

4.0L V8 - VINS [K,U]

Selected Block

1990 Lexus LS 400

For Lextreme Powertrain 2020 S. Hacienda Blvd. # D Hacienda Heights California 91745

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Friday, May 09, 2003 10:59AM

REMOVAL & INSTALLATION

NOTE: For installation reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel related component. DO NOT allow fuel to contact engine or electrical components.

To relieve fuel pressure, wrap cold start injector banjo bolt with shop towel. Ensure ignition is off or battery is disconnected. Slowly loosen banjo bolt to relieve pressure. Clean up any fuel which may have dripped onto engine.

ENGINE

NOTE: Before removing, label all electrical connectors, vacuum hoses and fuel lines for reassembly reference. Also place mating marks on engine hood and other major assemblies before removing.

Removal

1) Disconnect cable from negative terminal of battery and wait 20 seconds. Remove hood, dust covers and air duct. Remove battery and engine splash shield. Drain engine oil and coolant.

2) Disconnect radiator upper hose from water inlet. Remove drive belt, fan fluid coupling and fan pulley. Remove radiator. Disconnect airflow meter connector and air cleaner hose from intake air connector pipe. Remove air cleaner, airflow meter and hose assembly.

3) Remove ignitor cover, and disconnect connectors. Remove throttle body cover. Disconnect accelerator cable and cruise control actuator cable. Remove air connector pipe from throttle body. Remove power steering pump without disconnecting hoses, and move pump aside.

4) Remove radiator reservoir tank. Remove A/C compressor without disconnecting hoses. Disconnect heater, fuel and vacuum hoses. Remove relay box cover. Disconnect wires and connectors. Remove underdash cover and lower finish panel. Disconnect engine wiring harness in passenger compartment. Disconnect 3 engine and transmission ECU connectors. Disconnect circuit opening relay connector, cowl wire connector and instrument panel wire connector. Remove 2 bolts, and pull engine wiring loom through cowl panel.

5) Disconnect power steering oil cooler pipe from oil pan. Remove engine wiring from wire bracket on front suspension crossmember. Remove steering damper. Remove front exhaust pipe from

catalytic converters and remove catalytic converters. Remove exhaust pipe heat insulator. Remove center floor crossmember braces from beneath drive shaft. Remove drive shaft.

6) Disconnect transmission control rod. Attach engine chain hoist to engine hangers. Remove engine mounts-to-front suspension crossmember nuts. Remove rear engine mounting. Disconnect ground strap. Lift engine slowly and carefully out of vehicle. Place engine and transmission assembly on a stand. Separate engine and transmission.

NOTE: Use care not to damage power steering gear housing, neutral start switch and ABS actuator assembly.

Installation

Lower engine into engine compartment. Insert front motor mount studs into front suspension crossmember. Keep engine level. Install rear engine mount/crossmember; ensure front arrow points forward. Install nuts on front mount studs. Connect transmission control rod and drive shaft. To complete installation, reverse removal procedure.

INTAKE MANIFOLD

Removal & Installation

Manufacturer does not provide a separate, specific procedure for intake manifold removal. To remove intake manifold, use procedures listed in CYLINDER HEAD under REMOVAL & INSTALLATION in this article. When installing components, ensure White paint marks on intake manifold gaskets face upward and gaskets are installed in correct direction.

EXHAUST MANIFOLD

NOTE: Manufacturer does not provide specific instruction for accessing exhaust manifolds from engine compartment.

Removal & Installation

1) From beneath vehicle, disconnect and remove sub-oxygen (O₂) sensors from center exhaust pipe. Remove center exhaust pipe from catalytic converters. Remove catalytic converters. Disconnect main O₂ sensor from exhaust manifold. Remove dust and heat shields as necessary. Remove exhaust manifold from cylinder head.

2) To install manifold, reverse removal procedure. Ensure Yellow paint marks on exhaust manifold gaskets face toward manifold. Tighten exhaust manifold nuts to 29 ft. lbs. (39 N.m). Tighten O₂ sensors to 32 ft. lbs. (44 N.m).

CYLINDER HEAD

Removal

1) Disconnect cable from negative terminal of battery and wait 20 seconds. Drain engine coolant. Remove camshaft timing pulleys. See TIMING BELT under REMOVAL & INSTALLATION in this article. Disconnect accelerator, A/T throttle actuator and cruise control cables.

2) Remove spark plug wiring clamps and covers. Remove right ignition coil. Remove water inlet housing from water pump. Disconnect water by-pass hose from ISC valve. Remove timing belt cover rear plate. Remove EGR pipe. Remove fuel pressure and EGR Vacuum Solenoid Valves (VSV). Disconnect vacuum hoses. Remove EGR valve and vacuum modulator.

3) Disconnect water by-pass pipes. Remove ISC valve. Remove throttle body and accelerator bracket. Remove brake booster vacuum fitting. Disconnect cold start injector. Remove 4 intake chamber gaskets. Disconnect engine wiring from intake manifold.

4) Disconnect heater hoses from rear water by-pass fitting. Remove fuel delivery pipes and injectors. Remove intake manifold. Remove front water by-pass fitting. Disconnect sub-oxygen (O₂) sensors from exhaust pipe. Remove exhaust pipe and support brackets. Remove catalytic converters. Disconnect right side main oxygen sensor. Remove exhaust manifold and gasket.

5) Remove oil dipstick and guide. Disconnect left side main O₂ sensor. Remove exhaust manifold and gasket. Remove engine hangers. Remove engine wiring brackets from right cylinder head. Remove valve covers. Remove camshafts. See CAMSHAFT under REMOVAL & INSTALLATION in this article.

6) Disconnect ground straps and engine wiring clamps from rear of cylinder heads. Uniformly loosen cylinder head bolts in several sequential passes. See Fig. 9. Remove cylinder head bolts and washers.

CAUTION: Removing bolts in incorrect sequence can cause cylinder head warpage or cracking.

7) Lift cylinder heads from dowels on cylinder block. If it is difficult to lift off cylinder head, pry between cylinder head and cylinder block. Be careful not to damage block surface.

Inspection

Clean cylinder head. Remove gasket material. Using a gasket scraper, remove all gasket material from cylinder head mounting surfaces. Using a wire brush, clean combustion chambers. Using a soft brush and solvent, thoroughly clean cylinder heads. Inspect cylinder heads for warpage. Maximum warpage of any mounting surface is .004" (.10 mm). If warpage exceeds specification, replace cylinder head. Inspect ports and combustion chamber for cracks. Replace cylinder head if cracked.

4.0L V8 - VINS [K,U]Selected Block (p. 3)1990 Lexus LS 400For Lextreme Powertrain 2020 S. Hacienda Blv

Installation

1) Position new cylinder head gaskets in position on cylinder block. Gaskets are color-coded to indicate which side of engine they fit on. White mark indicates right side gasket and Yellow mark indicates left side gasket. Ensure gaskets are positioned on appropriate side, with paint marks facing rear of engine. Position cylinder heads on block. Apply a light coat of engine oil on threads and under heads of cylinder head bolts.

2) Install cylinder head bolts and washers. Tighten cylinder head bolts in 2 steps. If any cylinder head bolt is broken or deformed, replace it. Uniformly tighten cylinder head bolts on each cylinder head in several sequential passes. See Fig. 9. Tighten bolts to 29 ft. lbs. (39 N.m). Mark front of bolt head with a paint dot. Tighten cylinder head bolts an additional 90 degrees, in sequence shown. Ensure paint mark is now at 90-degree angle to front. Reverse removal procedure to complete installation.

