1966-73 GT-6 & 1966-67 2000 SEDAN 6 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	122	1998	2x1 Bbl.	....	....	9.5-1	2.94	74.7	2.99	76
1968-70	122	1998	2x1 Bbl.	....	....	8.5-1	2.94	74.7	2.99	76
1968-70	122	1998	2x1 Bbl.	....	....	9.25-1	2.94	74.7	2.99	76
1971-73	122	1998	2x1 Bbl.	....	....	8.0-1	2.94	74.7	2.99	76

ENGINE IDENTIFICATION

Engine code and serial number is stamped on a pad on left side of cylinder block. Engine number prefix denotes model range. Engine number suffix (if used) denotes high compression engine (HE) or low compression engine (LE).

ENGINE REMOVAL

2000 Sedan – 1) Disconnect battery and drain cooling system, oil pan and transmission. Disconnect and plug fuel inlet line at fuel pump. Remove air cleaner assembly.

2) Disconnect servo hose and heater hoses. Disconnect throttle lever at bellcrank and choke cable at rear carburetor. Disconnect fuel and vacuum lines from carburetor.

3) Disconnect fuel line from fuel pump, distributor vacuum line and remove both lines from engine. Remove both carburetors.

4) Raise rear of vehicle and disconnect drive shaft. Disconnect exhaust pipe from manifold, exhaust pipe bracket from transmission and separate exhaust pipe from muffler. Remove exhaust pipe.

5) Remove starter cable and disconnect water hose from water pump. Remove fan belt and disconnect all electrical connections from engine. Remove water pump.

6) From inside drivers compartment, remove gear shift knob, boot and transmission cover. Remove pivot bolt and pull gear shift lever from transmission.

7) Raise front of vehicle as high as possible and support with safety stands. Disconnect speedometer cable, back-up light switch and overdrive solenoid (if equipped).

8) Disconnect clutch slave cylinder from mount. Disconnect brake line from union next to battery. Attach holding hooks to suspension coil springs. Remove both front wheels.

9) Separate top of suspension strut from fender panel. Disconnect compression rods from chassis members. Place a jack under front crossmember.

10) Remove bolts securing crossmember to chassis, pull forward on jack to separate steering and compression rods and lower jack to remove front suspension.

11) Attach a hoist to engine and place a suitable jack under engine and transmission. Remove rear transmission support and front engine mounts. Lower engine and transmission on to jack.

12) Pull engine and transmission out from under vehicle. To install engine and transmission, reverse removal procedure.

GT 6 & GT 6+ – 1) Disconnect battery and remove radiator, hoses, air ducts, hood and air cleaner. Remove seats, dash support, capeting and tunnel cover surrounding parking brake.

2) Remove gear shift knob and lift off transmission cover. Disconnect speedometer cable, clutch slave cylinder, drive shaft and exhaust pipe bracket.

3) Place transmission in first gear and remove transmission top cover. Drain oil pan and place a jack underneath oil pan. Remove transmission crossmember.

4) Disconnect tachometer drive at distributor, choke and throttle controls, starter cable and ground wire to clutch housing. Disconnect temperature sending unit.

5) Disconnect exhaust pipe and ground strap on front engine plate. Attach a hoist to engine and disconnect front motor mounts.

6) Raise engine allowing rear of engine to tilt downward while pulling forward until engine clears engine compartment. To install, reverse removal procedure.

INTAKE MANIFOLD

Removal – Drain cooling system and remove air cleaner assembly. Disconnect fuel and vacuum lines from carburetors, and connecting link from pedal assembly. Disconnect heater hoses and intake manifold-to-emission valve hoses. Progressively loosen clips and bolts attaching manifolds to engine block, then remove intake manifold and carburetors as an assembly.

Installation – Reverse removal procedure and note the following: Make sure all mating surfaces are clean and smooth. Use all new gaskets and seals.

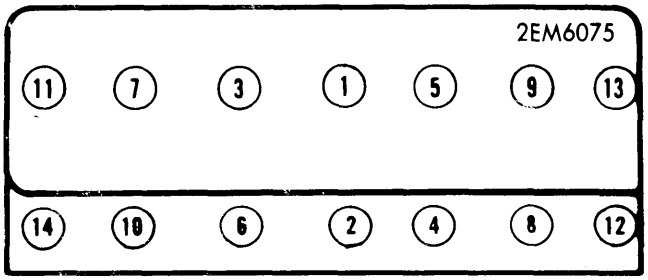
CYLINDER HEAD

Removal – 1) With intake and exhaust manifolds removed, disconnect all remaining electrical leads and vacuum lines attached to cylinder head. Loosen generator pivot bolts, remove bolt attaching upper generator bracket to cylinder head, remove drive belt and swing generator outward.

