

Oldsmobile 6 Engines

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

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.....	CCC,CCD.....	CCA,CCB

ENGINE REMOVAL

- 1) Drain cooling system, disconnect battery cables, remove hood (mark hinge positions) and radiator shroud. Disconnect all wires, water and vacuum hoses, hot air pipe, and fuel line (from tank) at fuel pump. Disconnect accelerator linkage at manifold bellcrank and exhaust pipe at manifold flange.
- 2) Remove upper radiator support and radiator. If equipped with power steering, remove pump bracket at block and lay aside. Raise vehicle on hoist. With manual transmission, disconnect clutch equalizer. Remove transmission to engine attaching bolts and lower vehicle.
- 3) Raise transmission slightly with a floor jack and remove engine front mount through bolts. Attach lifting tackle to engine and remove engine assembly from chassis.

INTAKE MANIFOLD

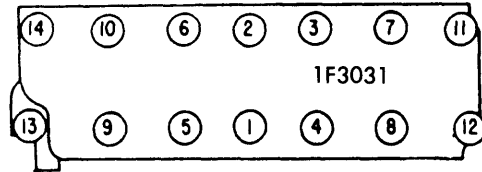
Removal – Remove air cleaner, disconnect throttle controls at bellcrank and remove throttle return spring. Disconnect fuel and vacuum lines at carburetor. Disconnect crankcase ventilation hose at rocker arm and exhaust pipe at manifold. Remove manifold bolts and remove manifold.

Installation – Clean all gasket surfaces on cylinder head and manifolds. Install new gasket and manifold assembly. Tighten all nuts and bolts.

CYLINDER HEAD

Removal – Drain cooling system, remove intake manifold assembly, and remove rocker arm nuts, balls, rocker arms and push rods. Disconnect necessary wires and hoses, remove coil, cylinder head bolts, then remove cylinder head and gasket.

Installation – Thoroughly clean all gasket surfaces, threads on head bolts and in block. Do not use gasket sealer on composition steel asbestos gaskets. Install head bolts (with sealer on threads) finger tight, then tighten evenly 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. Exh.	1.715-1.725"	45°	46°	1/32-1/16"	.3410-.3417"	.001-.0027"
	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

Guides are integral with cylinder head. Valves with oversize stems are available in .003", .0015" and .030" oversize. Ream guides to proper oversize using step procedure.

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.

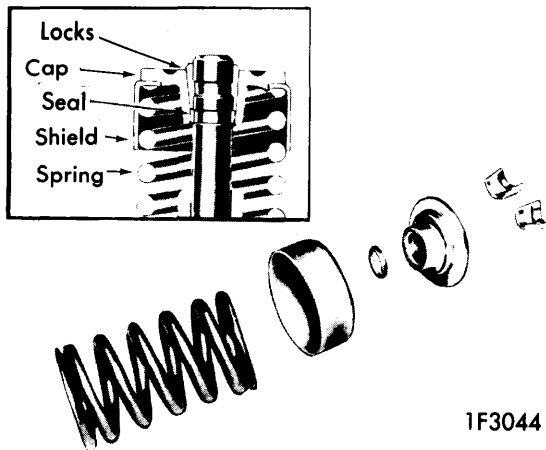
VALVE SPRINGS

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 (BT-6413), compress valve spring and remove valve locks, cap, shield and valve spring. Remove and discard oil seal.

