

119 Lubrication System

GENERAL	119-1	Oil pans, removing and installing (M60 engine)	119-6
TROUBLESHOOTING	119-1	OIL PANS (M70 ENGINE)	119-8
Oil pressure, testing	119-2	Oil pans, removing and installing (M70 engine)	119-8
Oil pressure warning system, testing	119-2	OIL PUMP	119-11
Oil level sensor, testing	119-3	Oil pump, removing and installing	119-11
OIL PAN (M30 ENGINE)	119-5		
Oil pan, removing and installing (M30 engine)	119-5	TABLE	
OIL PANS (M60 ENGINE)	119-6	a. Oil Level Sensor Continuity Test	119-4

GENERAL

Engine oil pressure is generated by a gear-type pump mounted to the bottom of the engine block. On all 7 Series engine variants the oil pump is chain driven by the crankshaft.

The oil pan and the oil pump can be removed with the engine installed, although engine lifting equipment is necessary.

All engines are equipped with an oil pressure warning system and an oil level warning system to help prevent serious engine damage. Other safety features include a filter bypass to guard against bursting the filter due to over pressure and an oil pump pressure relief valve to prevent excessive system pressure.

Oil pan removal procedures in this section are organized according to engine code. If necessary, see **100 Engine-General** for engine code and application information.

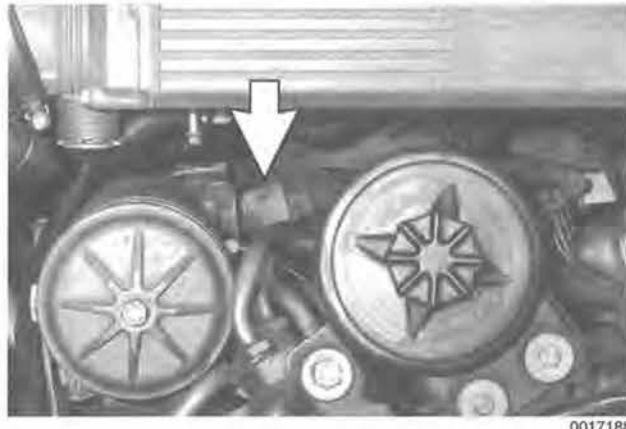
NOTE—

Oil change procedure and oil filter replacement are covered in 020 Maintenance.

TROUBLESHOOTING

The lubrication warning system consists of an oil pressure switch mounted in the oil circuit, an oil level sensor mounted in the oil pan, an instrument panel warning light, and graphic check control displays. The check control display will also warn the driver if either the oil level sensor or the oil pressure sensor are faulty or disconnected.

119-2 LUBRICATION SYSTEM



0017188

CAUTION—

If the check control displays **ENGINE OIL PRESS** after the engine is started, or if the red oil pressure warning light comes on or flashes on while driving, always assume that the oil pressure is low.

Oil pressure, testing

- Oil pressure switch location (**arrow**) on M70 engine. Switch locations vary depending on engine.
- Disconnect harness connector from oil pressure switch. Thoroughly clean around switch and then remove it. Install in its place an oil pressure gauge.

Oil pressure switch locations

- 735i/iL, M30 engine . . . rear corner of engine, left side
- 740i/iL, M60 engine on oil filter housing
- 750iL, M70 engine on oil filter housing

CAUTION—

Some oil may drain out as the oil pressure switch is removed. Use a rag to soak up any spills and install the gauge as quickly as possible.

- With gauge installed, start engine and check oil pressure. Oil pressure specifications are listed below.

NOTE—

For the most accurate test results, the engine oil should be new and of the correct grade.

Oil Pressure Specifications

- At idle (engine warm) 0.5 bar (7 psi)
- At maximum engine speed (engine warm) 5.0 bar (73.5 psi)

- If testing shows low oil pressure, one or more of the following conditions may be indicated:
 - Worn or faulty oil pump
 - Worn or faulty bearings
 - Severe engine wear.

Any of these conditions indicate the need for major repairs.

Oil pressure warning system, testing

When the ignition is turned on, the oil pressure warning light comes on. When the engine is started and the oil pressure rises, the oil pressure switch opens and the warning light goes out.

