

1968-73 OPEL 1.5 LITER & 1.9 LITER 4 CYLINDER

GENERAL SPECIFICATIONS											
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke		
	cu. ins.	cc					in.	mm	in.	mm	
1968	1.5	91	1500	2-Bbl.	80@5100	87@3400	9.0-1	3.25	82.55	2.75	69.85
	1.9	115.8	1900	2-Bbl.	102@5200	115@3100	9.0-1	3.66	92.96	2.75	69.85
1969	1.9	115.8	1900	2-Bbl.	102@5200	121@3600	9.0-1	3.66	92.96	2.75	69.85
1970	1.9	115.8	1900	2-Bbl.	102@5400	115@3000	9.0-1	3.66	92.96	2.75	69.85
1971	1.9	115.8	1900	2-Bbl.	78@4800	100@2600	7.6-1	3.66	92.96	2.75	69.85
1972	1.9	115.8	1900	2-Bbl.	.....	.....	7.6-1	3.66	92.96	2.75	69.85
1973	1.9	115.8	1900	2-Bbl.	75 @ 4800	92 @ 2800	7.6-1	3.66	92.96	2.75	69.85

ENGINE IDENTIFICATION

Engine number is stamped on a machined pad on left side of engine. First two digits designate engine size.

Application	Code Number
1968	
1500 Rallye Kadett Engine.....	1.5S
1900 Super Kadett Engine.....	1.9S
1969-70	
1900 Super Kadett & GT Engine.....	1.9S
1971-72	
1900 Std. Opel & GT.....	1.9S
1973	
Opel 1900, Manta & GT.....	1.9US

NOTE - "US" denotes engines equipped with Opel Emission Control System (i.e. - 1.9US)

ENGINE REMOVAL

Removal (Exc. GT & 1900) - 1) NOTE - Recommend engine removal procedure is to lower engine, transmission and front suspension as an assembly from under vehicle. Disconnect battery ground cable and remove air cleaner.

2) Drain radiator and disconnect upper and lower radiator hoses. Disconnect all electrical connections. Disconnect vacuum hoses at intake manifold tee mounting and remove tee.

3) Disconnect choke cable, heater control valve and throttle linkage. Remove heater hoses at heater. Disconnect water valve bracket at manifold. Remove gear shift lever.

4) Using suitable equipment (two post axle type hoist) raise both front and rear of vehicle.

5) Disconnect and plug fuel lines. Disconnect clutch, drive shaft and exhaust pipe at manifold. Remove tailpipe and muffler hangers. Unfasten engine ground strap.

6) Using jack stands, support front of vehicle. Disconnect brake hoses. Remove steering pinch bolt. Remove steering mast guide sleeve stop bolt from mast jacket bracket. Pull steering column out until it clears mast flange.

7) Chain front suspension to hoist, this will help avoid any chance engine and transmission might have of falling.

8) Disconnect shock absorber mountings at upper mounting bolts. Remove transmission support bracket bolts. Lower engine and front suspension. With assembly on floor remaining components can be removed as necessary.

Removal (1969-73 GT) - 1) Disconnect battery ground and remove air cleaner. Drain radiator and disconnect upper and lower hoses. Disconnect all electrical connections. Disconnect vacuum hoses at intake manifold "T" mounting and remove.

2) Disconnect throttle linkage. Remove heater hoses at heater and disconnect water valve bracket at manifold. Remove gear shift lever.

3) Using suitable equipment, lift engine so front mounts are relieved of pressure. Raise both front and rear of vehicle (a two axle post type hoist is recommended).

4) Disconnect and plug fuel lines. Disconnect speedometer cable and clutch cable and remove propeller shaft. Disconnect exhaust pipe at manifold and remove tailpipe and muffler hangers. Unfasten engine ground strap.

5) Detach transmission crossmember from transmission and frame. Remove engine crossmember from engine and frame. Carefully lower engine and transmission. Remove engine from under vehicle.

Removal (1971-73 1900) - 1) NOTE - Engine can be removed through top of engine compartment. Remove hood, disconnect battery ground and drain radiator. Remove radiator hoses, radiator and shroud. Disconnect heater and choke hoses.

