# L 4-CYLINDER DIESEL

## ENGINE CODING

### ENGINE IDENTIFICATION

Engine identification tag is located on engine valve cover. It contains engine identification code.

***ENGINE IDENTIFICATION***

| Application | Code |
|---|---|
| Pickup | L |

## ENGINE, MANIFOLDS & CYLINDER HEAD

### ENGINE

**Removal**

**1)** Remove hood, air cleaner and both batteries. Drain cooling system, disconnect radiator hoses, fan shroud, radiator and remove from vehicle.

**2)** If equipped with air conditioning, remove drive belt and compressor bracket bolts. Lay compressor aside. Remove fan belt, fan, and fan pulley.

**3)** Disconnect fuel hoses from injection pump, heater hoses at left side of engine, and vacuum reservoir hose. If equipped with air conditioning, disconnect idle-up vacuum hose.

**4)** Disconnect wires to alternator, starter, oil pressure switch, thermo switch and terminal "B" from glow plug relay No. 1. Disconnect wiring harness to engine at left fender.

**5)** Disconnect accelerator wire from injector pump. Using proper tool (Toyota No. 09305-20012), remove transmission shift lever from inside vehicle. Raise vehicle, drain engine oil, and remove engine cover panel.

**6)** Disconnect wire to back-up light switch. Disconnect engine shock absorber, remove drive shaft, and disconnect speedometer cable. Disconnect clamp from exhaust pipe at transmission housing.

**7)** Disconnect exhaust pipe mount nuts at manifold, and remove clutch slave cylinder. Lower vehicle and remove engine mount bolts. Place jack under transmission, and remove rear engine mount at crossmember.

**8)** Attach chain to engine brackets, and position hoist over engine. Remove engine and transmission together as a unit.

**Installation**

If transmission was separated from engine, complete installation by attaching transmission to engine and reversing removal procedure.

### CYLINDER HEAD

**Removal**

**1)** Using starter, turn engine over until No. 1 cylinder is at TDC on compression stroke. Disconnect negative battery terminals. Remove glow plug bracket and glow plugs.

**2)** Disconnect injection and fuel pipes and remove from engine. Arranging in order for correct reassembly, remove injection nozzle holders and linkage pipe.

**3)** Remove intake and exhaust manifolds. Remove fan belt, fan and fan pulley. Remove crankshaft damper bolts and using puller, remove damper.

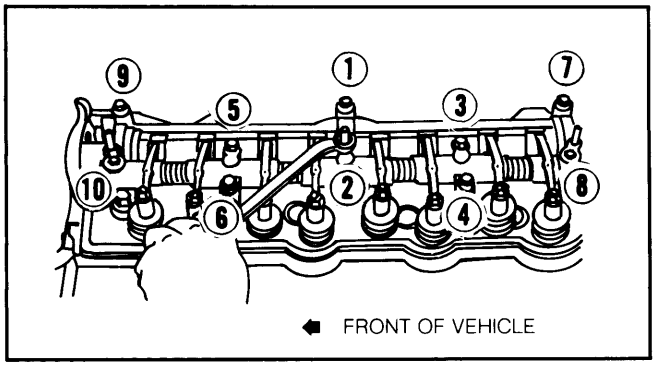
**4)** If timing belt is to be re-used, mark belt and camshaft gear and injection pump pulley and belt before removing belt, to ensure correct reassembly.

**5)** After removing timing belt cover and belt guide, remove valve cover. Loosen idler pulley and remove timing belt.

**6)** Using spanner wrench, hold camshaft timing gear while removing bolt. Tap camshaft pulley with plastic hammer to remove.

**7)** Gradually, remove No. 2 oil seal retainer and loosen rocker arm attaching bolts in reverse order of sequence shown in *Fig. 1*.

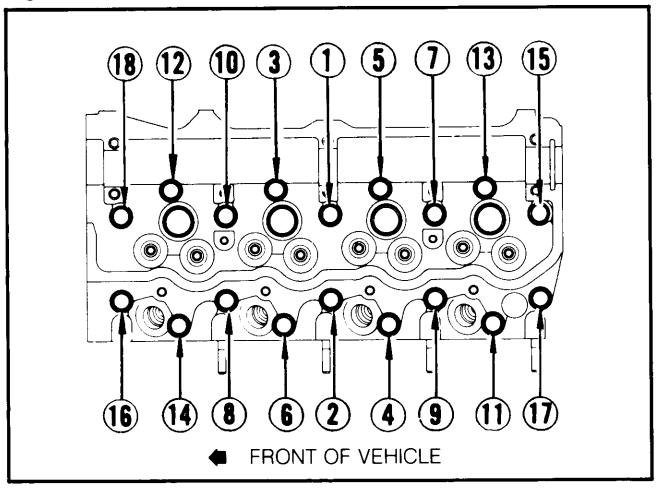
***Fig. 1: Rocker Arm Assembly Tightening Sequence***




*Loosen in reverse order to disassemble.*

**8)** Remove rocker arm assembly and camshaft. Gradually loosen cylinder head bolts in reverse order of sequence shown in *Fig. 2*. Remove cylinder head.

