RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine identification number is stamped on left side of engine block near ignition distributor.

Engine Codes

Application	Code
Rabbit (1457 cc)	
W/Carburetor	FX
W/Fuel Injection	EJ
Scirocco (1588 cc)	EH
Dasher (1588 cc)	
Federal	YK, YH
California	YG

ENGINE, CYLINDER HEAD & MANIFOLDS

ENGINE

NOTE – *On Rabbit and Scirocco models only, engine and transmission must be LOWERED out of vehicle as an assembly.*

Removal (Rabbit & Scirocco) – **1)** Disconnect battery cables at battery. Loosen fuel filler cap to relieve tank pressure. Drain coolant by removing hose from thermostat flange and disconnect radiator fan motor and thermoswitch. Remove radiator with ducts and fan.

2) On air conditioned vehicles, remove air conditioner compressor and tie aside without disconnecting hoses. On all models, disconnect the following electrical connectors: Alternator, thermoswitch, oil pressure switch, warm-up regulator, coolant temperature sensor, coil and condenser wires, cold start valve and starter solenoid harness.

3) On carburetor equipped models, remove fuel hose. On fuel injection models, remove injectors. Remove fuel lines for cold start valve and warm-up regulator. On all models disconnect remaining fuel, coolant, emission control and vacuum lines and position out of way. Disconnect and remove accelerator linkage from engine.

NOTE – *When disconnecting fuel lines or components, have container available to catch leaking fuel in case system is still under pressure.*

4) Disconnect speedometer cable and ground cable from transmission. Detach selector cable and bracket on automatic transmission models. Detach clutch cable and relay shaft lever on manual transmission models. Disconnect starter wires and back up light switch on all models.

5) Remove exhaust flex-pipe nuts or spring clip. Remove starter. Disconnect both drive shafts from drive flanges. Remove horn and place out of way. Remove engine front mount. Remove axle nuts and disconnect lower ball joints from bearing housings, then remove drive shaft while holding strut assembly away from vehicle.

6) Reconnect ball joints so vehicle may be lowered onto wheels. Remove complete rear mount. Remove right front wheel. Attach suitable sling (US 1105) to engine and lift slightly. On manual transmission models, remove relay shaft and gearshift lever rods. On all models, remove bolts holding side mounts to body and lower engine/transmission assembly to dolly. Raise vehicle to clear and remove assembly from beneath car.

Installation – To install, reverse removal procedures using caution to observe all tightening specifications.

NOTE – *Mounts must be properly aligned and free of tension before tightening.*

Removal (Dasher) – **1)** Remove battery and drain crankcase. Remove air cleaner and ducting. Disconnect and plug fuel inlet hose. On manual transmission models, disconnect clutch operating lever, then disengage cable housing from bracket on engine mount.

2) Remove fuse block mounting screws and bend open wiring harness clip. Tie fuel hose, clutch cable and fuse block out of way. Disconnect heater control cable. Remove front engine mount and mount support.

3) Disconnect coil and any electrical components that might interfere with engine removal. If equipped with A/C, remove condensers and compressor and set out of way without disconnecting hoses. Drain coolant then remove radiator and expansion tank.

4) Working under vehicle, remove starter and disconnect exhaust pipe at manifold. On automatic transmission models, remove converter bolts through hole left by starter removal. On all models, remove engine mount nuts and lower engine/transmission bolts.

5) Install support bar under transmission and attach engine hoist. Raise engine until assembly hits steering rack housing and remove upper engine/transmission bolts. Pry engine loose from transmission and remove intermediate plate. Lift and turn engine to left and remove from vehicle. Secure torque converter with strap on automatic transmission models.

Installation – To install, reverse removal procedures, ensuring that aligning dowels between engine/transmission are tight. Torque converter on automatic transmission models must be fully seated with front of pilot approximately $1\frac{3}{16}$" (30 mm) below bell housing flange. Check that all mounts are free of strain before tightening.

CYLINDER HEAD & MANIFOLDS

Removal – **1)** On cars with carburetors, remove air cleaner and ducting. On fuel injection models, disconnect duct connecting throttle valve housing with mixture control unit. On all models, remove camshaft drive belt and drain engine coolant. If equipped with A.I.R. (California models), disconnect air lines from connections on exhaust manifold.

CAUTION – *Never drain coolant while engine is hot. Doing so could cause engine block or cylinder head to warp.*

RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER (Cont.)

