

2.1L OPPOSED 4-CYL
Article Text
1991 Volkswagen Vanagon
For Volkswagen Technical Site
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Saturday, March 18, 2000 08:53PM

ARTICLE BEGINNING

1991 VOLKSWAGEN ENGINES
2.1L Opposed 4-Cylinder

Vanagon

*** PLEASE READ THIS FIRST ***

NOTE: For engine repair procedures not covered in this article,
see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION article
in the GENERAL INFORMATION section.

ENGINE IDENTIFICATION

Engine code and number is stamped on right crankcase below
breather. The first 2 characters designate engine code.

ENGINE IDENTIFICATION CODE TABLE
AA
Application Engine Code

2.1L Opposed 4-Cylinder MV
AA

VALVE CLEARANCE ADJUSTMENT

NOTE: Engine uses adjustable hydraulic valve lifters. Lifters
require adjustment only if rocker arms have been removed or
adjuster setting has been changed.

- 1) Place No. 1 cylinder at TDC on compression stroke.
Distributor rotor will align with mark on distributor housing. Loosen
adjuster lock nut on intake valve rocker arm of cylinder No. 1.
- 2) Turn adjusting screw clockwise until it contacts valve
stem. Turn adjusting screw clockwise an additional 2 turns, and
tighten lock nut. Repeat procedure for exhaust valve.
- 3) Rotate crankshaft counterclockwise 180 degrees. Adjust
valve clearance of cylinder No. 4 as described in step 2). Use same
procedure to adjust cylinders No. 3 and 2, respectively, rotating
crankshaft 180 degrees between adjustment of each cylinder.
- 4) Install rocker arm cover and new gasket. Start engine and
let idle until no lifter noise is heard. Replace lifters if oil level
and pressure is normal and lifters are noisy.

REMOVAL & INSTALLATION

FUEL PRESSURE RELEASE

Remove fuel pump relay from fuse/relay panel. Crank engine 3-

5 seconds. Reinstall fuel pump relay.

BLEEDING COOLING SYSTEM

1) Set heater control valve to maximum heat. Open control valve for auxiliary heater (if equipped) under rear seat. Remove radiator grille and raise front of vehicle about 16". Open bleeder screw on upper right corner of radiator. See Fig. 1.

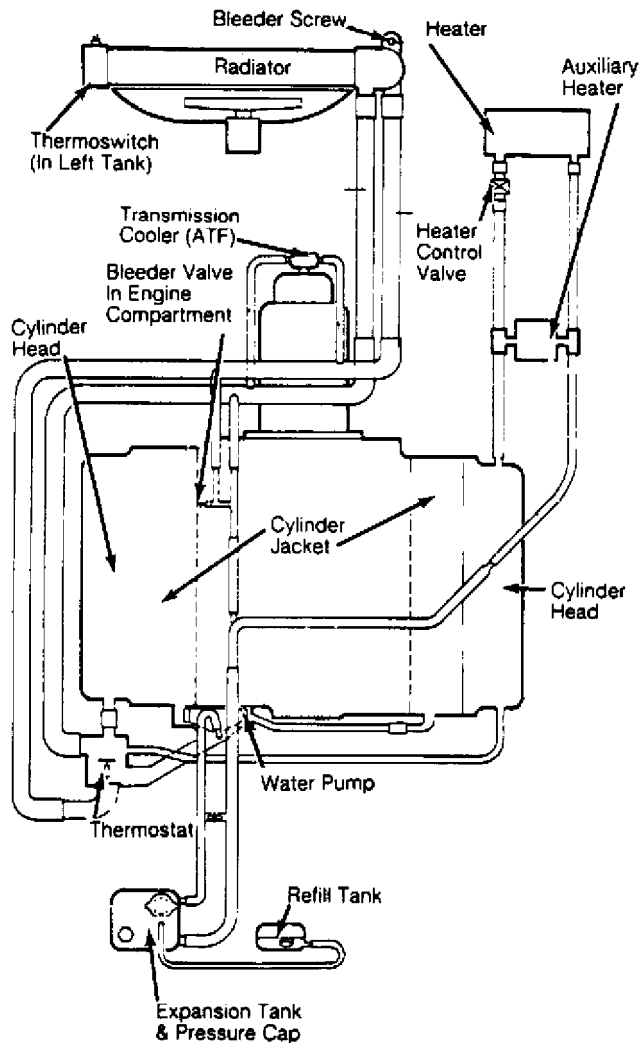


Fig. 1: Bleeding Cooling System
Courtesy of Volkswagen United States, Inc.

2) Open bleeder valve in engine compartment (turn counterclockwise). See Fig. 1. Fill expansion tank until full. Start and run engine at 2000 RPM. Keep topping tank until coolant flows from bleeder screw on radiator without any air bubbles. Add coolant until tank is full, and install cap on tank.

3) Turn engine off and restart after 20 seconds. Open

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expansion tank cap with engine running at 2000 RPM. Close bleeder screw on radiator when coolant is flowing out. Add coolant to expansion tank until full, and close tank tightly.

4) Close bleeder valve in engine compartment. Switch engine off. Top off refill tank to maximum mark. Pressure check cooling system with engine running until cooling fan has cycled.

ENGINE

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Place mating marks on major assemblies before removal.

Removal

1) Disconnect negative battery cable. Remove air cleaner with airflow sensor and air intake duct. Disconnect wires from alternator. Disconnect wiring from fuel injectors, throttle valve switch and auxiliary air regulator.

