1.8 LITER O.H.C. 4-CYLINDER

Cavalier
Cimarron
Firenza
J2000
Skyhawk

IDENTIFICATION CODING

ENGINE IDENTIFICATION

Engine can be identified by the eighth digit of Vehicle Identification Number, located on the left upper side of instrument panel and visible through the windshield. Engine also has a code number stamped in the left side of engine, at transmission mounting flange.

Engine Code

Engine	Code
1.8L (112") TBI	0

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD & MANIFOLDS

INTAKE MANIFOLD

Removal – **1)** Remove air cleaner and drain cooling system. Remove alternator and bracket from camshaft carrier. Remove power steering pump and support out of way. Remove power steering bracket from intake manifold. Remove ignition coil. Remove throttle cable from intake manifold bracket.

2) Disconnect throttle, downshift and TV cables from fuel injection assembly. Disconnect all wiring harness connectors from throttle body. Remove brake vacuum hose at filter. Disconnect fuel lines. Remove preheat water hose from water pump and intake manifold.

3) Remove "S" hose from water pump. Disconnect any ECM connectors necessary to move harness away from manifold. Support ECM harness out of way. Remove 4 lower and 5 upper intake manifold retaining nuts and washers. Remove intake manifold.

Installation – **1)** Clean all gasket mating surfaces. Install intake manifold with new gasket. Tighten bolts, starting in the center and moving outward.

2) Reverse removal procedure to complete assembly. Refill cooling system and adjust all drive belts. Start engine and run until normal operating temperature is reached. Check for leaks.

EXHAUST MANIFOLD

Removal – Remove air cleaner, spark plug wires and retainers. Remove oil dipstick tube and breather assembly. Disconnect oxygen sensor wire. Disconnect exhaust pipe from manifold and remove manifold nuts. Remove exhaust manifold and gasket.

Installation – Clean all gasket mating surfaces and install manifold using new gasket. Tighten bolts, starting in the center and moving outward. To complete installation, reverse removal procedure.

CYLINDER HEAD

NOTE – *Cylinder head and camshaft carrier bolts should only be removed when engine is cold.*

Removal – **1)** Remove intake and exhaust manifolds as previously outlined. Remove upper radiator hose. Disconnect wiring harness and any connectors from thermostat housing. Remove front timing belt cover and timing probe holder. Loosen water pump bolts and remove timing belt.

2) Loosen camshaft carrier and cylinder head bolts gradually in reverse sequence. *See Fig. 1.* Remove camshaft carrier. Remove cylinder head.

Installation – **1)** Clean all mating surfaces on cylinder head and camshaft carrier. Clean out threads in cylinder head bolt holes. Install new head gasket and position cylinder head. Apply a continuous bead of anaerobic sealer to camshaft carrier mating surface.

2) Install camshaft carrier and bolts. Tighten bolts gradually, in sequence, to 18 ft. lbs. (24 N·m). Then tighten each bolt, in sequence, an additional 180° in 3 steps. Complete remainder of installation by reversing removal procedure. Start engine and let run until thermostat opens. Tighten each bolt, in sequence, an additional 30-50°. *See Fig. 1.*

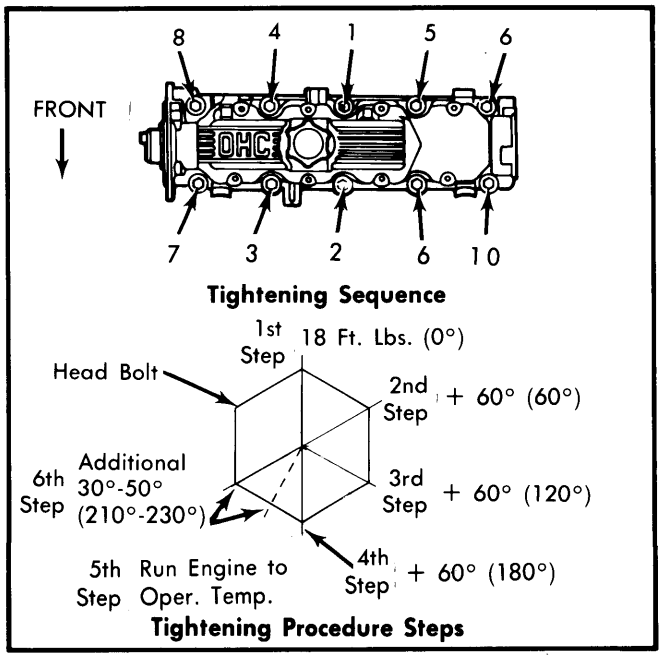

Fig. 1 Cylinder Head Tightening Procedure. Threads on Bolts and in Bolt Holes Must Be Clean. Complete One Tightening Sequence for Each Step of Procedure.

