

General Motors 4 Engines

1400 CC & 1600 CC 4 CYL.

GENERAL SPECIFICATIONS									
Engine	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke		Displ.	
				in.	mm	in.	mm	cu. ins.	cc
1400 cc	52@5300	67@3400	8.5:1	3.228	82.0	2.606	66.2	85	1400
1600 cc	60@5300	77@3200	8.5:1	3.228	82.0	2.900	75.7	97.6	1600

ENGINE IDENTIFICATION

Engine Code is stamped on pad at right side of block below number 1 spark plug.

Engine Code

Application	Federal	Calif.
1400 cc		
Man. Trans.	CVA, CVB.....	CDD
Auto. Trans.	CDS, CDU.....	CDT
1600 cc		
Man. Trans.	CNA,CNB.....	CNK,CNJ,CYJ, CYW,CYX
Auto. Trans.	CYC,CYD.....	CYK

2) Lower vehicle and remove bolt holding oil dipstick tube to manifold. Disconnect fuel line at carburetor. Remove coil, cam covers, camshaft, rocker arms, guides, and valve lifters with shims. *NOTE* - Identify rocker arms, guides, valve lifters, and shims so they may be reinstalled in original positions. Remove cam carrier from head, using a sharp wedge if necessary. Remove head from engine.

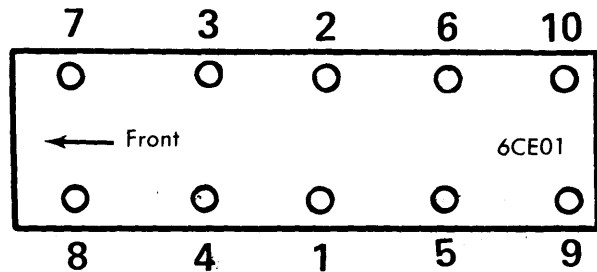
Installation - Install head gasket over dowel pins with note "This Side Up" facing up. Place head on engine. Apply sealer to top of head and cam carrier mating surfaces, coat head bolts with sealer and tighten bolts in sequence shown. Complete installation in reverse of removal procedure.

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD

Removal - 1) Remove engine front upper and lower covers, crankshaft drive pulley, idler pulley and timing belt. Drain cooling system and disconnect upper radiator hose and heater hose at intake manifold. Remove air cleaner and accelerator cable support bracket. Disconnect all wiring, raise vehicle and disconnect exhaust pipe from manifold.



CYLINDER HEAD TIGHTENING SEQUENCE

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)
1400 & 1600 cc							
Int.	1.5303-1.5405 (38.87-39.13)	45°	46°	.049-.059 (1.25-1.50)	.3138-.3144 (7.972-7.985)	.0006-.0017 (.015-.045)
Exh.	1.2547-1.2650 (31.87-32.13)	45°	46°	.063-.075 (1.60-1.90)	.3130-.3136 (7.952-7.965)	.0014-.0025 (.035-.065)

VALVE ARRANGEMENT

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

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 and afford specified clearance using suitable reamer set (J-26590).

VALVE STEM OIL SEALS

Install oil seal on valve stem before installing spring. Make sure that seal is flat and not twisted. *NOTE* - Do not interchange intake and exhaust seals. Intake is identified by the letters "IN" and exhaust by "EX".

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
All	1.505" (38.23)	64-72@1.26 (29-33@32)	167-179@.886 (76-81@22.5)

VALVE SPRINGS

Removal - Remove camshaft covers, depress valve spring using suitable tool (J-25477) and remove rocker arms. Identify rocker arms and guides so they may be reinstalled in same

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positions. Remove spark plug and install air line adapter tool in spark plug hole, apply air pressure. Depress valve springs using suitable tool (J-25477). Remove rocker guides, valve retainers, caps, spring and valve stem oil seal.

Installation — Before reinstalling old springs, check with a suitable spring tester. Springs should be replaced if not within 10 lbs. (4.5 kg) of specified load. Install oil seal, compress valve spring and cap and install valve retainers and guides.
NOTE — Grease may be used to hold retainers in place. Release compressor and make sure retainers seat properly. Continue installation in reverse of removal.

VALVE SPRING INSTALLED HEIGHT

Specified height is 1.25" (32 mm) measured from top of spring seat or shim to top of valve spring. If measured height exceeds specifications, install a valve spring seat shim to meet specifications.

VALVE STEM INSTALLED HEIGHT

Specified height is .71" (18 mm) measured from end of valve stem to top of cylinder head. This height is required to assure correct operation of hydraulic lifters. If measured height exceeds specifications, grind tip of valve. **CAUTION** — Do not grind more than .030" (.75 mm) from any exhaust valve tip.