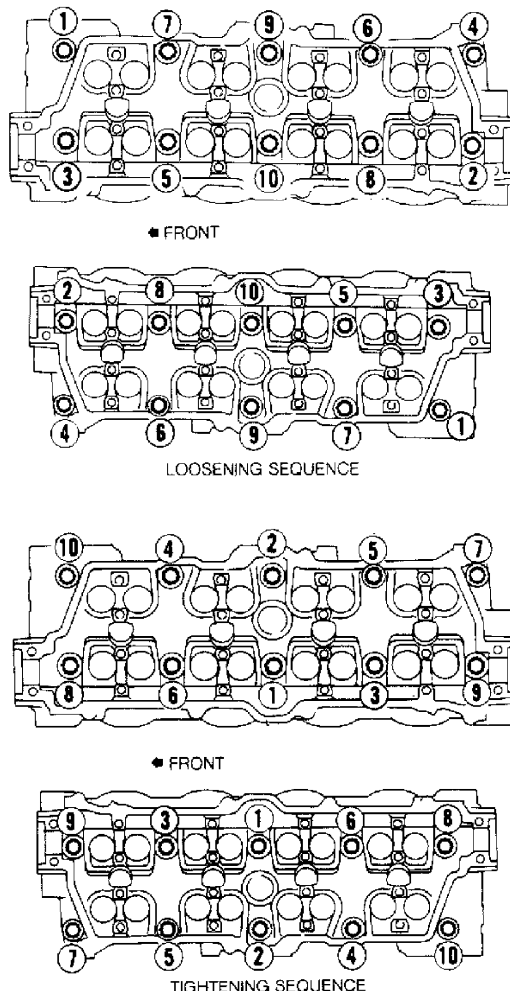


Fig. 9: Cylinder Head Bolt Loosening & Tightening Sequence

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4.0L V8 - VINS [K,U]Selected Block (p. 4)1990 Lexus LS 400For Lextreme Powertrain 2020 S. Hacienda Blv

FRONT CRANKSHAFT OIL SEAL

Removal & Installation

Remove timing belt. See TIMING BELT under REMOVAL & INSTALLATION in this article. Remove crankshaft timing pulley. Cut oil seal lip and pry seal from oil pump/front cover housing. Apply multipurpose grease to new seal lip. Use seal installer and tap in new seal until outer surface is flush with edge of pump case. Reverse removal procedure to complete installation.

TIMING BELT

Removal

1) Disconnect cable from negative terminal of battery and wait 20 seconds. Remove air duct and dust covers. Remove battery. Remove engine splash shield and drain engine coolant. Remove drive belt, fan, fluid coupling and fan pulley. Disconnect radiator upper hose from water inlet. Remove radiator and air cleaner. Disconnect air cleaner hose from intake air connector pipe. Remove air cleaner, airflow meter and hose assembly.

2) Remove throttle body cover and disconnect cables. Remove intake air connector pipe. Remove A/C compressor without disconnecting hoses and move it aside. Remove power steering pump without disconnecting hoses. Disconnect air hose from air intake chamber. Remove upper high tension wire cover. Remove right side engine wiring cover.

3) Remove left side engine wiring cover. Disconnect PCV hose from valve on left cylinder head. Remove right and left upper timing belt covers. Remove high tension wiring and clamps from distributor caps. Remove left side intermediate timing belt cover and ignition coil.

NOTE: DO NOT pull or bend wiring, otherwise inside conductor may be damaged.

4) Remove drive belt idler pulley. Disconnect crank position sensor connector. Remove right side intermediate timing belt cover. Remove rubber caps from distributor cap. Remove ignition coil. Remove water by-pass hose and pipe. Remove left side intermediate timing belt covers. Disconnect crank position sensor wire from clamp on timing belt cover. Remove rubber caps from distributor cap.

5) Remove distributor caps. Remove distributor rotors. Remove distributor housings. Disconnect sensor connector from ignition coil bracket. Disconnect crank position sensor connector from engine wire.

6) Remove alternator. Remove drive belt tensioner located above alternator. Remove spark plugs. If reusing timing belt, check installation marks on timing belt. Ensure there are 4 installation marks on timing belt. See Fig. 13. If installation marks have

7) Position No. 1 cylinder at TDC (compression). Turn crankshaft pulley and align groove with "0" timing mark on lower timing belt cover. Ensure timing marks of camshaft timing pulleys and timing belt rear plates align. If not, turn crankshaft one revolution (360 degrees). See Fig. 12.

8) Remove timing belt tensioner. If necessary, place new installation marks on timing belt to match timing marks of camshaft timing pulleys. When replacing only timing belt tensioner, use a piece of string to tension timing belt. Place marks on timing belt and right camshaft timing pulley. Remove tensioner and dust boot. Preset tensioner before installing.

9) Loosen tension between left and right camshaft timing pulleys by slightly turning left pulley clockwise. Disconnect timing belt from camshaft timing pulleys. Remove camshaft timing pulleys.

10) Using puller, remove crankshaft pulley. Remove fan support bracket. Remove lower timing belt cover, spacer and gasket. Remove crank angle sensor plate, which also acts as timing belt guide plate.

11) Ensure installation reference marks are present. Remove timing belt. Remove lower idler pulley. Using puller, remove crankshaft timing belt pulley.

Inspection

1) DO NOT bend, twist or turn timing belt inside out. DO NOT allow timing belt to come into contact with oil, water or steam. DO NOT use timing belt tension when installing or removing mount bolt of camshaft timing pulley.

2) Check belt for premature parting, cracked or damaged teeth. Ensure camshafts are not locked. If there is wear or damage on only one side of belt, check belt guide and alignment of each pulley. Inspect idler pulleys for damage and turning smoothness. Inspect timing belt tensioner for oil leakage. If there is just a small trace of oil on seal of push rod, tensioner is okay.

3) If leakage is found, replace tensioner. Check tensioner by pressing push rod strongly against hard surface to ensure it doesn't move. If push rod moves, replace tensioner. Measure push rod protrusion from housing end. Rod should protrude .413-.453" (10.5-11.5 mm). If protrusion is not as specified, replace tensioner.

Installation

1) Install crankshaft timing pulley on crankshaft, with flange side rearward. Apply Loctite to bolt threads and install lower idler pulley. Install upper idler pulley. Tighten idler pulley bolts to 25 ft. lbs. (34 N.m). Ensure pulleys move smoothly.

2) Ensure engine is cold. Using crankshaft pulley bolt, turn crankshaft and align timing marks of crankshaft timing pulley and oil pump body. Ensure pulleys are clean. Align installation mark on timing belt with drilled mark of crankshaft timing pulley.

3) Temporarily install timing belt on crankshaft timing

4.0L V8

pulley and idler pulleys. Install crank angle sensor plate. Install timing belt cover spacer. Install lower timing belt cover. Install fan bracket. Install crankshaft pulley. Tighten crankshaft pulley bolt to 181 ft. lbs. (245 N.m).

4) Align camshaft and pulley drive pins, and install camshaft timing pulleys. Ensure "L" and "R" marks on pulleys face forward on appropriate camshafts. Tighten pulley retaining nuts to 80 ft. lbs. (108 N.m).

5) Position No. 1 cylinder to TDC on compression stroke. Turn crankshaft pulley and align groove with "0" timing mark on lower belt cover. Align camshaft timing pulley marks with marks on rear cover plate. See Fig. 12.

6) Ensure installation mark on timing belt aligns with end of fan bracket. Ensure pulleys are clean. Slightly turn left camshaft timing pulley clockwise. Align installation mark on timing belt with timing mark on pulley. Position timing belt on left camshaft timing pulley.

