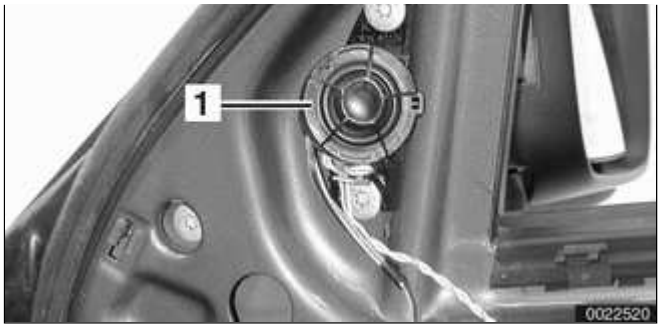


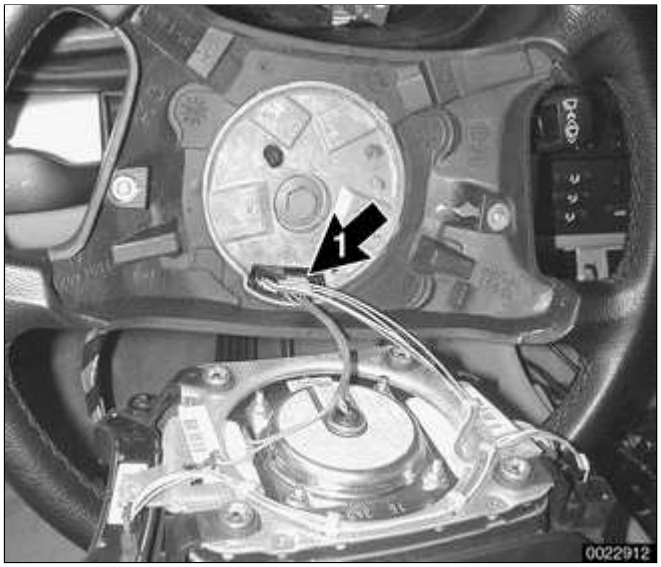


Fig. 34 Underneath horn pad at steering wheel

1 - Airbag connector

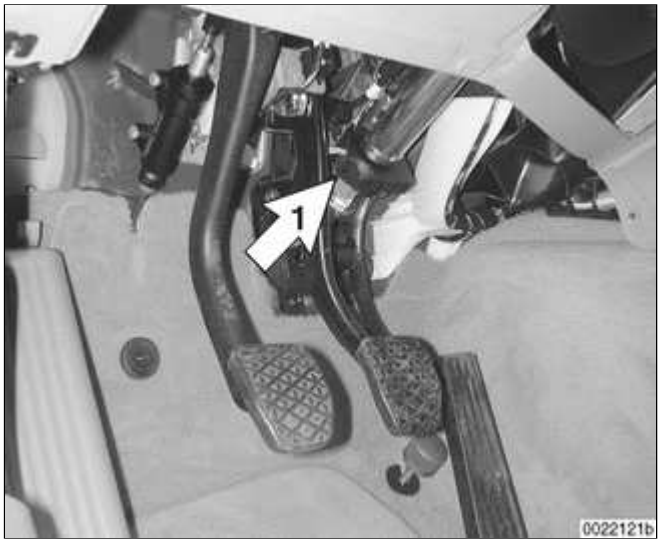


Fig. 35 Left side of steering column, below dashboard

1 - Steering angle sensor

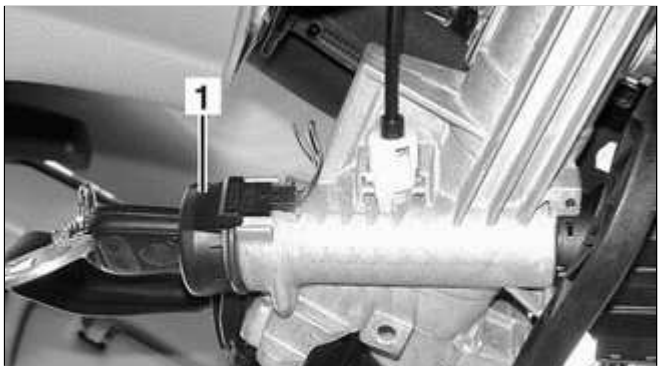


Fig. 36 At ignition switch

1 - EWS (electronic immobilizer) ring antenna

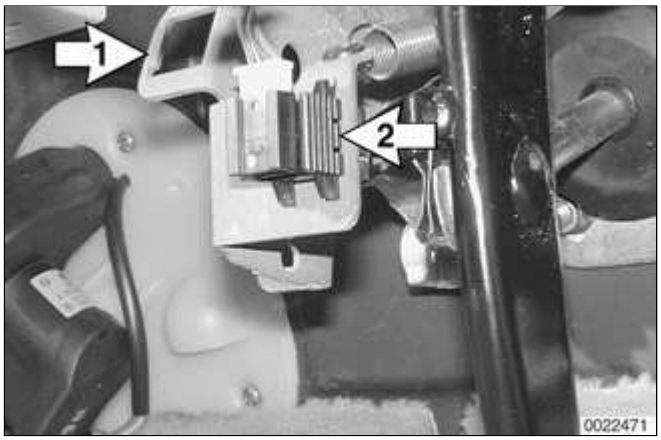


Fig. 37 At pedal cluster

1 - Cruise control cut-off switch (if equipped)

2 - Brake light switch

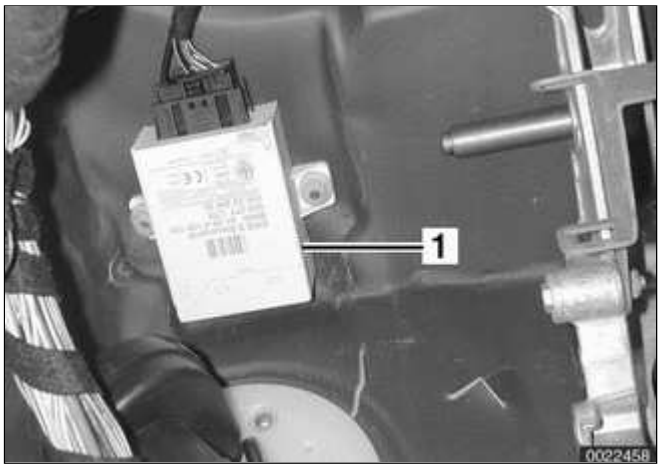


Fig. 38 Above pedal cluster

1 - EWS control module

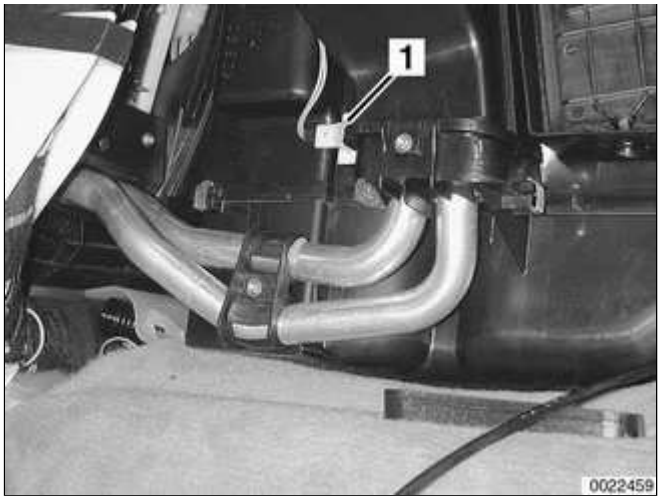


Fig. 39 Left side IHKA housing, below instrument cluster

1 - A/C evaporator temperature sensor

Fig. 40 Right side IHKA housing, below glove compartment

1 - Blower motor resistor pack

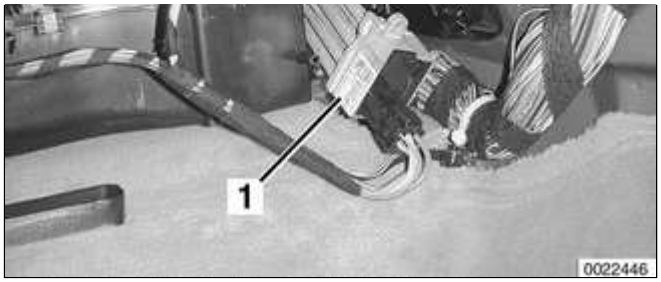


Fig. 41 Right side dashboard

1 - Passenger airbag

2 - Passenger airbag connector

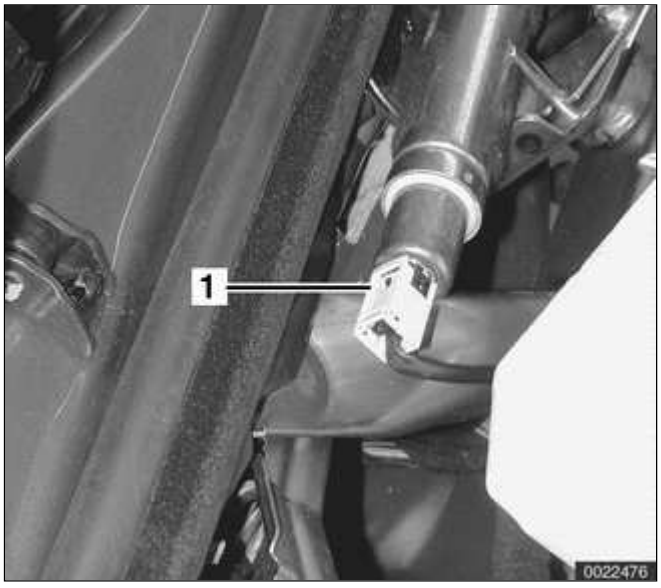


Fig. 42 In windshield pillar (A-pillar)

1 - Head protection airbag (HPS) electrical connector

Fig. 43 In headliner

1 - Sunroof motor

Fig. 44 In left rear roof pillar (C pillar)

1 - Antenna amplifier

Fig. 45 Behind center console utility bin

1 - Heater core temperature sensor

Fig. 46 Under shifter bezel

1 - Shiftlock solenoid

Fig. 47 At shifter bezel

1 - Gear position indicator light

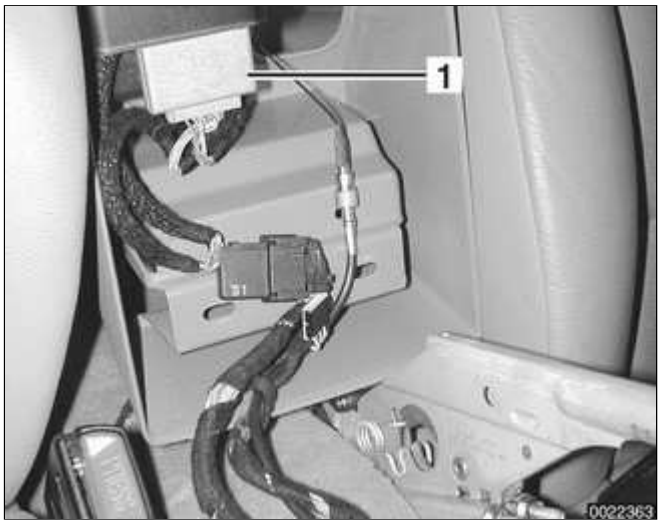


Fig. 48 Under center console

1 - Telephone connector

Fig. 49 Under center console, rear of parking brake handle

1 - Parking brake warning switch

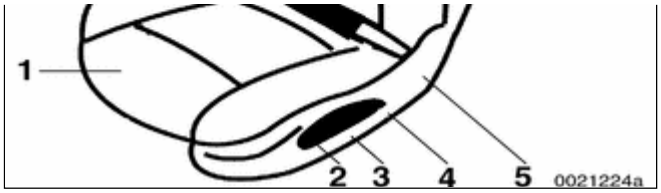
Fig. 50 Driver seat (Convertible seat front view)

1 - Seat memory module

2 - Seat control switch module

3 - Seat tilt motor

4 - Seat forward-back motor



5 - Seat height motor

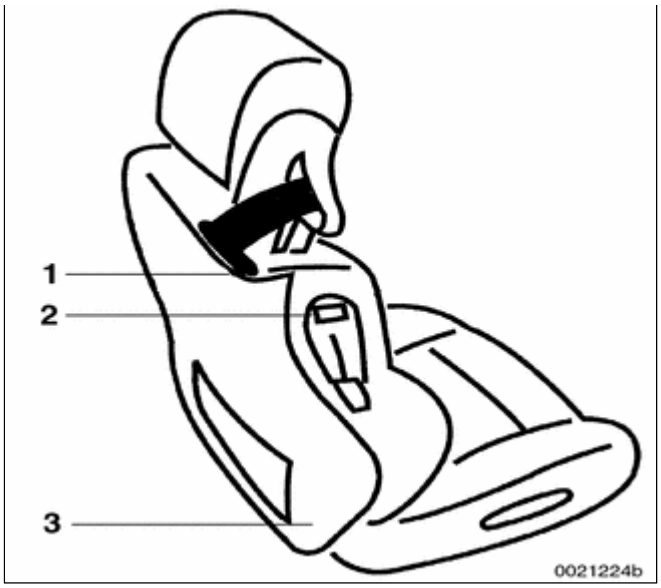


Fig. 51 Passenger seat (Convertible seat rear view)

1 - Headrest motor

2 - Comfort entry switch

3 - Backrest motor

Fig. 52 Below rear seat cushion, under access covers (top of fuel tank)

1 - Right side: Electric fuel pump and fuel level sender connector

2 - Left side: Fuel level sender connector

Electrical components in luggage/cargo compartment

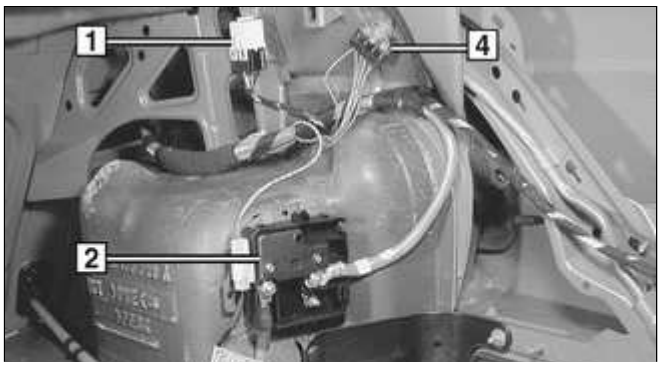


Fig. 53 Right side trunk

1 - Rear window defogger relay

2 - F108 (200 amp fuse) in main harness

3 - Battery safety terminal (BST) (explosive charge)