2) Disconnect exhaust pipe. Remove nuts and bolts that hold exhaust manifold and intake manifold (air intake distributor) to head. Remove manifolds. Remove upper alternator bolt and adjusting bracket. Disconnect all coolant hoses and temperature gauge wire. Remove spark plugs.

3) Remove valve cover. Remove head bolts. Start at either end and work toward center. If head is stuck, insert block of wood in each outboard exhaust port and pry head free.

Installation – To install, reverse removal procedure and note the following: Make sure head gasket is positioned with "OBEN" mark facing up. Tighten head bolts in sequence and steps shown.

Cylinder Head Tightening Steps

Application	Ft. Lbs. (mkg)
Step One	22 (3.0)
Step Two	43 (6.0)
Step Three	54 (7.5)

NOTE – *Polygon (12 point) socket head bolts are set to final torque while cold and do not need to be retorqued when hot. Tighten in sequence to 54 ft. lbs. (7.5 mkg) plus an additional ¼ turn.*

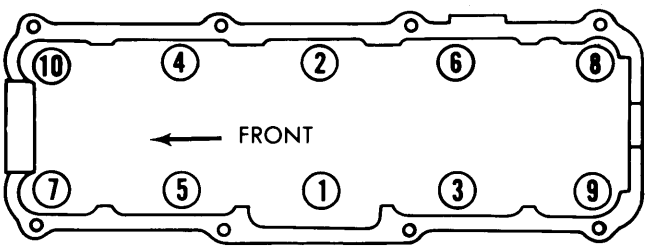

Fig. 1 Cylinder Head Tightening Sequence (Loosen in Reverse Order)

CAMSHAFT

TIMING BELT

NOTE – *Sprockets DO NOT have to be removed to replace camshaft drive belt.*

Removal – Remove alternator belt and A/C compressor drive belt (if equipped). Remove water pump pulley and upper drive belt cover. Remove lower drive belt cover and loosen belt tensioner so that tension is removed from drive belt. Work belt off sprockets toward front of engine.

Installation – **1)** Rotate camshaft sprocket until index punch mark on camshaft sprocket is lined up with top surface of valve cover mounting flange on spark plug side of head. Rotate crankshaft and intermediate shaft until index punch mark on intermediate shaft sprocket aligns with "V" notch on crankshaft pulley.

2) Use care not to move any sprocket. Fit belt on bottom first and then at top so there is no slack between sprockets. Tighten tensioner so belt can just be twisted 90° halfway between camshaft and intermediate sprockets. Tighten adjuster locknut and reverse removal procedure for remaining components.

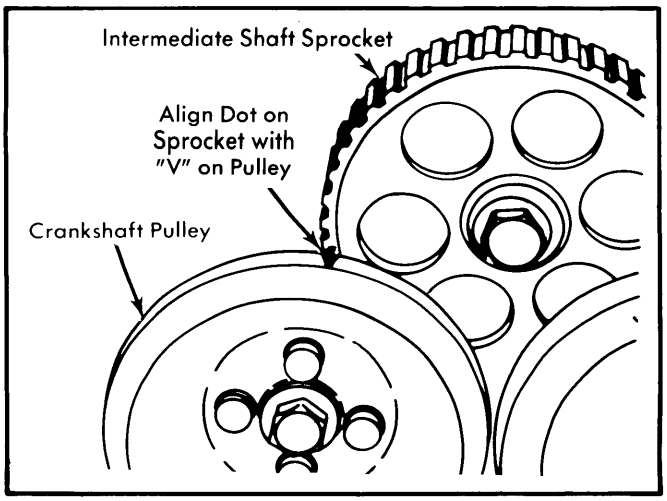

Fig. 2 Crankshaft and Intermediate Shaft Index Marks Aligned with Notch on Crankshaft Pulley

CAMSHAFT

Removal – **1)** Remove camshaft cover. Loosen and remove bearing caps in following sequence: 5, 1, and 3, then loosen bearing caps 2 and 4 diagonally. Bearing caps are numbered front to rear.

2) Check camshaft end play. Remove camshaft and lift out cam followers. Install camshaft using only bearing caps 1 and 5. Fit dial indicator so tip of gauge touches front of camshaft. Pry camshaft back and forth. Reading should not exceed .006" (.15 mm). If end play is beyond limits, replace either camshaft or cylinder head.

