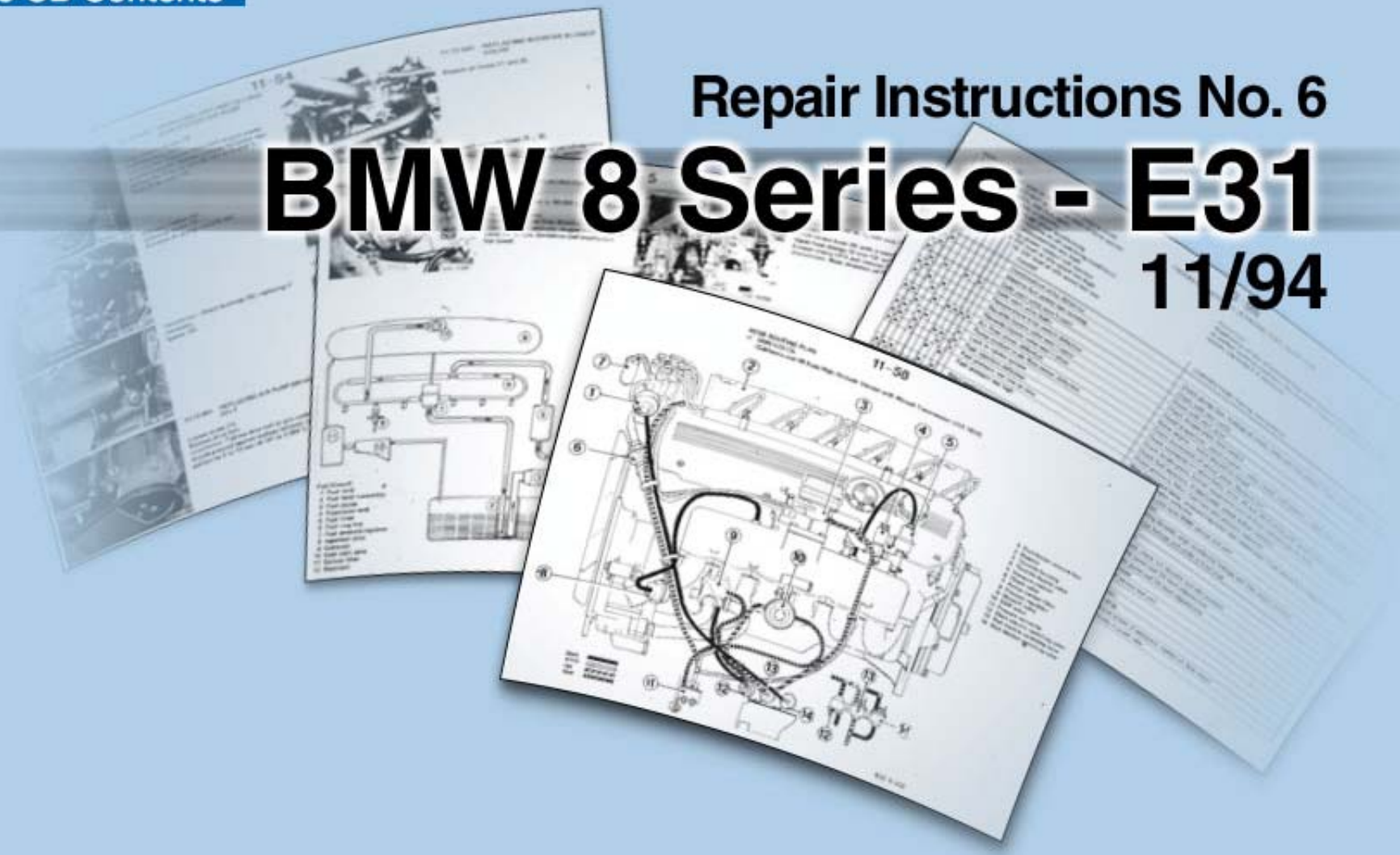
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Repair Instructions No. 6

BMW 8 Series - E31

11/94

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BMW Maintenance System

The maintenance operations are valid up to model year 93.
From model year 94, see Inspection Sheet.

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BMW Maintenance System – USA

Maintenance operations are valid until model year 93.
From model year 94, see Inspection Sheet.

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INTRODUCTION

These Repair Instructions are to assist you in performing the necessary maintenance and repair work expertly and correctly. This complements the practical and theoretical training given in our service training schools.

Beginning with 1985 models, Repair Instructions are divided into:

- Repair Instructions for the Series
- The Repair Instructions (3, 5, 6, 7 and 8 Series) describe removal, installation and replacement of construction groups on the vehicle.
- Construction Group Repair Instructions for BMW Automobiles
- The Construction Group Repair Instructions (Main Groups 11, 12, 13, 23, 24 and 33) describe removal, installation and replacement of construction groups on removed assemblies. Testing instructions and troubleshooting charts also feature in the Construction Group Repair Instructions.

For all Technical Data (tightening torques, adjustment values etc.) technical data microfilms are provided.

The Repair Instructions (microfilm or manual) illustrate work which is only possible to perform on standard production cars, i.e. not applicable to cars which have been subsequently modified.

The structure of these Repair Instructions is based on the same numbering system as the flat rate manuals (FR numbers),

Cross references to other FR (Flat Rate) numbers are only intended as assistance and must not be used for extension of the flat rates.

The individual page numbering, for example 64 – 11/8 means:
64 Main Group
11 Sub-group
8 Serial numbers

All the special tools mentioned in the Repair Instructions are summarized in the special tool microfiche, order no. 01 99 9 699 422. The use of special tool is illustrated in the descriptions of various repair operations.

Normally, the Repair Instructions only describe the removal work required for each operation. Installation takes place in reverse order. If it does not, *installation notes* are provided to explain the correct procedure.
In contrast to this, the removal and installation operations for complex tasks are described separately.

The Service Information bulletins provide regular information on improvements and modifications. As an additional source of information, we recommend using the illustrated parts microfiches.

BAYERISCHE MOTOREN WERKE AG
CENTRAL SERVICE DEPARTMENT

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Page Cross Reference:
Those pages in the page cross reference plan which are underlined (e.g. 11) are new or revised.

GENERAL INFORMATION

PRECAUTIONS FOR WORKING WITH PARTS CONTAINING ASBESTOS

Inhaling fine asbestos dust could impair health.
Conform with these safety precautions when working with asbestos parts.

- Only work outdoors or in well ventilated rooms.
- Only use manually operated or slow running equipment, with dust extracting equipment if necessary! Only operate fast running equipment with dust extracting attachments.
- Moisten parts prior to machining whenever possible.
- Never blow out brake and clutch parts.
- Moisten dust, fill in containers which can be sealed perfectly and scrap in a manner which prevents danger.
- Asbestos waste and scrapped parts must be collected in perfectly sealed containers marked accordingly and then eliminated without danger for human beings or the environment.

GENERAL INFORMATION

Important When Disconnecting Battery!

Disconnect the battery by disconnecting the ground lead on the battery. Disconnecting the battery will cancel fault memories of control units, so that fault memories must first be interrogated with a tester and, if applicable, faults printed.

Always disconnect both ground wires — otherwise danger of short circuit!

Note after reconnection of the battery!

Re-initialization of the front power windows: Shut the doors, shut the windows using the switch, hold the switch pressed at least 3 seconds.

Re-initialization of the sun roof: shut the sun roof using the switch and hold the switch pressed at least 3 seconds.

Checking initialization: automatic tip closing should work. If not, repeat the above procedures.

Important With Connected Battery!

Working on components, wire connections and so on could cause faults in fault memories of the concerned control units. If disconnection of the battery is specified in the Repair Manual for the carrying out of repairs, there must always be conformance with this in the interest of safety.

Windshield Wipers (Wiper Operating Motor)

Intermittent wiping and wiper speed 1 are switched off by a protector in case of failure. The protector remains active even after eliminating the fault. It can be cancelled by turning the ignition off (terminals 15 and R) for 3 minutes.

Car with Interlock System

If a component of the interlock system was removed and installed or the installed position of the interlock cable changed, the following function check must be carried out.

1. Move selector lever of automatic transmission into "P".
2. Remove ignition key.
3. Press button on selector lever.
4. If the selector lever can be moved out of "P", the interlock cable must be adjusted – refer to Group 25.
5. Switch ignition on.
6. Press button on selector lever.
7. If the selector lever cannot be moved out of "P", the interlock cable must be adjusted – refer to Group 25.

INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS

Important!

Disconnecting the car's battery will cancel fault memories of control units, so that it is absolutely essential to interrogate fault memories prior to disconnection of the car's battery and to have the faults printed with the BMW Service Tester's printer. Stored faults must then be investigated.

Disconnection and connection of control unit plugs always requires that the ignition be switched off.

Removal and installation of components, relays, fuses, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis. Consequently after finishing work on the electrical system it is always necessary to interrogate fault memories, investigate stored faults and cancel the fault memories.

INSTRUCTIONS FOR WORKING ON IGNITION, DME (DIGITAL MOTOR ELECTRONICS) AND ENGINE ELECTRICAL SYSTEMS

Caution!

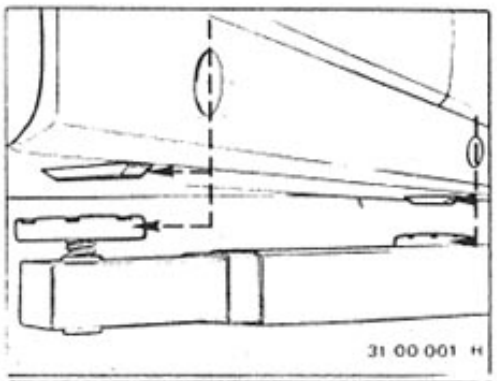
Always switch off the ignition before working on the ignition system — dangerous high tension voltage!

Always remove the DME master relay for the compression test so that the ignition final stages of the DME control unit cannot activate the ignition coils — dangerous high tension voltage!

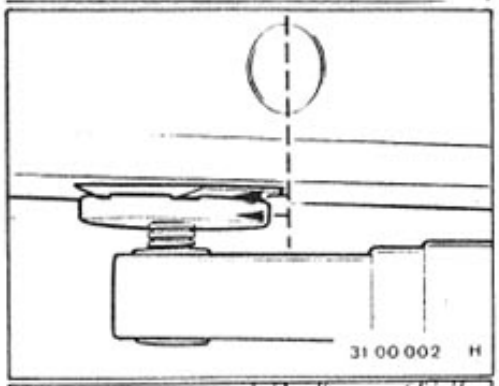
Always switch off the ignition before connecting and disconnecting the Service tester, other testers, adapters and so on as well as exchanging components.

LIFTING CAR WITH A CAR HOIST

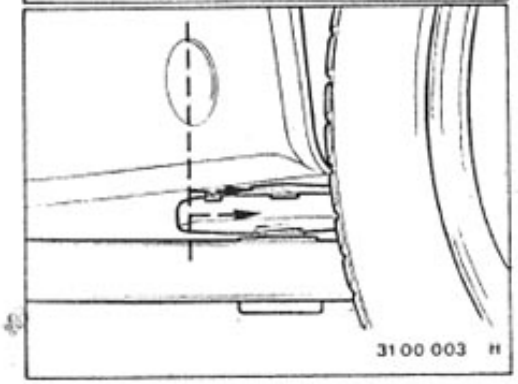
Before driving a car on the platform, make sure that there is sufficient space (clearance) between the hoist and car (spoilers, splash guards, etc.).



Car hoists must conform with local and national legislative measures concerning accident prevention and maintenance.
Arms of a car hoist must always be applied only on the reinforced points of the frame members.
Make sure that the underside is not damaged.



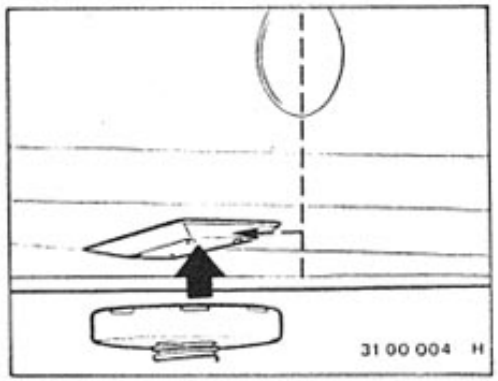
Front:
Apply rubber block of lifting arm on the front reinforcement of the frame member, below a cover for the supplied car's jack.



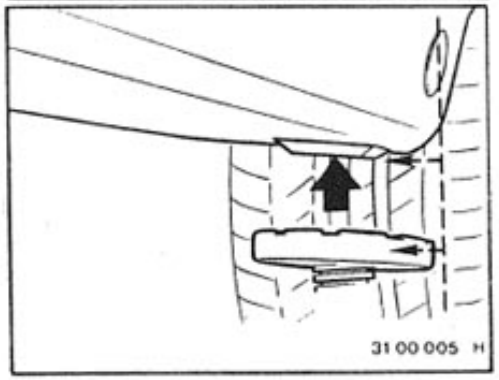
Rear:
Apply rubber block of lifting arm on the rear reinforcement of the frame member, below a cover for the supplied car's jack.

LIFTING CAR WITH A GARAGE JACK

A garage jack may also only be applied for lifting the car on the same take-up points described for the car hoist.
A suitable liner (rubber, wood or plastic) must be used between the jack and car to avoid damage to the undercoating, frame members or floor plate.



Front Take-up Point



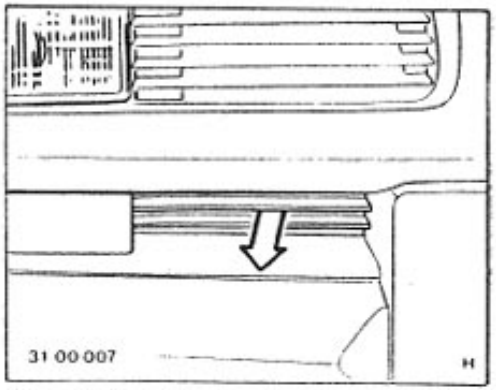
Rear Take-up Point

Important!
Conform with safety precautions and to speed specifications when a car is "driven" on a car hoist or with the rear end jacked up. Also refer to Group 26.

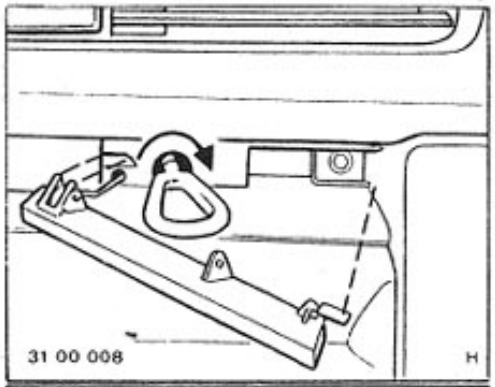
Towing

Always observe applicable legal regulations when towing.

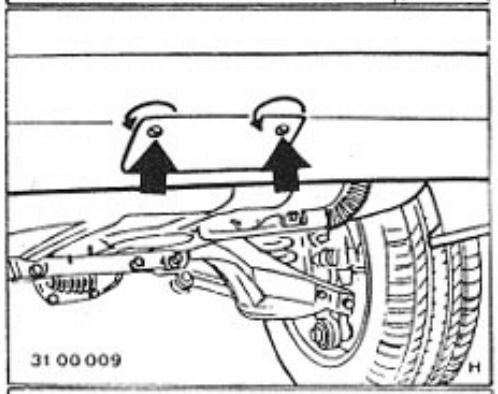
Caution!
Follow instructions in the relevant Owner's Manual.



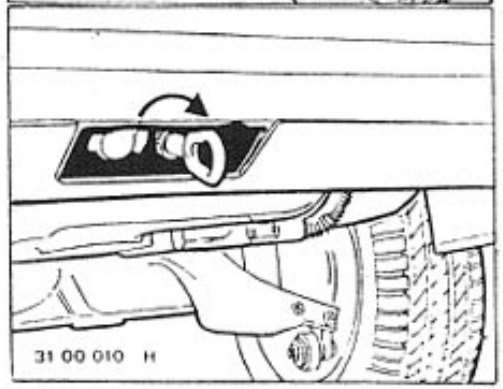
Lift off front right ornamental grille.



Screw in towing eye at front.



Open flap.



Screw in rear towing eye.

BMW MAINTENANCE SYSTEM 00 00 009 Pre-delivery inspection	General information					Important information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Interrogate fault memories in diagnosing system.						Refer to operating instructions for BMW diagnosing system.
Brief test.						Refer to BMW service tester operating instructions. Further instructions appear on monitor.
Check / correct engine oil level.				Gr. 11		Approved oil only!
Check fuel pipes, tank and hoses for correct routing, condition and leaks.						
Check / correct level of fluid in tank for brakes and clutch.				Gr. 34		Use approved brake fluid.
Check connections and pipes of brake system for leaks, correct position and damage.						
Check / adjust parking brake lever travel.	Gr. 34					
Check wheel bolt tightening torque.		Gr. 36				
Check rim size, tire size and type as well as tire inflation pressure (including spare wheel).		Gr. 36		SI 36		

BMW MAINTENANCE SYSTEM 00 00 009 Pre-delivery inspection	General information					Important information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Check / correct washing fluid level and antifreeze concentration in supply tank for windshield and headlight cleaners.					+	
Check / correct intensive cleaning fluid level in supply tank.						
Check function of windshield wipers/washer and aiming of water spray nozzles; remove protective sleeves from wiper blades.					+	
Check acid level and charged condition of battery (high current test) and add distilled water if necessary. Charge battery if necessary.	Gr. 61			Gr. 00 SI		
Check lights: headlights/additional headlights, parking lights, brake lights, turn signals, tail lights, backup lights, rear fog lights, license plate lights, passenger compartment lights, glovebox light, engine compartment light and trunk light.					+	
Check horn, headlight flasher and hazard warning lights.					+	
Check instrument and sign lights.					+	
Check control and warning lamps in instrument cluster and check control (incl. ABS, airbag).						
Check heating, ventilating and blower.	Gr. 64					
Check function of headlight cleaners and central locks.					+	
Insert and check function of cigar lighters.						

SI = Service Information

BMW MAINTENANCE SYSTEM 00 00 009 Pre-delivery inspection	General information					
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	Important information!
Check function of engine, clutch, transmission, final drive, steering, foot and hand operated brakes. Break in parking brake. Check function of control lamps for ABS and ASC. Check function of speedometer with odometer and daily trip recorder, tachometer, clock, temperature gage and fuel gage. Check engine, transmission, steering, final drive, drive shaft boots, fuel system, clutch and brakes for leaks. Remove seat and other protective covers. *Important!* Reset service indicator only in cars up to production date of 9/90. Reset service indicator after pre-delivery inspection: Switch off all electrical equipment. Switch on ignition – do not run engine. Plug SI-R* with adapter in diagnosis socket. Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on. Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds. Release inspection button – green lamp goes out. Load and time memories are separate and the procedures must always be repeated to reset the time memory. There must be a break of at least 10 seconds between the first and second resettings, and the second resetting can take place,up to 17.5 hours after the first resetting. Checking Service Indicator: All five green light emitting diodes must come on. Yellow and possibly red light emitting diodes as well as INSPECTION sign light must go out. * SI-R = Service indicator resetter, Order No. 62 1 100. Adapter, Order No. 62 1 140. New SI-R, Order No. 62 1 110						

BMW MAINTENANCE SYSTEM 00 00 210 BMW Running-In Check at 2,000 km	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Interrogate fault memories in diagnosing system. Brief test.						Refer to operating instructions for BMW diagnosing system. Refer toBMW service tester operating instructions. Further instructions appear on monitor.
Replace engine oil and oil filter at operating temperature.	Gr. 11	Gr. 11		Gr. 11	+	Use approved oil.
Replace oil in final drive at operating temperature.	Gr. 33	Gr. 33		Gr. 33	+	Use approved oil.
Final inspection with traffic safety test, brakes, steering, control and warning lamps as well as check control reports.						

BMW MAINTENANCE SYSTEM 00 00 220 BMW Inspection I	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Interrogate fault memories in diagnosing system. Brief test.						Refer to operating instructions for BMW diagnosing system. Refer to BMW service tester operating instructions. Further instructions appear on monitor.
Replace engine oil and oil filter at operating temperature.	Gr. 11	Gr. 11		Gr. 11		Use approved oil.
Replace spark plugs.		Gr. 12				
Check coolant hoses for leaks; check / correct coolant level and antifreeze concentration.				Gr. 17	+	Replace coolant at least every 2 years.
Check routing and condition of fuel pipes, tank and hoses as well as for leaks.	Gr. 13/16					
Check condition, routing and suspension of exhaust system as well as for leaks.						