4 - Ground X498

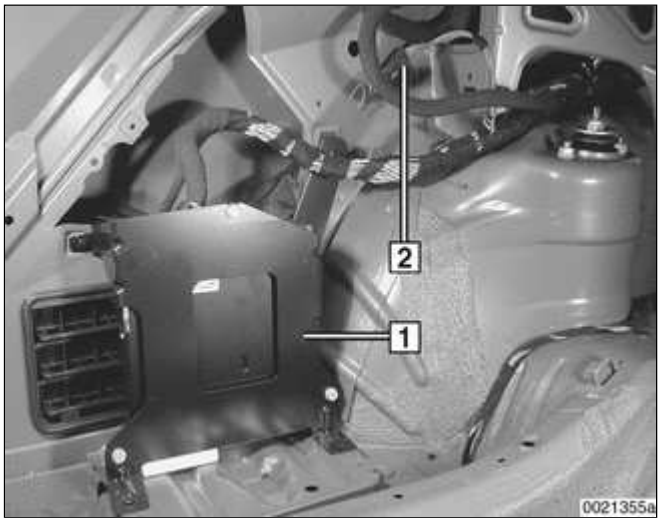


Fig. 54 Left side trunk

1 - Sound system amplifier

2 - Ground X13016

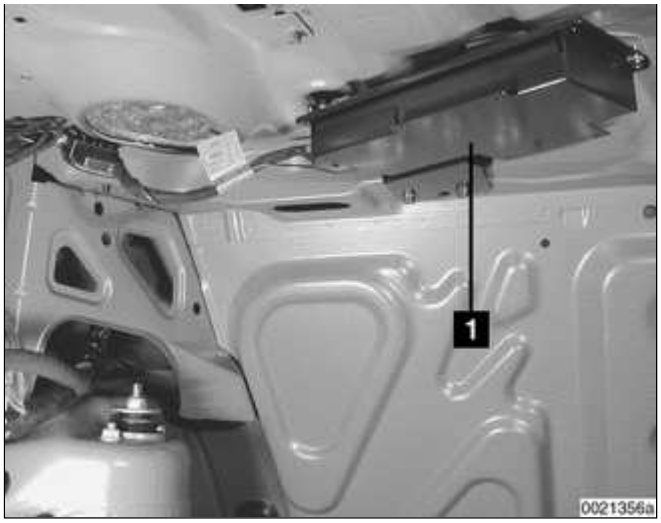


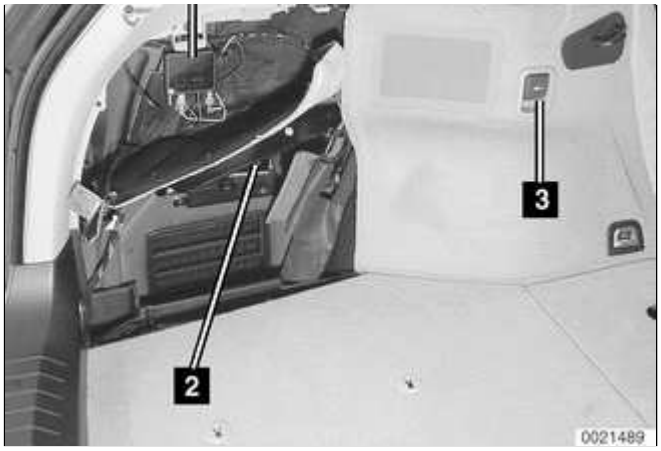
Fig. 55 Trunk, below parcel shelf

1 - Telephone transceiver

Fig. 56 Right cargo area, behind trim panel (Sport Wagon)

1 - Rear window washer pump

Fig. 57 Left cargo area (Sport Wagon)



1 - Antenna diversity amplifier

2 - Sound system components

3 - Power socket, 12 volt

Electrical components underneath car

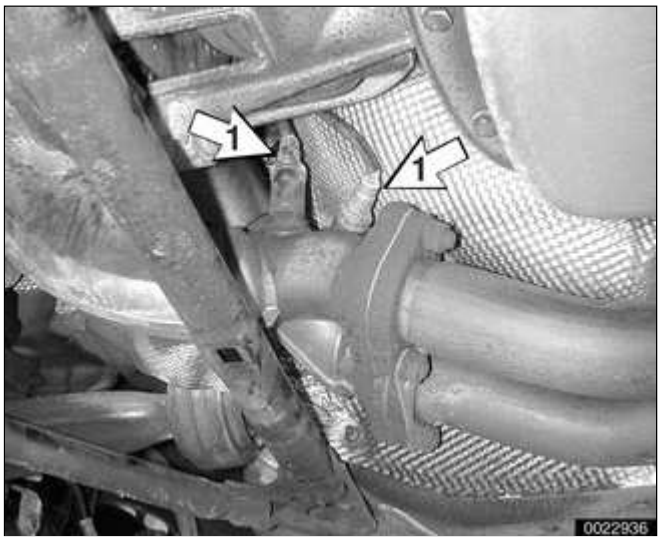


Fig. 58 Underneath right side of engine, at lower end of front exhaust pipes

1 - Post-catalyst oxygen sensors

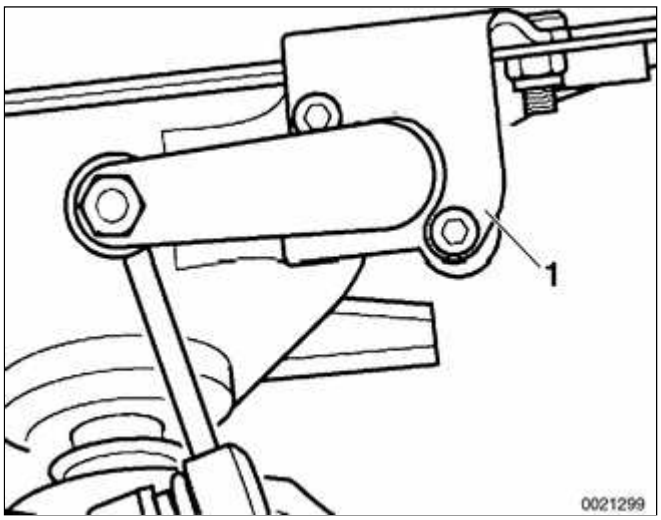
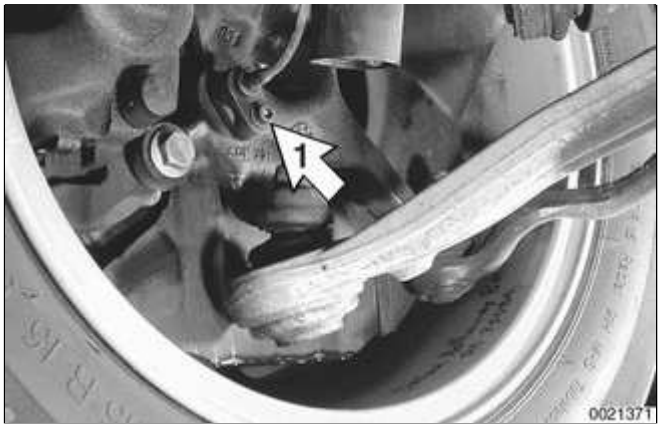


Fig. 59 At front subframe, right side

1 - Front ride level sensor

Fig. 60 Right front steering arm (rear wheel drive model shown)



1 - ABS wheel speed sensor, front

Note:

Left front wheel speed sensor is similar.

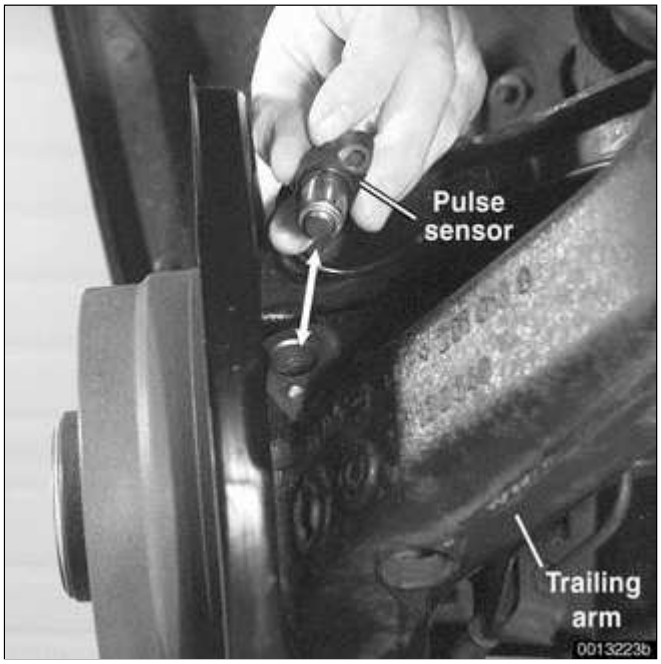


Fig. 61 Right rear wheel bearing housing (1999 rear wheel drive model shown)

ABS wheel speed sensor, rear

Note:

Left rear wheel speed sensor is similar.

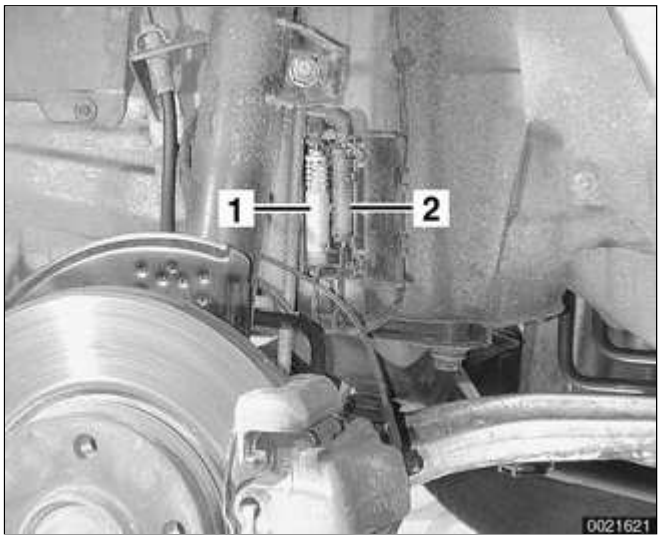


Fig. 62 In left front wheel housing

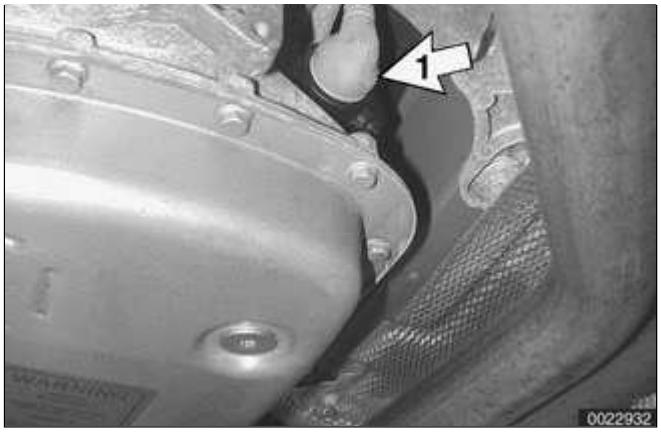
1 - ABS wheel speed sensor connector (2-pin grey)

2 - Brake pad wear sensor connector (2-pin black)

Note:

- *Right rear wheel speed sensor connector is similar.*
- *The right front and left rear brake pads lack the wear sensor.*

Fig. 63 Rear of automatic transmission (GM)



1 - Transmission control (AGS) connector

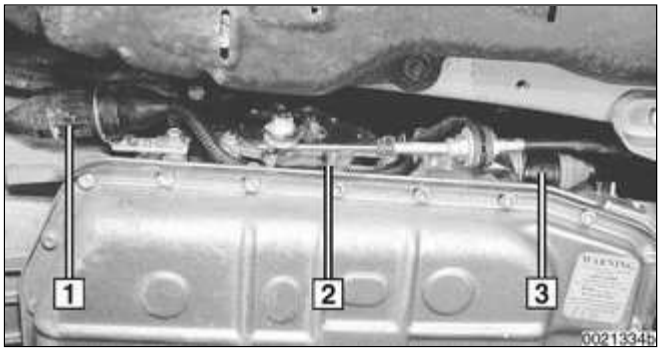


Fig. 64 Left side of automatic transmission (ZF)

1 - Transmission range switch/back-up light switch harness connector

2 - Transmission range switch/back-up light switch

3 - Transmission control (AGS) harness connector

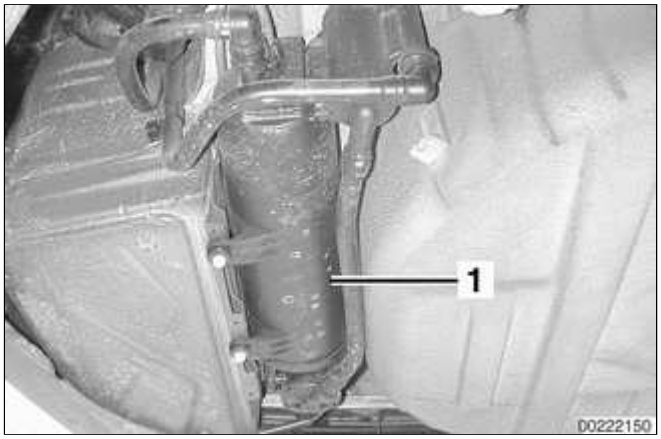


Fig. 65 Underneath trunk

1 - LDP/DMTL fuel tank diagnosis pump

Convertible top electrical components

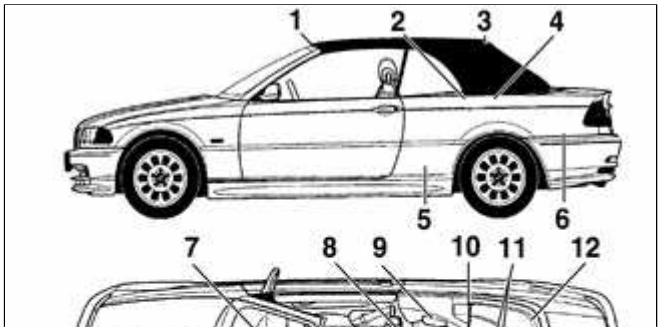


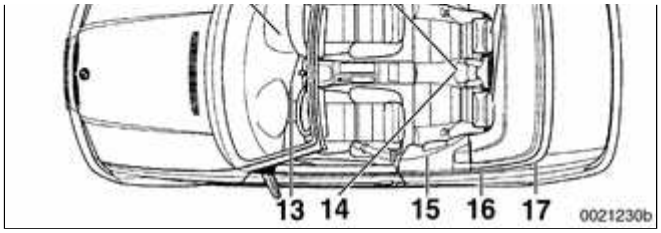
Fig. 66 Convertible

1 - Visor latch hall sensors

2 - Solenoid valves

3 - Tension bow hall sensor

4 - Main pillar hall sensor



5 - Convertible top module (CVM II)

