Audi Engines

4000 4-CYLINDER DIESEL & TURBO DIESEL

ENGINE CODING

ENGINE IDENTIFICATION

Engine number is stamped on a machined pad. It is located on left side of engine, near fuel injection pump. Letter prefix indicates engine type.

ENGINE IDENTIFICATION CODE

Engine	Code
Std. Diesel (1586 cc)	CR
Turbo Diesel (1586 cc)	CY

ENGINE & CYLINDER HEAD

ENGINE

Removal

1) Disconnect battery ground strap. Remove engine cover plate and transmission cover plate. Fully open heater control valve and open cap on expansion tank. Drain coolant by detaching hose from thermostat and lower radiator hose.

2) If A/C equipped, do not loosen any A/C system hoses. Detach radiator cowl from radiator and remove complete with both fans. Remove front grille and detach condensor from radiator.

3) Disconnect electrical plugs from fan and thermoswitch. Remove radiator with fan attached. Remove fuel supply line and fuel return line from injector pump. Disconnect accelerator cable from pump lever and detach bracket from pump body.

4) Disconnect cold start cable at pin and detach retaining washer from bracket. Disconnect wire from fuel shut-off solenoid. Remove gear shift light switch complete with wiring from bracket.

5) Disconnect wiring from oil pressure switch, coolant temperature sensors, glow plugs and thermoswitch. Detach coolant hose at rear of engine. Disconnect clutch cable from bracket and clutch lever.

6) Remove nuts (1 each) from right and left engine mounts. Remove vacuum hose to vacuum pump at reservoir. Remove alternator. Remove front engine stop. If A/C equipped, remove compressor belt (after removing crankshaft pulley).

7) Remove bolts attaching compressor bracket to engine. Remove compressor with bracket attached. Secure compressor and bracket assembly away from engine. Ensure A/C hoses are not under tension.

8) Remove exhaust pipe from manifold (or turbocharger). Disconnect starter cable from starter and intermediate plate. Remove exhaust pipe from support bracket at transmission. Remove starter. Remove 2 lower transmission-to-engine bolts. Remove flywheel cover plate bolts.

9) Support transmission with transmission support bar (VW 785/1B or equivalent). Attach lifting chain to engine. Lift engine and transmission until transmission housing touches steering rack. Adjust transmission support bar to contact transmission.

10) Remove remaining transmission-to-engine bolts. Separate engine from transmission. Carefully lift engine from vehicle.

Installation

1) Prior to installing engine, attach intermediate plate to rear of engine (over dowel sleeves). Use grease to hold plate in position. Place starter on engine carrier (support) before installing engine.

2) Install engine in reverse order of removal procedures. Use care not to interchange fuel supply and return lines. Return line is marked "OUT" on union fitting. Adjust throttle and clutch cables.

CYLINDER HEAD

Removal

1) Disconnect battery ground strap. Remove air cleaner, duct and air filter. Drain coolant from engine. Remove cam cover and timing belt cover. Label and disconnect all wires, hoses and lines that may interfere with cylinder head removal.

2) Remove and plug fuel lines at injectors. Set No. 1 piston on TDC after compression stroke. Secure camshaft in place by installing camshaft holding tool (2065A) at rear of camshaft.

3) Insert pin tool (2064) through cutout in injection pump sprocket, to lock sprocket in place. Check that timing marks on injection pump sprocket, pump body and mounting plate are aligned. Also, ensure TDC mark on flywheel is aligned with reference mark on bell housing.

4) Loosen timing belt tensioner to relieve tension on timing belt. Remove crankshaft pulley. Remove timing belt. Disconnect accelerator cable from injection pump.

5) On non-turbo models, disconnect exhaust pipe support bracket from transmission. Disconnect exhaust pipe from manifold. Remove exhaust manifold from cylinder head. Remove cylinder head. Remove injectors and glow plugs prior to servicing head.

6) On turbocharged models, remove engine and transmission cover plate. Loosen stabilizer bar clamps and push stabilizer bar downward. Disconnect oil return line from turbocharger and engine support. Remove oil return line.

7) Remove turbocharger heat shield. Remove hoses between turbocharger, intake manifold and air cleaner. Remove oil supply line. Disconnect exhaust pipe from turbocharger.

8) Disconnect turbocharger from exhaust manifold and remove. Remove exhaust manifold. Remove cylinder head. Remove injectors and glow plugs prior to servicing head.

