

Oldsmobile V8 Engines

GENERAL SPECIFICATIONS						
Engine	Net HP At RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore	Stroke	Displ. Cu. Ins.
350" 4-Bbl.	180 @ 3800	275 @ 2800	8.5-1	4.057"	3.385"	350
4-Bbl.①	200 @ 4200	300 @ 3200	8.5-1	4.057"	3.385"	350
455" 4-Bbl.	210 @ 3600	350 @ 2400	8.5-1	4.126"	4.250"	455
4-Bbl.②	230 @ 3800	370 @ 2800	8.5-1	4.126"	4.250"	455
4-Bbl.	230 @ 4000	370 @ 2800	8.5-1	4.126"	4.250"	455
4-Bbl.	275 @ 4200	395 @ 3200	8.5-1	4.126"	4.250"	455

① — Dual Exhaust.

② — Toronado

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

Engine can be identified by a Code Tape containing engine code letters. The Code Tape is located directly above engine unit number on oil fill tube. Engines are coded as follows:

Application	California	Federal
350" 4-Bbl.	TB,TC,TL,TO.....	QB,QC,QL, QO,QU,QW
455" 4-Bbl.	VA,VB,VC,VD VL,VO,VP.....	UA,UB,UC,UD, UL,UN,UP,UR, UO,UV,UX

ENGINE REMOVAL

Drain cooling system and remove hood (mark hinge positions), air cleaner and hot air pipe. Disconnect battery cables, transmission cooler lines, all hoses, vacuum lines and electrical connections, exhaust pipes at manifolds and throttle cable. Remove upper radiator support and radiator. Remove power steering pump bracket and position pump to side with hoses attached. Remove A/C compressor bracket and position compressor to side with hoses attached.

All (Except Toronado) — 1) Raise car and remove torque converter cover. Remove engine mount bolts or nuts and three bolts holding converter to flywheel. Remove three bolts, transmission-to-engine, on right side. Remove starter with wires attached and position to one side.

2) Lower car and support transmission with floor jack (raise slightly). Remove three left transmission-to-engine bolts. Attach suitable lift chain (BT-6606) to engine and remove engine from car.

Toronado — 1) Disconnect fuel lines at fuel pump and raise car. Loosen upper left hand bolt securing flywheel cover. Disconnect and remove starter. Remove three remaining flywheel cover bolts and pivot cover out of upper left hand bolt slot. Remove converter-to-flywheel bolts and scribe converter to flywheel for reassembly.

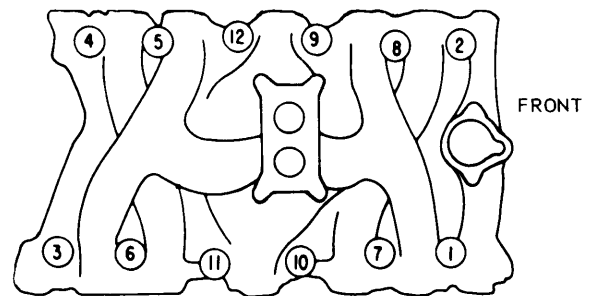
2) Remove engine front mount attaching nuts. Remove bolts securing right hand output shaft support brackets. Scribe as far around washers as possible to assure original alignment when bracket is replaced. Remove through bolt and bracket securing final drive to engine on left side.

3) Remove lower right hand transmission to engine attaching bolts. Support final drive assembly with chain to frame. Lower car and attach lifting tackle to engine. Remove five remaining transmission bolts (raising or lowering transmission as necessary). Remove engine from car.

INTAKE MANIFOLD

Removal — Drain radiator and remove air cleaner assembly. Disconnect all coolant hoses to manifold, throttle cable, fuel and vacuum lines. Remove coil and disconnect or remove alternator and A/C compressor brackets as necessary. Remove bolts and remove intake manifold assembly from engine with carburetor attached. **NOTE** — Remove oil fill tube on 455" to provide removal clearance.

Installation — Clean all gasket surfaces. Coat both sides of new intake manifold gasket with suitable sealer and install gasket on head. Install end seals, being sure that ends of seals are positioned under edges of heads. Install manifold and bolts. Tighten bolts in two steps in sequence shown in illustration.