HYDRAULIC VALVE LASH ADJUSTERS

NOTE — Lash adjusters are serviced as complete assemblies only. Parts are not interchangeable between adjusters

No adjustment of lash adjusters is required. Servicing of adjusters requires only that care and cleanliness be exercised in the handling of parts. Adjuster must be full of oil prior to installation.

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)
1400 & 1600 cc	.0008-.0016 (.020-.040)	.0001-.0003 (.003-.007)	①	1	.009-.019 (.229-.483)	.012-.027 (.305-.686)
				2	.008-.018 (.203-.452)	.012-.032 (.305-.813)
				3	.015-.055 (.381-1.397)	.000-.005 (.000-.127)

① — Pin is locked in rod.

OIL PAN

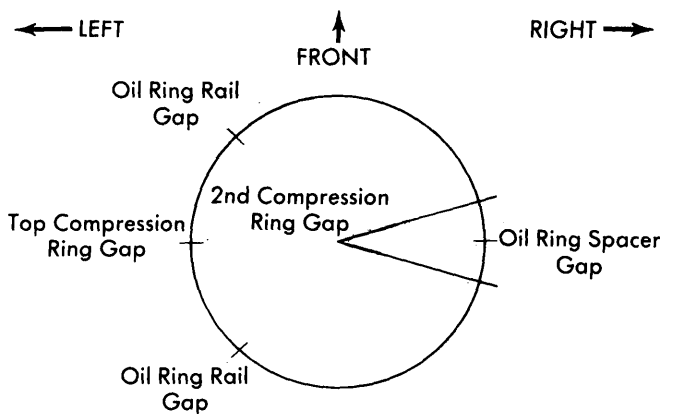
See Oil Pan Removal at end of ENGINE Section.

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 cylinder head and oil pan 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 cover studs with plastic tubing or other suitable material. Push piston and rod assembly out top of cylinder block, turning crankshaft slightly as necessary to disconnect rods from crankshaft.

Installation — Lightly coat cylinder bores, pistons and rings with engine oil. Ensure that ring gaps are properly spaced (see illustration) and marked side of compression rings are toward top of piston. Install ring compressor on piston and cover rod studs with protective material. Install each piston and rod assembly (with notch in top of piston facing front of engine) in its respective bore and guide connecting rod onto crankshaft journal while tapping piston head with hammer handle to seat connecting rod against crankshaft. Remove tubing from studs and install rod caps. Tighten nuts.



RING GAP LOCATION

FITTING PISTONS

Measure piston bore diameter, then measure piston diameter at skirt across centerline of piston pin. Maximum acceptable clearance is .002" (.050 mm) for either a used or new piston in worn cylinder bore. Oversize pistons are available in .001" (.025 mm) and .030" (.75 mm) oversize.

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PISTON PINS

Piston and piston pin are a matched set and are not serviced separately. Measure diameter of piston pin with a micrometer and measure piston pin bore in piston with a dial bore gauge or inside micrometer. If clearance is in excess of specifications, replace piston and pin.

Removal — Place piston on suitable support. Using a pilot tool as driver, use arbor press to push pin from piston and rod.

Installation — Lubricate piston pin bores in piston and connecting rod and assemble rod to piston (alignment of rod in relation to notch on piston head is not important). Place piston on suitable support and using a pilot tool and arbor press, push 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. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1400 & 1600 cc	2.0078-2.0088 (51.024-51.00)	.0009-.0026 (.024-.066)	No. 5	.004-.008 (.100-.202)	1.8093-1.8103 (45.958-45.984)	.0014-0031 (.036-.078)	.004-.012 (.110-.316)

MAIN & CONNECTING ROD BEARINGS

NOTE — Following procedures are with oil pan 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 standard size, .001" (.025 mm), .010" (.25 mm) and .020" (.50 mm) undersize. Selective fitting is required on each connecting rod. A standard bearing half may be used in combination with a .001" (.025 mm) undersize. *NOTE* — If bearing is being fitted to an out-of-round journal, be sure to fit to maximum diameter. Coat bearing surfaces with oil, install rod cap and tighten nuts.

Main Bearings — 1) If engine is in vehicle, support crankshaft at both ends. Starting with rear main bearing cap and working forward, remove one cap at a time and check clearances using Plastigage method. If clearances are not within specifications, bearing halves must be replaced or crankshaft must be ground and undersize bearings installed. *NOTE* — If a new bearing cap is being installed and clearance is less than .001" (.025 mm), inspect for burrs or nicks. If none are found, shim new bearing cap. A standard bearing half may be used in combination with a .001" (.25 mm) undersize bearing half, or a .001" (.25 mm) undersize bearing half may be used with a .002" (.050 mm) undersize bearing half to obtain correct clearance.

