

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1969-71 8R-C	113.4	1858	1x2-Bbl.	108@5500	117@3800	9.0:1	3.39	86	3.15	80
1972-73 18R-C	120	1968	1x2-Bbl.	97@5500①	106@3800①	8.5:1	3.48	88.5	3.15	80

① - Net rating.

ENGINE IDENTIFICATION

Engine number stamped in right side of cylinder block. First group of numerals or letters on engine number pad designates engine type.

► CHANGES, CAUTIONS, CORRECTIONS

See "Engine Notes" at end of article.

ENGINE REMOVAL

1) Drain coolant and engine oil, disconnect battery cables. If equipped with auto. trans., drain fluid. Unscrew hinge bolts and remove hood.

2) Remove air cleaner and disconnect heater hoses, fuel lines and all engine wiring. Disconnect flexible cable to carburetor and remove bracket holding cable to cylinder head cover. Disconnect vacuum hoses to emission control and mark them for reinstallation. Make sure to disconnect throttle retard hose connection at base of carburetor.

3) Disconnect vacuum line for brake booster at intake manifold. If equipped with air conditioning, disconnect lines at compressor. Disconnect plug-in for electric clutch.

4) Remove baffle between radiator and front suspension to gain access to lower radiator hose and auto. trans. hoses. Remove radiator and auto. trans. cooler hoses. Remove fan shrouds and grille, radiator baffle, and radiator. Remove condenser lines and condenser.

NOTE - On some Corona Mark II vehicles, it is necessary to remove headlight assemblies to remove condenser.

5) Remove hood lock support, disconnect clutch hose bracket (if equipped). Remove front engine mount attaching bolts. Engine will rest on mounts.

6) Disconnect exhaust pipe from exhaust manifold and disconnect support bracket from side of transmission. Remove clutch cylinder (if equipped). Remove support bracket for parking brake equalizer.

7) Disconnect speedometer drive cable, transmission linkage and driveshaft. Remove rear engine support after placing jack under engine and removing engine mounting bolts and crossmember. Engine will rest on jack. Remove engine using engine hoist. To install, reverse removal procedure.

INTAKE & EXHAUST MANIFOLDS

Removal - 1) Disconnect battery and remove air cleaner. Remove fuel line, vacuum hoses, automatic choke line and PCV hose. Remove throttle rod, carburetor and heat insulator.

2) Raise and support front end of vehicle. Separate exhaust pipe at manifold. Remove manifold bolts, loosening gradually, and remove intake and exhaust manifold assembly. Manifolds may now be separated.

Installation - Thoroughly clean all gasket surfaces and install new gaskets. Install manifold assembly and gradually tighten bolts working from center out.

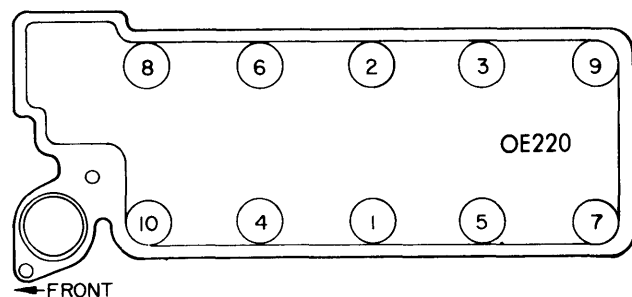
CYLINDER HEAD

Removal - 1) Disconnect battery and remove air cleaner. Drain cooling system and remove radiator and heater hoses. Remove spark plug wires and vacuum lines. Remove fuel lines, throttle linkage and carburetor.

2) Remove manifolds. See *Intake & Exhaust Manifolds*. Remove cylinder head cover and rocker shaft oil delivery pipe. Remove rocker shaft assembly. **NOTE** - Loosen rocker shaft bolts gradually working towards center.

3) Remove timing chain gear from camshaft. Remove camshaft bearing caps and remove camshaft. Remove timing chain gear from timing chain. Remove cylinder head bolts, loosening in sequence gradually, in two or three steps. Lift and remove cylinder head.

