GENERAL SPECIFICATIONS						
Engine	Net HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore	Stroke	Displ. Cu. Ins.
250" 1-Bbl.	100 @ 3600	175 @ 1800	8.2-1	3.87"	3.53"	250

► *NET HORSEPOWER & TORQUE NOTE — Horsepower and Torque figures given above are NET. Net Horsepower and Torque represents power at the flywheel when the engine is installed in a vehicle, with wide open throttle and all systems operating such as; air cleaner, exhaust system, water pump, generator, oil pump and air conditioning.*

ENGINE IDENTIFICATION

Six cylinder engine code is stamped on distributor mounting pad on right side of block and is decoded as follows:

Application	Man. Trans.	Auto. Trans.
250" 1-Bbl.	CCR	CCW,CCX

ENGINE REMOVAL

1) Remove hood (mark hinge positions), air cleaner, radiator shroud and disconnect battery cables at battery. Drain cooling system and remove radiator, fan blade and pulley. Disconnect all necessary wires, water and vacuum hoses.

2) Disconnect accelerator linkage at manifold bellcrank, exhaust pipe at manifold flange, fuel line at fuel pump and power steering bracket, then position pump to one side. Raise vehicle and remove drive shaft, then plug extension housing.

3) Disconnect shift linkage at transmission, speedometer cable and clutch linkage at cross-shaft, then remove cross-shaft engine bracket. Using suitable lifting device, raise engine to remove weight from front mounts and remove front mount through bolts. Remove rear mount to crossmember bolts. Remove engine and transmission from vehicle as a unit.

INTAKE MANIFOLD

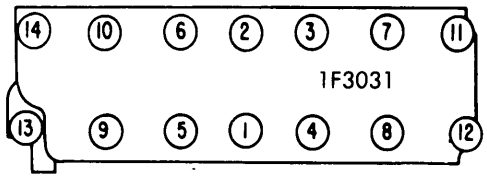
Removal — Disconnect battery and remove air cleaner. Disconnect power steering pump bracket and position pump to one side. Disconnect both throttle rods at bellcrank and remove throttle return spring. Disconnect fuel and vacuum lines at carburetor and vapor hose at canister. Disconnect exhaust pipe at manifold flange, remove manifold attaching bolts and clamps. Remove manifold assembly. To separate exhaust and intake, remove one bolt and two nuts at center of assembly.

Installation — Clean all gasket surfaces and reassemble manifolds using a new gasket, tightening nuts and bolts finger tight. Position new gasket on head and install manifold. Install and tighten bolts and clamps.

CYLINDER HEAD

Removal — Drain cooling system and remove manifold assembly. Disconnect all water and vacuum hoses to cylinder head. Disconnect wires, battery ground strap at head and remove coil. Remove rocker arm cover, rocker arm nuts, balls, rocker arms and push rods. *NOTE — Retain rocker arm components and push rods in order, for reinstallation in original location.* Remove cylinder head bolts, cylinder head and gaskets.

Installation — Clean all gasket surfaces, threads on cylinder head bolts and in block. Position new head gasket on block with the head up. *NOTE — Do not use gasket sealer on composition steel asbestos gasket.* Position cylinder head on gasket and install bolts, using suitable sealer on threads. Tighten bolts in sequence (see illustration).



CYLINDER HEAD TIGHTENING SEQUENCE

VALVES								
Engine & Valve		Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
250"	Int.	1.715-1.725"	45°	46°	1/32-1/16"	.3410-.3417"	.001-.0027"	.....
	Exh.	1.495-1.505"	45°	46°	1/16-3/32"	.3410-.3417"	.0015-.0032"	.....

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E-E-I-I-E

VALVE GUIDE SERVICING

Valve guides are integral with cylinder head. If valve stem-to-guide clearance is not within specifications, ream guide to install valve with oversize stem. Valves are available in .003", .015" and .030" oversize. *CAUTION — Ream valve guides in steps, starting with .003" reamer and progressing to size required.* Reface valve seat and use suitable tool to break sharp corner (ID) of guide after reaming for oversize valve stem.