CAUTION: Do not resurface cylinder heads. If warped, they must be replaced. Also, replace cylinder head bolts when head has been removed.

CAUTION: Turbo-diesel and standard diesel head gaskets do not use the same material. Head gaskets are not interchangeable.

CAUTION: Cylinder head gaskets have identification notches next to part number. Notches indicate thickness of head gasket. If new pistons or short block is installed, measure the height pistons project above cylinder block deck when piston is at TDC. Select new head gasket according to maximum measured piston height.

Installation

1) Clean all gasket mating surfaces. If short block or new pistons have not been installed, install new

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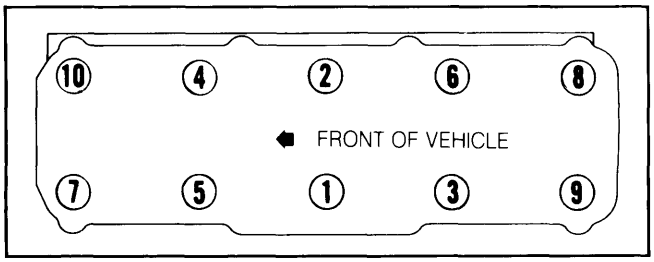
head gasket that has same amount of identification notches as old gasket. Marking "OBEN" on gasket must face upward.

2) Position head over cylinder block. Install head bolts 8 and 10 at each end of cylinder head. Loosely tighten bolts to align cylinder head on block. *See Fig. 1.*

Fig. 1: Cylinder Head Tightening Sequence



Install bolts 8 and 10 to align cylinder head, then install remaining bolts.

3) Tighten head bolts in 3 steps, turning bolts an additional 1/2 turn after final tightening. *See Fig. 1.* Install timing belt. Ensure valve timing is correct. Adjust timing belt tension. Adjust valves.

4) Before installing turbocharger, coat exhaust manifold-to-turbocharger bolts (heads and threads) with high temperature grease. Also, fill oil supply line connection at turbocharger with engine oil prior to installing oil supply line. Run engine at idle for 1 minute to lubricate turbocharger.

5) Install remaining components. Head bolts must be retightened after engine has been allowed to reach normal operating temperature. With engine warm, retighten head bolts in sequence an additional 1/4 turn.

6) After 1000 miles, retighten head bolts an additional 1/4 turn. Engine may be cold or warm for 1000 mile head bolt retightening. Also, check valve adjustment.

CAMSHAFT

TIMING BELT & SPROCKET

Removal

1) Remove timing belt cover and cam cover. Turn crankshaft to place No. 1 piston on TDC at end of compression stroke. Lobes of camshaft on No. 1 cylinder must point upward.

2) Secure camshaft in place by installing camshaft holding tool (2065A) at rear of camshaft. Tool must be properly installed to prevent camshaft from moving.

3) Insert pin tool (2064) through small cutout in injection pump sprocket to lock sprocket in place. Injection pump sprocket must not be allowed to move.

4) Check that timing marks on injection pump sprocket, pump body and mounting plate are aligned. Check that TDC mark on flywheel is aligned with reference mark on bell housing.

5) Loosen timing belt tensioner to relieve tension on timing belt. Remove crankshaft pulley. Do not allow crankshaft to turn. Remove timing belt.

Installation

1) Check that TDC mark on flywheel is still aligned with reference mark. Loosen camshaft sprocket bolt 1/2 turn. Loosen sprocket from camshaft by tapping with a rubber mallet.

2) Install timing belt. Tighten camshaft sprocket bolt. Remove pin tool from injection pump sprocket. Apply tension to belt by turning timing belt tensioner to right.

3) Using tension tester (VW 210), check timing belt tension midway between camshaft and injection pump sprockets. Tension is correct if tester scale reads 12-13.

4) Remove tool from camshaft. Turn crankshaft clockwise 2 turns. Strike timing belt with a rubber mallet midway between camshaft sprocket and injection pump sprocket. Using tension tester (VW 210), recheck timing belt tension.

5) If necessary, readjust timing belt tension. Check injection pump timing. Install remaining components in reverse order of removal.

VALVE TIMING & INJECTION PUMP TIMING

1) Remove timing belt cover and cam cover. Turn crankshaft to place No. 1 piston on TDC at end of compression stroke. Lobes of camshaft on No. 1 cylinder must point upward and valves must be closed.