Installation - **CAUTION** - Do not slide cylinder head on block as locating dowels may cause damage to gasket surface. Install cylinder head and new gasket and tighten cylinder head bolts in sequence, taking two or three steps. Reverse removal procedure for remaining components. See *Camshaft*.



CYLINDER HEAD TIGHTENING SEQUENCE

Toyota Engines

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

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)	
1969-71 8R-C	Int.	1.687-1.699 (42.84-43.15)	45°	45°	.05-.06 (1.2-1.6)	.3140-.3144 (7.975-7.985)	.0010-.0022 (.0254-.0058)
	Exh.	1.333-1.345 (33.85-34.16)	45°	45°	.05-.06 (1.2-1.6)	.3132-.3140 (7.955-7.976)	.0014-.0030 (.0356-.0762)
1972-73 18R-C	Int.	1.608-1.620 (40.84-41.15)	45°	45°	.05-.06 (1.2-1.6)	.3140-.3144 (7.975-7.985)	.0010-.0022 (.0254-.0058)
	Exh.	1.411-1.423 (35.84-36.14)	45°	45°	.05-.06 (1.2-1.6)	.3132-.3144 (7.955-7.976)	.0014-.0030 (.0356-.0762)

VALVE ARRANGEMENT

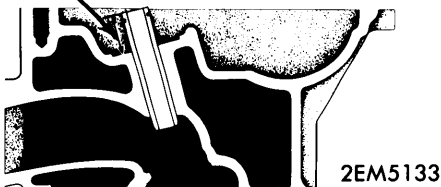
E-I-I-E-E-I-I-E (front to rear).

VALVE GUIDE SERVICING

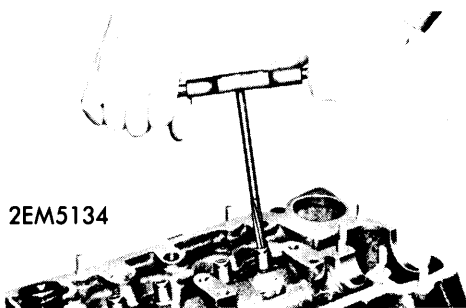
1) Measure clearance between valve stem and valve guide. If clearance exceeds .003" (.076 mm) for intake of .004" (.102 mm) for exhaust valve, guide must be replaced. Drive guide down through combustion chamber using a suitable driver (09201-60010).

2) Drive in new valve guide in same direction. Valve guide should protrude approximately .63" (16 mm) above cylinder head. New valve guide should be reamed for correct clearance with valve stem.

Protruded Length .63" (16 mm)



2EM5133
VALVE GUIDE INSTALLATION



VALVE GUIDE REAMING

VALVE STEM OIL SEALS

1) Using a suitable 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.

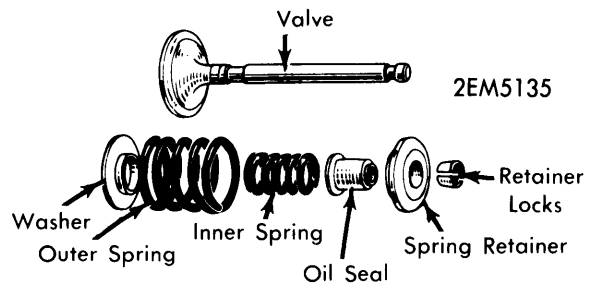
VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1969-73	Inner	15.2@1.48 (6.89@37.59)
	Outer	50.6@1.64 (22.95@41.65)

VALVE SPRING

Removal - With cylinder head removed, compress valve spring with a suitable spring compressor and remove valve keepers. Release spring compressor and remove spring retainer and spring.

Inspection - With valve spring removed, check spring tension while compressed to specified length in a suitable spring tester. Check valve spring free length, if less than specified, springs must be replaced. See *Valve Springs specification table for correct specifications*. Check valve spring squareness with a steel square. If inner spring is out of square more than .063" (1.6 mm) or outer spring is out of square more than .074" (1.9 mm) valve springs must be replaced.

