

020 Maintenance Program

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GENERAL

The information given in this repair group includes the routine checks and maintenance steps that are both required by BMW under the terms of the vehicle warranty protection and recommended by BMW to ensure long and reliable vehicle operation.

NOTE —

Aside from keeping your car in the best possible condition, proper maintenance plays a role in maintaining full protection under BMW's new-car warranty coverage. If in doubt about the terms and conditions of your car's warranty, an authorized BMW dealer should be able to explain them.

BMW has taken a unique approach to establishing maintenance intervals. BMW's Service Indicator System computes maintenance intervals based not only on elapsed mileage, but also on such inputs as engine speed, engine temperature, number of starts, and length of trips. At the appropriate time, the system indicates, through lights in the instrument cluster, when the next routine maintenance is due.

NOTE —

BMW is constantly updating their recommended maintenance procedures and requirements. The information contained here is as accurate as possible at the time of publication. If there is any doubt about what procedures apply to a specific model or model year, or what intervals should be followed, remember that an authorized BMW dealer has the latest information on factory-recommended maintenance.

BMW Service Indicator

The BMW Service Indicator notifies the driver when maintenance is required. The service indicator consists of multiple light emitting diodes (LEDs)—typically five green, one yellow, and one red—as well as **OIL SERVICE** and **INSPECTION** indicators.

When the ignition is turned on, the green LEDs come on. They go out when the engine is started. After the Service Indicator is reset, all green LEDs will be illuminated with the key on. As the car is driven in normal use, fewer and fewer green LEDs will be illuminated before start-up, indicating that the next maintenance interval is approaching.

When the car has accumulated sufficient use to require the next maintenance interval, the yellow LED will come on along with either the **OIL SERVICE** indicator or the **INSPECTION** indicator. These LEDs will stay on after the engine is started. If maintenance service is delayed, the red LED will also illuminate as a reminder that maintenance service is overdue.

An **OIL SERVICE** interval will always be followed by an **INSPECTION** interval, which will then be followed by an **OIL SERVICE** interval, and so on. See Fig. 1.

GENERAL

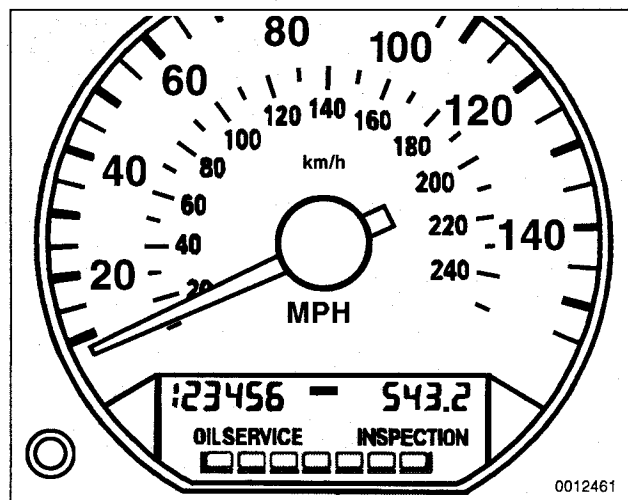


Fig. 1. Service indicator display in lower section of speedometer.

Oil Service

The Oil Service indicator signals the need for the most basic level of routine maintenance. BMW's required oil service specifies changing the engine lubricating oil and the engine oil filter after the engine has been warmed up. BMW-recommended additional maintenance for this service is listed in **Table a**.

NOTE —

- For reference, the BMW Oil Service requirements are approximately equivalent to the maintenance that other European manufacturers specify at intervals with a maximum of every 7,500 miles or 6 months.

CAUTION —

Be sure to follow the instructions for resetting the Oil Service indicator light. The Inspection indicator can be accidentally reset rendering its function inaccurate.

Inspection I and Inspection II

The Inspection indicator signals the need for more comprehensive maintenance and inspection. There are two sets of inspection requirements, Inspection I and Inspection II. These inspections alternate throughout a car's maintenance history. If the last inspection interval was Inspection I, the next inspection interval (following an Oil Service) will be Inspection II, the next after that will be Inspection I, and so on.

Inspection I tasks are listed in **Table b**. Inspection II includes most of the tasks from Inspection I with additional Inspection II tasks. A complete listing of Inspection II tasks are listed in **Table c**.

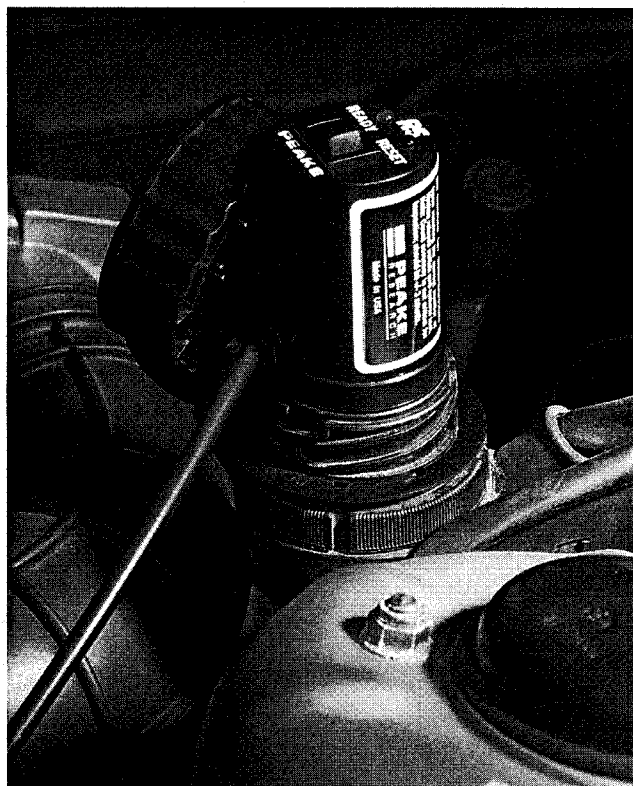
NOTE —

For reference, the BMW Inspection I and Inspection II requirements are approximately equivalent to the maintenance requirements that other European manufacturers specify. Inspection I is normally due at intervals with a maximum of 15,000 miles or 12 months. Inspection II is normally due at intervals with a maximum of 30,000 miles or 24 months.

Resetting Service Indicator

When the specified maintenance has been carried out, the service indicator memory should be reset.

The service indicator is reset using a special tool. The tool is plugged into the diagnostic connector in the engine compartment. See Fig. 2.



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Fig. 2. Service indicator reset tool installed in diagnostic connector (aftermarket tool shown).

CAUTION —

Follow the manufacturer's directions when resetting the service indicator. If the reset procedures are done incorrectly, the reset tool or the electronic service indicator may be damaged.

Aftermarket reset tools can be purchased from one of the following manufacturers:

Assenmacher Specialty Tools
Boulder, CO 80301
(303) 530-2424

Peake Research, Automotive Products Division
P.O. Box 28776
San Jose, CA 95159
(408) 369-0406

MAINTENANCE TABLES

Table a, b, c, and d on the following pages list the routine maintenance tasks specified by BMW. The intervals for most of these tasks are determined by the Service Indicator. The maintenance intervals for a few additional items are based on either elapsed mileage or time. These intervals are indicated in separate tables.

Except where noted, the maintenance items listed apply to all models and model years covered by this manual. The columns on the right side of each table give quick-reference information about the job. The bold text references the repair groups where additional repair information can be found.

020-4 MAINTENANCE PROGRAM

Table a. Oil Service

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Engine compartment maintenance				
Change oil and oil filter		*	*	
Check fluid levels (coolant, steering, brake/clutch, ATF)		*	*	
Under car maintenance				
Check steering rack and steering linkages for leaks and excess play. Repair Group 320				
Inspect brake system. Check brake calipers, rotors, and brake pad thickness. Inspect for damaged hoses and lines, leaks or damage. Check hand brake, adjust cable if necessary. Repair Group 340				
Check and adjust tire pressures, including spare	*			
Body and interior maintenance				
Check operation of exterior and interior lights, including glove box light, engine compartment light, trunk light, instrument panel lights, horns, headlight flasher and dimmer switch. Check headlight and driving light aiming. 6 Electrical System				
Check function/condition of seat belts. Repair Group 720				
Check windshield washer fluid level and concentration, add as necessary. Check operation of washer system. Check condition of wiper blades. Repair Group 611		*		
Road Test				
Check braking performance, steering, heating and ventilation, manual or automatic transmission, and mirrors				
Service Interval Reset				
Reset service indicator using special reset tool.	*			