2) Disconnect 2 vacuum hoses from charcoal filter valve. Disconnect and plug fuel return line at pressure regulator and fuel line from fuel pump at "T" fitting. Remove throttle cable from throttle valve lever. On automatic transaxle models, remove snap ring and spring from throttle rod.

3) On all models, mark and disconnect coil lead and wiring plug at distributor, wiring at oxygen sensor, oil pressure switch, temperature sensor and temperature sender. Disconnect wiring to coolant level warning switch, located in expansion tank. Mark and disconnect ground leads on top left side of crankcase. See Fig. 2.

4) Clamp off both radiator hoses at thermostat housing. Clamp off both heater hoses at right rear side of engine compartment. Open expansion tank cap. Remove drain plugs at bottom of cylinder heads, and drain coolant. Disconnect coolant hoses from expansion tank at engine end. Remove expansion tank.

5) Disconnect brake booster vacuum line at check valve. Remove 2 upper bolts and nuts holding engine to transaxle. On models with automatic transaxle, remove 3 bolts attaching torque converter to drive plate. Access bolts through hole on top of transaxle housing. Remove rod from kickdown lever.

6) On all models, disconnect wiring at starter. On models with power steering, remove power steering pump with hoses attached. Secure pump in engine compartment. On models with A/C, remove compressor with hoses attached. Secure compressor in engine compartment.

7) Remove plates from left and right side of engine. Remove bolts from rear cover plate located at muffler, and leave plate in place. On all models, loosen transaxle mount bolts for front bracket 3 turns. Loosen lower transaxle mount bolt.

8) Attach Support Bar (VW 785/1B) so support pad is about 4.75" (120.0 mm) below transaxle housing. Support engine with Jack Adapter (US 612/5) and transmission jack. Remove 4 bolts retaining engine carrier at frame. While lowering engine, adjust angle of engine and keep wiring out of way of oil filler tube.

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9) Lower engine/transaxle assembly until transaxle rests on support bar. Remove 2 lower nuts holding engine to transaxle. Separate engine from transaxle. On automatic transaxle models, secure torque converter in transaxle. Remove engine from vehicle.

Installation

Check release bearing and replace if necessary. Replace all self-locking nuts. Replace coolant drain plug gaskets. To install, reverse removal procedure. Check and adjust throttle cables and linkage. Fill and bleed cooling system. See BLEEDING COOLING SYSTEM under REMOVAL & INSTALLATION.

INTAKE MANIFOLD

Removal & Installation

Procedures for removal and installation are not available. Remove intake manifold and throttle valve as an assembly. See Fig. 2. Replace all gaskets at installation.

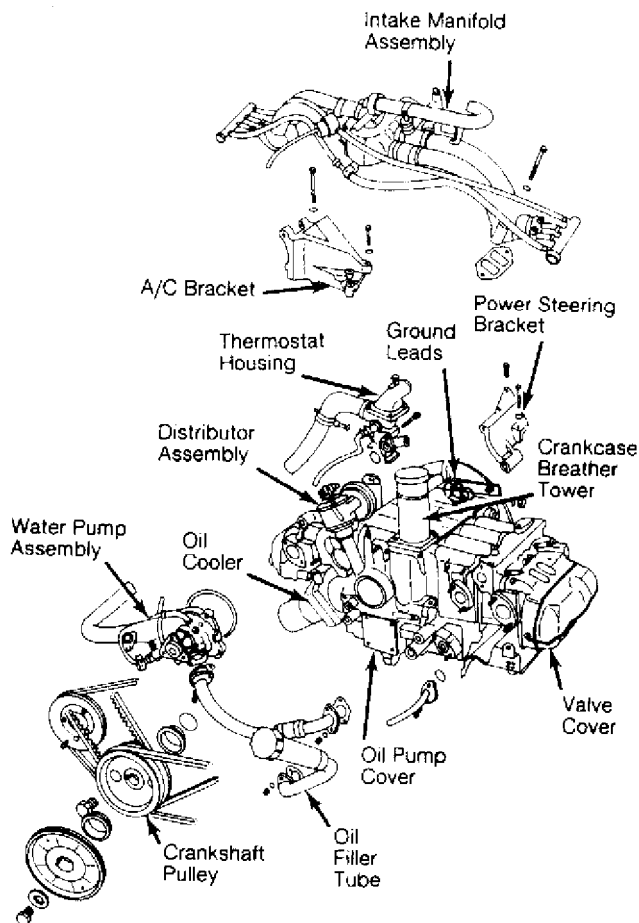


Fig. 2: Identifying External Engine Components
Courtesy of Volkswagen United States, Inc.

EXHAUST MANIFOLD

Removal & Installation

Procedures for removal and installation are not available.
See Fig. 3. Replace all gaskets at installation. Place metal surface of gaskets against cylinder head.

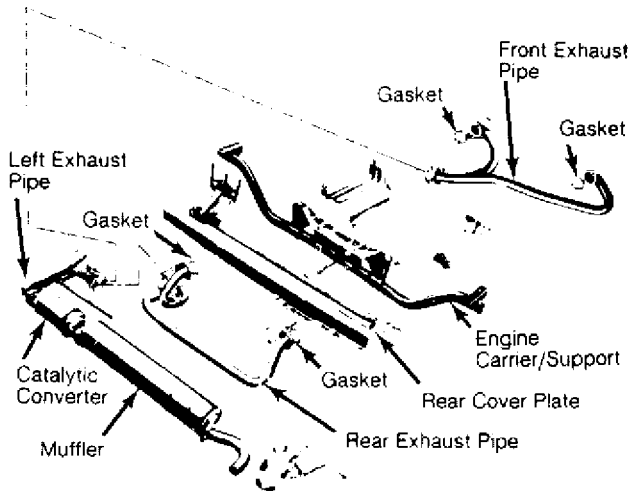


Fig. 3: Removing Exhaust System
Courtesy of Volkswagen United States, Inc.

