

L 4-CYLINDER DIESEL

ENGINE CODING

ENGINE IDENTIFICATION

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

Engine Identification	
Application	Code
Pickup	L

ENGINE & 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. If equipped with air conditioning, remove drive belt, compressor bracket bolts and lay compressor aside. Remove fan belt, fan and fan pulley.

2) 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. 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.

3) 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. Disconnect wire to back-up light switch. Disconnect engine shock absorber, remove drive shaft and disconnect speedometer cable.

4) Disconnect clamp from exhaust pipe at transmission housing. 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. Attach chain to engine brackets and position hoist over engine. Remove engine and transmission together as a unit.

CAUTION – If vehicle is equipped with air conditioning, take care not to damage condenser. Make sure engine is clear of all wiring and hoses.

Installation – If transmission was separated from engine, attach transmission to engine and reverse removal procedure to complete installation.

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. Disconnect injection and fuel pipes and remove from engine. Using suitable wrench, remove injection nozzle holders and linkage pipe. Arrange in order for correct reassembly.

2) Remove intake manifold bolts and remove manifold. Remove exhaust manifold bolts and remove manifold. Remove fan belt, fan and fan pulley. Remove crankshaft damper bolts

and using suitable puller, remove damper. After removing timing belt cover and belt guide, remove valve cover. Loosen idler pulley and remove timing belt and idler pulley.

NOTE – 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.

CAUTION – Release tension on timing belt before removing attaching bolts to crankshaft pulley, camshaft pulley and injection pump pulley. Do not bend or twist belt and keep belt free from oil, water or steam.

3) After removing attaching bolts, select suitable puller and remove crankshaft timing pulley. Using proper wrench to hold injection pump drive pulley from turning, remove bolt. Using puller, remove pulley being careful not to drop pulley as it will spring out. Using proper wrench to hold camshaft timing gear from turning, remove bolt. Using puller, remove timing gear.

4) Remove No. 2 oil seal retainer and loosen rocker arm attaching bolts gradually in reverse order of sequence shown in Fig. 1. Remove rocker arm assembly and camshaft. Loosen cylinder head bolts gradually in reverse order of sequence shown in Fig. 2. Remove cylinder head.

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

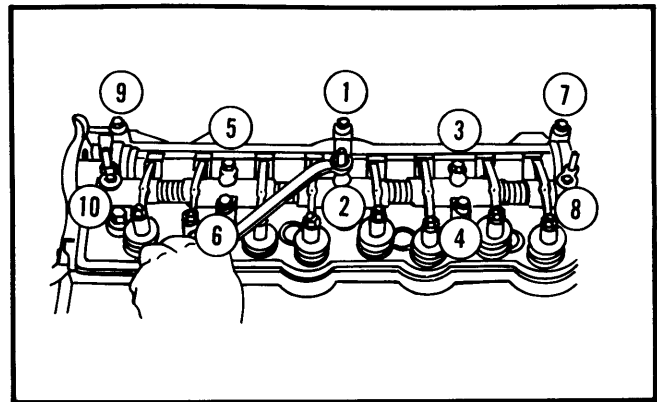


Fig. 1 Rocker Arm Assembly Tightening Sequence (Loosen in Reverse Order to Disassemble)

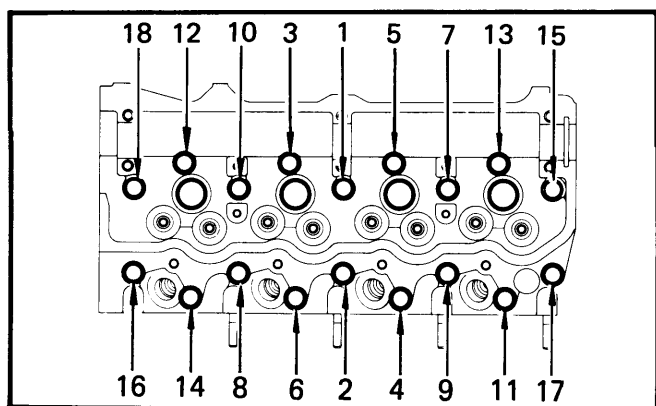


Fig. 2 Cylinder Head Tightening Sequence (Loosen in Reverse Order to Disassemble)

L 4-CYLINDER DIESEL (Cont.)