NOTE—

Make sure the oil level is correct before doing the tests listed below.

- Turn ignition switch on. The warning light on instrument panel should light up. Remove connector from oil pressure switch. The light should go out and check control should display "OIL PRESS SENSOR".

NOTE—

If the light does not go out, the wiring to the switch is most likely grounded somewhere between the switch terminal and the warning light. See 600 Electrical System-General for electrical wiring troubleshooting information.

- If warning light does not light when ignition is on, remove connector from oil pressure switch and use a jumper wire to ground connector terminal to a clean metal surface.

NOTE—

If the warning light comes on, check the switch as described in the next step. If the warning light does not come on, the wiring circuit to the dash light or the light itself is faulty.

- To test switch, connect an ohmmeter between terminal in switch body and ground. With engine off, there should be continuity. With engine running, oil pressure should open switch and there should be no continuity. Replace a faulty switch.

WARNING—

Keep in mind that low oil pressure may be preventing the switch from turning the light out. If the light remains on while the engine is running, check the oil pressure as described above. Do not operate the engine to drive the car until the problem is corrected. The engine may be severely damaged.

Tightening Torques

- Oil pressure switch (lubricate threads)
 - M30 engine 37 Nm (27 ft-lb)
 - M60/M70 engine 27 Nm (20 ft-lb)

Oil level sensor, testing

The oil level sensor is similar in operation to the fuel level sensor in the fuel tank. When the oil level falls below a safe level, a warning is displayed in the check control module. Check that the oil level is correct before testing the sensor.

The oil level sensor is mounted in the oil pan and contains two switches. The static switch senses the oil level when the engine is off and the ignition is on and the dynamic switch senses the level when the engine is running.

119-4 LUBRICATION SYSTEM



— Check that oil level is correct on dipstick.

With ignition key off, separate main engine harness connector.

- On 735i models, engine connector is near left front strut tower.
- On 740i/iL models, connector is on right cylinder head, beneath top engine cover.
- On 750iL models, connectors are near left front strut tower.



Blue/yellow wire (1) is for dynamic switch and blue/white wire (2) is for static switch.

- Working at side of connector leading to sensor, make resistance checks given below. If any faults are found, sensor should be replaced.

Table a. Oil Level Sensor Continuity Test

Test terminals	Test results
Blue/yellow wire and ground (static switch)	
correct oil level	1k $\pm$ 1% ohms (switch open)
low oil level	0-0.2 ohm (switch closed)
Blue/white wire and ground (dynamic switch)	
low oil level	No continuity (switch open)

NOTE—

- Use a new O-ring when replacing the oil level sensor.
- On models with the oil level sensor mounted in the bottom of the oil pan, drain the engine oil before removing the sensor.

TROUBLESHOOTING

OIL PAN (M30 ENGINE)

On the M30 engine the oil pan can be removed with the engine installed, but the procedure requires lifting the engine far enough to remove the pan.

Oil pan, removing and installing (M30 engine)

- Disconnect negative (–) battery cable. See **020 Maintenance**.

CAUTION—

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.

- Raise car and support in a safe manner.

WARNING—

Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Drain engine oil as described in **020 Maintenance**.
- Disconnect oil level sensor harness connector.
- Remove radiator cooling fan and fan shroud. See **170 Radiator and Cooling System**.

NOTE—

The radiator cooling fan nut (32 mm wrench) has left hand threads.

- Remove air cleaner housing from car.
- Remove coolant expansion tank mounting bolts. Disconnect overflow hose and coolant level sensor harness connector from expansion tank.
- On cars with automatic transmission, remove brackets that hold ATF cooler lines to oil pan and cylinder block.
- Working from below, remove engine splash shield.
- Remove bellhousing reinforcement plate by removing mounting bolts (arrows).
- Without disconnecting any fluid lines, remove power steering pump with bracket from engine. Support pump from body using stiff wire.
- Disconnect exhaust pipe-to-transmission support bracket.
- Using an engine lifting device at front and rear engine lifting points, raise engine just until weight of engine is supported.



OIL PAN (M30 ENGINE)

119-6 LUBRICATION SYSTEM

- Working from below, remove engine mount retaining nuts and ground strap (if applicable). Then raise engine as much as possible.
- Remove oil pan retaining bolts and lower oil pan.