CYLINDER HEAD

NOTE: Cylinder head may be removed with engine installed.

Removal

1) Remove rocker arm cover. Loosen rocker arm retaining nuts so tension is relieved evenly. Remove intake manifold assembly.

2) Remove expansion tank cap and drain plugs under cylinder heads. Drain cooling system. Disconnect coolant hoses at cylinder head. Remove front and rear exhaust pipes from cylinder head. Remove push rods and keep in order for reassembly.

3) Remove 8 cap nuts holding cylinder head to block. Gradually loosen nuts in reverse order of tightening sequence. See Fig. 4. Remove cylinder head and gasket. Remove push rod tubes. Remove metal sealing ring and thin Green "O" ring from cylinder sleeve.

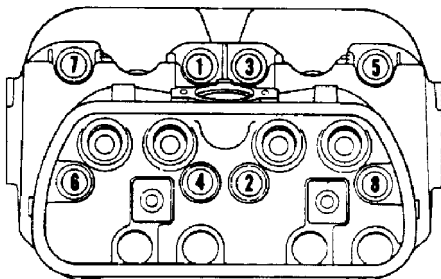


Fig. 4: Cylinder Head Nuts Tightening Sequence
Courtesy of Volkswagen United States, Inc.

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Installation

1) Ensure push rod tube is about 7.64" (194.0 mm) long between inside edges of tube sealing "O" rings. See Fig. 5. Seam of tube faces upward and small end of tube faces cylinder head. Always use new sealing rings and thoroughly clean mating surfaces.

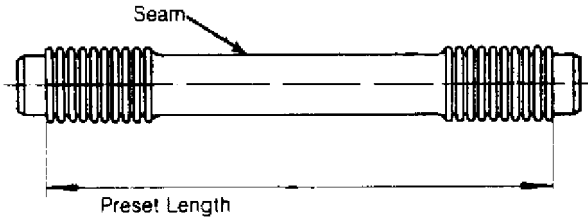


Fig. 5: Measuring Push Rod Tube Length
Courtesy of Volkswagen United States, Inc.

2) Clean cylinder head sealing surface. Install new thin Green "O" ring and metal gasket on cylinder sleeves. Apply a 1-2 mm bead of Sealing Compound (VW No. D 000 400) to center of new water jacket gasket.

CAUTION: Using too much sealant may plug cylinder head cooling passages. Install cylinder head within 45 minutes after applying sealant.

3) Coat sealing face of cap nuts with waterproof sealant. Install and snug cap nut at No. 1 stud to hold cylinder head in place. Install remaining cap nuts. Tighten cap nuts (in sequence) to 84 INCH lbs. (10 N.m). See Fig. 4. Make sure push rod tubes are correctly seated.

4) Tighten cap nuts in 2 steps (in sequence) to final torque of 37 ft. lbs. (50 N.m). Install push rods, ensuring push rods fit into cups of lifters. Install rocker assembly with slots facing upward on shaft supports. Adjust hydraulic lifters after tightening rocker arm assembly nuts. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS. Install rocker cover with new gasket.

5) Install remaining parts in reverse order of removal. Use new exhaust flange gaskets with metal surface toward head. Always use new locking nuts. Fill and bleed cooling system. See BLEEDING COOLING SYSTEM under REMOVAL & INSTALLATION.

CRANKSHAFT FRONT SEAL

Removal

1) Loosen A/C compressor or power steering pump (if equipped). Remove drive belts from crankshaft pulley. Loosen alternator and remove drive belt.

2) Remove coolant expansion tank and set aside. Remove screws and bolts from exhaust heat shield. Move heat shield down and away from installed position. Rotate pulley until alignment holes are horizontal.

3) Insert Alignment Plate (3149) into pulley. See Fig. 6.

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Place Pad (3149) across engine mounts to hold pulley in place. Remove crankshaft pulley bolt and pulley. Pry out seal.

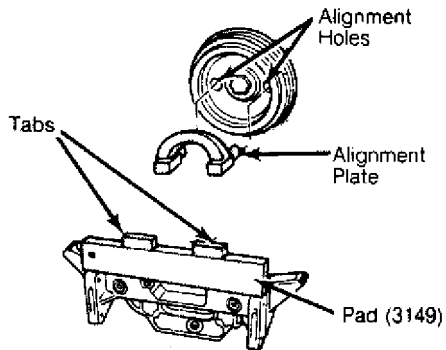


Fig. 6: Removing Front Crankshaft Pulley
Courtesy of Volkswagen United States, Inc.

Installation

Coat seal with oil. Install seal with Seal Installer (3088) and bolt without washer. Tighten bolt until stop is reached. Reverse removal procedure to install pulley.

ROCKER ARM ASSEMBLY

NOTE: Hydraulic valve lifters must be adjusted whenever rocker shafts have been removed and installed.

Removal & Installation

Remove rocker arm cover and gasket. Gradually remove rocker arm shaft nuts. Check adjusting screw surfaces for wear or damage. Ensure threads of adjusting screws and lock nuts move freely. To install, reverse removal procedure. Adjust lifters. See VALVE CLEARANCE ADJUSTMENT.

REAR MAIN BEARING OIL SEAL

Removal & Installation

1) Remove flywheel or drive plate and pry out seal. Clean seating area for seal. Remove "O" ring from inside lip of flywheel. Check pilot bearing felt ring for damage.

