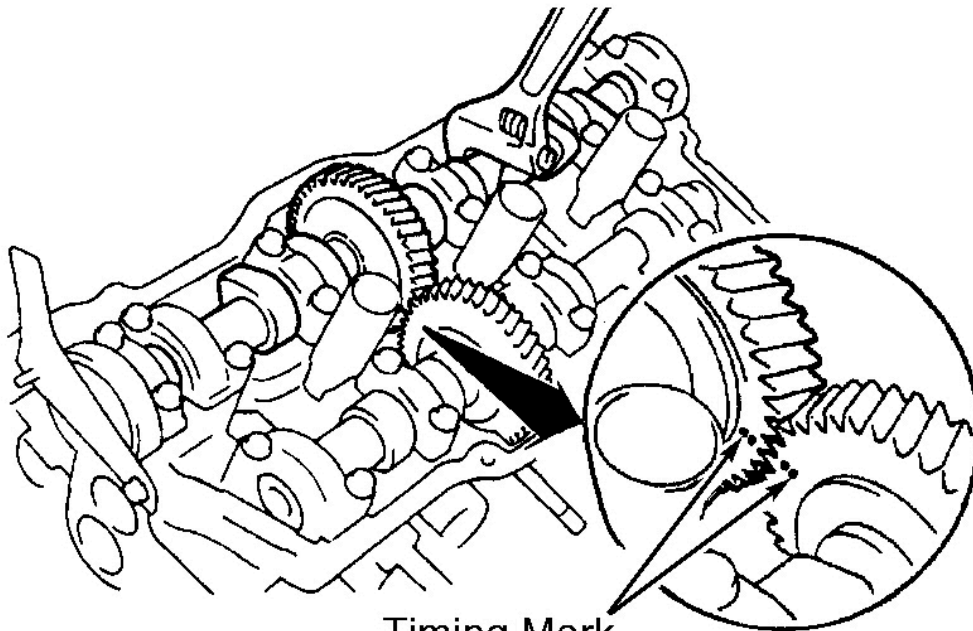


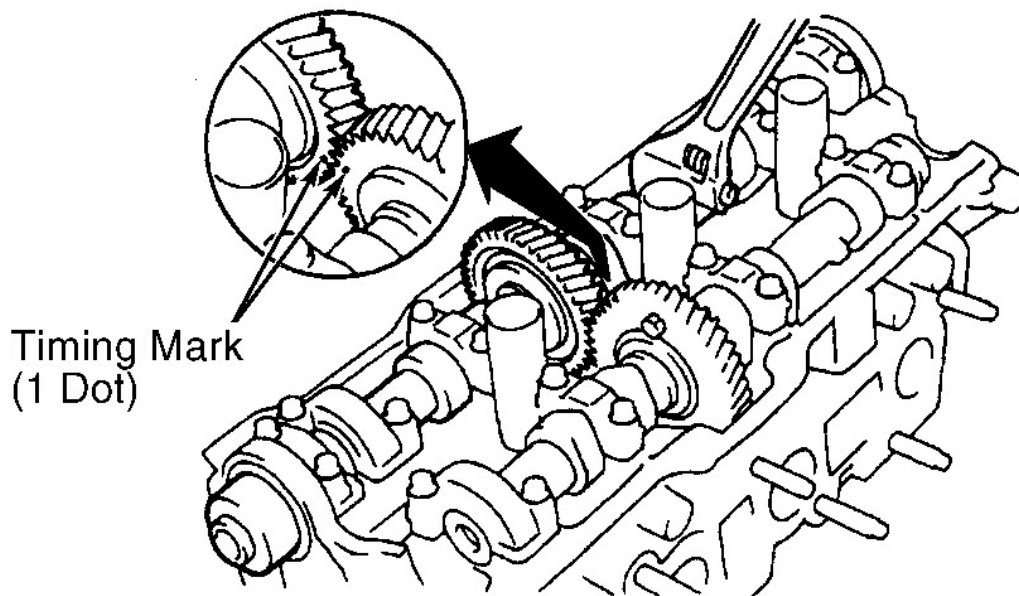
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Timing Mark
(2 Dots)

RIGHT CYLINDER HEAD



Timing Mark
(1 Dot)

LEFT CYLINDER HEAD

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Fig. 25: Aligning Camshaft Timing Marks

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- On all applications, secure camshaft sub-gear on exhaust camshaft to main gear with a 6 x 1.0 x 18-mm service bolt. See **Fig. 26**. Before removing camshaft bearing cap bolts, ensure torsional spring force of camshaft sub-gear is held by service bolt.

