1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8

GENERAL SPECIFICATIONS

Model	Displ. Cu. ins.	Displ. cc	Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore in.	Bore mm	Stroke in.	Stroke mm
M-116	213.50	3499	①	230@6050	.....	9.3-1	3.622"	92	2.590"	65.8
M-117	275.81	4520	①	.....	.....	8.0-1	3.622"	92	3.346"	85

① – Fuel injection.

▶ CHANGES, CAUTIONS, CORRECTIONS

See "Engine Notes" at end of article.

ENGINE IDENTIFICATION

Identification number is located on tag attached to engine crankcase. First six digits of code identify engine. Refer to following chart to decode number:

Model	Body Type	Engine Code
280SE 3.5	111.026	116.980
280SE 3.5	111.027	116.980
300SEL 3.5	109.056	116.981
280SE 4.5	108.067	117.984
280SEL 4.5	108.086	117.984
300SEL 4.5	109.057	117.981
350SL 4.5	107.044	117.982
450SE 4.5	116.032	117.983
450SEL 4.5	116.033	117.983
450SLC 4.5	107.024	117.982
450SL 4.5	107.044	117.982

ENGINE REMOVAL

Removal – 1) Disconnect all necessary water hoses, electrical leads (both battery cables), fuel lines, vacuum lines and fuel injection linkage. Remove fan, radiator and air cleaner.

2) Drain power steering reservoir and disconnect hoses. Close air compressor valves. On 300 SEL models disconnect air compressor lines to supply tank and lines to anti-freeze tank.

3) Disconnect fuel injection heating connections, oil pressure gauge and ground strap. Remove left engine shock mount and loosen right side. On late models disconnect upper left side mount and right side on lower suspension. Disconnect and lower exhaust system. Disconnect torsion bar and hand brake.

4) Remove tunnel shield and disconnect drive shaft at center bearing. Using suitable jack, support transmission. Remove engine carrier, marking it for reinstallation. Disconnect all linkage extending from transmission. On standard transmission, disconnect hydraulic lines. Attach suitable hoist, remove engine mounting bolts and lift engine from vehicle.

INTAKE MANIFOLD REMOVAL

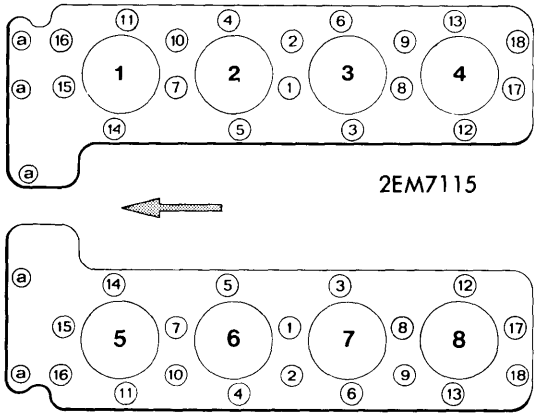
Drain cooling system and remove air cleaner. Disconnect fuel injection linkage and fuel lines on pressure regulator. Disconnect fuel start valve. Remove ignition valves. Extract intake manifold bolts and lift manifold off in rearward direction. To install, reverse removal procedure.

CYLINDER HEAD REMOVAL

1) Drain cooling system and crankcase. Remove air cleaner and battery. Disconnect cable set for electronic ignition system and fuel injection linkage. Loosen ring line with injection valves and remove.

2) Disconnect and remove intake pipe (manifold). On automatic transmission models, remove fluid filler pipe on cylinder head. Remove alternator and bracket. On 300 SEL and 280 SE models, disconnect holder for engine shock mount. Remove oil pump (high pressure) carrier and distributor.

3) Disconnect exhaust system. Drain power steering reservoir and disconnect both hoses. Remove chain tensioner and valve covers. Mark camshaft gear and chain for reinstallation. Remove upper chain dampers (side rails). Withdraw bolts and remove cylinder head. *NOTE – Bottom row of camshaft bearing bolts also secure cylinder head.* Care must be exercised when removing right side cylinder head as chain may not clear. To install, reverse removal procedure.