2) Lightly oil seal and install on Seal Installer Guide (VW 191A). Attach Seal Installer Base (VW 191B) to crankshaft. Press seal and guide in until seal seats. Lightly lubricate new "O" ring and install into flywheel or drive plate. Install flywheel or drive plate.

WATER PUMP

Removal

Remove expansion tank cap. Drain coolant at drain plugs on bottom of cylinder heads. Remove drive belt(s). Disconnect all hoses to water pump and thermostat housings. Remove water pump and thermostat housing as an assembly.

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Installation

1) Clean all sealing surfaces and replace gaskets. Install water pump and thermostat housing assembly. Tighten bolts and nuts. See TORQUE SPECIFICATIONS TABLE at end of article. Attach hoses and tighten clamps.

2) Install drive belt. Apply thumb pressure to belt, and adjust belt deflection to 3/8-9/16" (10-15 mm). Fill and bleed cooling system. See BLEEDING COOLING SYSTEM under REMOVAL & INSTALLATION.

CYLINDER HEAD OVERHAUL

CYLINDER HEAD

Information is not available from manufacturer.

NOTE: Minor cracks between valve seats or between seat and spark plug thread are acceptable. Cracks may not exceed .019" (.50 mm) in width. Cracks may not extend beyond first coil of plug thread.

VALVE SPRINGS

Compress spring retainer and springs. Remove keepers, and release spring compressor. Remove retainer and both inner and outer springs. Ensure springs are of equal length. To install, reverse removal procedure.

VALVE GUIDES

1) Measure valve stem-to-guide clearance with dial indicator pointer on head of valve. Rock valve back and forth and note reading. Maximum clearance is .047" (1.20 mm). If guides are to be replaced, securely mount head in drill press with combustion chambers down.

2) Carefully use step drill to remove shoulder of valve guide. Avoid cutting head or valve guide boss. Using drift, tap out remaining guide toward combustion chamber side. Install new guide with drift, from side opposite combustion chamber. Ream guides to fit valve stems.

NOTE: DO NOT machine exhaust valves. They MUST be hand lapped to seats.

VALVES

Check valve dimensions. Minimum length from stem tip to face is 4.823" (122.50 mm). Valve margin must not be less than specification. See CYLINDER HEAD TABLE under ENGINE SPECIFICATIONS at end of article.

VALVE TRAIN OVERHAUL

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HYDRAULIC VALVE LIFTERS & ROCKER ARMS

1) Remove rocker arm covers. Remove rocker arm shaft assembly. Remove push rods. Remove lower cover plate. Remove push rod tube. Remove lifters. Keep lifters in order of removal to ensure proper installation.

2) Looking through lifter bores, inspect camshaft lobes. Ensure lifter moves freely in bore.

3) Check and bleed lifters before installing. Apply firm thumb pressure to push rod socket. Push rod socket should NOT move. If socket moves, remove lock ring. Remove push rod socket, plunger, check ball, spring, check valve retainer and plunger spring.

4) Fill valve body bore with oil up to bleed hole. Insert plunger spring, check valve retainer, check valve spring, ball and plunger. Push downward on plunger and at the same time open ball check valve with scribe.

5) Place push rod socket into position. Hold a small socket on top of push rod socket, and place assembly in vise with bleeder hole facing up. Slowly tighten vise and compress lifter. Install lock ring. Recheck lifter.

CAUTION: Failure to install lifters in original location will cause premature camshaft failure.

6) Lightly oil lifter body and slide into lifter bore. Replace push rod tube sealing rings at each end. Compress push rod tube and position in cylinder block with seam facing upward. Small end of tube must be toward cylinder head.

7) Release push rod tube and allow it to expand into position. Ensure tube seats properly. Install push rods and ensure push rods are seated in lifter, not on lifter edge.

8) Install rocker arm shaft assembly. Tighten nuts evenly. Adjust hydraulic valve lifters. See VALVE CLEARANCE ADJUSTMENT.

CRANKCASE, PISTON & CYLINDER SLEEVE ASSEMBLY OVERHAUL

PISTON & CYLINDER SLEEVE

1) With cylinder heads removed, mark pistons and cylinder sleeves with matching numbers. Note cylinder sleeve position for installation reference. Place piston at TDC.

2) Using slide hammer and Clamping Puller (3092), pull out sleeve until piston pin snap ring is visible through hole in cylinder housing. Remove piston pin circlip. See Fig. 7.

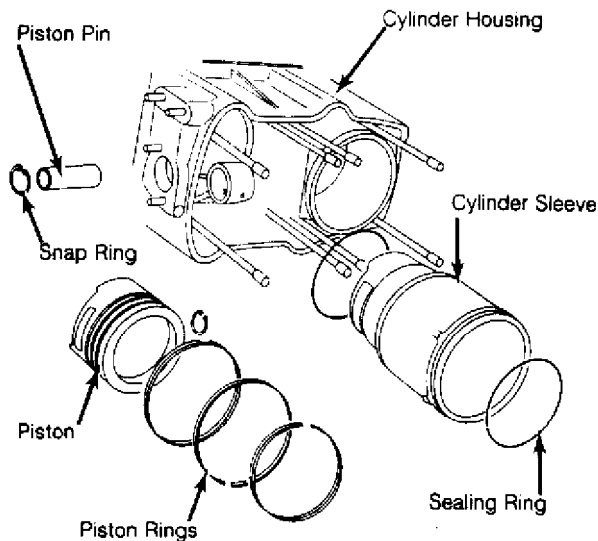


Fig. 7: Installing Cylinder/Piston into Cylinder Housing
Courtesy of Volkswagen United States, Inc.

