22R 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine serial number is stamped on left side of cylinder block, behind the alternator. Last group of numerals and letters designates engine type.

ENGINE IDENTIFICATION

Application	Code
Celica, Corona & Pickup (2366 cc)	22R

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

Removal

1) Remove engine hood, and disconnect negative battery cable. With engine cool, drain cooling system. Remove air cleaner. Remove radiator, shroud, hoses and upper bracket.

2) If equipped with air conditioning, remove compressor and condenser but DO NOT disconnect refrigerant hoses.

3) Disconnect following hoses: Fuel hose from carburetor, water by-pass hose from carburetor choke housing, brake booster hose from intake manifold, heater hoses from engine, air injection tube at rear of engine and emission control hoses from carburetor and intake manifold.

NOTE: Label all emission control hoses for identification, to ensure proper installation.

4) Disconnect accelerator linkage from carburetor. If equipped with automatic transmission, disconnect automatic transmission throttle cable. Raise vehicle and drain engine oil.

5) Remove starter and disconnect exhaust pipe at manifold. Disconnect wires from oil pressure switch and sending unit. Remove 2 transmission stiffener plates and engine undercover.

6) Place block of wood on jack and put jack under transmission. If equipped with automatic transmission, disconnect cooler lines from engine and remove 6 torque converter mounting bolts through service holes at rear of engine.

7) On all models, remove transmission housing mounting bolts. Remove motor mount bolts (above crossmember). Disconnect wiring from coil, alternator, and water temperature sending unit.

8) If equipped with power steering, remove pump and move to one side. Disconnect hoses from air pump. Attach sling to engine and lift carefully from vehicle. If equipped with automatic transmission, ensure that converter remains with transmission.

Installation

1) Lower engine into position ensuring that engine is aligned with transmission and motor mount supports. On manual transmission models, install motor mount and transmission housing mounting bolts.

2) On automatic transmission models, install guide pin in the torque converter and align with one of the drive plate holes. Align upper starter stud with hole in starter housing on engine.

3) Align sleeves on block with converter housing. Install motor mount bolts and remove hoisting sling. Install 2 longest bolts in upper converter housing. Install 6 torque converter bolts finger tight, then to final torque.

4) To complete installation on all models, reverse removal procedure and check for leaks.

INTAKE MANIFOLD

Removal

1) Remove air cleaner and brackets. Disconnect fuel line and throttle controls at carburetor. Disconnect all remaining tubes and lines from carburetor and manifold.

2) Beginning at ends and working toward center, loosen manifold bolts and nuts in 2 steps. Remove intake manifold assembly with carburetor attached.

Installation

Install new gasket on clean mating surfaces and install manifold. Tighten bolts and nuts in 2 steps, beginning at lower center and working outward.

EXHAUST MANIFOLD

Removal

Remove air cleaner and intake heat tube. Disconnect exhaust pipe at manifold flange. Loosen bolts and nuts in 2 steps, beginning at ends of manifold. Remove manifold.

Installation

Install manifold with new gasket to clean mating surfaces. Beginning in center and working outward, tighten nuts and bolts in 2 steps.

CYLINDER HEAD

Removal

1) Disconnect battery and drain cooling system. Disconnect exhaust pipe at manifold flange. Remove air cleaner and cover carburetor. Remove all hoses and linkages to intake manifold, carburetor and cylinder head.

2) Remove distributor with cap and wires. Remove fuel pump. Remove cylinder head cover and set No. 1 piston to TDC on compression stroke. Paint mating marks on camshaft sprocket and timing chain.

3) Remove rubber half circle seal and cam sprocket retaining bolt. Pull distributor drive gear and fuel pump drive cam off sprocket. Remove sprocket from camshaft, allowing sprocket and chain to rest in cylinder head.

4) Remove chain cover bolt, then remove cylinder head bolts in reverse of tightening sequence. *See Fig. 1.* Pry equally at front and rear of rocker arm assembly to clear locating dowels.

5) Lift head carefully to clear locating dowels but DO NOT pry between head and block. Drain engine oil due to coolant which will run into pan during head removal.