VALVES

VALVE ARRANGEMENT

E-I-E-I-E-I-E-I (Front-to-Rear).

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1.8 LITER O.H.C. 4-CYLINDER (Cont.)

VALVE GUIDE SERVICING

Guides are integral with cylinder head. If valve stem clearance in guide is excessive, valves with oversize stems are available. Ream guide bores to accommodate oversize stems with specified clearance using reamer set (J-26590 or equivalent).

VALVE STEM OIL SEALS

Coat valve stem with engine oil and install plastic protective sleeve over end of valve. Slide oil seal over valve stem and seat on valve guide. Remove plastic sleeve.

VALVE SPRINGS

Removal – **1)** Remove camshaft carrier cover. Remove rocker arms by compressing valve springs using a suitable valve spring compressor (J-33302 or equivalent). Keep rocker arms in order for installation in original position. Remove spark plugs and install air compressor adapter in spark plug port. Apply air pressure to hold valves in place.

2) Using valve spring compressor, compress valve spring. Remove rocker guides, valve locks and caps. Remove valve spring and oil seal.

Installation – **1)** Install oil seal, valve spring and cap. Compress valve spring and install valve locks. Install rocker guides and rocker arms.

2) Remove valve spring compressor and air compressor adaptor. Install spark plugs and camshaft carrier cover.

VALVE SPRING INSTALLED HEIGHT

VALVE STEM INSTALLED HEIGHT

HYDRAULIC VALVE LASH COMPENSATORS

NOTE – *Lash compensators are serviced as complete assemblies only. Parts are not interchangeable.*

No adjustment of lash is required. Servicing of compensators requires only that care and cleanliness be exercised when handling parts.

PISTONS, PINS & RINGS

OIL PAN

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

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

Removal – **1)** With cylinder head and oil pan removed, use a ridge reamer to remove any ridge or deposits on upper end of cylinder bore. When reaming ridges, piston must be at bottom of stroke and covered with cloth to collect cuttings.

2) Remove connecting rod caps and bearings. If bearings are to be reused, store them so that they can be reinstalled in original positions. Protect crankshaft by placing a sleeve or hose over ends of rod bolts. Remove piston and rod from top of cylinder. Replace cap onto rod and mark rod so that it can be reinstalled in original location.

Installation – **1)** Coat piston, rings and cylinder wall liberally with engine oil. Make sure ring gaps are properly spaced. *See Fig. 2.* Marked side of compression rings must be toward top of piston. Position piston so that identification numbers on rod face water pump and arrow on piston faces front of engine. Protect cylinder walls and crankshaft by covering ends of rod bolts with a sleeve or hose.

2) Compress piston rings with a ring compressor and install piston in bore by tapping lightly with a plastic hammer. Install bearings in rods and caps. Install rod caps with identification number facing same direction on number on rod and tighten nuts.