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

2) Remove three bolts attaching water pump to cylinder head. Remove rocker cover, rocker arm shaft assembly and push rods. Progressively loosen cylinder head nuts and remove, then raise cylinder head clear of head studs.

Installation – Clean mating surfaces of engine block and cylinder head, then install cylinder head using a new gasket. Install flat washers and head nuts, then tighten progressively in stages and in sequence shown in illustration. To complete installation, reverse removal procedure.



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)
1966-73							
Intake	1.303 (33.10)	45°	45°	.060 (1.52)	.3107-.3112 (7.891-7.905)	.0018-.0023 (.046-.058)	....
Exhaust	1.178 (29.92)	45°	45°	.060 (1.52)	.3100-.3105 (7.874-7.887)	.0015-.0025 (.038-.064)	....

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) With cylinder head removed and disassembled, check rock of valve in guide. If valve head moves more than .02" across seat, valve guide must be replaced.

2) Replace valve guide with a suitable guide tool (Churchill Tool No. S.60A-6). Install guide so that guide protrudes .749-.751" from top of head.

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1966-73			
Inner	1.56 (39.62)	11-14@1.14 (4.99-6.35@28.96)	....
Outer	1.61 (40.89)	27-30@1.39 (12.25-13.61@35.2)	....

VALVE SPRINGS

1) With cylinder head removed, compress valve spring with a valve spring compressor. Remove valve keepers and release spring compressor.

2) Remove spring retainer, inner and outer spring and lower spring seat. Check springs for wear or cracking. Check springs in a spring tester. If length is less than specified, replace spring.

3) To install valve springs, reverse removal procedure. Install components in reverse of removal order.

ROCKER ARM ASSEMBLY

1) With rocker arm assembly removed, drive pin out of end cap and slide off end cap, rocker arms, springs and stands, noting removal order.

2) Thoroughly clean and inspect all components. Replace rocker arms if contact face is worn. Check clearance of rocker arms on shaft, if clearance exceeds .0024", replace shaft or rocker arms.

3) Make sure oil passage in shaft is clear. To assemble, reverse disassembly procedure.

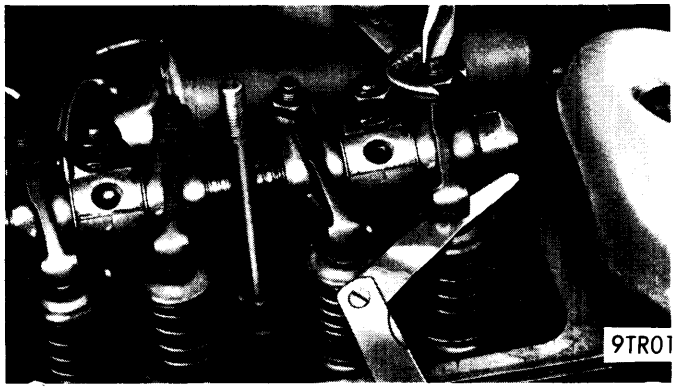
VALVE TAPPET SERVICE

Inspect face of tappets for wear or chipping. Lubricate tappets with motor oil before installation. Make sure tappets rotate freely in bore in crankcase.

