1965-70 TOYOTA (3R-B & 3R-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
1965-70	115.8	1897	2-Bbl.	90@4600	110@2600	8.0-1	3.46	88	3.07	78

ENGINE IDENTIFICATION

Engine serial number and code is stamped in pad on right side of engine next to distributor. First series of digits is engine code.

Application	Code
1897 cc Engine (1965-67)	3R-B
1897 cc Engine (1968-70)	3R-C

ENGINE REMOVAL

NOTE — Engine and transmission are removed as one unit.

1) Drain engine cooling system. Remove hood, air cleaner and disconnect battery ground cable. On Corona models, remove grille and radiator baffle plate.

2) On Stout models, remove choke connecting rod. On all models remove radiator hoses, radiator and fan shroud. Remove accelerator connecting rod, coil wire and disconnect primary lead from distributor to coil.

3) Disconnect cable from battery to starter. Remove oil cooler lines on Automatic Transmission models. Disconnect clutch hydraulic line on Manual Transmission models. Disconnect vacuum line from brake booster, (if equipped). Disconnect heater hoses (if equipped).

4) Disconnect fuel inlet line at fuel pump. Disconnect electrical connections at alternator. Disconnect exhaust pipe at manifold. Remove front engine mounting bolts and nuts. Disconnect wires from water temperature sending unit and oil pressure switch.

5) Raise front of vehicle and support with safety stands. Drain engine oil. Remove drive shaft and install a suitable plug in rear of transmission to prevent loss of oil.

6) Remove transmission cover on Stout models. Remove cover under engine (if equipped). Disconnect shifting rods at transmission. Disconnect speedometer cable, parking brake cable and exhaust pipe support bracket. Remove clutch slave cylinder and line on manual transmission models.

7) Place a jack under transmission and remove rear transmission mount. Attach a suitable lifting hoist to engine and lift engine and transmission up and out toward front of vehicle. To install, reverse removal procedure.

INTAKE MANIFOLD REMOVAL

NOTE — Intake and exhaust manifolds are removed as an assembly.

1) Remove air cleaner. Disconnect accelerator and choke control rods at carburetor. Disconnect PCV hose and fuel line at carburetor.

2) Remove carburetor and disconnect exhaust pipe at exhaust manifold. Remove manifold retaining bolts and remove manifolds.

3) To install, clean mating surfaces, use new gaskets and tighten bolts to specifications.

CYLINDER HEAD REMOVAL

1) Remove intake and exhaust manifolds as previously outlined. Drain engine cooling system and remove valve cover. Remove rocker arm assembly.

2) Disconnect spark plug wires at spark plugs. Remove push rods and mark or position them to insure that they are installed in same valve tappet.

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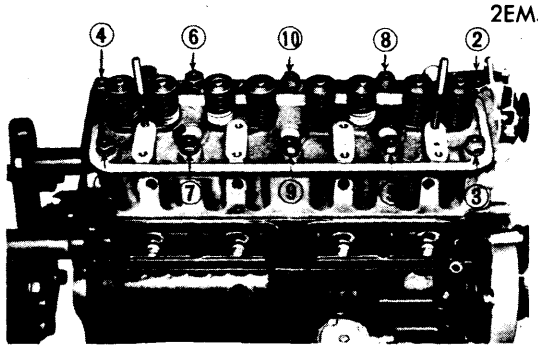

CYLINDER HEAD LOOSENING SEQUENCE

3) Remove cylinder head bolts in sequence shown in illustration and remove cylinder head. To install, clean mating surfaces, use new gasket and tighten bolts to specifications in sequence shown in illustration.

4) Reverse removal procedure to install remaining components. Tighten all bolts and nuts to specifications and adjust valve clearance.

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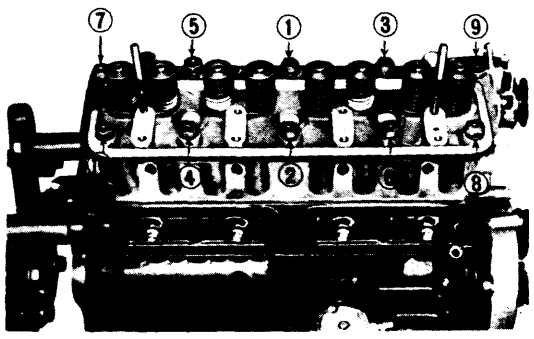


CYLINDER HEAD TIGHTENING SEQUENCE

1965-70 TOYOTA (3R-B & 3R-C ENGINES) 4 CYLINDER (Cont.)