6 - Hydraulic motor

7 - General module (GM V)

8 - Top storage cover lock motor

9 - Rear window defogger relays

10 - Storage cover lock hall sensor

11 - Roll-over cassettes and sensors

12 - Storage compartment floor microswitch

13 - Convertible top switch

14 - Cover lock motor hall sensor

15 - Convertible top module (CVM II)

16 - Storage cover and hard top lock hall sensor

17 - Storage cover hall sensor

Exterior electrical components

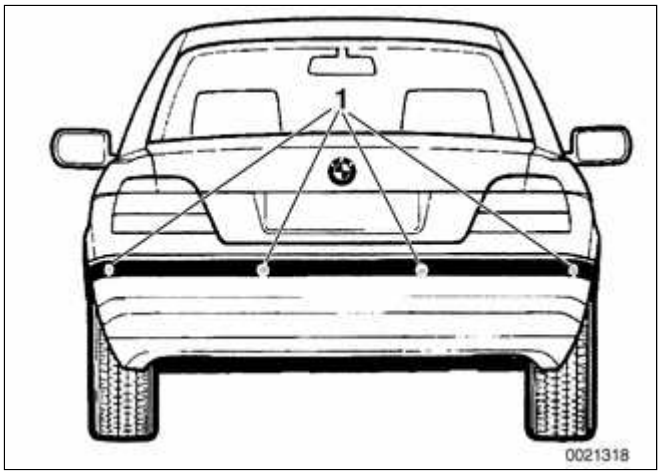


Fig. 67 Rear bumper

1 - Park distance control (PDC) ultrasonic sensors

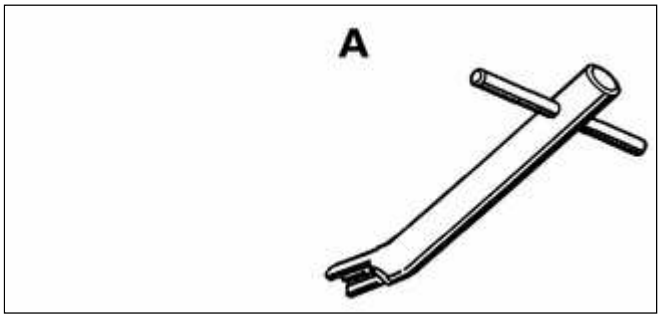
General

This repair group covers repair information for windshield, headlight (optional) and rear window (Sport Wagon) wiper and washer systems.

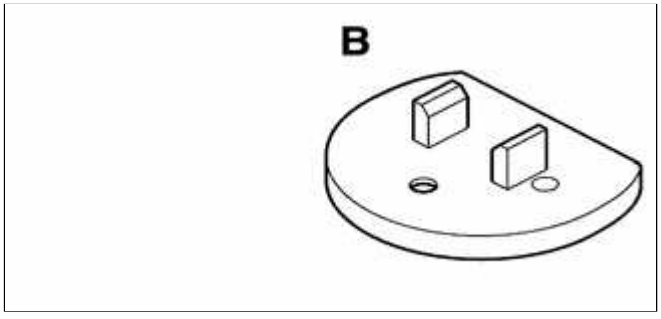
Replacement of the wiper/washer stalk switch assembly is covered in ⇒ 612 Switches. Electrical wiring diagrams and relays for the wiper/washer system are covered in Electrical Wiring Diagrams.

Special tools

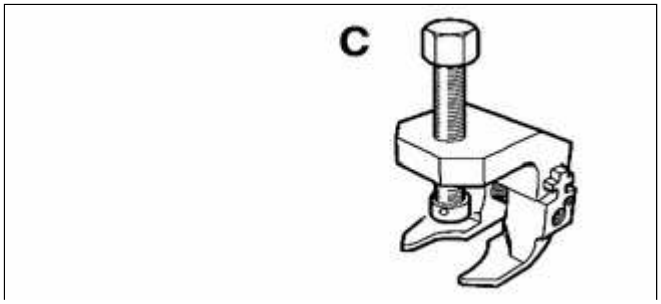
Although most wiper system repairs can be carried out with normal shop tools, a few special tools may be necessary as well.



- Headlight washer nozzle aligning tool BMW 00 9 100



- Rear wiper drive aligning tool BMW 61 1 330



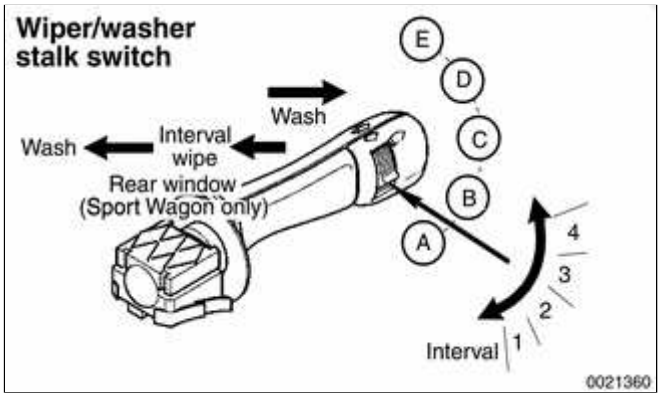
- Wiper arm removal tool BMW 61 6 060

Wiper and washer system

The wiper and washer functions in E46 vehicles are controlled by the ZKE V general module (GM V). Driver input to the system is via the multi-function stalk switch to the right of the steering column.

Operational faults in the wiper/washer system will set Diagnostic Trouble Codes (DTCs) which can be accessed through BMW scan tools DIS or MoDiC.

The components of the wiper/washer system are described below. Some functions or components are optional, as indicated.



- Wiper/washer stalk switch. The system has four wiper settings for the windshield at the steering column stalk switch.

The settings are:

- **A**: Single wipe (hold stalk switch down)
- **B**: Off
- **C**: Interval (thumb wheel on stalk switch)
- **D**: Slow (automatically switches to interval when car is stopped.)
- **E**: Fast (automatically switches to slow speed when car is stopped.)

In "interval" setting, wiping intervals are dependent on road speed. See ⇒ Table a. Wiper interval (seconds).

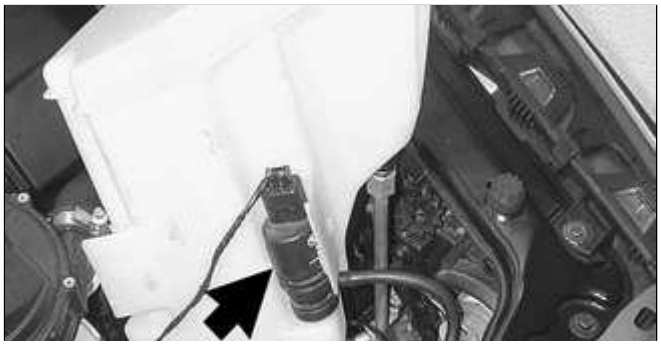
The windshield washer system is activated by pulling the stalk switch toward the driver.

In Sport Wagon models with rear wiper/washer, pushing the stalk switch one detent away from the driver activates the interval rear wiper. Pushing the stalk further forward activates the rear window washer.

- Windshield wiper double relay is in E-box, left rear of engine compartment (**arrow**) under plastic cover.

Rain sensor (optional). The infrared rain sensor and module switch on the windshield wipers automatically when water drops are detected on the windshield. The rain sensor system is described more fully below.

- **Windshield/headlight washer fluid tank** is in right front of engine compartment.

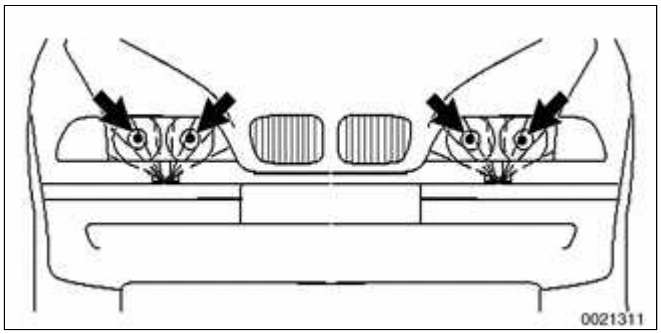


- **Windshield washer pump** is in rear portion of front washer tank (**arrow**).

Headlight washer pump (optional) is in front portion of front washer tank.

Windshield washer nozzle jets are located on the engine hood. With the ignition ON, the washer jets are

automatically heated. The nozzle heaters, being of the positive temperature coefficient (PTC) design, increase resistance as they heat up and automatically cut back on current consumption.



- **Headlight washer system** (optional). Headlight washer nozzles are on top of the front bumper. The headlight washer pump uses fluid from the front washer tank. If headlights are on, they will be cleaned every fifth time the windshield washers are activated.

Rear window wiper assembly (Sport Wagon) is mounted to the tailgate and linked to the rear wiper shaft via a mechanical coupling.

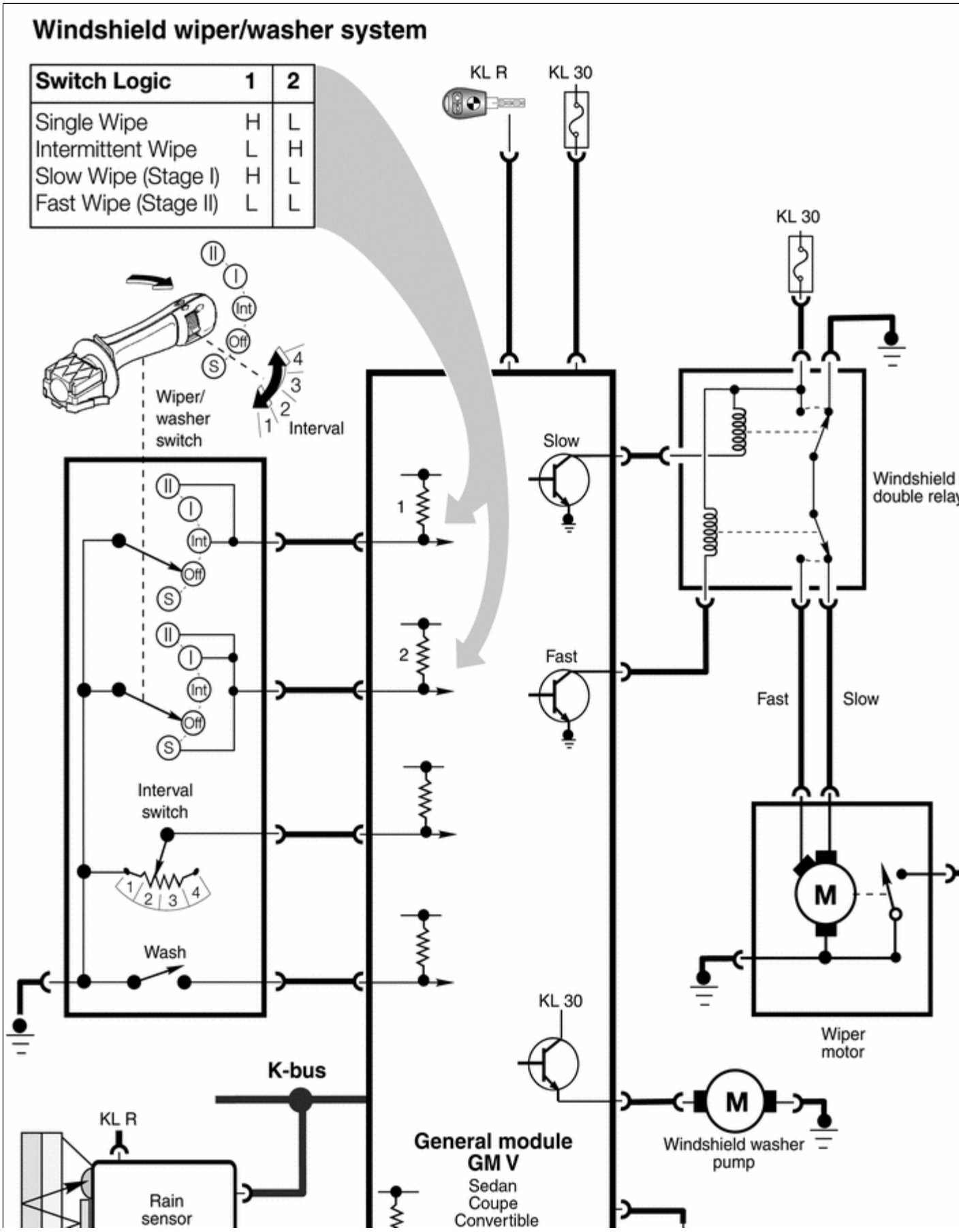
- **Rear washer fluid tank and pump** (Sport Wagon) is mounted in the right cargo compartment behind trim panel. Fill reservoir through cap in right side rear deck pillar.