3) Check camshaft runout. Fit dial indicator so gauge pin is against camshaft center journal. Turn camshaft and record runout range. Runout must not exceed .0004" (.01 mm). Replace camshaft as necessary.

4) Inspect camshaft lobes for wear. Worn lobes usually indicate lack of lubrication. Check engine oiling passages to make sure they are not restricted. Replace worn camshafts and worn discs.

5) Inspect cam followers for signs of seizure or lack of lubrication. If any aluminum particles from head are found on cam followers, replace followers. Cylinder head must be replaced if any follower bores are worn or excessively rough.

Installation – Lightly lube cam follower bores, then fit followers in their original bores. Install adjusting discs. Place camshaft on cylinder head. Loosely attach No. 2 and No. 4 bearing caps. Gradually tighten caps. Fit No. 5 and No. 3 bearing caps. Install new oil seal in front of camshaft. Install No. 1 bearing cap. Make sure all caps are torqued to proper specifications.

VALVE TIMING

With timing belt removed as previously described, rotate crankshaft and intermediate shaft until index mark (punch mark) on intermediate shaft is positioned in "V" notch on

RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER (Cont.)

crankshaft pulley *(Fig. 2)*. This is firing point of No. 1 cylinder. Next, turn camshaft until marking on rear of camshaft sprocket is in line with cylinder head cover *(Fig. 8)*. Replace timing belt.

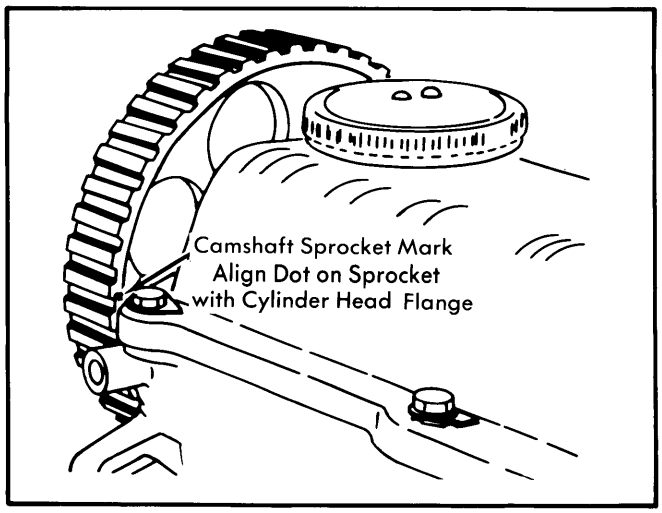

Fig 3 Index Mark on Camshaft Sprocket Aligned with Cylinder Head Flange

VALVES

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) Clean valve guides before making measurements. To measure guide, attach a suitable mounting device with a dial gauge (VW689/1) to mounting surface of cylinder head. Insert a new valve until end of stem is flush with end of valve guide.

2) Rock valve head against dial indicator and check amount of rock recorded. Maximum allowable rock is .039" (1 mm) for intake valves and .051" (1.3 mm) for exhaust valves. Proper valve guide diameter is .315"-.316" (8.01-8.04 mm).

3) Use a press and suitable adaptor (10-206) to remove and install valve guides. To remove guides, press out from combustion chamber side of head.

4) Coat new valve guides with engine oil. Press new guides into cold head from camshaft side. Make sure shoulder of guide meets firmly with top of cylinder head. Ream guides to uniform inside diameter.

CAUTION — *Do not use more than 1 ton pressure once guide shoulder is seated or shoulder may break.*

VALVE SPRINGS

NOTE — *Although normal maintenance on valve system is performed with head removed, it is possible to replace stem seals, keepers, retainers or broken springs with cylinder head installed.*

Removal (Head Installed) — With camshaft and tappets removed, turn crankshaft until piston of cylinder you are working on is at BDC. Apply steady air pressure of at least 85 psi through spark plug hole adapter to keep valves seated. Compress spring with suitable tool (VW 541) and remove valve keepers. Remove and replace damaged or worn parts.

Removal (Head Removed) — With camshaft and tappets removed, use suitable compressor (VW 541) to depress retainer and remove keepers. Take out retainer and springs.

Installation — Check springs on spring tester and inspect for cracks or distortion. Reverse removal procedure and note the following: Lower edge of valve spring retainer should be chamfered to prevent valve stem scoring. If necessary, grind a chamfer using stone or other suitable tool. When installing the springs, make sure closely spaced coils of outer springs are against spring seats.