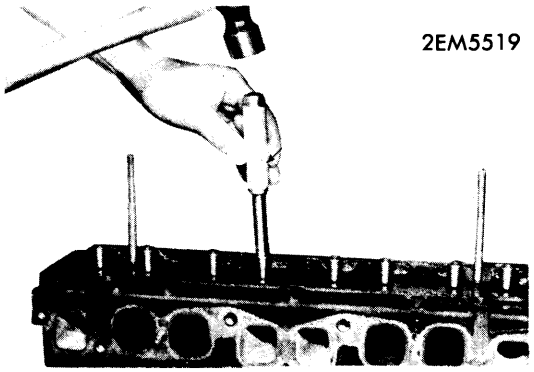
VALVES							
Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
All							
Int.	1.65"	45°	45°	.055"	3.54"	.001-.002"	.....
Exh.	1.38"	45°	45°	.055"	3.54"	.0016-.0028"	.....

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) With cylinder head removed and disassembled, check clearance between valve stem and valve guide. If clearance exceeds .004", replace valve and valve guide.



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VALVE GUIDE REPLACEMENT

2) To replace valve guide, drive out of cylinder head using a suitable driver (09201-40010). Drive guide into head using same driver, until guide protrudes .96" from top of head. Ream guide to correct clearance.

VALVE STEM OIL SEALS

An "O" ring type stem seal is installed on valve stem before valve spring is installed.

VALVE SPRINGS			
		PRESSURE (LBS.)	
Engine	Free Length	Valve Closed	Valve Open
All			
Int.			
Inner	1.78"	14.7@1.56"	.....
Outer	2.16"	53.9@1.87"	.....
Exh.			
Inner	1.78"	14.5@1.56"	.....
Outer	2.16"	53.0@1.88"	.....

VALVE SPRING REMOVAL

1) With cylinder head removed, compress valve spring with a valve spring compressor. Remove valve keepers and release spring compressor. Remove spring retainer and inner and outer springs.

2) Check valve spring squareness with a steel square. Replace spring if distance between top of spring and square is more than .063" (inner) and .074" (outer).

3) Check valve spring free length. If free length is less than 1.72" (inner) and 2.09" (outer), replace springs.

4) Check valve spring tension at installed height (see specifications) in a spring tester. If tension of exhaust springs is less than 13.4 lbs. (inner) and 47.3 lbs. (outer), replace exhaust springs.

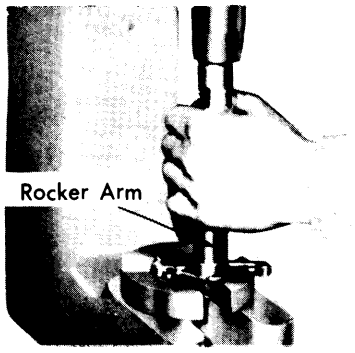
5) Check intake springs tension. If tension is less than 14.7 lbs. (inner) and 53.9 (outer), replace intake springs.

ROCKER ARM ASSEMBLY

1) Remove valve cover and bolts securing rocker arm assembly to cylinder head. Remove rocker arm assembly. Remove clips from ends of rocker shaft and remove support stands, rocker arms and springs.

2) Thoroughly clean and inspect all components. Check clearance between rocker arms and shaft, if clearance is excessive, replace rocker arm shaft or bushing in rocker arm.

3) To replace bushing, use a suitable replacement tool (09222-30010) to remove and install bushing in rocker arm. Oil new bushing before pressing in and install from front.



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ROCKER ARM BUSHING REPLACEMENT

4) With new bushing installed in rocker arm, ream bushing to correct clearance with rocker arm shaft (.0004-.0016"). If valve contact surface of rocker arm shows excessive wear, replace rocker arm. If contact surface is slightly worn, reface with a rocker arm refacing machine.

5) When assembling rocker arm assembly, make sure hole for support stand lock screw in rocker arm shaft is up. Thoroughly oil all components before assembly. Tighten retaining bolts to specifications when installing and adjust valve clearance.

1965-70 TOYOTA (3R-B & 3R-C ENGINES) 4 CYLINDER (Cont.)

VALVE TAPPET SERVICE

1) With valve tappet removed, check clearance between tappet and bore in crankcase, if clearance exceeds .004", replace tappet with next oversize and ream crankcase bore to appropriate clearance for oversize tappet. Correct tappet clearance is .0006-.002". Tappets are available in .003" and .005" oversizes.