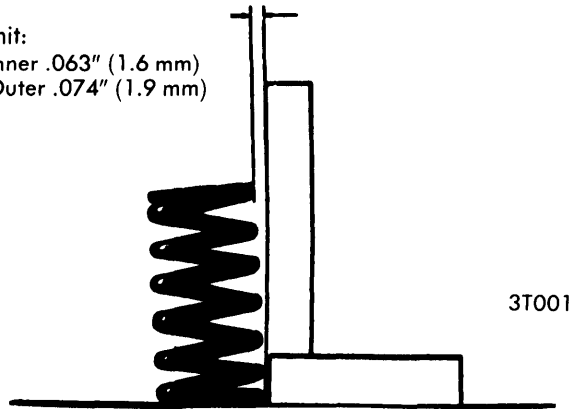
Installation - Install a new oil seal on valve stem and reverse removal procedure to install.



VALVE ASSEMBLY

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

Limit:
Inner .063" (1.6 mm)
Outer .074" (1.9 mm)



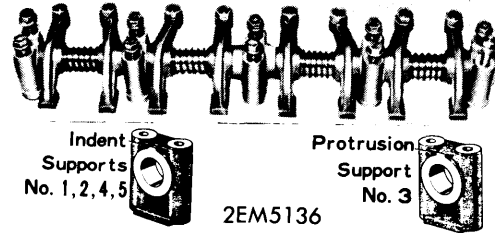
VALVE SPRING SQUARENESS LIMIT

ROCKER ARM ASSEMBLY

1) With rocker arm assembly removed, remove rocker shaft retaining screw. There are three different configurations of rocker arms and supports, mark of identify components to be sure that they are installed in original position. Remove support bolts, and slide off rocker arms, springs and supports.

2) Measure clearance of rocker arms on shafts, if clearance exceeds .002" (.05 mm) for 8 R-C engines or .003" (.08 mm) for 18R-C engines, rocker arm bushings or shafts must be replaced. Replace rocker arm bushings using a suitable mandrel (09222-30010) and an arbor press.

3) New bushing must be reamed to correct clearance for shaft. Correct clearance between rocker arms and shafts is .0012-.0015" (.030-.038 mm) for 8R-C engines and .0007-.0020" (.017-.051 mm) for 18R-C engines.



ROCKER SHAFT ASSEMBLY

VALVE CLEARANCE ADJUSTMENT

Valve clearance may be set hot or cold. However, cold setting should be used as a preliminary setting value. Position No. 1 piston at TDC of compression stroke (valves 1 & 2 closed), and adjust valves 1, 2, 3, and 5. Rotate crankshaft one complete turn, align TDC mark with pointer and adjust valves 4, 6, 7, and 8.

Valve Clearance Adjustment

Valve	Hot	Cold
Intake.....	.008" (.20 mm)	.007" (.18 mm)
Exhaust.....	.014" (.36 mm)	.013" (.33 mm)

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1969-73 8R-C & 18R-C	.001-.002 (.025-.051)	.0002 (.0051)	.0002-.0004 (.0051-.0102)	1	.004-.012 (.102-.305)	.0012-.0028 (.0305-.0711)
				2	.004-.012 (.102-.305)	.0012-.0028 (.0305-.0711)
				Oil	.004-.012 (.102-.305)	①

① - Clearance is .0008-.0028" (.02-.07 mm) for 8R-C and zero for 18R-C.

OIL PAN REMOVAL

1) Drain engine oil. Disconnect steering relay rod, tie rods from steering idler arm, pitman arm and knuckle arm. Remove front motor mount retaining bolts.

2) Using engine hoist, raise front of engine a small amount to gain access to oil pan attaching bolts. Remove oil pan bolts and remove oil pan. To install, reverse removal procedure.

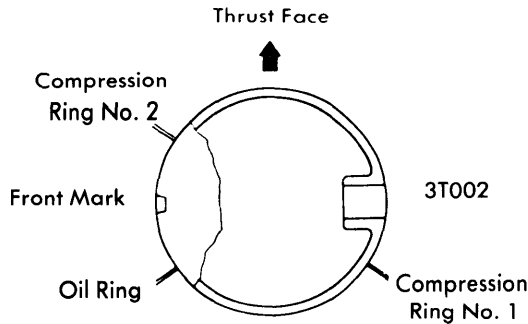
PISTON & ROD ASSEMBLY

Removal - Before removing piston and rod assembly, check top of cylinder bore for ridge or carbon deposit.