CAMSHAFT

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 belt, fan and pulley. Remove damper attaching bolt and using puller, remove damper.

2) Remove necessary attaching bolts and remove timing chain cover and belt guide. Loosen idler pulley bolt and remove timing belt.

Installation — 1) Before installing a new belt, remove idler pulley and spring. Check idler pulley to make sure it turns freely and smooth. 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.

2) Check camshaft timing pulley, injection pump pulley and crankshaft pulley for wear or damage. Install idler pulley loose enough so it may be moved side to side by hand. Check alignment of timing marks on each pulley as shown in Fig. 3. Injection pump timing is normally retarded.

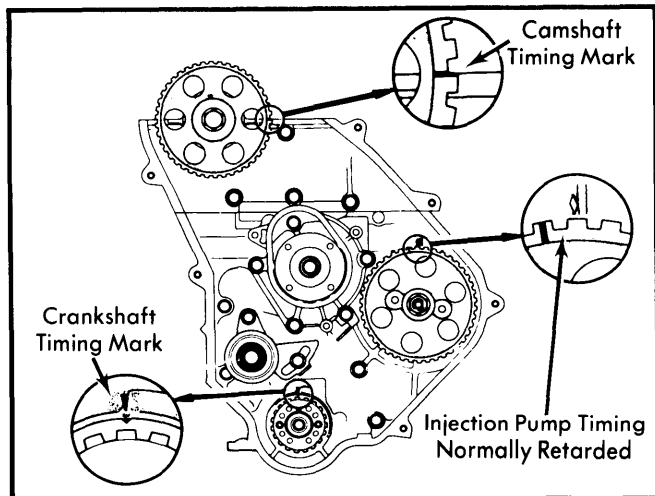


Fig. 3 Timing Mark Alignment Before Turning Crankshaft 2 Revolutions

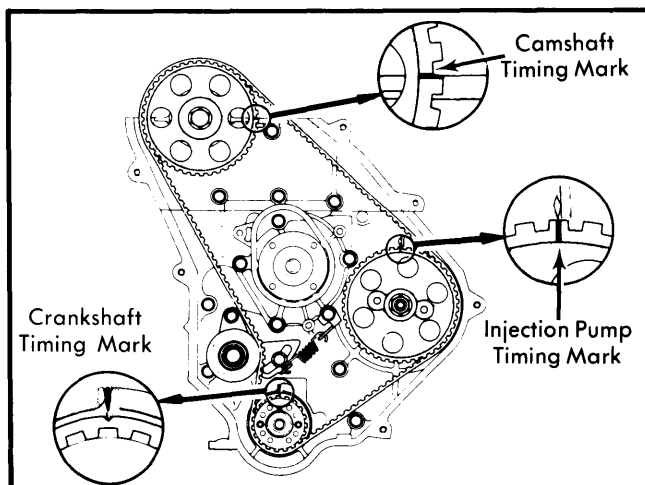


Fig. 4 Timing Mark Alignment After Turning Crankshaft 2 Revolutions

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

CAUTION — Before installing timing belt, engine should be cold. Always turn crankshaft clockwise.

CAMSHAFT

Removal — 1) Before removing camshaft, measure camshaft bearing clearance using Plastigage method. Clearance should be between .0009-.0030" (.022-.076 mm) with a limit of .004" (.10mm). With timing belt removed, loosen valve cover attaching bolts and remove valve cover. Gradually loosen rocker arm assembly bolts in reverse order of sequence shown in Fig. 1.

2) Remove rocker arm assembly and remove camshaft. Using proper gauge, measure camshaft runout. If runout is in excess of .0016" (.040 mm) camshaft must be replaced. Measure camshaft lobe height. If lobe height is less than 1.681" (42.69 mm) for intake and 1.689" (42.90 mm) for exhaust, camshaft must be replaced.

Installation — Install camshaft with Woodruff key facing straight upward. Loosen adjusting screw lock nuts on rocker arm assembly and install rocker arm assembly. Reverse removal procedures to complete installation.

VALVE TIMING

See TIMING BELT procedures for this information.

VALVES

VALVE ARRANGEMENT

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

VALVES & VALVE SEATS

Removal & Installation — 1) Using valve spring compressor tool, compress spring and remove valve keepers, and remove valve assembly keeping disassembled parts in order for proper reassembly. Resurface valve face and tip if necessary or replace valve(s).

