

119 Lubrication System

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GENERAL

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

NOTE —

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

All engines are equipped with an oil pressure warning system to help prevent engine damage. Other safety features include:

- A filter bypass to provide lubrication should the oil filter become clogged.
- An oil pump pressure relief valve to prevent excessive system pressure.

TROUBLESHOOTING

The lubrication warning system consists of an oil pressure switch mounted in the oil circuit and an instrument panel warning light.

CAUTION —

If the red oil pressure warning light comes on or flashes on while driving, always assume that the oil pressure is low.

Oil pressure, checking

To perform an oil pressure test, BMW specifies special tools that attach to the top of the oil filter housing. The following procedure works well using standard automotive oil pressure testing equipment attached to the oil pressure switch port in the engine. In some engines, however, access to this port may be extremely restricted.

1. Disconnect harness connector from oil pressure switch and remove switch. See Fig. 1.

NOTE —

Thoroughly clean around the oil pressure switch before removing it.

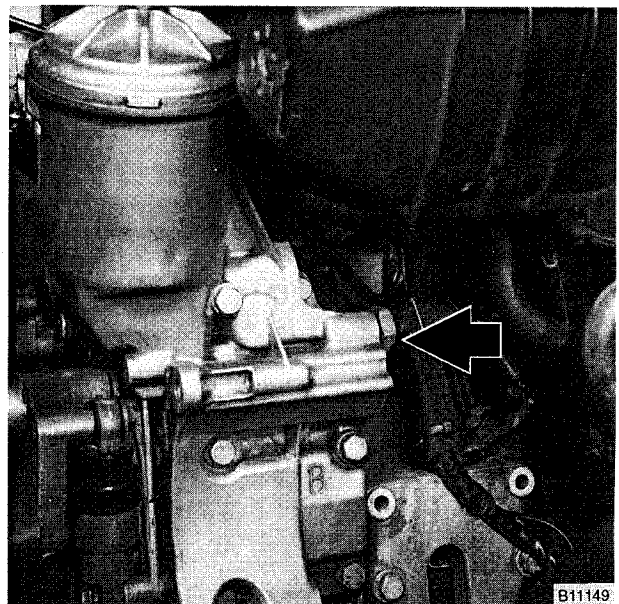


Fig. 1. Oil pressure switch location on M50 engine (arrow).

TROUBLESHOOTING

Component Location

- Oil pressure switch
all engines. 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.

2. Install pressure gauge in place of switch.
3. With gauge installed, start engine and allow to reach operating temperature. Check oil pressure both cold and hot.

NOTE —

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

Oil Pressure

- Idle (minimum) 0.5 bar (7 psi)
- Regulated pressure (elevated engine speed)
4-cylinder engines 4.3 ± 0.2 bar (63 ± 3 psi)
6-cylinder engines 4.0 bar (59 psi)

4. Remove pressure gauge and reinstall pressure switch.

If testing shows low oil pressure, one or more of the following conditions may be indicated:

- Worn or faulty oil pump.
- Worn or faulty engine bearings
- Severe engine wear.

All 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 slightly, the oil pressure switch opens and the warning light goes out. Make sure the oil level is correct before making tests.

1. Turn ignition switch on.
 - Warning light on instrument panel must light up.
2. Remove connector from oil pressure switch.
 - Warning light on instrument panel must go out.

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 **Electrical Wiring Diagrams** at rear of manual for electrical schematics.*

3. 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 to the instrument cluster or to the light itself is faulty.

4. 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 earlier. Do not drive the car until the problem is corrected. The engine may be severely damaged.

OIL PAN

The oil pan can be removed with the engine installed, although special engine support equipment will be needed.

Oil pan, removing and installing (4-cylinder engines)

1. Raise car and place securely on jackstands.
2. Remove splash shield(s) from under engine, where applicable.
3. Drain engine oil as described in **020 Maintenance Program**.
4. Disconnect vacuum hose adapter from vacuum brake booster at rear of engine compartment.
5. Remove oil dipstick guide tube mounting nut and pull guide tube from oil pan. See Fig. 2.

NOTE —

The guide tube is sealed in the pan with an O-ring. Check that the O-ring comes out with the tube. Use a new O-ring when installing the tube.