Remove ridge or carbon deposit with a suitable ridge reamer. Remove connecting rod caps and bearings. Mark or identify rod cap to ensure that it is installed on original connecting rod. Push piston and rod assembly up and out of cylinder bore.

Installation - Apply oil to piston and piston rings. Position piston ring gaps as shown in illustration. Using a suitable ring compressor, compress piston rings and install piston and rod assembly in bore with notch in top of piston facing front of engine. Install rod caps on corresponding connecting rod, with bearings installed and lubricated.

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)



PISTON RING GAP POSITIONS

FITTING PISTONS

1) With cylinder bore cleaned, measure for taper or out-of-round with a suitable cylinder gauge. If cylinder is tapered or out-of-round more than .0008" (.02 mm) or if the cylinders differ in size more than .002" (.05 mm), cylinders must be rebored for oversize pistons.

2) Measure piston diameter with a feeler gauge at right angle to piston pin axis. If clearance between piston and cylinder bore exceeds .008" (.2 mm), cylinders must be rebored and oversize pistons installed. Pistons are available .010" (.25 mm), .020" (.50 mm), .030" (.75 mm) and .040" (1.0 mm) oversize.

3) Check ring clearance in piston ring groove with a feeler gauge. If ring side clearance is excessive, ring groove is worn and piston must be replaced. Check ring end gap in cylinder bore with a feeler gauge. If cylinder bore is to specification and ring gap exceeds specifications, rings must be replaced.

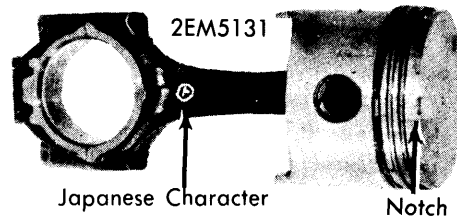
PISTON PINS

1) With piston and rod assembly removed from cylinder bore, remove snap rings from piston pin bore. Heat piston to approximately 140°F (60°C) and remove piston pin. Mark or identify piston pin to ensure that it is installed in original piston. Separate connecting rod from piston.

2) To check fit of pin in piston, heat piston to approximately 140°F (60°C) and install piston pin. Pin should push through piston with slight thumb pressure. If pin slides into piston too easily, piston and pin both must be replaced.

3) Check fit of piston pin in connecting rod. If clearance exceeds .0006" (.015 mm) for 8R-C engines or .0008" (.020 mm) for 18R-C engines, connecting rod bushing must be replaced. Using a suitable mandrel (09222-30010) and an arbor press, press old bushing out of connecting rod. Install new bushing and hone to correct clearance for piston pin.

4) To assemble piston and rod assembly, heat piston to approximately 140°F (60°C) and place piston in rod so that notch in top of piston and side of rod with Japanese character are facing in same direction. Lubricate piston pin and slide in pin bore in piston and connecting rod. Install snap rings making sure they are fully seated in groove.



PISTON & ROD ASSEMBLY

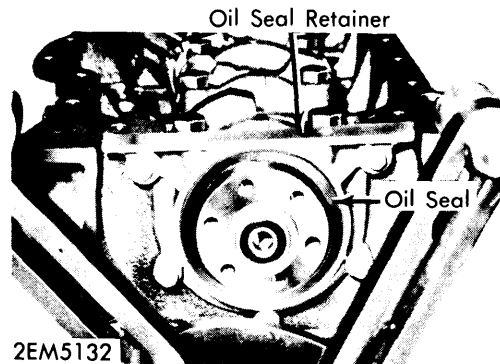
CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

