MIDGET 4 CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Number is stamped on a plate secured to left side of cylinder block or stamped directly into block. Engine can also be identified by the second digit in the VIN. Second digit should be an "A". The beginning identification number for 1978 Midget is GAN6UJ200001G.

ENGINE, CYLINDER HEAD & MANIFOLD

ENGINE

Removal – 1) Disconnect battery, remove hood, drain cooling system and remove radiator. Disconnect heater air intake hose. Remove fan, drain engine oil, and remove CAT.

2) Disconnect anti-diesel valve vacuum line. Disconnect heater hoses and temperature sender unit. Disconnect diverter valve hose from check valve. Disconnect electrical lead from alternator.

3) Disconnect distributor and coil wires and remove distributor cap. Remove air pump. Remove oil pressure switch wire. Separate ground cable from engine. Disconnect starter wires.

4) Disconnect fuel line from union in transmission tunnel. Disconnect back-up light lead. Remove speedometer cable, then refit clamp and bolt. Remove slave cylinder and wire out of way.

5) Remove transmission restraint cable. Disconnect propeller shaft from transmission. Remove 2 rear mounting bracket bolts that go into floor panel. Working inside vehicle, remove gear shaft lever assembly.

6) Remove 2 bolts securing rear mounting bracket to transmission tunnel. Remove nuts from front engine mounts. Attach hoist to engine so as to keep engine at about 70° during removal.

7) Take up engine weight, knock out front engine mount bolts and lift engine from vehicle.

Installation – To install, reverse removal procedure.

INTAKE MANIFOLD

Removal – 1) Drain cooling system. Remove carburetor. Disconnect heater hose and remove anti-diesel solenoid vacuum line.

2) Disconnect EGR valve. Remove 2 bolts mounting exhaust manifold to intake manifold. Disconnect thermostat hose.

3) Remove 6 nuts retaining intake manifold to cylinder head. Pull off manifold while removing both anti-diesel solenoid vacuum adaptor and EGR valve hose adaptor.

Installation – To install cylinder head, reverse removal procedure and note: 2 larger clamps and 2 washers go on inner lower cylinder head studs BEFORE installing cylinder head.

CYLINDER HEAD

Removal – 1) Disconnect battery. Drain cooling system. Remove carburetor. Disconnect temperature sender. Remove hose to thermostat. Remove fan shroud. Remove 3 water pump housing bolts.

2) Remove flame trap mounting bracket located on manifold, then place bracket to one side. Disconnect heater hoses at manifold. Disconnect anti-diesel solenoid. Disconnect EGR line at exhaust manifold and at clip on transmission. Remove preheater ducting. Separate CAT from exhaust manifold (6 nuts).

3) Remove nut and washer mounting heater return to cylinder head at stud. Remove rocker cover and place temperature unit to one side.

4) Remove rocker arm shaft. Remove push rods and keep them in order. Disconnect spark plug wires. Remove 10 mounting nuts and withdraw cylinder head.

Installation – To install cylinder head, reverse removal procedure and note: Make sure head gasket is installed with "Top" facing up.

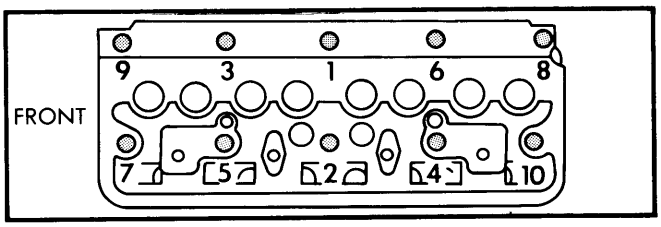

Fig. 1 Midget Cylinder Head Tightening Sequence

VALVES

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

Removal & Installation – With cylinder head removed, remove valve, spring and retainer. Using suitable tool (60A) and adapter (S 60A-2A), position tool on combustion chamber face of cylinder head, pull replacement guide in driving old guide out. Insure that guide protrusion above cylinder head top face is correct.

ROCKER ARM ASSEMBLY

Removal – Disconnect breather pipe from rocker cover and remove cover. Remove nuts and washers securing rocker arm shaft and remove rocker arm assembly.

Disassembly – Remove cotter key from front end of rocker shaft. Slide off rockers, pedestals, springs and spacers from shaft noting the order for reassembly. Remove screw securing rear pedestal to shaft and remove pedestal and rocker arm.

Reassembly – Reverse disassembly procedure, applying Loctite to rear pedestal locating screw.