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

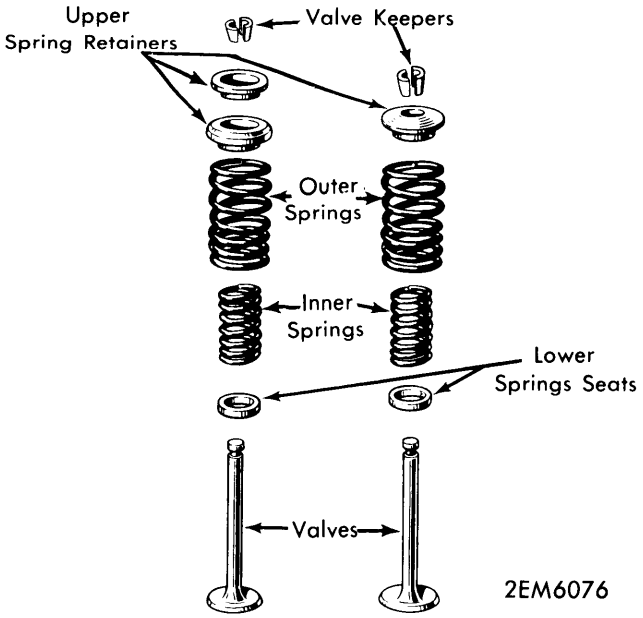
VALVE CLEARANCE ADJUSTMENT

Valve clearance is checked with engine cold. Rotate engine clockwise until valves in first column of table are fully open, then adjust valves in second column of table to .010" (.25 mm).



VALVE CLEARANCE ADJUSTMENT

Valves Open	Adjust Valves
10 & 12	1 & 3
2 & 5	8 & 11
7 & 9	4 & 6
1 & 3	10 & 12
8 & 11	2 & 5
4 & 6	7 & 9



VALVES & COMPONENTS

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit	Rod Fit	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1966-73	.0017-.0043 (.043-.109)	①	①	No. 1	.008-.013 (.203-.327)	.002-.004 (.051-.102)
				No. 2	.008-.013 (.203-.327)	.002-.004 (.051-.102)
				Oil	.008-.013 (.203-.327)	.001-.003 (.025-.076)

① — Push fit @ 68°F.

OIL PAN REMOVAL

1) Disconnect battery, drain cooling system and engine. Remove radiator top hose and dipstick. Attach a hoist to engine and raise slightly to take weight off engine mounts.

2) Disconnect front mounts and raise engine enough to remove oil pan. To install, clean mating surfaces, apply sealer to both sides of new gasket and tighten bolts to specifications.

PISTON & ROD ASSEMBLY

Removal — With cylinder head and oil pan removed, remove rod cap bolts and withdraw rod cap and bearings. *NOTE — If bearings are to be re-used, mark them for reassembly reference.* Push piston and rod assembly upwards through cylinder bore to remove.

Installation — Before installing, lubricate piston with clean engine oil. Position piston rings so gaps are staggered and facing away from thrust side of piston. Position piston and rod assembly in bore so that arrow on top of piston faces forward. Using a suitable ring compressor, compress piston rings and tap piston and rod assembly into position on crankshaft. Install rod caps, rod cap bolts, and tighten.

FITTING PISTONS

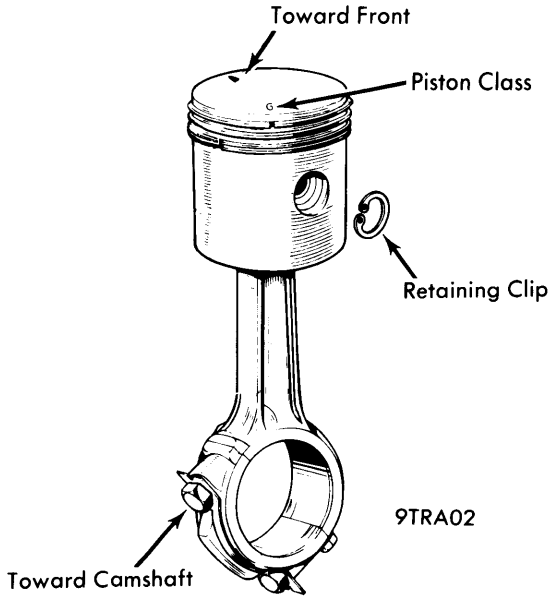
1) Pistons are manufactured for standard bores in three classes of size. Size is designated by a letter stamped in top of piston. A corresponding letter is stamped next to bore in cylinder block. If a piston is replaced, one of a corresponding class must be installed. Maximum variation in weight of all six pistons must not exceed seven grams.

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

Piston Class Size

Letter Code	Bore Size In. (mm)	Piston Size ① In. (mm)
"F"	2.9405-2.9408 (74.689-74.696)	2.9384-2.9388 (74.635-74.646)
"G"	2.9409-2.9412 (74.699-74.706)	2.9388-2.9392 (74.646-74.656)
"H"	2.9413-2.9416 (74.709-74.717)	2.9392-2.9396 (74.656-74.666)

① – Measured at right angle of pin bore on thrust face at top of piston skirt.