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)
1969-71 8R-C	2.3613-2.3622 (59.98-59.99)	.0008-.0020 (.02-.05)	Center	.002-.010 (.05-.25)	2.0866-2.0867 (52.99-53.00)	.0008-.0020 (.02-.05)	.002-.010 (.05-.25)
1972-73 18R-C	2.3613-2.3622 (59.97-59.99)	.0008-.0020 (.02-.05)	Center	.0008-.008 (.02-.20)	2.0866-2.0867 (52.99-53.00)	.0008-.0020 (.02-.05)	.002-.010 (.05-.25)

MAIN & CONNECTING ROD BEARINGS

1) Check crankshaft for straightness. If crankshaft is bent more than .002" (.051 mm), crankshaft must be straightened or replaced. Inspect all journals for wear or scoring. Check journals for out-of-round or taper. If journals taper or are out of round more than .0004" (.010 mm), crankshaft journals must be ground for undersize bearings.

2) Check bearing clearance using the Plastigage method. If clearance exceeds .003" (.076 mm), crankshaft journals must be ground for undersize bearings.



REAR OIL SEAL & RETAINER

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

THRUST BEARING ALIGNMENT

Check crankshaft thrust clearance at thrust bearing using a feeler gauge. If clearance exceeds limit of .012" (.305 mm) all main bearings must be replaced.

REAR MAIN BEARING OIL SEAL

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

ENGINE FRONT COVER OIL SEAL

With engine front cover removed, pry out old seal toward front side. Using suitable tool (09223-50010), drive seal into place. After installing new seal, coat seal lip lightly with multi-purpose grease.

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1969-71 8R-C	1.3768-1.3778 (34.9707-34.9801)	.001-.002 (.025-.051)	.40 (10.16)
18R-C	1.3768-1.3778 (34.9707-34.9801)	.001-.002 (.025-.051)	.317 [Ⓢ] (8.051)

Ⓢ — Intake only. Exhaust is .319" (8.1 mm).

TIMING CHAIN

Removal — 1) Remove cylinder head. See *Cylinder Head Removal*. Remove crankshaft pulley bolt and remove pulley. Remove oil pan, oil pump and timing chain cover.

2) Remove upper timing chain. Using suitable puller (09213-36010) remove camshaft drive gear. Remove both chain tensioners keeping parts separate to prevent mixing.

3) Using suitable puller, remove crankshaft timing gear and pump drive shaft gear with timing chain. Use puller on each gear alternately to remove uniformly. **NOTE** — Both upper and lower timing chains are identical. Mark and install in original position.

NOTE — If upper chain tensioner is disassembled, sealer must be applied to bolt attaching chain guide to tensioner.

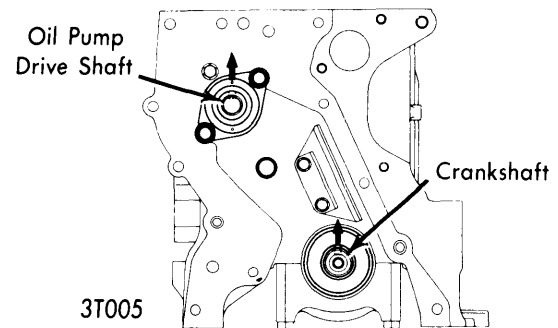
Installation — 1) Position key groove in crankshaft upwards with number one piston at TDC. Position oil pump shaft key upwards. Assemble lower timing chain on crankshaft and oil pump shaft sprockets aligning marks on chain with marks on sprockets.

2) Install sprockets and chain assembly on shafts together. **NOTE** — Do not force oil pump drive sprocket or plug at rear of oil pump drive shaft may be loosened.