2) Secure camshaft in place by installing camshaft holding tool (2065A) at rear of camshaft. Tool must be properly installed to prevent camshaft from moving.

3) Insert pin tool (2064) through small cutout in injection pump sprocket to lock sprocket in place. Injection pump sprocket must not be allowed to move.

4) When valve timing is correct, No. 1 cylinder camshaft lobes will point upward and valves will be closed. Also, TDC mark on flywheel will be aligned with reference mark on bell housing.

5) When injection pump timing is correct, timing marks on injection pump sprocket, pump body and mounting plate will be aligned.

CAMSHAFT

Removal

Remove timing belt. Mark cam bearing caps before removing. Bores are offset and must be installed in original position. Remove cam bearing caps 1, 3 and 5. Loosen nuts on cam bearing caps 2 and 4 in a diagonal pattern, then remove. Remove camshaft.

Installation

Lubricate bearing surfaces and camshaft journals. To install, reverse removal procedure. Prior to final tightening of bearing cap 5 (thrust bearing cap), align it by tapping end of camshaft with soft-faced hammer.

CAMSHAFT OIL SEAL

Removal

Remove timing belt cover. Remove timing belt. Remove camshaft sprocket. Using seal remover tool (2085), remove oil seal.

Installation

1) Install protective sleeve of seal installing tool (10-203) over camshaft. Coat seal lips with oil. Push seal over sleeve and into position.

2) Using seal installing tool (10-203), press seal into recess until flush. Install remaining components in reverse order of removal. Ensure valve timing is correct.

CAMSHAFT END THRUST

1) Check camshaft end thrust with cam followers removed. Ensure cam bearing caps are properly

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tightened. Attach dial indicator to cylinder head. Position indicator point on end of camshaft (or sprocket).

2) Push camshaft rearward and zero dial indicator. Push camshaft forward to record maximum movement. If end thrust exceeds .006" (.15 mm), check camshaft thrust flange and bearing cap for wear. Replace worn components.

INTERMEDIATE SHAFT

1) Use a dial indicator to measure intermediate shaft end play. Maximum end play is .010" (.25 mm). Make sure to remove vacuum pump prior to removing intermediate shaft.

2) If oil seal replacement is necessary, remove oil seal flange and press out seal. Lubricate new seal lips with oil. Install oil seal flange onto engine. Position seal into flange recess. Use seal installing tool (10-203) to press seal into place.

VALVES

VALVE ARRANGEMENT

E-I-E-I-I-E-I-E (Front to rear)

VALVE GUIDE SERVICING

Inspection

1) Clean valve guides. Attach dial indicator and adapting fixture (VW 387 or US 4420A) to mounting surface of cylinder head. Insert a new valve into valve guide. Valve tip must be flush with bottom of valve guide.

2) Rock valve back and forth against dial indicator point to measure amount of stem-to-guide clearance. Maximum clearance is .039" (1.0 mm) for intake valves and .051" (1.3 mm) for exhaust valves.

Removal

Use arbor press and valve guide remover/installer tool (10-206) to remove and install valve guides. Press guides out from combustion chamber side of head.

Installation

Coat new guide with oil. Press into cold cylinder head from camshaft side of head. Do not use more than 1 ton of pressure or guide shoulder may break. Ream guide by hand to proper size.

VALVE STEM OIL SEALS

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

CAUTION: Installing valve stem oil seal without using plastic protective sleeve of seal installing tool (10-204), may result in seal damage.

Removal

1) Remove camshaft. Remove adjusting disc and cam follower of cylinder to be serviced. Turn crankshaft until piston of cylinder concerned is at TDC. Remove valve springs, allowing valve to rest on piston head.

2) Using valve spring compressor (VW 541), compress valve spring and remove keepers, retainer and springs. Lift seal off valve stem.

Installation

Slide plastic protective sleeve onto valve stem. Lubricate new seal and push into place with seal installing tool (10-204). Install remaining components in reverse order of removal.

VALVE SPRINGS

Valve springs may be replaced with cylinder head installed on vehicle. To replace valve springs, use removal and installation procedure explained in "Valve Stem Oil Seals" above.

CAM FOLLOWERS

Removal

1) Before removing cam followers, mark them for identification. They must be installed in their original locations.

2) Remove camshaft and adjusting discs to gain access to cam followers. Remove cam followers and inspect for wear and damage. Replace as necessary.

