

## 2.8L IN-LINE V6 (VR6)

### Article Text

1993 Volkswagen Passat

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Wednesday, March 22, 2000 09:58PM

### ARTICLE BEGINNING

1992-93 ENGINE

Volkswagen 2.8L 6-Cylinder

1992-93 Corrado SLC, 1993 Passat

### \* 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 identification number is stamped on a machined pad, on front of the cylinder block. See Fig. 1. The engine code is also listed on a sticker attached to the timing belt cover and the vehicle identification located in luggage compartment.

#### ENGINE IDENTIFICATION CODES TABLE

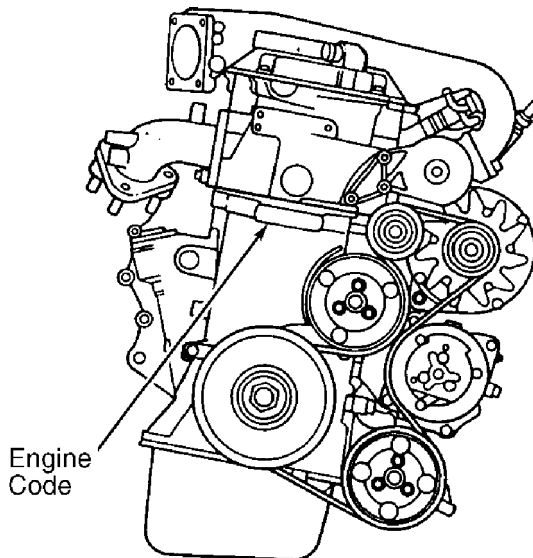
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Application	Engine Code
-------------	-------------

2.8L VR6 (1) .....	AAA
--------------------	-----

(1) - An "in-line" V6. See Fig. 7 for cylinder arrangement.

AA



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Fig. 1: Locating Engine Identification Number  
Courtesy of Volkswagen United States, Inc.

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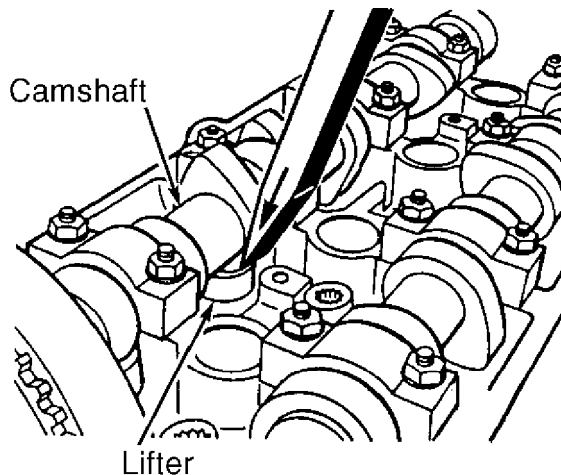
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## ADJUSTMENTS

### HYDRAULIC LIFTER TEST

To determine weak or noisy lifter, position camshaft lobe high point upward. Using a piece of wood, push lifter down. See Fig. 2. If lifter moves down more than .004" (.10 mm), replace lifter. If lifter moves less than .004" (.10 mm), lifter is okay. Repeat procedure for remaining lifters.

**CAUTION:** If lifter is replaced, allow 30 minutes for lifter to bleed down before starting engine.



93I83103

Fig. 2: Measuring Lifter Clearance  
Courtesy of Volkswagen United States, Inc.

## REMOVAL & INSTALLATION

### FUEL PRESSURE RELEASE

Remove fuel pump relay. Fuel pump relay is the lower right relay located in fuse/relay panel. Crank engine for 5 seconds. Reinstall fuel pump relay.

### ENGINE

**NOTE:** Engine is removed with transaxle attached.

#### Removal

1) Obtain radio code. Turn ignition off and wait 20 seconds. Disconnect negative battery cable. Remove air cleaner assembly. Install 8.0 mm bolt in belt tensioner hole and remove service belt. See Fig. 3.

2) On manual transmission models, disconnect clutch slave cylinder. On all models, remove power steering pump and attach to body. Remove radiator, front lock support and front bumper. Drain

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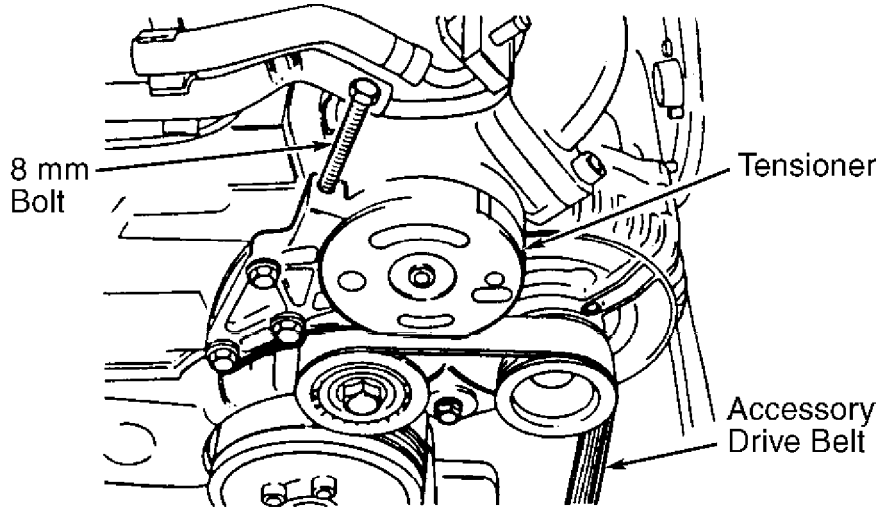
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cooling system. Disconnect cooling fan and thermoswitch.