***Fig. 2: Cylinder Head Tightening Sequence***




*Loosen in reverse order to disassemble.*

**Inspection**

Check cylinder head surface for warpage. Limit of surface warpage is .008" (.2 mm). The manifold mounting surface warpage limit is .016" (.4 mm). If either surface exceeds the limit, replace the head.

**Installation**

**1)** Clean cylinder block holes out using compressed air. Ensure that all mating surfaces are clean and free from oil, grease, dirt and all foreign materials.

**2)** Position head on block. Coat head bolts lightly with engine oil, install bolts, and tighten. Reverse removal procedure to complete installation.

# Toyota Engines

## L 4-CYLINDER DIESEL (Cont.)

### COMBUSTION CHAMBERS

**Removal**

Remove cylinder head and glow plugs. Drive out the cylinder head combustion chambers with a thin drift punch inserted through the glow plug hole. Keep in order for reassembly.

**Inspection**

Clean and check the combustion chambers for cracks and damage. Replace any defective chambers.

**Installation**

**1)** Align the combustion chamber knock pin with the cylinder head notch. Drive in the chamber with a soft faced hammer.

**2)** Check combustion chamber protrusion above the cylinder head. Protrusion should be 0-.0024" (0-.06 mm).

**3)** If protrusion is not within limit, adjust with shims. Shims are available from.05 to .20 mm in .05 mm increments.

## CAMSHAFT

### FRONT COVER OIL SEAL

**Removal**

Front cover oil seal may be replaced with cover installed on engine. Remove timing belt and crankshaft timing pulley. See Timing Belt. Carefully pry out old seal.

**Installation**

Coat the lip of the new seal with multipurpose grease. Install the new seal using a seal driver. Reverse removal procedure to complete assembly.

### TIMING BELT

**Removal**

**1)** Using starter, turn engine over until No. 1 piston is at TDC on compression stroke. Disconnect negative battery terminals. Remove fan belts, fan and pulley.

**2)** Remove damper attaching bolt and using puller, remove damper. Remove necessary attaching bolts and remove timing chain cover and belt guide.

**CAUTION: Before removing bolts securing crankshaft pulley, camshaft pulley and injection pump pulley, release tension on timing belt . Do not bend or twist belt, and keep belt free from oil, water or steam.**

**3)** Loosen idler pulley bolt, and remove timing belt. After removing attaching bolts, use gear puller to remove crankshaft timing pulley.

**4)** Using spanner wrench, hold injection pump drive pulley so it does not turn. Remove bolt. Being careful not to drop pulley, use gear puller to remove injection pump pulley.

**5)** On late model 1982 engines, an extra idler pulley is used between the crankshaft and oil pump timing pulleys. Remove center retaining bolt to remove pulley.

**NOTE: Late model 1982 engines with extra idler pulley use a different design timing belt. ALL timing pulleys and camshaft are also different from early 1982 engines. Timing pulleys and camshaft are not interchangeable between engines.**

**Inspection**

**1)** Check timing belt for wear, cracks, or missing teeth. Replace belt if defective. Before installing a new belt, remove idler pulley and spring. Check idler pulley bearing for smooth operation.

**2)** Check the free length of idler pulley spring. Length of spring should be 1.563" (39.70 mm). Under 8.8 lbs. (4 kg) tension, spring should measure 2.05" (52.0 mm) in length.

