

020 Maintenance

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GENERAL

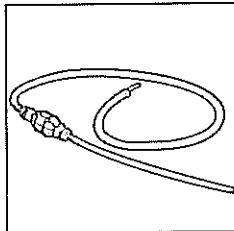
The information given in this repair group includes the routine checks and maintenance steps that are both required by BMW under the terms of the vehicle warranty protection and recommended by BMW to ensure long and reliable vehicle operation.

NOTE—

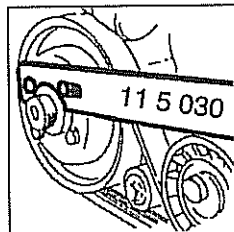
Aside from keeping your car in the best possible condition, proper maintenance plays a role in maintaining full protection under BMW's new car warranty coverage. If in doubt about the terms and conditions of your car's warranty, an authorized BMW dealer should be able to explain them to you.

Special tools

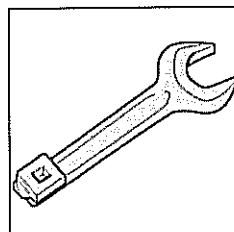
Some special tools are required for performing engine maintenance tasks. Be sure to have the necessary equipment on hand before starting any job.



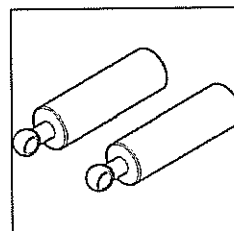
- ◀ Hand pump for manual transmission lifetime oil
(Tool No. BMW 002 080)



- ◀ Cooling fan counterhold wrench
(Tool No. BMW 11 5 030)



- ◀ Cooling fan wrench
(Tool No. BMW 11 5 040)



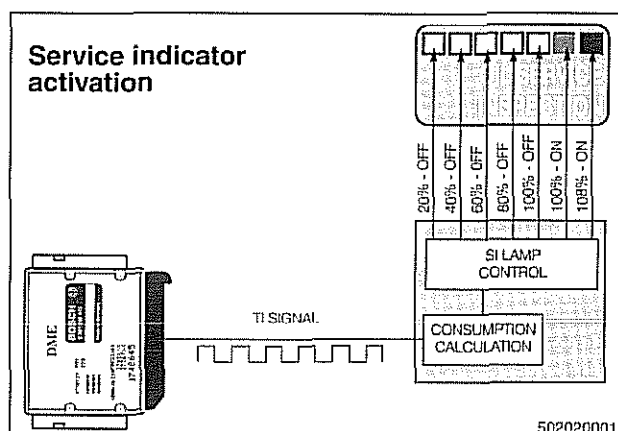
- ◀ Service position hood props
(Tool No. BMW 51 2 160)

Service Interval Indicator (SII)

The BMW Service Interval Indicator (SII) notifies the driver when oil change and other service is required. The SII displays the phrase "OIL SERVICE" or "INSPECTION" and 7 light emitting diodes (LEDs) in the instrument cluster: 5 green, one yellow and one red.

For the 1997 and later 5 Series, BMW introduced an oil change interval based on fuel consumption. The advantages of this system are:

- Fuel consumption is an accurate method of determining engine load and the need for service.
- The processing electronics are simple.
- Resetting of indicator before the scheduled time will not affect the time to the next service.



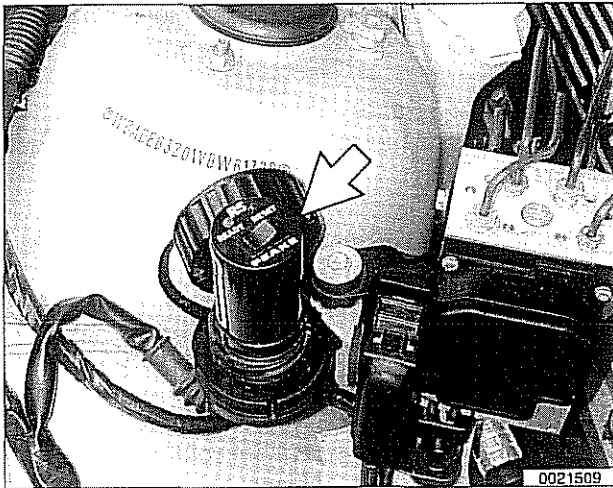
▶ The SII is programmed to measure a set volume of consumed fuel. This volume varies between models, dependent on vehicle and engine size. The SII control unit receives a signal from the engine control module (ECM) when the vehicle is in use. As 20% of the programmed fuel volume is consumed, one of the green LEDs will go out. Each successive 20% of fuel consumption will cause the next LED to go out until 100% of the measured volume has been consumed. At this point the yellow LED will come on, indicating that service is due. When 108% of the measured volume has been consumed, the red LED will illuminate, indicating that service is overdue.

Service Interval Indicator (SII), resetting

After the specified maintenance has been carried out, the SII memory should be reset.

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 15,000 miles or 12 months.



1997 to 2000 models

1997 to 2000 models are equipped with a data link connector (DLC) plug in the right side engine compartment:

- Reset SII using BMW service and scan tool (DISplus or MoD-iC, GT1) or a specialty tool from another manufacturer. Plug tool (arrow) into DLC.

CAUTION—

Follow the manufacturer's directions when resetting the SII. If the reset procedures are done incorrectly, the tool or the electronic Service Interval Indicator may be damaged.

Aftermarket reset tools that can reset all models with the DLC can be purchased from one of the following suppliers:

Specialty tool suppliers

Assenmacher Specialty Tools
6440 Odell Place
Boulder, CO 80301
303-530-2424
sales@asttool.com
<http://www.asttool.com>

Baum Tools Unlimited, Inc.
P.O. Box 5867
Sarasota, FL 34277-5867
800-848-6657
sales@baumtools.com
<http://www.baumtools.com>

Peake Research, Automotive Products Division
P.O. Box 28776
San Jose, CA 95159
408-369-0406
support@peakereasearch.com
<http://www.peakereasearch.com>

2001 and later models

On vehicles without the data link connector (DLC) in the engine compartment (2001 and later cars), the reset tool can not be used. Instead, the SII can be reset with the trip odometer reset button in the instrument cluster.

- Make sure ignition key is in OFF position.
- Press and hold trip odometer button in instrument cluster, and turn ignition key to ACCESSORY position.
- Keep button pressed for approximately 5 seconds until either of following appear in display: OIL SERVICE or INSPECTION, with RESET.
- Press button again and hold for approximately 5 seconds until RESET flashes.

- Service due is shown with RESET if the measured consumption limit has been reached and resetting is possible. If RESET is not shown, the minimum limit has not been reached and resetting is not possible.
- While display is flashing, press button briefly to reset SII.
- After display has shown new interval, the following will appear in display for approximately 2 seconds: END SIA.

NOTE —

- *The system can only be reset again after the vehicle has been driven approximately 50 to 75 miles (consumes at least 2.5 gallons of fuel). If the display shows RESET when resetting, the minimum driving distance has been fulfilled and the system can be reset again.*
- *It is possible to interrupt and end the reset procedure by changing the position of the ignition key.*

Inspection I, Inspection II

The Service Interval Indicator (SII) signals the need for maintenance and inspection. There are two sets of inspection requirements, alternating 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 I Service**. Inspection II includes most of the tasks from Inspection I with additional Inspection II tasks. A complete listing of Inspection II tasks is in **Table c. Inspection II Service**.

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 30,000 miles or 24 months. Inspection II is normally due at intervals with a maximum of 60,000 miles or 48 months.

MAINTENANCE TABLES

The intervals for most tasks listed in the maintenance tables below are determined by the SII.

NOTE—

BMW is constantly upgrading 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 year, or what intervals should be followed, remember that an authorized BMW dealer has the latest information on factory-recommended maintenance.

Except where noted, the maintenance items listed apply to all models and model years covered by this manual. The number in the "additional repair information" column refers to the repair group in this manual where additional information can be found.