BMW MAINTENANCE SYSTEM 00 00 220 BMW Inspection I	General Information					
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	Important Information!
Check power steering for leaks; check / correct oil level.				Gr. 32		
Check that steering is without play, adjusting if necessary. Check condition of tie rods and front axle joints. Check steering gear, linkage, joints and dust covers..						
Remove and install front and rear disk brake pads. Check total thickness. Replace pads if necessary. Check surface condition of brake disks. Check brake caliper dust covers for leaks. Lubricate wheel rim centers with grease.	Gr. 34/36					Wheel bolts: use specified torque.
Check connections and pipes of brake system for leaks (also for damage) and correct position. Check that parking brake cables move easily. Adjust parking brake.						*Important!* Use approved brake fluid. Replace brake fluid when indicated by Service Indicator or at least every 2 years. Also refer to Group 00.
Check / correct level of fluid in tank for brakes and clutch.	Gr. 34			Gr. 34		
Check / correct tire pressure (including spare wheel). Check condition of tires (if worn unevenly and customer approves, check and correct wheel alignment and invoice separately).	Gr. 32			SI Gr. 36	+	
Ride level height control: check / correct oil level in tank on unloaded car (car on lifting platform).	Gr. 37			Gr. 37		

SI = Service Information

BMW MAINTENANCE SYSTEM 00 00 220 BMW Inspection I	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Service Information	Owner's Manual	
Check/correct level and antifreeze concentration in washing fluid tank for windshield and headlights. Check/correct level in intensive cleaning fluid tank.						
Check windshield wipers/washer, wiper blades and aiming of spray nozzles.					+	
Check function of parking lights, turn signals, tail lights, brake lights, backup lights, rear fog lights, license plate lights, passenger compartment lights, glovebox light, engine compartment light and trunk light.					+	
Check function of headlights and additional headlights.					+	
Check horn, headlight flasher and hazard warning lights.					+	
Check instrument and sign lights.					+	
Check acid level in battery and add distilled water if necessary.				Gr. 00	+	
Check charged condition of battery (high current test).	Gr. 61					
Replace microfilter for heater or heater/air conditioner. Shorten replacement intervals if car is operated in extremely dusty regions.	Gr. 64					
Check condition and function of seat belts.	Gr. 72					
Check function of locks for doors, engine hood and trunk lid.						
Check entire body for corrosion.						Refer to Service information of Group 00.

BMW MAINTENANCE SYSTEM 00 00 220 BMW Inspection I	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Service Information	Owner's Manual	
Check all transmissions for leaks.						Visual inspection.
Final inspection with safety test (check ABS and airbag control lamps), brakes: (break in parking brake), steering, clutch or automatic transmission, springs and shock absorbers visually and check function of power steering.	Gr. 34					
Check control and warning lamps in instrument cluster as well as mirrors and heater blower.						
Check reports in check control.						
Important! Reset service indicator after inspection I: Switch off all electrical equipment. Switch on ignition – do not run engine. Plug SI-R* with adapter in diagnosis socket. Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on. Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds. Release inspection button – green lamp goes out.				Gr. 62		
The time-dependent inspection interval is due when the clock symbol lights up together with the INSPECTION sign and has no influence on the green light emitting diodes. If the load and time-dependent inspections occur simultaneously, resetting must be repeated after 10 seconds to have the clock symbol and INSPECTION sign lights go out.						
Important! When the clock symbol lights up in cars since 9/90 only the brake fluid has to be changed.						Replace brake fluid at latest every 2 years.
Checking Service Indicator: All five green light emitting diodes must come on. Yellow and possibly red light emitting diodes as well as INSPECTION sign light must go out.						
SI-R = Service Indicator resetter, Order No. 62 1 100. Adapter, Order No. 62 1 140. New SI-r, Order No. 62 1 110						

00 00 230 BMW Inspection II = Inspection I + following operations	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Both intake silencers: replace air filter inserts Shorten intervals accordingly for cars operated in dusty regions. Clean both air manifolds (intake volumes).	Gr. 13					
Replace spark plugs (M60 engine)	Gr. 12	Gr. 12			+	
Change oil in automatic transmission at operating temperature	Gr. 24			Gr. 24		Only use approved grades of oil
Change oil in differential at operating temperature	Gr. 33			Gr. 33		Only use approved grades of oil
Check gaiters on output shaft for condition and leaks						Visual inspection
Check thickness of handbrake linings, replacing if necessary	Gr. 34	Gr. 34				
With autom. stability and traction control (ASC + T): Replace filter insert in intake line,	Gr. 34					
At every 2nd inspection II:						
Replace both main fuel filters	Gr. 13					
Check clutch drive plate for wear	Gr. 21					
Change oil in manual transmission at operating temperature	Gr. 23			Gr. 23		Only use approved grades of oil

BMW MAINTENANCE SYSTEM 00 00 230 BMW Inspection II = Inspection I + Additional Work	General Information Repair Manual	 Technical Data	 Nominal Values	 Operating Fluids	 Owner's Manual	Important Information!
Check additional heater. If necessary, repair and invoice separately.	Gr. 64					Conform with national and local legislation.
Important! Reset service indicator after Inspection II: Switch off all electrical equipment. Switch on ignition – do not run engine. Plug SI-R* with adapter in diagnosis socket. Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on. Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds. Release Inspection button – green lamp goes out. The time-dependent Inspection interval is due when the clock symbol lights up together with the INSPECTION sign and has no influence on the green light emitting diodes. If the load and time-dependent inspections occur simultaneously, resetting must be repeated after 10 seconds to have the clock symbol and INSPECTION sign lights go out. Checking Service Indicator: All five green light emitting diodes must come on. Yellow and possibly red light emitting diodes as well as INSPECTION sign light must go out.						
SI-R = Service Indicator resetter, Order No. 62 1 100. Adapter, Order No. 62 1 140. New SI-R, Order No. 62 1 110.						

BMW MAINTENANCE SYSTEM BMW Annual Check (Resetting Service Interval Indicator)	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Important! When the clock symbol lights up in cars since 9/90 only the brake fluid has to be changed.	Gr. 34			Gr. 34		Replace brake fluid at latest every 2 years.
Reset service indicator for annual check (INSPECTION with clock sysmbol): Switch off all electrical equipment. Switch on ignition – do not run engine. Plug SI-R* with adapter** in diagnosis socket. Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on. Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds. Release inspection button – green lamp goes out.			Gr. 00/62 SI			
Service Indicator with Clock Symbol and Only One Red LED: The time-dependent inspection interval is due when the clock symbol lights up together with the INSPECTION sign and has no influence on the green light emitting diodes. If the load and time-dependent inspections occur simultaneously (clock symbol light and yellow or red LED on), resetting must be repeated after 10 seconds to have the clock symbol and INSPECTION sign lights go out and activate the green light emitting diodes.						
Checking Service Indicator: The number of green light emitting diodes does not change by resetting the time-dependent inspection service indicator. The INSPECTION sign and clock symbol lights must go out.						
* SI-R = Service indicator resetter, Order No. 62 1 100. ** Adapter, Order No. 62 1 140. New SI-R, Order No. 62 1 110. SI = Service Information						

BMW MAINTENANCE SYSTEM 00 00 249 BMW Engine Oil Service	General Information					
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	Important Information!
Replace engine oil and oil filter at operating temperature.	Gr. 11			Gr. 11		Use approved oil.
Important! Reset service indicator after Oil Service: Switch off all electrical equipment. Switch on ignition – do not run engine. Plug SI-R* with adapter in diagnosis socket. Push in and hold recessed, yellow OIL SERVICE button** – green lamp (function control) comes on. Yellow lamp also comes on after approx. 10 seconds and goes out after approx. 3 seconds. Release oil service button – green lamp goes out.				Gr. 00/62 SI		
Checking Service Indicator After Approx. 10 Seconds: All five green light emitting diodes must come on. Yellow and possibly red light emitting diodes as well as OIL SERVICE sign light must go out.						

* SI-R = Service indicator resetter, Order No. 62 1 100.
Adapter, Order No. 62 1 140.
New SI-R, Order No. 62 1 110

** *Caution!* Resetting with the wrong button cannot be corrected. Service intervals would be mixed up – also refer to BMW Technik information for Group 62.

SI = Service information

BMW MAINTENANCE SYSTEM 00 00 259 BMW Safety Test	General Information					Important Information!
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	
Interrogate fault memories in diagnosing system.						Refer to operating instructions of BMW diagnosing system.
Brief test						Refer to operating instructions of BMW Service Tester.
Steering Test: Steering gear, linkage, coupling, connections, leaks, oil volume.	Gr. 32			Gr. 32		Use approved oil.
Brake Test: Brake pads (remove and install wheels; remove pads), brake disks, pipes, hoses, connections, brake fluid level, parking brake cables, parking brake adjustment: break in parking brake.	Gr. 34					
Important! Replace brake fluid at latest every 2 years.				Gr. 34		Use approved brake fluid.
Tire and Wheel Rim Test: Condition, specified size, tread depth, tire wear pattern, tire pressure (including spare wheel).		Gr. 36		Gr. 36		
Light Test: Headlights, front fog lamps (also aiming), parking lights, tail lights, backup lights, license plate lights, instrument and sign lights, control and warning lamps.	Gr. 63				+	
Warning Equipment Test: Horn, turn signals, hazard warning lights, brake lights, headlight flasher, rear fog light, burglar alarm.					+	
Windshield Wipers/Washer and Headlight Cleaners: Wiper blades, washer (windshield, if applicable headlights), (if applicable fill intensive cleaning fluid tank), supply tank (level/antifreeze), spray nozzle aiming (windshield, if applicable headlights).				Gr. 00 SI	+	
Seat Belt Test: Condition and function.	Gr. 72					
Remarks: Repairs and adjustments are invoiced separately.						
SI = Service Information						

BMW MAINTENANCE SYSTEM	General Information					
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	Important Information!
00 11 229 Manual transmission oil change.	Gr. 23			Gr. 23	+	Use approved oil.
00 11 239 Automatic transmission fluid change.	Gr. 24			Gr. 24	+	Use approved ATF.
00 11 259 Final drive oil change.				Gr. 33	+	Use approved oil.

BMW MAINTENANCE SYSTEM 00 00 009 Pre-delivery inspection	General information					
	Repair Manual	Technical Data	Nominal Values	Operating Fluids	Owner's Manual	Important information!
Check function of other installed special equipment.					+	
Initialize sender of remote control system.						
Check data plate, vehicle identity number and chassis number.						
Compare ordered car equipment against delivered car eulp-ment.						
Tune in radio station and check for interference with engine running by switching all electric equipment on and off.						
Place tools in toolbox and secure jack and wheel bolt wrench.						
Paste label for BMW Emergency Service on lid of toolbox.						
Place owner's manual/service booklet, list of BMW service stations and BMW emergency service stations, spare keys and key case in glovebox.						
Stamp the service booklet and place it in the car.						

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Caution! From model 1993, follow Quality Certification Procedure I			Gr. 00			refer to SI 00 24 92 (3660)
Interrogate error memories in diagnosis system. Brief test						refer to operating manual BMW diagnosis systems
Check engine oil level (check lube oil for thinning), if necessary change oil and oil filter.			Gr. 00	Gr. 11	+	Only use approved grades of oil.
Check gasket on filler cover.						
Check coolant hoses for leaks and check routing.						Visual inspection
Check mounting of hose clips.						
Check concentration of coolant and coolant level, topping up if necessary.			Gr. 00	Gr. 17	+	Check long-term anti-freeze and corrosion inhibitor
Check acid level of batteries, topping up with distilled water if required. Check that battery connections are secure.						
Check spark plugs, replace or clean if required and adjust electrode gap.	Gr. 12	Gr. 12				
Check that fuel lines, fuel tank and fuel cap are secure and free of leaks and check fuel filter. Check that injection system is securely mounted and free of leaks.						Visual inspection
Check that exhaust system is correctly fitted.						Visual inspection

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Tighten nuts and bolts on steering transmission, flexible coupling, track rods and front axle, check self-locking nuts		Gr. 32/34				Check fuses Note tightening torque
Check power steering system for leaks.						Visual inspection
Check/adjust handbrake lever travel	Gr. 34					
Check fluid level in expansion tank for brake and clutch hydraulics.		Gr. 34	Gr. 00	Gr. 34		Always use approved grades of brake fluid.
Check connections and lines in brake system for leaks, damage and correct location.						Visual inspection
Check tire condition, tire size and type and tire pressure (including spare wheel).		Gr. 36	Gr. 36		+	
Check tightening torque on wheel studs. Check rim size and type.		Gr. 36				
Check light system: Check lights: parking lights, tail lights, brake lights, high-beam and low-beam headlights, side marking lights, foglights, reversing lights, license plate lights, inside lights (with delay system), glovebox lights, trunk lights and engine compartment lights, sun visor mirror light, map-reading lights at front and back.					+	
Check headlight alignment and adjust if necessary.	Gr. 63				+	
Check horn, headlight flasher and hazard warning lights with LED's					+	
Reset time.					+	
Program on-board computer (BC) and check function of input keys and remote control system.						

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Check instrument and sign lights light intensity.					+	
Check indicator and warning lights, clock, warning buzzer and check control: alternator, oil pressure, coolant temperature, indicator lights, brake linings/brake fluid level, foglights, Lambda oxygen sensor, safety belt, ignition key warning buzzer, high-beam headlights, tank clock, ABS and Airbag, check control, gear indicator.						
Fill supply tank for windshield wash system and check anti-freeze level.			Gr. 00		+	If necessary, top up anti-freeze.
Fill container on intensive cleaning system						
Check function of windshield cleaning system.					+	
Check windshield wipe-wash system and spray nozzle adjustment: Remove protective covers from wiper blades.					+	
Check function of intensive cleaning system.						
Check function of rear window heating system.						
Check function of cigarette lighter.						
Radio: check aerial and tuning, set radio stations, suppression when engine running and check all electrical consumers by switching on and off. Also check function of cassette player.	Gr. 65					
Check function of other available items of special equipment: electrical window regulators at front and back, slide/tilt sunroof in all settings, foglights and adjustment of electric radio aerial and speaker balance control. Check function of other items of equipment installed by dealer.						

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Check outside mirror.						
Check function of central locking system.					+	
Check seat adjustment by hand/electrically.						
Check safety belts.						
Check type plate, chassis and engine number.						
Check order against vehicle to be supplied.						
Place tool kit in vehicle tool box, secure jack and wheel brace.						
Attach sticker with telephone number for BMW breakdown service and date of annual brake fluid change.						
Place Owner's Manual, directory of BMW Service Centers, spare key and key wallet in the glovebox.						
Battery and accessories certificates.						
If applicable, operating manual for radio.						
Factory invoice (Monroney label).						
Cleaning kit for cassette player.						

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Trial run: Check acceleration, sunroof operation and brake system (before and during the trial run).						*Caution!* Increased braking action from systems with Politex brake linings.
Idle speed (rpm).		•				
Check function of Motronic.						refer to ETM
Check vehicle for wind noise.						
Check drive characteristics and wheel balance.						
Function check of: engine, clutch, transmission, rear axle, steering (wheels in straight-ahead setting); break in handbrake.	Gr. 34					
Check heating, ventilation and air-conditioning system						
Check function of instruments.						
Check cruise control system.						

BMW Maintenance System - USA

00 00 009 Pre-delivery inspection	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
After the trial run:						
Leak check on engine, transmission, steering system, differential, gaiters on input shafts, fuel system, clutch system and brake system as well as cooling system.						Visual inspection
Check and clean inside of vehicle.						
Vehicle washed and polished. Underseal undamaged. Vehicle without scratches or damage.						Visual inspection
Remove seat covers and protective covers.						
Caution! After pre-delivery inspection, reset service interval display: Switch off all consumers. Switch on ignition, do not run the engine. Insert SI-R* into diagnosis receptacle with adapter. Press and hold down red INSPECTION button - green lamp (function display) lights up. After approx. 3 seconds, red lamp also lights up, going out again after approx. 12 seconds. Release inspection button - green lamp goes out.						
Check service interval display: All five green LED's must light up. Yellow LED, and possibly also red LED and INSPECTION panel must go out.						

* SI-R = Reset button for Service Interval Display, Order no. 62 1 100
Adapter Order no. 62 1 140
SI-R new Order no. 62 1 110

00 00 215 BMW run-in check at 2 000 km (1200 miles)	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Caution! From model 1993, follow Quality Certification Procedure II			Gr. 00			refer to SI 00 24 92 (3660)
Interrogate fault memories in diagnosis system. Brief test						
Change engine oil and oil filter at operating temperature.	Gr. 11		Gr. 00	Gr. 11	+	Only use approved grades of oil
Change oil in differential at operating temperature.		Gr. 33	Gr. 00	Gr. 33		Only use approved grades of oil

BMW Maintenance System - USA

00 00 220 BMW Inspection I	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Interrogate fault memories in diagnosis system. Brief test						Refer to operating instructions BMW diagnosis system
Change engine oil and oil filter at operating temperature.	Gr. 11		Gr. 00	Gr. 11	•	Only use approved grades of oil
Clean joints and mounting points on throttle valve actuation mechanism, if necessary, oil/grease.			Gr. 13			
Check fuel tank, cap, lines and connections for leaks						Visual inspection
Check cooling system and all connections and heating hoses for leaks; check coolant level and concentration and, if required, top up						*Caution!* Every 2 years (from date of manufacture) coolant must be completely drained and changed.
Check condition, routing, suspension and leaktightness of exhaust system	Gr. 18					
Check oil level in manual transmission and top up if necessary.		Gr. 23	Gr.00	Gr.23		Only use approved grades of oil
Check power steering for leaks and oil level, topping up if necessary.	Gr. 32		Gr. 00	Gr. 32		
Check condition of wheel suspension, track rods, front axle joints, pitman arm and flexible coupling.	Gr. 31/34/36					Observe correct tightening torque Check self-locking nuts
Check steering system for backlash in straight-ahead setting.	Gr. 32					

BMW Maintenance System - USA

00 00 220 BMW Inspection I	General instructions					Important instructions
	Repair Instructions	Techn. Data	Service Info	Operating Fluids	Owner's Manual	
Check differential oil level and top up if necessary.			Gr. 00	Gr. 33		Only use approved grades of oil
Remove and install front and rear brake linings, checking total thickness. If necessary, replace linings. Check surface condition of brake discs. Grease wheel hub centers.	Gr. 34	Gr. 34	Gr. 36			
Check fluid level in expansion tank for brake and clutch hydraulic systems, topping up if necessary.	Gr. 34			Gr. 34		Use approved grade of brake fluid
Caution! Change brake fluid no later than every 2 years.	Gr. 34			Gr. 34		
Check brake calipers and gaiters for leaks.	Gr. 34		Gr. 00			Visual inspection
Check connections and lines in brake system for leaks, damage and correct routing. Check ease-of-movement of handbrake cables. Adjust handbrake.	Gr. 34					
Check tire pressure and correct if necessary (including spare wheel).			Gr. 36		+	
Check condition of tires.			Gr. 36			
If tires have worn unevenly: recommend axle alignment check (as separate invoice item).	Gr. 32					

BMW Maintenance System - USA

00 00 220 BMW Inspection I	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Level control, check hydraulic fluid level with laden vehicle. If necessary, top up hydraulic fluid (not required from 93 model).	Gr. 37			Gr. 37		
Tighten locks on doors, hood and trunk lids and check function.						
Oil door and lid hinges, grease door and lid locks.						
Check acid level in battery and top up with distilled water if necessary.						
Check function of air-conditioning system and check flow of refrigerant.	Gr. 64					
Replace microfilter in heating and air-conditioning system. Shorten intervals accordingly for cars operated in dusty regions.						
Check function of the following items of equipment: lights: headlights, parking lights, reversing lights, license plate lights, inside lights with delay system, glovebox light, engine compartment and trunk lights. Warning equipment: indicator lights, hazard warning lights, brake lights, horn, headlight flasher and headlight low-beam switch. Check/adjust beam alignment of headlights. Check function of Check Control; check indicator lamps for ABS, ASC and SRS systems.	Gr. 63					

BMW Maintenance System - USA

00 00 220 BMW Inspection I	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Top up container for windshield wash system / check concentration of anti-freeze in system. If necessary, top up fluid in intensive cleaning system.			Gr. 00		+	
Check function of wash-wipe system and check alignment of spray nozzles.						
Check seatbelts for condition and function.						
Final inspection and trial run with inspection of road safety: Brakes, steering system, clutch, automatic transmission control unit and mirrors; Break in handbrake.	Gr. 34					*Caution!* Increased brake force on systems with Politex brake linings. Break in handbrakes - see 34 10 014 in the Repair Instructions.
Check all transmissions for leaks.						Visual inspection
Caution! After Inspection I, reset service interval display: switch off all consumers. Switch on ignition, do not run the engine. Insert SI-R* with adapter in diagnosis receptacle. Press and hold down red INSPECTION button - green lamp (function check) lights up -. After approx. 3 seconds, the red lamp also lights up, going out after approx. 12 seconds. Release inspection button - remove green lamp.						
Check Service Interval Indicator: All five green LED's must light up. Yellow and possibly also red LED and INSPECTION panel must go out.						