CYLINDER HEAD TIGHTENING SEQUENCE
280 SE & 300 SEL 3.5

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)
M-116 & 117							
Int.	1.736-1.744 (44.1-44.3)	45°	45°	.051-.079 (1.3-2.0)	.3526-.3531 (8.955-8.970)	.0012-.0024 (.03-.06)	....
Exh.	1.455-1.467 (36.95-37.25)	45°	45°	.059-.079 (1.5-2.0)	.4302-.4311 (10.928-10.950)	.002-.0039 (.05-.10)	....

1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8 (Cont.)

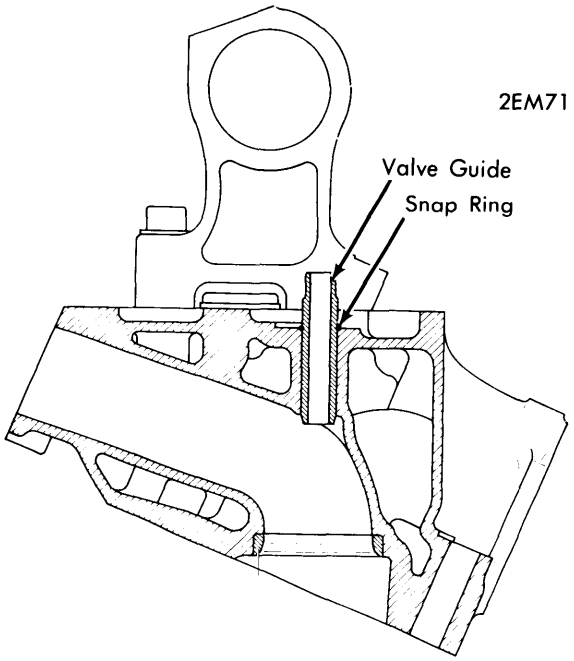
VALVE ARRANGEMENT

Right Bank – E-I-E-I-E-I-I-E (front to rear).
Left Bank – E-I-I-E-I-E-I-E (front to rear).

VALVE GUIDE SERVICING

1) With cylinder head removed and suitably supported, clean bores of valve guides. Hard oil carbon deposits can be eliminated with a honing needle.

2) Using a suitable plug gauge, inspect valve guide. If guide is beyond tolerance, replace.



REPLACEMENT OF VALVE GUIDES

3) With suitable remover/installer mandrel, drive worn guide from its position. Inspect valve guide bore (in cylinder head) and ream to accept ensuing oversize.

4) Heat cylinder head to approximately 194°F and cool valve guides (if possible). Coat valve guide bore with oil and, using remover installer mandrel, seat new valve guide. *NOTE – Ensure circlip is properly installed. Recheck bore of valve guide and equalize any high spots.*

Valve Guide Replacement Chart

Application	Intake In. (mm)	Exhaust In. (mm)
1971		
Std.	.5520-.5522 (14.020-14.025)	.5913-.5915 (15.020-15.025)
Green	.5517-.5519 (14.014-14.019)	.5911-.5913 (15.014-15.019)
Brown	.5522-.5524 (14.026-14.031)	.5916-.5918 (15.026-15.031)
First Repair Stage		
Grey Green	.5524-.5526 (14.032-14.037)	.5918-.5920 (15.032-15.037)
Grey	.5527-.5529 (14.038-14.043)	.5920-.5922 (15.038-15.043)
Grey Brown	.5529-.5531 (14.044-14.049)	.5923-.5925 (15.044-15.049)

Valve Guide Replacement Chart (Cont.)

Application	Intake In. (mm)	Exhaust In. (mm)
Second Repair Stage		
Red	.5596-.5603 (14.214-14.231)	.5990-.5996 (15.214-15.231)
Third Repair Stage		
White	.5675-.5681 (14.414-14.431)	.6068-.6075 (15.414-15.431)
1972-73		
Std. Size		
Grey	.5524-.5531 (14.03-14.05)	.5917-.5925 (15.03-15.05)
Second Repair Size		
Red	.5594-.5602 (14.21-14.23)	.5988-.5996 (15.21-15.23)
Third Repair Size		
White	.5673-.5681 (14.41-14.43)	.6067-.6075 (15.41-15.43)

① – Intake and exhaust valve guides have an interference fit in cylinder head of .0003-.0007" (.0076-.0178 mm).

