

# General Motors 6 Engines

## 4.1 & 4.8 LITER 6-CYLINDER

### IDENTIFICATION CODING

#### ENGINE IDENTIFICATION

Engine identification code is stamped on a machined pad on right side of engine. Pad is located just rearward of distributor.

#### ENGINE IDENTIFICATION CODES

Engine	Code
4.1L (250") 2-Bbl. ....	TLA, TLB, TLC, TLD, TLF TLH, TLJ, TLK, TLL, TLM TLR, TLS, TLT, TLU, TLW
4.8L (292") 1-Bbl. ....	TRB, TRF

#### ENGINE REMOVAL

See *Engine Removal* at end of *ENGINE* Section.

### CYLINDER HEAD & MANIFOLDS

#### EXHAUST MANIFOLD

**NOTE:** Intake manifold is integral with cylinder head on 4.1L Engine.

#### Removal (4.1L Engine)

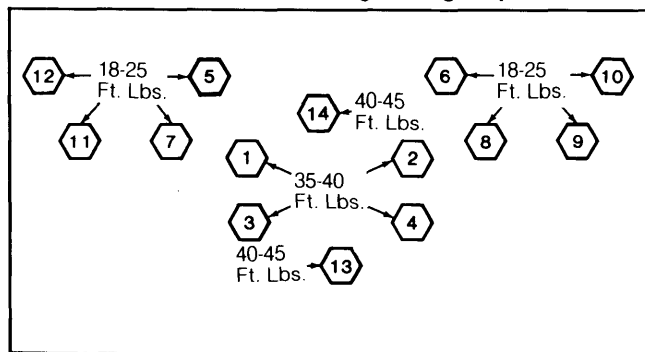
1) Disconnect negative battery cable at battery. Remove air cleaner. If equipped, remove power steering pump and air pump drive belts. Remove both pumps and mounting brackets. Remove air injection manifold from exhaust manifold.

2) Raise vehicle. Disconnect exhaust pipe from exhaust manifold, and catalytic converter bracket at transmission mount. Lower vehicle. Remove exhaust manifold.

#### Installation

Ensure gasket surfaces are clean. Place manifold in position with new gasket. Install and tighten exhaust manifold bolts. Reverse removal procedure to complete installation. See *Fig. 1*.

**Fig. 1: 4.1L Exhaust Manifold Tightening Sequence**



Note that bolt tightening specifications vary.

#### INTAKE & EXHAUST MANIFOLD

#### Removal (4.8L Engine)

1) Disconnect negative battery cable at battery. Remove air cleaner. Disconnect both throttle controls at bellcrank, and remove throttle return spring. Disconnect fuel line and vacuum lines at carburetor.

2) Disconnect crankcase vent hose at rocker arm cover and vapor hose at canister. Disconnect exhaust pipe at flange. Remove manifold assembly attaching bolts and clamps. Remove intake and exhaust manifold assembly.

#### Installation

Ensure gasket surfaces are clean. Place manifold in position with new gasket. Install and tighten clamps and bolts. Reverse removal procedure to complete installation.

### CYLINDER HEAD

#### Removal

1) Drain cooling system and disconnect upper radiator hose at engine. Remove exhaust manifold (4.1L) or intake and exhaust manifold assembly (4.8L). Remove rocker arm covers. Remove rocker arm assemblies and push rods in sequence, for reinstallation in original locations.

2) Disconnect and label all wires and vacuum hoses that may interfere with head removal. If equipped, disconnect air injection hose at check valve. Remove cylinder head.

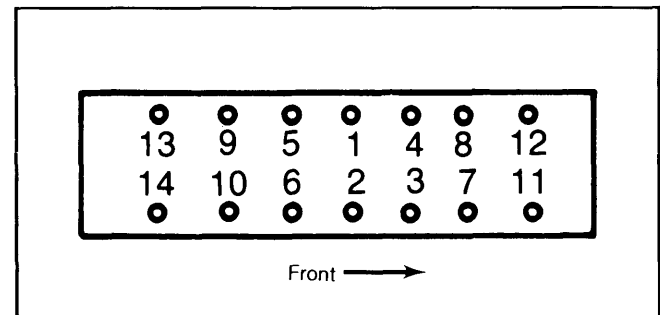
**CAUTION:** Do not apply gasket sealer to composition steel asbestos gaskets.

#### Installation

1) Ensure that gasket surfaces of cylinder head and block are clean, and all head bolt threads and threads in block are clean. Coat threads of head bolts with sealer.

2) To install cylinder head and remaining components, reverse removal procedure. Tighten head bolts in sequence. See *Fig. 2*. Lubricate rocker arm parts with Molykote (or equivalent). Adjust valves.

**Fig. 2: Cylinder Head Tightening Sequence**



Tighten front left-hand head bolt to 85 ft. lbs. (115 N.m), and all others to 95 ft. lbs. (129 N.m).

### VALVES

#### VALVE ARRANGEMENT

E-I-I-E-E-I-I-E-E-I-I-E (Front to rear)

#### VALVE GUIDES

Valve guides are integral with cylinder head. If guide is worn, it must be reamed for installation of valves with oversize stems. Valves are available with .003" (.08 mm), .015" (.38 mm) and .030" (.76 mm) oversize stems. Use reamers in sequence when reaming valve guides.