PISTON & ROD ASSEMBLY

2) Measure cylinder diameter at different heights in bore. If bore is worn excessively, it must be bored for oversize pistons. Maximum permissible bore wear is .010" (.254 mm). Pistons are available in .020" (.508 mm) oversize. *NOTE – If cylinders must be machined larger than .020" (.508 mm) oversize, thin wall cast iron liners must be installed and bored to either standard or .020" oversize.*

3) Piston rings are available in .010" (.254 mm), .020" (.508 mm), .030" (.762 mm) and .040" (1.016 mm) oversize. Check ring end gap in cylinder with ring positioned squarely in bore, ¼" (6.35 mm) below head mating surface of block. Check ring side clearance in piston. Install rings with word "TOP" or letter "T" facing upward.

PISTON PINS

Removal – With piston and rod assembly removed, remove retaining clips and drive out piston pins. Piston pin is full floating in connecting rod and piston.

Installation – **1)** Pin should push fit through connecting rod with slight thumb pressure at room temperature. Pin is tight in piston with piston at room temperature. Heat piston in hot water to facilitate installing piston pin.

2) If pin fits loosely in rod, bushing in connecting rod must be replaced. Remove old bushing and install new one using a suitable installing tool (Churchill No. 20. SM.FT.6201). *CAUTION – Make sure oil hole in bushing lines up with oil feed hole in connecting rod.*

3) Using a suitable reamer (Churchill No. 20.FT.6200A), ream pin bushing to correct size for new piston pin. Piston pins are manufactured in three sizes, designated by color code.

Piston Pin Size

Color Code	In. (mm)
Yellow	.8122-.8123 (20.630-20.632)
Green	.8123-.8124 (20.632-20.635)
White	.8124-.8125 (20.635-20.637)

4) Position piston on rod with arrow on top of piston pointing toward front of engine and rod bolts facing toward camshaft. Lubricate piston pin and install into rod and piston. Install pin retaining clips and check connecting rod alignment.

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)
1966-73	2.0005-2.0010 (50.813-50.825)	.0012-.0020 (.030-.051)	No. 4	.006-.008 (.152-.203)	1.875-1.8755 (47.625-47.638)	.001-.0027 (.025-.069)	.0086-.0125 (.2184-.3175)

MAIN & CONNECTING ROD BEARINGS

Rod Bearing Removal – With oil pan removed, remove connecting rod cap bolts, rod caps, and rod bearings. Note position of bearing caps in relation to connecting rods for reassembly reference.

Inspection – Using a micrometer, measure connecting rod journal diameter. If journal diameter or bearing clearance is not within specifications, replace rod bearings or regrind crankshaft to nearest undersize as necessary. Rod bearings are available in .010" (.254 mm), .020" (.508 mm), and .030" (.762 mm) undersize.

Rod Bearing Installation – Reverse removal procedure and note the following: Make sure assembly marks on rod cap and connecting rod are aligned.

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

Main Bearing Removal – 1) With engine removed from vehicle, remove oil pan, flywheel, front cover, timing chain and gears, front and rear engine plates, rear seal housing and front sealing block.

2) Remove main bearing cap bolts and main caps, then remove crankshaft. *NOTE – Main bearing caps are not interchangeable. Note numbers stamped on main bearing caps and cylinder block for reassembly reference.*

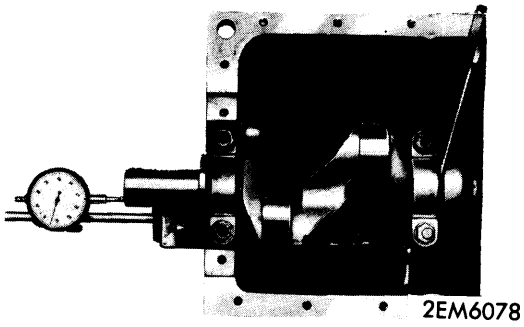
Inspection – Using a micrometer, measure main bearing journal diameter. With crankshaft mounted between centers, use a dial indicator and measure runout of center main bearing journal. Runout must not exceed .002" (.051 mm). If journal diameter, bearing clearance, or runout exceeds specifications, replace main bearings or regrind crankshaft to nearest undersize dimension as necessary. Main bearings are available in .010" (.254 mm), .020" (.508 mm), and .030" (.762 mm) undersize.