3) Using Piston Pin Puller/Installer (3091), remove piston pin. If piston pin cannot be pulled out, use Reamer (3159) to remove burr in piston pin bore. Remove piston and cylinder sleeve.

4) Remove piston and sleeve at pulley end of crankshaft before removing piston and sleeve at flywheel end. Remove rubber sealing rings from cylinder sleeve. Clean all scale deposits and sealing compound from cylinder head and cylinder housing surfaces.

5) Install new sealing rings on sleeve. Thick Black ring is inner ring and thin Green ring is outer ring. Piston and sleeve assemblies at flywheel end of crankshaft must be installed first. Align all marks made and noted at removal.

6) Install piston in cylinder sleeve so piston pin can be installed. Install piston pin snap ring on flywheel side of piston. Place installing piston cylinder on TDC. Center connecting rod with Support (3090), and hold support rod in place with rubber band.

7) Align connecting rod and piston. Install piston pin through access hole in cylinder housing with Piston Pin Puller/Installer (3091). Install piston pin snap ring. Ensure piston and rod move freely on pin. Push cylinder sleeve in until it seats in cylinder housing. To complete installation, reverse removal procedure.

FITTING PISTONS

1) Measure piston diameter at bottom of skirt, about 5/8" (15.0 mm) from edge and at 90 degrees to pin bore. Measure inside diameter of cylinder sleeve near top of sleeve. See PISTON, PINS & RINGS TABLE under ENGINE SPECIFICATIONS at end of article.

2) Replace piston and/or cylinder sleeve as necessary. Arrow on piston top faces flywheel end. Size, weight and installation direction are marked on crown of piston. Weight group is indicated by "+" or "-" mark. Pistons marked "-" weigh 16.12-16.37 oz. (457-464 g). Pistons marked "+" weigh 15.80-16.08 oz. (448-456 g).

FITTING RINGS

1) Insert piston ring squarely into cylinder sleeve near bottom end. Using a feeler gauge, measure end clearance. See PISTON, PINS & RINGS TABLE under ENGINE SPECIFICATIONS at end of article. If not within specification, replace as necessary.

2) Install rings on piston with TOP mark up. See Fig. 8. Using feeler gauge, measure piston ring side clearance. If clearance is not within specification, replace rings and/or pistons. See PISTON, PINS & RINGS TABLE under ENGINE SPECIFICATIONS at end of article.

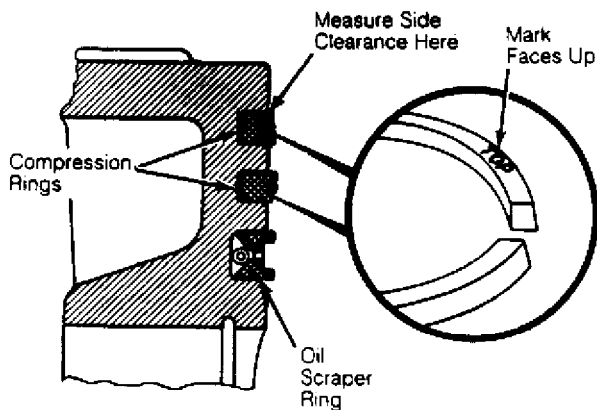


Fig. 8: Installing Piston Rings
Courtesy of Volkswagen United States, Inc.

CRANKCASE

1) Remove engine from vehicle and place on engine stand. Remove manifolds, cylinder heads, pistons and cylinder sleeves. Note directional arrows on carrier, and remove engine carrier assembly.

2) Mark pressure plate position for installation reference, and remove pressure plate and clutch disc. Remove flywheel or drive plate. Remove crankcase breather tower. Remove distributor assembly. Index distributor drive shaft gear to ensure installation to exact position.

3) Using Shaft Remover/Installer (VW 228b), pull distributor drive shaft gear from crankcase. Remove 2 shims located at bottom end of distributor shaft gear and retain shims for installation. Remove water pump assembly. See Fig. 1. Remove thermostat housing. Remove oil filter and cooler. Pry out front and rear crankshaft seals.

4) Remove oil filler tube. Remove oil pump cover and gears. Using Puller (VW 201), remove oil pump housing and gasket. Remove lifters. Keep lifters in a marked order for installation. Remove nuts retaining crankcase halves together.

5) Separate crankcase halves. Use a rubber mallet if necessary. DO NOT use pry bars or levers between crankcase halves, oil leaks will occur. Lift camshaft from crankcase. Remove crankshaft and connecting rods as an assembly. See Fig. 9.