* SI-R = reset button for Service Interval Display, order no. 62 1 100
Adapter Order no. 62 1 140
SI-R new Order no. 62 1 110

BMW Maintenance System - USA

00 00 231 BMW Inspection II = Inspection I + Extra Work	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Replace spark plugs.	Gr. 12	Gr. 12		+		
Both intake silencers: replace air filter insert. Shorten intervals accordingly for cars operated in dusty regions. Clean both air manifolds (intake volumes)	Gr. 13					
Replace (both) main fuel filters. If dirty fuel is used, shorten interval accordingly. (recommended in California and mandatory in all other States)	Gr. 13				+	
Check clutch drive plate for wear	Gr. 21					
Change oil in automatic transmission at operating temperature	Gr. 24	Gr. 24	Gr. 00	Gr. 24	+	Only use approved grades of oil
Change oil in differential at operating temperature		Gr. 33	Gr. 00	Gr. 33	+	Only use approved grades of oil
Check gaiters on output shaft for condition and leaks						Visual inspection
Check thickness of handbrake linings.	Gr. 34	Gr. 34				
With automatic stability and traction control (ASC+T): Replace filter insert in intake line	Gr. 34					
Inspect entire body for rust damage in accordance with the warranty terms. (at least every 2 years).						
Every 2nd Inspection II:						
Change oil in manual transmission at operating temperature.	Gr. 23	Gr. 23	Gr. 23	Gr. 23	+	Only use approved grades of oil.

00 00 231 BMW Inspection II = Inspection I + Extra Work	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	

Caution!
After Inspection II, reset Service Interval Display:
Switch off all consumers.
Switch on ignition, do not run the engine.
Insert SI-R* with adapter in diagnosis receptacle.
Press and hold down red INSPECTION button - green lamp (function check) lights up -. After approx. 3 seconds, a red lamp also lights up, then goes out after approx. 12 seconds.
Release inspection button - remove green lamp.

Check Service Interval Display:
All five green LED's must light up.
Yellow and possibly also red LED and INSPECTION panel must switch off.

* SI-R = reset button for Service Interval Display, Order No. 62 1 100
Adapter Order no. 62 1 140
SI-R new Order no. 62 1 110

BMW Maintenance System - USA

00 00 249 BMW Engine Oil Service	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Change engine oil and oil filter at operating temperature.		Gr. 00	Gr. 11			Only use approved grades of oil
Only during first engine oil service, (from Model '93): Change oil in differential at operating temperature		Gr. 33	Gr. 00	Gr. 33	•	Only use approved grades of oil

Caution!
After oil service, reset Service Interval Display:
Switch off all consumers.
Switch on ignition, do not run the engine.
Insert SI-R** in diagnosis receptacle with adapter.
Press and hold down yellow OILSERVICE*** button - green lamp (function check) lights up -. After approx. 10 seconds, the yellow lamp also lights up and goes out again after approx. 3 seconds.
Release OILSERVICE button - green lamp goes out.

Check Service Interval Display after approx. 10 seconds:
All five green LED's must light up together.
The yellow (and possibly the red) LED and the lettering in OILSERVICE panel must go out.

** SI-R = Reset button for Service Interval Display Order No. 62 1 100
Adapter Order No. 62 1 140
SI-R new Order No. 62 1 110

*** *Caution!*
Reset with the wrong button cannot be corrected.
Service Intervals are confused - also refer to BMW Technik - After-Sales Service Information, Gr. 62.

BMW Maintenance System - USA	General instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
BMW Lambda oxygen sensor service (required every 50 000 miles)						
Replace Lambda oxygen sensor every 50 000 miles	Gr. 11	Gr. 11				
Every 3 years from date of manufacture:						
BMW Airbag system (SRS) inspection						
Visual inspection to ensure that all airbag (SRS) components are still in original condition (no change in shape or position). No unauthorized wiring changes, additional wires or connections on airbag wiring harness are permitted. The airbag trim and ripcords must not be frayed, torn or separated in any other way. The airbag must not be treated with cleaning agent, lubricant or protective agent. Check that the correct labels (2 off) are fitted to front axle carrier and on glovebox.						

00 00 259 Additional scope recommended: separate invoice items	General Instructions					Important instructions
	Repair Instructions	Technical Data	Service Info	Operating Fluids	Owner's Manual	
Check steering system: steering transmission, steering linkages, flexible coupling, screw connections. Check power steering system for leaks, oil fill and condition.	Gr. 32		Gr. 00	Gr. 32		Only use approved grades of oil
Check brakes: brake blocks (remove and refit wheels), brake discs, lines, hoses, connections, fluid level, handbrake.	Gr. 34					
Caution! Change brake fluid at least once a year.			Gr. 00	Gr. 34		Always use approved grade of brake fluid
Check tires and disk wheels: condition, tire pressure, permitted size (including spare wheel).		Gr. 36	Gr. 36			
Check lighting: headlights, auxiliary headlights (including beam alignment), parking lights, tail lights and reversing lights, license plate lights, instrument and info' panel lights, glovebox lights, engine compartment light and trunk light, indicator and hazard warning lights, Check Control, ABS and Airbag warning lights.	Gr. 63					
Check warning system: horn, headlight flasher, indicator lights, hazard warning lights, brake lights.						
Check windshield wipe/wash, headlight cleaning system: wiper blades, wash system (windshield, headlights where appropriate and intensive cleaning system), fluid container (fluid level/anti-freeze), spray nozzle adjustment (windshield and headlights) and, where necessary, fluid level for intensive cleaning system.			Gr. 00		+	
Check safety belts: condition and function.	Gr. 72					
Clean cassette player head and align rollers every 50 - 100 hours or more often if sound quality is poor.						
Final inspection and trial run with inspection for road safety: Brakes, steering unit, clutch, automatic transmission control unit and mirrors.						*Caution!* Increased brake action on systems fitted with Politex brake linings.
Comment: Repair and adjustment work as separate invoice items.						

11 Engine

Engine M70 .....
Engine M60 .....
Engine M73 .....

11 Engine M70

	General information	11- 0/1
11 00 039	Cylinder compression – check	11- 0/1
00 00 249	BMW engine oil service	11- 0/2
11 00 050	Engine – remove and install	11- 0/3
11 12 002	Cylinder head cover, right or left – remove and install/seal	11-12/1
105	Cylinder head, left – remove and install	11-12/1
11 13 010	Oil pan, upper section – remove and install or replace	11-13/1
11 14 102	Timing gear, upper section – remove and install, seal or replace	11-14/1
110	Timing gear cover, lower section – remove and install, seal or replace	11-14/1
115	Timing gear, lower section – remove and install, seal or replace	11-14/2
11 22 000	Flywheel – replace	11-22/1
11 23 031	Vibration damper hub – replace	11-23/1
11 28 010	Alternator drive belt – replace	11-28/1
11 31 002	Camshaft, left or right – replace	11-31/1
051	Timing chain – replace	11-31/1
11 33 062	All hydraulic valve clearance compensation elements – replace	11-33/1
11 51 000	Water pump – remove and install or replace	11-51/1
11 53 000	Coolant thermostat – remove and install or replace	11-53/1
11 61 056	Sealing flange for air intake manifold, left or right – replace	11-61/1
11 62 145	All exhaust manifolds – remove and install or replace	11-62/1

For additional work, refer to “Construction Group Repair Instructions”

General Information

M70

Cylinder configuration:

Cylinders 1 ... 6, viewed in direction of travel, are arranged on the right side of the vehicle, starting with cylinder 1.

Cylinders 7 ... 12, viewed in direction of travel, are arranged on the left side of the vehicle, starting with cylinder 7.

Air manifold, throttle body and air filter with mass air flow sensor for each cylinder bank are arranged on the opposite side to their respective bank.

The operations described apply to both cylinder banks: if special explanations are required, the procedures for each cylinder bank are described separately.

General instructions for operations on valve timing:

If operations on the cylinder head are performed where the camshaft was removed, please note the following:
The hydraulic valve tappets expand without load being applied by the camshaft and, after installation, require some time before they compress back down. This means that, if parts are assembled in rapid sequence, even the "closed" valves may still be open and in direct contact with the piston.

Note the following wait periods between installation of the camshaft and mounting of the cylinder head:

ambient temperature 20° C	4 mins.
10° C - 20° C	11 mins.
0° C - 10° C	30 mins.

After assembly of the camshaft and the timing chain, wait for the following periods before turning the engine crankshaft:

ambient temperature 20° C	after 10 mins.
10° C - 20° C	after 30 mins.
0° C - 10° C	after 75 mins.

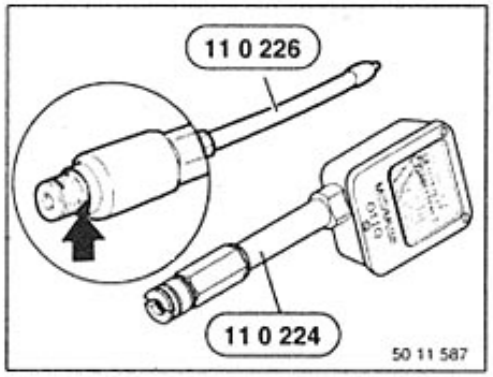
General instructions for work involving the gaskets:

Apply a bead of cement to all contact points and a thin, even coat of Hylomar SQ 32M** to determine the location of the gaskets.

** Refer to BMW Parts Service

11 00 039 Checking compression of all cylinders (M70)

Caution!
High voltage – danger of death!
Disconnect power supply from ignition coils.
Disconnect fuel pump relay and DME main relay.
Note instructions on compression check, refer to General Data MG12

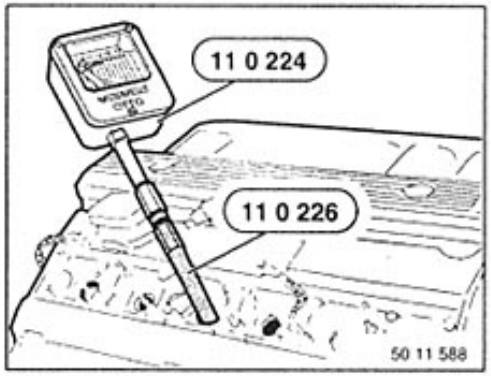


Removing all spark plugs, refer to 12 12 011

Insert special tool 11 0 226 in spark plug thread by hand.

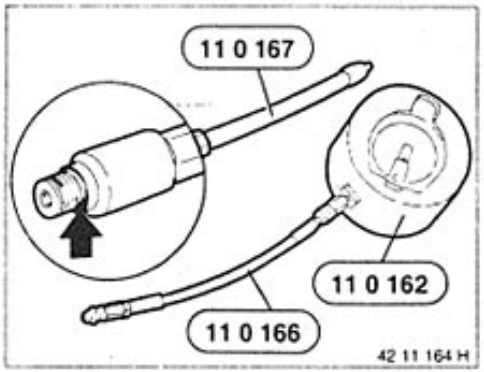
Note:
Check condition of seal and replace if necessary.

Connect up special tool 11 0 224 (compression tester).



Depress accelerator and actuate starter until compression stops rising.

Compression pressure



Note:
special tool 11 0 162 / 166 / 167 can still be reused.

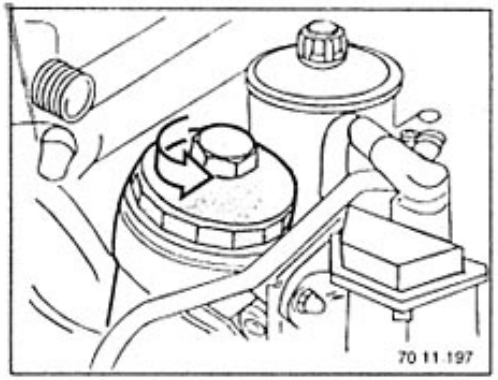
Refer to Technical Data

00 00 249 BMW engine oil service

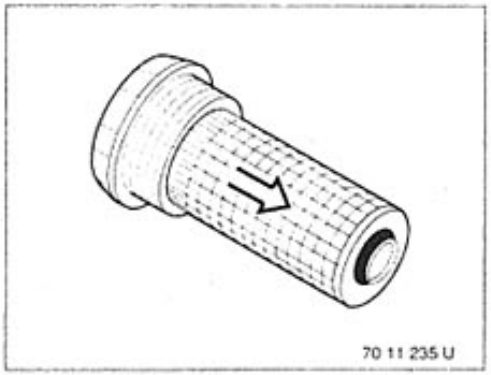
M70

(change engine oil and oil filter)

The oil change should be performed at operating temperature.

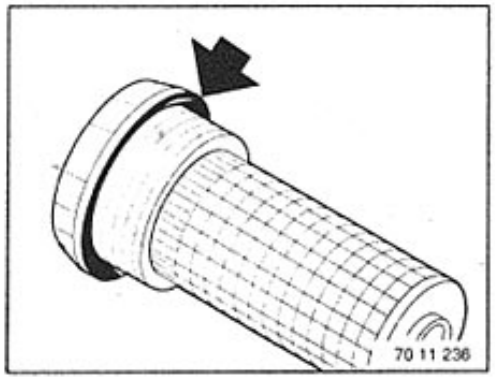


Drain oil from oil filter into oil pan by opening the oil filter cover.



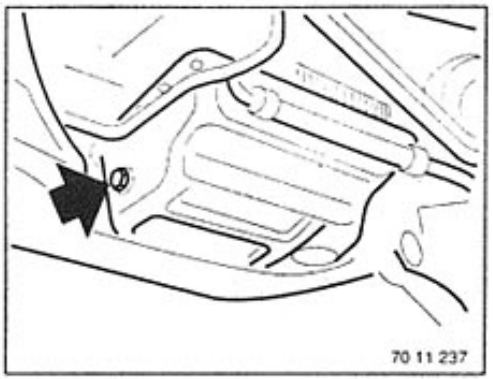
Remove oil filter from oil filter cover.

Installation:
Note installation direction of filter.
Filter must locate in cover.



Installation:
Replace O-ring in oil filter cover.
Tightening torque 11 42 2AZ*

* Refer to Technical Data



Once oil filter housing has been drained, open oil drain plug.
Drain or draw off the oil.

Installation:
Fit a new seal.
Tightening torque 11 13 1AZ*

Fill with engine oil

Switch on engine and run at idle speed until oil indicator lamp goes out.

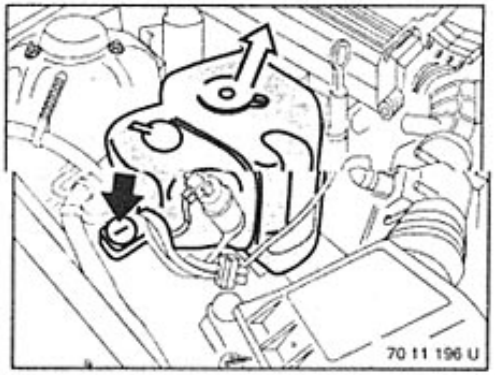
Switch off engine and check oil level (vehicle on level ground).
Engine oil grades **

* Refer to Technical Data
** Refer to BMW Operating Fluids

11 00 050 Removing and installing engine

M70

Remove radiator and expansion tank, refer to 17 11 500.

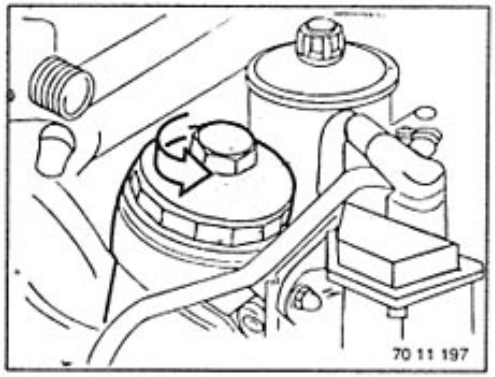


Remove windshield wash container and place to one side.



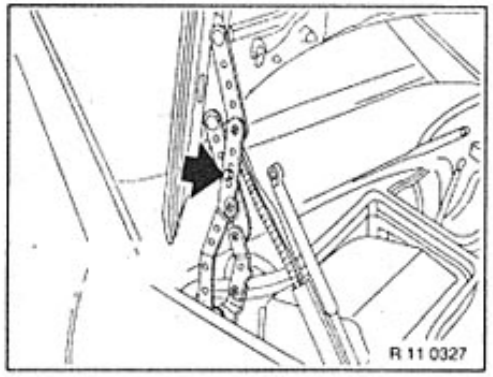
Remove transmission, refer to 23 00 025, 24 00 026.

Caution!
To prevent damage to the heating connections, special tool 00 0 200 or special tool 11 0 010 used for removal of transmission must remain in place until engine is attached to special tool 11 0 100.

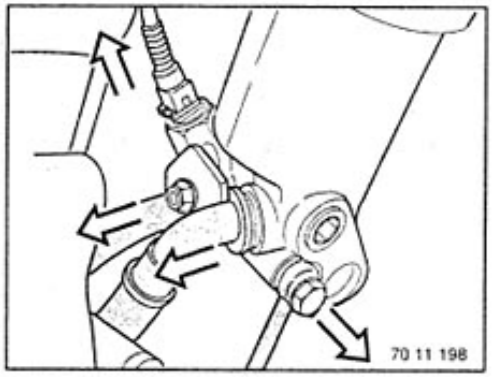


Drain oil from oil filter into the oil pan by opening the oil filter cover.

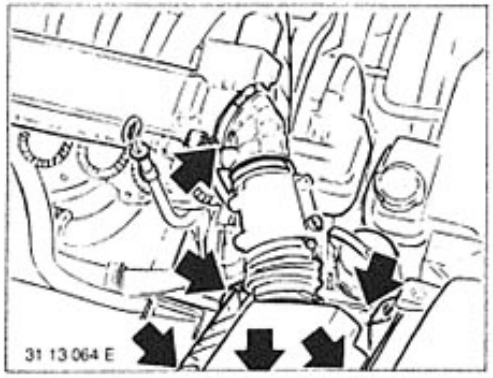
Installation:
Fit new gasket.



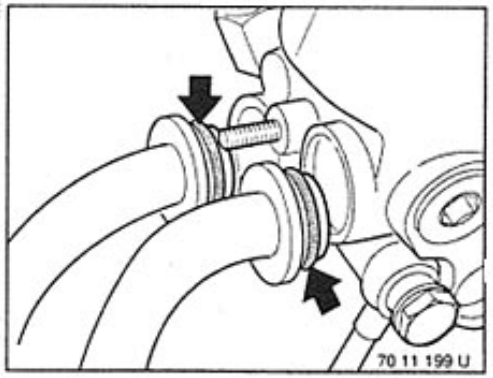
Lift engine hood into assembly position. Disconnect damper strut on engine hood, completely open engine hood and secure with one screw on each side (left and right).



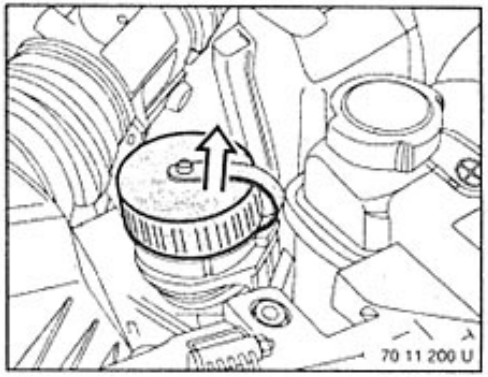
Disconnect oil lines from oil filter. Remove connector.



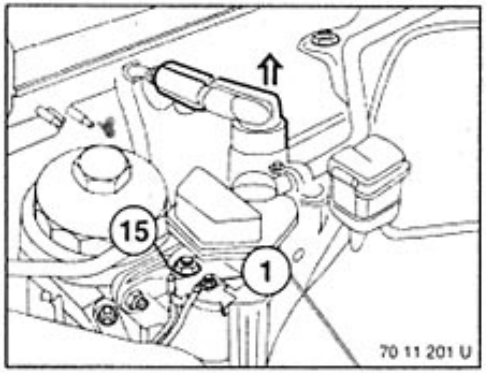
Remove complete mass air flow sensor with suction gaiter and upper section of filter from left and right sides.



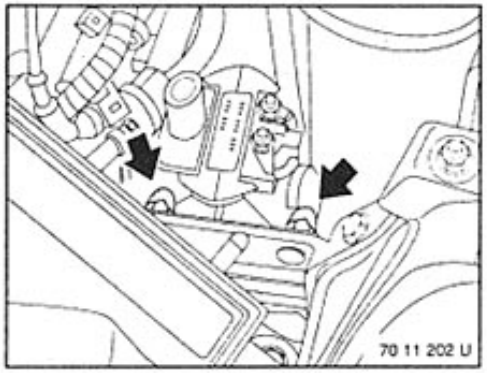
Installation:
Fit new seals.



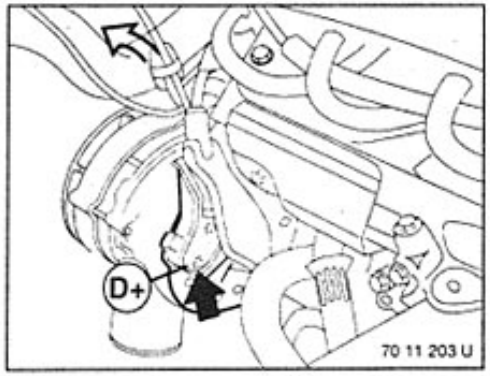
Unclip diagnostic plug.