Main Bearing Installation – 1) With all parts clean and free of obstructions, install main bearings in block and main caps, making sure offset tangs of bearings are located in corresponding slots of block and main caps.

2) Lubricate bearing surfaces, then lower crankshaft into position. Place thrust washers into position, making sure white metal faces of washers are against thrust face of crankshaft. Install bearing caps making sure numbers on caps correspond with numbers stamped on block. Install main bearing cap bolts and tighten.

THRUST BEARING

Measure end play of crankshaft using a dial indicator or feeler gauges. End play should be .006-.008" (.152-.203 mm). If end play exceeds specifications, install oversize thrust washers, available in thicknesses of .096" (2.436 mm) and .098" (2.487 mm).

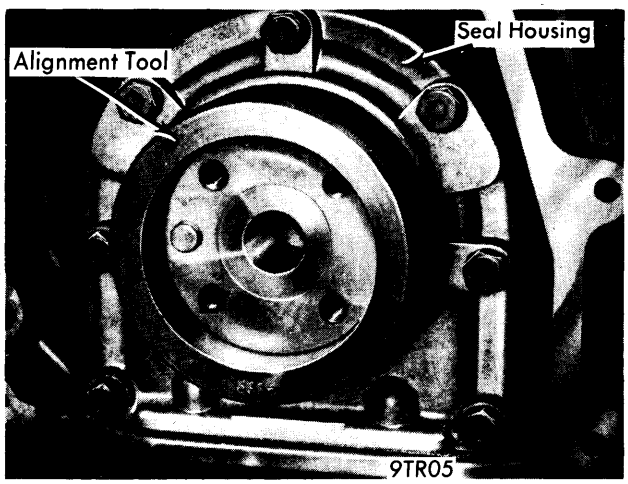


CHECKING CRANKSHAFT END PLAY

REAR OIL SEAL

Removal – Rear oil seal is secured in seal housing attached to rear face of engine block. Housing must be removed to replace seal. Remove seal housing and drive out oil seal, using two holes provided in seal housing.

Installation – Install oil seal in housing, making sure seal lip faces toward front of engine. Mount housing to engine block and install but do not tighten attaching bolts. Insert a suitable alignment tool (Churchill No. S.335) between seal lip and crankshaft, move housing to allow tool to center, then tighten housing attaching bolts and remove tool.



REAR MAIN BEARING OIL SEAL ALIGNMENT

ENGINE FRONT COVER

Removal – Remove radiator and left engine valance if engine is installed in vehicle. Remove fan assembly, crankshaft pulley, and front cover attaching screws. Remove front cover and discard gasket.

Installation – Reverse removal procedure and note the following: Make sure oil slinger is installed on crankshaft with dished side facing forward. With new gasket positioned on front engine plate, mount front cover to plate making sure timing chain tensioner is properly positioned against timing chain.

FRONT COVER OIL SEAL

Removal & Installation – With front cover removed, pry out oil seal. Install new seal into front cover, making sure sealing lip faces toward rear of engine.

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1966-73	1.8402-1.8407 (46.741-46.754)	.0026-.0046 (.066-.117)	....

TIMING CHAIN

1) Remove front engine cover as previously outlined. Remove camshaft sprocket and timing chain. Check sprockets for wear or damage and replace as necessary.

2) Install camshaft sprocket on camshaft without installing timing chain. Place a straight edge across both sprockets and check difference in height.

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

3) If height of sprockets varies considerably, remove or install shims behind crankshaft sprocket to obtain correct height. Remove camshaft sprocket.

4) Install timing chain on sprocket and install sprocket and chain on engine. Position sprockets in correct position. See *Valve Timing*. To install remaining components, reverse removal procedure.

CAMSHAFT

Removal – With cylinder head, tappets, timing chain and camshaft sprocket removed, remove fuel pump, distributor, and distributor drive gear. *NOTE – If operation is being performed in vehicle, hood must be removed.* Remove camshaft lock plate and withdraw camshaft.

Installation – Reverse removal procedure and note the following: Lubricate camshaft bearing surfaces before installing. With camshaft installed, measure camshaft end play.