VALVE STEM OIL SEALS

With tappet, adjuster pad, keepers, springs, and spring seats removed, extract valve stem oil seal. When installing new seal, first position protective plastic sleeve on valve stem, lubricate seal, and use a suitable mandrel (10-204) to push seal onto valve guide.

VALVE CLEARANCE ADJUSTMENT

1) Adjust valves with engine at normal operating temperature. Clearance adjustments are to be checked and made according to firing sequence (1-3-4-2). Rotate crankshaft until No. 4 cylinder valves overlap, then measure valve clearances of No. 1 cylinder.

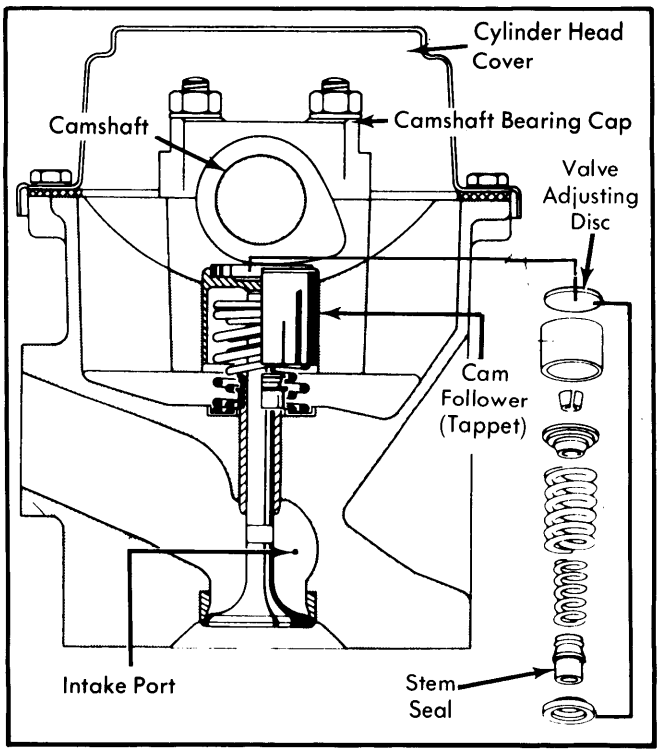

Fig. 4 Assembled View of Valve and Camshaft

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2) If adjustment is necessary, use special tools 10-208 (disc removal tool) and VW546 (tappet depressing tool) to remove and install adjusting discs. Rotate camshaft until cam lobes no longer rest on adjusting discs of cylinder to be adjusted. Turn tappet until notches are at 90° to camshaft. Insert tool VW546 and depress tappet. Using tool 10-208, grasp tappet disc and rotate it out from under camshaft.

3) Thickness is stamped on bottom side of dics. Using clearance measurement, determine thickness of adjusting disc necessary to bring valve clearances within specifications. Discs are available in .0019" (.05 mm) increments from .1181" (3.0 mm) to .1673" (4.25 mm). Reverse removal procedure to install proper disc. Repeat procedure as required for remaining valves.

Valve Clearance Specifications

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

NOTE – *Cold settings are given for reference as initial settings to be used during cylinder head rework. Final adjustments are to be made with engine at normal operating temperature. After head repairs, recheck valve clearances after 600 miles.*

PISTONS, PINS & RINGS

OIL PAN

Removal – On Rabbit and Scirocco, drain oil, remove bolts and remove oil pan. On Dasher, support engine from above with support bar and threaded rod. Remove nuts holding engine mounts on subframe and bolts holding subframe to body. Pull subframe downward to separate engine mounts and body. Drain oil, remove mounting bolts and remove oil pan.

Installation – To install, reverse removal procedure. Make sure gasket surfaces are clean before installing new gaskets.

PISTON & ROD ASSEMBLY

NOTE – *Piston and rod assemblies can be removed with engine in vehicle. Manufacturer recommends engine removal for extensive overhaul work.*

Removal – Mark cylinder number on crown of each piston. If necessary, mark arrows pointing toward front of block on piston crowns. Remove rod cap bolts and force piston out top of cylinder. Use wooden hammer handle for this operation. Mark connecting rods and bearing caps for proper reinstallation.