## 4.1 & 4.8 LITER 6-CYLINDER (Cont.)

### VALVE STEM OIL SEALS

"O" ring-type seals are used. Lightly coat seal with engine oil and install in lower groove of valve stem. Make sure seal is not twisted in groove.

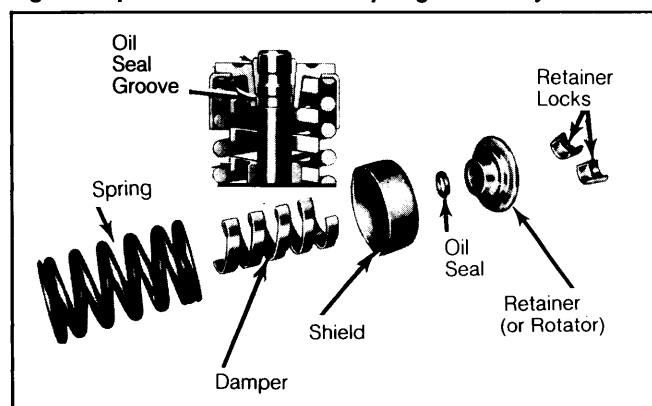
### VALVE SPRINGS

#### Removal

1) Remove valve cover. Remove spark plug, rocker arm assembly and push rod of cylinder to be serviced. Install air hose and adapter in spark plug hole, and apply air pressure. Do not remove air pressure until all components are reinstalled.

2) Use valve spring compressor to compress valve spring, and remove retainer locks. Release spring compressor and remove spring retainer (or rotator), shield, spring, damper (if equipped), and oil seal. See Fig. 3.

Fig. 3: Exploded View of Valve Spring Assembly



Damper is not used on 4.1L engines.

#### Installation

Install damper, spring, shield and retainer. Use compressor tool to compress valve spring, and install new oil seal and retainer locks. Remove compressor tool. Remove air hose and adapter. Install remaining components in reverse order of removal.

### VALVE SPRING INSTALLED HEIGHT

Measure valve spring installed height from spring seat (or top of shim), to top of spring (or valve shield). Installed height should be 1.63-1.69" (41.4-43.0 mm). If height exceeds specifications, install a 1/16" (1.58 mm) thick shim under spring.

### ROCKER ARM STUDS

Rocker arm studs that are loose in head or have damaged threads, can be replaced with oversize studs. Use reamer (J-5715) for .003" (.08 mm) oversize replacement studs, and reamer (J-6036) for .013" (.33 mm) oversize replacement studs.

#### Removal

Remove damaged stud using stud remover (J-5802-A). Install tool over stud. Tighten nut on tool to extract stud from cylinder head.

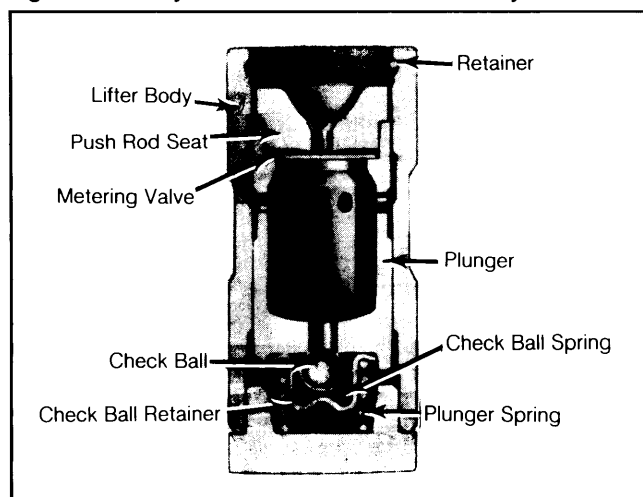
#### Installation

Ream hole for oversize studs. Coat press-fit area of stud with hypoid axle grease. Drive rocker stud into place with stud driver (J-6880). When driver bottoms on head, stud is at correct height.

### HYDRAULIC VALVE LIFTER ASSEMBLY

Disassemble lifters and thoroughly clean. Inspect all components for wear and damage. If any components are worn or damaged, complete lifter assembly must be replaced. If push rod seat or lifter body wear is noted, inspect mating engine components for wear. See Fig. 4.

Fig. 4: Cutaway View of Valve Lifter Assembly



Replace lifters as complete assemblies; do not interchange parts between lifters.

### VALVE ADJUSTMENT

1) Remove distributor cap. Mark distributor housing at No. 1 and No. 6 rotor firing positions.

2) With distributor rotor in the positions designated in Valve Adjustment table, adjust valves as follows: Loosen rocker arm adjusting nut until push rod lash (play) is felt. Tighten adjusting nut until all lash is removed. When lash has been removed, tighten adjusting nut 1 full turn to complete procedure.

### VALVE ADJUSTMENT

Rotor Position	Adjust Int. Nos.	Adjust Exh. Nos.
No. 1	1, 2, 4	1, 3, 5
No. 6	3, 5, 6	2, 4, 6

## PISTON, PINS & RINGS

### OIL PAN

See Oil Pan Removal at end of ENGINE Section.