2) Using a suitable tool installed in oil hole in crankshaft, rotate crankshaft clockwise to remove upper bearing half. Oil new upper bearing half and insert plain (un-notched) end between crankshaft and indented (notched) side of block. Rotate bearing into place. Install main bearing cap with "F" pointing toward front of engine and insert installed in cap. Tighten bolts and rotate crankshaft to see that there is no excessive drag.

THRUST BEARING ALIGNMENT

With crankshaft forced toward front of engine, check end play at front of number five bearing cap with a feeler gauge. If end play exceeds specifications, thrust bearings must be replaced.

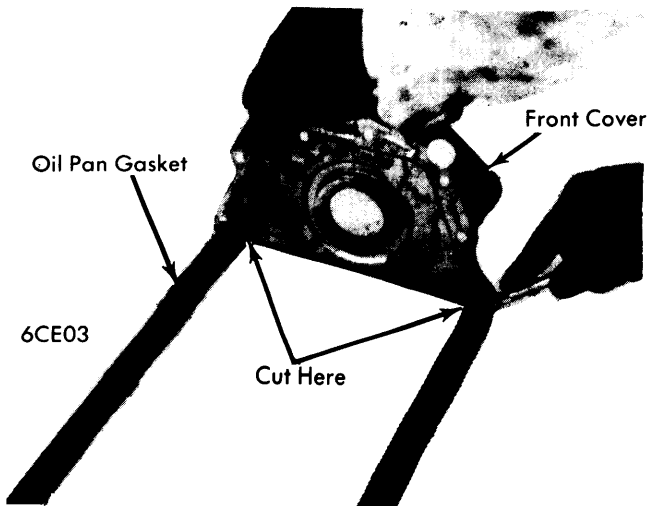
REAR MAIN BEARING OIL SEAL

Removal — With engine removed from vehicle, remove oil pan and rear main bearing cap. Clean bearing cap and cylinder block and inspect crankshaft seal surface for excessive wear, nicks, etc.

Installation — Install new seal in cylinder block, taking care to seat seal against rear main bearing bulkhead. Coat horizontal bearing cap split line with suitable sealer and install rear bearing cap while sealer is still wet to touch. Install and tighten cap bolts and place suitable two part sealer in vertical grooves. Remove excess sealer and reinstall oil pan.

ENGINE FRONT COVER

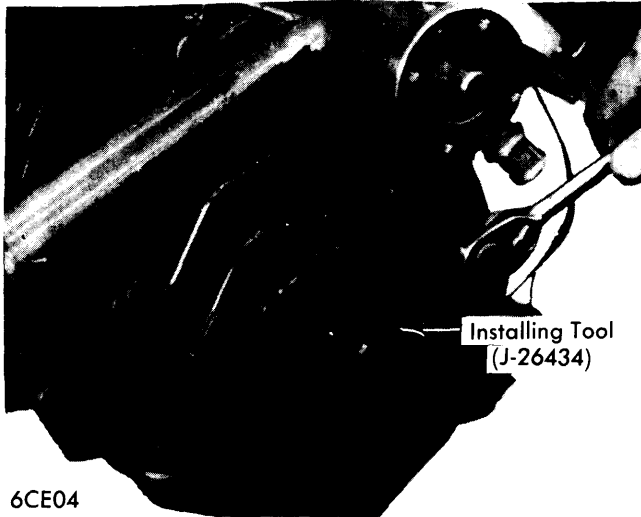
Removal — Remove timing belt upper and lower covers, crankshaft drive pulley, timing belt and timing sprocket. Remove attaching bolts (including three oil pan bolts). Remove oil cover gasket and front portion of oil pan gasket along with front cover. Inspect front oil seal and replace if necessary.



CUTTING OIL PAN GASKET

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Installation — Replace front cover gasket and cut portion of oil pan gasket as shown in illustration. Apply suitable sealer to cut off portion of oil pan gasket and install front cover using suitable installing tool (J-26434). Continue installation in reverse of removal procedure.



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INSTALLING ENGINE FRONT COVER

FRONT COVER OIL SEAL

Front cover oil seal may be replaced with engine front cover removed.