Installation

1) Apply liquid sealer at 2 front corners of block and position head gasket over locating dowels. Place head in position and turn camshaft so dowel is at top.

2) Install rocker arm assembly over locating dowels and tighten head bolts in 3 steps. Continue installation in reverse of removal sequence, ensuring that valve and ignition timing is properly set.

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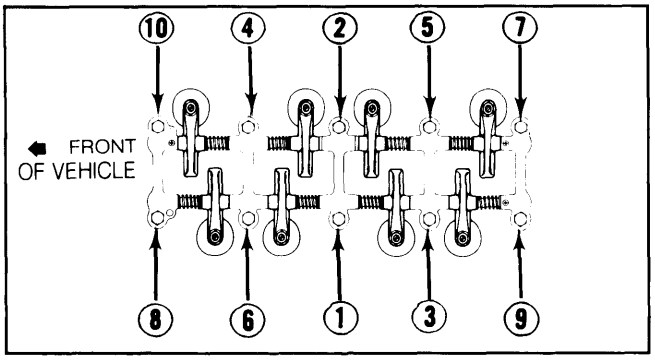
Fig. 1: Cylinder Head/Rocker Arm Bolt Tightening Sequence



Loosen head bolts in reverse order.

CAMSHAFT

ENGINE FRONT COVER OIL SEAL

Seal is a press fit in oil pump body at front of crankshaft. Remove by prying out with screwdriver. Drive new seal into position, using driver tool (09223-50010). Lubricate seal lip lightly with multi-purpose grease after installation.

TIMING CHAIN

Removal

1) Remove cylinder head and oil pan. Remove radiator, drive belts, air pump and alternator bracket. Remove crankshaft pulley and timing chain cover assembly.

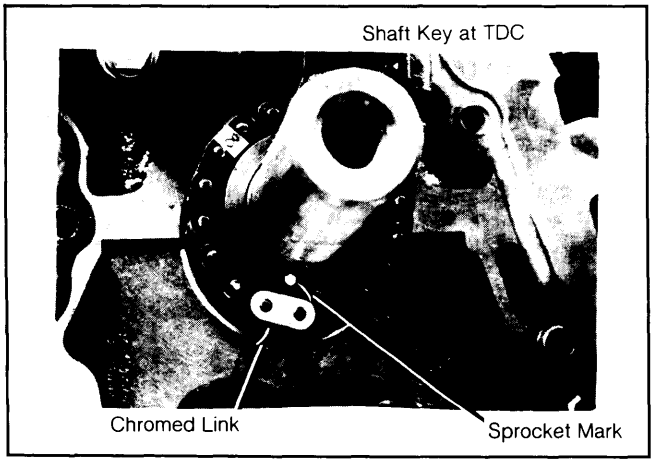
2) Remove chain from damper sprocket and remove cam sprocket and chain. Using puller (09213-36010), remove both oil pump drive and chain sprocket.

3) Check chain, sprockets, tensioner and chain dampers for wear and replace as necessary. With chain stretched tight by hand, maximum distance between 17 links should be 5.79" (147.0 mm).

Installation

1) Turn crankshaft until shaft key is at TDC. Position chain with chromed link over sprocket in line with sprocket mark as illustrated. Chain must be positioned between the 2 dampers.

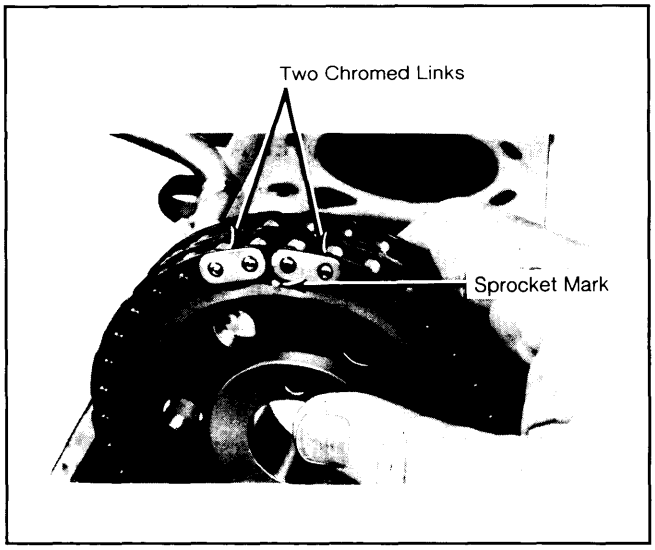
Fig. 2: Aligning Crankshaft Sprocket and Timing Chain



Chain must be positioned between the 2 dampers.