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. After valves, valve seats and valve guides have been serviced, reverse removal procedure to complete installation.

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

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2) Before installing new guide, make sure that hole in head is clean and apply a thin coat of oil to guide hole. Using suitable tool, drive guide into head until tip of guide protrudes .642-.657" (16.30-16.68 mm) above top of cylinder head. Using correct size reamer, ream intake valve guide clearance to .0008-.0022" (.020-.055 mm) and exhaust valve guide clearance to .0016-.0030" (.040-.076 mm).

VALVE SPRINGS

Valve springs must be square within .079" (2.00 mm). Using proper caliper measuring tool, measure spring free length. Spring free length should be within 1.8091-1.8327" (45.951-46.550 mm). Replace spring(s) that are not within specified installed height. Installed height is 1.547" (32.29 mm) at 53.4 lb. (24.2 kg) load.

VALVE CLEARANCE ADJUSTMENT

Turn crankshaft until No. 1 piston is at TDC on compression stroke. Adjust cylinders No. 1 & 2 intake valves and cylinders No. 1 & 3 exhaust valves. Turn crankshaft 360°. Adjust cylinders No. 3 & 4 intake valves and cylinders No. 2 & 4 exhaust valves.

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

Valve Clearances		
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 TUNE-UP Section for necessary procedures.

ROCKER ARM ASSEMBLY

Removal — Remove valve cover, and loosen rocker arm assembly attaching bolts in reverse of sequence shown in Fig. 7. Remove rocker arm assembly and check rocker arm-to-shaft clearance. If worn excessively, disassemble and measure clearance between the rocker arm and shaft. See Rocker Arm Assembly Chart.

Installation — After all clearances have been checked, reverse removal procedures to complete installation. See Fig. 5.

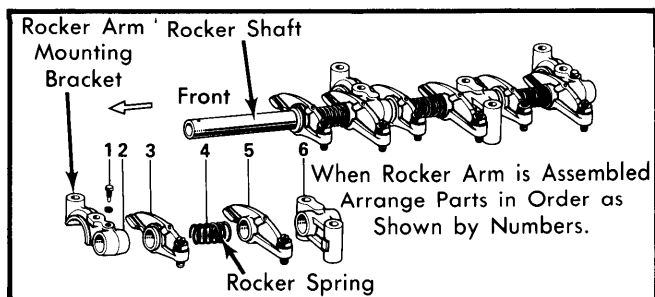


Fig. 5 Rocker Arm Shaft Assembly

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

NOTE — Align oil hole of front rocker support with rocker shaft oil hole.

PISTONS, PINS, & RINGS

PISTON & ROD ASSEMBLY

Removal & Installation — 1) With cylinder head, oil pan and oil screen removed, mark connecting rods and caps for identification, to ensure proper reassembly. Remove connecting rod caps and place a short piece of hose on connecting rod stud to prevent damage to crankshaft journal.

2) Push piston and rod assembly out of the top of cylinder bore. After piston and cylinder block have been serviced, reverse removal procedure to complete installation.

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.

FITTING PISTONS

1) Inspect cylinder liner walls for deep scratches or damage. If necessary, rebores cylinder liners all the same size. Standard bore size is 3.5433-3.5445" (89.999-90.030 mm), with a wear limit of .008" (.20 mm). If damage is excessive or bore measurement exceeds limits, replace cylinder liners.

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

PISTON 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 as shown in Fig. 6.

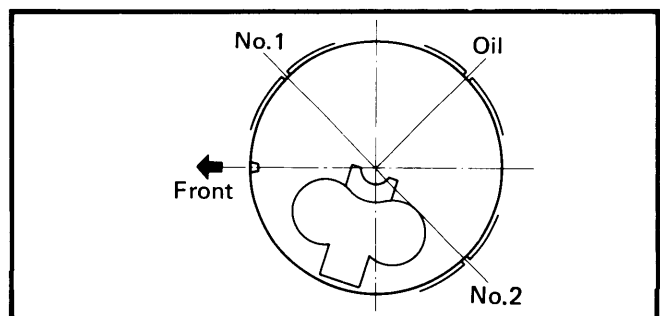


Fig. 6 Piston Ring Gap Spacing

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PISTON PINS

Removal & Installation — 1) Piston pin fit is checked by rocking piston at right angle to pin. If any movement is felt, replace piston and pin. Heat piston to 140° F (60° C) and remove snap rings. Using suitable tool, remove pin. Measure oil clearance between bushing and piston pin.