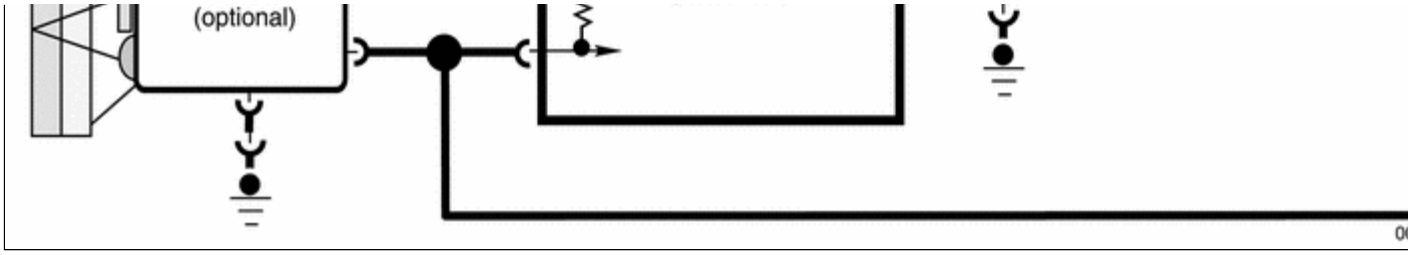
The rear window wiper/washer system is described more fully below.

Table a. Wiper interval (seconds)

Thumb wheel position	Vehicle speed (mph)					
	<4	5 - 22	23 - 45	46 - 60	61 - 87	>87
1	26	19	17	15	15	13
2	17	12	11	10	9	7
3	10	6	6	5	4	3
4	5	3	3	2	2	2

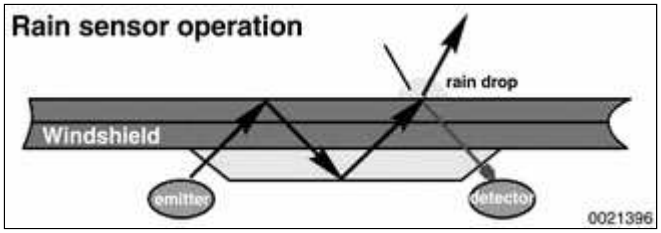
Windshield wiper/washer system





Rain sensor system (optional)

The optional rain sensor system uses an infrared sensor, located at the top of the windshield in front of the rear view mirror, to detect the presence of water drops (or dirt) on the windshield. The signal from the sensor is communicated to the GM V, which activates the interval wipe cycle if the wiper stalk switch knurled knob (interval control) is in one of the four interval settings.



The rain sensor functions by aiming a beam of infrared light through the windshield at a set angle. The beam is reflected back and forth within the windshield until it is detected by the detector component of the rain sensor. Rain drops (or other impurities) on the outside of the windshield cause some of the infrared to be dissipated outside the windshield. As a result the detector "sees" less infrared intensity. This is interpreted as a need for the wiper to be turned on.

System components:

- An optical prism body attached to the top of the windshield
- Infrared emitter and detector diodes
- Optics heater (to prevent condensation from forming on diodes and prism)

- Control module (connected to GM V via K-bus)

The rain sensor is on-line as soon as it receives KL R (ignition on) operating power.

- When the windshield wiper stalk switch is placed in the intermittent position, the GM V signals the rain sensor control module via the K-bus of the request for intermittent wiping and the position of the knurled wheel (sensitivity).

- As an acknowledgment, the rain sensor sends a command via the K-bus to activate the wiper motor.

- If more than 12 seconds pass before the GM V receives the acknowledgment, it concludes the rain sensor has a defect and operates the intermittent wipe function as a system not equipped with a rain sensor. The wiper intermittent cycling is based solely on the knurled wheel setting.

The rain sensor continuously monitors the windshield for rain accumulation and signals the GM V to activate the wipers based on the knurled wheel position and how fast rain accumulates on the windshield.

The knurled wheel position signal (1 - 4) via the K-bus informs the rain sensor of the selected level of sensitivity:

- Position 1 (least sensitive) delays the wiper activation signal.

- Position 4 (most sensitive) sends the wiper activation signal to the

GM V sooner.

Depending on the intensity of the rain the wipers can be operated continuously as if set in the normal wiper stalk switch position regardless of the knurled wheel setting. For this reason, the vehicle speed signal on the K-bus is not utilized on rain sensor equipped wiper systems.

If the ignition switch is turned off with the wiper switch in the intermittent position, the rain sensor will only become active after the ignition is switched back on and one of the following occurs:

- The stalk switch is moved from the intermittent position and then back.
- The knurled wheel setting is adjusted.
- The wash function is activated.

The reasoning behind this switching strategy is to have the driver make a conscious decision to activate the system.

The rain sensor control module adapts to the optics system environment as follows:

- Windshield aging: As the vehicle ages, windshield pitting in the rain sensor monitoring area may cause a loss of light in the optics system. The control module adapts for loss of light based on the intensity of the detected infrared light with a cleared windshield. Therefore, rain sensor function is not adversely affected due to windshield aging.
- Dirty windows: The rain sensor adaptation reacts less sensitively to

a dirty windshield (dirt, road salt, wax residue) after a completed wipe cycle. A dirty windshield has a film on it that diminishes the ability of infrared to refract into water droplets that are present. This causes a delay in the rain sensor detection capabilities which lengthens the time intervals on an intermittent wipe.

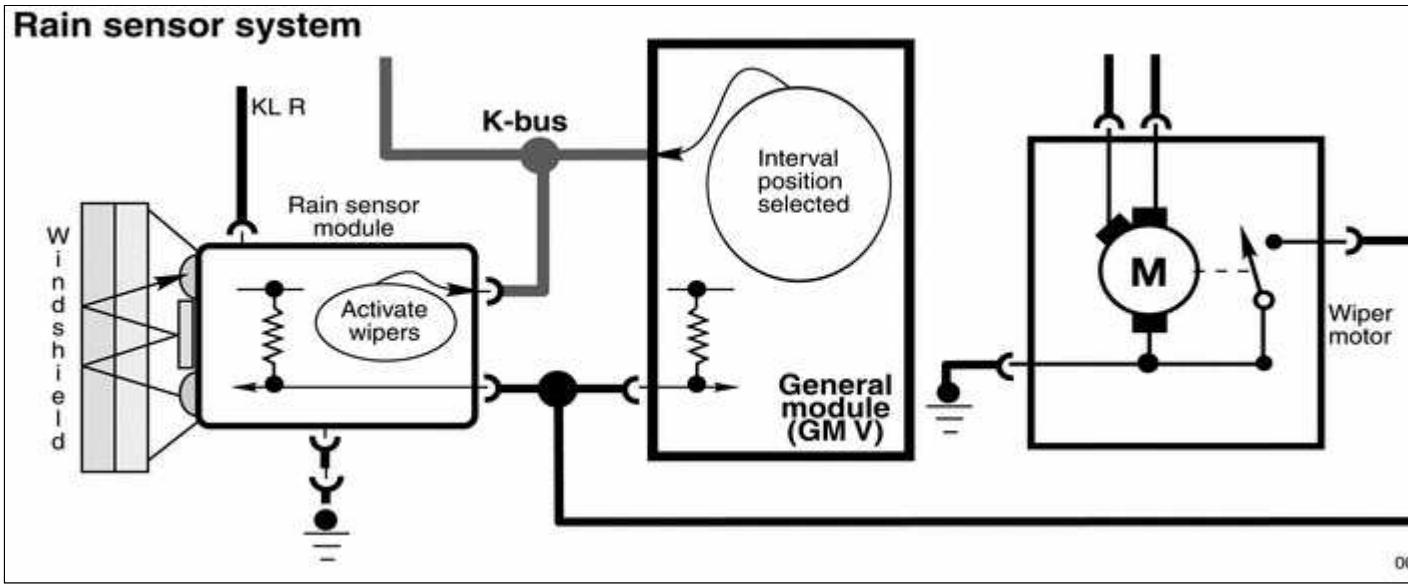
CAUTION!

On rain sensor equipped models, make sure the wiper blades are in perfect condition. Only use window cleaner to clean the windshield.

Note:

A dirty windshield can cause the rain sensor control module to set a fault due to approaching limits of its adaptation abilities.

Rain sensor system



Rear window wiper/washer system (Sport Wagon)

The rear wiper motor assembly in Sport Wagon models is mounted in the tailgate through a sound-insulating rubber bushing.

The rear wiper/washer is controlled by the wiper/washer steering column stalk switch via the ZKE V system. The functions of the system are:

- Normal interval wipe
- Programmed interval wipe
- Continuous wipe
- Washing

Normal operation is a timed interval of approx. 7 seconds. This is triggered by pressing the stalk switch forward to the first detent. Full sweep and park position of the wiper arm are recognized by two hall sensors on the motor assembly. If the wiper is switched OFF, the wiper arm will return to the park position.

Programmed interval wipe:

- Quickly switch rear wiper ON and OFF.
- Wait the needed interval time.
- Switch rear wiper ON again.

The OFF time will be the programmed interval, up to approx. 30 seconds.

Continuous wiping is activated any time the rear wiper is on and the transmission

is in reverse. The signal is provided by the back-up light switch via the LSZ (light control module).

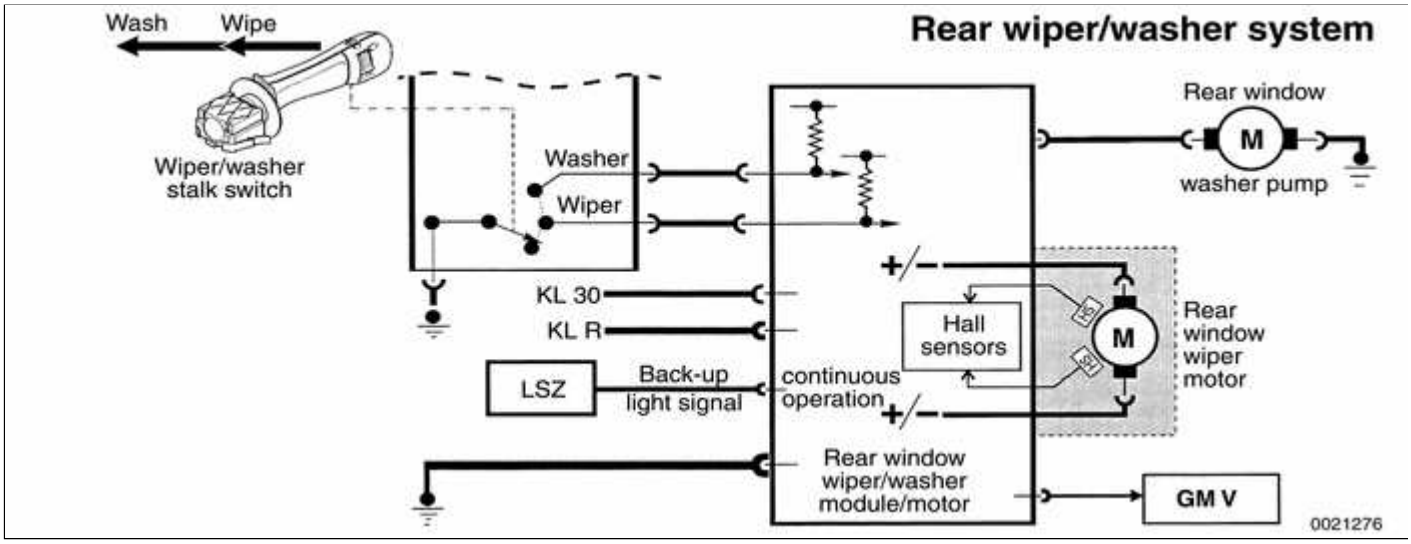
Rear window washing is activated when the stalk switch is pushed forward past the first detent:

- Wash cycle 1. Washer pump ON for 1.5 seconds. Wiper ON 1 second later.
- Wash cycle 2. Washer pump ON for 0.5 second after 0.8 second delay. Wiper continues.
- Wash cycle 3. Washer pump ON for 0.5 second after 0.8 second delay. Wiper ON for two wipe-dry cycles.

Note:

After washing, the rear wiper will remain in interval (normal) wiping mode until switched OFF.

Rear wiper/washer system



Wiper Blades

Wiper blade cleaning problems

Common cleaning problems with the wipers include streaking or sheeting, water drops after wiping, and blade chatter.

CAUTION!

Never turn on the wiper blades while the hood is open. Damage to the wiper system and hood may occur. To ensure safety during wiper system repair procedures, remove the windshield wiper fuse. See ⇒ 610 Electrical Component Locations.

Streaking is usually caused when wiper blades are coated with road film or car wash wax. Clean the blades using soapy water. If cleaning does not cure the problem, the blades should be replaced. BMW recommends replacing the wiper blades twice a year, before and after the cold season.

Water drops that remain behind after wiping are usually caused by oil, road film, or diesel exhaust residue on the glass. Use an alcohol or ammonia solution or a non-abrasive cleaner (such as Bon-Ami®) to clean the windshield.

Chatter may be caused by dirty or worn blades, or by wiper arms that are out of alignment. 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 at rest is perpendicular to the windshield. If problems persist, the blades and wiper arms should be replaced.

Note:

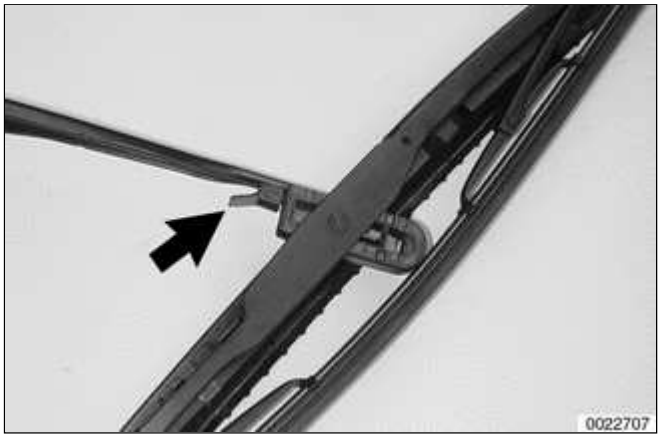
BMW has available a special tool/gauge (BMW special tool 00 9 210) to align the angle of the wiper arm to the windshield glass.

The wiper blades can be renewed in one of two ways:

- Complete blade replacement
- Rubber insert replacement

Insert replacement is the most economical method, although over time the wiper blade itself will become worn. One rule of thumb would be to replace just the inserts every second time.