Table b. Inspection I Service

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Engine compartment maintenance				
Change oil and oil filter.	*	*	*	
Check brake/clutch fluid level		*		
Check battery acid level and correct as necessary. Repair Group 121				
Check engine coolant level and anti-freeze protection and add as necessary. Inspect for cooling system leaks. Repair Group 170		*		
Lubricate throttle linkage		*		
Under car maintenance				
Check transmission for external leaks.				
Check manual transmission oil level and add as necessary. Repair Group 230	*	*		
Check final drive lubricant and add as necessary.	*	*		
Check fuel tank, fuel lines, and all connections for leaks.				
Inspect exhaust system. Repair Group 180				
Check steering rack and steering linkages. Check power steering system for leaks. Check fluid level. Repair Group 320		*		*
Inspect brake system for damaged hoses and lines, leaks or damage. Remove calipers and check brake pad wear. Check brake rotors for scoring damage. Repair Group 340	*			
Check parking brake operation, adjust cable if necessary. Repair Group 340	*			
Inspect front and rear suspension, including wheel bearings, for play. Repair Group 320/330				*
Inspect wheels and tires, including spare, check tire pressure and condition				
Body and Interior Maintenance				
Lubricate door hinges and hood latch, hood hinges				
Check headlight and driving light aiming and adjust as necessary.	*			*
Check operation of headlights, parking lights, back-up lights, license plate lights, interior lights, glove box light, engine compartment light, trunk light, instrument panel lights, turn signals, emergency flashers, stop lights, horns, headlight flasher and dimmer switch				
Replace ventilation/A/C micro-filter. Check function of air conditioning. Repair Group 640	*			
Check function of seat belts. Repair Group 720				
Check tightness of mounting screws on airbag front crash sensors (Airbag I). Repair Group 721				
Check windshield washer fluid level and concentration, add as necessary. Check operation of washer system. Check condition of wiper blades. Repair Group 611		*		
Tighten nuts and bolts for door locks and striker plates				
Replace batteries for alarm/remote control in master key (where applicable).		*		
Road Test				
Check braking performance, steering, HVAC, manual or automatic transmission, and mirrors				
Service Interval Reset				
Reset service indicator using special reset tool.	*			

020-6 MAINTENANCE PROGRAM

Table c. Inspection II Service

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Engine compartment maintenance				
Inspect V-belt /Poly-ribbed drive condition. Check V-belt tension, if applicable.	*			
Lubricate throttle linkage.		*		
Replace air filter.	*	*		
Change oil and oil filter.	*	*	*	
Replace spark plugs. Repair Group 120	*	*		
Check brake/clutch fluid level.		*		
Check battery acid level and correct as necessary. Repair Group 121				
Check engine coolant level and anti-freeze protection and add as necessary. Inspect for cooling system leaks. Repair Group 170	*			
Under car maintenance				
Change automatic transmission fluid. Repair Group 240	*	*	*	
Change manual transmission oil. Repair Group 230	*	*	*	
Check clutch plate for wear. Repair Group 210	*			
Check drive axle boots for leaks. Repair Group 330				
Change final drive fluid (1995 and later models: change synthetic oil every 2nd Inspection II).	*		*	
Replace fuel filter.	*	*		
Check fuel tank, fuel lines, and all connections for leaks.				
Inspect exhaust system. Repair Group 180				
Check steering gear and steering linkages. Check power steering system for leaks. Check fluid level. Repair Group 320		*		*
Inspect brake system for damaged hoses and lines, leaks or damage. Remove calipers and check brake pad wear. Check brake rotors for scoring damage. Repair Group 340				
Check parking brake operation, adjust cable if necessary. Check thickness of parking brake linings. Repair Group 340		*		
Inspect front and rear suspension, including front and rear wheel bearings, for play. Repair Group 310/330				*
Inspect wheels and tires, including spare, check tire pressure and condition.				
Body and Interior Maintenance				
Lubricate door hinges and hood latch, hood hinges.		*		
Check headlight and driving light aiming and adjust as necessary.	*			*
Check operation of headlights, parking lights, back-up lights, license plate lights, interior lights, glove box light, engine compartment light, trunk light, instrument panel lights, turn signals, emergency flashers, stop lights, horns, headlight flasher and dimmer switch.				
Check active check control panel for faults (where applicable). 6 Electrical System				

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Table c. Inspection II Service (continued)

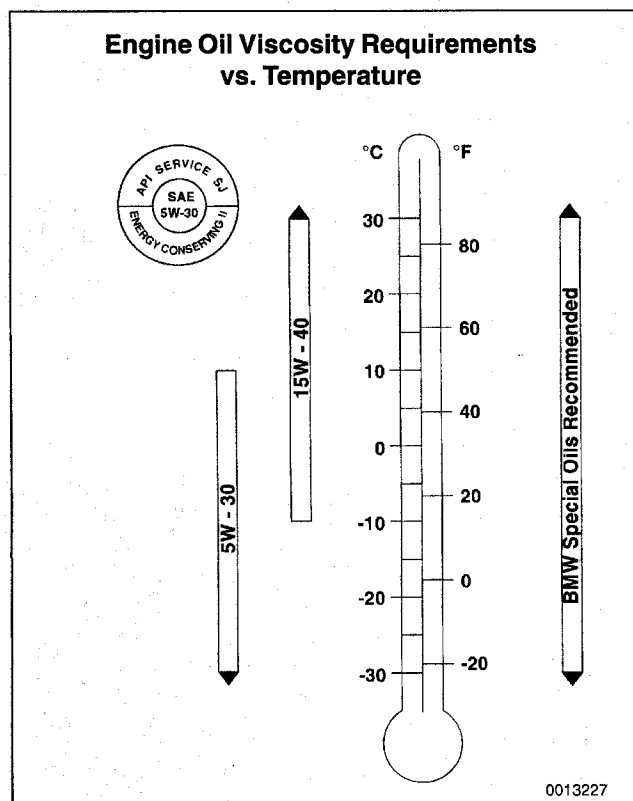
Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Body and Interior Maintenance (cont.)				
Replace ventilation/A/C micro-filter. Check function of air conditioning. Repair Group 640	*	*		
Check function of seat belts. Repair Group 720				
Check windshield washer fluid level and concentration, add as necessary. Check operation of washer system. Check condition of wiper blades Repair Group 611		*		
Tighten nuts and bolts for door locks and striker plates.	*			
Replace batteries for alarm/remote control in master key (where applicable).		*		
Check ground connection (mounting screws) of SRS (airbag) front sensor to body, if applicable. Repair Group 721	*			*
Road Test				
Check braking performance, steering, HVAC, manual or automatic transmission, and mirrors				
Service Interval Reset				
Reset service indicator using special reset tool.	*			

Table d. Scheduled Maintenance—Time/Mileage Intervals

Maintenance item	every 12 months	every 24 months	every 36 months	every 50,000 miles	every 60,000 miles	every 100,000 miles	New parts required	Dealer service recommended
Replace oxygen sensor. Repair Group 180 1992-1994 1995- on				*		*	*	
Flush and replace brake fluid/clutch fluid. Repair Group 340		*					*	
Drain and flush cooling system and replace coolant. Repair Group 170 1992-1996 1997-1998			*				*	
Anti-corrosion warranty inspection.	*							*

FLUID AND LUBRICANT SPECIFICATIONS

The fluids and lubricants specified by BMW are listed in **Table e**. Shown below is engine oil viscosity (SAE grade) vs. operating temperature range for the BMW engines covered in this manual.



WARNING —

The use of fluids that do not meet BMW's specifications may impair performance and reliability, and may void warranty coverage.

Table e. Fluids and Lubricants

Fluid	Approximate capacity	Specification
Engine oil with filter change		
M42 engine	5.0 l (5.3 US qt.)	API service SH or SJ
M44 engine	5.0 l (5.3 US qt.)	
M50 engine	6.5 l (6.9 US qt.)	
M52 engine	6.5 l (6.9 US qt.)	
S50US engine	6.5 l (6.9 US qt.)	
S52US engine	6.0 l (6.3 US qt.)	
Manual transmission oil		
M42 engine	1.1 l (1.2 US qt.)	See 230 Manual Transmission for fluid specification information
M44 engine	1.1 l (1.2 US qt.)	
M50 engine	1.1 l (1.2 US qt.)	
M52 engine	1.2 l (1.3 US qt.)	
S50US engine	1.2 l (1.3 US qt.)	
S52US engine	1.2 l (1.3 US qt.)	

Continued

Table e. Fluids and Lubricants (continued)

Fluid	Approximate capacity	Specification
Automatic transmission fluid (ATF) (drain and fill) (additional fluid required when installing a dry torque converter)		
A4S 310R A4S 270R A5S 310Z	See 240 Automatic Transmission for fluid specification information	
Final drive (drain and fill) (Lifetime fluid; no fluid change required)		
4-cylinder 6-cylinder	1.1 l (1.2 US qt.) 1.7 l (1.8 US qt.)	BMW SAF-XO synthetic oil (ex. limited slip) BMW SAF-XLS synthetic oil (limited slip)
Power steering fluid		
All models	permanently sealed no drain plug	Dexron III® ATF
Brake fluid		
All models	—	SAE Dot 4
Engine coolant		
M42 engine M44 engine M50 engine M52 engine S50US engine S52US engine	6.5 l (6.9 US qt.) 6.5 l (6.9 US qt.) 10.5 l (11.1 US qt.) 10.5 l (11.1 US qt.) 10.75 l (11.4 qt.) 10.75 l (11.4 qt.)	50% BMW anti-freeze/ 50% water

CAUTION —

Multi-viscosity engine oils should not be used in the manual transmission. Use of such an oil could shorten the service life of the transmission.

Manual Transmission Fluid

The manual transmissions installed in the E36 models are normally filled with automatic transmission fluid (ATF), although alternative synthetic lubricants may have been used from the factory, depending on transmission type and model year. Consult **230 Manual Transmission** for additional information on identifying the type of fluid installed.