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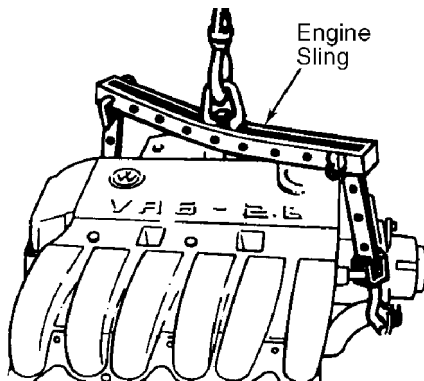
Fig. 3: Releasing Accessory Drive Belt Tensioner  
Courtesy of Volkswagen United States, Inc.

3) Label and disconnect electrical wiring and vacuum hoses. Disconnect throttle, cruise and kickdown linkage (if equipped). Remove air duct from intake manifold. Attach Engine Sling (2024A). See Fig. 4.

4) Disconnect drive axle from transaxle. See FWD AXLE SHAFTS article in DRIVE AXLES. Disconnect exhaust pipe from exhaust manifold. Raise engine and transaxle out of vehicle.

#### Installation

Reverse removal procedure to complete installation. Use NEW self-locking nuts and coolant. Ensure engine mounts are installed to original location. Align all engine supports with mount bushings before tightening mount bolts. Tighten bolts to specification. See TORQUE SPECIFICATIONS table at end of article.



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Fig. 4: Attaching Engine Sling  
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## INTAKE MANIFOLD

Removal and installation procedure is not available from manufacturer. See TORQUE SPECIFICATIONS table at end of article.

## EXHAUST MANIFOLD

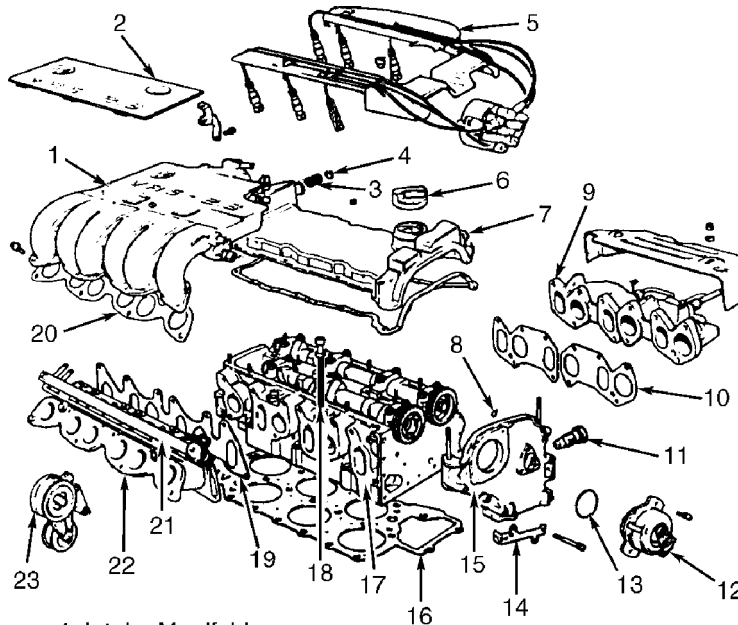
Removal and installation procedure is not available from manufacturer. See TORQUE SPECIFICATIONS table at end of article.

## CYLINDER HEAD

### Removal

1) Removal and installation procedure is not available from manufacturer. Cylinder head may be removed with engine in vehicle. See Fig. 5. Match mark all components for installation reference.

2) Remove cylinder head bolts in reverse sequence of installation. See Fig. 7. Replace cylinder head bolts after loosening or removing.



1. Intake Manifold

2. Trim Plate

3. Flame Trap Coil

4. Circlip

5. Ignition Wire Guide

6. Oil Filler Cap

7. Cylinder Head Cover

8. "O" Ring

9. Exhaust Manifold

10. Exhaust Manifold Gasket

11. Chain Tensioner

12. Ignition Distributor

13. "O" Ring

14. Retaining Bracket

15. Camshaft Sprocket Cover

16. Cylinder Head Gasket

17. Cylinder Head

18. Cylinder Head Bolt

19. Gasket

20. Gasket

21. Fuel Rail

22. Intake Manifold

23. Tensioner

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Fig. 5: Identifying 2.8L VR6 Cylinder Head  
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#### Inspection

Thoroughly clean all gasket mating surfaces. Check cylinder head for warpage. Maximum warpage is .004" (.10 mm). Check minimum cylinder head height and replace cylinder head (if necessary).