WARNING—

If the oil pan does not separate easily from the engine cylinder block, a few taps with a rubber mallet should break it free. Do not pry the oil pan loose.

- Rotate crankshaft so that no. 6 connecting rod journal is at its highest point (TDC) and withdraw oil pan. Rotate crankshaft as pan is being removed, if necessary.
- Installation is reverse of removal.
 - Thoroughly clean all old gasket material from mating surfaces.
 - Coat mating surfaces on timing case cover and end cover with a sealing compound.
 - Install oil pan using a new gasket.
 - Tighten oil pan mounting bolts evenly in stages.
 - Reconnect oil level sensor harness connector.
 - Fill engine with oil as described in **020 Maintenance**.

Tightening Torques

- Motor mount bracket to motor mount. 45 Nm (33 ft-lb)
- Oil pan to engine block 9 - 11 Nm (6.5 - 8 ft-lb)

OIL PANS (M60 ENGINE)

There is an upper and a lower oil pan on the M60 engine. The oil pans can be removed with the engine installed, but the procedure requires lifting the engine far enough to remove the pans.

Oil pans, removing and installing (M60 engine)

- Disconnect negative (–) battery cable. See **020 Maintenance**.

CAUTION—

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.

- Raise car and support in a safe manner.

WARNING—

Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Loosen oil filter cover at top of oil filter housing. Drain engine oil.
- Remove radiator cooling fan and fan shroud. See **170 Radiator and Cooling System**.

NOTE—

The radiator cooling fan nut (32 mm wrench) has left hand threads.

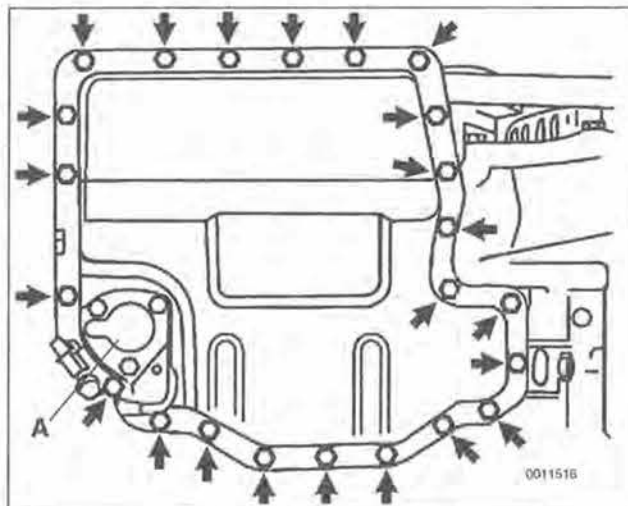
- Remove oil dipstick guide tube completely.

NOTE—

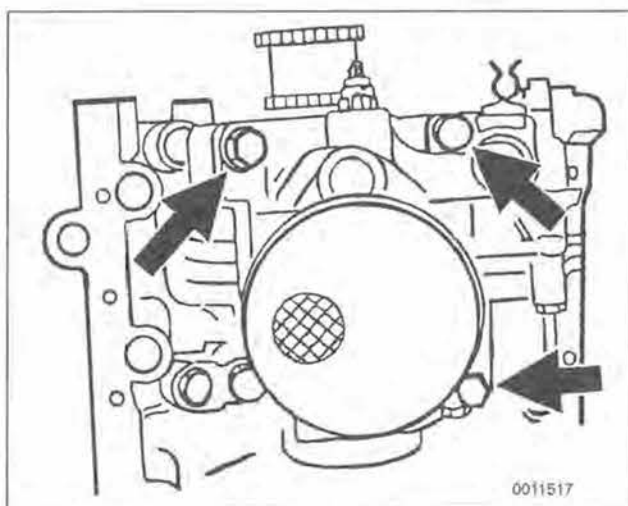
The guide tube is sealed in the oil pan using an O-ring. Check that the O-ring comes out with the tube. Use a new O-ring when installing the tube. Also note the "top" marking on the guide tube clamping bracket during installation.

CAUTION—

Do not reuse the nut at the guide tube clamping bracket. It is a single-use nut and should be replaced.