### PISTON & ROD ASSEMBLY

#### Removal

1) Remove oil pan, oil pump and cylinder head. Position piston at bottom of stroke, and cover with cloth to collect metal cuttings. Remove ridge at top of cylinder bore with a ridge reamer.

2) If necessary, mark connecting rod for cylinder identification. Remove connecting rod cap nuts and cap, and cover rod bolts with rubber hose. Push piston and rod assembly out top of cylinder block.

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## 4.1 & 4.8 LITER 6-CYLINDER (Cont.)

### Installation

1) Before installing piston and rod assembly, ensure ring gaps are properly spaced. See Fig. 5. Lightly coat pistons, rings and cylinder walls with engine oil. Install rod bearings in rod and cap, and lubricate with engine oil.

2) Compress piston rings with ring compressor. Do not allow position of rings to change. Cover connecting rod bolts with rubber hose. Install piston and rod assembly, with notch on top of piston facing front of engine. Install and tighten connecting rod cap.

### FITTING PISTONS

1) Using telescope gauge and micrometer, measure cylinder bore diameter at a point  $2\frac{1}{2}$ " (64 mm) from top of bore. Measure piston diameter across piston skirt, at center line of piston pin. Difference between the two measurements is piston-to-cylinder bore clearance.

2) Using cylinder bore gauge, measure cylinder bore taper by working gauge up and down in bore. Measure cylinder bore out-of-round. Take measurements at different points in bore, by rotating gauge horizontally, around entire circumference of bore. Out-of-round must not exceed .002" (.05 mm). Taper must not exceed .005" (.13 mm).

3) If taper or out-of-round are not within limits, hone or bore cylinders for installation of new pistons.

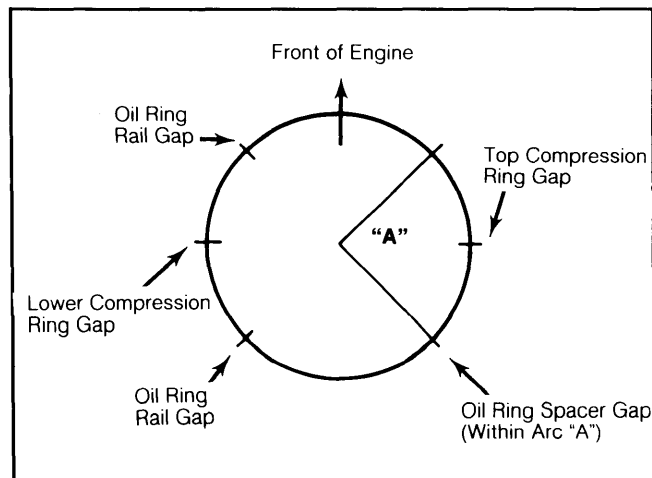
### FITTING RINGS

1) Position ring into cylinder bore at a point about  $\frac{1}{4}$ " above ring travel. Ring must be square in bore. Measure ring end gap with a feeler gauge.

2) Before installing compression rings on pistons, check side clearance. Insert outer edge of ring in its respective groove, and slide ring around entire circumference of groove. The ring should slide freely in groove.

3) Check side clearance of compression rings, with feeler gauge inserted between ring and ring groove. Install rings with gaps properly positioned. Note that anti-rotation tang of oil ring spacer is inserted into oil hole (or slot) of piston. See Fig. 5.

Fig. 5: Desired Ring Gap Locations



Insert tang of oil ring spacer in oil hole (or slot) of piston. Hole is located within arc of oil ring spacer gap "A".

### PISTON PINS

#### Removal

Using an arbor press and piston pin remover/installer tool, press piston pin from piston and connecting rod.

#### Installation

Check clearance of piston pin in piston, and replace piston and pin assembly if not within limits. Lubricate piston pin holes in piston and connecting rod. Position connecting rod on piston and press in piston pin, using pin remover/installer tool and an arbor press. Check piston for freedom of movement on piston pin.

## CRANKSHAFT & ROD BEARINGS

### MAIN & CONNECTING ROD BEARINGS

**NOTE:** Following procedures are performed with oil pan and oil pump removed. Remove oil film from surfaces to be checked.

#### Connecting Rod Bearings

1) Ensure rod caps are marked for cylinder identification. Remove rod cap and bearings. Inspect bearings for wear or damage and replace as necessary.

2) Check crankshaft rod bearing journal for out-of-round or taper. Maximum crankshaft out-of-round or taper must not exceed .001" (.03 mm).

3) Check rod bearing clearance using the Plastigage method (as explained in Main Bearings). If clearance exceeds specifications, standard, .001" (.03 mm), or .002" (.05 mm) undersize bearings may be used in combination to produce correct clearance. If clearance is still excessive, crankshaft must be reconditioned.

4) Clean crankshaft journal and bearing surface in rod. Insert bearings in rod and cap, then lubricate bearing surfaces with oil. Pull piston and rod assembly down onto crankshaft. Install and tighten rod cap.

