

Opel Engines

1966-71 OPEL 1.1 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
1966-67 Std.	65.76	1100	1X1-Bbl.	54@5600	59@3000	7.8-1	2.95	74.93	2.40	59.96
Hi-Perf.	65.76	1100	1X1-Bbl.	60@5600	63@3200	8.8-1	2.95	74.93	2.40	59.96
Ralley	65.76	1100	1X1-Bbl.	67@6000	62@5000	9.2-1	2.95	74.93	2.40	59.96
1968 Std.	65.76	1100	1X1-Bbl.	55@5600	59@2800	8.2-1	2.95	74.93	2.40	59.96
1969 Std.	65.76	1100	1X1-Bbl.	55@5600	57@3400	8.2-1	2.95	74.93	2.40	59.96
Hi-Perf.	65.76	1100	2X1-Bbl.	67@6700	62@5000	9.2-1	2.95	74.93	2.40	59.96
1970 Std. & GT	65.76	1100	2X1-Bbl.	63@6000	58@4000	8.2-1	2.95	74.93	2.40	59.96
Hi-Perf. & GT	65.76	1100	2X1-Bbl.	67@6000	62@5000	9.2-1	2.95	74.93	2.40	59.96
1971 Std.	65.76	1100	2X1-Bbl.	49@5500	52@3600	7.6-1	2.95	74.93	2.40	59.96

ENGINE IDENTIFICATION

1966-67 – Engine number is located on left side of engine just above crankcase dip stick. Engines can be distinguished from each other by means of a letter included in engine number.

1968-71 – Engine number is stamped on a machined pad on left side of engine. First two digits designate engine size.

Application

Code Number

1966-67	
54 HP Engine.....	1
60 HP Engine.....	S
67 HP Engine.....	SR
1968	
1100 Std. Kadett Engine.....	1.1
1969	
1100 Std. Kadett Engine.....	1.1S
1100 High Performance	1.1SR
1970	
1100 Std. & GT.....	1.1R
1100 High Performance & GT.....	1.1SR
1971	
Std. Opel Engine.....	1.1R

ENGINE REMOVAL

All Exc. 1970 GT – 1) Remove hood and disconnect battery cables. Drain cooling system and remove assembly including hoses. Using suitable tool (J-21709) remove shift linkage. Remove air cleaners. Withdraw throttle rod from carburetor and rear support.

2) From engine, disconnect fuel line, control cables for carburetors and heater, heater hoses and starter wires, alternator, distributor, and back-up light switch on transmission.

3) Remove oil filter and its housing. Disconnect exhaust pipe from exhaust manifold. Raise car and support in safe manner. Remove drive shaft.

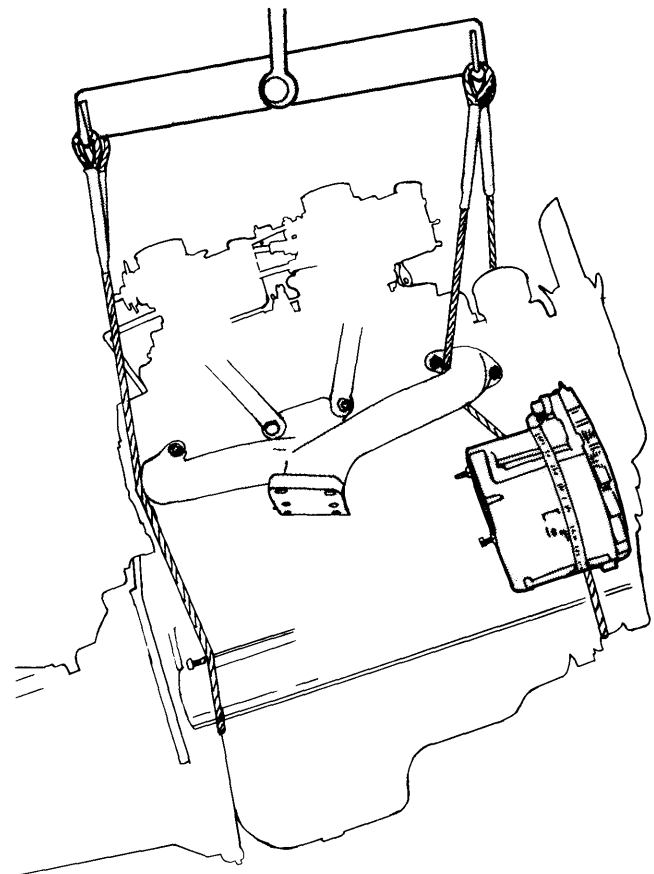
4) Support transmission with a jack. Attach suitable lift to engine. Remove transmission to crankcase bolts. Extract transmission mounting bolts. Remove engine mounts from each side of engine. Lift engine from car.