7) Align timing marks of left camshaft pulley and timing belt rear plate. Ensure timing belt has tension between crankshaft pulley and left camshaft pulley. Slightly turn right crankshaft timing pulley clockwise. Align installation mark on timing belt with timing mark of camshaft pulley. Position belt on pulley. Turn pulley to align timing marks. Ensure there is belt tension between camshafts.

8) Set timing belt tensioner to installation position. Position tensioner in a press. Slowly press in push rod using 220-2205 lbs. (100-1000 kg) of pressure. Align hole in push rod with hole in housing and place a 1.27-mm Allen wrench through holes to hold setting position. Release press. Install dust boot on tensioner and install tensioner in front cover. See Fig. 15. Torque bolts to 19 ft. lbs. (26 N.m).

9) Remove Allen wrench from tensioner. Check valve timing by turning crankshaft pulley 2 revolutions from TDC to TDC. Always turn crankshaft clockwise. Ensure timing marks align as shown. See Fig. 11. If marks do not align, remove timing belt and realign.

10) Install spark plugs and torque to 13 ft. lbs. (18 N.m). Install drive belt tensioner. Install alternator and wiring. Install right and left distributor housings. Tighten housing bolts to 13 ft. lbs. (18 N.m).

11) Connect crank position sensor connector to engine wiring harness. Install crank position sensor connector to ignition coil bracket. Install distributor rotors. Align protrusion of distributor rotor with groove of camshaft timing pulley. See Fig. 16. Install distributor caps.

12) Install intermediate timing belt covers. Connect crank position sensor connector. Run crank position sensor wire through timing belt cover hole and install grommet. Install water by-pass pipe. Connect water by-pass hose to water inlet housing.

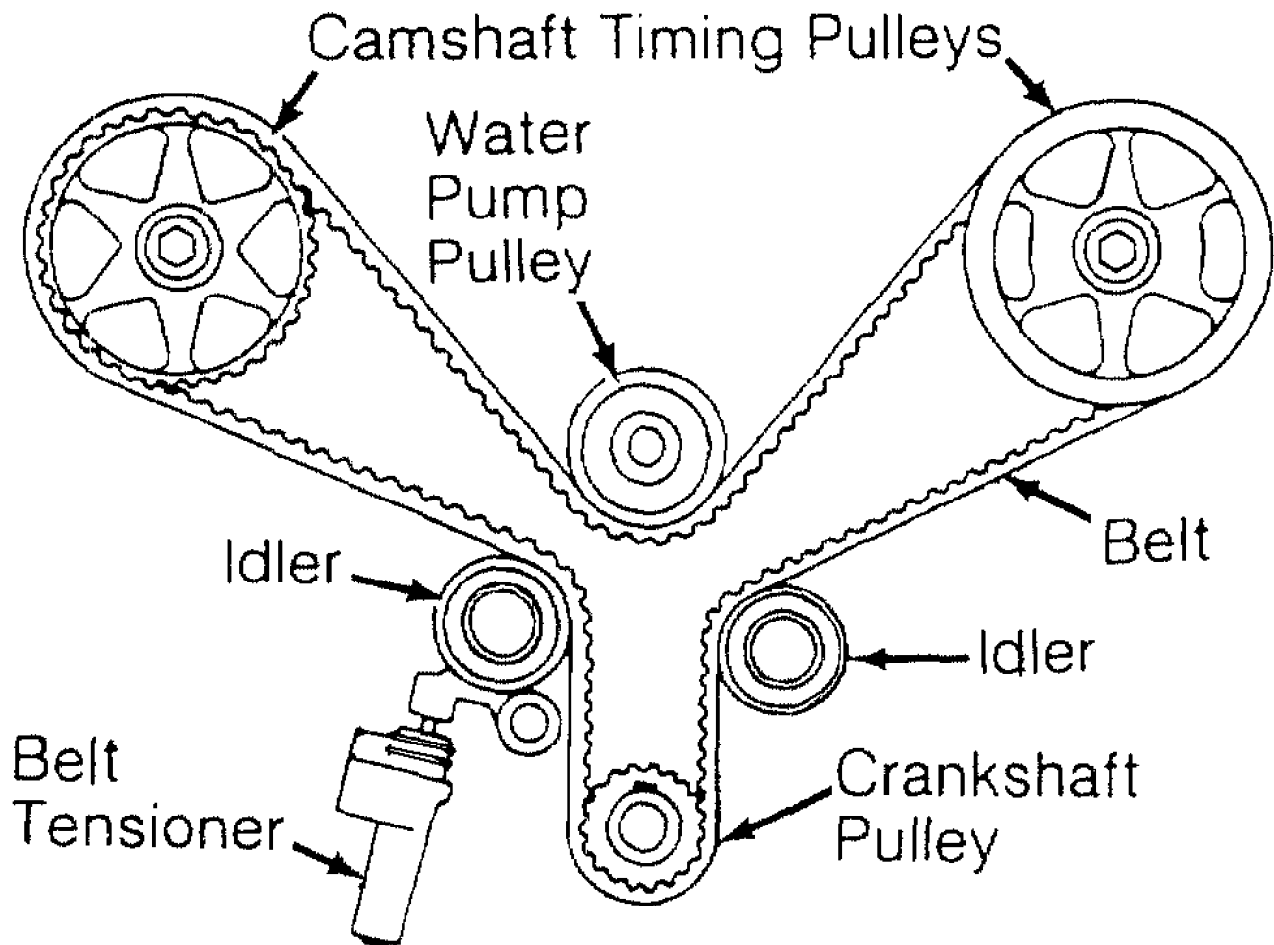
13) Install left ignition coil. Install drive belt idler pulley. Install drive belt idler pulley and torque to 27 ft. lbs. **4.0L3V8 - VINS |**

N.m). Install high tension wiring and holders. Install wiring cover. Install right and left upper timing belt cover. Connect vacuum hose to EVAP solenoid valve.

14) Install engine wire covers. Install upper high tension wiring cover. Ensure upper and lower covers fit together properly. Install power steering pump. Connect air hose to air intake chamber. Install A/C compressor and tighten bolt to 36 ft. lbs. (49 N.m), and nut to 22 ft. lbs. (29 N.m).

15) Install intake air connector pipe to throttle body. Connect air hose to ISC valve. Connect cables and install throttle body cover. Install air cleaner assembly. Install radiator. Install fan pulley, fluid coupling, fan and drive belt. Install drive belt by turning drive belt tensioner counterclockwise.