Installation

Lightly oil cam followers prior to installing. To install cam followers and remaining components, reverse removal procedure.

VALVE CLEARANCE ADJUSTMENT

NOTE: Cold valve clearances are given for initial settings, after engine work has been performed. Recheck valve clearance and make final adjustment with engine warm (coolant temperature about 95° F, 35° C).

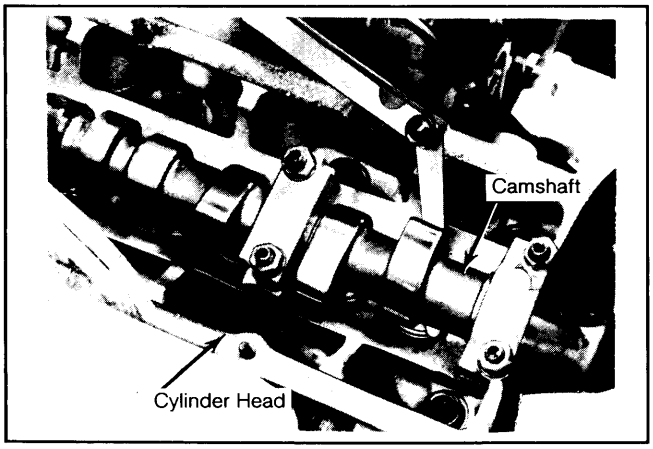
Measuring Valve Clearance

1) Remove cam cover. Cam lobes of cylinder to be checked must point upward. To turn camshaft, engage transmission in 4th gear and push vehicle.

CAUTION: Never use camshaft sprocket bolt to turn camshaft, as this may stretch timing belt.

2) Using a feeler gauge, measure valve clearances of each cylinder in firing order sequence. *See Fig. 2.* If clearance is not as specified in "Valve Clearance Specifications", adjustment is necessary.

Fig. 2: Measuring Valve Clearance



Measure clearances in firing order sequence.

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VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Intake	
Hot	.008-.012 (.20-.30)
Cold	.006-.010 (.15-.25)
Exhaust	
Hot	.016-.020 (.40-.51)
Cold	.014-.018 (.36-.46)

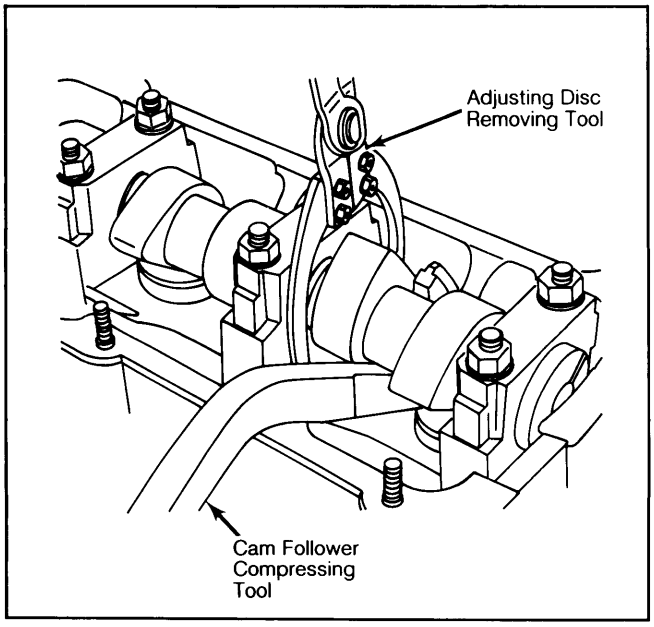
NOTE: When cylinder head service has been performed, valve clearance must be checked and adjusted after 1000 miles.

Adjusting Valve Clearance

1) When adjusting valves, piston of cylinder being serviced must not be at TDC. Turn crankshaft about 1/4 turn past piston TDC position. This will keep valves from contacting pistons when cam followers are depressed.

2) To remove adjusting disc, cam follower must be depressed using compressing tool (VW 546). *See Fig. 3.* Turn cam followers so that grooves are accessible for compressing tool.

Fig. 3: Removing and Installing Adjusting Discs



Ensure piston of cylinder being serviced is not at TDC.

3) Using compressing tool, depress cam follower. Use disc remover tool (US 4476) to remove adjusting disc.

4) Thickness of adjusting disc is stamped on bottom of disc. If measured valve clearance is larger than specifications, use a thicker disc. If clearance is less than specification, use a thinner disc. Adjust clearance to middle of tolerance range.