Table a. Oil Service

	Tools Required	New parts required	Warm engine required	Dealer service recommended	Additional repair information
Engine compartment maintenance					
Change oil and oil filter	*	*	*		020
Reset Service Interval Indicator (SII)	*				020
Replace interior ventilation microfilter		*			020
Under car maintenance					
Check overall thickness of front and rear brake pads. If replacement is necessary: Examine brake disc surface. Clean brake pad contact points in calipers. Grease wheel centering hubs. Check thickness of parking brake linings only when replacing rear brake pads. Check operation of parking brake and adjust as necessary.	*				340
Check and adjust tire pressures, including spare	*				020

Table b. Inspection I Service

	Tools Required	New parts required	Warm engine required	Dealer service recommended	Additional repair information
Undercar maintenance					
Change oil and oil filter.	*	*	*		020
Check engine drive belt condition					020

Table b. Inspection I Service (continued)

	Tools Required	New parts required	Warm engine required	Dealer service recommended	Additional repair information
Check transmission and differential for external leaks.	*				230/240
Check CV joint boots for damage or leaks.					331
Visually check fuel tank, fuel lines, and connections for leaks.					160
Check condition, position, and mounting of exhaust system. Visually check and adjust if necessary.					180
Check power steering system for leaks. Check power steering fluid level and adjust if necessary.					320
Check steering rack/box and tie rods for tightness. Check condition of front axle joints, steering linkage, and steering shaft joints.	*				320
Check overall thickness of front and rear brake pads using BMW special tool. If replacement is necessary: Examine brake disc surface. Clean brake pad contact points in calipers. Grease wheel centering hubs. Check thickness of parking brake linings only when replacing rear brake shoes. Check operation of parking brake and adjust as necessary.	*				340
Check front control arm bushings for damage or wear.					310
Check brake system connections and lines for leaks, damage, and incorrect positioning					340
Check parking brake actuator. Adjust if necessary	*				340
Check all tire pressure (including spare) and correct if necessary. Check condition of tires (outer tread surface), tread wear pattern; in case of uneven wear, perform wheel alignment.	*				020
Inspect entire body according to terms of rust perforation limited warranty. (Must be performed at least every two years).					
Read out on-board diagnostic (OBD II) fault codes.	*				100 / 130 / OBD
Check engine coolant system / heater hose connections for leaks. Check coolant level and antifreeze protection level. Add coolant as necessary.					170

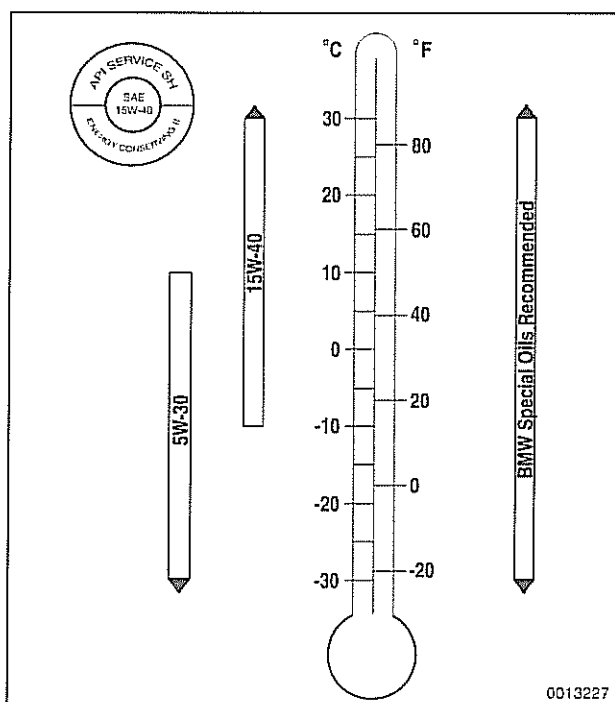
Maintenance

Table b. Inspection I Service (continued)

	Tools Required	New parts required	Warm engine required	Dealer service recommended	Additional repair information
Check windshield washer fluid level and antifreeze protection. Add washer fluid as necessary.					611
Replace ventilation microfilter. (Note: reduce replacement intervals in dusty operation conditions)		*			020
Reset Service Interval Indicator (SII).	*				020
Body/electrical					
Check battery state of charge	*				121
Check operation of: headlights, parking lights, back-up lights, license plate lights, interior lights, glove box illumination, engine compartment light, trunk light, turn signals, emergency flashers, stop lights.					630
Check operation of horn and headlight dimmer switch					630
Check wipers and windshield washer system Check aim of washer jets and adjust if necessary.					611
Check condition and function of seat belts.					720
Visually examine all airbag units for torn covers, obvious damage or attachment of decals, decorations or accessories.					721
Check central locking system and double lock.					515
Replace batteries for alarm remote control in all master keys.	*	*			515
Check operation and condition of all door, hood, and trunk latches.					410/515
Check air conditioner operation.					640
Check heater, air conditioner blower, and rear window defogger operation.					640
Check all warning/indicator lights, check control.					620
Check operation of rear view mirrors.					
Road test					
Check braking performance, steering, heating and air conditioner operation.					
Check manual transmission and clutch operation or automatic transmission operation.					

Table c. Inspection II Service

	Tools required	New parts required	Warm engine required	Dealer service recommended	Additional repair information
Engine compartment maintenance					
Replace air filter element. (Note: reduce replacement intervals in dusty operating conditions).		*			020
Brake system maintenance					
Replace brake fluid every 2 years (time interval begins from vehicle production date).	*	*		*	340
Cooling system service					
Replace coolant every 3 years (time interval begins from vehicle production date).	*	*			170
Oxygen sensor service					
Replace oxygen sensor every 160,000 km (100,000 miles).	*	*			180
Spark plug service					
Spark plugs: M52 / M62 engine: Replace every 60,000 km (48,000 miles). M52 TU / M54 / M62 TU engine: Replace every 160,000 km (100,000 miles).	*	*			020



FLUID AND LUBRICANT SPECIFICATIONS

Engine oil viscosity (SAE grade) vs. operating temperature range for the BMW engines covered in this manual.

Fluid and lubricant capacities and specifications are listed below. See **Fluids and lubricants**.

WARNING —

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

Fluids and lubricants

Table d. Engine oil with filter change

Fluid	Approximate capacity	Specification
6-cylinder models	6.5 liters (6.9 US qt)	1997 – 1998 15W-40 mineral oil BMW part no. 07 510 017 868
V-8 models	7.5 liters (7.9 US qt)	1999 and later 5W-30 synthetic oil BMW part no. 07 51 0 017 866

Table e. Manual transmission oil

Fluid	Approximate capacity	Specification
Getrag S5D 250G	1.1 liters (1.2 US quarts)	BMW part no. 83 22 9 408 942 (MTF-LT-1)
ZF S5D 320Z	1.3 liters (1.4 US quarts)	
Getrag S6S 420G	1.9 liters (2.0 US quarts)	

Table f. Automatic transmission fluid (ATF)

Lifetime fluid (drain and refill)

(Additional fluid required when installing dry torque converter)

Transmission	Approximate capacity	Specification
A5S 310Z	Total volume: 7.8 liter (8.2 US qt) Oil change volume: 3.3 liter (3.5 US qt)	BMW 83 22 9 407 807 (Exxon LT 71141) or BMW 83 22 0 024 359 (Texaco ETL 8072B or Shell LA2634)
A5S 360R A5S 390R	Total volume: 9.0 liter (9.5 US qt) Oil change volume: 4.0 liter (4.2 US qt)	
A5S 440Z	Total volume: 9.7 liter (10.2 US qt) Oil change volume: 4.0 liter (4.2 US qt)	

Table g. Differential oil

(Lifetime fluid; no fluid change required)

Differential	Approximate capacity (initial fill)	Specification
G	1.6 liter (1.7 US qt)	BMW SAF-XO synthetic oil
188 Compact	1.0 liter (1.1 US qt)	
220 / 215 Compact	1.4 liter (1.5 US qt)	

Table h. Engine Coolant

Year, model	Approximate capacity	Specification
1997: 6-cylinder V-8	9.9 liter (10.5 US qt) 11.4 liter (12.0 US qt)	50% mixture of BMW phosphate / nitrite free antifreeze and water
1998 – 2002: 6-cylinder V-8	10.5 liter (11.1 US qt) 12.0 liter (12.7 US qt)	
1997 – 2002 with latent heater: V-8	13.5 liter	

Table i. Brake fluid

Brake system fluid	BMW high performance, DOT 4
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ENGINE OIL SERVICE

With the introduction of synthetic oil and extended oil change intervals, a new oil filter with improved filter paper design was introduced. The new filter paper resists deterioration caused by high oil temperatures over an extended time.