VALVE CLEARANCE ADJUSTMENT

Start engine and warm to 167-185°F. Set idle RPM to 550. Adjust exhaust valve clearance to .014" and intake valve clearance to .008". Tighten lock-nut securely.

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
All	.0012-.002"	①	②	No. 1 No. 2 No. 3	.008-.016" .006-.014" .006-.014"	.0012-.0027" .0012-.0027" .0010-.0027"

① — Push fit with piston heated to 122-140°F.

② — Push fit.

OIL PAN REMOVAL

Drain engine oil, remove oil pan retaining bolts and remove oil pan. To install, clean mating surfaces, use new gasket with sealer and tighten bolts to specifications.

PISTON & ROD ASSEMBLY

1) Remove oil pan and cylinder head as previously outlined. Mark connecting rod caps to insure that they are installed on same connecting rod and in same position.

2) To install piston and connecting rod assembly, make sure bearing halves are properly seated in connecting rod and cap. When installing piston, position ring end gaps away from thrust side of piston.

3) Compress rings with a ring compressor and install piston with notch in top toward front of engine. Push in from top and make sure bearing half is properly seated against crankshaft journal. Install rod cap in proper position and tighten nuts to specifications.

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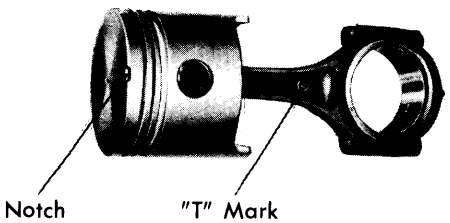

PISTON & ROD ASSEMBLY MARKS

PISTON PIN REPLACEMENT

1) Remove piston and rod assembly as previously outlined. Remove circlips from piston pin hole. Heat piston to 122-140°F and remove piston pin. Mark connecting rod, piston and pin to insure reassembly with same components.

2) To check fit of piston pin in piston, heat piston to 122-140°F and push in piston pin. Pin should push fit and not fall through. If pin falls through, fit is to loose, replace piston and pin.

3) Check fit of piston pin in rod. Pin should push fit in connecting rod bushing. If side clearance is felt or fit is too loose, press out bushing and install new one using a suitable replacement tool (09222-40011). Hone new bushing to proper fit.

4) With piston heated to 104-140°F, place in position on connecting rod with notch in top of piston facing in same direction as "T" mark on connecting rod. Lubricate piston pin and install in piston and connecting rod. Install circlips. Install piston and rod assembly as previously outlined.

FITTING PISTONS

1) With piston removed from crankcase, check cylinder bore for taper or out-of-round. If taper or out-of-round exceeds .008", cylinder bore must be bored to next oversize.

2) Pistons and rings are available in oversizes ranging from .010" to .060" in .010" increments.

3) Check piston-to-cylinder clearance. A .0012" feeler gauge should require 2.2-5.5 lbs. tension, measured on a spring tension gauge, to be pulled out from between piston and cylinder wall.

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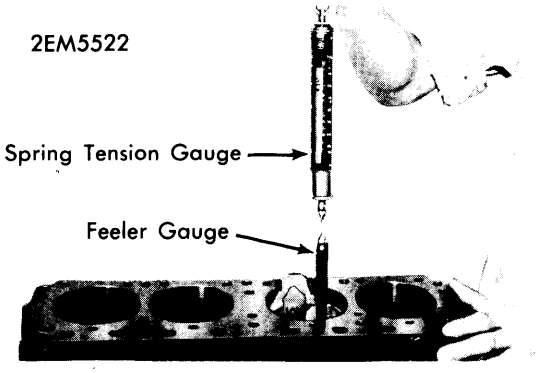


PISTON FIT CHECKING

4) Check ring side clearance in piston and end gap in cylinder bore (see specifications). If side clearance exceeds specifications with new rings, replace piston. Install piston and rod assembly as previously outlined.

1965-70 TOYOTA (3R-B & 3R-C ENGINES) 4 CYLINDER (Cont.)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
	MAIN BEARINGS				CONNECTING ROD BEARINGS		
Engine	Journal Diam.	Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
All	2.3634-2.3640"	.0008-.0022"	No. 2	.002-.009"	2.1648-2.1654"	.001-.0024"	.0067-.0110"

MAIN & CONNECTING ROD BEARING SERVICE

1) Remove engine, cylinder head, oil pan and piston and rod assemblies as previously outlined. Remove crankshaft pulley with a suitable puller (09213-60013). Remove clutch and flywheel or torque converter assembly.