2) Install cam sprocket in chain so that timing mark on sprocket is located between 2 chromed links. Slide oil pump drive spline over crankshaft key. Install cover assembly with new gasket over dowels and pump spline.

Fig. 3: Aligning Camshaft Sprocket and Timing Chain



Position camshaft so that dowel on sprocket flange is at 12 o'clock position.

3) Continue installation in reverse of removal procedure and set camshaft timing as follows: With No. 1 cylinder at TDC on compression stroke, position camshaft so that dowel on sprocket flange is at 12 o'clock position. Complete assembly procedure.

VALVE TIMING

1) Valve timing is determined by the relationship between the camshaft and the crankshaft. Turn crankshaft to position No. 1 piston at TDC (align mark on crankshaft with pointer on chain cover).

2) Turn camshaft to locate dowel pin and stamped mark on camshaft at 12 o'clock position. Install timing gear and chain on camshaft. A locating pin may be needed to stretch chain and a hammer may be needed to drive on gear. Tighten timing gear bolts.

CAMSHAFT

Removal

1) With cylinder head and rocker arm assembly removed, remove camshaft bearing caps and lift out camshaft.

2) Camshaft bearing clearance may be checked using Plastigage method. If clearance exceeds specifications, replace cylinder head and/or camshaft.

Installation

To install, reverse removal procedure. Install bearing caps in numbered order with arrows pointing toward the front. Adjust valve timing.

VALVES

VALVE ARRANGEMENT

Right Side — Intake valves.
Left Side — Exhaust valves.

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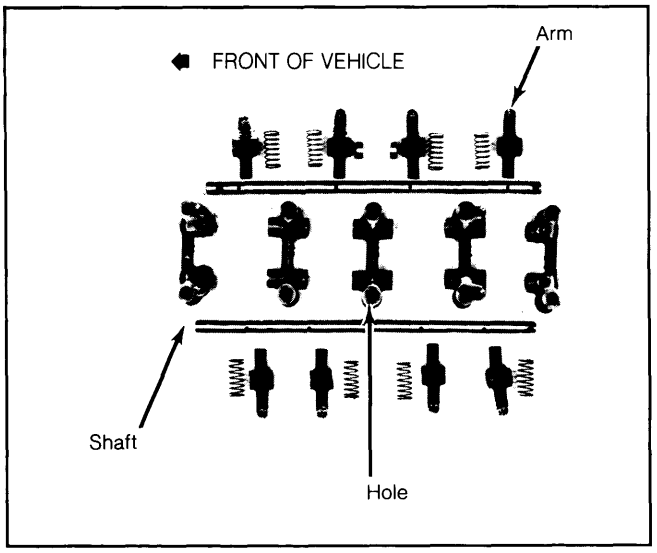
ROCKER ARM ASSEMBLY

1) If rocker arms appear loose, disassemble rocker arm assembly and measure rocker arm-to-shaft clearance. Clearance should be .0004-.0020" (.01-.05 mm), with a maximum limit of .0031" (.08 mm).

2) If clearance exceeds maximum limit, replace rocker arms and/or shafts. Reassemble in reverse of disassembly, noting that all rocker arms are identical, but that all rocker stands are different.

Fig. 4: Disassembled View of Rocker Arm Assembly



VALVE SPRINGS

Check valve spring free length and squareness. If less than 1.8" (45.8 mm) long or out of square more than .07" (1.9 mm), replace spring. Use a spring tester and measure tension at installed height. Replace spring if less than specified.