2) Disconnect brake booster vacuum hose and remove air cleaner. Disconnect all electrical connections and accelerator linkage. Remove console, shift lever boot, plate and shift lever.

3) Disconnect fuel pump and remove splash shield. Disconnect speedometer cable, back-up light switch and clutch cable. Disconnect propeller shaft, exhaust pipe, clutch housing support, and transmission support. Remove engine mounts.

4) Attach hoist to engine and lift engine and transmission from vehicle.

INTAKE & EXHAUST MANIFOLD REMOVAL

1) Disconnect battery and remove air cleaner. Disconnect throttle linkage and vacuum advance at carburetor. Remove fuel inlet line from carburetor.

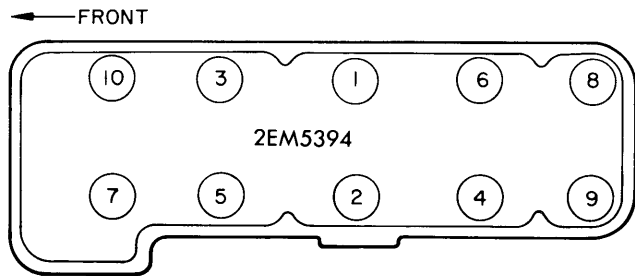
1968-73 OPEL 1.5 LITER & 1.9 LITER 4 CYLINDER (Cont.)

- 2) Remove P. C. V. valve from rocker arm cover. Release radiator pressure; disconnect and plug automatic choke water hoses.
- 3) Disconnect exhaust pipe. Remove six bolts mounting manifold assembly to cylinder head. Lift off manifold assembly.
- 4) If necessary, intake and exhaust manifolds can be separated by removing carburetor and four bolts attaching manifolds.
- 5) To install, reverse removal procedure and tighten all nuts and bolts to specifications.

CYLINDER HEAD REMOVAL

- 1) Drain radiator and block. Remove hoses from thermostat housing.
- 2) Remove manifold assembly as outlined above. *NOTE* — If cylinder head is being removed to change gasket, it is not necessary to remove manifold assembly.
- 3) Remove spark plug wires, and bolt holding wires away from cylinder head.

- 4) Remove rocker arm cover. Using suitable tool (J-22915) extract cylinder head bolts. Remove three bolts securing plate to front cover.
- 5) Remove plastic screw from end of camshaft. Remove three bolts attaching camshaft sprocket to cylinder head. Slide sprocket off camshaft and remove head.
- 6) To install, reverse removal procedure and tighten all bolts to specification. See *Illustration*.



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)
1.5 & 1.9 Intake	① 1.574 (40)	44°	45°	.049-.059 (1.24-1.50)	.3438-.3543 (8.73-9.00)	.001-.0025 (.025-.064)	....
Exhaust	1.338 (34)	44°	45°	.063-.073 (1.60-1.85)	.3524-.3528 (8.95-8.96)	② .002-.0035 (.050-.089)	....

- ① — 1968 1.5 liter engine: intake 1.496" (37.9 mm) & exhaust 1.259" (31.9 mm).
 ② — 1971 & later models, exhaust .0024-.0039" (.06-.10 mm).

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E

VALVE GUIDE SERVICING

- 1) Remove cylinder head as previously described. *NOTE* — Never place removed cylinder head with installed camshaft and valves, contact face down.
- 2) Using suitable spring compressor (J-8062) compress valve spring and remove cap retainers. Release tool and remove spring and cap.
- 3) Remove valves and place them in numerical order for reinstallation in original position.
- 4) Remove carbon from combustion chambers, pistons and valves. Clean carbon and gum deposits from valve guide bores.
- 5) Visually inspect valve faces and seats for pits, burned areas or any evidence of poor seating.
- 6) New intake valves must not be refaced or lapped with grinding compound. For correct valve head angle, see specification chart.
- 7) Inspect valve guides for wear or pits. Valve guides can be reamed to fit oversize stems. *NOTE* — Oversize valves are sometimes fitted during production. Oversize valve and guides are available in following diameters:

Valve & Valve Guide Oversizes

Oversizes	Valve Guide Dia.	Valve Stem Dia.
.0030" (.08 mm) ①		
Intake.....	.3553-.3563 (9.02-9.05)	.3538-.3543 (8.99-9.00)
Exhaust.....	.3553-.3563 (9.02-9.05)	.3524-.3530 (8.95-8.97)
.0059" (.15 mm) ②		
Intake.....	.3612-.3622 (9.17-9.20)	.3597-.3602 (9.14-9.15)
Exhaust.....	.3612-.3622 (9.17-9.20)	.3583-.3589 (9.10-9.12)
.0118" (.30 mm) ③		
Intake.....	.3671-.3681 (9.32-9.35)	.3656-.3661 (9.29-9.30)
Exhaust.....	.3671-.3681 (9.32-9.35)	.3642-.3648 (9.25-9.27)

- ① — Oversize identification mark is No. 1.
 ② — Oversize identification mark is No. 2.
 ③ — Oversize identification mark is Letter A.
- 8) Reseat valve seats in cylinder head, using suitable tool.
 - 9) Lube valves with engine oil and reinstall valves, valve springs, caps and cap retainers. Install valve spring with closely wound coils toward cylinder head.
 - 10) Install cylinder head and adjust valve clearances.

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VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1968-70 1.5 & 1.9	Intake	72.75 @ 1.634 (32.9 @ 41.5)	125.66 @ 1.319 (56.9 @ 35.5)
	Exhaust	68.34 @ 1.378 (30.9 @ 35.0)	131.61 @ 1.063 (59.7 @ 27.0)
1971-72 1.9	Intake	81.6 @ 1.57 (37 @ 39.9)	153.2 @ 1.18 (69.5 @ 30.0)
	Exhaust	71.7 @ 1.36 (32.5 @ 34.5)	157 @ 1.18 (71.2 @ 24.4)
1973 1.9	Intake	93 @ 57 (42 @ 15)	182 @ 1.18 (82 @ 30)
	Exhaust	97 @ 1.36 (44 @ 36)	180 @ .96 (81.6 @ 24)

ROCKER ARM STUD REPLACING

- 1) Remove air cleaner, rocker arm cover and rocker arm. *NOTE* — Rocker arm studs are screwed into cylinder head. The tapered part of the stem serves to prevent stud from loosening.
- 2) Attach vise-grip pliers to stud and remove stud from cylinder head.
- 3) Screw in new stud. Seat tapered part of stud by striking stud end with a rubber mallet.

4) Put two turned down rocker arm nuts on threaded part of stud and torque stud into cylinder head. Torque value is 29 ft. lbs. *NOTE* — After a short period of operation, valve clearance generally increases. Check stud tightness and retorquing to specification.

VALVE LIFTER SERVICING

- 1) Valve lifters can be removed after extracting rocker arm cover and rocker arms.
- 2) No oversize lifters are available. Valve lifter guide pit marks can generally be eliminated or smoothed with fine emery cloth. At this time lifters should be replaced.
- 3) To install, reverse removal procedure and adjust valve clearance.

VALVE CLEARANCE ADJUSTMENT

1968-70 — With engine at normal operating temperature, remove rocker arm cover and gasket. *NOTE* — To prevent oil splash from timing chain, install suitable sheet metal oil deflector shield over chain. Set engine at slow idle and adjust intake and exhaust valves to .012" (.30 mm).

1971-73 — 1) Hydraulic lifter adjustment must be done with engine off. It does not matter if engine is cold or at operating temperature.

- 2) Set piston of respective cylinders to TDC. Manufacturer recommends adjusting lifters in the firing order.
- 3) Back off adjusting nut at the rocker arm until clearance is achieved. Tighten adjusting nut until any clearance between valve, rocker arm and lifter is eliminated. Tighten adjusting nut one revolution further. No readjustment will be necessary.