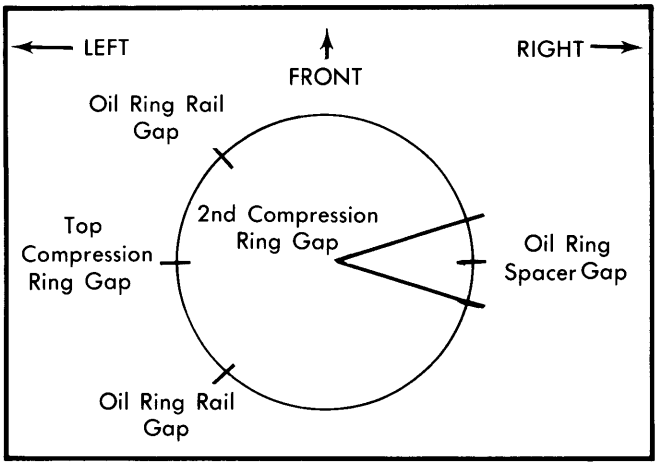

Fig. 2 Oil Ring Gap Spacing. Marking On Compression Rings Faces Upward

FITTING PISTONS

Measure cylinder bore diameter. Measure piston diameter 90° from piston pin and 2.36" from top of piston. Subtract piston diameter from cylinder bore diameter to obtain clearance. If clearance exceeds specifications, select a new piston to fit cylinder. Oversize pistons are available in .020" (.50 mm) oversize. Measure new piston and hone cylinder to specified clearance.

PISTON PINS

Removal – Remove piston rings. Using a piston support fixture and pilot (J-24086 & J24086-9 or equivalent), press piston pin out of piston and rod.

Inspection – Piston and pin are a matched set and are not serviced separately. Measure outside diameter of piston pin and inside diameter of piston pin bore. If clearance exceeds specifications, replace piston and pin.

Installation – Coat piston pin bores in piston and connecting rod with oil. Install piston pin and connecting rod in piston. Place piston assembly in support and pilot tool used in removal procedure. Press piston pin through rod until pilot hub bottoms on support fixture. After pilot hub bottoms out do not exceed 5000 psi with press. Remove piston from fixture and check for freedom of movement on piston pin.

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1.8 LITER O.H.C. 4-CYLINDER (Cont.)

CRANKSHAFT & ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

NOTE – *Following procedures are with oil pan removed. Do not file rods or caps. Always replace both halves of a bearing.*

Connecting Rod Bearings – 1) Remove rod caps after making sure caps are marked for cylinder identification. Use Plastigage method to check for proper clearance.

2) Replace any bearing not within clearance specifications. Replacement bearings are available in standard, .010" and .020" undersize. Select fit each bearing to rods for best fit.

3) Coat bearing surfaces with oil. Install rod with bearing and tighten rod nuts. With all bearings checked and installed, tap each connecting rod forward and rearward along crankshaft to check for side clearance. Measure rod side clearance between connecting rod and side of crankpin.

Main Bearings – 1) Support crankshaft at both ends. Starting at rear of engine, remove 1 main cap at a time and check clearance using Plastigage. Replace bearings that are not within clearance specifications.

2) When checking front main bearing, loosen accessory drive belts to prevent tapered reading from plastigage. Replacement bearings are available in standard, .010" and .020" undersize.

3) Check crankshaft journal for wear. If journal does not meet specifications, remove crankshaft and grind to nearest available undersize.

4) Coat all bearing surfaces with oil. Install bearings so that oil grooves face same direction as when removed. Install main caps so that bottom of number 1 (cast on surface of main cap) faces rear of engine. Install main cap bolts and fill rear main cap side grooves with sealing compound (G.M part 3997597 or equivalent).

5) Hand tighten all main cap bolts. Tap rear end of crankshaft with a plastic hammer. Tighten main cap bolts to specifications. Force crankshaft toward front of engine and check end play. If end play exceeds specifications, thrust bearing must be replaced.

REAR MAIN BEARING OIL SEAL

Removal – With engine removed from vehicle, remove flywheel or flex plate. Using a screwdriver or small chisel, pry rear oil seal out of bore.

Installation – Clean seal mating surface. Check crankshaft for scratches or nicks and repair as necessary. Install seal onto seal driver (J-33004 or equivalent), and lubricate inside of seal with engine oil. Tighten seal installer bolts until seal bottoms in block.

CAMSHAFT

TIMING BELT REPLACEMENT

Removal – 1) Disconnect negative battery cable. Remove any belts and guards or shields necessary to gain access to crankshaft pulley. Remove timing belt front cover.

2) Rotate crankshaft so that timing mark on crankshaft pulley lines up with 10° BTDC mark on indicator scale. Check to make sure that mark on camshaft sprocket lines up with mark on camshaft carrier. Remove crankshaft pulley.

3) Remove timing probe holder. Loosen water pump retaining bolts and rotate water pump to loosen timing belt. Remove timing belt.