Automatic Transmission Fluid

The automatic transmissions installed in the E36 models are normally filled with Dexron III automatic transmission fluid (ATF), although alternative fluids have been installed from the factory, depending on transmission type and model year. Some transmission are filled with a special BMW "life-time" automatic transmission fluid, which does not require periodic fluid changes. Consult **240 Automatic Transmission** for additional fluid specification information.

NOTE —

The transmission lubricant type can be found on the "type-plate" on the side of the transmission. Consult an authorized BMW dealer for alternate fluid use and the most-up-to-date information regarding transmission operating fluids.

Final Drive Gear Oil

BMW recommends using only a specially formulated synthetic gear oil that is available through an authorized BMW dealer parts department. For additional information on this lubricant and any other lubricants that may be compatible, contact an authorized BMW dealer service department. See **331 Final Drive**.

Brake Fluid

Brake fluid absorbs moisture easily, and moisture in the fluid affects brake performance and reliability. This is why brake fluid should be flushed from the system every two years. When replacing or adding brake fluid, use only new fluid from previously unopened containers. Do not use brake fluid that has been bled from the system, even if it is brand new. Use only DOT 4 brake fluid. See **340 Brakes** for more information.

Engine Coolant (Anti-freeze)

BMW recommends coolant that is a 50/50 mixture of distilled water and phosphate/nitrate free anti-freeze containing ethylene glycol. Anti-freeze raises the boiling point and lowers the freezing point of the coolant. It also contains additives that help prevent cooling system corrosion.

Power Steering Fluid

The power steering fluid is Dexron III® ATF, or equivalent. The system is permanently filled and does not have a drain. Routinely adding ATF is not required unless the system is leaking.

WARNING —

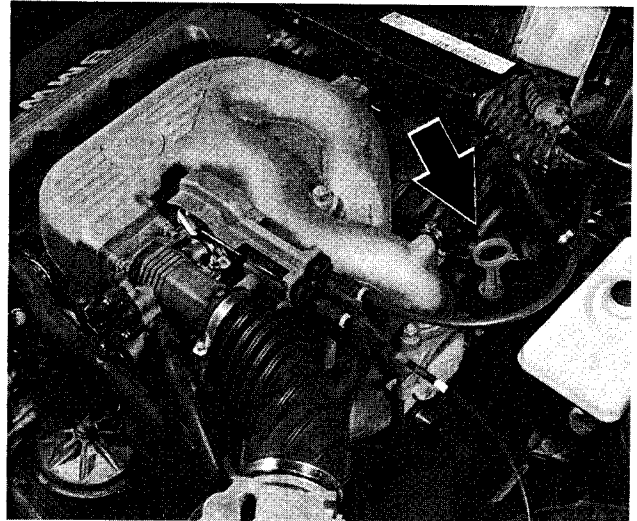
Be sure to check the fluid specifications on the power steering reservoir to confirm the fluid type installed in the system. In some instances, the power steering system may be filled with an alternative hydraulic fluid designated CHF 7.1.

ENGINE OIL SERVICE

Engine oil, checking level

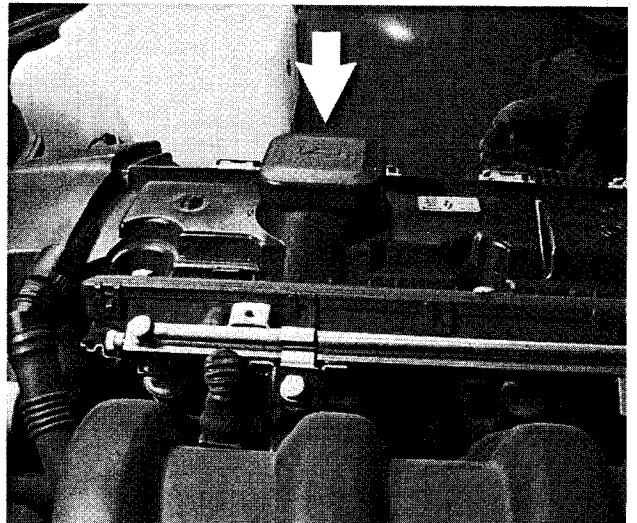
The engine oil level is checked with a dipstick in the engine block. Check the oil level with the car on a level surface, after the engine has been stopped for at least a few minutes. Check the level by pulling out the dipstick and wiping it clean. Reinsert it all the way and withdraw it again. The oil level is correct if it is between the two marks near the end of the stick. See Fig. 3.

Add oil through the filler cap on the top of the cylinder head. See Fig. 4. Add only the amount needed to bring the oil level to the **MAX** mark on the dipstick, using an oil of the correct viscosity and grade. Too much oil can be just as harmful as too little.



0012208

Fig. 3. Engine oil level dipstick location on 4-cylinder engine (arrow). Dipstick is marked with minimum and maximum level marks.



0012202

Fig. 4. Oil filler cap (arrow). 6-cylinder engine shown.

Engine oil and filter, changing

A complete oil change requires new oil (see **Table e**), a new oil filter insert kit, and a new drain plug sealing washer. The tools needed, a drain plug socket or box wrench (17 mm or 19 mm) and a drain pan (8-10 US qt. capacity), are described in **010 Fundamentals for the Do-It-Yourself Owner**.

NOTE —

If using a "fast-lube" service facility for oil changes, make sure the technician hand-starts and torques the engine oil drain plug using hand-tools. Power tools can strip the threads of the plug and the oil pan.

1. Run engine for a few minutes to warm engine oil. Shut engine off.
2. With car on level ground, place drain pan under oil drain plug. See Fig. 5.

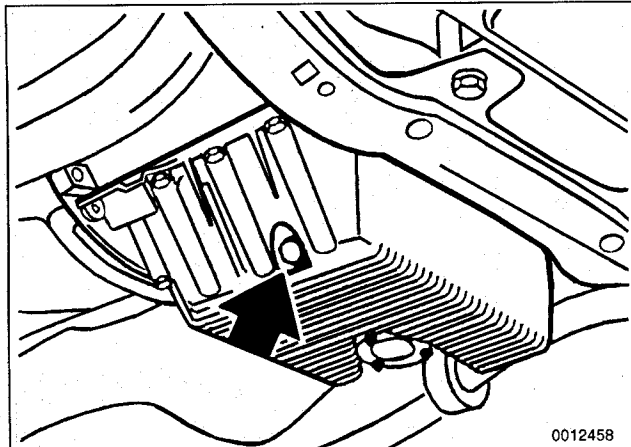


Fig. 5. Engine oil drain plug (arrow) in oil pan.

3. Remove filter housing cover. Remove filter cartridge and discard any O-rings. See Fig. 6.

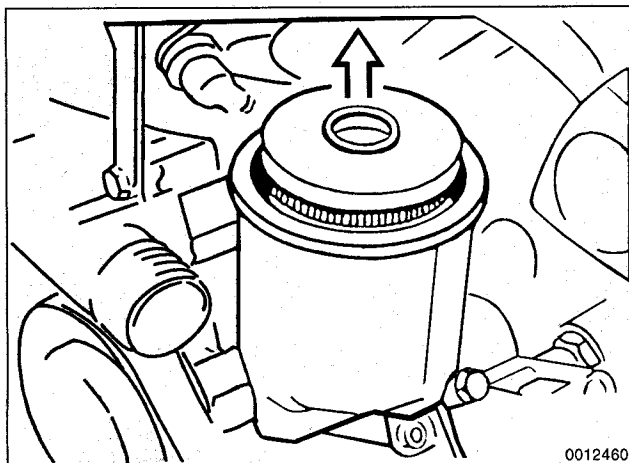


Fig. 6. Engine oil filter cartridge. Note O-ring locations when removing cover and filter.

4. Using a socket or box wrench, loosen drain plug at oil drain pan. By hand, remove plug and let oil drain into pan.

CAUTION —

Pull the loose plug away from the hole quickly to avoid being burned by hot oil. It will run out quickly when the plug is removed. If possible, use gloves to protect your hands.

5. When oil flow has diminished to an occasional drip, re-install drain plug with a new metal sealing washer and torque plug.

Tightening Torques

- Engine oil drain plug
 - M12 bolt (17mm wrench) 25 Nm (18 ft-lb)
 - M22 bolt (19mm wrench) 60 Nm (44 ft-lb)

6. Lubricate and install new O-rings. Install a new filter cartridge and housing cover. Tighten cover. See Fig. 7.

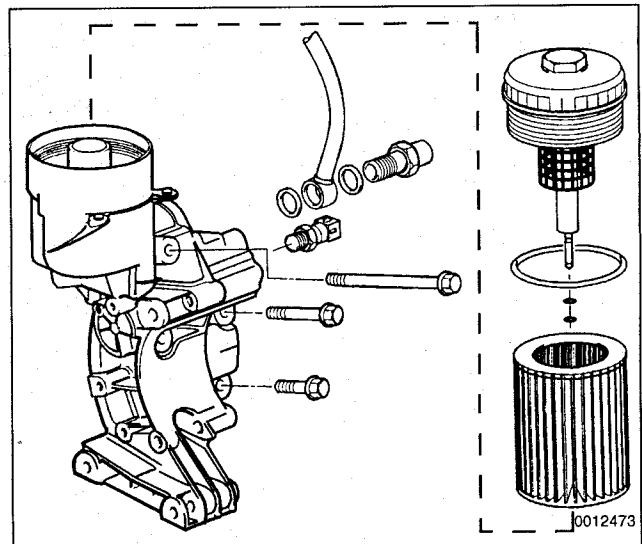


Fig. 7. Oil filter housing on 6-cylinder engine. 4-cylinder engine is similar.