5) Adjusting discs are available in .002" (.05 mm) increments from .118" (3.0 mm) to .167" (4.25 mm).

6) To install disc, depress cam follower and slip disc into place. Ensure side of disc with thickness marking is installed downward, facing cam follower. Repeat procedure until all valves are properly adjusted.

PISTONS, PINS & RINGS

OIL PAN

Removal

Drain engine oil. Attach a lifting device or support bar to engine. Raise engine slightly to support engine weight. Remove cover plate under engine. Remove 4 subframe bolts and lower sub frame out of way. Remove oil pan.

Installation

Using a new gasket, install oil pan. Install oil pan bolts and tighten in a crisscross pattern. Install sub frame and cover plate. Remove support device from engine.

PISTON & ROD ASSEMBLY

Removal

1) Remove cylinder head, oil pan and oil pump. Place piston to be removed at bottom of cylinder and cover with a cloth to collect metal cuttings. Using a ridge reamer, remove any ridge or deposit from upper end of cylinder bore.

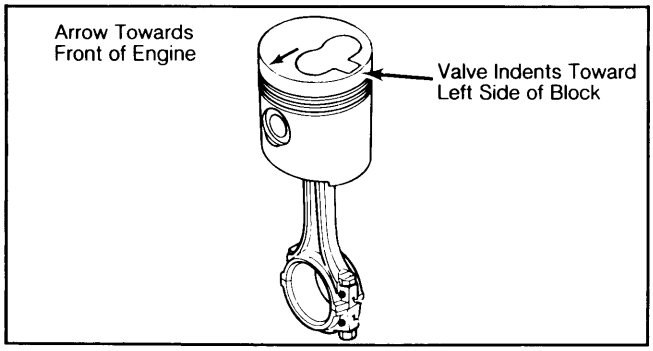
2) Before removing piston and rod from engine, mark piston, rod and rod cap for cylinder identification. Remove rod cap and carefully push piston and rod out top of cylinder. Install rod cap on rod from which removed.

Installation

1) Coat cylinder bore, piston and rings with engine oil. Ensure ring gaps are properly spaced. Install ring compressor on piston, making sure position of rings does not change.

2) Install piston and rod in its respective bore. Arrow on piston head should face toward front of engine, and valve indent on piston head will be toward left side of block. *See Fig. 4.* Forged casting beads on rod and cap must be on intermediate shaft side of engine.

Fig. 4: Piston Position For Installation



Be sure casting beads on rod and cap are on intermediate shaft side of engine.

FITTING PISTONS

1) Take cylinder measurements 90° to crankshaft centerline and in line with crankshaft centerline as follows: 3/8" from top of bore, at middle of bore and 3/8" from bottom of bore. Difference between the corresponding measurements is out-of-round, and must not exceed .0016" (.040 mm).

2) Measure piston diameter 90° to piston pin bore, approximately 9/16" from bottom of piston skirt.

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Compare this measurement with measurement of corresponding cylinder bore. Maximum allowable piston-to-cylinder clearance is .0012" (.030 mm) for a new piston, and .0028" (.070 mm) for a used piston.

3) Install oversize pistons if piston-to-cylinder clearance is excessive. Three sizes of oversize replacement pistons are available.

FITTING RINGS

1) Place piston rings squarely into cylinder bore about 9/16" from bottom of bore. Use a feeler gauge to measure ring end gap.

2) With rings installed on piston, use a feeler gauge to measure ring side clearance. Take measurement around entire circumference of piston, between top of ring and ring land.

3) Install rings on piston with "TOP" mark facing upward. Space ring end gaps 120° apart.

PISTON PIN REPLACEMENT

Removal

Remove circlip from pin bore groove. Use piston pin tool (VW 207c) to remove and install piston pins. If pins are too tight it may be necessary to warm pistons to about 140° F (60° C).

Installation

1) Assemble connecting rod to piston. Arrow on piston head must face forward and valve indents must be on left side of block. Also, forged casting beads on connecting rod and cap must be on intermediate shaft side of engine when assembly is installed.

2) Use piston pin tool (VW 207c) to install piston pin. Install circlip into pin bore groove.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT MAIN BEARINGS

1) Main bearing caps are numbered 1 through 5 (front to rear). Never interchange bearing caps. Always measure main bearing clearances 1 at a time.

