

MIDGET 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
1974	77.8	1275	2x1-Bbl.	65 @ 6000	72 @ 3000	8.1-1	2.78	70.61	3.20	81.28

ENGINE IDENTIFICATION

Engine identification and serial numbers are stamped on crankcase, located on right hand side above generator.

ENGINE REMOVAL

- 1) Disconnect battery, remove hood, drain cooling system and remove radiator. Disconnect heater hoses at heater unit. Disconnect cables from carburetors.
- 2) Disconnect oil pressure gauge pipes and oil cooler lines from connections at engine. If tachometer is of mechanical drive type, disconnect cable and reduction gear assembly from rear of generator.
- 3) Disconnect electrical connections from generator, coil and distributor. Remove distributor cap complete with spark plug wires. Remove starter cable from front end of starter and disconnect fuel line at fuel pump. Release clamp which holds exhaust pipe to exhaust manifold and lower exhaust pipe.
- 4) Remove fuel filter bowl and starter motor. Take up weight of transmission using a jack and remove set screws holding transmission to engine crankcase. Remove engine mounts complete with brackets and supports and take up weight of engine with suitable engine hoist. Remove engine from vehicle.

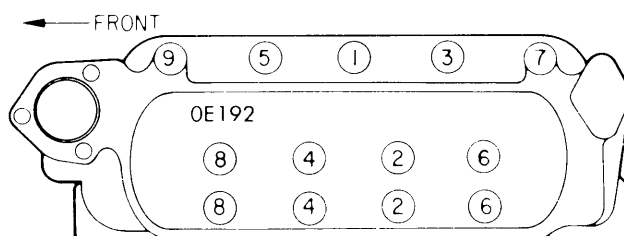
INTAKE & EXHAUST MANIFOLD REMOVAL

Removal - Remove air cleaners and carburetors. Disconnect ignition vacuum advance line from union on intake manifold and unscrew union from manifold to release heater water line. Disconnect gulp valve hose at intake manifold. Remove nuts attaching exhaust pipe to exhaust manifold and remove pipe. Remove nuts and lift off intake and exhaust manifolds.

Installation - To install intake and exhaust manifolds, reverse removal procedure.

CYLINDER HEAD REMOVAL

- 1) With hood removed, cooling system drained and battery cables disconnected, loosen retaining clip on hose which connects radiator to thermostat housing. Pull hose clear of housing.
 - 2) Remove carburetors and air cleaners and remove rocker cover. Remove spark plug wires and spark plugs. Remove clip holding vacuum pipe onto hot water control valve. If equipped with heater, disconnect inlet hose.
 - 3) Loosen top clip on water by-pass hose and remove heater hose and pipe. Remove intake and exhaust manifolds as previously described.
 - 4) Loosen rocker shaft bracket nuts and external cylinder head bolts gradually, a turn at a time, until load is released. Remove rocker shaft bracket nuts and lift off rocker assembly together with brackets.
 - 5) Remove push rods and keep them in order of removal. Cylinder head may now be removed. Lift head straight up to prevent studs from binding in holes. To install, reverse removal procedure.
- NOTE* - To facilitate breaking cylinder head joint, tap each side of head with a drift made of wood.



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)
1275 cc Int.	1.307-1.312 (33.198-33.325)	45°	45°2793-.2798 (7.094-7.107)	.0015-.0025 (.038-.064)	.318 (8.077)
Exh.	1.152-1.157 (29.261-29.388)	45°	45°2788-.2793 (7.082-7.094)	.0015-.0025 (.038-.064)	.318 (8.077)

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

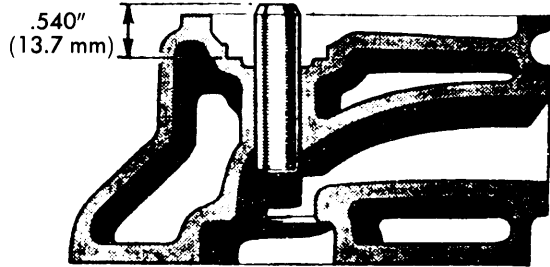
1) With cylinder head removed, remove valve and valve spring at valve guide where service is required. Place cylinder

head with machined face down on clean surface. Drive valve guide down into combustion space with suitable drift.