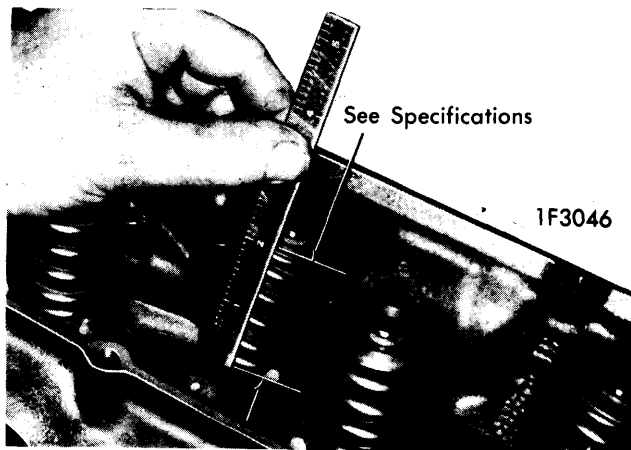
Installation — Before reinstalling old springs, check with a suitable spring tester. Springs should be replaced if not within 10 lbs. of specified load. Set valve spring, shield and cap in place on valve stem. Compress spring and install oil seal in lower groove of stem (ensure seal is flat and not twisted). 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 INSTALLATION

VALVE SPRING INSTALLED HEIGHT

Installed height of valve spring should be $1\frac{1}{32}'' \pm \frac{1}{32}''$. 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.

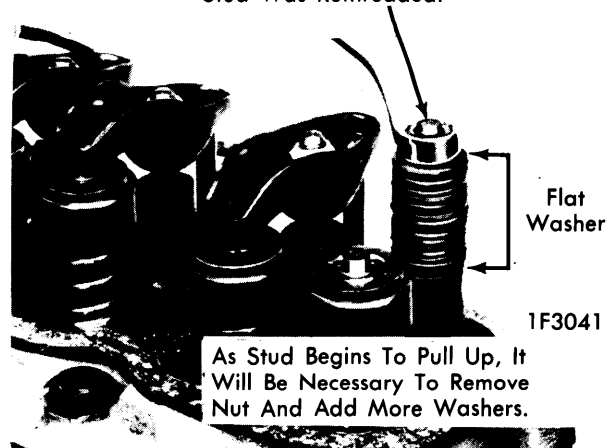


VALVE SPRING INSTALLED HEIGHT

ROCKER ARM STUDS

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

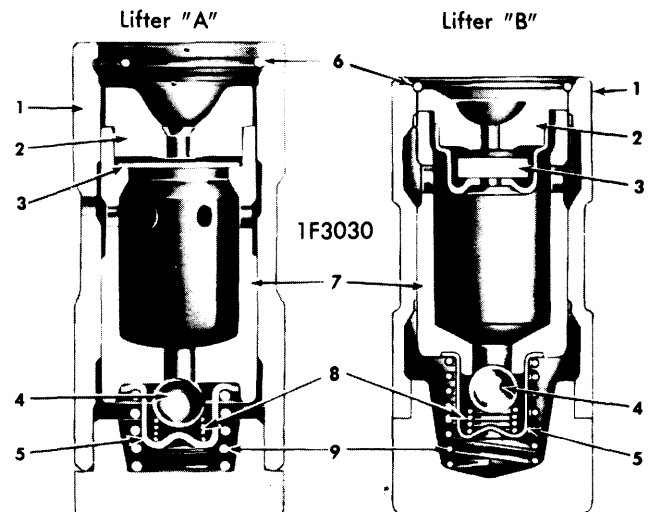
Use Either $\frac{3}{8}''-24$ or $\frac{3}{8}''-16$ Nut Depending Upon Whether Or Not Stud Was Rethreaded.



REMOVING ROCKER ARM STUD

HYDRAULIC VALVE LIFTER ASSEMBLY

Two types of lifters are used. Units are interchangeable 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 assembly and valve should move. Lifters are serviced as complete assemblies only. **CAUTION** — Do not pump lifter assembly during leakdown test.



- 1 — Lifter Body
- 2 — Push Rod Seat
- 3 — Metering Valve (Type "A")
- 4 — Check Ball
- 5 — Check Ball Retainer
- 6 — Push Rod Seat Retainer
- 7 — Plunger
- 8 — Check Ball Spring
- 9 — Plunger Spring

HYDRAULIC VALVE LIFTERS

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						
Engine	PISTONS	PINS		RINGS		
	① Clearance	② Piston Fit	③ Rod Fit	Ring	End Gap	Side Clearance ④
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 negative battery cable, fuel line at fuel pump and starter leads at starter motor. Remove upper radiator support and bracket to upper hose. Remove front engine mount bolts (bracket to engine mount).

