1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1963-67 B 18 D	108.62	1780	2x1-Bbl.	①95@5400	105@3500	8.7-1	3.313	84.14	3.150	80
1963-68 B 18 B	108.62	1780	2x1-Bbl.	115@6000	112@4000	8.7-1	3.313	84.14	3.150	80
1968 B 20 B	121.43	1990	2x1-Bbl.	118@5800	123@3500	9.5-1	3.500	88.90	3.150	80
1969-71 B 20 B	121.43	1990	2x1-Bbl.	118@5800	123@3500	9.3-1	3.500	88.90	3.150	80
1970-72 B 20 E	121.43	1900	②	130@6000	130@3500	10.5-1	3.5008	88.92	3.150	80
1972-73 B 20 F	121.43	1990	②	112@600	115@3500	8.7-1	3.5008	88.92	3.150	80

① – Some engines are rated at 90 horsepower.
② – Fuel Injection.

ENGINE IDENTIFICATION

Engine type designation, part number, and manufacturing serial number are located on machined pad on left side of engine.

Engine Identification Chart

Application	Engine Code
544 (1963-66)	B-18-D
122 (1963-67)	B-18-D
122 (1963-68)	B-18-B
140 (1968-71)	B-20-B
(1971)	B-20-E
(1972)	B-20-F
P-1800 (1963-67)	B-18-B
(1968-69)	B-20-B
(1970-71)	B-20-E
(1972-73)	B-20-F

ENGINE REMOVAL

Except B 20 E & F Engines – 1) Drain and remove radiator. Remove positive battery cable. Disconnect engine electrical wiring, fuel inlet line, vacuum and heater hoses.

2) Disconnect carburetor linkage. Remove exhaust pipe from exhaust manifold. Remove transmission selector lever. Raise vehicle and support with jack stands. Disconnect clutch linkage and place jack under transmission.

3) Disconnect speedometer cable, electrical wires to transmission and overdrive (if equipped). Disengage drive shaft and disconnect ground strap.

4) Remove crossmember and rear engine mounting brackets. Remove front mounting nuts. Attach suitable hoist and remove engine. To install, reverse removal procedure.

B 20 E & F Engines – 1) Remove positive battery cable. Remove pressure sensor hose, fuel hose for cold start valve, and fuel hoses from pipes at fire wall.

2) Remove electrical lead for temperature sensor, cold start valve and throttle valve switch. Remove hose for air intake, ground from intake duct, and pressure regulator. Remove injectors and plug openings.

3) Remove throttle bracket and cable. Remove remaining electrical leads. Remove heater hose, vacuum hoses, spark plug wires, and distributor cap. Drain and remove radiator, with expansion tank.

4) Remove front engine mount nuts and exhaust manifold flange. Attach suitable hoist. Remove ground strap, clutch linkage, transmission crossmember, speedometer cable, and drive shaft. Remove engine from vehicle. To install, reverse removal procedure.

INTAKE MANIFOLD

B 18 B, B 18 D & B 20 B, Removal – Remove air cleaner. Disconnect throttle linkage, remove and plug fuel line(s) and vacuum lines to intake manifold. Disconnect exhaust pipe at manifold flange. Remove any electrical connections to manifold. Remove all connecting nuts and bolts and lift manifold off engine and out of vehicle. *NOTE – If carburetors are to be removed, both carburetors must be lifted off manifold as a unit as intermediate shaft is carried in levers in throttle splines.*

Installation – Place new gasket on cylinder head. Refit all related parts in reverse order of removal. Tighten nuts and bolts, and reconnect all electrical connections, fuel, and vacuum lines.

B 20 E & F, Removal – 1) Remove hose for pressure sensor from inlet duct; fuel hose for cold start valve from distributor line, and fuel hoses from lines on firewall. Remove plug contacts for temperature sensor, cold start valve, and throttle valve switch.

2) Remove hose for induction air, remove electric lead for temperature sensor and ground lead from inlet duct. Remove bolts for pressure regulator bracket. Remove injectors and fit with masking covers and protective plugs in holes.

Installation – 1) Remove protective plugs and masking covers. Place new rubber seals on injectors. Install injectors and distributor pipe, fit pressure regulator.