NOTE: Camshaft bearing caps are numbered for location on top of camshaft bearing cap. Camshaft bearing cap is also stamped with either an "I" for intake camshaft or an "E" for exhaust camshaft. Arrow on top of camshaft bearing cap must point the proper direction in accordance with cylinder head application. See **Fig. 27**. Camshaft bearing caps must be installed in correct location.

- Note location of camshaft bearing caps, as camshaft bearing caps are numbered for location on top of camshaft bearing cap. Camshaft bearing cap is also stamped with either an "I" for intake camshaft or an "E" for exhaust camshaft. Arrow on top of camshaft bearing cap must point the proper direction in accordance with cylinder head application. See **Fig. 27**.

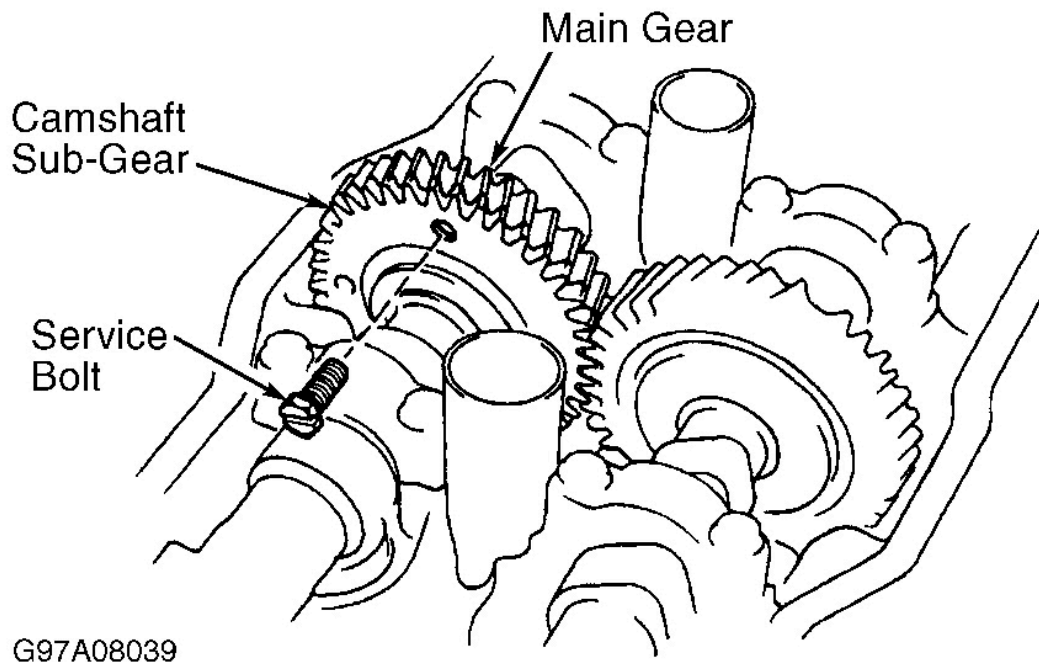


Fig. 26: Installing Service Bolt To Secure Camshaft Sub-Gear (Right Cylinder Head Shown; Left Cylinder Head Similar)

