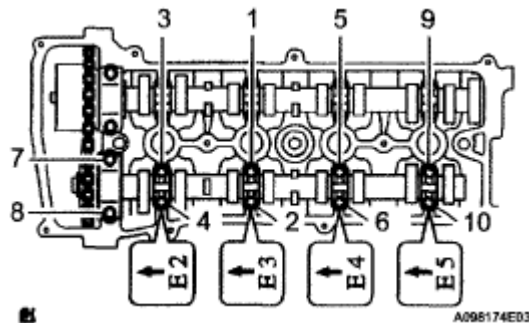
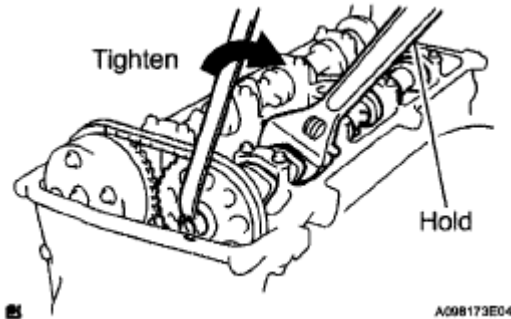


Fig. 21: Identifying Bearing Cap Bolts In Sequence

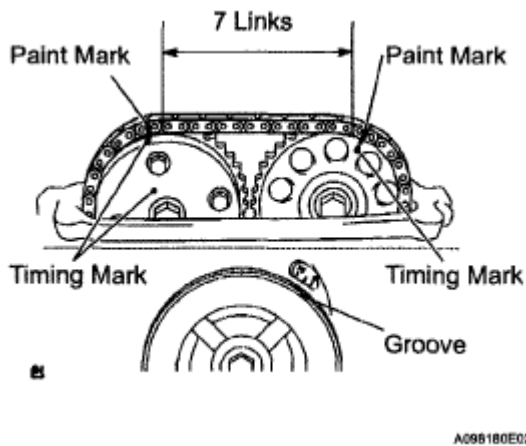
- g. While holding the camshaft with a wrench, tighten the camshaft timing sprocket set bolt.

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

NOTE: Be careful not to damage the valve lifter.

**Fig. 22: Tightening Camshaft Timing Sprocket Set Bolt**

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

**Fig. 23: Identifying Paint Marks On Chain And Camshaft Timing Gear And Sprocket**

17. INSTALL NO. 1 CHAIN TENSIONER

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

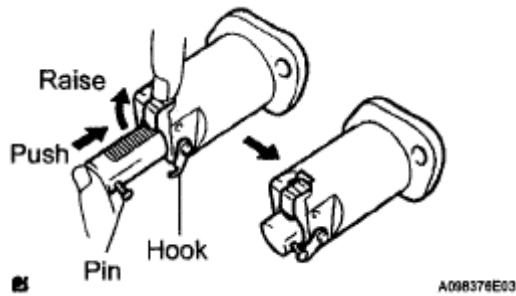


Fig. 24: Pushing Plunger And Hook

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

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

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

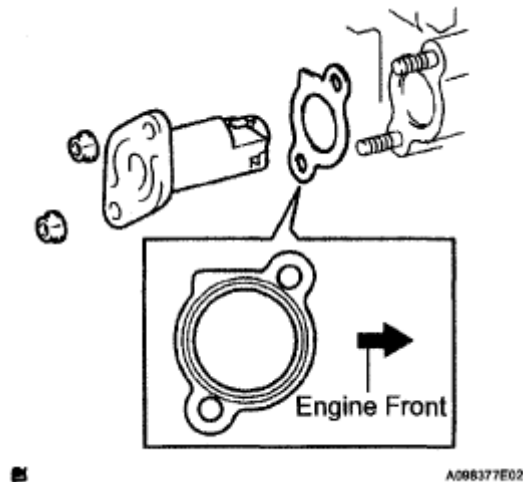


Fig. 25: Identifying Chain Tensioner Gasket And Nuts

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

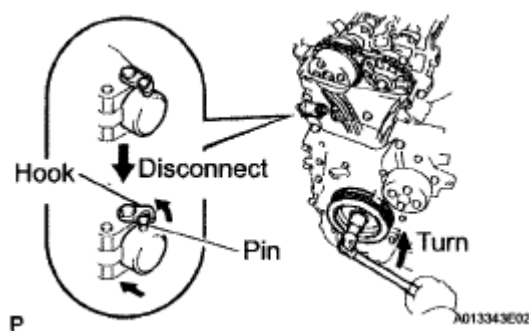
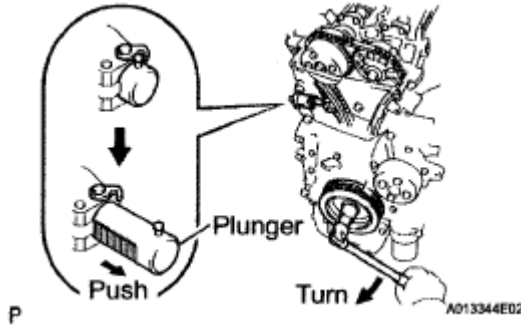


Fig. 26: Turning Crankshaft

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

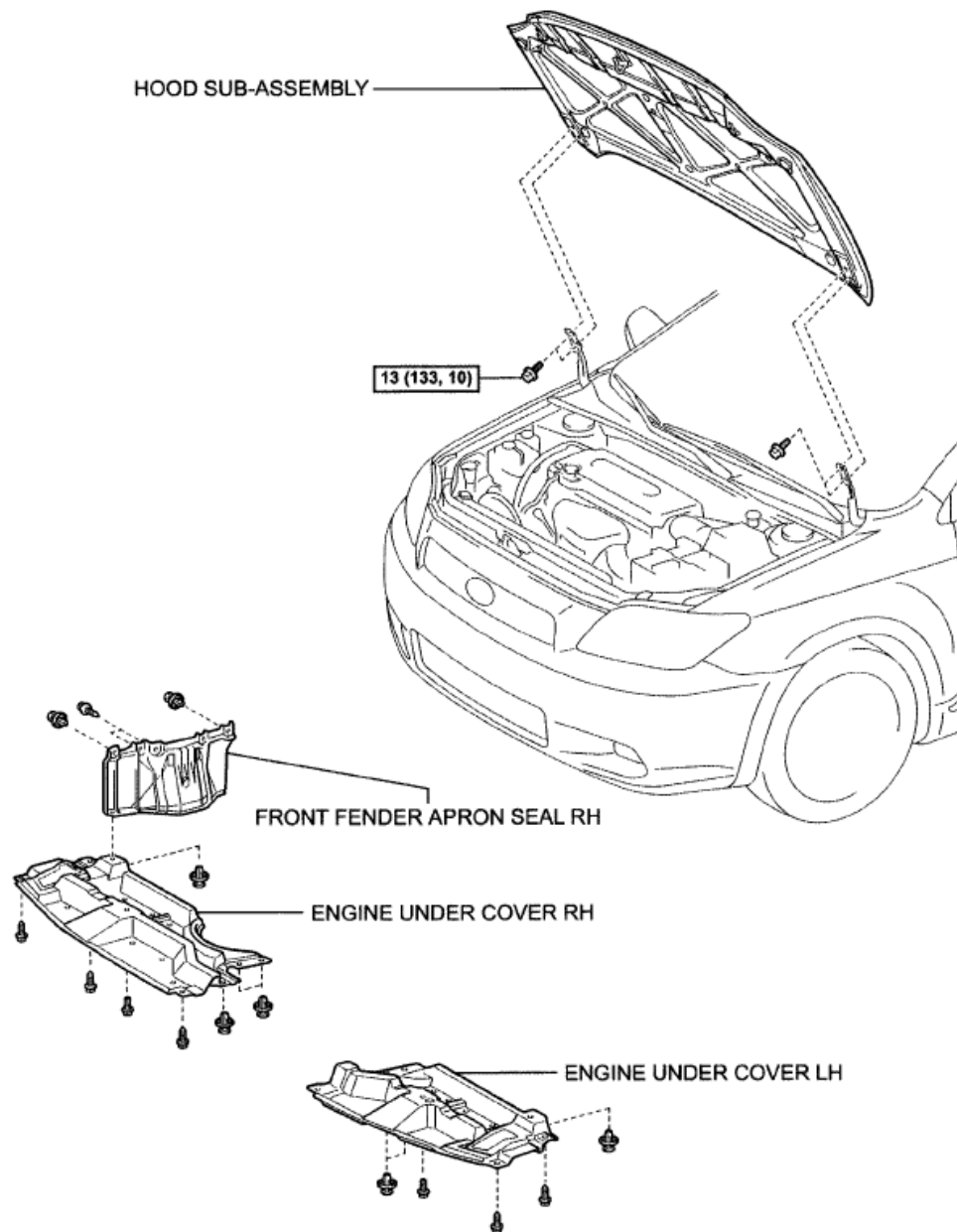
**Fig. 27: Pushing Plunger**

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

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

TIMING CHAIN

COMPONENTS



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

A114140E05

Fig. 28: Identifying Timing Chain Components With Specification (1 To 5)

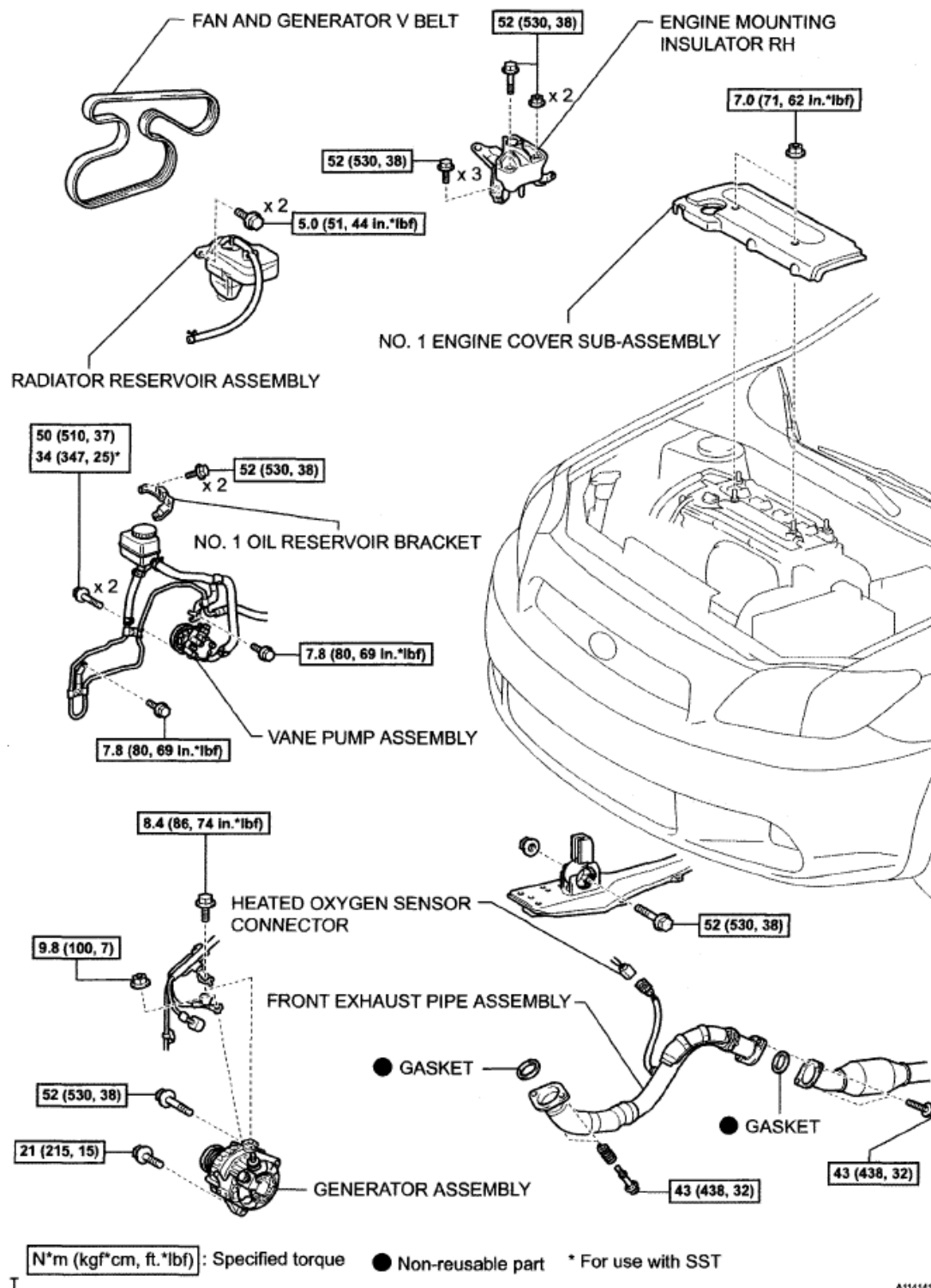
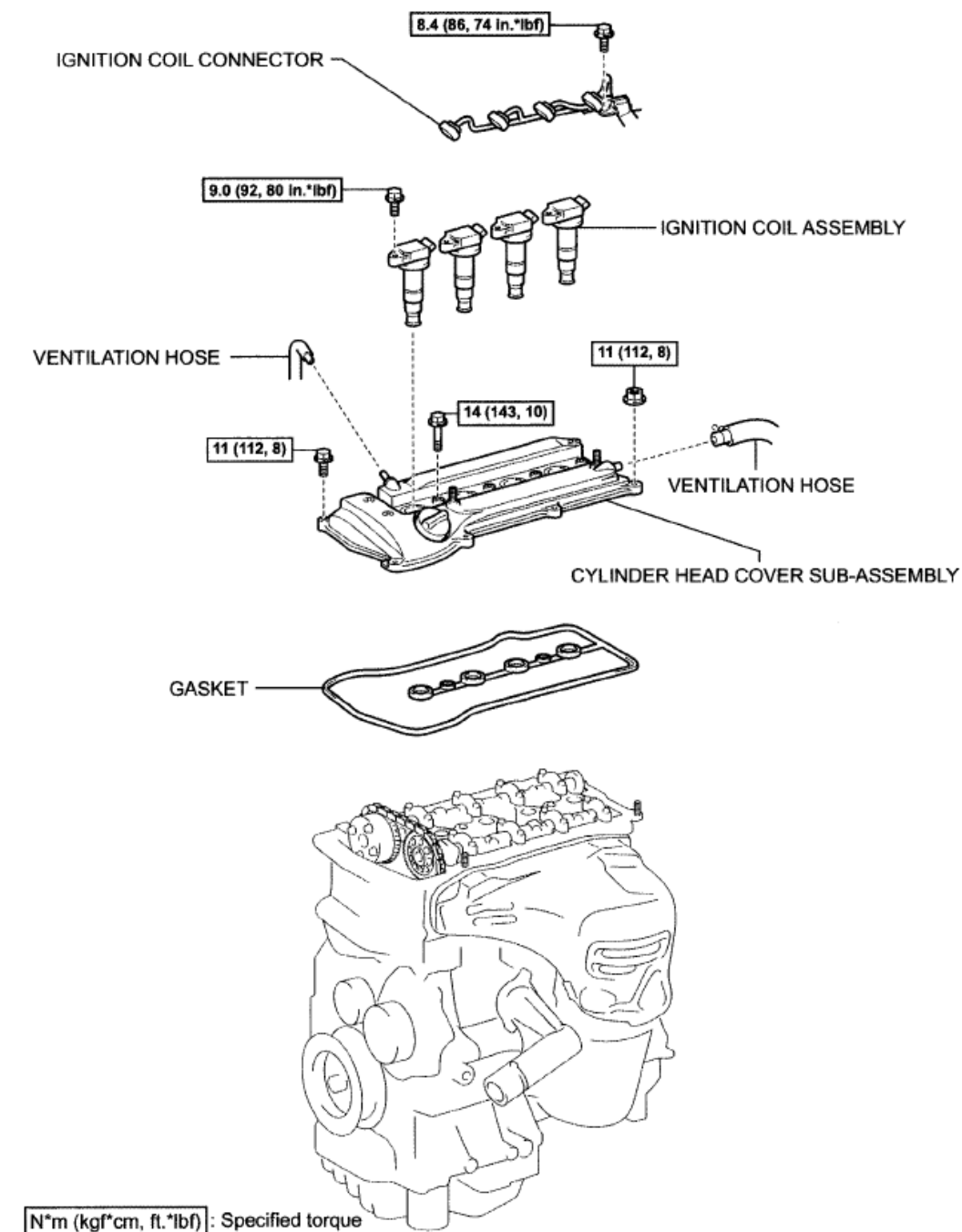


Fig. 29: Identifying Timing Chain Components With Specification (2 To 5)



A114142E02

Fig. 30: Identifying Timing Chain Components With Specification (3 To 5)

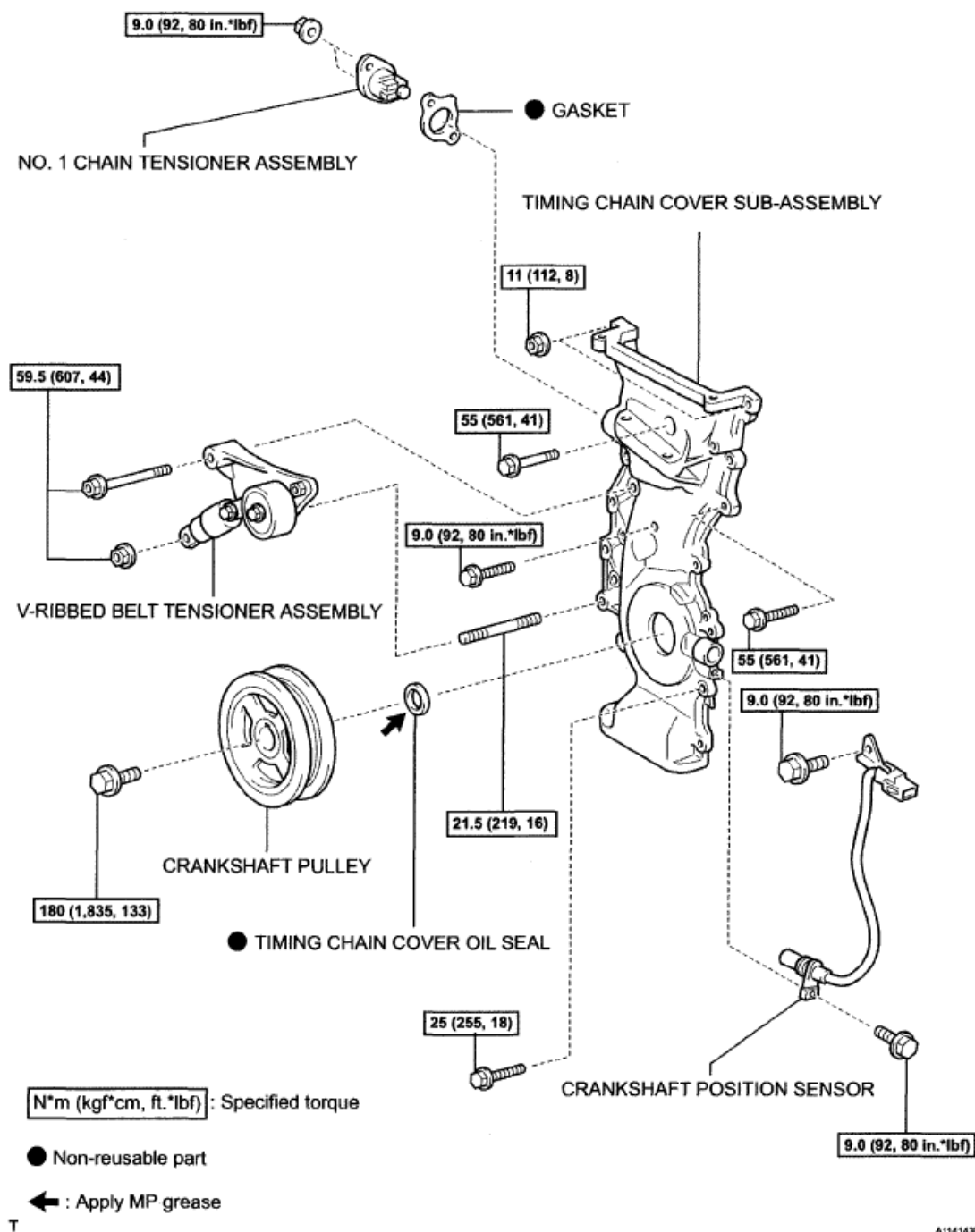
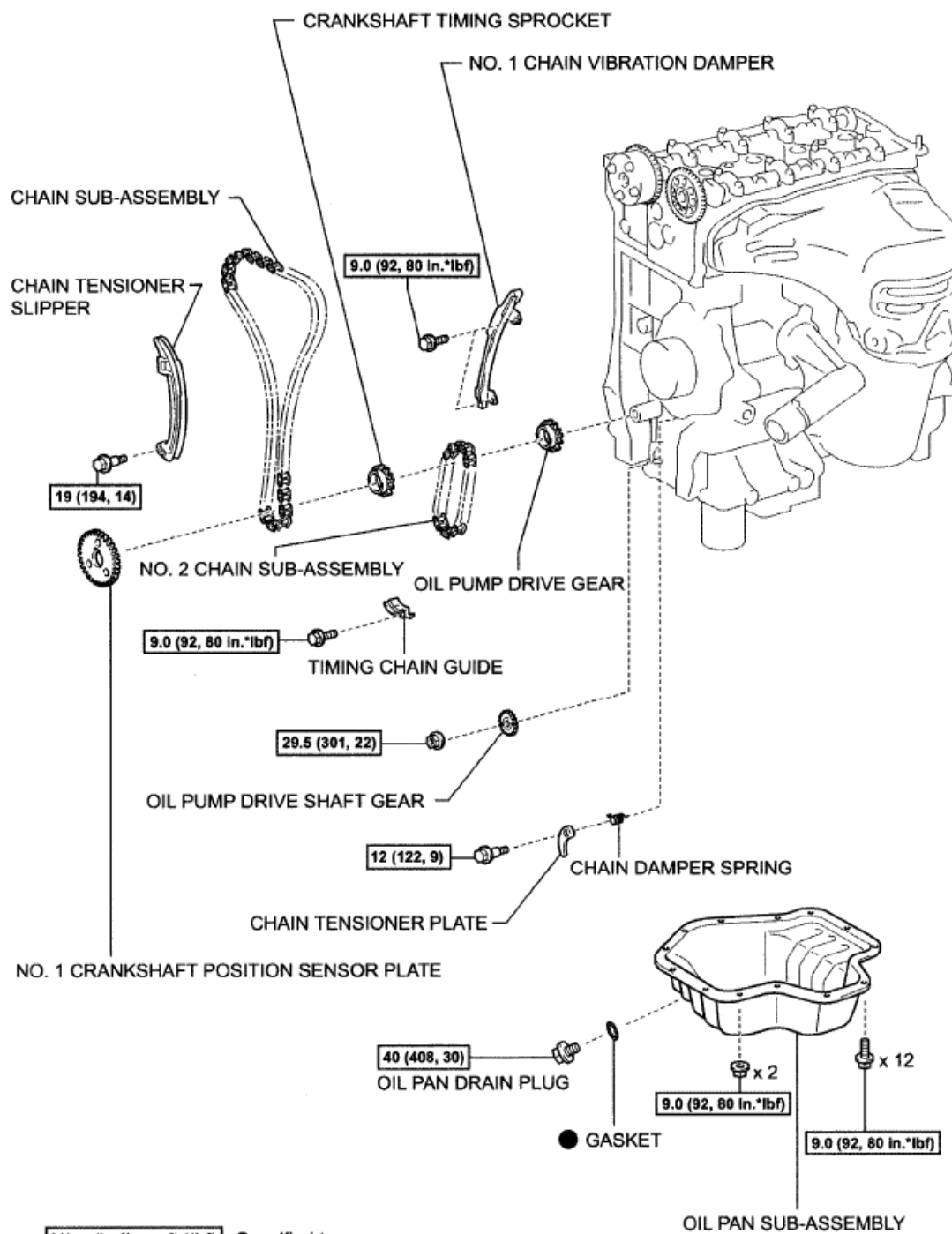


Fig. 31: Identifying Timing Chain Components With Specification (4 To 5)



A114144E03

Fig. 32: Identifying Timing Chain Components With Specification (5 To 5)**REMOVAL****1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

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

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

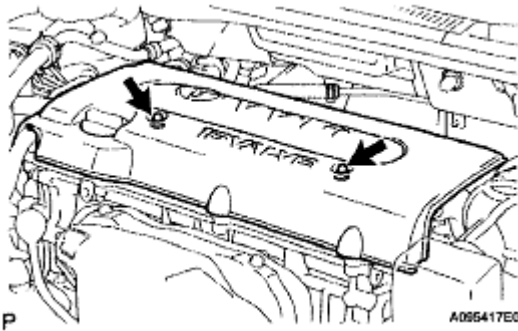


Fig. 33: Locating Engine Cover And Nuts

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

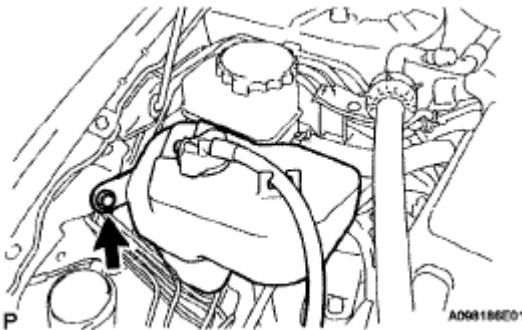


Fig. 34: Identifying Radiator Reservoir And Bolt

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

NOTE: Do not disconnect the 2 oil reservoir hoses.

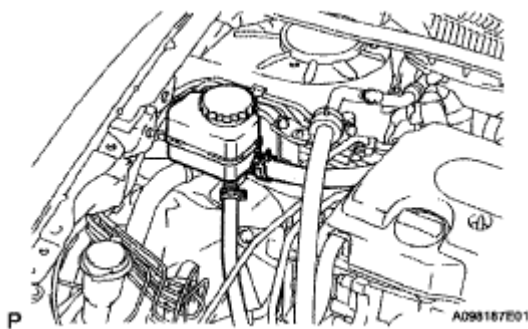


Fig. 35: Identifying Vane Pump Oil Reservoir

- c. Remove the 2 bolts.

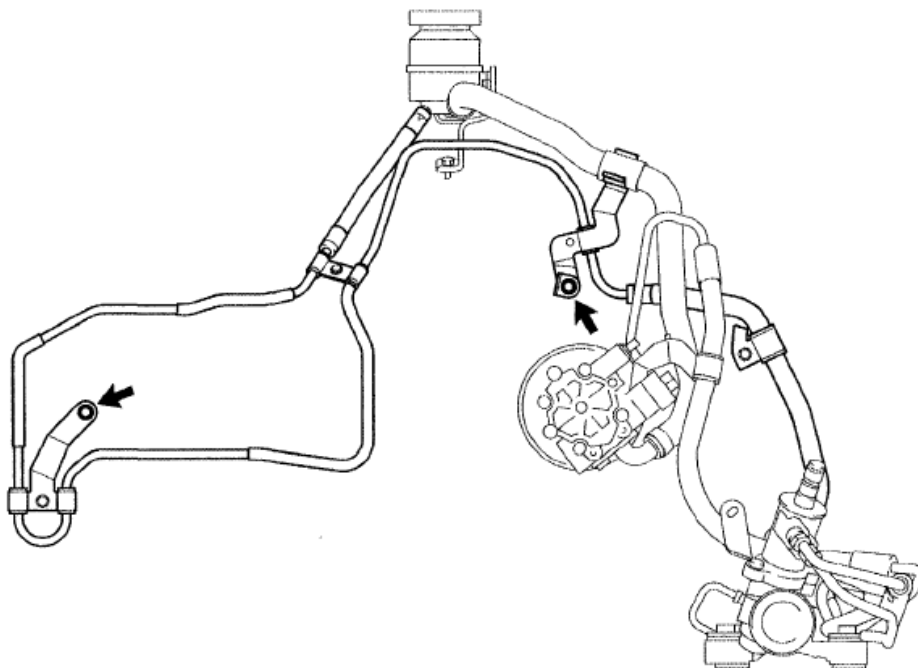


Fig. 36: Locating Oil Reservoir Bolt

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

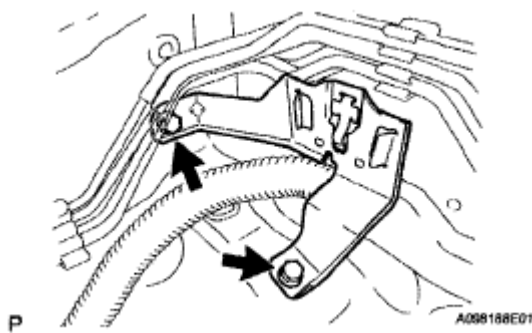


Fig. 37: Locating Oil Reservoir Bracket And Bolts

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

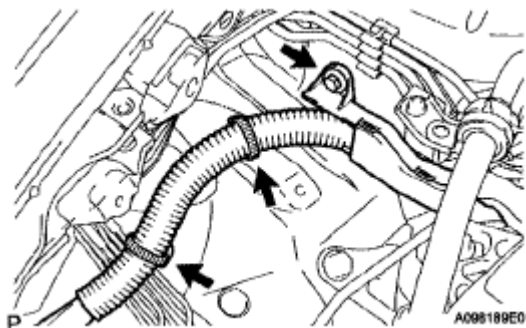


Fig. 38: Locating Clamps Of Engine Wire

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

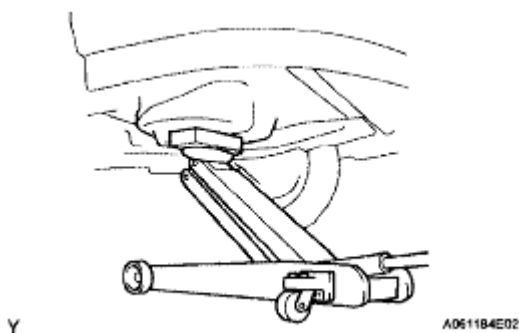


Fig. 39: Placing Transmission Jack Underneath Engine

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

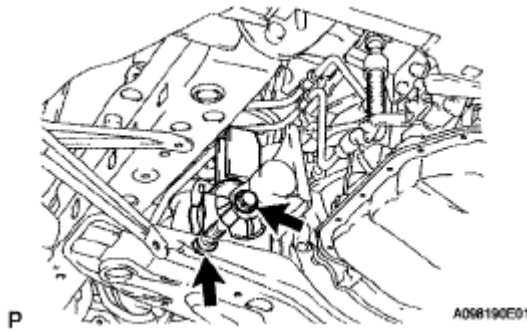


Fig. 40: Identifying Front Engine Mounting Bracket And Bolt

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

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

HINT:

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

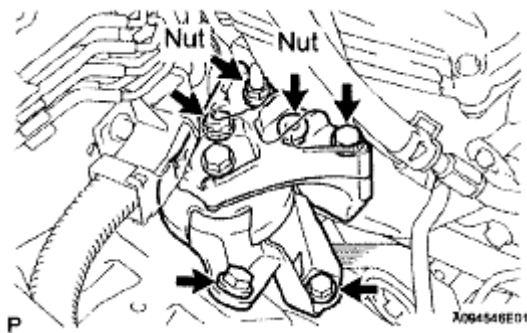


Fig. 41: Locating Engine Mounting Insulator, Nuts And Bolts

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

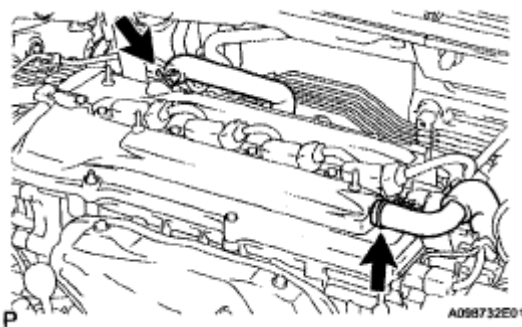


Fig. 42: Locating Ventilation Hoses From Cylinder Head Cover

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

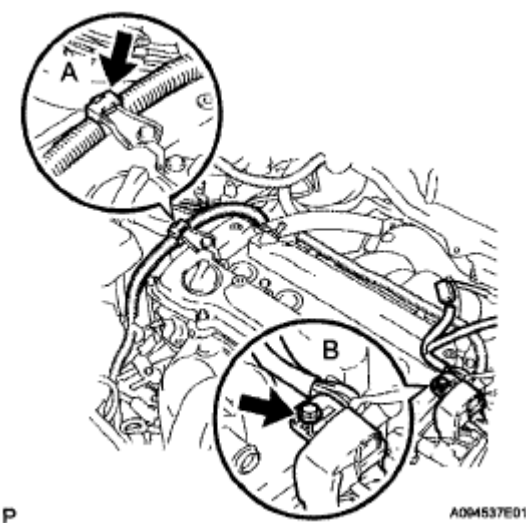


Fig. 43: Locating Engine Wire Label

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

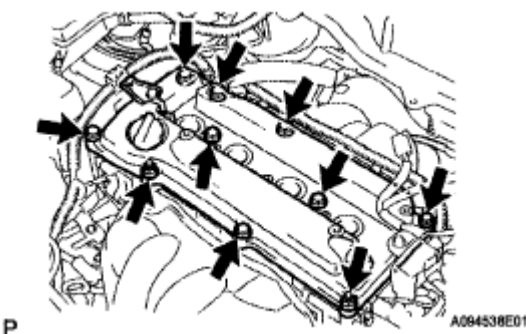


Fig. 44: Locating Cylinder Head Cover, Nuts And Bolts

16. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

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

NOTE: Do not lift the engine more than necessary.

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

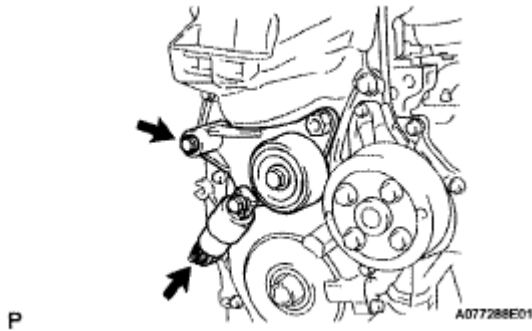
17. REMOVE CRANKSHAFT POSITION SENSOR (See REMOVAL)

Fig. 45: Locating V-Ribbed Belt Tensioner And Bolt

18. REMOVE OIL PAN SUB-ASSEMBLY

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

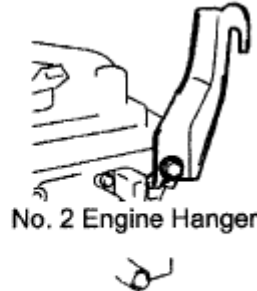
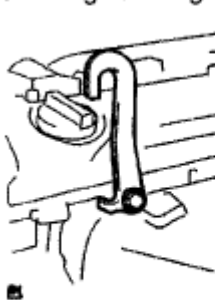
Torque: 38 N*m (387 kgf*cm, 28 ft.*lbf) Parts No.

OIL PAN SUB-ASSEMBLY ITEM REFERENCE

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

- b. Using a chain block and sling device, hold the engine.

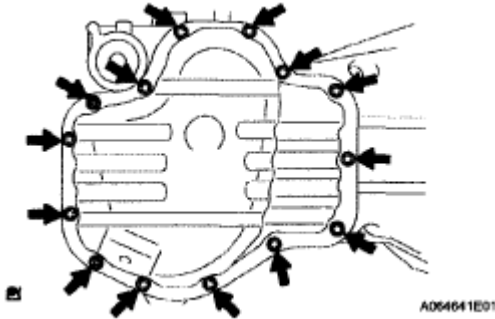
No. 1 Engine Hanger



A09B647E01

Fig. 46: Identifying Engine Hanger

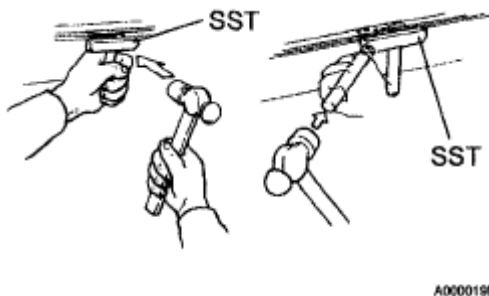
- c. Remove the 12 bolts and 2 nuts.

**Fig. 47: Locating Chain Block, Bolts And Nuts**

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

SST 09032-00100

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

**Fig. 48: Inserting Blade Of SST Between Crankcase**

19. SET NO. 1 CYLINDER TO TDC/COMPRESSION

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

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

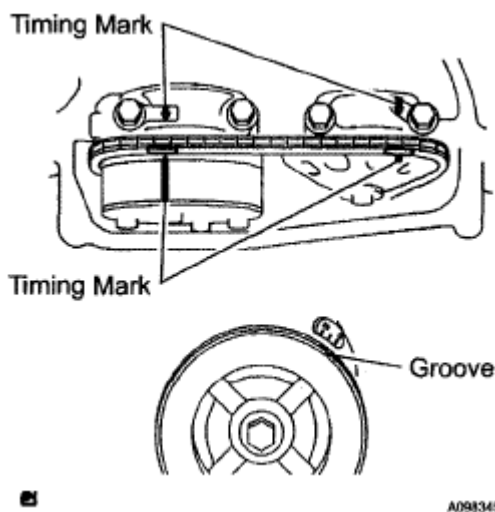


Fig. 49: Checking Timing Mark Of Camshaft Timing Gears

20. REMOVE CRANKSHAFT PULLEY

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

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

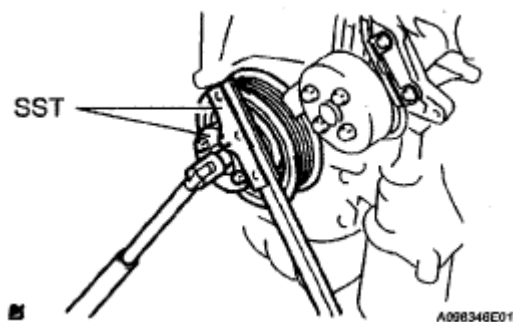


Fig. 50: Loosening Pulley Bolt With SST

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

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

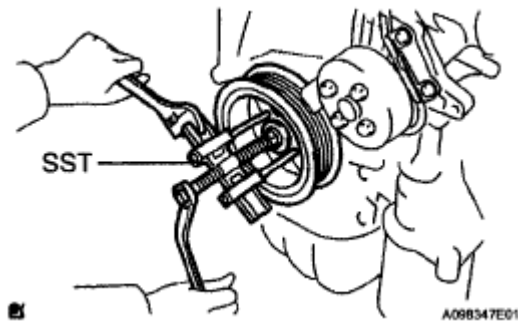


Fig. 51: Removing Crankshaft Pulley With SST

21. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

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

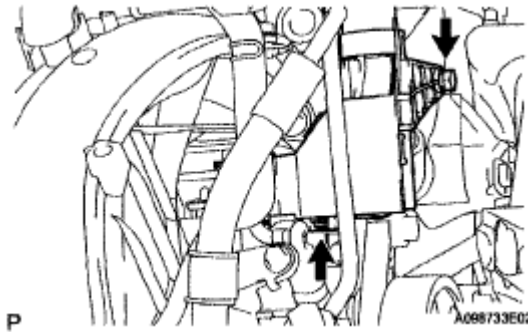


Fig. 52: Locating Wire Harness Protector Clamp

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

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

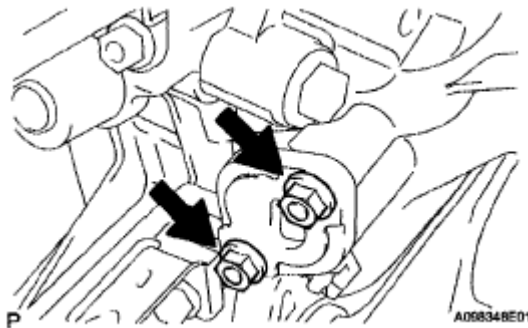


Fig. 53: Locating Chain Tensioner And Nuts

22. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

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

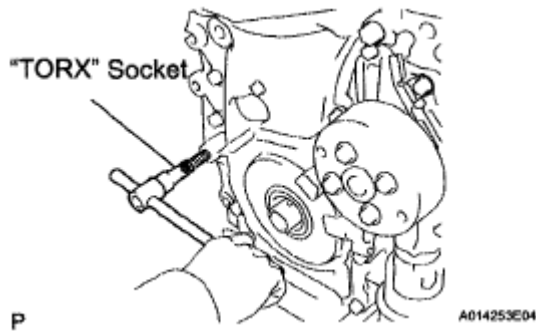


Fig. 54: Removing Timing Chain Cover Sub-Assembly

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

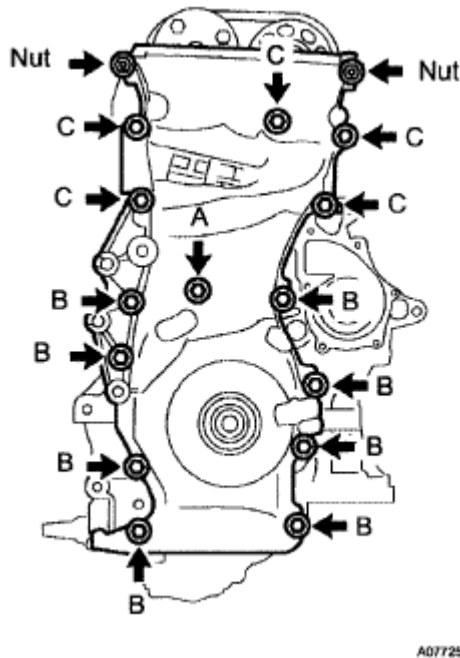


Fig. 55: Locating Timing Chain Cover Bolts

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

23. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE

24. REMOVE TIMING CHAIN GUIDE

- a. Remove the bolt and timing chain guide.

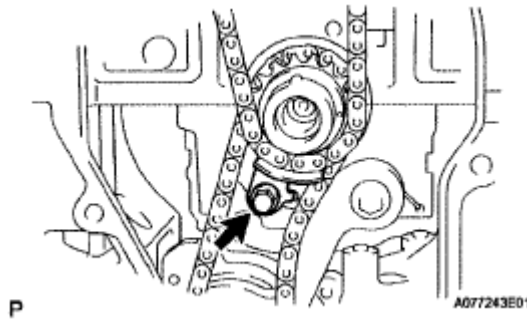


Fig. 56: Locating Timing Chain Guide With Bolt

25. REMOVE CHAIN TENSIONER SLIPPER

- a. Remove the bolt and chain tensioner slipper.

26. REMOVE CHAIN SUB-ASSEMBLY

27. REMOVE NO. 1 CHAIN VIBRATION DAMPER

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

28. REMOVE CRANKSHAFT TIMING SPROCKET

29. REMOVE NO. 2 CHAIN SUB-ASSEMBLY

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

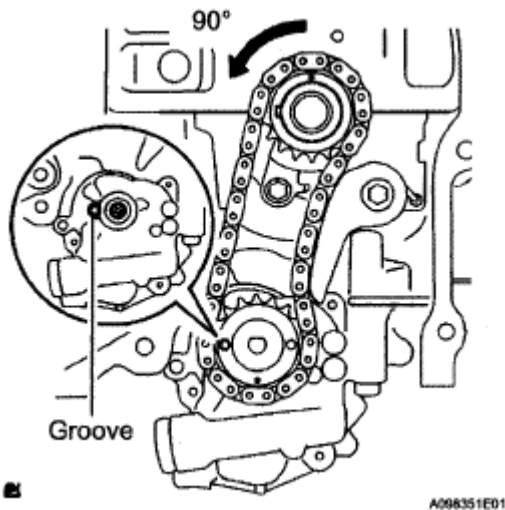


Fig. 57: Turning Crankshaft

- b. Insert a 4 mm diameter bar into the adjusting hole of the oil pump drive shaft gear to lock the gear in position, then remove the nut.

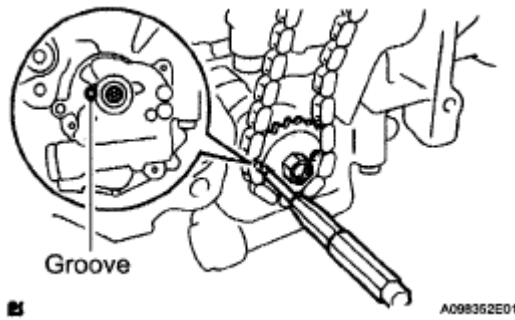


Fig. 58: Adjusting Hole Of Oil Pump Drive Shaft Gear To Lock Gear

- c. Remove the bolt, chain tensioner plate and spring.
- d. Remove the oil pump drive gear, oil pump drive shaft gear and No. 2 chain.

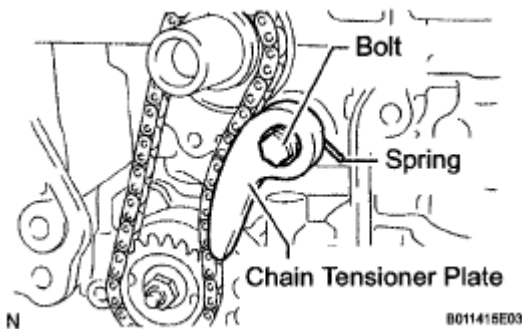


Fig. 59: Identifying Chain Tensioner Plate, Spring And Bolts

INSPECTION

1. INSPECT NO. 1 CHAIN TENSIONER

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

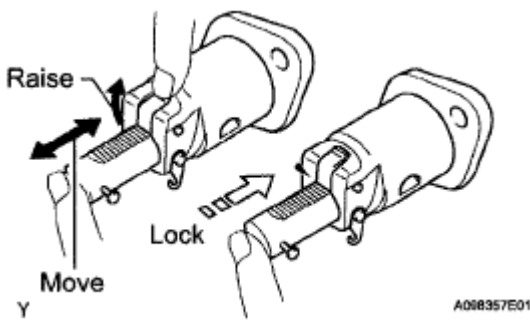


Fig. 60: Checking Plunger

2. INSPECT CHAIN SUB-ASSEMBLY

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

Maximum chain elongation:

122.6 mm (4.827 in.)

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

HINT:

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

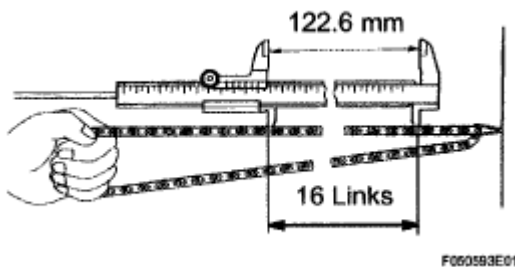


Fig. 61: Inspecting Chain Sub-Assembly

3. INSPECT CHAIN TENSIONER SLIPPER

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

Maximum wear:

1.0 mm (0.039 in.)

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

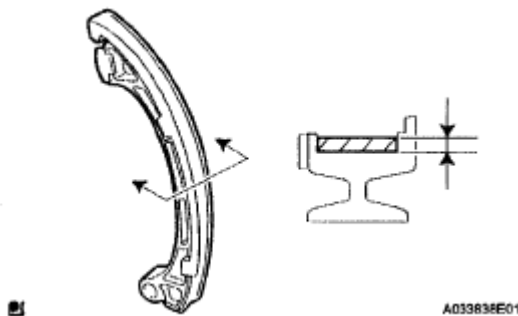


Fig. 62: Inspecting Chain Tensioner Slipper

4. INSPECT NO. 1 CHAIN VIBRATION DAMPER

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

Maximum wear:**1.0 mm (0.039 in.)**

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

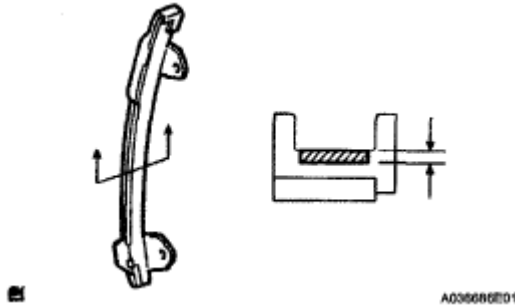


Fig. 63: Measuring Vibration Damper Wear

5. INSPECT CRANKSHAFT TIMING SPROCKET

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

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

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

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

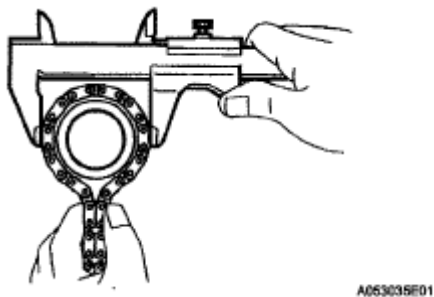


Fig. 64: Measuring Timing Gear Diameter With Chain

6. INSPECT OIL PUMP DRIVE GEAR

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

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

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

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

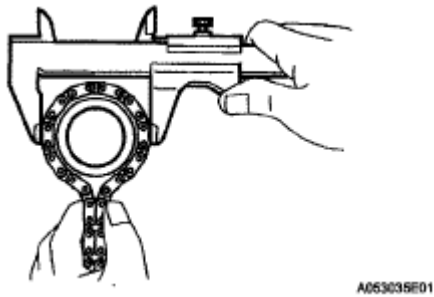


Fig. 65: Measuring Timing Gear Diameter With Chain

7. INSPECT OIL PUMP DRIVE SHAFT GEAR

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

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

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

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

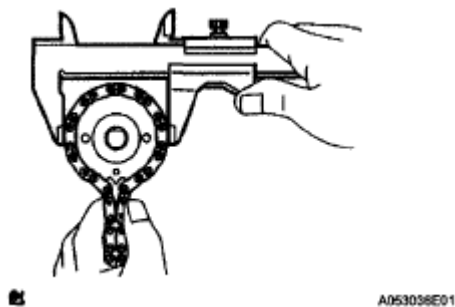


Fig. 66: Measuring Drive Shaft Gear Diameter With Chain

REPLACEMENT

1. REMOVE TIMING CHAIN COVER OIL SEAL

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

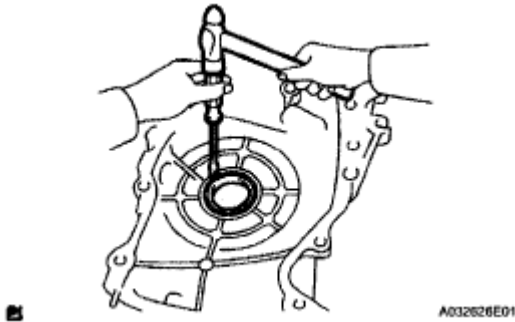


Fig. 67: Removing Timing Chain Cover Oil Seal

2. INSTALL TIMING CHAIN COVER OIL SEAL

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

SST 09223-22010

NOTE:

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

HINT:

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

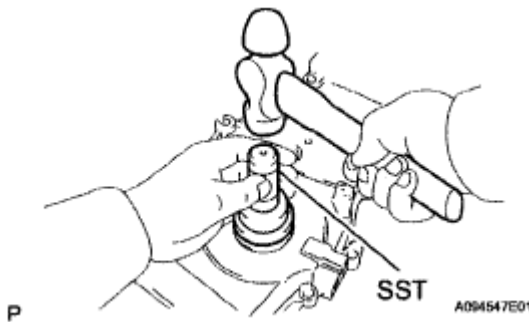


Fig. 68: Taping Oil Seal

INSTALLATION

1. INSTALL NO. 2 CHAIN SUB-ASSEMBLY

- a. Set the crankshaft key in the left horizontal position.
- b. Turn the cutout of the drive shaft to the top.