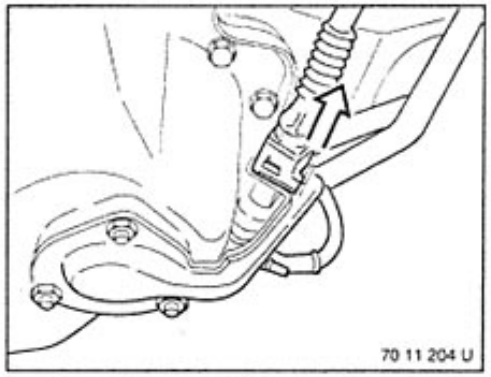
Disconnect ignition leads and connections on left and right ignition coils.



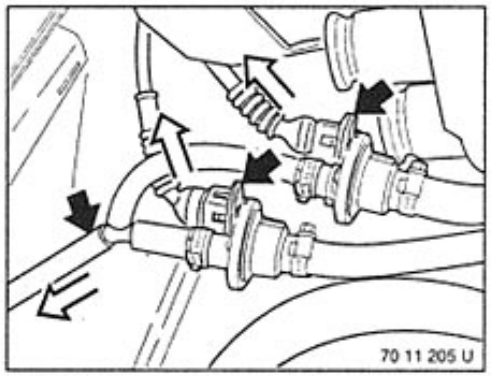
Unscrew right ignition coil.



Unscrew lead for D+ (thin lead) on the alternator and pull out of rubber cap.

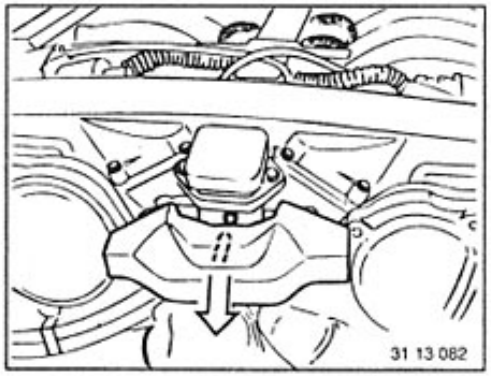


Disconnect oil level sender plug.

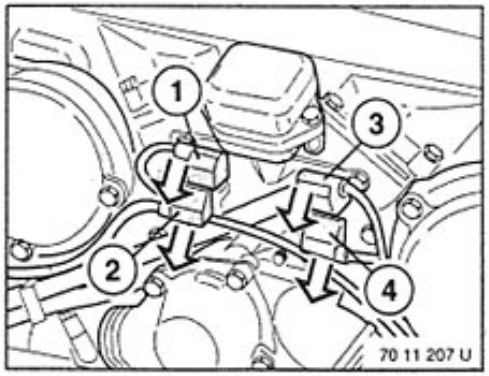


Pull both plugs off of tank venting valves.
Disconnect hose.

Important!
Don't mix up plugs.



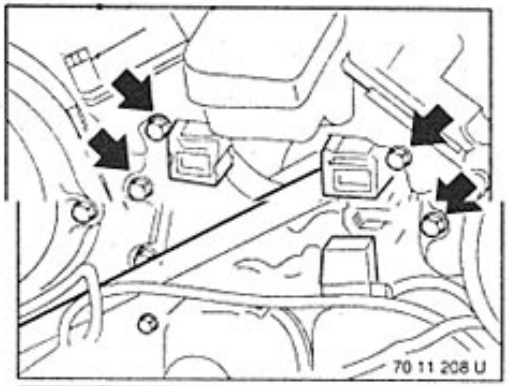
Pull off oil catching tray



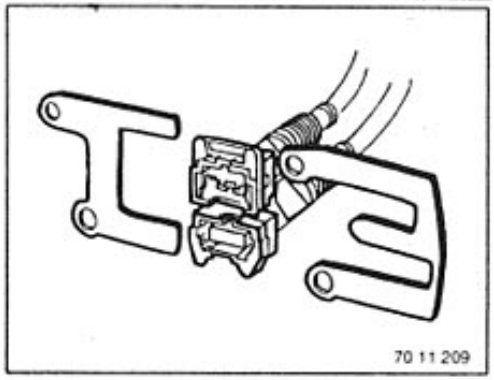
Pull off plugs (1 ... 4).

Installation:

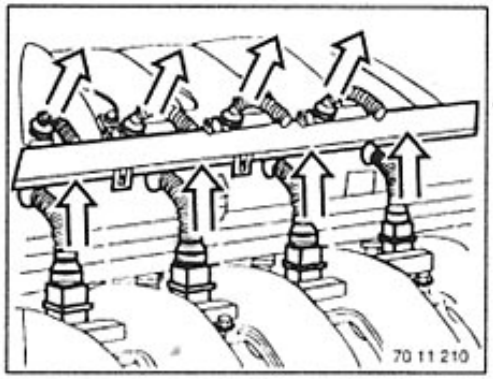
1 = Pulse sender	Cyl. 1 ... 6
2 = Cyl. identifier	Cyl. 1 ... 6
3 = Cyl. identifier	Cyl. 7 ... 12
4 = Pulse sender	Cyl. 7 ... 12



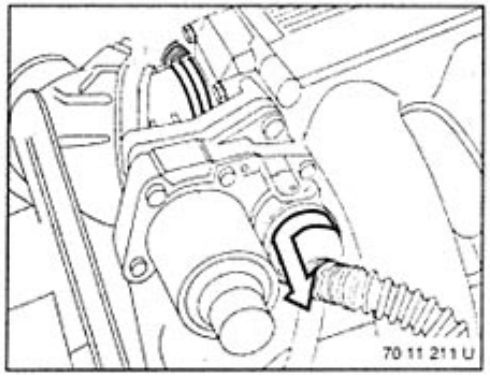
Unscrew bracket.



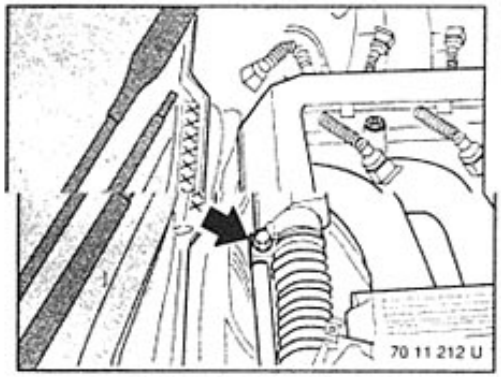
Pull plugs out of holders.



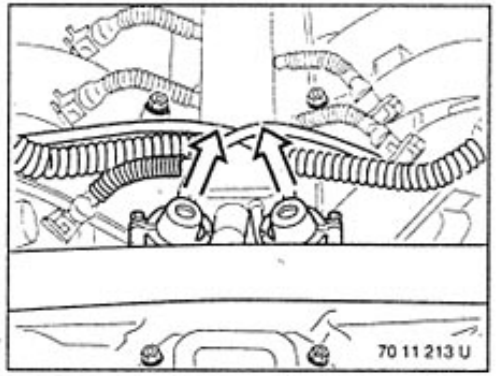
Pull plugs off of fuel injectors.



Disconnect plugs on left and right throttle valve assemblies.

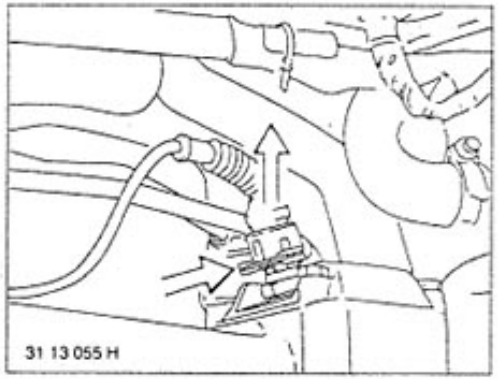


Unscrew electric lead duct on rear end of engine.

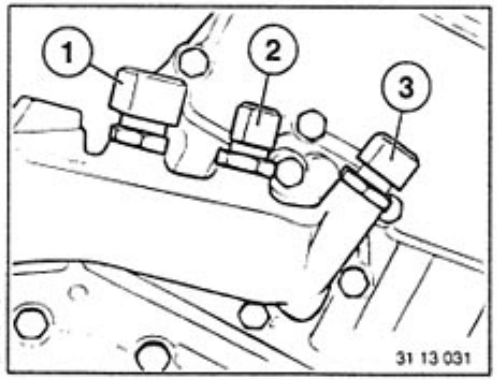


Pull vacuum hoses off of pressure regulators.

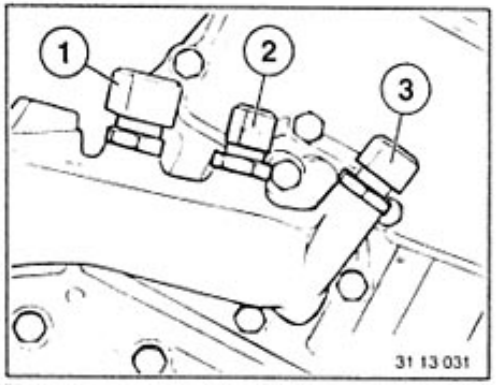
Installation:
Note arrangement of hoses.



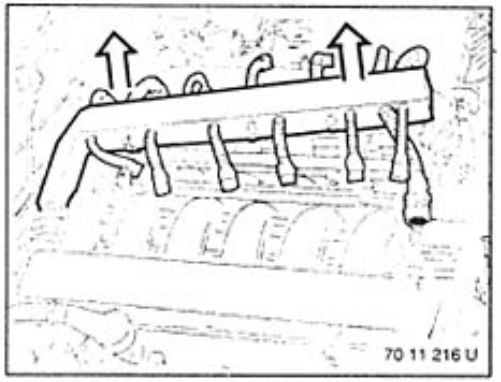
Pull off both plugs on air intake manifolds.



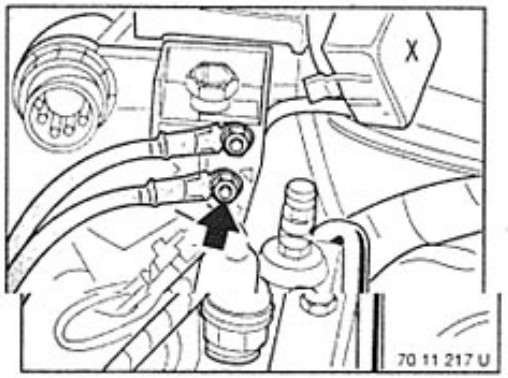
Pull off plugs on temperature sensors on rear end of engine.



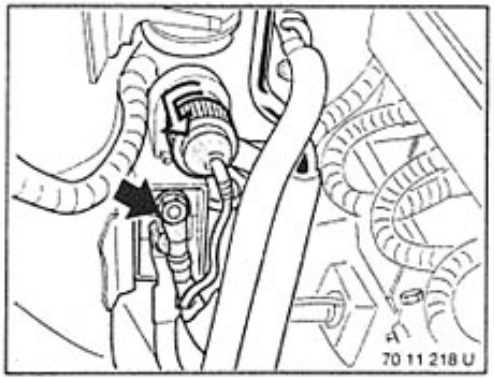
Arrangement:
1 Temperature sensor - DME
2 Temperature sensor - EML
3 Temperature sensor - temp. gage



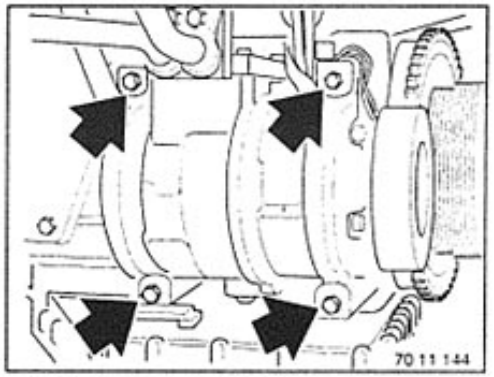
Lift off and move back electric lead duct.



Unscrew connection for alternator on B+ connection point.

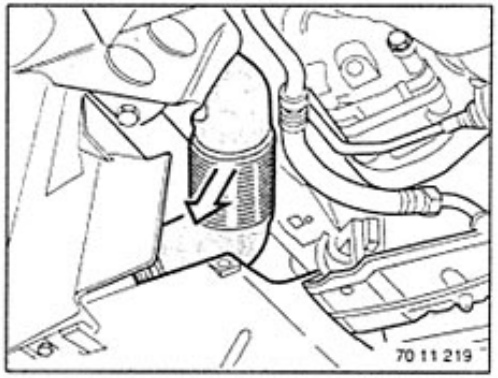


Unscrew connections for starter at connection point on right wheel house.

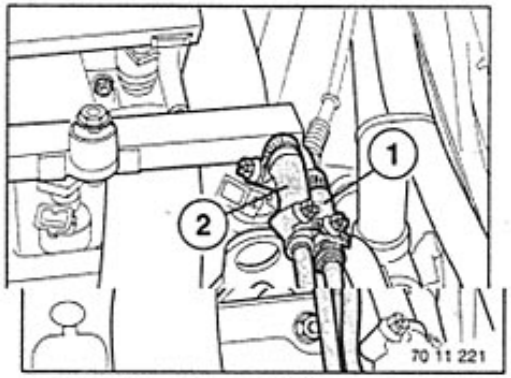


Unscrew AC compressor on engine.

Note:
Hoses remain connected.
Mount side of AC compressor on wheel house.

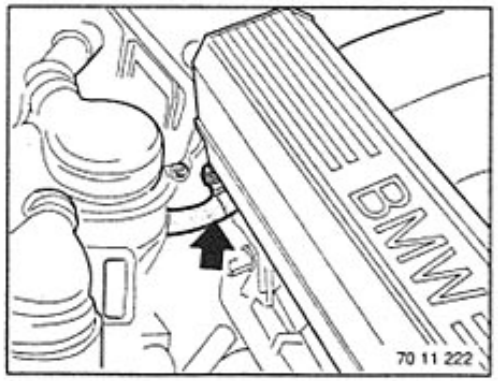


Unscrew cool air guide for alternator.

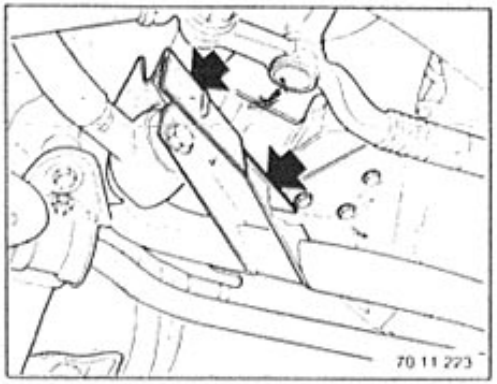


Unscrew fuel pipes (1 ... 2)

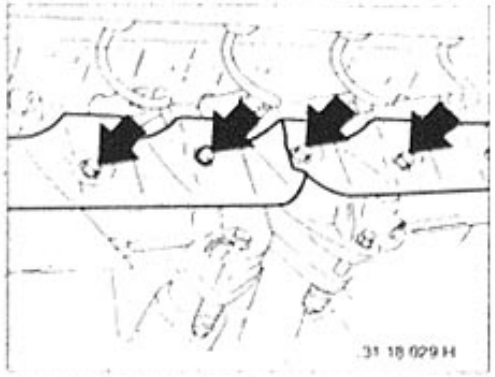
Installation:
Arrangement of Fuel Pipes:
1 = Cylinders 1 ... 6
2 = Cylinders 7 ... 12



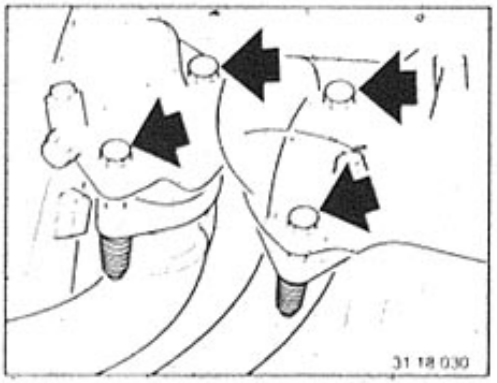
Unscrew fuel return pipe on rear end of engine to the right.



Unscrew heat shields on left and right thrust struts.



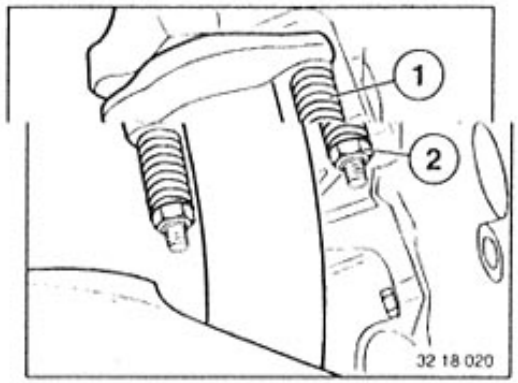
Unscrew heat shields on right exhaust manifolds.



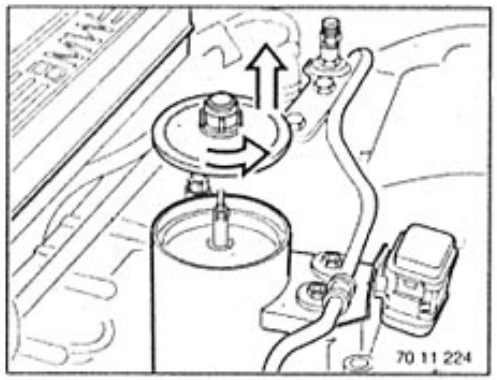
Unscrew right exhaust pipes on exhaust manifolds and remove.



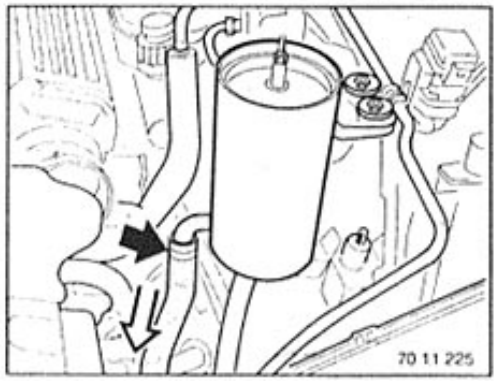
Important!
Tighten exhaust pipes only after installation of the engine and complete exhaust assembly.



Installation:
Replace self-locking nuts.
Lubricate tapers of flanges with CRC**
[illegible].
Press springs (2) flat uniformly by tightening nuts (1) with a torque of 10 Nm (7 ft. lbs.).
Loosen nuts (1) 1 and 1/2 turns afterwards.
Flanges must be parallel to each other after finishing installation.
Springs must not be pressed flat.
The pipe with compensator must be tightened last due to the danger of torsion.

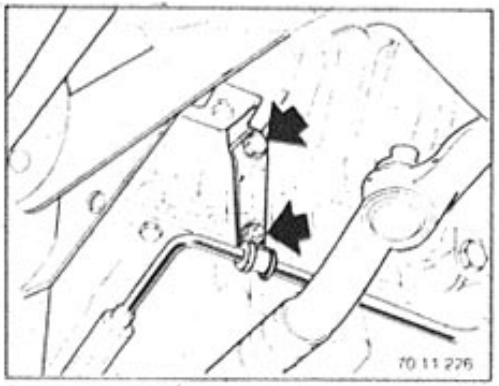


Draw oil out of power steering pump's supply tank.

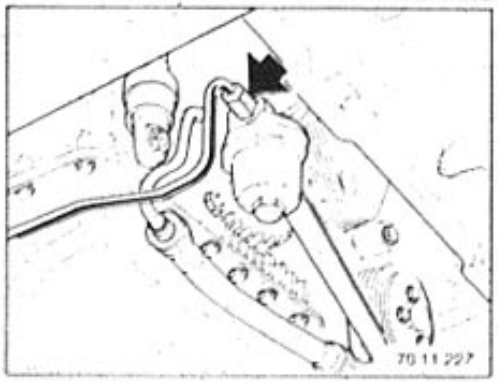


Unscrew hose on supply tank.

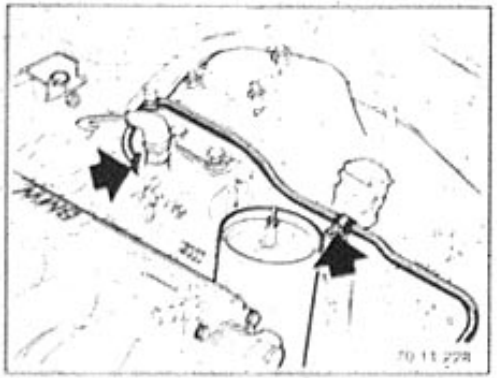
** Source of Supply: HWB



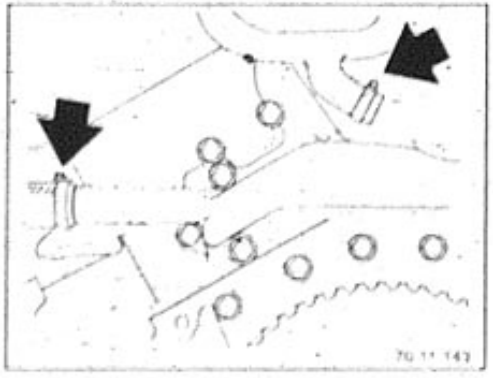
Unscrew bracket for ASC+T line and starter motor support from engine block.
Lift out starter motor.