2) Raise vehicle and drain oil. Disconnect transmission manual linkage (automatic only), exhaust pipe at exhaust manifold, and remove flywheel cover and starter. Position timing mark notch at 6 o'clock position.

3) Raise engine using suitable tool (BT-6501) under harmonic balancer and remove right engine mount with bracket (mount to frame). Remove oil pan bolts and raise engine just high enough to remove oil pan. **CAUTION** – Avoid over-lifting engine as cowl-mounted parts may be damaged. Remove oil pan.

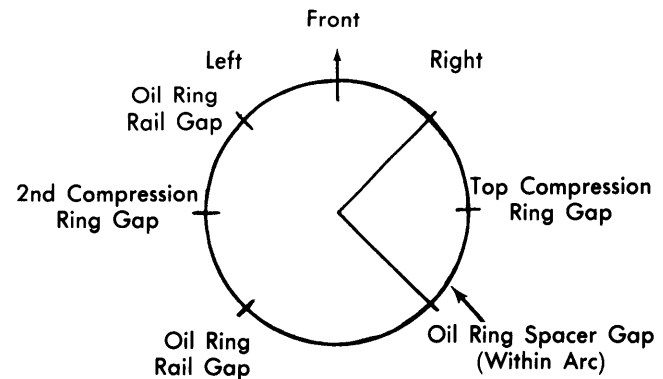
Installation – Clean all gasket surfaces, install new gaskets using suitable sealer and install oil pan. Tighten all bolts evenly.

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 identification and mark as necessary. Remove rod cap and install a piece of 3/8" 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 3/8" 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 seat connecting rod against crankshaft. Remove hose from studs and install mating rod cap. Tighten rod cap nuts.



40L01

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.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam.	① Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
250"	2.2983-2.2993"	.0035"	Rear	.002-.006"	1.999-2.000"	.0035"	.009-.014"

① - No. 1 Bearing .002".

MAIN & CONNECTING ROD BEARINGS

NOTE - Following procedures are with oil pan and oil pump removed.

Connecting Rod Bearings - After ensuring rod caps are marked for cylinder identification, 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", and .002" undersizes. Selective fitting is required on each connecting rod. A standard bearing half may be used in combination with a .001" under-size, or a .002" under-size in combination with a .001" under-size. **NOTE** - Always replace bearings in pairs. Never use a new bearing half with a used bearing half. Coat bearing surfaces with oil, install rod cap and tighten nuts.

Main Bearings - 1) Support crankshaft at both front and rear (damper and flywheel) 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.

2) If clearances are not within specifications, bearings are available in .001", .002", .010" and .020" undersizes. One half of a standard size bearing can be used in conjunction with one half of a .001" under-size bearing to obtain proper clearances. **NOTE** - Some production crankshafts are ground .009" under-size. A engine fitted with a under-size crankshaft is identified by .009" stamped on crankshaft counterweight forward of center main journal. A figure "9" will be stamped on block at left front oil pan rail.

3) Remove all main bearing upper halves (except rear main) by inserting suitable tool in oil hole of crankshaft journal 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.

4) To replace rear main bearing upper half, use a small drift punch and hammer to start bearing rotating out of block. **NOTE** - Take care not to 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.

5) Main bearing caps are to be installed with arrows pointing forward. Tighten main bearing bolts except rear main. Torque rear main bolts 10-12 ft. lbs. and tap end of crankshaft, first rearward, then forward to line up rear main bearing with crankshaft thrust face. Tighten all main bearing cap bolts. Rotate crankshaft to ensure there is no excessive drag.

