

5000 5 CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine number is stamped on left side of block just ahead of distributor.

Application	Code
2144 cc	
Federal	WD
California	WE

ENGINE & CYLINDER HEAD

ENGINE

NOTE — Leave all fuel injection lines connected unless otherwise specified.

Removal — 1) Disconnect battery ground cable. Remove coolant expansion tank cap, place A/C control in "COLD" position and drain coolant. Disconnect coolant hoses, remove radiator cowl, shroud, electric fan and radiator.

2) Remove control pressure regulator, cold start valve, fuel supply line, fuel injectors, and air cleaner cover with filter. Detach air duct and vacuum hoses from throttle valve assembly. Pull hood latch cable guide off of bracket at right front alignment hole.

3) Remove and suspend power steering pump, leaving hose connected. On air conditioned models, remove grill and tip condenser outwards. Dismount A/C compressor and tie back with wire, but do not disconnect refrigerant hoses. On all models, remove windshield washer and power steering reservoirs from holders. Remove distributor cap, wires and rotor.

4) Take off circlip and remove throttle cable (manual transmission) or throttle push rod (automatic transmission). Disconnect electrical leads from distributor, oil pressure and water temperature senders. Detach exhaust pipe from manifold and from transmission bracket. Remove front engine mount, starter and alternator.

5) On automatic transmission models, work through starter hole and remove torque converter mounting bolts. On all models, remove lower engine/transmission bolts and install transmission supporting tool. Remove upper engine/transmission bolts.

6) Attach suitable sling to engine and lift engine/transmission enough to remove left and right engine bracket. Lift engine so that front pulley is behind grill opening and support transmission. Detach engine from transmission and lift from car while turning slightly to right.

Installation — To install engine, reverse removal procedure noting that metal lip on gasket between exhaust manifold and pipe faces exhaust pipe. Straight adaptor on EGR temperature control valve goes to EGR valve while angled adaptor goes to vacuum amplifier. It is recommended that engine mounting bolts be tightened with the engine running at idle speed.

CYLINDER HEAD

Removal — 1) Disconnect battery ground strap and drain cooling system. Disconnect coolant hoses from head and exhaust pipe from manifold. Remove electrical and vacuum leads from distributor. Disconnect accelerator linkage, fuel and vacuum lines and air filter from manifold.

2) Remove valve cover and timing belt cover. Rotate crankshaft so that number 1 cylinder is at TDC on firing stroke. Remove drive belt sprocket from camshaft, but do NOT separate from timing belt. Loosen head bolts in reverse order of tightening sequence and lift off head.

Installation — Install head gasket with part number facing UP. Guide pins may be used at opposite corners of head to ease alignment. Install head using bolts 9 and 11 (see illustration) to center head, then tighten bolts in sequence illustrated. Complete assembly in reverse order of removal and ensure that timing marks are properly positioned.

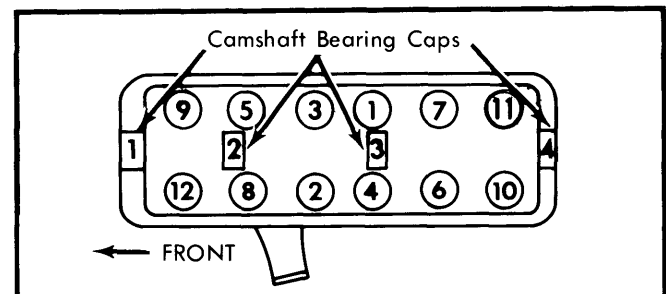


Fig. 1 Tighten Cylinder Head in Sequence Shown (Loosen in Reverse Order)

CAMSHAFT

TIMING BELT

Remove "V" drive belts and take off drive belt cover. Engine should be in number 1 firing position (TDC). Loosen water pump bolts and turn pump counterclockwise to loosen belt. Install new belt and adjust by turning water pump clockwise to tighten. Belt is properly adjusted when it can just be twisted 90° with thumb and index finger between camshaft and water pump sprockets. Ensure that valve timing is correct.

CAMSHAFT

Remove bearing caps 2 and 4, then diagonally loosen bearing caps 1 and 3. Remove camshaft from head. When installing, caps must go in original position. Lubricate bearings and journals and install caps with off-center position properly aligned.