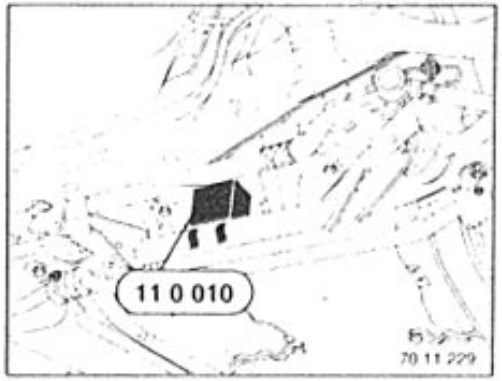
Unscrew ASC+T line from filter.



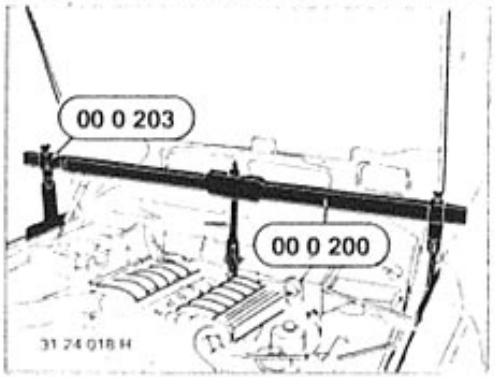
Remove bracket and hydraulic line from 3-phase governor.



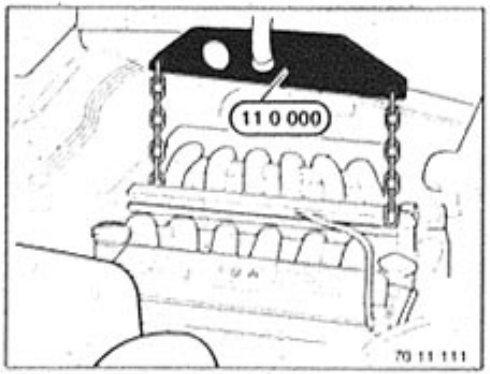
Fit heating hoses from coolant manifold and coolant pipe between heating firewall and engine.



Caution!
Before removing special tool 00 0 200, always install special tool 11 0 010 since otherwise the engine makes contact with the spigot neck of the heating unit, causing damage.
Install special tool 11 0 010.



Remove special tool 00 0 200.

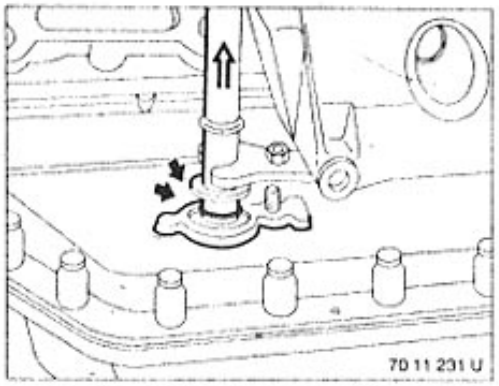


Attach special tool 11 0 000 to the brackets.



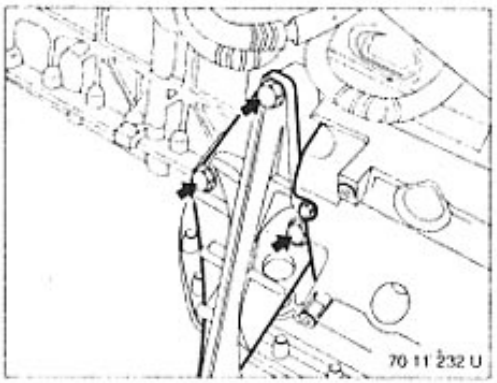
Unscrew ground tape from engine support arm.

Unscrew engine mount on left and right sides.



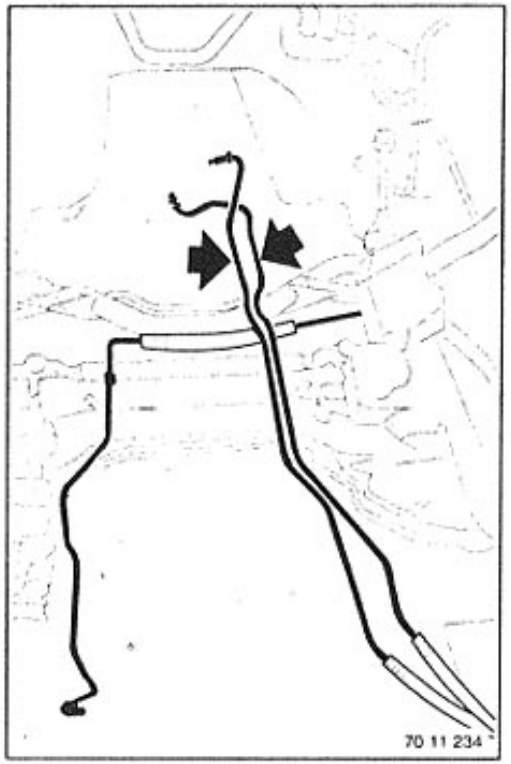
Remove guide tube for oil dipstick.

Installation:
Note arrangement of seal and disc.



Raise engine slightly and remove right engine support bracket.

Lift engine and turn back to the right.
Guide exhaust pipes to left of steering spindle when lifting out.



Installation:
On version with automatic transmission:
Before installing the engine, install oil cooler lines in the correct position.

11 12 002 Removing and installing / sealing left or right cylinder head cover

Remove the following components:

- Air intake manifold (11 61 056 without "both gasket faces")
- Protective cover for distributor cap and ratchet band
- Cylinder head cover with gasket

11 12 105 Removing and installing left cylinder head

Remove the following components:

- Engine (11 00 050)
- Support arm for left engine mount
- Support for left and right assembly frame
- Engine in assembly frame
- Rear left heat shield on A manifold partially installed
- Flexible hoses on left of manifold
- Injection pipe with E valves on left and right
- Ignition line pipe on left and right manifold
- Left and right distributor caps
- Manifold with noise insulation strip on left and right
- Valve cover with gasket on left and right sides
- Distributor finger housing and adapter housing with gasket on left and right
- Drive belt tensioner for alternator
- Timing case cover with gasket
- Chain tensioner
- Top sliding rail for timing chain
- Sprocket wheel on left and right camshaft
- Engine in TDC position, disconnect, check timing
- Sliding rail for left.timing chain
- Upper timing case with gasket
- Coolant connecting duct with gasket and rear O-ring
- Cylinder head screws on left, torque and torsion angle 120°
- Cylinder head with gasket on left
- Measure amount by which piston protrudes
- Clean crankcase
- Clean cylinder head
- Clean base of piston

11 13 010 REMOVING AND INSTALLING OR REPLACING UPPER OIL PAN SECTION

Remove following parts:

- Transmission (23 00 025, 24 00 024)
- Clutch pressure plate on drive plate (only manual transmissions)
- Windshield washing fluid tank
- Oil dipstick guide tube
- Both nuts on bottom engine mounts
- Splash guard
- Drain and fill engine oil
- Level sender plug
- Lower oil pan section
- Clean sealing surfaces
- Level switch
- O-ring
- AC compressor drive belt tensioner
- Drain hose from oil filter to oil pan
- Flywheel
- Ride level control oil pipe holder
- Power pump holder on oil pump

11 14 102 REMOVING AND INSTALLING, SEALING OR REPLACING UPPER TIMING CASE

Remove following parts:

- Both cylinder head covers
- Oil catch tray on timing case cover
- Fan
- Distributor caps left and right, ignition leads
- Distributor arms, adapters and distributor housings left and right
- Alternator drive belt and tighten
- Alternator drive belt tensioner
- Upper timing case cover and gasket
- Set and hold engine in TDC
- Chain tensioner
- Adjust chain tensioner
- Upper chain guide rail
- Both sprockets
- Check timing
- Left guide rail
- Upper timing case and gasket

11 14 110 REMOVING AND INSTALLING, SEALING OR REPLACING LOWER TIMING CASE COVER

Remove following parts:

- Upper timing case (11 14 102)
- Lower oil pan section
- Coolant hose on thermostat housing left, right, upper
- Coolant hose on expansion tank bottom
- Coolant hoses on radiator
- Fill coolant
- AC compressor drive belt tensioner
- Pulley on water pump
- Vibration damper on hub
- Wrench on hub (ST 11 2 230)
- Central bolt for hub
- Hub with puller (ST 00 7 501)
- Upper oil pan section loosened partially
- Timing case cover with seal and gasket (ST 11 1 210, 11 1 220)

ST = Special Tool

11 14 115 REMOVING AND INSTALLING, SEALING OR REPLACING LOWER TIMING CASE

Remove following parts:

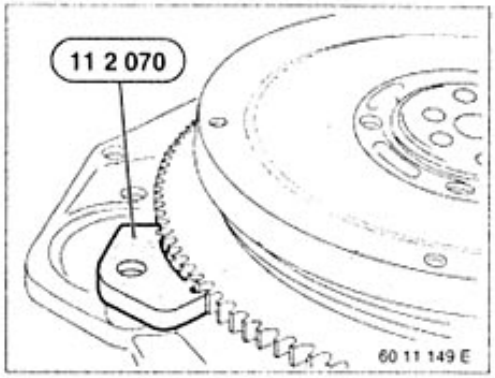
- Upper timing case (11 14 102)
- Lower oil pan section
- Lower timing case cover (11 14 110)
- Water pump
- Replace O-ring
- Tensioning rail and chain
- Lower timing case and gasket (ST 11 1 210, 11 1 220)

ST = Special Tool

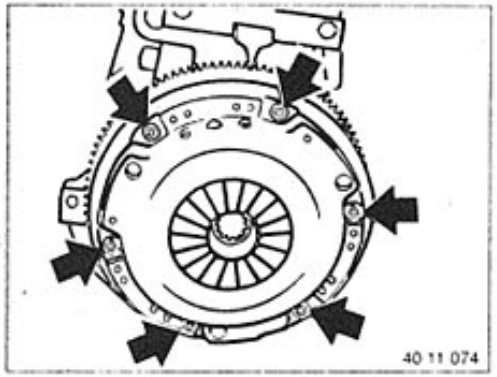
11 22 000 Replacing flywheel

M70

Remove transmission,
see 23 00 025

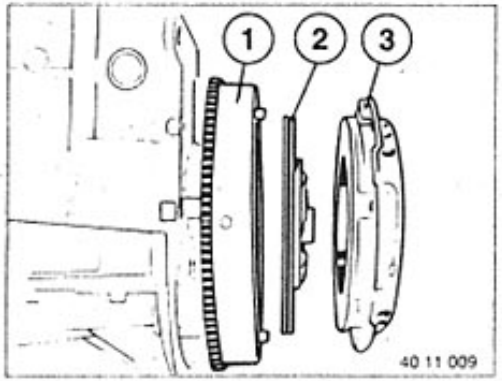


Arrest flywheel with special tool 11 2 070.



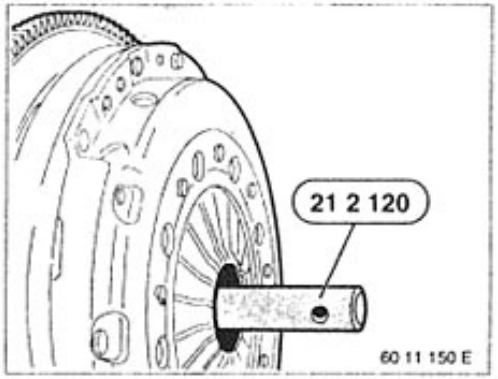
Unfasten screws, applying even pressure.
Remove pressure plate and drive plate.

Installation:
Note dowel pins.
Tightening torque 21 21 1AZ*

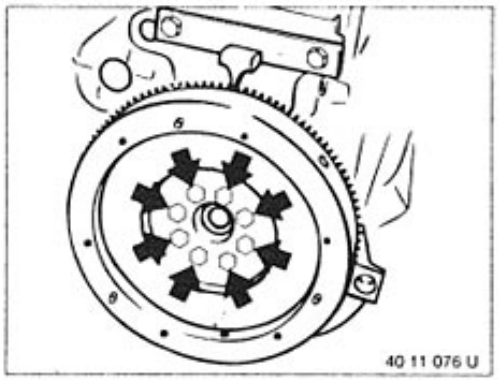


Installation:
1 Flywheel
2 Drive plate
3 Pressure plate

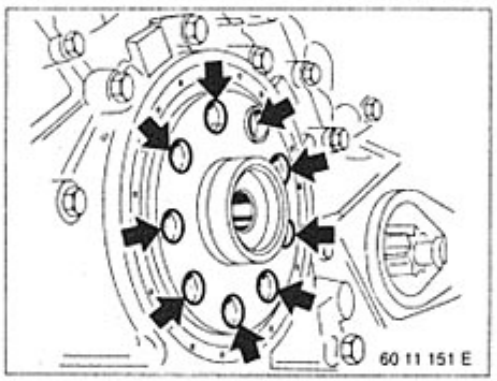
Caution!
Note direction of installation of drive plate.



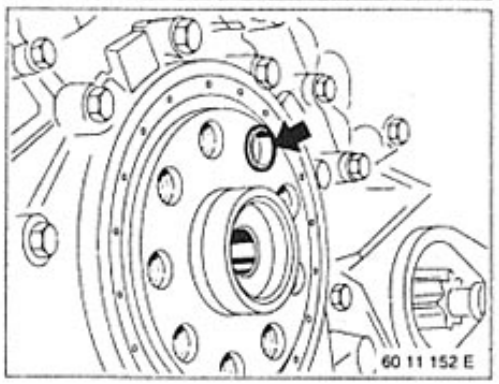
Installation:
Center drive plate with special tool 21 2 120.



Unfasten flywheel.



Installation:
Clean thread for flywheel screws in the crankshaft.



Installation:
Note hollow dowels.
Install new micro-encapsulated screws.
Tightening torque 11 22 1AZ*

* Refer to Technical Data

11 23 031 REPLACING HUB FOR VIBRATION DAMPER

Remove following parts:

- Fan
- Splash guard
- Water pump pulley
- AC compressor drive belt tensioner
- Tighten drive belt
- Alternator drive belt tensioner
- Tighten drive belt
- Vibration damper on hub
- Hub with puller (ST 00 7 501)
- Radial oil seal (with puller)
- Wrench for hub (ST 11 2 230)

ST = Special Tool

11 28 010 REPLACING ALTERNATOR DRIVE BELT

Remove following parts:

- Oil catch tray on timing case
- Fan
- Drive belt

11 31 002 Replacing left or right camshaft

Remove the following components:

- Upper timing case cover
- Finger
- Oil line for camshaft
- Bearing cover for camshaft

11 31 051 Replace timing chain

Remove the following components:

- Lower timing case cover (11 14 110)
- Engine into TDC position
- Tensioning rail and chain

11 33 062 REPLACING ALL HYDRAULIC VALVE CLEARANCE COMPENSATING ELEMENTS

Remove following parts:

- Both cylinder head covers
- Fan
- Drag lever with (ST 11 3 180)
- Hydraulic valve clearance compensating elements

ST = Special Tool

11 51 000 REMOVING AND INSTALLING OR REPLACING WATER PUMP

Remove following parts:

- Splash guard
- Fan
- Alternator drive belt tensioner
- AC compressor drive belt tensioner
- Pulley on water pump
- Coolant hose on thermostat housing left, top and right
- Vibration damper and hub
- Coolant - drain and fill
- Cover for thermostat housing
- Water pump with O-rings

11 53 000 REMOVING AND INSTALLING OR REPLACING COOLANT THERMOSTAT

Remove following parts:

- Splash guard
- Coolant - drain and fill
- Fan
- Cover for thermostat housing

11 61 056 REPLACING SEALING FLANGE FOR LEFT OR RIGHT INTAKE AIR MANIFOLD

Remove following parts:

- Air box complete on firewall
- Cover for fuel injectors
- Upper air cleaner section with air mass sensor
- Plugs on left and right throttle valve assemblies
- Plugs for fuel injectors
- Plugs for pulse sender and cylinder identifier
- Electric plate partially
- Injection pipe complete on manifold
- Fuel feed pipes
- Fuel return pipes
- Fuel injectors with vaseline
- Windshield washing fluid tank if necessary
- Ignition leads on manifold
- Intake air manifold
- Both sealing flanges

11 62 145 REMOVING AND INSTALLING OR REPLACING ALL EXHAUST MANIFOLDS

Remove following parts:

- Upper air cleaner section with air mass sensor left
- Clamp on split pipe left and right
- Heat shields on manifolds left
- Heat shield on steering gear
- * Manifold/split pipe bolts left
- Front manifold with gaskets (left)
- Rear manifold with gaskets (left)
- Nuts on staybolts
- * Staybolts for left manifolds in head
- Upper air cleaner section with air mass sensor right
- Windshield washing fluid tank
- Oil dipstick guide tube
- Heat shields on manifolds right
- Front manifold with gaskets (right)
- Rear manifold with gaskets (right)
- Nuts on staybolts
- Staybolts for right manifolds in head

11 Engine M60

	General information	11- 0/10
11 00 039	Compression check – all cylinders	11- 0/10
00 00 249	BMW engine oil service	11- 0/11
11 00 050	Engine – remove and install	11- 0/12
11 12 004	Both cylinder head covers – remove and install/seal	11- 12/10
11 12 005	Left cylinder head cover – remove and install/seal	11- 12/13
006	Right cylinder head cover – remove and install/seal	11- 12/13
105	Left cylinder head – remove and install	11- 12/14
106	Right cylinder head – remove and install	11- 12/14
107	Both cylinder heads – remove and install	11- 12/15
110	Left cylinder head gasket – replace	11- 12/15
111	Right cylinder head gasket – replace	11- 12/16
112	Both cylinder head gaskets – replace	11- 12/16
11 13 010	Upper section of oil pan – remove and install or replace	11- 13/10
020	Lower section of oil pan – remove and install or replace	11- 13/13
11 14 080	Top left timing case cover – remove and install, seal or replace	11- 14/10
085	Top right timing case cover – remove and install, seal or replace	11- 14/11
141	Radial seal in lower timing case cover – replace	11- 14/13
151	Crankshaft radial seal – replace	11- 14/13
11 22 000	Flywheel – remove and install or replace	11- 22/10
11 23 010	Vibration damper – remove and install or replace	11- 23/10
031	Hub for vibration damper – remove and install or replace	11- 23/10
11 28 010	Alternator drive belt – replace	11- 28/10
11 31 010	Timing of camshaft(s) – adjust	11- 31/10
011	Left camshaft – replace	11- 31/11
015	Right camshaft – replace	11- 31/11
11 41 000	Oil pump – remove and install or replace	11- 41/10
11 42 020	Complete full-flow oil filter – remove and install, seal or replace	11- 42/10
11 51 000	Water pump – remove and install or replace	11- 51/10
011	Pulley on water pump – replace	11- 51/10
11 53 000	Coolant thermostat – remove and install or replace	11- 53/10
325	Coolant manifold – remove and install or replace	11- 53/10
11 61 050	Intake air manifold – remove and install	11- 61/10
11 62 142	Both left exhaust manifolds – remove and install or replace	11- 62/10
143	Both right exhaust manifolds – remove and install or replace	11- 62/12

For additional work, refer to "Repair Instructions for 7 Series E38"

General information

M60

Cylinder configuration:

Cylinders 1 ... 4, viewed in direction of travel, are located on the right side of the vehicle, with cylinder 1 at the front.

Cylinders 5 ... 8, viewed in the direction of travel, are located on the left side of the vehicle, with cylinder 5 at the front.

The operations described apply to both cylinder banks: if special explanations are required, the procedures for each cylinder bank are described separately.

General Data for operations on the valve timing system:

If operations on the cylinder head are performed where the camshaft was removed, please note the following:
The hydraulic valve tappets expand without load being applied by the camshaft and, after installation, require some time before they compress back down. This means that, if parts are assembled in rapid sequence, even the "closed" valves may still be open and in direct contact with the piston.

Note the following wait periods between installation of the camshaft and mounting of the cylinder head:

ambient temperature 20° C	4 mins.
10° C - 20° C	11 mins.
0° C - 10° C	30 mins.

After assembly of the camshaft and the timing chain, wait for the following periods before turning the engine crankshaft:

ambient temperature 20° C	after 10 mins.
10° C - 20° C	after 30 mins.
0° C - 10° C	after 75 mins.

General instructions for work involving the gaskets:

Apply a bead of cement to all contact points and a thin, even coat of Hylomar SQ 32M** to determine the location of the gaskets.