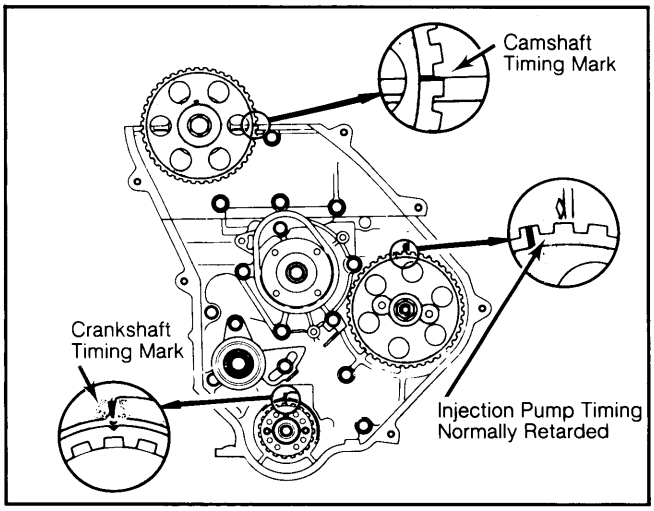
**3)** Check camshaft timing pulley, injection pump pulley and crankshaft pulley for wear or damage.

**Installation**

**1)** Before installing timing belt, engine should be cold. Always turn crankshaft clockwise.Install idler pulley loose enough so it may be moved side to side by hand.

**2)** Check alignment of timing marks on each pulley as shown in *Fig. 3.* Injection pump timing is normally retarded.

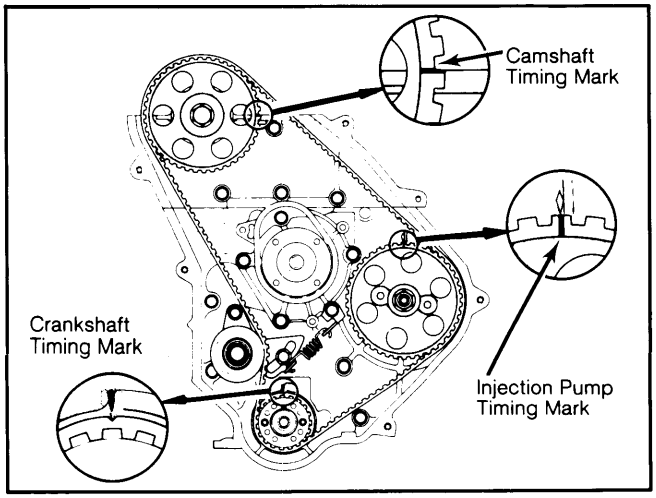
***Fig. 3: Aligning Timing Marks.***




*View before turning crankshaft 2 revolutions.*

**3)** Install timing belt and idler spring. Turn the crankshaft 2 revolutions clockwise from TDC to TDC. While turning crankshaft make sure idler pulley bracket is moving.

***Fig. 4: Aligning Timing Marks.***




*View after turning crankshaft 2 revolutions.*

# L 4-CYLINDER DIESEL (Cont.)

**4)** Ensure that each pulley aligns with marks shown in *Fig. 4.* Tighten timing belt idler pulley bolt. Reverse removal procedure to complete installation.

### VALVE TIMING

See Timing Belt.

### CAMSHAFT

**Removal**

Remove valve cover and timing belt. Gradually loosen rocker arm assembly bolts in reverse order of sequence shown in *Fig. 1.* Remove rocker arm assembly and camshaft.

**Inspection**

**1)** Using dial indicator, measure camshaft runout. If runout is in excess of .0016" (.040 mm) camshaft must be replaced.

**2)** Measure camshaft lobe height. If lobe height is less than 1.681" (42.7 mm) for intake and 1.689" (42.9 mm) for exhaust, camshaft must be replaced.

**Installation**

**1)** Install camshaft with Woodruff key facing straight upward. Loosen adjusting screw lock nuts on rocker arms and install rocker arm assembly.

**2)** Reverse removal procedures to complete installation. Adjust valve clearance with engine at normal operating temperature.

### CAMSHAFT END THRUST

With the camshaft bearing caps installed and torqued to specifications, end thrust should be .0022-.0061" (.055-.155 mm). The maximum end thrust limit is .012" (.3 mm).

### CAMSHAFT BEARINGS

Measure camshaft bearing clearance using Plastigage method. Clearance should be between .0009-.0030" (.022-.076 mm) with a limit of .004" (.10 mm).

## VALVES

### VALVE ARRANGEMENT

E-I-E-I-E-I-E-I (Front-to-rear).

### ROCKER ARM ASSEMBLY

**Removal**

**1)** Remove valve cover, and loosen rocker arm assembly attaching bolts in reverse of sequence shown in *Fig. 1.* Remove rocker arm assembly and check rocker arm-to-shaft clearance.

**2)** Keep all parts in order when disassembling rocker arm shaft. Rocker arms may be refaced if scored lightly. Measure clearance between the rocker arm and shaft. See Rocker Arm Assembly Specifications Table.