2) Use Plastigage method for measuring bearing clearances. Ensure oil film is removed from bearing halves and crankshaft journal prior to measuring clearance.

3) With Plastigage in place, install bearing cap and tighten to specification. Do not allow crankshaft to turn. Remove bearing cap. Measure flattened width of Plastigage with scale furnished to determine clearance.

4) When replacing bearings, install grooved bearing halves into cylinder block. Plain bearing halves are installed in main caps. Lubricate crankshaft journal and bearings prior to installing bearings.

CONNECTING ROD BEARINGS

1) Always measure connecting rod bearing clearances 1 at a time. Use Plastigage method for measuring bearing clearances. Ensure oil film is removed from bearing halves and crankshaft journal prior to measuring clearance.

2) With Plastigage in place, install bearing cap and tighten to specification. Do not allow crankshaft to turn. Remove bearing cap. Measure flattened width of Plastigage with scale furnished to determine clearance.

3) Use a feeler gauge to check connecting rod side clearance. Insert feeler gauge between connecting rod and crankshaft thrust face.

CRANKSHAFT END THRUST

Use a feeler gauge to check crankshaft end thrust. Using feeler gauge, measure end thrust between No. 3 main bearing (thrust bearing) and crankshaft thrust face.

REAR MAIN BEARING OIL SEAL

Removal

Remove transmission and flywheel. Carefully pry oil seal from seal flange.

Installation

Coat new seal lips with oil. Position seal in place. Place centering tool (2003/2A) on crankshaft and start seal into place. Using seal installing tool (2003/1), press in seal until seated. Install remaining components. Use Loctite on flywheel bolts.

FRONT MAIN BEARING OIL SEAL

Removal

1) Remove all drive belts. Remove timing belt cover. Set No. 1 piston on TDC after compression stroke. Remove crankshaft pulley. If equipped, remove vibration damper. Remove timing belt. Remove crankshaft sprocket.

2) For standard diesel engines, use seal removing tool (2085) to remove oil seal. For turbo diesel engines, use seal removing tool (2085) and Allen head bolt from seal installing tool (2083) to remove oil seal.

Installation

1) Coat new seal lips with oil. For standard diesel engines, use tool (10-203) to press new seal into place. For turbo diesel engines, use seal installing tool (2083) to press in seal.

2) Press in seal flush with front cover on standard diesel engines. Press in seal until fully seated, on turbo diesel engines. Install remaining components.

3) On standard diesel engines, install a new crankshaft sprocket bolt and collared washer. Use Loctite on bolt threads.

4) On turbo diesel engines, be sure to fit notch on drive belt sprocket into slot in crankshaft when installing. Use Loctite on crankshaft sprocket bolt threads.

ENGINE OILING

CRANKCASE CAPACITY

Capacity for standard diesel engine is 2.6 quarts (2.5L) without filter replacement; 3.2 quarts (3.0L) with filter replacement.

Capacity for turbo diesel engine is 4.5 quarts (4.0L) without filter replacement; 5.0 quarts (4.5L) with filter replacement.

NORMAL OIL PRESSURE

Minimum oil pressure is 29 psi (2.0 kg/cm²) at 2000 RPM, with oil temperature of 176° F (80° C).

ENGINE OILING SYSTEM

Oiling system is a pressure feed system. A gear-type oil pump lifts oil from oil pan and pressure feeds it to crankshaft journals, camshaft bearings and interme-

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diate shaft. Other parts of system receive oil lubrication by drainage or splash method.

To aid in piston cooling, turbo diesel engines use oil nozzles. Oil nozzles are installed at the bottom of each cylinder. Oil is sprayed into underside of piston to cool piston skirt and head. If oil nozzles are removed, coat retaining bolt threads with thread adhesive.

OIL PUMP

Removal & Disassembly

Remove oil pan. Remove oil pump attaching bolts and lower pump away from engine. Remove pump cover bolts and separate cover from pump body.

Inspection

1) With oil pump gears installed in pump housing, insert feeler gauge between drive gear and driven gear teeth (where teeth mesh). Allowable clearance is .002-.008" (.05-.20 mm).

2) Lay a straightedge over pump housing. Insert feeler gauge between pump gears and straightedge. End clearance must not exceed .006" (.15 mm).

Reassembly & Installation

Assemble pump in reverse order of disassembly. Prime oil pump prior to installing. Install pump in reverse order of removal procedures.