VALVE STEM OIL SEALS

"O" ring type used on all valves. Installed in lowest groove on upper part of valve stem above spring shield and below spring cap and locks.

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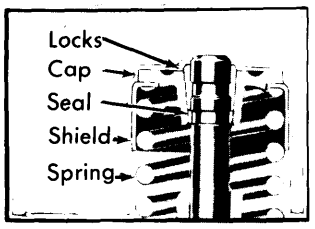
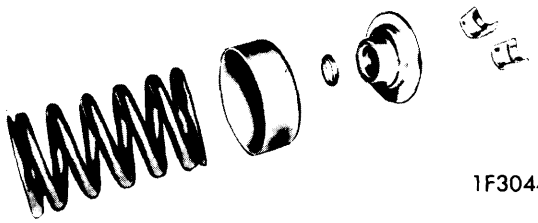
VALVE SPRINGS			
Engine	Free Length	PRESSURE (LBS.)	
		Valve Closed	Valve Open
250"	1.90"	55-64 @ 1.66"	180-192@1.27"

VALVE SPRINGS

Removal – Remove rocker arm cover, spark plug, rocker arm and push rod on cylinder(s) to be serviced. Install suitable air line adapter to spark plug port and apply air to hold valves in place. Using suitable tool (J-22891), compress valve spring and remove valve locks, cap, shield and valve spring. Remove and discard oil seal.

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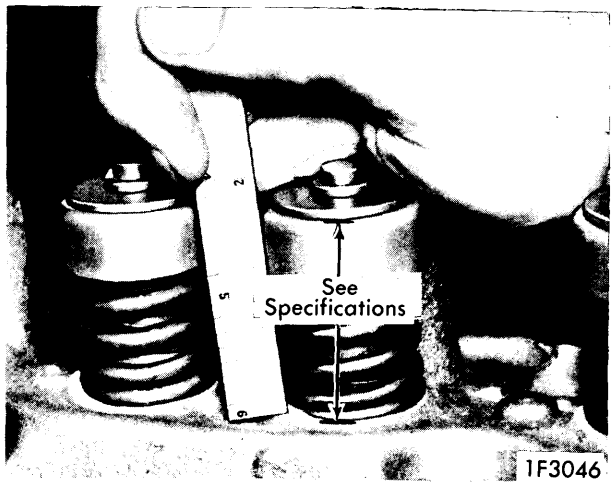
VALVE SPRING ASSEMBLY

Installation – Before reinstalling old springs, check with a suitable spring tester. Replace springs which are not within specifications. Set valve spring, shield and cap in place on valve stem. Compress spring and install oil seal in lower groove of stem (ensure seal is flat and not twisted). Install valve locks and release compressor tool. Check that valve locks are properly seated in upper groove of valve stem. *NOTE – Close coiled end of spring must be installed closest to cylinder head.*



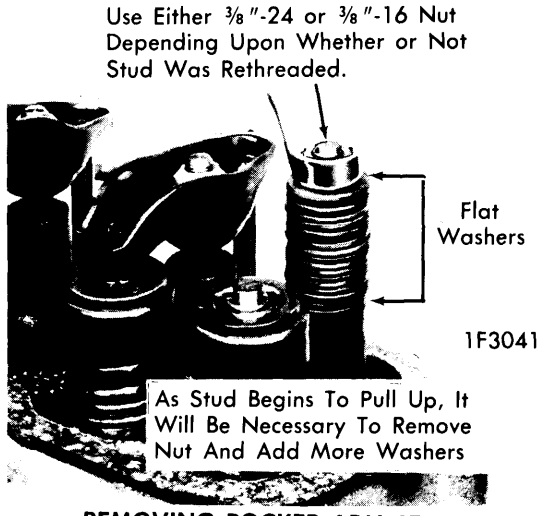
VALVE SPRING INSTALLED HEIGHT

VALVE SPRING INSTALLED HEIGHT

Installed height of valve spring should be $1^{2}\frac{1}{32}" \pm \frac{1}{32}"$. Measure from top of spring seat in head to top of spring or spring shield (see illustration). If measurement exceeds specifications, install $\frac{1}{16}"$ shim at spring seat. Do not shim to obtain a height under minimum specified.