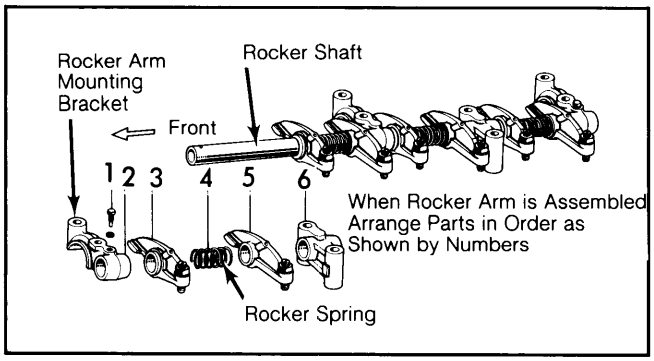
***ROCKER ARM ASSEMBLY SPECIFICATIONS***

| Application | In. (mm) |
|---|---|
| Oil Clearance | .0008-.0024 (.020-.060) |
| Limit | .004 (.10) |
| Rocker Arm Bore | |
| Limit | .7323 (18.600) |
| Shaft Diameter | |
| Limit | .7260 (18.440) |

**Installation**

After all clearances have been checked, reverse removal procedures to complete installation. Check that front rocker support and shaft oil holes are aligned. *See Fig. 5.*

***Fig. 5: Assembling Rocker Arm Shaft.***




*Oil holes of front rocker support and shaft must be aligned.*

### VALVE SPRINGS

**1)** Valve springs must be square within .079" (2.00 mm). Using Vernier caliper, measure spring free length. Spring free length should be within 1.8091-1.8327" (45.951-46.550 mm).

**2)** Replace spring(s) that are not within specified installed height. Installed height is 1.547" (32.3 mm) at 53.4 lbs. (24.2 kg) load. The installed load limit is 44.1 lbs. (20.0 kg.).

### VALVE STEM LENGTH

The overall length of the intake valve stem is 4.8405" (122.95 mm). The exhaust valve length is 4.8327" (122.75 mm). The valve stem tip may be refaced to a maximum of .020" (.5 mm).

### VALVE EDGE THICKNESS

The limit for intake valve head edge thickness is .035" (.9 mm). The limit for exhaust valves is .039" (1.0 mm).

### VALVE STEM OIL SEALS

**1)** New oil seals should be installed whenever the valve is disassembled. Seals should be installed with Toyota tool 09202-43012.

**2)** Coat seal lip with engine oil. Install seal so that bottom of seal is .374-.390" (9.5-9.9 mm) above valve spring seat on cylinder head.

### VALVE GUIDE SERVICING

**1)** With head disassembled, measure inside diameter of valve guide at several places using a dial indicator. Measure valve stem diameter and subtract the difference where clearance is the largest.

**2)** If clearance exceeds the limit, replace both valve and valve guide. To replace valve guide, position proper tool on guide. Drive out guide from top end toward combustion chamber.

**3)** Before installing new guide, make sure that hole in head is clean. Apply a thin coat of oil to guide hole. Using tool, drive guide into head until tip of guide protrudes .642-.657" (16.30-16.68 mm) above top of cylinder head.

# L 4-CYLINDER DIESEL (Cont.)

**4)** Using correct size reamer, ream intake valve guide to obtain a clearance of .0008-.0022" (.021-.057 mm). Ream exhaust valve guides to obtain a clearance of .0016-.0030" (.040-.076 mm).

### VALVE SEATS

**1)** Using valve spring compressor tool, compress spring and remove valve keepers. Remove valve assembly, keeping disassembled parts in order for proper reassembly.

**2)** Using a 45° cutter, resurface valve seat. If seat position is too high, use a 45° cutter first, then follow with a 60° cutter. If seat position is too low, use a 45° cutter first, then follow with a 30° cutter.

**3)** After valves, valve seats, and valve guides have been serviced, complete installation by reversing removal procedure.

### VALVE CLEARANCE ADJUSTMENT

**NOTE: Valve adjustment should be made with engine at normal operating temperature.**

**1)** Turn crankshaft until No. 1 piston is at TDC on compression stroke. Adjust intake valves for cylinders No. 1 & 2 and exhaust valves for cylinders No. 1 & 3.

**2)** Turn crankshaft 360°. Adjust intake valves for cylinders No. 3 & 4 and exhaust valves for cylinders No. 2 & 4.

***VALVE CLEARANCE SPECIFICATIONS***

| Application | Hot In. (mm) | [1] Cold In. (mm) |
|---|---|---|
| Intake | .010 (.25) | .011 (.27) |
| Exhaust | .014 (.36) | .015 (.38) |

[1] — Initial setting only.