1970 GT – 1) Remove hood and disconnect battery cables. Drain cooling system and remove assembly including hoses. Using suitable tool (J-21709) remove shift linkage. Remove air cleaners. Withdraw rod from carburetor and rear support.

2) From engine, disconnect fuel line, control cables for carburetors and heater, heater hoses and starter wires, alternator, distributor, and back-up light switch on transmission.

3) Remove oil filter and its housing. Disconnect exhaust pipe from exhaust manifold. Remove drive shaft.

4) Using suitable equipment (see illustration), attach engine harness. Loop cable around water pump housing and front exhaust manifold mounting flange. Secure ends to bar.



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ENGINE REMOVAL (1970 GT)

1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

- 5) Loop a second cable around crankcase between clutch housing and oil pan. Secure ends to bar.
- 6) Disconnect transmission crossmember from transmission and frame. Disconnect engine crossmember from engine and frame.
- 7) Pull engine toward front as far as possible and carefully lift engine from car.

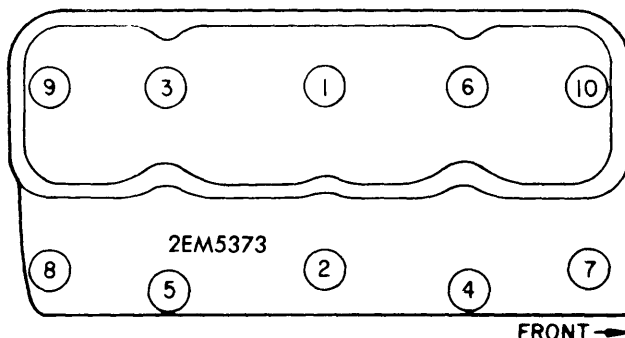
INTAKE MANIFOLD

- 1) Disconnect battery cables. Remove air cleaners and silencer. Remove throttle rod from carburetors and rear support.
- 2) Disconnect fuel line from carburetors, control cables from carburetors, vacuum lines from carburetors, heater hoses, and temperature control valve for heater.
- 3) Disconnect compound linkage (1970-71).
- 4) Remove A.I.R. control valve lines (1968-69) and rocker arm-to-intake manifold hose (1968-71).
- 5) Remove carburetor and support bracket.
- 6) Remove intake manifold by withdrawing three bolts. **NOTE** - Bolt heads are star type and require use of suitable removal tool (J-21636).
- 7) To install reverse removal procedure. **NOTE** - Install a new "O" ring into carburetor flange groove.

CYLINDER HEAD REMOVAL

- 1) Drain radiator and cylinder block. **NOTE** - Drain right side of engine block. Plug is located in front of engine mount.

- 2) Disconnect spark plug wires and remove distributor cap. Remove intake manifold as previously described. Loosen generator (alternator) and remove belt.
- 3) Remove A.I.R. pump belt, hose from A.I.R. pump, pump and mounting bracket, hose from control valve-to-A.I.R. check valve, and check valve (1968-69).
- 4) Disconnect exhaust pipe from exhaust manifold. Remove temperature switch. Disconnect heater inlet hose.
- 5) Remove rocker arm cover, rocker arm retaining nuts, rocker arms, rocker arm ball seats and push rods.
- 6) To install, reverse removal procedure. **NOTE** - Adjust valves cold by setting each piston to TDC of compression stroke and adjust intake valves to .008" and exhaust valves to .012".



CYLINDER HEAD TIGHTENING SEQUENCE

VALVES							
Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
1966-71							
Intake	1.259"	44°	45°	.....	.2756-.2760"	.0006-.0018"	.....
Exhaust	1.063"	44°	45°	.....	.2748-.2752"	.0014-.0026"	.....