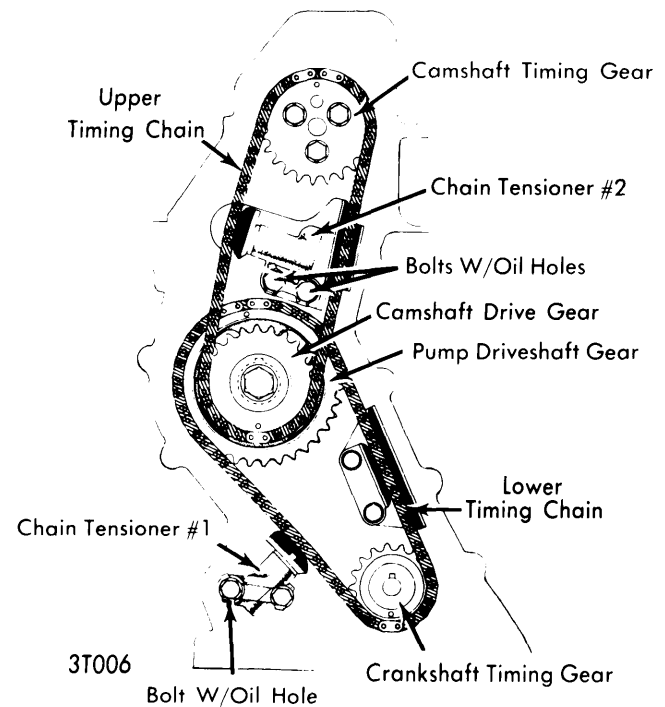
3) Install lower chain guide and engine front cover gasket. Install upper and lower chain tensioners. **NOTE** — Three chain tensioner bolts have oil holes and must be installed in proper location.

4) Install camshaft drive gear and tighten bolt. Align marks on upper timing chain with mark on camshaft drive gear and install chain. Install front engine cover. **NOTE** — Use seal washer and apply liquid sealer on threads of upper right bolt used to attach cover.

5) Install crankshaft pulley and tighten bolt. Install camshaft. See *Camshaft Installation*. Align mark on timing chain with dowel pin hole on camshaft sprocket. Position camshaft with stamped mark and dowel pin upward and install sprocket to camshaft. Reverse removal procedure for remaining components.



SHAFT ALIGNMENT



TIMING CHAIN INSTALLATION

CAMSHAFT

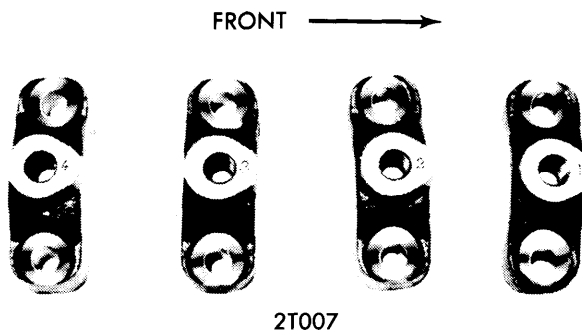
Removal — 1) Disconnect battery and remove air cleaner. Remove rocker arm cover and remove rocker arm assembly oil delivery pipes.

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

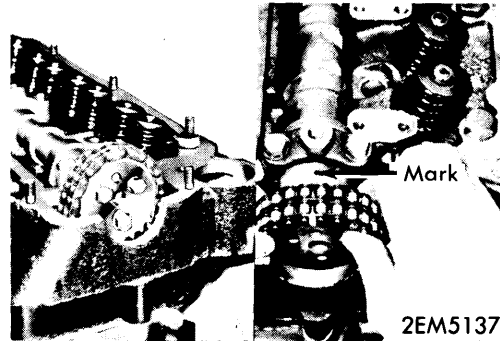
2) Loosen rocker arm assembly bolts in two or three steps, working from ends to center, and remove rocker arm assembly. Remove camshaft timing gear, camshaft bearing caps and remove camshaft.

3) Inspect camshaft for bend. If bend exceeds .004" (.10 mm) correct or replace camshaft. If endplay exceeds .010" (.25 mm) replace camshaft bearings. Measure lobes, if wear exceeds 1.712" (43.48 mm) for intake or 1.724" (43.79 mm) for exhaust, replace camshaft.

Installation — Install camshaft bearings, camshaft and camshaft bearing caps. Number one bearing is also thrust bearing. Tighten bearing cap bolts gradually in sequence starting at center. Replace remaining components in reverse of removal procedure. See *Timing Chain Installation*.