Wiper blades, replacing



➢ To replace wiper blades:

- Pivot wiper arm off windshield.
- Position wiper blade approximately perpendicular to wiper arm.
- Remove wiper blade from wiper arm by depressing retaining tab (**arrow**) and sliding blade out of arm.
- Installation is reverse of removal. Install wiper blade to wiper arm until retaining tab can be heard to click into position.

Note:

Some wiper blade versions may have two retaining tabs.

Wiper blade inserts, replacing

To replace wiper inserts:

- Remove wiper blade as described earlier.
- Unhook wiper blade insert from wiper arm guide. If necessary, guide slightly using needle nose pliers.
- Pull old insert from wiper arm guides, noting installation position.
- Remove metal support strips from old insert and install into slots in new insert, noting installation direction of cutouts in support strips.
- Slide new insert through wiper blade guides. Lock insert in place at end guides.

Note:

The notched cutouts in the retaining strips should engage the molded notches in the inserts.

Wiper arms, removing and installing

Note:

- *Wiper arm removal and installation on the Sport Wagon rear window is similar to the operation on the front wiper arms.*

- *It may be necessary to raise the engine hood to the service position to access the front wiper arm fasteners. See ⇒ 410 Fenders, Engine Hood.*

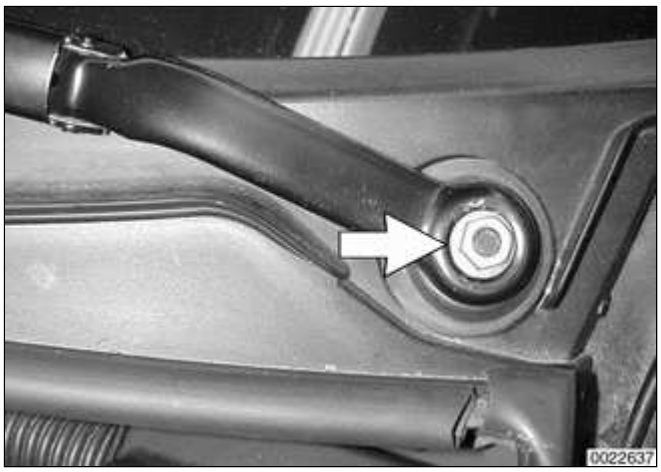
CAUTION!

- ***Make sure wipers are parked (stalk switch in OFF position) and the ignition is also OFF.***

- ***Use fender cover to protect windshield.***

- With engine hood in closed position, remove both wiper blades.

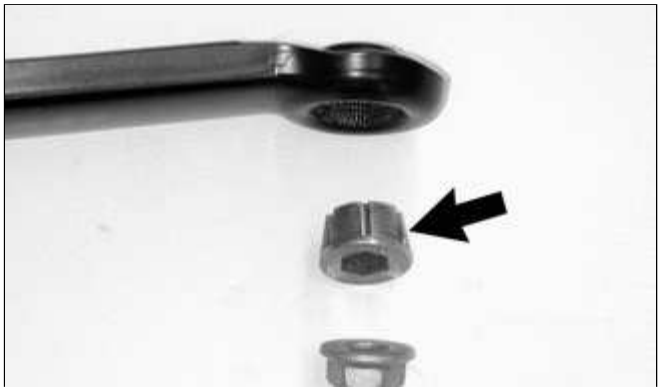
- Open hood. Gently pry off caps covering wiper arm retaining nuts.



➢ Remove each wiper arm retaining nut (**arrow**). Detach arm from shaft.

Note:

Use BMW special tool 61 6 060 or equivalent puller to remove arm.



➢ If wiper arm sleeve (**arrow**) at shaft is loose, it must be replaced.

- Install arms and thread nuts on loosely. Torque nuts after installing wiper blades.

Tightening torque

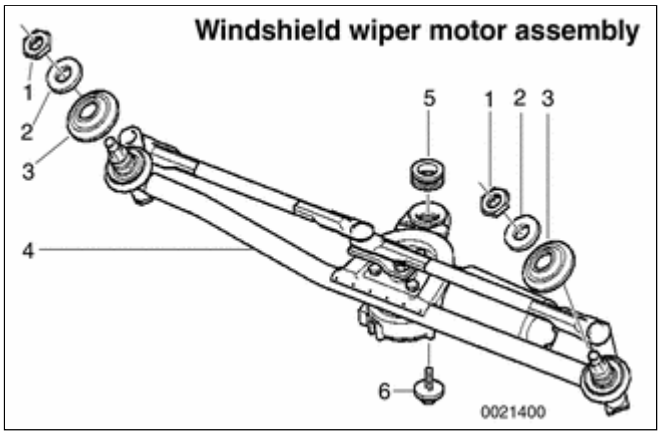
Tightening torque	
Front wiper arm to wiper shaft	30 Nm (22 ft-lb)
Rear wiper arm to wiper shaft	9.5 Nm (7 ft-lb)

- Check to make sure blades are positioned correctly Front wiper arms should be installed with tips to the right (passenger) side of the vehicle. Measure distance of wiper arms from lower portion of window gasket with wiper blades installed before tightening to correct torque.

Wiper blade park position	
Front wiper blade tip distance from windshield gasket	
Right blade	24 mm (1 in.)
Left blade	44 mm (1.7 in.)
Rear wiper blade tip distance from rear window gasket	12 mm (1/2 in.)

Wiper Assemblies

Windshield wiper assembly, removing and installing



The windshield wiper assembly (linkage and motor) is removed as a single unit. Once the assembly is removed, the wiper motor and other linkage parts can be repaired or replaced.

1 - Wiper assembly mounting nut -tighten to 10 Nm (88 in-lb)

2 - Washer

3 - Damping ring

4 - Motor and rod assembly

5 - Rubber damper

6 - Center mounting bolt -tighten to 10 Nm (88 in-lb)

Note:

- *BMW does not provide the windshield wiper motor as a separate component.*

- *It may be necessary to raise the hood to the service position to access the wiper arm fasteners. See ⇒ 410 Fenders, Engine Hood.*

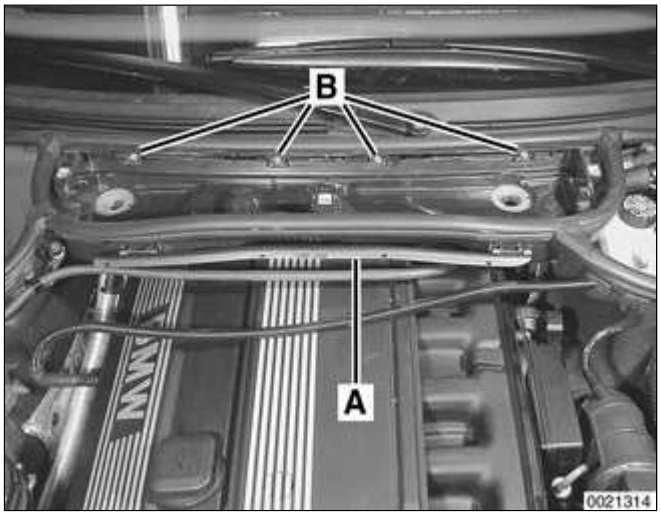
CAUTION!

- ***Make sure wipers are parked (stalk switch in OFF position) and the ignition is also OFF.***

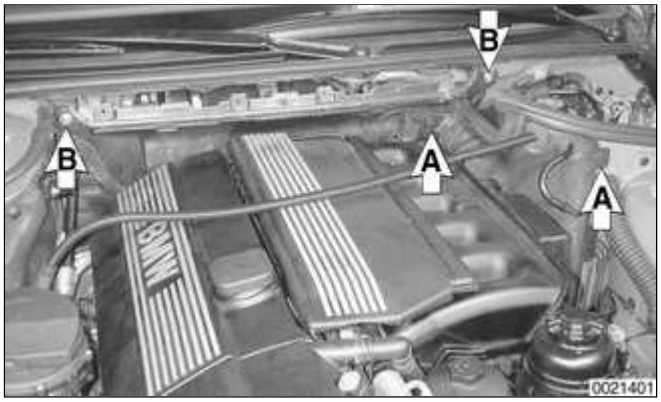
- ***Use fender cover to protect windshield.***

- ***To avoid damaging the wiper arms and pivots, do not manually slide or force the wiper arms across the windshield.***

- Remove wiper arms as described earlier.



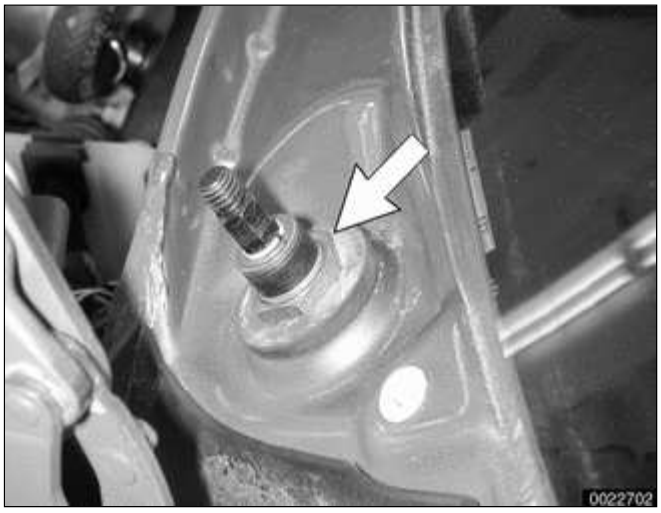
- Remove housing for microfilter for interior ventilation.
  - Remove upper cover and microfilter.
  - Open wiring harness loom (**A**) and remove wires.
  - Unfasten screws (**B**) and remove lower microfilter housing.



- Remove heater bulkhead cover.
  - Remove engine compartment side trim panel. Turn locking knobs (**A**) and slide trim panel from mounting lip.
  - Remove heater bulkhead cover mounting screws (**B**) and lift cover up and out from firewall.

- Detach wiper assembly inside cowl:
  - Remove assembly center mounting bolt (**A**).
  - Disconnect electrical harness connector (**B**).

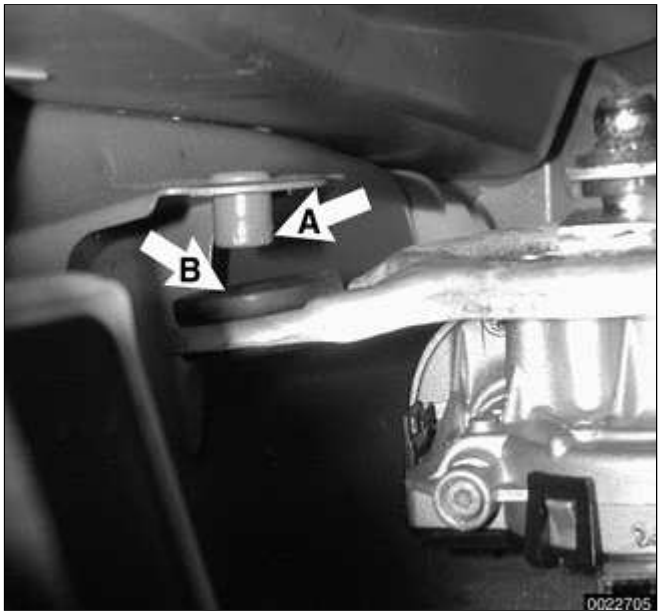
- Remove right side wiper rod (**arrow**) from transmission arm.
  - Release retaining clips and remove windshield base trim tray.



- Remove large nuts (**arrow**) at base of wiper arm shafts in cowl panel. Remove assembly.

Note:

Cover inside edges of cowl panel sheet metal with thick tape to prevent damage during wiper assembly removal.



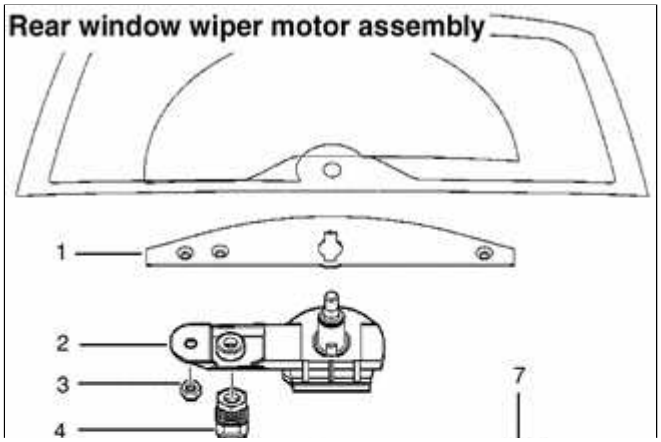
- Installation is reverse of removal, noting the following:
  - Fit center mounting rubber damper over pin (**A**) into wiper motor mounting arm (**B**).
  - Install all fasteners finger-tight first.
  - Once installed, wiper motor should first be run to parked position and switched off.

- Next, install wiper arms but not blades.
- Close hood and fit wiper blades.
- Recheck wiper blade position as described earlier under ⇒ Wiper arms, removing and installing.
- Check all electrical harness fittings and sealing grommets for correct reinstallation. Replace any wire ties cut off during removal.

Tightening torques	
Center wiper assembly mount to cowl	10 Nm (88 in-lb)
Wiper arm to wiper shaft	30 Nm (22 ft-lb)
Wiper shaft nut at cowl	10 Nm (88 in-lb)

Rear window wiper motor, removing and installing (Sport Wagon)

- Remove rear deck interior trim panel.



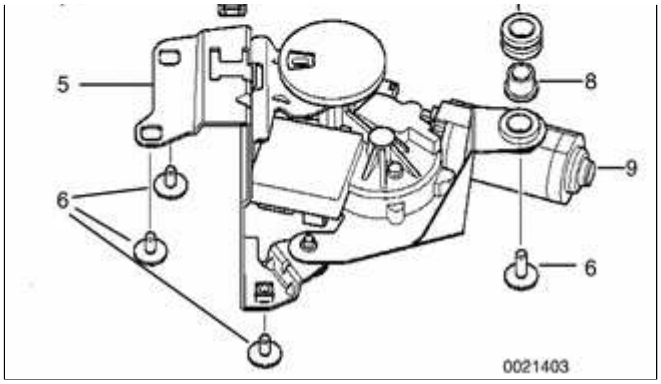
Detach electrical harness connector(s) and remove screws mounting motor assembly to rear deck lid. Remove motor assembly.