VALVE ARRANGEMENT

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

VALVE GUIDES

- 1) Remove cylinder head as previously described.
- 2) Using suitable compressor (J-8062) remove valve retainers, springs, and caps. Disengage compressor and remove valve. Scrape all carbon from chambers, piston heads and valves.
- 3) Inspect valve guides for wear or pitting. Imperfections can be reamed to fit oversize stems. **NOTE** - Always check valve stem diameter because oversize valves may have been installed at factory. Valves are marked at stem end. Valve guides are available in three oversizes:

Valve Guide Oversizes

Oversize	Valve Guide Dia.	Valve Stem Dia.
.0030" ①		
Intake.....	.2795-.2803"	.2785-.2789"
Exhaust.....	.2795-.2803"	.2778-.2781"
.0059" ②		
Intake.....	.2825-.2833"	.2815-.2819"
Exhaust.....	.2825-.2833"	.2807-.2811"
.0098" ③		
Intake.....	.2864-.2872"	.2854-.2858"
Exhaust.....	.2864-.2872"	.2846-.2850"

- ① - Oversize identification mark is No. 1.
- ② - Oversize identification mark is No. 2.
- ③ - Oversize identification mark is Letter A.

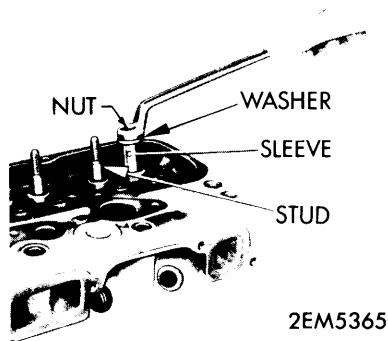
1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

4) Grind valve seat to 45° angle and reface both intake and exhaust valves to 44°. If valve seat is too wide, eliminate excess using a 25° cutting tool. Cut at top of seat. Top of intake and exhaust valves should not be less than .040" and .060", respectively, above clean combustion chamber.

5) Lubricate with engine oil and reinstall valves, valve springs, caps and valve retainers. *NOTE* — Springs must be installed with closely wound coils toward cylinder head.

VALVE SPRING REMOVAL

- 1) Remove cylinder head as previously described.
- 2) Using suitable valve spring compressor (J-8062) remove valve retainers, springs and caps. Disengage compressor and lift components from cylinder head.
- 3) To install, reverse removal procedure.



ROCKER ARM STUD REMOVAL

ROCKER ARM STUD REPLACEMENT

- 1) Remove air cleaner, rocker arm cover, rocker arm and push rod.
- 2) Place a 1" long sleeve over stud. Put a washer and nut over sleeve and remove stud (see illustration).
- 3) *NOTE* — Two types of studs are installed during production; studs differ in shaft thickness. One shaft is .006" smaller than other.
- 4) Lightly oil new stud. Using a rubber mallet, drive stud into bore so it extends 1 1/8" over top of cylinder head.

VALVE CLEARANCE ADJUSTMENT

NOTE — Valves can be adjusted Hot (Hot Method) or Cold (Cold Method). The former is the recommended procedure.

Hot Method — 1) Run engine until it is at normal operating temperature.

- 2) Remove valve cover and gasket.
- 3) While engine is running at a slow idle, adjust intake valves to .006" and exhaust valves to .010".
- 4) Reinstall valve cover with new gasket and check crankcase oil level.

Cold Method — 1) Remove valve cover and gasket.

- 2) Alternately set each piston to TDC of compression stroke.
- 3) Adjust intake valves to .008" and exhaust valves to .012" lash.
- 4) Reinstall valve cover with new gasket.

PISTONS, PINS, RINGS

Engine	PISTONS		PINS		RINGS		
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance	
1966-70	.0004-.0008"	.....	Press	Comp.	.010-.016"	.0024-.0034"
				1			
				2			
1971	.0004-.0012"	.....	Press	Oil	.008-.014"	.0013-.0025"
				1			
				2			
				Oil			

OIL PAN REMOVAL

- 1) Support engine-transmission assembly with jack stand at rear of engine.
- 2) Remove steering mast clamp bolt and steering mast guide sleeve stop-bolt from mast jacket support.
- 3) Disconnect brake lines and shock absorber mountings at upper shock mounting bolts.
- 4) Remove engine mounting nuts.
- 5) Remove front suspension crossmember nuts and lower crossmember so oil pan will clear when removed.
- 6) Remove oil pan mounting bolts and drop pan from car.

PISTON & ROD ASSEMBLY

- 1) Remove cylinder head as previously described.
- 2) Inspect cylinder bore above ring travel and eliminate ridges, if any exist.
- 3) Mark cylinder number on all pistons, rods and caps. *NOTE* — Cylinders are numbered 1-2-3-4 (Front to Rear).
- 4) Remove cap and bearing shell from No. 1 connecting rod.
- 5) Remove piston and rod assembly through top of cylinder. Remove remaining piston assemblies in similar manner.