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit	Rod Fit	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1968-73 1.5 & 1.9	.0012-.0014 (.030-.036)	.....	Press Fit	No. 1	.014-.022 (.36-.56)	.0024-.0034 (.06-.09)
		.....		No. 2	.014-.022 (.36-.56)	.0013-.0023 (.03-.06)
		.....		Oil	.015-.055 (.38-1.4)	.0013-.0024 (.03-.06)

OIL PAN REMOVAL

1968-70 Kadett & 1971-72 Opel Series — 1) Engine must be supported and suspension crossmember lowered to remove oil pan. Support engine with suitable metal brackets (J-23098) between frame horns and upper motor mount studs on each side.

2) Raise front of vehicle and support with jack stands. Remove steering shaft clamp bolt and mark location of shaft to flange. Remove steering mast guide sleeve stop bolt from mast jacket bracket (stop bolt and lock plate are located on column just under ignition switch). Pull steering column out of steering mast flange.

3) Disconnect brake lines at brake hose. Disconnect shock absorbers at upper mounting bolts. Remove engine mounting nuts and crossmember attaching nuts and lower crossmember. Drain engine oil, remove oil pan bolts and remove oil pan. To install components, reverse removal procedure.

1969-73 GT Series — To remove oil pan, engine must be supported with suitable metal brackets (J-23375) at frame horns and engine support member removed. *NOTE* — It is not necessary to remove suspension crossmember. Drain oil, remove oil pan bolts and remove oil pan. To install oil pan, reverse removal procedure.

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1971-73 1900 & Manta — 1) Engine must be supported and suspension crossmember lowered to remove oil pan. Suitably support engine from top by placing a beam across engine compartment between fender aprons, and hold engine up with chains to beam. Ensure device used will not allow engine to fall once engine mounts are removed.

2) Remove two motor mount bracket nuts. Remove two front suspension-to-frame rail bolt retaining nuts. Disconnect steering shaft U-joint.

3) Using a floor jack placed under center of front suspension crossmember, raise vehicle high enough for suspension to be removed.

4) Place jack stands under front of vehicle to support it in position.

5) Remove front crossmember support-to-frame mounting bolts.

6) Disconnect brake hoses.

7) Lower front suspension from vehicle.

8) Drain oil and remove oil pan.

PISTON & ROD ASSEMBLY

1) Remove oil pan as previously described.

2) Remove cylinder head as previously described.

3) Inspect cylinder bore above ring travel and eliminate ridges, if any exist.

4) Mark cylinder number on all pistons, rods and caps. *NOTE* — Cylinders are numbered 1-2-3-4 (Front to Rear).

5) Remove cap bearing shell from No. 1 connecting rod.

6) Remove piston and rod assembly through top of cylinder. Remove remaining piston assemblies in similar manner.

7) To install, compress piston rings and install piston and rod assembly from top of engine.

PISTON PIN REPLACEMENT

1) Inspect bearing surfaces of piston pins. Check for wear by measuring surfaces with a micrometer. Check fit of piston in piston boss. If pins fit too tight due to gum and varnish, use a suitable solvent to remove sludge.

2) If piston bosses are worn out-of-round, or are oversize, the piston and pin assembly must be replaced. To separate piston and rod, press piston pin from assembly with suitable press equipment. Pin fit in rod is a press fit. Pin fit in piston must fit with .0004-.0007" (.01-.02 mm) clearance.

FITTING PISTONS & RINGS

NOTE — It is recommended that replacement piston, pin and rod assemblies for 1968-69 models be serviced only as assemblies.

Pistons 1968-70 — 1) Cylinder bores may not be same size. Identification of cylinder sizes are stamped by index number on distributor side of crankcase on oil pan mounting flange. Index numbers are used on standard bores and oversize bores give full diameter.

2) New pistons have identification number stamped on top of piston. This number is last digit of diameter in millimeters for standard pistons and full diameter for oversize pistons.