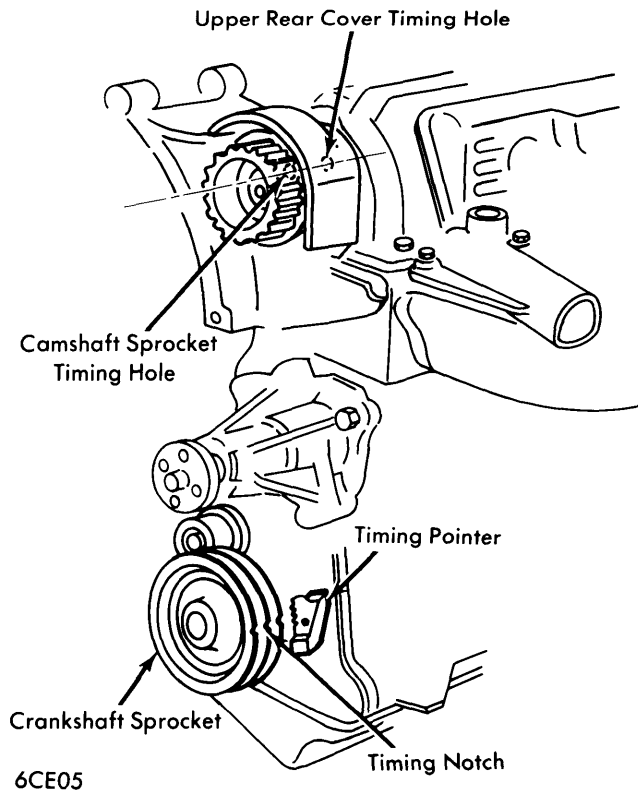
CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
All	① 1.1816-1.1831 (30.013-30.050) ② 1.7387-1.7402 (44.163-44.200)232 (5.8931)

- ① — End play is .007-.017" (.17-.43 mm)
- ② — Number 5 (rear) journal.
- ③ — Number 4 journal. Each succeeding journal is .0098" (.25 mm) larger than preceding journal.

TIMING BELT REPLACEMENT

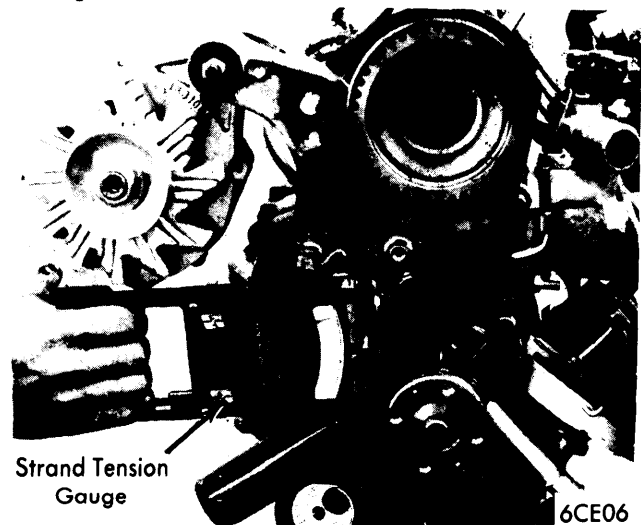
Removal — Remove timing belt upper and lower covers, crankshaft drive pulley and timing belt idler pulley. Remove timing belt from sprockets. Remove distributor cap and mark location of number 1 park plug on distributor housing. On vehicles with A/C, remove compressor and lower compressor bracket.

Installation — Lay timing belt over crankshaft sprocket and install crankshaft pulley. Rotate crankshaft to TDC of cylinder number 1 and align distributor with mark indicating number 1 spark plug made during removal procedure. Align timing hole in camshaft sprocket with hole in upper rear cover. **NOTE** — A drill rod may be inserted through both holes to aid in alignment. Install timing belt on camshaft sprocket, adjust belt tension and continue installation in reverse of removal procedure.



SPROCKET TIMING MARKS

Belt Tension Adjustment — With covers removed, place suitable strand tension gauge (J-23600) on idler pulley side of belt, midway between cam sprocket and idler pulley. Belt tension should be 55 lbs. (25 kg). To adjust tension, rotate crankshaft clockwise a minimum of one revolution and stop at number 1 cylinder TDC. **NOTE** — Do not back up. Remove idler pulley attaching bolt and apply Loctite sealer (or equivalent) to bolt. Install bolt and pulley but do not tighten bolt. Rotate idler pulley counterclockwise on its attaching bolt until specified belt tension is obtained. Tighten idler pulley attaching bolt.



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ADJUSTING TIMING BELT TENSION

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CAMSHAFT

Removal — With timing belt and camshaft sprocket removed, remove rocker arms and heater assembly. Remove cam carrier rear cover and camshaft thrust plate bolts, slide camshaft rearward slightly and remove thrust plate. Remove motor mount nuts and wire retainers, raise engine and remove camshaft.