#### Main Bearings

Some production crankshafts are ground to .009" (.23 mm) undersize at the assembly plant. They are identified as follows:

- Crankshaft counterweight of undersize journal, will be stamped on one side with the number "9," along with a large spot of light green paint.
- Main bearing cap will be painted light green on each side.

1) Mark or identify main bearing cap before removing. Support crankshaft weight, using a jack placed under counterweight next to the bearing being checked. Loosen drive belts from crankshaft pulley, prior to checking No. 1 bearing.

2) Remove main bearing cap and place a piece of Plastigage across full width of bearing, about  $\frac{1}{4}$ " off center, and away from oil holes. Install cap and tighten to specifications. Do not allow crankshaft to turn.

3) Remove cap and measure width of Plastigage with scale furnished. Standard, .001" (.03 mm) or .002" (.05 mm) undersize bearing halves may be used in combination to obtain correct clearance. Always replace both upper and lower bearing halves.

4) With the exception of rear main bearing, main bearings are removed from cylinder block using remover/installer tool (J-8080 or equivalent). Insert tool in

## 4.1 & 4.8 LITER 6-CYLINDER (Cont.)

crankshaft oil hole and rotate crankshaft clockwise. If tool not available, a cotter pin may be bent, as necessary, to do the job.

5) To remove rear main bearing from block, partially drive out bearing with a drift. Use a pair of pliers (with jaws taped) to hold bearing thrust surface to the oil slinger, and rotate crankshaft to remove bearing.

6) Lubricate journal and bearings. Insert plain end of new bearing between crankshaft and notched side of block. Insert bearing remover/installer tool into crankshaft oil hole, and rotate bearing into place. To install rear main bearing, use pliers (as used in removal), to aid in installation.

7) Install lower bearing half into cap. Install and tighten main bearing caps with arrows pointing toward front of engine. Align thrust bearing, then check crankshaft end play. Check end play by prying crankshaft forward, and inserting feeler gauge between crankshaft counterweight and forward face of rear main bearing cap.

### THRUST BEARING ALIGNMENT

Ensure all other main bearing caps have been properly tightened. Tighten rear main bearing cap to 10-12 ft. lbs. (14-16 N.m). Tap crankshaft rearward, then forward, using a lead hammer. Tighten rear main bearing cap. Retighten all main bearing caps.

### REAR MAIN BEARING OIL SEAL

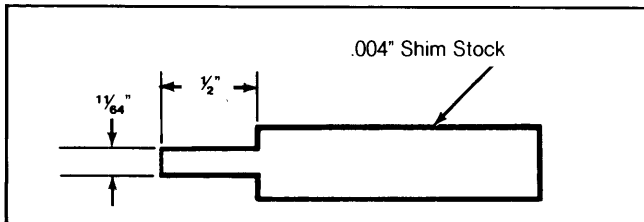
#### Removal

Remove rear main bearing cap and pry out old seal. Remove upper half of seal by tapping end with brass punch until seal protrudes enough to be removed with pliers.

#### Installation

1) Fabricate an oil seal installation tool, if one is not supplied with replacement oil seal. See Fig. 6. Coat seal lips with engine oil. Keep oil off of seal ends. Position tool between crankshaft and seal groove in cylinder block. Position seal between tip of tool and crankshaft.

Fig. 6: Rear Main Oil Seal Installation Tool



This tool is sometimes supplied with replacement oil seal.

2) Roll seal around crankshaft, using tool as a "shoehorn" to protect seal from sharp corner of seal groove in cylinder block. Tool must remain in position until seal is positioned with both ends flush with block.

3) Install lower seal into bearing cap, using tool as a "shoehorn". Feed seal into cap using light pressure with thumb and finger. Apply sealer to cap-to-block mating surface of cylinder block, being careful to keep sealer off the seal split line. Install and tighten bearing cap.

### ENGINE FRONT COVER

#### Removal

1) Drain and remove radiator. Remove drive belt(s), fan and pulley. Remove crankshaft pulley and

vibration damper. Remove oil pan-to-front cover attaching bolts, then front cover-to-block attaching bolts.

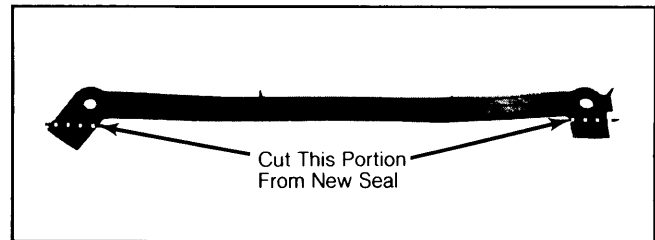
2) On 4.8L engine only, pull cover slightly forward to permit cutting of oil pan front seal. Cut oil pan seal flush with block at both sides of cover. Remove cover with attached portion of oil pan seal.

**NOTE:** 4.1L engines use RTV sealer in lieu of an oil pan front rubber seal.

#### Installation

1) Clean all gasket mating surfaces. On 4.8L engines, cut tabs from new oil pan front seal. See Fig. 9. Install seal to front cover, pressing locating tips into holes in cover. On 4.1L engines, place a  $\frac{3}{16}$ " bead of RTV sealer on cover-to-pan sealing surface.