CAUTION — Front oil seal must not be installed beyond flush position or oil return will be blocked.

VALVE TIMING

Rotate crankshaft until notch on "V" belt pulley aligns with mark on oil pump housing (engine out of vehicle) or TDC "0"

5000 5 CYLINDER (Cont.)

mark on flywheel aligns with lug cast on clutch housing (engine installed). Fully loosen belt tension by loosening and turning water pump counterclockwise. Turn camshaft sprocket so that punch mark on rear aligns with rocker cover gasket on left side of engine. Install and adjust belt.

position. Install pressure hose (VW 653/3) in spark plug hole and apply low pressure air to keep valve seated. Remove valve springs with compressor (VW 541/1 or 2036) and lift off seal with pliers (1-218). Place seal protector over valve stem, lubricate seal and push in place with installing tool (10-204).

VALVES

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) With head disassembled, insert new valve and check for wear with dial indicator. See Fig. 2. If wear exceeds .039" (1.0 mm) for intake, or .051" (1.3 mm) for exhaust valve, guides should be replaced.

2) Press worn guides out of head from combustion chamber side with suitable tool (10-206). Coat new guides with oil and press into cold head from camshaft side. Press guides in as far as they will go, but DO NOT use more than 1 ton pressure once shoulder is seated. Ream guide by hand to proper size.

VALVE STEM OIL SEALS

NOTE — Valve stem seals may be replaced with cylinder head installed on vehicle.

With camshaft and followers removed, remove spark plug and turn crankshaft until piston of cylinder concerned is at BDC

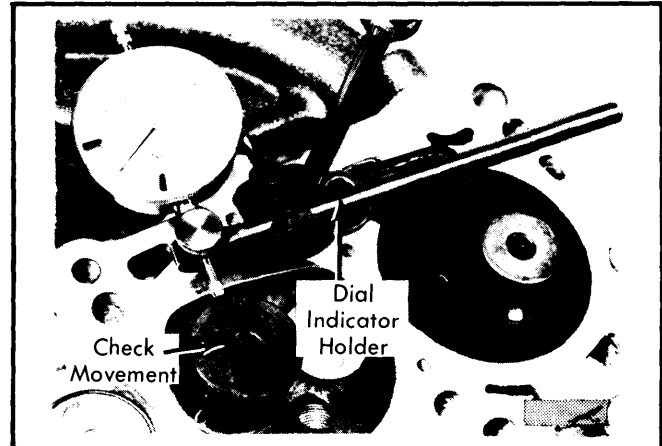


Fig. 2 Checking Valve Guide for Wear

VALVE SPRINGS

With camshaft and followers removed, compress spring with suitable tool (US 1020 and 1020/1 or 2037) and remove valve locks (keepers). Lift off valve springs. If required, valve spring seats may be removed using pliers (10-218). To install, reverse removal procedure.