CAMSHAFT END PLAY

Using a feeler gauge, measure end play of crankshaft by placing gauge between camshaft and lock plate. End play should be .004-.008" (.102-.203 mm). If not within specifications, replace lock plate.

VALVE TIMING

Engine	INTAKE Open (BTDC)	INTAKE Close (ABDC)	EXHAUST Open (BBDC)	EXHAUST Close (ATDC)
1966-73	18°	58°	58°	18°

VALVE TIMING

Unmarked Sprockets – 1) Rotate crankshaft until number one piston is at TDC. With timing chain removed, rotate camshaft until number one push rod reaches highest point of travel.

2) Adjust valve clearance of number 12 valve to .040". Rotate camshaft until number two push rod reaches highest point of travel. Adjust valve clearance of number 11 valve to .040".

3) Rotate camshaft until intake valve of number six cylinder is about to open and exhaust valve is almost closed. To check, measure clearance with equal size feeler gauges.

4) Remove camshaft sprocket, taking care not to move camshaft. Install timing chain on camshaft sprocket and install on camshaft and crankshaft sprocket.

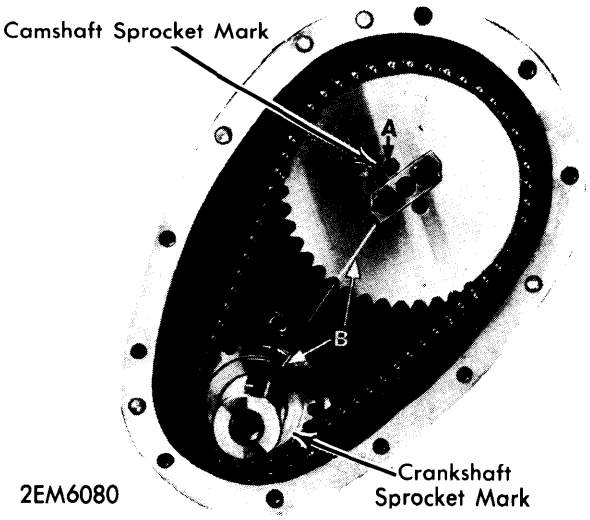
5) Align holes in camshaft sprocket and camshaft. Do not rotate camshaft to align holes. Reposition chain on camshaft sprocket if holes will not align.

6) If holes still do not align, rotate sprocket 90° and use other two holes. These holes allow a quarter of a tooth adjustment.

7) If camshaft sprocket is rotated 90° in opposite direction, a three quarter tooth adjustment is obtained. Take care not to rotate either camshaft or crankshaft during any of these procedures.

8) With sprockets positioned correctly, install camshaft lockplate and tighten bolts. Tighten sprocket bolts and bend over locktabs.

Marked Sprockets – Position chain on camshaft sprocket and install sprocket with mark aligned with mark on crankshaft sprocket as shown in illustration. Install lockplate and tighten bolts.



TIMING CHAIN & SPROCKETS INSTALLATION

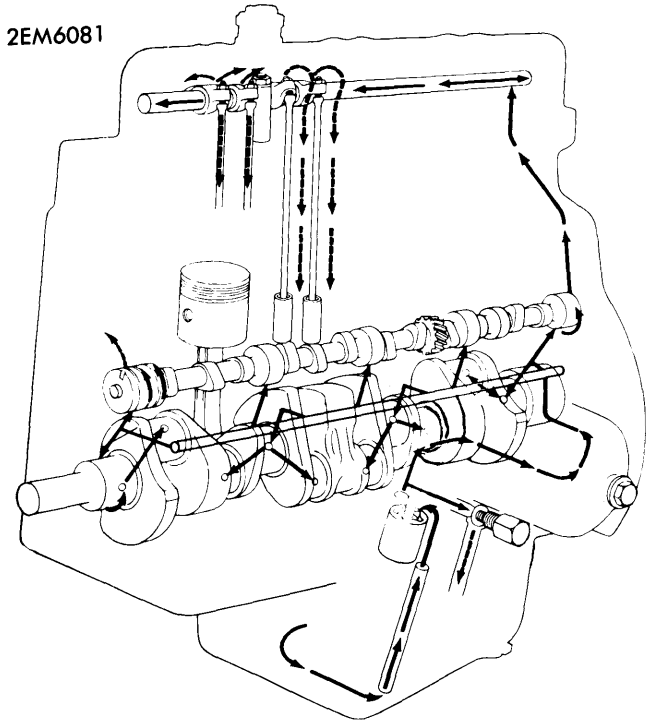
ENGINE OILING

Crankcase Capacity – 9.6 pts. (4.5 ltr).
Oil Filter – Full flow, paper element type.
Normal Oil Pressure – 60 psi @ 2000 RPM.