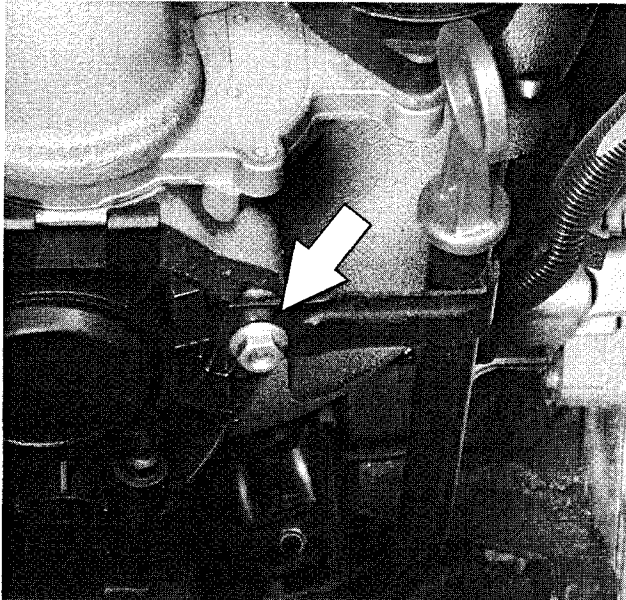


Fig. 2. Oil dipstick guide tube mounting nut (arrow) on M44 engine. Use new O-ring at base of tube during installation.

6. Install engine lifting equipment at front engine lifting point and raise engine approximately 5 mm (1/4 inch) until engine weight is supported.
7. Working beneath car, separate steering column shaft from steering rack at universal joint.
 - Point wheels straight ahead before disconnecting shaft from rack. Mark steering column shaft joint to steering rack spindle. See **320 Steering and Wheel Alignment**.

CAUTION —

In order to avoid the need for front-end realignment, do not unbolt power steering rack from suspension crossmember.

8. Support suspension crossmember (subframe) from below using appropriate jacking equipment.
9. At left and right sides, unbolt control arm bushing carriers from body. Disconnect stabilizer bar links from control arms. See Fig. 3.

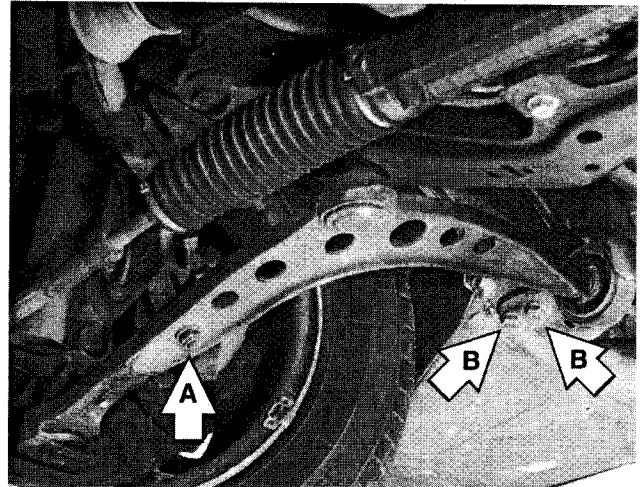


Fig. 3. Stabilizer bar link nut (A) and control arm bushing carrier bolts (B). Right side shown.

10. Remove bolts from left and right sides of suspension crossmember. Remove M10 nuts from bottom of left and right engine mounts. Lower crossmember as far as possible. See Fig. 4.

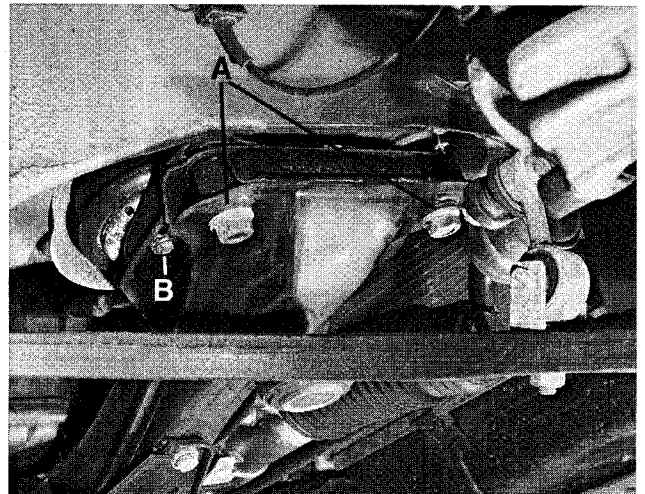


Fig. 4. Suspension crossmember bolts (A) and lower engine mounting nut (B). Right side shown.

11. Remove clamping brackets holding fuel lines to oil pan.
12. On cars with automatic transmission, remove ATF cooler line brackets from oil pan.
13. Remove engine drive belt from power steering pump. See **020 Maintenance Program**.
14. Unbolt power steering pump bracket and remove bracket with pump. Hang pump from chassis using wire.

- Remove oil pan screws. Lower and remove oil pan toward rear.

CAUTION —

If the oil pan does not separate easily from the engine cylinder block, make sure all mounting bolts have been removed. If necessary, a few taps with a rubber mallet should break it free. Never pry the oil pan loose.

- Installation is reverse of removal.
 - Thoroughly clean all old gasket material from mating surfaces and use a new gasket.
 - Apply a small amount of non-hardening sealer (3-Bond[®] 1209 or equivalent) to oil pan gasket directly below joints for end cover and front timing case cover. See Fig. 5.
 - When installing oil pan to engine, tighten forward screws first, then tighten rear.
 - Fill engine with oil as described in **020 Maintenance Program**.