2) Drift should be hardened steel .438" (11.1 mm) in diameter and not less than 4" (101 mm) long. Drift should be machined to .281" (7.14 mm) for a distance of 1" (25.4 mm) at one end. This will allow drift to engage bore of guide.

MIDGET 4 CYLINDER (Cont.)

3) When installing new guides, they should be driven in from top of cylinder head. Intake valve guides must be inserted with largest chamfer at top. Exhaust valve guides should have counterbored ends at bottom. Drive guides into combustion spaces until they are .540" (13.7 mm) above machined surface of valve spring seating surface.



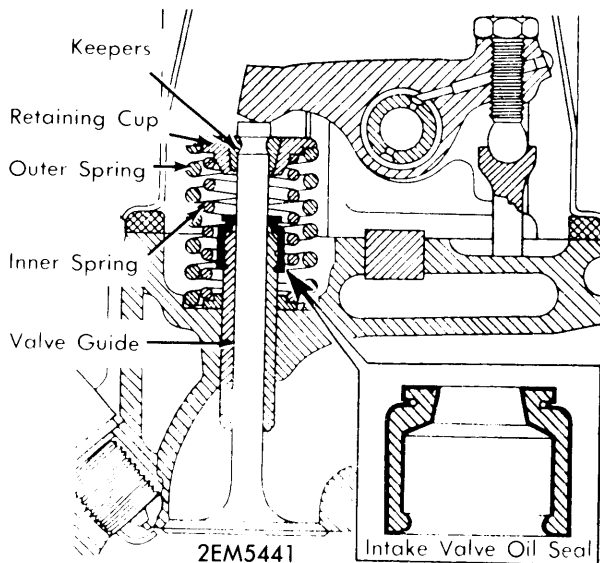
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VALVE GUIDES

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1275 cc Inner	1.703 (43.256)	25@1.270 (11.3@32.26)	44@0.952 (20@24.18)
	Outer	1.828 (46.431)	51@1.383 (23.1@35.13)

VALVE STEM OIL SEAL & VALVE SPRING REPLACEMENT

Removal — With cylinder head removed, use suitable tool (18G 45) to compress valve springs. Remove keepers, valve spring cups, springs and valve spring seats. Remove valve stem oil seals (intake valves only) and remove valves.



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VALVE COMPONENTS

Installation — Place valve into its guide, followed by spring seat. Slide an oil seal down each intake valve stem only and fit over valve guide. Install springs and spring cups. Compress spring and install keepers.

ROCKER ARM ASSEMBLY

Removal — 1) Drain cooling system and remove rocker cover. Loosen rocker shaft bracket nuts and external cylinder head stud nuts gradually, a turn at a time, until all load is released.

NOTE — It is important that external cylinder head nuts are loosened at the same time to avoid possibility of head distortion.

2) Remove rocker arm bracket nuts and remove rocker assembly together with brackets. Remove push rods, marking them for replacement in their original positions.

Disassembly — Remove screw holding rocker shaft in front rocker mounting bracket. Remove split pins, flat washer and spring washer from end of shaft and slide rockers, brackets and springs from shaft. Remove threaded plug installed in one end of shaft and clean out oil passages.

Reassembly — When reassembling, start with front mounting bracket and hold it with screw. Follow with remaining brackets and springs. Replace in original positions on shaft. The threaded plug end of shaft should be positioned to front of engine.

Installation — To install rocker arm assembly, reverse removal procedure.

VALVE TAPPETS

With carburetors, manifold, rocker cover and rocker assembly removed, remove pushrods. Remove tappet covers and lift out tappets, keeping them in correct order. When installing, tappets should fall into their guides under their own weight after being coated with engine oil.

VALVE CLEARANCE ADJUSTMENT

With engine cold, set valve clearance to .012" (.305 mm). To check valve clearance, turn crankshaft until valves in first column are fully open, then valves in second column may be checked and adjusted as necessary.