VALVE STEM SEALS

1) Remove rocker arm. Bring piston of respective cylinder to TDC and support valve. *NOTE – Valves must not seat on piston crown, because inclined arrangement of valves in relation to piston will bend valves.*

2) With hammer, strike valve spring retainer to loosen cone halves. Use suitable remover/replacer tool and push valve spring retainer downward until cones can be removed. Remove valve spring retainer, valve springs, and valve stem seals.

3) To install, lubricate valve stem seal. Place assembly sleeve on inlet valve. Slide on seal with assembly mandrel (see illustration). To complete installation, reverse removal procedure.

Valve Spring Chart

Free Length	Measurement
Inner 1.771" (44.98 mm)	1.220" @ 93-110 lbs. (30.99 mm @ 42-50 kg)
Outer 1.877" (47.68 mm)	1.574" @ 188-216 lbs. (39.98 mm @ 85-98 kg)

VALVE SEAT RING

1) If valve seat is worn, carefully remove it using suitable tool (000 589 17 69 00). Check valve guide prior to removing valve seat. See *Valve Guide Servicing*. Do not completely remove ring with tool, leave approximately .012-.016" (.3-.4 mm). The remainder can be removed with a screwdriver or scribe.

2) Thoroughly clean receiving bore and check diameter with suitable tool (000 589 03 19 00). Diameter should lie within 1.811-1.812" (45.999-46.024 mm) for both intake and exhaust.

3) To install, heat cylinder head to approximately 140°F and place valve seat ring into bore. Seat ring by lightly tapping with suitable mandrel and hammer. After valve seat ring is installed, peen at three points.

ROCKER ARM ASSEMBLY

1) Remove valve covers and from valve adjuster remove tensioning spring. A screwdriver should be only tool necessary.

NOTE – For cranking engine, do not use camshaft nut.

1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8 (Cont.)

2) Position suitable remover/replacer tool against camshaft and on valve spring retainer. Push valve downward to relieve rocker arm (rocker arm should not be under a load). Before removing arm mark for reinstallation.

3) To install, reverse removal procedure. *NOTE — Check valve clearance.*

VALVE ADJUSTMENT

Adjust valves with engine cold. Set camshaft lobes of corresponding valve in such a manner that tip of lobe does not push rocker. Valve clearance is measured between side of rocker arm and basic cam circle. Measure valve clearance by inserting tolerance strip for intake and exhaust valves. If adjustment is necessary, turn screw, using suitable tool. Clearance is correct when light resistance felt removing tolerance strip.

Valve Clearance Adjustment

Application	Intake	Exhaust
All 3.5 & 4.5	.003" (.08 mm)	.008" (.20 mm)

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)
M-116	.0008-.0012 (.02-.03)	0.0-.0005 (0.0-.012)	.0003-.0007 (.007-.018)	1 Comp.	.012-.018 (.3-.45)	.0024-.0036 (.06-.092)
				2 Comp.	.014-.022 (.35-.55)	.0016-.0028 (.04-.072)
				3 Oil	.01-.016 (.25-.40)	.0016-.0028 (.04-.072)
M-117	.0008-.0012 (.02-.03)	0.0-.0005 (0.0-0.12)	.0003-.0007 (.007-.018)	1 Comp.	.014-.022 (.35-.55)	.002-.0032 (.05-.082)
				2 Comp.	.014-.022 (.35-.55)	.0016-.0028 (.04-.072)
				3 Oil	.01-.016 (.25-.40)	.0016-.0028 (.04-.072)

OIL PAN REMOVAL

1) Drain crankcase and on automatic transmission models disconnect oil cooler. On 300 SEL models only, remove air suspension. Remove air cleaner. Disconnect front torsion bar.