CAMSHAFT BEARING CAPS



TIMING GEAR INSTALLATION

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
8R-C①	15°	45°	50°	10°
8R-C②	20°	48°	56°	12°
18R-C	20°	48°	56°	12°

- ① — Before Engine #0776230.
 ② — Effective Engine #0776230.

VALVE TIMING

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.) 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 to 7.3-11.6 ft. lbs.

ENGINE OILING

Crankcase Capacity — Crankcase capacity is 4.3 qts. on Corona and Pickup, 5.3 qts. on Corona Mk II & Station Wagon, and 4.6 qts. on Celica. Add 1 qt. with filter on all models.

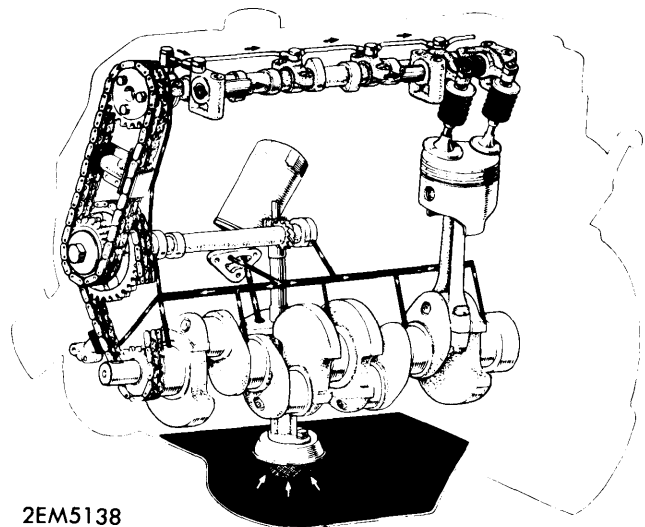
Normal Oil Pressure — 56.9 psi.

Pressure Relief Valve — 56.1-71.1 psi operating pressure.

Oil Filter — Full flow type with paper elements. By-pass valve opening pressure is 11.4-17.1 psi. Located on right side of engine.

ENGINE OILING SYSTEM

Forced feed oiling system utilizing a rotor-lobe type oil pump driven by distributor shaft. Oil from oil pan is pumped through a full flow oil filter and then to oil galleries in cylinder block. Oil is fed to crankshaft main bearings, timing chain assembly, and oil pump drive shaft. It is then channeled to camshaft and rocker arm assembly.



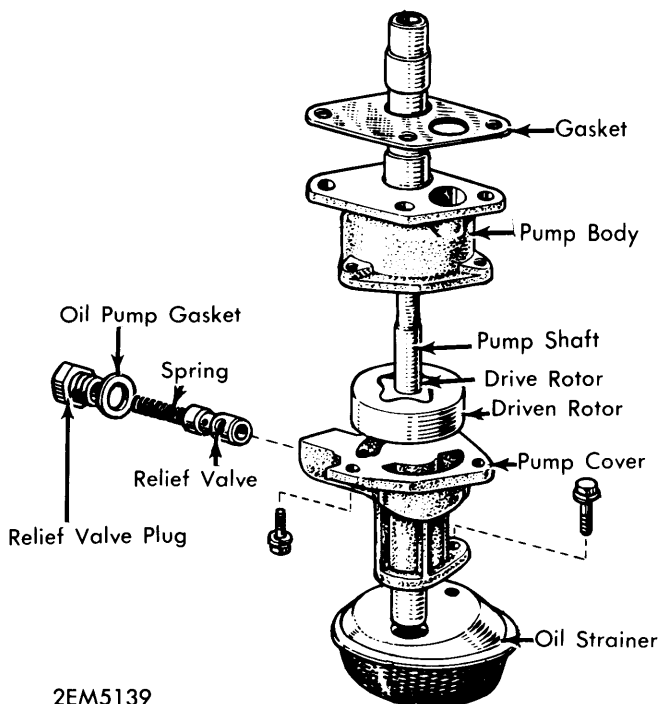
ENGINE OILING SYSTEM

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

ENGINE OILING (Cont.)

OIL PUMP

NOTE — Engine must be raised above front mounts and oil pan must be removed to gain access to oil pump.