ROCKER ARM STUDS

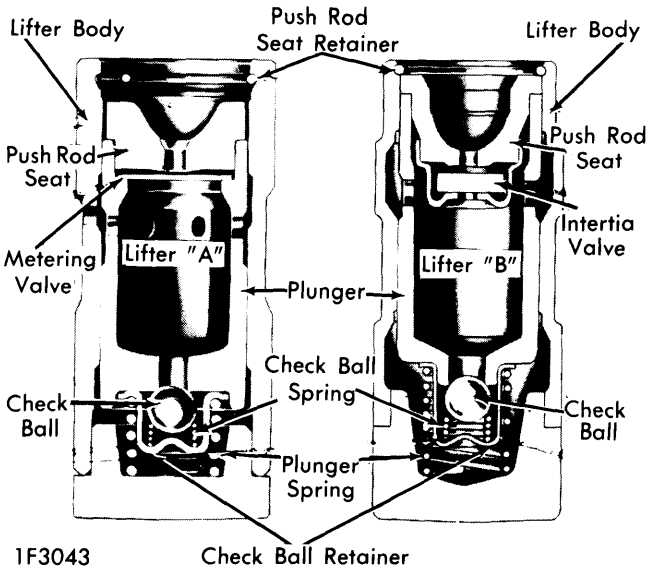
Studs that have damaged threads or are loose in head should be replaced. Studs are available in .001", .003" or .013" oversize. Ream hole for oversize studs and coat press fit area of stud with hypoid axle lubricant. *CAUTION – Do not attempt to install oversize studs without reaming stud hole.*



REMOVING ROCKER ARM STUD

HYDRAULIC VALVE LIFTER ASSEMBLY

Two types of lifters are used. Units are interchangable as complete assemblies, but internal parts of lifters are not interchangeable. Type "A" has a groove near its base which type "B" lacks. Type "B" uses an inertia valve and retainer which should not be removed from push rod seat. To check type "B", shake push rod seat and inertia valve assemly and valve should move. Lifters are serivced as complete assemblies only. *CAUTION – Do not pump lifter assembly during leakdown test.*



HYDRAULIC VALVE LIFTERS

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HYDRAULIC VALVE LIFTER ADJUSTMENT

1) Crank engine until rotor points to No. 1 cylinder position and points are open. Adjust the following valves:

Intake – Nos. 1, 2, 4. **Exhaust** – Nos. 1, 3, 5.

Back out rocker arm adjusting nut until lash is felt at push rod, then turn in nut until all lash is removed. When lash is removed, turn adjusting nut in one full additional turn.

2) Crank engine until rotor points to No. 6 cylinder position and points are open. Adjust the following valves:

Intake – Nos. 3, 5, 6. **Exhaust** – Nos. 2, 4, 6.

PISTONS, PINS, RINGS

	PISTONS	PINS		RINGS		
Engine	①Clearance	② Piston Fit	③ Rod Fit	Ring	End Gap	④ Side Clearance
250"	.0005-.0015"	.00015-.00025"	.0008-.0016"	Top 2nd Oil	.010-.020" .010-.020" .015-.055"	.0012-.0027" .0012-.0032" .005" Max.

① – Wear Limit – .0025"
② – Wear Limit – .001"
③ – Interference fit.
④ – Wear Limit – .001"

OIL PAN

Removal – 1) Disconnect positive battery cable, fuel line at fuel pump and remove radiator upper mounting panel or side mount bolts. Position a piece of heavy cardboard between fan and radiator. Raise vehicle on hoist and drain oil.

2) Disconnect and remove starter. Remove flywheel underpan or converter housing underpan and splash shield. Disconnect steering rod at idler lever and position to one side. Rotate crankshaft until timing mark on torsional damper is at 6 o'clock position. Remove bolts attaching brake line to front crossmember and move line away from crossmember.

3) Remove engine front mount through bolts and oil pan bolts. Remove left engine mount and frame bracket. Remove oil pan by lowering slightly and then rolling it into opening created by removal of left engine mount. Tilt front of pan upward and remove by pulling pan down and to rear of vehicle.