Valves Open	Valves to Adjust
1.....	8
3.....	6
5.....	4
2.....	7
8.....	1
6.....	3
4.....	5
7.....	2

MIDGET 4 CYLINDER (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)
1275 cc	① .0015-.0021 (.038-.053)	③	④ .0008-.0015 (.020-.053)	No. 1	.011-.016 (.279-.460)	.0015-.0035 (.038-.089)
	② .0029-.0037 (.074-.094)			No. 2	.008-.013 (.203-.330)	.0015-.0035 (.038-.089)
				No. 3	.008-.013 (.203-.330)	.0015-.0035 (.038-.089)
				Oil	.012-.028 (.305-.711)

- ① — At bottom of skirt. ③ — Hand push fit.
 ② — At top of skirt. ④ — Interference fit.

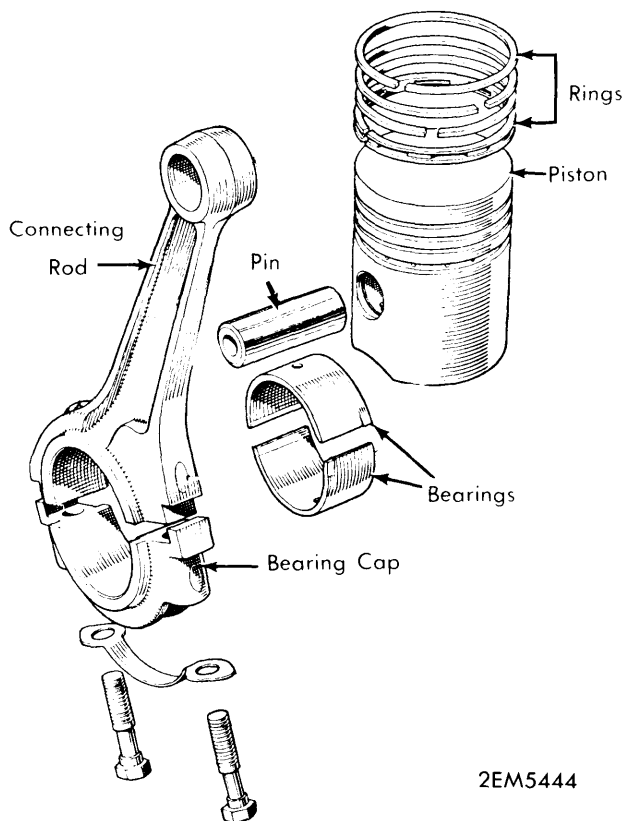
OIL PAN REMOVAL

Drain engine oil, remove oil pan screws and lower oil pan.

PISTON & ROD ASSEMBLY

1) Remove cylinder head and drain and remove oil pan. Bend back locking plate tabs and remove bearing cap bolts. Remove bearing cap and move connecting rods off of crankshaft. Remove piston and rod assembly from cylinder head side of block.

2) To install assembly, reverse removal procedure making sure that piston ring gaps are staggered at 90° to each other. **NOTE** — Connecting rod bearings are offset and must be installed so bearings of numbers one and three are offset towards rear of engine and bearings of numbers two and four are offset towards front of engine.



PISTON & ROD ASSEMBLY

FITTING PISTONS

Select smallest oversize necessary when installing new pistons in engine. Pistons are marked with actual oversize dimensions enclosed in an oval. These markings indicate actual bore size to which they must be fitted, the required clearance has been allowed for. See following table for oversizes and bore sizes:

Piston Specifications

Oversize	Suitable Bore Size In. (mm)
Standard.....	2.7800-2.7803 (70.612-70.619)
+ .010".....	2.7900-2.7903 (70.866-70.874)
+ .020".....	2.8000-2.8003 (71.12-71.127)

PISTON PIN REPLACEMENT

1) Piston pin is interference fit in connecting rod. To remove piston pin use suitable tool (18G 1002) to avoid crushing or distorting piston. Hold hexagon body of tool in vise with cut-out up.

