RABBIT, SCIROCCO & DASHER 4 CYLINDER

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
1976										
Rabbit/Scirocco	96.9	1588	①1x2-Bbl.	②71@5600	③86@3000	④8.2-1	3.13	79.5	3.15	80
Dasher	96.9	1588	Fuel Inj.	⑤81@5800	90.4@3300	④8.2-1	3.13	79.5	3.15	80

① – Later models have fuel injection. ② – With fuel injection 78@5500 RPM. ③ – With fuel injection 83@3200 RPM. ④ – Later models 8.0-1. ⑤ – Calif. models 79@5800 RPM

ENGINE IDENTIFICATION

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

Engine Codes

Application	Code
Rabbit/Scirocco	
Man. Trans.	
Carburetor Models	FN
Fuel Injection Models	EE
Auto. Trans.	
Carburetor Models	FN
Fuel Injection Models	EF
Dasher	
Man. Trans.	YG, YK (no EGR)
Auto. Trans.	YH

ENGINE

NOTE – *On Rabbit and Scirocco models only, engine and transaxle must be removed as an assembly.*

Removal, Rabbit & Scirocco with Man. Trans. – 1) Disconnect battery ground cable. Drain coolant and remove radiator with air ducts and fan. On fuel injected models, injectors must be pulled from manifold tubes of intake distributor. Disconnect all fuel lines except injector lines from fuel distributor. Control unit is removed with air ducting and air cleaner.

2) Disconnect electrical wiring from the following: Ignition coil, oil pressure switch, ignition coil, distributor, temperature sending unit, alternator, fuel injection, starter, and transmission.

3) Disconnect all coolant hoses. Disconnect accelerator cable. Disconnect speedometer cable, clutch cable and remove engine/transaxle front mount. Remove right side headlight cap.

4) Disconnect axle drive shafts and support with wire. Disconnect exhaust pipe from manifold and remove exhaust pipe support. Remove transmission rear mount and ground strap from body to transmission. Remove gear shift linkage. Use special wrench US 4463 (or equivalent) and remove TDC sensor (part of analysis system).

5) Attach hoist to mount, cast at rear of cylinder head and lower alternator mount in front of engine. Disconnect engine carrier from body and remove left transmission mount. Lift engine and transmission out of vehicle.

6) To separate transmission from engine, turn flywheel until mark on flywheel aligns with mark on transmission housing. Remove cover plate over drive shaft flange, then remove engine-to-transmission bolts.

Installation – To install engine/transmission assembly, reverse removal procedure and note the following: When attaching engine to transmission, align recess (window) in flywheel level with drive shaft flange. Lift engine/transmission into vehicle and loosly attach left transmission mount to transmission. Align assembly, then attach engine/transmission carrier to body.

Removal, Rabbit & Scirocco with Auto. Trans. – 1) Disconnect battery. Drain coolant and remove radiator. Disconnect heater hoses. Loosen air conditioner and place out of way. Pull fuel injectors from manifold tubes of intake air distributor. Disconnect fuel lines except injector lines from distributor.

2) Remove mixture control unit, air cleaner, and intake air duct. Disconnect fuel return line. Disconnect electrical plug from control pressure regulator. Disconnect throttle housing assembly. Disconnect all engine electrical wires. Make sure wire plug at auxiliary air regulator is disconnected.

3) Disconnect speedometer cable. Fit engine hoist to eyes on cylinder head, then slightly raise engine. Remove alternator if necessary. Remove engine/transaxle front mount. On Scirocco models, remove right side headlight cap.

4) Disconnect transaxle lever cable on transaxle. Disconnect throttle cable ball socket from lever and unhook accelerator pedal cable from lever. Remove engine/transaxle rear mounting. Disconnect exhaust pipe at manifold flange.

5) Remove cover from engine end of bell housing. Remove torque converter from drive plate. Disconnect axle drive shafts and suspend out of way. Remove engine/transaxle left mounting. Remove engine carrier from right side. Engine is free for removal.

6) Separate engine and transaxle. Make sure drive plate pulls cleanly away from converter and does not move cover off support.

Installation – To install engine/transaxle assembly, reverse removal procedure. Make sure all liquid capacities are correct and that cables are properly adjusted.