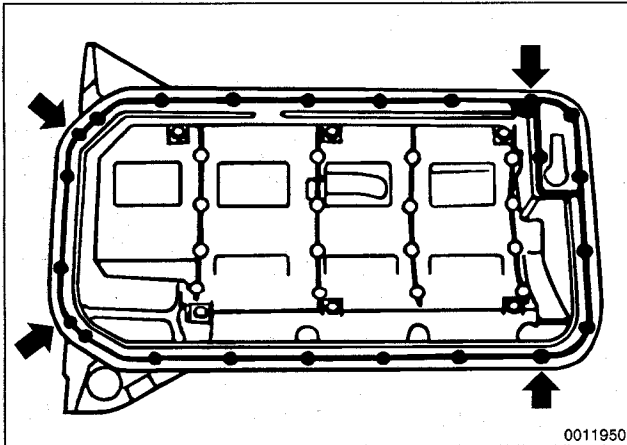


Fig. 5. Joint-mating areas at oil pan gasket where sealer should be applied (arrows). Apply a bead 3 mm wide by 2 mm high.

WARNING —

Always use new bolts when mounting the subframe to the body. The one-time only bolts should be replaced any time they are removed.

NOTE —

The oil pickup is attached to the oil pan using self-tapping screws. For this reason no threading for the pickup is present on new oil pans. Replace the seal for the pickup and use the old screws to reattach the pickup to the pan.

Center the steering spindle to the steering rack before installing the steering column shaft. See **320 Steering and Wheel Alignment** for specific installation markings and procedures.

OIL PAN

Tightening Torques

- Control arm bushing carrier to body (M10 bolt) 42 Nm (31 ft-lb)
- Engine mount to suspension crossmember (M10 nut) . 42 Nm (31 ft-lb)
- Front suspension crossmember to body See **310 Front Suspension**
- Oil pan to engine block (M6 bolt)
 - 8.8 grade 10 Nm (89 in-lb)
 - 10.9 grade 12 Nm (9 ft-lb)
- Power steering pump to bracket (self-locking nuts) 22 Nm (16 ft-lb)
- Power steering pump bracket to engine block or oil pan (self-locking nuts) . . . 22 Nm (16 ft-lb)
- Stabilizer bar link to control arm
 - M8 nut 22 Nm (17 ft-lb)
 - M10 nut 42 Nm (31 lb-ft)
- Steering column universal joint to steering rack spindle (M8 bolt) 19 Nm (14 ft-lb)

Oil pan, removing and installing (6-cylinder engine, 1992 models)

NOTE —

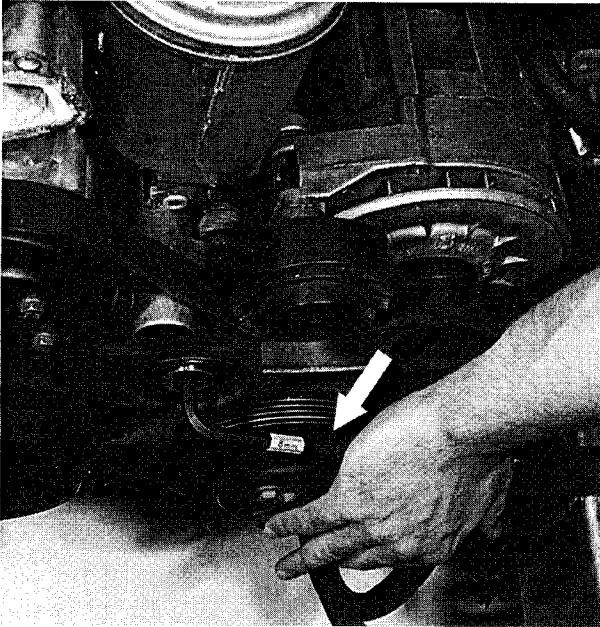
Cars built up to 9/92 (1992 models) use a different suspension crossmember than later production cars. Oil pan removal procedure on the earlier cars requires that the engine be raised and supported from above.

- Raise car and place securely on jackstands.
- Remove splash shield(s) from under engine, where applicable.
- Drain engine oil as described in **020 Maintenance Program**.
- Remove complete exhaust system. See **180 Exhaust System**.
- Remove air filter housing complete with mass air flow sensor. See **113 Cylinder Head Removal and Installation**.
- Remove alternator cooling duct from alternator and radiator support.
- Remove radiator cooling fan and fan shroud. Remove radiator securing clips at top of radiator. See **170 Radiator and Cooling System**.

NOTE —

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

8. Remove air plenum from rear of engine compartment. See **640 Heating and Air Conditioning**.
9. Release drive belt tension and remove alternator drive belt. Remove A/C compressor drive belt. See Fig. 6.