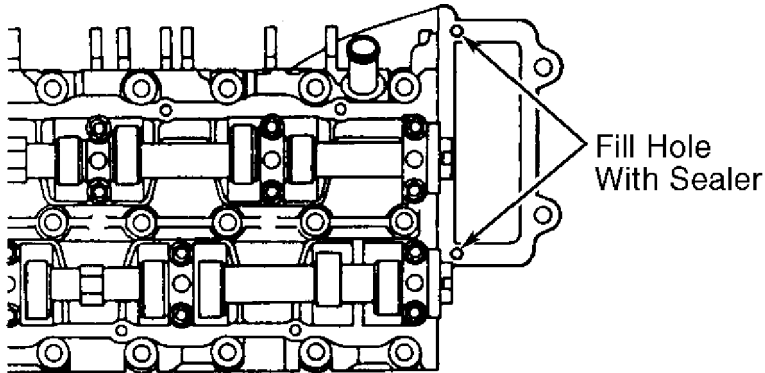
**NOTE:** DO NOT reuse antifreeze after replacing cylinder block, cylinder head, head gasket, radiator and/or heater core. The following INSTALLATION information is all that is available from manufacturer.

#### Installation

1) Ensure OBEN or TOP marking on cylinder head gasket faces up. Remove sealer from (2) 3 mm holes and replace with new sealer. See Fig. 6. Install gasket onto guide pins.

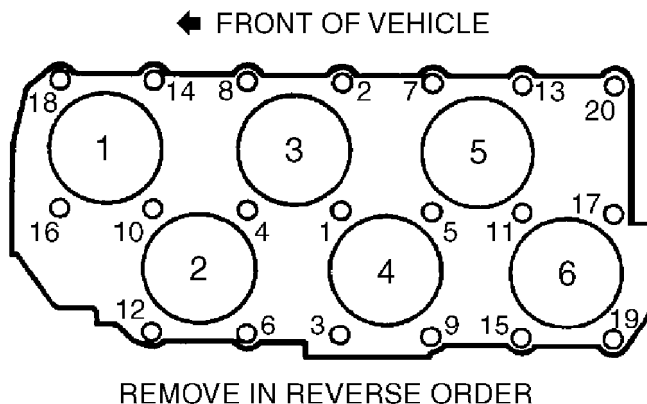
2) Install cylinder head onto cylinder block. Do not use any type of sealant. Install head bolts and tighten by hand.

3) Tighten cylinder head bolts (in 4 steps) in sequence to specification. See TORQUE SPECIFICATIONS table at end of article. See Fig. 7.



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Fig. 6: Sealing Cylinder Head 3 mm Holes  
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Fig. 7: Cylinder Head Bolts Tightening Sequence  
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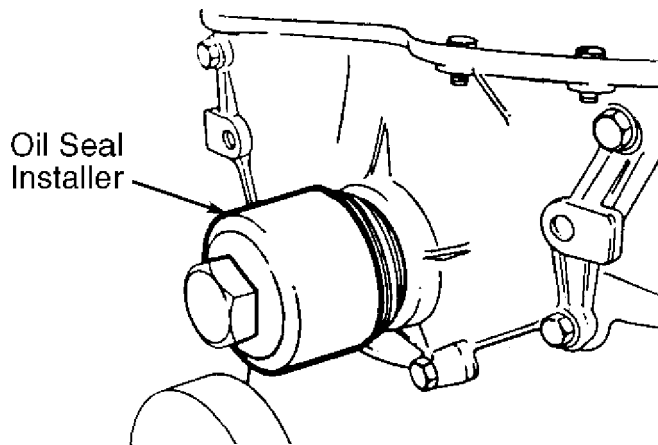
## CRANKSHAFT OIL SEAL

### Removal

Install 8.0 mm bolt in belt tensioner hole and remove accessory drive belt. See Fig. 3. Remove vibration damper. Loosen inner section of Oil Seal Extractor (3203) about 3 turns (4 mm) and lock in position with knurled screw. Turn inner section of oil seal extractor until seal is removed.

### Installation

Place guide Sleeve (3266/1) on crankshaft. Push oil seal over guide sleeve. Using Oil Seal Installer (3266) and vibration damper bolt, press oil seal in completely. See Fig. 8. Reverse removal procedure to complete installation.



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Fig. 8: Installing Crankshaft Oil Seal  
Courtesy of Volkswagen United States, Inc.

## TIMING CHAIN

### Removal

1) Ensure crankshaft is aligned at TDC. Remove transaxle and bellhousing assembly. Remove torque converter or clutch assembly (as applicable). Match mark all components to ensure reassembly in original position.

2) Mark timing chains for direction of travel. Align and install Camshaft Guide (3268) onto cylinder head bolts. See Fig. 9. Remove upper and lower chain tensioners. If necessary, remove intermediate sprocket and camshaft sprocket bolts. Remove timing chain.