MIDGET 4 CYLINDER (Cont.)

Installation – To install rocker arm assembly, reverse removal procedure. Adjust valve clearance.

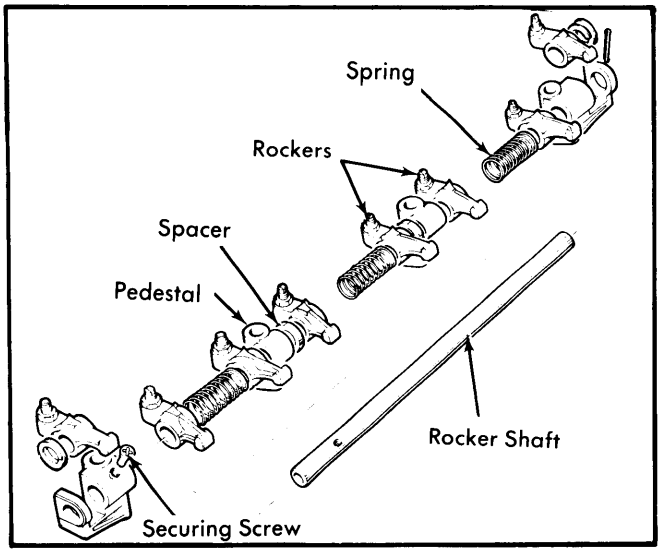

Fig. 2 Disassembled View of Rocker Arm & Shaft

VALVE CLEARANCE ADJUSTMENT

With engine cold, set valve clearance to .010" (.25 mm). To check valve clearance, turn crankshaft until valves in first column are fully open, then valves in the 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

PISTON, PINS & RINGS

OIL PAN

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

PISTON & ROD ASSEMBLY

Removal – Remove cylinder head, drain oil and remove pan. Remove bearing caps and move connecting rods off of crankshaft. Remove piston and rod assembly from cylinder head side of block.

Installation – Lubricate pistons, cylinder bores, and crankshaft with clean oil. Fit pistons and connecting rods to their original bores. Make sure that arrow on piston is pointing towards front of engine and that ring gaps are staggered. To complete installation, reverse removal procedure.

PISTON PINS

Removal & Installation – Piston pin is hand press fit in connecting rod. To remove pin, remove circlips then press out pin. Separate piston from connecting rod. To install, reverse removal procedure and note the following: Install new bushing and ream to proper size. Ensure piston is fitted correctly on connecting rod; arrow on top of piston facing front and cylinder number stamped on connecting rod and cap facing camshaft.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT & MAIN BEARING

Removal – 1) Remove engine from vehicle, then remove clutch assembly, and remove flywheel. Remove engine rear adapter plate, water pump and thermostat housing, then remove timing chain and gears. Remove camshaft locating plate and front mounting plate.

2) Remove dipstick, oil pan, crankshaft pulley and drive key. Remove shims if fitted, and two screws securing front sealing block. Remove crankshaft rear oil seal housing. Remove connecting rod and main bearing caps and remove crankshaft.

Installation – 1) Coat pilot bushing with zinc oxide grease and install in crankshaft. Install main bearings, crankshaft, and main bearing caps. Tighten caps to specification. Check crankshaft end play; adjust with selective thrust washers.

2) Install connecting rods, bearings, and caps. Use new bolts and tighten to specification. Install front sealing block using suitable sealing compound, then drive new wedges into slots. Cut protruding edges from wedges. To complete installation, reverse removal procedure.

CAMSHAFT

TIMING SPROCKET COVER & OIL SEAL

Removal – 1) Drain cooling system and remove radiator. Remove drive belts. Remove carburetor. Remove pre-heater ducting. Remove 6 CAT-to-exhaust manifold nuts.

2) Support engine with jack. Remove nuts, bolts and washers mounting both front motor mounts. Raise engine enough to remove crankshaft pulley and nut.

3) Remove 8 screws, 1 bolt, and 3 nuts keeping timing sprocket cover to block. Pull off cover. Remove oil seal from cover.

Installation – Dip new seal in oil and fit to cover using suitable tools (18 G 134 & 18 G 134BM). Complete installation by reversing removal procedure.

TIMING CHAIN

Removal – 1) Remove engine front cover as previously outlined. Remove oil thrower. Turn crankshaft until chain sprocket index marks are aligned.

NOTE – *When sprockets are aligned the punch marks in center of camshaft sprocket and on camshaft will be aligned as shown in Fig. 3.* Camshaft punch mark is visible through hole in camshaft sprocket.