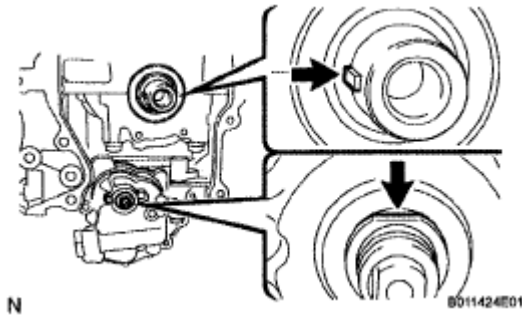


Fig. 69: Locating Chain Sub-Assembly

- c. Align the yellow mark links with the timing marks of the each gear as shown in the illustration.
- d. Install the gears onto the crankshaft and oil pump shaft with the chain wrapped on the gears.
- e. Temporarily tighten the oil pump drive shaft gear with the nut.

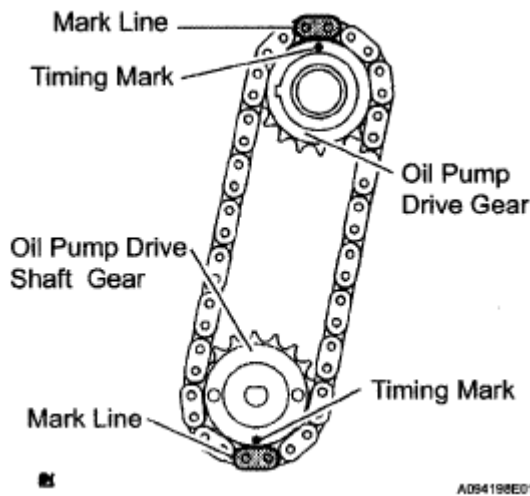


Fig. 70: Identifying Oil Pump Drive Shaft Gear, Timing Gear And Mark Line

- f. Insert the damper spring into the adjusting hole, then install the chain tensioner plate with the bolt.

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

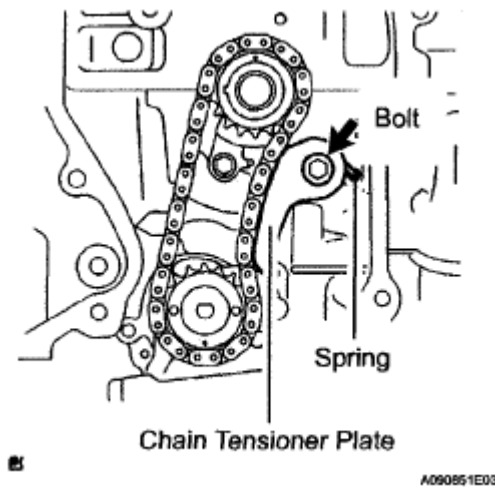


Fig. 71: Locating Chain Tensioner Plate With Bolt

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

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

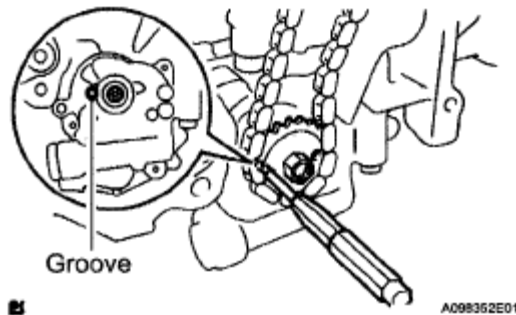


Fig. 72: Adjusting Hole Of Oil Pump Drive Shaft Gear To Lock Gear

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

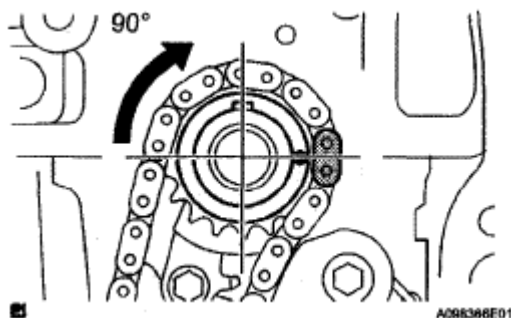


Fig. 73: Turning Crankshaft Position

2. INSTALL CRANKSHAFT TIMING SPROCKET**3. INSTALL NO. 1 CHAIN VIBRATION DAMPER**

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

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

4. INSTALL CHAIN SUB-ASSEMBLY

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

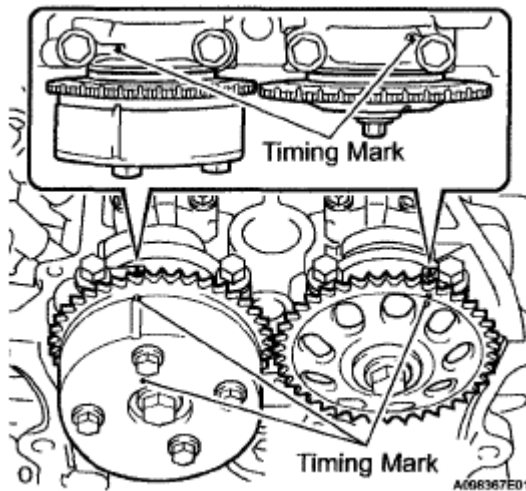


Fig. 74: Identifying Timing Marks Of Camshaft Timing Gear

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

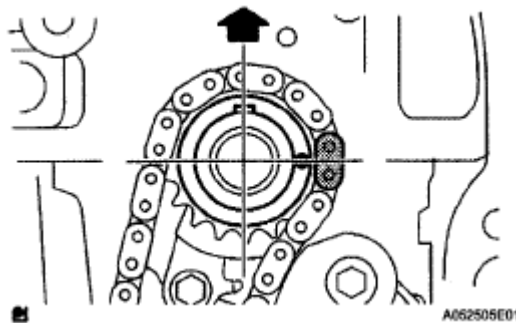


Fig. 75: Identifying Crankshaft Upward Position

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

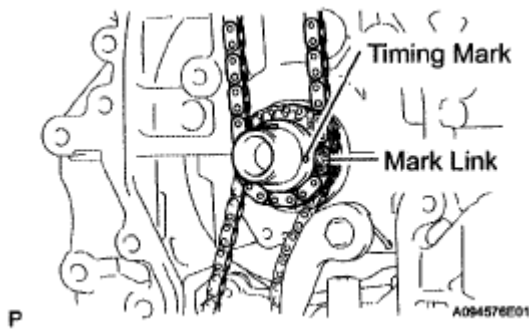


Fig. 76: Identifying Crankshaft Timing Mark And Mark Link

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

SST 09309-37010

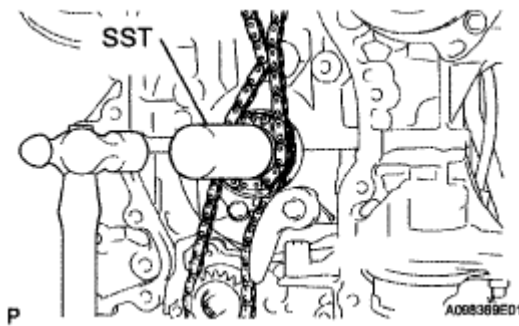


Fig. 77: Identifying SST

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

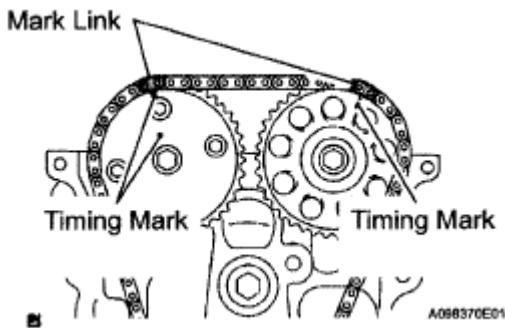


Fig. 78: Identifying Timing Mark On Camshaft Timing Gear And Sprocket

5. INSTALL CHAIN TENSIONER SLIPPER

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

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

6. INSTALL TIMING CHAIN GUIDE

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

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

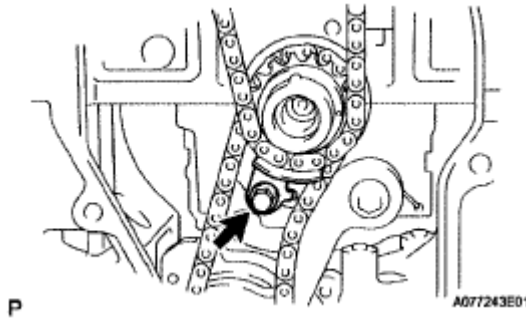


Fig. 79: Locating Timing Chain Guide With Bolt

7. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE

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

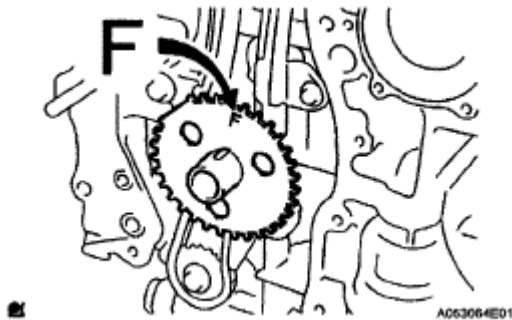


Fig. 80: Installing Crankshaft Position Sensor Plate

8. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.
- b. Apply of seal packing (Diameter 2.0 mm (0.079 in.)) as shown in the illustration.

Seal packing:

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

NOTE:

- Remove any oil from the contact surface.
- Install the chain cover within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the

chain cover.

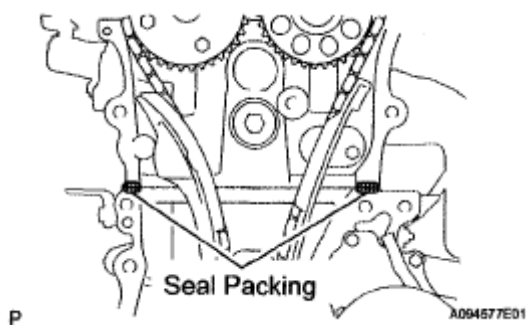


Fig. 81: Identifying Seal Packing

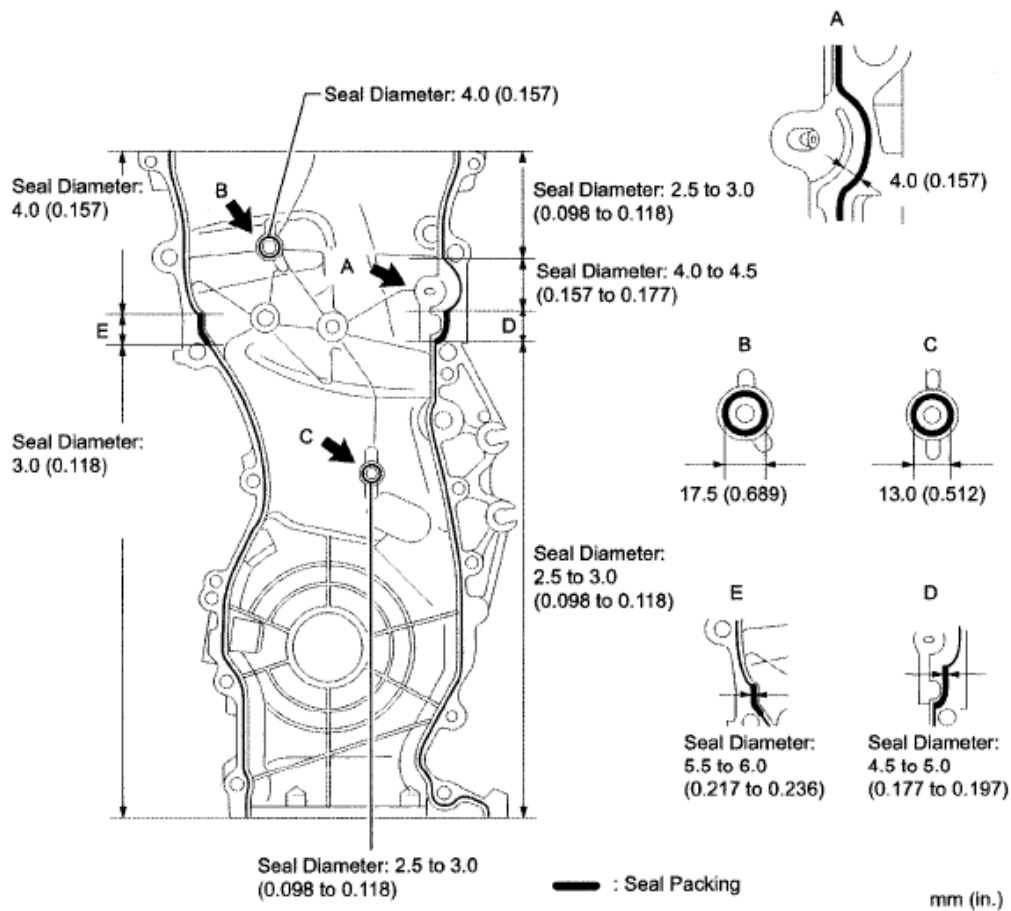
- c. Apply a continuous bead of seal packing as shown in the illustration.

Seal packing:

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

NOTE:

- Remove any oil from the contact surface.
- Install the chain cover within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the chain cover.



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Fig. 82: Locating Area Of Seal

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

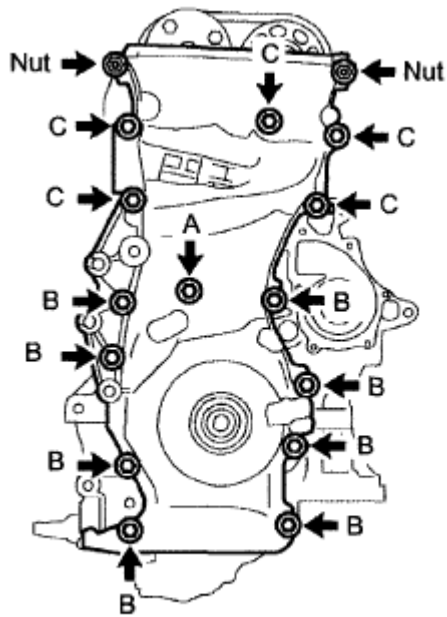
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf) for bolt A 25 N*m (255 kgf*cm, 18 ft.*lbf) for bolt B 55 N*m (561 kgf*cm, 41 ft.*lbf) for bolt C 11 N*m (112 kgf*cm, 8 ft.*lbf) for nut

HINT:

Bolt length:

TIMING CHAIN COVER BOLT LENGTH CHART

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



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Fig. 83: Locating Timing Chain Cover With Bolts

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

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

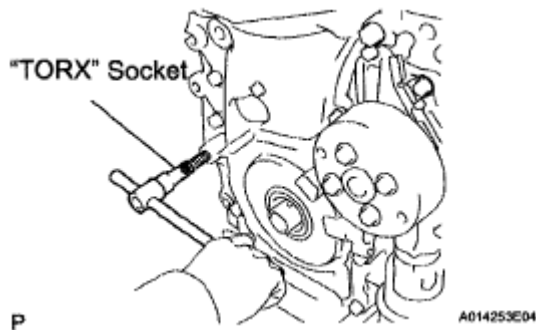


Fig. 84: Installing Stud Bolt For V-Ribbed Belt Tensioner

9. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

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

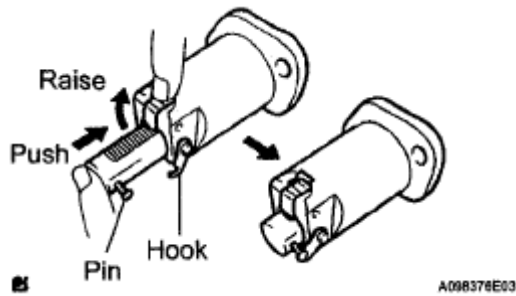


Fig. 85: Pushing Plunger And Hook

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

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

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

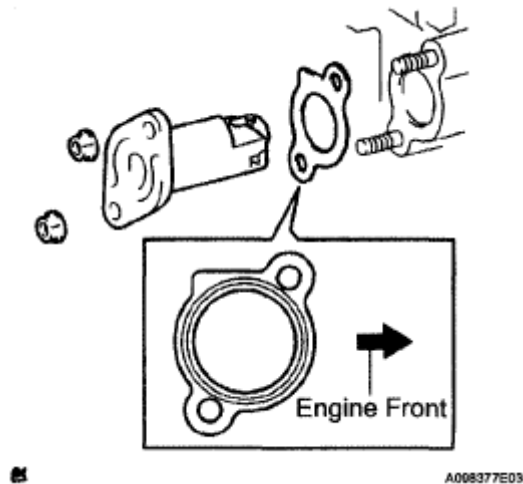


Fig. 86: Identifying Chain Tensioner, Gasket And Nuts

10. INSTALL CRANKSHAFT PULLEY

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

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

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

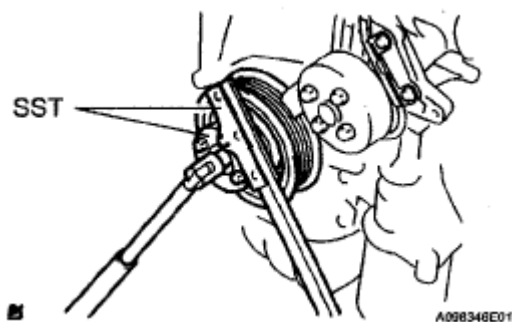


Fig. 87: Installing Crankshaft Pulley

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

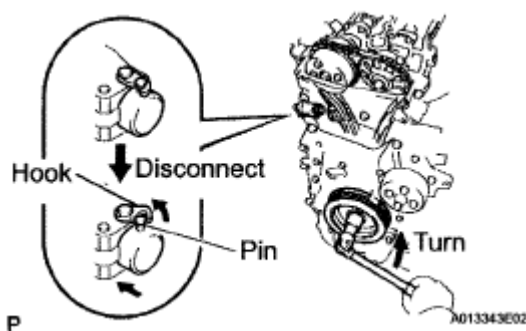


Fig. 88: Disconnecting Plunger Knock Pin From Hook

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

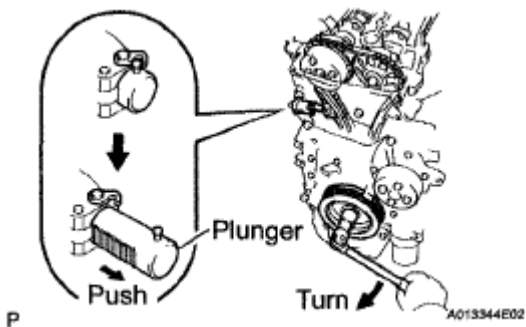


Fig. 89: Identifying Plunger Extended

- d. Connect the wire harness protector clamp.
e. Install the bolt.

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

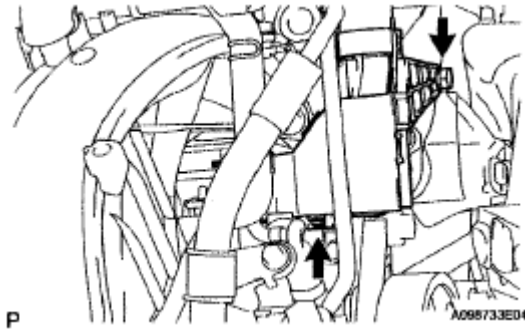


Fig. 90: Connecting Wire Harness Protector Clamp

11. INSTALL OIL PAN SUB-ASSEMBLY

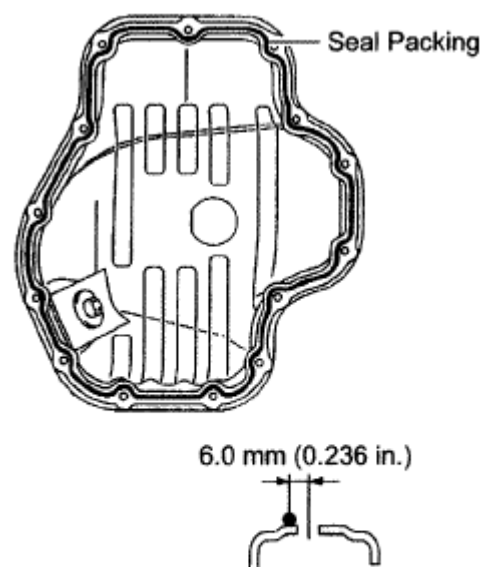
- Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and oil pan.
- Apply a continuous bead of seal packing (Diameter 3.0 to 4.0 mm (0.118 to 0.157 in.)) as shown in the illustration.

Seal packing:

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

NOTE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the oil pan.



Seal Diameter: 3.0 to 4.0 mm

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Fig. 91: Identifying Seal Diameter

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

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

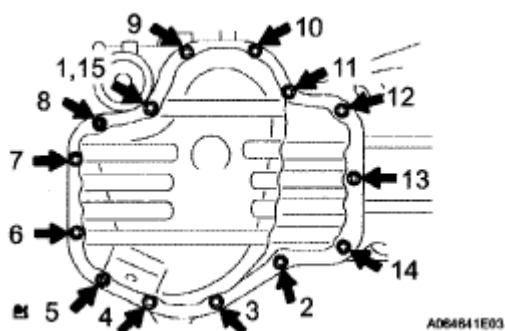


Fig. 92: Locating Oil Pan Bolts Sequence

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

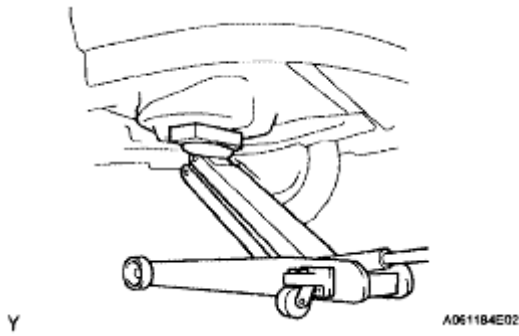


Fig. 93: Placing Transmission Jack Underneath Engine

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

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

NOTE: Do not lift the engine more than necessary.

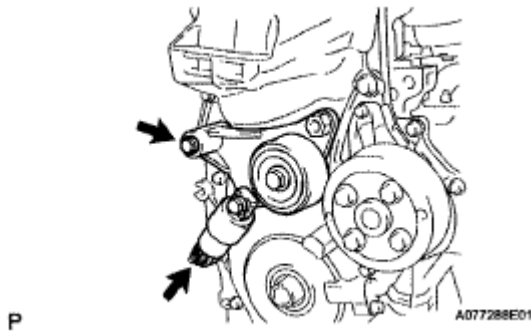


Fig. 94: Locating V-Ribbed Belt Tensioner And Bolt

14. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY**
 - a. Remove any old packing material from the contact surface.
 - b. Apply seal packing to the 2 locations shown in the illustration.

Seal packing:

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

- NOTE:**
- Remove any oil from the contact surface.
 - Install the oil pan within 3 minutes of applying seal packing.

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

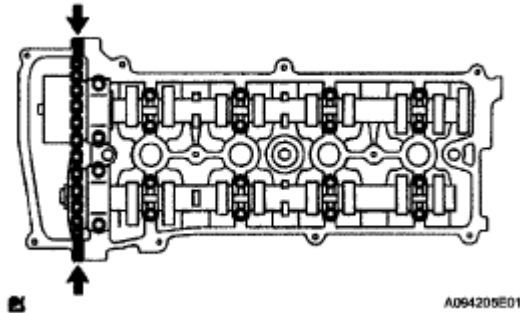


Fig. 95: Locating Area Of Seal Packing

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

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt A 14 N*m (143 kgf*cm, 10 ft.*lbf) for bolt B 11 N*m (112 kgf*cm, 8 ft.*lbf) for nut

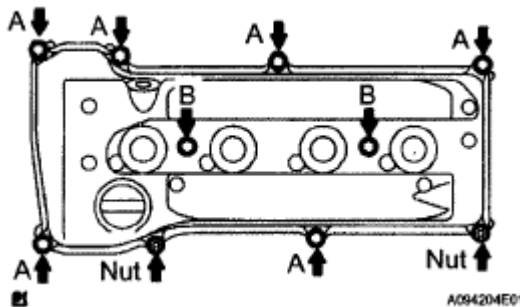


Fig. 96: Locating Cylinder Head Cover Bolts And Nuts

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

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

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

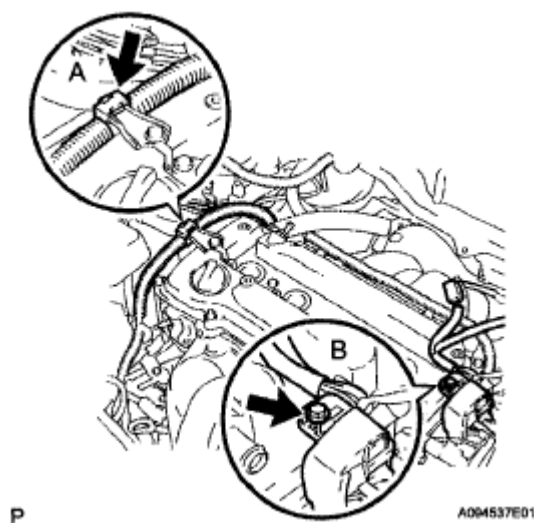


Fig. 97: Locating Clamp Of Engine Wire Label

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

15. INSTALL IGNITION COIL ASSEMBLY (See REMOVAL)

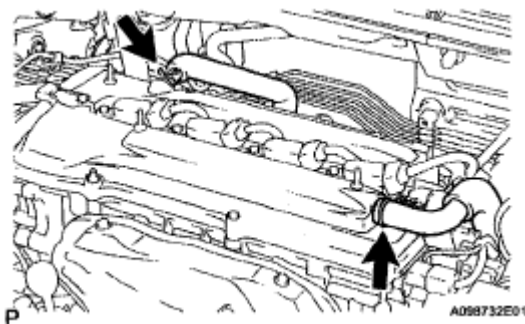


Fig. 98: Locating Ventilation Hoses To Cylinder Head Cover

16. INSTALL ENGINE MOUNTING INSULATOR RH

- a. Install the engine mounting insulator RH with the 4 bolts and 2 nuts.

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

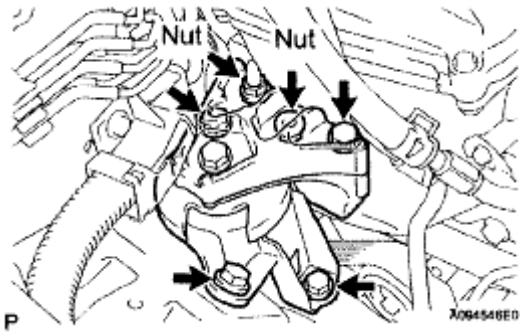


Fig. 99: Locating Engine Mounting Insulator With Bolts And Nuts

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

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

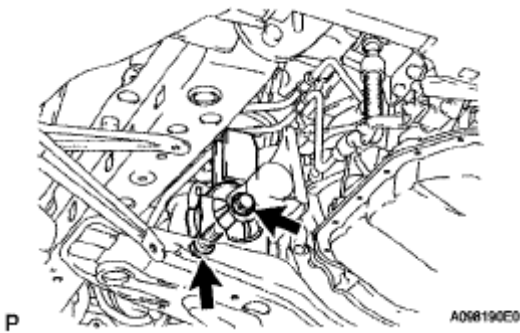


Fig. 100: Locating Front Engine Mounting Insulator With Bolt And Nut

- c. Connect the 2 clamps of the engine wire.
d. Install the wire harness protector with the bolt.

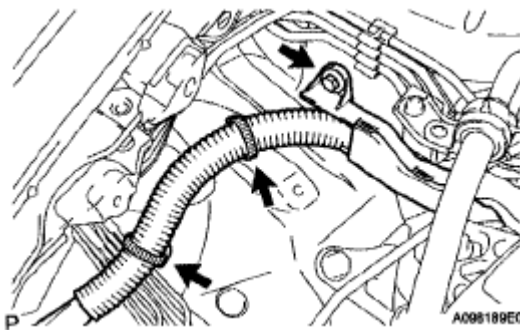


Fig. 101: Locating Clamps Of Engine Wire

- e. Install the No. 1 oil reservoir bracket with the 2 bolts.

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

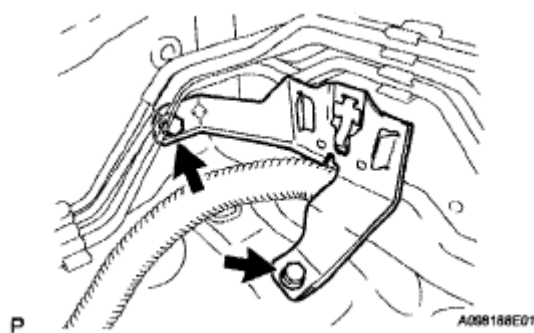


Fig. 102: Locating Oil Reservoir Bracket With Bolts

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

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

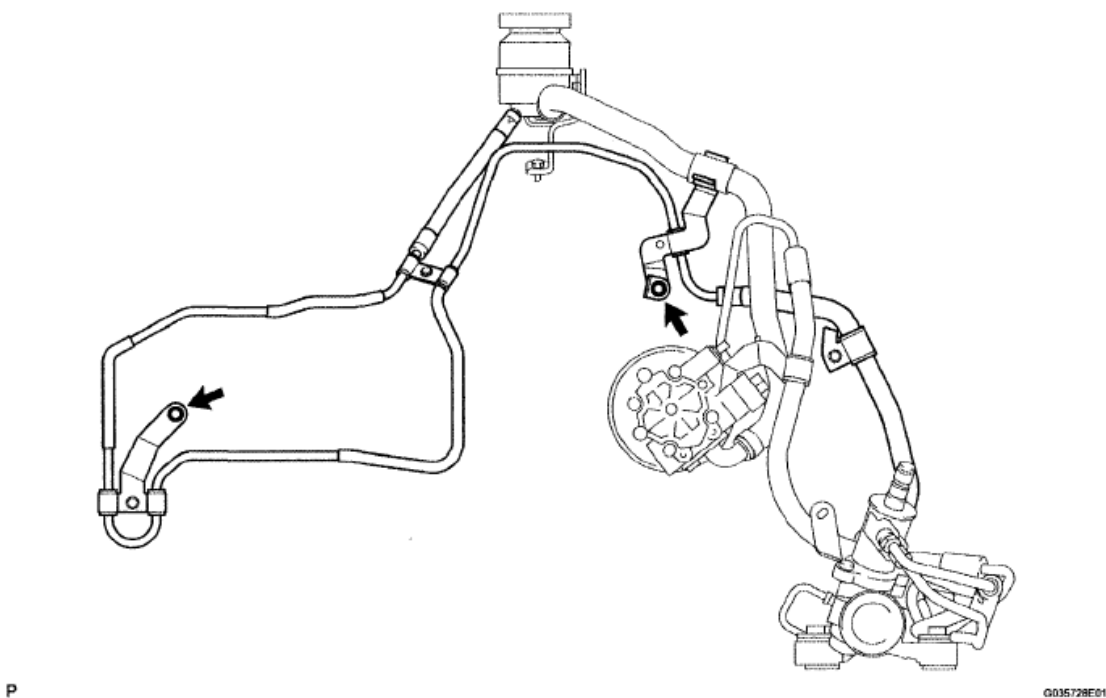


Fig. 103: Locating Oil Reservoir Bolt

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

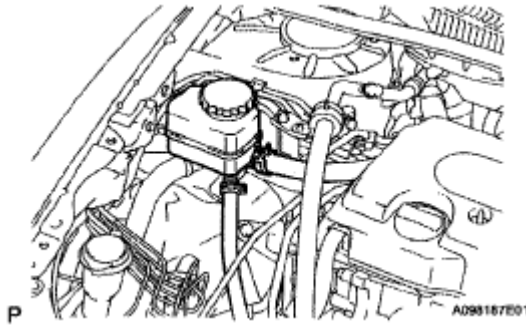


Fig. 104: Identifying Vane Pump Oil Reservoir

- h. Install the radiator reservoir with the bolt.

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

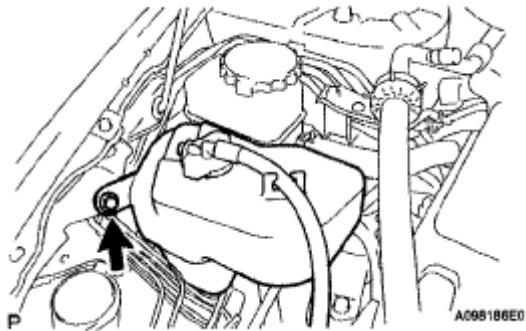


Fig. 105: Locating Radiator Reservoir With Bolt

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

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

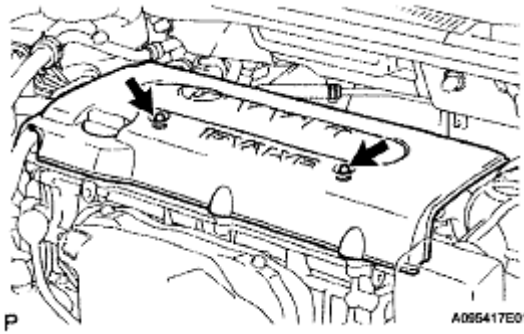


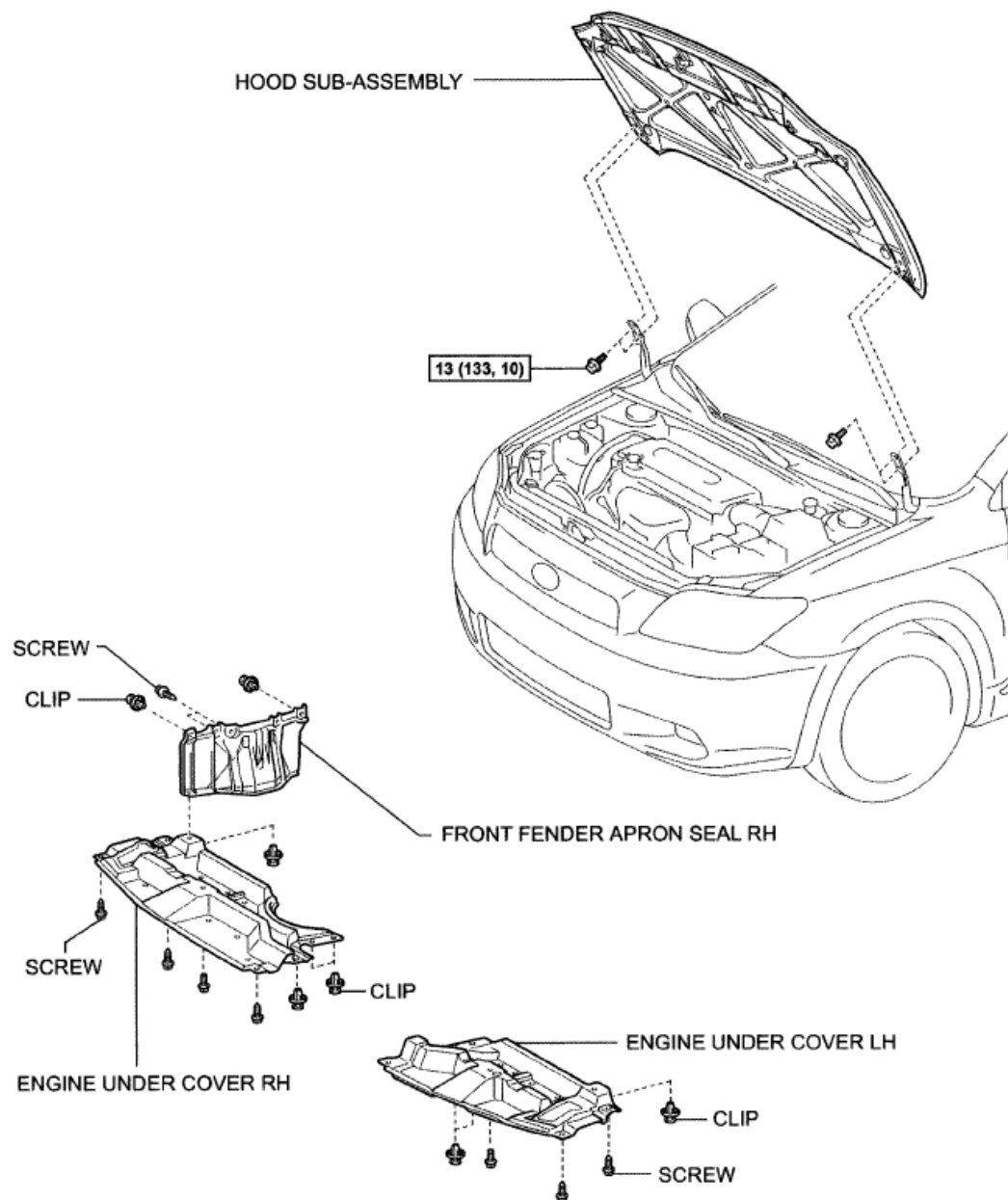
Fig. 106: Locating Engine Cover And Nuts

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

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

CYLINDER HEAD

COMPONENTS

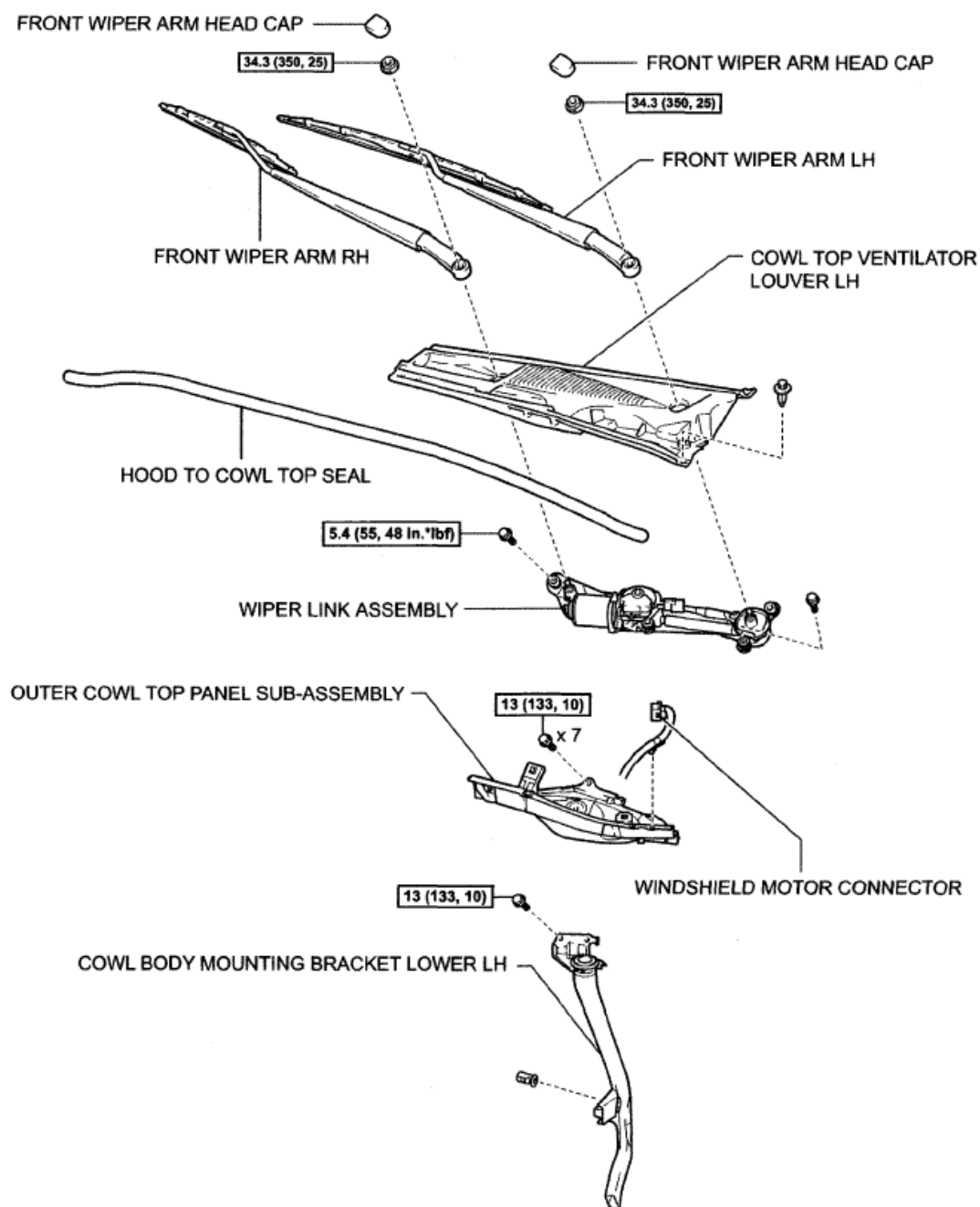


N*m (kgf*cm, ft.*lbf) : Specified torque

T

A114140E03

Fig. 107: Identifying Cylinder Head Components With Specification (1 Of 13)



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Fig. 108: Identifying Cylinder Head Components With Specification (2 Of 13)

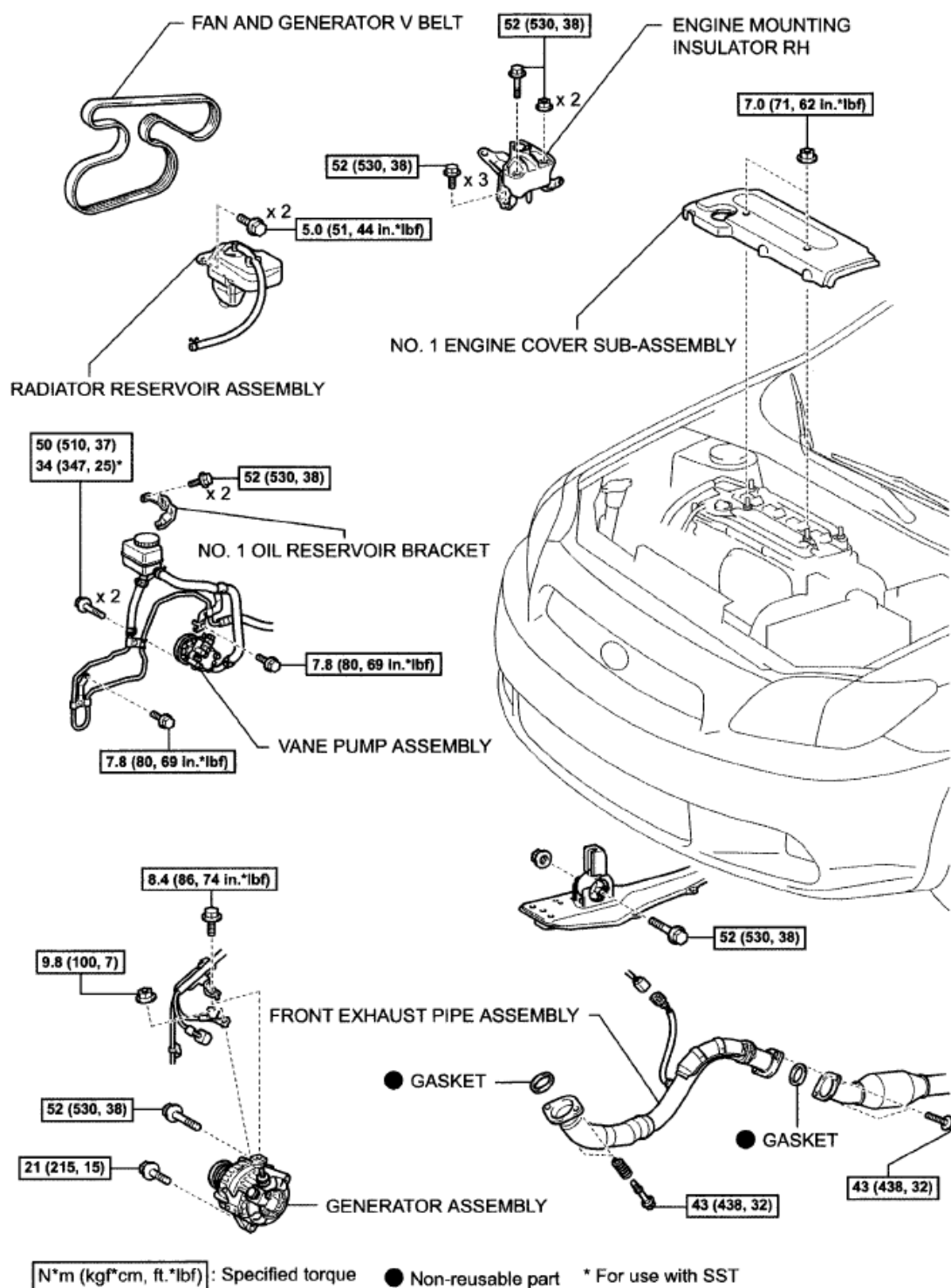
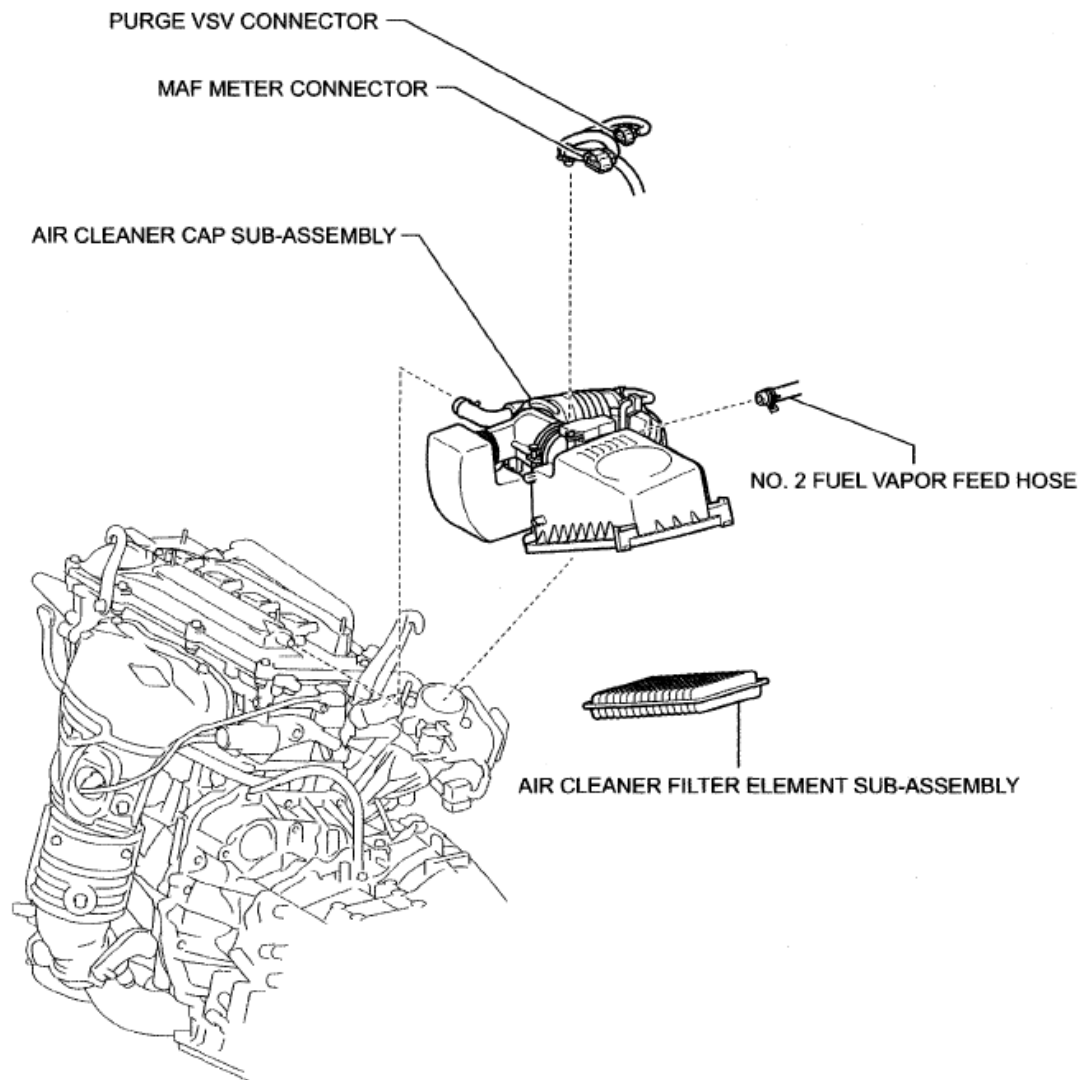