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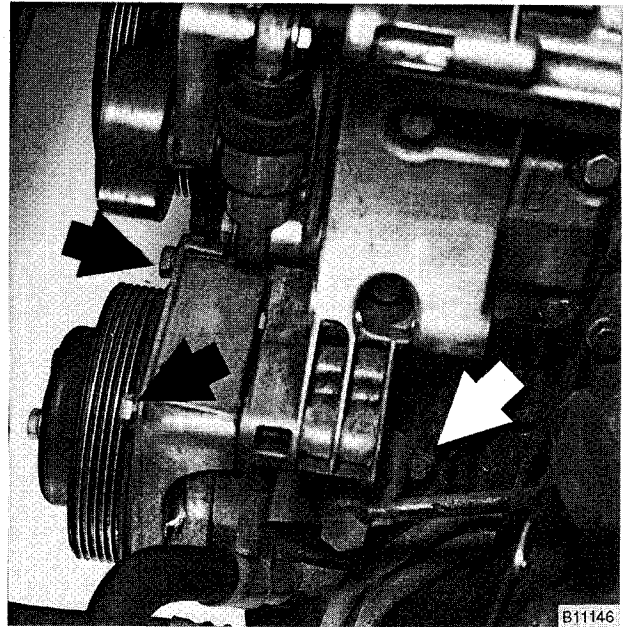
Fig. 6. To remove poly-ribbed drive belt, pry cover from front of tensioner. Then using 8 mm hex key, turn tensioner clockwise (**arrow**) to release tension and slip belt off pulleys.

10. Unbolt power steering reservoir and pull reservoir off engine mount bracket.
11. Without disconnecting fluid lines, remove power steering bracket (with pump) from oil pan and engine block. See Fig. 7. Disconnect fluid lines from bracket on engine mount. Hang pump from chassis using wire.
12. Without disconnecting refrigerant lines, remove A/C compressor from engine block. Hang compressor from chassis using wire. See **640 Heating and Air Conditioning**.
13. Remove oil dipstick guide tube mounting bolt and remove tube. See Fig. 8.

NOTE —

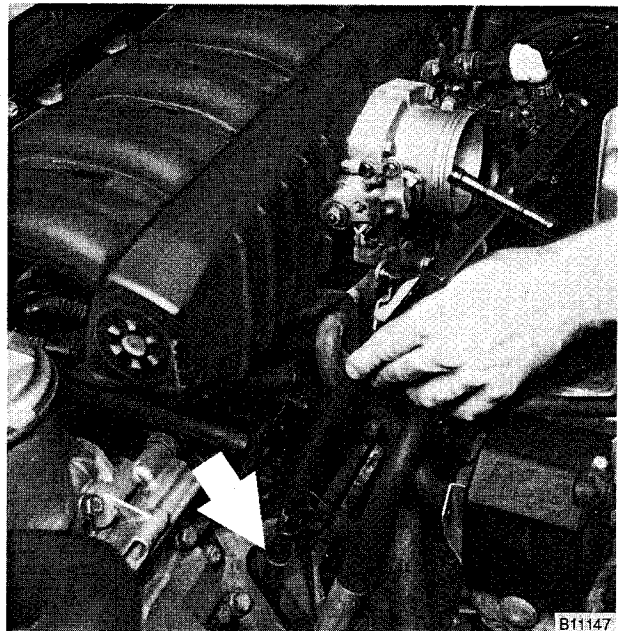
The guide tube is sealed in the oil pan with an O-ring. Check that the O-ring comes out with the tube. Use a new O-ring when installing the tube.

14. On cars with automatic transmission, remove brackets holding ATF cooler lines to oil pan and cylinder block.



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Fig. 7. Power steering pump mounting bolts (**arrows**).



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Fig. 8. Oil dipstick guide tube being removed. Use a new O-ring (**arrow**) during installation.

15. Install engine lifting equipment at front engine lifting point and raise engine just until its weight is supported.
16. Remove nuts at bottom of left and right engine mounts. Remove ground wire from right engine mount. Loosen nuts at top of left and right engine mounts (do not remove).

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17. Raise engine as much as possible. Check carefully for obstructions, wiring harness clearance and pinched hoses or lines as engine is raised.
18. Remove oil pan mounting bolts and lower oil pan to subframe crossmember.

NOTE —

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.

19. Remove oil pump sprocket mounting nut. See Fig. 9. Lift sprocket off together with drive chain.

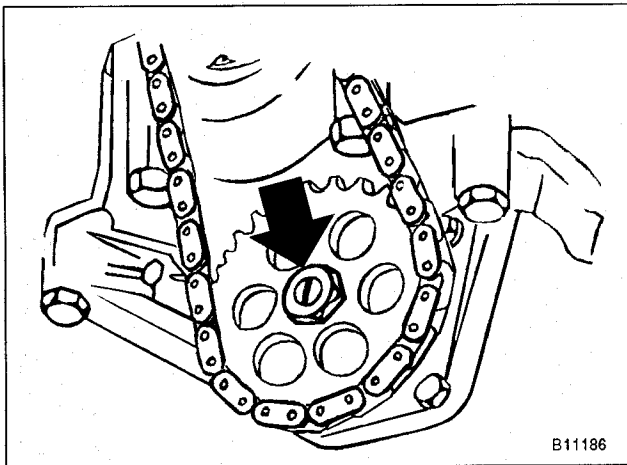


Fig. 9. Oil pump sprocket mounting nut (left-hand thread) on 6-cylinder engine (arrow).