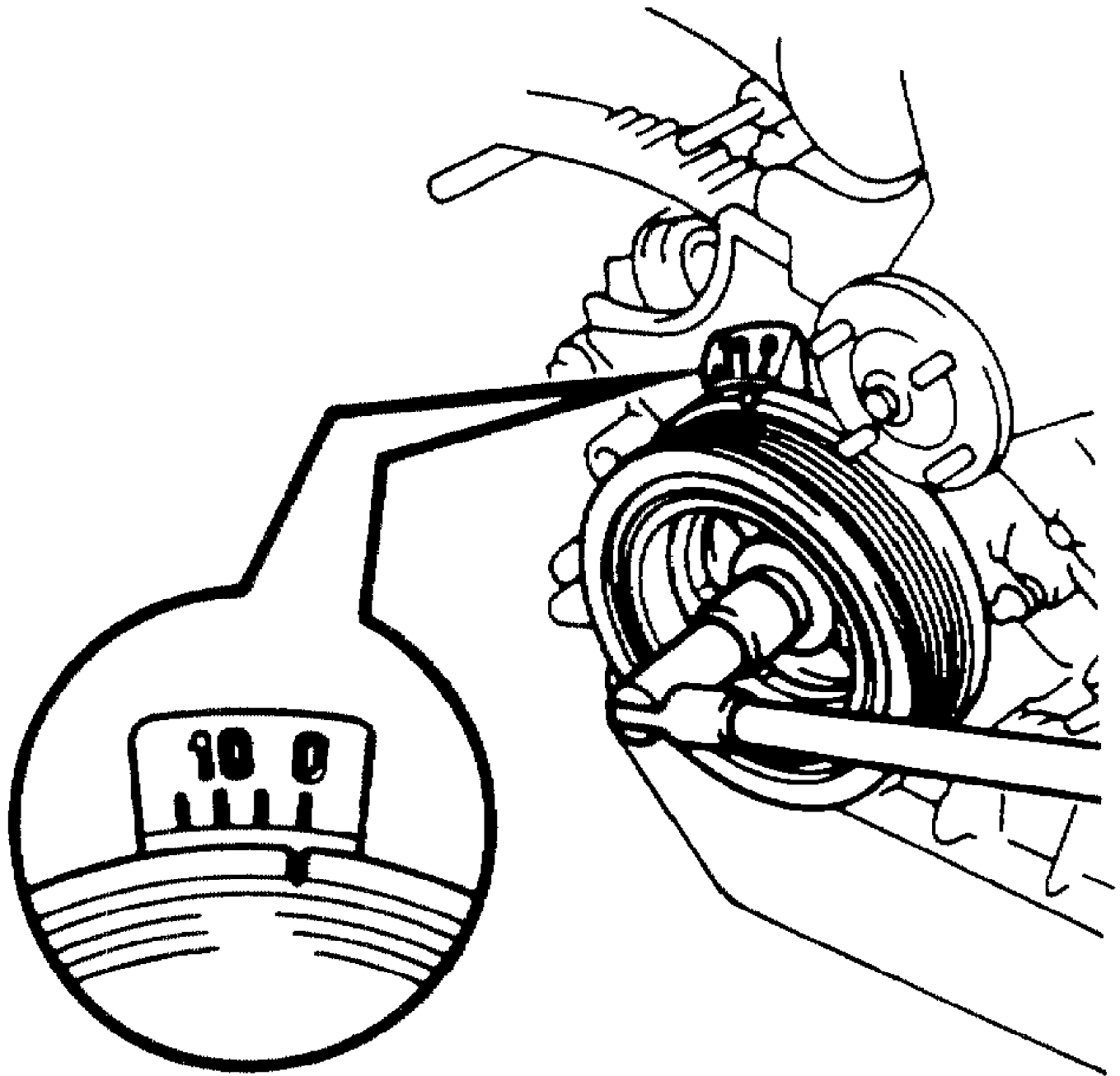
16) Install engine splash shield. Install battery. Install air duct and dust covers. Connect cable to negative terminal of battery. Fill with engine coolant.



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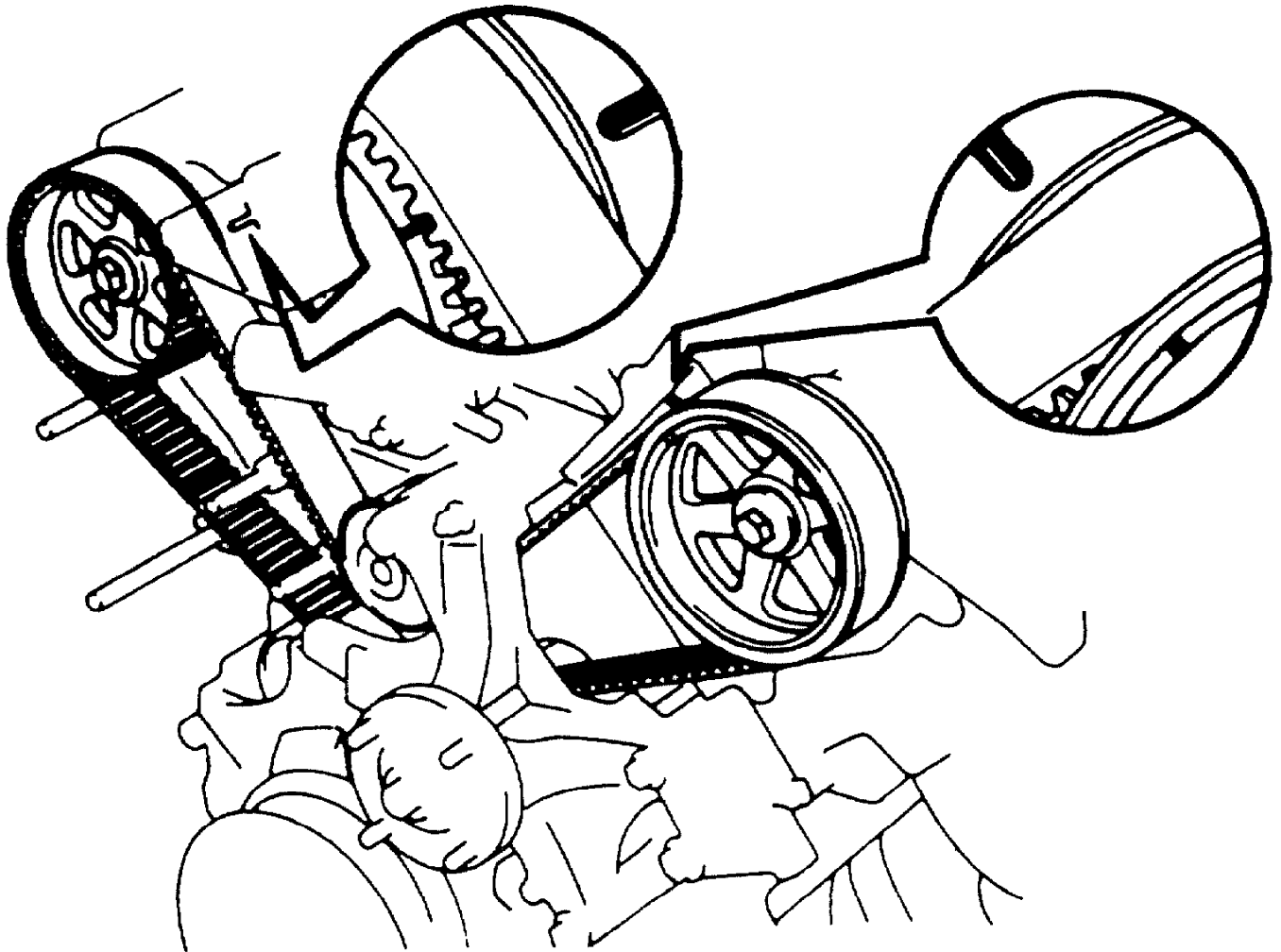
Fig. 10: Timing Belt Routing
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Fig. 11: Crankshaft TDC Position
Courtesy of Toyota Motor Sales, U.S.A., Inc.