NOTE – *If a ridge at top of cylinder prevents piston removal, use a ridge reamer to cut down the ridge. DO NOT force piston out of cylinder.*

Installation – Turn crankshaft so No. 1 journal is at BDC. Install piston connecting rod assembly until ring compressor contacts block. Use a wood handle to push piston into cylinder. Install No. 4 Piston and rod assembly. Ensure tabs on bearing halves engage notch in rod and cap. Install and tighten caps on rods 1 and 4. Turn crankshaft 180° and install No. 2 and 3 rod assemblies and rod caps.

PISTON PINS

Removal – Use needle-nosed pliers to remove pin circlips. Press out pin and remove piston from rod. For installation purposes, note direction piston is fitted to rod.

Installation – **1)** Check pin fit in each piston. Piston pin must be a thumb-push fit in piston. If correct fit is not obtained, replace both pin and piston.

2) Check pin fit in connecting rod. Wear limit is .0015" (.04 mm). Rebush connecting rod and hone bushing to obtain correct clearance.

FITTING PISTONS

1) Measure cylinder at three points: .39" (10 mm) from top and bottom, and at center of bore. Take measurements in line with thrust face and also at 90° to thrust face. Cylinder wear limit is .0028" (.07 mm) beyond standard dimensions; if this is exceeded, rebore cylinder and install oversize pistons.

2) Measure pistons at .63" (16 mm) from bottom of piston skirt (measuring 90° to pin bore). Combining this measurement with measurement of corresponding cylinder bore, note piston-to-cylinder clearance. If this exceeds .0028" (.07 mm), oversize pistons must be installed.

3) Place piston rings squarely in top of cylinder bore (above ring ridge) and measure end gap. Measure ring side

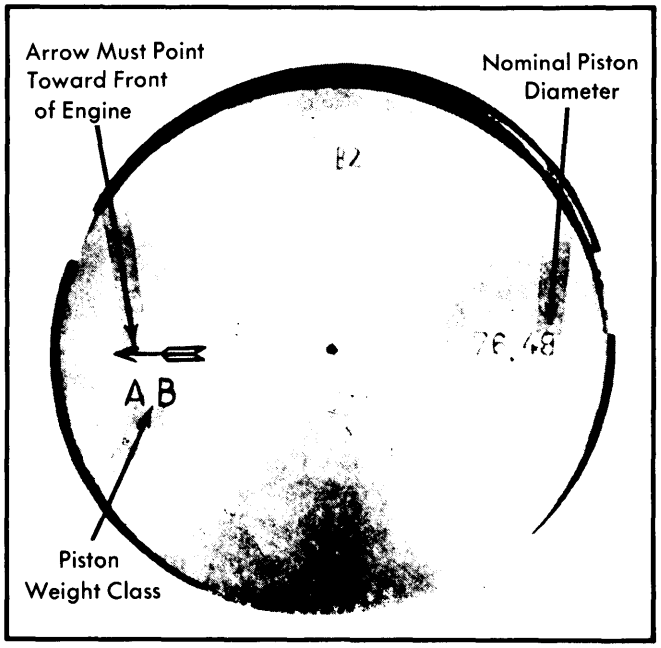

Fig. 5 Codes Stamped on Piston Head

RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER (Cont.)

clearance. Install rings on piston with end gaps 120° offset to each other (start with oil ring gap directly to the rear). Ensure stamp mark "TOP" on rings is facing upward.

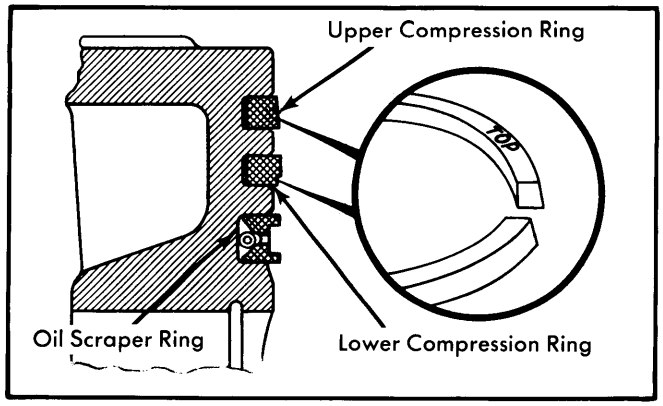

Fig. 6 Piston Ring Installation – Word TOP Must Face Piston Crown

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

1) Push crankshaft toward one end and measure crankshaft end play at No. 3 (thrust) bearing. Main bearing caps are stamped "1" to "5" (front to rear), and must be returned to original positions upon reassembly. Measure end play (side play) of connecting rods. Remove all bearing caps and check bearing clearance using Plastigage method.