2) Connect electric leads for temperature sensor and ground lead to inlet duct. Clip on plug contacts for temperature sensor, cold start valve and throttle valve switch. Connect hose for induced air. Attach fuel hoses and hose for pressure sensor.

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

CYLINDER HEAD REMOVAL

Except B 20 E & F Engines – 1) Drain cooling system. Disconnect and remove carburetor. Disconnect exhaust pipe, generator bracket, vacuum lines, heater pipe, top radiator hose, and interfering electrical leads.

NOTE – Heater pipe has clamp bolted to exhaust manifold.

2) Remove valve cover, rocker shaft, and push rods. Remove cylinder head. To install, reverse removal procedure.

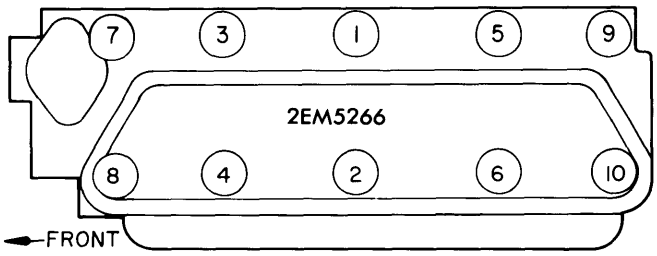
B 20 E & F Engines – 1) Drain cooling system. Remove positive battery cable. Disconnect and/or remove all necessary hoses and electrical wires, marking them for reinstallation.

2) Remove ground cable from intake duct and extract cable harness. Remove lock pin and bracket for throttle cable. Remove alternator bracket from cylinder head. Remove intake duct bracket and duct nuts. Remove valve cover, gasket, push rods and cylinder head. To install, reverse removal procedure.

Cylinder Head Torque Specifications

Step One	Step Two	①Step Three
29 ft. lbs. (4.0 mkg)	58 ft. lbs. (8.0 mkg)	65 ft. lbs. (9.0 mkg)

① – Tighten to final torque after engine has been operated for ten minutes.



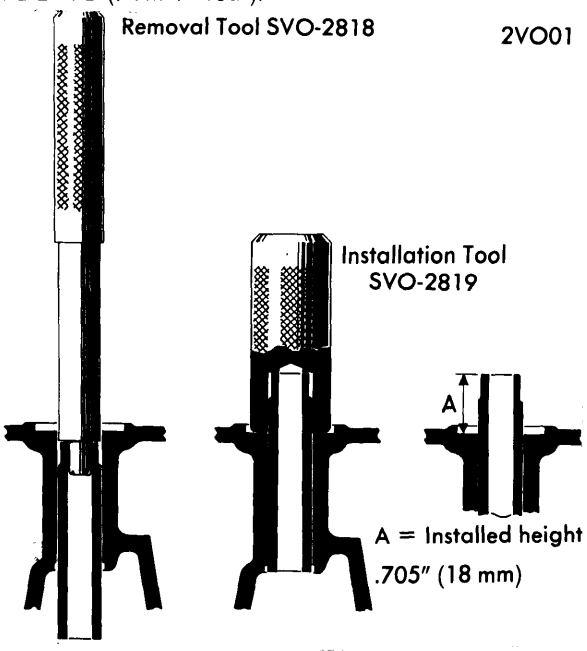
CYLINDER HEAD TIGHTENING SEQUENCE

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)
1963-68 B 18 B & D							
Intake	1.58 (40)	45°	44.5°	.055 (1.4)	.3419-.3425 (8.68-8.70)	.0010-.0022 (.025-.056)	.....
Exhaust	1.38 (35)	45°	44.5°	.055 (1.4)	.3403-.3409 (8.64-8.66)	.0026-.0037 (.066-.094)	.....
1969-73 B 20 B, E & F							
Intake	1.654 (42)	45°	44.5°	.080 (2.0)	.3132-.3138 (7.95-7.97)	.0012-.0026 (.030-.066)	.....
Exhaust	1.378 (35)	45°	44.5°	.080 (2.0)	.3120-.3126 (7.92-7.94)	.0024-.0038 (.061-.097)	.....