Use BMW specified oil to top off the engine oil level between oil changes, BMW recommends the following engine oils:

Table j. Engine Oil Specification

Years	Oil description	BMW part no.
1997 – 1998	BMW HP 15W-40 mineral oil	07 510 017 868
1999 and later	BMW HP 5W-30 synthetic oil	07 51 0 017 866

NOTE—

- Castrol supplies the mineral and synthetic oil recommended by BMW.
- BMW High Performance synthetic oil may be used in all E39 models, regardless of year.
- The use of engine oil additives is not recommended when using BMW High Performance synthetic engine oil.
- BMW is constantly upgrading 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.

CAUTION—

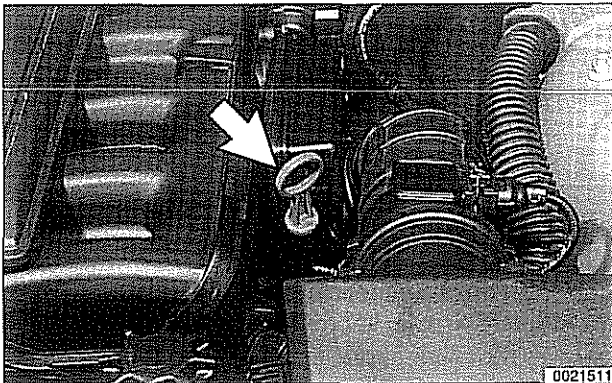
- In the case of cars that accumulate very low mileage per year, BMW recommends that the engine oil should be changed once a year at a minimum, regardless of whether mineral or synthetic based oil is used.
- In the interest of engine longevity, use half the recommended engine oil change interval.

Engine oil, checking level

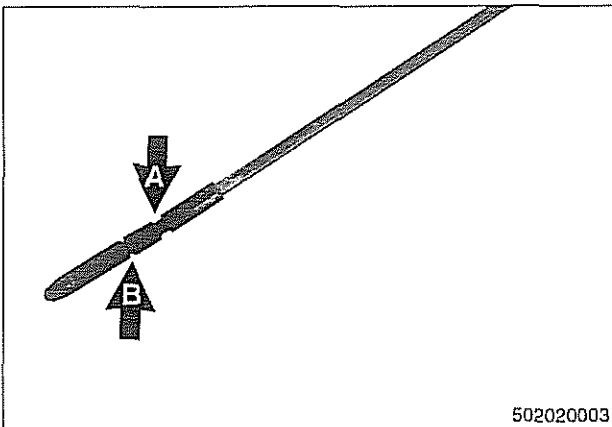
- Engine oil level is checked with a dipstick (arrow) in the engine block (6-cylinder oil dipstick shown, V-8 dipstick is similar).

- Check oil level with car on level surface, after engine has been stopped for at least a few minutes.
- Check level by pulling out dipstick and wiping it clean. Reinsert it all the way and withdraw it again.

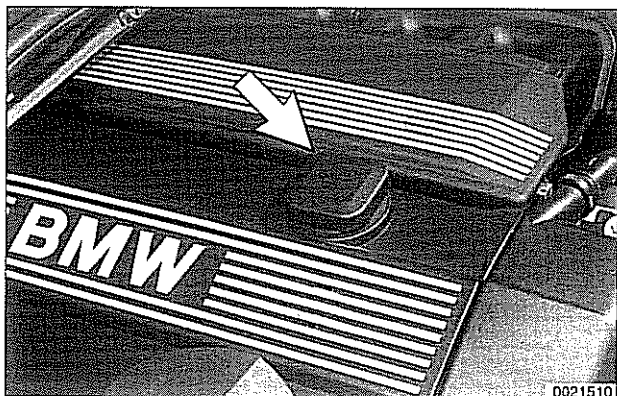
- Oil level is correct if it is between two marks (A and B) near end of dipstick.



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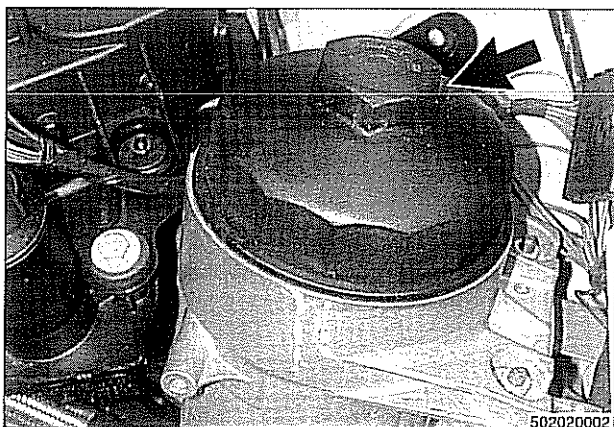
- If oil level is low, add oil by removing oil filler cap (arrow) on top of cylinder head (6-cylinder oil cap shown, V-8 is similar).
- Add only amount needed to bring oil level to upper mark on dipstick, using an oil of correct viscosity and grade.

Engine oil and filter, changing

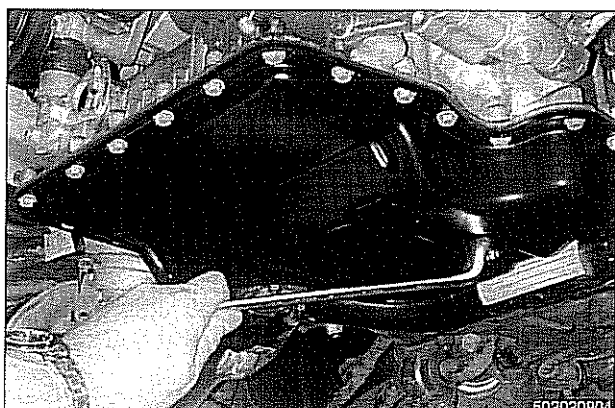
A complete oil change requires new oil, a new filter insert kit, and a new drain plug sealing washer. The tools needed, a 17 mm drain plug socket or box wrench, a 36 mm socket or wrench, and a drain pan (8 - 10 US qt. capacity), are described in **010 General**.

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.



- Run engine for a few minutes to warm engine oil. Shut engine off.
- With car on level ground, place drain pan under oil drain plug.
- Using a 36 mm socket, loosen and remove oil filter housing cover (arrow). Remove filter cartridge and discard any O-rings (V-8 engine oil filter housing shown, 6-cylinder oil filter housing is similar).

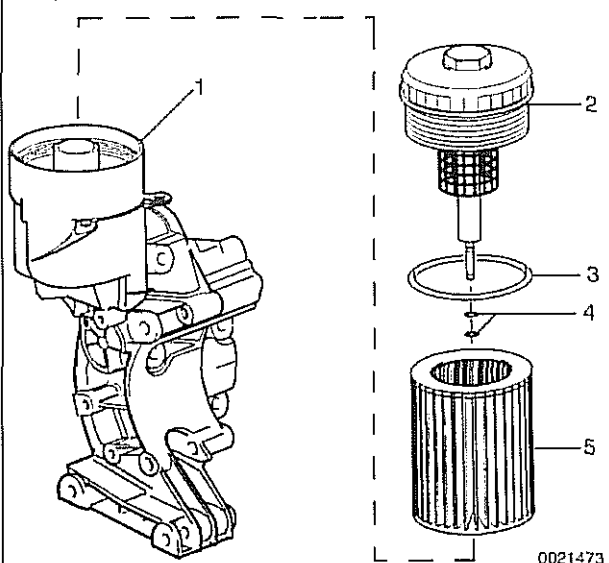


- Using a socket or box wrench, loosen drain plug at oil drain pan. Remove plug by hand and let oil drain into pan (V-8 engine oil drain plug shown, 6-cylinder drain plug is similar).

WARNING —

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

6-cylinder oil filter assembly



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

Tightening torque

Engine oil drain plug to oil pan	25 Nm (18 ft-lb)
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◀ Working at oil filter housing (1):

- Lubricate and install new oil filter O-rings (3, 4).
- Install a new filter cartridge (5).
- Install and tighten housing cover (2).
- 6-cylinder oil filter assembly shown, V-8 is similar.