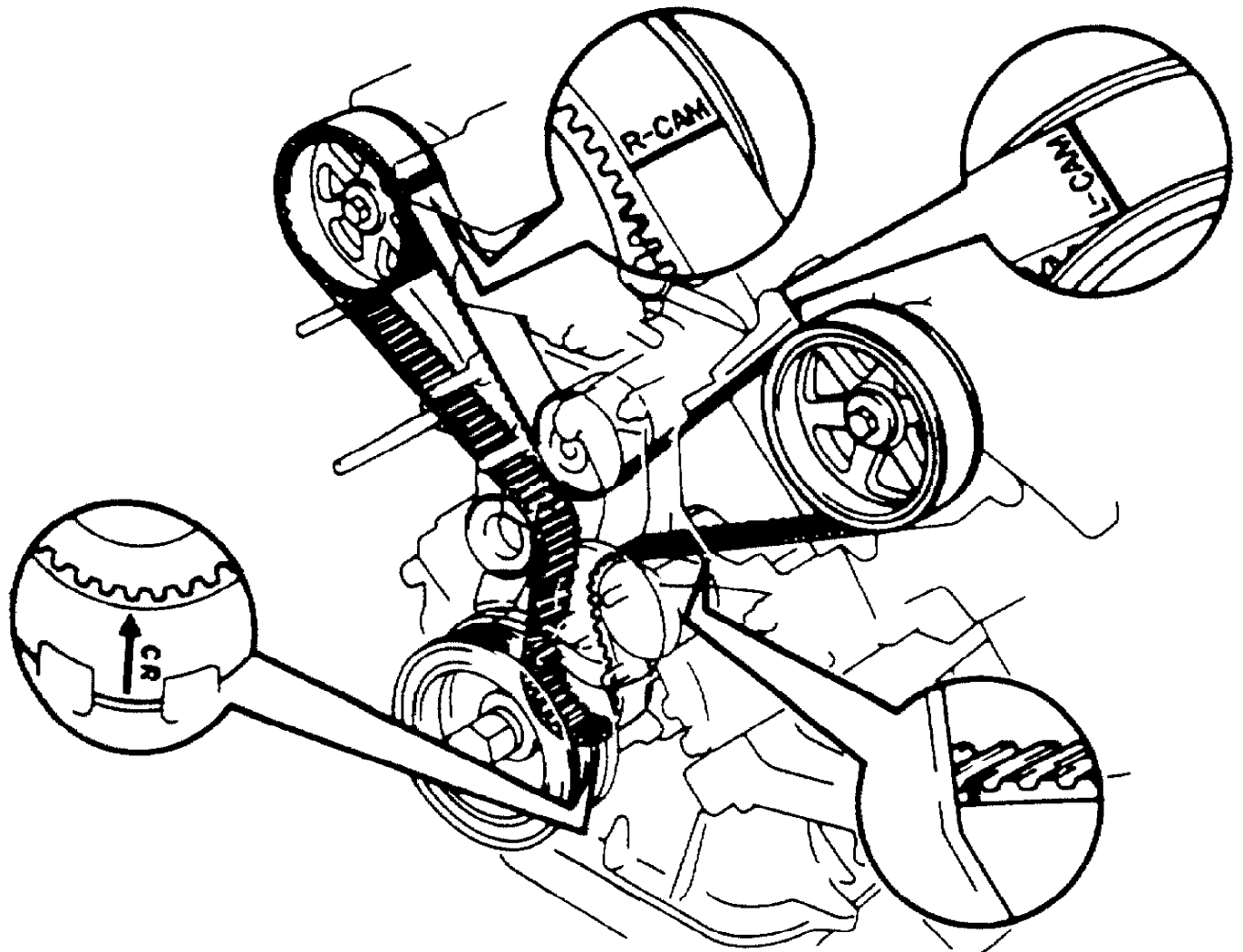


CAMSHAFT PULLEY TIMING MARKS

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Fig. 12: Camshaft Pully Timing Marks
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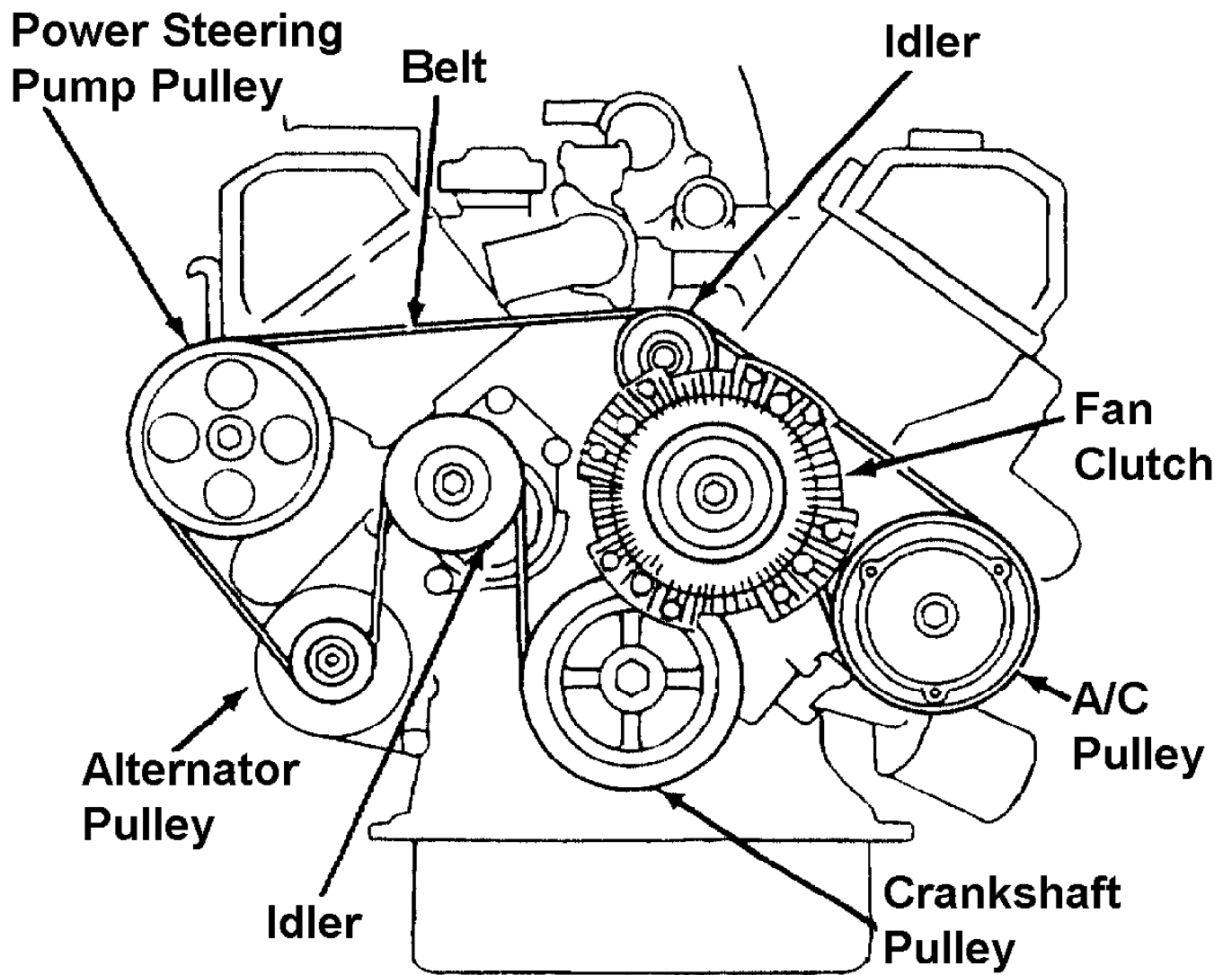
4.0L V8 - VINS [K,U]Selected Block (p. 10)1990 Lexus LS 400For Lextreme Powertrain 2020 S. Hacienda Bl



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Fig. 13: Marking Timing Belt For Replacement