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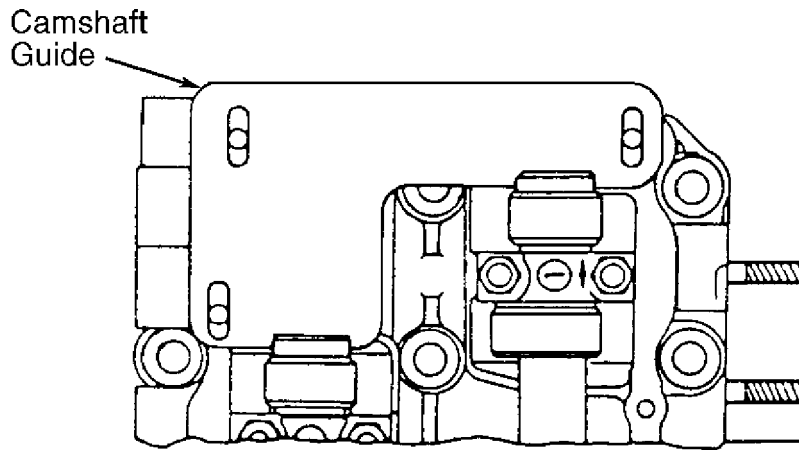
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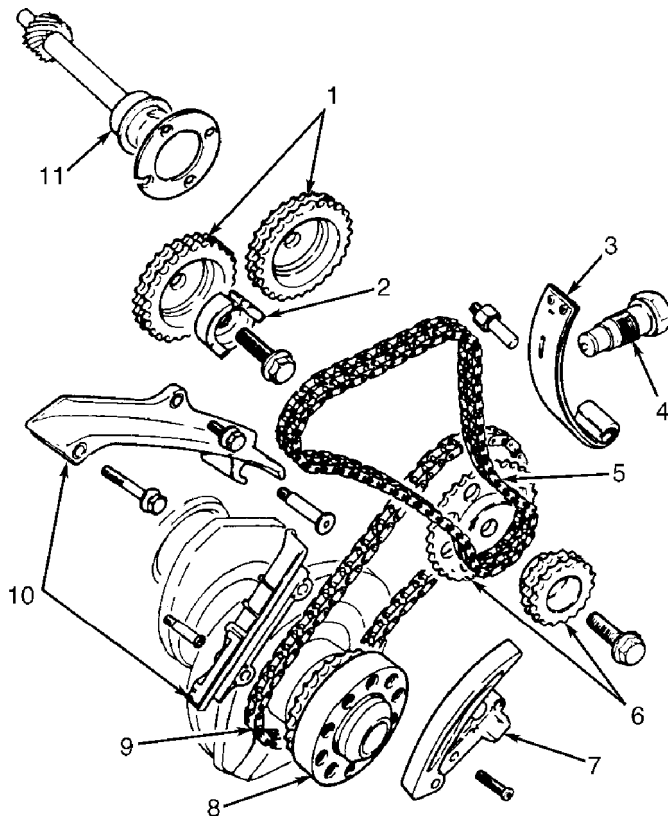
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Fig. 9: Installing Camshaft Guide Onto Cylinder Head  
Courtesy of Volkswagen United States, Inc.



- |                                |                        |
|--------------------------------|------------------------|
| 1. Camshaft Chain Sprocket     | 6. Intermediate Gear   |
| 2. Ignition Distributor Clutch | 7. Chain Tensioner     |
| 3. Tension Bar                 | 8. Drive Gear          |
| 4. Chain Tensioner             | 9. Timing Chain        |
| 5. Timing Chain                | 10. Sliding Rail       |
|                                | 11. Intermediate Shaft |

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Fig. 10: Exploded View Of Timing Chain & Related Components  
Courtesy of Volkswagen United States, Inc.

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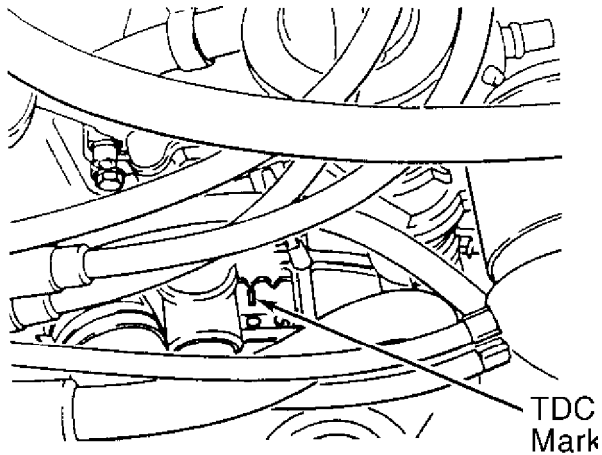
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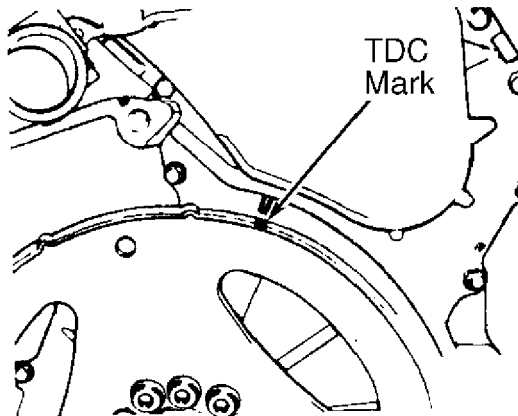
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#### Installation