Tightening torque

Cover to oil filter housing	25 Nm (18 ft-lb)
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- Refill crankcase with oil. Approximate oil capacity is listed in **Table d. Engine oil with filter change**. Use dipstick to check correct oil level.
- Start engine and check that oil pressure warning light immediately goes out.
- 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 re-check oil level.

ENGINE COMPARTMENT MAINTENANCE

The section describes other routine maintenance done in the engine compartment. Information on engine oil service is given earlier in this group.

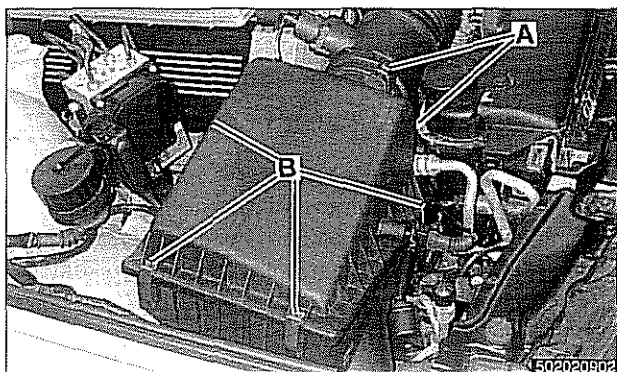
For these procedures, it is not necessary for the car to be raised and supported off the ground.

Accelerator and linkage

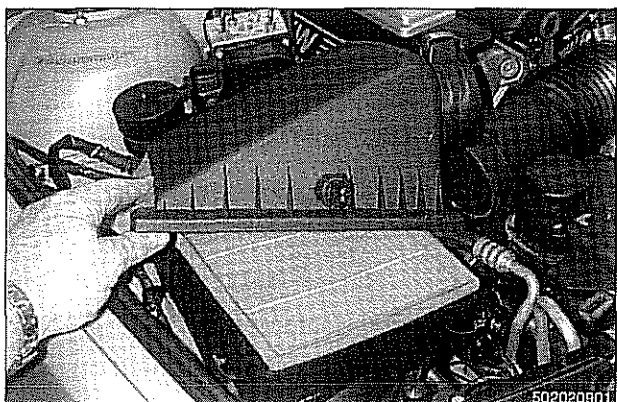
The accelerator and linkage at the throttle housing should be lubricated periodically. Use a general purpose oil on the joints and bearings of the linkage. Use a multipurpose grease on the bearing points of the throttle plate.

Air filter, replacing

The specified replacement 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.



- Release mass air flow sensor clips (A).
- Release upper air filter housing clips (B).



- Lift air filter upper housing, and remove filter element.

NOTE —

V-8 engine air filter assembly shown in illustration. 6-cylinder air filter assembly is similar but located at the left front of the engine compartment.

- On installation, install O-ring for mass air flow sensor into retaining clips in air filter upper housing.
- Replace air filter and upper air filter housing, and attach upper air filter housing clips.

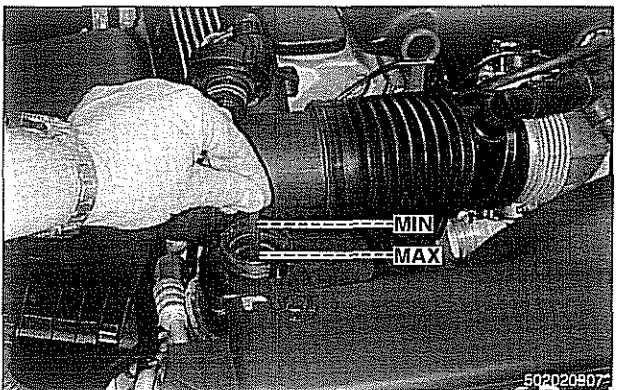
Cooling system, checking

Antifreeze raises the boiling point and lowers the freezing point of the coolant. BMW recommends engine coolant that is a 50 / 50 mixture of distilled water and ethylene glycol-based antifreeze.

Routine cooling system maintenance consists of maintaining the coolant level and inspecting hoses. Because the coolant's anticorrosion and antifreeze additives gradually lose their effectiveness, replacement of the coolant every three years is recommended.

CAUTION —

Use only BMW approved phosphate-free antifreeze when filling the cooling system. Use of antifreeze containing phosphates is harmful to the cooling system.

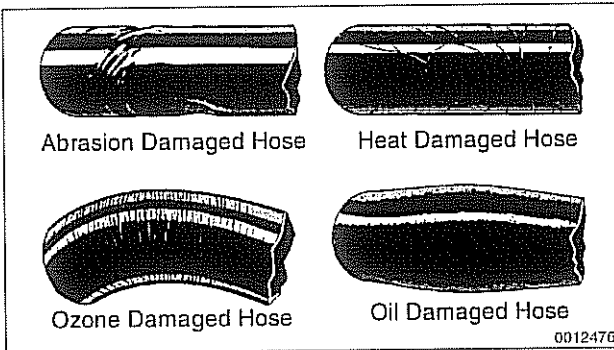


- Float in radiator tank indicates coolant level. Inspect while coolant is cold.
- When upper mark on float is level with top of filler neck, coolant is at minimum allowable level.
- When lower mark on float is level with top of filler neck, coolant is at maximum level.

Hose connections should be tight and dry. Coolant seepage at clamped connection indicates either that hose clamp is

loose, hose is damaged, or connection is dirty or corroded. Dried coolant has a chalky appearance. Hoses should be firm and springy. Replace any hose that is cracked, has become soft and limp, or has been contaminated by oil.

As a preventive measure, replacement of the cooling system hoses every four years is recommended. The illustration shows examples of damage to coolant hoses. Any of these conditions is cause for replacement (illustration courtesy of Gates Rubber Company, Inc.).



Engine drive belt, replacing

Drive belts and pulleys transfer power from the engine crankshaft to various accessories. E39 models use two polyribbed (serpentine) belts:

- The outer belt turns the A/C compressor.
- The inner, longer belt turns the alternator (generator), coolant pump and power steering pump.

Inspect drive belts with the engine off. If the belt shows signs of wear, cracking, glazing, or missing sections, it should be replaced immediately. To reduce the chance of belt failure while driving, replacement of the belts every four years is recommended.

WARNING—

Observe care when replacing belts. Personal injury could result if a tensioner springs back into position uncontrolled.

CAUTION—

Mark drive belt rotation direction if removing and reusing an old belt.

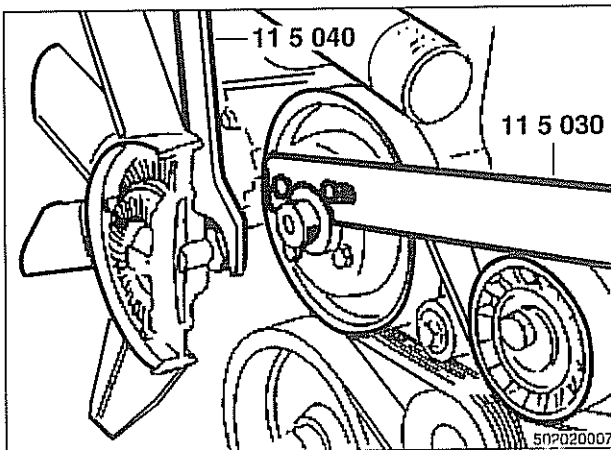
NOTE—

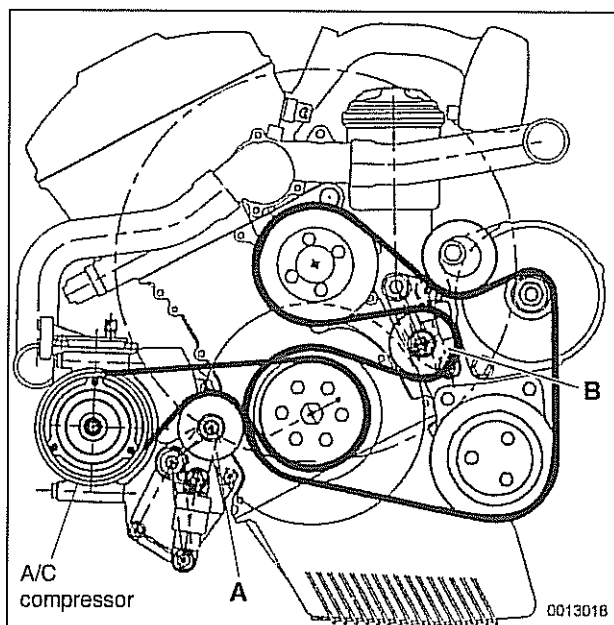
When belts are replaced with new ones, store the old set in the trunk for emergency use.