2EM5139

OIL PUMP

1) Remove oil drain plug and drain engine oil. Disconnect steering relay rod, tie rods from steering idler arm, pitman arm and knuckle arms (if necessary). Remove front motor mount bolts.

2) Lift engine slightly with engine hoist to gain access to oil pan bolts. Remove bolts and oil pan. Remove three screws and lockwashers that hold oil pump to block. Pull oil pump straight down to disengage from distributor drive shaft. Discard old gasket. To install, reverse removal procedure.

OIL PUMP CHECKING

1) Disassemble oil pump and check for wear or damage. Measure diameter of drive rotor. If rotor diameter is less than 1.403", replace drive rotor and driven rotor as a set.

2) Measure diameter of driven rotor. If diameter less than 1.967", replace drive rotor and driven rotor as a set. Measure tip clearance between drive rotor and driven rotor. If clearance exceeds .008", replace drive rotor and driven rotor as a set.

3) Measure side clearance between rotors and mating surface of pump cover. If clearance exceeds .006", replace rotors. Measure clearance between driven rotor and pump body. If clearance exceeds .008", replace pump body.

4) Check relief valve spring for stretch. If free length of spring is more than 1.85", replace spring. Make sure that all oil passages in pump body are clear. When replacing rotors in pump make sure that marks on each rotor are in alignment.

ENGINE COOLING

WATER PUMP REMOVAL

Drain cooling system and remove radiator, fan belt tensioning bar, fan belt, heater hose, and by-pass hose. Remove water pump bolts and remove water pump, fan, and fluid coupling assembly. Discard gasket. To install, reverse removal procedure using new gasket.

Thermostat — Starts opening at 177-182°F (80-83°C). Fully open at 203°F (95°C).

COOLING SYSTEM CAPACITY

Corona — 8.3 qts. including heater.

Corona Mk. II & Station Wagon — 7.8 qts. including heater.

Celica — 8.9 qts including heater.

Pickup — 8.8 qts. including heater.

Toyota Engines

1969-73 TOYOTA (8R-C & 18R-C ENGINES) 4 CYLINDER (Cont.)

ENGINE NOTES

1972-73 TOYOTA W/8R-C & 18R-C — OIL PUMP REVISIONS — From June, 1972, a new oil pump and pump drive shaft bushing (Part Nos. 15100-33011 & 11022-33010) have been introduced. This change was made to combat reports of hard starting which occurred suddenly on known well-tuned engines. This hard starting condition may be caused by wear of the distributor gear and oil pump drive shaft gear. The new pump ensures oil is pressure-fed directly to the meshing point of the distributor gear and oil pump drive shaft gear. If the pump drive shaft requires replacement, it is recommended that the oil pump and pump drive shaft bearing also be replaced to prevent recurrence of this problem.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	① 79 (10.9)
Main Bearing Cap Bolts	76 (10.5)
Connecting Rod Cap Nuts	46 (6.3)
Camshaft Bearing Cap Bolts	15 (2.1)
Timing Chain Cover	13 (1.8)
Oil Pump Shaft-to-Timing Gear	65 (9.0)
Chain Tensioner-to-Cylinder Block	② 13 (1.8)
Crankshaft Pulley	47 (6.5)
Rocker Shaft Support Bolts	① 15 (2.1)
Camshaft Gear	10 (1.4)
Intake & Exhaust Manifolds	33 (4.6)
Oil Pan	4 (0.5)
Cylinder Head Cover	6 (0.8)
Flywheel-to-Crankshaft	
8R-C	46 (6.4)
18R-C	55 (7.6)
Drive Plate-to-Crankshaft (Auto. Trans.)	39 (5.4)
Clutch Cover-to-Flywheel	
8R-C	8 (1.1)
18R-C	14 (1.9)
Oil Pump-to-Cylinder Block	14 (1.9)
Crankshaft Rear Oil Seal-to-Cylinder Block	14 (1.9)

- ① — Tighten cold, retighten with engine at operating temperature.
- ② — On 18R-C engine, No.1 support is 18 (2.5) and No.2 support 24 (3.3).