NOTE — Manufacture recommends that piston, piston pin and rod assembly on 1966-69 Models built for distribution in United States be serviced as an assembly.

1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

PISTON PIN REPLACEMENT

- 1) Inspect bearing surfaces of piston pins. Check for wear by measuring surfaces with micrometer. Check fit of piston pin in piston bore. If pins fit too tight due to gum and varnish, use a suitable solvent to remove sludge.
- 2) If piston pin bores are worn out-of-round or are oversize, piston assembly must be replaced. Oversize pins are not generally used.
- 3) Piston pin must be pressed from piston and connecting rod assembly. Opel recommends a specific tool layout for this procedure; however, most any press can be adapted to complete the operation.
- 4) Pin must, on reassembly, fit with .0004-.0007" clearance in bore.

FITTING PISTONS & RINGS

NOTE — 1970-71 pistons are cam ground. For fitting purposes piston should be measured 1/2" below top of piston.

Pistons — 1) Cylinder bores may not be same size. Identification of cylinder sizes are stamped with index numbers on distributor side of crankcase (on oil pan mounting flange). Index numbers are used on standard bores; 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) The arrow stamped on top of piston must be installed toward front of engine. 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 first, measure it, and bore block to fit piston.

Rings — 1) Top ring is chrome plated and can be installed either direction.

2) No. 2 ring is stamped with the word "Top" and must be installed with index mark facing up.

3) Oil ring can be fitted either direction. **NOTE** — Install rings with gaps 90° offset and check clearance.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam.	Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
1967-71	2.1260"	.004-.0022"	Center ①	.004-.008"	1.77"	.0006-.0025"	.004-.010"

① — 1971 No. 5 main bearing is thrust bearing.

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 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 has to be replaced. Minor imperfections may be eliminated by honing.

5) Bearings are available in standard size and several undersizes.

Main Bearings — 1) Crankshaft bearings consist of two halves which are identical (exc. rear main) and are 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 undersizes. **NOTE** — Do not file crankshaft bearing caps to adjust wear.

3) Inspect crankshaft main bearings in same manner as connecting rod bearings were checked.

REAR MAIN OIL SEAL

1966-71 — Procedure can be accomplished with engine removed. Coat seal with engine oil. Using suitable tool (J-21707-2) start lip of seal over rear of crankshaft. Using proper mallet, pound seal until it has seated.

1971 — Procedure can be achieved with engine installed. Remove transmission bell housing and clutch. Remove flywheel. Punch a hole in oil seal and insert a metal screw. Pull out oil seal. Oil new seal and place it in suitable installation tool (J-22928). Ensure lip of seal is not twisted. Fit seal to crankshaft flange and move lip of seal over rear of crankshaft. Using a mallet, drive in oil seal until seated.

TIMING CHAIN COVER & OIL SEAL

1) Remove fan belt, crankshaft pulley mounting bolts and pulley. **NOTE** — Pulley can generally be removed by hand.

2) Remove timing chain cover, oil slinger, and chain tensioner (tensioner is spring loaded).

3) With timing chain cover supported on bench, drive outer seal retainer and cork seal from cover. **NOTE** — Inner seal retainer must not be removed.

4) To install, fit oil seal through cover face. Carefully drive seal into position until it has seated.

1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

- 5) Scrape gasket material from timing chain and clean in a suitable solvent. Fit a new gasket to chain cover and coat it with a suitable sealer.
- 6) To reinstall timing chain cover, reverse steps 1 and 2.

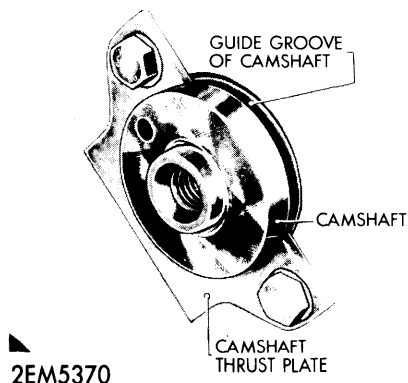
CAMSHAFT			
Engine	Journal Diam.	Clearance	Lobe Lift
1967-70			
Front	1.613"	.001-.003"	.....
2	1.594"	.001-.003"	.....
3	1.574"	.001-.003"	.....