Tightening Torque

- Engine oil filter cover to oil filter housing 25 Nm (18 ft-lb)

7. Refill crankcase with oil. Approximate oil capacity is listed in **Table e**. Use dipstick to check correct oil level.
8. Start engine and check that oil pressure warning light immediately goes out.
9. Allow engine to run for a few minutes to circulate new oil, then check for leaks at drain plug and oil filter. Stop engine and recheck oil level.

ENGINE COMPARTMENT MAINTENANCE

The information under this heading describes routine maintenance—other than oil change—done in the engine compartment. It is not necessary for the car to be raised and supported off the ground. Information on oil change is given earlier under **Engine Oil Change**.

Air filter, replacing

The specified maintenance intervals for the air filter are based on normal use. If the car is operated primarily in dusty conditions, the air filter should be serviced more frequently.

To replace the air filter on 6-cylinder engines, unclip and slide the filter cartridge assembly out of the air box and remove the filter from the frame assembly. See Fig. 8.

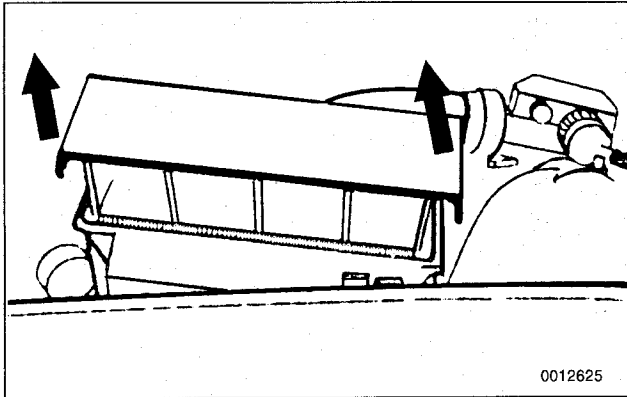


Fig. 8. To remove air filter cartridge on 6-cylinder engines, release filter cartridge at sides (**arrows**) and then remove filter element insert from cartridge.

To replace the air filter element on 4-cylinder engines, separate the upper air filter housing section from the lower section by unfastening the spring clips. Remove the air filter element from the air filter housing. See Fig. 9. Wipe the inside of the air filter housing clean and install the new element. Reinstall the upper air filter housing, making sure that the two halves are mated correctly. Refasten the spring-clips.

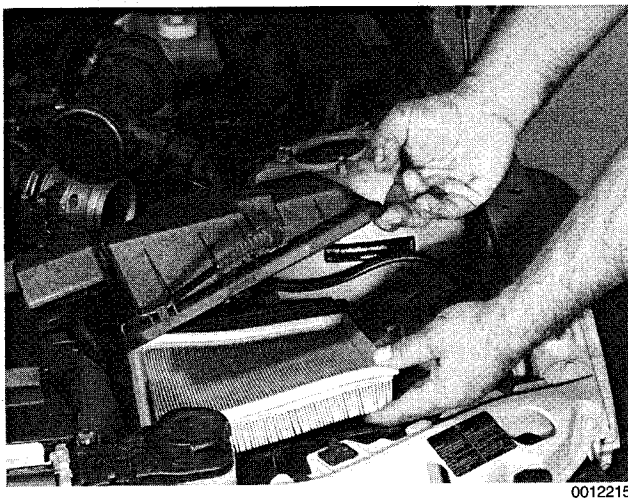


Fig. 9. Air filter element being removed on 4-cylinder engine.

Spark plugs, replacing

To access the spark plugs on 4-cylinder engines, remove the cover from atop the spark plugs. See Fig. 10. Using the special spark plug wire removal tool (attached to rear of cylinder head beneath engine cover), gently pull the spark plug wire from the spark plug. See Fig. 11. Blow away any dirt from around the base of the plug to prevent it from entering the engine. Remove and install the spark plugs one at a time.

NOTE —

Spark plug applications are often updated and superseded from the original plug specification. Consult an authorized BMW parts department for the latest parts information. The spark plug listed in the owner's manual may not be the latest recommend spark plug, especially on older cars.

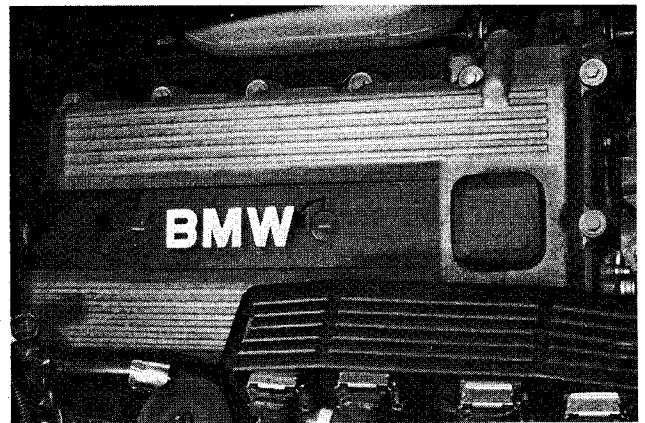


Fig. 10. To remove engine cover above spark plugs on 4-cylinder engine, turn retainers 90° counterclockwise and lift cover off.

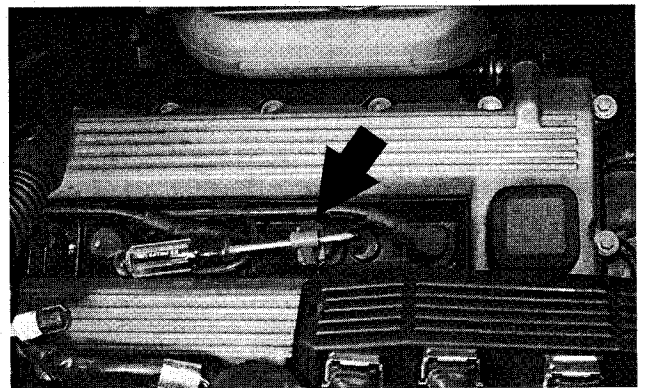


Fig. 11. To remove spark plug wire from spark plug on 4-cylinder engine, slide special removal tool over spark plug wire end (**arrow**) and pull straight off. Use a screwdriver for added leverage. Special tool is stored at rear of cylinder head below top cover.

6-cylinder engines use a coil-on-plug configuration, and removal of the top engine cover (between the camshafts) and ignition coils are necessary. See Fig. 12. Blow away any dust or dirt around the ignition coils, and then remove the coils. Blow away any dust or dirt around the spark plugs. Remove the spark plugs.



B11004

Fig. 12. Ignition coil being removed from spark plug on M52 engine.

NOTE —

If necessary, see **120 Ignition System** for more details on coil removal.

Lightly lubricate the new spark plug threads with a small amount of anti-seize compound. Thread the plugs into the cylinder head by hand to prevent cross-threading.

Tightening Torque

- Spark plug to cylinder head 25 Nm (18 ft-lb)

Idle Speed

Engine idle speed can change due to a number of factors, including normal wear. The idle speed is electronically adaptive and non-adjustable. See **130 Fuel Injection** for more information.

Battery, checking and cleaning

The battery is located in the right side of the luggage compartment. Simple maintenance of the battery and its terminal connections will ensure maximum starting performance, especially in winter when colder temperatures reduce battery power.

NOTE —

Design characteristics of the convertible body cause vibrations in the trunk area. Therefore, E36 convertibles require a special battery designed for constant vibration. When replacing the battery, be sure the replacement is designed specifically for the convertible.

Battery cables should be tight. The terminals, the cable clamps, and the battery case should be free of the white deposits that indicate corrosion and acid salts. Even a thin layer of dust containing conductive acid salts can cause battery discharge.

To remove battery corrosion, begin by disconnecting the cables. Disconnect the negative (–) cable first. Clean the terminal posts and the cable clamps with a wire brush. Clean the main chassis ground terminal next to the battery. Corrosion can be washed away with a baking soda and water solution that will neutralize the acid. Apply the solution carefully, though, since it will also neutralize the acid inside the battery. Reconnect the cable clamps, positive (+) cable first. Lightly coat the outside of the terminals, hold down screws, and clamps with petroleum jelly, grease, or a commercial battery terminal corrosion inhibitor.

WARNING —

- Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.
- Battery acid is extremely dangerous. Take care to keep it from contacting eyes, skin, or clothing. Wear eye protection. Extinguish all smoking materials and do not work near any open flames.

Battery electrolyte should be maintained at the correct level just above the battery plates and their separators. The correct level is approximately 5 mm (¼ in.) above the top of battery plates or to the top of the indicator marks (if applicable). The battery plates and the indicator marks can be seen once the filler caps are removed. If the electrolyte level is low, replenish it by adding distilled water only.