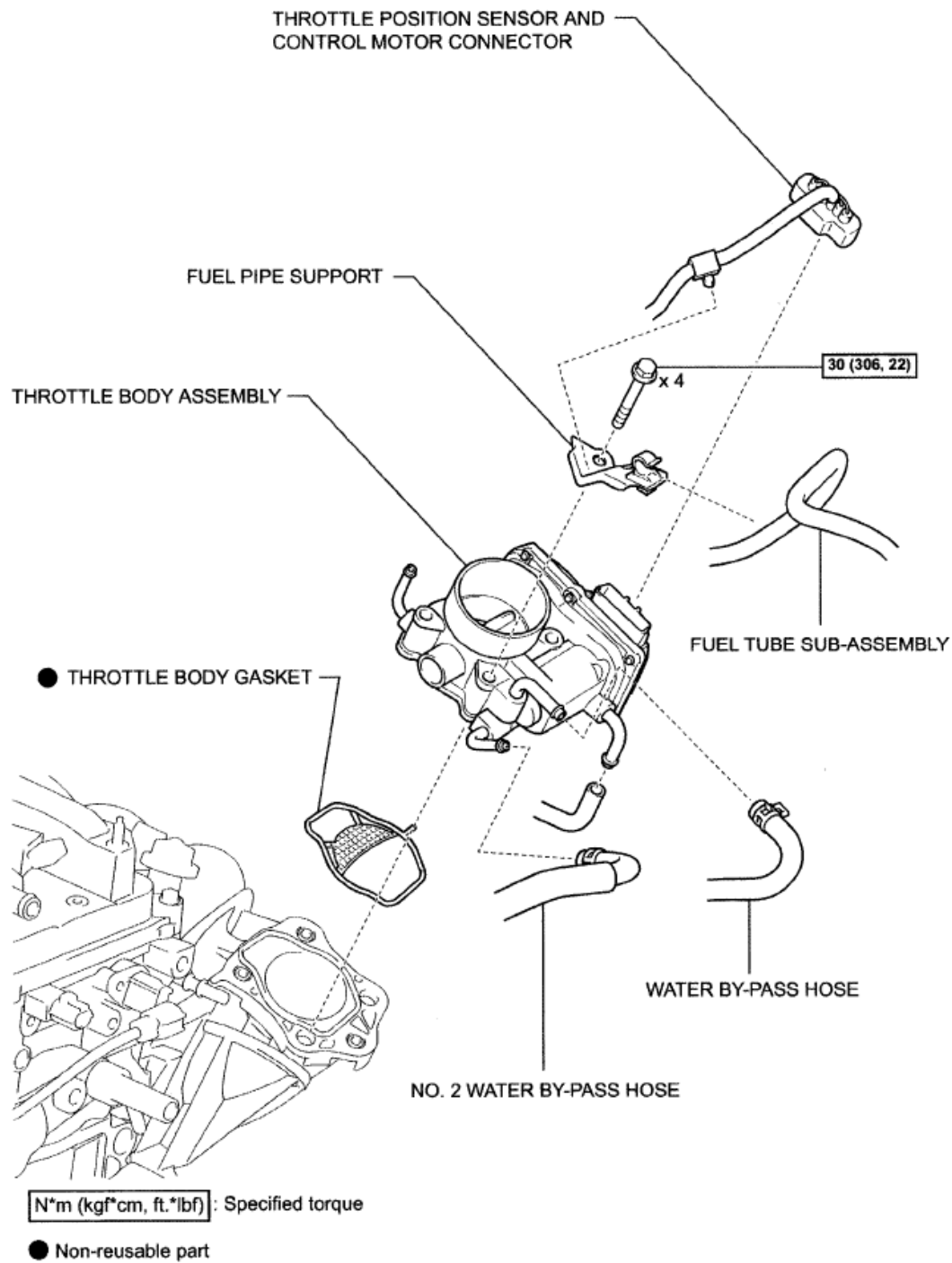
Fig. 109: Identifying Cylinder Head Components With Specification (3 Of 13)



T

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Fig. 110: Identifying Cylinder Head Components With Specification (4 Of 13)



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Fig. 111: Identifying Cylinder Head Components With Specification (5 Of 13)

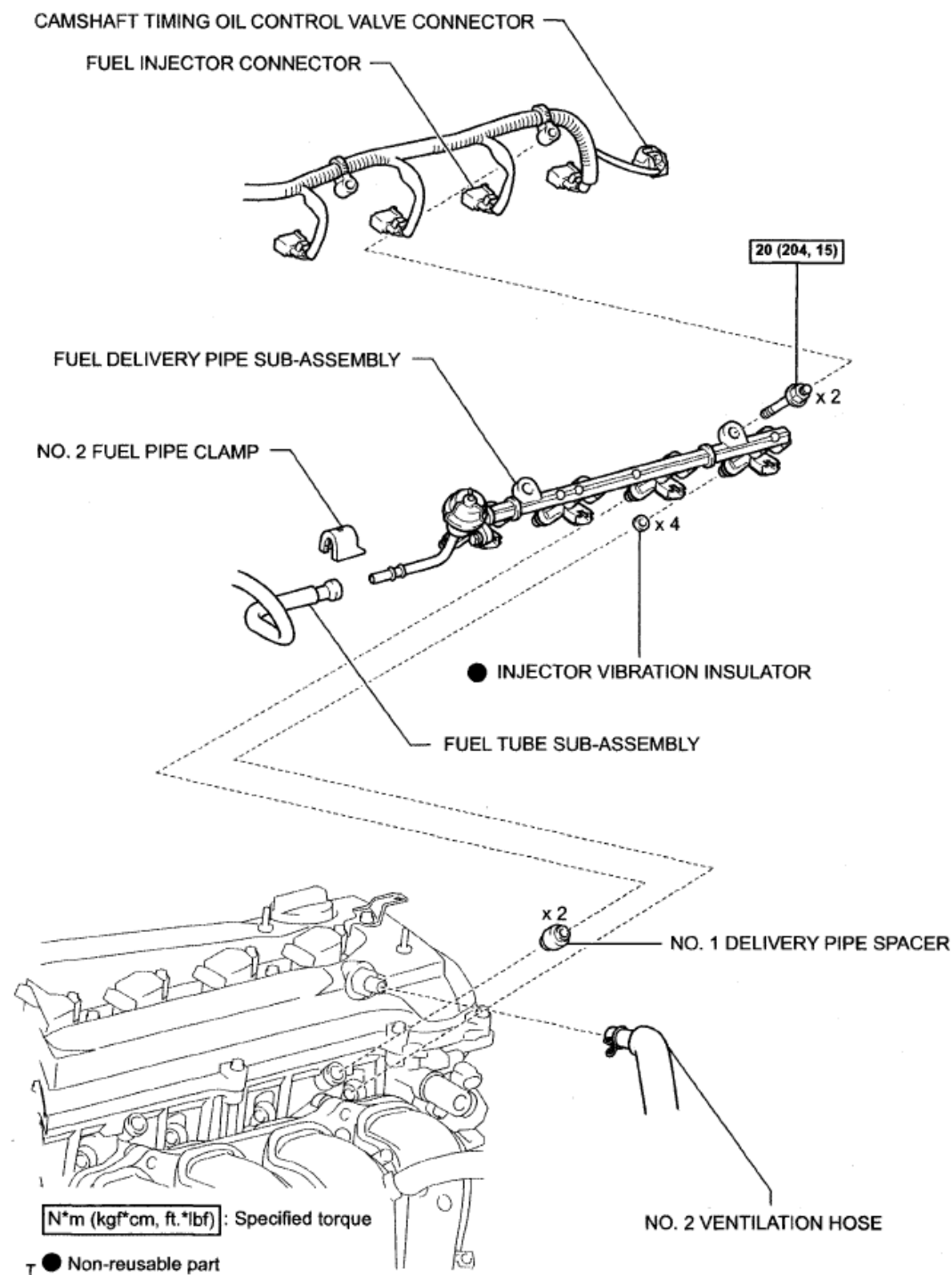


Fig. 112: Identifying Cylinder Head Components With Specification (6 Of 13)

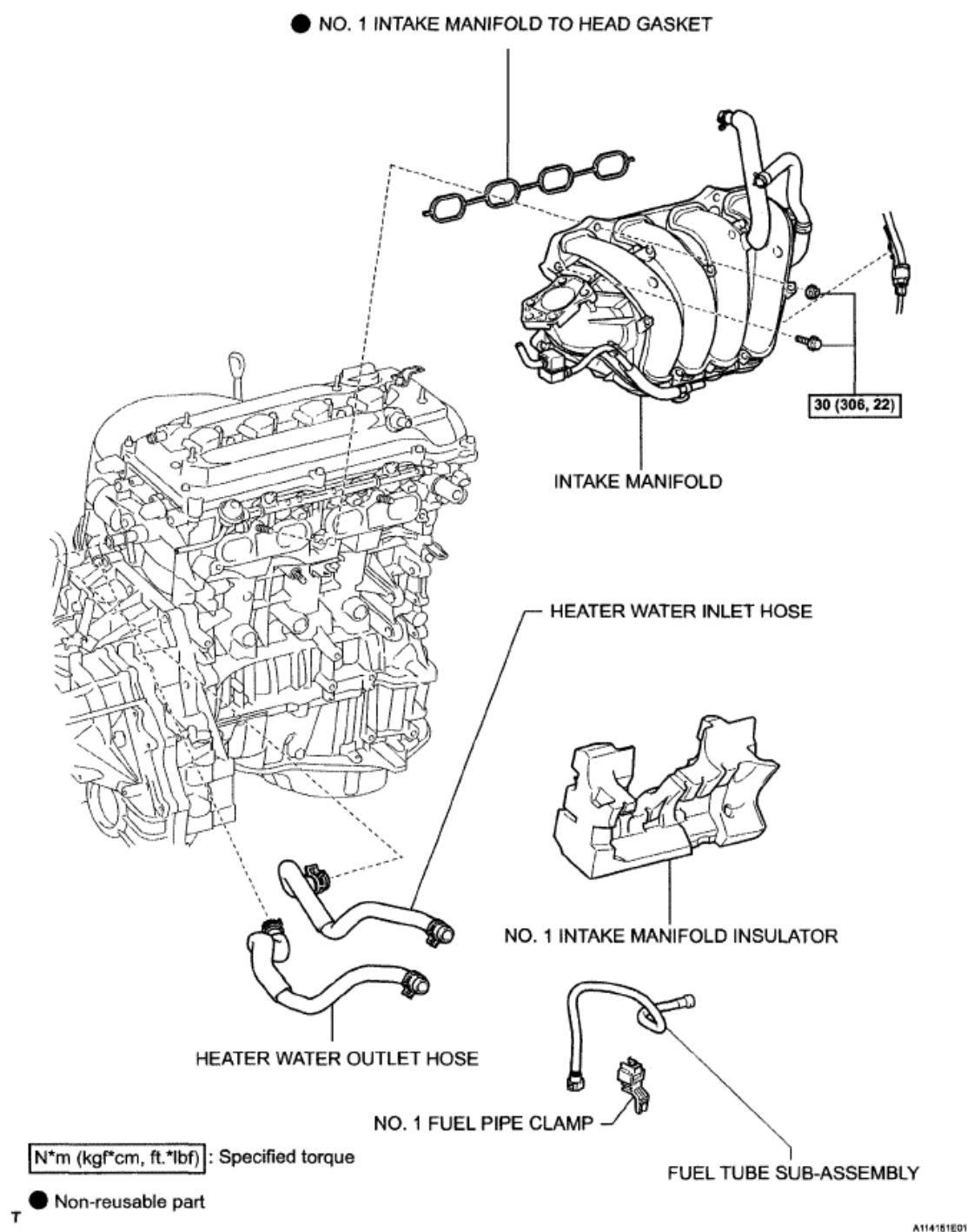
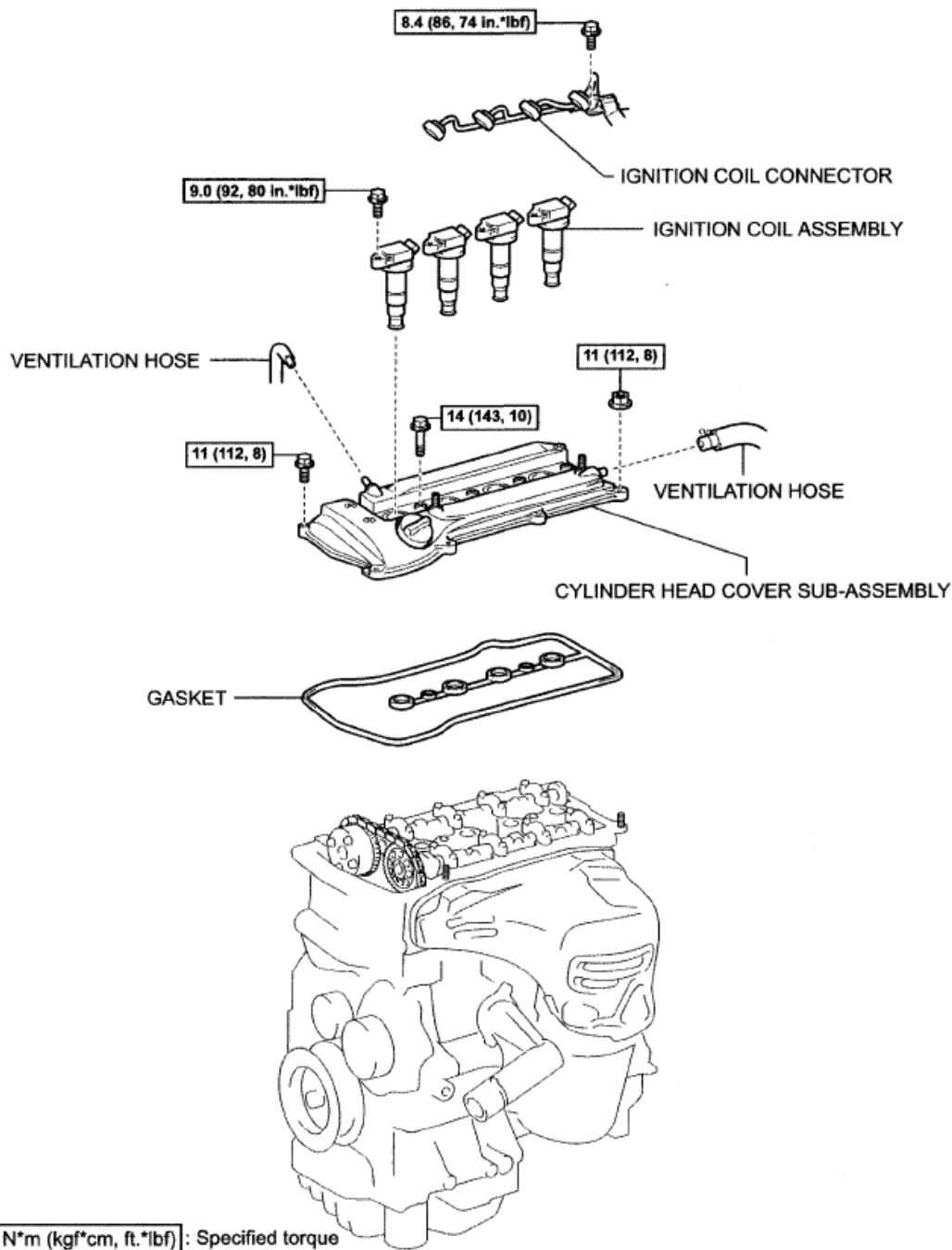


Fig. 113: Identifying Cylinder Head Components With Specification (7 Of 13)



A114142E04

Fig. 114: Identifying Cylinder Head Components With Specification (8 Of 13)

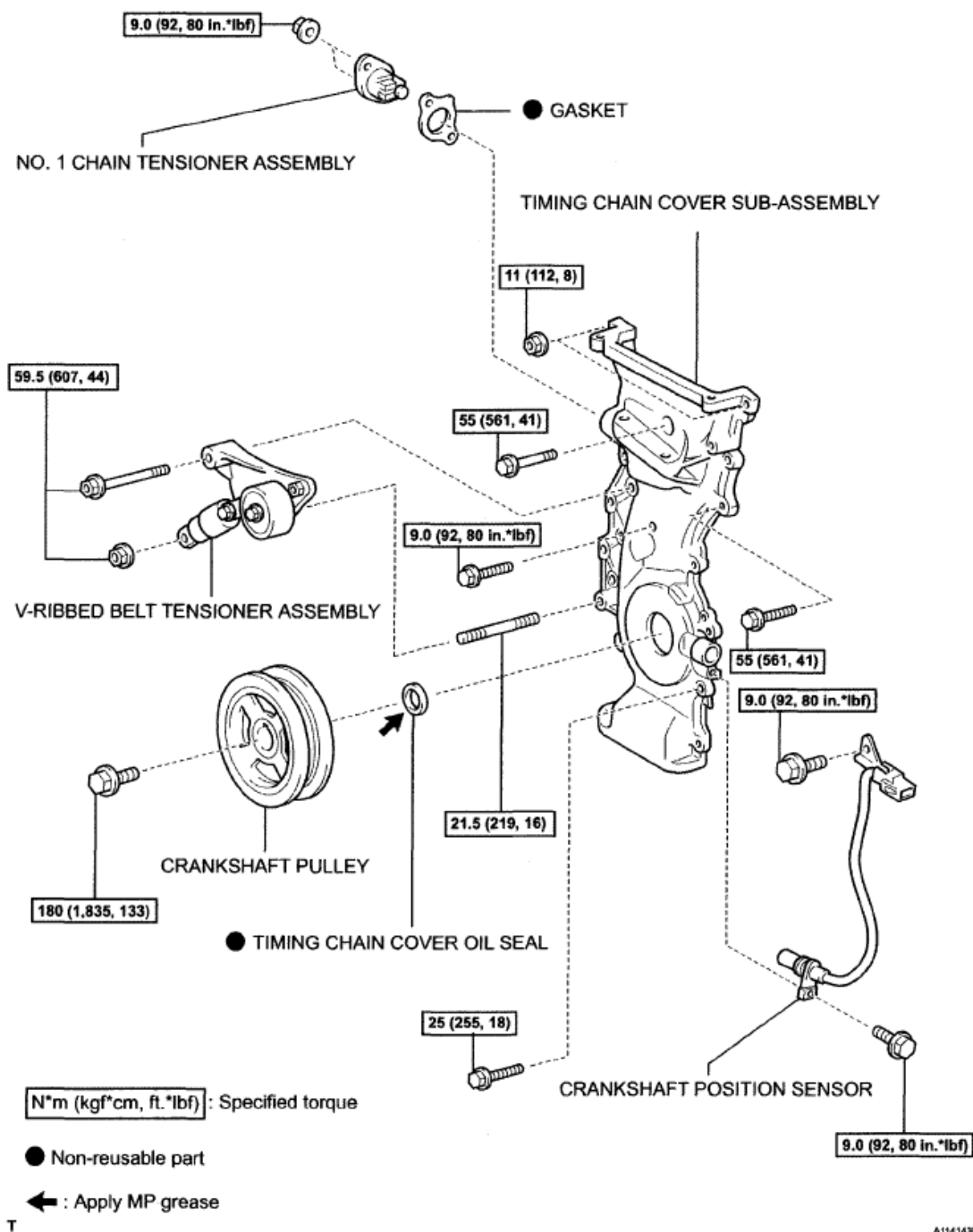


Fig. 115: Identifying Cylinder Head Components With Specification (9 Of 13)

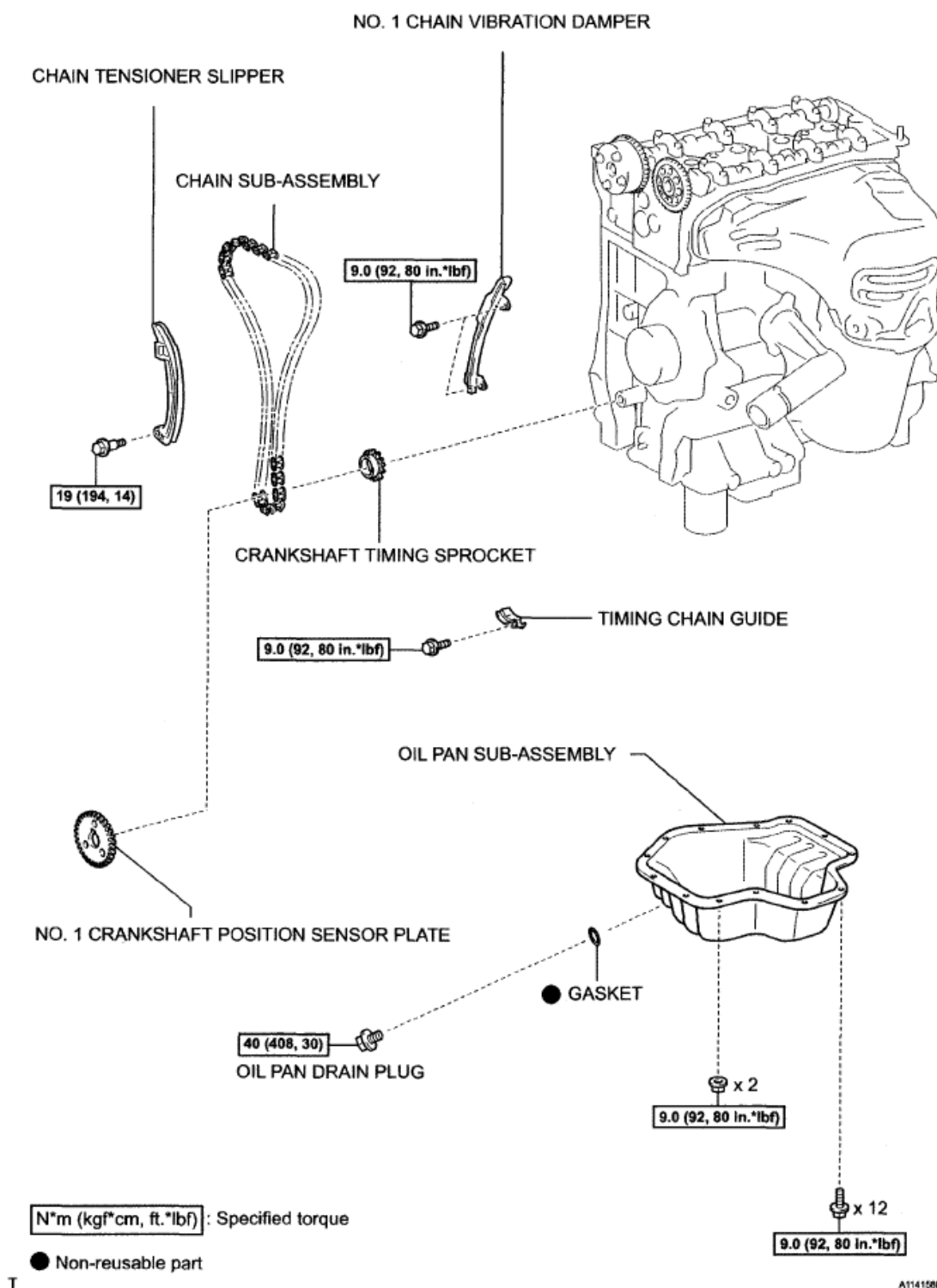
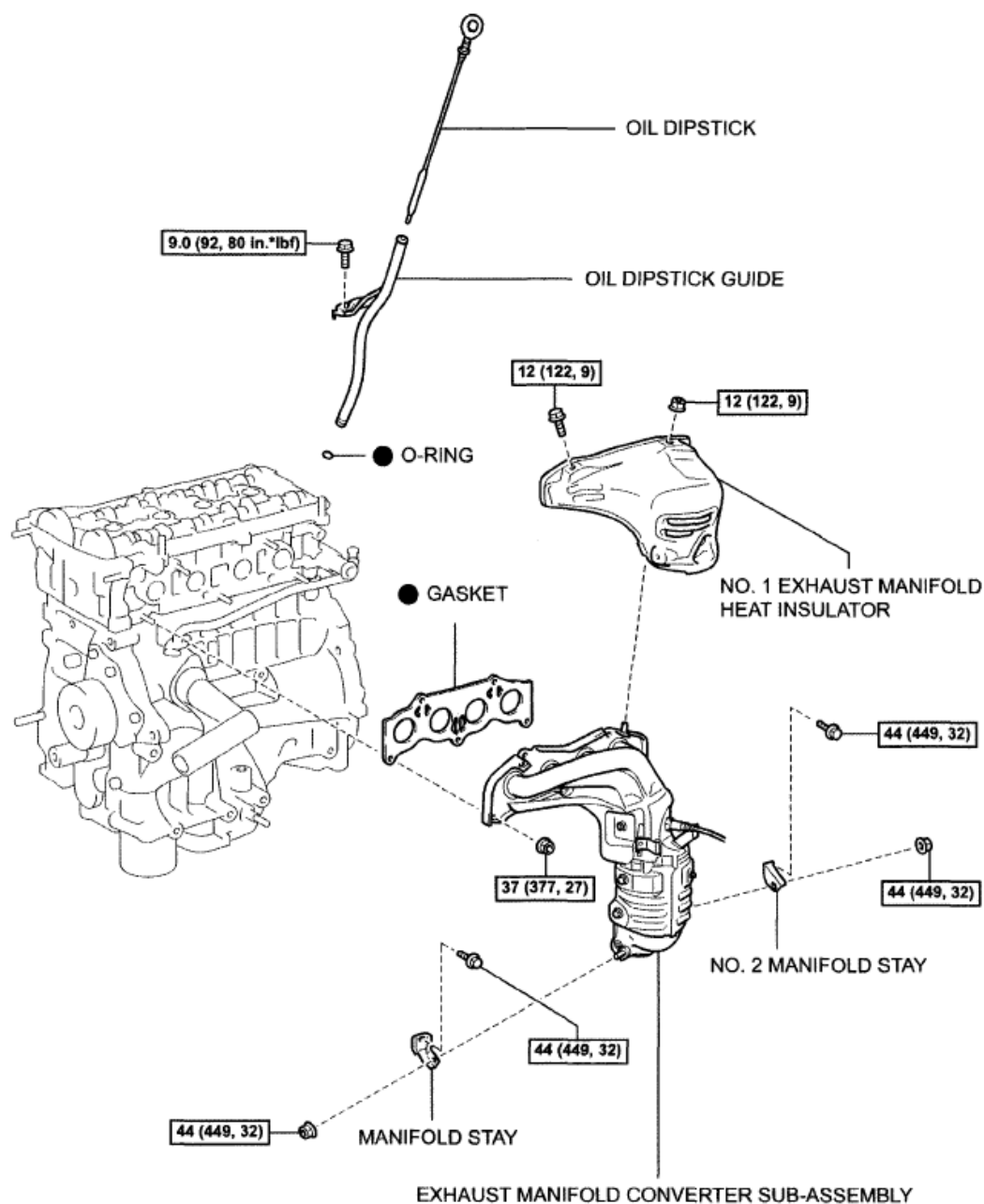


Fig. 116: Identifying Cylinder Head Components With Specification (10 Of 13)



A114152E01

Fig. 117: Identifying Cylinder Head Components With Specification (11 Of 13)

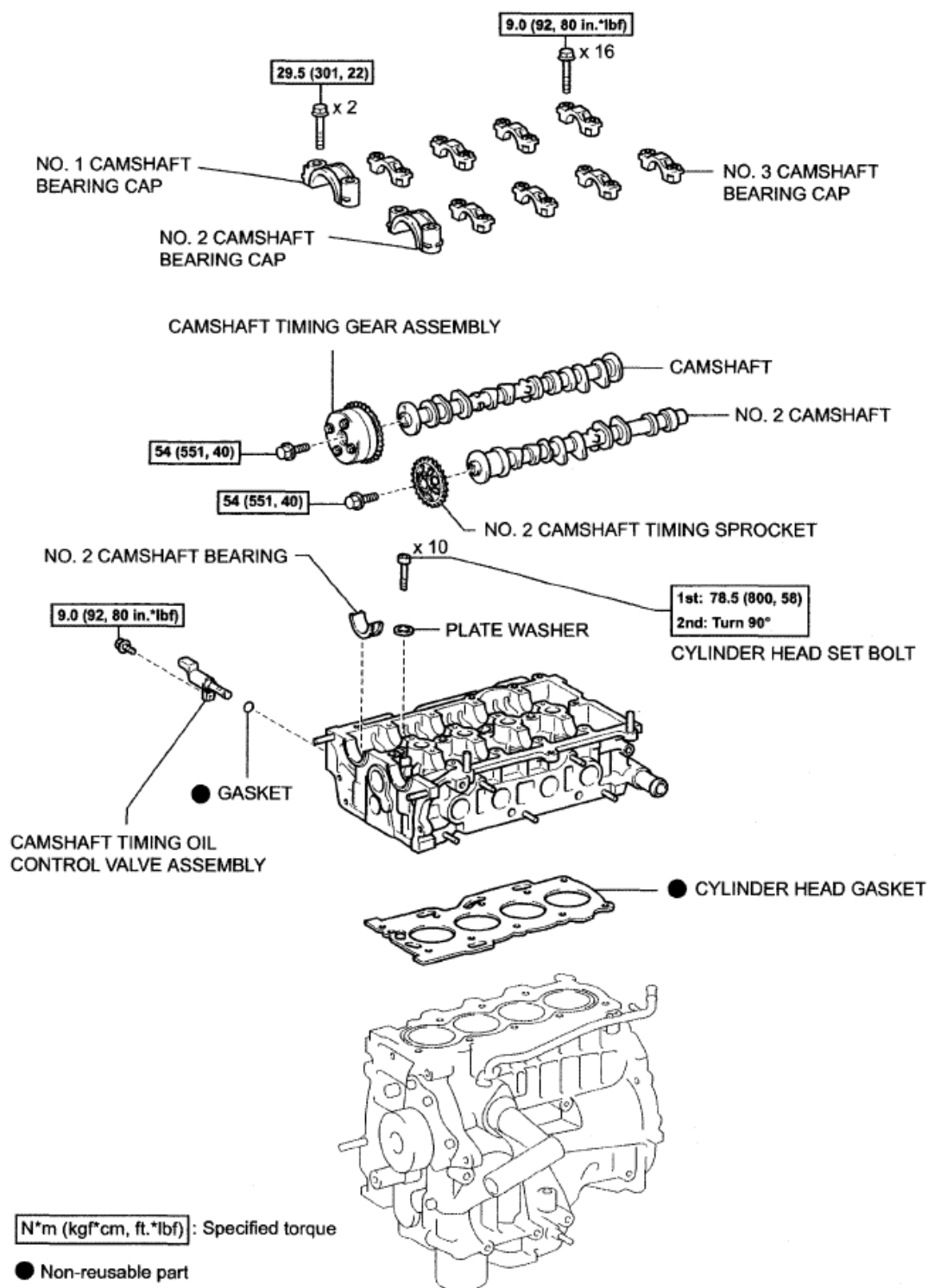


Fig. 118: Identifying Cylinder Head Components With Specification (12 Of 13)

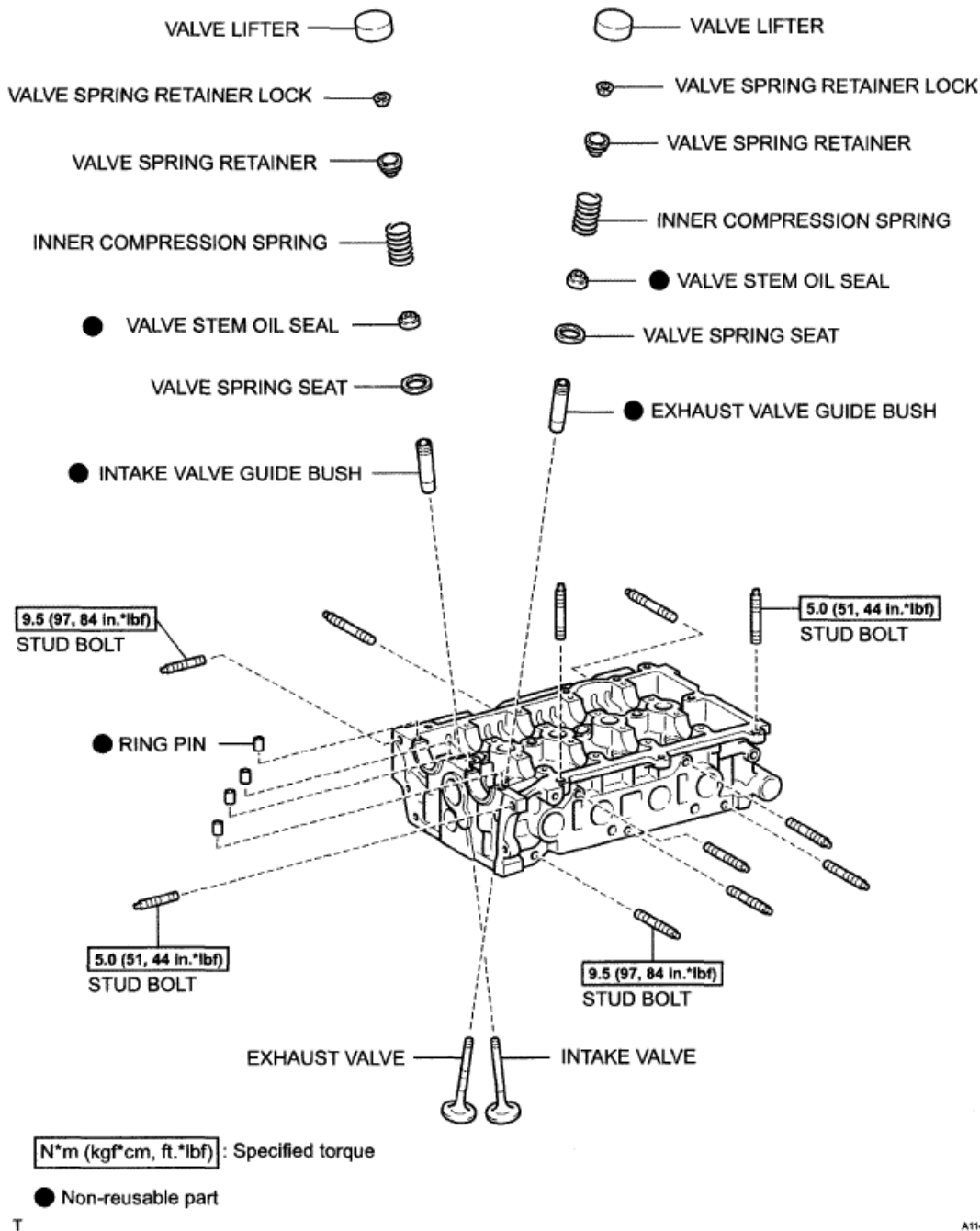


Fig. 119: Identifying Cylinder Head Components With Specification (13 Of 13)

REMOVAL

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

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

pretensioner activation.

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

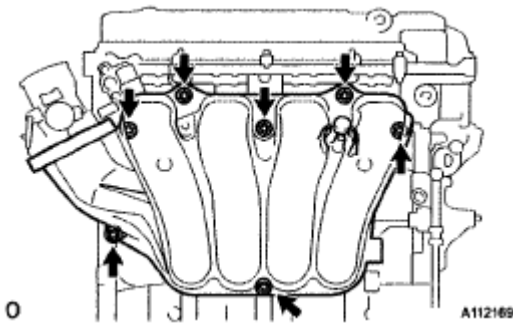


Fig. 120: Locating Intake Manifold Bolts

23. **REMOVE NO. 1 INTAKE MANIFOLD INSULATOR (See INSPECTION)**
24. **REMOVE FRONT EXHAUST PIPE ASSEMBLY (See REMOVAL)**
25. **REMOVE OIL DIPSTICK**
26. **REMOVE OIL DIPSTICK GUIDE**

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

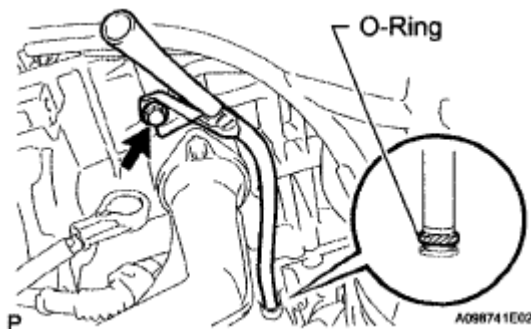


Fig. 121: Locating O-Ring And Bolt

27. REMOVE MANIFOLD STAY

- a. Remove the bolt, nut and stay.

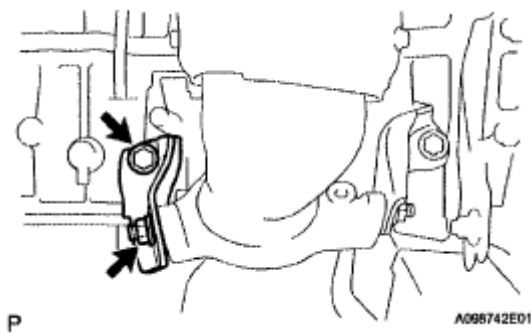


Fig. 122: Locating Manifold Stay And Bolt

28. REMOVE NO. 2 MANIFOLD STAY

- a. Remove the bolt, nut and stay.

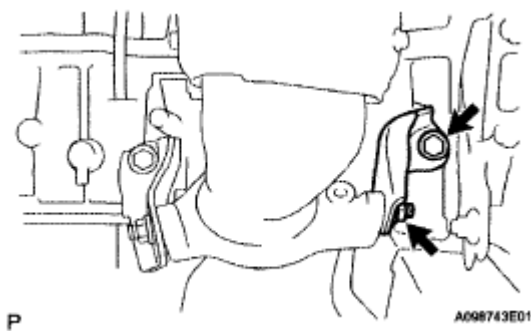


Fig. 123: Locating Manifold Stay And Bolt

29. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

- a. Disconnect the air fuel ratio sensor connector.

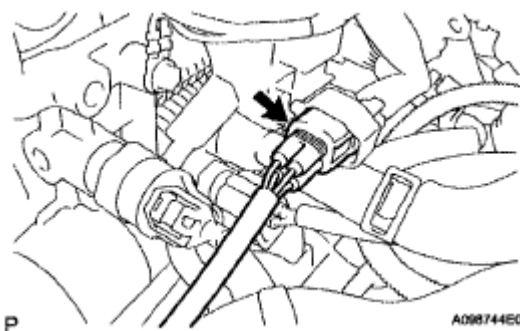


Fig. 124: Locating Air Fuel Ratio Sensor Connector

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

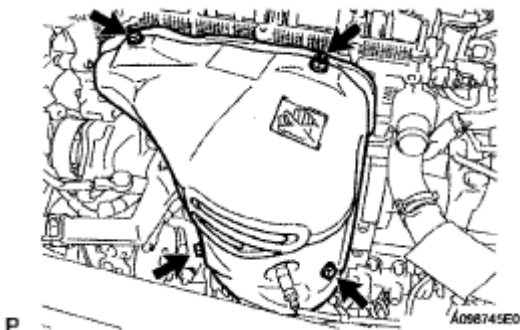


Fig. 125: Locating Heat Insulator, Bolts And Nut

30. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

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

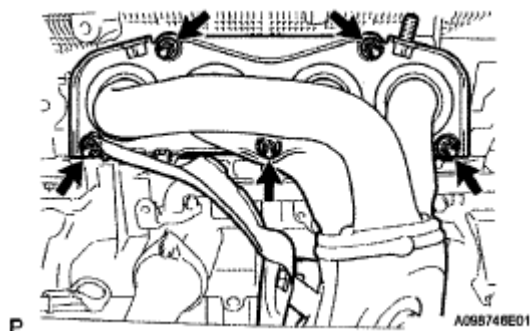


Fig. 126: Locating Manifold Converter And Nuts

31. REMOVE FAN AND GENERATOR V BELT (See REMOVAL)
32. REMOVE GENERATOR ASSEMBLY (See REMOVAL)
33. REMOVE VANE PUMP ASSEMBLY

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

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

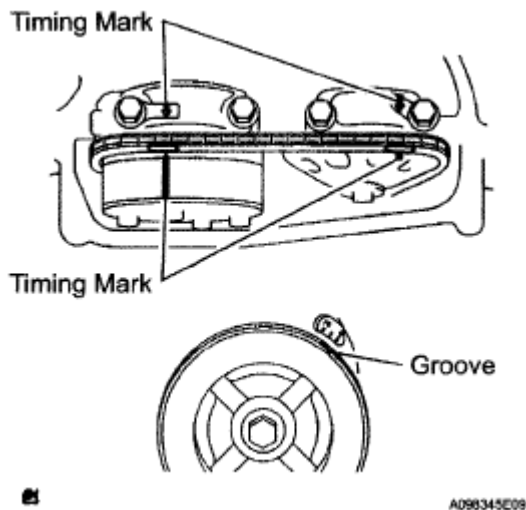


Fig. 127: Identifying Timing Mark Of Camshaft Timing Gears

41. **REMOVE NO. 2 CAMSHAFT**
 - a. Place paint marks on the chain and camshaft timing gears.

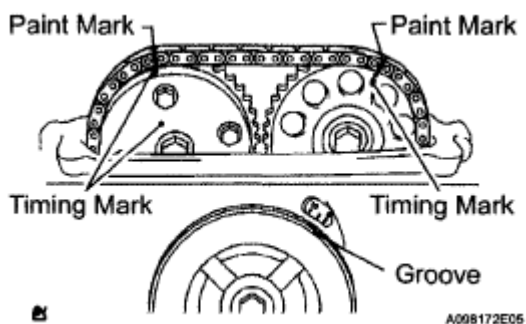


Fig. 128: Identifying Paint Marks On Chain And Camshaft Timing Gears

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

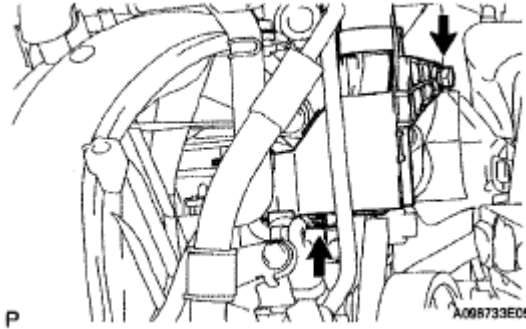


Fig. 129: Locating Wire Harness Protector Clamp

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

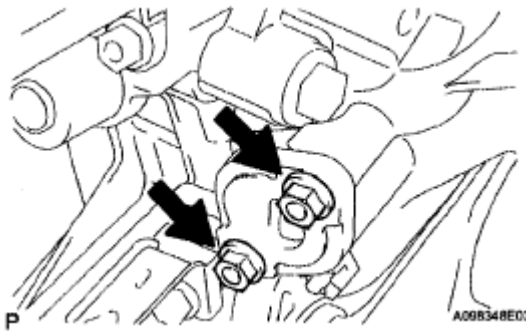


Fig. 130: Locating Tensioner And Bolt

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

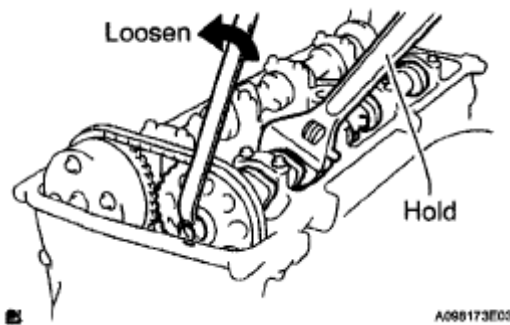


Fig. 131: Loosening Camshaft Timing Bolt

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

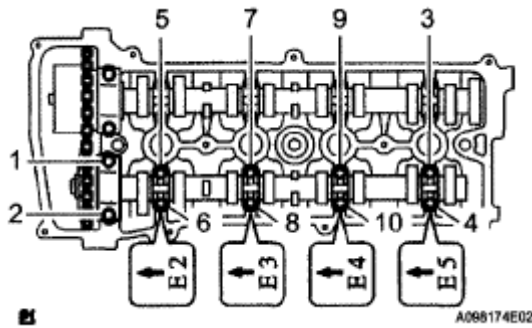


Fig. 132: Identifying Bearing Cap Bolts In Sequence

- h. While holding the No. 2 camshaft by hand, remove the camshaft timing sprocket set bolt.
- i. Remove the camshaft timing sprocket from the No. 2 camshaft with the timing chain wrapped on the sprocket.
- j. Remove the camshaft timing sprocket from the timing chain.

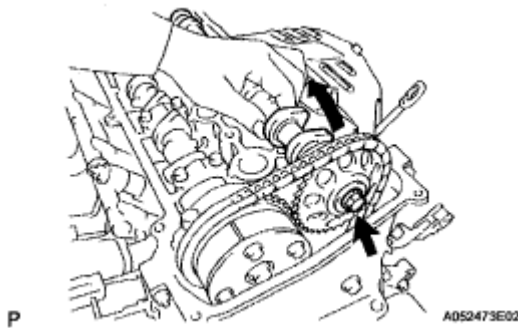


Fig. 133: Removing Camshaft Timing Sprocket Set Bolt

42. REMOVE CAMSHAFT

- a. Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.
- b. Remove the 5 bearing caps.
- c. Remove the camshaft and camshaft timing gear while holding the timing chain by hand.

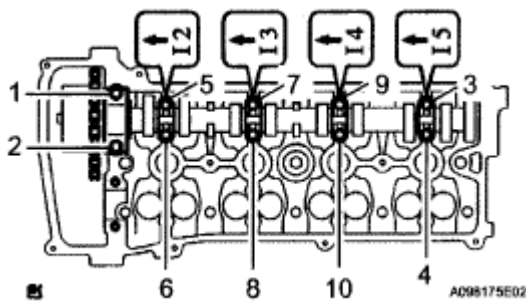


Fig. 134: Identifying Bearing Cap Bolts In Sequence

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

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

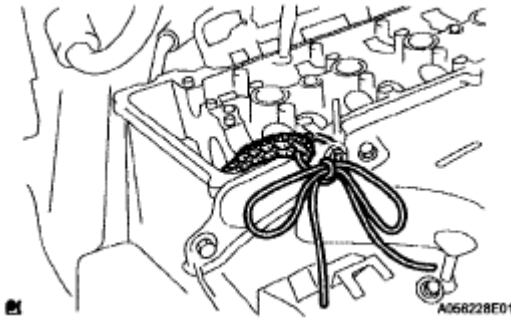


Fig. 135: Identifying Timing Chain With String

43. REMOVE CRANKSHAFT PULLEY (See INSPECTION)
44. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY (See REMOVAL)
45. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE
46. REMOVE TIMING CHAIN GUIDE (See REMOVAL)
47. REMOVE CHAIN TENSIONER SLIPPER (See REMOVAL)
48. REMOVE CHAIN SUB-ASSEMBLY
49. REMOVE NO. 1 CHAIN VIBRATION DAMPER (See REMOVAL)
50. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See ON-VEHICLE INSPECTION)
51. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY
 - a. Clamp the camshaft in a vise, and make sure that the camshaft timing gear does not rotate.
 - b. Cover all the oil ports with vinyl tape except the advance side port shown in the illustration.

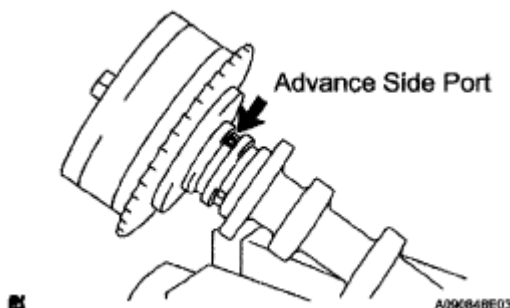


Fig. 136: Locating Advance Side Port

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

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

HINT:

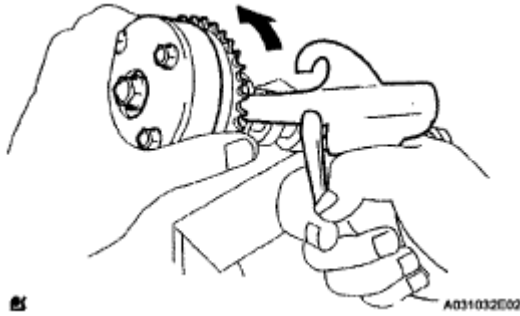


Fig. 137: Turning Camshaft Timing Gear To Advance Direction

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

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

NOTE:

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

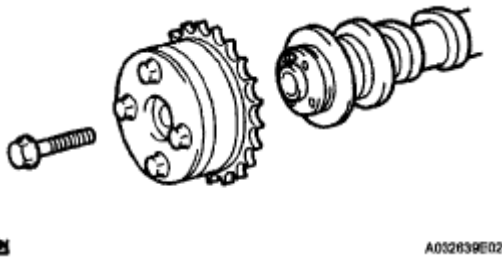


Fig. 138: Identifying Camshaft Timing Gear And Bolt

52. REMOVE NO. 2 CAMSHAFT BEARING

- a. Remove the camshaft bearing.