2) Bend back camshaft sprocket lock plate tabs and remove 2 bolts mounting sprocket. While making sure neither camshaft or crankshaft is moved, remove both sprockets and chain.

MIDGET 4 CYLINDER (Cont.)

Installation – 1) Remove crankshaft key. Temporarily install both sprockets. Check fit of sprockets by placing a metal straightedge across teeth of both sprockets. If necessary, shim crankshaft behind sprocket.

2) Remove sprockets. Refit key to crankshaft. Fit chain and sprockets making sure alignment marks are indexed. Install camshaft mounting bolts.

3) Place a straightedge along the left side (facing) chain run. If deflection at mid point exceeds .4" (10 mm), replace chain. Remove camshaft mount bolts, insert new lock plate and fefit bolts. Reverse removal procedure to install remaining components.

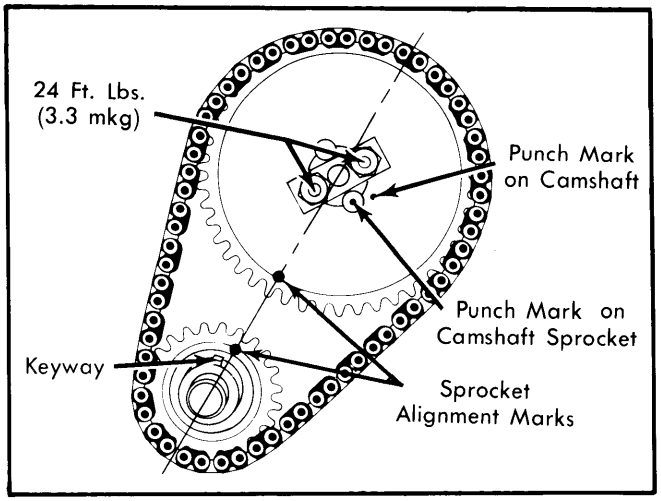

Fig. 3 Timing Chain Sprocket Alignment

CAMSHAFT

Removal – 1) Remove radiator, air pump drive belt and fan belt. Remove thermostat, water pump and fan. Remove crankshaft pulley, and engine front cover. Remove timing chain and gears.

2) Remove bolt securing cam locating plate and remove plate then remove cylinder head. Remove lifters and identify for reassembly. Remove distributor drive shaft and fuel pump. Withdraw camshaft from block.

NOTE – *Water pump housing removal is not required.*

Installation – To install camshaft, reverse removal procedure and note the following: Mark new camshaft with a punch mark in the position corresponding to that of the camshaft being removed. Check camshaft end play; if end play is beyond standard value of .0045-.0085" (.120-.216 mm), install new lock plate.

VALVE TIMING

1) Adjust valve clearance of number 7 and number 8 valves to .050" (1.27 mm). Rotate crankshaft to bring number 1 piston to TDC on compression stroke. Check that number 1 and 2 valves are fully closed and number 7 and 8 valves have the same clearance.

2) After valve timing has been checked, valve clearance should be set to specification.

ENGINE OILING

Crankcase Capacity – 4.8 qts. including filter.

Oil Filter – Full flow type with disposable cartridge.

Normal Oil Pressure – 40-60 psi; at idle 20 psi.

ENGINE OILING SYSTEM

Force feed system with rotor type oiling 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 becomes blocked .

OIL PUMP

Removal – Drain crankcase oil and remove oil pan. Loosen oil strainer locknut and unscrew oil strainer from oil pump cover plate. Remove three bolts securing oil pump to crankcase and remove pump.

Disassembly & Inspection – Remove inner rotor and shaft assembly. Remove outer rotor. Clean all components then reinstall rotors in pump body with chamfered edge of outer rotor at driving end of pump body. Place straightedge across face of pump body and check clearance between straightedge and rotors. Clearance should not exceed .0004" (0.1 mm). Check clearance between inner and outer rotors and pump body. Clearance between the inner and outer rotors, measured at the rotor lobes should not exceed .010" (.25 mm). Clearance between outer rotor and pump body should not exceed .008" (0.2 mm). If clearance is excessive at any location, pump should be replaced.

Reassembly – To reassemble, reverse disassembly procedure and ensure that outer rotor is installed in pump body with chamfered end at driving end of pump body.