Battery, replacing

Batteries are rated by ampere hours (Ah), the number of hours a specific current drain can be sustained before complete discharge, or by cold cranking amps (CCA), the number of amps available to crank the engine in cold weather conditions. In general, replacement batteries should always be rated equal or higher than the original battery.

CAUTION —

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

The battery is held in place by a single hand screw and plate. A secure battery hold-down is important in order to prevent vibrations and road shock from damaging the battery.

NOTE —

- Always disconnect the negative (–) cable first, and connect it last. While changing batteries, clean away any corrosion in or around the battery tray.
- Design characteristics of the convertible body cause vibrations to oscillate in the trunk area. Therefore, the convertible model uses a special battery designed for this constant vibration.

Accelerator and Throttle Linkage

The accelerator and throttle linkage should be lubricated periodically. Use a general purpose oil on the joints and bearings of the linkage. Use a multipurpose grease on the bearing points of the throttle plate.

Engine Drive Belts

Drive belts and pulleys transfer power from the engine crankshaft to various accessories. See Fig. 13. Depending on model and model year, engine driven accessories are driven by V-belts, poly-ribbed (serpentine) belts, or a combination of the two. For example, early 4-cylinder engines, use two V-belts and one poly-ribbed belt.

Inspect drive belts with the engine off. If the belt shows signs of wear, cracking, glazing, or missing sections, it should be replaced immediately.

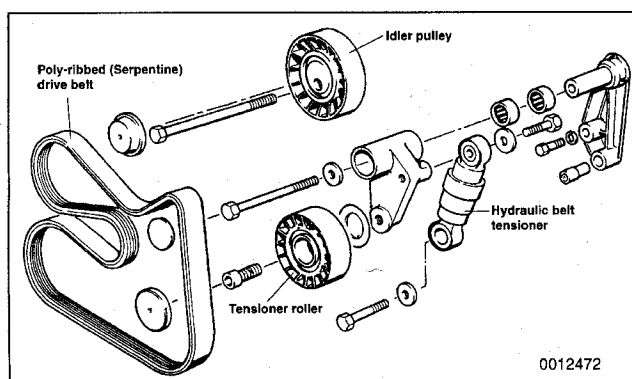


Fig. 13. Drive belt and tensioner assembly for late 4-cylinder engine with poly-ribbed drive belt.

V-belt, replacing (4-cylinder engines built up to 1/94)

V-belts should be inspected during regular maintenance intervals. Incorrect tension can decrease the life of the belt and the component it drives. The V-belt tension is adjusted through a toothed-rack mechanism.

Inspect belts with the engine off. Twist the belt to inspect its sidewalls and bottom. Belt structural damage, glazed or shiny sidewalls caused by a loose belt, or separation are all reasons to replace a belt.

Replacement of the V-belts every four years is recommended. Loosen the mounting bolts and adjust the belt-driven unit until the belt tension is as loose as possible. Remove the belt by slipping it over the pulleys. In some cases it may be necessary to remove one V-belt to get to another. Use a torque wrench and a crowfoot wrench to turn the tensioning gear bolt and set belt tension. Hold the wrench steady and tighten the locknut on the rear of the tensioning gear bolt. Tighten all other mounting nuts.

NOTE —

- For the most accurate check, V-belt tension should be checked using a V-belt tension gauge.
- Belt squealing is normally caused by loose belt tension. Belt dressings should not be used.

Tightening Torques

- Tensioning gear (alternator belt tensioning) 7 Nm (62 in-lb)
- Tensioning gear (power steering belt tensioning) 8 to 8.5 Nm (71 to 75 in-lb)
- Tensioning gear locking nut 24 Nm (18 ft-lb)

NOTE —

When belts are replaced with new ones, store the old set in the luggage compartment for emergency use.

When installing a new belt, gently pry it over the pulleys. Too much force may damage the belt or the accessory. Tension the belt(s), run the engine for a few minutes (at least 1500 rpm), then recheck the belt tension.

CAUTION —

Do not over tighten the V-belts. Overtightening will cause shaft bearings to fail prematurely.

Poly-ribbed belt, replacing (4-cylinder engines built from 1/94 and all 6-cylinder engines)

An automatic belt tensioner is used to keep the belts tensioned properly. Unless the tensioner mechanism malfunctions, the poly-ribbed belts do not require tension adjustment.

To reduce the chance of belt failure while driving, replacement of the belts every four years is recommended. Mark drive belt rotation direction if removing and reusing an old belt.

To remove the belt, it is necessary to retract the self-tensioner. Using a breaker bar or other long socket assembly, rotate the tensioner to loosen the belt. See Fig. 14 or Fig. 15. On 4-cylinder engines, it will be necessary to remove the A/C compressor belt to remove the main drive belt.

WARNING —

Observe care when replacing the belt. Personal injury could result if the tensioner springs back into position uncontrollably.

With the belt removed from the pulleys, inspect the pulleys for wear or damage that may cause early failure of the new belt. This is also a good opportunity to inspect the belt-driven accessories, checking for bearing wear and excess play. Drive belt routing is shown in Fig. 16 and Fig. 17.

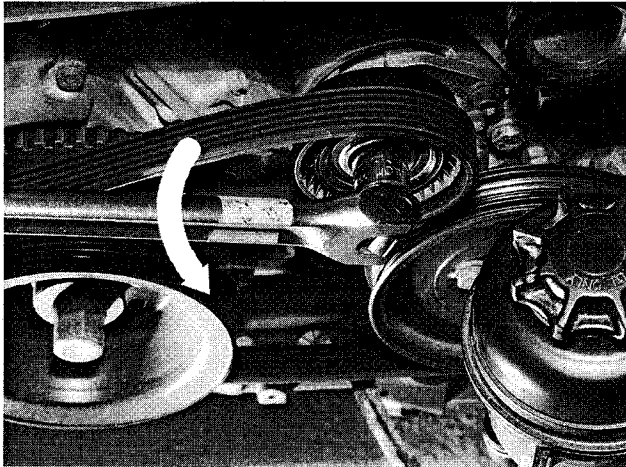


Fig. 14. Engine drive belt tensioner being released on late 4-cylinder engine. Pry off tensioner cover and then lever tensioner in clockwise direction (as facing engine) and slip belt off pulleys.

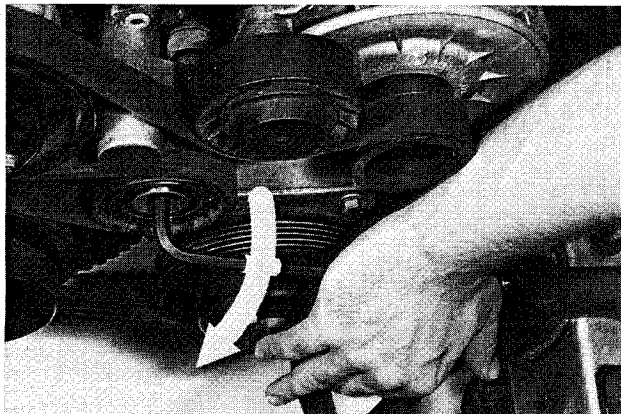


Fig. 15. Engine drive belt tensioner being released on 6-cylinder engine. Pry off tensioner cover and then lever tensioner in clockwise direction (as facing engine) and slip belt off pulleys.

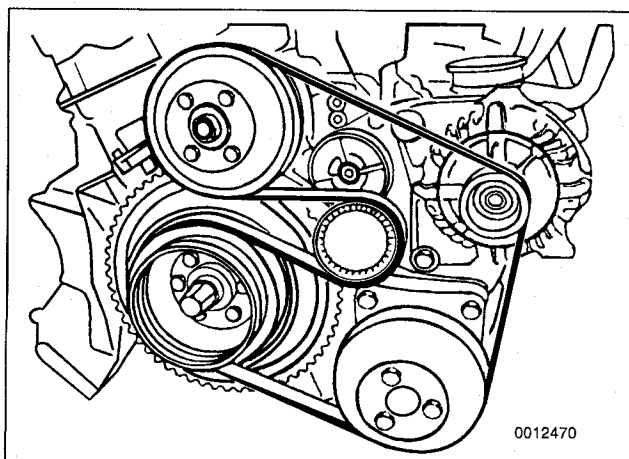


Fig. 16. Engine drive belt routing for 6-cylinder engine. A/C compressor drive belt not shown.

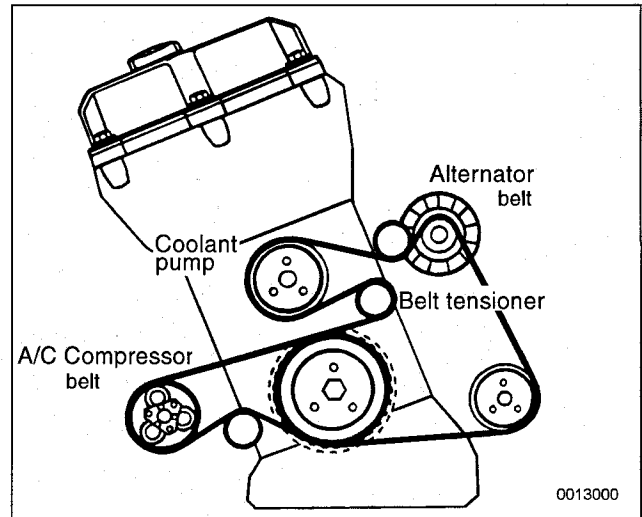


Fig. 17. Engine drive belt routing for late 4-cylinder engine with poly-ribbed drive belts.