2) Disconnect oil damper and place out of way. Remove air compressor with bracing bracket on 300 SEL models only. Remove oil dipstick. Raise front of vehicle and remove cover plate on intermediate flange.

3) On all models equipped with air conditioning, detach coolant compressor and place out of way. *NOTE — Do not disconnect coolant lines under pressure.* Loosen oil pan mounting bolts. For access to bolts behind damper align recess. Carefully lower oil pan.

350 SL — 1) Remove front axle and steering linkage. Drain crankcase. On automatic transmission models, drain oil cooler. Remove oil damper reservoir.

2) Remove vibration damper and pulley after marking for reinstallation. On models with air conditioning, place coolant compressor and bracket out of way. Disconnect two oil pump lines on bracket.

3) On automatic transmission models, disconnect transmission fluid lines and remove. Remove cover plate, support bracket, and dipstick guide tube. Remove oil pan. To install, reverse removal procedure.

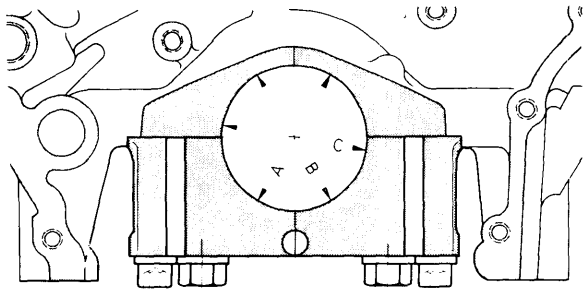
CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

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)
M-116 & 117	2.5179-2.5183 (63.955-63.965)	.001-.003 (.035-.075)	...	.004-.009 (.1-.24)	2.0455-2.0459 (51.955-51.965)	.001-.003 (.035-.065)	.009-.015 (.22-.38)

1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8 (Cont.)

MAIN & CONNECTING ROD SERVICE

1) Mount main bearing cap to cylinder block and attempt to obtain same absolute value at three different points (see illustration). Ensure cap is correctly positioned when taking reading.



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MEASURING BORE

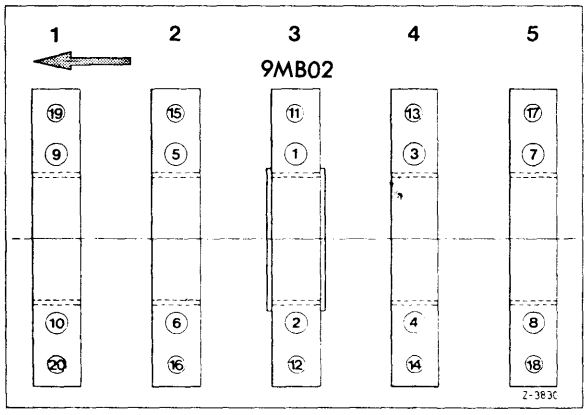
2) If basic bore diameter exceeds specific data, remove a maximum 0.02 mm from contact surface of bearing cap. It is imperative that taper is not more than 0.1 mm.

3) Bearings are available within existing production tolerances, in two groups of varying thicknesses. If basic bore is 0-.0004" (0-.01 mm) use a blue-coded bearing. If bore lies between .0004-.0008" (.01-.02 mm) use a red-coded bearing.

4) Remove bearing cap and thoroughly clean both cap and bearing. To install, place in position and tighten to specification.

5) Holding connecting rod in a suitable vise, use above procedure to inspect connecting rod bearings.

6) With crankshaft installed, inspect end play by shifting in a fore and aft motion. End play should lie between .004-.009" (.10-.23 mm).