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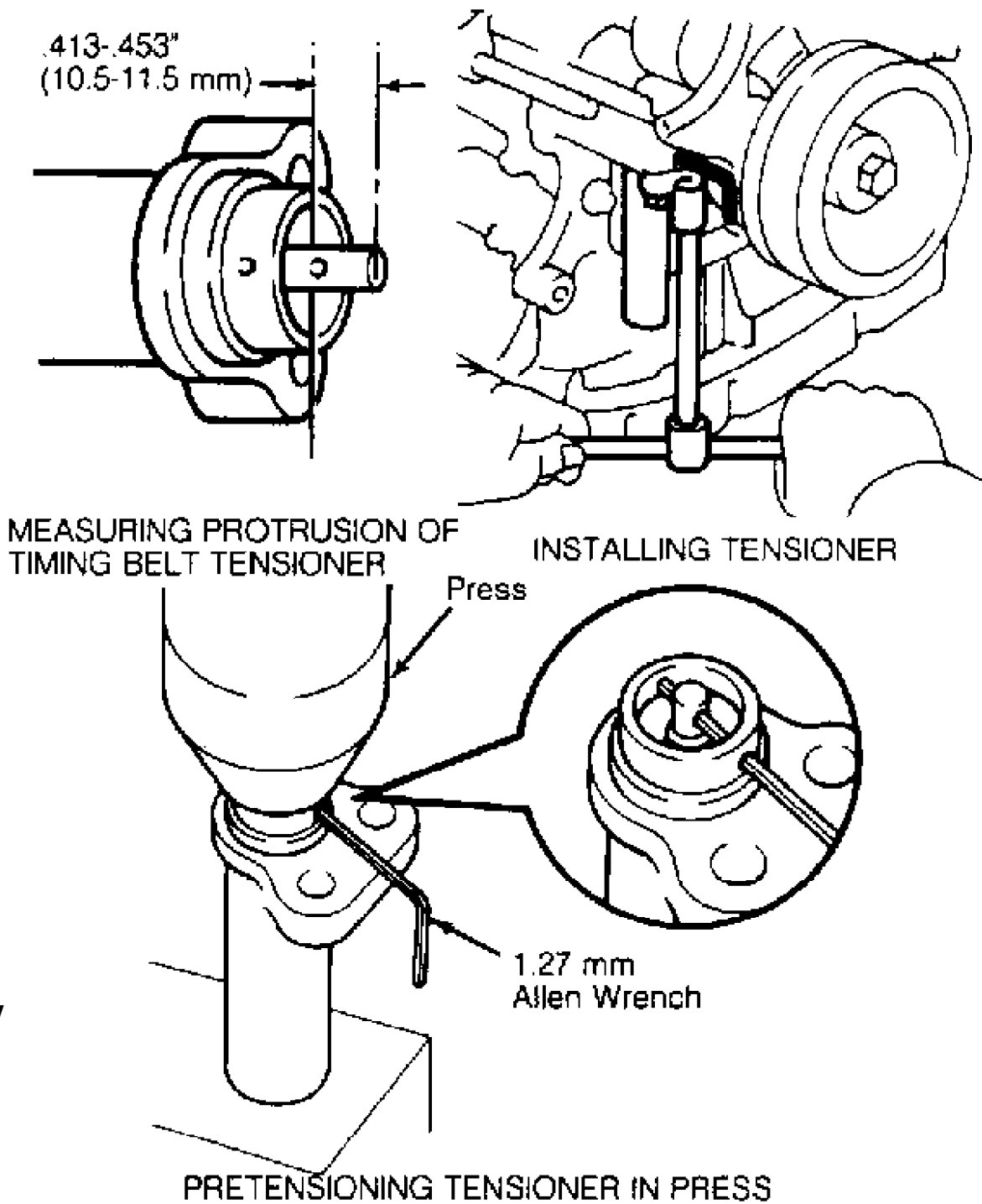


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Fig. 14: Accessory Drive Belt Installation

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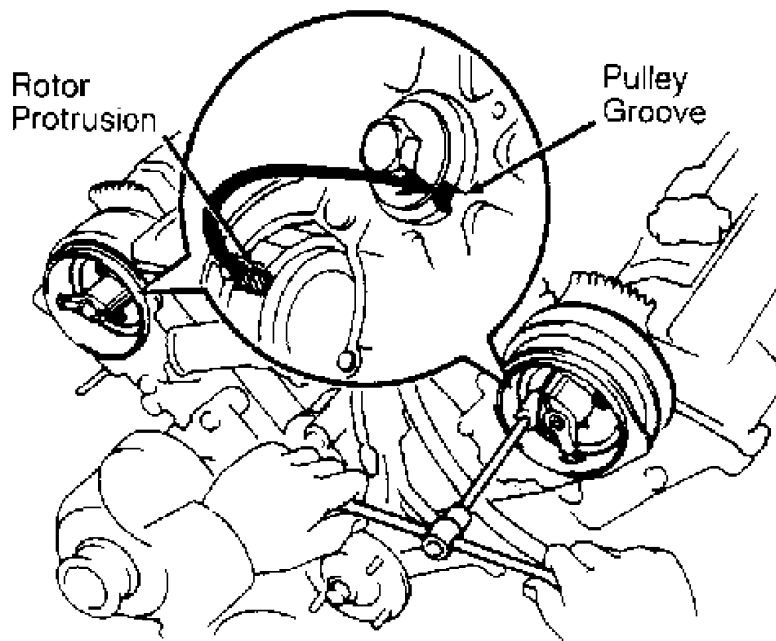
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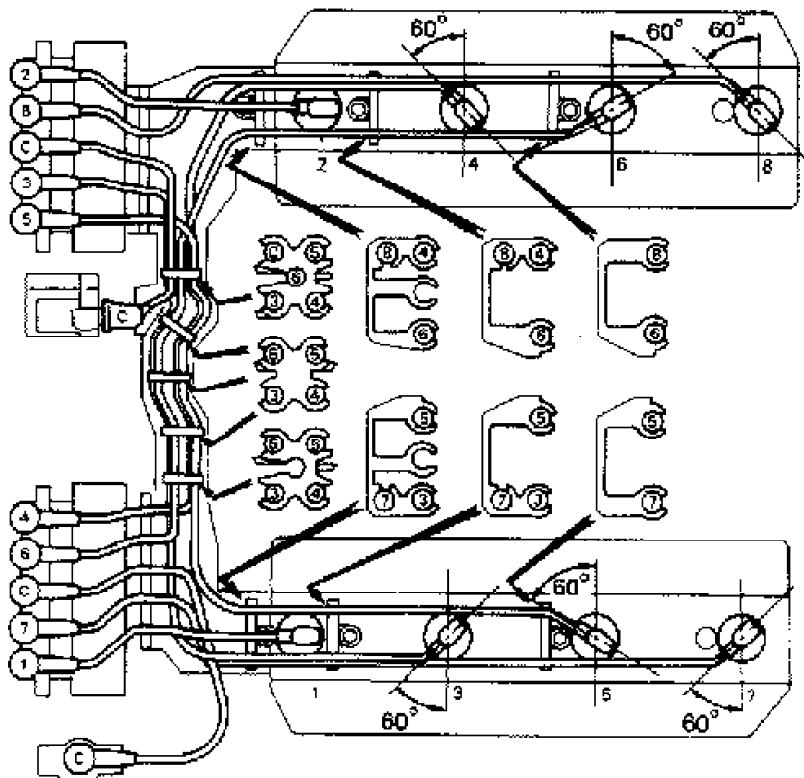
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Fig. 15: Pre-Tensioning & Installing Timing Belt Tensioner
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



DISTRIBUTOR & ROTOR INSTALLATION



INSTALLING HIGH TENSION WIRING

Fig. 16: Installing Distributor Rotors & High Tension Wiring
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

4.0L V8 - VINS [K,U] Selected Block (p. 14) 1990 Lexus LS 400 For Lextreme Powertrain 2020 S. Hacienda Bl

CAMSHAFT

Removal

1) Remove engine valve covers as described in cylinder head removal procedure. See CYLINDER HEAD under REMOVAL & INSTALLATION. With valve covers removed, bring service bolt hole of right-side driven sub-gear upward by turning exhaust camshaft with a wrench. Secure exhaust camshaft sub-gear to driven gear with a service bolt (6x1.0 mm, 16-20 mm long). Ensure torsional spring force of sub-gear has been eliminated. See Fig. 17.