Cooling System Service

Cooling system maintenance consists of maintaining the coolant level, inspecting hoses. Because the coolant's anti-corrosion and anti-freeze additives gradually lose their effectiveness, replacement of the coolant every two years up to 1996 models, and every three years from 1996 is recommended. As a preventive measure, replacement of the cooling system hoses every four years is also recommended.

CAUTION —

Use only BMW approved phosphate-free anti-freeze when filling the cooling system. Use of anti-freeze containing phosphates is considered to be harmful to the cooling system.

A translucent expansion tank, or overflow reservoir, provides monitoring of coolant level. Because the expansion tank is translucent, the coolant level can be checked visually without opening the system. Always check the coolant level with the engine cold. The coolant level should be at the maximum mark on the expansion tank, as shown in Fig. 18.

Hose connections should be tight and dry. Coolant seepage indicates either that the hose clamp is loose, that the hose is damaged, or that the connection is dirty or corroded. Dried coolant has a chalky appearance. Hoses should be firm and springy. Replace any hose that is cracked, that has become soft and limp, or has been contaminated by oil. See Fig. 19.

Power steering fluid, checking level

Check the power steering fluid level in the fluid reservoir. Park the car on level ground with the engine off. The level is correct if it is between the **MIN** and **MAX** marks on the dipstick. See Fig. 20. If the level is below the **MIN** mark, start the engine and add fluid to the reservoir to bring the level up. Stop the engine and recheck the level. Hand-tighten the reservoir cap.

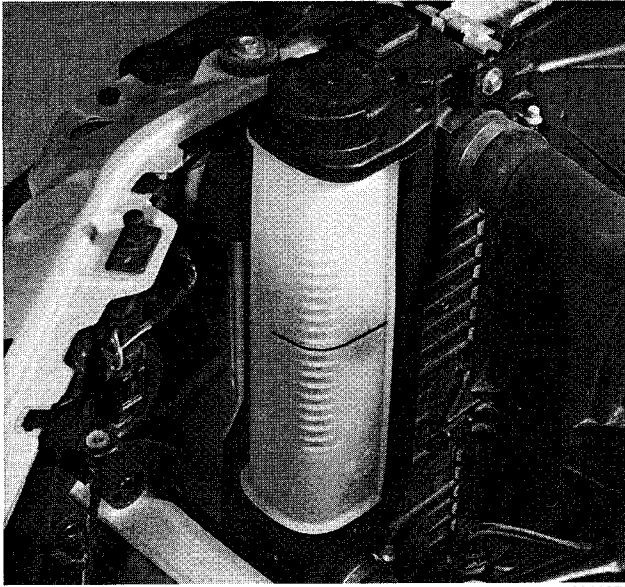


Fig. 18. Fill mark on coolant expansion tank. Coolant level should be at mark when engine is cold.

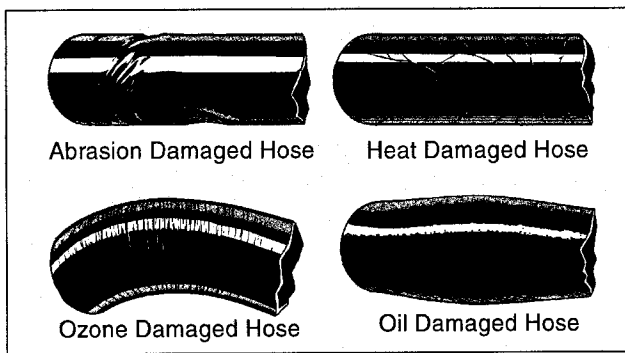


Fig. 19. Examples of damage to coolant hoses. Any of conditions shown is cause for replacement. Courtesy of Gates Rubber Company, Inc.

Specification

- Power steering fluid Dexron III® ATF

Oxygen Sensors

1996 and later engines are equipped with multiple oxygen sensors. See Fig. 21. A regulating sensor is mounted before each catalytic converter and a monitoring sensor downstream of each converter. The regulating sensor monitors engine combustion efficiency and helps to control the fuel injection system and exhaust emissions. The monitoring sensor is used by the On-board diagnostic system to monitor the function of the catalytic converter.

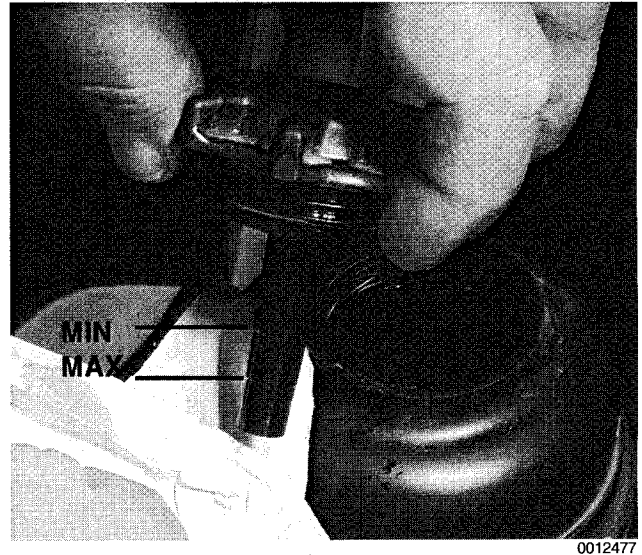


Fig. 20. Power steering fluid dipstick showing MIN and MAX marks.

OBD II enhanced emission standards require the engine control module (ECM) to monitor the oxygen content in the exhaust both before and after the catalytic converter. This allows for tighter control of the tail pipe emissions and also allows the ECM to diagnose converter problems. If the DME detects that catalytic converter or oxygen sensor efficiency has degraded past a certain pre-programmed limit, it will turn on the Check Engine light, and store a diagnostic trouble code (DTC) in the ECM.

Replacement of oxygen sensors at the specified intervals ensures that the engine and emission control system will continue to operate as designed. Extending the replacement interval may void the emission control warranty coverage. See **180 Exhaust System** for information on replacing the oxygen sensors.

Tightening Torque

- Oxygen sensor to exhaust system. 55±5 Nm (40±4 ft-lb)

NOTE —

Special sockets for replacing the oxygen sensor are available from most automotive parts stores. The socket has a groove cut down one side to allow the sensor to be installed without damaging the wire harness.

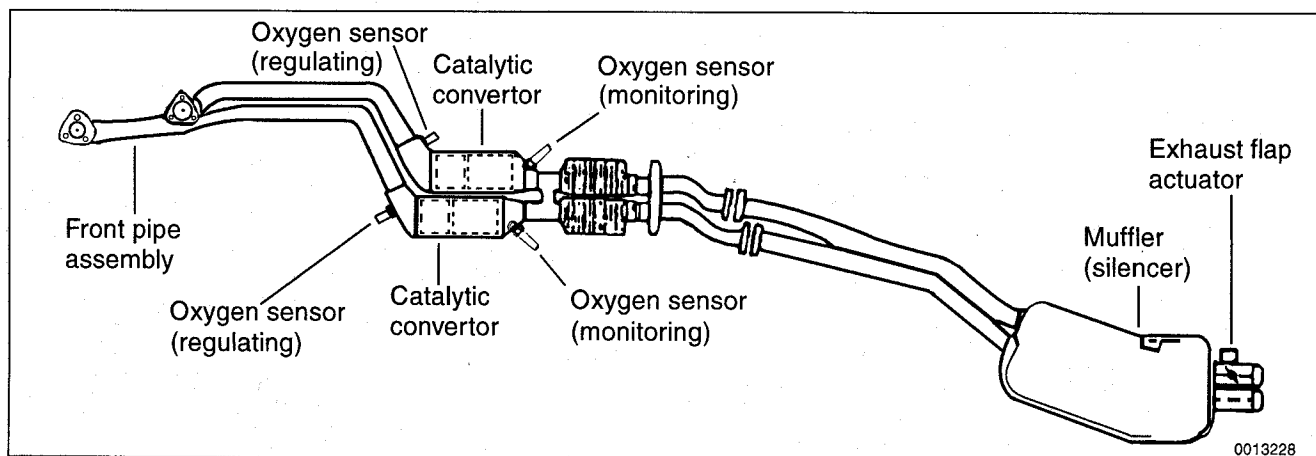


Fig. 21. Typical 1996 and later exhaust system showing oxygen sensor locations.

UNDER-CAR MAINTENANCE

Fuel filter, replacing

On early 4-cylinder cars, the fuel filter is mounted under the car on the left front bulkhead. On early 6-cylinder cars, the fuel filter is mounted to the front left motor mount in the engine compartment. See Fig. 22.