Fig. 7: Oil Pan Front Seal Modification



Use a sharp instrument to ensure a clean cut.

2) Coat front cover gasket with sealer, and position on cover. Apply  $\frac{1}{8}$ " bead of RTV sealer to joint formed by oil pan and cylinder block. Install oil seal centering tool (J-23042 or equivalent) in front cover seal and install cover to cylinder block.

3) Install and partially tighten oil pan-to-cover bolts. Install front cover-to-cylinder block bolts. Remove centering tool and tighten bolts. To install remaining components, reverse removal procedure.

### FRONT COVER OIL SEAL

#### Removal (Front Cover Installed)

Remove vibration damper. Pry seal out of cover with screwdriver, using care not to damage cover seal surface.

#### Installation

Install new seal with open end toward inside of cover. Drive seal into place using seal driver (J-23042).

#### Removal (Cover Removed)

Pry seal out of cover with screwdriver, using care not to damage cover seal surface.

#### Installation

Install new seal with open end of seal toward inside of cover. Support cover at seal recess area. Using a seal installing tool, drive seal into position.

### CAMSHAFT

#### Removal

1) Remove engine from vehicle. Remove valve cover and loosen all rocker arm nuts. Rotate rocker arms to side and withdraw push rods in sequence, for reinstallation in original locations.

2) Remove valve lifter side cover and remove lifters. Remove front engine cover and fuel pump. Align crankshaft and camshaft timing gear marks. Remove camshaft thrust plate bolts through access holes in camshaft gear. Carefully remove camshaft.

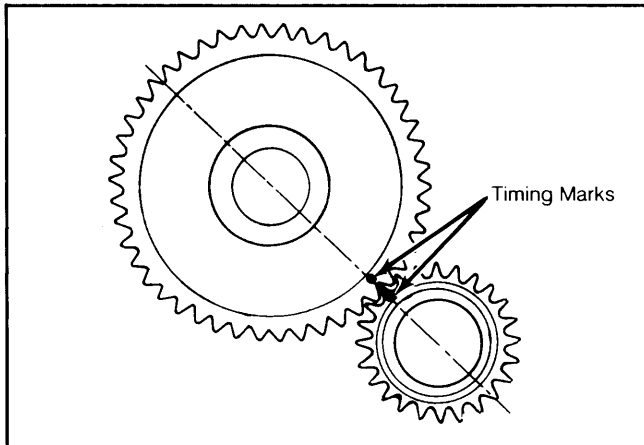
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### Installation

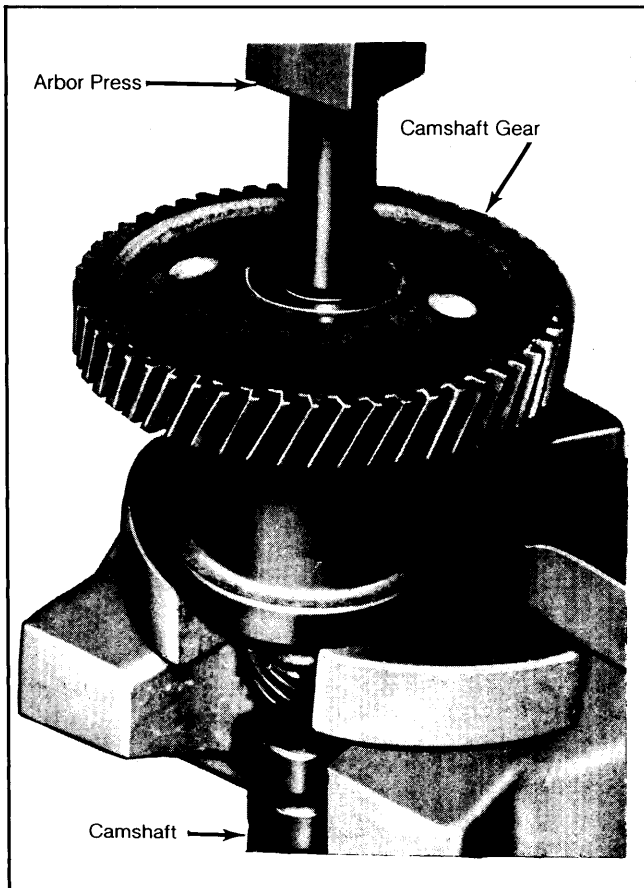
Coat camshaft lobes with Lubriplate (or equivalent). Reverse removal procedure to install camshaft, ensuring timing marks on gears are aligned. Take care to avoid damage to camshaft lobes or bearings. Install new valve lifters. Reassemble and install engine in vehicle. Change oil and oil filter. See Fig. 8.

**Fig. 8: Timing Gear Mark Alignment**



Remove camshaft thrust plate bolts through access holes in camshaft gear.

**Fig. 9: Removing Camshaft from Gear**



Properly support hub of camshaft gear, to avoid gear damage.