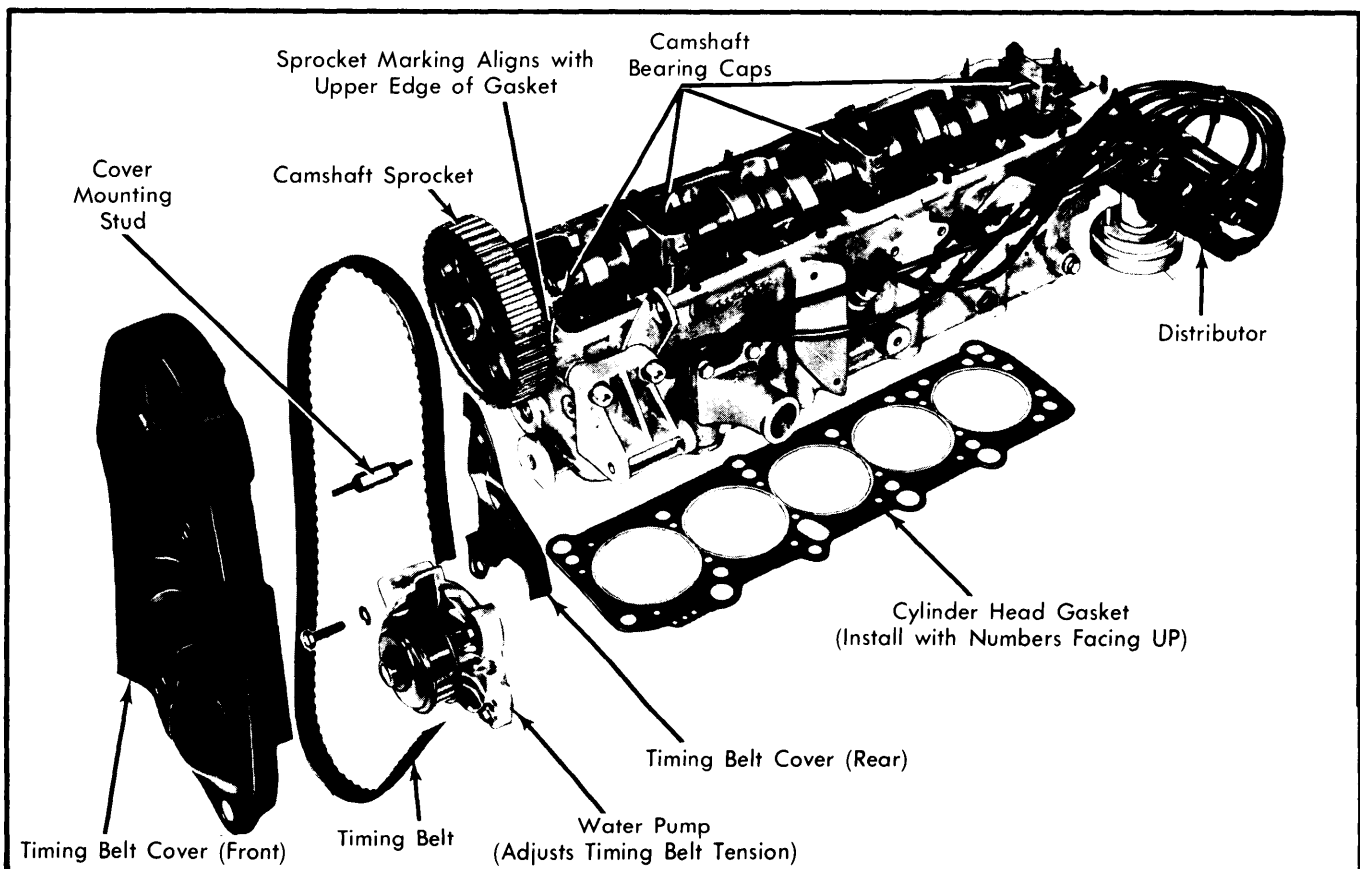


Fig. 3 Cylinder Head and Camshaft Assembly with Timing Belt and Cover

5000 5 CYLINDER (Cont.)

CAM FOLLOWERS (TAPPETS)

With camshaft removed, lift off followers and adjusting discs. Inspect for wear or damage and replace as necessary.

NOTE — Cam followers and valve system components must be kept in order and installed in original positions. Coat with oil when installing.

VALVE CLEARANCE ADJUSTMENT

1) Disconnect accelerator linkage and remove valve cover. Turn crankshaft so that both cam lobes of cylinder to be adjusted point upward. Check valve clearances between cam and follower in firing order (1-2-4-5-3). If clearance is greater than .002" (.05 mm) from specifications, select thicker or thinner disc.

2) To replace valve adjusting discs, use follower depressor tool (2078) to press follower down, then remove adjusting disc with tool (10-208 or US4476). Insert appropriate disc and recheck clearance. Discs are available in .0019" (.05 mm) increments from .1181" (3.0 mm) to .1673" (4.25 mm). Thickness is etched on bottom of disc and should be assembled with etched mark toward follower.

Valve Clearances

Application	Hot In. (mm)	Cold In. (mm)
Intake .....	.008-.012 (.20-.30)...	.006-.010 (.15-.25)
Exhaust .....	.016-.020 (.40-.50)...	.014-.018 (.35-.45)

NOTE — Cold settings are given for reference as initial setting after engine rework. Final adjustments are to be made after engine is warm (at least 95°F or 35°C), and checked again after 1000 miles.