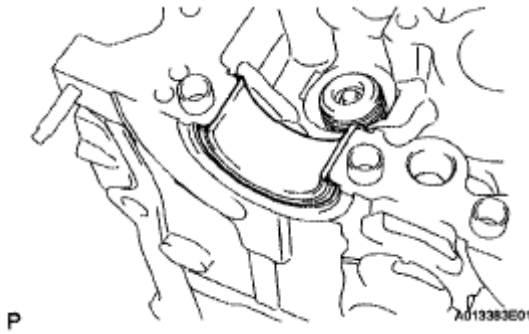


Fig. 139: Identifying Camshaft Bearing

53. REMOVE CYLINDER HEAD SUB-ASSEMBLY

- a. Disconnect the radiator hose inlet.

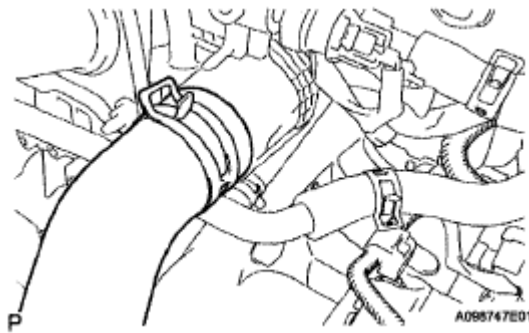


Fig. 140: Identifying Radiator Hose Inlet

- b. Disconnect the radio setting condenser connector.
- c. Disconnect the engine oil pressure switch connector.
- d. Disconnect the engine coolant temperature sensor connector.
- e. Disconnect the camshaft position sensor connector.
- f. Remove the bolt and ground cable.

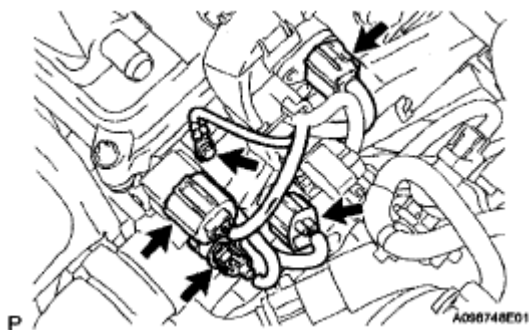


Fig. 141: Locating Camshaft Position Sensor Connector

- g. Using several steps, uniformly loosen and remove the 10 cylinder head bolts and 10 plate washers

with a 10 mm bi-hexagon wrench in the sequence shown in the illustration.

NOTE:

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

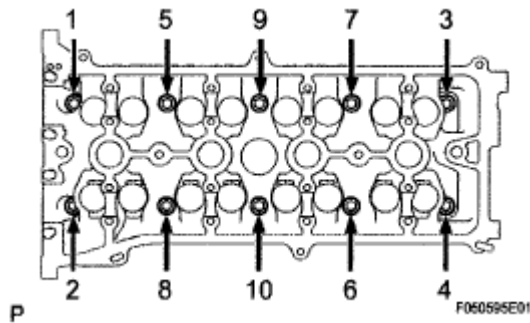


Fig. 142: Locating Cylinder Head Bolts Sequence

54. REMOVE CYLINDER HEAD GASKET

DISASSEMBLY

1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifters in the correct order.

2. REMOVE INTAKE VALVE

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

SST 09202-70020 (09202-00010)

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

HINT:

Arrange the removed parts in the correct order.

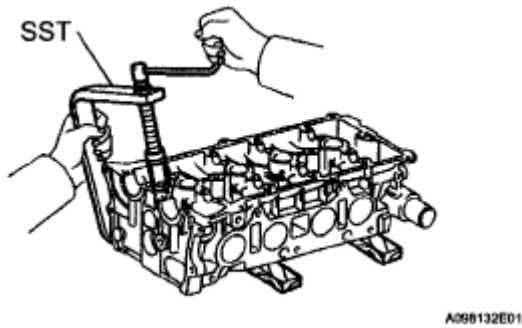


Fig. 143: Removing Retainer Locks

3. REMOVE EXHAUST VALVE

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

SST 09202-70020 (09202-00010)

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

HINT:

Arrange the removed parts in the correct order.

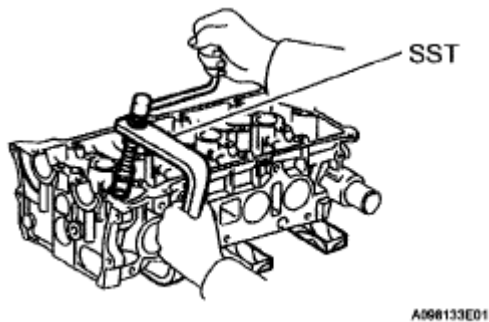


Fig. 144: Removing Retainer Locks

4. REMOVE VALVE SPRING SEAT

5. REMOVE VALVE STEM OIL SEAL

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



Fig. 145: Removing 16 Oil Seals Using Needle-Nose Pliers

6. REMOVE RING PIN

- a. Remove the 4 ring pins.

7. REMOVE STUD BOLT

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

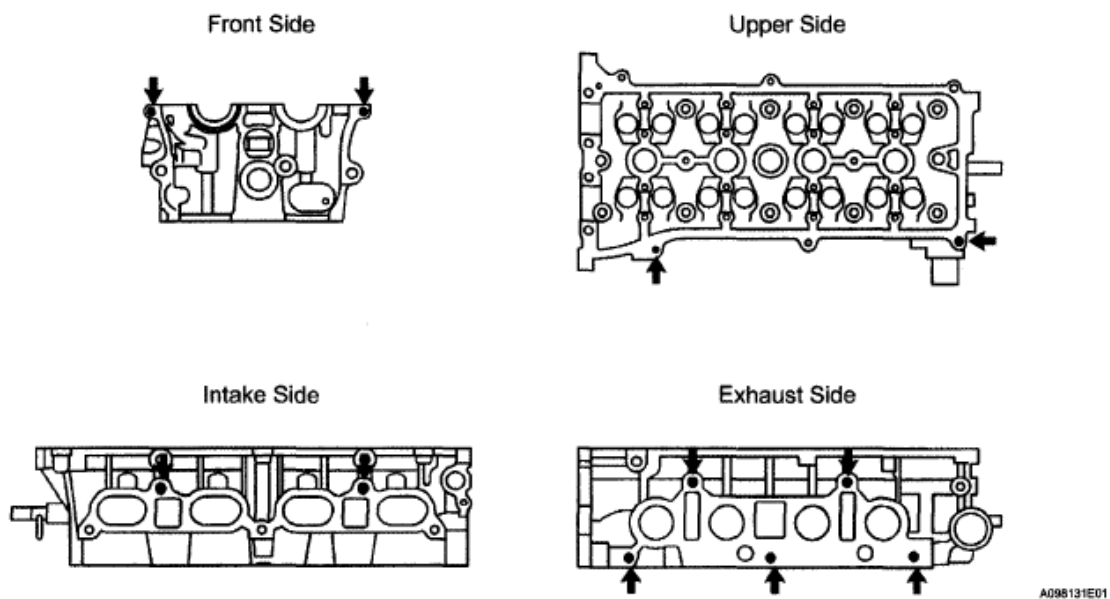


Fig. 146: Removing 11 Stud Bolts

INSPECTION

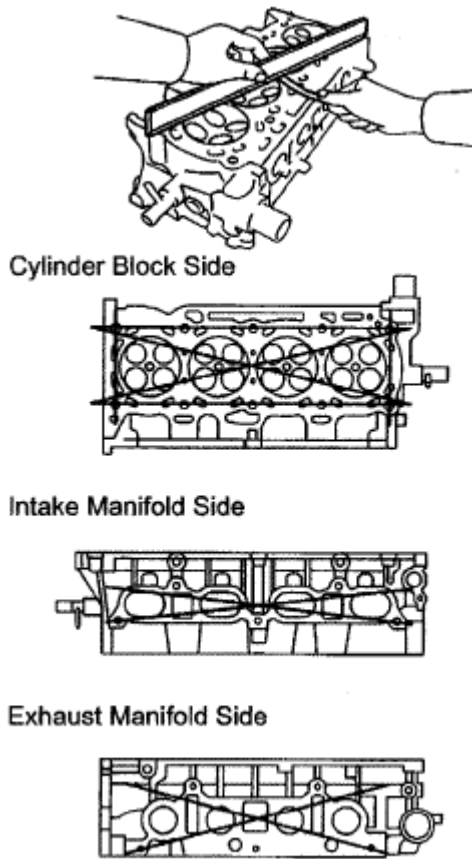
1. INSPECT CYLINDER HEAD FOR WARPAGE

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

Maximum warpage:

0.08 mm (0.0032 in.)

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



A098134E01

Fig. 147: Inspecting Cylinder Head For Warpage

2. INSPECT CYLINDER HEAD FOR CRACKS

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

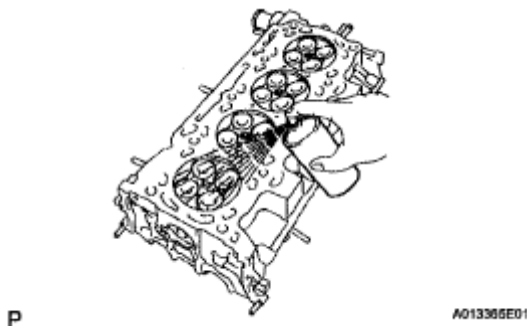


Fig. 148: Inspecting Cylinder Head For Cracks

3. INSPECT VALVE SEAT

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

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

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

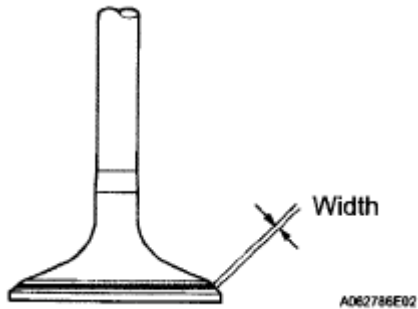


Fig. 149: Identifying Valve Width

4. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

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

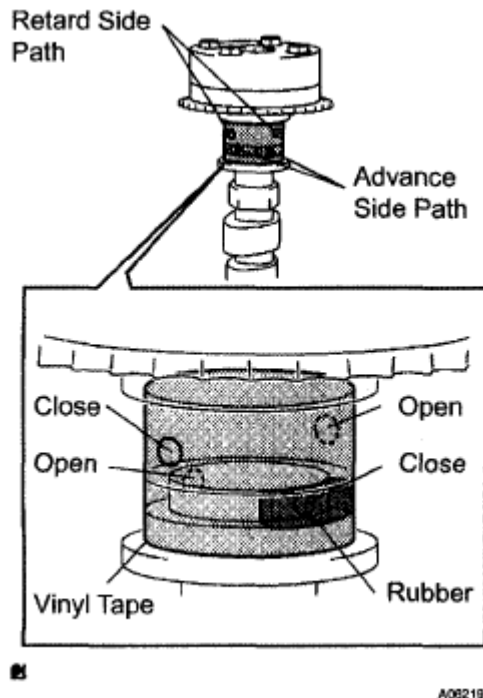
NOTE: **Be careful not to damage the camshaft.**

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

HINT:

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

2. Break through the tape of the advance side path and the retard side path on the opposite side of the groove.

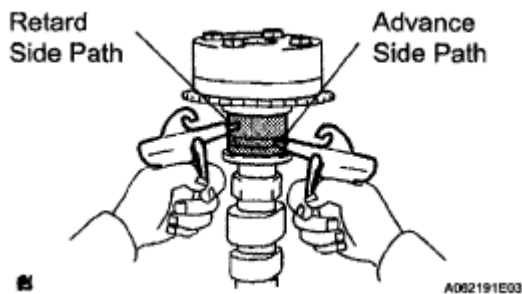


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Fig. 150: Identifying Retard Side Path And Advance Side Path

3. Apply approximately 200 kPa (2.0 kgf/cm², 28 psi) of air pressure to the paths whose tape was broken in the procedure above.

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



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Fig. 151: Applying Air Pressure To Paths

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

OK:

Gear rotates in advance direction.

HINT:

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

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

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

- c. Check for smooth rotation.

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

OK:

Gear rotates in advance direction.

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

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

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

5. INSPECT CAMSHAFT

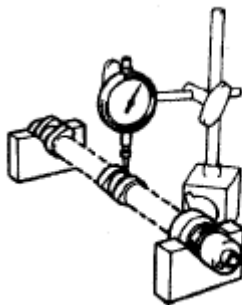
- a. Inspect the camshaft for runout.

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

Maximum circle runout:

0.03 mm (0.0012 in.)

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



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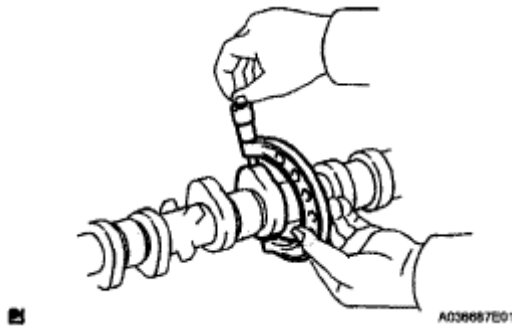
Fig. 152: Measuring Circle Runout Center Journal

b. Inspect the cam lobes.

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

Standard cam lobe height:**46.495 to 46.595 mm (1.8305 to 1.8345 in.) Minimum cam lobe height:****46.385 mm (1.8262 in.)**

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

**Fig. 153: Measuring Cam Lobe Height**

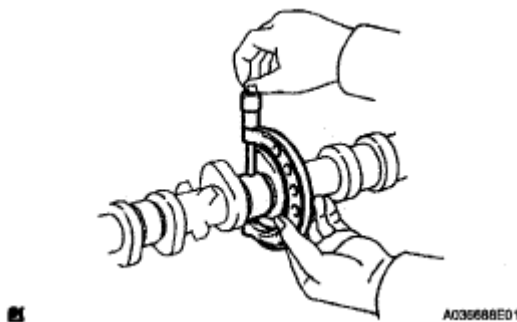
c. Inspect the camshaft journals.

1. Using a micrometer, measure the journal diameter.

Standard journal diameter**STANDARD JOURNAL DIAMETER SPECIFIED CONDITION REFERENCE**

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

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

**Fig. 154: Measuring Journal Diameter**

6. INSPECT NO. 2 CAMSHAFT

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

Maximum circle runout:

0.03 mm (0.0012 in.)

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

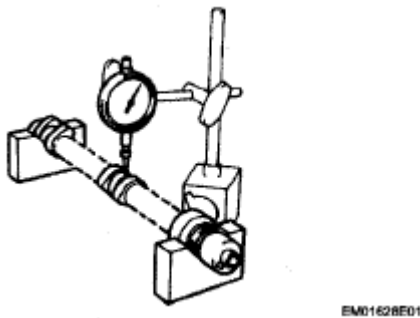


Fig. 155: Measuring Circle Runout Center Journal

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

Standard cam lobe height:

45.983 to 46.083 mm (1.8104 to 1.8143 in.)

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

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

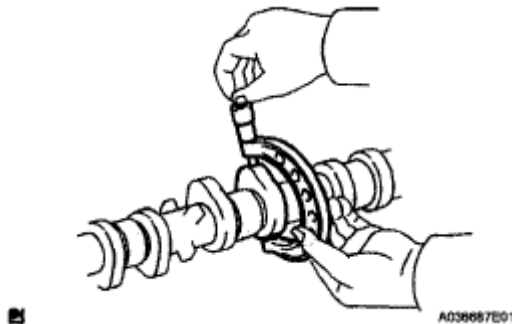


Fig. 156: Measuring Cam Lobe Height

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

Standard journal diameter

CAMSHAFT JOURNALS STANDARD CONDITION REFERENCE

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

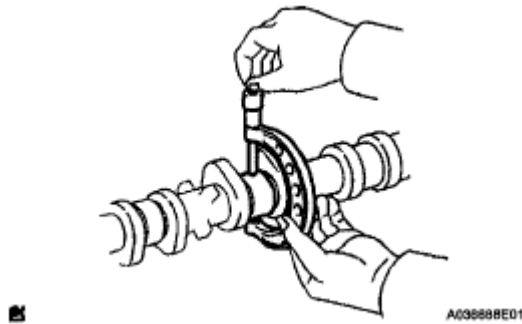


Fig. 157: Measuring Journal Diameter

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

7. INSPECT CAMSHAFT THRUST CLEARANCE

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

Standard thrust clearance

CAMSHAFT THRUST CLEARANCE STANDARD CONDITION REFERENCE

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

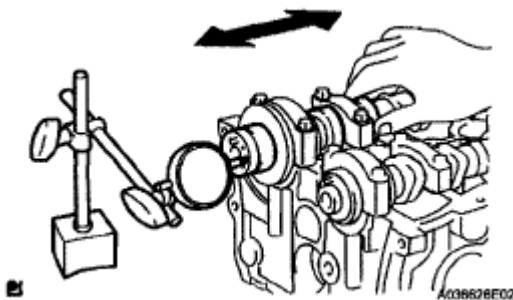


Fig. 158: Checking Camshaft Back And Forth

Maximum thrust clearance**CAMSHAFT THRUST CLEARANCE STANDARD CONDITION REFERENCE**

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

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

8. INSPECT CAMSHAFT OIL CLEARANCE

- Clean the 10 bearing caps and camshaft journals.
- Place the 2 camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.
- Install the 10 bearing caps (see **INSTALLATION**).

NOTE: Do not turn the camshaft.

- Remove the 10 bearing caps (see **REMOVAL** and).

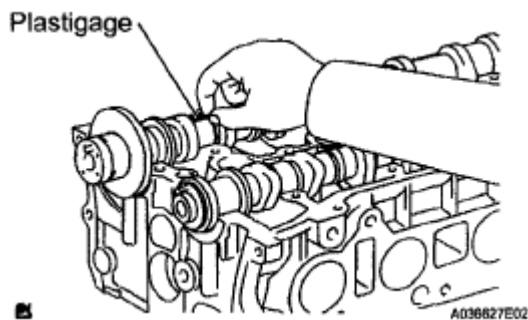


Fig. 159: Placing Camshafts On Cylinder Head

- Measure the Plastigage at its widest point.

Standard oil clearance**CAMSHAFT OIL CLEARANCE STANDARD CONDITION REFERENCE**

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

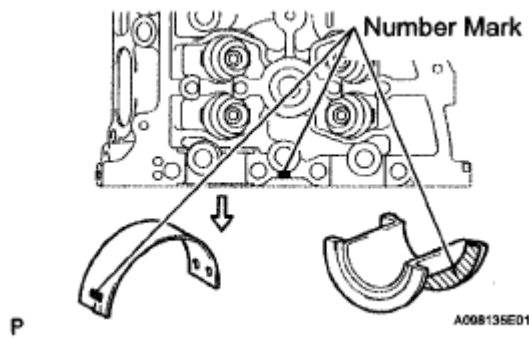


Fig. 160: Identifying Camshaft Bearing Number Mark

Maximum oil clearance

CAMSHAFT OIL CLEARANCE STANDARD CONDITION REFERENCE

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

NOTE: Completely remove the Plastigage after the measurement.

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

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

Standard cylinder head journal bore diameter

CAMSHAFT OIL CLEARANCE STANDARD CONDITION REFERENCE

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

Standard bearing center wall thickness

CAMSHAFT OIL CLEARANCE THICKNESS CHART

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

Standard camshaft journal diameter:

35.971 to 35.985 mm (1.4162 to 1.4167 in.)

9. INSPECT VALVE LIFTER

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

Standard lifter diameter:

30.966 to 30.976 mm (1.2191 to 1.2195 in.)

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

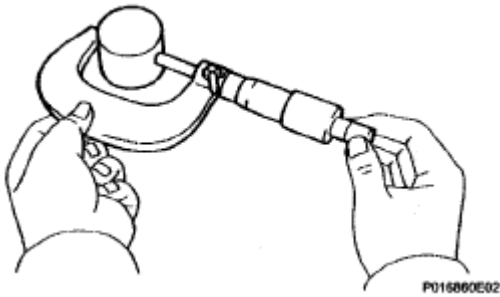


Fig. 161: Measuring Lifter Diameter

10. INSPECT VALVE LIFTER OIL CLEARANCE

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

Standard lifter bore diameter:

31.009 to 31.025 mm (1.2208 to 1.2215 in.)

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

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

Standard oil clearance:

0.033 to 0.059 mm (0.0013 to 0.0023 in.)

Maximum oil clearance:

0.079 mm (0.0031 in.)

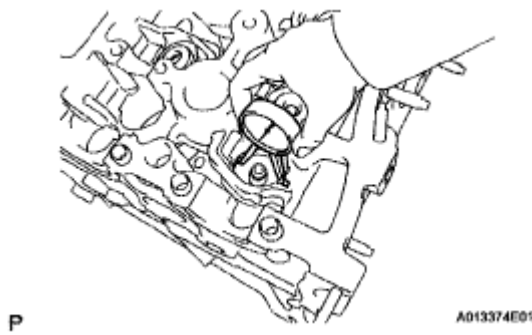


Fig. 162: Measuring Valve Lifter Of Cylinder Head

If the oil clearance is greater than the maximum, replace the valve lifter. If necessary, replace the cylinder head sub-assembly.

11. INSPECT INNER COMPRESSION SPRING

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

Standard free length:

4.7 mm (0.185 in.)

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

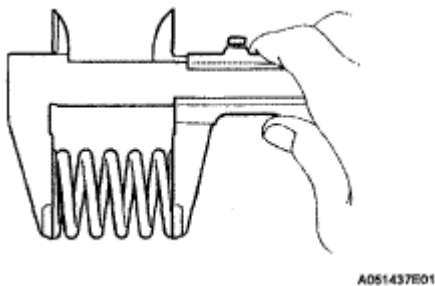


Fig. 163: Measure Free Length Of Valve Spring

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

Maximum deviation:

1.6 mm (0.063 in.) Maximum angle (Reference): 2°

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

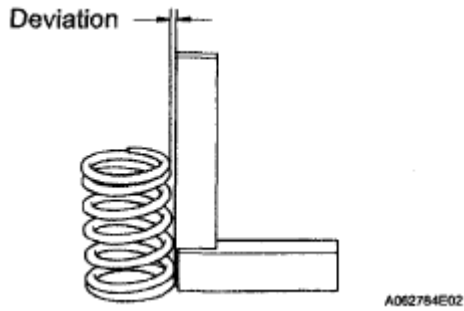


Fig. 164: Measuring Deviation Of Inner Compression Spring

12. INSPECT INTAKE VALVE

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

Standard overall length:

101.71 mm (4.0043 in.)

Minimum overall length:

101.21 mm (3.9846 in.)

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

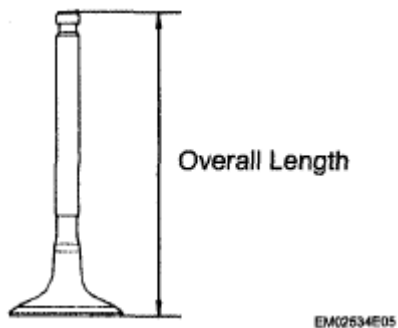


Fig. 165: Measuring Valve Overall Length

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

Standard valve stem diameter:

5.470 to 5.485 mm (0.2154 to 0.2159 in.)

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

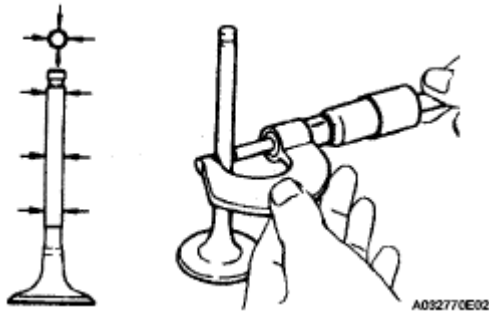


Fig. 166: Measuring Diameter Of Valve Stem

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

Standard margin thickness:

1.0 mm (0.039 in.)

Minimum margin thickness:

0.50 mm (0.0197 in.)

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

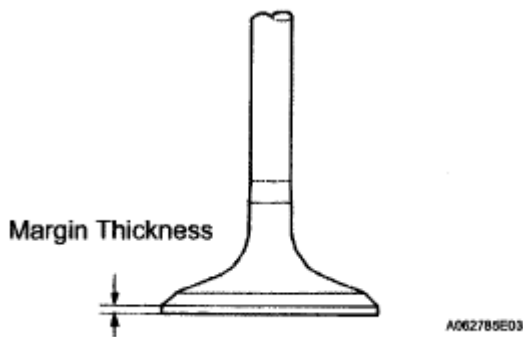


Fig. 167: Measuring Valve Head Margin Thickness

13. INSPECT EXHAUST VALVE

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

Standard overall length:

101.15 mm (3.9823 in.)

Minimum overall length:

100.70 mm (3.9646 in.)

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

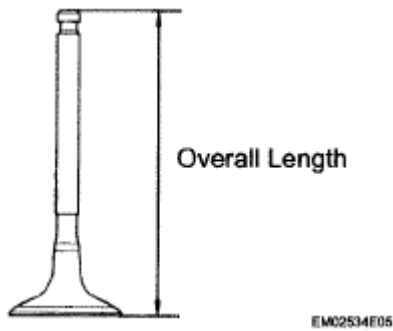


Fig. 168: Measuring Valve Overall Length

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

Standard valve stem diameter:

5.465 to 5.480 mm (0.2152 to 0.2158 in.)

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

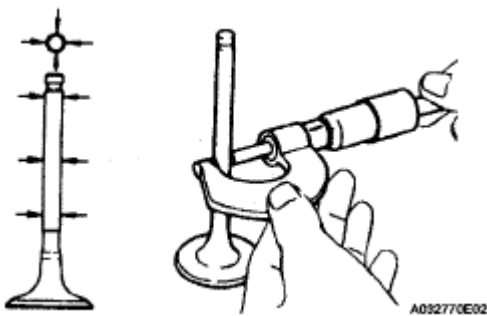


Fig. 169: Measuring Diameter Of Valve Stem

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

Standard margin thickness:

1.0 mm (0.039 in.)

Minimum margin thickness:

0.50 mm (0.0197 in.)

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

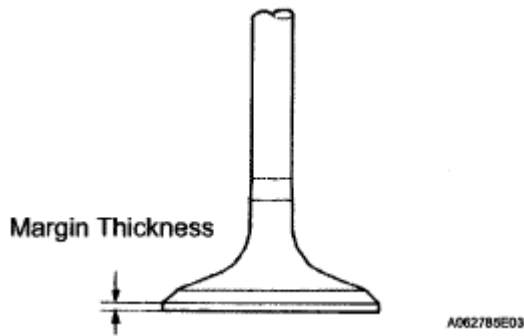


Fig. 170: Measuring Valve Head Margin Thickness

14. INSPECT INTAKE VALVE GUIDE BUSH

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

Standard bush inside diameter:

5.510 to 5.530 mm (0.2169 to 0.2177 in.)

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

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

Standard oil clearance:

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

Maximum oil clearance:

0.08 mm (0.0032 in.)

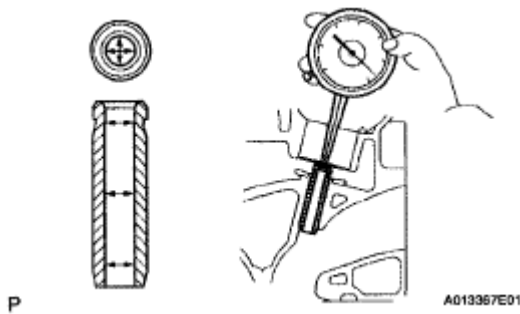


Fig. 171: Measuring Inside Diameter Of Guide Bush

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

15. INSPECT EXHAUST VALVE GUIDE BUSH

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

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

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

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

Standard oil clearance:**0.030 to 0.065 mm (0.0012 to 0.0026 in.)****Maximum oil clearance:****0.10 mm (0.0039 in.)**

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

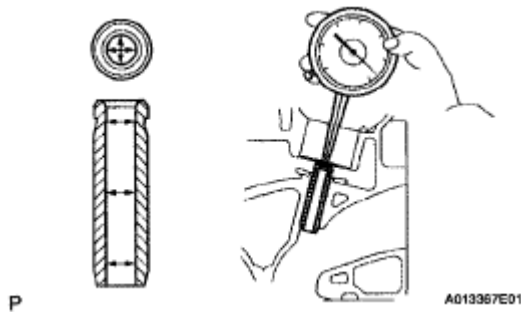


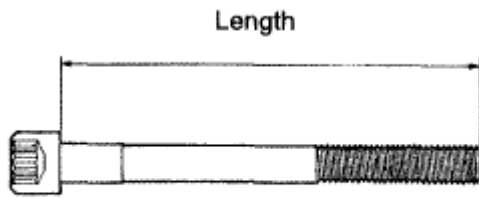
Fig. 172: Measuring Inside Diameter Of Guide Bush

16. INSPECT CYLINDER HEAD SET BOLT

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

Standard bolt length:**161.3 to 162.7 mm (6.350 to 6.406 in.)****Maximum bolt length:****164.2 mm (6.465 in.)**

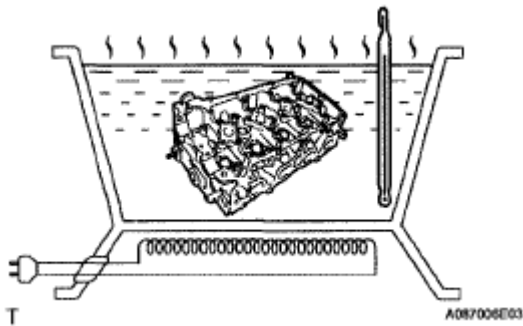
If the bolt length is greater than the maximum, replace the cylinder head set bolt.



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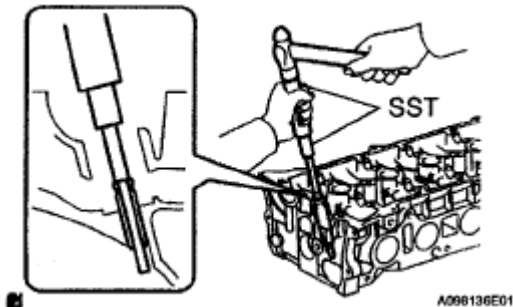
Fig. 173: Measuring Length Of Head Bolts From Seat To End**REPLACEMENT****1. REMOVE INTAKE VALVE GUIDE BUSH**

- a. Heat the cylinder head to 80 to 100°C (176 to 212°F).
- b. Place the cylinder head on wooden blocks.

**Fig. 174: Heating Cylinder Head**

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

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

**Fig. 175: Taping Guide Bush****2. REMOVE EXHAUST VALVE GUIDE BUSH**

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

- b. Place the cylinder head on wooden blocks.

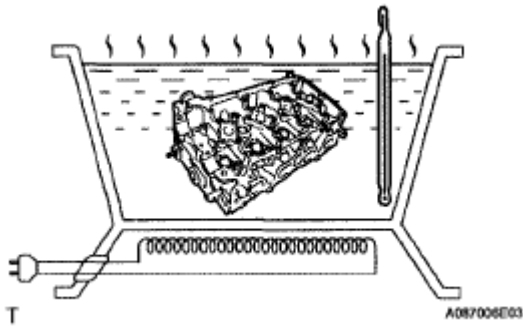


Fig. 176: Heating Cylinder Head

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

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

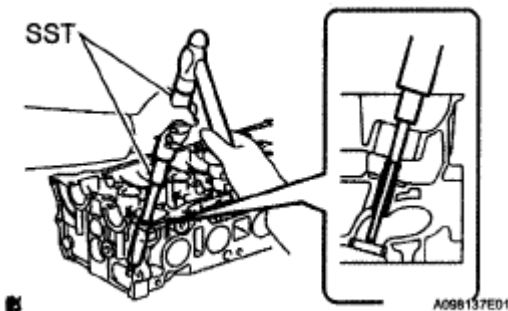


Fig. 177: Taping Guide Bush

3. INSTALL INTAKE VALVE GUIDE BUSH

- Heat the cylinder head to 80 to 100°C (176 to 212°F).
- Place the cylinder head on wooden blocks.
- Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Standard diameter:

10.285 to 10.306 mm (0.4049 to 0.4058 in.)

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

Standard diameter:

10.333 to 10.344 mm (0.4068 to 0.4072 in.)

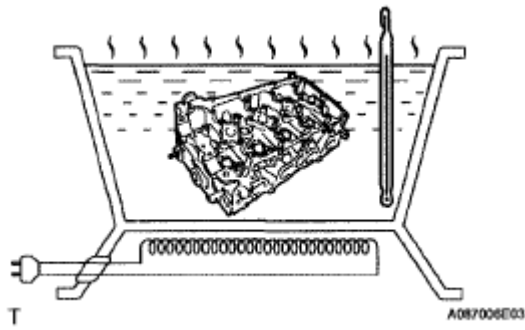


Fig. 178: Heating Cylinder Head

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

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

Standard protrusion height:

9.6 to 10 mm (0.3780 to 0.3937 in.)

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

Standard oil clearance:

0.025 to 0.060 mm (0.0010 to 0.0024 in.)

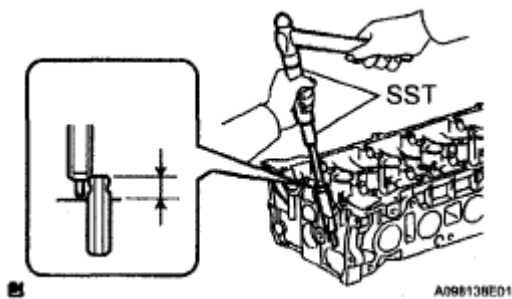


Fig. 179: Taping Guide Bush

4. INSTALL EXHAUST VALVE GUIDE BUSH

- Heat the cylinder head to 80 to 100°C (176 to 212°F).
- Place the cylinder head on wooden blocks.
- Using a caliper gauge, measure the bush bore diameter of the cylinder head.

Standard diameter:

10.285 to 10.306 mm (0.4049 to 0.4058 in.)

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

Standard diameter:

10.333 to 10.344 mm (0.4068 to 0.4072 in.)

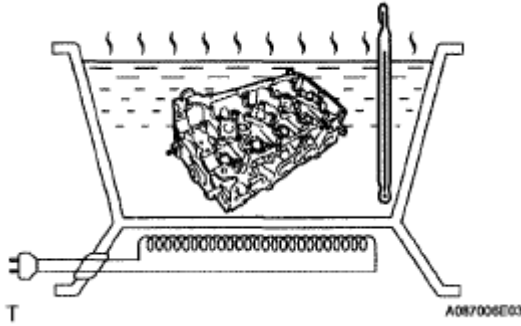


Fig. 180: Heating Cylinder Head

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

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

Standard protrusion height:

9.6 to 10.0 mm (0.3780 to 0.3937 in.)

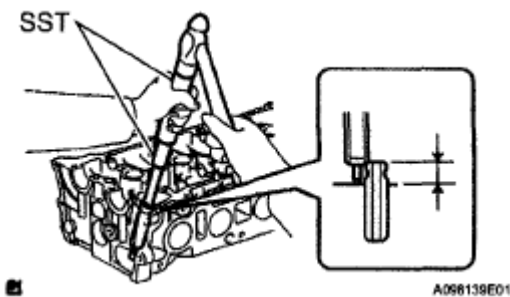


Fig. 181: Taping Guide Bush To Specified Protrusion Height

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

Standard oil clearance:

0.030 to 0.065 mm (0.0012 to 0.0026 in.)

REASSEMBLY

1. INSTALL INTAKE VALVE

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

SST 09202-70020 (09202-00010)

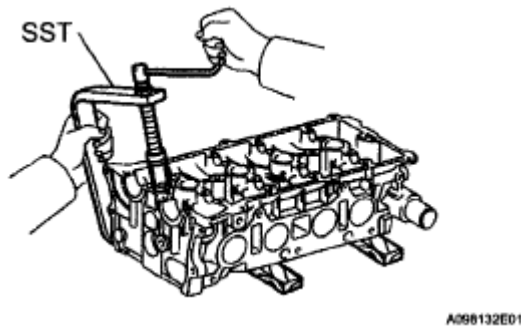


Fig. 182: Installing Intake Valve

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

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

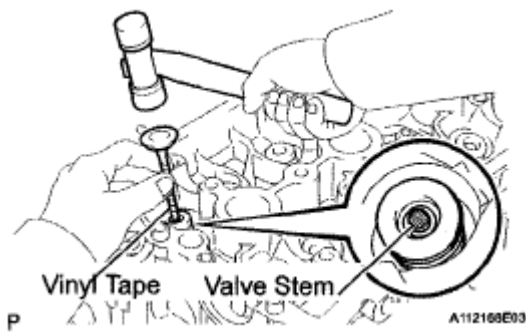


Fig. 183: Installing Valve To Fit Into Place

2. INSTALL EXHAUST VALVE

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

SST 09202-70020(09202-00010)

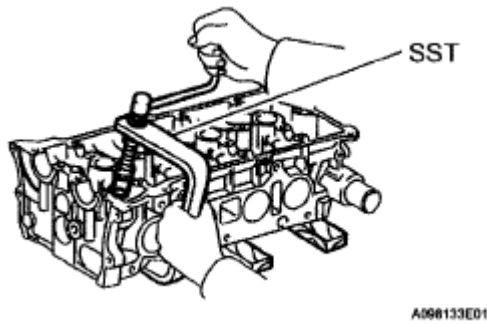


Fig. 184: Removing Retainer Locks

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

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

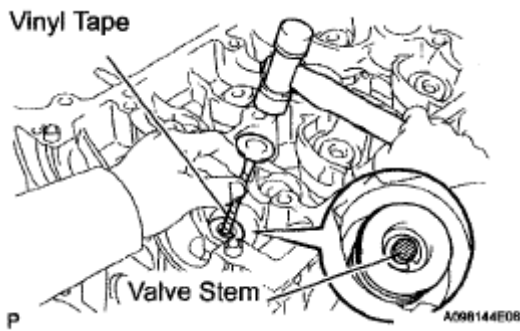


Fig. 185: Installing Valve To Fit Into Original Place

3. INSTALL VALVE LIFTER

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

NOTE: Install the valve lifters in their original places.

4. INSTALL STUD BOLT

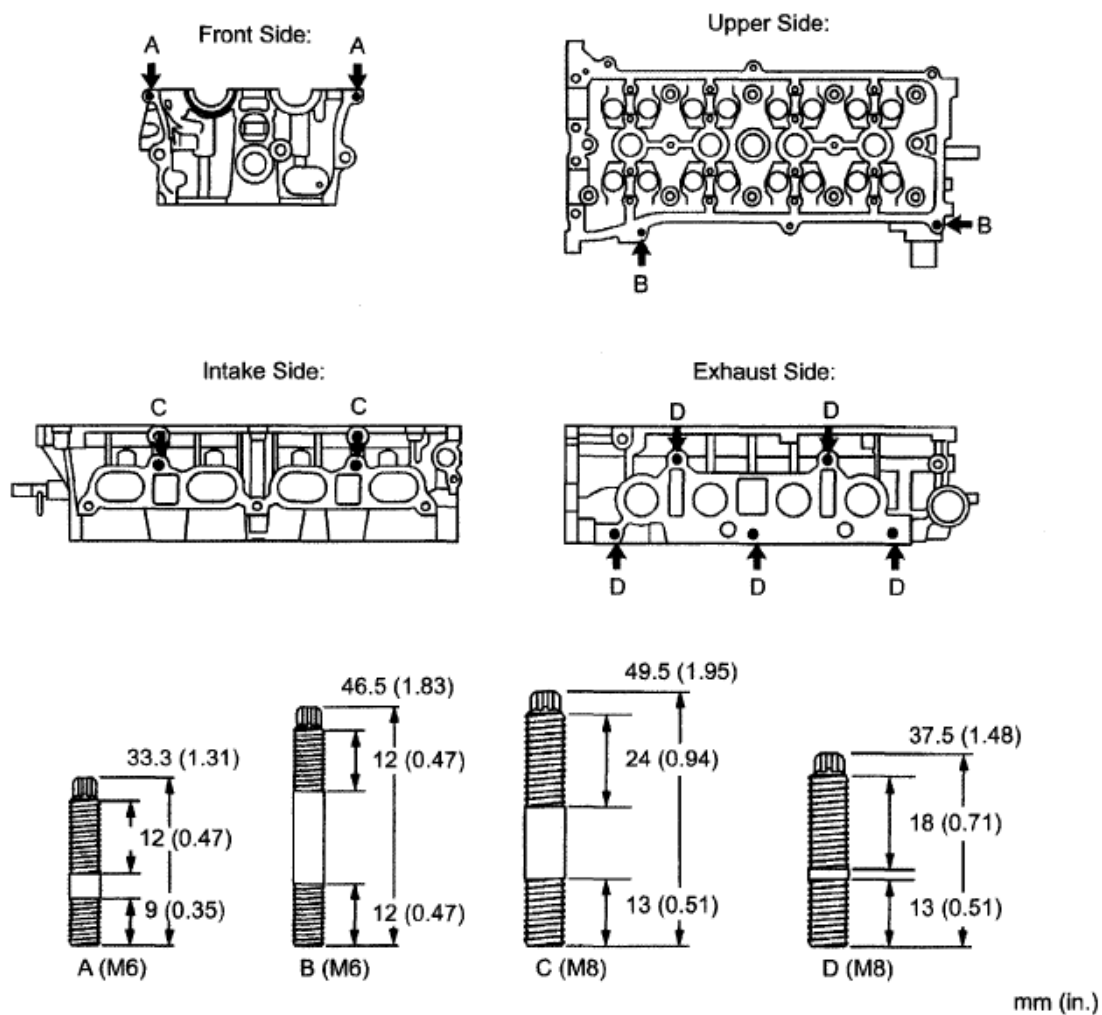
- a. Using E5 and E7 "torx" socket wrenches, install the 11 stud bolts.

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

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

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

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



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Fig. 186: Identifying Stud Bolt Dimension**5. INSTALL VALVE SPRING SEAT****6. INSTALL RING PIN**

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

protrusion height:**3.0 mm (0.12 in.)**

Upper Side:

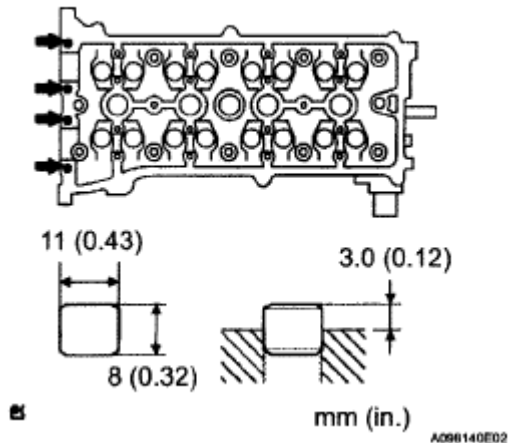


Fig. 187: Locating Ring Pins To Specified Protrusion Height

INSTALLATION

1. INSTALL CYLINDER HEAD GASKET

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

NOTE:

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

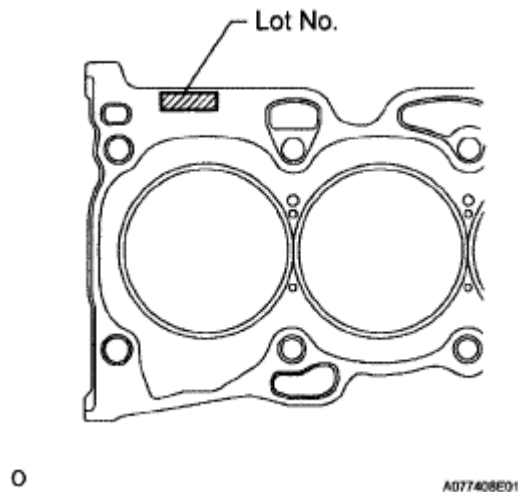


Fig. 188: Identifying Cylinder Block Surface With Lot Number

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

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

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

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

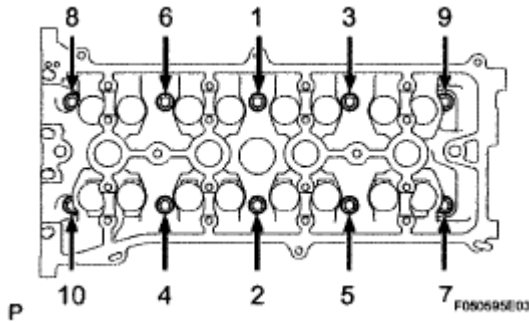


Fig. 189: Identifying Cylinder Set Head Bolts Tighten Sequence

- Mark the front of the cylinder head bolts with paint.
- Retighten the cylinder head bolts by 90° as shown in the illustration.
- Check that the paint mark is now at a 90° angle to the front.

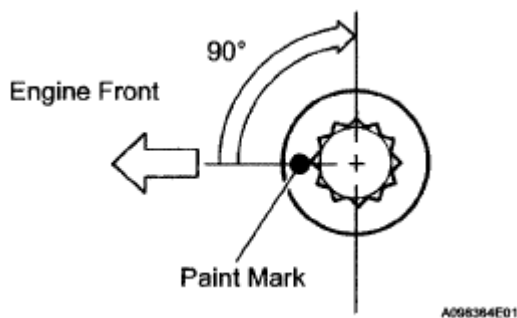


Fig. 190: Identifying Cylinder Head Bolts Paint Mark

- Connect the ground cable with the bolt.

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

- Connect the camshaft position sensor connector.
- Connect the engine coolant temperature sensor connector.
- Connect the engine oil pressure switch connector.
- Connect the radio setting condenser connector.
- Connect the heater water inlet hose.

1. Connect the radiator hose inlet.

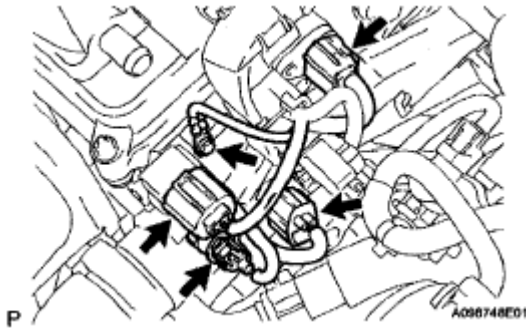


Fig. 191: Locating Engine Coolant Temperature Sensor Connector

3. INSTALL NO. 2 CAMSHAFT BEARING

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

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



Fig. 192: Identifying Camshaft Bearing Onto Cylinder Head

4. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

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

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

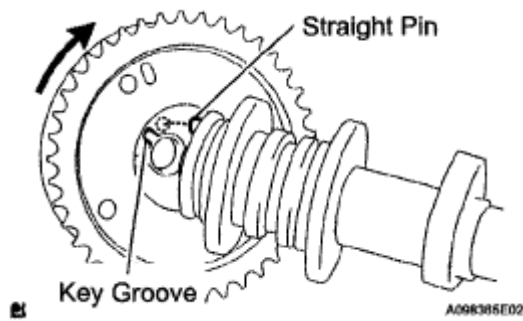


Fig. 193: Turning Camshaft Timing Gear

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

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

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

5. INSTALL NO. 2 CAMSHAFT TIMING SPROCKET

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

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

NOTE: Do not to damage the camshaft.

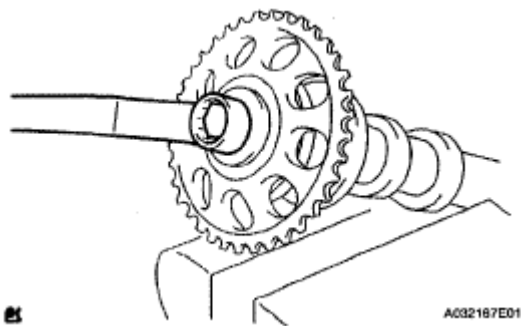


Fig. 194: Installing Camshaft Timing Sprocket With Bolt

6. INSTALL CAMSHAFT

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

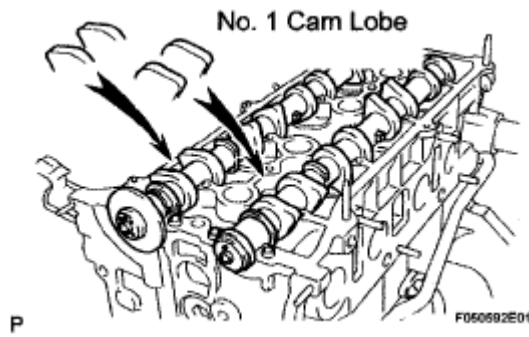


Fig. 195: Identifying Cam Lobes Facing Directions

- c. Examine the front marks and numbers and check that the order is as shown in the illustration. Then install the bearing caps onto the cylinder head.
- d. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

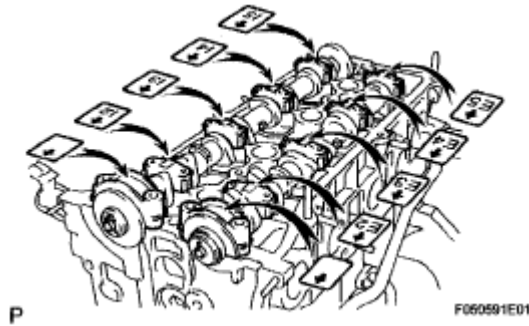


Fig. 196: Inspecting Camshaft Bearing Caps

- e. Using several steps, uniformly tighten the 20 bearing cap bolts in the sequence shown in the illustration.