RABBIT, SCIROCCO & DASHER 4 CYLINDER (Cont.)

Removal, Dasher – 1) Disconnect battery. Drain oil. Remove air cleaner. Disconnect clutch operating lever. Disengage cable housing from bracket on engine mount. Disconnect fuel inlet hose and plug.

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 engine electrical items that might hinder engine removal. Disconnect all wires from fuel injection components. Drain coolant. Remove radiator.

4) Work under vehicle and disconnect electrical wires from starter. Disconnect exhaust pipe at manifold. Remove converter bolts through hole left by starter removal. Remove lower bolts that mount engine to transmission.

5) Attach engine hoist. Raise engine until assembly hits steering rack housing. Remove upper bolts that mount engine to transmission. Pry engine from transmission. Remove intermediate plate. Make sure torque converter is supported on automatic transmission models.

Installation – To install engine, reverse removal procedure. Make sure all fluid levels are correct. Adjust any cables removed.

CYLINDER HEAD & MANIFOLDS

Removal – 1) Disconnect duct connecting throttle valve housing with mixture control unit. Drain coolant. Remove camshaft drive belt. On models with carburetors, disconnect all items that are attached to either carburetor or intake manifold.

NOTE – *Some California models are equipped with A.I.R. which must be disconnected.*

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 following: Make sure head gasket is positioned with "OBEN" mark facing up. Tighten head bolt 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)
Cylinder Head Hot Torque	61 (8.5)

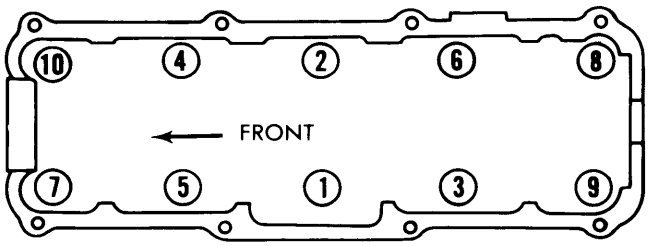

Fig. 1 Cylinder Head Tightening Sequence

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)
1588 cc							
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)	....

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 adaptor (10-206) to remove and install valve guides. Always perform this operation from top 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 firmly meets with top of cylinder head.

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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 SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1588 cc			
Inner	....	46-51@.719 (21-23@18.3)	....
Outer	....	96-106@.916 (43.5-48@22.3)	....

VALVE SPRINGS

1) Remove camshaft and cam followers (tappets). Remove cylinder head from engine. Use valve spring compressor similar to VW541 and force spring to compress enough to remove split keeper. Release tool. Take out retainer and valve springs.

2) Check spring free length and length under a load. Use spring tester. Inspect spring for cracks or distortion. When installing spring make sure closely spaced coil of outer springs are against spring seats.

VALVE CLEARANCE ADJUSTMENT

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

2) If adjustment is necessary, determine thickness of tappet adjuster disc installed. Using clearance measurement, determine thickness of tappet disc necessary to bring valve clearances within specifications. Tappet discs are available in .0019" (.05 mm) increments from .1181" (3.0 mm) to .1673" (4.25 mm). Thickness is stamped on bottom side of disc.

3) Special tools 10-208 (disc removal tool) and VW546 (tappet depressing tool) are required to remove and install new tappet discs. Rotate camshaft until cams of cylinder to be changed no longer rest on the tappet discs. Turn tappet until notches are at 90° to camshaft. Install tool VW546 and depress tappet. Using tool 10-208, grasp tappet disc and rotate it out from under camshaft. Install proper disc and remove tools. Repeat procedure as required to bring all valves within proper clearances.