PISTONS, PINS & RINGS

OIL PAN

Removal & Installation — Oil pan may be removed while engine is installed. Remove 2 front bolts in subframe and drain engine oil. Turn flywheel so that recesses point down and remove both rear pan bolts. Remove remaining pan bolts and lower pan from engine. To install, use new pan gasket and tighten pan bolts in a criss-cross pattern.

PISTON & ROD ASSEMBLY

Removal & Installation — Note that rod cap and rod are marked for proper installation. Remove cap nuts and push piston/rod assembly out of cylinder from bottom. When assembling, note that arrow on piston top points to crankshaft pulley (front of engine). Valve detents will be at left side of block. Raised casting marks on connecting rod and cap must face oil filter side of engine.

FITTING PISTONS

1) Measure cylinder at 3 points: 3/8" (10 mm) from top and bottom, and at center of bore. Measure in line with and at 90° to thrust face. Wear limit is .003" (.08 mm).

NOTE — Do not measure when block is mounted in repair stand with adapter VW 540 due to possible distortion.

2) Measure pistons at 9/16" (15 mm) from bottom of piston skirt, 90° to pin bore. Subtract this measurement from that of corresponding cylinder bore and note piston-to-cylinder clearance. If clearance exceeds .027" (.07 mm), oversize pistons must be installed.

3) Place each piston ring squarely into bottom of cylinder about 9/16" (15 mm) and measure end gap. Measure ring side clearance in pistons with feeler gauge. Compression ring clearance should be .002-.003" (.05-.08 mm) with a wear limit of .008" (.2 mm). Oil ring clearance should be .001-.002" (.03-.05 mm) with a wear limit of .006" (.15 mm).

4) Install rings on pistons with "TOP" mark facing piston crown. Ring gaps should be spaced 120° apart. Use suitable compressor (US 1008 A or equivalent) and install piston/rod assemblies.

PISTON PINS

Removal & Installation — Use pin type drift to pry circlip from pin boss. Press out pin with suitable driver (10-508). If pin is too tight, heat piston to approximately 140°F (60°C) prior to removal. Assemble piston/connecting rod assembly so that arrow on piston top faces forward when assembly is correctly installed. Use new circlips to retain pins.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

Check crankshaft end play at number 4 main bearing with feeler gauge. Check main and connecting rod bearing clearance using Plastigage method. Main bearings are numbered 1 through 6 with 1 at drive belt end and 6 at flywheel end. Install bearing shells with lubrication grooves in block and shells without grooves in bearing caps. All bearing shells must be installed in original position if they are not being replaced. Use new connecting rod cap nuts.

Crankshaft Journal Diameters

Size	Main Bearing In. (mm)	Connecting Rod In. (mm)
Std.	2.260 (57.96)	1.790 (45.96)
1st US	2.250 (57.71)	1.780 (45.71)
2nd US	2.240 (57.46)	1.770 (45.46)
3rd US	2.230 (57.21)	1.760 (45.21)

NOTE — Bearing clearance may be checked with engine installed in vehicle. DO NOT turn crankshaft when checking with Plastigage.

CRANKSHAFT REAR OIL SEAL

Removal & Installation — With flywheel removed, use tool (2086) to pry old seal from sealing flange. Coat lips and outer edge of new seal with oil push seal into position by hand, then use installing tool (2003/1) to press in until properly seated.

5000 5 CYLINDER (Cont.)

CRANKSHAFT FRONT OIL SEAL

Removal & Installation — With front crankshaft pulley removed, pry old seal from housing using puller (2086). Coat seal lip and outer edge lightly with oil and start into position. Use pulley bolt and tool (2080) to press seal in until seated.

ENGINE OILING

Crankcase Capacity — 5.3 quarts (includes filter change).

Oil Filter — Replaceable spin-on type.

Normal Oil Pressure — 14 psi at idle, 85 psi at 5500 RPM with oil temperature 176°F (80°C).