CRANKSHAFT MAIN BEARING TIGHTENING SEQUENCE

REAR CRANKSHAFT SEALING RING

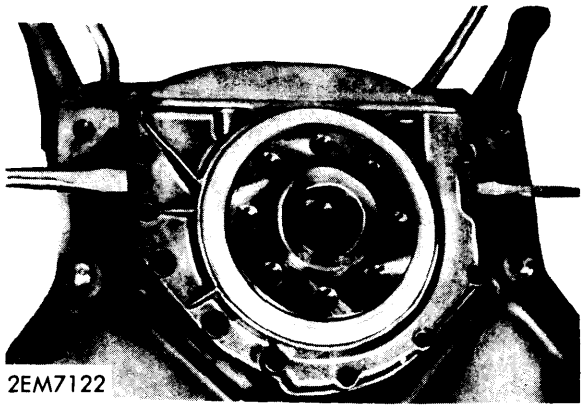
1) Remove air cleaner on automatic transmission models only. Disconnect control pressure linkage to transmission. Drain transmission. Disconnect rear torsion bar from mount. *NOTE — Level control rod must be disconnected from valve.*

2) Disconnect handbrake linkage. Disconnect from transmission, linkage, vacuum line, speedometer cable and oil filler tube.

3) On manual transmission models only, disconnect hydraulic line and plug openings. Disconnect transmission bell housing and starter, placing it out of way.

4) Remove engine mounts and crossmember after suitably supporting engine. Engine must not tilt downward. Lift out transmission.

5) Remove driven plate or flywheel and intermediate flange. Using two screwdrivers, remove cover and force sealing ring out of cover. To install, use a suitable tool and insert sealing ring. Coat cover with appropriate sealing compound. Reverse removal procedure to install remaining components.



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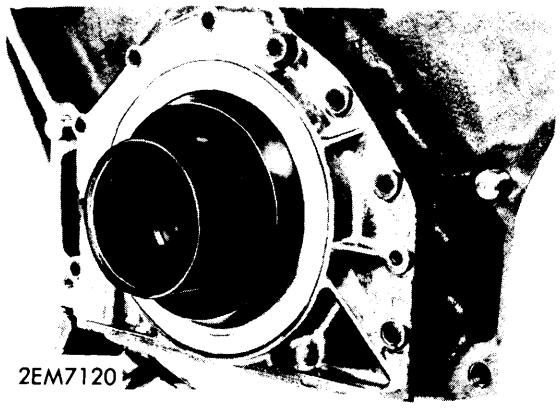
REMOVING SEALING RING



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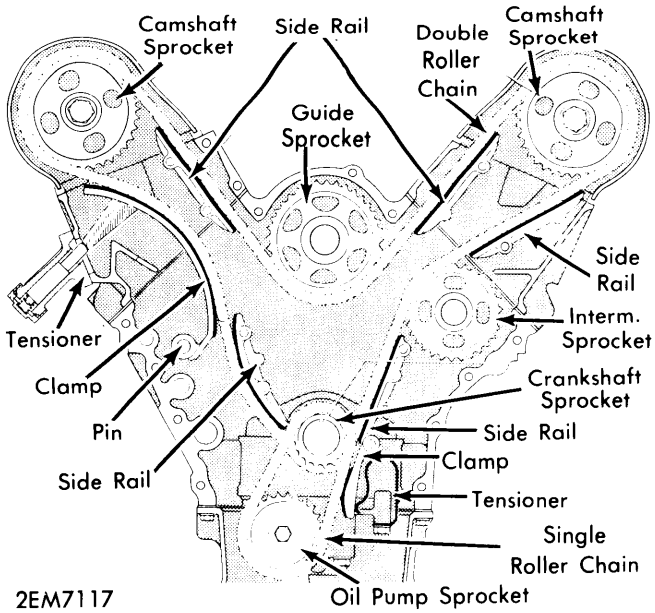
SEATING SEALING RING

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
M-116 & 117	.....	.0010-.0022 (.025-.057)	.....

CAMSHAFT REMOVAL

1) Remove air cleaner, venturi control valve unit and disconnect vacuum hose to brake unit. Remove valve covers. Remove both camshaft sprocket bolts, spark plugs and valve clamp sprlngs (see illustration). Extract rocker arms and mark for reinstallation.

1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8 (Cont.)



TIMING & CRANKSHAFT CHAINS

NOTE — Both camshafts should not be removed at same time.