** Refer to BMW Parts Service

11 00 039 Checking compression of all cylinders

M60



Caution!
High voltage – danger of death!
Interrupt power supply to ignition coils.
Follow instructions on compression testing, refer to General Data MG12
Repair Instructions for 7 Series E38

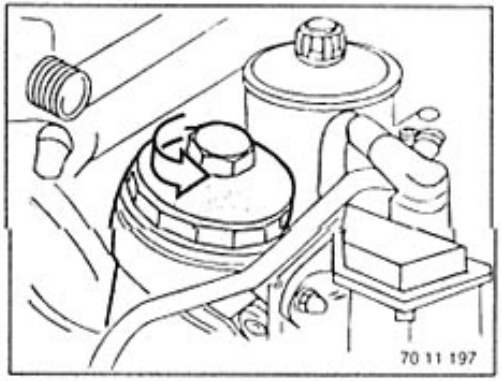
Disconnect fuel pump relay and DME master relay (installation: electronics box), refer to Electrical Troubleshooting Manual (schematics) 8 Series E31
Directory of components 7000.0

After checking interrogate fault memory and if necessary rectify faults. Cancel fault memory.
Subsequent procedure, refer to 11 00 039
Repair Instructions Series 7 E38

00 00 249 BMW engine oil service

M60

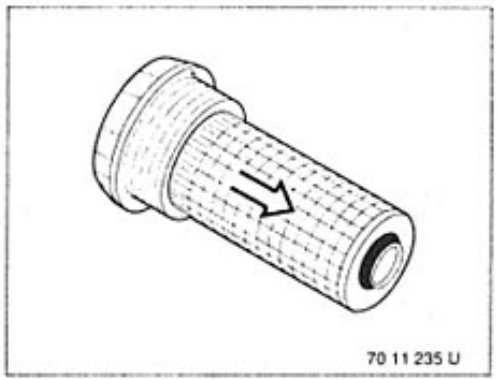
Change engine oil and oil filter



Unscrew and remove oil filter cover.

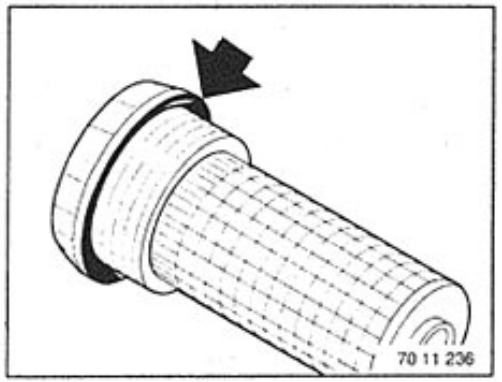
Note:
Oil flows out of the oil filter housing into the oil pan.

Installation:
Tightening torque 11 42 2AZ*



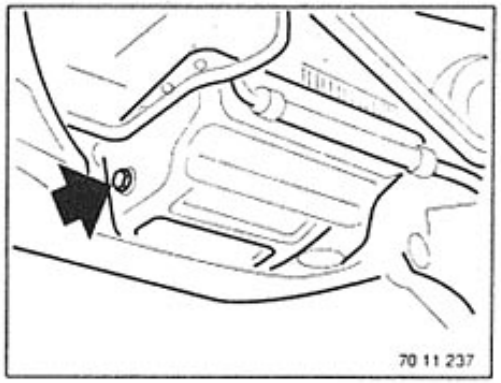
Remove oil filter from the oil filter cover.

Installation:
Note installation direction of the oil filter insert. Oil filter insert must engage in the oil filter cover.



Installation:
Fit new seal.

* Refer to Technical Data



Once the oil has drained out of the oil filter housing, open the oil drain plug or draw off the oil.

Installation:
Replace seal.
Tightening torque 11 13 1AZ*

Top up the engine oil level.

Switch on engine and run at idle speed until the oil display lamp goes out.

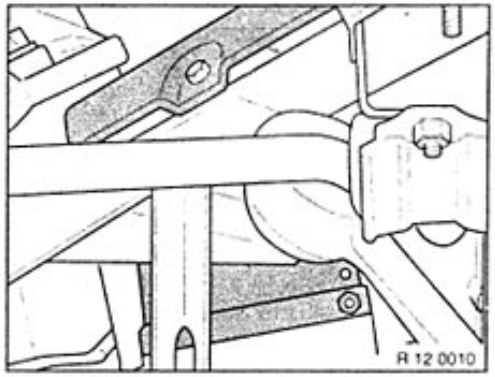
Switch off engine and check the oil level.

Note:
Vehicle on level ground.

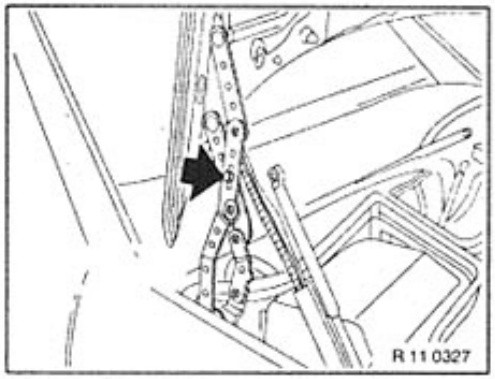
Refer to Technical Data

11 00 050 Removing and installing engine (M60)

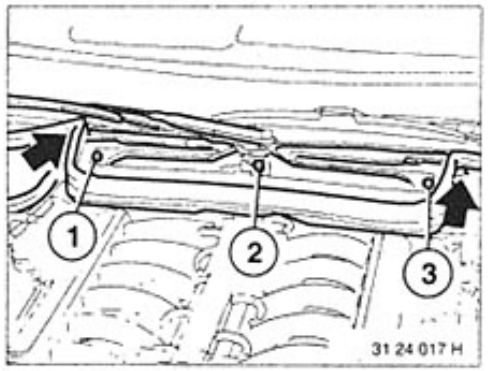
Interrogate the fault memory in all the control units.
Follow instructions on disconnecting and connecting battery, refer to General Data HG12
Disconnect battery ground lead.
Remove automatic transmission, refer to 24 00 026



Remove left and right rear heat baffle plates.

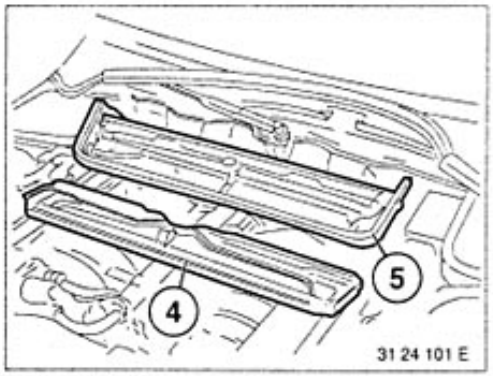


Lift engine hood into assembly position. Fully extend gas strut on engine hood, fully open engine hood and secure with one screw on each side (left and right).

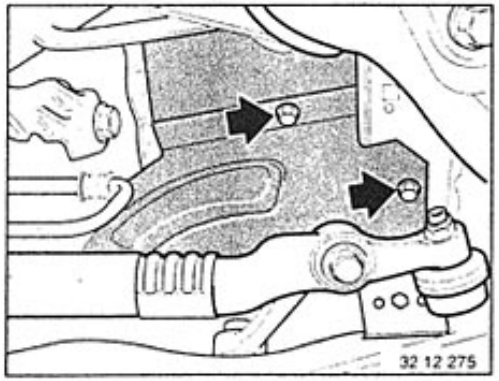


Partially remove rubber seal from air manifold.
Twist mounting (1 ... 3).
Remove screws on left and right sides.

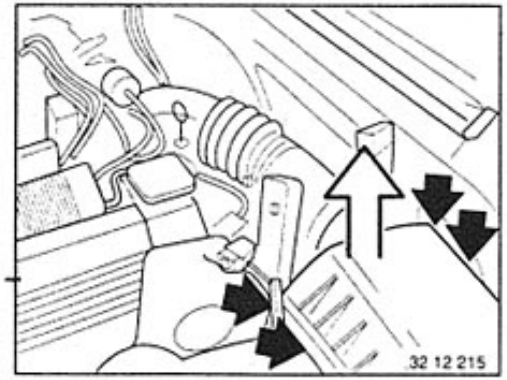
Remove radiator with expansion tank, refer to 17 11 000.



Lift off trim (4) and microfilter (5).

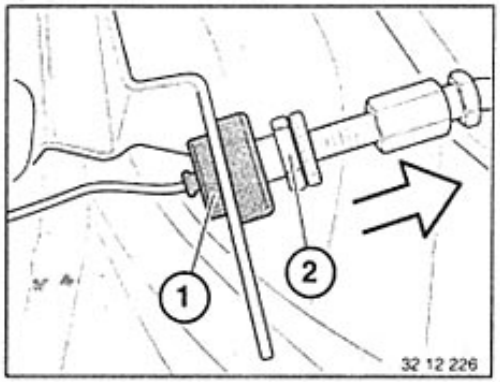


Remove left and right heat baffle plates from front axle carrier.



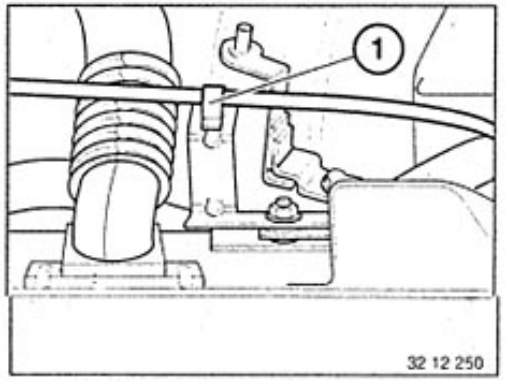
Remove upper section of suction filter with mass air flow sensor.

Remove left and right cable ducts.
These operations are described in the section on Removing Cylinder Head, see 11 12 004.

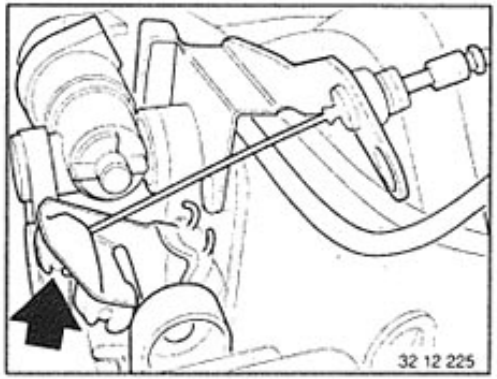


Remove Bowden cable (2) from rubber mount (1).
Press rubber mount (1) out of bracket.

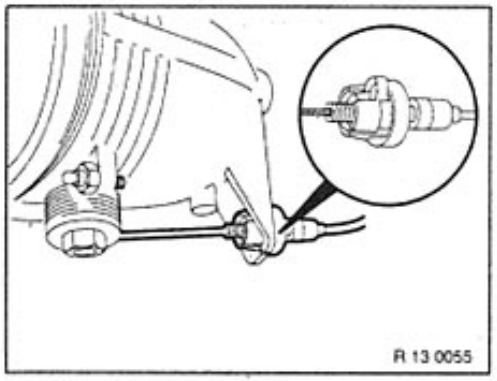
Note:
If necessary, disconnect the connectors beside the timing cases if this facilitates the task of lifting out the engine.



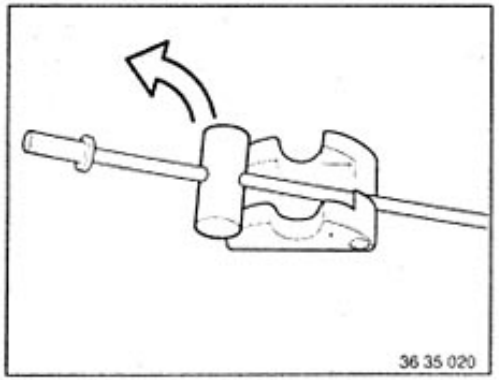
Remove accelerator cable from guide (1) and place to one side.



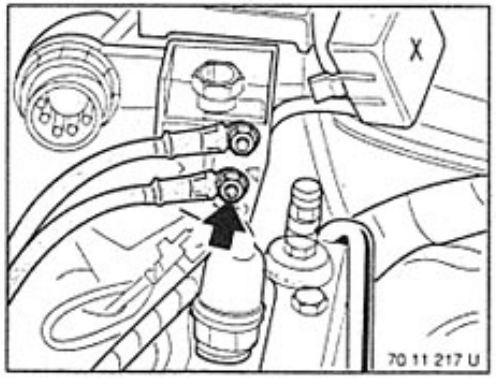
Disconnect accelerator cable.
Press together both lugs on the nipple mount and press out the actuating lever.



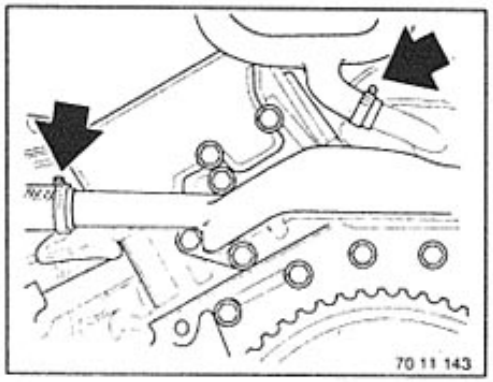
Press plastic locking unit in and remove Bowden cable from ASC throttle valve.



Press nipple out of nipple mount.
Remove Bowden cable from nipple mount.



Disconnect cable from positive terminal.



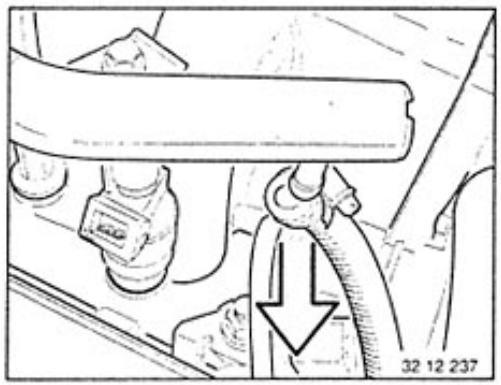
Remove heating hoses from coolant manifold and coolant tube between heating firewall and engine.

Remove 3-phase alternator,
see 12 31 020.

Remove complete main flow oil filter,
see 11 42 020.

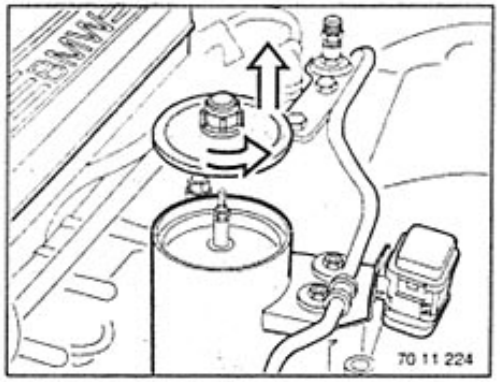
Unfasten vane pump from bracket and tie to one side,
see 32 41 060 Repair Instructions for 7 Series E32.

Note:
Lines remain connected.

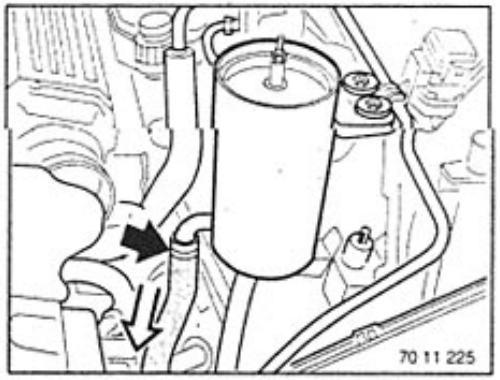


Caution!
Catch fuel as it escapes.

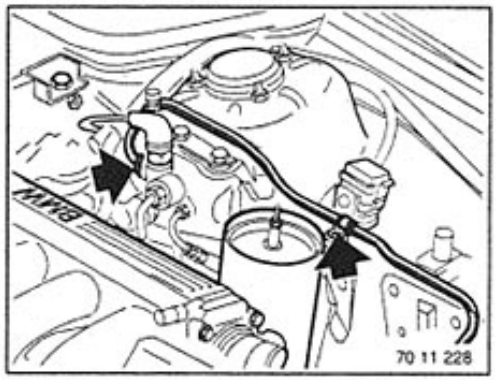
Remove fuel intake and fuel return lines on injection tube.



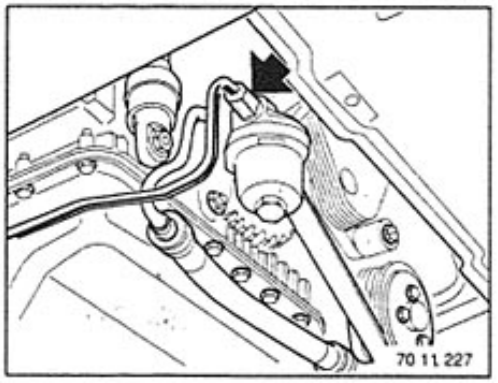
Draw off oil from container for power steering.



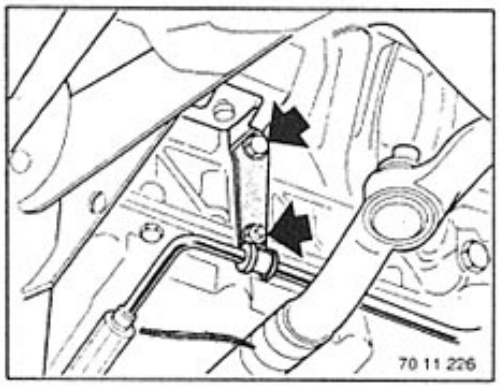
Remove hose from oil container.



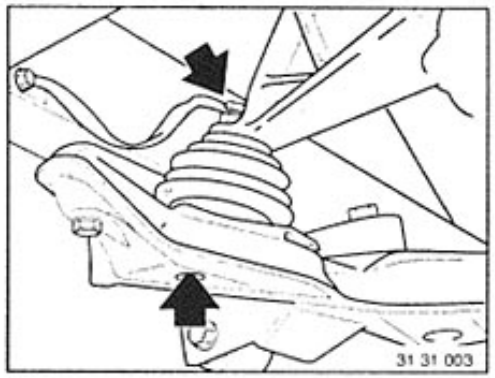
Remove bracket and hydraulic line from 3-phase governor.



If necessary, remove hydraulic line for ASC+T filter and remove from lower section of oil pan.



Unfasten hydraulic line from back of lower section of oil pan.

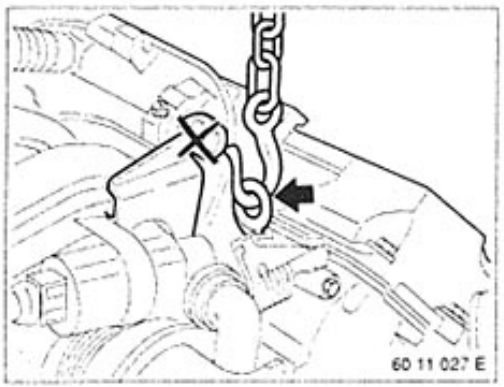


Unfasten left and right engine mounts.
Remove ground tape from engine support arm.

Installation:
Tightening torque 11 81 1AZ / 2AZ*

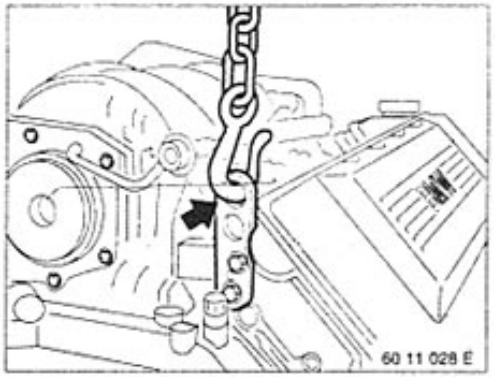
Unfasten air conditioning compressor from support block, see 64 52 020.

Note:
Lines remain connected.

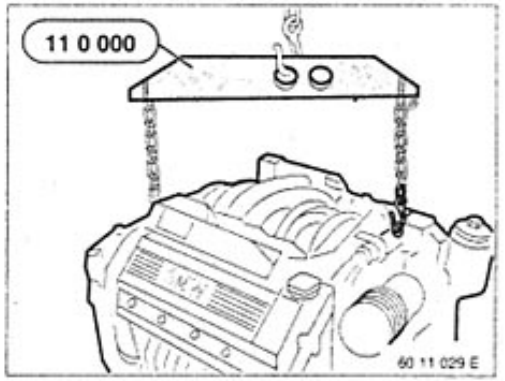


Caution!
Only lift engine using the mounting lugs provided for this purpose.

Arrangement of front engine mounting.



Arrangement of rear engine mounting.



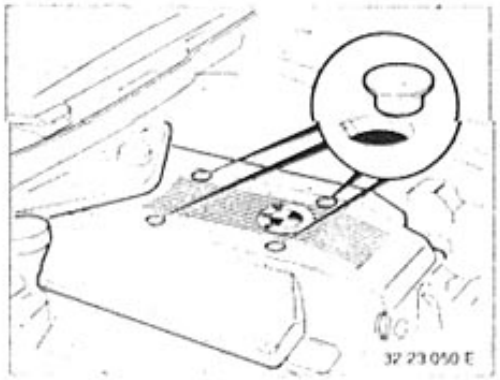
Lift out engine using special tool 11 0 000.

* Refer to Technical Data

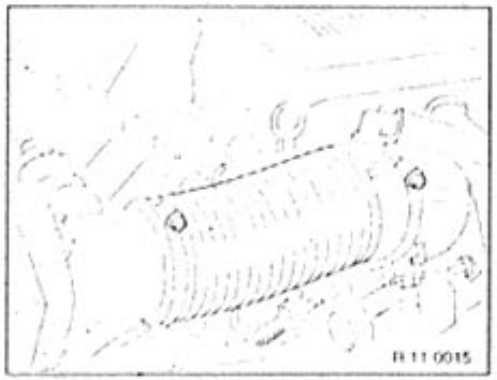
11 12 004 Removing and installing / sealing both cylinder head covers

M60

Read out error memories of all control units.
Disconnect battery negative lead.