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

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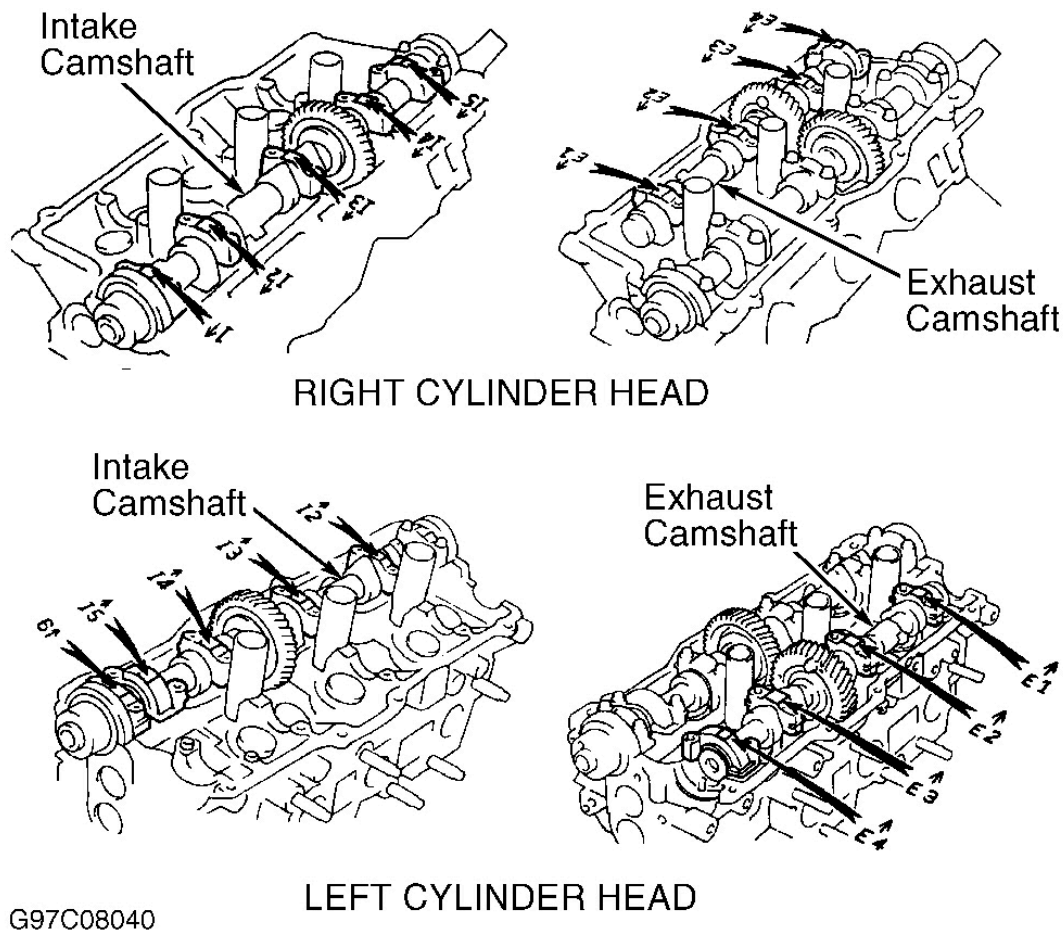


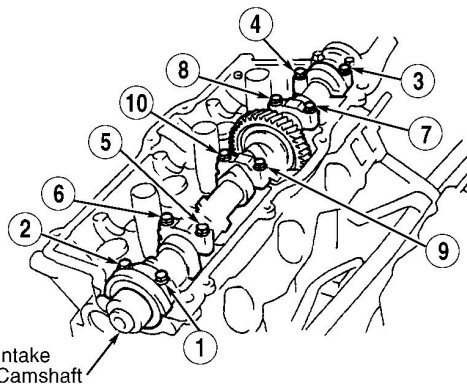
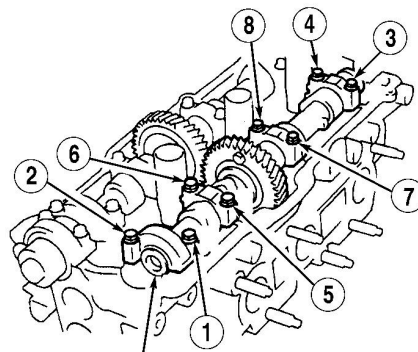
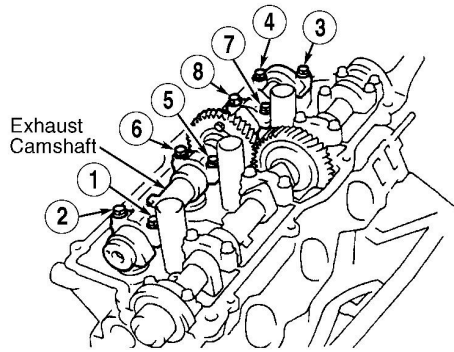
Fig. 27: Identifying Camshaft Bearing Caps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION: Camshaft bearing cap bolts must be removed in proper sequence to prevent damage to cylinder head and camshaft thrust surfaces.