**NOTE: Injection pump timing should be checked. Refer to Toyota Diesel Fuel Injection article in the FUEL SYSTEMS Section.**

## PISTONS, RINGS & PINS

### PISTON & ROD ASSEMBLY

**Removal & Installation**

**1)** With cylinder head, oil pan, and oil screen removed, mark connecting rods and caps for reassembly identification.

**2)** Remove connecting rod caps, and place a short piece of hose on connecting rod stud to prevent damage to crankshaft journal.

**NOTE: If carbon has built up at top of piston travel area in cylinder block, it may be necessary to use a ridge reamer to remove carbon before removing piston and rod assembly.**

**3)** Push piston and rod assembly out top of cylinder bore. After piston and cylinder block have been serviced, reverse removal procedure.

### FITTING PISTONS

**1)** Inspect cylinder liner walls for deep scratches or damage. If necessary, rebore cylinder liners all the same size. Check the block topside surface, and replace if the warpage exceeds .0008" (.2 mm).

**2)** Standard bore size is 3.5433-3.5445" (90.00-90.03 mm), with a wear limit of .008" (.20 mm). If damage is excessive or bore measurement exceeds limits, replace cylinder liners.

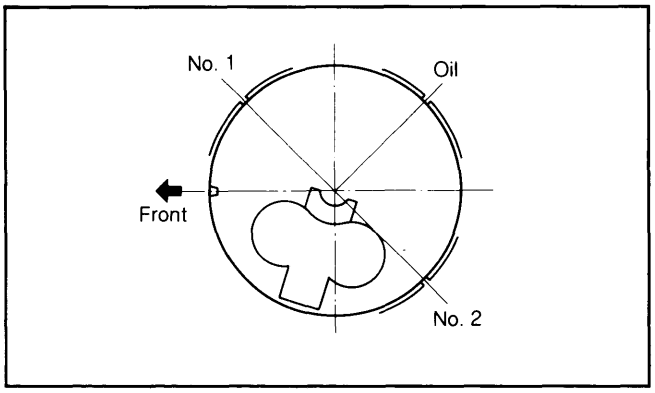
**3)** Measure piston diameter in thrust direction 1.34" (34.0 mm) up from skirt bottom edge. Measurement must be made at normal temperature of 68°F (20°C).

**4)** Measure cylinder bore and subtract the piston size to obtain correct piston clearance. Piston clearance should be .0014-.0022" (.035-.055 mm).

### FITTING RINGS

After correct size rings have been selected, install rings on piston using proper ring expander tool. Measure ring end gap. Measure ring side clearance and space rings on piston. *See Fig. 6.*

***Fig. 6: Positioning Piston Ring Gap***




*The oil ring ends should be opposite the expander coil joint.*

### PISTON PIN REPLACEMENT

**1)** To check piston pin fit, rock piston at right angle to pin. If any movement is felt, replace piston and pin.

**2)** Heat piston to 140°F (60°C) and remove snap rings. Using remover/installer tool (09221-46010), drive out piston pin. Measure oil clearance between bushing and piston pin.

**3)** Clearance should be .0002-.0005" (.005-.012 mm), with a limit of .0020" (.050 mm). If clearance exceeds limits, replace bushing and grind bore with a pin hole grinder.

**4)** Heat piston to 140°F (60°C) and coat the piston pin with engine oil. Piston pin should push into piston hole with thumb pressure.

**5)** Before assembling piston and connecting rod, heat piston to 140°F (60° C). Marks on piston and connecting rod should face forward. *See Fig. 7.*

### CYLINDER LINERS

**Removal**

If cylinder liners are bored or worn to maximum, they may be replaced. Liners must be pressed out from the bottom of the block. The pressing force will be 4,400-6,600 lbs. (2,000-3,000 kg).