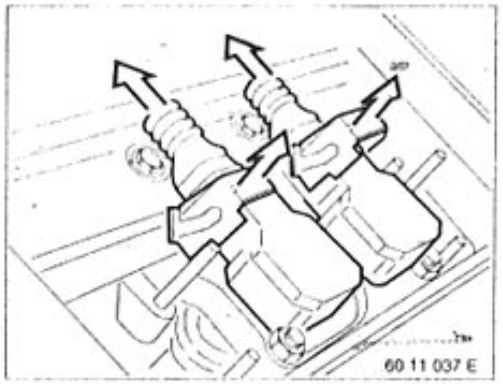
Lever clips off manifold cover.
Unscrew bolts.
Remove cover and insulation material.



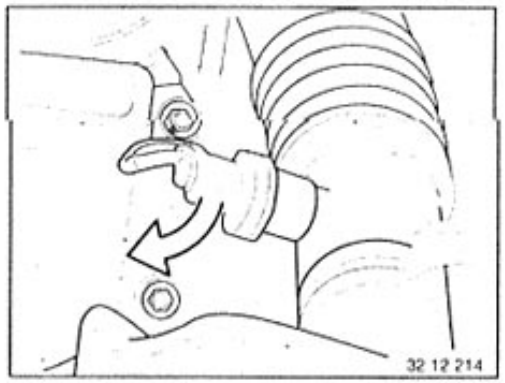
Remove hose to idle speed actuator and remove dust cover between throttle body and mass air flow sensor.



Remove covers from ignition coils.

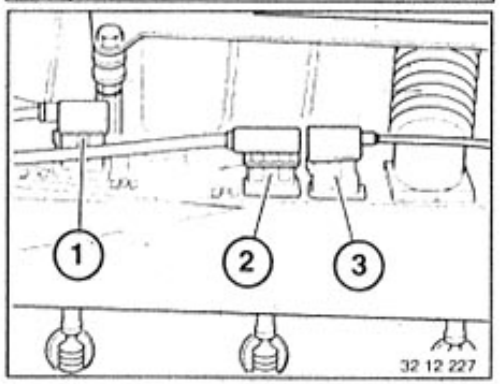


Remove connectors from ignition coils on both cylinder banks.



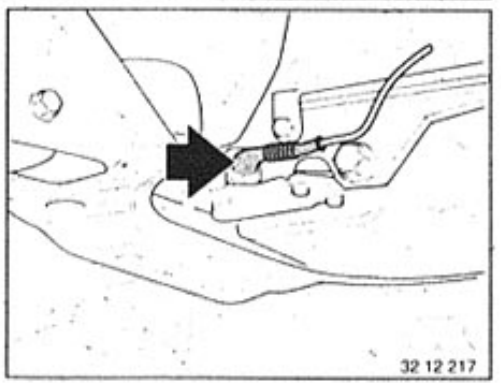
Disconnect plug connection on mass air flow sensor.

Remove tank venting valve from bracket, see 13 90 500.

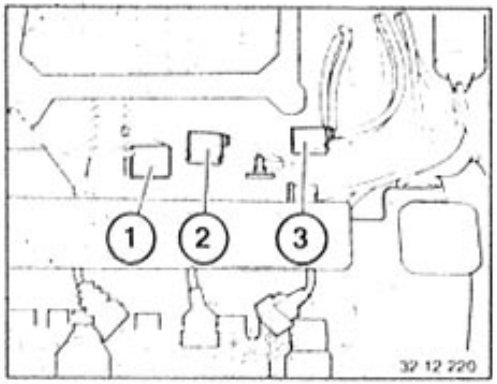


Disconnect all plug connections on left cable duct:
(1) camshaft sensor
(2) and (3) knock sensors

Caution!
Incorrect installation of plug connections (2) and (3) causes engine damage.
Note instructions,
see 12 14 610 / 611.

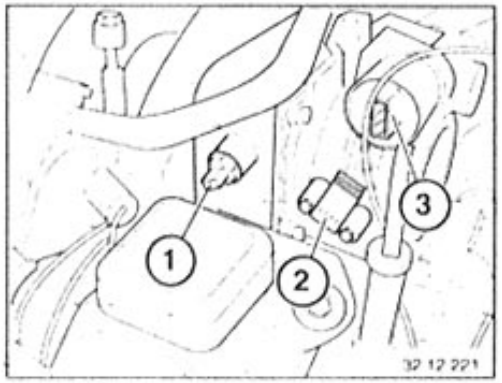


Disconnect plug connection on oil level switch.
Remove cable guide to oil level switch.

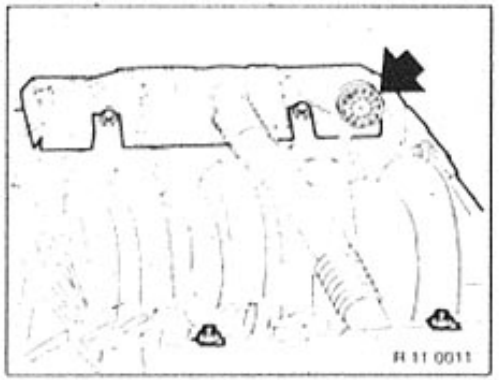


Disconnect all plug connections on right cable duct:
(1) and (2) knock sensors
(3) TDC sensor

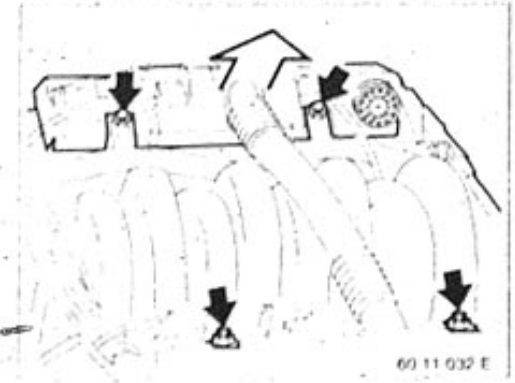
Caution!
Incorrect installation of plug connections (1) and (2) causes engine damage.
Note instructions,
see 12 14 610 / 611.



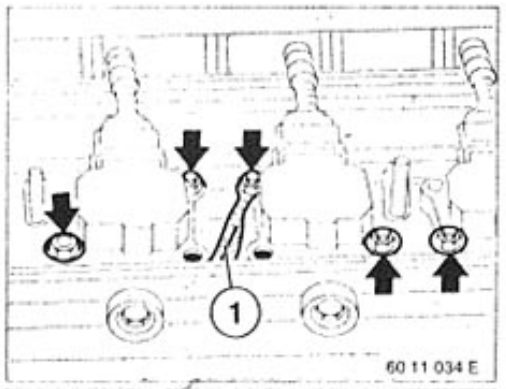
Disconnect plug connections:
(1) temperature sensor for intake air
(2) throttle valve potentiometer
(3) idle speed actuator



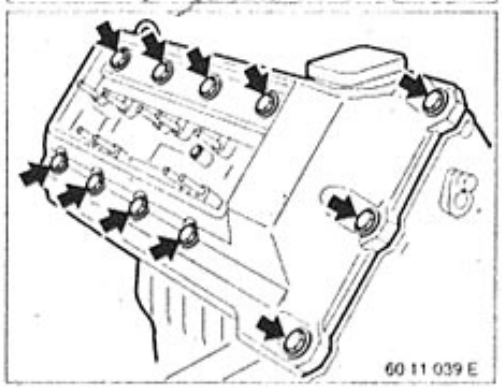
Disconnect engine connector from left and right cable ducts.



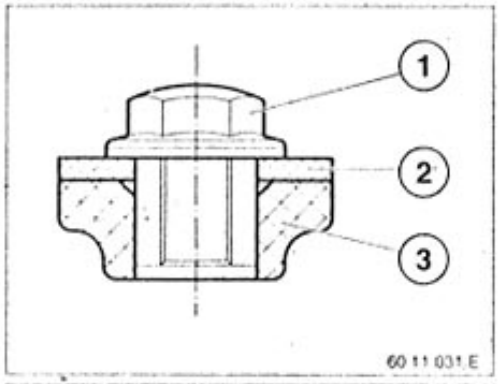
Remove left and right cable ducts from bracket and fold to one side.



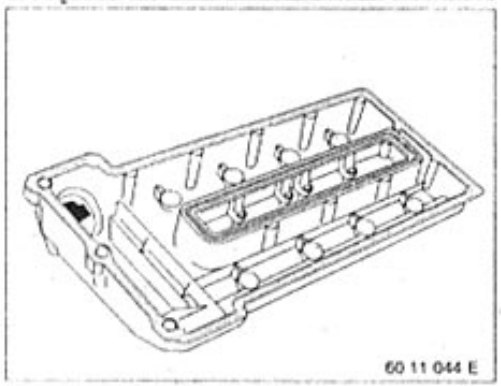
Remove ignition coils from both cylinder banks, see 12 13 011.



Unfasten left and right retainers.



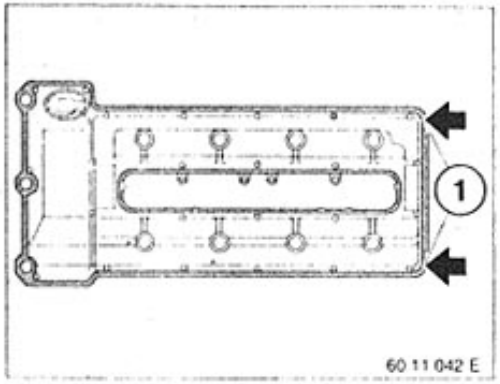
Installation:
Layout of retaining elements:
(1) nut
(2) washer
(3) rubber seal



Installation:
Check gasket and replace if necessary.

Coat the entire circumference of the outer and inner groove and the sealing face of the cylinder head cover with rubber anti-friction compound, e.g. glycerine**.
Press the inner gasket into the cover groove with no torsional stress, starting at the four corner radii.

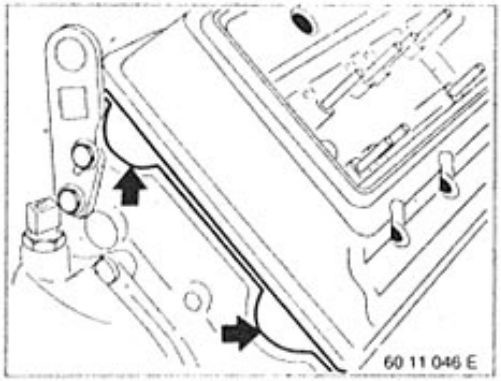
** Source of Supply: BMW Parts Service



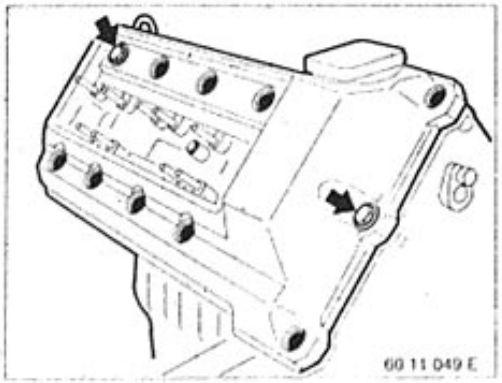
Installation:
Align outer gasket loosely over the cover groove. Secure gasket in the cover groove, starting at the four reverse corners (1) and press into groove with no torsional stress.



Installation:
Coat the contact faces of the joint with Hylomar SQ 32 M** liquid sealing compound.



Installation:
Check for correct seating of gasket on back of cylinder head when installing the cylinder head cover.



Installation:
Attach two retainers to the locating points, without preload at this stage, and align the cover. Install all the other retaining elements and tighten crosswise, radiating out from the center.

** Source of Supply: BMW Parts Service

11 12 005 Removing and installing / sealing left cylinder head cover

M60

This operation is described in the section on removing and installing / sealing both cylinder heads,
see 11 12 004 .

11 12 006 Removing and installing / sealing right cylinder head cover

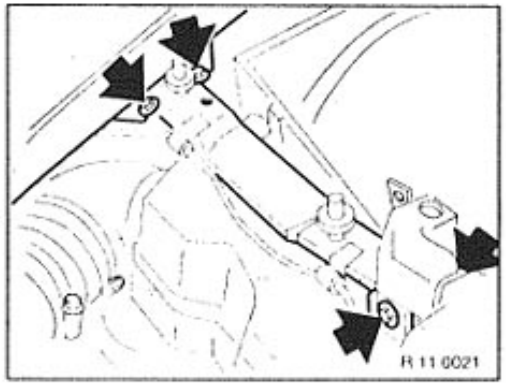
M 60

This operation is described in the section on removing and installing / sealing both cylinder heads,
see 11 12 004 .

11 12 105 Removing and installing left cylinder head

M60

Remove right pop-up headlight,
refer to 63 12 460



Remove support for pop-up headlights and lower section of intake filter housing.

Remove both cylinder head covers,
refer to 11 12 004

Remove intake air manifold,
refer to 11 61 050

Remove coolant manifold,
refer to 11 53 325

Remove both left exhaust manifolds,
refer to 11 62 142

Unfasten air conditioning compressor from mount,
refer to 64 52 020

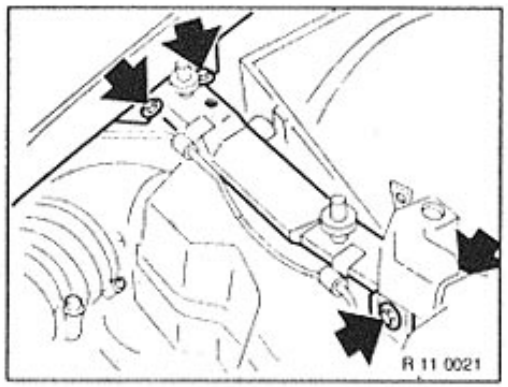
Note:
Lines remain connected.

Subsequent procedure.
refer to 11 12 105
Repair Instructions Series 7 E38

11 12 106 Removing and installing right cylinder head

M60

Remove right pop-up headlight,
refer to 63 12 460



Remove support for pop-up headlights and lower section of intake filter housing.

Remove both cylinder head covers,
refer to 11 12 004

Remove intake air manifold,
refer to 11 61 050

Remove coolant manifold,
refer to 11 53 325

Remove both right exhaust manifolds,
refer to 11 62 143

Unfasten air conditioning compressor from mount,
refer to 64 52 020

Note:
Lines remain connected.

Subsequent procedure
refer to 11 12 106
Repair Instructions for 7 Series E38

11 12 107 Removing and installing both cylinder heads

M60

This operation is described in section on removing and installing right / left cylinder heads,
refer to 11 12 105 / 106

11 12 110 Replacing left cylinder head gasket

M60

This operation is described in section on removing and installing right / left cylinder heads,
refer to 11 12 105

11 12 111 Replacing right cylinder head gasket

M60

This operation is described in section on removing and installing right / left cylinder heads,
refer to 11 12 106

11 12 112 Replacing both cylinder head gaskets

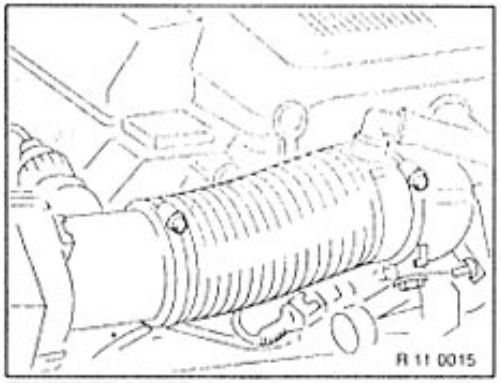
M60

This operation is described in section on removing and installing both cylinder heads,
refer to 11 12 107

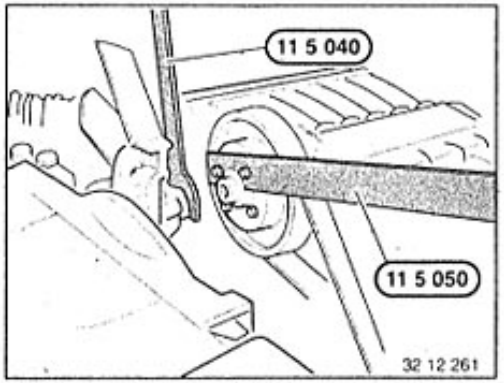
11 13 010 Removing and installing or replacing upper section of oil pan

M 60

Remove exhaust assembly, see 18 00 020.

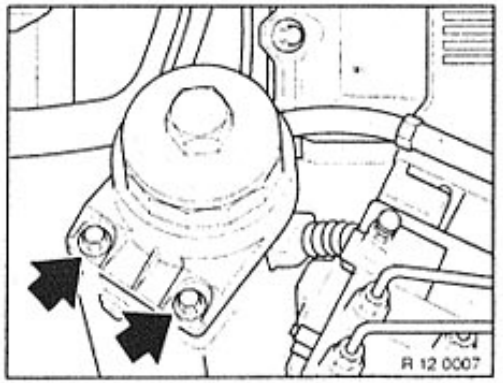


Pull off hose to idle speed actuator and remove dust cover between throttle body and mass air flow sensor.



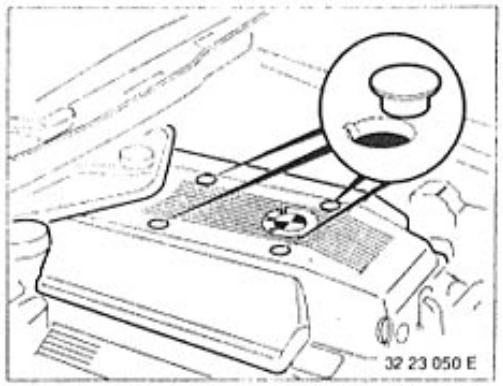
Remove fan.
Use special tools 11 5 040 and 11 5 050.

Caution!
Left-hand threads.

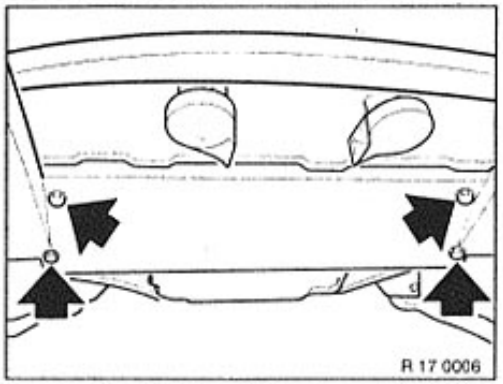


Unfasten full-flow oil filter, lift out of bracket and press forwards.

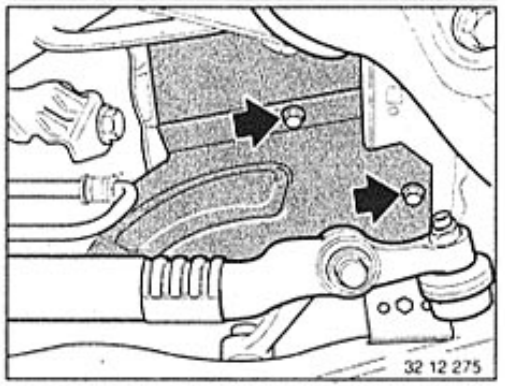
Note:
Hoses remain connected.



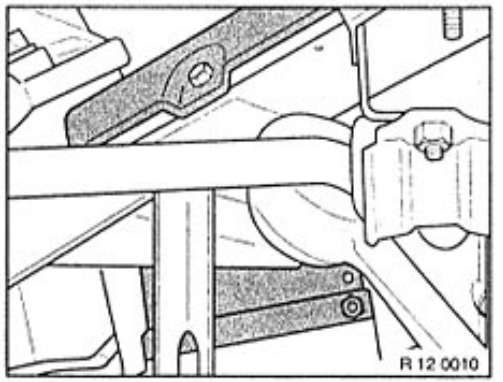
Lever clips out of manifold cover.
Unscrew bolts.
Remove cover together with noise insulation.



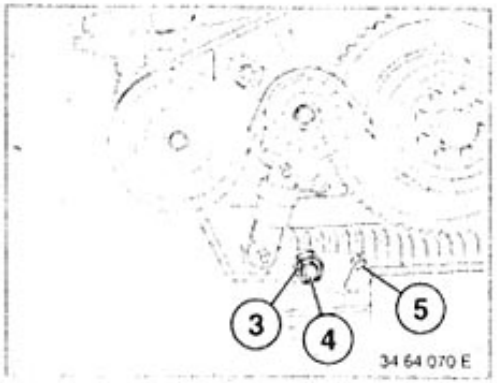
Unscrew and remove splash guard.