VALVE ARRANGEMENT

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



VALVE GUIDE REMOVAL & INSTALLATION

VALVE GUIDES

Press out worn guide using suitable tool (SVO-2818, B 20 engines, or SVO-1459, B 18 engines). Press in new guide using suitable tool (SVO-2819, B 20 engines, or SVO-2289, B 18 engines). On B 20 F engines only, use a .016" (.40 mm) washer between cylinder head and tool when installing guide. Ensure all valve are free in guides.

VALVE STEM OIL SEALS

Oil seals are rubber umbrella or cup-type placed over valve guides. Metal ring on seal holds unit in place against guide.

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
B 18 D	1.77 (45)	56±4.5@1.54 25±2@39	145±8@1.20 66±3.5@30
All Others	1.81 (46)	65±5@1.57 29.5±2.3@40	181.5±9.5@1.18 82.3±4.3@30

VALVE SPRING

Remove rubber ring, compress valve spring, and remove retainer. Using suitable valve spring tester, ensure springs meet

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

specifications given in table. To install, place valves in position, fit lower rubber washer, valve spring, upper washer, retainer, and rubber ring.

VALVE SPRING INSTALLED HEIGHT

Valve spring ends must be square in relation to height. Installed height of valve spring cannot exceed specifications. Measure height from base of spring pad on cylinder head to underside of valve spring retainer. Installed height should be 1 9/16-1 37/64" (39.7-40.0 mm).

ROCKER ARM BUSHINGS

Replace rocker arm bushings, using suitable tool (SVO-1867). After installing new bushings, ream rockers to fit shaft. Align oil holes in bushing and rocker arm.

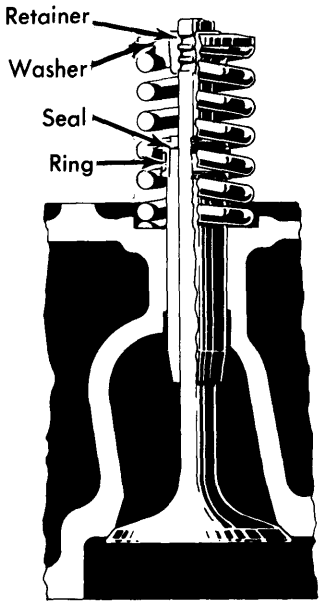
VALVE CLEARANCE ADJUSTMENT

Set No. 1 piston at TDC and adjust valves 1, 2, 3 & 5 (from front to rear). Set No. 4 piston (No. 3 on B 18 engines) at TDC and adjust remaining valves.

Application	Clearance
B 18 B & B 20 B	.020-.022" (.51-.56 mm)
B 18 D (90 H.P.)	.016-.018" (.41-.46 mm)
B 18 D (95 H.P.)	.020-.022" (.51-.56 mm)
B 20 E & B 20 F	.016-.018" (.41-.46 mm)

ROCKER ARM ASSEMBLY

Remove all related hoses, electrical leads, and mechanical linkage. Take off rocker arm cover and remove rocker arm shaft assembly and push rods. Check for excessive wear or undue damage on all parts, replace if necessary. Rocker arms can be rebushed if wear exceeds .004" (.10 mm) by pressing out old bushings using a suitable tool (SVO-1867 or equivalent). Ream new bushing to accurate fit on rocker arm shaft using a suitable reamer. Hole in bushing should be aligned with hole in rocker arm. Grind rocker arm tips (if necessary) to ensure correct angle to valve stems. Reassemble components in reverse order of disassembly.



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VALVE & GUIDE ASSEMBLY

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit	Rod Fit	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1963-68 B 18 B & D	.0008-.0016 (.020-.041)	①	②	Comp. 1	.010-.020 (.25-.51)	.0021-.0032 (.053-.081)
				2	.010-.020 (.25-.51)	.0021-.0032 (.053-.081)
				Oil	.010-.020 (.25-.51)	.0017-.0028 (.043-.071)
1969-72 B 20 B & E	.0008-.0016③④ (.020-.041)	①	②	All	.016-.022 (.41-.56)	.0017-.0028 (.043-.071)
1972-73 B 20 F	.0016-.0024 (.041-.061)	①	②	All	.016-.022 (.41-.56)	.0016-.0028 (.041-.071)

① — Handpush fit.
② — Close running fit.
③ — 1971 B 20 B, .0014-.0020" (.036-.051 mm).
④ — 1970-73 B 20 E, .0016-.0024" (.041-.061 mm).