2) Screw large nut back until flush with end of center screw. Push screw and nut forward until nut contacts thrust race. Slide parallel sleeve, short length diameter first, onto center screw, up to its shoulder.

3) Place piston assembly on center screw and attach remove/replacer bushing, longest diameter portion toward piston. Screw stop nut onto center screw and adjust until there is about .031" (.794 mm) end play in whole assembly.

4) Lock stop nut securely in position with lock screw and check that curved face of body is clean. Slide piston assembly into position against curved face. Check that piston rings are over cut-out in tool body.

5) Screw large nut up to thrust race and hold lock screw (not stop nut) with a wrench. Turn large nut until pin is pulled out of piston.

6) To install pin, remove large nut of tool and pull center screw out a few inches. Slide parallel sleeve, longest length diameter part first, onto center screw up to its shoulder.

7) Place piston on connecting rod small end up to undercut. Smear pin with thin oil and slide it over center screw and into piston bore up to face of connecting rod. Slide remove/replacer bushing, short spigot toward pin, onto center screw.

8) Screw stop nut onto center screw and adjust until there is approximately .031" (.794 mm) end play. Lock nut securely in position with lock screw. Check that curved face of body is clean and slide piston into position against curved face. Check that piston rings are over cut-out in tool body.

MIDGET 4 CYLINDER (Cont.)

9) Screw large nut onto center screw until it contacts thrust race. Using a torque wrench set to 16 ft. lbs. (2.2 mkg), and holding lock screw with wrench, turn large nut to pull pin until flange of remover/replacer bushing is .031" (.794 mm) from piston skirt.

NOTE — It is important that care is taken to prevent flange from contacting piston.

10) If torque wrench reading has not reached 16 ft. lbs. (2.2 mkg) during the pull, fit of pin to connecting rod is not correct and pin must be replaced. Make sure to keep large nut and center screw of tool.

11) Check assembly and make sure that piston pivots freely on pin and is free to slide sideways. If assembly is satisfactory, reinstall in engine.

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)
1275 cc	2.0005-2.0010 (50.813-50.825)	.0010-.0027 (.025-.069)	Center	.002-.003 (.051-.076)	1.6254-1.6259 (41.285-41.297)	.0010-.0025 (.025-.064)	.006-.010 (.152-.254)

CRANKSHAFT & MAIN BEARING SERVICE

1) Drain oil pan and remove engine as previously described. Place engine upside down on engine stand. Remove oil pan, oil strainer, timing chain and sprockets. Remove flywheel and engine rear plate. Remove spark plugs to allow easy turning of crankshaft.

2) Remove connecting rod bearing caps and bearings. Keep bearings in order for correct replacement. Remove main bearing caps complete with bottom bearing halves. Caps and their respective bearings should be kept together.

3) Remove threaded plug from rear bearing cap oil return pipe and remove pipe. Each bearing cap is stamped with a number and this number is also stamped on web of crankcase near bearing cap. The bottom halves of the thrust washers are removed with center main bearing cap.

4) Remove crankshaft, two remaining halves of thrust washers, and top halves of main bearings from crankshaft. Crankshaft may be ground only to .010" undersize without heat treatment.

5) To install crankshaft or bearings, reverse removal procedure making sure that thrust washers are placed with oil grooves outward and bearings are lubricated and placed into notched recesses machined in bearing cap. When installing rear main bearing cap, coat mating surfaces with Hylomar Jointing Compound.

ENGINE FRONT COVER & OIL SEAL

1) Drain cooling system and remove radiator. Loosen but do not remove generator attaching bolts. Remove fan belt. Bend back tab on crankshaft pulley nut lock washer. Remove pulley nut using suitable tool (Service Tool 18G 98) and pry pulley from crankshaft.

2) Remove set screws which hold timing cover to front engine plate and remove cover. Using suitable tool (18G 134 & Adapter 18G 134BD), remove front oil seal.