2) Place No. 1 cylinder at TDC. Ensure timing pointer is at TDC and markings on both compensating washers of camshaft are in alignment with markings on front camshaft bearings.

3) Connect timing chain and camshaft sprocket with wire so chain does not fall or skip. Drive cam sprocket from camshaft. Remove bearing bracket bolts and lift camshaft off with brackets.

4) To install, lubricate new camshaft and insert into bearing brackets, position into cylinder head and tighten to 57.8 ft. lbs. *NOTE — If external lubrication pipe has been removed replace plastic connectors.* Reverse removal procedure for remaining components.

DISTRIBUTOR DRIVE GEAR

1) With timing and crankshaft chains exposed, disconnect all chain dampers (side rails) and timing chain tensioner. Remove chain from intermediate gear. Pull gear forward and remove from bearing in cylinder crankcase by twisting. Remove in an upward direction.

2) To install, reverse removal procedure. *NOTE — When reinstalling chain, ensure hex bolts on camshaft gears are not loosened.*

CHAIN TENSIONER

NOTE — In all instances chain tensioner is lubricated and connected to oiling circuit.

M 117.982 Engines — Remove right side valve cover. Extract both mounting bolts and remove chain tensioner. Cable bracket must be held aside.

M 117.981-984 Engines — Disconnect battery, remove right side valve cover, and alternator. Unbolt bracket of right side engine damper (mount) from frame. On models with M 117.981 engines, remove strut to air compressor. Remove chain tensioner to gain clearance as necessary.

VALVE TIMING

Engine	INTAKE Open (BTDC)	INTAKE Close (ABDC)	EXHAUST Open (BBDC)	EXHAUST Close (ATDC)
M-116	22°	50°	45°	17°
M-117	26°	44°	60°	14°

VALVE TIMING

NOTE — Measurements must be made with valve clearance cancelled and with .016" valve lift.

1) After removing tensioning springs, push valve down using suitable rocker arm installer/remover. Insert a valve gauge between cam and rocker arm.

2) Attach a dial gauge in such a manner that feeler rests on valve retainer of inlet valve, under a preload of .079". Set dial to zero.

3) Turn engine and read dial when gauge reaches 60. Readings should correspond to those found in Valve Timing Chart.

4) If timing requires correction, an offset Woodruff key or new chain must be installed. Keys are available in four offsets.

ENGINE OILING

ENGINE OILING SYSTEM

Lubrication is provided by a gear type oil pump directly driven by crankshaft. Oil is picked up through a strainer from lower portion of oil pan and forced to oil filter through a duct in timing casing. After passing through filter, oil flows to center main duct, to crankshaft and through rod bearings up rods to piston pin bushing. Oil galleries run to cylinder head, valve assemblies and to camshafts. Circuit also includes chain tensioner, ignition and, if applicable, air compressor.

Oil Filter — Disposable cartridge type. Located near front of engine.

Normal Oil Pressure — 7 psi (.5 kg/cm^2) at idle and 28-71 psi (2-5 kg/cm^2) at 3000 RPM.

Over Flow Valve — Valve is located in crankcase and enters into main oil gallery. When filter becomes severely contaminated valve will open and oil will enter in an unfiltered state.

Crankcase Capacity — 9 qts. (8.5 ltr) including filter.

1971-73 MERCEDES-BENZ 3.5 & 4.5 LITER V8 (Cont.)