ENGINE COOLING

THERMOSTAT

Thermostat begins opening at 185°F (85°C), and is fully open at 221°F (106°C).

COOLANT CAPACITY

Capacity is 7.4 quarts (7.0L).

EXPANSION TANK CAP

Expansion tank cap pressure relief valve opens at 13-17 psi (.9-1.2 kg/cm²).

WATER PUMP

Removal & Disassembly

Drain coolant and remove alternator and bracket. Remove coolant hoses to pump housing. Remove pump housing attaching bolts from engine. Remove pump assembly. Remove attaching bolts and separate water pump from pump housing.

Reassembly & Installation

To reassemble, reverse disassembly procedure. Use new gasket between pump and housing. When installing pump assembly, use new seal between pump housing and cylinder block.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Camshaft Bearing Caps	14 (20)
Camshaft Sprocket Bolt	33 (45)
Connecting Rod Caps	33 (45)
Crankshaft Pulley/Damper	
Standard Engine (Loctite)	108 (150)
Turbo Engine (Loctite)	145 (200)
Cylinder Head Bolts	
Step 1	29 (40)
Step 2	43 (60)
Step 3	[1] 54 (75)
Exhaust Manifold	18 (25)
Exhaust Manifold-to-Turbocharger	[2] 33 (45)
Exhaust Pipe-to-Turbocharger	18 (25)
Flywheel (Loctite)	54 (75)
Glow Plugs	20 (27)
Injection Pump Sprocket	33 (45)
Injectors	51 (70)
Injector Pipes	18 (25)
Intake Manifold	18 (25)
Intermediate Shaft Pulley	33 (45)
Main Bearing Caps	47 (65)
Oil Return Line	
Bracket-to-Turbocharger	18 (25)
Timing Belt Tensioner	33 (45)

[1] — After final tightening, turn bolts an additional 1/2 turn. Run engine until it reaches normal operating temperature, then stop engine. Retighten head bolts an additional 1/4 turn. At 1000 miles, retighten bolts an additional 1/4 turn.

[2] — Apply high-temperature grease to bolt head and threads before installing.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displacement		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore		Stroke	
	Cu. In.	cc					In.	mm	In.	mm
1982										
Std. Diesel	97	1588	Fuel Inj.	53@4800	75@2000	23:1	3.01	76.5	3.40	86.4
Turbo Diesel	97	1588	Fuel Inj.	69@4500	100@3000	23:1	3.01	76.5	3.40	86.4

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ENGINE SPECIFICATIONS (Cont.)

VALVES

Engine Size & 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 (33.99)	45°	45°	.079 (2.01)	.314 (7.98)	.039 Max. (1.00)	.....
Exhaust	1.220 (31.00)	45°	45°	.094 (2.40)	.313 (7.95)	.051 Max. (1.30)	.....

PISTONS, PINS, RINGS

	PISTONS	PINS		RINGS		
Engine	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
1588 cc	.0011 [1] (.028)	[2]	.....	Top	.012-.020 [3] (.30-.51)	.002-.004 [4] (.05-.10)
				Center	.012-.020 [3] (.30-.51)	.002-.003 [4] (.05-.08)
				Oil	.010-.016 [3] (.25-.41)	.001-.002 [5] (.03-.05)

[1] — Wear limit is .003" (.07 mm).
[2] — Push fit at 140°F (60°C).
[3] — Wear limit is .040" (1.02 mm).
[4] — Wear limit is .008" (.20 mm).
[5] — Wear limit is .006" (.15 mm).

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

	MAIN BEARINGS				CONNECTING ROD BEARINGS		
Engine	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							
Std. Size	2.125 [1] (53.97)	.0010-.0030 [2] (.025-.076)	No. 3	.0030-.0070 [3] (.076-.178)	1.881 [1] (47.77)	.0011-.0034 [4] (.028-.086)	.015 (.38)
1st U/Size	2.115 (53.72)				1.870 (47.52)		
2nd U/Size	2.105 (53.47)				1.861 (47.27)		
3rd U/Size	2.095 (53.22)				1.851 (47.02)		

[1] — Maximum out-of-round for standard or undersize crankshaft journals is .001" (.03 mm).
[2] — Wear limit is .007" (.18 mm).
[3] — Wear limit is .015" (.37 mm).
[4] — Wear limit is .005" (.12 mm).