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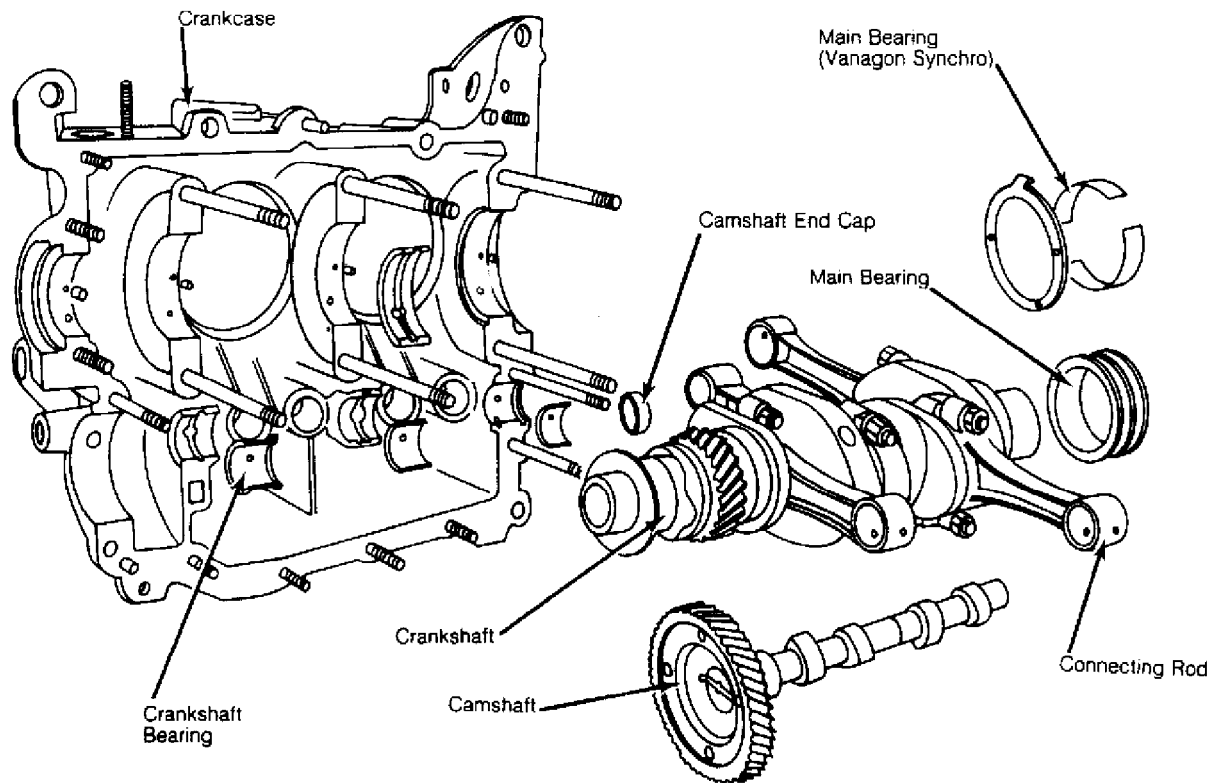


Fig. 9: Exploded View of Crankcase, Crankshaft & Camshaft Assembly
Courtesy of Volkswagen United States, Inc.

6) Remove bearings from crankcase halves. Remove main bearing locating dowels. Remove camshaft plug.

7) Clean all sealant from bolts, nuts and washers. Clean old sealant from crankcase. Blow out all oil galleys with compressed air. Ensure studs are tight.

NOTE: Use only Sealant (AMV 188 000 02) on crankcase half mating surfaces.

8) Ensure bearing locating dowels fit snugly in crankcase. Install main bearing and camshaft bearings in crankcases. Lubricate bearings with engine oil. Lay crankshaft and connecting rods into left half of crankcase. Properly align main bearings and locating dowels.

9) Install camshaft with "0" mark between marks on crankshaft gear. Check backlash of timing gears. Rotate crankshaft backward. If camshaft lifts out of bearing, install a smaller camshaft gear. Size of camshaft gear is marked on inner side of gear. Smaller size camshaft gears are available to adjust backlash. Coat edge of camshaft plug with sealant, and install plug.

10) Install rear thrust washer with tab on thrust washer toward main bearing and separating line of crankcase. Ensure projection on main bearing fits in notches in crankcase. Oil holes must be in left half of crankcase. See Fig. 10.

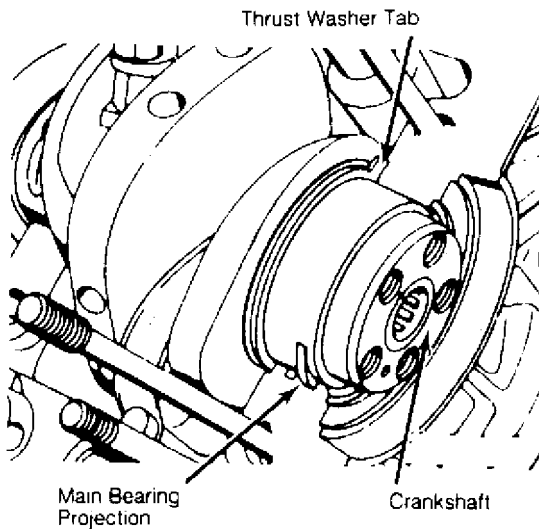


Fig. 10: Installing Thrust Washer & Main Bearing
Courtesy of Volkswagen United States, Inc.

11) Apply a thin layer of Sealant (AMV 188 000 02) to mating surfaces of both crankcase halves. Place right half of crankcase over studs, and compress crankcase halves together. Coat both sides of washers and face of cap nuts with Sealant (D3).

12) Tighten 8-mm nut above and behind No. 1 exhaust lifter bore first. Tighten all 10-mm nuts and then all remaining 8-mm nuts. Place No. 1 cylinder on TDC. Install distributor drive gear with Shaft Remover/Installer (VW 228b). Ensure drive gear is in exact position as marked at removal.

13) To complete installation, reverse removal procedure. Tighten all bolts/nuts to specification. See TORQUE SPECIFICATIONS TABLE at end of article. Fill fluid levels. Bleed cooling system. See BLEEDING COOLING SYSTEM under REMOVAL & INSTALLATION.

CRANKSHAFT, ROD & MAIN BEARINGS

1) Remove crankshaft and rods assembly. Mark rod and rod caps with matching cylinder number. Note position of rod to ensure installation to original position. Remove and discard rod cap nuts. Remove rod and cap.