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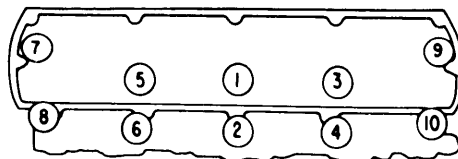
INTAKE MANIFOLD TIGHTENING SEQUENCE

CYLINDER HEAD

Removal - Drain cooling system and remove intake manifold. Remove exhaust manifold. Remove valve cover, rocker arm bolts, pivots, rocker arms and push rods. **NOTE** - Identify pivots and rocker arms for installation to original locations. Loosen or remove any accessory brackets which interfere. Remove cylinder head bolts and remove cylinder head.

Installation - Clean all gasket surfaces and coat both sides of head gasket with suitable sealer. Install gasket on block and install cylinder heads. **NOTE** - Install gasket with bead

toward cylinder block on 455". Dip cylinder head bolts in engine oil, install and tighten in two steps in sequence shown in illustration.



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CYLINDER HEAD TIGHTENING SEQUENCE

VALVES							
Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
350" Int.	1.875"	44°	45°	.037-.075"	.3425-.3432"	.0010-.0027"
Exh.	1.622"	30°	31°	.050-.090"	.3420-.3427"	.0015-.0032"
455" Int.	1.995"	44°	45°	.037-.075"	.3425-.3432"	.0010-.0027"
Exh.	1.622"	30°	31°	.050-.090"	.3420-.3427"	.0015-.0032"

VALVE ARRANGEMENT

I-E-I-E-E-I-E-I (both banks, front to rear).

VALVE GUIDE SERVICING

Guides are integral with cylinder head. If stem-to-guide clearance is excessive, replace valve. Some valves with oversize stems are used in production, and can be identified by marks on inboard side of cylinder head on machined surface just above intake manifold. Valve guide reamers are available in .003", .005" and .013" oversize. When reconditioning, always use next oversize reamer and replacement valve. Service valves are available in standard, .003", .005", .010", and .013" oversizes.

VALVE STEM OIL SEALS

Cup type used on all valves. Install with cupped side down toward cylinder head.

VALVE SPRINGS			
Engine	Free Length	PRESSURE (LBS.)	
		Valve Closed	Valve Open
All	1.96"	76-84 ①	180-194 ②

① - Spring compressed to 1.670" on 350"; 1.620" on 455".
 ② - Spring compressed to 1.270".

VALVE SPRINGS

Removal - Remove rocker arm cover, spark plug and rocker arm assemblies on cylinder(s) to be serviced. Install air line adapter (BT-72-1B) to spark plug port and apply air to hold valves in place. Using suitable tool (BT-6413), compress valve spring and remove valve keys, rotators and springs.

Installation - Reverse removal procedure and ensure that valve keys are securely locked in groove of valve stem.

VALVE SPRING INSTALLED HEIGHT

To measure valve stem height, place suitable tool (BT-6428) over installed valve stem, and measure clearance between gauge and stem. Clearance should be at least .035" (350" engines), or .005" (455" engines). Grind tip of valve stem if clearance less than specified. With valve keys installed on valves, tap all valve stem ends with a hammer to seat valve retainers (or rotators) and keys. Remeasure clearance between valve stem and gauge, then measure clearance between valve retainer (or rotator) and gauge. If any valve stem end is less than .005" above rotator or .030" above retainer, valve is too short and must be replaced.

ROCKER ARM ASSEMBLY

Friction surfaces on rocker arms and pivots must be coated with a suitable lubricant upon reassembly and installed in original locations.

HYDRAULIC VALVE LIFTER ASSEMBLY

Valve lifter assemblies must be kept in sequence when removed, (for installation in their original location). Some engines have both standard and .010" oversize lifters. Oversize is etched "O" on side of lifter and cylinder block. Inspect all components for nicks, burrs or scoring of parts. If either body or plunger is defective, replace with new lifter assembly. Check lifter foot for wear with a straightedge across lifter foot. Replace any lifter showing a concave surface on lifter foot.