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

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

NOTE:

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

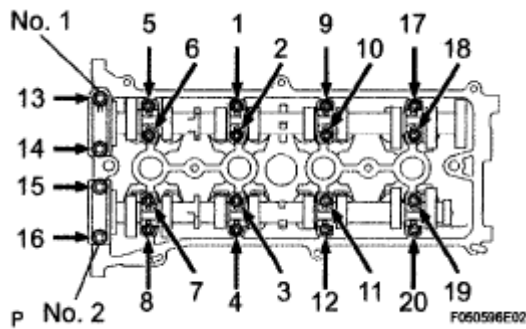


Fig. 197: Identifying Bearing Cap Bolts In Sequence

7. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

8. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

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

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

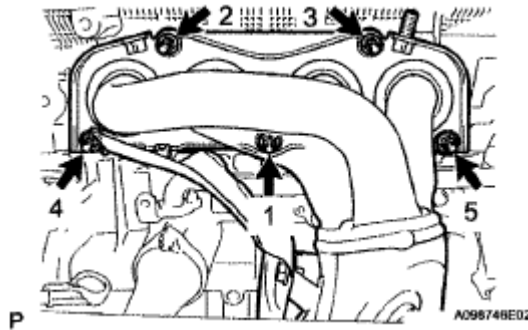


Fig. 198: Locating Exhaust Manifold Converter Nuts Sequence

9. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

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

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

- b. Connect the air fuel ratio sensor connector.

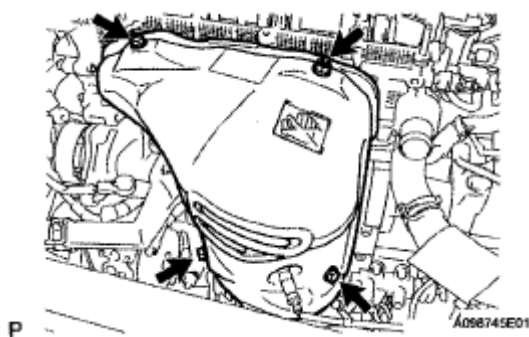


Fig. 199: Locating Exhaust Manifold Heat Insulator With Bolts And Nut

10. INSTALL NO. 2 MANIFOLD STAY

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

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

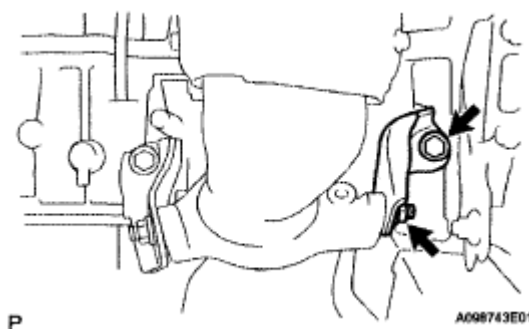


Fig. 200: Locating Stay With Bolt And Nut

11. INSTALL MANIFOLD STAY

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

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

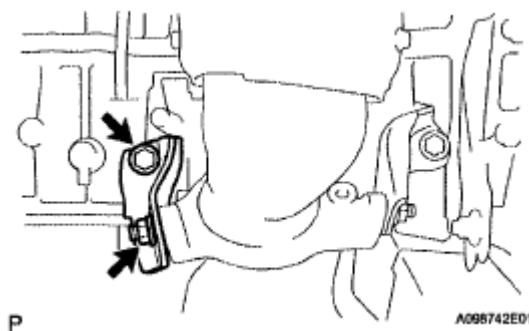


Fig. 201: Locating Manifold Stay

12. INSTALL OIL DIPSTICK GUIDE

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

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

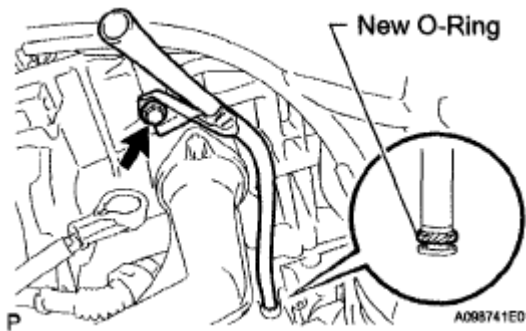


Fig. 202: Locating O-Ring And Guide

13. INSTALL OIL DIPSTICK

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

14. INSTALL NO. 1 CHAIN VIBRATION DAMPER (See INSTALLATION)**15. INSTALL CHAIN SUB-ASSEMBLY****16. INSTALL CHAIN TENSIONER SLIPPER (See INSTALLATION)****17. INSTALL TIMING CHAIN GUIDE (See INSTALLATION)****18. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE (See INSTALLATION)****19. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY (See INSTALLATION)****20. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY (See INSTALLATION)****21. INSTALL CRANKSHAFT PULLEY (See INSTALLATION)****22. INSTALL OIL PAN SUB-ASSEMBLY (See INSTALLATION)****23. INSTALL CRANKSHAFT POSITION SENSOR (See REMOVAL)****24. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See INSTALLATION)****25. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See INSTALLATION)****26. INSTALL IGNITION COIL ASSEMBLY (See REMOVAL)****27. INSTALL ENGINE MOUNTING INSULATOR RH (See INSTALLATION)****28. INSTALL VANE PUMP ASSEMBLY****29. INSTALL GENERATOR ASSEMBLY (See INSTALLATION)****30. INSTALL FAN AND GENERATOR V BELT (See REMOVAL)****31. INSTALL FRONT EXHAUST PIPE ASSEMBLY (See DISASSEMBLY)****32. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR (See INSPECTION)****33. INSTALL INTAKE MANIFOLD (See INSTALLATION)**

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

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

REPAIR

1. REPAIR VALVE SEATS

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

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

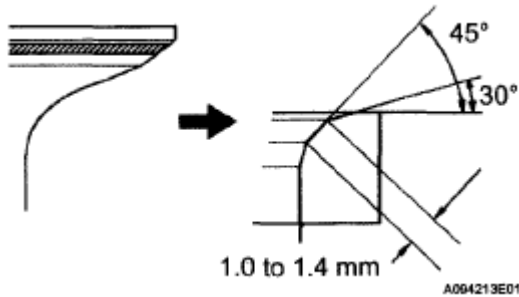


Fig. 203: Seating Too High On Valve Face

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

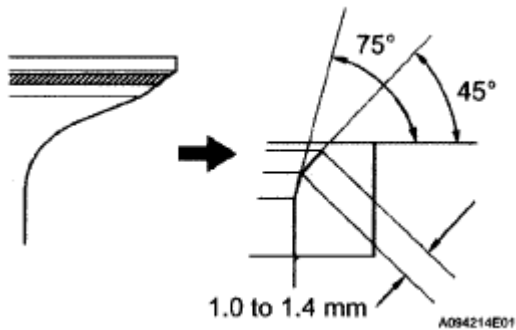
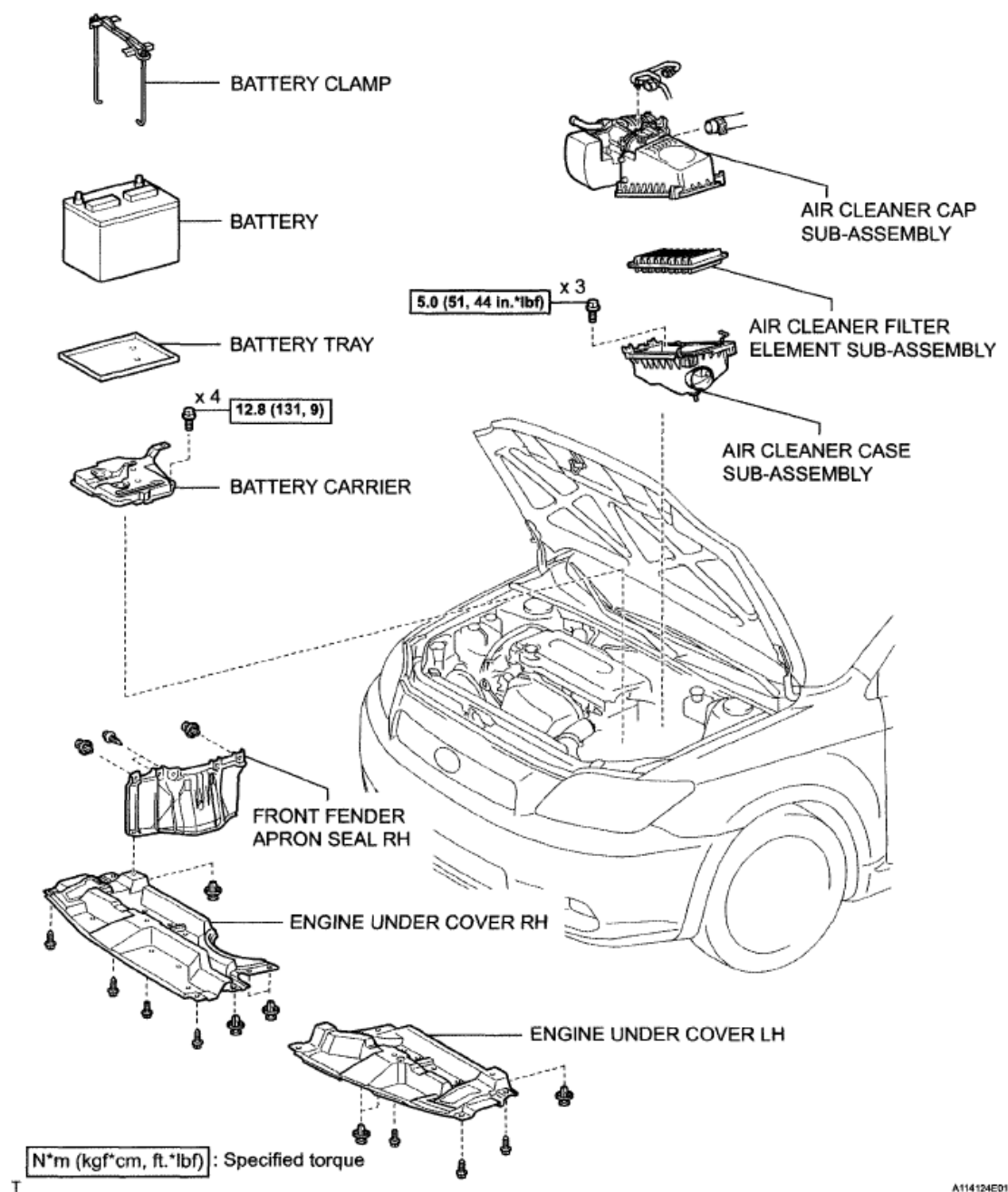


Fig. 204: Seating Too Low On Valve Face

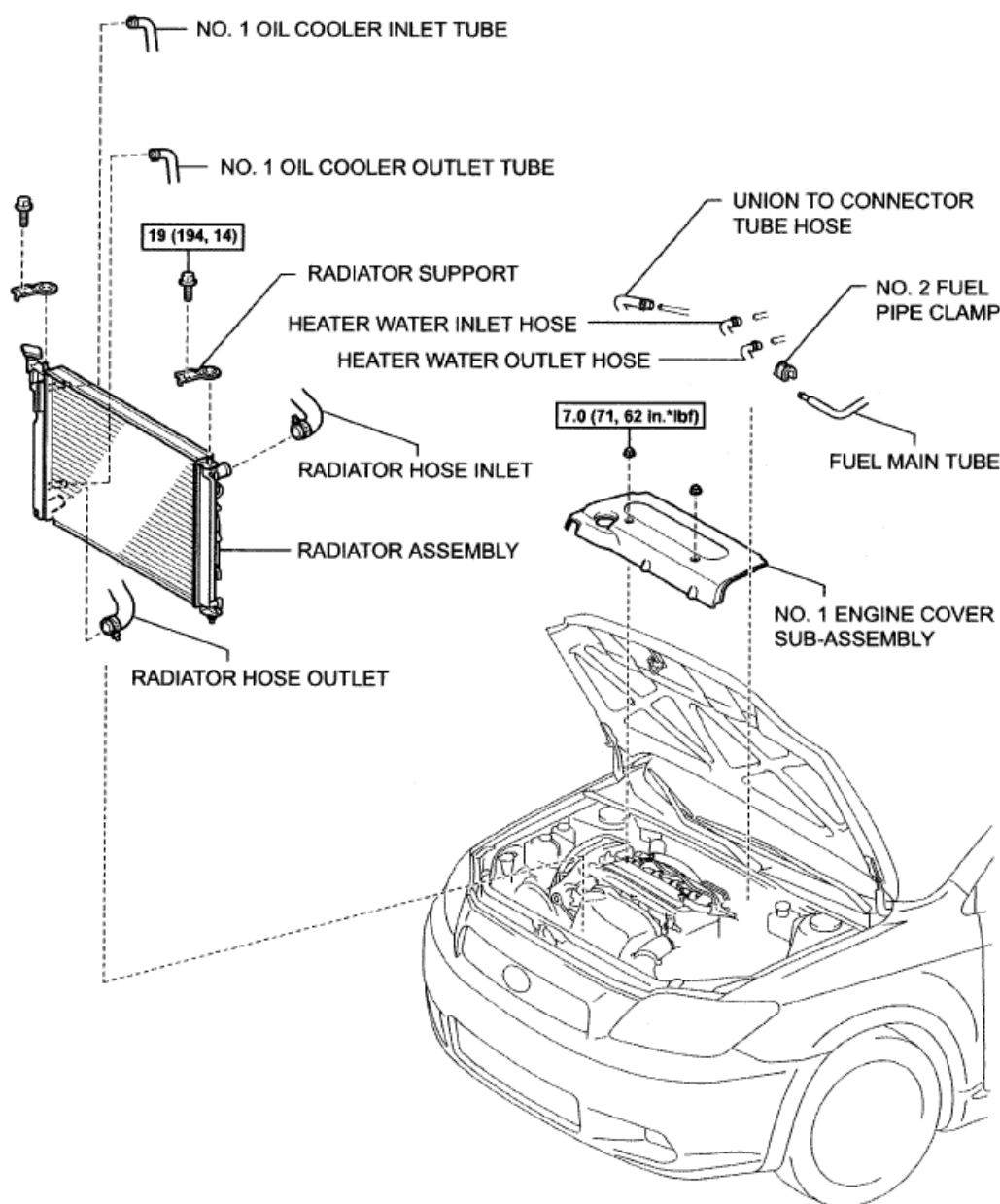
ENGINE ASSEMBLY

COMPONENTS



A114124ED1

Fig. 205: Identifying Engine Assembly Components With Specification (1 Of 11)

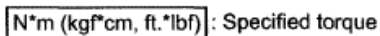


N*m (kgf*cm, ft.*lbf): Specified torque

T

A114125E02

Fig. 206: Identifying Engine Assembly Components With Specification (2 Of 11)



A114126E02

Fig. 207: Identifying Engine Assembly Components With Specification (3 Of 11)

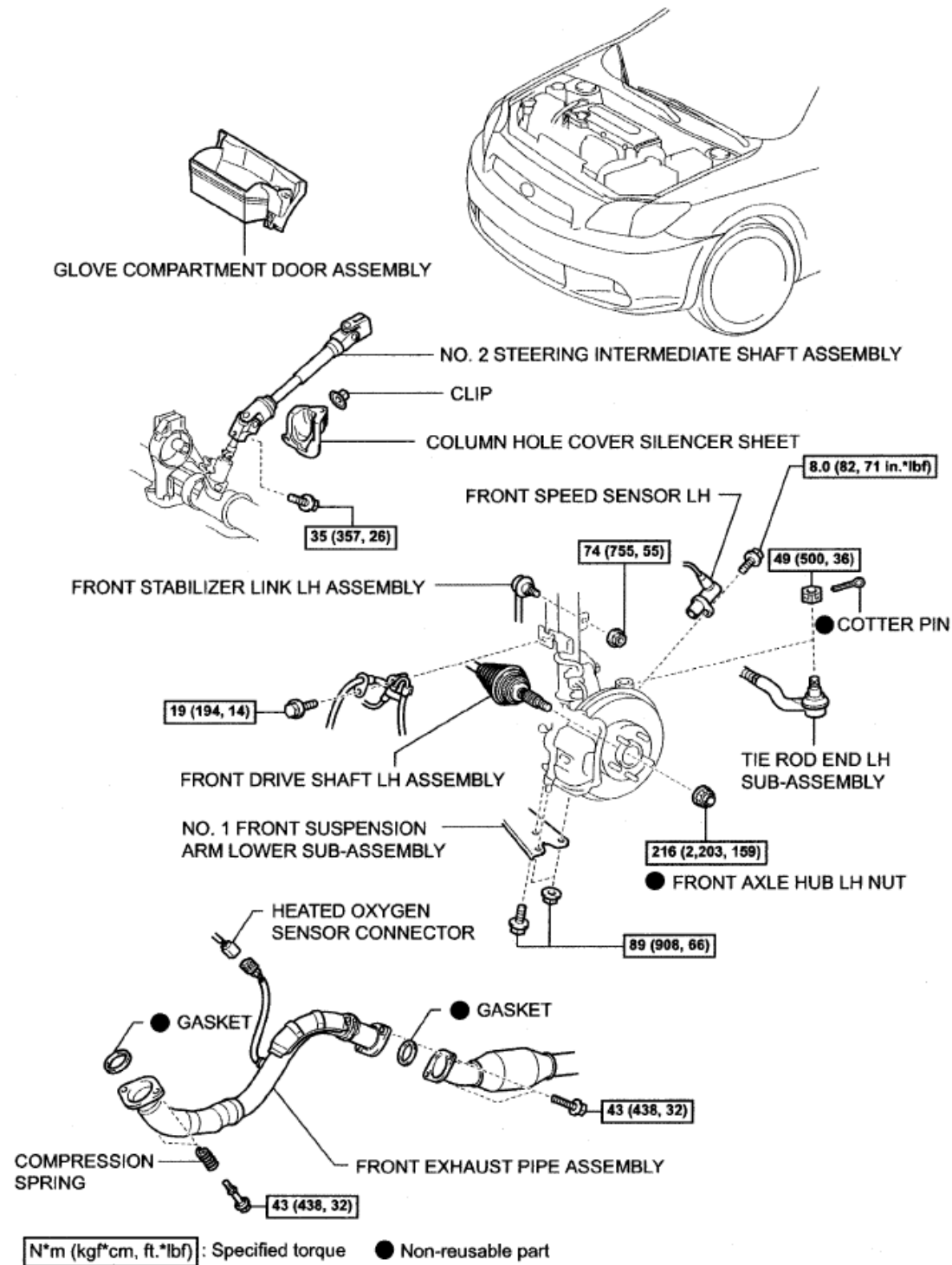


Fig. 208: Identifying Engine Assembly Components With Specification (4 Of 11)

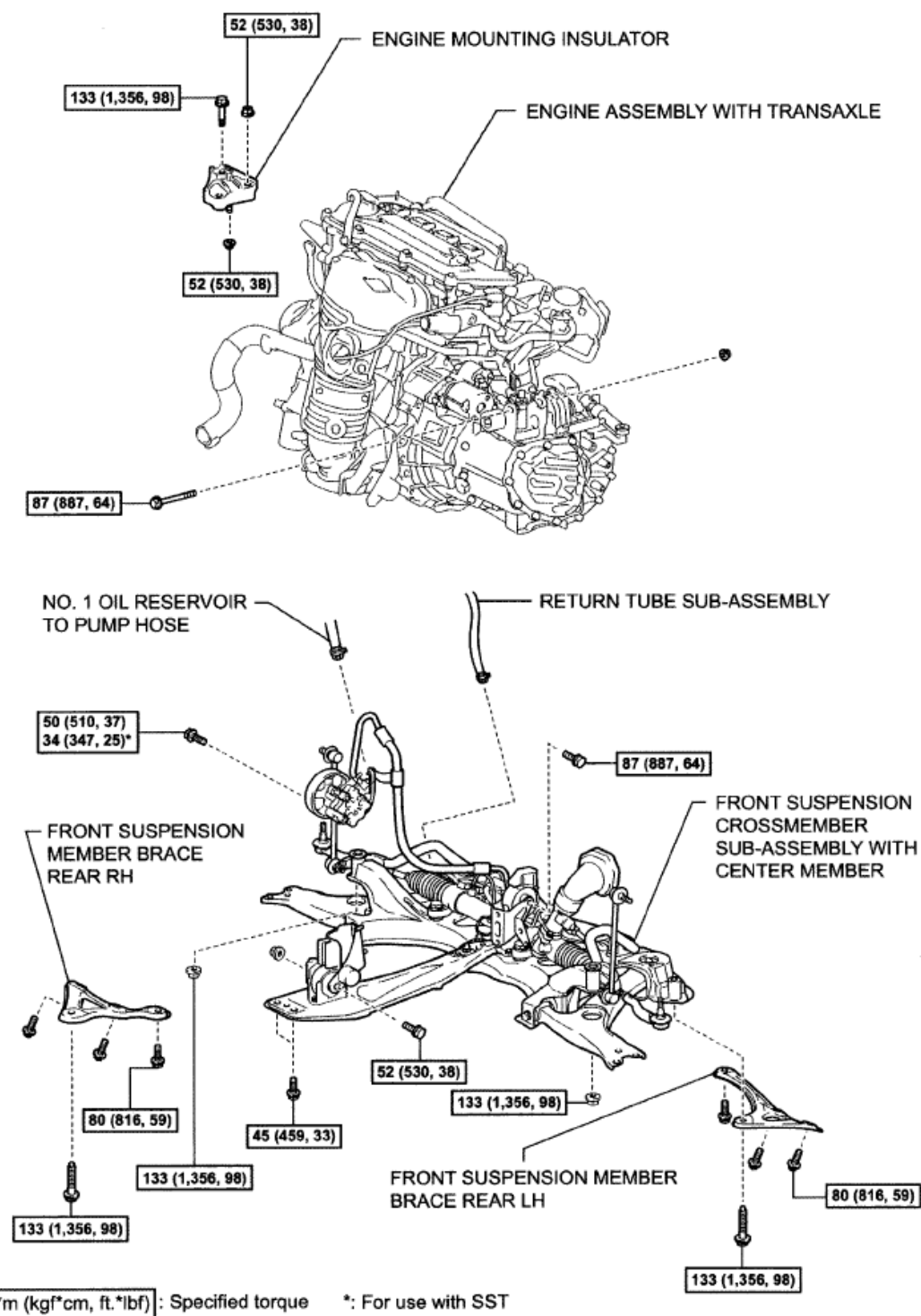
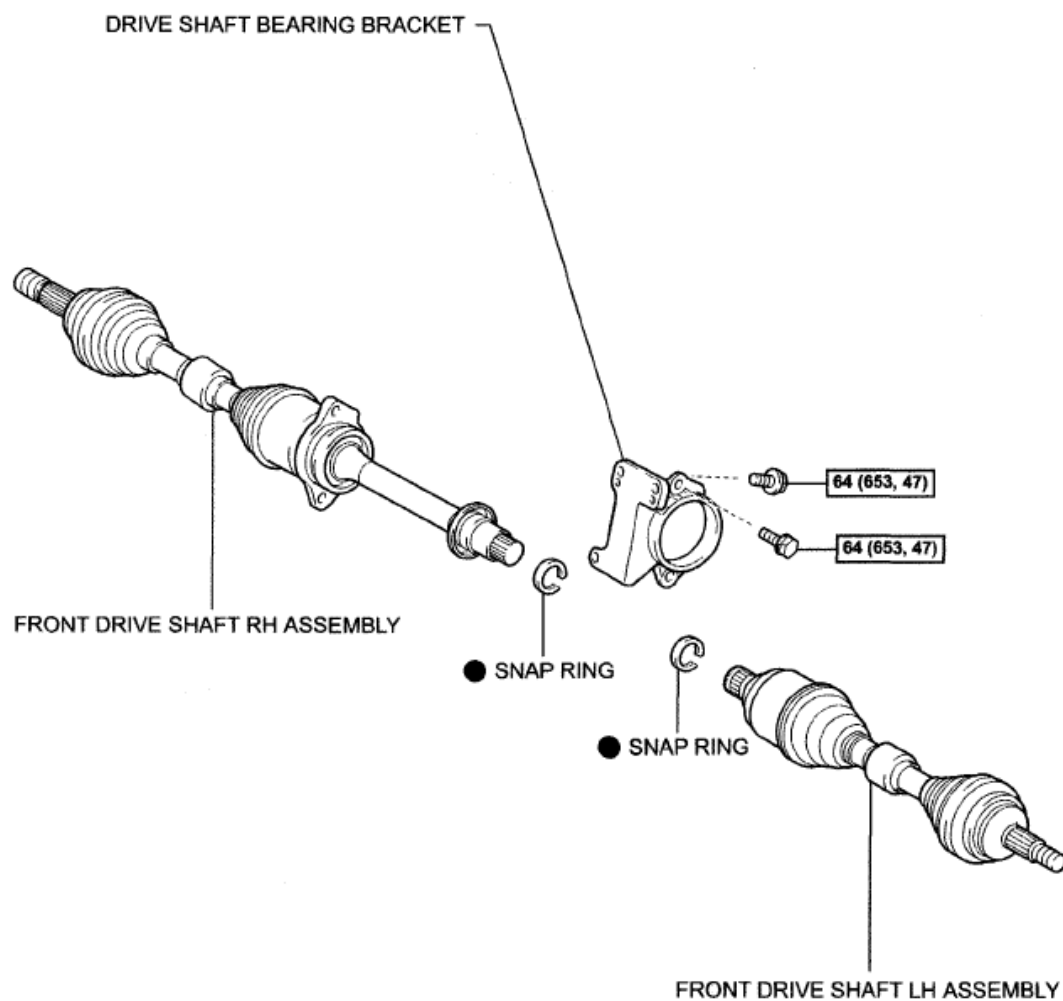


Fig. 209: Identifying Engine Assembly Components With Specification (5 Of 11)



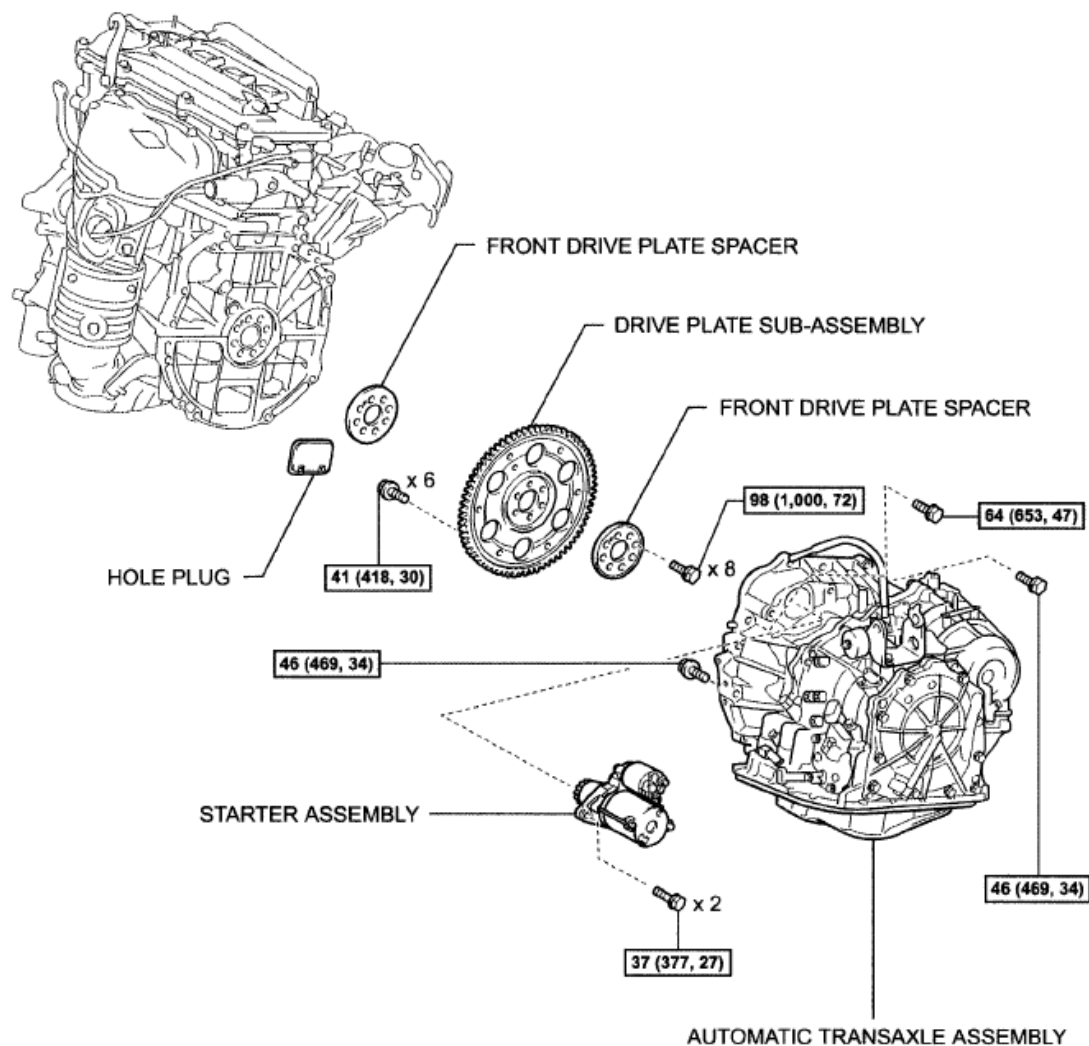
N*m (kgf*cm, ft.*lbf): Specified torque

● Non-reusable part

A114129E01

Fig. 210: Identifying Engine Assembly Components With Specification (6 Of 11)

Automatic Transaxle:

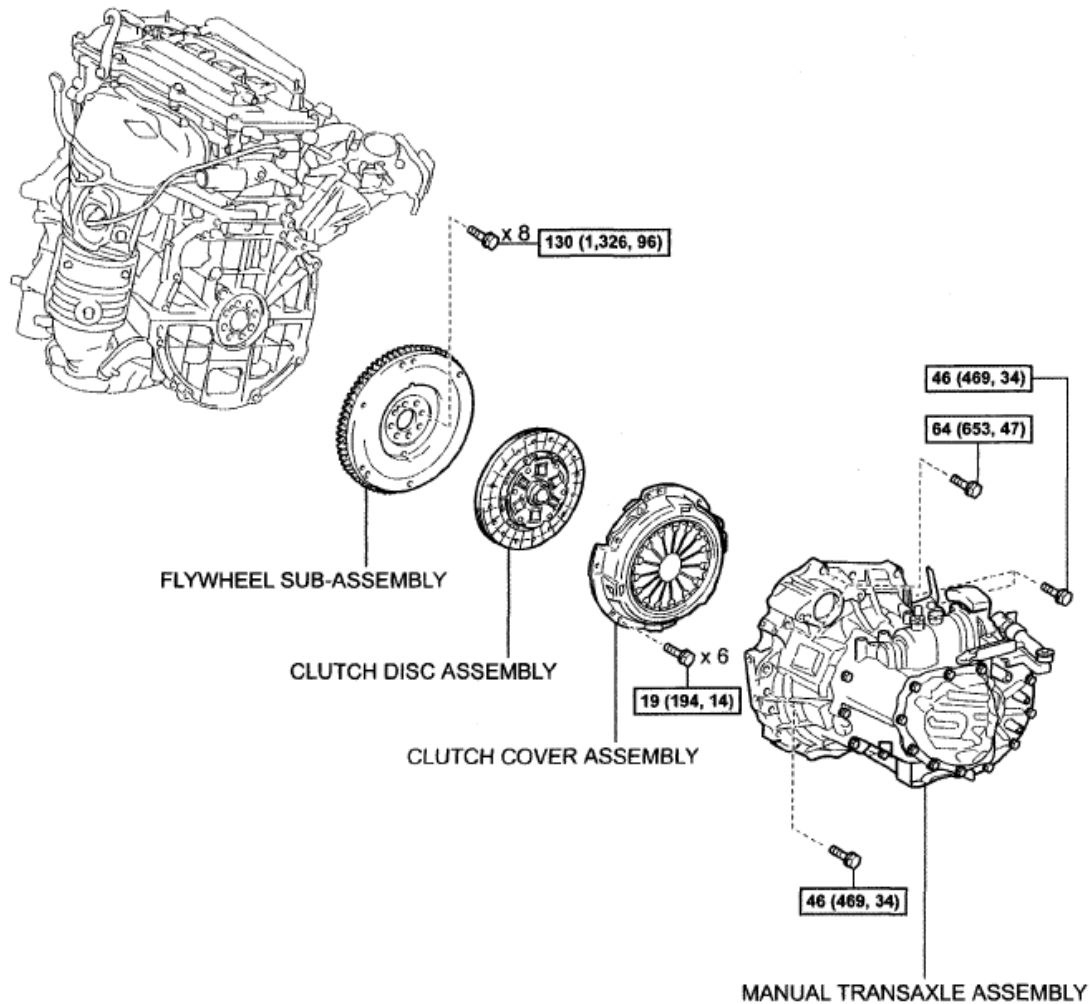


T **N*m (kgf*cm, ft.*lbf)**: Specified torque

A114130E01

Fig. 211: Identifying Engine Assembly Components With Specification (7 Of 11)

Manual Transaxle:



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

A114131E01

Fig. 212: Identifying Engine Assembly Components With Specification (8 Of 11)

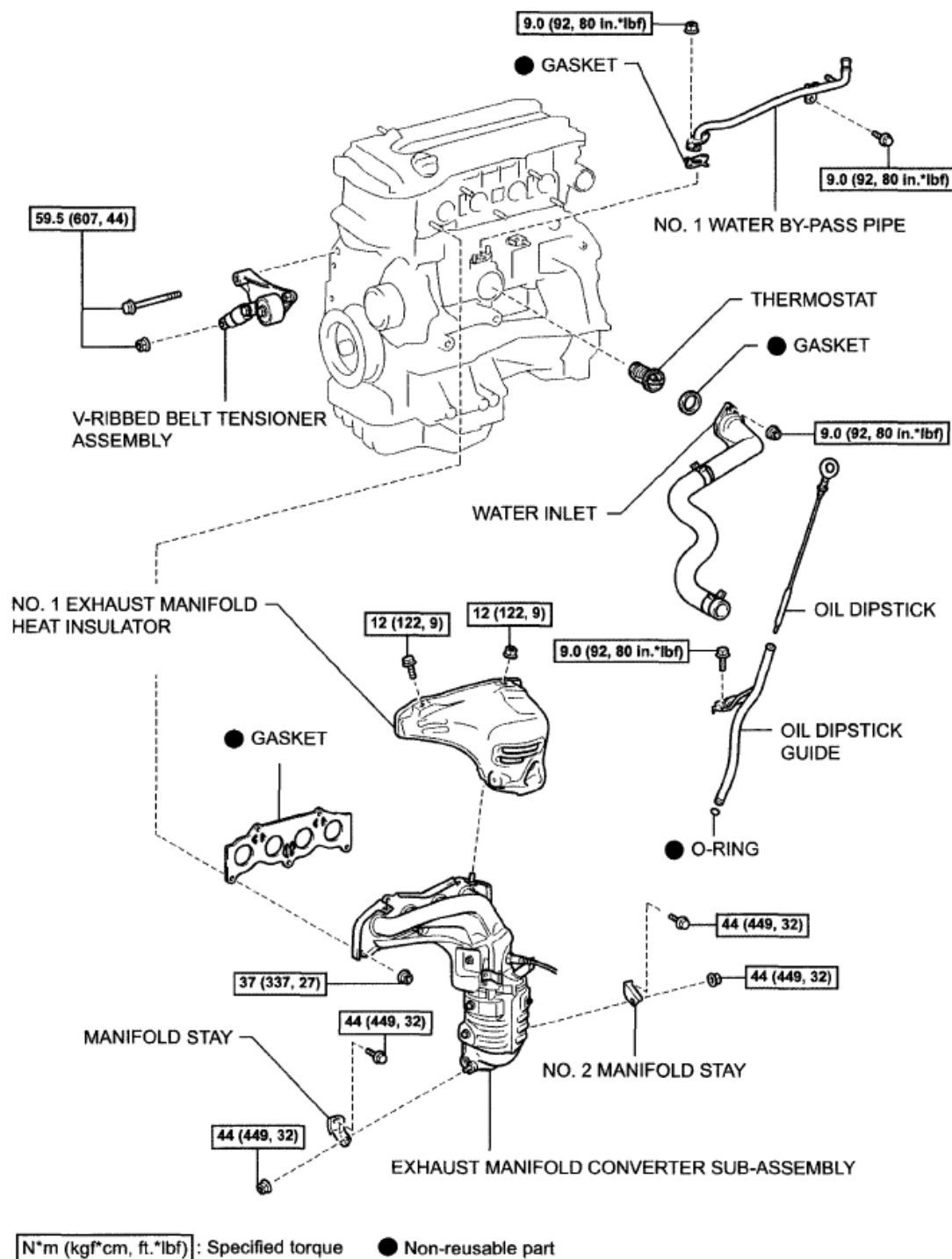
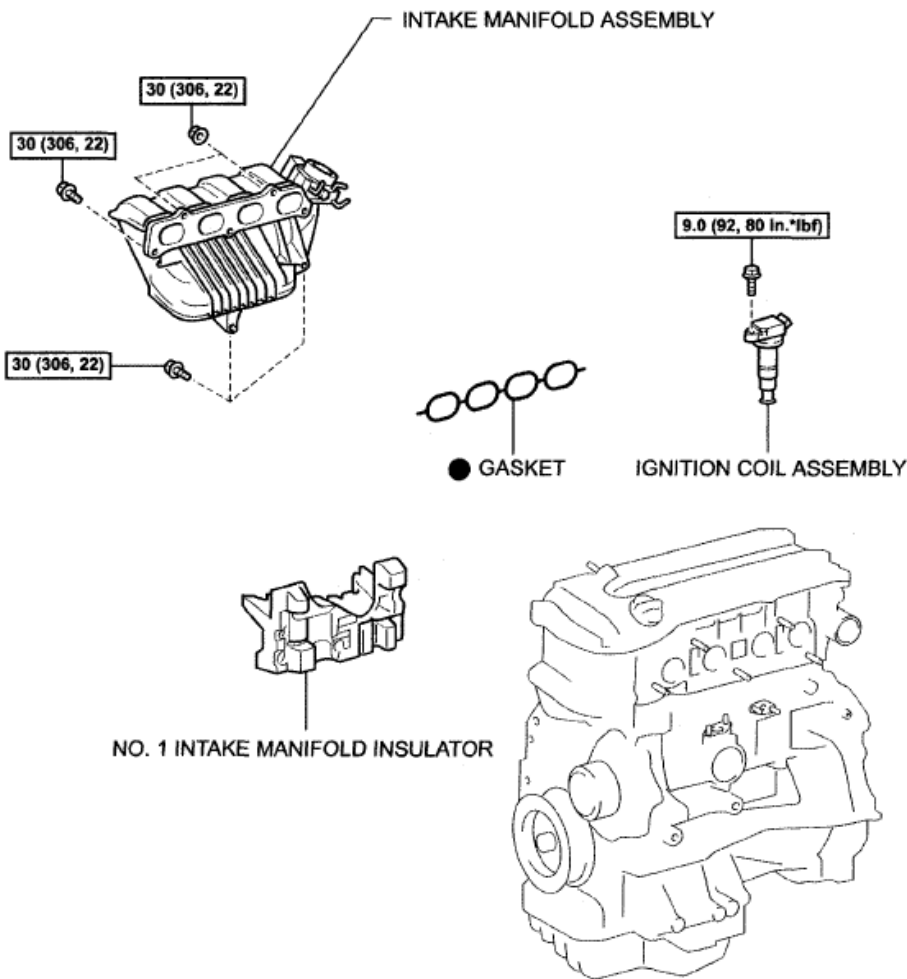


Fig. 213: Identifying Engine Assembly Components With Specification (9 Of 11)



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

● Non-reusable part

T

A114133E01

Fig. 214: Identifying Engine Assembly Components With Specification (10 Of 11)

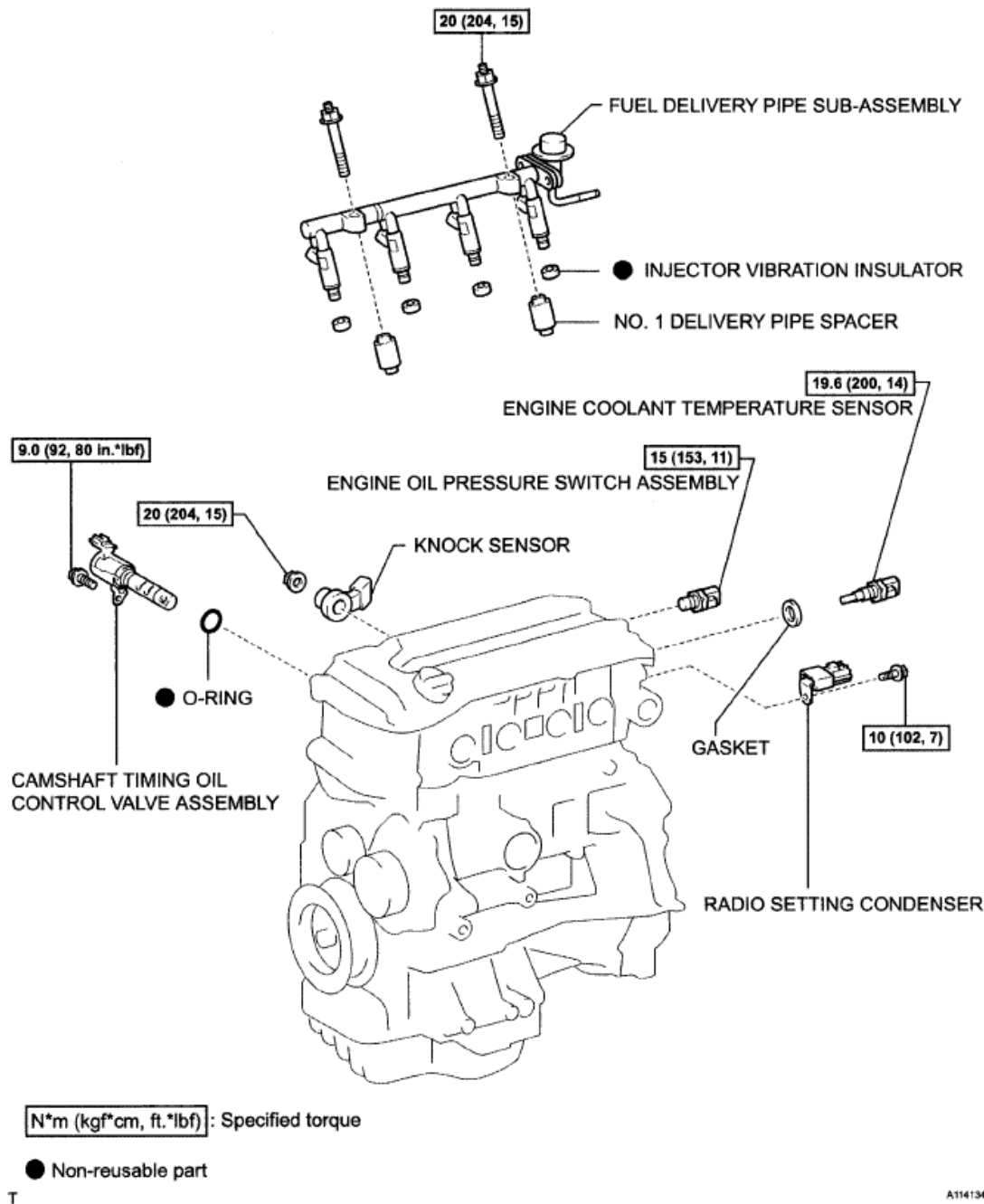


Fig. 215: Identifying Engine Assembly Components With Specification (11 Of 11)

REMOVAL

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

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

pretensioner activation.

3. **REMOVE BATTERY**
 - a. Loosen the 2 nuts and remove the battery clamp.
4. **REMOVE BATTERY TRAY**
5. **REMOVE FRONT WHEEL**
6. **REMOVE ENGINE UNDER COVER RH**
7. **REMOVE ENGINE UNDER COVER LH**
8. **REMOVE FRONT FENDER APRON SEAL RH (See REMOVAL)**
9. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (See REMOVAL)**
10. **DRAIN ENGINE COOLANT (See COOLANT)**
11. **DRAIN AUTOMATIC TRANSAXLE FLUID (for Automatic Transaxle) (See REMOVAL)**
12. **DRAIN TRANSAXLE OIL (for Manual Transaxle) (See REMOVAL)**
13. **DISCONNECT RADIATOR HOSE INLET**
14. **DISCONNECT RADIATOR HOSE OUTLET**
15. **DISCONNECT NO. 1 OIL COOLER INLET TUBE (for Automatic Transaxle)**
16. **DISCONNECT NO. 1 OIL COOLER OUTLET TUBE (for Automatic Transaxle)**
17. **REMOVE RADIATOR ASSEMBLY (See REMOVAL)**
18. **REMOVE AIR CLEANER ASSEMBLY**
 - a. Remove the air cleaner cap and element (see REMOVAL).
 - b. Remove the clamp of the engine wire.
 - c. Remove the 3 bolts from the air cleaner case.
 - d. Disconnect the air cleaner case from the No. 1 air cleaner inlet.

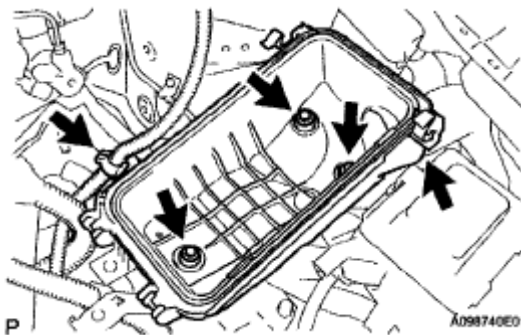


Fig. 216: Locating Air Cleaner Case And Bolt

19. **REMOVE BATTERY CARRIER**
 - a. Disconnect the clamp of the engine wire.
 - b. Remove the 4 bolts and battery carrier.

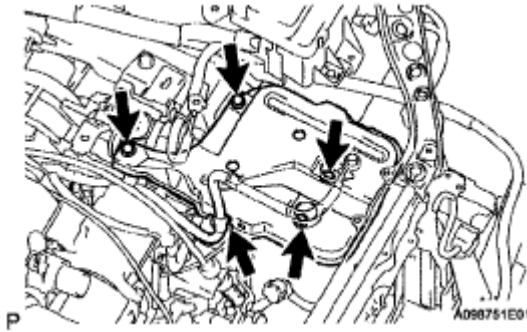


Fig. 217: Locating Battery Carrier And Bolts

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

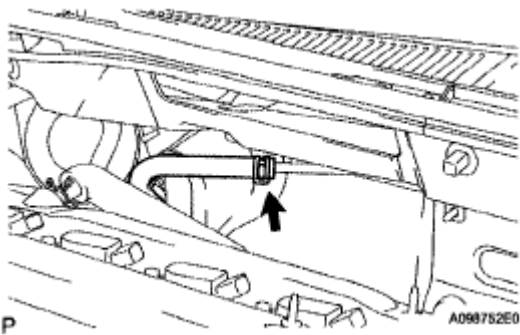


Fig. 218: Locating Connector Tube Hose From Booster Vacuum Tube

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

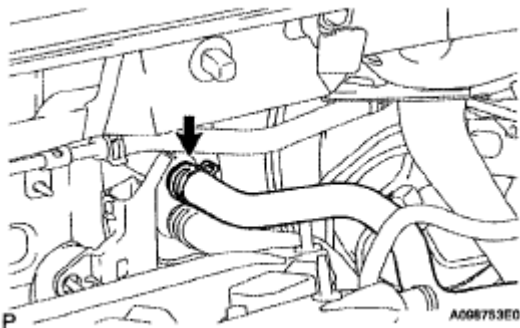


Fig. 219: Locating Heater Water Inlet Hose From Booster Vacuum Tube

23. **DISCONNECT HEATER WATER OUTLET HOSE**
 - a. Disconnect the heater water outlet hose from the air conditioner tube.

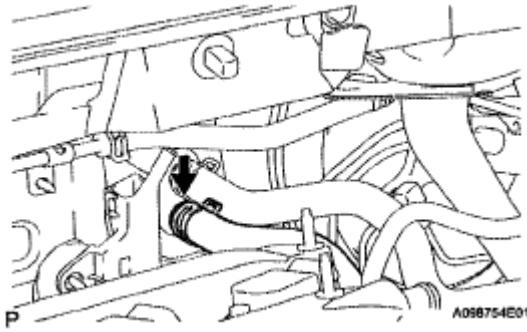


Fig. 220: Locating Heater Water Outlet Hose From Air Conditioner Tube

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

HINT:

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

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

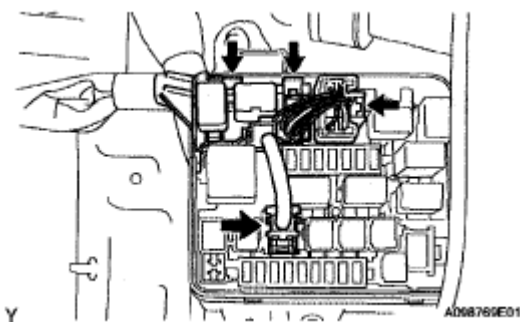


Fig. 221: Locating Engine Room Relay Block Cover

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

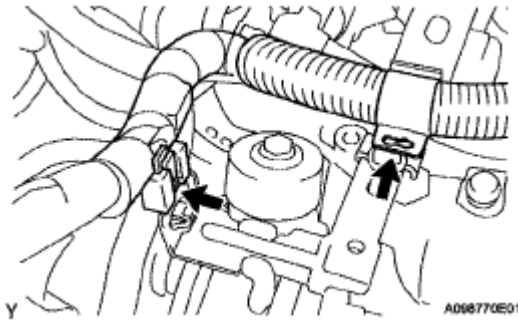


Fig. 222: Locating Engine Wire And Clamps

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

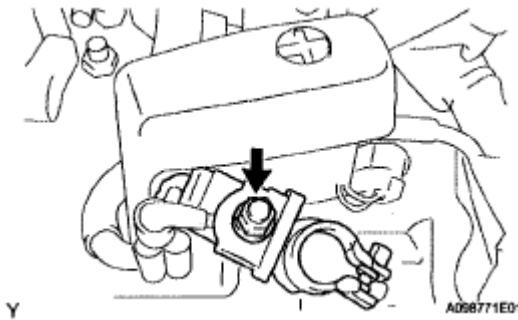


Fig. 223: Locating Nut From Battery Positive Terminal

- g. Remove the bolt and ground cable.