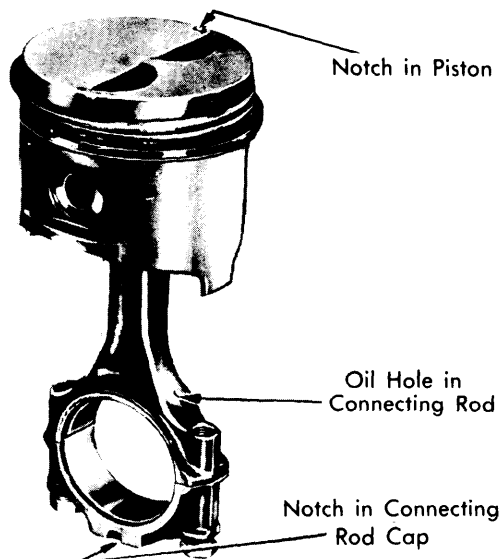
3) Pistons and connecting rods are available as an assembly.

4) Measure cylinder bore and select new piston (size) to be installed. If reboring, select piston, measure it, and bore block to fit piston.

Pistons 1971-73 — 1) Pistons are cam ground. For fitting purposes piston must be measured 1/2" below top of piston.

2) Oversize pistons are available. If cylinder is to be bored, first select piston.

3) Piston must be assembled with notch in piston head facing toward front of engine, oil hole in connecting rod pointing toward right (manifold side) and notch in connecting rod facing rearward.



PISTON & ROD ASSEMBLY

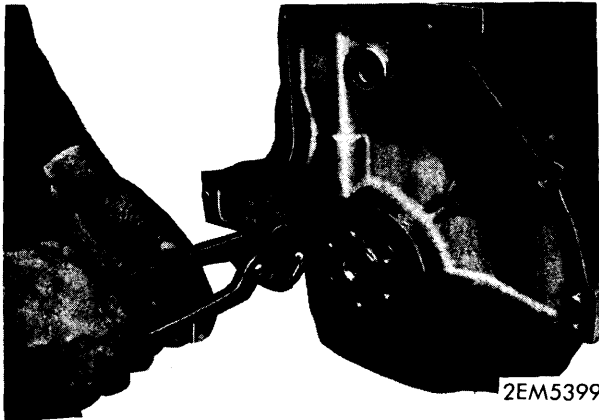
Piston Rings (All Models) — Install replacement piston rings as specified by ring manufacturer. If piston ring installation instructions are not furnished by ring manufacturer, the following procedure should be used: Install oil ring spacer band with joint at piston front below notch. Space oil ring steel bands one or two inches on each side of spacer band joint. Install number two compression ring so "TOP" mark is up and ring gap is at back of piston, 180° from piston notch. Install number one compression ring with gap in front under piston notch. Either side can be placed up.

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)
1968-73 1.5 & 1.9	2.2829-2.2835 (57.99-58.00)	.0009-.0025 (.023-.064)	No. 5	.0017-.0061 (.043-.155)	2.0461-2.0468 (51.97-51.99)	.0006-.0025 (.015-.064)	... ....

1968-73 OPEL 1.5 LITER & 1.9 LITER 4 CYLINDER (Cont.)

REAR MAIN BEARING OIL SEAL SERVICE

- 1) Remove transmission, bell housing and clutch.
 - 2) Remove flywheel.
 - 3) Using a punch, make a small hole in oil seal and insert a metal screw. With a pair of pliers, pull out oil seal.
 - 4) Fit new seal to installer J-22928 (or equivalent). Place installer, with seal, over crankshaft flange and carefully seat seal.
 - 5) Reverse removal procedure for remaining components.
- NOTE** — Replace flywheel bolts and torque to specification.



REMOVING REAR MAIN OIL SEAL

MAIN BEARING & CONNECTING ROD BEARING SERVICE

Connecting Rod Bearings — 1) Remove oil pan as previously described.

- 2) Disconnect two connecting rods at a time from crankshaft. Inspect bearing and crankpin journals. While rotating crankshaft to bring rod journals to bottom, it is necessary to temporarily reconnect rods to crankshaft.
- 3) If rod bearings are chipped or scored, they must be replaced. If bearings appear satisfactory, use Plastigage method to check clearance.
- 4) If crankpin journals are scored or ridged, crankshaft must be reground or replaced. Minor imperfections may be eliminated by honing.
- 5) Bearings are available in standard sizes and several oversizes. Select correct bearing and reinstall cap with bearing. Tighten nuts to specification.

Main Bearings — 1) Crankshaft bearings consist of two halves which are identical (Exc. rear main) and interchangeable in cap and crankcase.