Pressure Regulator Valve – Located in side of crankcase next to oil filter. Remove plug and pull out spring and piston. Check spring free length and for wear or cracking. Lubricate piston and spring when installing. Install plug with new sealing ring.

ENGINE OILING SYSTEM

Full pressure oil system, utilizing a rotor type oil pump driven by camshaft. A full-flow oil filter and a pressure regulator valve are also employed.

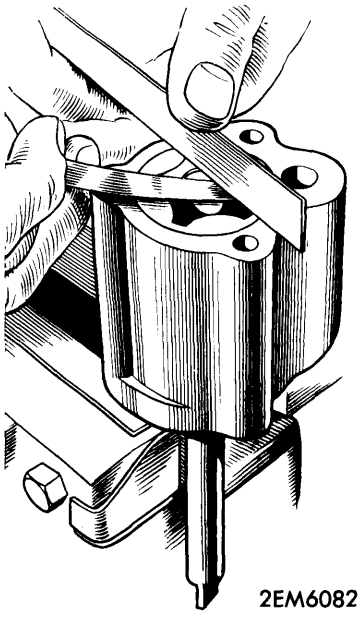


ENGINE OILING DIAGRAM

OIL PUMP

1) Remove oil pan as previously outlined. Remove oil pump. Separate cover from housing and withdraw inner and outer rotors.

2) Thoroughly clean and inspect all components. Check clearance between outer rotor and pump housing. Check clearance between inner and outer rotors.



CHECKING OIL PUMP ROTORS TO COVER CLEARANCE

3) Check clearance between rotors and cover using a straight edge on pump housing. If clearances are excessive, replace rotors, housing or cover as necessary.

4) Assemble and lubricate pump. Install cover on pump and position pump in crankcase. Evenly tighten bolts. Install oil pan as previously outlined.

Oil Pump Specifications

Application	In. (mm)
Rotor-to-Housing Clearance	.010 (.254)
Inner-to-Outer Rotor Clearance	.010 (.254)
Rotor End Play (Rotor-to-Cover)	.004 (.102)
Regulator Valve Spring	
Free Length	1.55 (39.37)
Installed Length	1.25 (31.75)
Load When Installed	14.5 lbs. (6.58 kg)

ENGINE COOLING

WATER PUMP

1) Disconnect battery and drain cooling system. Disconnect hoses at water pump and temperature sending unit connection. Disconnect fuel and vacuum line clip. Remove water pump.

2) Clean mating surfaces and use new gasket with sealer. To install reverse removal procedure.

Thermostat – Begins opening at 175-183° F (79-83° C), and is fully open at 200-205°F (93-96°C).

Cooling System Capacity – 13.2 pts. (6.2 ltr).

1966-73 GT-6 & 1966-67 2000 SEDAN 6 CYLINDER (Cont.)

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	42-46 (5.8-6.4)
Connecting Rod Bolts	38-42 (5.3-5.8)
Main Bearing Cap Bolts	55-60 (7.6-8.3)
Camshaft Sprocket Bolts	24-26 (3.3-3.6)
Camshaft Lock Plate Bolts	18-20 (2.5-2.8)
Front Cover-to-Block Bolts	18-20 (2.5-2.8)
Front Cover-to-Plate Bolts	8-10 (1.1-1.4)
Front Plate-to-Block Bolts	18-20 (2.5-2.8)
Manifold-to-Cylinder Head	20-22 (2.5-3.0)
Flywheel Bolts	42-46 (5.8-6.4)
Oil Pump Bolts	8-10 (1.1-1.4)
Rocker Arm Assy. Nuts	24-26 (3.3-3.6)
Oil Pan Bolts	16-18 (2.2-2.5)
Rocker Cover Nuts	1.5 (.3)
Water Pump Bolts	18-20 (2.5-2.8)
Rear Oil Seal Housing Bolts	18-20 (2.5-2.8)
Crankshaft Pulley Bolt	90-100 (12.4-13.8)