All models, use BMW special tools 11 5 030 and 11 5 040 to loosen and remove cooling fan and clutch from coolant pump.

NOTE—

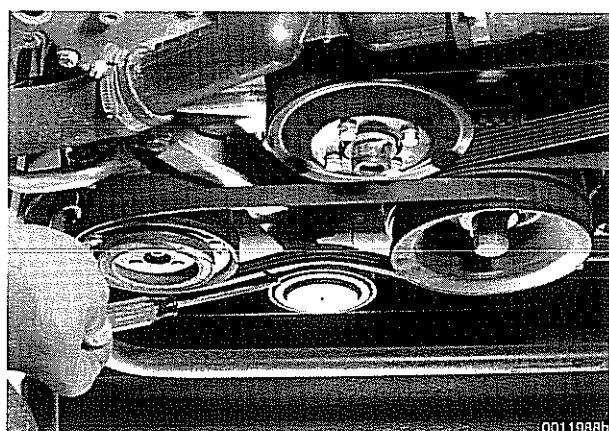
- 32 mm cooling fan nut has left-hand threads.
- If necessary, remove fan cowl from radiator.



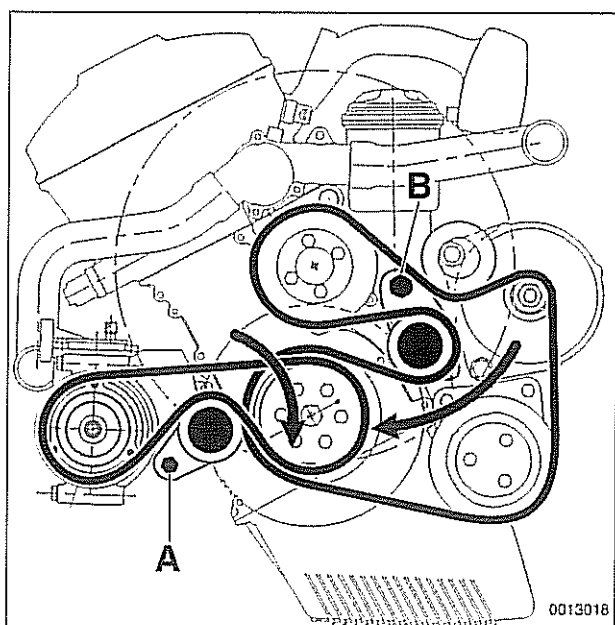


6-cylinder engine with hydraulic belt tensioners.

- Use long-handled wrench to turn A/C belt tensioner (A) clockwise. Remove A/C belt.
- Similarly, turn main engine drive belt tensioner (B) clockwise and remove belt.

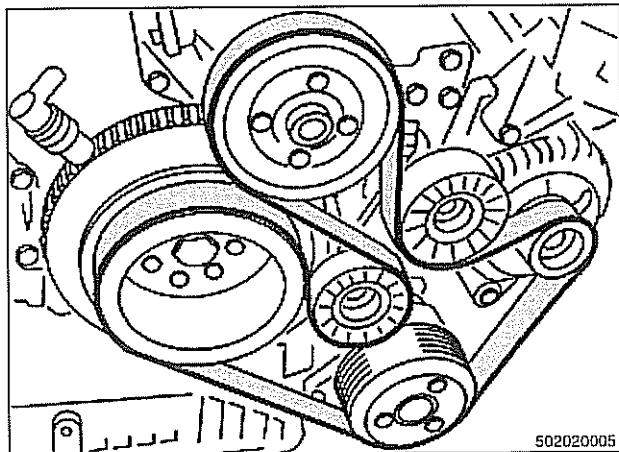


Some models have a dust cover over belt tensioner release lug, which must be pried off prior to removing belt.



6-cylinder engine with spring-loaded belt tensioners.

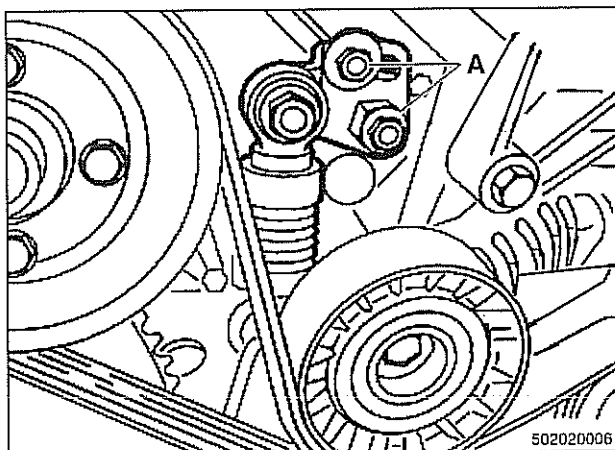
- Use long-handled wrench to turn A/C belt tensioner release lug (A) clockwise (against spring tension). Remove A/C belt.
- Similarly, turn main engine drive belt tensioner lug (B) clockwise and remove belt.



◀ V-8 engine drive belt diagram (A/C belt not shown).

NOTE—

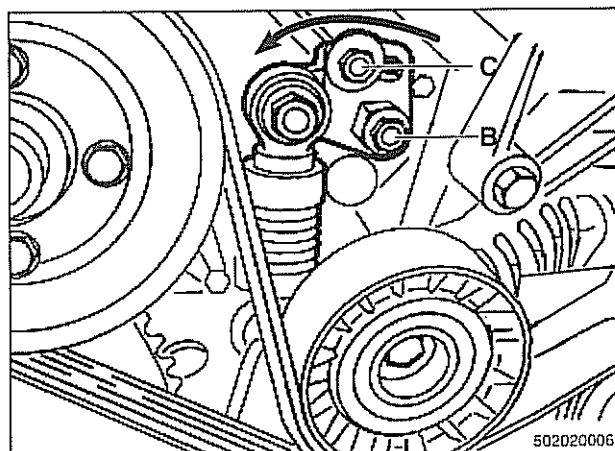
Two types of belt tensioners are used on the V-8 engines. The tensioner shown in this procedure is for cars built up to 8/97. The later style tensioner is similar.



◀ V-8 engine tensioner.

- Loosen fasteners(A) to relieve belt tension.

— Remove drive belt.

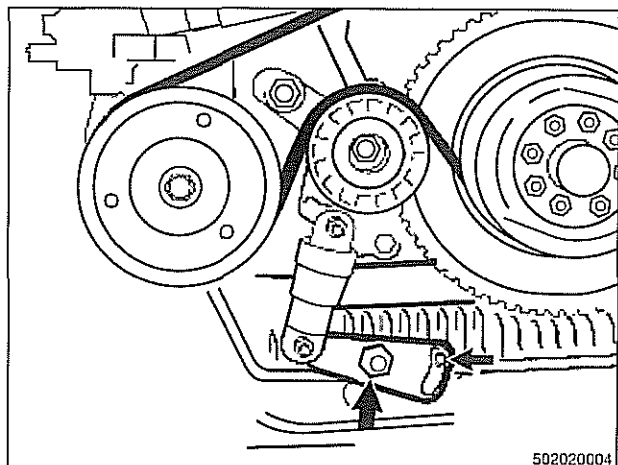


◀ When reinstalling belt, check that it is correctly positioned on belt pulleys.

- With bolts (B and C) finger tight, pretension adjuster by turning hex counterclockwise (arrow) to stop.
- Tighten mounting bolts.