MECHANICAL VALVE LIFTER ASSEMBLY

Mechanical valve lifters can be removed only with cylinder head off engine. See *Cylinder Head Removal*. Use suitable tool (SVO-2424 or equivalent) to remove valve lifters from engine block assembly. Check surfaces of valve lifter for undue wear or fatigue, and replace if necessary. Clean lifters and engine assembly lifter bores thoroughly before reassembling in reverse order of removal.

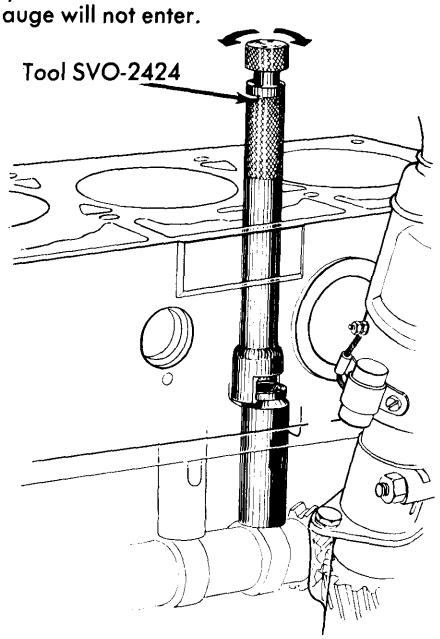
MECHANICAL VALVE LIFTER ADJUSTMENT

NOTE — Valve clearance can be adjusted either hot or cold. Clearance is the same for both intake valve and exhaust valve.

Bring No. 1 piston to top dead center on compression stroke, and adjust No. 1, 2, 3 and 5 as counted from front. Then bring No. 4 piston to top dead center on compression stroke and adjust No. 4, 6 and 7 valves. Two gauges should be used, a

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

"Go" gauge of .016" (.40 mm) and a "No-Go" gauge of .018" (.45 mm). Clearance should be adjusted so that thinnest gauge can easily be inserted between valve and rocker arm, while thicker gauge will not enter.



REMOVING MECHANICAL VALVE LIFTER

OIL PAN REMOVAL

1) Using suitable lifting device, raise front of engine. Place jack stands under front jack points. Drain crankcase. Remove lower engine mounting nuts. Remove steering rod from pitman arm.

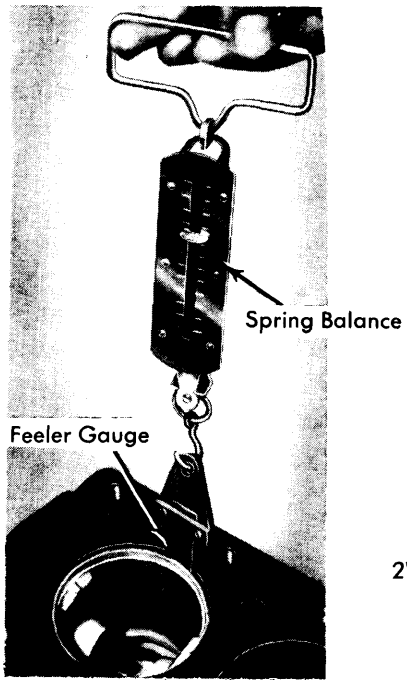
2) Place jacking device under front axle member, remove two rear bolts and replace with two ½-13x9" auxiliary bolts. Remove front axle member bolts and lower and remove jacking device so that front axle member is suspended in two auxiliary bolts. Disconnect oil temperature gauge fitting and reinforcing bracket at clutch housing. Remove oil pan bolts and oil pan. Reinstall all related parts in reverse of removal procedure. Replace long auxiliary bolts with original bolts.

PISTON & ROD ASSEMBLY

Removal & Installation – Disassemble oil pan and related parts. See *Oil Pan Removal*. Check to ensure that connecting rods and rod caps are marked correctly to reinstall in correct location. Remove carbon ridge from cylinder bores. Remove connecting rods with pistons, replace connecting rod caps on respective connecting rods. To reassemble, lubricate all internal surfaces with engine oil before assembly. Make sure that notch in piston crown is facing front of engine, connecting rod marking should face away from camshaft side. Use suitable installing ring (SVO-2823 or equivalent) to fit piston and connecting rod assembly into block. Tap lightly on piston dome with wooden handle while guiding connecting rod onto crankshaft. Secure and tighten all nuts and bolts. Reassemble in reverse of removal procedure.