2) Crankshaft bearings are precision type which do not require reaming to size. Shims are not available. Bearings are available in standard and undersize. **NOTE** — Do not file crankshaft bearing caps to adjust wear.

3) Crankshaft main bearings can be inspected in same manner as connecting rod bearings (Plastigage method).

THRUST BEARING ALIGNMENT

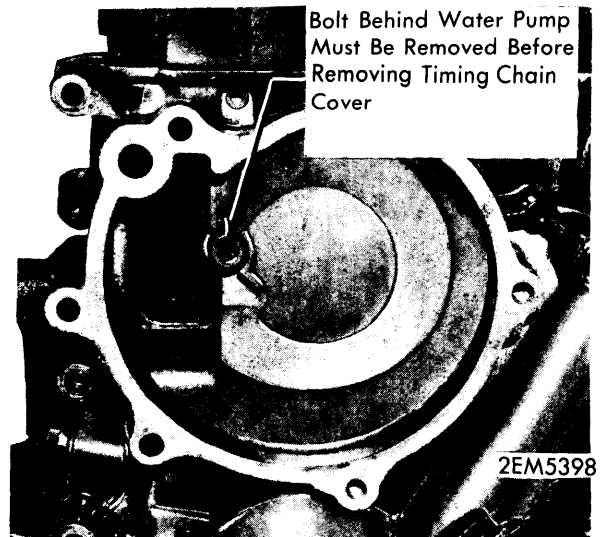
If thrust bearing has been disturbed or replaced, it is necessary to line up thrust surfaces of the bearing before cap bolts are tightened. Move crankshaft forward and backward (fore and

aft) the maximum travel limit. After having moved the crankshaft several times, finger tighten thrust cap bearing bolts and move crankshaft forward one more time. Thrust bearing should now be aligned.

TIMING CHAIN COVER

1) Support engine and remove oil pan as previously outlined. Remove radiator and shroud. Remove cylinder head as previously outlined. Remove generator (alternator) and mounting brackets. If equipped with A.I.R., remove pump and brackets.

2) Remove fuel pump and ignition distributor. Remove chain tensioner from timing chain cover. Remove crankshaft pulley, water pump and timing chain cover bolts. **NOTE** — Remove hidden bolt behind water pump, see illustration. To install timing chain cover, reverse removal procedure.



BOLT BEHIND WATER PUMP

TIMING CHAIN COVER OIL SEAL

NOTE — It is possible to replace oil seal without removing timing chain cover.

- 1) Remove fan belt. Remove A.I.R. belt (1968-69). Remove crankshaft pulley bolt and pulley.
- 2) Insert suitable tool (screwdriver) behind seal and rest tool on crankshaft pin. Pry out oil seal.
- 3) Oil a new seal and place it on tool J-22924 (or equivalent). Place seal and installer on crankshaft. Using crankshaft washer and bolt, seat seal into cover.

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1.9			
Front	1.926 (48.9)	.001-.003 (.03-.08)	....
1	1.916 (48.7)	.001-.003 (.03-.08)	
2	1.911 (48.5)	.001-.003 (.03-.08)	
3	1.906 (48.4)	.001-.003 (.03-.08)	

1968-73 OPEL 1.5 LITER & 1.9 LITER 4 CYLINDER (Cont.)

CAMSHAFT REMOVAL

- 1) Remove cylinder head as previously described.
- 2) Loosen rocker arm nuts and swing rocker arms off lifters.
- 3) Remove valve lifters and place them in a suitable holder. Lifters must be replaced in original position.
- 4) Remove cover from access hole on left rear of cylinder head. Remove camshaft toward front, support camshaft with one hand inserted through access hole.

5) To install, reverse removal procedure. Check camshaft end clearance between cover and nylon screw with feeler gauge. Clearance must be .004-.008". Excess clearance may be eliminated by readjusting cover carefully with a suitable drift. **NOTE** — Maximum permissible radial runout of camshaft center bearing with camshaft supported in outer bearings is .001".