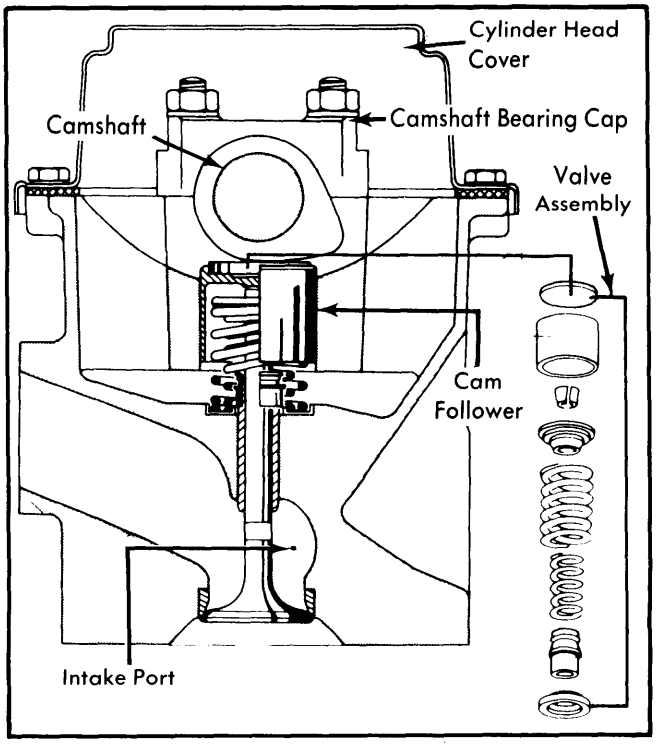

Fig. 2 Assembled View of Valve and Camshaft

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

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1588 cc	.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)

RABBIT, SCIROCCO & DASHER 4 CYLINDER (Cont.)

OIL PAN

Removal – Drain oil. Remove nuts mounting engine mounts on subframe. Remove four bolts holding subframe to body. Pull subframe downward to separate engine mounts and body. Remove 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.

1) Mark connecting rods and bearing caps for proper reinstallation. Remove rod cap bolts and force piston out top of cylinder. Use wooden hammer handle for this operation.

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.*

2) During reinstallation make sure tabs on bearing halves engage notch in rod and cap. Put crankshaft so No. 1 journal is at BDC. Install piston/connecting rod assembly in No. 1 cylinder until ring compressor contacts block. Use a wood handle to push piston into cylinder. Make sure rod is guided over crankshaft. Install crankshaft 180° before installing No. 2 and No. 3 rod assemblies.

PISTON PIN

1) Use needle nosed pliers to remove pin circlips. Press out piston pin and remove piston from rod. Note direction piston is fitted to rod for installation purposes.

2) Check piston pin fit in each piston. Piston pin must be a thumb push fit in piston. Make check when piston is heated to 140° F (60° C). If correct fit is not obtained, replace both pin and piston.

3) Check pin fit in connecting rod. Wear limit .0015" (.04 mm), rebush connecting rod. 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.

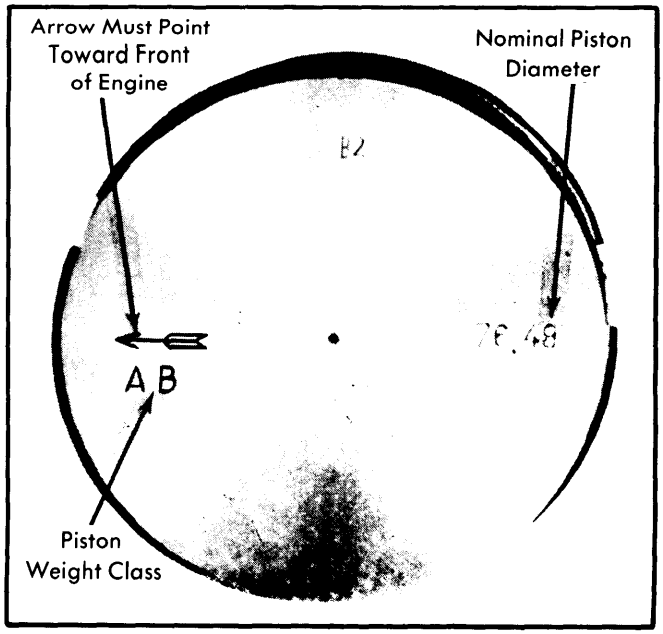

Fig. 3 Codes Stamped on Piston Head

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 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.