PISTON PINS

Piston pins are available in .002" (.05 mm) oversize from standard diameter. If replacement oversize pins are needed, piston pin hole should be reamed out to correct measurement using suitable reaming tool. Use reamer fitted with pilot guide, take only small cuts at a time. Pin fit is correct when pin can be pushed through connecting rod hole by hand, with only light resistance.

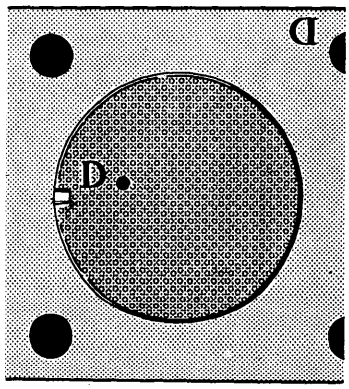


MEASURING PISTON CLEARANCE

FITTING PISTON

1) Standard bore pistons and cylinders are stamped with same letter.

2) Check piston clearance by inserting piston pull-scale with .0008" (.020 mm) or .0016" (.041 mm) feeler gauge (.0020" or .051 mm on B 20 E & F engines) into cylinder at 90° to pin bore. Fit piston, crown first, into cylinder so that feeler gauge is held against cylinder wall by piston.



PISTON INSTALLATION

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

3) Holding piston to prevent side thrust, withdraw gauge with a steady pull on scale. Clearance is correct when scale reads *2.2 lbs. (1 kg). NOTE – Procedure should be performed at several depths.*

4) When fitting piston, ensure slot on top of piston faces forward, as shown in illustration. Index number on connecting rod must face away from camshaft side.

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)
1963-68 B 18 B & D	2.4977-2.4982 (63.44-63.45)	.0015-.0035 (.038-.089)	.....	.0007-.0042 (.017-.108)	2.1295-2.1300 (54.08-54.10)	.0015-.0032 (.038-.081)	.....
1969 B 20 B	2.4977-2.4982 (63.44-63.45)	.0010-.0030 (.025-.076)	.....	.0007-.0042 (.017-.108)	2.1295-2.1300 (54.08-54.10)	.0015-.0032 (.038-.081)	.....
1970-72 B 20 B & B 20 E	2.4981-2.4986 (63.45-63.46)	.0011-.0031 (.028-.079)	.....	.0018-.0054 (.046-.137)	2.1299-2.1304 (54.10-54.11)	.0012-.0028 (.030-.071)	.....
1972-73 B 20 F	2.4981-2.4986 (63.45-63.46)	.0011-.0033 (.028-.084)	.....	.0018-.0054 (.046-.137)	2.1299-2.1304 (54.10-54.11)	.0012-.0028 (.030-.071)	.....

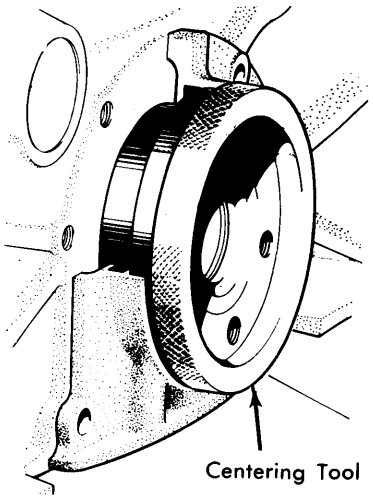
MAIN & CONNECTING ROD BEARINGS

Removal & Installation – 1) Remove oil pan and related parts. See *Oil Pan Removal.* Identify and mark connecting rod caps and main bearing caps to ensure correct replacement.

2) Remove connecting rod caps and push pistons to top of cylinders. Remove main bearing caps and thoroughly clean all bearing surfaces.

3) Measure all journals using suitable micrometer. Out-of-roundness on connecting rod bearings should not exceed .003" (.076 mm), and main bearings must not exceed .002" (.051 mm). If values obtained are close to, or in excess of, wear limits; crankshaft must be removed and reground to undersize.