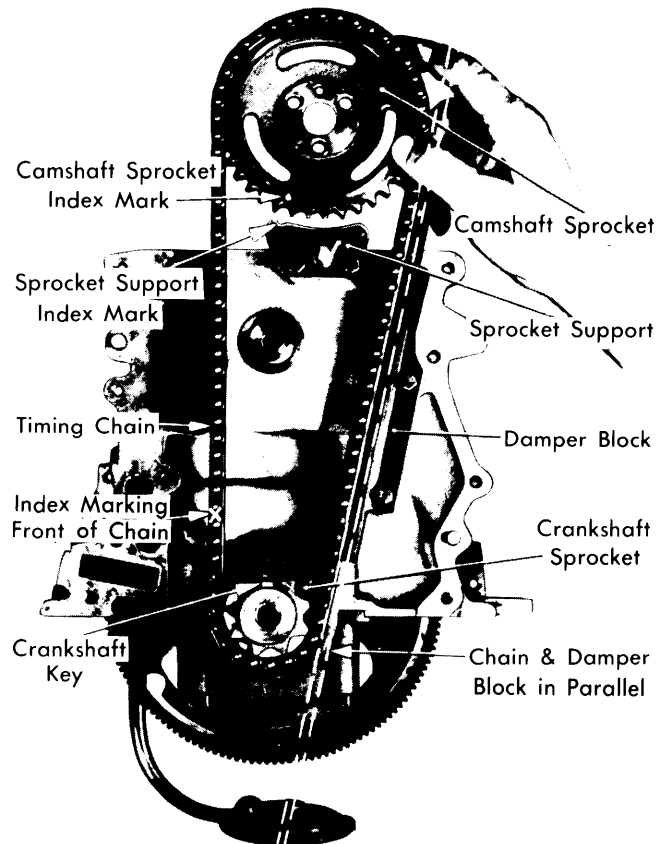
TIMING CHAIN REPLACEMENT

- 1) Remove timing chain cover as previously outlined. Remove chain sprocket bolts and remove chain and sprockets together. **NOTE** — Mark front side of chain with paint (if chain is being reinstalled) so chain will rotate in same direction as prior to removal.
- 2) To install chain and sprockets, turn crankshaft so key for sprocket is on top and vertical. Assemble chain with camshaft sprocket, then put chain over crankshaft sprocket. Ensure that paint mark is toward front if installing original chain. Make sure camshaft sprocket mark is in alignment with mark on support and chain in parallel with damper block. Inspect chain tensioner for proper operation. Install timing chain cover and cylinder head, and check valve timing. See *Valve Timing*.

VALVE TIMING

After sprocket has been installed to camshaft, recheck alignment of chain. When marks on camshaft sprocket are aligned with marks on camshaft sprocket support, No. 1 and No. 4

pistons will be at TDC. No. 4 piston will be in firing position and No. 1 piston will be on exhaust stroke. To time engine to fire on No. 1 cylinder, rotate crankshaft 360°.



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VALVE TIMING MARKS

ENGINE OILING**ENGINE OILING SYSTEM**

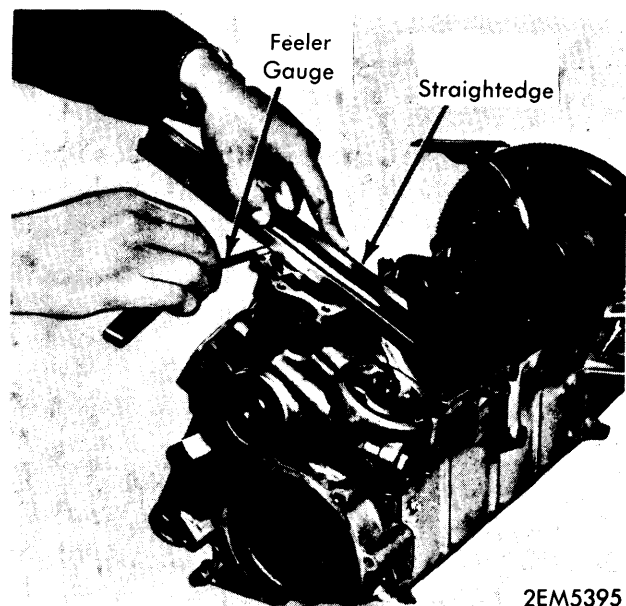
Pressure lubrication of engine is achieved by a gear type oil pump. Pump sucks oil through a screen into pump housing and forces it through a full flow type oil filter into main oil galley. Part of oil is fed to the crankshaft and camshaft bearings. The bearings of crankshaft journals are connected with main bearings by bores so main bearings can effectively be oiled. Oil thrown off crankshaft serves as lubrication for cylinder walls.