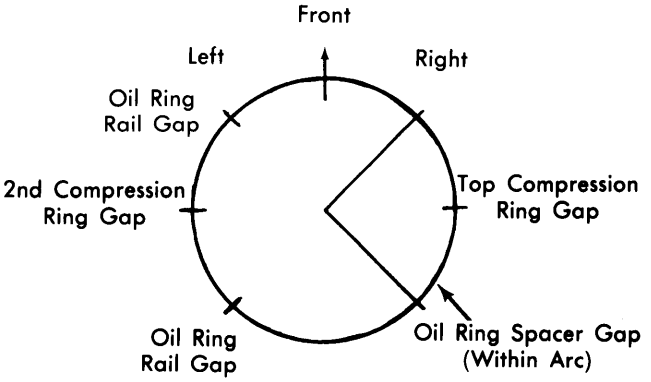
Installation – Clean all gasket surfaces. Install new rear seal in rear main bearing cap and front seal on crankcase front cover (press tips into holes provided in cover). Install side gaskets to block using suitable sealer. Install oil pan and tighten bolts.

PISTON & ROD ASSEMBLY

NOTE – New pistons must be installed in same cylinders for which they were fitted and used pistons in same cylinder from which they were removed.

Removal – With oil pan, oil pump and cylinder head removed, use a suitable ridge reamer to remove any ridge or deposits on upper end of cylinder bore. *NOTE – Piston must be at bottom of stroke and covered with cloth to collect cuttings.* Inspect connecting rods and caps for cylinder identifications and mark as necessary. Remove rod cap and install a piece of ⅜" hose on connecting rod studs. Push piston and rod assembly out top of cylinder block.

Installation – Lightly coat pistons, rings and cylinder walls with engine oil. Ensure ring gaps are properly spaced (see illustration) and compression ring has marked side toward top of piston. Install ring compressor on piston. With ⅜" hose on connecting rod studs, install each piston and rod assembly (with notch on piston head towards front of engine and oiling hole in connecting rod towards camshaft) in its respective bore. Guide connecting rod onto crankshaft journal while tapping piston head with hammer handle to seal connecting rod against crankshaft. Remove hose from studs and install mating rod cap. Tighten rod cap nuts.



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RING GAP LOCATIONS

FITTING PISTONS

Measure cylinder bore diameter 2 1/2" from top of cylinder bore. Measure piston diameter across center line of piston pin. Maximum acceptable clearance is .0025" (used or new piston in worn cylinder bore). Oversize pistons are available in .001" and .030" oversize.

PISTON PINS

Piston and piston pin are a matched set and are not serviced separately. Measure diameter of piston pin and measure piston pin bore. If clearance is in excess of limits, piston and pin should be replaced.

Removal – Place piston on suitable support and using a pilot tool as a driver, press pin from piston and rod.

Installation – Assemble rod to piston and place on suitable support. Use a pilot tool and an arbor press to press pin into piston and rod assembly. Check piston for freedom of movement on pin.

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CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
	MAIN BEARINGS				CONNECTING ROD BEARINGS		
Engine	Journal Diam.	① Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
250"	2.2983-2.2993"	.0003-.0029"	Rear	.002-.006"	1.9928-2.000"	.0035"	.009-.014"

① – No. 1 Bearing .002".

MAIN & CONNECTING ROD BEARINGS

Connecting Rod Bearings – With oil pan and oil pump removed, ensure rod caps are marked for cylinder identification and remove rod caps. Use Plastigage method to check for proper bearing clearances. If not within specifications, new bearings must be installed. New bearings are available in .001", .002", .010" and .020" undersizes. Selective fitting is required on each connecting rod. *NOTE – Always replace bearings in pairs. Never use a new bearing with a used bearing.* Coat bearing surfaces with oil, install rod cap and tighten nuts.

Main Bearings – 1) Support crankshaft at both front and rear and ensure that all bearing caps, other than one being checked, are tight. Starting with rear main bearing cap and working forward, remove one cap at a time and check bearing clearances using Plastigage method. If clearances are not within specifications, bearings are available in .001", .002", .010" and .020" undersizes. *NOTE – Always replace bearings in pairs. Never use a new bearing with a used bearing. Upper and lower bearings are not interchangeable.*

2) Remove all upper main bearings by inserting suitable tool in oil hole of crankshaft journal (except rear main) and rotating crankshaft clockwise to roll bearing from engine. Oil new upper bearing and insert plain (unnotched) end between crankshaft and indented (or notched) side of block. Rotate bearing into place.