- Remove engine and transmission splash shields from beneath car.
- Disconnect harness connector at oil level sensor.
- Remove oil pan lower section mounting bolts (arrows).
 - Remove oil pan lower section.
 - Oil level sensor is at A.
- Remove engine drive belt. See **020 Maintenance**.
- Without disconnecting any fluid lines, remove power steering pump and its bracket from engine block. Support pump from body using stiff wire.
- Using an engine lifting device at front and rear engine lifting points, raise engine slightly and support it.



- Remove engine mount retaining nuts and ground strap from left and right mounts.
- Remove ATF cooler line brackets from oil pan and cylinder block.
- Raise engine off mounts as much as possible with lifting equipment.
- Unbolt oil pump mounting fasteners (arrows). Oil pump drive sprocket shown removed.
 - Remove oil pump and pipes as described in **Oil pump, removal and installation**.

CAUTION—

Do not reuse the oil pump mounting nuts. They are single-use nuts and should be replaced.

119-8 LUBRICATION SYSTEM

- Remove oil return line fitting (banjo bolt) at top of oil pan.
- Remove mounting bolts from upper oil pan and remove pan.

CAUTION —

If the oil pan does not separate easily from the cylinder block, a few taps with a rubber mallet should break it free. Do not pry the oil pan loose.

- Installation is reverse of removal.

NOTE —

When mounting the oil pans, note that the longer M6 bolts (20 mm) are used in the upper pan and the slightly shorter M6 bolts (18 mm) are used in the lower pan.

- When installing upper oil pan, apply a bead of non-hardening sealing compound (3-Bond®1207B or equivalent) to front and rear end cover seam areas on block.
- Install oil pump pipes using new O-rings.
- Install oil pump and tension drive chain as described below under **Oil pump, removal and installation**.
- Reconnect oil level sensor harness connector.
- Use a new O-ring when installing dipstick guide tube.
- Reinstall ground wire at engine mount.
- Fill engine with oil as described in **020 Maintenance**.

Tightening Torques

- Engine mount to mount carrier 47 Nm (35 ft-lb)
- Lower oil pan to upper oil pan (M6) . . . 10 Nm (89 in-lb)
- Oil pan to engine block (M6) 10 Nm (89 in-lb)
- Oil pump sprocket to pump shaft 47 Nm (35 ft-lb)
- Oil pump to engine block
(use new nuts) 22 Nm (17 ft-lb)
- Oil return line to oil pan
(banjo bolt) 30 Nm (22 ft-lb)

OIL PANS (M70 ENGINE)

There is an upper and a lower oil pan on the M70 engine. The oil pans can be removed with the engine installed, but the procedure requires removing the transmission as well as raising the engine far enough to remove the pans from the rear.

Oil pans, removing and installing (M70 engine)

- Disconnect negative (–) battery cable. See **020 Maintenance**.

CAUTION —

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.

- Raise car and support in a safe manner.

WARNING—

Make sure the car is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove radiator cooling fan and fan shroud. See **170 Radiator and Cooling System**.

NOTE—

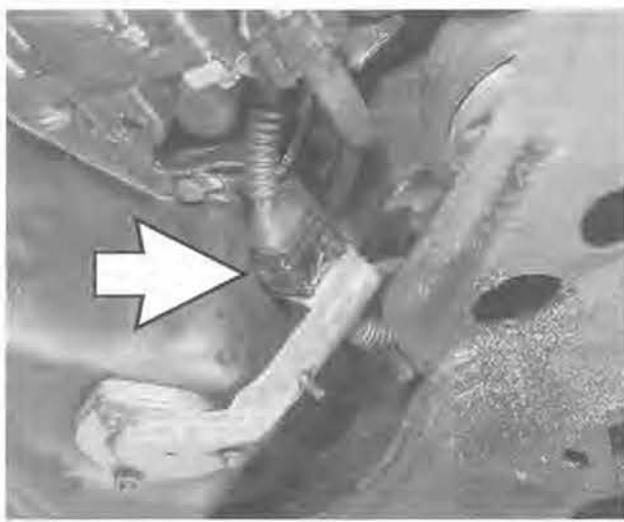
The radiator cooling fan nut (32 mm wrench) has left hand threads.