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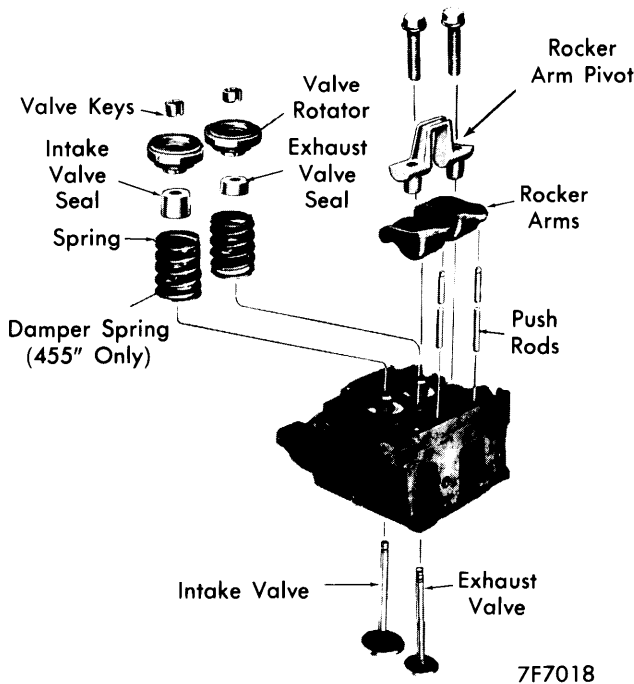
Leak-Down Testing — Lifter must be assembled while submerged in test fluid. Proceed as follows:

1) Install suitable adapter tool (BT-105-2) in reservoir of suitable leak-down tester (BT-60) and fill reservoir with test fluid to 1/2" below top of reservoir. Assemble ball check, spring and retainer into plunger with flange pressed tight against bottom of recess in plunger.

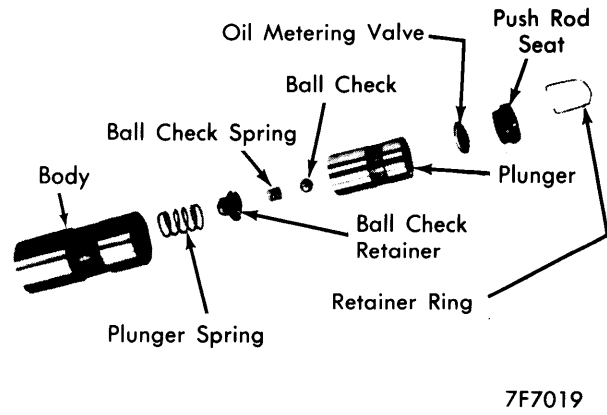
2) Install spring over ball check retainer. Hold plunger with spring up and insert into lifter body (to prevent cocking spring). Place assembly in tester cup and position push rod seat into plunger. Position 1/4" steel test ball on push rod seat and lower tester ram until it contacts steel ball. Allow ram to move downward by its own weight until air bubbles disappear. Repeat several times until all air is expelled from lifter. **CAUTION** — Do not attempt to expel air from lifter by pumping ram.

3) After air removed, allow ram to bleed down lifter to expose ring groove and install retaining ring. Adjust ram screw so it contacts steel ball in push rod seat when pointer is at start line. Raise arm and start test by resting ram on steel ball.

4) Rotate reservoir one revolution every two seconds, and time indicator from start line to stop line. Allowable leak-down time is six seconds for used lifters, and 9-60 seconds for new lifters. **NOTE** — If lifter within specifications, place in service without removing test fluid.



ROCKER ARM & VALVE ASSEMBLIES



HYDRAULIC VALVE LIFTER ASSEMBLY

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance	Piston Fit	Rod Fit ①	Ring	End Gap	Side Clearance
350"	.001-.002"	.0003-.0005"	.0008-.0018"	Top	.010-.023"	.0020-.0040"
				No. 2	.010-.023"	.0020-.0040"
				Oil	.015-.055"
455"	.001-.002"	.0003-.0005"	.0008-.0018"	Top	.010-.023"	.0020-.0040"
				No. 2	.010-.023"	.0020-.0040"
				Oil	.015-.055"

① Interference fit.

OIL PAN

Removal (All Except Toronado) — Align distributor rotor on No. 1 firing position. Disconnect battery cables and remove dipstick, upper radiator support and fan shroud. Hoist car and drain oil. Remove flywheel cover, starter and disconnect exhaust pipes. Disconnect engine mounts, jack up front of engine and remove oil pan.