2) Note position of rod bearing and remove bearing. Keep rod bearing with rod from which it was removed. Repeat procedure for remaining rods to be removed. If replacing rods, they must be replaced as a complete set of 4.

3) Note color mark(s) on crankshaft. Main bearings must match crankshaft color. Remove Woodruff key and snap ring from crankshaft. Place assembly in press. Using Plate (VW 402), press off crankshaft timing gear and distributor drive gear.

4) Check side clearance with rods installed on crankshaft. Using a feeler gauge, measure between rod and crankshaft. See

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CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS TABLE under ENGINE SPECIFICATIONS at end of article. Check crankshaft journals for wear and damage. Blow out oil holes with compressed air. Replace as necessary.

5) Place crankshaft in vise. Heat crankshaft timing gear and distributor drive gear to 175°F (80°C). Oil main bearing, and place bearing on crankshaft with dowel locating hole facing crankshaft web.

6) Place heated gears and spacer on crankshaft. Ensure timing marks (2 dots) on crankshaft gear are facing out. Install snap ring. Oil main bearing and install with groove toward oil thrust ring.

7) Install oil thrust ring and Woodruff key. Install connecting rod bearings in rods and caps, with tangs engaging notches. Install connecting rods to proper cylinder, with forged mark on rod facing up. Install and snugly tighten NEW rod nuts and tighten snug.

8) Tap both sides of rod lightly to keep bearing shells from being pinched. Tighten rod nuts to specification. See TORQUE SPECIFICATIONS TABLE at end of article. To complete installation, reverse removal procedure. Fill fluid levels. Bleed cooling system. See BLEEDING COOLING SYSTEM under REMOVAL & INSTALLATION. Check for leakage.

CRANKSHAFT END PLAY

Mount dial indicator with tip at 90 degrees to face of flywheel. See Fig. 11. Move flywheel in and out to check end play. If end play is incorrect, remove flywheel, "O" ring, oil seal, and adjustment shims. see CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS TABLE under ENGINE SPECIFICATIONS at end of article. Determine shim(s) required to correct crankshaft end play.

NOTE: Always use shims to set or correct crankshaft end play.

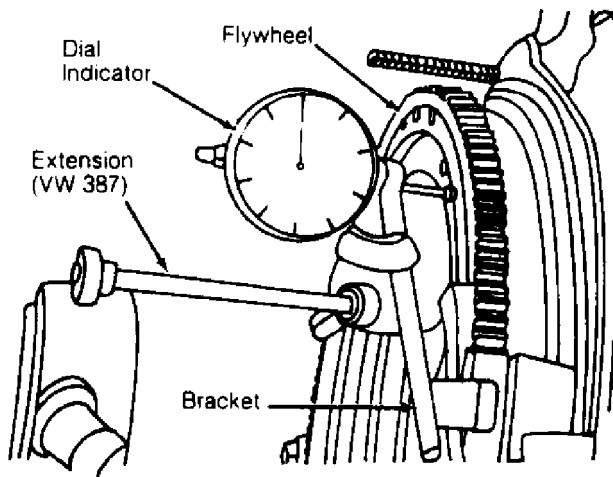


Fig. 11: Measuring & Adjusting Crankshaft End Play
Courtesy of Volkswagen United States, Inc.

ENGINE OILING LUBRICATION SYSTEM

Gear-type oil pump at front of engine is driven by camshaft. Oil flows under full pressure from pump to filter and to main bearing journals through oil galleys in crankcase casting. Crankshaft is cross-drilled to provide oil to connecting rod journals. Oil filter is connected to an oil cooler. Nonadjustable pressure relief valve is located in engine case.

CRANKCASE CAPACITY

Oil capacity without filter is 4.2 qts. (4.0L). Oil capacity with filter is 4.7 qts. (4.5L).

OIL PRESSURE

Minimum oil pressure should be 29 psi (2 kg/cm²) at 2000 RPM with oil temperature of 176°F (80°C). Oil pressure warning light should go out at pressure of 2-6.5 psi (.15-.45 kg/cm²). Spring-loaded pressure relief valve opens when oil pressure becomes excessive.

OIL PUMP

REMOVAL & DISASSEMBLY

Remove engine. Remove exhaust and engine carrier. Remove oil pump cover with 4 sealing nuts. Remove gears from pump housing. Install Puller (VW 201) and remove pump housing.

INSPECTION

- 1) Check pump housing for scoring. Ensure post for driven gear is tight in pump housing. Check lug of drive gear for excessive wear. Ensure machined surface of pump cover is smooth and flat.
- 2) Place gears in pump housing. Place straightedge across pump body and face of gears. Measure end play of gears to straightedge with feeler gauge. See OIL PUMP CLEARANCE SPECIFICATIONS TABLE.

OIL PUMP CLEARANCE SPECIFICATIONS TABLE

Application In. (mm)

Oil Pump End Play (1) .004 (.10)

(1) - Maximum allowable clearance.

REASSEMBLY & INSTALLATION

- 1) Lightly coat THICK oil pump housing gasket with sealer. Place over studs against crankcase. Carefully tap pump housing into crankcase with soft mallet. Align studs and pump housing. Avoid

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tearing gasket edge.

2) Place drive gear in pump housing and rotate until lug fits into groove on face of camshaft. Install driven gear, rotating crankshaft slightly to align gear teeth. Install dry THIN oil pump cover gasket over studs.