VALVE STEM OIL SEALS

1) Using a spring compressor, remove valve keepers. Withdraw spring retainer and springs. Remove valve stem oil seal from end of valve guide.

2) Slide a new oil seal over valve stem, using care not to damage seal as it passes over keeper grooves. Force seal over end of valve guide. Reverse removal procedure for remaining components.

VALVE GUIDE SERVICING

1) Measure clearance between valve stem and guide. If clearance exceeds specifications, valve guides must be replaced.

2) If valve guide being replaced has a snap ring installed, break guide using punch and hammer (only replacement valve guides have snap rings). Using driver tool (09201-60011), drive old guide down through combustion chamber.

3) Drive in new valve guide from top of head until snap ring contacts cylinder head. Guide should have .75" (19 mm) protrusion above cylinder head. Ream new valve guide to provide proper stem clearance.

VALVE CLEARANCE ADJUSTMENT

1) Engine must be at normal operating temperature. Remove valve cover and rotate crankshaft until No. 1 piston is TDC on the compression stroke. Measure clearance between rocker arm and valve stem. Adjust intake valves 1 and 2 to .008" (.20 mm) and exhaust valves 1 and 3 to .012" (.30 mm).

2) Rotate crankshaft one complete revolution (360°) and align timing mark at TDC. Adjust intake valves 3 and 4 to .008" (.20 mm) and exhaust valves 2 and 4 to .012" (.30 mm).

PISTONS, PINS & RINGS

OIL PAN

Removal

1) Drain engine oil, then remove engine undercover and detach steering idler arm bracket. On all Pickups except 4-WD, remove pitman arm and front crossmember.

2) On Celica and Corona, remove engine shock absorber (if so equipped) and engine mount bolts. Jack engine up about 1" (25 mm). On all models, remove pan bolts and nuts, then take off pan and gasket.

Installation

Place gasket on pan and apply sealer to 4 corners where front cover and rear seal retainer join cylinder block. Install pan. To complete installation, reverse removal procedure.

PISTON & ROD ASSEMBLY

Removal

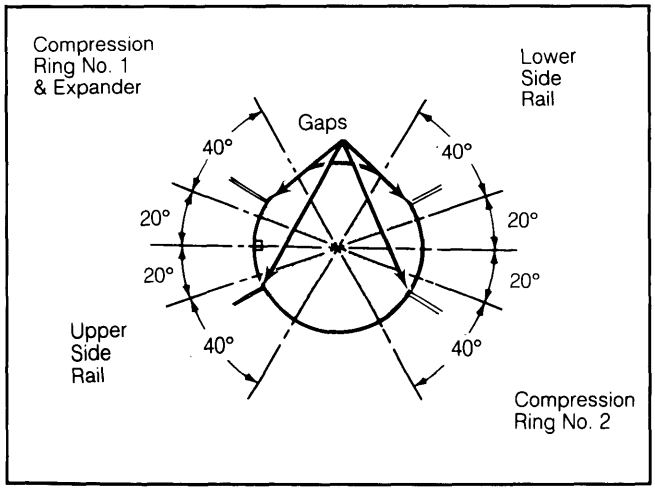
1) With cylinder head and pan removed, machine ring ridge from top of cylinder. Mark rods and caps for correct assembly, then remove rod caps.

2) Cover rod bolts with short length of hose to prevent crankshaft damage, then push piston/rod assembly out of block.

Installation

Lubricate piston, cylinder and journal with clean engine oil. Position rings, and install ring compressor. *See Fig. 5.* Stamped mark on ring must face upward. Install piston/rod assembly in proper position with notch on piston top facing forward.

Fig. 5: Correct Piston Ring Gap Arrangement



Stamped mark on ring must face upward.