**Installation**

**1)** Coat the outside surface of the new liner with engine oil before installation. Press in the new liner

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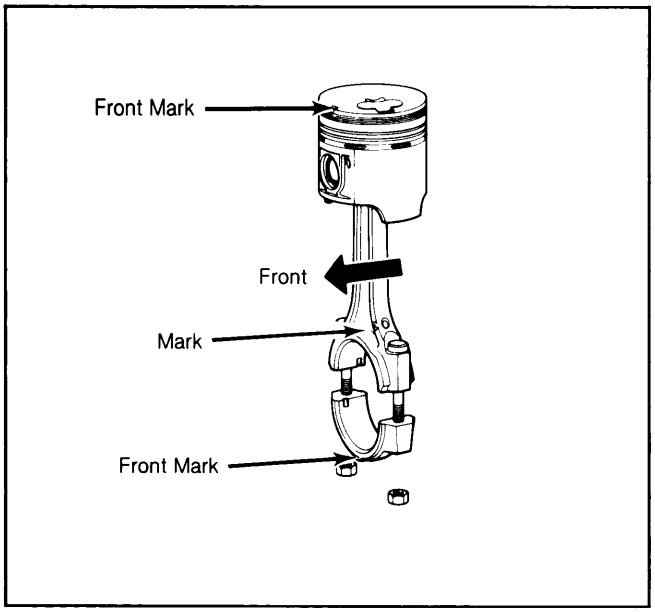
*Fig. 7: Assembling Piston and Rod*




*Heat piston to 140°F (60°C) prior to assembly.*

through the top of the block. Pressing force is 4,400-6,600 lbs. (2,000-3,000 kg).

**2)** Measure liner protrusion above the cylinder block at four positions. The protrusion must be .0004-.0039" (.01-.10 mm). The protrusion of any two adjacent cylinders may not vary more than .0016" (.04 mm).

**3)** If protrusion is not within specifications, adjust the liner protrusion with liner shims. Shims are available in .002" (.05 mm) and .004" (.10 mm) thickness.

## CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

### Crankshaft Main Bearings

**Removal**

Loosen crankshaft bearing bolts gradually, starting with center bearing, alternating and working toward the ends. Remove bearing caps and keep them in order to ensure proper reassembly.

**Inspection**

**1)** Inspect crankshaft for excessive wear or damage. Measure main journal diameters. If measurements exceed limits crankshaft must be reground or replaced.

**2)** Using Plastigage method, measure main journal oil clearance. Clean journal, cap and bearing. Lay a strip of Plastigage across journal, install cap and tighten cap bolts.

**3)** Remove cap bolts, cap and measure Plastigage at widest point. If clearance is not within specifications, replace bearings.

**4)** Oversize bearings are available in .005" (.125 mm) and .009" (.250 mm). Measure crankshaft runout. If measurements exceed .0024" (.060 mm), replace crankshaft.

**Installation**

Install crankshaft in block and install main bearing caps and bolts. Tighten main bearing bolts in reverse order in which they were removed. Reverse removal procedure to complete installation.

### CONNECTING ROD BEARINGS

**1)** Check connecting rod bearings for flaking of scoring. Measure the connecting rod journal diameter. Regrind or replace if wear is excessive.

**2)** Measure connecting rod oil clearance using Plastigage method. Undersize bearings are available in the same sizes as main bearings.

### THRUST BEARING ALIGNMENT

**1)** Measure crankshaft thrust clearance with piston and connecting rod assembly removed. Standard thrust clearance is .0016-.0098" (.040-.248 mm).

**2)** Thrust wear limit is .012" (.30 mm). If clearance exceeds limits, replace thrust bearings as a set.

### REAR MAIN BEARING OIL SEAL

**Removal**

Oil seal may be replaced without removing crankshaft or oil pan. Remove transmission, clutch and flywheel. *See appropriate Toyota article in CLUTCHES Section*. Without scratching crankshaft, pry out rear oil seal.

**Installation**

Coat the lip of the new oil seal with multipurpose grease. Install seal using a seal driver. Replace flywheel, clutch and transmission.

## ENGINE OILING

### CRANKCASE CAPACITY

The crankcase capacity is 6.1 qts. (5.8L) with filter and 5.1 qts. (4.8L) without filter.

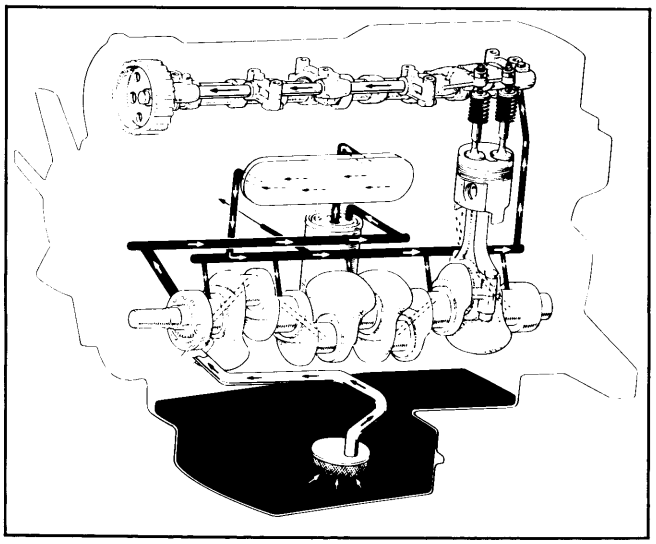
### OIL FILTER

Replaceable spin-on type filter is mounted on right side of engine block.