CAMSHAFT REMOVAL

- 1) Remove engine, cylinder head, and timing chain cover as previously described.
- 2) Remove timing chain. See *Timing Chain Removal*.
- 3) Remove crankshaft pulley and distributor.
- 4) Invert engine and remove camshaft thrust plate. Remove camshaft and engine front plate. **NOTE** — If lifters are to be removed, oil pan must be removed.
- 5) To install, reverse removal procedure and tighten all bolts to specification.

CAMSHAFT BEARINGS

- 1) Replacement camshaft bearings are available in .020" undersize. Camshaft bearings must be reamed to size after being pressed into crankcase.
- 2) Coat camshaft and bearings with engine oil and carefully insert camshaft into crankcase.
- 3) Install camshaft thrust plate into guide groove in front camshaft with closed side of plate facing camshaft.

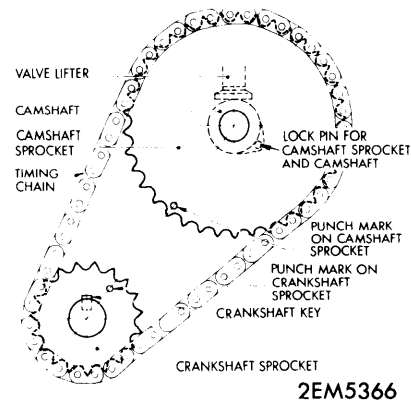


CAMSHAFT THRUST PLATE POSITION

TIMING CHAIN REPLACEMENT

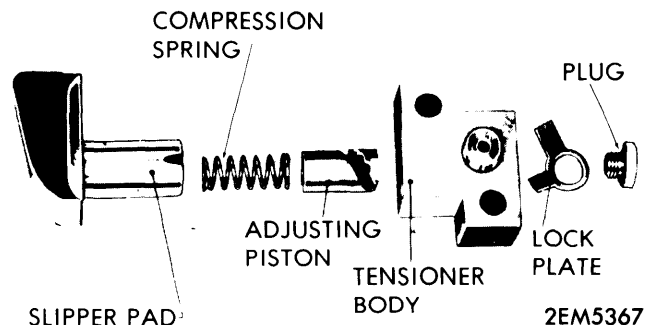
- 1) Remove fan belt, crankshaft pulley mounting bolts and pulley. **NOTE** — Pulley can generally be removed by hand.
- 2) Remove timing chain cover, oil slinger, and chain tensioner (tensioner is spring loaded). Mark forward side of timing chain so it can be reinstalled in its original position.

- 3) Remove camshaft sprocket mounting bolt and washer. Remove camshaft and crankshaft sprockets together with timing chain.
- 4) To install, fit crankshaft sprocket (smaller sprocket) onto crankshaft so index mark is facing toward front.
- 5) Install camshaft sprocket (larger sprocket) onto camshaft and lock pin so index mark is facing front.
- 6) Adjust both sprockets until index marks are opposite each other.



CORRECT POSITION — VALVE TIMING MARKS

- 7) Prior to installation of timing chain tensioner assembly, inspect for visual signs of wear. Chain tensioner may be disassembled. If any parts are found defective, complete assembly must be replaced.
- 8) Insert chain tensioner compression spring into adjusting piston. **NOTE** — Compression spring must be installed into plunger so helical slot of adjusting piston and guide pin fit into each other in plunger sleeve.
- 9) With 1/8" Allen wrench, turn adjusting piston clockwise until guide pin engages top of helical slot blocking piston for installation purposes. Slide plunger sleeve into tensioner body and bolt body to front of engine. Remove end plug and lock plate, release adjusting piston. Reinstall end plug.
- 10) Reverse removal procedure for remaining components.



TIMING CHAIN TENSIONER

1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

ENGINE OILING

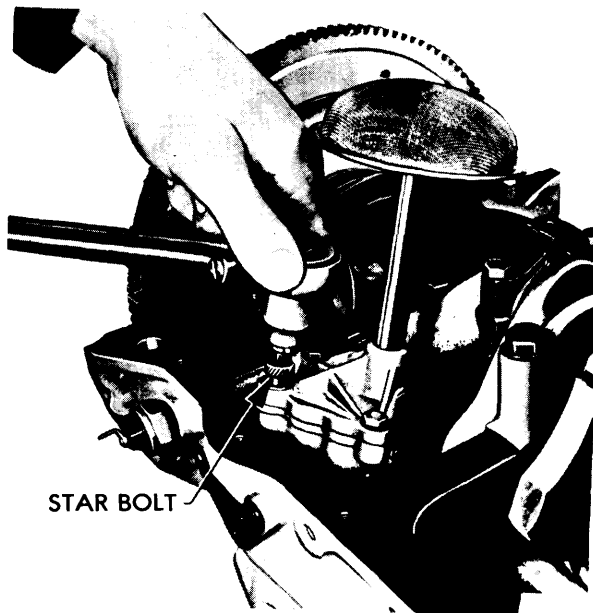
ENGINE OILING SYSTEM

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. Under pressure, oil that is thrown off crankshaft serves as lubrication for cylinder walls. Remaining oil is fed to oil galley in cylinder head and serves the valve mechanism.