1 - Plastic trim

2 - Rear wiper pivot assembly

3 - Nut M6 -tighten to 9.5 Nm (7 ft-lb)

4 - Mechanical coupling



5 - Wiper motor assembly

6 - Torx bolt M6 -tighten to 9.5 Nm (7 ft-lb)

7 - Damper ring

8 - Mounting sleeve

9 - Rear wiper motor assembly

- To install:

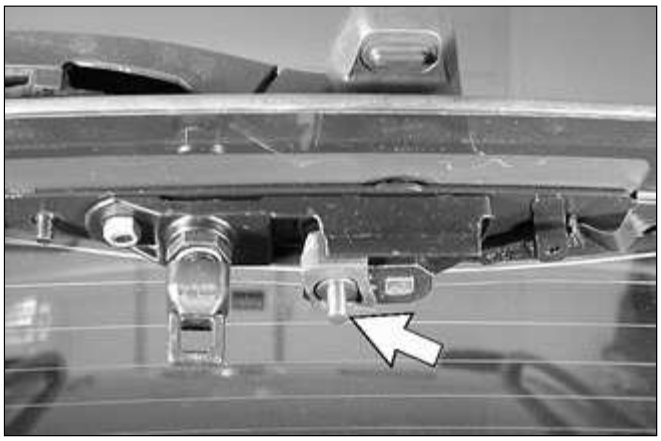
- Remove rear window lock assembly from rear deck.
- Install wiper motor assembly and thread mounting bolts finger tight.
- Place BMW special tool 61 1 330 on rear window wiper drive and close rear window.
- With rear wiper vertical, allow rear wiper shaft mechanical coupling to snap into special tool bore.
- Tighten down wiper motor assembly.
- Remove special tool.
- Remainder of assembly is reverse of removal.

Tightening torque	
Wiper motor to rear deck (Torx)	9.5 Nm (7 ft-lb)

Rear window wiper shaft, removing and installing (Sport

Wagon)

- Remove rear wiper arm.
- Lift rear window and remove wiper shaft housing plastic trim covers.
- Remove housing mounting nuts. Remove housing.
- Slacken rear window lift nut.



- Remove wiper shaft assembly mounting nut (**arrow**). Pull shaft and bearing out of housing.
- Installation is reverse of removal. Adjust wiper arm position as described earlier.

Tightening torques	
Rear window button to rear window	9.5 Nm (7 ft-lb)
Wiper arm to wiper shaft	9.5 Nm (7 ft-lb)
Wiper shaft housing to rear window	9.5 Nm (7 ft-lb)

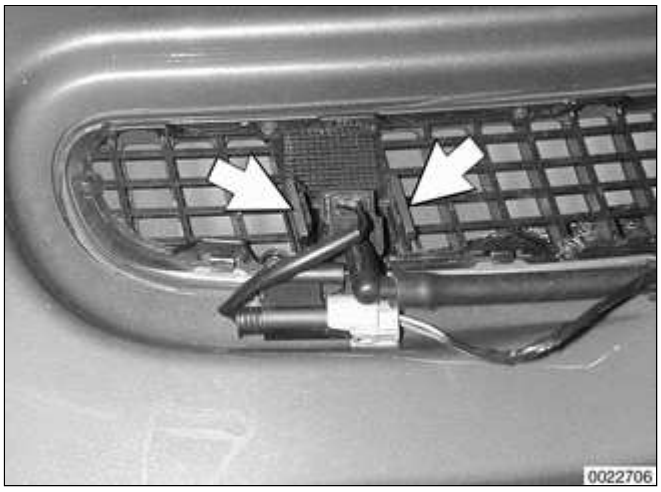
Washer Systems

The windshield washer system includes the heated spray nozzles in the engine hood, the washer fluid pump, and the washer fluid reservoir in the front passenger side of the engine compartment.

The headlight washer system (optional) consists of the front washer fluid tank (shared with the windshield washer system), a separate washer pump and spray nozzles in the front bumper.

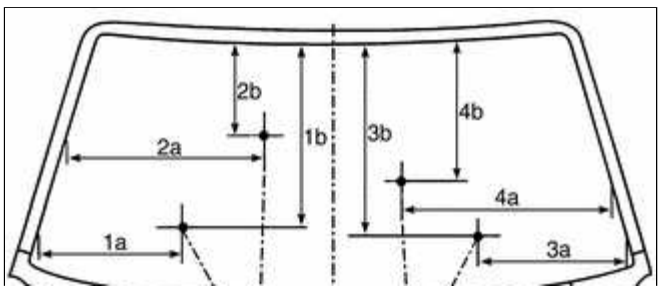
The rear window washer system (Sport Wagon only) consists of a washer tank and pump in the right side cargo compartment behind a trim panel and a spray nozzle at the top of the rear window frame.

Windshield spray nozzle, removing and installing



➢ Working under open engine hood, gently squeeze retaining clips (**arrows**) on nozzle sides to free nozzle from plastic intake grille.

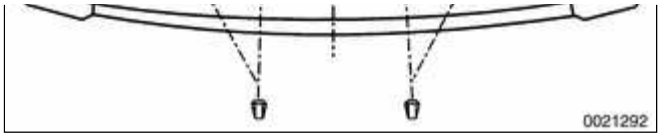
- Carefully disconnect hose from nozzle. Disconnect harness connector for nozzle heater.



➢ Installation is reverse of removal:

- Check and adjust nozzles before driving. Use diagram.

1a - 265 mm (10.4 in)



1b - 445 mm (17.5 in.)

2a - 400 mm (15.7 in.)

2b - 270 mm (10.6 in.)

3a - 260 mm (10.2 in.)

3b - 550 mm (21.7 in.)

4a - 500 mm (19.6 in.)

4b - 350 mm (13.8 in.)

Note:

The windshield spray nozzles can be aimed by using a sewing needle or a similar diameter stiff piece of wire.

Headlight washer spray nozzle, removing and installing

Note:

Headlight nozzles are marked L or R on the underside. Do not mix them up.

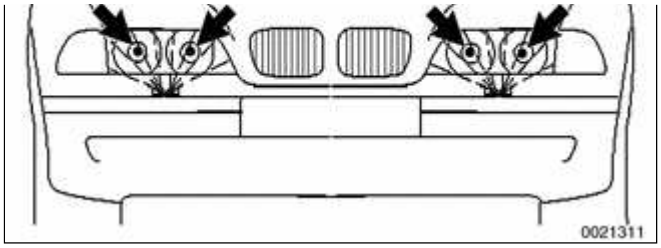
- Prior to removal, cover spray nozzle with shop rag. Wash water drains out.

- Gently pry out spray nozzle and pull out to stop. Tug on nozzle to detach from washer fluid duct.

- Transfer trim to new nozzle before installing.

- Snap new nozzle on fluid duct by pushing into opening. Check to make sure nozzle is fully snapped into place.

- Using BMW special tool 00 9 100 or equivalent, adjust headlight washers



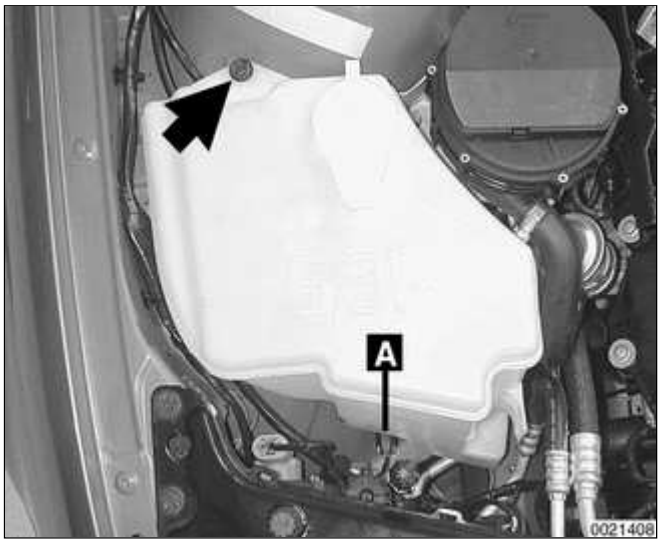
so that spray jets strike approximately in center of each beam (**arrows**).

Note:

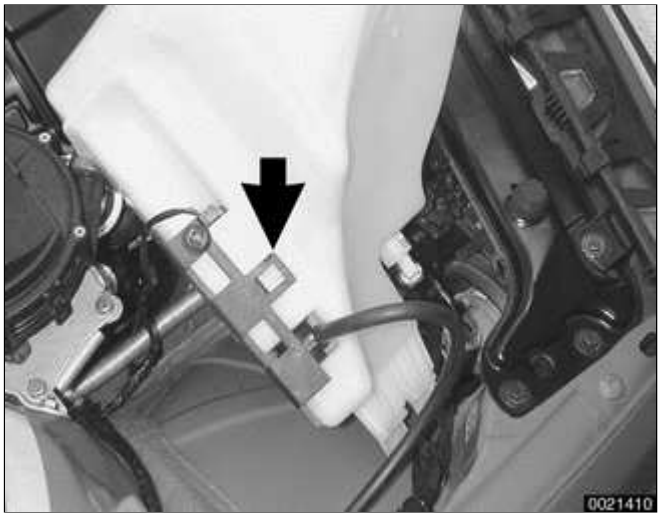
To turn on headlight washer jets, turn on ignition, lights and windshield washer system. To repeat spray procedure, turn off ignition, then back on again. Otherwise the headlight washers are disabled for 3 minutes.

Front washer fluid reservoir and washer fluid pumps, replacing

- Open hood and siphon washer fluid from reservoir.

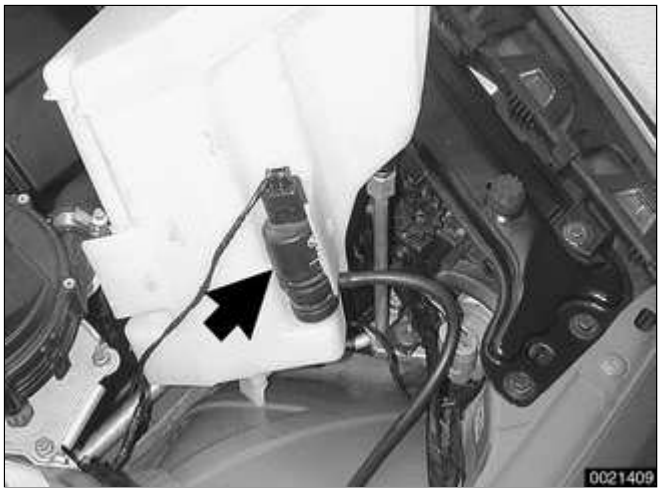


➢ Detach washer fluid level sensor harness connector (**A**) in front bottom of fluid reservoir. Remove reservoir retaining screw (**arrow**).



➢ Lift reservoir. Pry gently at retaining clip (**arrow**) on heat shield to disengage from reservoir.

- Cut off wire tie to release washer pump harness from heat shield. Lay heat shield aside.



- To remove windshield washer pump (**arrow**) and headlight washer pump if equipped:
  - Disconnect electrical connection at pump.
  - Twist pump clockwise.
  - Pull pump out of reservoir.
- Installation is reverse of removal, noting the following:
  - Twist washer fluid level sensor clockwise to remove from base of reservoir.
  - Transfer reservoir cover and strainer to new container.
  - Coat fluid pump sealing ring with anti-friction agent.
  - On installation check that fluid hoses are not kinked.
  - Make sure reservoir heat shield is correctly engaged. Replace wire tie.
  - Refill reservoir.

Front washer fluid level sensor, replacing

- Remove front washer fluid reservoir:
  - Twist washer fluid level sensor

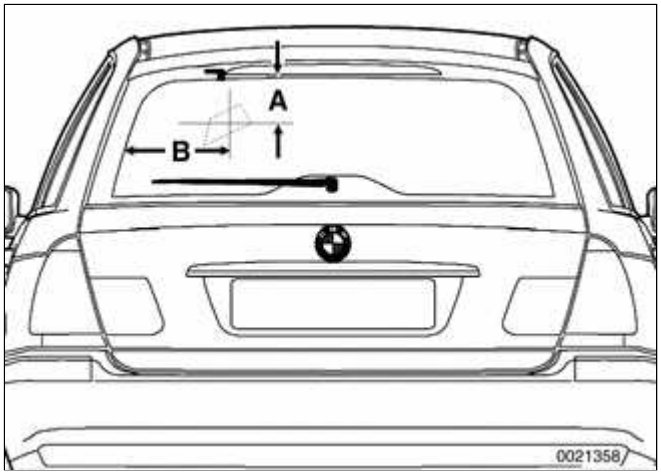
(**arrow**) clockwise to remove from base of reservoir.

- Installation is reverse of removal.

Rear window spray nozzle, removing and installing (Sport Wagon)

- Use plastic prying tool to lever nozzle out of rubber strip at top of rear window.

- Push new nozzle into rubber strip.



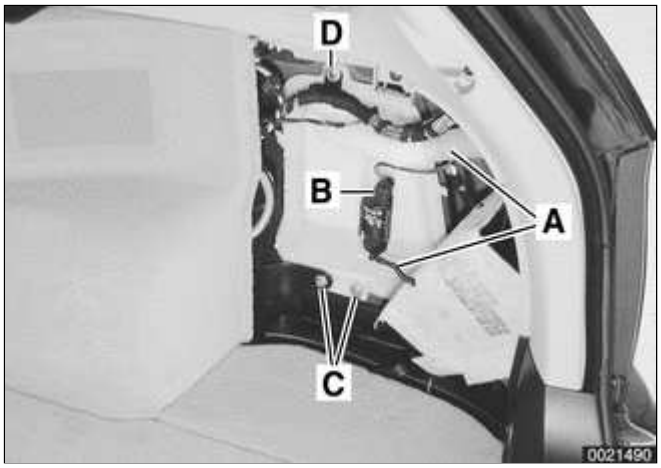
Adjust nozzle spray pattern using alignment specifications.