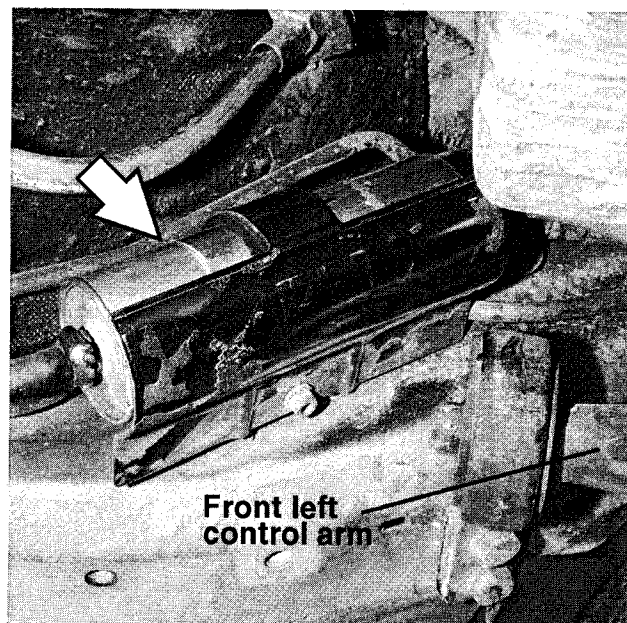


Fig. 22. Fuel filter location (arrow) on bulkhead under left side of vehicle. Filter for M42 engine shown.

On later cars, the fuel filter is located beneath the center of the car, approximately under the driver's seat. See Fig. 23. A protective cover is installed over the fuel filter, which must be removed to access the filter.

NOTE —

Drain the fuel filter from the inlet side into a container and inspect the drained fuel. Check for rust, moisture and contamination.

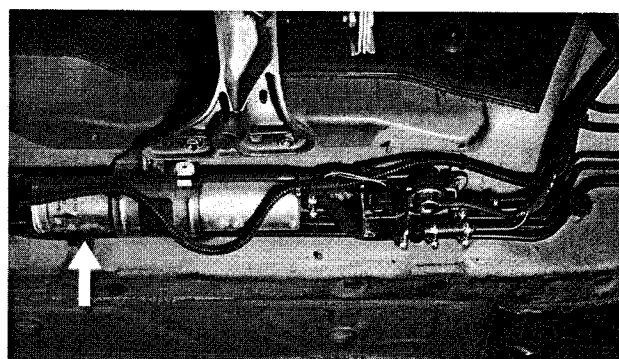


Fig. 23. Fuel filter location under center of car (arrow). Filter for M52 engine shown.

When replacing the fuel filter, disconnect the battery negative (–) cable and clamp the filter inlet and outlet hoses to lessen fuel spillage. Loosen the center clamping bracket and the two hose clamps on either end of the filter. Note the arrow or markings indicating direction of flow on the new filter. Install the filter and use new hose clamps.

WARNING —

Fuel will be expelled when the filter is removed. Do not smoke or work near heaters or other fire hazards. Keep a fire extinguisher handy.

CAUTION —

Clean thoroughly around the filter connections before removing them.

UNDER-CAR MAINTENANCE

Tires, checking inflation pressure

Correct tire pressures are important to handling and stability, fuel economy, and tire wear. Tire pressures change with temperature. Pressures should be checked often during seasonal temperature changes. Correct inflation pressures can be found on the driver's door pillar and in the owner's manual. Note that tire pressures should be higher when the car is more heavily loaded.

WARNING —

Do not inflate any tire to a higher pressure than the tire's maximum inflation pressure listed on the sidewall. Use care when adding air to warm tires. Warm tire pressures can increase as much as 4 psi (0.3 bar) over their cold pressures.

Tires, rotating

BMW does not recommend tire rotation. Due to the car's suspension design, the front tires begin to wear first at the outer shoulder and the rear tires begin to wear first at the middle of the tread or inner shoulder. Rotating the tires may adversely affect road handling and tire grip.

NOTE —

The main purpose of tire rotation is to promote even wear and maximum tire life. Tire life may be decreased slightly if the tires are not rotated.

Wheels, aligning

BMW recommends checking the front and rear alignment once a year and whenever new tires are installed. See **320 Steering and Wheel Alignment** for a more detailed discussion of alignment requirements and specifications.

Brake system, inspecting

Routine maintenance of the brake system includes maintaining the brake fluid in the reservoir, checking brake pads for wear, checking hand brake function, and inspecting the system for fluid leaks or other damage.

Check that brake hoses are correctly routed to avoid chafing or kinking. Inspect unions and brake calipers for signs of fluid leaks. Inspect rigid lines for corrosion, dents, or other damage. Inspect flexible hoses for cracking. Replace faulty hoses or lines as described in **340 Brakes**.

WARNING —

Incorrect installation or overtightening hoses, lines, and unions may cause chafing or leakage. This can lead to partial or complete brake system failure.

Brake pad/rotor wear, checking

All E36 cars are fitted with disc brakes at all four wheels. See Fig. 24. Although the brakes are equipped with a brake pad warning system, the system only monitors one wheel per axle. It is recommended that pad thickness should be checked whenever the wheels are off or brake work is being done.

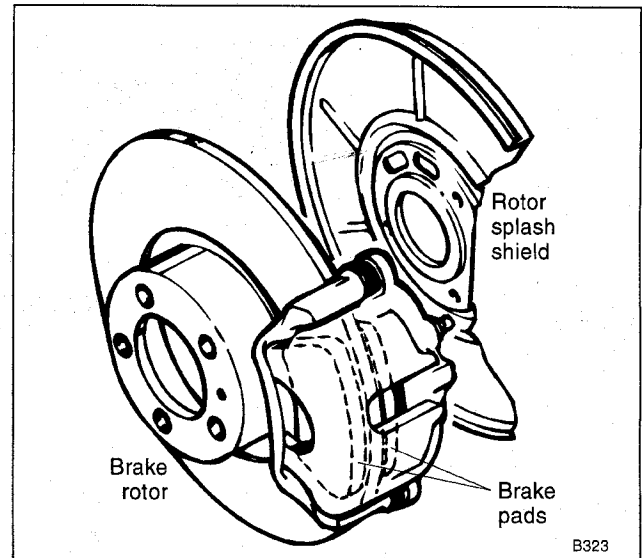


Fig. 24. Disc brake pad wear can be checked through opening in caliper.

The brake caliper should be unbolted from the suspension strut to properly inspect the brake pads and the rotors. See Fig. 25. Brake caliper removal and installation procedures are given in **340 Brakes**.

Brake Pad Lining Minimum Thickness (Dimension A)

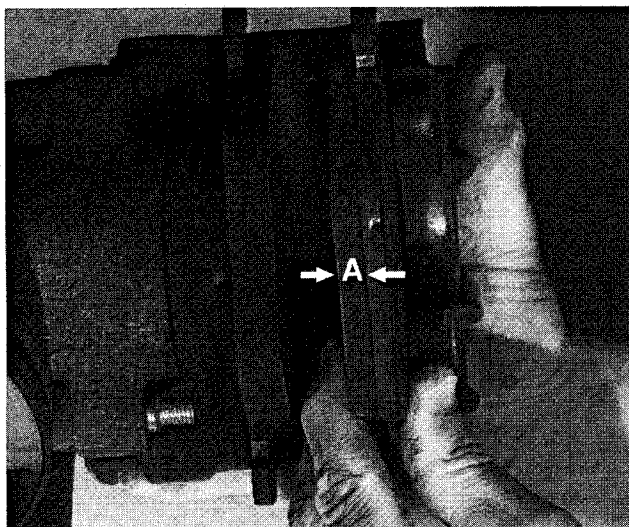
- Front and rear disc brake pads. . . . 3.0 mm (0.12 in)

Brake fluid, replacing

BMW strictly recommends replacing the brake fluid every two years. This will help protect against corrosion and the effects of moisture in the fluid. See **340 Brakes** for brake fluid flushing procedures.

Parking brake, checking

The parking brake system is independent of the main braking system and may require periodic adjustment depending on use. Adjust the parking brake if the brake lever can be pulled up more than 8 clicks. Check that the cable moves freely. A description of the parking brake and parking brake adjustment can be found in **340 Brakes**.



0011920

Fig. 25. Inspect brake pads with the caliper removed. Minimum brake pad thickness shown by dimension (A).

NOTE —

The parking brake may lose some of its effectiveness if it is not used frequently. This is due to corrosion build-up on the parking brake drum. To remove corrosion, apply the parking brake just until it begins to grip, then pull the lever up one more stop (click). Drive the car approximately 400 meters (1,300 ft.) and release the brake. To recheck the adjustment of the parking brake see 340 Brakes.

Exhaust system, inspecting

Exhaust system life varies widely according to driving habits and environmental conditions. If short-distance driving predominates, the moisture and condensation in the system will not fully dry out. This will lead to early corrosion damage and more frequent replacement.

Scheduled maintenance of the exhaust system is limited to inspection. Check for restrictions due to dents or kinks. Check for weakness or perforation due to rust. Check to see that all the hangers are in place and properly supporting the system and that the system does not strike the body. Alignment of the system and the location of the hangers are described in **180 Exhaust System**.

Manual Transmission Service

Manual transmission service consists of inspecting for leaks and checking and changing the fluid.

Evidence of transmission leaks is likely to be seen around the driveshaft mounting flange and at the bottom of the bellhousing. For more information on identifying oil leaks and their causes, see **230 Manual Transmission** and **210 Clutch**.

Manual transmission fluid, checking and filling

The manual transmission fluid level should be checked at specified intervals. Check and fill the transmission with the car on a level surface. Transmission fluid level checking and replacement procedures are covered in **230 Manual Transmission**.