2) Measure crankshaft journals with a micrometer to determine if crankshaft is out-of-round. Maximum ovality permissible is .0012" (.03 mm). Install main inserts with bearing half having oil groove into block. Lubricate bearings and install caps.

Crankshaft Journal Diameters

Size	Main Bearing In. (mm)	Rod Bearing In. (mm)
Standard	2.124 (53.95)	1.809 (45.95)
1st US	2.114 (53.70)	1.799 (45.70)
2nd US	2.104 (53.45)	1.789 (45.45)
3rd US	2.094 (53.20)	1.779 (45.20)

REAR MAIN BEARING OIL SEAL

NOTE – *Rear main bearing oil seal may be replaced with engine in vehicle. Transmission and flywheel must be removed.*

Insert screwdriver between crankshaft flywheel flange and inside lip of oil seal. Pry oil seal out. Install seal guide sleeve tool 2003 (or equivalent) over crankshaft flange. Start new seal over guide and into recess in seal carrier. Pull out guide tool and fit drive PLATE 2003 (or equivalent) with bolts to flywheel mounting flange. Tighten bolts evenly to seat seal.

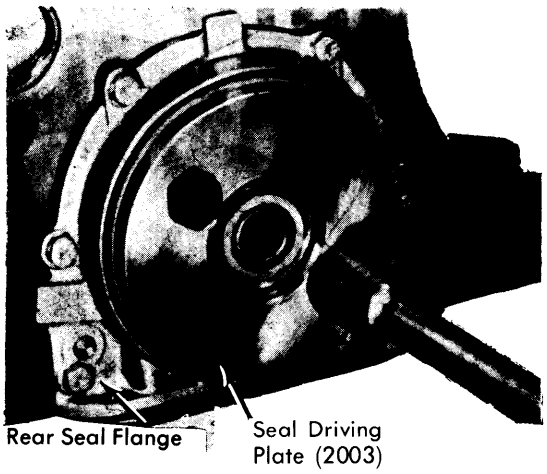

Fig. 7 Using Special Tool to Install Rear Main Oil Seal

FRONT MAIN BEARING OIL SEAL AND INTERMEDIATE SHAFT OIL SEAL

Remove camshaft belt. Remove crankshaft sprocket. Pry seal from seal carrier, being careful not to damage carrier. Use tool 10-219 (or equivalent) to reve seal *(Fig. 8)*. Using suitable tool (10-203), press in new seal until flush with seal carrier. If tool 10-203 was used, remove it and use aluminum part of tool (or equivalent) to press seal in until recessed .080" (2 mm) from front of seal carrier.

NOTE – *Same procedure applies to intermediate shaft oil seal except: Remove intermediate shaft sprocket. Only press new seal in until flush with seal carrier.*

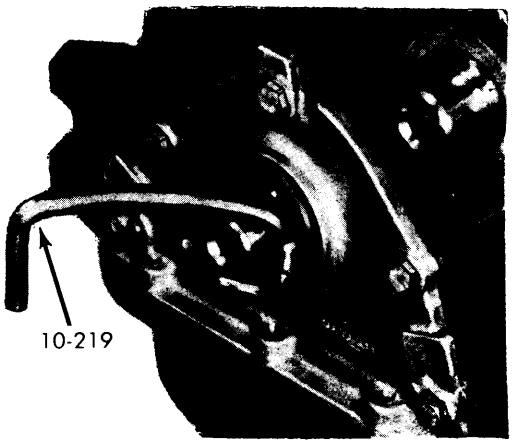

Fig. 8 Using Special Tool to Remove Front Oil Seal

ENGINE OILING

Crankcase Capacity – On Rabbit and Scirocco models, 3.7 quarts with filter change. On Dasher models, 3.2 quarts with filter change.

RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER (Cont.)

Oil Filter – Replaceable spin-on type.

Normal Oil Pressure – 28 psi@2000 RPM (normal operating temperature).

ENGINE OILING SYSTEM

Oiling system is a pressure feed type. A gear oil pump lifts oil from pan and pressure feeds it to crankshaft journals, camshaft bearings, and intermediate shaft. Other parts of system receive oil mist or splash for lubrication.