- Remove engine and transmission splash shields from beneath car.
- Remove transmission as described in **240 Automatic Transmission**.
- Loosen oil filter cover at top of oil filter housing. Drain engine oil.
- ◀ Working underneath car, disconnect oil level sensor harness plug (arrow) at right side of pan.
- Remove lower oil pan bolts, then remove lower pan.
- Unbolt oil pump as described in **Oil pump, removal and installation**.

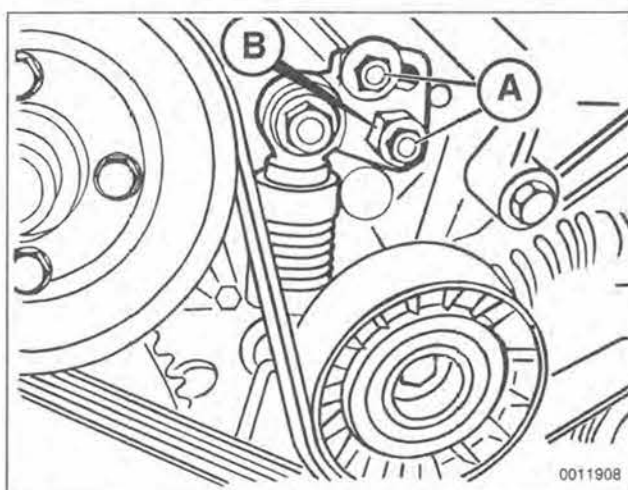
CAUTION—

Do not reuse the oil pump mounting nuts. They are single-use nuts and should be replaced.

- Remove top engine plastic cover.
- Remove windshield washer fluid tank after detaching harness connector and fluid hose.
- Detach coolant expansion tank from bulkhead and lift up slightly to allow engine to be raised. Detach hoses and harness connector as necessary.
- ◀ Loosen mounting nuts on belt tensioner (A). Use an open end wrench to rotate tensioner hex (B) counterclockwise and remove belt. Remove belt tensioner from engine.
- Remove oil dipstick guide-tube.
- Detach oil filter housing supply and return hoses at oil pan.



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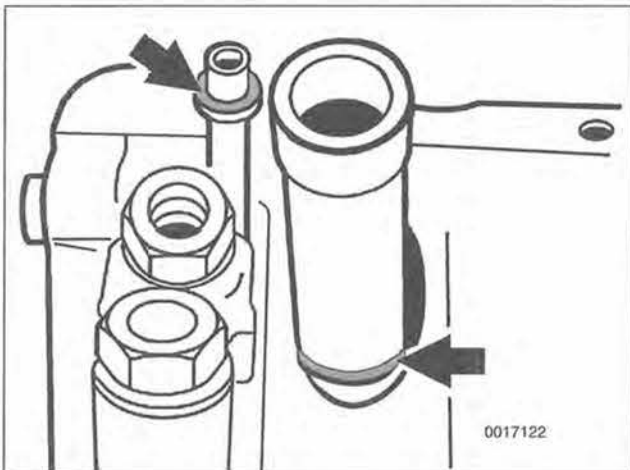
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119-10 LUBRICATION SYSTEM



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- Turn engine to TDC so that 0/T mark on harmonic balancer (**arrow**) aligns with mark on engine.
- Unbolt flywheel.
- Detach oil pipe from self-levelling suspension (LAD) system pump and remove pump bracket from oil pan, if applicable.



0017122

- Sealing O-rings on oil pump pipes (**arrows**). Note O-rings in oil pipes.
 - Use hair-dryer to soften sealing O-rings.
 - Remove oil pump pipes from upper oil pan.
- Remove oil pump mounting bracket at crankshaft bearing journal.
- Detach left and right engine mounts from suspension cross-member. Detach grounding strap as necessary.
- Using a lifting device at front and rear engine lifting points, raise engine off mounts as much as possible until upper oil pan can be removed from rear.
- Remove upper oil pan bolts.
- Installation is reverse of removal.
 - When installing upper oil pan, apply bead of non-hardening sealing compound (3-Bond®1207B or equivalent) to front and rear end cover seam areas on block.
 - Install oil pump pipes using new O-rings. Make sure O-rings do not snag or tear on sharp oil pan edges.
 - Install oil pump and tension drive chain as described below under **Oil pump, removal and installation**.
 - Reconnect oil level sensor harness connector.
 - Use a new O-ring when installing dipstick guide tube.
 - Reinstall ground wire at engine mount.
 - Fill engine with oil as described in **020 Maintenance**.
 - Bleed self-levelling suspension (LAD) system as described in **330 Rear Suspension**.