3) Make sure oil thrower behind crankshaft pulley is installed with face marked "F" away from engine. Fill groove between lips of oil seal with grease and using suitable tool (Service Tool 18G 1044) centralize oil seal on crankshaft.

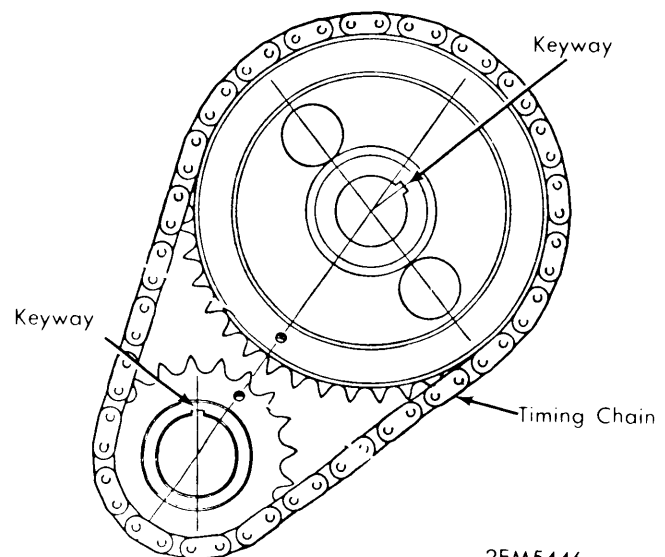
4) With timing cover in place, tap pulley onto crankshaft and tighten attaching screws.

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1275 cc No. 1	1.6655-1.6660 (42.304-42.316)	.001-.002 (.025-.501)	.250 (6.35)
No. 2	1.6228-1.6233 (41.219-41.232)		
No. 3	1.3728-1.3735 (34.870-34.887)		

TIMING CHAIN REPLACEMENT

1) Remove engine front cover and oil thrower as previously described. Remove camshaft sprocket nut and lockwasher. Note that locating tag on lock washer fits into keyway of camshaft sprocket.

2) Camshaft and crankshaft sprockets may now be removed together with timing chain. Ease each wheel forward a fraction at a time using small levers. Note number of packing washers immediately behind crankshaft sprocket.



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TIMING SPROCKET & CHAIN INDEX MARKS

MIDGET 4 CYLINDER (Cont.)

3) When reassembling original components, the same number of washers should be replaced. If new components have been installed which would disturb alignment of sprockets, thickness of washers will have to be determined.

4) To determine washer thickness, place straight edge across sides of camshaft sprocket teeth and measure gap between straight edge and crankshaft gear.

5) When replacing timing chain and sprockets, set crankshaft with keyway at TDC and camshaft with keyway at about one o'clock position as viewed from front. Assemble sprockets into timing chain with two marks on sprockets opposite to each other.

6) Keep sprockets in this position, engage crankshaft gear keyway with key on crankshaft and rotate camshaft until camshaft sprocket keyway and key are aligned. Push sprockets onto shafts as far as they will go. Secure camshaft gear with lock washer and nut.

7) Replace oil thrower with face marked "F" or concave side away from engine.

CAMSHAFT REMOVAL

NOTE — It is necessary to remove engine from vehicle to remove camshaft.

1) Remove oil pan, rocker assembly, push rods, tappets and timing cover as previously described. Remove oil thrower behind crankshaft pulley. Unlock and remove camshaft sprocket nut and remove nut and lock washer.

NOTE — Locating tag on lock washer fits into keyway of camshaft sprocket.

2) Ease each sprocket forward a little at a time with small levers. Make a note of the number of packing washers immediately behind crankshaft sprocket. Remove sprockets and chain.

3) Remove flywheel and engine back plate, unscrew oil pump retaining screws and remove pump.

4) Turn crankshaft so that rotor arm is pointing to segment in distributor cover for No. 1 spark plug. Disconnect low tension lead from terminal and disconnect vacuum advance pipe at distributor. If equipped with mechanical tachometer, disconnect cable from rear of generator. Remove two bolts holding distributor clamp plate to distributor housing and remove distributor.