NOTE —

The oil pump sprocket nut has left hand threads.

20. Unbolt oil pump pickup tube from oil pump. Unbolt oil pump from engine block. See **Oil pump, removing and installing (6-cylinder engine)**.
21. Remove oil pan from rear.

22. Installation is reverse of removal.

- When installing oil pan, apply a bead of non-hardening sealing compound (3-Bond 1209[®] or equivalent) to front and rear end cover seam areas on block.
- Position oil pump pickup tube and oil pan onto block and install pickup tube using a new gasket.
- Be sure tab on gasket faces down towards intake of pickup tube.
- Tighten forward oil pan screws first, then tighten rear.
- Fill engine with oil as described in **020 Maintenance Program**.
- After adding engine oil, start and run engine. Raise engine speed to 2,500 rpm until oil pressure warning lamp goes out (about 5 seconds).

Tightening Torques

- Engine mount to suspension crossmember (M10 nut) . . . 42 Nm (31 ft-lb)
- Oil pan to engine block (M6 bolt)
8.8 grade 10 Nm (89 in-lb)
10.9 grade 12 Nm (106 in-lb)
- Oil pump to engine block 22 Nm (16 ft-lb)
- Oil pump sprocket to oil pump shaft
(M10x1 left-hand thread) 25 Nm (18 ft-lb)
- Power steering pump to bracket
(self-locking nuts) 22 Nm (16 ft-lb)
- Power steering pump bracket to engine
block or oil pan (self-locking nuts) . . . 22 Nm (16 ft-lb)

Oil pan, removing and installing (6-cylinder engine, 1993 and later models)

NOTE —

Cars built after 9/92 use a different suspension crossmember than earlier production cars. Oil pan removal procedure on the later cars requires that the engine be supported from above and the front suspension crossmember be unbolted and lowered from the chassis.

1. Raise car and place securely on jackstands.
2. Remove splash shield from under engine, if applicable.
3. Drain engine oil as described in **020 Maintenance Program**.
4. Remove alternator cooling duct from alternator and radiator support.

5. Remove air filter housing complete with mass air flow sensor. See **113 Cylinder Head Removal and Installation**.
6. Remove oil dipstick guide tube mounting bolt. Disconnect oil separator hose from base of guide tube and remove tube from oil pan (where applicable). See Fig. 10.

NOTE —

The guide tube is sealed in the block using an O-ring. Check that the O-ring comes out with the tube. Use a new O-ring when installing the tube.

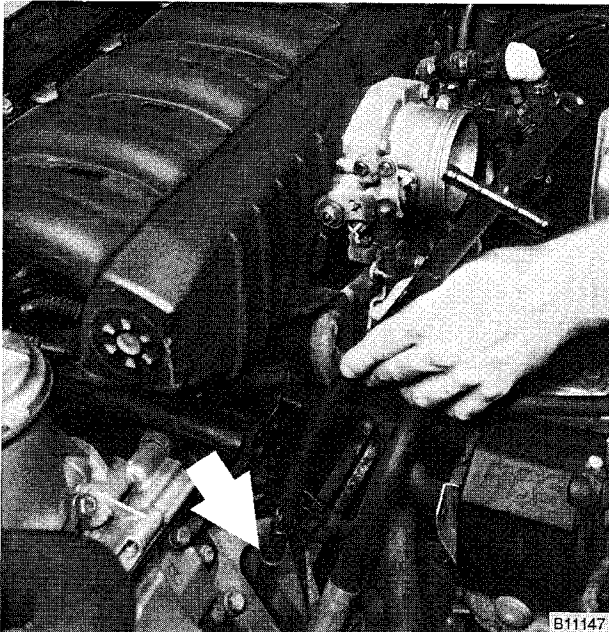


Fig. 10. Oil dipstick guide tube being removed. Use new O-ring (arrow) during installation.

7. M50/S50US engine: Using a clean syringe, remove power steering fluid from fluid reservoir. Disconnect power steering fluid lines from steering rack. See **320 Steering and Wheel Alignment**.
8. M52/S52US engine: Unbolt power steering reservoir from engine, then tie to chassis with wire.
9. Install engine lifting equipment at front engine lifting point and raise engine approximately 5 mm (¼ inch) until engine weight is supported. See Fig. 11.
10. Working beneath car, separate steering column shaft from steering rack at universal joint.
 - Mark steering column shaft joint to steering rack spindle. Point wheels straight ahead before disconnecting shaft from rack. See **320 Steering and Wheel Alignment**.