NOTE: Keep camshaft level when removing, as thrust clearance of camshaft is small. If camshaft is not kept level, cylinder head thrust area may be damaged, causing camshaft to seize or break. Follow removal procedure steps carefully.

2) Remove spark plugs. Turn right exhaust camshaft with a wrench to position single-dot timing mark of camshaft driven gear at 10-degree angle (approximately) to top surface of cylinder head. Remove oil pipe from between camshafts. Uniformly loosen and remove bearing cap bolts in several sequential passes, in reverse order of tightening sequence. See Fig. 18.

3) Remove bearing caps and right exhaust camshaft. Set single-dot timing mark of right intake camshaft drive gear at 45-degree angle (approximately) to top surface of cylinder head by turning intake camshaft. Uniformly loosen and remove bearing cap bolts in several sequential passes, in reverse order of tightening sequence. See Fig. 18. Remove bearing caps and right intake camshaft.

4) Position service bolt hole of driven sub-gear upward by turning left exhaust camshaft with a wrench. Secure exhaust camshaft sub-gear to driven gear with a service bolt. Ensure torsional spring force of sub-gear has been eliminated. Position double-dot timing mark of camshaft driven gear at 15-degree angle (approximately) to top surface of cylinder head by turning exhaust camshaft.

5) Remove intake camshaft side of oil feed pipe to cylinder head. Uniformly loosen and remove bearing cap bolts in several sequential passes, in reverse order of tightening sequence. See Fig. 18. Remove oil feed pipe, bearing caps and left exhaust camshaft.

6) Set single-dot timing mark of left intake camshaft drive gear at approximately 60-degree angle by turning intake camshaft. Uniformly loosen and remove bearing cap bolts in several sequential passes, in reverse order of tightening sequence. See Fig. 18. Remove bearing caps, oil seal and left intake camshaft.

7) Disassemble exhaust camshafts. Hold hex portion of camshaft in a vise. Insert bolt into service hole of camshaft sub-gear. Using a screwdriver, turn sub-gear clockwise, and remove service bolt. Using snap ring pliers, remove snap ring. Remove wave washer, camshaft sub-gear and camshaft gear spring.

4.0L V8 - VINS [K,U]Selected Block (p. 15)1990 Lexus LS 400For Lextreme Powertrain 2020 S. Hacienda BI

Installation

1) Install plugs in rear intake camshaft bearings. Ensure cup side faces forward. Apply sealant to mating surface of rear intake bearing caps. On right cylinder head, install bearing cap I1 in position, with arrow mark facing rearward. On left cylinder head, install bearing cap I6 in position, with arrow mark facing forward. Install a new seal washer on bearing cap bolt and lubricate threads. Tighten to 12 ft. lbs. (16 N.m).

2) Assemble exhaust camshafts by installing camshaft gear spring, camshaft sub-gear, wave washer and snap ring. Mount hexagonal wrench head portion of camshaft in a vise. Insert service bolt "A" into hole of camshaft sub-gear. Using a screwdriver, align service holes and gear teeth by turning camshaft sub-gear clockwise. Install service bolt "B". Remove service bolt "A". See Fig. 17.

3) Install right intake camshaft in cylinder head. Apply multipurpose grease to thrust portion of camshaft. Position intake camshaft timing mark at a 45-degree angle to cylinder head. Apply sealant to bearing cap I6. Install cap with arrow mark facing rearward.

4) Align arrow marks at front and rear of cylinder head with marks on bearing cap. Install other bearing caps in sequence. Lightly oil threads and under heads of bearing cap bolts (except outer caps). Install a new seal washer on bearing cap bolts that attach oiler tube. Ensure bearing cap bolts are of correct length. See Fig. 18.

5) Uniformly tighten bearing cap bolts in several sequential passes to 12 ft. lbs. (16 N.m). Position drive gear timing mark at a 10-degree angle to cylinder head. Apply grease to thrust portion of exhaust camshaft. Align timing marks of camshaft drive and driven gears. Position exhaust camshaft on cylinder head. Ensure exhaust camshaft moves smoothly in thrust direction.

6) Install rear bearing cap with arrow mark facing rearward. Align arrow marks at front and rear of cylinder head with mark on bearing cap. Install bearing caps in sequence with arrow mark facing rearward. Ensure correct bolt lengths are used.

7) Apply a light coat of engine oil on threads and under heads of bearing cap bolts. Install oil pipe and bolts. Uniformly tighten bearing cap bolts in several sequential passes to 12 ft. lbs (16 N.m). Alternately tighten 2 bearing cap bolts on rear bearing cap of intake camshaft in several passes to 12 ft. lbs (16 N.m).

8) Install left intake camshaft. Turn camshaft to position service bolt installed in driven sub-gear upward. Remove service bolt. Apply grease to thrust portion of camshaft. Place camshaft timing mark at a 60-degree angle to cylinder head. Apply sealant to bearing cap I1. Install cap with arrow mark facing forward. Align arrow marks at front and rear of cylinder head with mark on bearing cap.

9) Apply a light coat of engine oil on threads and under heads of bearing cap bolts. Install oil pipe and bolts. Uniformly tighten bearing cap bolts in several sequential passes to

10) Install left exhaust camshaft. Position timing marks on camshaft drive gear at a 15-degree angle to cylinder head. Apply grease to thrust portion of exhaust camshaft. Align timing marks of camshaft drive and driven gears. Place exhaust camshaft on cylinder head. Ensure exhaust camshaft moves smoothly in thrust direction.

11) Install front bearing cap with arrow mark facing forward. Front bearing cap determines thrust position of camshaft. Align arrow marks at front and rear of cylinder head with mark on bearing cap. Install other bearing caps in sequence with arrow mark facing forward.

12) Apply a light coat of engine oil on threads and under heads of bearing cap bolts. Install oil pipe and bolts. Uniformly tighten bearing cap bolts in several sequential passes to specification. See TORQUE SPECIFICATIONS TABLE at end of article. Position service bolt installed in driven sub-gear upward by turning camshaft. Remove service bolt. Check and adjust valve clearance. Install camshaft oil seals. Apply grease to oil seal lip.