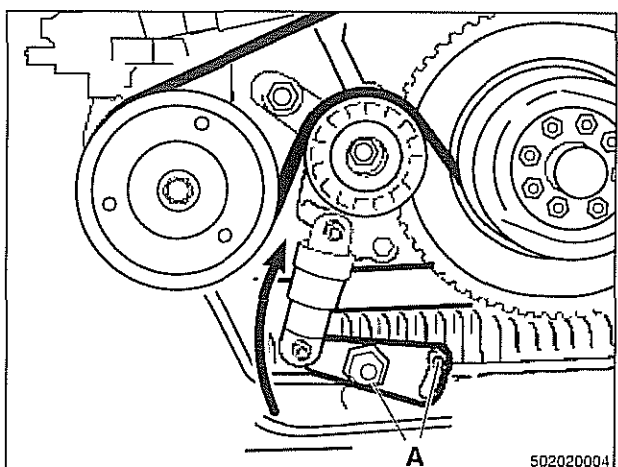
NOTE—

On 8/97 and later tensioner, turn hex on tensioner plate to align lower plate mounting bolt.



Remove A/C compressor belt:

- Loosen tensioner mounting fasteners (**arrows**).
- Swing tensioner down to remove belt.



To reinstall compressor belt:

- Route belt over pulleys.
- Pretension belt by turning adjuster clockwise (**arrow**) to stop.
- Tighten tensioner mounting bolts (**A**).

Tightening torques

Fan clutch to coolant pump (left- hand thread)	
with BMW tool 11 5 040	30 Nm (22 ft-lb)
without BMW tool 11 5 040	40 Nm (29 ft-lb)
Tensioner to engine block	
8.8 grade	22 Nm (16 ft-lb)
10.9 grade (liquid-cooled alternator)	30 Nm (22 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 not adjustable. See **130 Fuel Injection** for more information.

Catalytic converter and oxygen sensors

OBD II enhanced emission standards require the engine control module (ECM) to monitor the oxygen content in the exhaust with oxygen sensors placed before and after the catalytic converter. This allows for tighter control of tail pipe emissions and also allows the ECM to diagnose converter problems. If the ECM detects that catalytic converter or oxygen sensor efficiency has degraded past a certain preprogrammed limit, it will turn on the malfunction indicator light (MIL), and store a diagnostic trouble code (DTC) in the ECM. See **OBD On-Board Diagnostics** for more information on OBD II systems.

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 manifold	50 Nm (37 ft-lb)
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NOTE —

A special socket for replacing the oxygen sensor is 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.

Power steering fluid, checking level

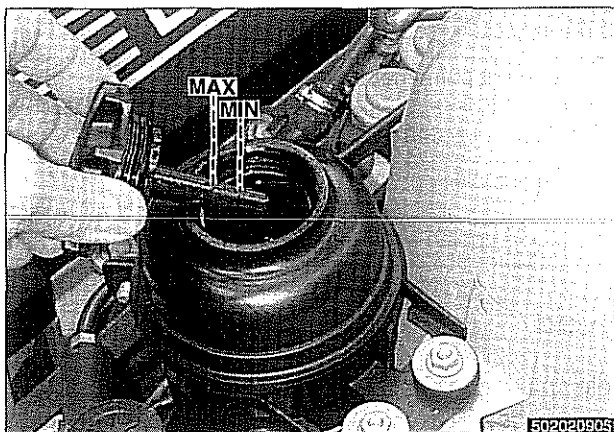
The power steering system is permanently filled and does not have a drain. Routinely adding ATF is not required unless the system is leaking.

◀ To check power steering fluid level in fluid reservoir:

- Park car on level ground with engine off.
- Level is correct if it is between **MIN** and **MAX** marks on dipstick.
- If level is below **MIN** mark, add fluid to reservoir to bring level up.
- Hand-tighten reservoir cap.

Power steering fluid

Dexron III® ATF or equivalent



Spark plugs

E39 models through model year 1998 were equipped with spark plugs with two electrodes. These are gapped to 0.7 mm (0.028 in) by the manufacturer and are not adjustable.

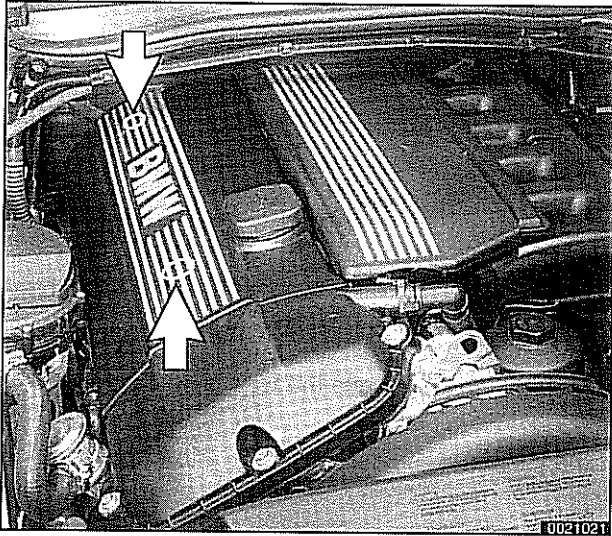
Starting with 1999 models, long life spark plugs with 3 or four electrodes were used. These can be retroactively fitted to earlier models. The recommended spark plug replacement interval for these is 100,000 miles. The electrode gap in these spark plugs is not adjustable.

Spark plug applications

M52	Bosch F8LDCR
M52 TU, M54	Bosch FGR7DQP or NGK BKR6EQUP
M62 to 7/97	Bosch F7LDCR or NGK BKR6EK
M62 from 7/97	Bosch F9LDCR
M62 TU	Bosch FGR7DQP or NGK BKR6EQUP

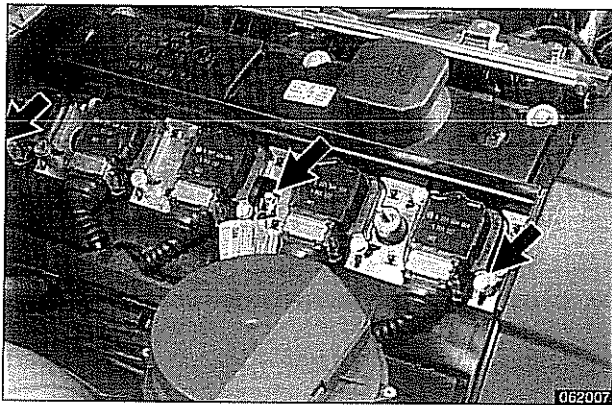
Spark plugs, replacing

E39 engines use a coil-over-spark plug configuration, with one ignition coil above each spark plug. Spark plugs should be removed only after the engine has cooled.



➤ Remove engine cover(s) over ignition coils:

- Remove acoustic cover over fuel injectors / intake manifold.
- 6-cylinder engine: Remove oil filler cap.
- Remove plastic trim covers (**arrows**).
- Remove cover hold-down bolts. Remove coil cover(s)
- 6-cylinder engine: Temporarily reinstall oil filler cap to keep out contaminants.



➤ Remove ignition coil grounding harnesses (**arrows**). 6-cylinder coils shown, V-8 engine is similar.



➤ Remove ignition coils:

- Pull up on spring clips to disconnect ignition coil harness connectors.
- Remove coil mounting bolts. Pull coils up and off spark plugs.

— Remove spark plugs.

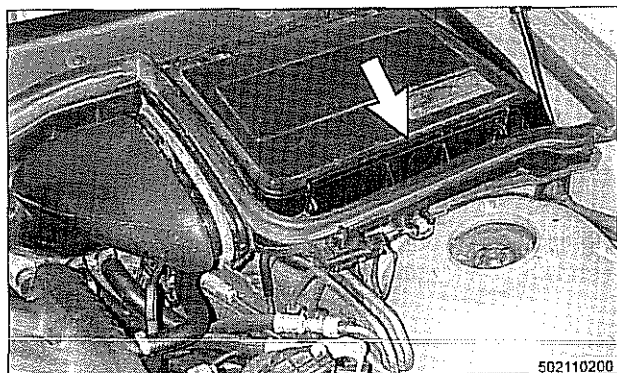
- Installation is reverse of removal, bearing in mind the following:
 - Lightly lubricate new spark plug threads with copper-based anti-seize compound.
 - Thread plugs into cylinder head by hand to prevent cross-threading.
 - Be sure to reinstall and tighten coil grounds.