3) To replace upper rear main bearing, use a small drift punch and hammer to start bearing rotating out of block. *NOTE – Do not nick crankshaft journal.* Use a pair of pliers (with taped jaws) to hold bearing thrust surface to oil slinger and rotate crankshaft to remove bearing. Oil new bearing and insert plain (unnotched) end between crankshaft and indented (or notched) side of block. Use pliers as in removal to rotate bearing into place.

REAR MAIN BEARING OIL SEAL

Removal – *NOTE – Replace upper and lower seal halves as a unit and install seal with lip facing front of engine.* With oil pan removed, remove rear main bearing cap. Remove seal from cap. Use a small brass drift punch to tap upper seal until end protrudes far enough to be removed with pliers.

Installation – Lubricate seal lips and bead with engine oil, keeping oil off seal mating ends. While rotating crankshaft, roll seal into place being careful that seal bead is not cut. Install rear main bearing cap (with new seal) and tighten bolts. *NOTE – Cross seal tabs must be in place and properly seated.*

ENGINE FRONT COVER

Removal – Remove engine from vehicle and remove oil pan. Using suitable tool (J-6978), remove torsional damper. Remove front cover bolts and front cover.

Installation – Clean all gasket surfaces. Install suitable centering tool (J-21742) in front cover oil seal. Use suitable sealer on new gasket and position gasket on cover, then install cover to block and tighten bolts. Remove centering tool. *NOTE – Centering tool must be used so torsional damper installation will not damage seal and seal is positioned evenly around balancer.*

FRONT COVER OIL SEAL

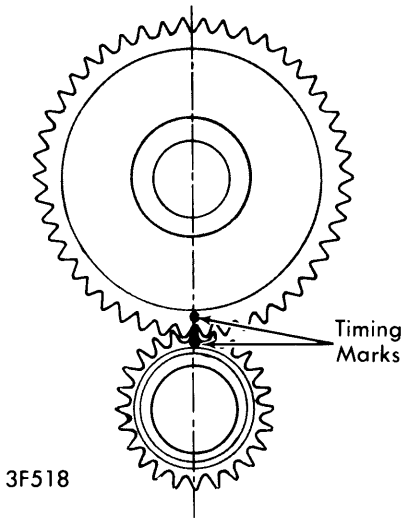
Removal – With front cover removed, pry old seal out of front cover taking care not to distort cover.

Installation – Install new seal with open end towards inside of cover. Drive seal into position with suitable tool. *CAUTION – Support cover at sealing area to prevent cover distortion.*

CAMSHAFT			
Engine	Journal Diam.	Clearance	Lobe Lift
250"	1.8682-1.8692"	.....	.2217"

TIMING GEARS

With valve timing marks lined up (see illustration), check backlash between timing gears with a dial indicator. Backlash should be .004-.006". Remove camshaft from engine and replace gear if necessary. See *Camshaft Gear*. Use suitable puller (J-6978) to remove crankshaft gear and drive new gear onto crankshaft using suitable driver. Install camshaft with gear, ensuring timing marks are lined up.



TIMING GEAR ALIGNMENT

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CAMSHAFT

Removal – Remove engine from vehicle. Remove front cover, valve lifters and fuel pump. Align timing marks and remove two camshaft thrust plate bolts by working through holes in camshaft gear. Remove camshaft and gear assembly by pulling out through front of block. *NOTE – Support camshaft when removing so as not to damage camshaft bearings.*

Installation – Install camshaft and gear assembly being careful not to damage bearings or camshaft. Line up timing marks on camshaft and crankshaft gears and push camshaft into position. Install bolts and tighten.