Rear window spray nozzle alignment specifications	
A	100 mm (3.9 in.)
B	320 mm (12.6 in.)

Rear window washer fluid reservoir, replacing (Sport Wagon)

- Working in right rear cargo area, remove side trim panel, then remove sound insulation.

- Siphon out washer fluid reservoir.



To remove tank:

- Detach filling and pressure hoses (**A**).
- Remove washer pump electrical harness connector (**B**).
- Loosen mounting nuts at bottom of tank (**C**) slightly.
- Remove top mounting nut (**D**) and remove reservoir.

- To remove fluid pump:

- Detach electrical harness connector (**B**).
- Pry pump gently outward and up to remove from tank.

- When installing:

- Coat pump sealing ring with anti-friction agent.
- Make sure hoses are not kinked.
- Refill reservoir.

General

This section covers replacement of electrical switches at the steering wheel, steering column, dashboard, pedal cluster, center console and other locations.

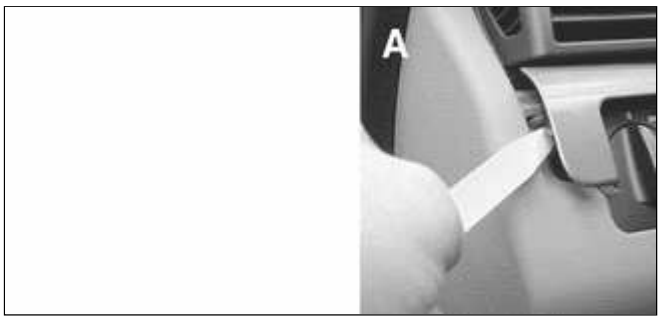
See also the following sections:

- ⇒ 119 Lubrication System for information on testing the oil pressure switch
- ⇒ 250 Gearshift Linkage for information about the gearshift lever
- ⇒ 515 Central Locking and Anti-theft for information about the electronic immobilization system (EWS 3.3)
- ⇒ 520 Seats for information about power seat controls
- ⇒ 540 Sunroof
- ⇒ 541 Convertible Top
- ⇒ 610 Electrical Component Locations
- ⇒ 630 Lights
- Electrical Wiring Diagrams.

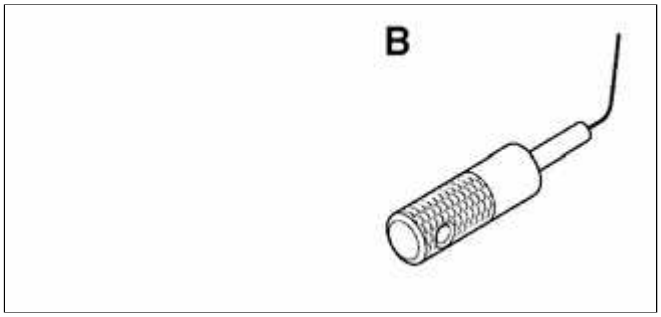
Special tools

A few special tools are necessary for

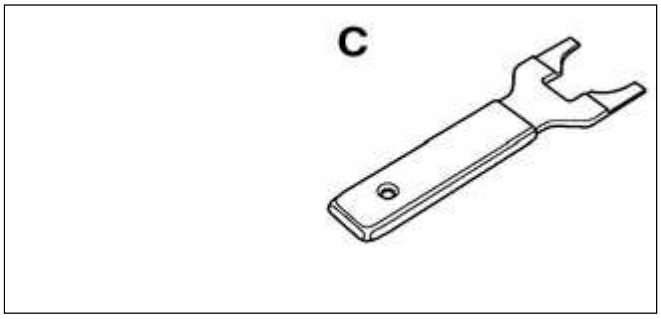
the repairs detailed in this section.



- Plastic prying tool BMW 00 9 321



- Ignition cylinder removal tool BMW 32 3 110



- Ring antenna removal tool BMW 61 3 300

CAUTION!

- ***When working on electrical switches or lights, always disconnect the negative (-) cable from the battery and insulate the cable end to prevent accidental reconnection.***
- ***Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.***
- ***To prevent marring the trim when working on interior components, work with plastic prying tools or wrap the tips of screwdrivers and pliers with tape before prying out switches or electrical accessories.***

612-2

Steering Wheel Switches

E46 vehicles are equipped with either the multi-function (MFL) steering wheel or the sports steering wheel. Incorporated into each steering wheel are an SRS airbag, horn contacts, selected cellular phone and radio controls and cruise control buttons.

To replace the steering wheel switches, remove the airbag first. See ⇒ 721 Airbag System (SRS).

WARNING!

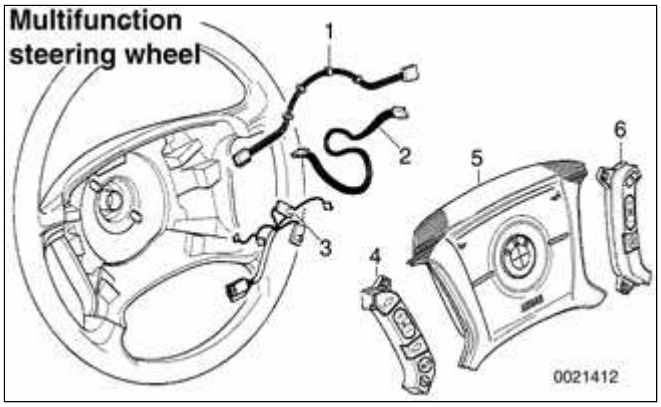
Improper handling of the airbag could cause serious injury. Store the airbag with the horn pad facing up. If stored facing down, accidental deployment could propel it violently into the air, causing injury.

CAUTION!

Special test equipment is required to retrieve SRS fault codes, diagnose system faults, and reset/turn off the SRS indicator light. The SRS indicator light will remain on until any problem has been corrected and the fault memory has been cleared.

Multi-function (MFL) steering wheel switches, accessing

- Remove airbag.

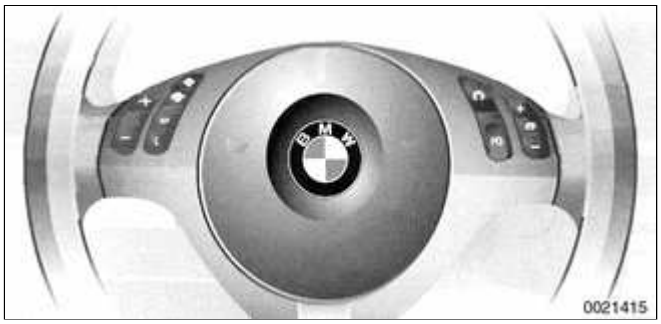


- Detach electrical harness connectors
  - 1 - Cruise control/radio/telephone electrical harness
  - 2 - Horn button electrical harness
  - 3 - Airbag electrical harness
  - 4 - Radio/telephone control switch set
  - 5 - Airbag
  - 6 - Cruise control switch set
- Remove small screws on back side of airbag pad to release left or right switch set.

Note:

BMW does not provide the horn contact switch as a separate part.

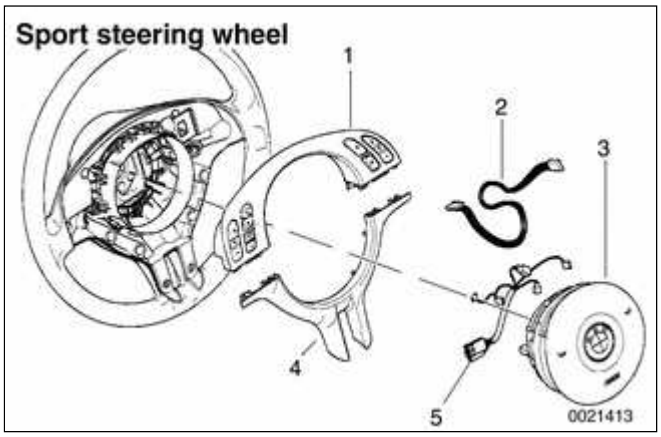
Sport steering wheel switches, accessing



- Remove airbag.

Note:

There is a special procedure for detaching the airbag from the sport steering wheel. See ⇒ 721 Airbag System (SRS).



- Remove screws mounting switch carrier to steering wheel.
  - 1 - Switch carrier
  - 2 - Steering wheel switch set electrical harness
  - 3 - Airbag
  - 4 - Lower cover

5 - Horn button and airbag electrical harness

- Pull switch carrier and trim down to detach from steering wheel. Remove electrical harness connector.

- Separate bottom trim piece from switch carrier.

Note:

BMW does not provide the horn contact switch as a separate part.

Steering Column Switches

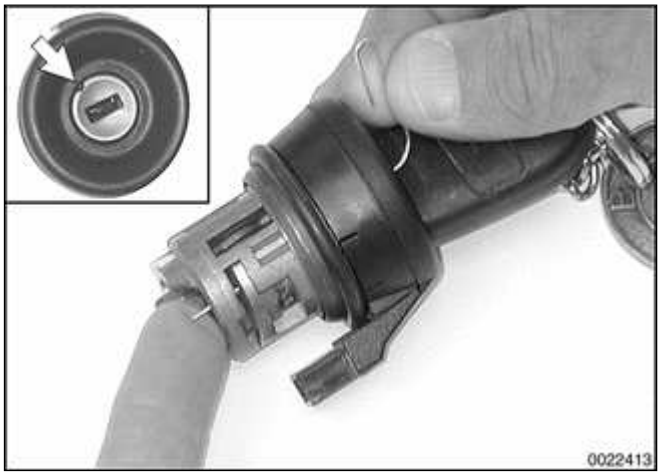
To remove any of the steering column switches, it is necessary to first remove the upper and lower column trim pieces. See ⇒ 513 Interior Trim.

CAUTION!

To prevent marring interior trim, work with plastic prying tools or wrap the tips of screwdrivers and pliers with tape before prying out switches or electrical accessories.

Ignition lock cylinder, removing and installing

To remove the EWS ring antenna prior to removing ignition lock cylinder, it is necessary to remove the upper and lower steering column trim. Use BMW special tool 61 3 300 to force off the ring antenna. Alternatively, remove the ignition switch key cylinder first.



With ignition key in ON position (60° from LOCKED):

- Insert a thin piece of stiff wire into opening (**arrow**) in lock cylinder and pull lock cylinder out.
- Detach ring antenna harness connector.
- Gently work ring antenna off key cylinder.
- Reinstallation is reverse of removal.

Steering column stalk switch assembly, removing and installing

To replace either the directional/headlight dimmer stalk switch or the wiper/washer stalk switch, you must first remove the entire stalk switch assembly from the steering column.

CAUTION!

To prevent marring interior trim, work with plastic prying tools or wrap the tips of screwdrivers and pliers with tape before prying out switches or electrical accessories.

- Disconnect negative (-) cable from battery and cover terminal with insulating material.

CAUTION!

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

- Remove airbag unit from steering wheel. See ⇒ 721 Airbag System (SRS). Store airbag unit in a safe place with pad facing up.

WARNING!

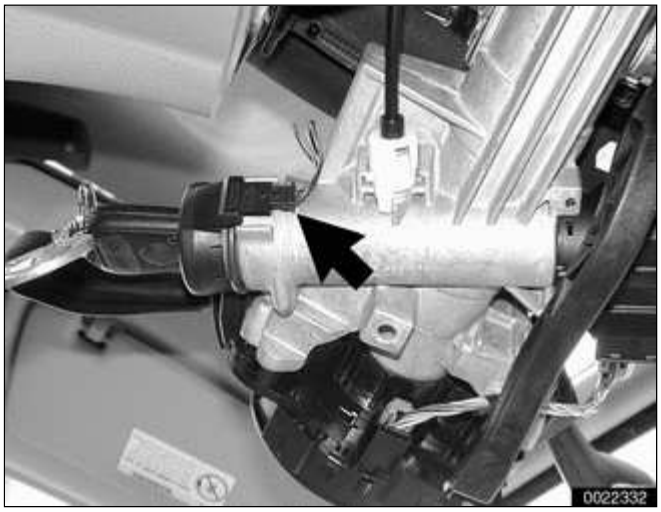
Any work involving the SRS system should only be performed by an authorized BMW dealer. Making repairs without the proper knowledge and special test equipment may cause serious personal injury. See ⇒ 721 Airbag System (SRS)

- With front wheels pointed straight ahead, remove steering wheel. See ⇒ 320 Steering and Wheel Alignment.

Note:

To help with reassembly, mark steering wheel and spindle shaft before disassembly.

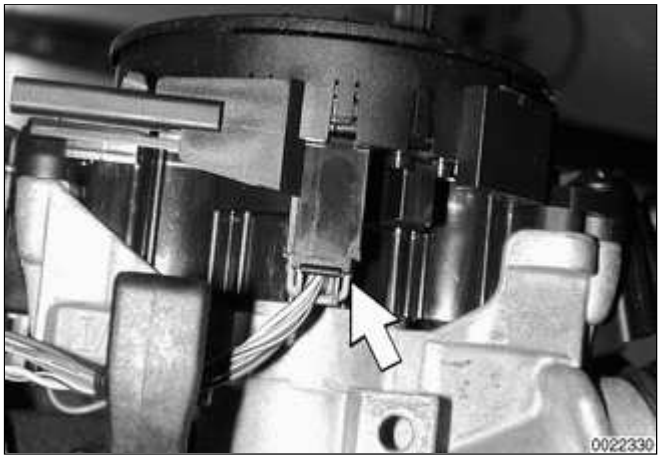
- Remove steering column trim. See ⇒ 513 Interior Trim.



➢ Detach EWS ring antenna electrical harness connector (**arrow**).

➢ Detach wiper/washer switch electrical harness connector (**arrow**).

➢ Detach turn signal/headlight dimmer switch electrical harness connector (**arrow**).



- Detach airbag electrical harness connector (**arrow**).

- Remove stalk switch housing retaining screws (**arrows**). Slide switch housing off steering column.

  - Installation is reverse of removal, noting the following:

  - Place turn signal indicator in center position before installing.