4) If all journals check out to standard size, refit with replacement bearings. Reinstall main bearing caps, refit connecting rods to crankshaft and tighten all nuts and bolts to specifications. Reassemble engine in reverse order of removal.



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CENTERING REAR SEALING FLANGE

REAR MAIN BEARING OIL SEAL

Removal & Installation – 1) Remove clutch housing and transmission as a unit. Remove clutch and flywheel. Remove rear main oil seal flange.

2) Clean flange area carefully. Fit on sealing flange but do not tighten bolts. Center rear main seal flange using suitable tool (SVO-2439 or equivalent). Adjust position of flange if necessary. Check to see that flange seats flush with underside of block assembly.

3) Fit new felt ring and install washer and circlip. Press circlip into position using centering tool. Ensure that circlip engages in its groove. Reinstall flywheel, clutch assembly, clutch housing and transmission.

ENGINE FRONT COVER OIL SEAL

Removal & Installation – 1) Remove fan belt tensioner. Loosen stabilizer at frame. Screw out bolt in crankshaft, remove belt pulley. Remove circlip and take out washer and felt ring.

2) Check correct casing fit by inserting .004" (.10 mm) feeler gauge in gap between casing and crankshaft hub. If feeler gauge jams at any point, casing must be recentered.

3) Fit new felt ring, place washer in position and fit circlip. Check to ensure that circlip is properly in position. Fit remaining parts and tension fan belt.

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

ENGINE FRONT COVER

Removal & Installation – 1) Loosen fan belt, remove fan and pulley from water pump. Disconnect stabilizer attachment from frame. Take off bolt and remove crankshaft belt pulley.

2) Remove front cover case. Loosen several front bolts for oil pan sump, taking care not to damage gasket. Remove circlip, washer, and felt ring from case.

3) Replace front cover gasket. Ensure that oil drain hole in casing is open. Place case in position and fit bolts without tightening. Center case using suitable tool (SVO-2438 or equivalent), turn tool while tightening bolts and adjust position of case so that tool is not jammed. Tighten all bolts and remove tool.

4) Fit new felt ring washer and circlip. Push into postition using centering tool, check to ensure that circlip is in groove. Fit all other parts in reverse order of removal. Tighten belts and place stabilizer attachment back onto frame.

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1968-73			
All Models			
Front	1.8494-1.8504 (46.97-47.00)	.0008-.0030 (.020-.076)	.....
1	1.6916-1.6929 (42.97-43.00)		.....
2	1.4557-1.4567 (36.97-37.00)		.....

TIMING GEAR REMOVAL

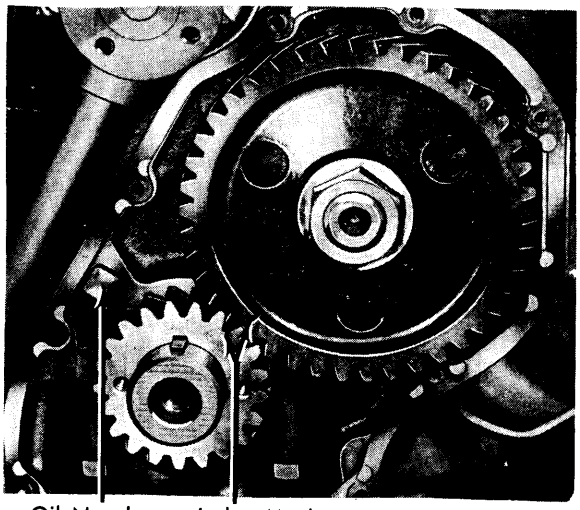
1) Drain radiator, remove cover plate, and radiator. Remove fan belt, fan, and pulley. Disconnect stabilizer from frame. Remove crankshaft pulley and timing cover. *NOTE – Loosen several front oil pan bolts.*

2) With suitable puller (SVO-2250) remove camshaft gear. Using suitable puller (SVO-2440) remove hub from crankshaft, and with suitable puller (SVO-2405) remove crankshaft gear. *NOTE – Oil nozzle should be removed and cleaned.*

3) To install, position camshaft gear using suitable tool (SVO-2408). *NOTE – Do not push camshaft back far enough to loosen seal washer.* Position crankshaft gear, using suitable tool (SVO-2407), and refit hub. Ensure gears align as shown in illustration. To install remaining components, reverse removal procedure.