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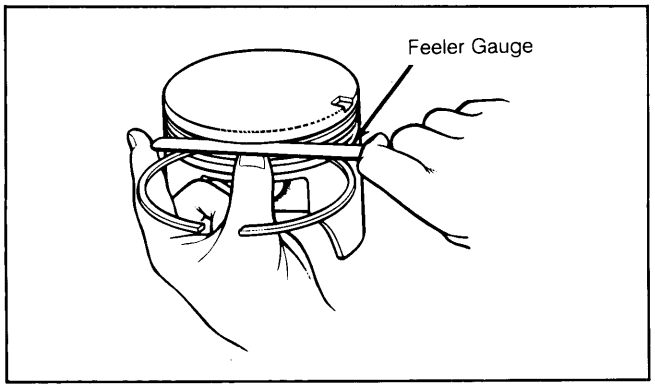
PISTONS & RINGS

1) Measure cylinder bore at top and bottom of wear area and center of bore, in line with and at 90° to crankshaft. Standard bore in 3.6220-3.6232" (91.998-92.029 mm) with a wear limit of .008" (.20 mm). Maximum taper and out of round is .0008" (.20 mm).

2) Measure piston at right angle to skirt and 1.02" (26 mm) below center of pin. If not within specifications, rebore cylinder and/or replace pistons. Measure ring end gap at bottom of ring travel. Check clearance of ring in land groove.

Fig. 6: Measuring Ring Groove Clearance



PISTON PINS

Removal

1) Heat piston to 176°F (80°C) and push piston pin out of piston and connecting rod. Piston pin should push through connecting rod with thumb pressure when rod is at 68°F (20°C).

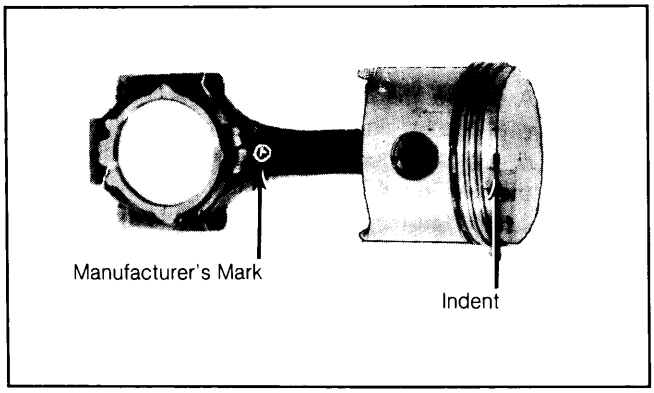
2) If pin is too loose in rod, press out bushing from connecting rod using press tool (09222-30010). Install and hone new bushing.

NOTE: Piston and pin are a matched set. Use new snap rings for reassembly.

Installation

Heat piston to 176°F (80°C) and position piston and connecting rod so mark on rod and indent on piston crown face same direction. Push piston pin into piston and rod assembly.

Fig. 7: Correct Alignment of Piston and Rod Assembly



Mark on rod and indent on piston crown face same direction.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

1) Measure crankshaft runout at center bearing journal. If runout exceeds .004" (.1 mm), replace crankshaft. Inspect all journals for wear or scoring. Check for out-of-round or taper. If crankshaft is worn excessively, grind journals for undersize bearings.

2) Measure bearing clearances using Plastigage method. If clearance exceeds specifications, grind journals for undersize bearings. Both main and connecting rod bearings are available .010" (.25 mm) undersize.

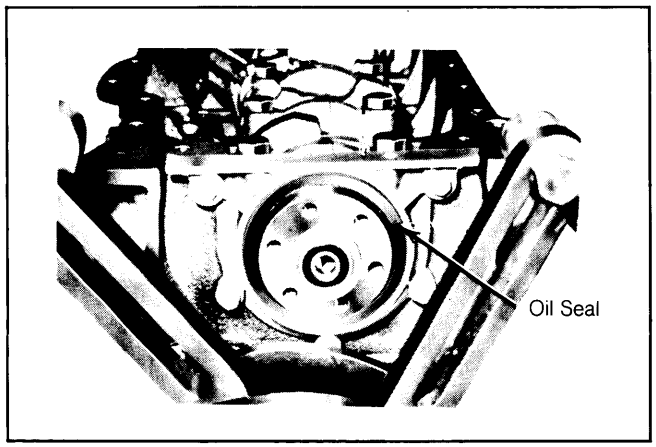
THRUST BEARING ALIGNMENT

Check crankshaft end play at thrust bearing using a feeler gauge. If end play exceeds limit of .012" (.30 mm), replace thrust washers. Thrust washers are available in two oversizes, .125" (3.2 mm) and .250" (6.3 mm).