5) Remove screws holding camshaft locating plate to cylinder block. Pull camshaft out, rotating shaft slowly.

CAMSHAFT BEARING SPECIAL TOOL

Old bearings can be punched out, new ones must be tapped into position. Bearings are easily damaged and use of Service Tool 18G 124A is recommended. Tool consists of a body with built in thrust race, screw wing nut, stop plate, "C" washer and handle. Tool is used in conjunction with special adaptors.

CENTER BEARING REPLACEMENT

1) Insert suitable pilot adaptor (18G 124K) into camshaft front bore from inside block and insert suitable adaptor (18G 124B) into center bearing from rear, small end first.

2) With body of tool positioned on center screw, pass screw through pilot adaptor and adaptor in center liner. Place slotted washer on flat at rear of center screw and insert handle into screw behind slotted washer. Tighten up wing nut to remove bearing.

NOTE — When installing bearings, line up oil holes in bearings and cylinder block and make sure that they remain correctly positioned during installation procedure.

3) To install center bearing, insert suitable pilot adaptor (18G) into camshaft front bearing from inside of block. Place new bearing on small end of suitable adaptor (18G 124B) and place adaptor in center bore from rear, largest diameter first.

4) With body of tool positioned on center screw, insert screw through pilot adaptor and adaptor in center bore. Place larger "C" washer on center screw with cut away part turned away from butt joints of bearing; this joint must be covered by washer.

5) Place slotted washer and handle in center screw and tighten up wing nut to pull liner into position.

FRONT & REAR BEARING REPLACEMENT

1) Insert small end of suitable adaptor (18G 124K) into camshaft front bearing, from inside block, and thread body of tool onto center screw. Pass screw through adaptor from front of block. Place slotted washer on flat at rear of center screw.

2) Insert handle into center screw behind slotted washer and tighten up wing nut to remove worn bearing. The rear bearing is removed by the same method, using suitable adaptor (18G 124M) and removing bearing from rear of block.

NOTE — When installing bearings, line up oil holes in bearings and cylinder block and make sure that they remain correctly positioned during installation procedure.

3) Place new bearing on smallest diameter of suitable adaptor (18G 124K) and insert adaptor into camshaft front bearing bore from inside block, largest diameter first.

4) Thread body of tool onto center screw and pass screw through adaptor located in front bearing from front of block. Position larger "C" washer on center screw with cut away portion turned away from butt joint of bearing. *NOTE* — This joint must be covered by washer.

5) Place slotted washer on flat at rear of center screw and insert handle into screw behind slotted washer. Tighten wing nut to pull bearing into position. Replace rear bearing by the same method, using suitable adaptor (18G 124M) and pulling bearing into position from rear of block. Do not use "D" washer when installing rear bearing.

REAMING BEARINGS

NOTE — Make sure that cutting tool is kept clear of cuttings at all times. Cutting tool should be removed from bearing half way through the cut and cuttings removed. Feed reamer very slowly and keep cutters dry. Arbor should be lightly lubricated before assembling cutters and pilots. Clean thoroughly when operation is completed.

1) Insert suitable taper pilots (18G 123AT and 18G 123BA) into center and rear bearings respectively. Place suitable parallel pilot (18G 123AQ) on arbor, followed by suitable cutter (18G 123AN).

2) Thread arbor through front and center bearings, place suitable cutter (18G 123AP) on arbor, and thread arbor through taper pilot in rear bearing. Secure cutters and pilots in respective positions. Cutter (18G 123AN) should be located in No. 10, and cutter (18G 123AP) should be located in No. 7 on arbor.

MIDGET 4 CYLINDER (Cont.)

3) Cutter for front bearing will cut first with arbor piloting in center and rear bearings. Cutter for rear liner will follow with arbor piloting in front and center bearings. Clear away all cuttings before plain pilot is allowed to enter front bearing. When cut in rear bearing is finished, free cutters and remove arbor.