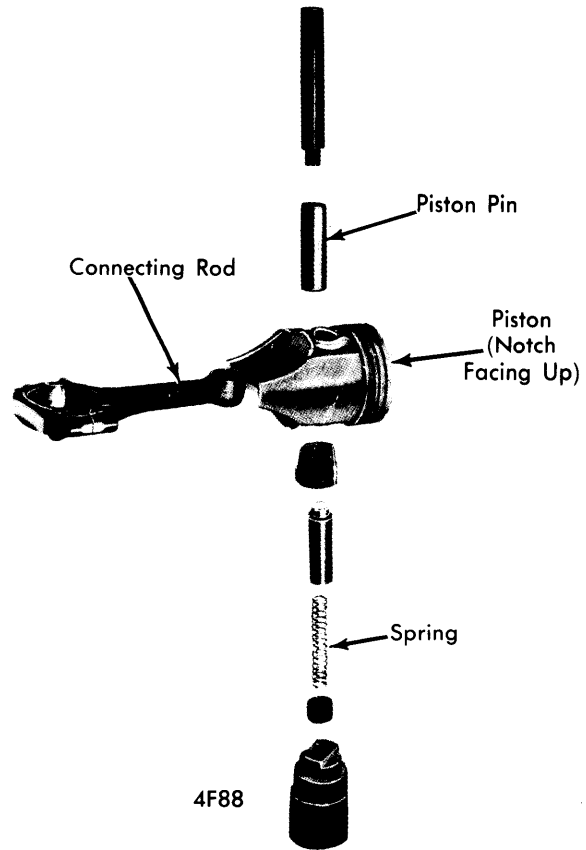
Removal (Toronado) — Remove engine assembly and position on engine stand. Drain oil and remove filter assembly. Remove front engine mount and bracket. Remove oil pan bolts and oil pan.

Installation (All Models) — Clean all gasket surfaces and coat both sides of side pan gaskets with suitable sealer. Position gaskets on engine block. Install front and rear seals ensuring that tab on gasket is installed in notch of seal. Install oil pan and tighten bolts evenly.

PISTON & ROD ASSEMBLY

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 short piece of 3/8" hose over connecting rod studs. Push piston and rod assembly out top of cylinder block.

Installation — Lightly coat pistons, rings and cylinder walls with engine oil. Install ring compressor on piston and install piston and rod assembly in its respective cylinder bore with notch on piston head facing front of engine. Guide connecting rod onto crankshaft journal while tapping piston head with hammer handle to seat connecting rod against crankshaft. Install mating rod cap and tighten rod cap nuts.



PISTON PIN REMOVAL & INSTALLATION

FITTING PISTONS

When measuring piston for size or taper, measurement must be made on skirt 90° from piston pin hole. To check cylinder-to-piston clearance, insert a .0015" x 1/2" x 12" ribbon feeler gauge between inverted piston (pin removed) and cylinder wall at right angle to piston pin position. Force required to withdraw feeler gauge should be 3-12 lbs.

PISTON PINS

Use suitable tool (BT-6408) for installation and removal of piston pin (see illustration) while noting following: Coat piston bore with engine oil before pressing new pin into place. Press in pin until it contacts stop tool.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam.	Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	⊕ Sideplay
350"	2.4990" ②	.0005-.0021" ③	No. 3	.004-.008"	2.1243"	.0004-.0033"	.006-.020"
455"	2.9998"	.0005-.0021" ④	No. 3	.004-.008"	2.4993"	.0004-.0033"	.006-.020"

- ① Total 2 rods.
- ② No. 1 is 2.4993"
- ③ No. 5 is .0015-.0031"
- ④ No. 5 is .0020-.0034"

MAIN & CONNECTING ROD BEARINGS

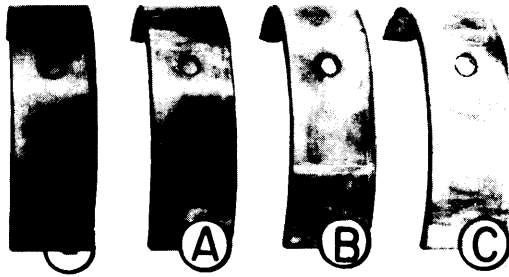
NOTE — Following procedures are performed with oil pan and oil pump removed.

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.

NOTE — Tang on bearing half must fit with notch on rod cap and connecting rod. 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.

2) If clearances are not within specifications, new bearings are available in standard, .0005", .0010", and .0015" undersizes. To replace upper main bearing half, insert a flattened cotter pin or roll out pin in oil passage hole in crankshaft and rotate crankshaft in direction opposite to cranking rotation. Place new upper bearing half on crankshaft journal with locating tang in correct position and rotate shaft to turn bearing into place using tool as in removal. Tighten all main bearing cap bolts and rotate crankshaft to ensure there is no excessive drag.