2) 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. Heat piston to 140° F (60° C), install piston pin and push into piston hole with thumb pressure.

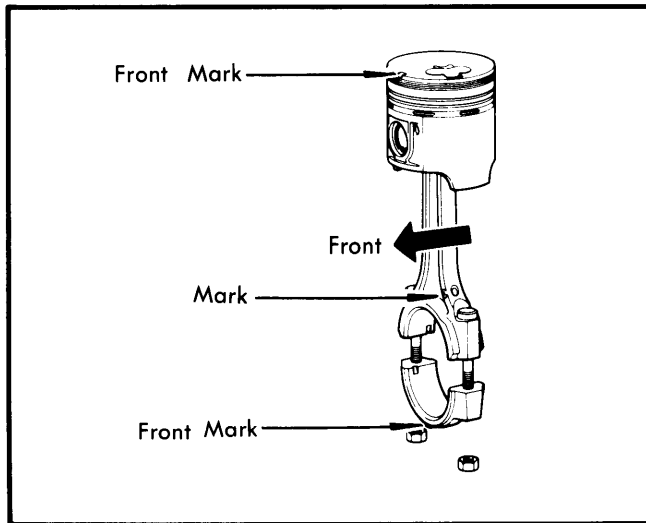


Fig. 7 Piston and Rod Assembly Installation

CRANKSHAFT

Removal — 1) With cylinder head off and pistons removed, measure crankshaft thrust clearance. Standard thrust clearance is .0016-.0098" (.040-.248 mm), with a wear limit of .012" (.30 mm). If clearance exceeds limits, replace thrust bearings as a set.

2) Oversize bearings are available in .005" (.125 mm) and .009" (.250 mm). 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 — Inspect crankshaft for excessive wear or damage. Measure connecting and main journal diameters. If measurements exceed limits crankshaft must be reground or replaced. 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.

MAIN BEARINGS

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. Remove cap

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

ENGINE OILING

Crankcase Capacity — 6.1 qts. with filter; 5.1 qts. without filter.

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

OIL PUMP

Removal — Disconnect negative battery terminal. Remove fan belt, fan and fan pulley. Remove damper attaching bolt and using puller, remove damper. 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 — Inspect gears and pump body for damage or excessive wear. Measure body clearance, tip clearance of driven and drive gears and side clearance.

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.

Oil Pump Specifications

Application	Clearance 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)

ENGINE COOLING

Thermostat — Starts to open at 187-194° F (86-90° C).

Radiator Cap — 17 psi (1.2 kg/cm²).

Cooling System Capacity — 11.1 qts.

WATER PUMP

Removal & Installation — Drain cooling system. Remove fan belt, fan and fan pulley. Remove water pump attaching bolts and remove water pump. Clean gasket surfaces and reverse removal procedure to complete installation.

L 4-CYLINDER DIESEL (Cont.)

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)
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)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1981 2188 cc	133.3	2188	F.I.	.....	.....	.....	3.54	90.0	3.39	86.0

VALVES

Engine & 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°	44.5°	.051-.063 (1.29-1.60)	.3336-.3342 (8.473-8.488)	.0008-.0022 (.020-.055)	.....
Exhaust	44.5°	44.5°	.051-.063 (1.29-1.60)	.3328-.3335 (8.453-8.470)	.0016-.0030 (.040-.076)	.....

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 (61.981-61.998)	.0012-.0028 (.030-.071)	No. 3	.002-.010 (.040-.248)	2.0858-2.0866 (52.98-53.00)	.0012-.0028 (.030-.071)	.0031-.0079 (.078-.200)

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	① Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
2188 cc	.0014-.0022 (.035-.056)	Push Fit	.....	No. 1	.0078-.0157 (.198-.398)	.0024-.0039 (.060-.099)
	.....	.....	.....	No. 2	.0118-.0197 (.299-.500)	.0016-.0031 (.040-.078)
	.....	.....	.....	Oil	.0118-.0197 (.299-.500)	.0012-.0028 (.030-.071)