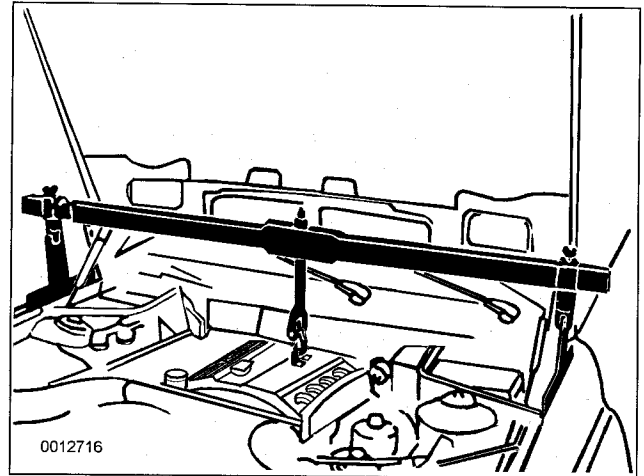


Fig. 11. Engine lifting equipment shown installed across engine.

CAUTION —

In order to avoid the need for front-end realignment, do not unbolt power steering rack from suspension crossmember.

11. Support suspension crossmember from below using appropriate jacking equipment.
12. Loosen nuts at top of left and right side engine mounts. Remove nuts from bottom of left and right side engine mounts.
13. At left and right sides, unbolt control arm bushing carriers from body. Disconnect stabilizer bar links from control arms. Refer to Fig. 3.
14. Remove bolts from left and right sides of suspension crossmember and lower front axle as far as possible.
15. Remove fuel line clamping brackets from oil pan. On cars with automatic transmission, remove ATF cooler line brackets from oil pan.
16. Remove oil pan screws. Lower and remove oil pan forward to remove.

CAUTION —

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.

17. Installation is reverse of removal.

- Thoroughly clean all old gasket material from mating surfaces and use a new gasket.
- Apply a small amount of non-hardening sealer (3-Bond 1209® or equivalent) to oil pan gasket directly below joints for end cover and front timing case cover. See Fig. 12.
- Tighten oil pan bolts starting at front first, working toward back (transmission) end.
- Fill engine with oil as described in **020 Maintenance Program**.
- After adding engine oil, start and run engine. Raise engine speed to 2,500 rpm until oil pressure warning lamp goes out (about 5 seconds).

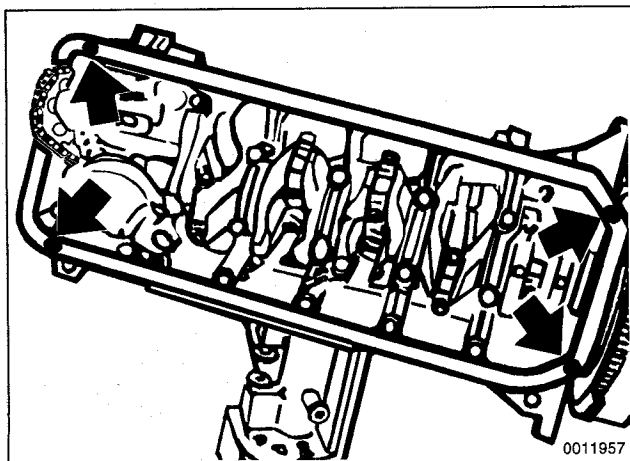


Fig. 12. Joint-mating areas at oil pan gasket where sealer should be applied (arrows). Apply a bead 3 mm wide by 2 mm high.

WARNING —

- Always use new bolts when mounting the sub-frame to the body. The one-time only bolts should be replaced any time they are removed.
- Special installation instructions apply when installing the front suspension crossmember to the body. See **310 Front Suspension** for fastener specifications and tightening torques.

Center the steering spindle to the steering rack before installing the steering column shaft. See **320 Steering and Wheel Alignment** for more specific procedures.

Tightening Torques

- Control arm bushing carrier to body (M10 bolt) 47 Nm (35 ft-lb)
- Engine mount to suspension crossmember(M10 nut) . . 42 Nm (31 ft-lb)
- Oil pan to engine block (M6 bolt) 8.8 grade 10 Nm (89 in-lb) 10.9 grade 12 Nm (106 in-lb)
- Stabilizer bar link to control arm (M10 nut) 42 Nm (31 lb-ft)
- Steering column universal joint to steering rack spindle (M8 bolt) 19 Nm (14 ft-lb)
- Suspension crossmember to body See **310 Front Suspension**

OIL PUMP

Oil pump, removing and installing (4-cylinder engine)

Oil pressure on M42 and M44 engines is generated by a gear-type pump mounted to the rear of the front engine cover (timing chain case). The pump is gear-driven off the front of the crankshaft.