Automatic Transmission Service

The automatic transmission is not equipped with a dipstick. Therefore, checking the ATF level is an involved procedure, which includes measuring and maintaining a specified ATF temperature during the checking procedure.

For more complete ATF service, including checking ATF level and ATF filter replacement procedures, see **240 Automatic Transmission**.

Front suspension and steering linkages, inspecting

Inspection of the front suspension and steering includes a check of all moving parts for wear and excessive play. Also inspect the rubber seals and boots for cracks or tears that could allow the entry of dirt, water, and other contaminants. See **310 Front Suspension**.

Rear suspension, inspecting

Final drive and rear drive axle service consists of checking and changing the gear oil, inspecting for leaks, and checking the rear drive axle rubber boots for damage.

The areas where leaks are most likely to occur are around the drive shaft and drive axle mounting flanges. For more information on identifying oil leaks and their causes, see **330 Rear Suspension**.

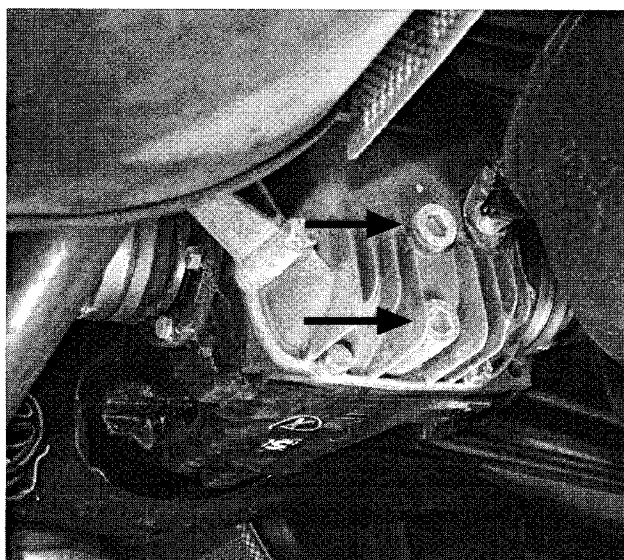
Final drive oil level, checking

Check the lubricant level with the car level. Remove the oil filler plug. The level is correct when the fluid just reaches the edge of the filler hole. Install and tighten the oil filler plug when the oil level is correct. See Fig. 26.

The final drive should be filled with a special BMW lubricant available through an authorized BMW dealer. In addition, the lubricant type varies depending on whether or not a limited-slip differential is fitted.

Tightening Torque

- Final drive filler plug to final drive housing 70 Nm (52 ft-lb)



0012474

Fig. 26. Final drive oil filler and oil drain plugs.

NOTE —

- Use a 14 mm or 17 mm allen bit socket to remove the drain plug.
- If the car is raised in the air, it should be level.

Fuel tank and fuel lines, inspecting

Inspect the fuel tank, fuel lines, and fuel system for damage or leaks. Check for fuel leaks in the engine compartment or fuel odors in the passenger compartment. Check for faulty fuel lines by bending them. If any leaks are present, fuel should be expelled. Check for any evaporative emissions hoses that may have become disconnected, checking carefully at the charcoal canister and evaporative emissions purge system. See **130 Fuel Injection** and **160 Fuel Tank and Fuel Pump** for component locations and additional information.

WARNING —

When checking for fuel leaks, the engine must be cold. A hot exhaust manifold or exhaust system could cause the fuel to ignite or explode causing serious personal injury. Ventilate the work area and clean up spilled fuel immediately.

Clutch fluid, checking

The hydraulic clutch and the brake system share the same reservoir and the same brake fluid. Clutch fluid level and brake fluid level are checked at the same time. See **340 Brakes** for more information. See **210 Clutch** for information on the clutch and the hydraulic clutch operating system.

Drive axle joint boots, inspecting

The protective boots must be closely inspected for cracks and any other damage that will allow contaminants to get into the joint. If the rubber boots fail, the water and dirt that enter the joint will quickly damage it. Replacement of the drive axle joint boots and inspection of the joints are described in **330 Rear Suspension**.

BODY AND INTERIOR MAINTENANCE

Windshield Wiper Blade Maintenance

Common problems with the windshield wipers include streaking or sheeting, water drops after wiping, and blade chatter. Streaking is usually caused when wiper blades are coated with road film or car wash wax. Clean the blades using soapy water. If cleaning the blades does not cure the problem then they should be replaced. BMW recommends replacing the wiper blades twice a year, before and after the cold season. On older cars, check the tension spring that holds the wiper to the glass. Replace the wiper arm if the springs are weak.

Drops that remain behind after wiping are caused by oil, road film, or diesel exhaust coating the windshield. Use an alcohol or ammonia solution, or a non-abrasive cleanser to clean the windshield.

Wiper blade chatter may be caused by dirty or worn blades, by a dirty windshield, or by bent or twisted wiper arms. Clean the blades and windshield as described above. Adjust the wiper arm so that there is even pressure along the blade, and so that the blade is perpendicular to the windshield at rest. Lubricate the wiper linkage with a light oil. The linkage is located under the hood on the driver's side. If the problem persists, the blades are excessively aged or worn and should be replaced. See **611 Wipers and Washers**.

Body and hinges, lubricating

The door locks and lock cylinders can be lubricated with an oil that contains graphite.

The body and door hinges, the hood latch, and the door check rods should be lubricated with SAE 30 or SAE 40 engine oil. Lubricate the seat runners with multipurpose grease. Do not apply any oil to rubber parts. If door weatherstrips are sticking, lubricate them with silicone spray or talcum powder. The hood release cable should be lubricated as well.

The use of winter lock de-icer sprays should be kept to an absolute minimum, as the alcohol in the de-icer will wash the grease out of the lock assemblies, and may cause the locks to corrode internally, or become difficult to operate.

Seat Belts

Dirt and other abrasive particles will damage seat belt webbing. If it is necessary to clean seat belts, use a mild soap solution. Bleach and other strong cleaning agents may weaken the belt webbing and should be avoided.

WARNING —

Do not clean the seat belt webbing using dry cleaning or other chemicals. Allow wet belts to dry before allowing them to retract.

The condition of the belt webbing and the function of the retractor mechanisms should be inspected. See **720 Seat Belts** for seat belt inspection information.

Exterior Washing

The longer dirt is left on the paint, the greater the risk of damaging the glossy finish, either by scratching or by the chemical effect dirt particles may have on the painted surface.

Do not wash the car in direct sunlight. If the engine hood is warm, allow it to cool. Beads of water not only leave spots when dried rapidly by the sun or heat from the engine, but also can act as small magnifying glasses and burn spots into the finish. Wash the car with a mixture of lukewarm water and a car wash product. Rinse using plenty of clear water. Wipe the body dry with a soft cloth towel or chamois to prevent water-spotting.

Waxing

For a long-lasting, protective, and glossy finish, apply a hard wax after the car has been washed and dried. Use carnauba or synthetic based products. Waxing is not needed after every washing. You can tell when waxing is required by looking at the finish when it is wet. If the water coats the paint in smooth sheets instead of forming beads that roll off, a new coat of wax is needed. Wax should not be applied to black trim pieces, rubber, or other plastic parts.

Polishing

Use paint polish only if the finish assumes a dull look after long service. Polish can be used to remove tar spots and tarnish, but afterwards a coat of wax should be applied to protect the clean finish. Do not use abrasive polish or cleaners on aluminum trim or accessories.

Washing Chassis

Periodic washing of the underside of the car, especially in winter, will help prevent accumulation of road salt and rust. The best time to wash the underside is just after the car has been driven in wet conditions. Spray the chassis with a powerful jet of water. Commercial or self-service car washes may not be best for this, as they may recycle the salt-contaminated water.

Special Cleaning

Tar spots can be removed with a bug and tar remover. Never use gasoline, kerosene, nail polish remover, or other unsuitable solvents. Insect spots also respond to tar remover. A bit of baking soda dissolved in the wash water will facilitate their removal. This method can also be used to remove spotting from tree sap.

Interior Care

Dirt spots can usually be removed with lukewarm soapy water or a dry foam cleaner. Use spot remover for grease and oil spots. Do not pour the liquid directly on the carpet or fabric, but dampen a clean cloth and rub carefully, starting at the edge of the spot and working inward. Do not use gasoline, naphtha, or other flammable substances.

Leather Upholstery and Trim

Leather upholstery and trim should be periodically cleaned using a slightly damp cotton or wool cloth. The idea is to get rid of the dirt in the creases and pores that can cause brittleness and premature aging. On heavily soiled areas, use a mild detergent (such as Woolite®) or other specially formulated leather cleaners. Use two tablespoons to one quart of cold water. Dry the trim and upholstery completely using a soft cloth. Regular use of a good quality leather conditioner will reduce drying and cracking of the leather.



BODY AND INTERIOR MAINTENANCE

Cylinder Head and Valvetrain

The aluminum cylinder head uses chain-driven double overhead camshafts and four valves per cylinder. See Fig. 1. The cylinder head employs a crossflow design for greater

1. Camshafts
2. Rocker arms
3. Hydraulic valve adjusters (HVA)
4. Valve and conical valve spring