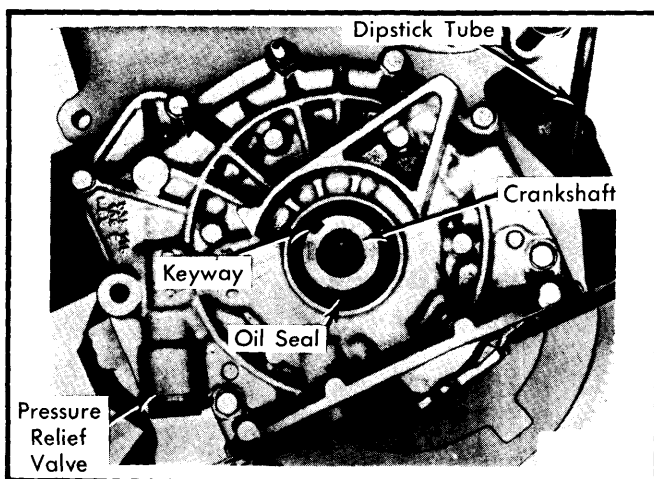


Fig. 4 Engine Oil Pump with Crankshaft Oil Seal

OIL PUMP

Gear type pump is mounted at front of engine, driven by crankshaft with oil suction pipe extending to oil pan. To remove, take off timing belt cover and front "V" belt pulley/drive belt sprocket. Drain engine oil and remove oil pan and oil suction pipe. Unbolt pump and remove from front of engine. Inspect endcover, housing and gears for wear or scoring. Replace pump gears in pairs only, with triangle marking toward endcover (rear). To install, reverse removal procedure.

ENGINE COOLING

Cooling System Capacity — 8.6 quarts.

Thermostat — Opens at 194°F (90°C).

Expansion Tank Cap — Relief valve opens at 17-19 psi.

Radiator — Cross flow type with electric cooling fan and coolant expansion tank. Fan cuts in at 194-203°F (90-95°C) and cuts off at 185-194°F (85-90°C).

WATER PUMP

Water pump is driven by timing belt and is mounted at lower left front of engine block. To remove, drain cooling system and remove timing belt cover. Loosen and remove water pump mounting bolts. Remove pump and check for wear. To install, use new "O" ring and reverse removal procedure. Add coolant mixture until tank is full and replace cap. Run engine until cooling fan turns on. Check coolant level and top off if necessary.

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
1979	130.8	2144	Fuel Inj.	103@5300	112.4@4000	8.0:1	3.13	79.5	3.40	86.4

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)
2144 cc Intake	1.496 (38.0)	45°	45°	.079 (2.0)	.314 (7.97)	.039 (1.0)	.....
Exhaust	1.220 (31.0)	45°	45°	.094 (2.4)	.313 (7.95)	.051 (1.3)	.....

ⓐ — Maximum allowable clearance.

5000 5 CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

PISTONS, PINS, RINGS						
Engine	PISTONS Clearance In. (mm)	PINS		RINGS		
		Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)②	Side Clearance In. (mm)③
2144 cc	.001-.003 (.025-.080)	①	.....	All	.010-.020 (.25-.50)	.0008-.003 (.02-.08)

① — Push fit at 140°F (160°C). ② — Wear limit .040" (1.0 mm). ③ — Wear limit .004" (.1 mm).

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)
2144 cc	2.281 (57.96)	.0006-.006 (.016-.160)	No. 4	.003-.010 (.08-.25)	1.809 (45.96)	.0006-.005 (.016-.12)	.016 (.40)

TIGHTENING SPECIFICATIONS

Application	Fr. Lbs. (mkg)
Head Bolts	
Cold①	55 (7.5)
Warm (Hex Socket Head Only)	61 (8.5)
Main Bearing Caps	47 (6.5)
Connecting Rod Caps	36 (5.0)
Flywheel/Drive Plate (Use Loctite)	54 (7.5)
Crankshaft Pulley/Sprocket	235 (35)
Oil Pan Bolts	7 (1.0)
Exhaust Manifold	18 (2.5)
Intake Manifold	18 (2.5)
Camshaft Bearing Caps	14 (2.0)
Camshaft Sprocket	58 (8.0)
Oil Pump Mounting Bolts	7 (1.0)
Timing Belt Cover	7 (1.0)
Cylinder Head Cover	7 (1.0)
Water Pump Mounting Bolts	14 (2.0)
Engine Mount Bolts	33 (4.5)

① — Tighten polygon socket head bolts ¼ turn past specified torque and DO NOT retighten.