NOTE —

Oil pump removal requires lowering of the front suspension and removal of the oil pan, as well as removal of the timing chain assembly.

1. Disconnect negative (–) battery cable from battery.

CAUTION —

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

2. Drain engine oil as described in **020 Maintenance Program**.
3. With engine cold, drain coolant. See **170 Radiator and Cooling System**.
4. Remove top cover from oil filter housing to allow engine oil to drain into oil pan. Remove oil pan as described earlier. Reinstall oil filter cover.
5. Remove alternator. Unbolt power steering pump from bracket, then remove alternator mounting bracket. See **121 Battery, Starter, Alternator**.
6. Remove crankshaft vibration damper and hub. Then remove upper and lower timing chain covers, complete timing chain, chain sprockets and chain guides. See **117 Camshaft Timing Chain**.

7. Unbolt timing chain case from front of engine. See Fig. 13.

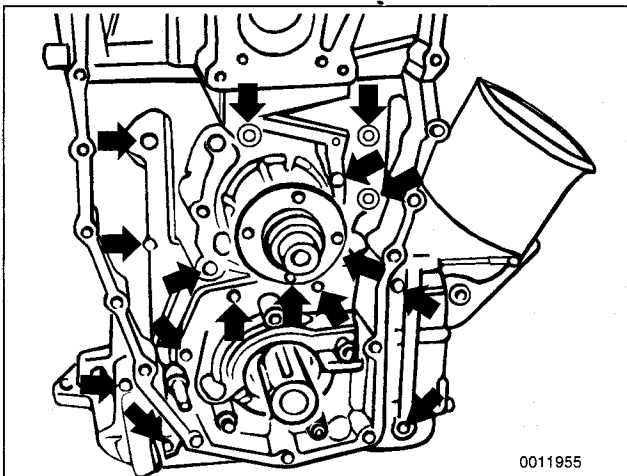


Fig. 13. Timing chain case mounting bolts (arrows) on M44 engine.

8. Remove cover from oil pump on rear of timing chain case. See Fig. 14. Inspect oil pump gears and oil pump cavity in timing chain case for wear and/or scoring.

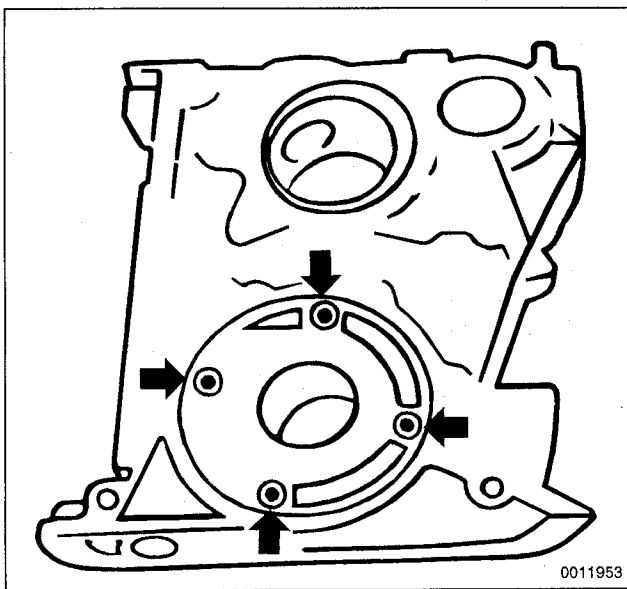


Fig. 14. Oil pump cover mounting bolts (arrows) on M44 engine.

9. Installation is reverse of removal.

- Replace all gaskets and O-rings.
- Install a new rubber seal (profile gasket) between top of timing chain case and cylinder head.
- Be sure to thoroughly clean sealing surfaces.
- Use 3-Bond 1209® or equivalent sealant on both sides of seal before installing.

10. Protect profile gasket using thin sheet metal (BMW special tool no. 11 2 330) when installing timing chain case. See Fig. 15.

- Apply a thin coating of grease to both sides of sheet metal tool and to top surface of profile gasket.
- Place sheet metal between gasket and cylinder head and carefully slide upper chain cover into position.
- Tighten all mounting bolts and then carefully withdraw sheet metal. Install timing chain as described in 117 **Camshaft Timing Chain**.

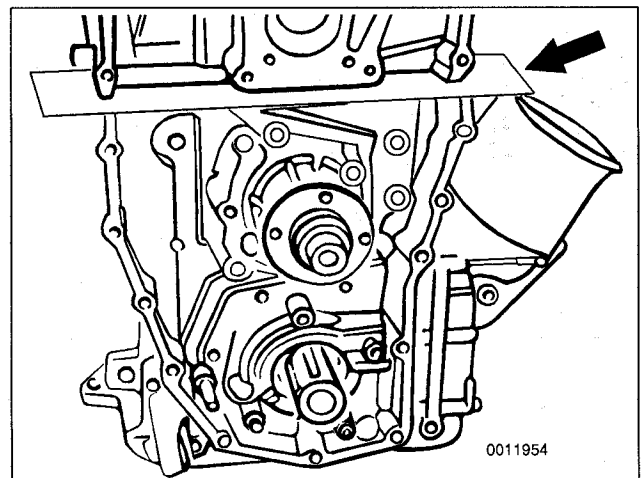


Fig. 15. Use thin sheet metal (arrow) to protect profile gasket during installation of timing chain case. Carefully withdraw sheet metal after tightening fasteners.