OIL PUMP

Removal – 1) With oil pan removed (see *OIL PAN* in this article), remove pump mounting bolts. Remove oil pump, leaving pickup tube attached.

2) Separate pickup tube from pump. Check oil pump gear backlash. Clearance should be between .002-.008" (.05-.20 mm). If specification is exceeded, replace gears or pump.

3) Measure oil pump gear end play. If end play exceeds .006" (.15 mm), replace pump.

Installation – To install, reverse removal procedure. Make sure all mating surfaces are clean before installing gaskets. Oil pump drive shaft must align with distributor drive gear.

ENGINE COOLING

Cooling System Capacity

Application	Capacity
Rabbit/Scirocco	4.9 qts.
Dasher	
With Expansion Tank	6.9 qts.
Without Expansion Tank	6.4 qts.

Thermostat – Begins to open at 176° F (80° C) and is fully open at 200° F (94° C).

WATER PUMP

NOTE – *The front portion of water pump (shaft, seals, bearing, and housing) can be replaced separately. To do this camshaft drive belt and sprockets must be removed. To avoid removing drive belt, remove water pump as an assembly.*

Removal – Drain coolant. Remove alternator belt and alternator. On some Calif. models A.I.R. pump must be removed. Remove bolt holding camshaft belt cover to pump. Disconnect hoses from water pump. Remove water pump bolts.

Installation – To install, reverse removal procedure and make sure to use new "O" ring in recess in pump mounting flange.

NOTE – *Do not use sealer between water pump mounting flange and engine block.*

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ. cu. ins.	Displ. cc	Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore in.	Bore mm	Stroke in.	Stroke mm
1979										
Rabbit										
W/Carb.	88.9	1457	34 PICT-5	62@5400	76.6@3000	8.0:1	3.13	79.5	2.89	73.4
CIS	88.9	1457	Fuel Inj.	71@5800①	73@3500①	8.0:1	3.13	79.5	2.89	73.4
Scirocco & Dasher	96.9	1588	Fuel Inj.	78@5500①	84@3500①	8.0:1	3.13	79.5	3.15	80

① – California models slightly less.

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)
All							
Intake	1.338 (33.9)	45°	45°	.079 (2.0)	.314 (7.98)	.001-.002 (.03-.05)	....
Exhaust	1.220 (31.0)	45°	45°	.095 (2.4)	.313 (7.95)	.002-.003 (.05-.07)	....

RABBIT, SCIROCCO & DASHER (GASOLINE) 4 CYLINDER (Cont.)

ENGINE SPECIFICATIONS (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)
All	.0012 (.03)	Push Fit	.0004-.0008 (.01-.02)	Comp.	.012-.018 (.30-.45)	.0008-.002 (.02-.05)
				Oil	.010-.016 (.25-.40)	.0008-.002 (.02-.05)

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)
All	2.126 (54)	.0011-.0033 (.028-.088)	No. 3	.003-.007 (.07-.17)	1.81 (46)	.0011-.0033 (.028-.088)	①.010 (.25)

① — Wear Limit.

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)①	Lobe Lift In. (mm)
All	.....	.0008-.002 (.02-.05)	.....

① — End play .006" (.15 mm)

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
All			
Inner	....	46-51@.719 (21-23@18.3)	....
Outer	....	96-106@.916 (43.5-48@22.3)	....

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Timing Belt Tensioner Lock Nut	33 (4.5)
Intermediate Sprocket Bolt	58 (8.0)
Crankshaft Sprocket Bolt	58 (8.0)
Water Pump Pulley Bolts	14 (2.0)
Crankshaft Pulley Bolts	14 (2.0)
Main Bearing Cap Bolts	47 (6.5)
Flywheel-to-Crankshaft Bolts	54 (7.5)
Connecting Rod Cap Bolts	33 (4.5)
Camshaft Sprocket Bolt	58 (8.0)
Camshaft Bearing Cap Nuts	14 (2.0)
Cylinder Head Bolts ①	
Cold	54 (7.5)
Hot	61 (8.5)
Manifolds-to-Cylinder Head	18 (2.5)
Oil Pump Mounting Bolts	
Socket Head Bolt	14 (2.0)
Hex Head Bolt	7 (1.0)
Oil Pan Bolts	7 (1.0)

① — For 12-point socket bolts, tighten COLD only to 54 ft. lbs. (7.5 mkg), then ¼ turn tighter.