No Letter - Std.
Letter "A" - .0005"
Letter "B" - .0010"
Letter "C" - .0015"

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MAIN BEARING IDENTIFICATION

REAR MAIN BEARING OIL SEAL

Removal & Installation - 1) Drain crankcase, remove oil pan and rear main bearing cap. Using suitable tool (BT-6434), drive both ends of oil seal into bearing groove in cylinder block until groove is packed tight. Measure amount seal was driven up into block, add $\frac{1}{16}$ ", then cut this length from the old seal in bearing cap (remove bearing cap seal with razor blade). Repeat procedure on other side of block.

2) Place a drop of suitable sealer on end of seal piece and work two pieces of seal (cut from old cap seal) into cylinder block grooves using two small screwdrivers. Drive into place using suitable tool (BT-6433 or BT-6434). Trim seal flush with block.

3) Install lower seal in bearing cap using suitable seal installer (BT-6408-1 on 350" or BT-23-18 on 455"). Rotate tool slightly and cut off each end of seal flush with cap. Install suitable sealer on cap and install cap to engine. Tighten rear main bearing cap bolts.

ENGINE FRONT COVER

Removal - Drain cooling system and disconnect all coolant hoses. Remove radiator upper support and radiator. Remove all belts, fan and fan pulley, crankshaft pulley and harmonic balancer. Remove oil pan. Remove cover, timing pointer and water pump assembly.

Installation - Install new cover gasket with suitable sealer around water holes and position to block. Install front cover, timing indicator and water pump assembly. Apply engine oil to front cover bolts, install and tighten.

FRONT COVER OIL SEAL

Removal - With crankshaft pulley and pulley hub removed, remove seal with suitable puller tool (BT-6406).

Installation - Apply suitable sealer to outside diameter of new seal. Using suitable tool (BT-6405), install oil seal to front cover. Tighten until .005" feeler gauge will just fit between front cover and tool.

CAMSHAFT			
Engine	Journal Diam.	Clearance ①	Lobe Lift
All	2.0357-2.0365" ②	.0020-.0058"

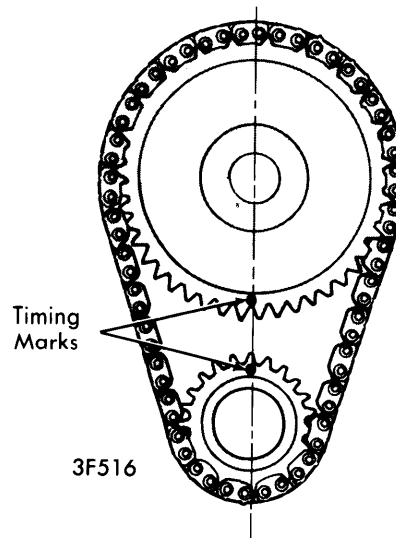
① End play - .011-.077"

② Each succeeding journal .020" smaller than preceding journal.

TIMING CHAIN

Removal - Remove front cover, fuel pump eccentric and oil slinger. Remove camshaft sprocket and timing chain. Remove crankshaft sprocket key and then crankshaft sprocket.

Installation - Install camshaft sprocket, crankshaft sprocket and timing chain together and align timing marks (see illustration). Install fuel pump eccentric with flat side rearward. Drive crankshaft sprocket key in with a brass hammer until it bottoms.



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TIMING CHAIN SPROCKET ALIGNMENT

CAMSHAFT

NOTE - Engine must be removed on Toronado models to allow removal of camshaft.

Removal - 1) Remove intake manifold, oil pan and front cover. Disconnect all electrical leads and remove distributor with cap and wiring intact. Remove power steering pump bracket attaching bolts and position pump to one side.

2) Support engine with suitable engine jack and remove engine mount-to-bracket bolts on both sides. Raise engine as far as possible, remove engine mount-to-engine attaching bolts and remove mounts. Position wood block between exhaust manifolds and front crossmember to support engine. Remove engine jack.

3) Lower car and remove rocker arms, push rods and valve lifters. Position A/C condensor to one side. Remove timing chain. Remove camshaft by carefully sliding it out front of engine.