2) Remove front engine cover. Remove main bearing cap bolts and remove main bearing caps with bearing halves. Remove crankshaft and bearing halves in crankcase.

3) Thoroughly clean crankshaft and blow out oil passages with compressed air. Check crankshaft for runout with a dial indicator on center main bearing journal. If runout exceeds .002", straighten or replace crankshaft.

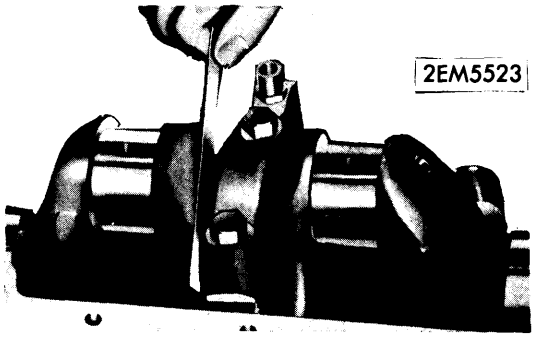
4) Check main and connecting rod bearing journals for taper or out-of-round. If taper or out-of-round exceeds .004", crankshaft must be ground to next undersize. Main and connecting rod bearings are available in .010", .020", .030" and .040" undersizes.

5) Main and connecting rod bearing clearance is checked by the Plastigage method. To check connecting rod bearing clearance, make sure bearing halves and crankshaft journal are thoroughly clean. Place a piece of Plastigage wire on journal being checked. Install connecting rod cap on connecting rod and tighten nuts to specifications.

6) Remove connecting rod cap and check flattened wire against scale on back of package. If clearance exceeds .0031", crankshaft must be ground to next undersize and appropriate size bearings installed. Main bearing clearance is checked in same manner, if clearance exceeds .003", crankshaft must be ground to next undersize and appropriate bearings installed.

7) Installed bearing halves in crankcase and main bearing caps. Lubricate bearings and install crankshaft. Install main bearing caps with arrows pointing toward front of engine. Check crankshaft endplay. *See Thrust Bearing Alignment.* Install rear main bearing oil seal. *See Rear Main Bearing Oil Seal Installation.* Position crankshaft and camshaft gears correctly. *See Valve Timing.*

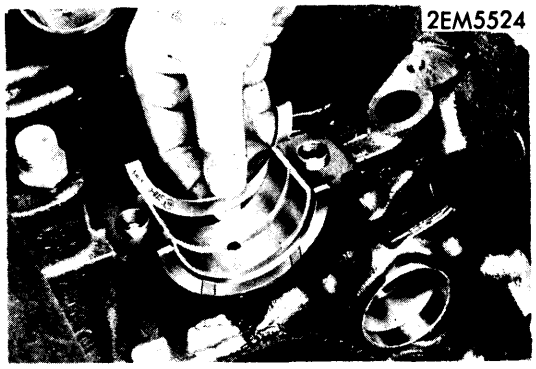
8) Tighten all bolts and nuts to specifications. To install remaining components, reverse removal procedure. Install engine as previously outlined.



CRANKSHAFT ENDPLAY CHECKING

THRUST BEARING ALIGNMENT

Check crankshaft endplay with number two bearing and main cap installed. If endplay exceeds .012", replace thrust bearing. If standard bearing will not give proper endplay, thrust bearings are available in .005" and .010" oversize thicknesses. Install thrust bearing with oil groove side against thrust side of crankshaft.



THRUST BEARING INSTALLATION

REAR MAIN BEARING OIL SEAL INSTALLATION

Rear main bearing oil seal is located in seal mount behind number three main bearing journal. Install seal in crankcase and main bearing cap and seat using a suitable cylindrical tool. Install rear main bearing cap and drive packing into groove between crankcase and cap with a punch.

ENGINE FRONT COVER & OIL SEAL

Seal in front cover should be replaced whenever cover is removed. Pry seal out of cover toward front and install new seal with a suitable installing tool (09505-20110). Use new gasket and sealer when installing front cover and tighten bolts to specifications.

1965-70 TOYOTA (3R-B & 3R-C ENGINES) 4 CYLINDER (Cont.)