REAR MAIN BEARING OIL SEAL

With rear main bearing oil seal retainer removed, pry out old seal. Using tool (09223-41010) drive oil seal in place. After installing new seal, coat seal lip lightly with multi-purpose grease.

Fig. 8: Installed View of Rear Seal and Retainer



ENGINE OILING

CRANKCASE CAPACITY

4.9 qts. (4.6L) including filter.

PRESSURE RELIEF VALVE

64 psi (4.5 kg/cm²) operating pressure.

OIL FILTER

Full-flow type with paper elements. Located at right side of engine.

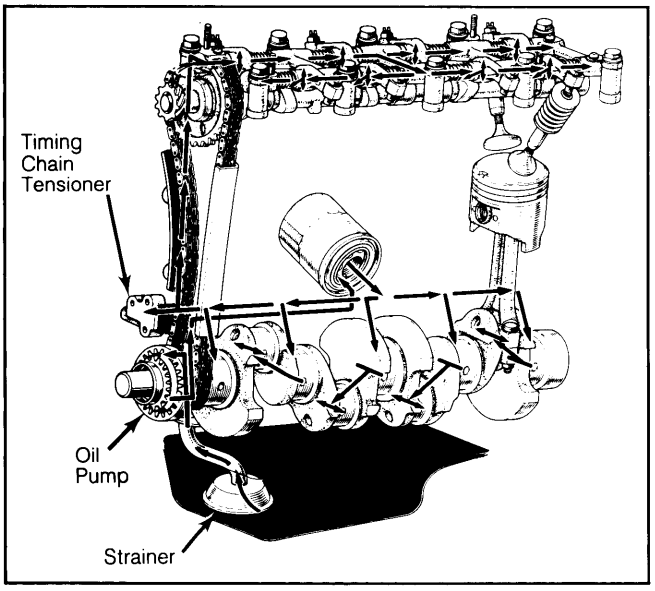
ENGINE OILING SYSTEM

Oiling system is force fed, utilizing a gear and crescent type oil pump, driven from front of crankshaft. Oil from oil pan is pumped through a full flow oil filter and then to oil galleries in cylinder block. Oil is fed to

22R 4-CYLINDER (Cont.)

crankshaft bearings, timing chain assembly, camshaft and rocker arm assembly.

Fig. 9: Engine Oiling System



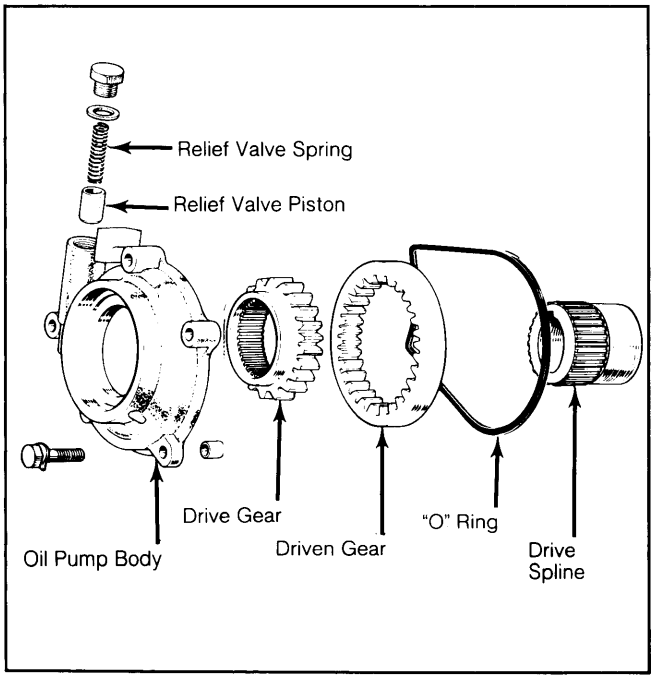
OIL PUMP

Removal

1) Remove oil pan and strainer. Remove drive belts and crankshaft pulley. Remove 5 bolts and oil pump assembly.