Tightening Torques

- Timing chain case to engine block
 - M6 10 Nm (7.5 ft-lb)
 - M8 22 Nm (16 ft-lb)
- Thermostat housing to upper timing chain cover(M6) 10 Nm (89 in-lb)
- Oil filter cover to oil filter housing (M8) 25 Nm (18 ft-lb)
- Oil pump cover to timing chain case (M6) 10 Nm (89 in-lb)
- Oil pan to engine block (M6 bolt)
 - 8.8 grade 10 Nm (89 in-lb)
 - 10.9 grade 12 Nm (106 in-lb)
- Alternator to alternator bracket 43 Nm (32 ft-lb)

Oil pump, removing and installing (6-cylinder engine)

Oil pressure on the 6-cylinder engines is generated by a gear-type pump bolted to the bottom of the engine block. The oil pump is chain driven off the front of the crankshaft.

NOTE —

Oil pump removal requires raising the engine (cars built up to 9-92) or lowering the front suspension crossmember (cars built from 9-92) to remove the oil pan.

1. Drain oil as described in **020 Maintenance Program**.
2. Remove oil pan as described earlier.
3. Remove oil pump sprocket mounting nut (left-hand thread). See Fig. 16. Lift sprocket off together with drive chain.

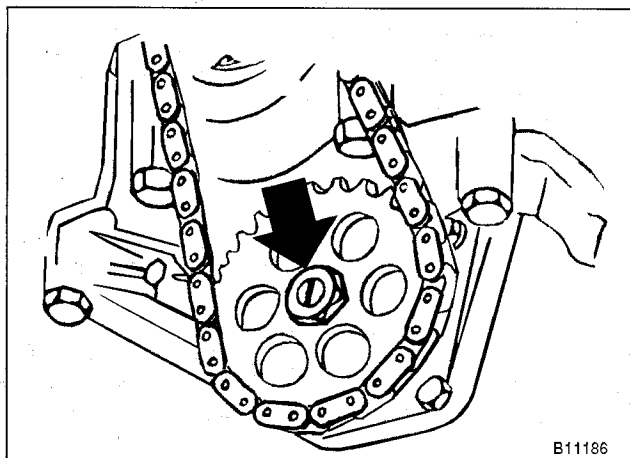


Fig. 16. Oil pump sprocket mounting nut (left-hand thread) on 6-cylinder engine (arrow).

4. Remove mounting bolts from oil pump and oil pump pickup tube. Withdraw pump.

NOTE —

- Note any spacers between pump and engine block. See Fig. 17.
- Note position of locating dowels.

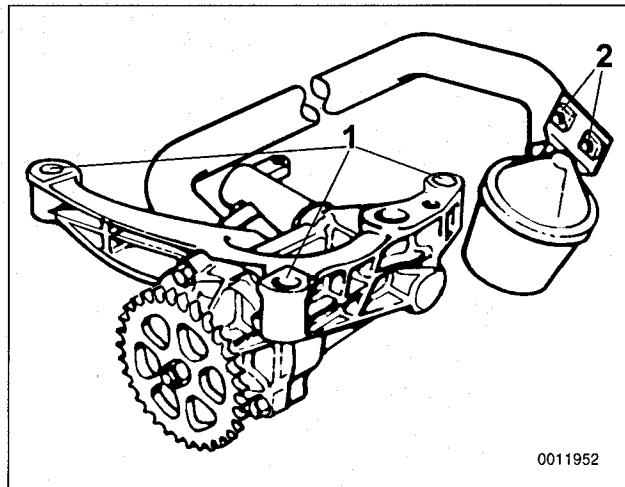


Fig. 17. Oil pump mounting points (1) and pickup tube mounting points (2).

5. Remove cover from oil pump and check for wear or scoring. Spin oil pump shaft and check that gears turn smoothly. Replace pump if gears spin with difficulty or any wear is present.

6. Installation is reverse of removal, noting the following:

- Align sprocket splines to oil pump shaft splines before tightening sprocket nut.

Tightening Torques

- Oil pump to engine block (M8) 22 Nm (16 ft-lb)
- Oil pan to engine block (M6 bolt)
8.8 grade 10 Nm (89 in-lb)
10.9 grade 12 Nm (106 in-lb)
- Oil pump sprocket to oil pump shaft
(M10x1 left-hand thread) 25 Nm (18 ft-lb)



OIL PUMP