### TIMING GEARS

#### Inspection

With engine front cover removed, check backlash between timing gear teeth. Backlash should be .004-.006" (.10-.15 mm) for new gears, and .004-.008" (.10-.20 mm) for used gears. Check both gears for runout with a dial indicator. Maximum camshaft gear runout is .004" (.10 mm). Maximum crankshaft gear runout is .003" (.08 mm).

#### Removal

1) Remove camshaft from engine. Position camshaft and gear on arbor press, and properly support hub of gear. Make sure thrust plate is positioned so Woodruff key in shaft will not be damaged when camshaft is pressed out of gear. Press camshaft from gear. See Fig. 9.

2) Remove crankshaft gear from crankshaft, using gear puller (J-8105 or equivalent).

#### Installation

1) With crankshaft properly supported, use hollow driver (J-5590 or equivalent), to drive gear onto crankshaft.

2) To install camshaft gear, position camshaft in a press with camshaft supported at back of front journal. Place gear spacer ring and thrust plate over camshaft and install Woodruff key in keyway. Press gear onto camshaft until it bottoms on gear spacer ring.

### CAMSHAFT BEARINGS

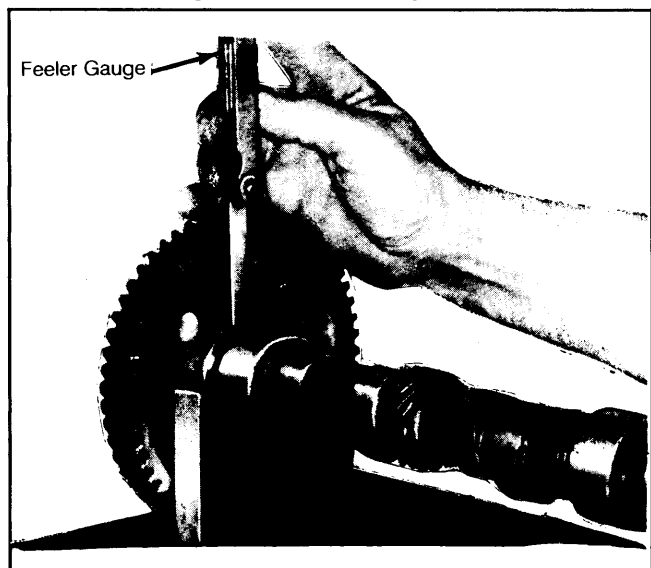
#### Removal

With engine removed from vehicle, remove camshaft, oil pan and oil pump. Drive camshaft rear plug from block. Drive camshaft bearings from engine. Remove front and rear bearings after center bearings have been removed.

#### Installation

Install front and rear bearings first, to act as guide for pilot of tool, and to center remaining bearings being pulled into place. Oil holes in cam bearings must align with oil holes in block. Install new camshaft rear plug.

**Fig. 10: Checking Camshaft End Play**



End play is .001-.005" (.03-.13 mm).

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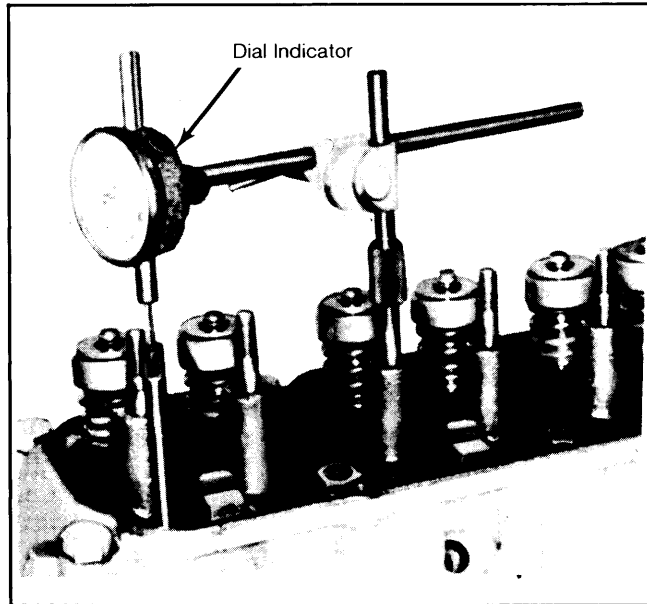
### CAMSHAFT END THRUST

Check camshaft end play with feeler gauge. End play should be .001-.005" (.03-.13 mm). See Fig. 10.

### CAM LOBE LIFT

1) With valve cover removed, remove rocker arm assemblies. Mount dial indicator on rocker arm stud. Position dial indicator and ball socket adapter on push rod. See Fig. 11.

Fig. 11: Checking Camshaft Lobe Lift



If readings are not within specifications, replace camshaft and lifters.

2) Slowly rotate engine in direction of rotation until lifter is on base circle of camshaft. Zero dial indicator. Rotate engine until push rod is fully raised. Record lobe lift reading and compare with specifications. If not within limits, replace camshaft and lifters.

### ENGINE OILING

#### Crankcase Capacity

4.1L capacity is 4 quarts (3.8L). Capacity for 4.8L is 5 quarts (4.75L). Add 1 quart (.95L) when replacing oil filter.

#### Oil Filter

Replace at every other oil change, or more often under severe conditions.