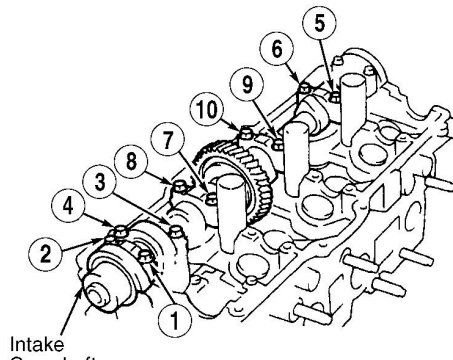
10. Remove exhaust camshaft bearing cap bolts in sequence using several steps. See **Fig. 28**. Remove camshaft bearing caps and exhaust camshaft.
11. Remove intake camshaft bearing cap bolts in sequence using several steps. See **Fig. 28**. Remove camshaft bearing caps, intake camshaft and oil seal.
12. If disassembling exhaust camshaft, mount hexagonal area of camshaft in soft-jawed vise. Using Spanner Wrench (SST 09960-10010), rotate camshaft sub-gear clockwise and remove service bolt. See **Fig. 29**. Remove snap ring, wave washer, camshaft sub-gear and camshaft gear spring. See **Fig. 13**.

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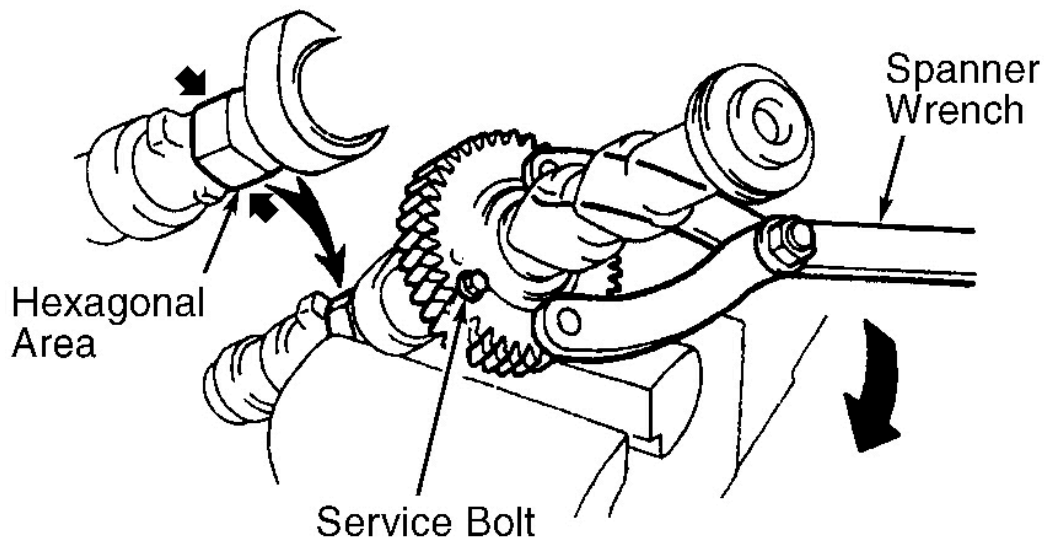
RIGHT CYLINDER HEAD



LEFT CYLINDER HEAD

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



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Fig. 29: Disassembling & Reassembling Exhaust Camshaft