Tightening Torques

- Drive belt tensioner to engine block . . . 24 Nm (17 ft-lb)
- Engine mount to mount carrier 45 Nm (33 ft-lb)
- Flywheel to crankshaft 100 Nm (72 ft-lb)
- Lower oil pan to upper oil pan (M6) . . 10 Nm (89 in-lb)
- Oil drain plug to lower oil pan (M12) . . 33 Nm (24 ft-lb)
- Oil line to lower oil pan (Banjo bolt) . . 30 Nm (22 ft-lb)
- Oil pan to engine block (M6) 10 Nm (89 in-lb)
- Oil pump bracket to crankshaft journal 34 Nm (25 ft-lb)
- Oil pump sprocket to pump shaft 47 Nm (35 ft-lb)
- Oil pump to engine block
(use new nuts) 22 Nm (17 ft-lb)
- Oil return line to oil pan
(banjo bolt) 30 Nm (22 ft-lb)

OIL PUMP

The oil pump is mounted to the bottom of the cylinder block inside the engine oil pan. When the engine is running, oil is drawn from the oil pan by the oil pump's pickup tube and circulated through the engine.

Oil pump, removing and installing

- Remove oil pan as described earlier.

NOTE—

When working on the M60 or the M70 engine, just remove the lower oil pan.

- Remove oil pump sprocket mounting nut (**arrow**). Lift sprocket off pump together with drive chain.

- Remove oil pump mounting fasteners and withdraw pump. Note any spacers between pump and engine block.

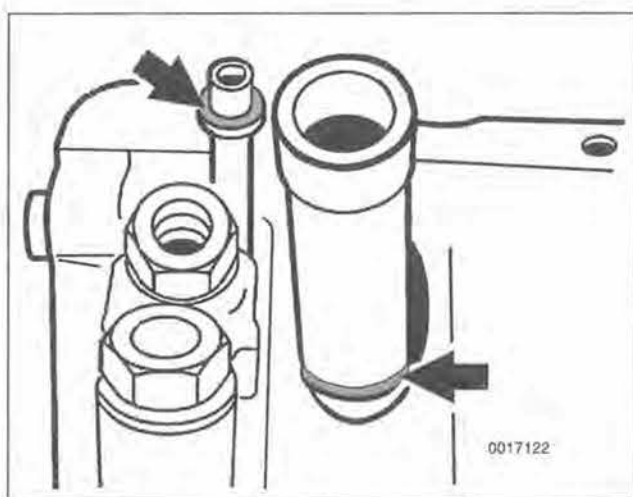
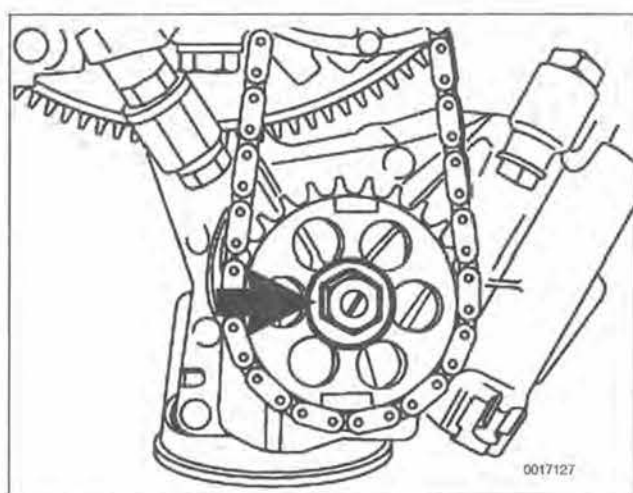
CAUTION—

Do not reuse the oil pump mounting nuts. They are single-use nuts and should be replaced.