VALVE TIMING

Camshaft and crankshaft marks are aligned as shown in illustration. On B 18 B, B 18 D and B 20 B engines, intake valve should open at TDC with valve clearance set at .057" (1.45 mm). B 20 E & F engines have intake valve opening at 5.5° BTDC with valve clearance set at .050-.055" (1.27-1.40 mm).



CORRECT POSITION – TIMING GEARS

ENGINE OILING

ENGINE OILING SYSTEM

Engine utilizes a force-feed lubricating system. Oil is moved through oil pump to oil filter located on outside of engine block assembly. Lubricant is forced from filter to drilled gallery in center of block where oil moves under pressure to main bearings. Main bearings are drilled to pass lubricant on to rod bearings and to camshaft bearings. Oil from camshaft bearings is pushed up into head assembly where it lubricates rocker arm shaft and rocker arms. Push rods and valve lifters receive oil along with valve assembly. Oil nozzle at front of timing gear recess sprays gears with lubricant directly from main oil gallery. Cylinder walls and rings are lubricated by splash from connecting rods. Excess oil from all areas is returned to sump via drain holes in block assembly.

Crankcase Capacity – Approximately 4 quarts, including oil filter.

Oil Filter – Full-flow, disposable, can type.

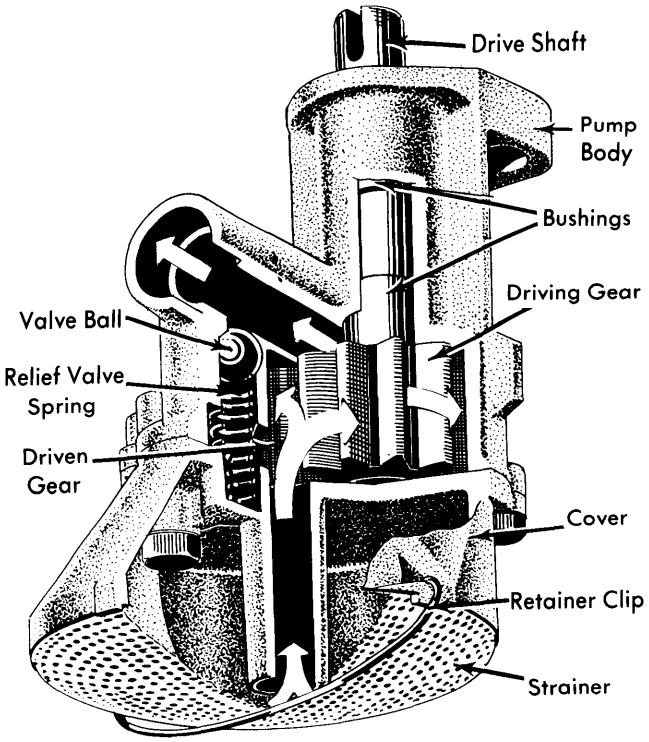
Normal Oil Pressure – With engine warm, 36-85 psi at 2000 RPM.

OIL PUMP

Removal & Installation – Remove oil pan and related parts. *See Oil Pan Removal.* Pull oil pump out of engine, disassemble and clean all parts throughly. Check all parts for undue wear or fatigue , replace if necessary. Backlash clearance should be .006-.014" (.15-.36 mm), end play allowable is .0008-.0040" (.020-.10 mm), replace bushings or shaft if worn. Drive shaft and gear are matched set and must be replaced as an assembly. Reinstall oil pump, making sure that sealing rings on oil delivery pipe are securely in place. Be certain oil pump goes into groove in pump shaft. Reinstall oil pan and related parts in reverse order of removal.

1963-73 VOLVO B 18B, B 18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

ENGINE OILING (Cont.)