Leave Camshaft Guide (3268) installed. Ensure crankshaft is aligned at TDC. See Fig. 11. Ensure intermediate shaft is correctly aligned. See Fig. 12. Install timing chain on sprockets. Reverse removal procedure to complete installation



WITH TRANSAXLE INSTALLED



WITH TRANSAXLE REMOVED

93B83114

Fig. 11: Aligning Crankshaft At TDC  
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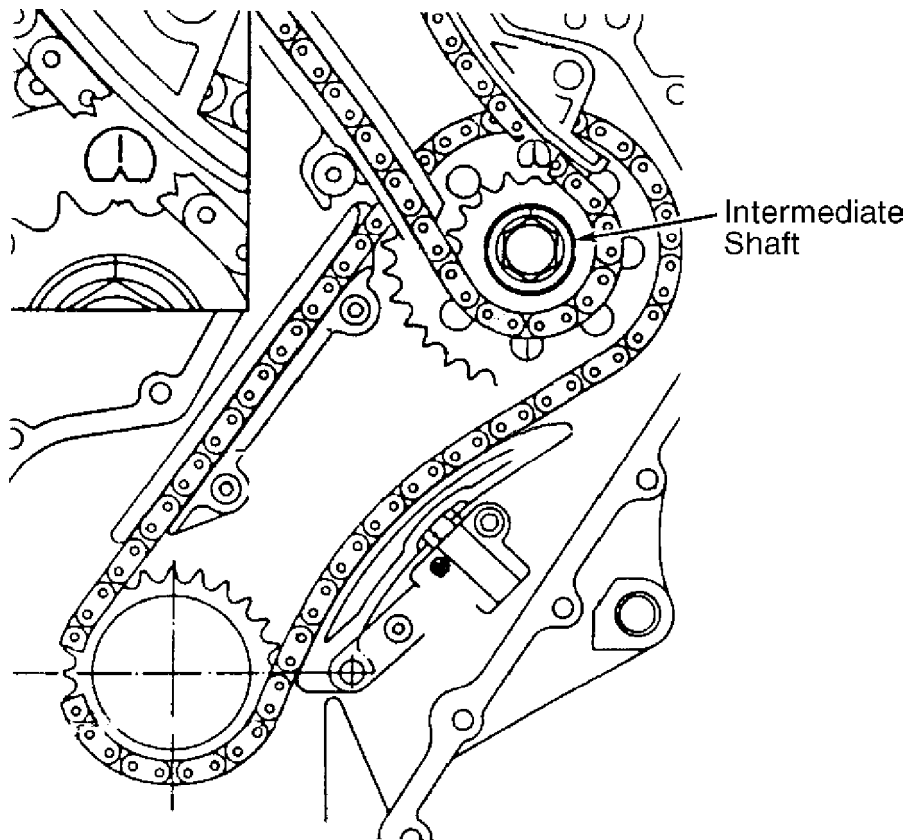
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Fig. 12: Aligning Intermediate Shaft At TDC  
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## CAMSHAFT

### Removal

Remove valve cover. Place crankshaft at TDC. Remove timing chain from camshaft sprocket. Remove camshaft bearing caps. Remove camshaft.

### Inspection

Check camshaft bearing oil clearance. See CAMSHAFT table under ENGINE SPECIFICATIONS at end of article. If oil clearance exceeds specification, install new camshaft and recheck clearance. If clearance still exceeds specification, replace cylinder head.

### Installation

1) Lubricate all contact surfaces. When installing bearing caps, ensure identification mark on bearing cap is readable from exhaust manifold side and arrow points toward vibration damper. See Fig. 13.

2) Tighten bearing caps No. 1, 3 and 5 alternately in a diagonal sequence to 15 ft. lbs. (20 N.m). Repeat procedure for bearing caps No. 2, 4 and 6.

3) To complete installation, reverse removal procedure. Ensure timing marks are properly aligned. Before starting engine,

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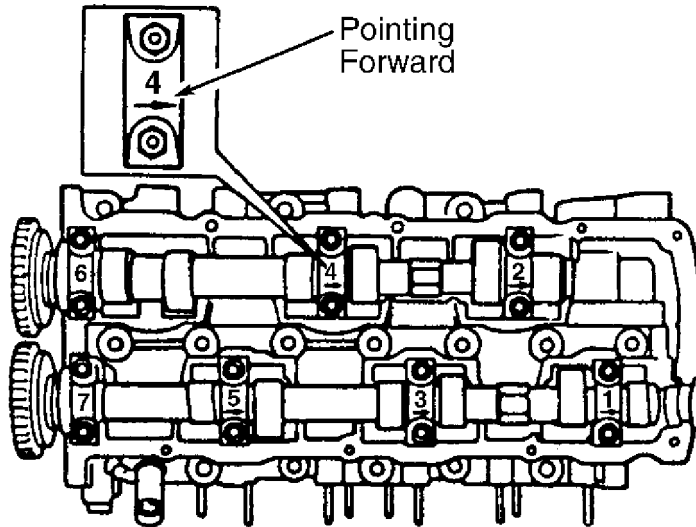
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allow 30 minutes for cam followers to bleed down.