Installation — To install, reverse removal procedure. **NOTE** — Apply Molycoat (or equivalent) to rocker arms if camshaft was replaced.

CAMSHAFT BEARINGS

This engine uses no camshaft bearings. Camshaft rides directly in camshaft carrier. Inspect bearing surfaces of carrier for wear or damage. If bearing areas are defective, camshaft carrier must be replaced.

CAM LOBE LIFT

Remove camshaft cover and install dial indicator on cam carrier so that intake and exhaust lobe on same cylinder can be measured. Rotate crankshaft in direction of rotation until dial indicator is on heel of cam lobe. Zero indicator and rotate engine slowly or "bump" engine over with remote starter switch until indicator is in fully raised position. **NOTE** — Ignition primary lead must be disconnected from coil during this test. Note and record reading and continue to rotate engine until indicator reads zero as a check on the accuracy of the reading. Compare total lift recorded with specifications.

Crankcase Capacity — 4 quarts. Add 1/2 quart with filter change.

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

Normal Oil Pressure — 39-46 psi (2.74-3.23 kg/cm²)@2000 RPM.

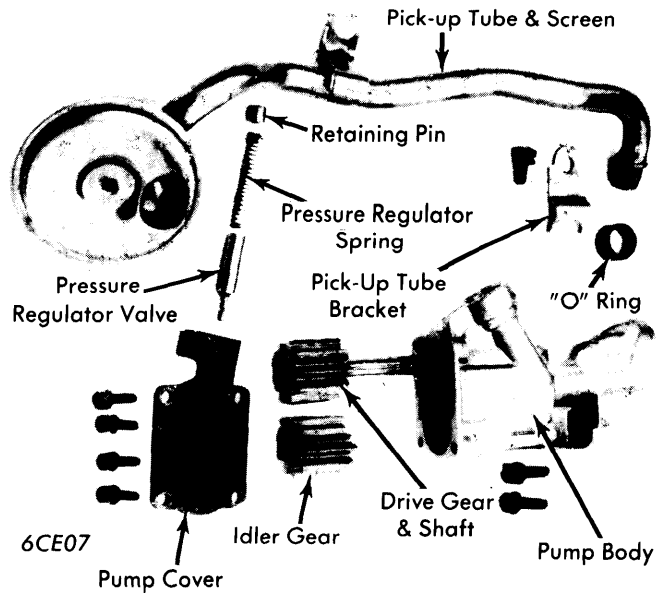
—**Pressure Regulator Valve** — In oil pump body. Not adjustable.

ENGINE OILING SYSTEM

All oil from the oil pump passes through a full-flow oil filter and into a main gallery. Main, connecting rod and camshaft bearings are pressure lubricated along with the valve lash adjusters. Piston pins and cylinder walls are splash lubricated. No lubrication is supplied to the timing belt.

OIL PUMP

Disassembly — Remove oil pump cover bolts, remove cover and gasket. Remove pump gear assembly, pressure regulator valve and related parts. If necessary, disengage pick-up tube from pump body and replace it with a new tube and "O" ring seal. **NOTE** — Do not try to separate screen from tube. They are one assembly.



OIL PUMP ASSEMBLY

Reassembly — Clean and inspect all parts for wear or damage. **NOTE** — Pump gears and body are not serviced separately. If pump gears or body are worn or damaged, replace entire pump assembly. To assemble, reverse disassembly procedure.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Camshaft Carrier Bolts	70-80 (9.7-11.1)
Camshaft Sprocket Bolt	65-85 (9.0-11.8)
Crankshaft Pulley Bolt.....	65-85 (9.0-11.8)
Connecting Rod Nuts	34-40 (4.7-5.5)
Exhaust Manifold Center Bolts	13-18 (1.8-2.5)
Exhaust Manifold End Bolts.....	19-25 (2.6-3.5)
Flywheel Bolt	40-52 (5.5-7.2)
Idler Pulley Bolt.....	13-18 (1.8-2.5)
Intake Manifold Bolt.....	13-18 (1.8-2.5)
Main Bearing Caps.....	40-52 (5.5-7.2)
Water Pump Bolts	13-18 (1.8-2.5)
	INCH Lbs. (cmkg)
Camshaft Cover Nuts.....	12-16 (14-18)
Crankcase Front Cover Bolt	75-110 (86-127)
Crankcase Front Cover Nut.....	80-105 (92-121)
Oil Pan Bolts	45-60 (47-69)
Oil Pump Cover Screws.....	71-97 (82-112)
Oil Pump Bolts	45-60 (52-69)