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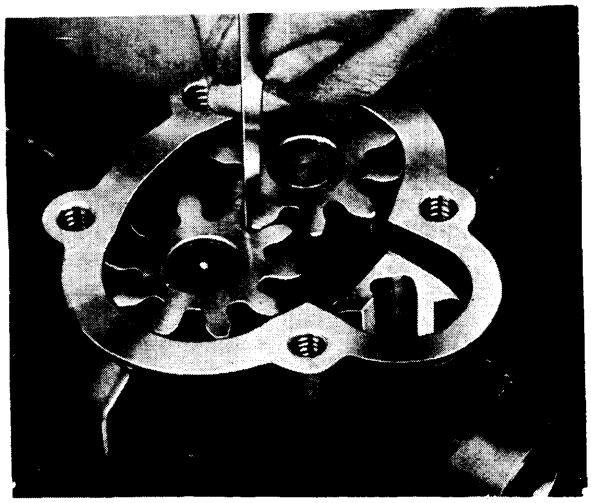
OIL PUMP ASSEMBLY



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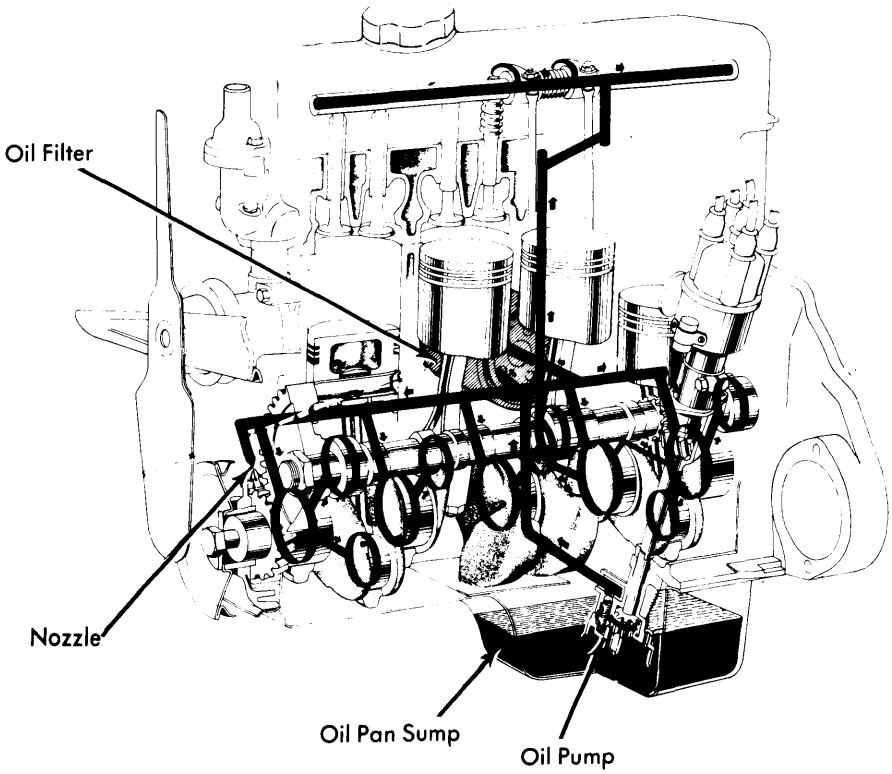
BACKLASH MEASUREMENT



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ENGINE LUBRICATION SYSTEM

1963-73 VOLVO B 18B, B18D & B 20 (544, 122, 140 & P-1800 SERIES) 4 CYLINDER (Cont.)

ENGINE COOLING

WATER PUMP

Remove fan belt, fan, and pulley. Disconnect lower radiator hose. Remove bolts and lift out water pump. To reinstall, clean gasket area thoroughly, install new gasket, reassemble in reverse of removal procedure.

Thermostat – Type 1: Begins opening at 168-172°F (76-78°C), is fully open at 192°F (89°C). Type 2: Begins to open at 177-181°F (81-83°C), is fully open at 195°F (91°C).

Cooling System Capacity – 2.6 gallons.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	61-69 (8.4-9.5)
Main Bearing Bolts	87-94 (12.0-13.0)
Connecting Rod Bearing Bolts	38-42 (5.3-5.8)
Flywheel Bolts	36-40 (4.9-5.5)
Camshaft Nut	94-108 (13.0-14.9)
Crankshaft Pulley	50-58 (7.0-8.0)
Oil Pan Bolts	6-8 (.97-1.1)