### NORMAL OIL PRESSURE

Normal oil pressure at idle speed should be 11.4 psi (.8 kg/cm²).

*Fig. 8: Engine Oiling System.*



# L 4-CYLINDER DIESEL (Cont.)

### OIL PRESSURE REGULATOR VALVE

There are two oil pressure regulator valves. Both are located in the oil cooler. One is the oil pump relief valve and the other is the oil cooler relief valve.

### ENGINE OILING SYSTEM

Oil is forced from a gear type oil pump to full-flow oil filter. From the filter, oil is directed to the crankshaft main bearings which in turn feeds the connecting rod bearings. The oil passage above the rear main bearing feeds the rocker arm shaft through the No. 5 rocker support. The oil is then returned to the pan.

### OIL PUMP

**Removal**

**1)** Disconnect negative battery terminal. Remove fan belt, fan and fan pulley. Remove engine front cover, timing belt and pulleys. See Timing Belt.

**2)** Disconnect lower radiator hose and remove timing case attaching bolts. Remove timing chain cover. Remove oil pump plate attaching screws, and disassemble oil pump.

**Inspection**

**1)** Inspect gears and pump body for damage or excessive wear. Measure the clearance between the outer pump gear and the timing chain cover (body clearance).

**2)** Measure tip clearance of driven and drive gears and side clearance. Replace any parts that are worn beyond limits.

***OIL PUMP CLEARANCE SPECIFICATIONS***

| Application | In. (mm) |
|---|---|
| Body Clearance | .0024-.0059 (.060-.149) |
| Limit | .008 (.20) |
| Side Clearance | .0012-.0035 (.030-.088) |
| Limit | .0059 (.149) |
| Tip Clearance | |
| Drive Gear-Crescent | .0087-.0098 (.220-.248) |
| Driven Gear-Crescent | .0059-.0083 (.149-.210) |
| Limit | .012 (.30) |

**Installation**

Reverse removal procedure to complete installation, making sure to assemble drive and driven gears to pump body with triangular marks facing pump plate side. Apply Loctite to oil pump plate retaining screws.

## ENGINE COOLING

### COOLANT CAPACITY

The coolant capacity is 11.1 qts. (10.5L).

### THERMOSTAT

The thermostat starts to open at 187-194°F (86-90°C). At 212°F (100°C) the thermostat should be open more than .39" 10 mm.

### WATER PUMP

**Removal**

Drain cooling system. Remove fan belt, fan and fan pulley. Remove water pump attaching bolts and remove water pump.

**Disassembly**

**1)** Press pulley seat from pump shaft. Heat pump body to 167°-176°F (75°-85°C). Press out the bearing, shaft and impeller through the rear of the housing.

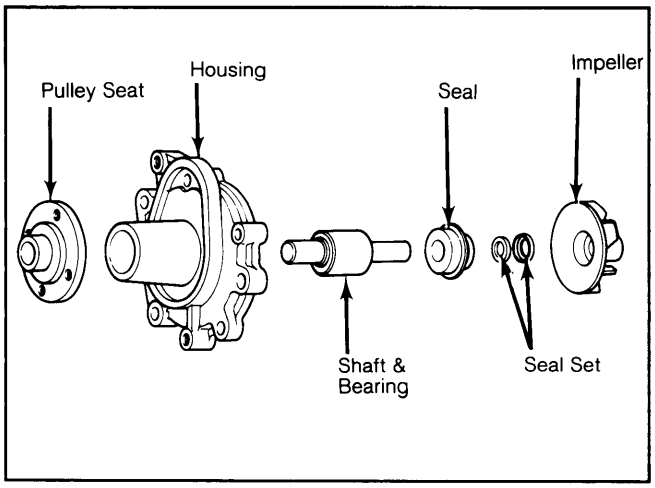
**2)** Press the impeller off of the pump shaft. Remove the seal from the pump shaft. Check all parts for wear, cracks or damage.

**Reassembly**

**1)** Heat the pump body to 167°-176°F (75°-85°C). Press the bearing and shaft assembly into the body. Bearing should be flush with the front edge of the housing neck.