NOTE – *Oil pressure relief valve is located in front of block behind hex head plug bolt. Spring free length should be 1.53" (38.8 mm).*

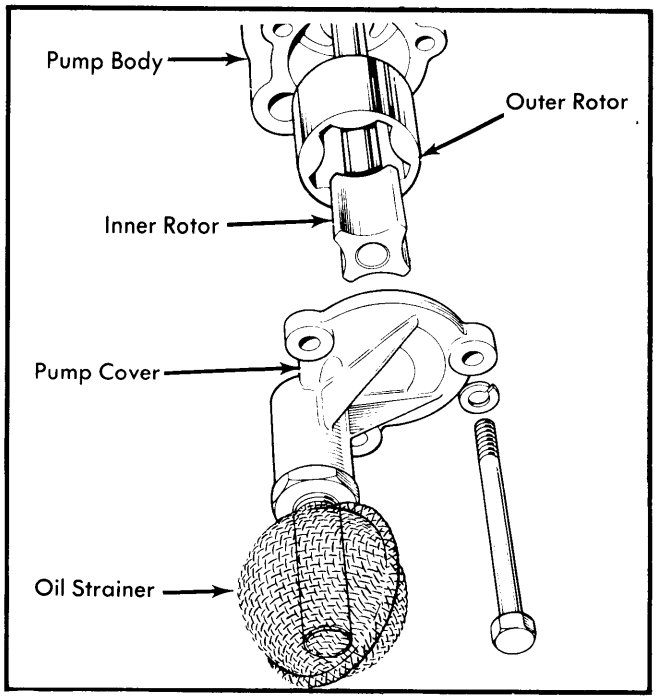

Fig. 4 Engine Oil Pump Disassembled View

MIDGET 4 CYLINDER (Cont.)

Installation – To install oil pump, reverse removal procedure.

ENGINE COOLING

Cooling System Capacity – 5.7 quarts including heater.

Thermostat – Opening temperature, 190°F (88°C)

Radiator Cap – 15 psi (1.5 kg)

WATER PUMP

Removal – Remove radiator, loosen alternator adjusting bracket and remove fan belt. Remove nuts and bolts securing fan and remove fan from coupling assembly. Remove nuts securing water pump to thermostat housing and remove water pump, fan coupling, and tolerance ring.

Installation – To install water pump, reverse removal procedure and refill cooling system.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1977	91.0	1493	1x1-Bbl.	.....	.....	7.5-1	2.9	73.7	3.44	87.5

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)
1493 cc							
Int.	1.380 (34.99)	45°	45.5°	.....	.3107-.3113 (7.89-7.91)	.0007-.0023 (.02-.06)	.....
Exh.	1.170 (29.71)	45°	45.5°	.....	.3100-.3105 (7.874-7.887)	.0015-.0030 (.04-.07)	.....

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)
1493 cc	①.002-.003 (.051-.076) ②.0002-.0016 (.005-.041)	③	④	1	.012-.022 (.305-.559)	.0015-.0035 (.038-.089)
				2	.012-.022 (.305-.559)	.0015-.0035 (.038-.089)
				Oil	.015-.055 (.38-.1.40)	.....

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

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)
1493 cc	2.3115-2.3120 (58.713-58.725)	.0005-.002 (.013-.050)	Rear	.006-.014 (.15-.36)	1.8750-1.8755 (47.625-47.638)	.001-.003 (.03-.08)	.....

MIDGET 4 CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.)	
		Valve Closed	Valve Open
1493 cc	1.52 (38.6)	.....	.....

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ALDC)	Open (BLDC)	Close (ATDC)
1493 cc	18°	58°	58°	18°

CAMSHAFT			
Engine	Journal Diam. in. (mm)	Clearance in. (mm)	Lobe Lift in. (mm)
1493 cc			
No. 1	1.9659-1.9664 (49.93-49.95)	.0016-.0036 (.04-.09)	.....
No. 2	1.9649-1.9654 (49.90-49.92)	.0026-.0046 (.07-.12)	.....
No. 3	1.9659-1.9664 (49.93-49.95)	.0016-.0036 (.04-.09)	.....

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	46 (6.4)
Connecting Rod Bolt	40-45 (5.5-6.2)
Rocker Shaft	32 (4.4)
Oil Pan	20 (2.8)
Engine Front Cover	
Small Bolt	10 (1.4)
Large Bolt	20 (2.8)
Water Pump	20 (2.8)
Manifold	25 (3.5)
Crankshaft Pulley	150 (20.7)
Rocker Cover	2 (.03)
Main Bearing Cap Bolts	65 (9.0)