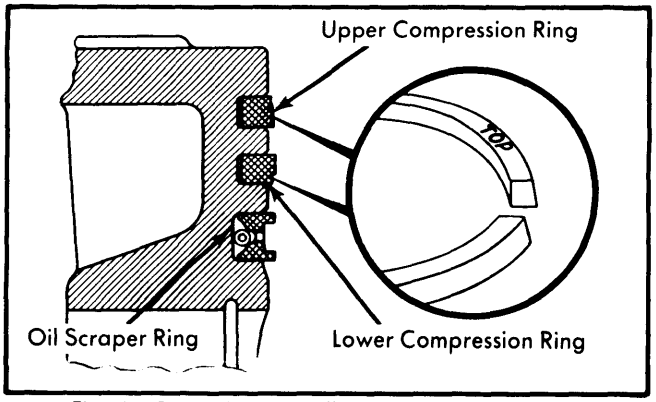

Fig. 4 Piston Ring Installation – Word TOP Must Face Piston Crown

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)
1588 cc	2.126 (54)	.0011-.0033 (.028-.088)	No. 3	.003-.007 (.07-.17)	1.81 (46)	.0011-.0033 (.028-.088)	①.015 (.37)

① – Wear Limit.

RABBIT, SCIROCCO & DASHER 4 CYLINDER (Cont.)

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)	Con. Rod Bearing In. (mm)
Standard	2.126 (54.00)	1.81 (46.00)
1st US	2.116 (53.75)	1.80 (45.75)
2nd US	2.106 (53.50)	1.79 (45.50)
3rd US	2.096 (53.25)	1.78 (45.25)

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 10-205 (or equivalent) over crankshaft flange. Start new oil seal into recess in carrier. Pull out guide sleeve. Fit drive plate 10-220 (or equivalent) and seat seal by tightening bolt in plate.

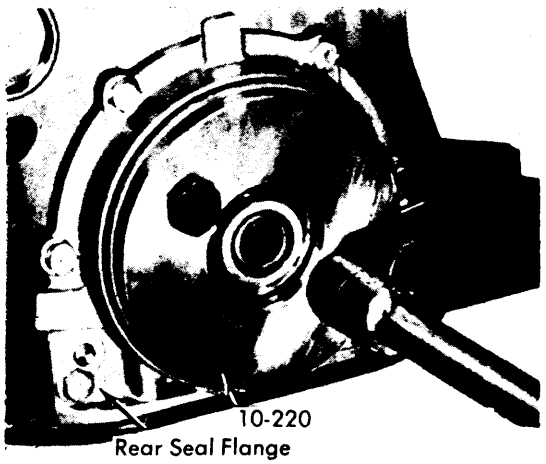

Fig. 5 Using Special Tool to Install Rear Main Oil Seal

FRONT MAIN BEARING OIL SEAL AND INTERMEDIATE SHAFT OIL SEAL

Remove camshaft belt. Remove crankshaft sprocket. Pry seal from carrier being careful not to damage seal carrier. Special tool 10-219 can be used to remove seal. Press in new seal until flush with seal carrier. If tool 10-203 was used, remove it at this time. Use aluminum part of tool (or equivalent) and 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.*

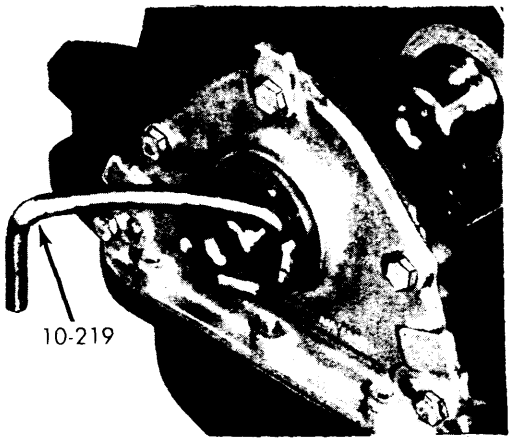

Fig. 6 Using Special Tool to Remove Front Oil Seal

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)①	Lobe Lift In. (mm)
1588 cc	.....	.0008-.002 (.02-.05)	.....

① – End play .006" (.15 mm)

TIMING BELT

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

Removal – Remove A.I.R. pump belt and alternator belt. Remove water pump pulley. Remove camshaft belt cover. Loosen camshaft drive belt tensioner lock nut. Turn adjuster counterclockwise to release tension on belt. Work belt off sprockets.