Crankcase Capacity – 3.0 quarts with oil filter change. 2.5 quarts without oil filter change.

Oil Filter – Full-flow type.

By-Pass Valve – Located in filter support. Valve serves to prevent oil supply to bearings from being blocked by filter malfunctions.



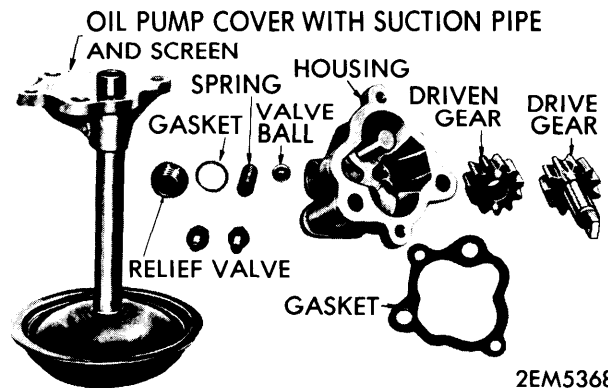
STAR BOLT

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OIL PUMP REMOVAL

OIL PUMP

- 1) Remove oil pan as previously described.
- 2) Using suitable tool (J-21736), remove two oil pump mounting bolts, oil pump, and gasket.
- 3) Remove oil pump cover, screen assembly, and slide out pump gears.
- 4) Remove pressure relief valve assembly. Wash all component parts in a suitable solvent.



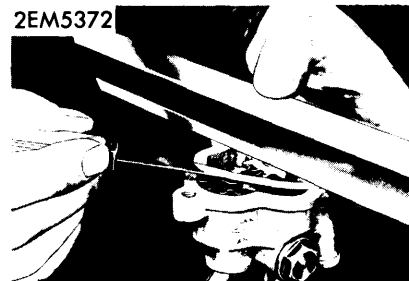
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OIL PUMP ASSEMBLY

5) To install, fit oil pump gears in housing. Inspect lash between gears using a feeler gauge (see specifications).

6) Using straight edge, check gap between housing and straight edge (see specifications). *NOTE* – Pump is constructed so gears extend above housing.

7) To install, reverse removal procedure and tighten all bolts to specifications.

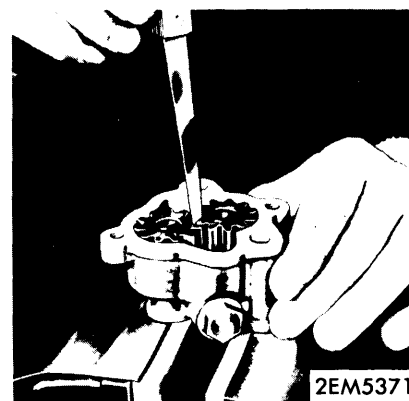


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CHECKING OIL PUMP END CLEARANCE

Oil Pump Specifications

Back Lash Between Gears.....	.004-.008"
Straight Edge-to-Housing.....	.001-.004"



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CHECKING OIL PUMP GEAR LASH

Opel Engines

1966-71 OPEL 1.1 LITER 4 CYLINDER (Cont.)

ENGINE COOLING

Thermostat — The water pump and thermostat are located in one housing. Thermostat opens at 190°F.

RADIATOR CAPACITIES

Application	Quarts
1966-67	
Without Heater	5
With Heater	5.5
1968-70	5
1971	6

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Connecting Rod Bolts	
1966-68	20
1969-71	36
Crankshaft Main Bearing Bolts	45
Flywheel-to-Crankshaft Bolts	25
Cylinder Head Bolts	35
Pulley-to-Crankshaft Bolts	30
Sprocket-to-Camshaft Bolts	30
Oil Pan Bolts	5

NOTE — If no torque is given, use the following chart:

10 mm Bolts	30 Ft. Lbs.
8 mm Bolts	15 Ft. Lbs.
6 mm Bolts	60 In. Lbs.