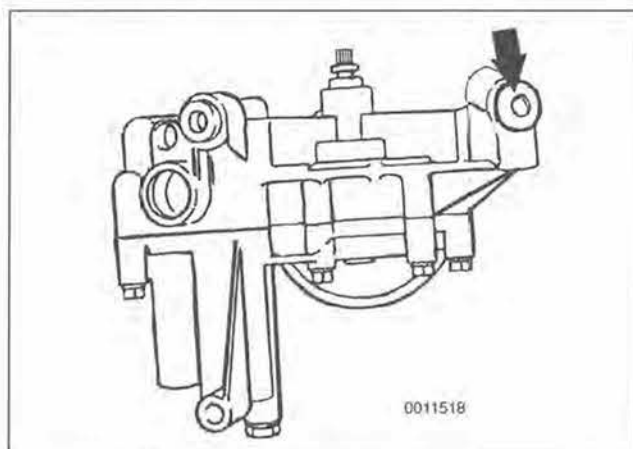
- Remove two oil pipes from engine block.
- Remove oil pump cover and check for wear or scoring. Spin oil pump shaft and check that gears turn smoothly. If gears spin with difficulty or any wear is present, pump should be replaced.

- Installation is reverse of removal, noting the following:

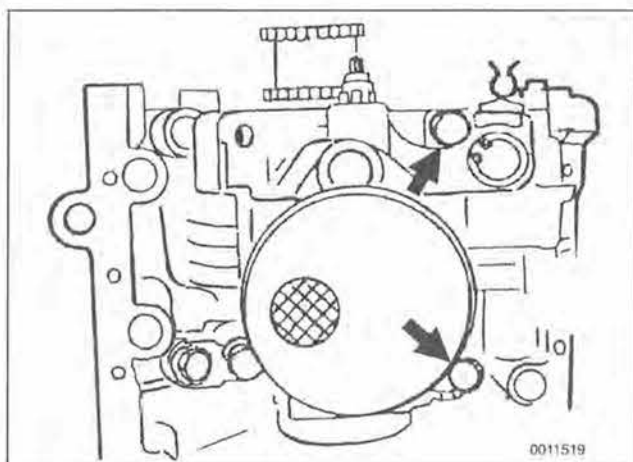
- Align sprocket splines to oil pump shaft splines before tightening sprocket nut.
- Before installing pump, install oil pipes into block using new O-rings (**arrows**).



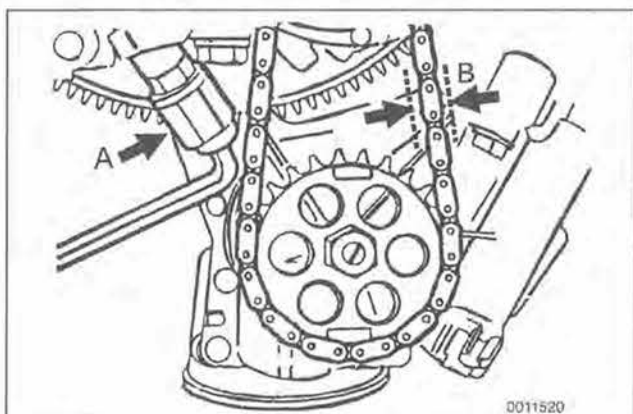
119-12 LUBRICATION SYSTEM



Turn threaded spacer (arrow) on pump fully to stop.



Install oil pump and tighten two nuts on left side of pump (arrows).



Adjust chain slack by turning threaded spacer (A) using hex wrench.

Oil Pump Chain Adjustment

- Slack B 10 ± 2 mm (0.394 $\pm$ 0.079 in.)

- Install and tighten final mounting bolt.
- Remainder of installation is reverse of removal.

Tightening Torques

- Oil pump cover to oil pump (M6) 10 Nm (89 in-lb)
- Oil pump to engine block
(use new nuts) 22 Nm (16 ft-lb)
- Oil pump sprocket to oil pump shaft
 - M30 engine (M10x1) 25 Nm (18 ft-lb)
 - M60/M70 engine (M10) 47 Nm (35 ft-lb)



OIL PUMP