#### Oil Pressure

With engine at normal operating temperature, oil pressure should be 30-40 psi (2.1-2.8 kg/cm<sup>2</sup>) at speeds of 35-40 MPH.

#### Pressure Regulator Valve

In pump body, not adjustable.

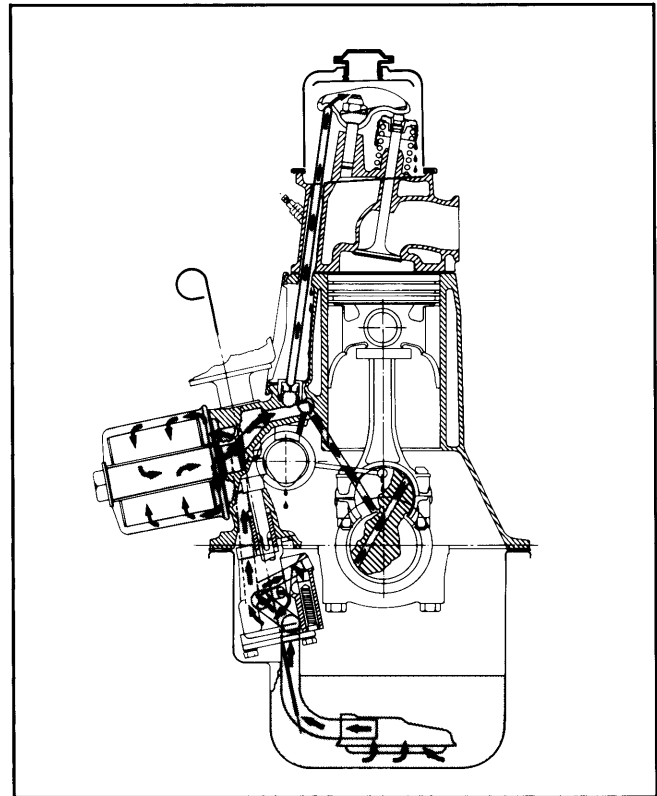
### ENGINE OILING SYSTEM

Gear-type pump provides full pressure lubrication. Oil drawn through pick-up screen, is pressurized through pump and routed to oil filter. A bypass valve allows oil flow to main gallery in the event back pressure is encountered at filter.

Main gallery supplies oil to camshaft bearings, lifters and main bearings. Connecting rod bearings are supplied oil from crankshaft main bearings, through cross-drilled passages.

Oil passing through hollow push rods lubricates valve train. Oil drains back to crankcase through drain holes. Timing gears are lubricated through nozzle, which is fed from front camshaft bearing. See Fig. 12.

Fig. 12: Engine Oiling System



### OIL PUMP

#### Removal

Remove oil pan. Remove oil inlet tube attaching bolt and oil pump attaching bolts. Remove oil pump and tube assembly.

#### Disassembly

Remove oil inlet tube assembly. Remove pump cover. Mark idler gear and drive gear at a meshing point, for later reassembly of gears in same meshing position. Remove idler gear and drive gear with shaft, from pump body. Remove pressure regulator valve retaining pin, then remove spring and valve.

**NOTE:** If any part of oil pump requires replacement, the entire pump assembly must be replaced.

#### Inspection

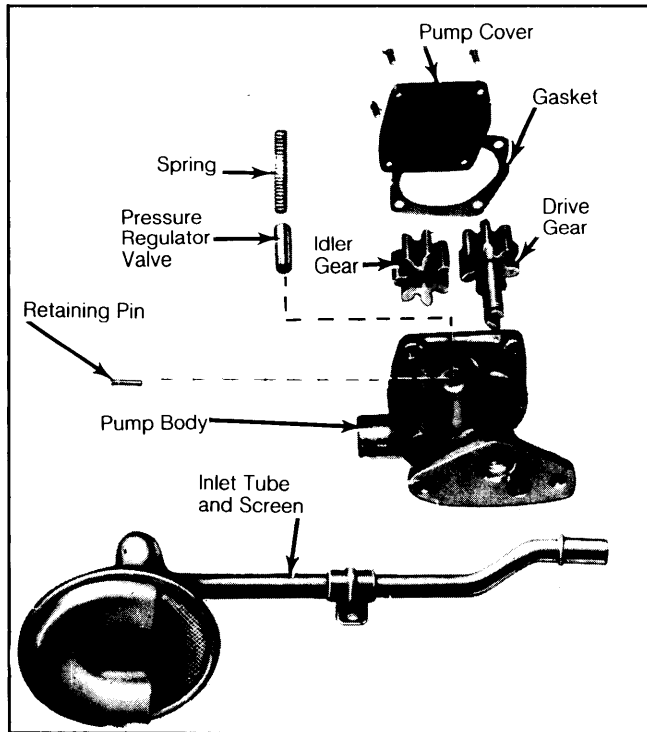
1) Clean all parts. Inspect pump body and cover for cracks and excessive wear. Inspect pump gears for damage or excessive wear. Check drive gear shaft for looseness in pump body.

2) Inspect oil inlet tube assembly for damage. Check pressure regulator valve for fit in bore.