93D83116

Fig. 13: Installing Camshafts Into Cylinder Head  
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## WATER PUMP

NOTE: Coolant/water mixture should be used at all times.

### Removal

1) Obtain radio security code. Turn ignition off and wait for 20 seconds. Disconnect negative battery cable. Drain cooling system. Disconnect front exhaust pipe from catalytic converter.

2) Install 8.0 mm bolt in belt tensioner hole and remove drive belt. See Fig. 3. Remove ignition cable guide. Disconnect front and rear motor mounts. Attach Engine Sling (2024A) to engine. See Fig. 4.

3) Lift engine enough to access water pump. Secure pulley using Spanner Wrench (VAG 1590). Remove water pump bolts. Push engine toward left side and remove water pump.

### Installation

When installing motor mounts, ensure that recess on engine bracket fits into mounting tab of bonded rubber bushing. Hand tighten motor mount bolts and light rock engine to ensure motor mounts are fully seated. To complete installation, reverse removal procedure.

## OIL PAN

Information not available from manufacturer.

## OVERHAUL

## CYLINDER HEAD



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Application

In. (mm)

Intake Valve ..... 1.33 (33.9)

Exhaust Valve ..... 1.34 (34.1)

AA

3) The difference is maximum refacing allowable for valve and seat. If valve installed height is too low or too high, lifters will not work correctly. Replace cylinder head assembly.

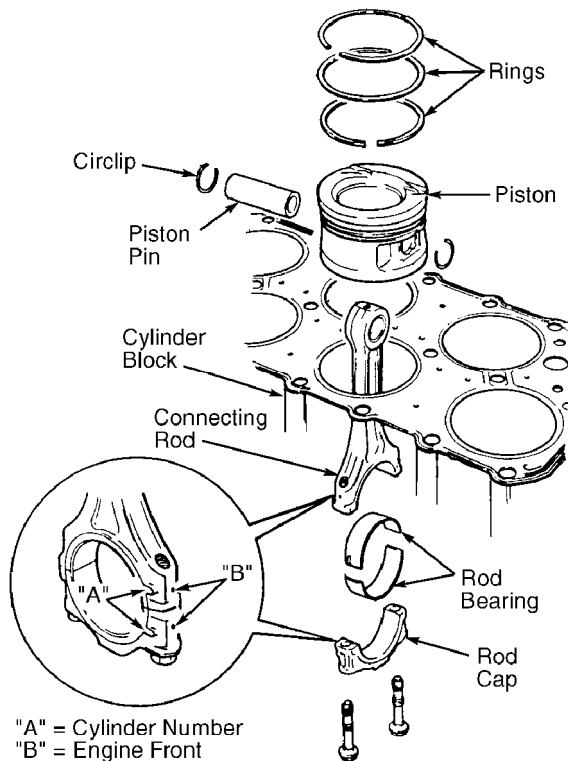
#### Valves

Measure valve length, stem diameter and valve margin. If not within specification, replace valves. Lap valves by hand or replace as necessary. See VALVES SPECIFICATIONS table under ENGINE SPECIFICATIONS at end of article.

### CYLINDER BLOCK ASSEMBLY

#### Piston & Rod Assembly

1) Make sure piston, rod and rod caps are marked with matching cylinder number prior to removal. Ensure arrow on top of piston points toward pulleys. Ensure marks on rod and cap are positioned correctly. See Fig. 15. Rod cap bolts and nuts must be replaced after removing or loosening.



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Fig. 15: Assembling Piston & Rod  
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2) Mark piston in relation to pin. Remove circlips from ends of pin bore. Use Piston Pin Replacer/Installer (VW 222A) to remove and install piston pin. If pin is too tight, heat piston to 140°F (60°C). Ensure rod is properly positioned with piston.

#### Fitting Pistons

Measure clearances with cylinder block supported on work bench. Check clearance of piston-to-cylinder bore. Piston diameter is stamped on top of piston in millimeters.

#### PISTON-TO-CYLINDER BORE DIMENSIONS TABLE

AA			
Size	Piston Diameter		Cylinder Bore
	In. (mm)		In. (mm)
Standard .....	3.188 (80.98)	.....	3.189 (81.01)
1st Over .....	3.208 (81.49)	.....	3.209 (81.51)
2nd Over .....	3.228 (81.98)	.....	3.229 (82.01)
AA			

#### Piston Rings

1) Measure ring end gap. Measure ring side clearance with piston. Replace if necessary. See PISTONS, PINS & RINGS SPECIFICATIONS table under ENGINE SPECIFICATIONS at end of article.

2) Install rings on piston with OBEN or TOP mark facing upward. Recessed edge on outside of center ring must face piston pin (down). Position ring gaps on piston at 120 degree intervals.

#### Connecting Rod Bearings

Mark rod caps for reinstallation. Use Plastigage to measure bearing clearances. Measure connecting rod side play. Replace or machine as necessary. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS at end of article. Tighten evenly to specification in several steps. See TORQUE SPECIFICATIONS table at end of article.

#### Crankshaft & Main Bearings

Main bearing caps are marked with matching journal for installation in original position. See Fig. 16. Measure crankshaft end play. See THRUST BEARING.