ENGINE COOLING

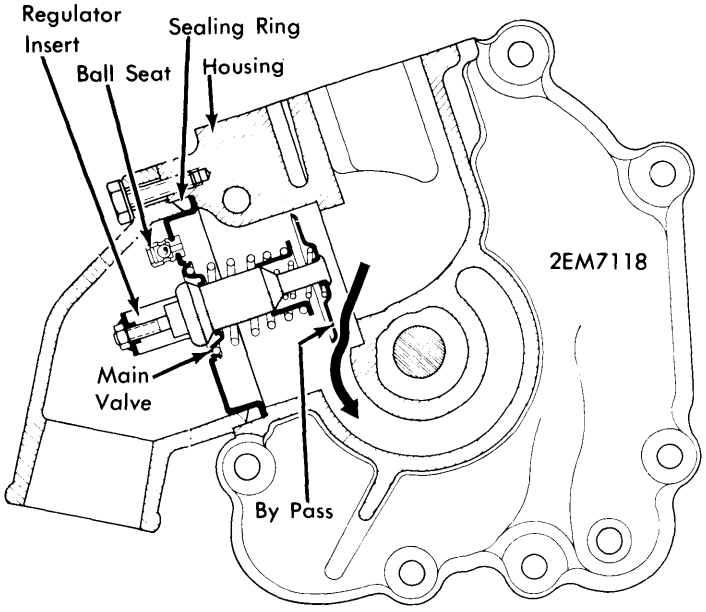
WATER PUMP

Disconnect all necessary water hoses and any remaining components from water pump housing. Remove distributor and all mounting bolts. Remove pump from vehicle. To install, reverse removal procedure.

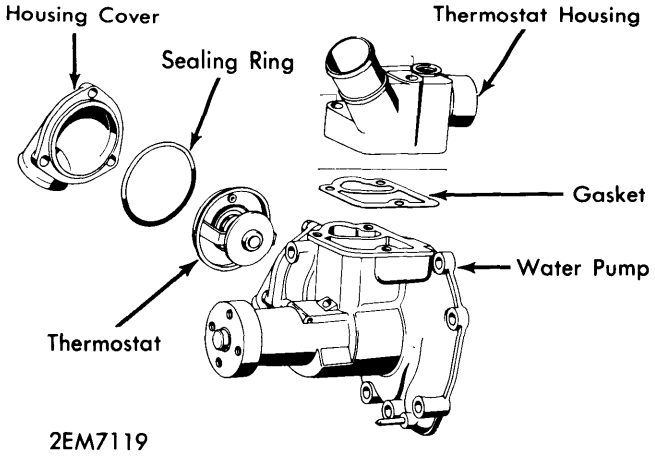
Thermostat – Located in water pump housing, as shown in illustration. To remove drain cooling system, remove air cleaner, disconnect battery and alternator. Remove housing and thermostat. When installing ensure ball valve is mounted at highest point.

Cooling System Capacities

Application	Quarts
280 SE 3.5	13.9
300 SEL 3.5	13.9
280 SE 4.5	13.2
280 SEL 4.5	13.2
300 SEL 4.5	13.2
300 SL 4.5	13.2



WATER PUMP ASSEMBLY



THERMOSTAT ASSEMBLY

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	
Cold	36 (5)
Warm	43 (6)
Camshaft Bolt	36 (5)
Crankshaft-to-Flywheel	29 (4)
Crankshaft Bolt	181-195 (25-27)
Pulley-to-Hub	25 (3.5)
Vibration Damper-to-Hub	25 (3.5)
Oil Pump	18 (2.5)
Oil Pan Plug	36 (5)
Oil Pan-to-Crankcase	6 (.8)
Chain Tensioner-to-Cylinder Head	18 (2.5)
Main Bearing Bolts	
M10	47 (6.5)
M12	72 (10)
Rod Bolts	29-36 (4-5)

ENGINE NOTES

► *1973 MERCEDES BENZ – EXHAUST VALVE WARNING* – Almost all Mercedes Benz passenger vehicle engines are equipped with sodium-filled exhaust valves. Under no circumstances should these exhaust valve be cut or melted down for other purposes (punches, chisels, etc.), since there is a danger of explosion when the sodium is exposed.

► *1973 MERCEDES BENZ – IMPROVED OIL PUMP DRIVE SHAFT* – From March, 1973, high pressure oil pumps with improved drive shafts have been installed. These pumps are marked with a yellow dot on the neck of the pump cover. When repairing these pumps, ensure the proper kit is obtained. Installation of the new drive shaft will require a special assembly sleeve (Part No. 700 589 00 46 00) and a special installer (Part No. 700 589 01 46 00).