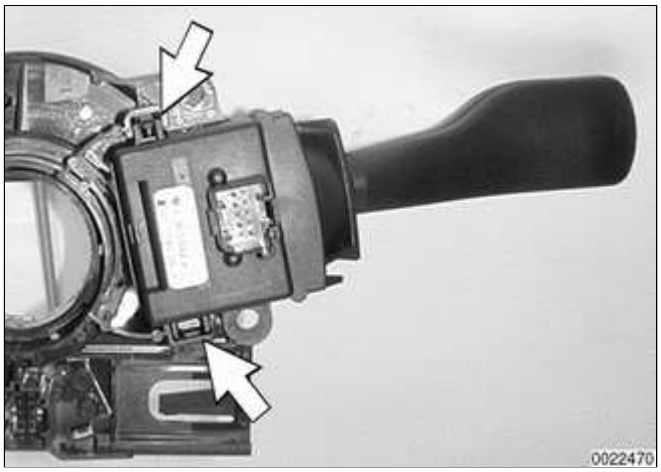
  - Ensure that self cancelling cams on turn signal switch are not damaged during installation.

Tightening torque	
Steering wheel to steering column spindle shaft	63 Nm (46 ft-lb)

Turn signal/headlight dimmer switch/ wiper switch removing and installing

- After removing steering column stalk switch assembly, as

described above, turn switch assembly face-down on work bench.



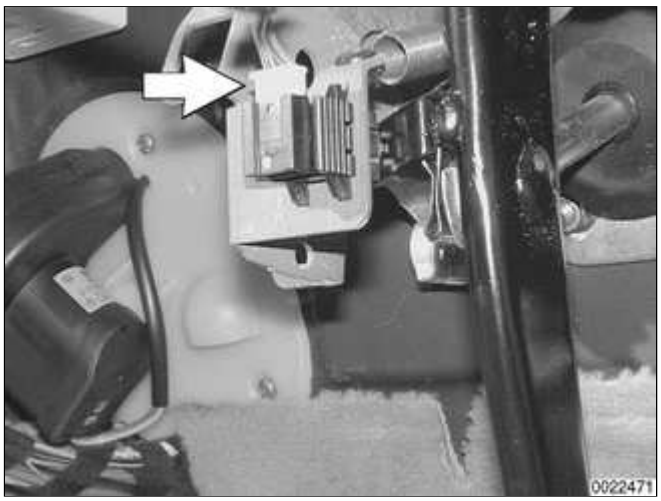
- Squeeze locking tabs (**arrows**) on sides of switch and slide switch out of assembly holder.

  - Push in new switch until it positively snaps into switch housing.

Pedal Cluster Switches

To access either the brake pedal or the clutch pedal switch, remove the left footwell trim (above pedals). See ⇒ 513 Interior Trim.

Brake light switch, replacing



Working at pedal cluster:

- Detach electrical harness connector (**arrow**) from brake light switch.
- Slide switch out of holder (toward rear of car).

Note:

The brake light switch is held in place via a serrated mounting. Remove switch mounting from pedal cluster bracket.

- Push brake pedal down, install new switch, then allow brake pedal to spring back slowly, automatically adjusting switch position.

Cruise control clutch switch, replacing

- Working at pedal cluster:
- Push clutch pedal to floor and lock in position using a pedal stop.
- Detach electrical harness

connector from switch.

- Squeeze together retaining clips at front of switch. Slide switch out of holder (toward rear of car).

- Install new switch, then allow clutch pedal to spring back slowly, automatically adjusting switch position.

Other Interior Switches

Many of the remaining electrical switches are housed at the bottom center of the dashboard, or in the center console.

The ASC or DCS switch is ahead of the shifter console at the bottom of the center dashboard. When equipped, seat heater switches are in the same location.

The right front and right rear window switches are ganged into one unit on the right side of the shifter. The left front and left rear window switches are ganged with the child safety rear window lockout switch (sedan and Sport Wagon models) on the left side of the shifter.

The central locking switch and hazard warning switch are ganged into one unit behind the shifter mechanism.

Replacement of the above switches is covered below, noting when each switch is accessible.

The left and right electric outside rear view mirrors are controlled by one switch on the driver door armrest.

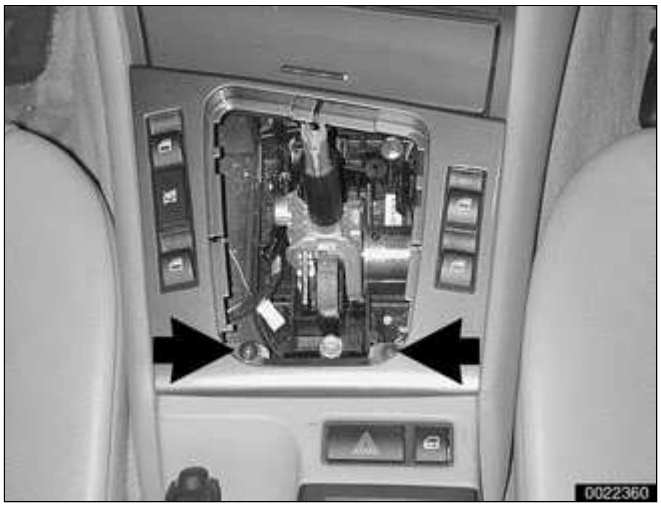
Lower dashboard/console switches, replacing

- Remove shift knob by pulling knob straight off the gearshift lever.

Note:

Removal of the shift knob will require about 90 lbs. of force. Do not twist knob or locating key can be damaged.

- Pry up on rear of shift boot/bezel to unclip, then remove boot from front retainers.



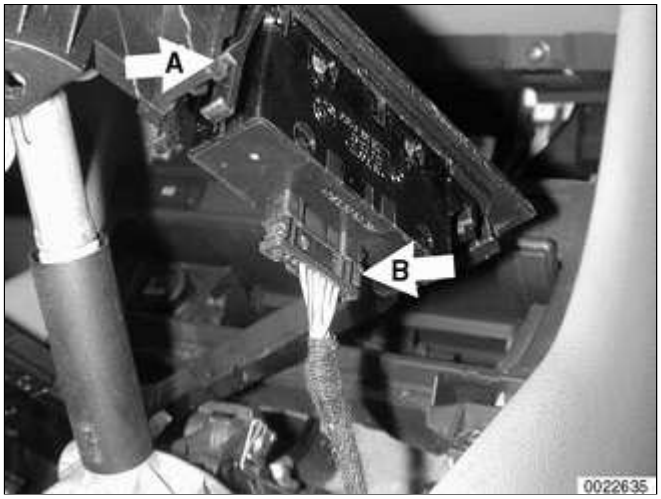
➢ Remove retaining screws (**arrows**) under transmission selector boot/trim.

Power window switches, replacing

- To remove left or right ganged window switches:

♦ Shifter bezel: Lift up by prying gently.

♦ Shifter boot: Unclip bottom of boot from center console trim by pushing forward. Pull boot up around shifter, but do not remove.



➢ Unclip switch retainer (**A**) and pull out switches from under console trim.

♦ Detach electrical harness connector (**B**) from switches.

- Installation is reverse of removal.

ASC/DSC/seat heater switches, replacing

Either the ASC or DSC switch is located in the storage compartment/ash tray housing. Seat heater switches are also located here, if equipped.

This procedure can be skipped in order to access center console switches.

- Remove storage compartment below IHKA control panel:
  - Open compartment door.
  - Push upward in center of compartment, then pull out.
  - Remove retaining screws from storage compartment/ash tray housing.
  - Slide housing out and disconnect electrical harness connectors. Remove housing from lower dashboard
  - With housing removed slide switches out of housing by gently pushing from behind.
  - Installation is reverse of removal.

Central locking/hazard warning switches, replacing

- Working at rear of center console, press rolling cover of rear ashtray down. Depress cover fully to pop ashtray out of console. Remove

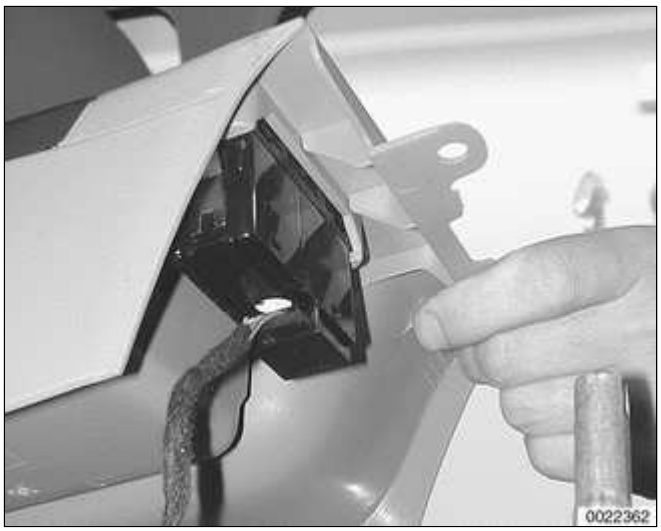
ashtray.

- Remove retaining screws and storage tray housing. Disconnect electrical harness connector for storage tray courtesy light.

- Remove screws at base of storage tray compartment in console.

- Unclip trim boot for parking brake lever and pull boot and handle forward off brake lever.

- Slide center console back from dash and lift up.



- Disconnect electrical harness protector from hazard light/central locking switch.

- To remove switch from console, depress retaining tabs on each side of switch and push switch out through surface of console trim.

- Installation is reverse of removal.

Outside mirror switch, replacing

- Carefully pry outside mirror switch from door arm rest.

- Disconnect harness connector

from switch.

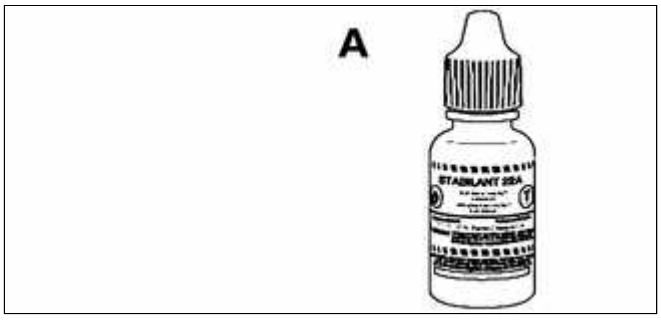
- Installation is reverse of removal.

General

This repair group covers removal and installation of the instrument cluster. Instrument cluster self-test procedures are also included.

Special tools

Individual instrument cluster components are not available. Since instrument clusters are only available as complete units, BMW recommends no special tools.



- Würth Stabilant® 22A Electrical contact enhancer

Experience has found that the use of an electrical contact enhancer will help prevent oxidation and intermittent circuit malfunctions at electrical harness connectors.

CAUTION!

When servicing the instrument cluster, always disconnect the negative (-) cable from the battery and insulate the cable end to prevent accidental reconnection.

Instrument Cluster

The dashboard mounted instrument cluster is the control and information center of the E46 cars. It is connected to most of the systems and sensors in the car through the use of "bus" networks:

- K-bus connects to Central Body Electronics (ZKE V) functions, heating/A/C (IHKA), rain sensor system, exterior and interior lights, Multiple Restraint System (MRS III), and Driveway Protection (EWS III).
- CAN-bus connects to engine management (DME), transmission control (AGS) and traction/stability control (ASC/DSC).
- D-bus connects to 20-pin Diagnostic Link Connector (DLC) and/or 16-pin OBD II diagnostic connector.

The instrument cluster stores and communicates Diagnostic Trouble Codes (DTCs) via the D-bus diagnostic link.

If the vehicle is equipped with On-Board Computer, pushing the button at the end of the directional stalk switch brings up on the cluster information of interest to the driver:

- Time
- Outside temperature
- Average fuel consumption

- Cruising range
- Average vehicle speed

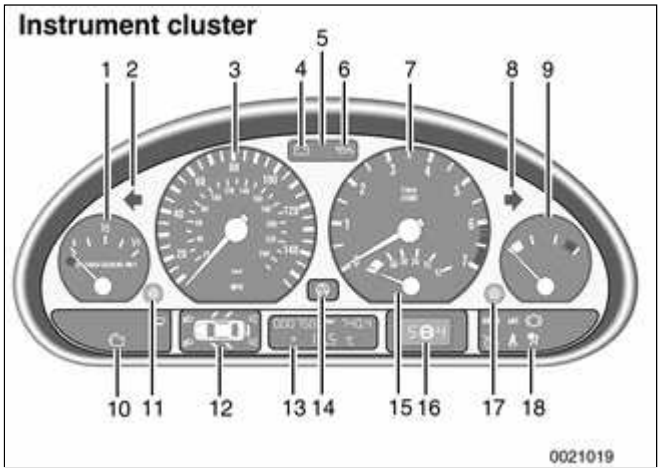
These functions are more fully explained in the Owner's Manual.

The cluster also stores important vehicle memory functions such as total mileage and service interval data. Instrument cluster replacement must be followed by special procedures, using BMW scan tools DIS or MoDiC or equivalent, to synchronize vehicle memory and mileage with the new cluster unit.

Note:

Specific vehicle information is stored redundantly in the instrument cluster and the light control module. This information includes: Vehicle identification number (VIN), Total vehicle mileage, and Service interval data.

Instrument cluster layout



The instrument cluster uses stepper motor driven analog gauges for display of engine and road speed, engine temperature, fuel level and economy.

1 - Fuel Gauge

2 - Left directional

3 - Tachometer

4 - Alternator warning light

5 - High beam warning

6 - Oil warning light

7 - Speedometer

8 - Right directional

9 - Temperature gauge

10 - Warning lights (Check Engine, etc.)

11 - Left reset button (odometer/service interval)

12 - Check Control LCD

13 - Odometer/On-Board Computer LCD

14 - ASC/DSC warning light

15 - Fuel economy gauge

16 - Transmission range/ program LCD (includes transmission fault indicator)

17 - Right reset button (clock)

18 - Warning lights (brakes, etc.)

In addition, three LCD blocks display:

- Check Control pictographs
- Service interval and mileage (On-Board Computer)
- Automatic transmission range/program and failure display

Warning indicators and lamps are arranged to the right and left of the LCD blocks. The ASC/DSC light, charge indicator, high beam and oil pressure lamps are located between the speedometer and tachometer.

The instrument cluster is a sealed unit and contains no serviceable components.