2) Remove oil pump drive spline from crankshaft and "O" ring from engine block. Remove relief valve plug, spring and piston from pump body. Remove driven and drive gear from pump body.

Fig. 10: Exploded View of Oil Pump



Install new "O" ring in block and apply sealer to upper bolt.

OIL PUMP SPECIFICATIONS

Application	Clearance In. (mm)
Drive Gear-to-Crescent	
Standard	.0087-.0098 (.220.25)
Wear Limit	.012 (.30)
Driven Gear-to-Crescent	
Standard	.0059-.0083 (.15-.21)
Wear Limit	.012 (.30)
Driven Gear-to-Body	
Standard	.0035-.0059 (.09-.15)
Wear Limit	.008 (.20)
Gear Faces-to-Body	
Standard	.0012-.0035 (.03-.09)
Wear Limit	.0059 (.15)

Installation

Reassemble pump and lubricate seal lip. Install new "O" ring in block and apply sealer to upper bolt. Install and tighten pump. Complete installation in reverse of removal procedure.

ENGINE COOLING

THERMOSTAT

On Federal models except Cab and Chassis Pickup, starts to open at 190°F (88°C) and is fully open at 212°F (100°C). On California models and all Cab and Chassis Pickups, starts to open to 180°F (82°C) and is fully open at 203°F (95°C).

COOLING SYSTEM CAPACITY

8.9 qts. (8.4L).

RADIATOR CAP

11-15 psi (7.5-1.05 kg/cm²).

WATER PUMP

Removal

Drain cooling system and loosen alternator pivot adjusting bolts. Pivot alternator toward engine to loosen drive belt. Remove fluid coupling, pulley and fan belt. Remove 7 bolts and 2 nuts and take pump off engine.

Installation

To install, use new gasket on clean mating surfaces and reverse removal procedure.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Camshaft Bearing Bolts	13-16 (18-22)
Camshaft Sprocket Bolt	51-65 (69-88)
Connecting Rod Cap Bolts	40-47 (54-64)
Crankshaft Pulley Bolt	102-130 (139-177)
Cylinder Head Bolts	53-63 (72-86)
Exhaust Manifold	29-36 (39-49)
Flywheel Bolts	73-86 (99-117)
Intake Manifold	13-19 (18-26)
Main Bearing Cap Bolts	69-83 (94-113)

Toyota Engines

22R 4-CYLINDER (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	144.4	2366	2-Bbl.	96@4800	122@2800	9.0:1	3.62	92.0	3.50	89.0

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)
2366 cc							
Intake	.....	44.5°	45°	.047-.063 (1.19-1.60)	.3138-.3145 (7.970-7.988)	.0008-.0024 (.0020-.060)	.....
Exhaust	.....	44.5°	45°	.047-.063 (1.19-1.60)	.3136-.3142 (7.965-7.980)	.0012-.0026 (.030-.066)	.....

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)
2366 cc	.0020-.0028 (.050-.071)	Press Fit	.0002-.0004 (.005-.011)	No. 1	.0110-.0157 (.28-.40)	.008 (.20)
	.....	.....	.....	No. 2	.0110-.0157 (.28-.40)	.008 (.20)
	.....	.....	.....	Oil	.0018-.0315 (.30-.80)	.....

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)
2366 cc	2.3614-2.3622 (59.98-60.00)	.0010-.0022 (.025-.055)	Center	.0008-.0087 (.020-.220)	2.0862-2.0866 (52.989-52.999)	.0010-.0022 (.025-.055)	.0063-.0102 (.160-.259)

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm) [1]	Lobe Lift In. (mm) [2]
2366 cc	1.2984-1.2992 (32.98-33.0)	.0004-.0020 (.010-.050)	Int. 1.680 (42.68) Exh. 1.682 (42.74)

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
2366 cc	1.80 (45.7)	55@1.59 (25@40.5)	.....

[1] — End play is .0031-.0071" (.08-.18 mm).
[2] — Total lobe height.