**2)** Apply liquid sealer to the outside edge of the seal and press into the body. Install seal set into the rotor. Face of seal set that contacts seal in body should be coated with engine oil.

***Fig. 9: Exploded View of Water Pump***




**3)** Press the impeller onto the pump shaft. Press the pulley seat on the pump shaft to specified depth. Depth is 2.60" (66 mm) measured from the front face of pulley to rear face of the pump housing.

**Installation**

Clean gasket surfaces and reverse removal procedure to complete installation.

***TIGHTENING SPECIFICATIONS***

| Application | Ft. Lbs. (N.m) |
|---|---|
| Camshaft-to-Timing Pulley | 69-75 (94-102) |
| Connecting Rod Cap | 37-43 (50-58) |
| Crankshaft Pulley | 69-75 (94-102) |
| Cylinder Head | 84-90 (113-123) |
| Flywheel | 84-90 (114-122) |
| Head Bolts | 84-90 (114-122) |
| Main Bearing Cap | 71-81 (97-110) |
| Manifold | |
| Intake | 8-11 (11-15) |
| Exhaust | 11-15 (15-20) |
| Rocker Arm Support | 11-15 (15-20) |

# L 4-CYLINDER DIESEL (Cont.)

## ENGINE SPECIFICATIONS

### GENERAL SPECIFICATIONS

| Year | Displacement | | Fuel System | HP@RPM | Torque Ft. Lbs.@RPM | Compr. Ratio | Bore | | Stroke | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cu. In. | cc | | | | | In. | mm | In. | mm |
| 1982 | 135.5 | 2188 | Fuel Inj. | 62@4200 | 93.3©2400 | 21.5:1 | 3.54 | 90.0 | 3.39 | 86.0 |

### VALVES

| Engine Size & Valve | Head Diam. In. (mm) | Face Angle | Seat Angle | Seat Width In. (mm) | Stem Diameter In. (mm) | Stem Clearance In. (mm) | Valve Lift In. (mm) |
|---|---|---|---|---|---|---|---|
| 2188 cc | | | | | | | |
| Intake | ..... | 44.5° | 45° | .051-.063 (1.3-1.6) | .3336-.3342 (8.473-8.489) | .0008-.0022 (.021-.057) | ..... |
| Exhaust | ..... | 44.5° | 45° | .051-.063 (1.3-1.6) | .3328-.3335 (8.454-8.470) | .0016-.0030 (.040-.076) | ..... |

### PISTONS, PINS, RINGS

| Engine | PISTONS | PINS | | RINGS | | |
|---|---|---|---|---|---|---|
| | Clearance In. (mm) | Piston Fit In. (mm) | Rod Fit In. (mm) | Ring No. | End Gap In. (mm) | Side Clearance In. (mm) |
| 2188 cc | .0014-.0022 (.035-.055) | ..... | .0006-.0009 (.014-.022) | No. 1 | .0078-.0157 (.20-.40) | .0024-.0039 (.06-.10) |
| | | | | No. 2 | .0118-.0197 (.30-.50) | .0016-.0031 (.04-.08) |
| | | | | Oil | .0118-.0197 (.30-.50) | .0012-.0028 (.03-.07) |

### CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

| Engine | MAIN BEARINGS | | | | CONNECTING ROD BEARINGS | | |
|---|---|---|---|---|---|---|---|
| | Journal Diam. In. (mm) | Clearance In. (mm) | Thrust Bearing | Crankshaft End Play In. (mm) | Journal Diam. In. (mm) | Clearance In. (mm) | Side Play In. (mm) |
| 2188 cc | 2.4402-2.4409 (61.98-62.00) | .0012-.0028 (.03-.07) | No. 3 | .0016-.0098 (.04-.25) | 2.0858-2.0866 (52.98-53.00) | .0012-.0028 (.03-.07) | .0031-.0079 (.08-.20) |

### VALVE TIMING

| Engine | INTAKE | | EXHAUST | |
|---|---|---|---|---|
| | Open (BTDC) | Close (ABDC) | Open (BBDC) | Close (ATDC) |
| 2188 cc | 14° | 44° | 51° | 11° |

### VALVE SPRINGS

| Engine | Free Length In. (mm) | PRESSURE Lbs. @ In. (Kg @ mm) | |
|---|---|---|---|
| | | Valve Closed | Valve Open |
| 2188 cc | 1.809-1.833 (45.95-46.6) | 53.4@1.547 (24.2@39.30) | ..... ..... |