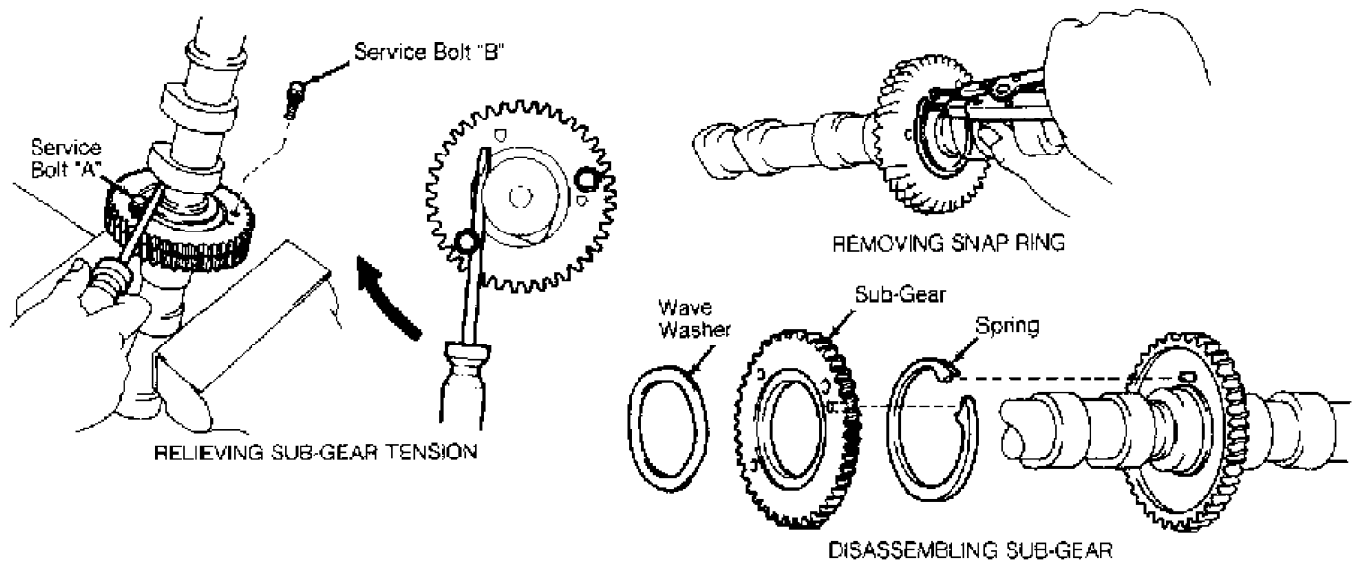


Fig. 17: Installing & Removing Camshaft Sub-Gears
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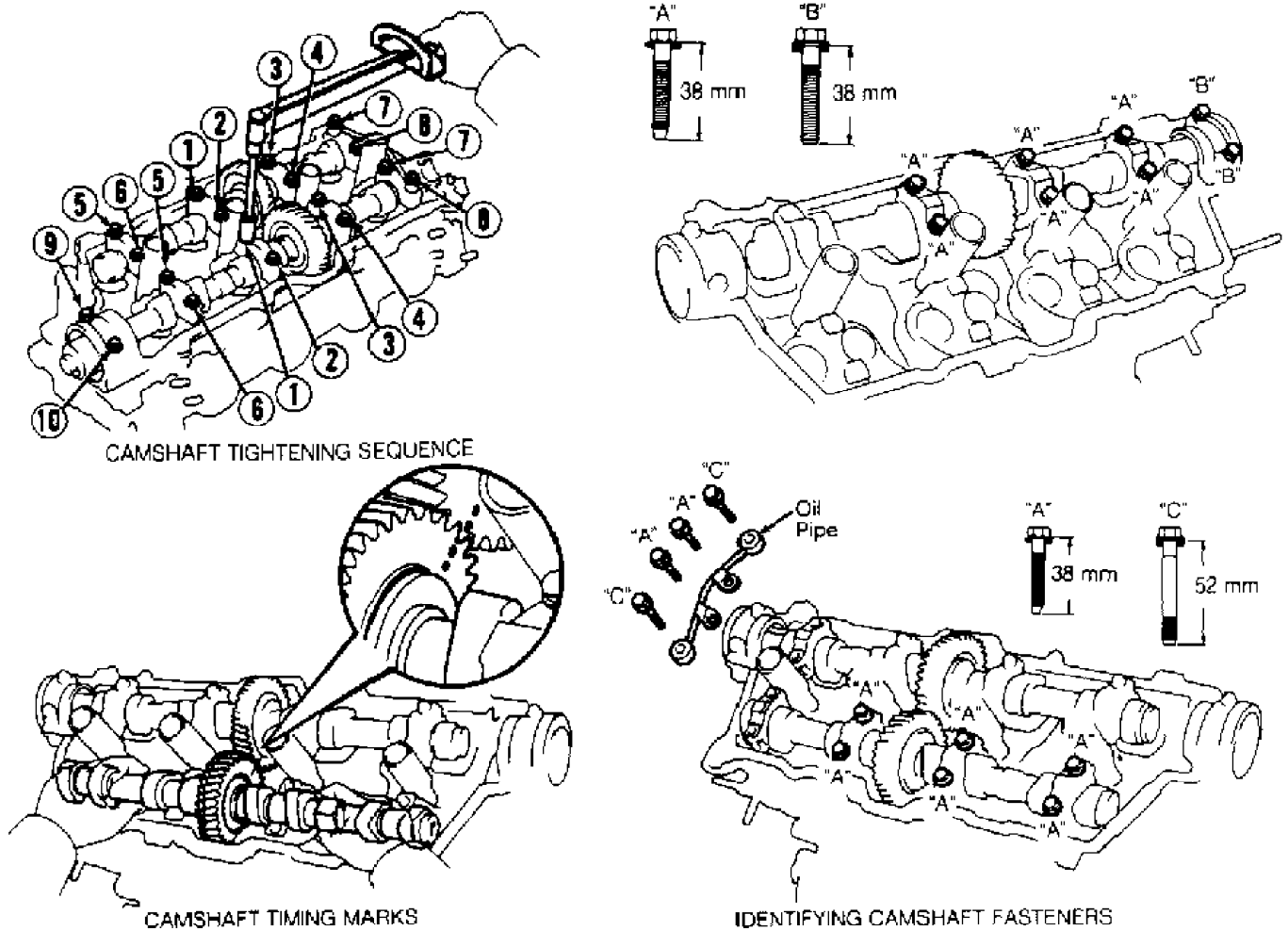


Fig. 18: Installing Camshafts In Cylinder Heads
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REAR CRANKSHAFT OIL SEAL
4.0L V8 - VINS [K,U] Selected Block (p. 18) 1990 Lexus LS 400 For Lextreme Powertrain 2020 S. Hacienda Bl

Removal & Installation

If seal plate is removed from engine, seal may be tapped out using a punch or screwdriver and hammer. Clean seal plate. If replacing seal with seal plate attached to cylinder block, cut lip of seal and carefully pry out seal. Lubricate seal lip with multipurpose grease. Use a seal installer to tap new seal into place until edge of seal surface is flush with seal plate. If seal plate was removed, apply a .8-.12" (2-3 mm) wide bead of sealant on seal plate. Replace "O" ring on back of cylinder block and install on engine. Tighten retaining bolts to 69 INCH lbs. (7.8 N.m).

WATER PUMP

Removal & Installation

1) Drain engine coolant. Disconnect radiator lower hose from water inlet pipe. Disconnect pick-up sensor and remove ignition coil. Disconnect timing belt from water pump pulley. See TIMING BELT under REMOVAL & INSTALLATION in this article.

2) Remove water inlet housing. Remove water pump. Pump is fastened by 5 bolts, one nut and 2 stud bolts; ensure all are removed before prying pump from block. Ensure block and pump mounting surfaces are not damaged. Check pump for wear and bearing smoothness. Thoroughly clean all components.

3) Install new "O" ring on water by-pass pipe and lubricate with soapy water. Apply a .08-.12" (2-3 mm) bead of sealant to mounting surface of pump. Install water pump. Tighten bolts to 14 ft. lbs. (20 N.m). Reverse removal procedure to complete installation.

OIL PAN

NOTE: Oil pan and strainer should be removed and cleaned if oil pump is removed for repair.

Removal & Installation

Remove engine splash shield and drain engine oil. Remove dipstick. Remove oil pan. Clean mounting surface and apply a .12-.16" (3-4 mm) wide bead of sealant. Install pan and tighten mounting bolts and nuts to 69 INCH lbs. (7.8 N.m). Reverse removal procedure to complete installation.