Installation – 1) Install timing belt on sprockets. Install crankshaft pulley and check for alignment of timing marks. Rotate water pump clockwise using suitable wrench adapter (J-33039 or equivalent) until slack is removed from timing belt. Hand tighten water pump bolts.

2) Using a belt tension gauge (J-26486 or equivalent), check tension of belt between water pump and camshaft sprocket. If belt tension is not within specifications, loosen water pump bolts and rotate pump until correct tension is obtained.

3) Tighten water pump bolts to specifications. Reverse remainder of removal procedure to complete installation.

TIMING BELT REAR COVER

Removal & Installation – Remove timing belt as previously outlined. Remove attaching bolts and timing belt rear covers. Reverse removal procedure for installation.

TIMING BELT SPROCKETS

Removal – With timing belt removed, remove camshaft carrier cover. Hold camshaft with a wrench at space provided near rear of camshaft. Remove camshaft sprocket retaining bolt, washer and camshaft sprocket. Remove crankshaft retaining bolt and thrust washer. Remove crankshaft sprocket.

Installation – Install camshaft sprocket on camshaft. Align timing marks on camshaft sprocket and camshaft carrier. Hold camshaft with wrench and install retaining bolt and washer. Install camshaft carrier cover. Position crankshaft sprocket over key on end of crankshaft. Install thrust washer and retaining bolt.

FRONT OIL SEAL

Removal & Installation – Remove crankshaft sprocket as previously outlined. Remove key and thrust washer from crankshaft. Pry out crankshaft front oil seal. Install sleeve from seal installing kit (J-33083 or equivalent) onto front of crankshaft. Coat inside of seal with oil and install with seal driver from kit. Remove sleeve from front of crankshaft. Reinstall crankshaft sprocket.

CAMSHAFT

Removal – Remove camshaft sprocket and rocker arms as previously described. Remove distributor. Remove camshaft thrust plate from camshaft carrier. Slide camshaft rearward and remove from carrier. Remove camshaft front seal with a seal remover (J-33085 or equivalent).

Installation – To install, reverse removal procedure.

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1.8 LITER O.H.C. 4-CYLINDER (Cont.)

ENGINE OILING

Crankcase Capacity – 4 quarts with or without filter change. Change oil every 12 months or 7,500 miles whichever comes first.

Oil Filter – Replace at first oil change and every other oil change thereafter if oil change interval is determined by mileage. Change filter at every oil change if interval is determined by time.

Normal Oil Pressure – 20-60 psi at operating speeds.

Pressure Regulator Valve – Located in oil pump body. Not adjustable.

ENGINE OILING SYSTEM

Oil from the oil pump passes through a full flow oil filter to the main oil galley located on the left side of the block. Main, connecting rod and camshaft journals and valve lash compensators are pressure lubricated. Cylinder walls are spray lubricated from a drilled passage in the connecting rods.

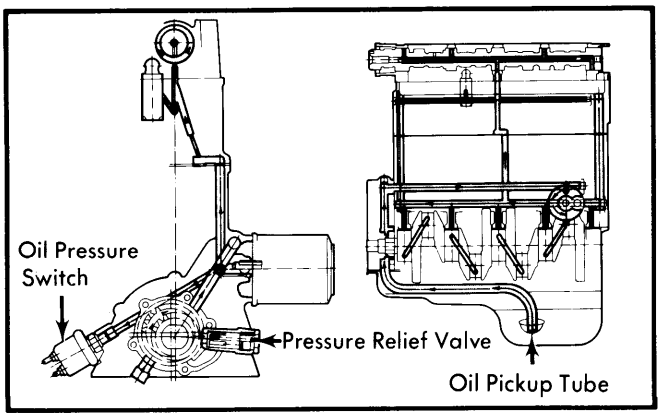

Fig. 3 Engine Oiling System. Cylinder Walls Are Spray-Lubricated From a Drilled Passage In Connecting Rod.

OIL PUMP

Removal – Remove crankshaft sprocket and timing belt rear cover as previously described. Disconnect wiring harness from oil pressure switch. Remove oil pan and oil filter. Remove bolts attaching oil pickup tube to block. Remove oil pump.