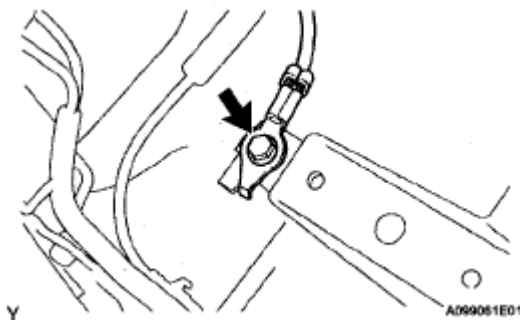


Fig. 224: Locating Ground Cable And Bolt

32. REMOVE FRONT EXHAUST PIPE ASSEMBLY (See **REMOVAL**)
33. REMOVE COLUMN HOLE COVER SILENCER SHEET (See **DISASSEMBLY**)
34. REMOVE NO. 2 STEERING INTERMEDIATE SHAFT ASSEMBLY (See **DISASSEMBLY**)
35. REMOVE FRONT AXLE HUB NUT (See **REMOVAL**)

36. **DISCONNECT FRONT STABILIZER LINK ASSEMBLY LH** (See REMOVAL)
37. **DISCONNECT FRONT STABILIZER LINK ASSEMBLY RH** (See REMOVAL)
38. **DISCONNECT FRONT SPEED SENSOR LH** (See REMOVAL)
39. **DISCONNECT FRONT SPEED SENSOR RH** (See REMOVAL)
40. **SEPARATE TIE ROD END LH SUB-ASSEMBLY** (See REMOVAL)
41. **REMOVE TIE ROD END RH SUB-ASSEMBLY** (See DISASSEMBLY)
42. **SEPARATE FRONT NO. 1 SUSPENSION ARM SUB-ASSEMBLY LOWER LH** (See REMOVAL)
43. **SEPARATE FRONT NO. 1 SUSPENSION ARM SUB-ASSEMBLY LOWER RH** (See REMOVAL)
44. **REMOVE FRONT AXLE HUB LH SUB-ASSEMBLY** (See INSTALLATION)
45. **REMOVE FRONT AXLE HUB RH SUB-ASSEMBLY** (See INSTALLATION)
46. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**
 - a. Disconnect the No. 1 pump hose.

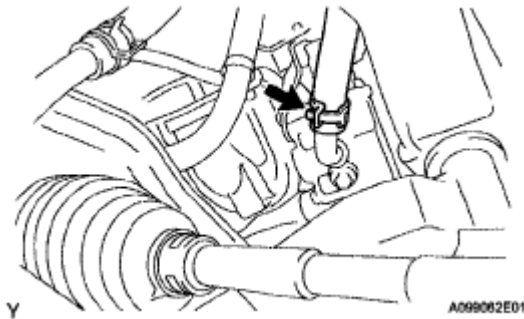


Fig. 225: Locating Pump Hose

- b. Disconnect the return tube.
- c. Set the engine lifter.

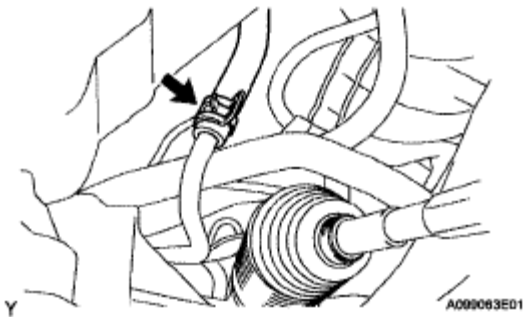


Fig. 226: Locating Return Tube

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

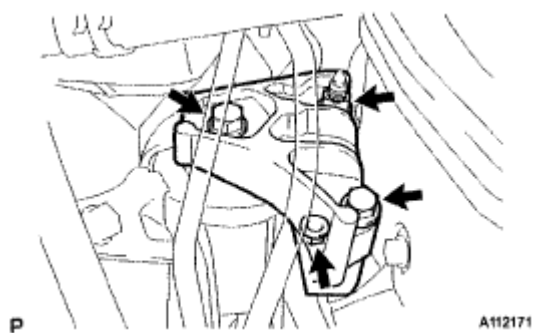


Fig. 227: Locating Engine Mounting Insulator RH

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

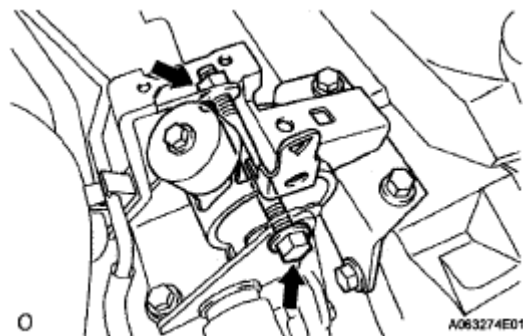


Fig. 228: Locating Engine Mounting Insulator LH

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

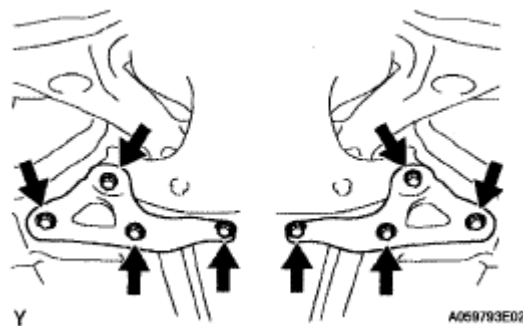


Fig. 229: Locating Front Suspension Member Brace Rear And Bolts

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

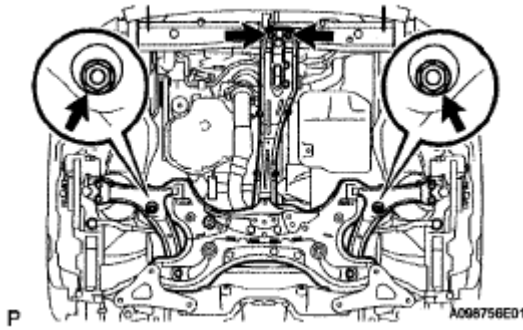


Fig. 230: Locating Transaxle Bolts And Nuts

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

Parts No.

ITEM REFERENCE CHART

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

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

No. 1 Engine Hanger

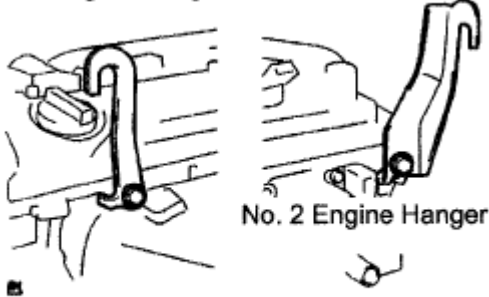


Fig. 231: Identifying Engine Hanger

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

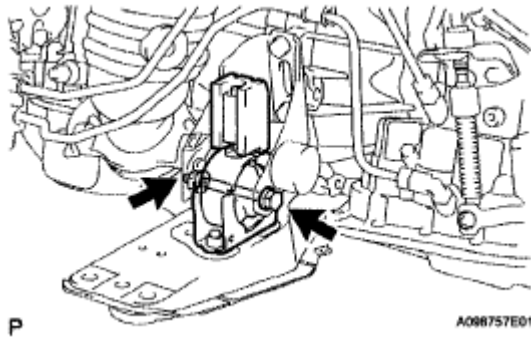


Fig. 232: Locating Through Bolt

- b. Remove the through bolt and engine mounting insulator RR from the engine mounting bracket RR.
- c. Separate the engine and transaxle assembly from the suspension crossmember and the engine mounting member.

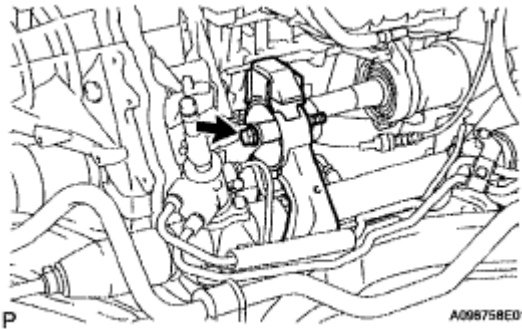


Fig. 233: Locating Through Bolt And Engine Mounting

49. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** (See REMOVAL)
50. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** (See DISASSEMBLY)
51. **REMOVE STARTER ASSEMBLY** (See REMOVAL)
52. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY** (See INSPECTION)
53. **REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY** (for Automatic Transaxle)
54. **REMOVE DRIVE PLATE SUB-ASSEMBLY** (for Automatic Transaxle)
 - a. Using SST, hold the crankshaft.

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

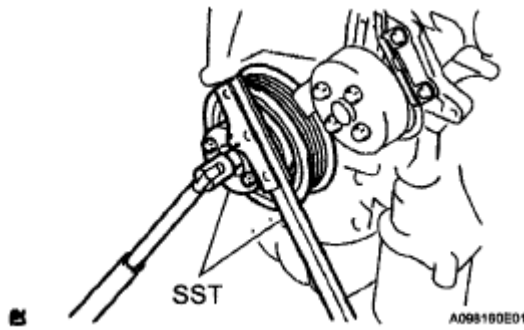


Fig. 234: Holding Crankshaft With SST

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

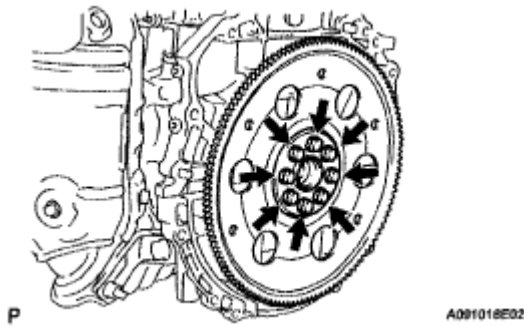


Fig. 235: Locating Flywheel Bolts

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

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

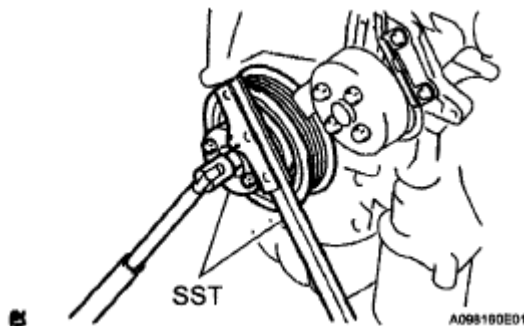


Fig. 236: Holding Crankshaft With SST

- b. Remove the 8 bolts and flywheel.

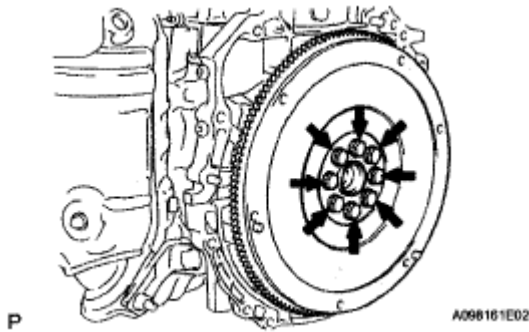


Fig. 237: Locating Flywheel Bolts

59. REMOVE DRIVE SHAFT BEARING BRACKET

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

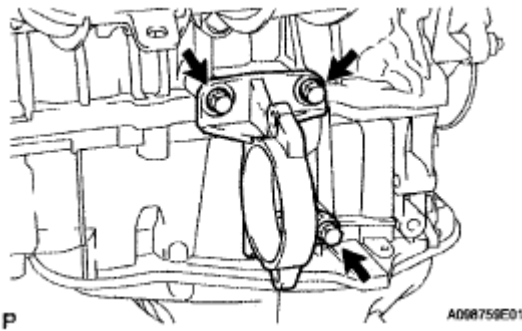


Fig. 238: Locating Drive Shaft Bearing Bracket And Bolts

60. **REMOVE OIL DIPSTICK**
61. **REMOVE OIL DIPSTICK GUIDE (See REMOVAL)**
62. **REMOVE MANIFOLD STAY (See REMOVAL)**
63. **REMOVE NO. 2 MANIFOLD STAY (See REMOVAL)**
64. **REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR (See REMOVAL)**
65. **REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY (See REMOVAL)**
66. **REMOVE WATER INLET (See REMOVAL)**
67. **REMOVE THERMOSTAT**
68. **REMOVE NO. 1 WATER BY-PASS PIPE**
 - a. Remove the bolt, 2 nuts and water by-pass pipe.
 - b. Remove the gasket from the cylinder block.

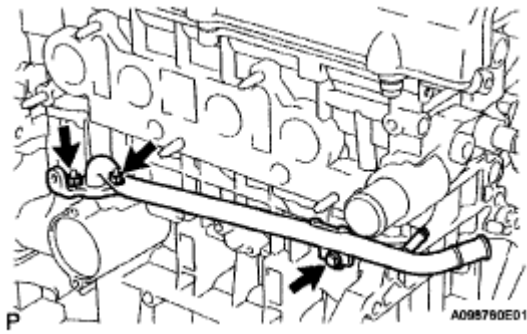


Fig. 239: Locating Water By-Pass Pipe, Nuts And Bolts

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

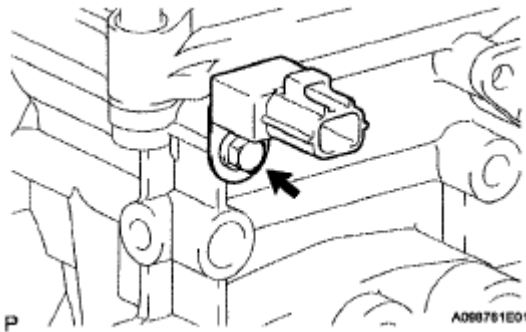


Fig. 240: Locating Bolt And Condenser

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

INSTALLATION

1. **INSTALL ENGINE COOLANT TEMPERATURE SENSOR** (See INSTALLATION)
2. **INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY**
3. **INSTALL RADIO SETTING CONDENSER**

- a. Install the condenser with the bolt.

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

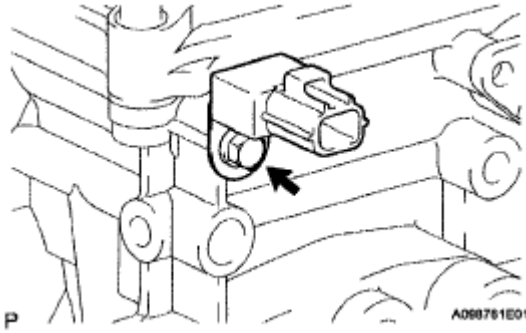


Fig. 241: Locating Bolt And Condenser

4. INSTALL KNOCK SENSOR (See INSPECTION)
5. INSTALL CAMSHAFT TIMING CONTROL VALVE ASSEMBLY (See INSTALLATION)
6. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY (See INSTALLATION)
7. INSTALL IGNITION COIL ASSEMBLY (See REMOVAL)
8. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See INSTALLATION)
9. INSTALL NO. 1 INTAKE MANIFOLD INSULATOR (See INSPECTION)
10. INSTALL INTAKE MANIFOLD ASSEMBLY (See INSTALLATION)
11. INSTALL NO. 1 WATER BY-PASS PIPE

- a. Install a new gasket and the water by-pass pipe with the bolt and 2 nuts.

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

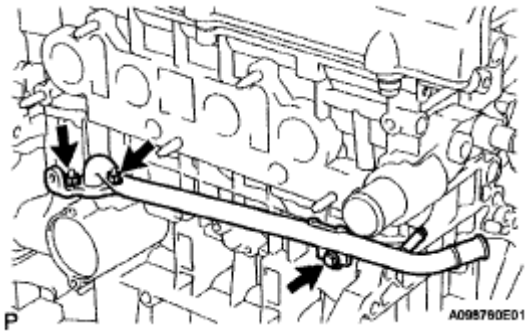


Fig. 242: Locating Water By-Pass Pipe, Nuts And Bolts

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

16. **INSTALL NO. 2 MANIFOLD STAY** (See INSTALLATION)
17. **INSTALL MANIFOLD STAY** (See INSTALLATION)
18. **INSTALL OIL DIPSTICK GUIDE** (See INSTALLATION)
19. **INSTALL OIL DIPSTICK** (See INSTALLATION)
20. **INSTALL DRIVE SHAFT BEARING BRACKET**
 - a. Install the drive shaft bearing bracket with the 3 bolts.

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

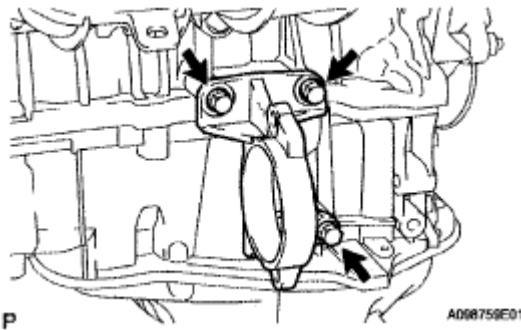


Fig. 243: Locating Drive Shaft Bearing Bracket And Bolts

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

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- c. Using SST, hold the crankshaft.

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

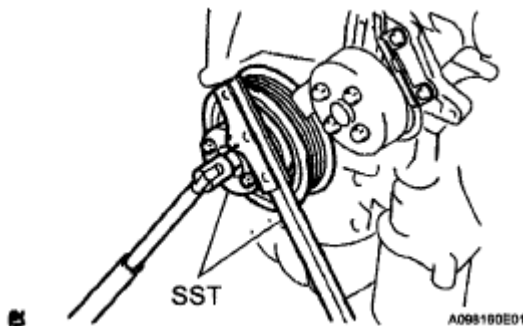


Fig. 244: Holding Crankshaft With SST

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

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

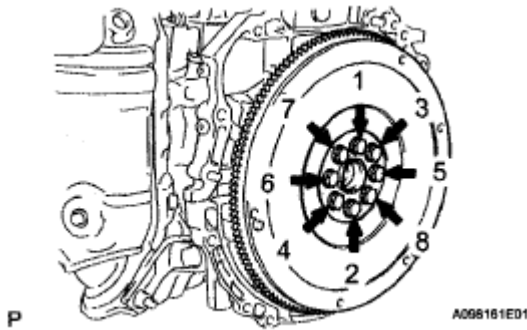


Fig. 245: Locating Flywheel Bolts

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

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- c. Using SST, hold the crankshaft.

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

- d. Install the front spacer, drive plate and rear spacer onto the crankshaft.

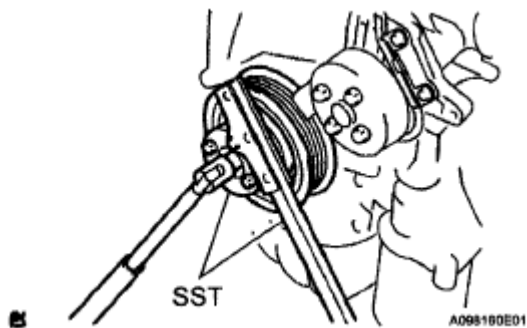


Fig. 246: Holding Crankshaft With SST

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

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

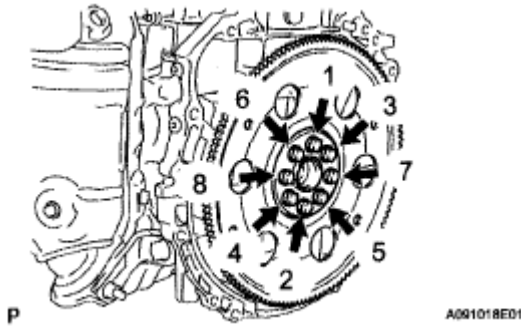


Fig. 247: Locating Flywheel Bolts

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

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

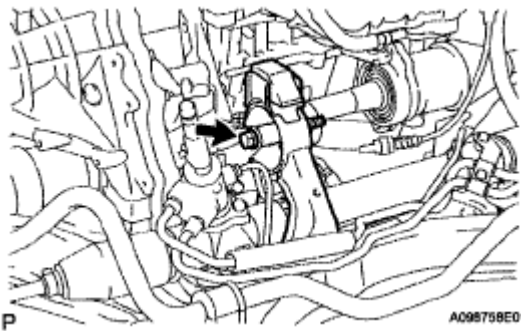


Fig. 248: Locating Transaxle Bolts And Nuts

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

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

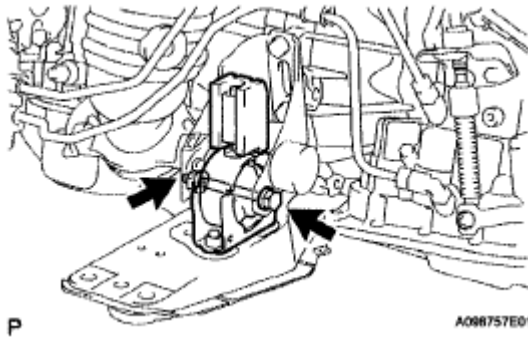


Fig. 249: Locating Through Bolt

32. INSTALL VANE PUMP ASSEMBLY

33. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

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

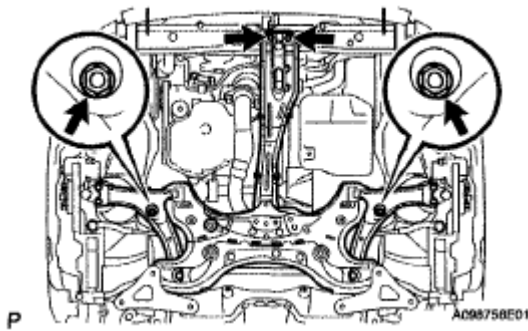


Fig. 250: Locating Through Bolt And Engine Mounting

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

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

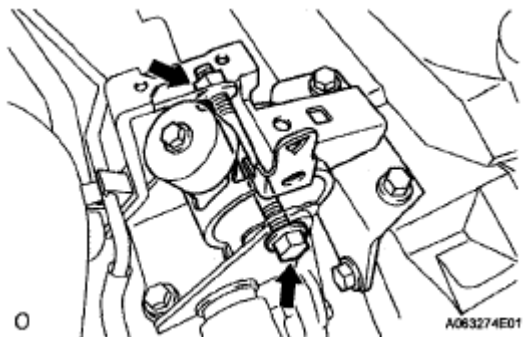


Fig. 251: Locating Engine Mounting Insulator LH

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

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

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

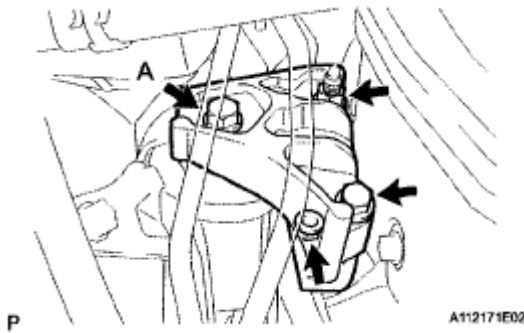


Fig. 252: Locating Engine Mounting Insulator RH With Bolts And 2 Nuts

- e. Tighten the 2 bolts and 2 nuts.

Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf) for bolt 133 N*m (1,356 kgf*cm, 98 ft.*lbf) for nut

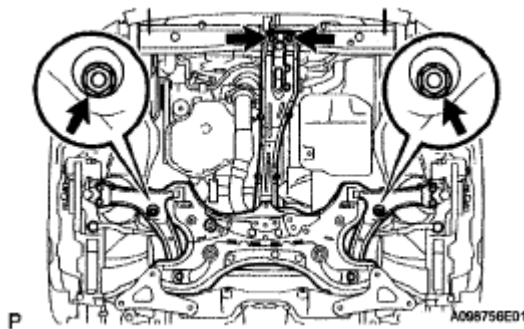


Fig. 253: Locating Transaxle Bolts And Nuts

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

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

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

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

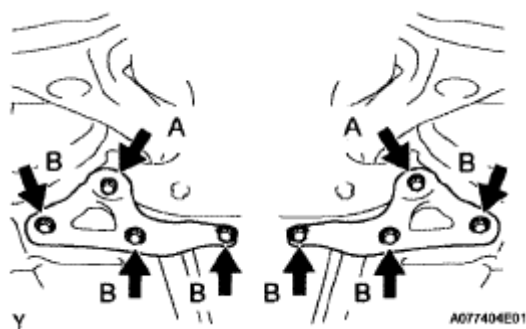


Fig. 254: Locating Front Suspension Member Brace Rear RH And LH With Bolts

- g. Connect the return tube.

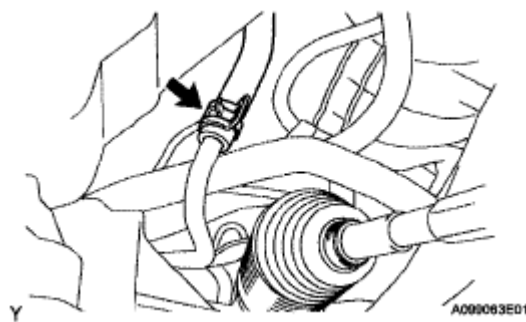


Fig. 255: Locating Return Tube

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

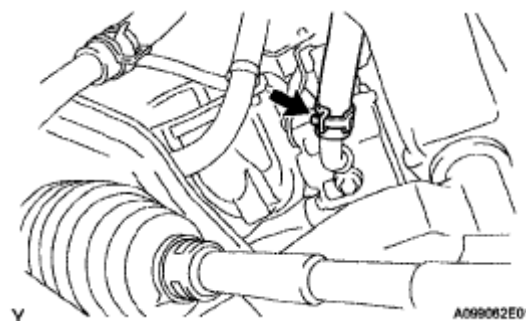
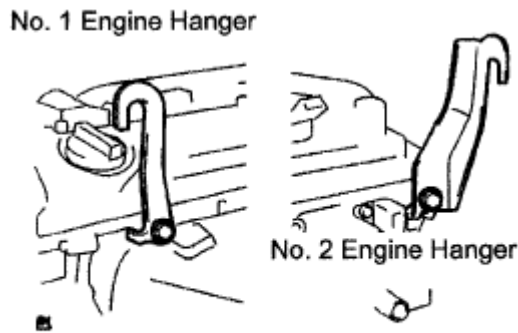


Fig. 256: Locating Oil Reservoir To Pump Hose

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



A09B647E01

Fig. 257: Identifying Engine Hanger

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

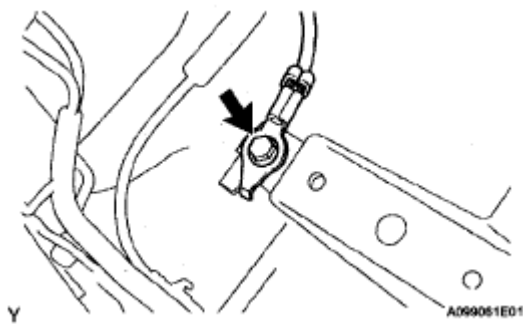


Fig. 258: Locating Ground Cable And Nut

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

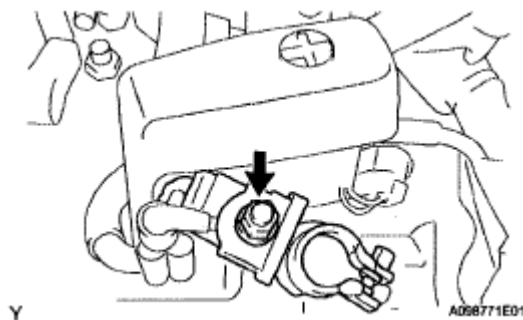


Fig. 259: Locating Nut From Battery Positive Terminal

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

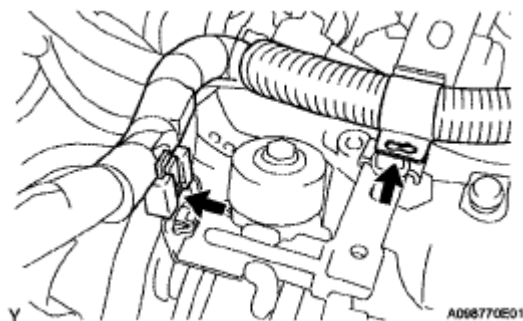


Fig. 260: Locating Engine Wire And Clamps

- d. Install the engine wire harness with the 2 claws.
e. Connect the 2 connectors.

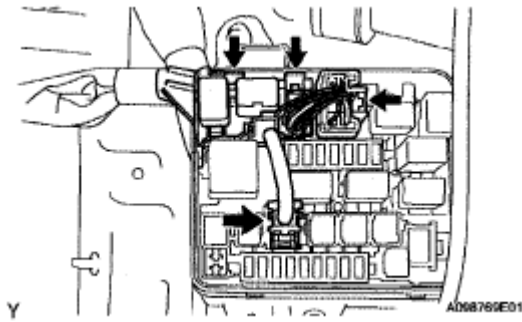


Fig. 261: Installing Engine Wire Harness With 2 Claws

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

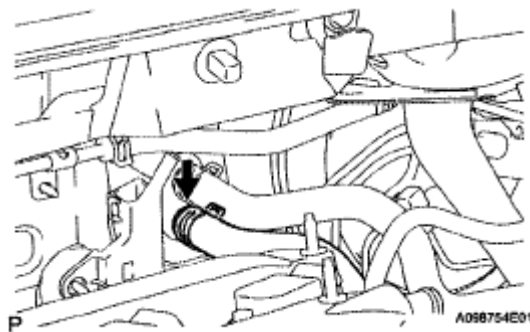


Fig. 262: Locating Heater Water Outlet Hose From Air Conditioner Tube

58. **CONNECT HEATER WATER INLET HOSE**
 - a. Connect the heater inlet hose to the air conditioner tube.

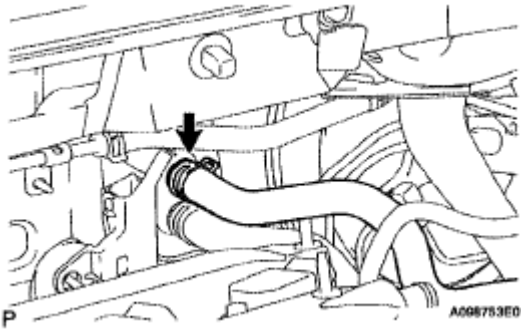


Fig. 263: Locating Heater Water Inlet Hose From Booster Vacuum Tube

59. CONNECT UNION TO CONNECTOR TUBE HOSE

- a. Connect the union to connector tube to the booster vacuum tube.

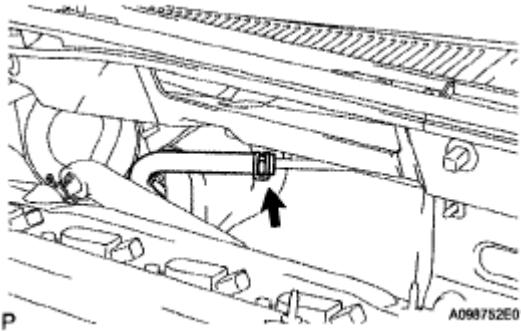


Fig. 264: Locating Connector Tube Hose From Booster Vacuum Tube

60. CONNECT FUEL MAIN TUBE (See INSTALLATION)

61. INSTALL BATTERY CARRIER

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

Torque: 12.8 N*m (131 kgf*cm, 9 ft.*lbf)

- b. Connect the clamp of the engine wire.

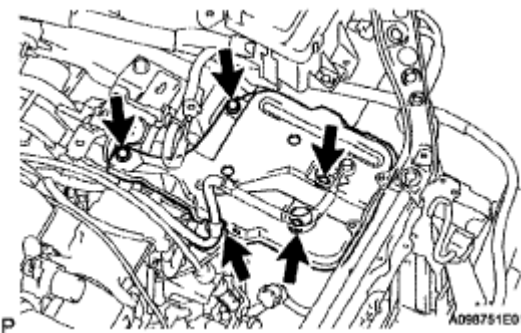


Fig. 265: Locating Battery Carrier And Bolts

62. INSTALL AIR CLEANER CASE SUB-ASSEMBLY

- a. Connect the air cleaner case to the No. 1 air cleaner inlet.
- b. Install the air cleaner case with the 3 bolts.

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

- c. Connect the clamp of the engine wire.

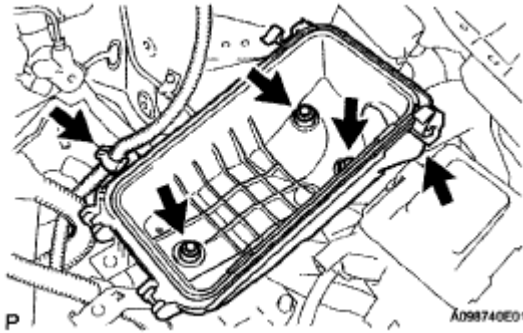


Fig. 266: Locating Air Cleaner Case And Bolt

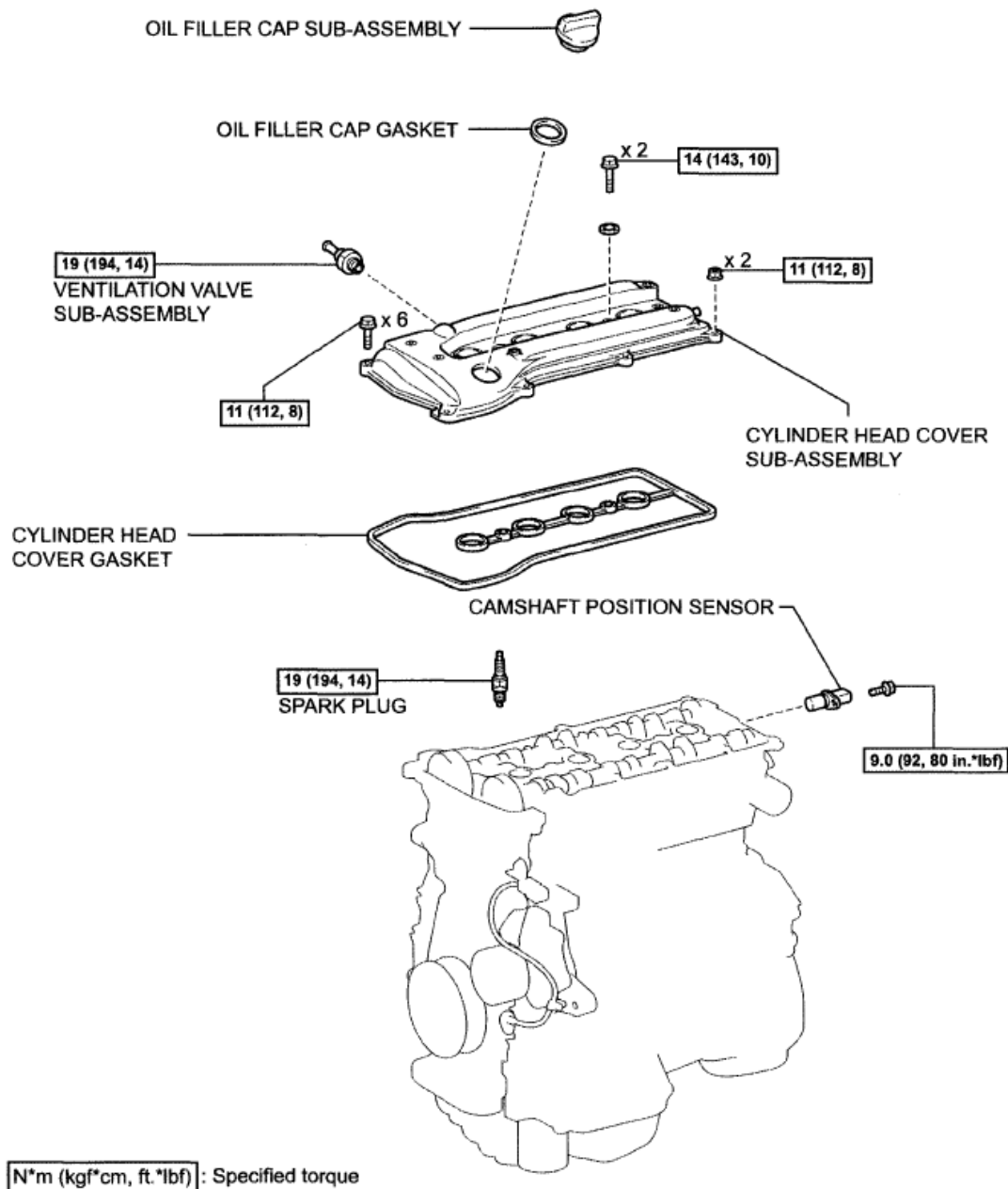
63. **INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY (See INSTALLATION)**
64. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY (See INSTALLATION)**
65. **INSTALL RADIATOR ASSEMBLY (See INSTALLATION)**
66. **CONNECT NO. 1 OIL COOLER OUTLET TUBE (for Automatic Transaxle)**
67. **CONNECT NO. 1 OIL COOLER INLET TUBE (for Automatic Transaxle)**
68. **CONNECT RADIATOR HOSE OUTLET**
69. **CONNECT RADIATOR HOSE INLET**
70. **INSTALL BATTERY TRAY**
71. **INSTALL BATTERY**
72. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
73. **ADD MANUAL TRANSAXLE OIL (See INSTALLATION)**
74. **ADD AUTOMATIC TRANSAXLE FLUID (See INSTALLATION)**
75. **ADD ENGINE COOLANT (See COOLANT)**
76. **CHECK FOR FUEL LEAKAGE (See ON-VEHICLE INSPECTION)**
77. **CHECK FOR ENGINE COOLANT LEAKS**
 - a. Check for the engine coolant leaks (see COOLANT).
78. **CHECK FOR MANUAL TRANSAXLE OIL LEAKS**
79. **CHECK FOR AUTOMATIC TRANSAXLE FLUID LEAKS**
80. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY (See INSTALLATION)**
81. **INSTALL FRONT FENDER APRON SEAL RH (See INSTALLATION)**
82. **INSTALL ENGINE UNDER COVER LH**

- 83. **INSTALL ENGINE UNDER COVER RH**
- 84. **INSTALL FRONT WHEEL (See INSTALLATION)**
- 85. **PERFORM INITIALIZATION**
 - a. Perform initialization (see INITIALIZATION).

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

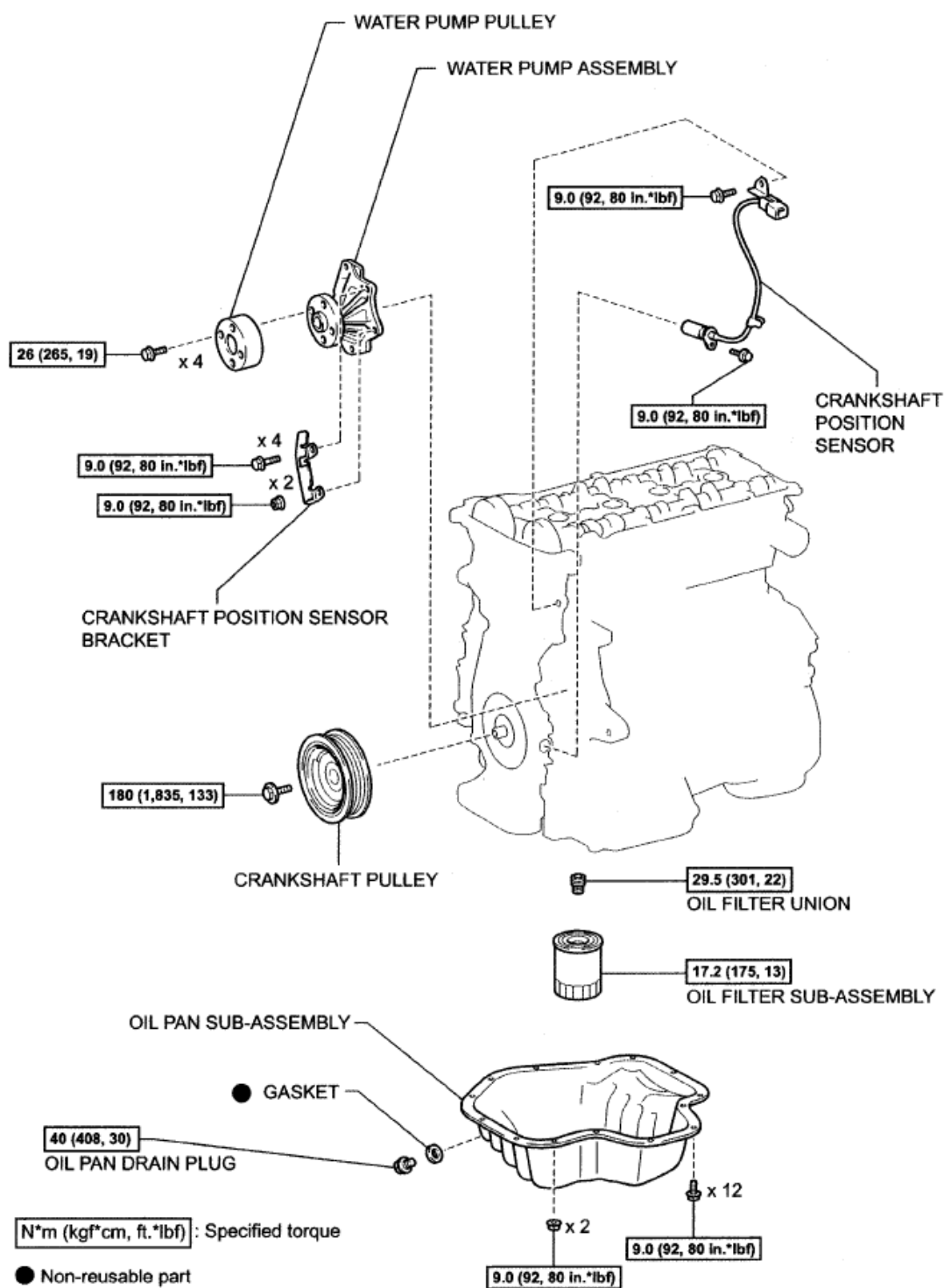
ENGINE UNIT

COMPONENTS



A114135E03

Fig. 267: Identifying Engine Unit Components With Specification (1 Of 6)

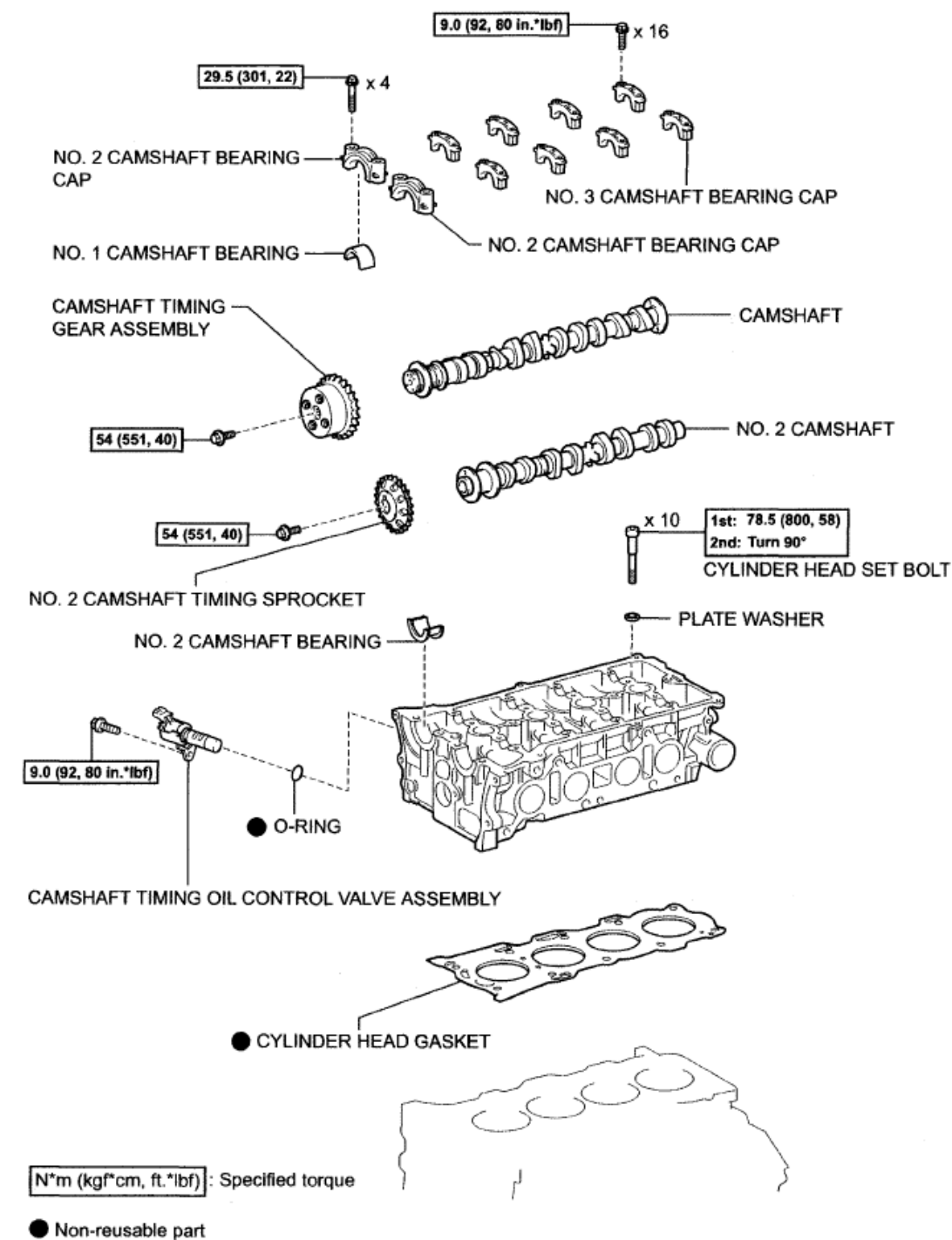


A114136E02

Fig. 268: Identifying Engine Unit Components With Specification (2 Of 6)

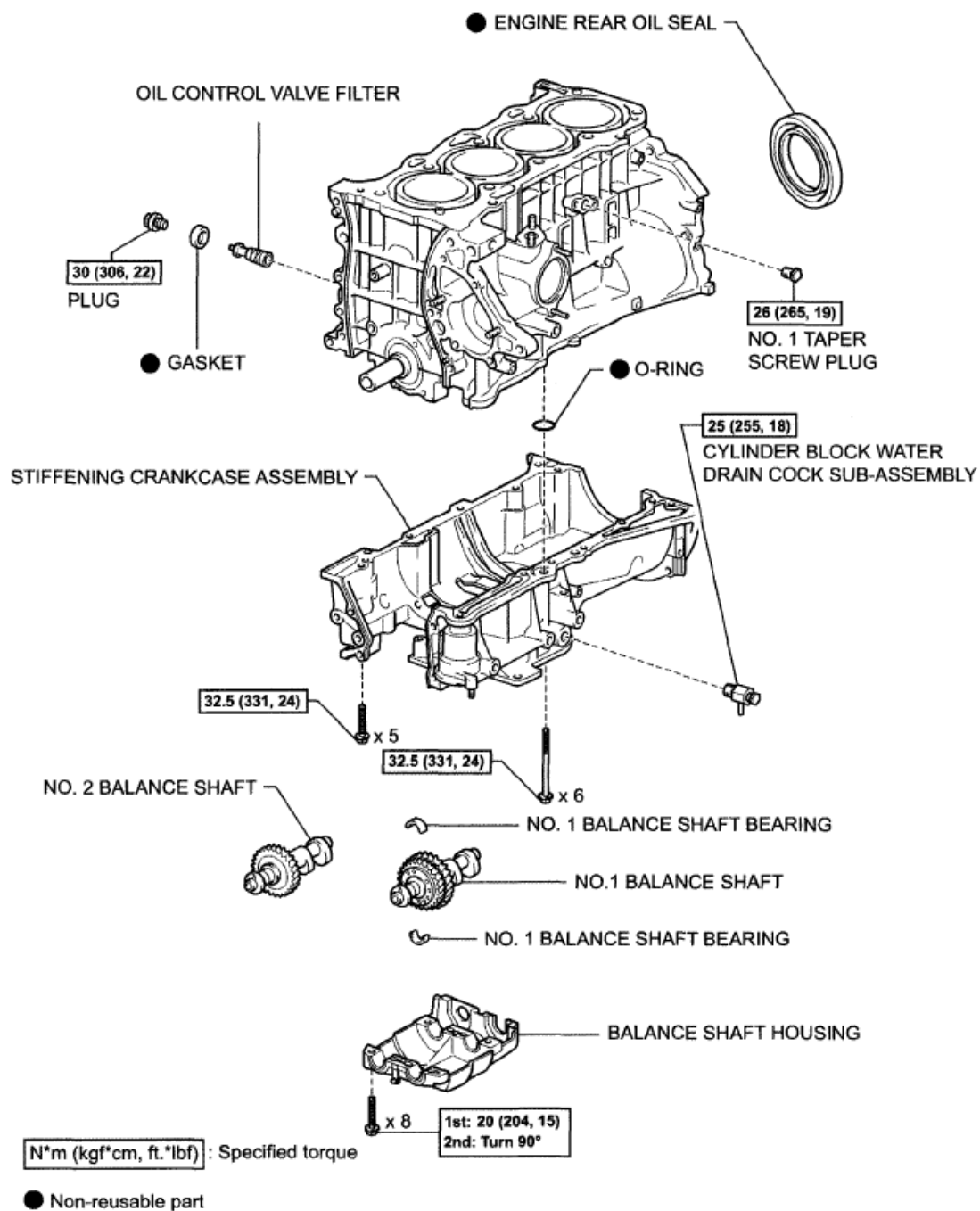


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A11413BE02

Fig. 270: Identifying Engine Unit Components With Specification (4 Of 6)



A114139E03

Fig. 271: Identifying Engine Unit Components With Specification (5 Of 6)

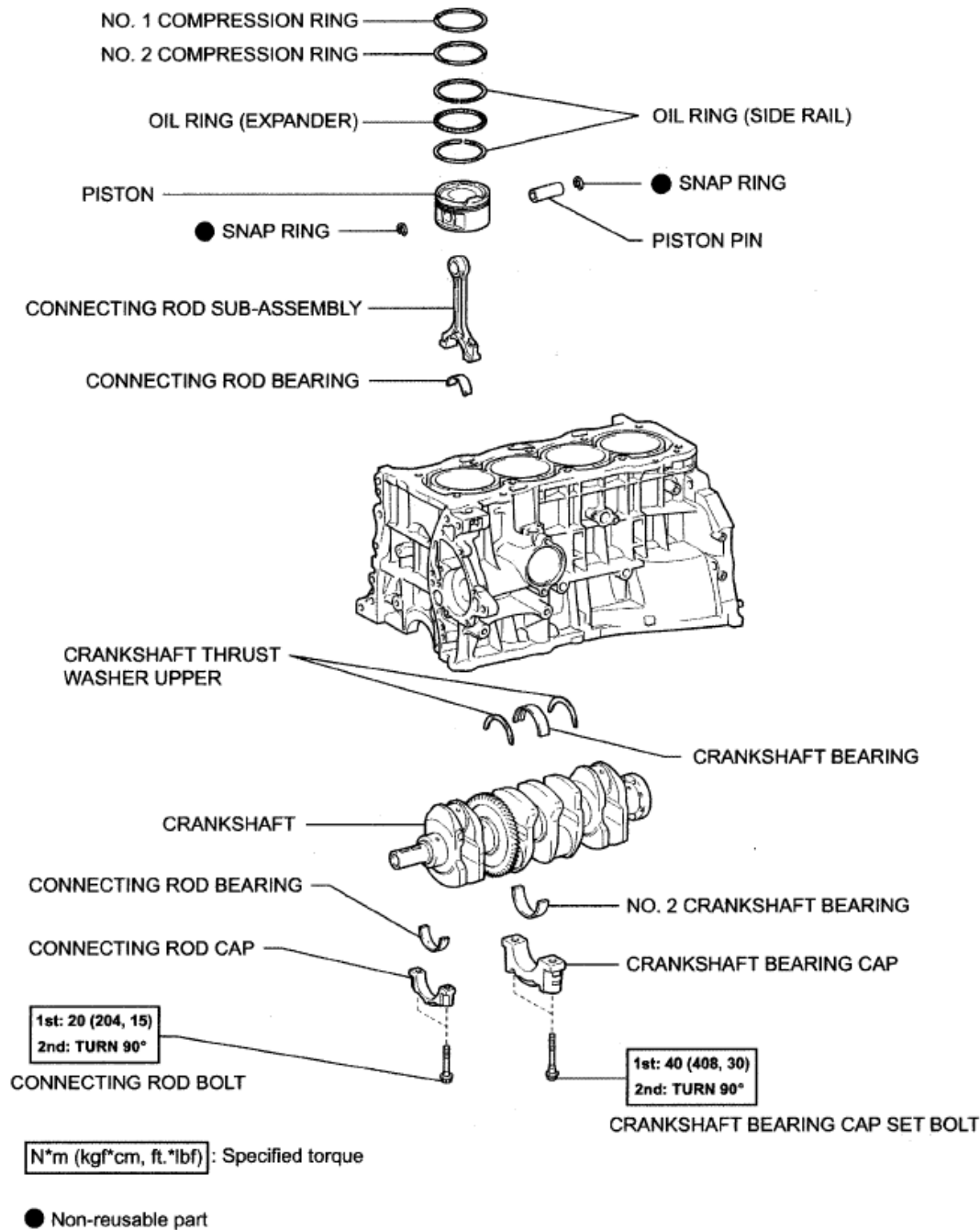


Fig. 272: Identifying Engine Unit Components With Specification (6 Of 6)

DISASSEMBLY

1. REMOVE SPARK PLUG
2. REMOVE OIL FILLER CAP SUB-ASSEMBLY
3. REMOVE OIL FILLER CAP GASKET
4. REMOVE VENTILATION VALVE SUB-ASSEMBLY

5. **REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** (See REMOVAL)
6. **REMOVE CYLINDER HEAD COVER GASKET**
7. **REMOVE OIL FILTER SUB-ASSEMBLY** (See REPLACEMENT)
8. **REMOVE OIL FILTER UNION**
 - a. Using a 12 mm socket hexagon wrench, remove the oil filter union.
9. **REMOVE CAMSHAFT POSITION SENSOR** (See REMOVAL)
10. **REMOVE CRANKSHAFT POSITION SENSOR** (See REMOVAL)
11. **REMOVE WATER PUMP PULLEY** (See REMOVAL)
12. **REMOVE WATER PUMP ASSEMBLY** (See REMOVAL)
13. **REMOVE OIL PAN DRAIN PLUG**
 - a. Remove the oil pan drain plug and gasket.
14. **REMOVE OIL PAN SUB-ASSEMBLY** (See REMOVAL)
15. **REMOVE CRANKSHAFT PULLEY** (See INSPECTION)
16. **REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY** (See REMOVAL)
17. **REMOVE TIMING CHAIN COVER SUB-ASSEMBLY** (See REMOVAL)
18. **REMOVE TIMING CHAIN COVER OIL SEAL** (See REPLACEMENT)
19. **REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE**
20. **REMOVE TIMING CHAIN GUIDE** (See REMOVAL)
21. **REMOVE CHAIN TENSIONER SLIPPER** (See REMOVAL)
22. **REMOVE CHAIN SUB-ASSEMBLY**
23. **REMOVE NO. 1 CHAIN VIBRATION DAMPER** (See REMOVAL)
24. **REMOVE CRANKSHAFT TIMING SPROCKET**
25. **REMOVE NO. 2 CHAIN SUB-ASSEMBLY** (See REMOVAL)
26. **REMOVE OIL PUMP DRIVE GEAR**
27. **REMOVE OIL PUMP ASSEMBLY** (See DISASSEMBLY)
28. **REMOVE CAMSHAFT**
 - a. Using several steps, uniformly loosen and remove the 20 bearing cap bolts in the sequence shown in the illustration.
 - b. Remove the 10 bearing caps, then remove the camshaft and No. 2 camshaft.