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Fig. 13: Oil Pump Assembly



Be sure to mark gears at a meshing point, prior to disassembly.

**Reassembly**

Install oil inlet tube assembly. Apply sealer to end of tube, and tap tube into place, using plastic hammer. Install idler gear into pump body with smooth side of gear toward cover opening. Reassemble remaining components in reverse order of disassembly.

**Installation**

Prime oil pump with engine oil prior to installation. Install oil pump and pick-up tube in reverse order of removal.

### ENGINE COOLING

**WATER PUMP**

**Removal**

Disconnect negative battery cable at battery. Drain cooling system. Remove all drive belts, then remove fan and pulley from water pump. Remove lower radiator hose and heater hose from water pump. If necessary, remove alternator adjusting bracket from water pump. Remove water pump.

**Installation**

Clean all gasket mating surfaces. Install components in reverse order of removal procedure, using new gasket.

**NOTE:** For further information on cooling system capacities and other cooling system components, see appropriate article in "Engine Cooling Systems" at end of ENGINE Section.

**TIGHTENING SPECIFICATIONS**

Application	Ft. Lbs. (N.m)
Camshaft Thrust Plate Bolts	7 (9)
Connecting Rod Cap Nuts	
4.1L	35 (47)
4.8L	40 (54)
Cylinder Head Bolts	<sup>1</sup> 195 (129)
Engine Front Cover Bolts	7 (9)
Exhaust Manifold Bolts (4.8L)	<sup>2</sup> 30 (41)
Flywheel-to-Crankshaft Bolts	
4.1L	60 (81)
4.8L	110 (149)
Intake Manifold Bolts (4.8L)	40 (54)
Main Bearing Cap Bolts	65 (88)
Oil Pump Attaching Bolts	10 (13)
Vibration Damper Bolt (4.8L)	60 (81)
Water Pump Bolts	15(20)

<sup>1</sup> — Tighten left-hand front bolt to 85 ft. lbs. (115 N.m)

<sup>2</sup> — For 4.1L, see Fig. 1 in this article.

### ENGINE SPECIFICATIONS

**GENERAL SPECIFICATIONS**

Year	Displ.		Carburetor	HP at RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore		Stroke	
	cu. ins.	liters					in.	mm	in.	mm
1982	250	4.1	2-Bbl.	.....	.....	8.25:1	3.88	98.5	3.53	89.7
	292	4.8	1-Bbl.	.....	.....	8.00:1	3.88	98.5	4.12	104.7

**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)
4.1L & 4.8L Int.	.....	<sup>1</sup> 45°	46°	.035-.060 (.89-1.52)	.....	.0010-.0027 (.025-.069)	.....
Exh.	.....	<sup>1</sup> 45°	46°	.062-.093 (1.58-2.36)	.....	(.0015-.0032) (.038-.081)	.....

<sup>1</sup> — 4.8L face angle is 46°.

# General Motors 6 Engines

## 4.1 & 4.8 LITER 6-CYLINDER (Cont.)

### ENGINE SPECIFICATIONS (Cont.)

#### 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)
4.1L	.0010-.0020 (.025-.051)	.0008-.0016 (.020-.041)	.0008-.0016 (.020-.041)	1	.010-.020 (.25-.51)	.0012-.0027 (.030-.069)
				2	.010-.020 (.25-.51)	.0012-.0032 (.030-.081)
				3	.015-.055 (.38-1.40)	.005 Max. (.13 Max.)
4.8L	.0026-.0036 (.066-.091)	.0008-.0016 (.020-.041)	.008-.0016 (.020-.041)	1 & 2	.010-.020 (.25-.51)	.002-.004 (.05-.10)
				3	.015-.055 (.38-1.40)	.0050-.0055 (.127-.140)

#### 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)
4.1L	2.2979-2.2994 (58.366-58.405)	<sup>1</sup> .0010-.0024 (.025-.061)	No. 7	.002-.006 (.05-.15)	1.999-2.000 (50.77-50.80)	.0010-.0026 (.025-.066)	.006-.017 (.15-.43)
4.8L	2.2979-2.2994 (58.366-58.405)	<sup>1</sup> .0010-.0024 (.025-.061)	No. 7	.002-.006 (.05-.15)	2.099-2.100 (53.31-53.34)	.0010-.0026 (.025-.066)	.006-.017 (.15-.43)

<sup>1</sup> — Rear main bearing (No. 7) clearance is .0016-.0035" (.041-.89 mm).

#### CAMSHAFT

Engine	Journal In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
4.1L <sup>1</sup>	1.8677-1.8697 (47.440-47.490)	.....	<sup>2</sup> .2217 (5.631)
4.8L <sup>1</sup>	1.8677-1.8697 (47.440-47.490)	.....	.2315 (5.880)

<sup>1</sup> — End play is .003-.008" (.08-.20 mm).

<sup>2</sup> — Calif. vehicles exhaust lobe lift is .2315 (5.88 mm).

#### VALVE SPRINGS

Engine	Free. Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
4.1L & 4.8L	2.08 (52.8)	78-86@1.66 (35-39@42.2)	170-180@1.26 (77-81@32.0)