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

Inspection

1. Inspect components for damage. Check camshaft journal diameter, lobe height and journal runout. Replace camshaft if not within specification. See **CAMSHAFT** under ENGINE SPECIFICATIONS.
2. Install camshaft in cylinder head. Using Plastigage, check camshaft oil clearance. Tighten camshaft bearing cap bolts to specification in sequence when checking oil clearance. See **Fig. 31**. See **TORQUE SPECIFICATIONS**.
3. Replace camshaft and/or cylinder head if oil clearance is not within specification. See **CAMSHAFT** under ENGINE SPECIFICATIONS.
4. Check camshaft end play with camshaft bearing cap bolts tightened to specification. Replace camshaft and/or cylinder head if end play is not within specification. See **CAMSHAFT** under ENGINE SPECIFICATIONS.
5. Install both camshafts without camshaft sub-gear installed on exhaust camshaft. Tighten camshaft bearing cap bolts to specification. Check gear backlash between camshaft gears.
6. Replace camshaft if gear backlash exceeds specification. See **CAMSHAFT** under ENGINE SPECIFICATIONS. Measure distance between ends of camshaft gear spring. Replace camshaft gear spring if distance is not .716-.740" (18.20-18.80 mm).

Installation

1. If reassembling exhaust camshaft, install camshaft gear spring and camshaft sub-gear on exhaust camshaft. Ensure pins on camshaft sub-gear engage with ends of camshaft gear spring. Install wave

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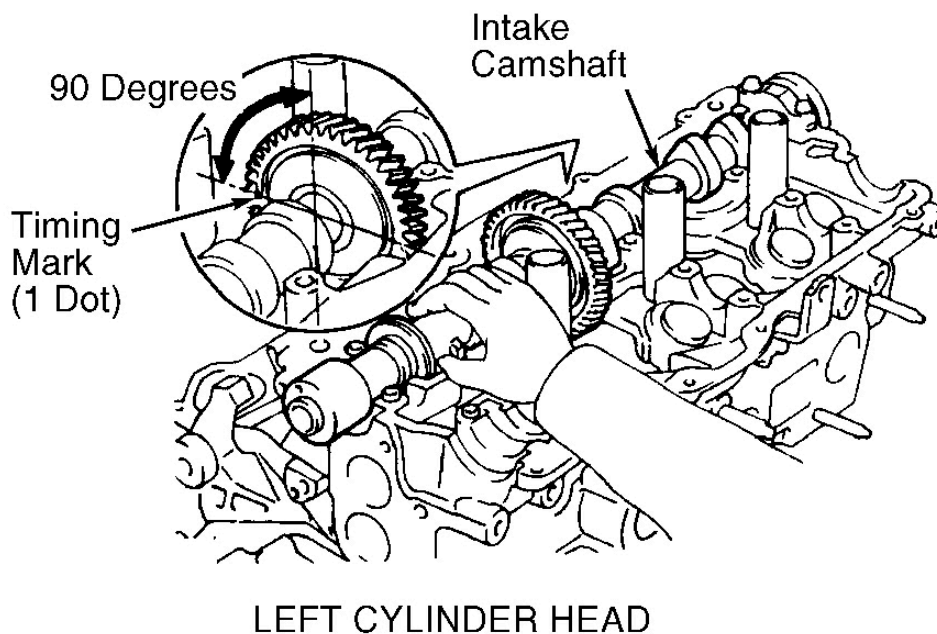
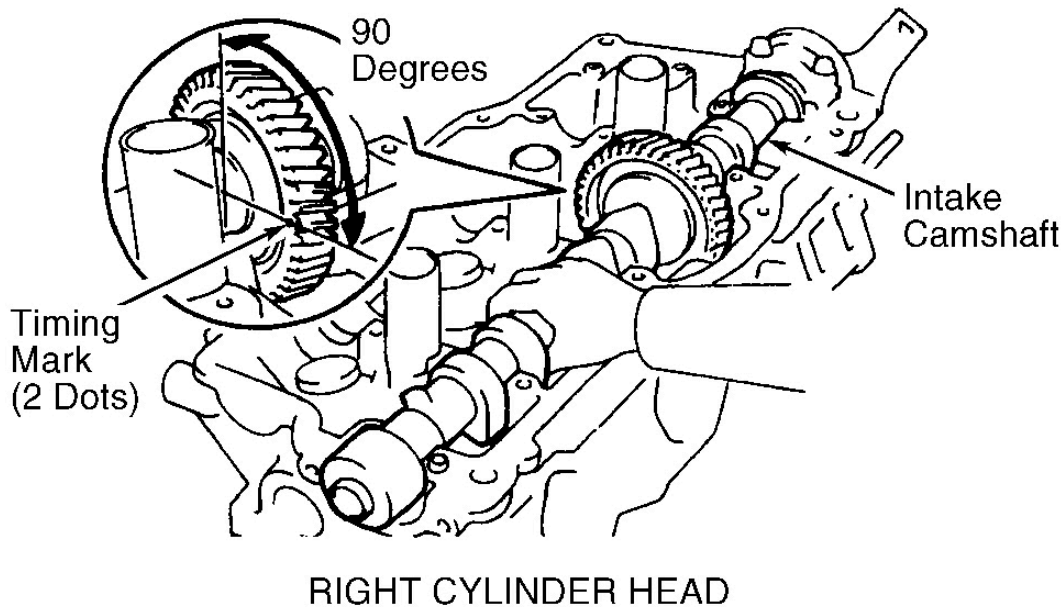
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washer and snap ring on exhaust camshaft.