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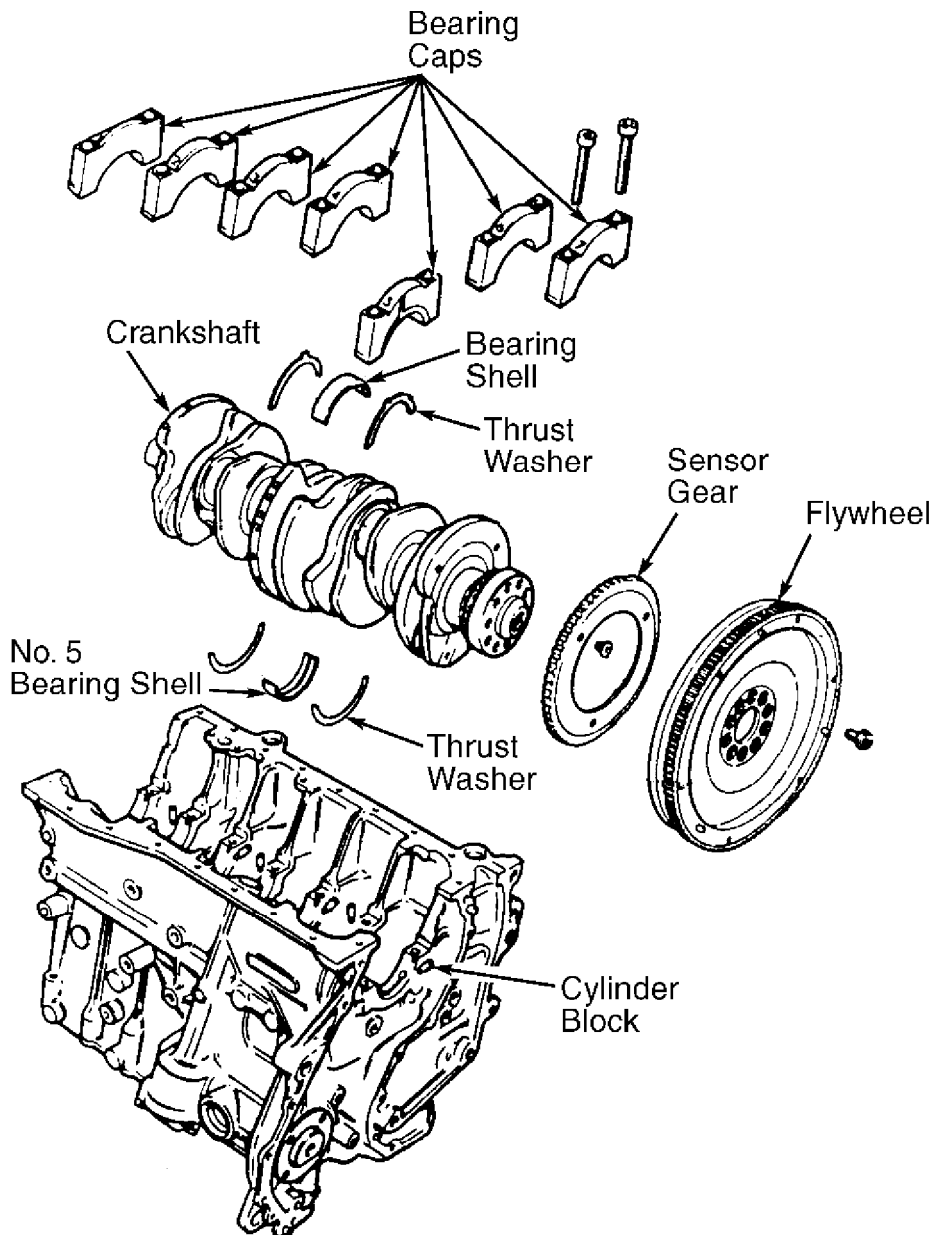
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Fig. 16: Exploded View Of Crankshaft Assembly  
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#### Thrust Bearing

Insert feeler gauge between No. 5 main bearing and crankshaft thrust face to measure end play. See Fig. 16. Replace thrust bearing as necessary. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS at end of article.

#### Cylinder Block

Check cylinder bore for wear, out-of-round and taper. Check cylinder block for warpage. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS at end of article.



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## TORQUE SPECIFICATIONS

## TORQUE SPECIFICATIONS TABLE

[illegible]