Tightening torque

Spark plug to cylinder head	25 Nm (18 ft-lb)
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Interior ventilation microfilter, replacing

Two interior ventilation microfilters are used, one on each side of the engine compartment at the fire wall.



- To replace the microfilter, unclip the wire fastener and remove the cover.
 - Lift out the filter, and replace. Left side shown; right is similar.
 - Replace cover and clip wire fastener to retain cover.

OTHER MECHANICAL MAINTENANCE

Battery, checking, cleaning, and replacing

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.

Battery cables should be tight. The terminals, cable clamps and 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:
 - Disconnect battery cables. Disconnect negative (-) cable first.
 - Remove battery from trunk.
 - Clean terminal posts and cable clamps with a wire brush.
 - Clean main chassis ground terminal next to battery. Corrosion can be washed away with a baking soda and water solution that will neutralize acid.
 - Reinstall battery and reconnect cable clamps, positive (+) cable first.
 - Lightly coat outside of terminals, hold down screws, and clamps with petroleum jelly, grease, or a commercial battery terminal corrosion inhibitor.

WARNING—

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.

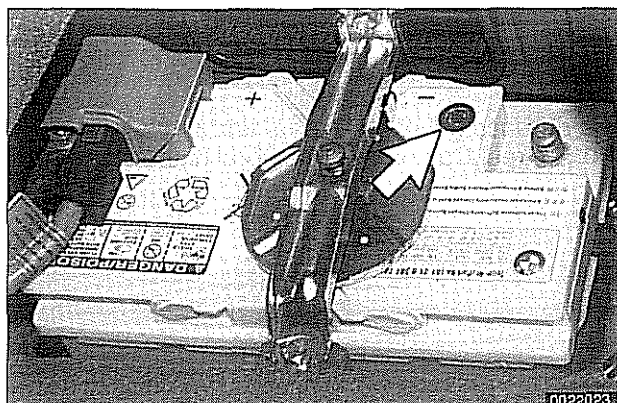
CAUTION—

Prior to disconnecting the battery, read the battery disconnection cautions given in 001 General Cautions and Warnings.

NOTE—

The original equipment battery in E39 models is maintenance free. The original electrolyte will normally last the entire service life of the battery under moderate climate conditions.

Battery electrolyte should be maintained at the correct level just above the battery plates and their separators. The correct level is approximately 5 mm ($\frac{1}{4}$ 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.



- ◀ The original equipment BMW battery is equipped with a built-in hydrometer "magic eye" (arrow). Battery condition is determined by the color of the eye:

- Green: Adequate charge
- Black: Inadequate charge, recharge
- Yellow: Defective battery, replace

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 condi-

tions. In general, replacement batteries should always be rated equal or higher than the original battery.

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.

CAUTION—

*Prior to disconnecting the battery, read the battery disconnection cautions given in **001 General Cautions and Warnings**.*

NOTE—

- Always disconnect the negative (–) cable first, and connect it last. While changing the battery, clean away any corrosion in or around the battery tray.
- More battery and charging system information is in **121 Battery, Alternator, Starter**.

Brake fluid, replacing

Brake fluid absorbs moisture easily, and moisture in the fluid affects brake performance and reliability. This is why BMW strictly recommends replacing the brake fluid 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.

NOTE—

See **340 Brakes** for brake fluid flushing procedures.

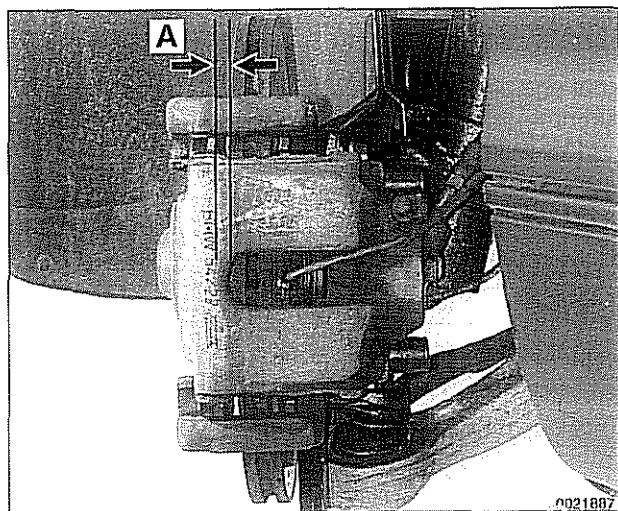
Brake pad / rotor wear, checking

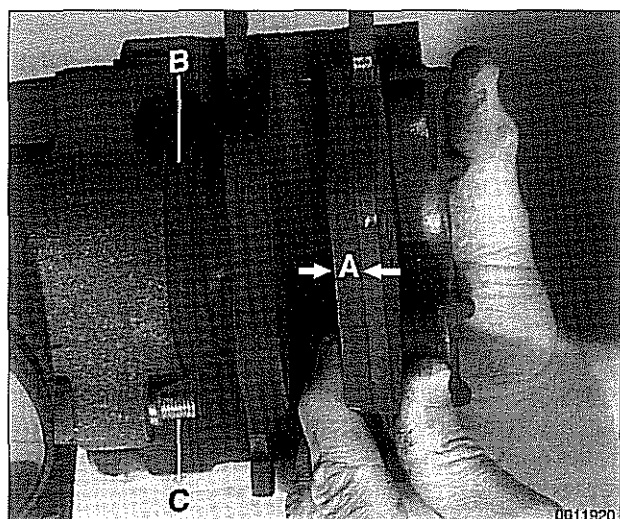
Disc brakes are fitted at all four wheels. Although the brakes are equipped with a brake pad warning system, the system only monitors one wheel per axle. Pad thickness should be checked whenever wheels are off or brake work is being done.



Disc brake pad wear can be checked through opening in caliper:

- Measure distance (A) of brake pad “ear” to brake rotor. See **340 Brakes**. Compare to specification below.





◀ Unbolt caliper from steering arm to properly inspect:

- Brake pad thickness (A)
- Brake rotor
- Condition of caliper seal (B)
- Condition of caliper slider bolts (C)

NOTE —

Brake caliper removal and installation procedures are given in 340 Brakes.

Brake pad lining minimum thickness

Dimension A	3.0 mm (0.12 in)
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Brake system, inspecting

Routine maintenance of the brake system includes maintaining the brake fluid in the reservoir, checking brake pads for wear, checking parking 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.

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.

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**.

Clutch fluid, checking

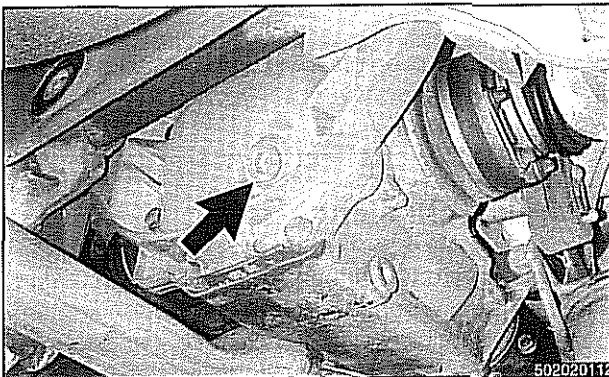
In cars equipped with manual transmission and clutch, the hydraulic clutch and the brake system share the same reservoir and the same brake fluid. Clutch fluid level and brake fluid level are checked at the same time.

NOTE —

- See **340 Brakes** for more information.
- See **210 Clutch** for information on the clutch and the hydraulic clutch operating system.

Differential oil level, checking

The E39 differential is filled with lifetime oil that ordinarily does not need to be changed. BMW recommends using only a specially formulated synthetic gear oil (SAF-XO) 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.



◀ Check rear differential oil level at filler plug (arrow).

- Check lubricant level with car on a level surface:
 - Level is correct when fluid just reaches edge of filler hole.
 - If necessary, top up fluid.
 - Replace filler plug sealing ring.
 - Install and tighten oil filler plug when oil level is correct.

NOTE —

- Use either a 14 mm or 17 mm Allen socket to remove the drain plug.
- If the car is raised in the air, it should be level when checking or filling final drive fluid level.