2. Using spanner wrench, rotate camshaft sub-gear clockwise until holes in main gear and camshaft sub-gear are aligned. Temporarily install service bolt. See **Fig. 29**. Ensure gear teeth of main gear and camshaft sub-gear are aligned. Tighten service bolt.
3. Apply engine oil to thrust surfaces and journals of camshafts. Install intake camshaft on cylinder head. Rotate intake camshaft so timing mark with 2 dots on right cylinder head applications or timing mark with one dot on left cylinder head applications is properly positioned with surface on cylinder head. See **Fig. 30**.

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Fig. 30: Installing Intake Camshaft On Cylinder Head
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Apply engine oil to seal lip on NEW oil seal. Install oil seal on intake camshaft. Apply sealant on No. 1 intake camshaft bearing cap at bearing cap-to-cylinder head surface.
5. Install intake camshaft bearing caps in numerical order. Ensure arrow on top of camshaft bearing cap is

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pointing toward proper direction in accordance with cylinder head application. See **Fig. 27**.

6. Coat camshaft bearing cap bolt-to-camshaft bearing cap surface and bolt threads with engine oil. Install and tighten intake camshaft bearing cap bolts to specification in sequence using several steps. See **Fig. 31**. See **TORQUE SPECIFICATIONS**.

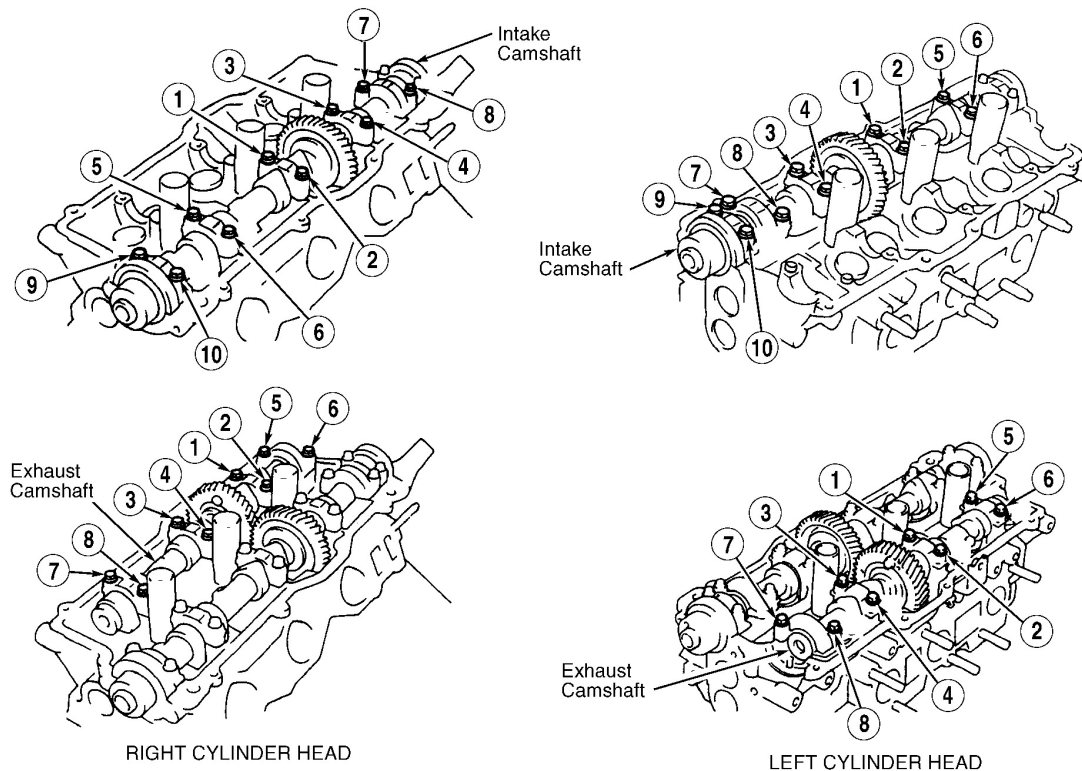


Fig. 31: Camshaft Bearing Cap Bolt Installation Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Install exhaust camshaft on cylinder head so timing marks with 2 dots on right cylinder head applications or timing mark with one dot on left cylinder head applications is aligned with timing mark on intake camshaft. See **Fig. 25**.
8. Install exhaust camshaft bearing caps in numerical order. Ensure arrow on top of camshaft bearing cap is pointing toward proper direction in accordance with cylinder head application. See **Fig. 27**.
9. Coat camshaft bearing cap bolt-to-camshaft bearing cap surface and bolt threads with engine oil. Install and tighten exhaust camshaft bearing cap bolts to specification in sequence using several steps. See **Fig. 31**. See **TORQUE SPECIFICATIONS**.

CAUTION: Ensure service bolt is removed from camshaft sub-gear on exhaust camshafts.