CAMSHAFT			
Engine	Journal Diam.	Clearance	Lobe Lift
All		.001-.0026"	.....
Journal			
No. 1	1.8291-1.8297"		
No. 2	1.8192-1.8198"		
No. 3	1.8094-1.8100"		
No. 4	1.7996-1.8002"		
No. 5	1.7898-1.7904"		

CAMSHAFT REMOVAL

1) With engine front cover removed, remove fuel pump and distributor. Remove rocker arm assembly and push rods as previously outlined. Remove tappet cover plates from side of crankcase and remove tappets.

2) Remove camshaft thrust plate bolts and carefully remove camshaft to avoid damaging camshaft lobes or bearings. Check camshaft runout with a dial indicator placed on number two bearing journal. If runout exceeds .002", straighten or replace camshaft.

3) Check camshaft lobe height. If lobe height is less than 1.498" (intake) and 1.493" (exhaust), replace camshaft. Pitted or scored lobes can be smoothed with an oil stone.

4) Check camshaft journals for taper or out-of-round. If taper or out-of-round exceeds .002", camshaft journals must be ground to next undersize and bearings of appropriate size installed.

6) Bearings of .005",.010" and .020" undersizes are available. Check clearance between bearings and camshaft journals. If Clearance exceeds .004", replace camshaft bearings.

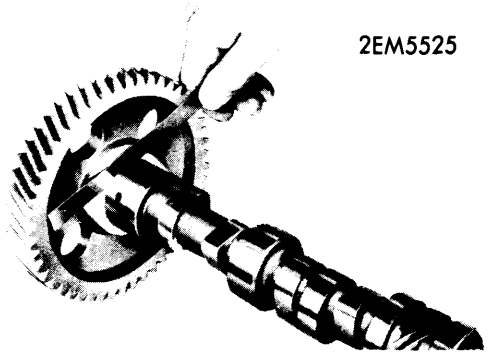
7) To replace camshaft bearings, remove expansion plug from rear camshaft bearing hole. Remove bearings and install new bearings of appropriate size with a suitable bearing replacement tool (09215-40010). When installing bearings, make sure oil holes in bearings align with oil holes in crankcase.

8) If undersize bearings are installed, bearings will have to be reamed to correct clearance. Install new expansion plug.

9) Lubricate camshaft thoroughly and install in crankcase. Position camshaft gear and crankshaft gear correctly. See *Valve Timing*. Reverse removal procedure to install remaining components.

CAMSHAFT END THRUST

Check clearance between camshaft thrust plate and first bearing journal. If endplay exceeds .012", replace thrust plate.



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CAMSHAFT ENDPLAY CHECKING

VALVE TIMING				
	INTAKE		EXHAUST	
Engine	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
3R-B	23°	53°	63°	13°
3R-C	10°	50°	50°	10°

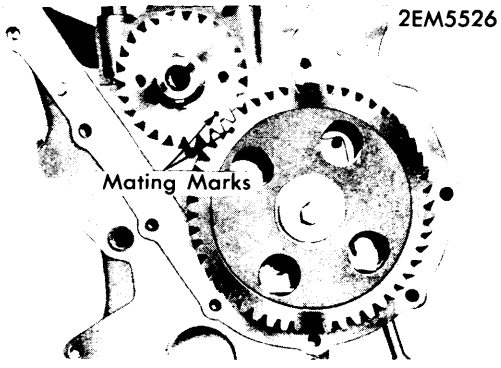
TIMING GEAR REPLACEMENT

1) With camshaft installed, check backlash between both gears. If backlash exceeds .012", replace gears as necessary.

2) With camshaft removed, check runout of camshaft gear. If runout exceeds .010", replace camshaft gear. Remove and install gear with a suitable replacement tool (09210-31010).

VALVE TIMING

When installing camshaft, make sure mating marks on camshaft and crankshaft gears are lined up (see illustration).