CAMSHAFT GEAR

Removal – With camshaft removed from engine, use suitable gear remover and place camshaft through remover, place end of remover on table of arbor press and press shaft out of gear. *CAUTION – Thrust plate must be positioned so Woodruff key in shaft does not damage it when shaft is pressed out of gear. Support hub of gear to prevent damage to gear.*

Installation – Support camshaft at back of front journal in a arbor press. Place gear spacer ring and thrust plate over end of shaft. Install Woodruff key in shaft keyway. Install gear and press onto shaft until it bottoms against gear spacer ring. Check that end clearance of thrust plate is .001-.005".

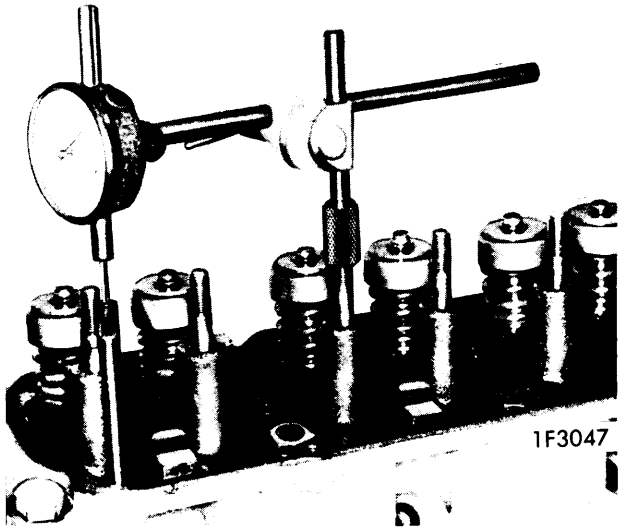
CAM LOBE LIFT

With valve cover, rocker arms and balls removed from cylinder head, proceed as follows:

1) Using suitable clamping or mounting fixture, attach dial indicator to rocker arm stud so indicator probe rests on top of push rod with indicator and probe in a vertical position over push rod.

2) Rotate crankshaft slowly in direction of engine rotation or, using an auxiliary starter switch, bump engine until valve lifter is on heel of cam lobe. At this point, push rod will be at its lowest point. *CAUTION – If using an auxiliary starter switch, distributor primary lead must be disconnected from negative post of coil.*

3) With push rod at lowest position, zero dial indicator and bump engine over until push rod is in fully raised position. Compare total lift recorded with specifications. Continue to rotate crankshaft until indicator reads zero. Check all remaining lobes of camshaft in same manner.



MEASURING CAMSHAFT LOBE LIFT

ENGINE OILING

Crankcase Capacity – 4 quarts. Add 1 quart with filter change.

Oil Filter – Replace filter at first oil change, then every second oil change thereafter.

Normal Oil Pressure (Hot) – 40 psi @ 2000 RPM.

Pressure Regulator Valve – In pump body. Not adjustable.

ENGINE OILING SYSTEM

Oil under pressure is directed from oil pump to a full-flow oil filter. In case filter becomes clogged and restricts full flow of oil, a by-pass valve is located in filter mounting base. From oil filter, oil flow is directed as follows:

Crankshaft & Camshaft Bearings – Each main and camshaft bearing receives oil from a passage extending through crankcase webs from main oil gallery.

Connecting Rods & Pistons – Oil is delivered from each main bearing to adjacent connecting rod bearing through drilled passages in crankshaft. A hole in connecting rod sprays oil onto cylinder walls for piston and pin lubrication, when holes in rod and journal index.

Valve Lifters – Main oil gallery intersects lifter bores and lifters are supplied with oil directly from main oil gallery. Lifter has metering valve directly below hole in push rod seat to permit oil to pass into hollow push rod.

Rocker Arms & Valve Stems – Oil passes up through hollow push rod to a hole in upper end of push rod that matches hole in rocker arm. Oil sprayed from this hole and across rocker arm lubricates valve stem tip. Oil in rocker arm chamber drains down through push rod holes to valve lifter chamber, then returns to crankcase through drain holes.

Timing Gears – Lubricated by oil flow from a nozzle pressed in front face of block above crankshaft gear. Oil is fed to nozzle through cross-passage from front camshaft bearing.

Distributor Drive Gear – Lubricated by oil drainage from valve lifter chamber.