4) To ream center bearing, insert suitable pilots (18G 123BC and 18G 123BB) in front and rear bearings. Thread arbor through pilot in front bearing and place cutter for center bearing on arbor. Thread arbor through center bearing and pilot located in rear bearing.

5) Secure cutter and pilot in position. Suitable adaptor (18G 123B) should be located in No. 7 position on arbor. Ream center bearing, release cutter, remove arbor.

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ALDC)	Open (BLDC)	Close (ATDC)
All Engines	5°	45°	51°	21°

VALVE TIMING

1) Set No. 1 cylinder intake valve clearance to .021" with engine cold. Turn crankshaft until valve is about to open. Indicator groove in flange of crankshaft pulley should be opposite center pointer on indicator bracket beneath crankshaft pulley.

2) After timing has been checked, valve clearance should be reset to specifications. See *Valve Clearance Adjustment*.

ENGINE OILING

Crankcase Capacity – 3.9 qts. including filter.

Oil Filter – Full-flow type with disposable cartridge.

Normal Oil Pressure – 20 psi (1.4 kg/cm²) @idle: 40-70 psi (2.81-4.92 kg/cm²) @2000 RPM (approximate).

Pressure Relief Valve – Nonadjustable oil pressure relief valve is located at right rear of cylinder block and is held in position by a domed hex nut sealed by two fiber washers or one copper washer. Valve is set for 50 psi (3.5 kg/cm²), spring free length is 2.86" (72.6 mm).

ENGINE OILING SYSTEM

Force feed type with rotor type oil pump. A full-flow type oil filter is used. An oil pressure relief valve is used to enable oil to by-pass filter if oil filter becomes blocked.

OIL PUMP

Engine must be removed to gain access to oil pump. Remove flywheel, clutch assembly and engine back plate. Unscrew oil pump retaining screws and remove pump. To disassemble, proceed as follows:

Concentric Type – Serviced as assembly only.

Hobourn-Eaton Type – 1) Remove cover screw and remove cover from dowels in pump body. Remove outer and inner rotors complete with drive shaft.

2) Clean all parts and inspect for wear or damage. Check clearance between rotor and pump body. If clearance exceeds .010" (.254 mm), rotors, pump body, or complete assembly must be replaced.

3) Place straightedge across joint face of pump body and measure clearance between underside of straightedge and face of rotors. If clearance exceeds .005" (.127 mm), cover locating dowels can be removed and joint face can be carefully lapped.

4) Check clearance between rotor lobes. If clearance exceeds .006" (.152 mm), rotors must be replaced. To reassemble, reverse disassembly procedure.

ENGINE COOLING

Cooling System Capacity – Approximately 3.5 qts.

Thermostat – Opening temperature is 180°F (82°C).

WATER PUMP

1) Remove radiator. Remove fan retaining screws and remove fan. Loosen air pump mounting screws and remove pump drive belt. Remove air pump adjusting link bolt and raise air pump as high as hoses will allow. Tighten mounting bolts to retain pump.

2) Loosen generator alternator mounting bolts and remove fan belt. Remove the two generator alternator top mounting bolts and swing generator alternator down so that it rests on fender panel.

3) Disconnect by-pass hose from water pump and disconnect radiator bottom hose from water pump and heater tube. Remove water pump mounting screws and remove pump from cylinder block. To install, reverse removal procedure.

MIDGET 4 CYLINDER (Cont.)

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	① 42 (5.8)
Connecting Rod Nuts	② 42 (5.8)
Oil Pump Bolts	12 (1.7)
Rocker Shaft Bracket.....	25 (3.5)
Oil Pan	6 (.83)
Engine Front Cover	
1/4" Bolt	6 (.83)
5/16" Bolt.....	14 (1.9)
Water Pump	17 (2.4)
Manifolds	15 (2.1)
Crankshaft Pulley.....	70 (9.7)
Rocker Cover	4 (.55)
Flywheel	40 (5.5)

① — If studs stamped "22" or with small drill point, tighten to 50 ft. lbs. (6.9 mkg).

② — Tighten Nyloc nut to 32-34 ft. lbs. (4.4-4.7 mkg).