Installation — To install camshaft, reverse removal procedure. *NOTE* — Before installation, coat camshaft and bearings liberally with suitable lubricant.

CAMSHAFT BEARINGS

Removal — Bearings must be replaced as a complete set. Using suitable tool (BT-6409) remove bearings in order (No. 1 first, No. 2 second, etc.).

Installation — To install camshaft bearings, reverse removal procedure while noting the following: To aid in aligning bearings with oil passages, place bearing in front bore with tapered edge toward block and align oil hole in bearing with center of oil slot in bore. Mark top of bearing. When installing bearing, mark will act as a guide.

VALVE TIMING

1) Remove distributor cap, right valve cover, No. 4 cylinder intake and exhaust rocker arms and pivot. Ground coil wire to engine. *NOTE* — On High Energy Ignition systems, remove wire from "BAT" terminal of distributor. Turn ignition switch on and crank engine until rotor is in line with No. 4 spark plug wire position (No. 4 piston at top of cylinder).

2) Measure from pivot boss on head surface to top of No. 4 intake push rod and record measurement. Crank engine until rotor approaches No. 1 spark plug wire position. Continue to turn engine until timing mark on crankshaft pulley is at TDC. Measure from pivot boss surface to top of No. 4 intake push rod. Measurement should increase over first recorded measurement by $\frac{1}{8}'' \pm \frac{1}{32}''$ (350" engines) or $\frac{3}{64}'' \pm \frac{1}{32}''$ (455" engines).

ENGINE OILING

Crankcase Capacity — 4 quarts (Exc. Toronado); 5 quarts Toronado. Add 1 quart with filter change.

Oil Filter — Replace filter at first oil change and every second oil change after that.

Normal Oil Pressure — 30-45 psi at 1500 RPM.

Pressure Regulator Valve — Located in oil pump cover. Not adjustable.

Timing Chain & Sprockets — Lubricated from drilled hole in hexagonal headed plug which closes front end of right main oil gallery.

OIL PUMP

Located on rear main bearing cap. Do not remove drive shaft extension washers (serviced as a unit). Pressure relief valve clearance in bore should be .0025-.005". End clearance of gears should be .0025-.0065".

ENGINE OILING SYSTEM

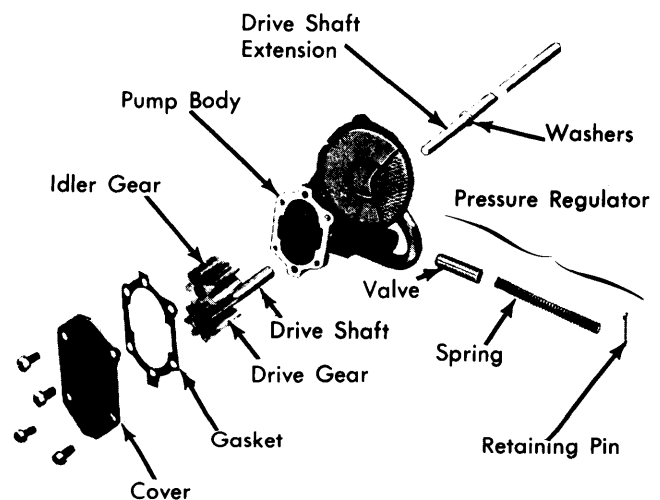
See illustration. Oil pump mounted on rear main bearing cap in crankcase with full flow filter on right side of crankcase. Oil from filter flows through passages at rear of block to rear end of right main oil gallery and through "V" passage at front of engine to left main oil gallery. Oil distribution is as follows:

Crankshaft & Camshaft Bearings — Rear crankshaft and camshaft bearings are lubricated by a vertical passage intersecting horizontal cross passage from oil filter. Other crankshaft and camshaft bearings are lubricated by a "V" shaped oil passage in each crankcase web.

Valve Lifters — Each lifter supplied with oil through short passage leading upward from main gallery at point directly below lifter.

Rocker Arms, Push Rods & Valves — Hollow push rods are supplied with oil through hole in valve lifter push rod seat.

Distributor Drive Gear — Lubricated from drilled hole in plug at rear end of left main oil gallery.