REAR MAIN BEARING OIL SEAL

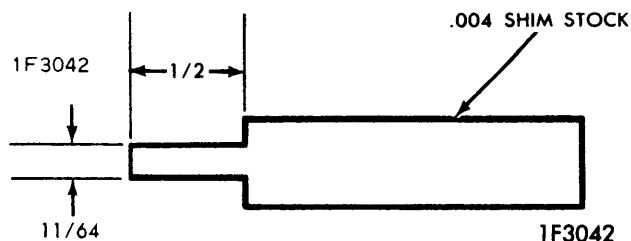
NOTE - Replace upper and lower seal halves as a unit. Install seal with lip facing front of engine. With oil pan and oil pump removed, proceed as follows:

Removal - Remove rear main bearing cap and 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 - 1) Coat seal lips and bead with light engine oil, keeping oil off seal mating ends. To replace upper seal, fabricate a tool from .004" shim stock (see illustration). Position top of tool between crankshaft and seal seat, then position seal between crankshaft and tip of tool so seal bead contacts tip of tool.

2) Roll seal around crankshaft using tool as a "shoehorn" to protect seal bead from sharp corner of seal seat surface. Remove tool, being careful not to withdraw seal.

3) Install lower seal in bearing cap, using tool as a "shoehorn". Feed seal into cap using light pressure with thumb and finger. Apply sealant to bearing cap interface, being careful to keep sealant off seal split line. Install bearing cap and tighten bolts.



REAR MAIN SEAL INSTALLING TOOL

ENGINE FRONT COVER

Removal - Remove harmonic balancer and two oil pan-to-front cover bolts. Remove front cover bolts. Pull cover slightly forward and cut oil pan front seal flush with cylinder block at both sides of cover. Remove front cover.

Installation - Clean all gasket surfaces. Cut tabs from new oil pan front seal and install seal to front cover, pressing tips into holes in cover. Coat front cover gasket with sealer and position on cover. Apply a 1/8" bead of silicone rubber sealant to joint formed at oil pan and cylinder block. Install suitable centering tool (J-23042) in front cover seal. **NOTE** - Centering tool must be used so torsional damper installation will not damage seal and seal is positioned evenly around balancer. Install front cover to block. Install oil pan-to-cover bolts finger tight. Install front cover bolts and tighten all bolts.

FRONT COVER OIL SEAL

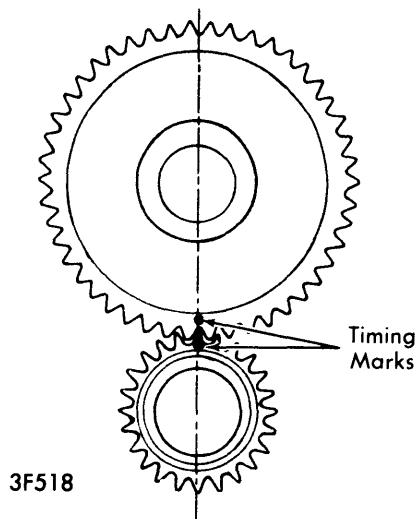
Removal – With front cover removed, pry old seal out of cover front. If cover is on engine, remove torsional damper and pry old seal from cover.

Installation – Install new seal with open end towards inside of cover. Drive seal into position with suitable tool. **CAUTION** – If cover is removed from engine, it must be supported 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 (BT-6610) 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

CAMSHAFT

Removal – Remove valve lifters, front cover, grille, radiator, fuel pump and condenser if equipped with A/C. Align timing gear marks and remove camshaft thrust plate bolts. Remove camshaft by pulling out through front of block.

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 torque to specifications.

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".

CAMSHAFT BEARINGS

Following procedures are performed with front cover, lifters, oil pan, oil pump and camshaft removed from engine. Engine must be removed from vehicle.

Removal – Using suitable tool (BT-6609) drive out No. 1 bearing. Install pilot and drive out Nos. 2 and 3. Slide slip ring forward on jaws of tool so tool will enter behind No. 4 bearing. Pull ring rearward so jaws of tool will expand behind bearing and pull out.