10. On all cylinder head applications, remove service bolt from exhaust camshaft. Check and adjust valve

clearance. See **VALVE CLEARANCE ADJUSTMENT** under ADJUSTMENTS.

11. Apply sealant to grooves of semi-circular plugs and install in cylinder head (if removed). See **Fig. 13**. Before installing valve cover and gasket, apply sealant at front and rear areas of the cylinder head. See **Fig. 7**.
12. Using NEW gasket, install valve cover. Install and tighten valve cover bolts to specification in several steps. See **TORQUE SPECIFICATIONS**.
13. To install remaining components, reverse removal procedure using NEW gaskets. Tighten bolts/nuts to specification. See **TORQUE SPECIFICATIONS**.
14. When installing camshaft position sensor, ensure pin on camshaft position sensor engages with hole in cylinder head. Install timing belt using proper procedure. See **TIMING BELT** under REMOVAL & INSTALLATION. Fill cooling system.

CRANKSHAFT REAR OIL SEAL

Removal

Remove transmission and flywheel/drive plate. For automatic transmission, see **TRANSMISSION REMOVAL & INSTALLATION - A/T** article in AUTOMATIC TRANSMISSION SERVICING. For manual transmission, see **CLUTCH** article. Using a knife, cut off oil seal lip. Pry oil seal from crankshaft rear oil seal housing. Use care not to damage sealing surfaces.

Installation

1. Ensure all sealing surfaces are clean. Apply grease to seal lip of NEW oil seal. Using Oil Seal Installer (SST 09223-15030), install oil seal in crankshaft rear oil seal housing until oil seal is even with housing surface.
2. Apply Loctite to flywheel/drive plate bolts. Install and tighten flywheel/drive plate bolts to specification in a crisscross pattern. See **TORQUE SPECIFICATIONS**. To install remaining components, reverse removal procedure.

WATER PUMP

Removal

1. Water pump is located on front of cylinder block, behind timing belt. See **Fig. 15**. Drain cooling system. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION.
2. Disconnect lower radiator hose from thermostat housing. Remove nuts, thermostat housing, gasket and thermostat. Disconnect oil cooler hose from water pump. Remove bolts and water pump.

Installation

1. Ensure sealing surface on rear of water pump is clean. Apply sealant on grooves at rear of water pump before installing. See **Fig. 32**. Install water pump. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.