OIL PUMP

Removal – Mark gears so they may be reassembled with the same teeth indexing. Do not disturb pickup screen on pipe. Screen is serviced as an assembly. *NOTE – If pump gears or body are damaged or worn, replacement of entire pump assembly is required.*

Installation – Apply sealer to end of pipe and tap into place. Install idler gear in pump body with smooth side of gear toward cover opening. *NOTE – Bottom of screen must be parallel with bottom of pan.*

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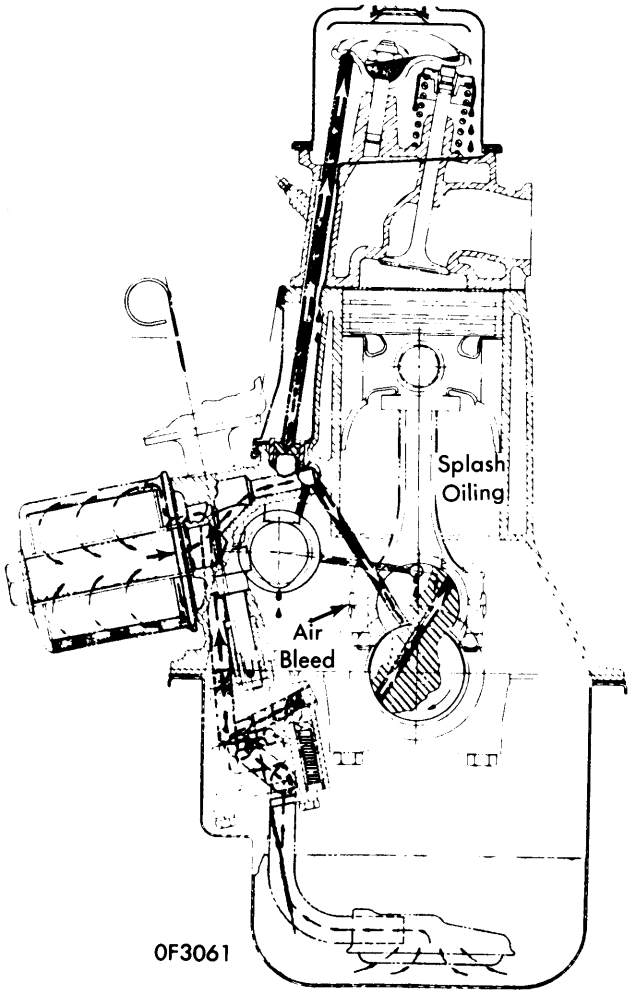
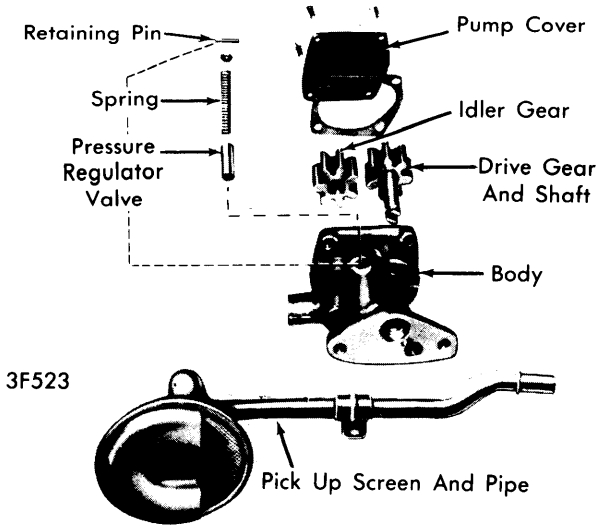
ENGINE OILING (Cont.)



ENGINE OILING SYSTEM



OIL PUMP ASSEMBLY

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Cylinder Head	95
Manifold Clamp Bolt	30
Intake Manifold-to-Exhaust Manifold	25
Oil Pan-to-Block (1/4")	7
(5/16")	7
Oil Pan-to-Front Cover	5
Main Bearing Caps	65
Flywheel	60
Connecting Rod Caps	35
Camshaft Thrust Plate	7
Engine Front Cover	7
Water Pump	15
Water Outlet	20
Thermostat Housing	30
Oil Pump Mounting	9

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