3) Place pump cover plate on studs. Tighten new sealing nuts in diagonal pattern. Sealing ring of nut faces oil pump cover. To complete installation, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

AA

Application	Ft. Lbs. (N.m)
Connecting Rod Nuts	33 (45)
Coolant Drain Plug	37 (50)
Coolant Pipe-To-Cylinder Head	15 (20)
Crankcase Half	
8-mm Nuts	15 (20)
10-mm Nuts	22 (30)
Crankshaft Pulley Bolt	258 (350)
Cylinder Head-To-Crankcase Nuts (1)	
Step 1	(2)
Step 2	30 (40)
Step 3	37 (50)
Engine-To-Transaxle Nuts	22 (30)
Exhaust Flange-To-Cylinder Head Nut	15 (20)
Flywheel Or Drive Plate-To-Crankshaft	80 (110)
Oil Drain Plug	20 (25)
Oil Pump Cover Nuts	20 (25)
Pressure Plate-To-Flywheel	15 (20)
Rocker Shaft-To-Cylinder Head Nuts	20 (25)
Starter Mount Bolt	18 (25)
Torque Converter-To-Drive Plate	22 (30)
Water Pump-To-Crankcase	15 (20)

(1) - Tighten nuts in sequence. See Fig. 4.

(2) - Tighten to 84 INCH lbs (10 N.m).

AA

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS TABLE

AA

Application	Specification
Displacement	128 Cu. In. (2.1L)
Bore	3.701" (94.0 mm)
Stroke	2.99" (76.0 mm)

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Compression Ratio 9.0:1
Fuel System PFI
Horsepower @ RPM 95 @ 4800
Torque Ft. Lbs. @ RPM 117 @ 3200
AA

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS SPECIFICATIONS TABLE
AA
Application In. (mm)

Bore Diameter
Pin Bore (Full Floating) (1)
Rod Length (1)
Side Play (Maximum)028 (.70)

(1) - Information is not available.
AA

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK SPECIFICATIONS TABLE
AA
Application In. (mm)

Cylinder Bore
Standard Diameter 3.701-3.702 (94.00-94.03)
Maximum Taper002 (.06)
Maximum Out-Of-Round002 (.06)
AA

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS TABLE
AA
Application In. (mm)

Crankshaft
End Play
Standard003-.005 (.07-.13)
Service Limit006 (.15)
Runout (1)
Main Bearings Diameter (2)
Blue Dot
Journal No. 1 2.3614-2.3618 (59.980-59.990)
Journals No. 2 & 3 2.1645-2.1649 (54.980-54.990)
Journal No. 4 1.5741-1.5748 (39.983-40.000)
Red Dot
Journal No. 1 2.3610-2.3613 (59.971-59.979)
Journals No. 2 & 3 2.1642-2.1645 (54.971-54.979)
Journal No. 4 1.5741-1.5748 (39.983-40.000)

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Journal Out-Of-Round001 (.03)
Journal Taper001 (.03)
Oil Clearance	(1)
Connecting Rod Bearings		
Journal Diameter	..... 2.1647-2.1651	(54.984-54.996)
Journal Out-Of-Round	.....	.001 (.03)
Journal Taper	.....	.001 (.03)
Oil Clearance	.....	(1)

(1) - Information is not available.

(2) - Bearing and crankcase must have same color code
(Red or Blue).

AA

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATIONS TABLE

AA

Application	In. (mm)
-------------	----------

Pistons

Diameter	.....	3.700 (93.98)
Clearance		
Standard	.....	.001-.002 (.02-.05)
Maximum	.....	.008 (.20)
Piston Pin Bore	.....	(1)

Pins

Pin Diameter	(1)
Piston Fit	.....	Full Floating
Rod Fit	.....	Full Floating

Rings

No. 1

End Gap		
Standard	.....	.012-.018 (.30-.45)
Service Limit	.....	.035 (.95)
Side Clearance		
Standard	.....	.002-.003 (.05-.08)
Service Limit	.....	.005 (.12)

No. 2

End Gap		
Standard	.....	.012-.020 (.30-.50)
Service Limit	.....	.040 (1.0)
Side Clearance		
Standard	.....	.002-.003 (.04-.07)
Service Limit	.....	.004 (.10)

No. 3 (Oil)

End Gap		
Standard	.....	.010-.016 (.25-.40)
Service Limit035 (.95)
Side Clearance		
Standard001-.002 (.02-.05)
Service Limit004 (.10)

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[illegible][illegible]

Face Angle	45°
Head Diameter	1.340" (34.00 mm)
Length	4.823" (122.50 mm)
Minimum Margin	(1)
Stem Diameter	.3508-.3512" (8.91-8.92 mm)

[illegible][illegible]

Intake Valve	
Seat Angle	45°
Seat Width	.055-.098" (1.40-2.50 mm)
Exhaust Valve	
Seat Angle	45°
Seat Width	.055-.098" (1.40-2.50 mm)

Valve Guides		
Intake Valve		
Valve Guide I.D. ....	.315"	(8.00 mm)
Valve Guide Oil Clearance (1)	.047"	(1.20 mm)
Exhaust Valve		
Valve Guide I.D. ....	.354"	(9.00 mm)
Valve Guide Oil Clearance (1)	.047"	(1.20 mm)
Push Rod Tube Length (2)	7.6"	(194 mm)

[illegible]

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CAMSHAFT SPECIFICATIONS

CAMSHAFT SPECIFICATIONS TABLE

AA

Application	In. (mm)
-------------	----------

End Play006 (.16)
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Camshaft Runout0015 (.04)
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Camshaft Backlash000-.002 (.00-.05)
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AA

END OF ARTICLE