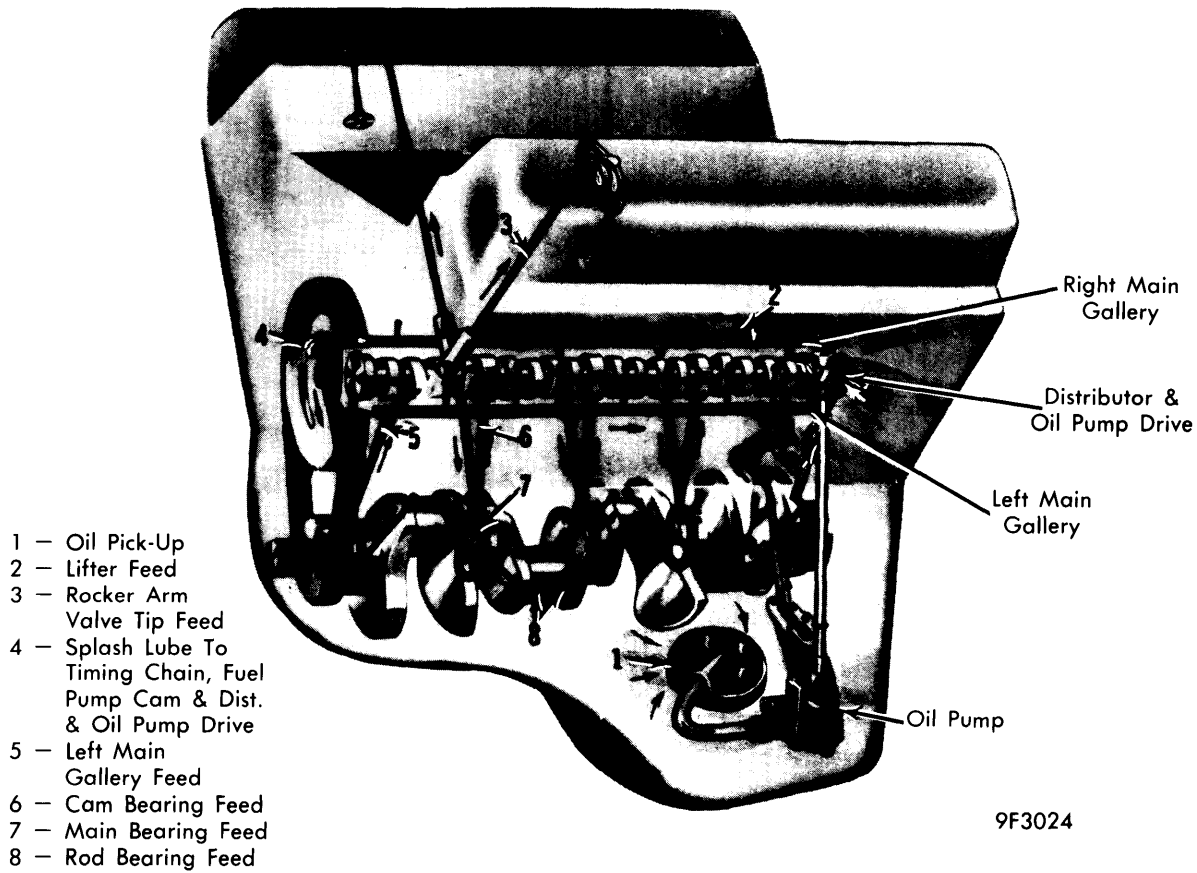


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OIL PUMP ASSEMBLY

Oldsmobile V8 Engines

ENGINE OILING (Cont.)



ENGINE OIL SYSTEM

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.	Application	Ft. Lbs.
Cylinder Head	① 85	Oil Pan	10
Intake Manifold	② 40	Engine Front Cover (3/8" Bolts)	35
Exhaust Manifold	25	(Toronado)	50
Main Bearings (350" Exc. Rear)	80	Water Pump-to-Front Cover	13
(350" Rear)	120	Rocker Arm Studs-to-Head	25
(455" All)	120	Rocker Arm Cover	7
Con. Rod Caps	42	Fuel Pump-to-Block	25
Crankshaft Pulley Hub	160	Fuel Pump Eccentric-to-Camshaft	65
Crankshaft Pulley	20	Engine Mounts-to-Engine	75
Oil Pump-to-Bearing Cap	35		
Oil Pump Cover	8	① - Torque to 60 ft. lbs. and then 85 ft. lbs.	
Oil Filter	20	② - Torque to 15 ft. lbs. and then 40 ft. lbs.	