Installation – 1) Rotate camshaft sprocket until index mark (punch mark) on camshaft sprocket is lined up with top surface of valve cover mounting flange. Make sure to align index marks on spark plug side.

2) Rotate crankshaft and intermediate shafts until index mark (punch mark) on intermediate shaft sprocket is positioned in "V" notch on crankshaft pulley.

NOTE – *Make sure sprockets are not moved after belt has been removed.*

3) Fit belt from bottom first. Make sure there is no slack between sprockets. Tighten belt tensioner until belt can just be twisted 90°. Make twist halfway between camshaft and intermediate sprockets. Tighten lock nut. Reverse removal procedure for remaining components.

RABBIT, SCIROCCO & DASHER 4 CYLINDER (Cont.)

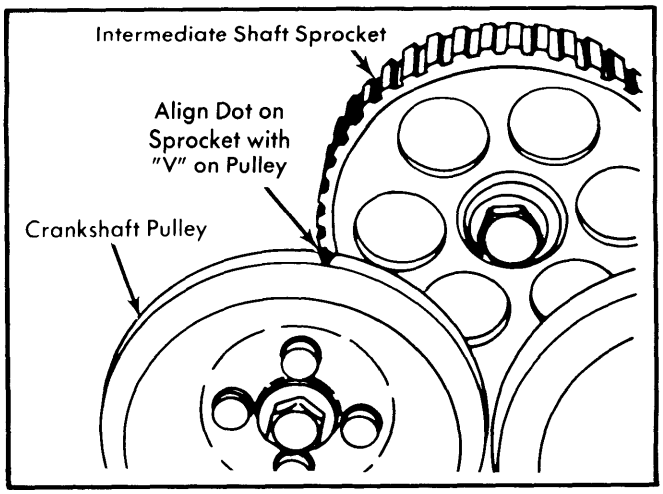

Fig. 7 Crankshaft and Intermediate Shaft Index Marks Aligned with Notch on Crankshaft Pulley

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, turn crankshaft and intermediate shaft until both markings are in line with notch of pulley *(Fig. 4)* 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. 5)*. Replace timing belt.

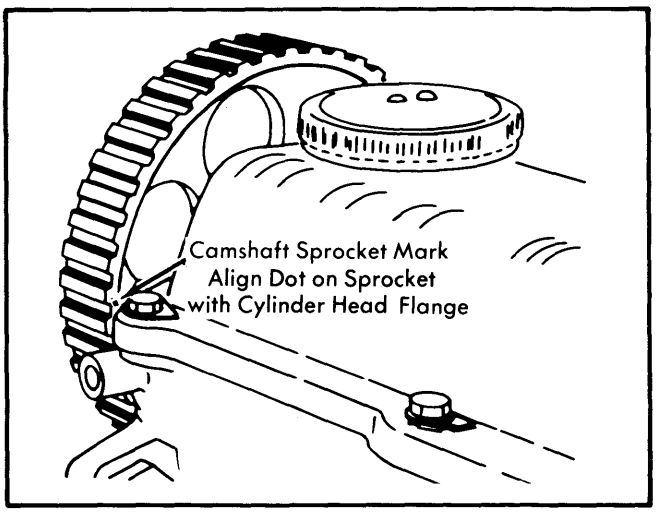

Fig. 8 Index Mark on Camshaft Sprocket Aligned with Cylinder Head Flange

ENGINE OILING

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

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) Drain oil. Remove nuts mounting engine mounts on subframe. Remove four bolts holding subframe to body. Pull subframe downward to separate engine mounts and body. Remove pan. Remove pump mounting nuts and remove pump with 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.

RABBIT, SCIROCCO & DASHER 4 CYLINDER (Cont.)

ENGINE COOLING

Cooling System Capacity

Application	Capacity
Rabbit/Scirocco	6.8 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.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Timing Belt Tensioner Lock Nut	33 (4.5)
Intermediate Sprocket Bolt	58 (8.0)
Crankshaft Pulley Bolt	58 (8.0)
Water Pump 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	
Cold	54 (7.5)
Hot	61 (8.5)
Oil Pump Mounting Bolts	
Socket Head Bolt	14 (2.0)
Hex Head Bolt	7 (1.0)
Oil Pan Bolts	7 (1.0)