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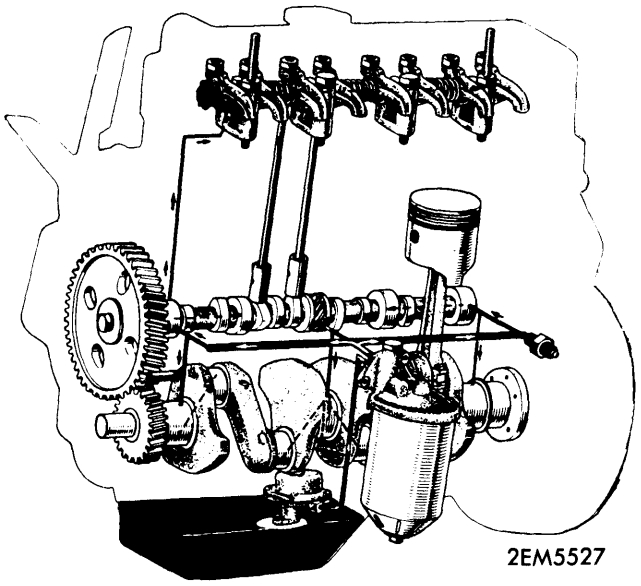
CAMSHAFT & CRANKSHAFT GEAR MARKS

1965-70 TOYOTA (3R-B & 3R-C ENGINES) 4 CYLINDER (Cont.)

ENGINE OILING



ENGINE OILING SYSTEM

ENGINE OILING SYSTEM

Oil is circulated through engine by pressure provided by a trochoid rotor type oil pump. Pump is mounted on bottom of crankcase and inside oil pan. Pump is driven by camshaft via distributor drive. Oil is drawn from oil pan and circulated through a full flow oil filter and into main oil gallery. Oil is then distributed to main and connecting rod bearing journals and camshaft journals. Cylinders and piston pins are lubricated by oil spraying from hole in crankshaft end of connecting rod. Timing gears are lubricated by oil squirting from hole in crankcase next to gears. Oil flows from number one camshaft bearing journal to rocker arm shaft to lubricate rocker arms. Excess oil from rocker arms and shaft lubricates valves.

Crankcase Capacity – 5.1 qts. with filter.

Oil Filter – Full flow, mounted on left side of crankcase.

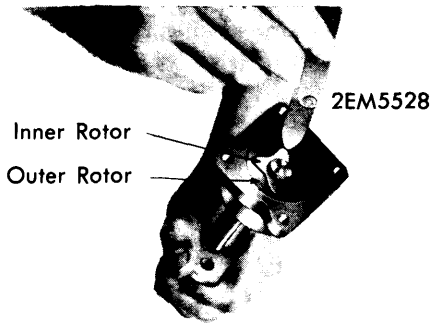
Normal Oil Pressure – 40-50 psi with engine running and at 212°F.

Pressure Regulator Valve – In oil pump. *See Oil Pump.*

OIL PUMP

1) Remove oil pan as previously outlined. Disconnect oil pump outlet pipe and remove oil pump with strainer. Remove strainer, pump cover, plug from cover with relief valve spring and piston and rotors from pump body.

2) Thoroughly clean and inspect all components. Check tip clearance, if clearance exceeds .008", replace both rotors. Check clearance between drive rotor and cover. Place a straight edge on pump body and insert a feeler gauge between straight edge and drive rotor. If clearance exceeds .006", replace rotors or cover.



TIP CLEARANCE CHECKING

3) Check clearance between outer rotor and pump body. If clearance exceeds .008", replace rotors or pump body. Check relief valve piston for wear or signs of seizure. Check relief valve spring (see specifications).

4) To assemble and install, reverse disassembly and removal procedures. Tighten all bolts and nuts to specifications.

Oil Pump Specifications

Application	Measurement
Rotor Tip Clearance	.0026-.0047"
Rotor-to-Cover Clearance	.0012-.0027"
Outer Rotor-to-Pump Body Clearance	.004-.006"
Relief Valve Spring	
Free Length	1.85"
Length Loaded (@ 13.2-14.6 lbs.)	1.45"

ENGINE COOLING

WATER PUMP

1) Drain engine cooling system and remove radiator hoses. Remove bypass hose. Remove fan belt and fan. Remove fuel line clamp from water outlet. Remove water pump retaining bolts and remove water pump.

2) To install water pump, clean mating surfaces, use new gasket with sealer and reverse removal procedure.

Thermostat – Starts opening at 177-182°F and is fully open at 203°F.

Cooling System Capacity – 9.0 qts.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Cylinder	80-85
Connecting Rod Bolts	43-51
Main Bearing Bolts	75-80
Camshaft Lock Plate	11-15
Engine Front Cover	7-12
Crankshaft Pulley Bolt	31-41
Oil Pump Bolt	11-15
Oil Pan Bolts	3-4
Rocker Arm Assembly	15-18
Intake & Exhaust Manifolds	14-22
Flywheel Bolts	43-49
Clutch Cover-to-Flywheel	14-21