Tightening torque

Filler plug to final drive housing	70 Nm (52 ft-lb)
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Drive axle joint (CV joint) boots, inspecting

CV joint 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.

NOTE—

Replacement of the CV joint boots and inspection of the joints are described in 331 Final Drive.

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 to see that all the hangers (arrow) are in place and properly supporting the system and that the system does not strike the body.
- Check for restrictions due to dents or kinks.
- Check for weakness or perforation due to rust.

NOTE—

Alignment of the system and the location of the hangers are described in 180 Exhaust System.



Fuel filter, replacing

The fuel filter is located beneath the center of the car, approximately under the driver's seat. A protective cover must be removed to access the filter.



Fuel filter for M62 engine (arrow)

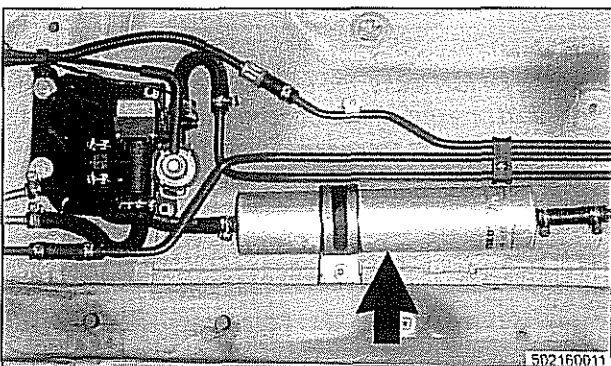
- Disconnect battery negative (–) cable.

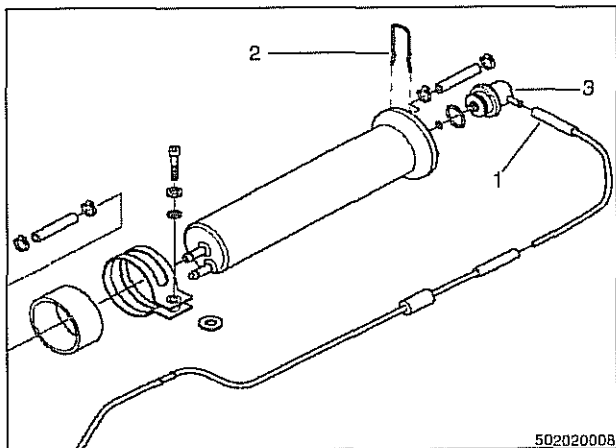
CAUTION—

Disconnecting the battery cables may erase fault codes stored in engine control module memory.

WARNING—

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





- When replacing fuel filter:
 - Use appropriate hose clamping device to clamp off filter inlet and outlet hoses to lessen fuel spillage.
 - Loosen center clamping bracket and hose clamps on either end of filter.
 - Note arrow or markings indicating direction of flow on new filter.
 - Install new filter using new hose clamps.
- Drain fuel filter from inlet side into a container and inspect drained fuel. Check for rust, moisture and contamination.

◀ If fuel filter is equipped with fuel pressure regulator:

- Remove vacuum hose (1).
- Pull out locking clip (2).
- Remove fuel pressure regulator (3).
- Install pressure regulator in new filter.

CAUTION—

- Clean thoroughly around the filter connections before removing them.
- After assembly, check filter connections carefully for leaks before installing cover.

NOTE—

Additional information about the fuel filter assembly is in **160 Fuel Tank and Fuel Pump**.

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 any evaporative emissions hoses that may have become disconnected, checking carefully at 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.

Suspension, front, inspecting

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

Suspension, rear, inspecting

Differential and rear drive axle service consists of checking and changing the gear oil, inspecting for leaks, and checking the drive axle CV joint 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** and **331 Final Drive**.

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 pressure higher 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.

Transmission service, automatic

The automatic transmissions installed in E39 models are filled with special automatic transmission fluid. The transmission lubricant type can be found on the "type-plate" on the side of the transmission. The recommended lubricants are listed earlier in this repair group. See **Fluids and lubricants**. If in doubt, consult an authorized BMW dealer for alternate

fluid use and the most-up-to-date information regarding transmission operating fluids.

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 information, including checking ATF level and ATF filter replacement procedures, see **240 Automatic Transmission**.

Transmission service, manual

Manual transmission service consists of inspecting for leaks and checking the fluid. Evidence of transmission leaks is likely to be seen around the driveshaft mounting flange and at the bottom of the bellhousing.

NOTE —

*For more information on identifying oil leaks and their causes, see **230 Manual Transmission** and **210 Clutch**.*

Transmission fluid, checking and filling (manual transmission)

The manual transmission installed in the E39 models is filled with a special lifetime fluid (MTF-LT-1). This oil ordinarily does not need to be changed.

- ◀ Check manual transmission oil level at transmission filler plug (A). Make sure car is on level surface.

NOTE —

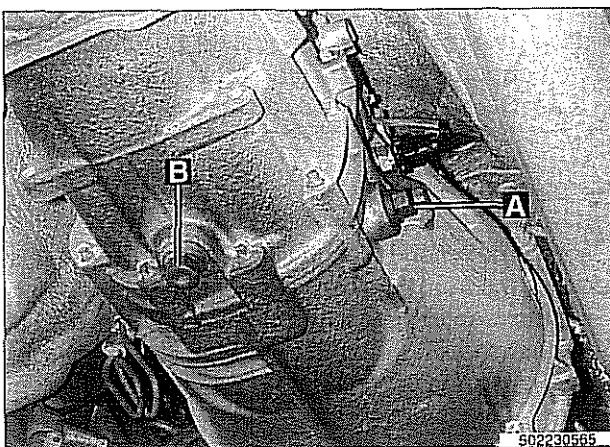
*Transmission fluid level checking and replacement procedures are covered in **230 Manual Transmission**.*

Wheels, aligning

BMW recommends checking the front and rear alignment once a year and whenever new tires are installed.

NOTE —

*See **320 Steering and Wheel Alignment** for a more detailed discussion of alignment requirements and specifications.*



BODY AND INTERIOR MAINTENANCE

Body and hinges, lubricating

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

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

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

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.

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. 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.

Polishing

Use paint polish only if the finish assumes a dull look after long service. Polish can be used to remove tar spots and tar-nish, 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.

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.

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 tree sap spots.

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.

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 look-

ing 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.

Windshield wiper blade maintenance

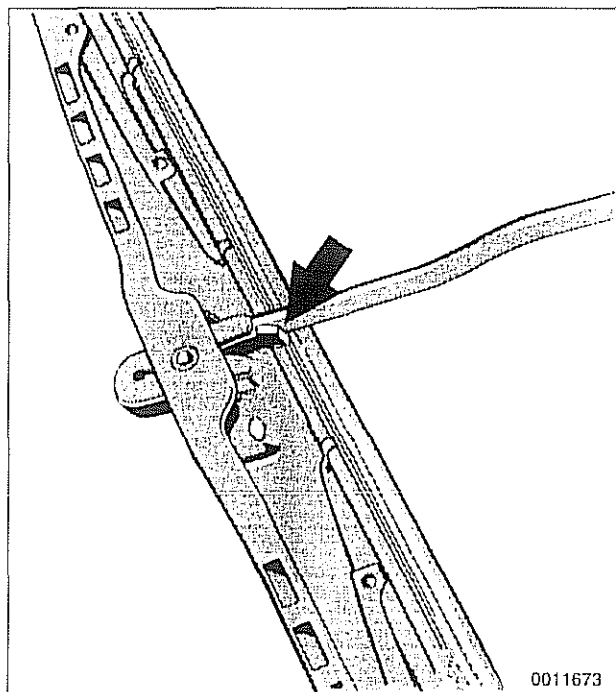
Common problems with the windshield wipers include streaking or sheeting, water drops after wiping, and blade chatter. Streaking is usually caused when wiper blades are coated with road film or car wash wax. Clean the blades using soapy water. If cleaning the blades does not cure the problem, they should be replaced. BMW recommends replacing the wiper blades twice a year, before and after the cold season.

➤ To replace wiper blade, depress retaining tab (arrow) and slide blade out of arm.

- Check tension spring that forces wiper against glass. Replace wiper arm if spring tension is 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 nonabrasive 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** for more information.



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