Disassembly – Remove cover from rear of pump. Remove pump gears. Remove pressure regulator plunger, spring and plug. Remove pickup tube and "O" ring seal from oil pump body. Discard "O" ring seal.

Oil Pump Specifications

Application	Specifications
Idler Gear-to-Body Clearance	.004-.007"
Drive Gear-to-Body Clearance	.013-.017"
Gear-to-Cover Clearance	.001-.004"

Reassembly – Clean and inspect all parts. Install valve plunger and spring. Coat valve plug with sealer (Loctite 573 or equivalent) and install. Install pump gears with mark on outer pump facing front of engine. Install rear cover. Using a new "O" ring, install pickup tube.

Installation – Use a new gasket and reverse removal procedure.

ENGINE COOLING

WATER PUMP

Removal – Remove timing belt and timing belt rear cover as previously described. Remove hose from water pump. Remove water pump and seal ring.

Installation – Install water pump and seal ring. Connect hose to water pump. Install timing belt rear cover. Install timing belt and rotate water pump until belt is tensioned to specifications. Tighten water pump bolts to specifications.

NOTE – *For further information on cooling system capacities and other cooling system components, see appropriate article in ENGINE COOLING SYSTEMS section.*

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke		Displ.	
				in.	mm	in.	mm	cu. ins.	cc
1.8L (112")	84@5200	102@2800	9.0:1	3.34	84.8	3.13	79.5	112	1796

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)
1.8L (112")							
Int.	1.614 (41)	46°	45°	.051-.055 (1.30-1.40)	.313-.314 (7.97-7.99)	.0006-.0017 (.015-.042)	.....
Exh.	1.378 (35)	46°	45°	.067-.070 (1.70-1.80)	.313-.314 (7.97-7.99)	.0012-.0024 (.030-.060)	.....

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1.8 LITER O.H.C. 4-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)
1.8L (112")	.0008 (.020)	.0002-.0004 (.005-.011)	①	1	.012-.020 (.30-.50)	.0024-.0036 (.060-.092)
				2	.012-.020 (.30-.50)	.0012-.0024 (.030-.062)
				3	.016-.055 (.40-1.40)	.....

① — Interference fit.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	① 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)
1.8L (112")	2.283 (57.99)	.0006-.0016 (.015-.041)	No. 3	.004-.008 (.100-.202)	1.928 (48-99)	.0008-.0025 (.019-.063)	.0028-.0095 (.070-.242)

① — Maximum out-of-round permissable is .0002" (.0005 mm).

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1.8L (112")	.....	77-88@1.44 (35-40@36.5)	170-183@.98 (77-83@25)

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance① In. (mm)	Lobe Lift In. (mm)
1.8L (112")			
Jrnl. 1	1.672-1.671 (42.47-.42-.45)	.....	.241 (6.12)
2	1.682-.1.681 (42.72-42.70)		
3	1.692-.1.690 (42.97-42.95)		
4	1.702-1.700) (43.22-43.20)		
5	1.711-.1.710 (43.47-43.45)		

① — End play is .0016-.0063" (.040-.160 mm).

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Camshaft Carrier & Cylinder Head Bolts	
Step 1	18 (24)
Step 2, 3 & 4	①
Step 5	②
Camshaft Sprocket Bolt	34 (46)
Crankshaft Pulley Bolts	20 (27)
Crankshaft Sprocket Bolt	115 (156)
Connecting Rod Nuts	39 (53)
Exhaust Manifold Bolts	16 (22)
Flywheel Bolts	45 (61)
Intake Manifold Bolts	25 (34)
Main Bearing Cap Bolts	57 (77)
Oil Pressure Relief Valve Plug	15 (20)
Oil Pump Retaining Bolts	5 (7)
Oil Pickup Tube Bolts	5 (7)
Timing Belt Front Cover Bolts	5 (7)
Timing Belt Rear Cover Bolts	19 (26)
Water Pump Retaining Bolts	19 (26)

① — Steps 2, 3 & 4. Tighten an additional 180° clockwise in 3 steps of 60° each.

② — Step 5. Run engine until it reaches operating temperature, then tighten bolts an additional 30° to 50°.

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