Crankcase Capacity — All models, 3 qts. without filter change and 3 ¼ qts. with filter change.

Oil Filter — Full-flow type.

OIL PUMP

- 1) Remove screws mounting oil pump cover assembly to timing cover and remove cover. Slide out oil pump gears. Clean gears in a suitable solvent and inspect for wear and scoring.



2EM5395

MEASURING OIL PUMP GEAR END CLEARANCE

1968-73 OPEL 1.5 LITER & 1.9 LITER 4 CYLINDER (Cont.)

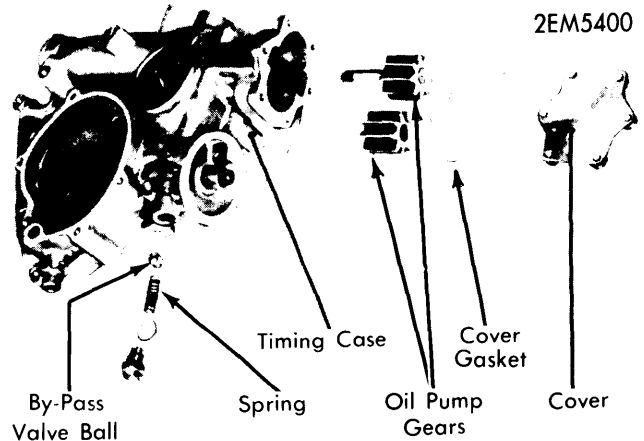
ENGINE OILING (Cont.)

2) If pump cover is scored by gear action, it must be replaced. If distributor shaft bushing is worn, assembly must be replaced. In some cases a .008" oversize bore for pump gears and shafts may have been installed during manufacturing. These cases can be distinguished by the number 0.2" stamped into pump flange. Oversize replacement gears are available.

3) If new gears are installed, end clearance should be measured with a straight edge and feeler gauge. Gears must not protrude over pump housing more than .004".

4) Inspect oil pump gear backlash. Backlash should not exceed .004-.008".

5) Inspect spring, ball and seat for dirt and foreign material that might impair operation.



OIL PUMP ASSEMBLY

ENGINE COOLING

WATER PUMP

1) Drain coolant. Remove fan belt, fan blade and pulley on pump shaft.

2) 1968-69 remove A.I.R. belt.

3) Remove crankshaft pulley. Disconnect water pump inlet and heater hose from water pump. Remove bolts, pump assembly and gasket from timing chain cover.

4) To install, reverse removal procedure.

Thermostat - Standard thermostats are 190°. Thermostat should begin to open at 189°F and be fully open at approximately 212°F. If thermostat does not operate properly, it must be replaced.

Cooling System Capacity - All models 6 quarts.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head Bolts	
Warm.....	58 (8)
Cold.....	72 (10)
Cylinder Head-to-Timing Cover.....	17 (2.4)
Connecting Rod Bolts.....	36 (5)
Crankshaft Main Bearing Bolts.....	72 (10)
Crankshaft Pulley Bolt	
1968 Models.....	54 (7.5)
1969 & Later.....	72 (10)
Camshaft Sprocket Bolt.....	18 (2.5)
Engine Support-to-Cylinder Block Bolts.....	40 (5.5)
Flywheel-to-Crankshaft Bolts.....	43 (6)
Intake & Exhaust Manifold-to-Cylinder	
Head Bolts.....	33 (4.6)
Rocker Arm Studs.....	29 (4)
Timing Case-to-Cylinder Block Bolts.....	14 (2)
Water Pump-to-Timing Case Bolts.....	11 (1.5)