Installation – Install pilot and drive Nos. 4, 3 and 2 bearings into place until white marks on tool are flush with pilot. **NOTE** – Oil holes must be aligned. Drive No. 1 bearing into place.

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.

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.

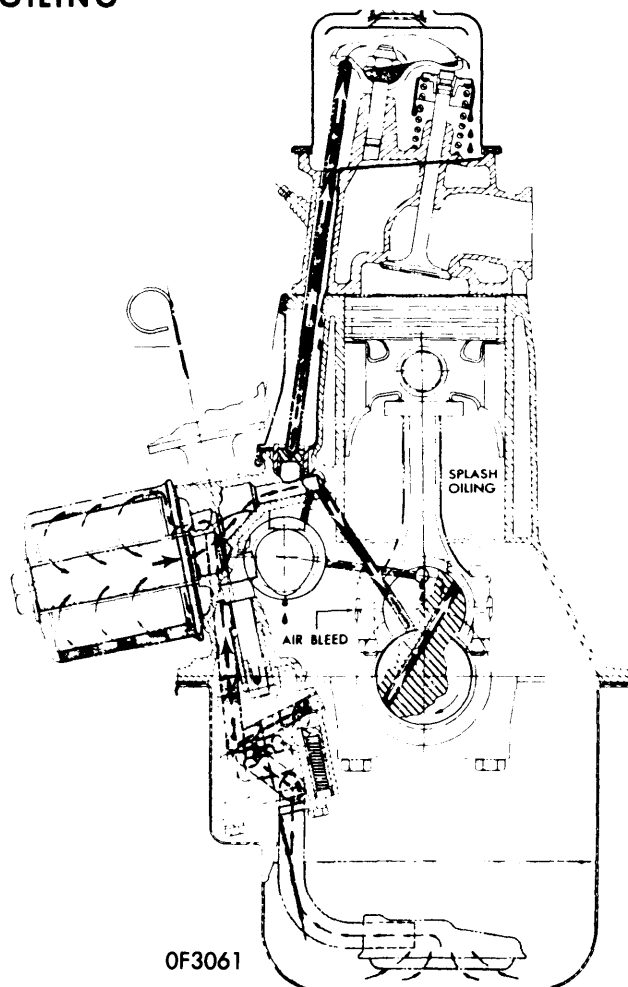
Connecting Rods & Pistons - Oil is delivered from each main bearing to adjacent connecting rod bearing through drilled passages in crankshaft. A hole in connecting rod sprays oil onto cylinder walls for piston and pin lubrication, when holes in rod and journal index.

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.

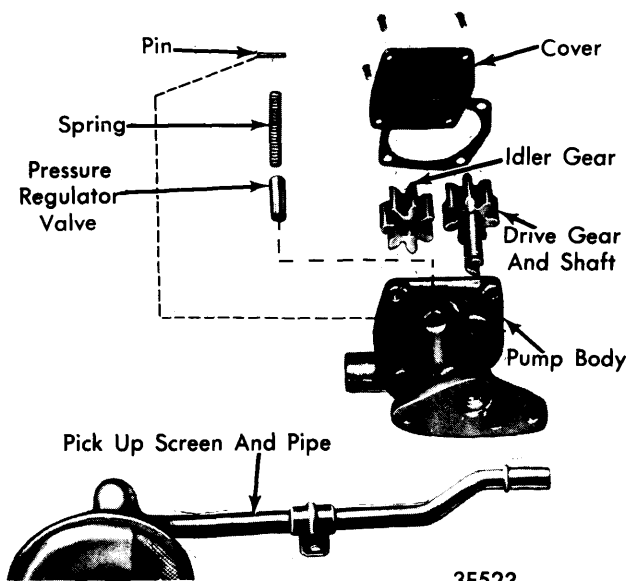


ENGINE OILING SYSTEM

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.



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