Application	Ft. Lbs. (N.m)
A/C Bracket-To-Engine Bolt	22 (30)
Axle Shaft-To-Transaxle Drive Flange Bolt	33 (45)
Camshaft Bearing Cap Bolt	15 (20)
Camshaft Sprocket Bolt	74 (100)
Clutch Cover Bolt	15 (20)
Connecting Rod Bolt	22 (30) + 1/4 Turn
Crankshaft Main Bearing Cap Bolt	22 (30) + 1/2 Turn
Cylinder Head Bolt (1)	
Step 1	30 (40)
Step 2	44 (60)
Step 3	Additional 1/4 (90) Turn
Step 4	Additional 1/4 (90) Turn
Engine Bracket (Front)	44 (60)
Engine Bracket (To Body)	33 (45)
Engine-To-Transaxle 10-mm Bolt	44 (60)
Engine-To-Transaxle 12-mm Bolt	55 (80)
Exhaust Manifold-To-Cylinder Head Bolt & Nut	18 (25)
Exhaust Pipe-To-Catalytic Converter Bolt	18 (25)
Exhaust Pipe-To-Manifold Nut	30 (40)
Flywheel-To-Crankshaft Bolt	44 (60) + 1/4 Turn
Intake Manifold	18 (25)
Intermediate Shaft Sprocket Bolt	74 (100)
Oil Pan Bolt	15 (20)
Oil Pan Drain Plug	37 (50)
Oil Pressure Switch	18 (25)
Oil Pump Cover Long Bolt	(2)
Oil Pump Cover Short Bolt	18 (25)
Power Steering Pump Bracket Bolt	18 (25)
Pressure Plate Bolt	15 (20)
Starter Mount Bolt	18 (25)
Timing Belt Tensioner Nut	15 (20)
Torque Converter-To-Carrier Plate Bolt	22 (30)
Vibration Damper Bolt	332 (450)
Water Pump Pulley Bolt	15 (20)
Water Pump Housing-To-Engine Bolt	15 (20)

INCH Lbs. (N.m)

Fuel Rail Bolt (Lower)	89	(10)
Timing Belt Idler Bolt	89	(10)
Valve Cover Retaining Nut	89	(10)
Water Pump-To-Housing	115	(13)

(1) - Never reuse cylinder head bolt(s) when servicing.

(2) - Tighten bolt to 89 INCH lbs. (10 N.m).

[illegible]



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## ENGINE SPECIFICATIONS

### GENERAL ENGINE SPECIFICATIONS

#### GENERAL ENGINE SPECIFICATIONS TABLE

Application		Specification
Displacement		
170 Cu. In. (2.8L)		
Bore		
3.19" (81.0 mm)		
Stroke		
3.56" (90.3 mm)		
Compression Ratio		
10.5:1		
Fuel System		
Motronic MFI		
Horsepower @ RPM		
Corrado SLC		178 @ 5800
Passat		172 @ 5800
Torque Ft. Lbs @ RPM		
177 @ 4200		

### CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS

#### CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECS TABLE

Application		In. (mm)
Crankshaft		
End Play		
Standard		.003-.007 (.07-.17)
Service Limit		.010 (.25)
Runout		.001 (.03)
Main Bearings		
Journal Diameter		2.361-2.363 (59.98-60.04)
Journal Out-Of-Round		.001 (.03)
Journal Taper		.001 (.03)
Oil Clearance		
Standard		.0008-.0020 (.02-.06)
Service Limit		.007 (.17)
Connecting Rod Bearings		
Journal Diameter		1.881-1.883 (47.78-47.84)
Journal Out-Of-Round		.001 (.03)
Journal Taper		.001 (.03)
Oil Clearance		.0004-.002 (.01-.06)

### PISTONS, PINS & RINGS SPECIFICATIONS

#### PISTONS, PINS & RINGS SPECIFICATIONS TABLE

Application		In. (mm)
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Pistons

[illegible]

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## VALVES SPECIFICATIONS

### VALVES SPECIFICATIONS TABLE

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Application	Specification
-------------	---------------

#### Intake Valves

Face Angle .....	45°
Head Diameter .....	1.535" (39.00 mm)
Length .....	4.210" (106.95 mm)
Minimum Margin (1) .....	(2)
Stem Diameter .....	.274" (6.97 mm)

#### Exhaust Valves

Face Angle .....	45°
Head Diameter .....	1.346" (34.20 mm)
Length .....	4.210" (106.95 mm)
Minimum Margin (1) .....	(2)
Stem Diameter .....	.243" (6.95 mm)

(1) - DO NOT machine valves; hand lap only.

(2) - Information not available from manufacturer.

AA

## CYLINDER HEAD SPECIFICATIONS

### CYLINDER HEAD SPECIFICATIONS TABLE

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Application	Specification
-------------	---------------

Cylinder Head Height .....	5.492-5.515"
----------------------------	--------------

Maximum Warpage .....	.039" (1.00 mm)
-----------------------	-----------------

#### Valve Seats

Intake Valve	
Seat Angle .....	45°
Seat Width .....	(1)

Exhaust Valve	
Seat Angle .....	45°
Seat Width .....	(1)

#### Valve Guides

Intake Valve	
Valve Guide Installed Height .....	(2)
Oil Clearance .....	(3) .039" (1.0 mm)

Exhaust Valve	
Valve Guide Installed Height .....	(2)

Valve Stem-to-Guide	
Oil Clearance .....	(3) .051" (1.30 mm)

(1) - Information not available from manufacturer.

(2) - Valve guide shoulder flush with cylinder head.

(3) - New valve installed in cylinder head. Dial indicator used to measure valve rock in guide.

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#### CAMSHAFT SPECIFICATIONS

##### CAMSHAFT SPECIFICATIONS TABLE

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

End Play .....	.006 (.15)
----------------	------------

Oil Clearance .....	.004 (.10) Maximum
---------------------	--------------------

Runout .....	.0004 (.01) Maximum
--------------	---------------------

AA

END OF ARTICLE