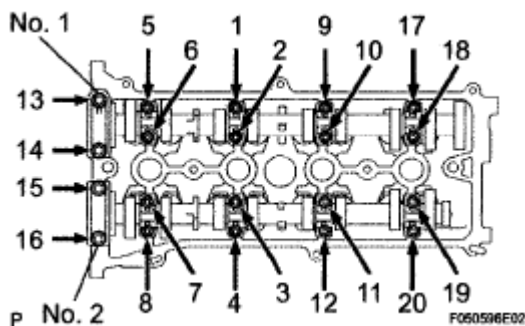
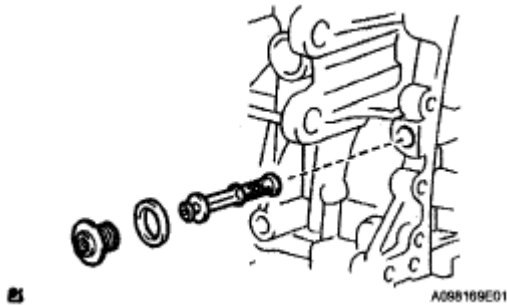
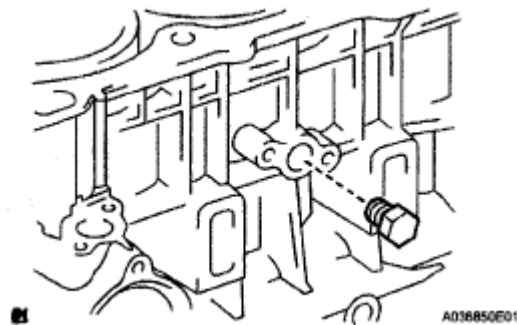


Fig. 273: Identifying Bearing Cap Bolts In Sequence

29. **REMOVE CYLINDER HEAD SUB-ASSEMBLY (See REMOVAL)**
30. **REMOVE CYLINDER HEAD GASKET**
31. **REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**
32. **REMOVE OIL CONTROL VALVE FILTER**
 - a. Using a 6 mm socket hexagon wrench, remove the plug and gasket.
 - b. Remove the oil control valve filter.

**Fig. 274: Identifying Oil Control Valve Filter**

33. **REMOVE NO. 1 TAPER SCREW PLUG**
 - a. Remove the plug from the cylinder block.

**Fig. 275: Identifying Plug From Cylinder Block**

34. **INSPECT BALANCE SHAFT THRUST CLEARANCE**
 - a. Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:

0.05 to 0.09 mm (0.0020 to 0.0035 in.) Maximum thrust clearance:

0.09 mm (0.0035 in.)

If the thrust clearance is greater than the maximum, replace the balance shaft housing and bearings.

If necessary, replace the balance shaft.

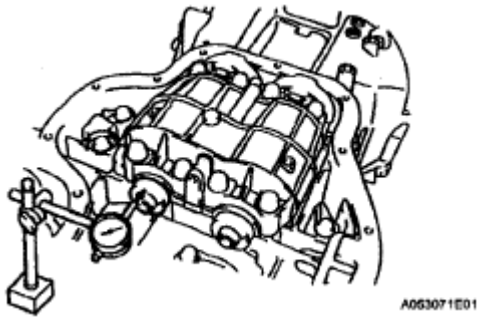


Fig. 276: Measuring Thrust Clearance

35. INSPECT BALANCE SHAFT OIL CLEARANCE

- a. Using several steps, uniformly loosen and remove the 8 bolts in the sequence shown in the illustration.
- b. Remove the balance shaft housing from the crankcase.

HINT:

Keep the lower bearing and balance shaft housing together.

- c. Lift out the No. 1 and No. 2 balance shafts.

HINT:

Keep the upper bearing with the crankcase.

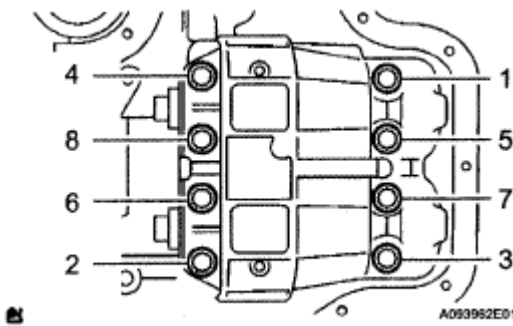


Fig. 277: Identifying Balance Shaft Housing Bolts Sequence

- d. Clean each bearing and journal.
- e. Check each bearing and journal for pitting and scratches.

If a bearing or journal is damaged, replace the bearings. If necessary, replace the balance shaft.

- f. Place the No. 1 and No. 2 balance shafts onto the crankcase.

- g. Lay a strip of Plastigage across each journal, (h) Install the balance shaft housing.

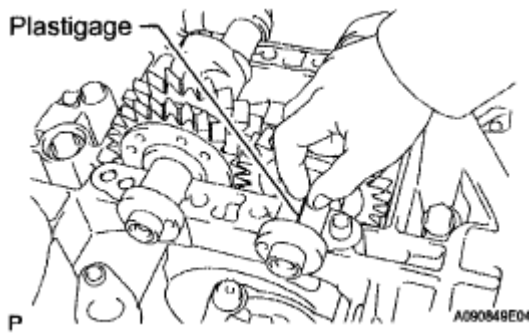


Fig. 278: Inspecting Balance Shaft

- h. Apply a light coat of engine oil on the threads and under the heads of the bolts.
i. Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: 21.6 N*m (220 kgf*cm, 16 ft.*lbf)

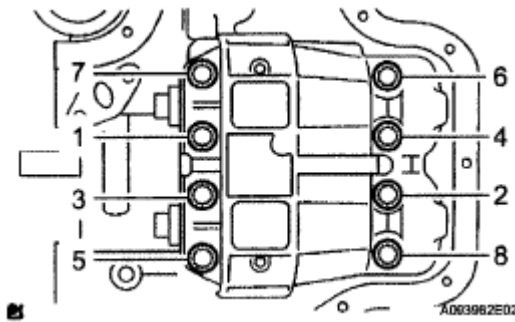


Fig. 279: Identifying Tighten Bolts Sequence

- j. Mark the front of the bolts with paint.

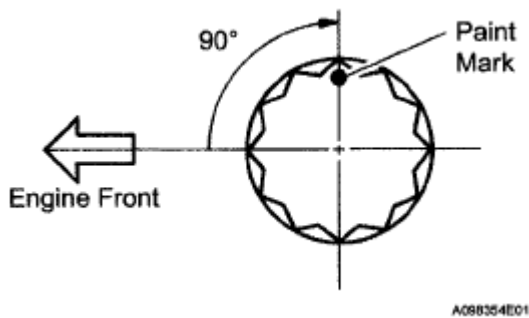


Fig. 280: Identifying Retighten Bolts Paint Mark

- k. Retighten the bolts 90° as shown in the illustration.

1. Check that the paint mark is now at a 90° angle to the front, (n) Remove the balance shaft housing from the crankcase.
- m. Measure the Plastigage at its widest point.

Standard oil clearance:**0.004 to 0.049 mm (0.0002 to 0.0019 in.)****Maximum oil clearance:****0.049 mm (0.0019 in.)****NOTE: Remove the Plastigage completely after the measurement.**

If the oil clearance is greater than the maximum, replace the bearing. If necessary, replace the balance shaft.

HINT:

If replacing a bearing, select a new one with the same number.

Standard balance shaft housing journal bore diameter**STANDARD BALANCE SHAFT HOUSING JOURNAL BORE DIAMETER SPECIFIED CONDITION REFERENCE**

Item	Specified Condition
Mark 1	26.000 to 26.006 mm (1.0236 to 1.0239 in.)
Mark 2	26.007 to 26.012 mm (1.0239 to 1.0214 in.)
Mark 3	26.013 to 26.018 mm (1.0241 to 1.0243 in.)

Standard balance shaft journal diameter:**22.985 to 23.000 mm (0.9049 to 0.9055 in.)****Standard bearing center wall thickness****STANDARD BEARING CENTER WALL THICKNESS SPECIFIED CONDITION REFERENCE**

Item	Specified Condition
Mark 1	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 2	1.490 to 1.492 mm (0.0587 to 0.0587 in.)
Mark 3	1.493 to 1.495 mm (0.0588 to 0.0589 in.)

36. REMOVE BALANCE SHAFT**37. REMOVE NO. 1 BALANCE SHAFT BEARING**

38. REMOVE ENGINE REAR OIL SEAL

- a. Using a knife, cut off the lip of the oil seal.
- b. Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

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

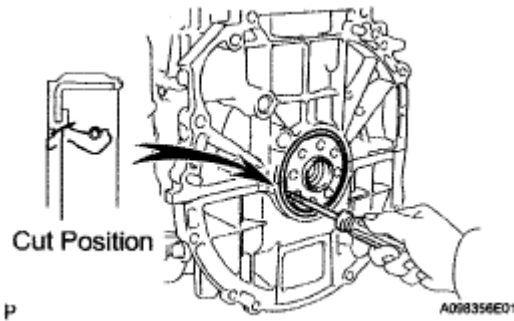


Fig. 281: Cutting Off Lip Of Oil Seal

39. REMOVE STIFFENING CRANKCASE ASSEMBLY

- a. Using several steps, uniformly loosen and remove the 11 bolts in the sequence shown in the illustration.
- b. Remove the crankcase by prying the portions between the crankcase and cylinder block.

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

- c. Remove the O-ring from the cylinder block.

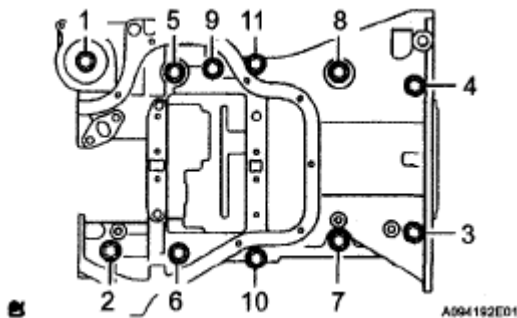


Fig. 282: Identifying Stiffening Crankcase Assembly Bolts Sequence

40. INSPECT CONNECTING ROD THRUST CLEARANCE

- a. Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:**0.160 to 0.362 mm (0.0063 to 0.0143 in.)****Maximum thrust clearance:****0.362 mm (0.0143 in.)**

If the thrust clearance is greater than the maximum, replace the connecting rod. If necessary, replace the crankshaft.

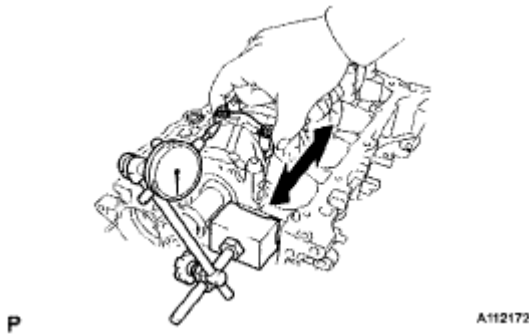


Fig. 283: Inspecting Connecting Rod Thrust Clearance

41. INSPECT CONNECTING ROD OIL CLEARANCE

NOTE: Do not turn the crankshaft during the measurement.

- a. Using marking paint, write the matched cylinder number on each connecting rod and cap.

HINT:

The matchmarks in the connecting rods and caps are for ensuring correct reassembly.

- b. Using a 12 mm socket wrench, remove the 2 bolts and connecting rod cap.
- c. Clean the crank pin and bearing.
- d. Check the crank pin and bearing for pitting and scratches.

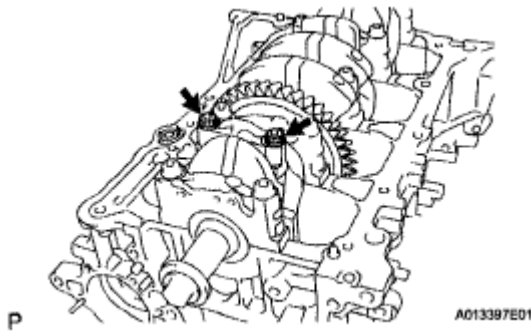


Fig. 284: Locating Connecting Rods Caps And Bolts

- e. Lay a strip of Plastigage on the crank pin.

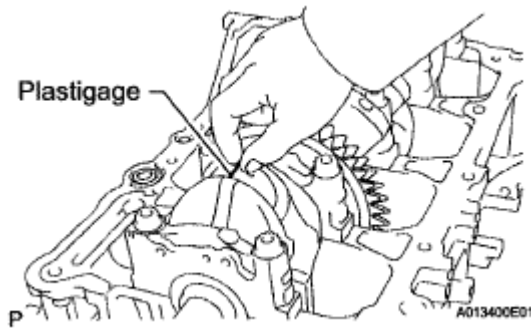


Fig. 285: Laying Strip Of Plastigage On Crank Pin

- f. (Check that the front mark of the connecting rod cap is facing in the correct direction.)
 g. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.
 h. Using a 12 mm socket wrench, tighten the bolts in several passes to the specified torque.

Torque: 24.5 N*m (250 kgf*cm, 18 ft.*lbf)

- i. Mark the front of the connecting rod bolts with paint.

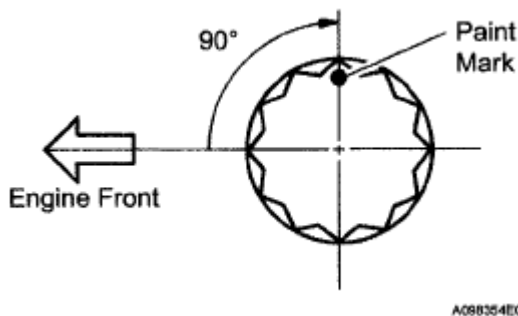


Fig. 286: Identifying Retighten Bolts Paint Mark

- j. Retighten the cap bolts 90° as shown in the illustration.

- k. Check that the crankshaft turns smoothly.
- l. Using a 12 mm socket wrench, remove the 2 bolts and connecting rod cap.
- m. Measure the Plastigage at its widest point.

Standard oil clearance:**0.024 to 0.048 mm (0.0009 to 0.0019 in.)****Maximum oil clearance:****0.08 mm (0.0032 in.)****NOTE: Remove the Plastigage completely after the measurement.**

If the oil clearance is greater than the maximum, replace the connecting rod bearing. If necessary, grind or replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number as marked on the connecting rod.

There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Standard connecting rod large end bore diameter**STANDARD CONNECTING ROD LARGE END BORE DIAMETER SPECIFIED CONDITION REFERENCE**

Mark	Specified Condition
Mark 1	51.000 to 51.007 mm (2.0079 to 2.0082 in.)
Mark 2	51.008 to 51.013 mm (2.0082 to 2.0084 in.)
Mark 3	51.014 to 51.020 mm (2.0084 to 2.0087 in.)

Standard connecting rod bearing thickness**STANDARD CONNECTING ROD BEARING THICKNESS SPECIFIED CONDITION REFERENCE**

Mark	Specified Condition
Mark 1	1.485 to 1.488 mm (0.0585 to 0.0586 in.)
Mark 2	1.489 to 1.491 mm (0.0586 to 0.0587 in.)
Mark 3	1.492 to 1.494 mm (0.0587 to 0.0588 in.)

Standard crankshaft pin diameter**STANDARD CRANKSHAFT PIN DIAMETER SPECIFIED CONDITION REFERENCE**

--	--

Mark	Specified Condition
-	47.990 to 48.000 (1.8894 to 1.8898 in.)

42. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- Using a ridge reamer, remove all the carbon from the top of the cylinder.
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

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

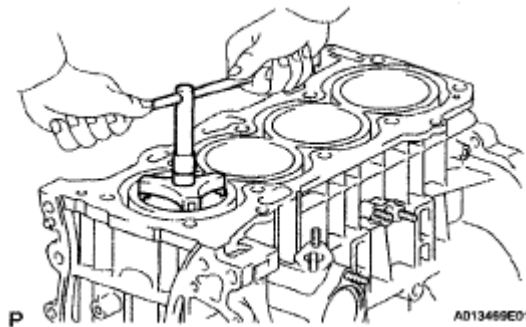


Fig. 287: Pushing Piston

43. REMOVE CONNECTING ROD BEARING

44. REMOVE PISTON RING SET

- Using a piston ring expander, remove the 2 compression rings.
- Remove the 2 side rails and expander by hand.

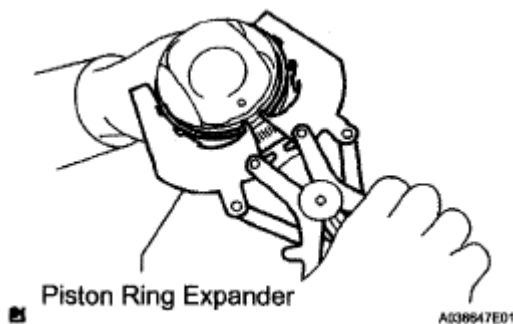


Fig. 288: Removing Piston Ring Set

45. REMOVE PISTON PIN HOLE SNAP RING

- Using a small screwdriver, pry out the 2 snap rings.

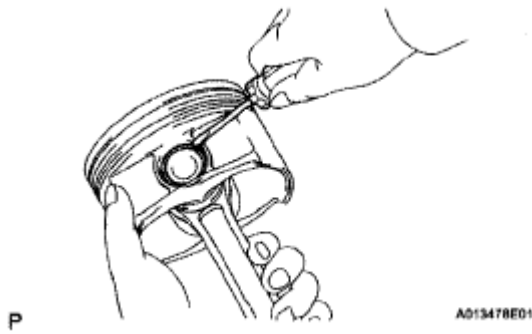


Fig. 289: Removing Piston Pin Hole Snap Ring

46. REMOVE PISTON

- a. Gradually heat the piston up to 80 to 90°C (176 to 194°F).

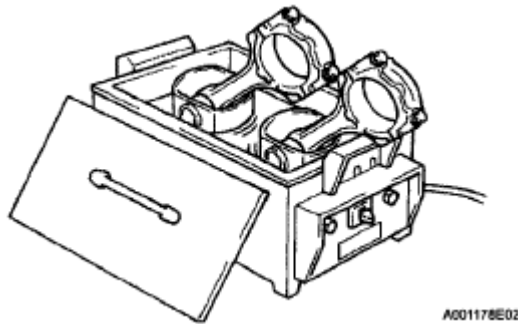


Fig. 290: Identifying Piston With Connecting Rod Gradually Heat

- b. Using a plastic hammer and brass bar, lightly tap out the piston pin, then remove the connecting rod.

HINT:

- The piston and pin are a matched set.
- Arrange the piston, pin, ring, connecting rod and bearings in the correct order.

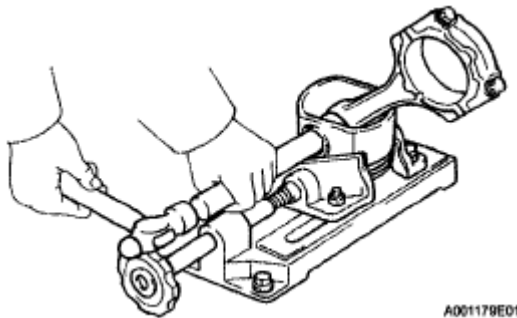


Fig. 291: Removing Connecting Rod

47. INSPECT CRANKSHAFT THRUST CLEARANCE

- a. Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.04 to 0.24 mm (0.0016 to 0.0095 in.)

Maximum thrust clearance:

0.30 mm (0.0118 in.)

If the thrust clearance is greater than the maximum, replace the thrust washers as a set.

HINT:

The thrust washer thickness is 1.93 to 1.98 mm (0.0760 to 0.0780 in.).

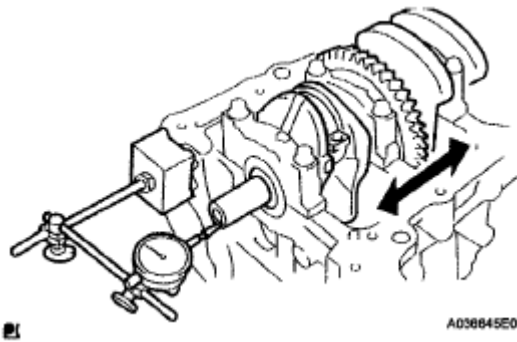


Fig. 292: Measuring Thrust Clearance Crankshaft Back And Forth

48. INSPECT CRANKSHAFT OIL CLEARANCE

NOTE: Do not turn the crankshaft during the measurement.

- a. Clean each main journal and bearing.
- b. Check each main journal and bearing for pitting and scratches.
- c. Install the upper bearing with an oil groove onto the cylinder block.

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

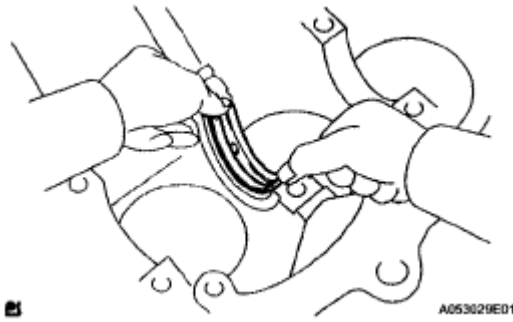


Fig. 293: Installing Upper Bearing With Oil Groove Onto Cylinder Block

- d. Install the lower bearing onto the bearing cap.

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

- e. Place the crankshaft onto the cylinder block.

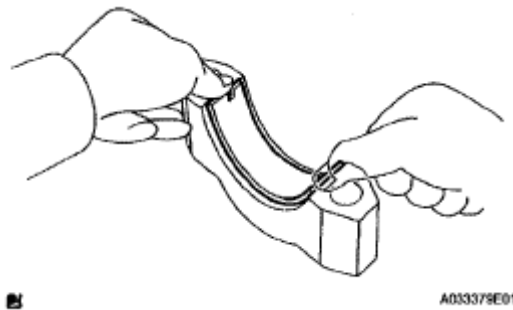


Fig. 294: Installing Lower Bearing Onto Bearing Cap

- f. Lay a strip of Plastigage across each journal.

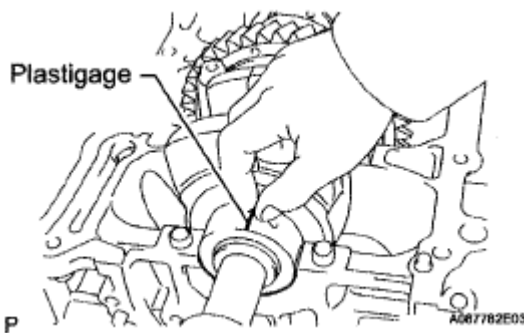


Fig. 295: Laying Strip Of Plastigage Journal

- g. Examine the front marks and numbers and install the bearing caps onto the cylinder block in the order shown in the illustration.
- h. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

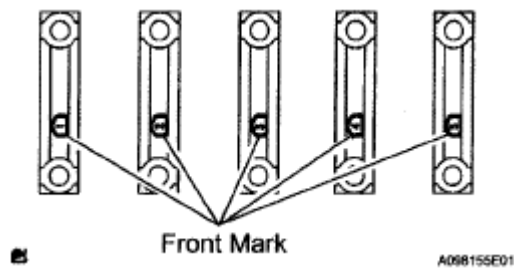


Fig. 296: Identifying Front Marks On Bearing Caps

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

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

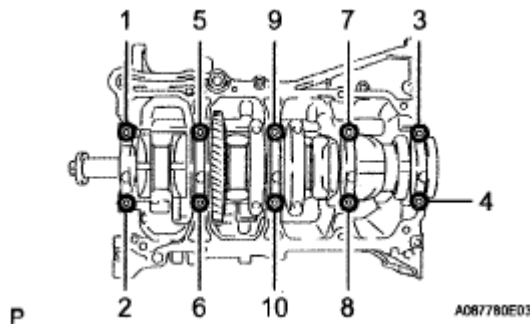


Fig. 297: Identifying Bearing Cap Bolts In Sequence

- j. Mark the front of the bearing cap bolts with paint.

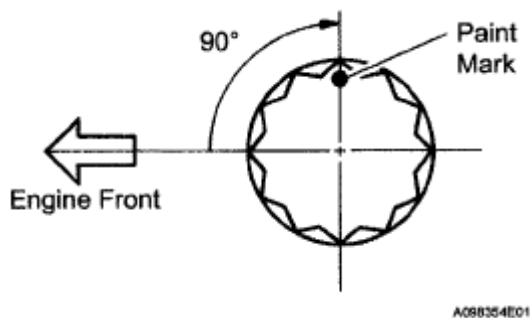


Fig. 298: Identifying Retighten Bolts Paint Mark

- k. Retighten the 10 bearing cap bolts by 90°.
 - l. Check that the paint marks are at a 90° angle to the front.
- m. Remove the bearing caps.
- n. Measure the Plastigage at its widest point.

Standard oil clearance:

0.017 to 0.040 mm (0.0007 to 0.0016 in.)

Maximum oil clearance:

0.050 mm (0.0020 in.)

NOTE: Remove the Plastigage completely after the measurement.

If the oil clearance is greater than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

HINT:

If replacing a bearing, select a new one with the same number. If the number of the bearing cannot be determined, calculate the correct bearing number by adding together the numbers imprinted on the cylinder block and crankshaft. Then select a new bearing with the calculated number. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

SPECIFIED CONDITION REFERENCE

Cylinder block + Crankshaft	0 to 2	3 to 5	6 to 8	9 to 11
Use bearing	"1"	"2"	"3"	"4"

EXAMPLE

- Imprinted number on the cylinder block is 3.
- Imprinted number on the crankshaft is 4. $3 + 4 = 7$

Select the bearing marked "7".

Standard cylinder block journal bore diameter

STANDARD CYLINDER BLOCK JOURNAL BORE DIAMETER SPECIFIED CONDITION REFERENCE

Mark	Specified Condition
0	59.000 to 59.002 mm (2.3228 to 2.3229 in.)
1	59.003 to 59.004 mm (2.3230 to 2.3230 in.)
2	59.005 to 59.006 mm (2.3230 to 2.3231 in.)
3	59.007 to 59.009 mm (2.3231 to 2.3232 in.)
4	59.010 to 59.011 mm (2.3232 to 2.3233 in.)
5	59.012 to 59.013 mm (2.3233 to 2.3234 in.)
6	59.014 to 59.016 mm (2.3234 to 2.3235 in.)

Standard crankshaft journal diameter

STANDARD CRANKSHAFT JOURNAL DIAMETER SPECIFIED CONDITION

REFERENCE

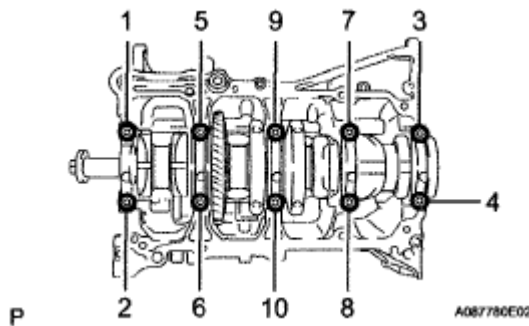
Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

Standard bearing center wall thickness**STANDARD BEARING CENTER WALL THICKNESS SPECIFIED CONDITION
REFERENCE**

Mark	Specified Condition
1	1.993 to 1.996 mm (0.0785 to 0.0786 in.)
2	1.997 to 1.999 mm (0.0786 to 0.0787 in.)
3	2.000 to 2.002 mm (0.0787 to 0.0788 in.)
4	2.003 to 2.005 mm (0.0789 to 0.0789 in.)

49. REMOVE CRANKSHAFT

- Using several steps, uniformly loosen and remove the 10 bearing cap bolts in the sequence shown in the illustration.
- Remove the 5 bearing caps from the cylinder block.
- Remove the crankshaft from the cylinder block.

**Fig. 299: Identifying Bearing Cap Bolts In Sequence****50. REMOVE CRANKSHAFT THRUST WASHER UPPER****51. REMOVE CRANKSHAFT BEARING****HINT:**

Arrange the bearings in the correct order.

52. REMOVE NO. 2 CRANKSHAFT BEARING

HINT:

Arrange the bearings in the correct order.

53. REMOVE STUD BOLT

- a. Remove the 8 stud bolts.

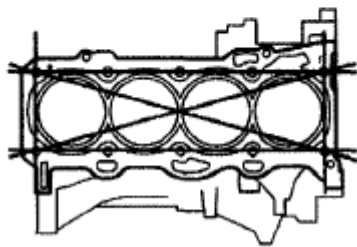
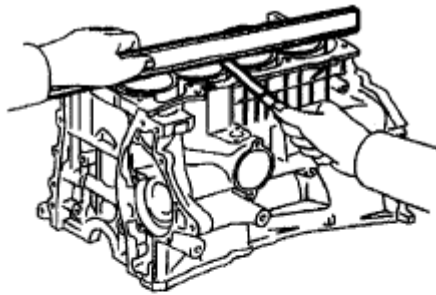
INSPECTION**1. INSPECT CYLINDER BLOCK FOR WARPAGE**

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

Maximum warpage:

0.05 mm (0.0020 in.)

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



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Fig. 300: Inspecting Cylinder Block For Warpage

2. INSPECT CYLINDER BORE

- a. Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

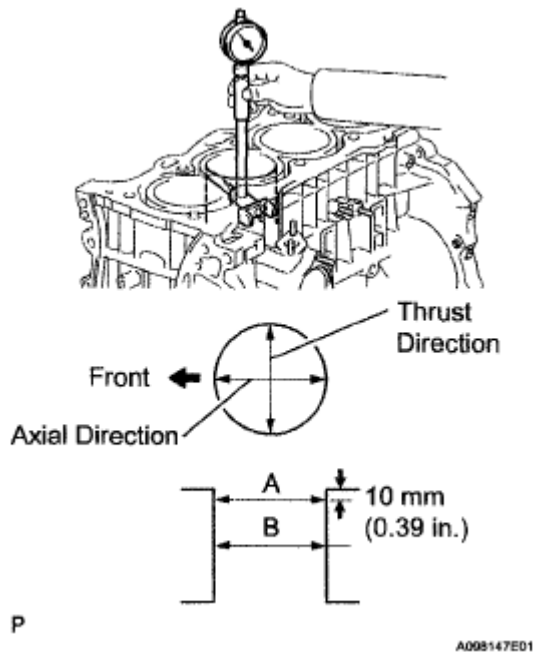
Standard diameter:

88.500 to 88.513 mm (3.4843 to 3.4848 in.)

Maximum diameter:

88.633 mm (3.4895 in.)

If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.



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Fig. 301: Measuring Cylinder Bore Diameter Positions A And B In Thrust And Axial Directions

3. INSPECT PISTON

- Using a micrometer, measure the piston diameter at right angles to the piston pin hole, and at the piston 30.3 mm (1.193 in.) from the piston head.

Standard piston diameter:

88.439 to 88.449 mm (3.4819 to 3.4822 in.)

If the diameter is not as specified, replace the piston.

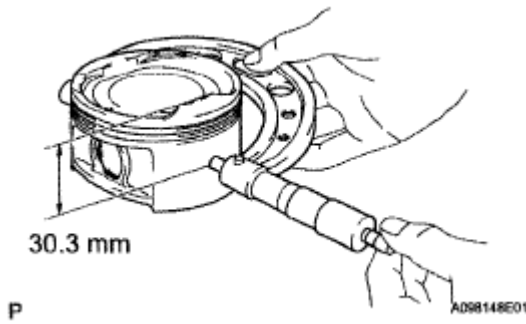


Fig. 302: Measuring Piston Diameter Right Angles To Piston Pin Hole

4. INSPECT PISTON OIL CLEARANCE

- a. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.051 to 0.074 mm (0.0020 to 0.0029 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

If the oil clearance is greater than the maximum, replace all the pistons. If necessary, replace the cylinder block.

5. INSPECT RING GROOVE CLEARANCE

- a. Using a feeler gauge, measure the clearance between the new piston ring and wall of the ring groove.

Standard ring groove clearance

STANDARD RING GROOVE CLEARANCE SPECIFIED CONDITION REFERENCE

Item	Specified Condition
No. 1 ring	0.17 to 0.22 mm (0.0067 to 0.0087 in.)
No. 2 ring	0.17 to 0.21 mm (0.0067 to 0.0083 in.)
Oil ring	0.21 to 0.29 mm (0.0083 to 0.0114 in.)

If the groove clearance is not as specified, replace the piston.

6. INSPECT PISTON RING END GAP

- a. Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

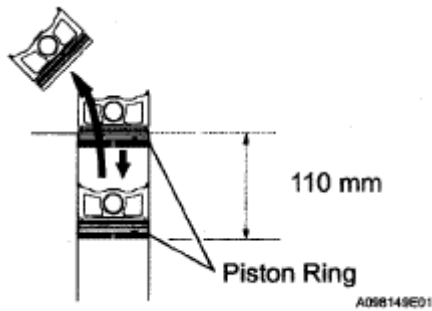


Fig. 303: Inspecting Piston Ring End Gap

- b. Using a feeler gauge, measure the end gap.

Standard end gap

STANDARD END GAP SPECIFIED CONDITION REFERENCE

Item	Specified Condition
No. 1 ring	0.22 to 0.32 mm (0.0087 to 0.0126 in.)
No. 2 ring	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
Oil ring	0.10 to 0.35 mm (0.0039 to 0.0138 in.)

Maximum end gap

MAXIMUM END GAP SPECIFIED CONDITION REFERENCE

Item	Specified Condition
No. 1 ring	0.89 mm (0.0350 in.)
No. 2 ring	1.35 mm (0.0531 in.)
Oil ring	0.73 mm (0.0287 in.)

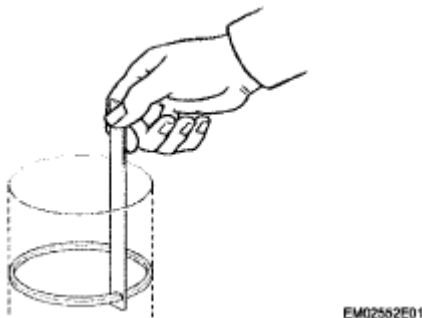


Fig. 304: Measuring End Gap

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum, even with a new piston ring, replace the cylinder block.

7. INSPECT PISTON PIN OIL CLEARANCE

- a. Using a caliper gauge, measure the piston pin bore diameter.

Standard piston pin bore diameter:

22.001 to 22.010mm (0.8662 to 0.8665 in.)

STANDARD PISTON PIN BORE DIAMETER SPECIFIED CONDITION REFERENCE

Item	Specified Condition
A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
B	22.005 to 22.007 mm (0.8663 to 0.8664 in.)
C	22.008 to 22.010 mm (0.8665 to 0.8665 in.)

If the diameter is not as specified, replace the piston.

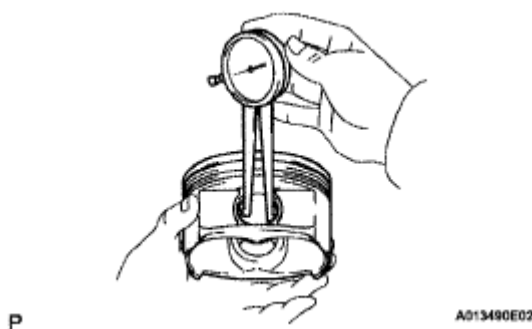


Fig. 305: Measuring Piston Pin Bore Diameter

- b. Using a micrometer, measure the piston pin diameter.

Standard piston pin diameter:

21.997 to 22.006 mm (0.8660 to 0.8664 in.)

STANDARD PISTON PIN BORE DIAMETER SPECIFIED CONDITION REFERENCE

Item	Specified Condition
A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)

If the diameter is not as specified, replace the piston pin.

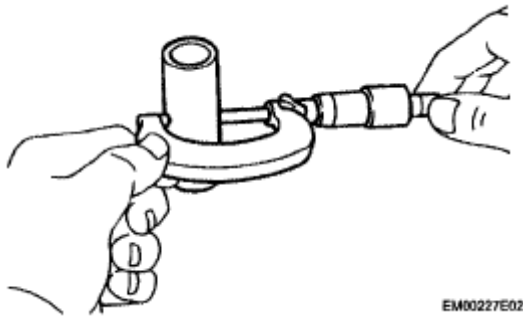


Fig. 306: Measuring Piston Pin Diameter

- c. Using a caliper gauge, measure the connecting rod small end bore diameter.

Standard connecting rod small end bore diameter:

22.005 to 22.014 mm (0.8663 to 0.8667 in.)

**STANDARD CONNECTING ROD SMALL END BORE DIAMETER SPECIFIED
CONDITION REFERENCE**

Item	Specified Condition
A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
B	22.009 to 22.011 mm (0.8665 to 0.8666 in.)
C	22.012 to 22.014 mm (0.8666 to 0.8667 in.)

If the diameter is not as specified, replace the connecting rod.

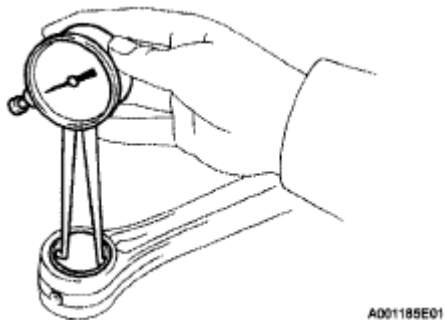


Fig. 307: Measuring Connecting Rod Small End Bore Diameter

- d. Subtract the piston pin diameter measurement from the piston pin bore diameter measurement.

Standard oil clearance:

0.001 to 0.007 mm (0.00004 to 0.0003 in.)

Maximum oil clearance:

0.013 mm (0.0005 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

- e. Subtract the piston pin diameter measurement from the connecting rod small end bore diameter measurement.

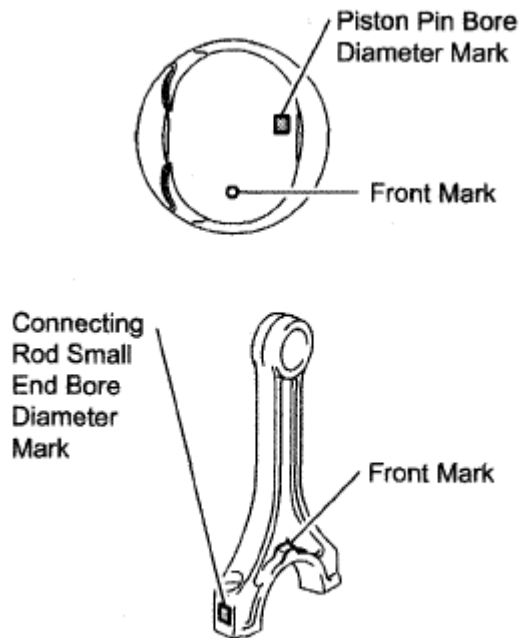
Standard oil clearance:

0.005 to 0.011 mm (0.0002 to 0.0004 in.)

Maximum oil clearance:

0.017 mm (0.0007 in.)

If the oil clearance is greater than the maximum, replace the connecting rod. If necessary, replace the connecting rod and piston pin as a set.



AC08150E01

Fig. 308: Identifying Piston Pin Bore Diameter Mark And Front Mark

8. INSPECT CONNECTING ROD SUB-ASSEMBLY

- a. Using a connecting rod aligner and feeler gauge, check the connecting rod alignment.
 - 1. Check for misalignment.

Maximum misalignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the misalignment is greater than the maximum, replace the connecting rod.

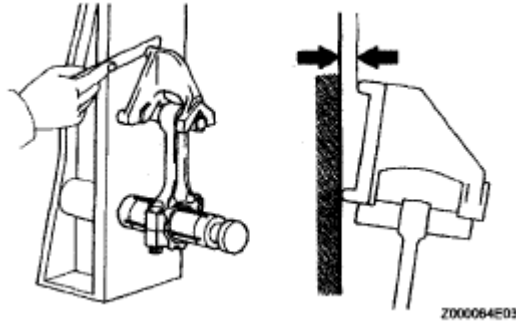


Fig. 309: Checking Connecting Rod Alignment

2. Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod.

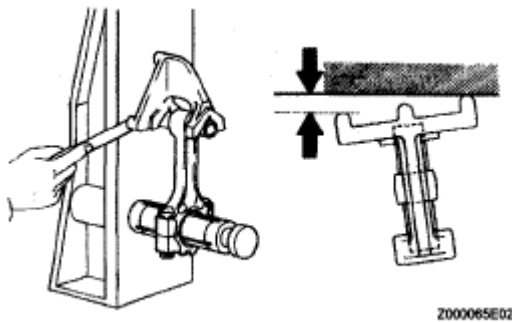


Fig. 310: Checking For Twist

9. INSPECT CONNECTING ROD BOLT

- a. Using vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter:

7.2 to 7.3 mm (0.283 to 0.287 in.)

Maximum diameter:

7.0 mm (0.276 in.)

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

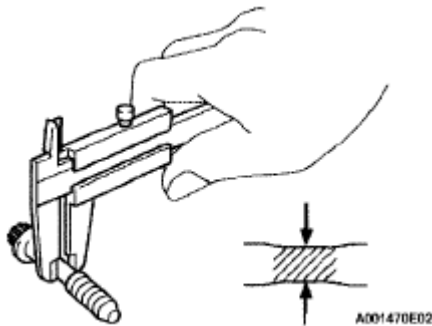


Fig. 311: Inspecting Connecting Rod Bolt

10. INSPECT CRANKSHAFT

- a. Using a dial indicator and V-blocks, measure the circle runout as shown in the illustration.

Maximum taper and distortion:

0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

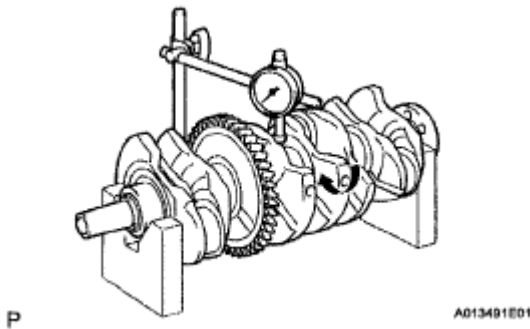


Fig. 312: Measuring Circle Runout

- b. Using a micrometer, measure the diameter of each main journal.

Standard diameter:

54.998 to 55.000 mm (2.1649 to 2.1654 in.)

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

- c. Check each main journal for taper and distortion as shown in the illustration.

Maximum taper and distortion:

0.003 mm (0.0001 in.)

If the taper and distortion are greater than the maximum, replace the crankshaft.

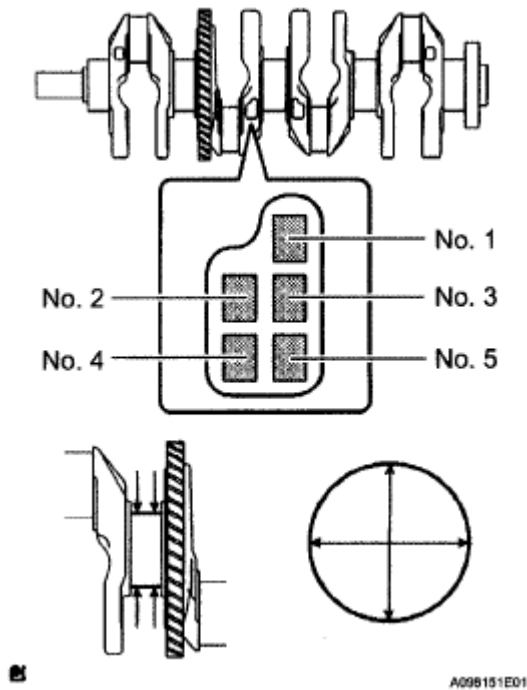


Fig. 313: Measuring Diameter Of Main Journal

Standard diameter (Reference)

STANDARD DIAMETER SPECIFIED CONDITION REFERENCE

Mark	Specified Condition
0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
5	54.998 to 54.990 mm (2.1649 to 2.1650 in.)

- d. Using a micrometer, measure the diameter of each crank pin.

Standard diameter:

47.990 to 48.000 mm (1.8894 to 1.8898 in.)

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

- e. Inspect each crank pin for taper and distortion as shown in the illustration.

Maximum taper and distortion:**0.003 mm (0.0001 in.)**

If the taper and distortion are greater than the maximum, replace the crankshaft.

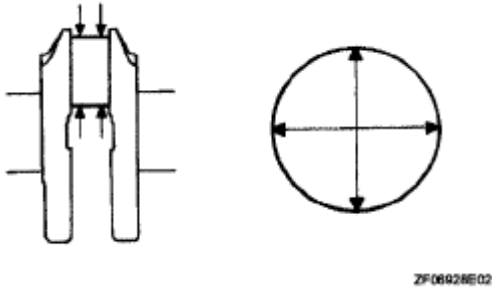


Fig. 314: Measuring Diameter Of Crank Pin

11. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- a. Using vernier calipers, measure the tension portion diameter of the bolts.

Standard diameter:**7.5 to 7.6 mm (0.295 to 0.299 in.)****Minimum diameter: 7.5 mm (0.295 in.)**

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

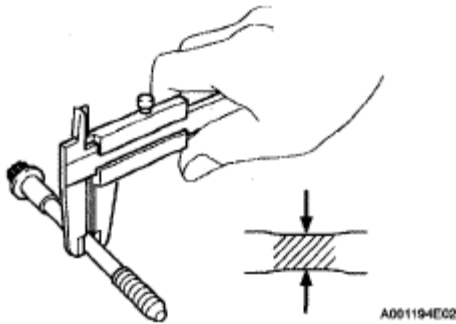


Fig. 315: Measuring Tension Portion Diameter Of Bolts

REPLACEMENT**1. REPLACE TIMING CHAIN COVER OIL SEAL****HINT:**

There are 2 methods to replace the oil seal.

- a. If the timing chain cover is removed from the cylinder block:
 1. Using a screwdriver and hammer, tap out the oil seal.
 2. Apply multi-purpose grease to the lip of a new oil seal.

NOTE: Keep the lip free of foreign objects.

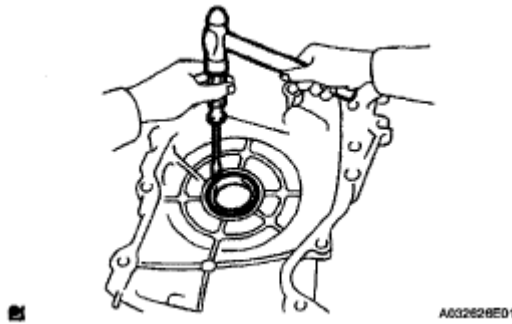


Fig. 316: Taping Oil Seal

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

SST 09223-22010

NOTE: Wipe any extra grease off the crankshaft.

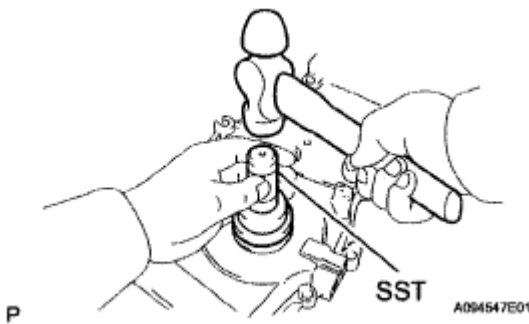


Fig. 317: Taping Oil Seal Surface

- b. If the timing chain cover oil seal is installed to the cylinder block:
 1. Remove the front wheel RH.
 2. Remove the front fender apron seal RH (see **REMOVAL**).
 3. Remove fan and generator V belt (see **REMOVAL**).
 4. Remove the crankshaft pulley (see **INSPECTION**).
 5. Using a knife, cut off the lip of the oil seal.
 6. Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

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

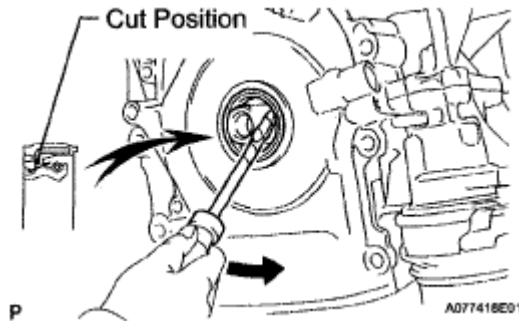


Fig. 318: Prying Out Oil Seal

7. Apply multi-purpose grease to the lip of a new oil seal.

NOTE: Keep the lip free of foreign objects.

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

SST 09223-22010

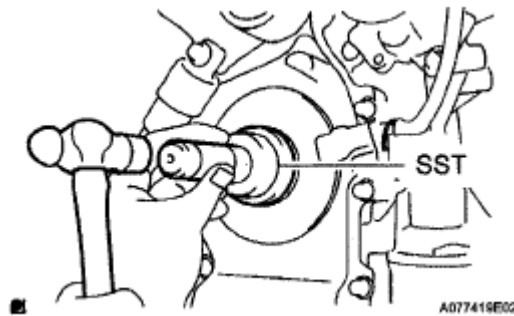


Fig. 319: Taping Oil Seal

9. Install the crankshaft pulley (see **INSTALLATION**).
10. Install the fan and generator V belt (see **REMOVAL**).
11. Install the front fender apron seal (see **INSTALLATION**).
12. Install the front wheel RH (see **INSTALLATION**).

2. REPLACE ENGINE REAR OIL SEAL

- a. If the engine is installed to the vehicle, perform the following procedures.
 1. Remove the automatic transaxle assembly (for automatic transaxle) (see **REMOVAL**).
 2. Remove the drive plate sub-assembly (for automatic transaxle) (see **REMOVAL**).
 3. Remove the manual transaxle assembly (for manual transaxle) (see **MANUAL**).

TRANSAXLE ASSEMBLY).

4. Remove the clutch cover assembly (for manual transaxle) (see **REMOVAL**).
5. Remove the clutch disc assembly (for manual transaxle).
- b. Using a knife, cut off the lip of the oil seal.
- c. Using a screwdriver with its tip wrapped with tape, pry out the oil seal.

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

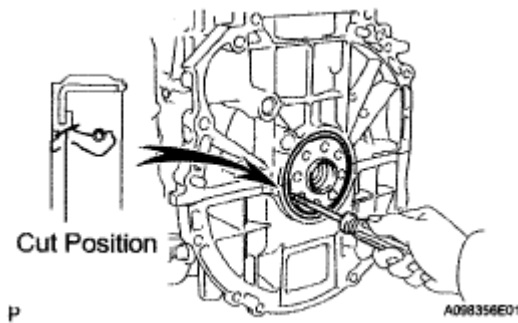


Fig. 320: Prying Oil Seal

- d. Apply multi-purpose grease to the lip of a new oil seal.

CAUTION: Keep the lip free of foreign objects.

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

SST 09223-15030, 09950-70010 (09951 -07100)

NOTE: Wipe any extra grease off the crankshaft.

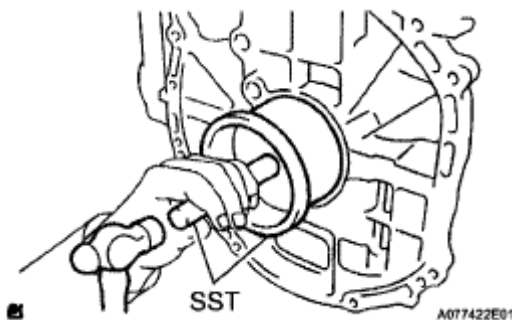


Fig. 321: Taping Oil Seal

- f. If the engine is installed to the vehicle, perform the following procedures.
1. Install the drive plate sub-assembly (for automatic transaxle) (see **REMOVAL**).
 2. Install the automatic transaxle assembly (for automatic transaxle) (see **INSTALLATION**).
 3. Install the clutch disc assembly (for manual transaxle) (see **INSTALLATION**).
 4. Install the clutch cover assembly (for manual transaxle) (see **INSTALLATION**).
 5. Install the manual transaxle assembly (for manual transaxle) (see **INSTALLATION**).

REASSEMBLY

1. INSTALL TIGHT PLUG

- a. Apply adhesive around the new tight plugs.

Adhesive:

Toyota Genuine Adhesive 1324, Three bond 1324 or equivalent

- b. Using SST, install the 2 tight plugs.

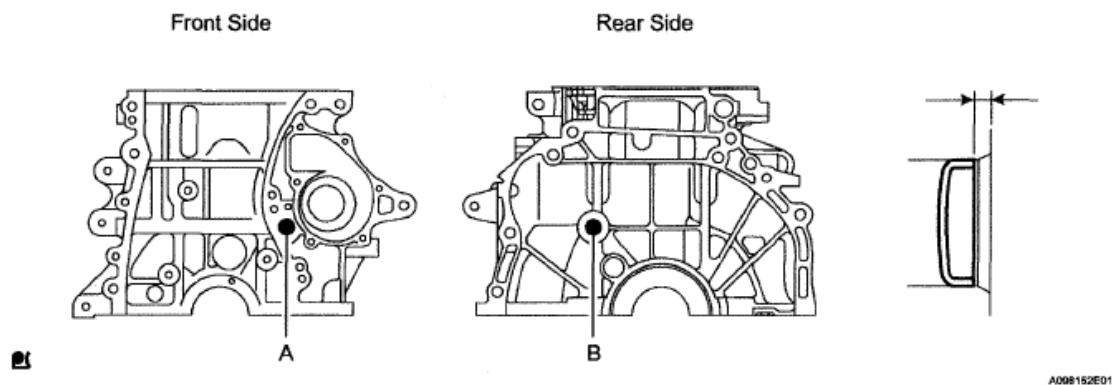


Fig. 322: Identifying Tight Plug Hole

SST 09950-60010 (09951 -00200), 09950-70010 (09951-07100)

Standard depth

STANDARD DEPTH SPECIFIED CONDITION REFERENCE

Item	Specified Condition
A	1.7 to 2.7 mm (0.067 to 0.106 in.)
B	2.2 to 3.2 mm (0.087 to 0.126 in.)

2. INSTALL RING PIN

- a. Using a plastic hammer, install 12 new ring pins.

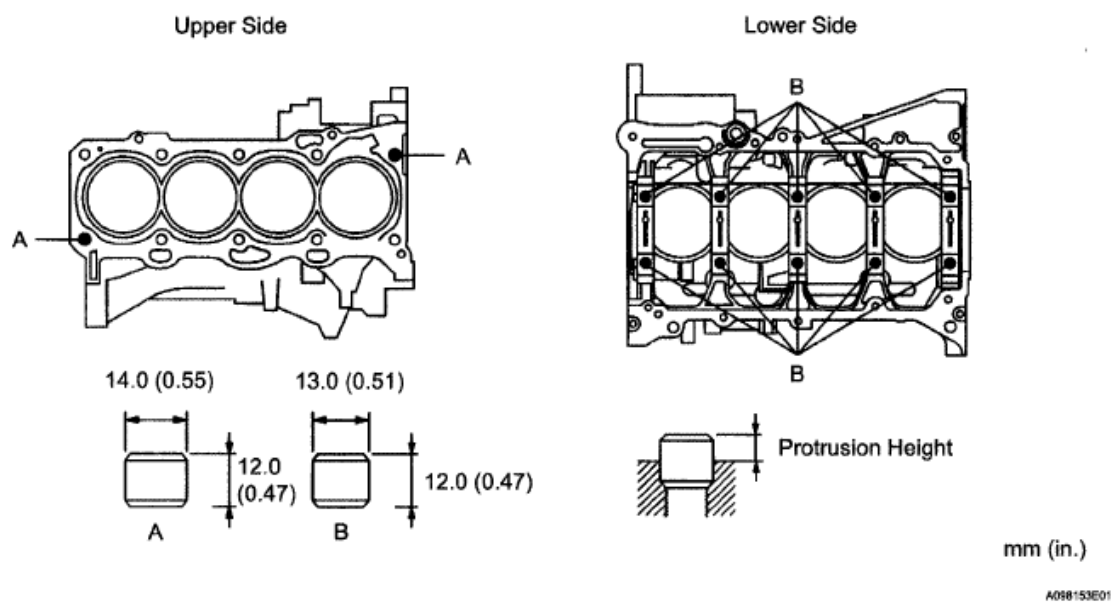


Fig. 323: Identifying Ring Pin Height

Standard protrusion height

STANDARD PROTRUSION HEIGHT SPECIFIED CONDITION REFERENCE

Item	Specified Condition
A	6.0 mm (0.236 in.)
B	5.0 mm (0.197 in.)

3. INSTALL STRAIGHT PIN

- Using a plastic hammer, install 8 new straight pins.

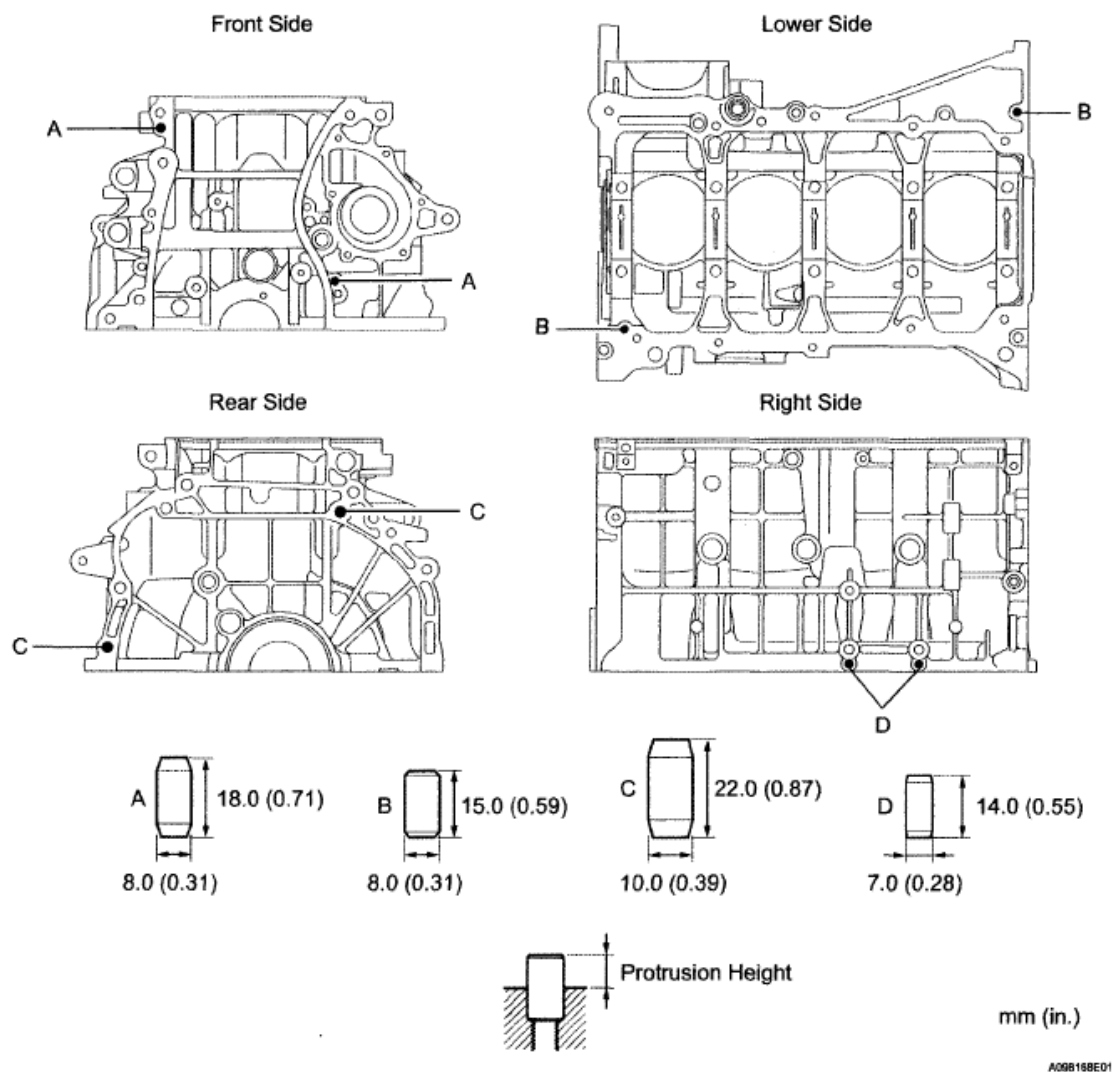


Fig. 324: Identifying Straight Pin Height

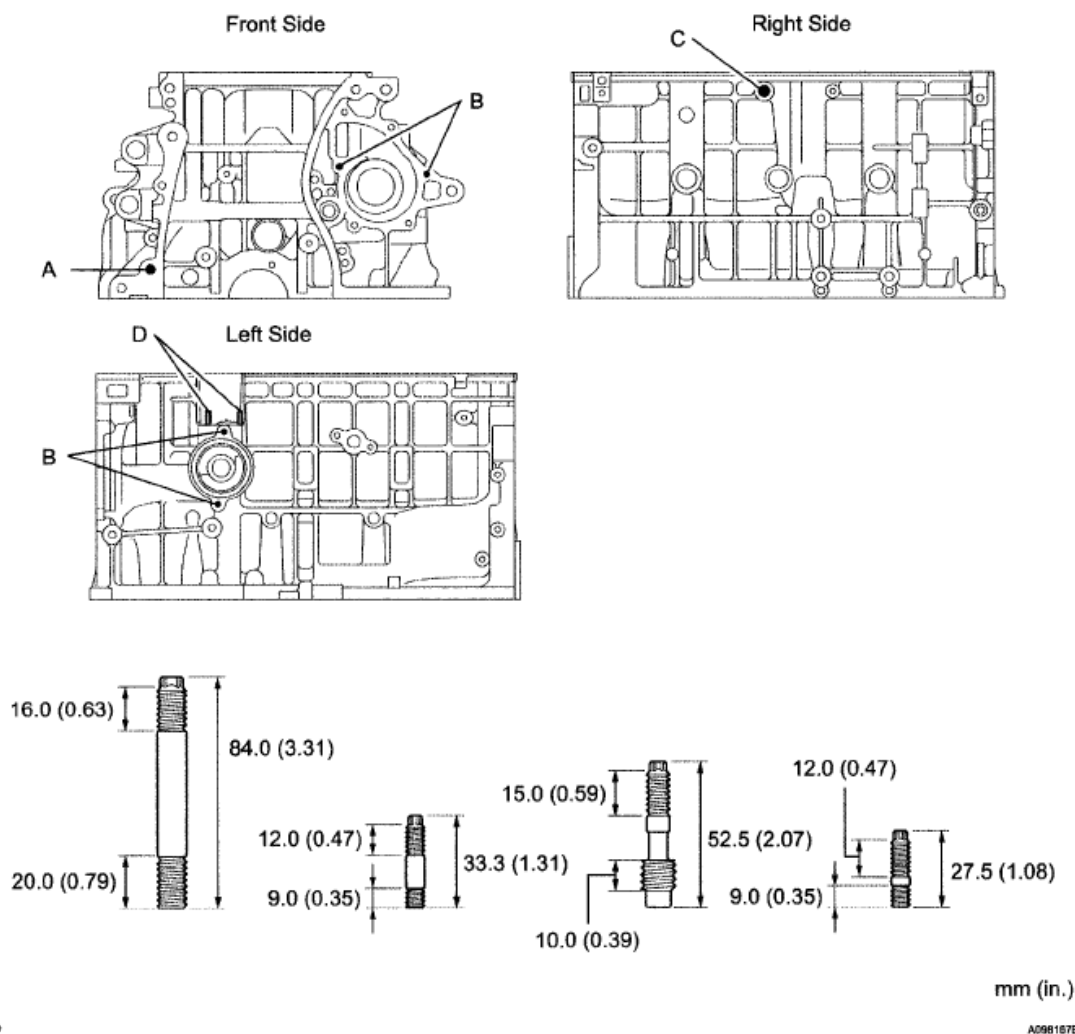
Standard protrusion height

STANDARD PROTRUSION HEIGHT SPECIFIED CONDITION REFERENCE

Item	Specified Condition
A	8.0 mm (0.315 in.)
B	7.5 mm (0.295 in.)
C	12.0 mm (0.472 in.)
D	5.0 mm (0.197 in.)

4. INSTALL STUD BOLT

- Install the 8 stud bolts into the cylinder block.



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Fig. 325: Identifying Stud Bolt Height**Torque****TORQUE SPECIFIED CONDITION REFERENCE**

Item	Specified Condition
A	5.0 N*m (51 kgf*cm, 44 in.*lbf)
B	21.5 N*m (219 kgf*cm, 16 ft.*lbf)
C	5.0 N*m (51 kgf*cm, 44 in.*lbf)
D	9.5 N*m (97 kgf*cm, 84 in.*lbf)

5. INSTALL PISTON

- Using a small screwdriver, install a new snap ring onto one end of the piston pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the

piston.

- b. Gradually heat the piston up to 80 to 90°C (176 to 194°F).

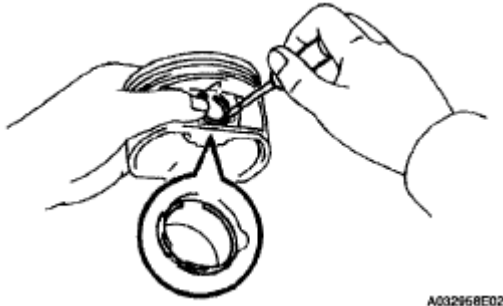


Fig. 326: Installing Snap Ring

- c. Align the front marks of the piston and connecting rod, then push in the piston pin with your thumb until the pin comes into contact with the snap pin hole.

HINT:

Make sure that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

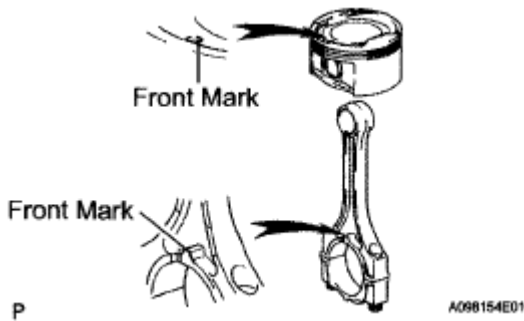
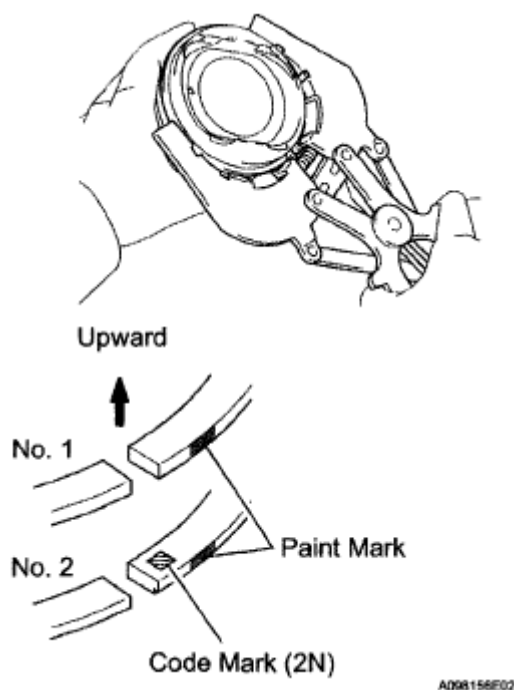


Fig. 327: Identifying Front Marks Of Piston And Connecting Rod

6. INSTALL PISTON RING SET

- a. Install the expander and 2 side rails by hand.
- b. Using a piston ring expander, install the 2 compression rings with the paint mark as shown in the illustration.

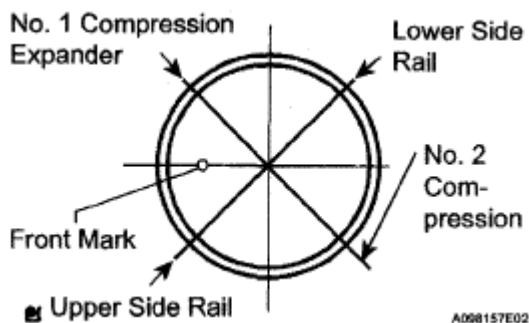
NOTE: Install No. 2 compression ring with the cord mark (2N) facing upward.



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Fig. 328: Installing Compression Ring With Cord Mark

- c. Position the piston rings so that the ring ends are as shown in the illustration.



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Fig. 329: Positioning Piston Rings

7. INSTALL CRANKSHAFT BEARING

- a. Install the upper bearing with an oil groove onto the cylinder block.

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

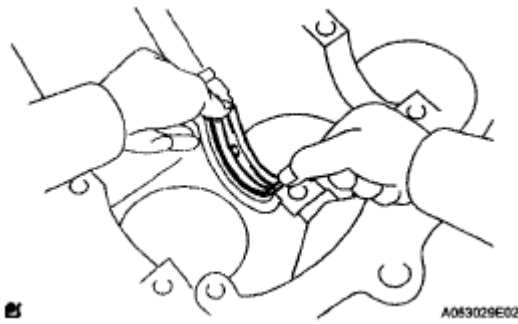


Fig. 330: Installing Upper Bearing

8. INSTALL NO. 2 CRANKSHAFT BEARING

- a. Install the lower bearing onto the bearing cap.

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

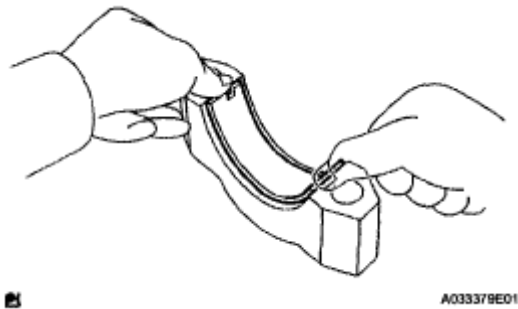


Fig. 331: Installing Lower Bearing

9. INSTALL CRANKSHAFT THRUST WASHER UPPER

- a. Install the 2 thrust washers onto the No. 3 journal position of the cylinder block with the oil groove facing outward.

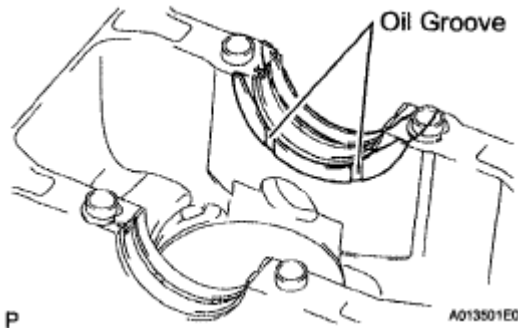


Fig. 332: Identifying Oil Groove

10. INSTALL CRANKSHAFT

- a. Apply engine oil to the upper bearing, and install the crankshaft onto the cylinder block.

- b. Examine the front marks and numbers and install the bearing caps onto the cylinder block in the order shown in the illustration.
- c. Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

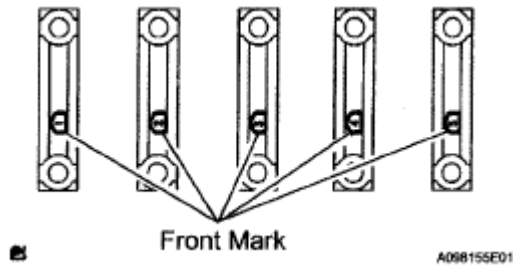


Fig. 333: Identifying Front Marks On Bearing Caps

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

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

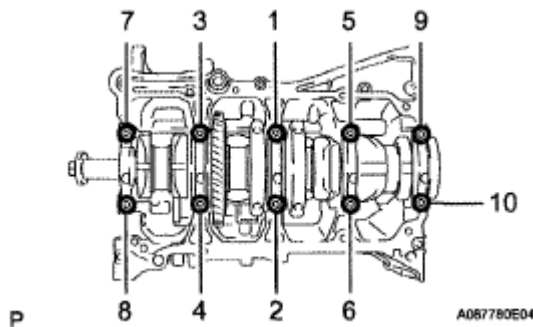


Fig. 334: Identifying Bearing Cap Bolts In Sequence

- e. Mark the front of the bearing cap bolts with paint.
- f. Retighten the 8 bearing cap bolts by 90° in the same sequence.
- g. Check that the paint marks are now at a 90° angle to the front.
- h. Check that the crankshaft turns smoothly.

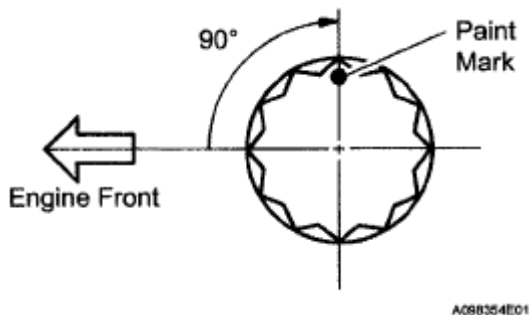


Fig. 335: Identifying Retighten Bolts Paint Mark

11. INSTALL CONNECTING ROD BEARING

- a. Align the bearing claw with the oil groove of the connecting rod or connecting rod cap.

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

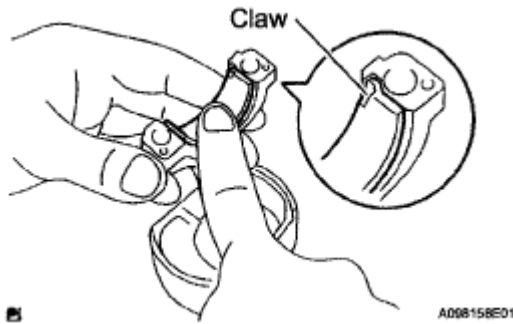


Fig. 336: Aligning Bearing Claw With Oil Groove Of Connecting Rod Or Connecting Rod Cap

12. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

- a. Apply engine oil to the cylinder walls, pistons, and surfaces of connecting rod bearings.
- b. Check the position of the piston ring ends.
- c. Using a piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

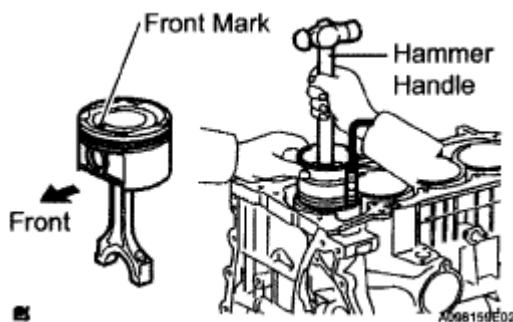


Fig. 337: Identifying Front Mark Of Piston

- d. Check that the front mark of the connecting rod cap is facing in the correct direction.

NOTE: Match the numbered connecting rod cap with the connecting rod.

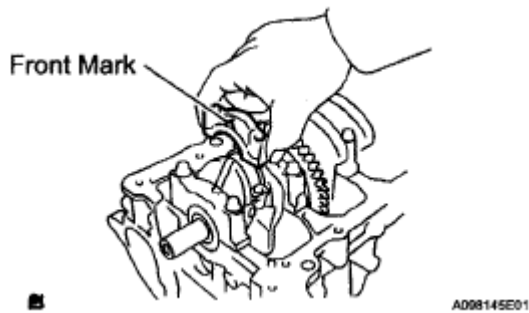


Fig. 338: Checking Front Mark Of Connecting Rod Cap

- e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.
- f. Using a 12 mm socket wrench, tighten the bolts in several passes to the specified torque.

Torque: 24.5 N*m (250 kgf*cm, 18 ft.*lbf)

- g. Mark the front of the connecting rod bolts with paint.
- h. Retighten the cap bolts 90° as shown in the illustration.
- i. Check that the crankshaft turns smoothly.

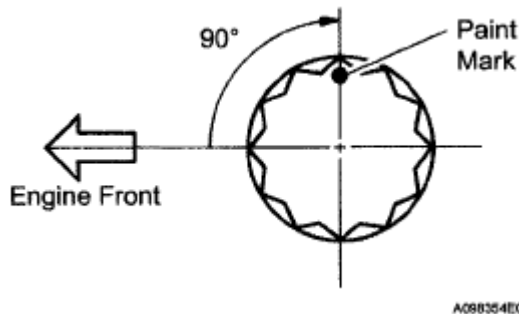


Fig. 339: Identifying Retighten Bolts Paint Mark

13. INSTALL BALANCE SHAFT

- a. Rotate the No. 1 driven gear of the No. 1 balance shaft in the rotating direction until it hits the stopper.
- b. Confirm that the matchmarks on the No. 1 and No. 2 driven gears are aligned.

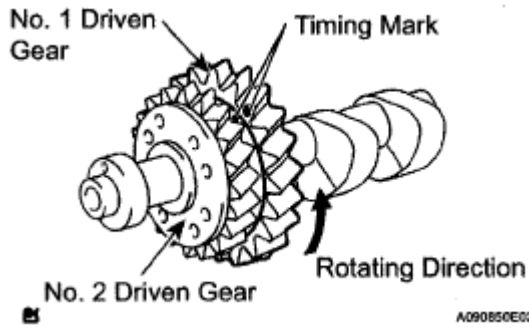


Fig. 340: Identifying Driven Gear Timing Mark

- c. Align the matchmarks of the No. 1 and No. 2 balance shafts as shown in the illustration.
- d. Place the No. 1 and No. 2 balance shafts onto the crankcase.
- e. Apply a light coat of engine oil to the threads and under the heads of the bolts.

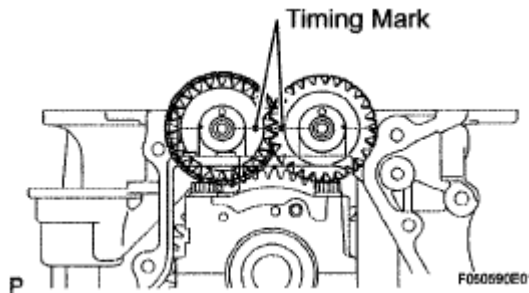


Fig. 341: Identifying Matchmark Of Balance Shaft

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

Torque: 21.6 N*m (224 kgf*cm, 16 ft.*lbf)

- g. Mark the front of the bolts with paint.
- h. Retighten the bolts 90° as shown in the illustration.

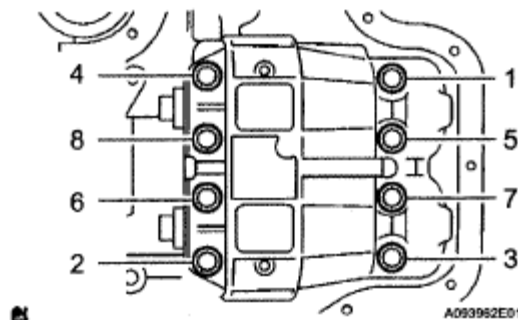


Fig. 342: Identifying Balance Shaft Housing Bolts Sequence

- i. Check that the paint mark is now at a 90° angle to the front.

14. INSTALL STIFFENING CRANKCASE ASSEMBLY

- a. Remove any old packing material and be careful not to drop any oil on the contact surfaces of the cylinder block and crankcase.

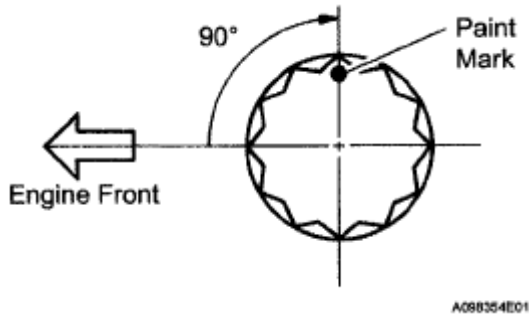


Fig. 343: Identifying Retighten Bolts Paint Mark

- b. Apply a continuous bead of seal packing (Diameter 2.5 to 3.0 mm (0.098 to 0.118 in.)) as shown in the illustration.

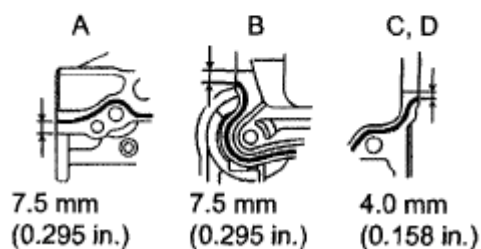
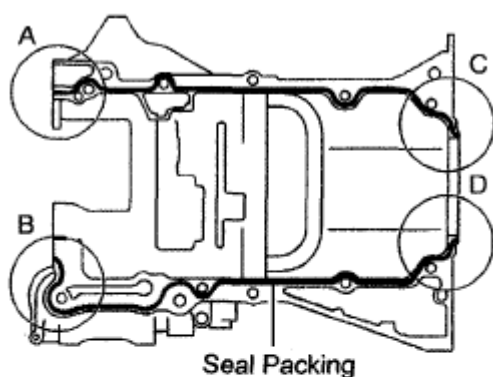
Seal packing:

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

NOTE:

- Remove any oil from the contact surface,
- Install the crankcase within 3 minutes of applying seal packing.
- Do not add engine oil for at least 2 hours after installing the crankcase.

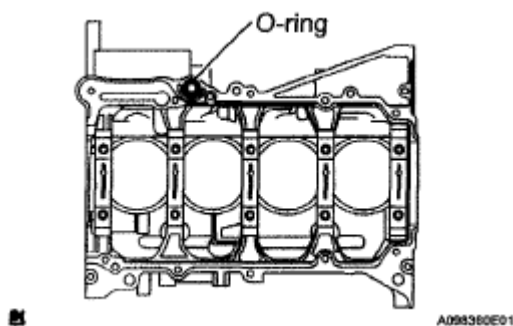
Seal Width: 2.5 to 3.0 mm



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Fig. 344: Identifying Crankcase Seal Packing Area

- c. Place a new O-ring on the cylinder block as shown in the illustration.



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Fig. 345: Identifying O-Ring On Cylinder Block

- d. With the No. 1 crank pin of the crankshaft placed at the 6 o'clock position, install the No. 1 and No. 2 balance shafts and align the adjusting holes as shown in the illustration.

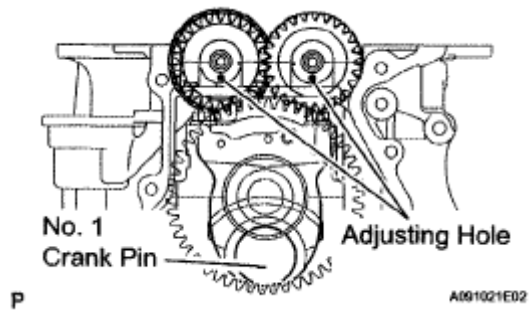


Fig. 346: Identifying Crank Pin And Adjusting Hole

- e. Temporarily install the crankcase with the 11 bolts.

HINT:

- Bolt length: 112 mm (4.41 in.) for A of 12 mm head
- 35 mm (1.38 in.) for B of 12 mm head

- f. Uniformly tighten the bolts.

Torque: 32.5 N*m (331 kgf*cm, 24 ft.*lbf)

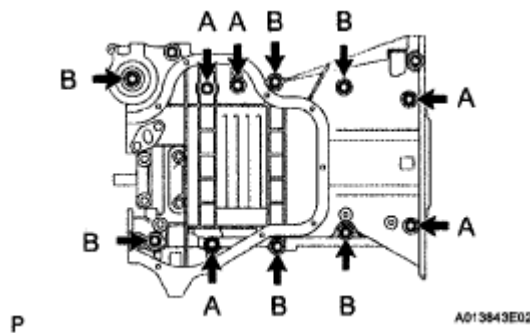


Fig. 347: Identifying Crankcase With Bolts

- g. Confirm that the timing marks of the balance shafts are aligned when the key groove is placed at the 6 o'clock position, as shown in the illustration.

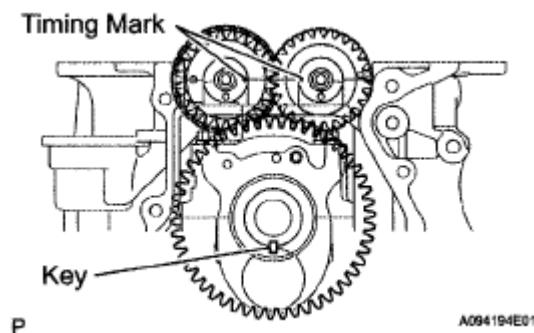


Fig. 348: Identifying Timing Marks Of Balance Shafts

15. INSTALL ENGINE REAR OIL SEAL (See REPLACEMENT)

16. INSTALL NO. 1 TAPER SCREW PLUG

- a. Apply adhesive to 2 or 3 threads of the plug, and install it.

Torque: 26 N*m (265 kgf*cm, 19 ft.*lbf) Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

HINT:

- Install the plug within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the plug.

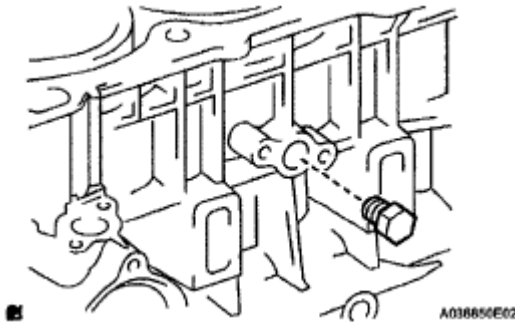


Fig. 349: Identifying Taper Screw Plug

17. INSTALL OIL CONTROL VALVE FILTER

- a. Check that there is no foreign objects on the mesh part of the oil control valve filter.
- b. Using a 6 mm socket hexagon wrench, install a new gasket and the oil control valve filter with the plug.

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

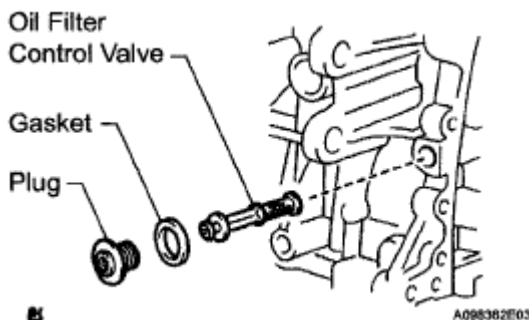


Fig. 350: Identifying Control Valve, Oil Filter And Plug

18. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

- a. Apply adhesive to 2 or 3 threads of the drain cock.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

- b. After tightening the drain cock to the specified torque, turn the drain cock clockwise as shown in the illustration.

Torque: 14 N*m (255 kgf*cm, 18 ft.*lbf)

NOTE:

- Install the drain cock within 3 minutes of applying adhesive.
- Do not add coolant for at least an hour after installing the drain cock.
- Do not turn the drain cock by more than 1 revolution (360°) after tightening the drain cock to the specified torque.
- Do not loosen the drain cock after setting it correctly.

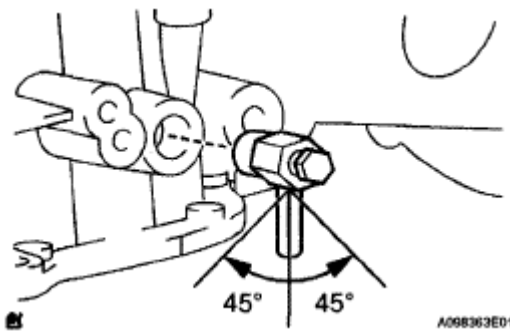


Fig. 351: Turning Drain Cock

19. INSTALL CYLINDER HEAD GASKET

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

NOTE:

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

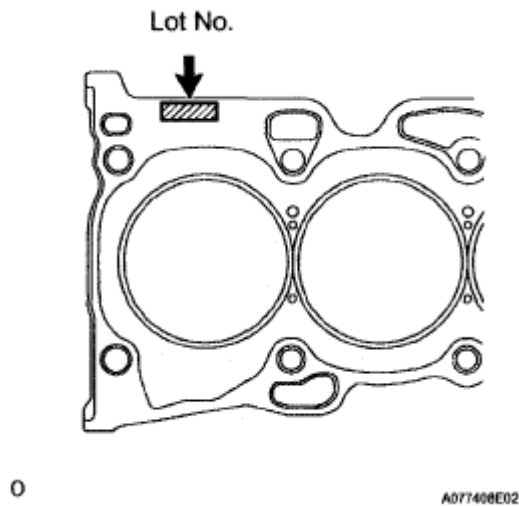


Fig. 352: Identifying Cylinder Block Surface With Lot Number

20. INSTALL CYLINDER HEAD SUB-ASSEMBLY

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

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

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

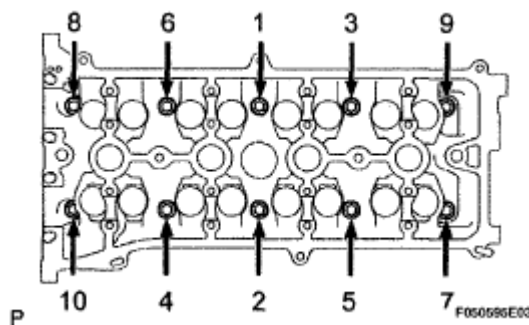


Fig. 353: Identifying Cylinder Head Bolts Install Sequence

- Mark the front of the cylinder head bolts with paint.
- Retighten the cylinder head bolts so that the paint marks are at a 90° angle to the front.

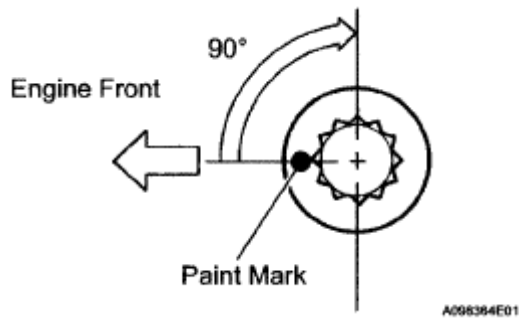


Fig. 354: Identifying Cylinder Head Bolts Paint Mark

21. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY

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

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

22. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY (See INSTALLATION)

23. INSTALL NO. 2 CAMSHAFT TIMING SPROCKET (See INSTALLATION)

24. INSTALL NO. 2 CAMSHAFT BEARING (See INSTALLATION)

25. INSTALL NO. 1 CAMSHAFT BEARING

- a. Clean the contact surfaces of the bearing and the No. 1 bearing cap.
- b. Align the bearing claw with the claw groove of the No. 1 bearing cap and push in the bearing.

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

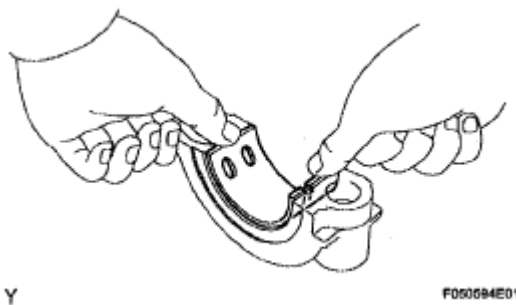


Fig. 355: Aligning Bearing Claw

26. INSTALL CAMSHAFT (See INSTALLATION)

27. INSTALL OIL PUMP ASSEMBLY (See INSTALLATION)

28. INSTALL CHAIN SUB-ASSEMBLY (See REPLACEMENT)

29. INSTALL CRANKSHAFT TIMING SPROCKET

30. INSTALL NO. 1 CHAIN VIBRATION DAMPER (See INSTALLATION)

31. **INSTALL CHAIN SUB-ASSEMBLY (See INSTALLATION)**
32. **INSTALL CHAIN TENSIONER SLIPPER (See INSTALLATION)**
33. **INSTALL TIMING CHAIN GUIDE (See INSTALLATION)**
34. **INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1 (See INSTALLATION)**
35. **INSTALL TIMING CHAIN COVER OIL SEAL (See REASSEMBLY)**
36. **INSTALL TIMING CHAIN COVER SUB-ASSEMBLY (See INSTALLATION)**
37. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY (See INSTALLATION)**
38. **INSTALL CRANKSHAFT PULLEY (See INSTALLATION)**
39. **INSTALL OIL PAN SUB-ASSEMBLY (See INSTALLATION)**
40. **INSTALL OIL PAN DRAIN PLUG**
 - a. Place a new gasket on the oil pan drain plug, then install it onto the oil pan.

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

41. **INSTALL WATER PUMP ASSEMBLY (See INSPECTION)**
42. **INSTALL WATER PUMP PULLEY (See INSTALLATION)**
43. **INSTALL CRANKSHAFT POSITION SENSOR (See REMOVAL)**
44. **INSTALL CAMSHAFT POSITION SENSOR (See REMOVAL)**
45. **INSTALL OIL FILTER UNION**
 - a. Using a 12 mm socket hexagon wrench, install the oil filter union.

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

46. **INSTALL OIL FILTER SUB-ASSEMBLY (See REPLACEMENT)**
47. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See INSPECTION)**
48. **CHECK VALVE CLEARANCE (See VALVE CLEARANCE)**
49. **ADJUST VALVE CLEARANCE (See ADJUSTMENT)**
50. **INSTALL CAMSHAFT (See ADJUSTMENT)**
51. **INSTALL NO. 2 CAMSHAFT (See ADJUSTMENT)**
52. **INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY (See ADJUSTMENT)**
53. **INSTALL CYLINDER HEAD GASKET**
 - a. Install the gasket onto the cylinder head cover.
54. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See INSTALLATION)**
55. **INSTALL VENTILATION VALVE SUB-ASSEMBLY**
 - a. Apply adhesive to the threads of the ventilation valve.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

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

56. INSTALL OIL FILLER CAP SUB-ASSEMBLY

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