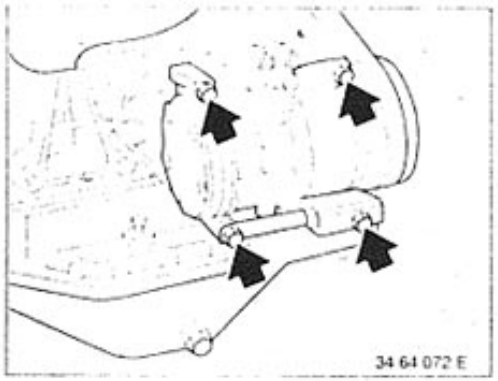
Remove left and right heat baffle plates from front axle carrier.



Remove left and right rear heat baffle plates.



Remove adjustment plate and drive belt from air conditioning compressor, see 64 52 020.



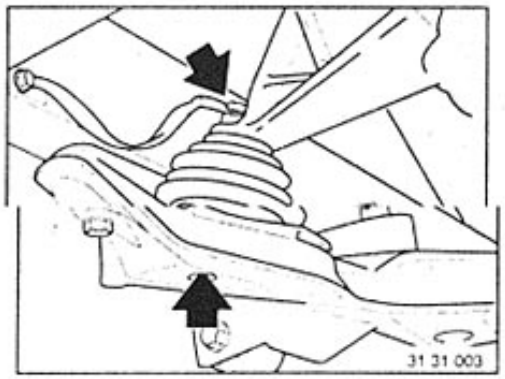
Unfasten air conditioning compressor from mounting bracket, see 64 52 020.

Note:
Lines remain connected.

Remove alternator drive belt, see 11 28 010.

Unfasten vane pump from bracket, see 32 41 060 Repair Instructions for the 7 Series E32.

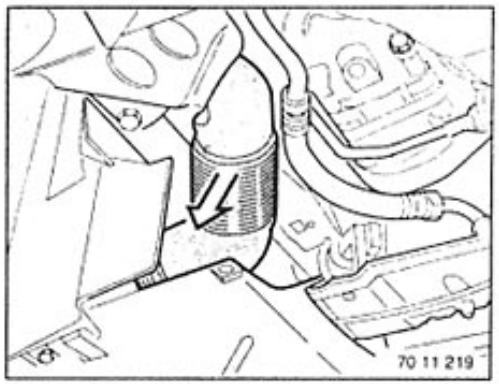
Note:
Lines remain connected.



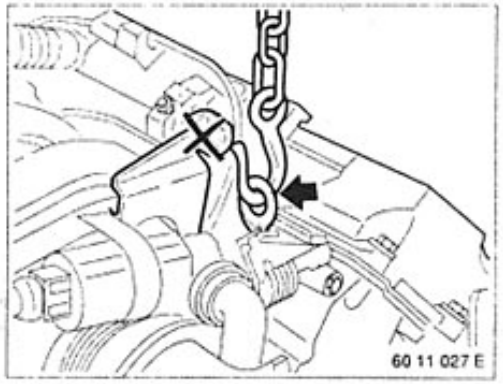
Unscrew left and right engine mounts. Remove ground tape from engine supporting arm.

Installation:
Tightening torque 11 81 1AZ / 2AZ*

* Refer to Technical Data

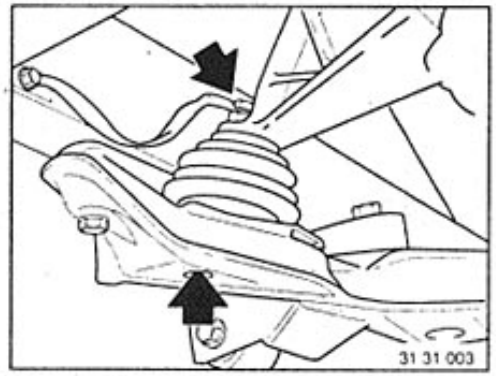


Remove cooling air guide for 3-phase alternator.



Lift up front of engine with special tool 00 0 200.

Important!
Note gap between engine and splash guard.

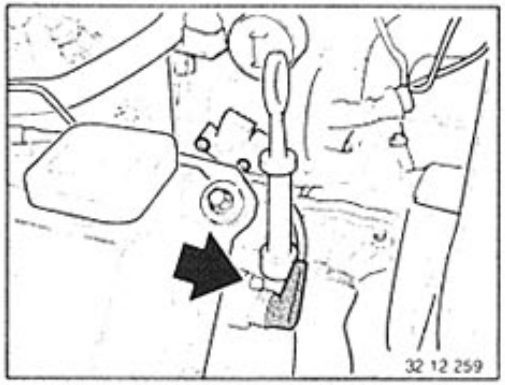


Remove right engine mount.

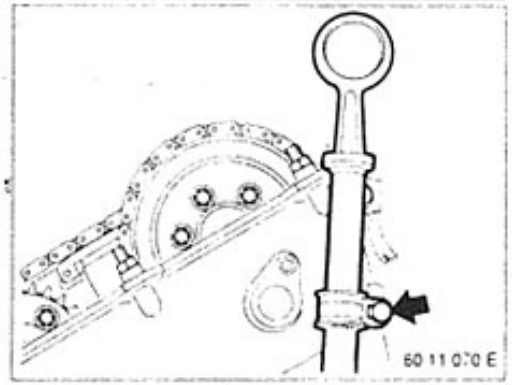
Unfasten mounting bracket for air conditioning compressor.



Unfasten dip stick guide from oil pan.



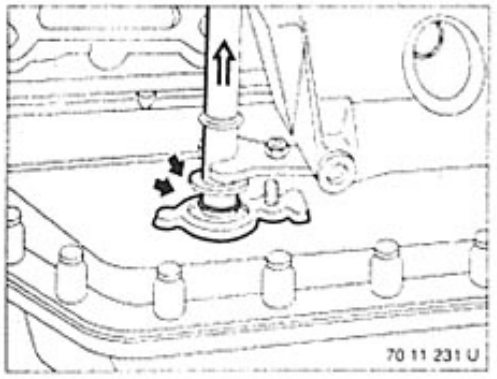
Remove camshaft sensor.



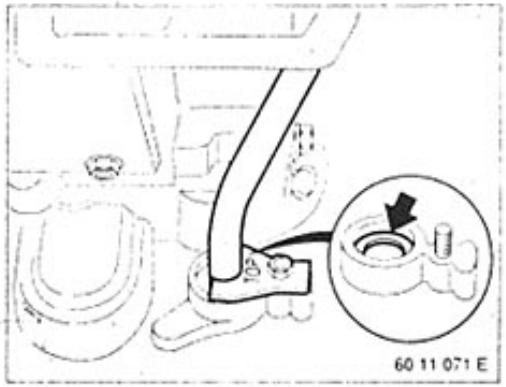
Remove tank venting valve from bracket, see 13 90 500.

Unfasten top of dip stick guide.

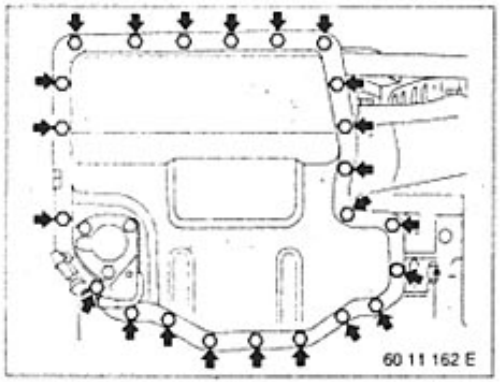
Unfasten water hose from bracket between expansion tank and water pump.



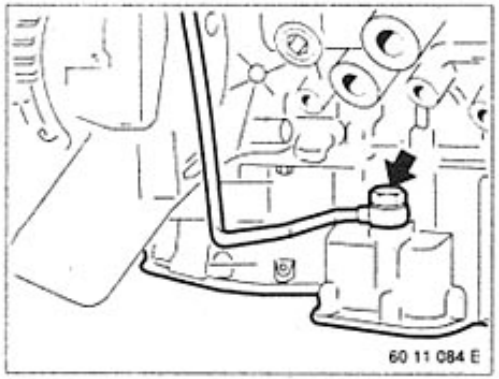
Remove dip stick guide by pulling upwards.



Installation:
Pull water hose to one side.
Place disc and O-ring in oil pan bore.
If necessary, replace O-ring.



Remove complete lower section of oil pan, see 11 13 020.

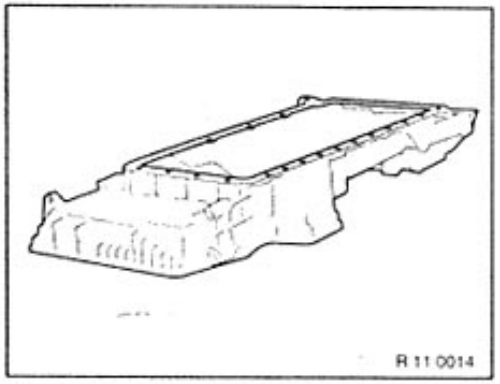


Remove return line between oil filter and oil pan.

Installation:
Replace the sealing ring.

Remove oil lines for automatic transmission from vane pump.

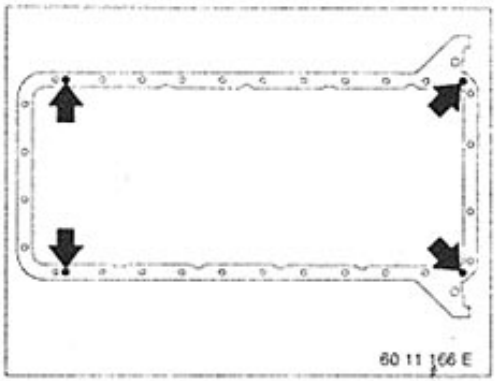
Remove oil pump, see 11 41 000.



Unfasten screws in oil pan.
Remove upper section of oil pan by pulling forwards.

11 13 020 Removing and installing or replacing lower section of oil pan

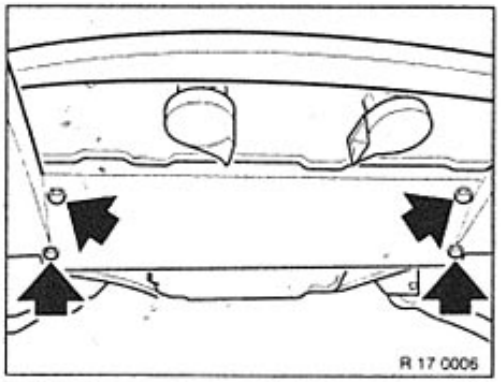
M 60



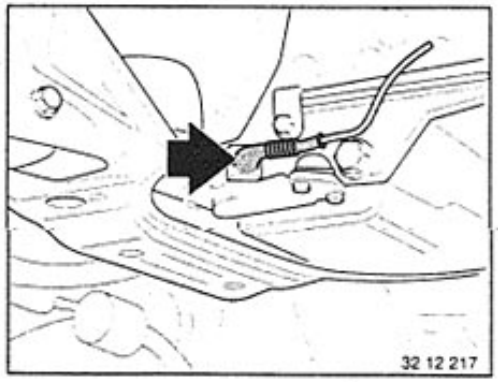
Installation:
Clear sealing faces of gasket residue and clean.
Coat contact edges of sealing face with liquid sealing compound Hylomar SQ 32 M**
Replace seal.

Drain engine oil.
This operation is described in the section on the BMW engine oil service,
see 00 00 249.

Installation:
Insert all screws in oil pan.
Fit screws on transmission end without preload. Tighten screws on engine end.
Tighten screws on transmission end.

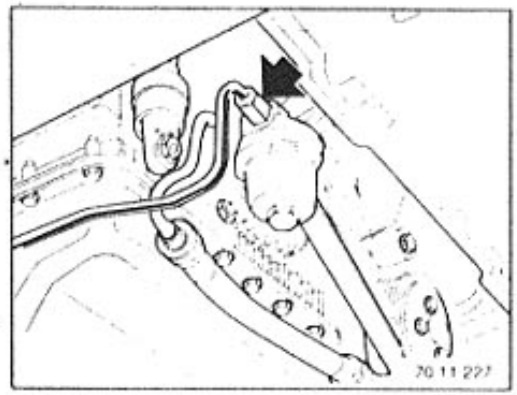


Remove underbody protection from engine.

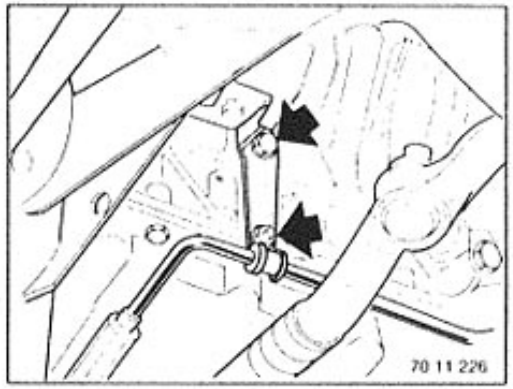


Disconnect plug connection on oil level switch.

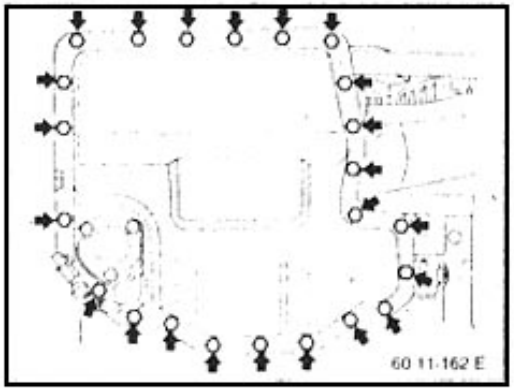
* Source of Supply: BMW Parts Service



If necessary, unfasten hydraulic line for ASC+T from filter.



Unfasten hydraulic line from lower section of oil pan.



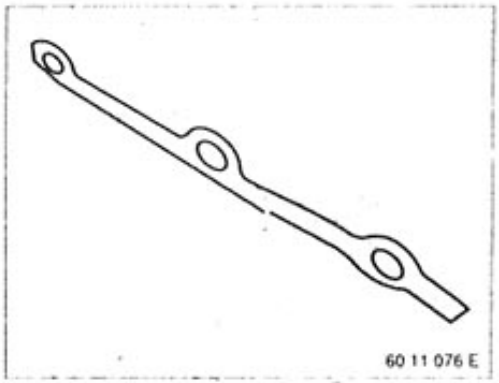
Unfasten screw connection from lower section of oil pan.

Installation:
Clean sealing faces and fit new gasket.

11 14 080 Removing and installing, sealing or replacing top left timing case cover

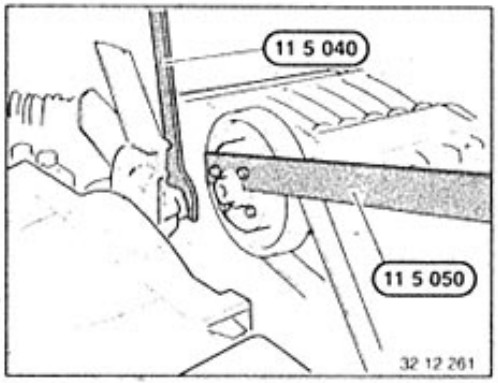
M60

Remove left cylinder head cover. This operation is described in the section removing and installing / sealing both cylinder head covers, see 11 12 004 .

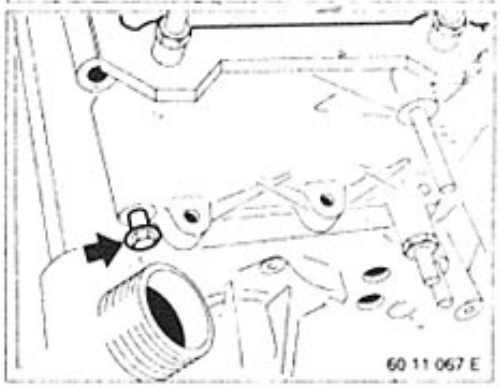


Installation:
Sealing faces clean and free of oil.
Replace gasket.

Caution!
Remove protective film.

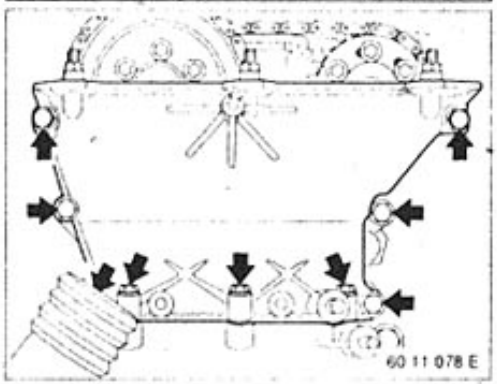


Remove fan cowl.
Use special tool 11 5 040 and 11 5 050.



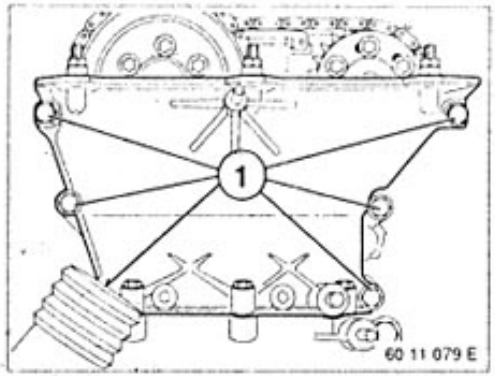
Installation:
Ensure that gaskets are correctly seated, fit timing case cover with screw inserted.

Caution!
It is not possible to install the screw afterwards.

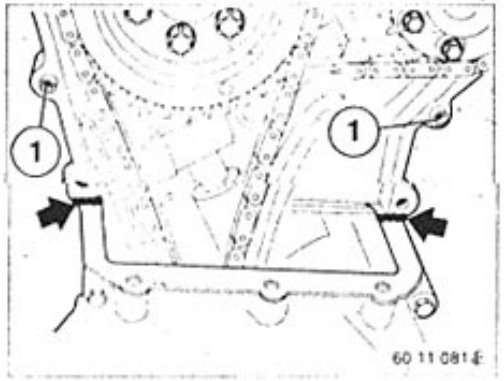


Disconnect positive battery lead from alternator, unfasten retaining screws from protective pipe and place line to one side.

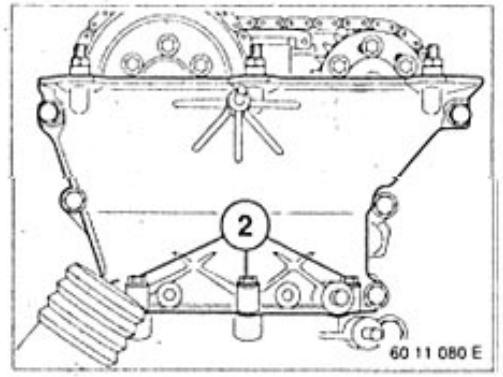
Unscrew bolt connection on timing case cover.



Installation:
Install all screws.
Tighten screw connection (1) until flush with cylinder head.



Installation:
Ensure that hollow dowels are correctly located (1).
Coat the edges of the joint between cylinder head and cylinder head gasket with liquid sealing compound Hylomar SQ32 M**.



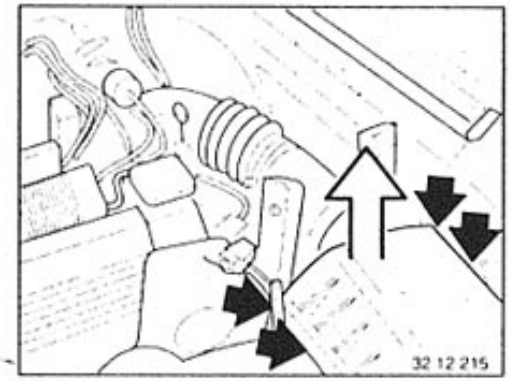
Installation:
Tighten screw connection (2) on timing case cover in two stages.
Then tighten the screw connection to the cylinder head in two stages.

* Source of Supply: BMW Parts Service

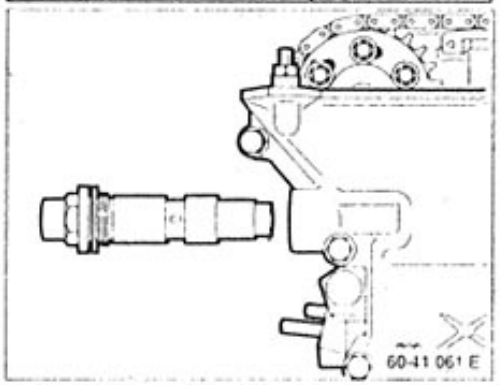
11 14 085 Removing and installing, sealing or replacing top right timing case cover

M60

Remove right cylinder head cover. This operation is described in the section on removing and installing / sealing both cylinder head covers,
see 11 12 004 .

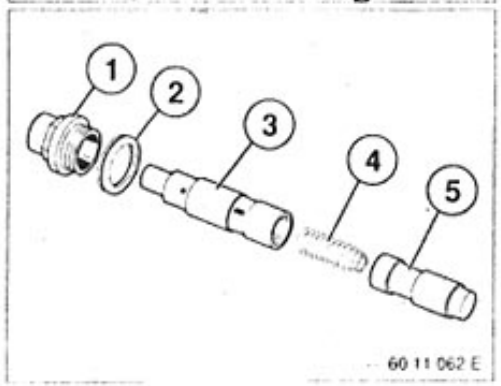


Remove upper section of air intake housing with mass air flow sensor.



Remove chain tensioner.

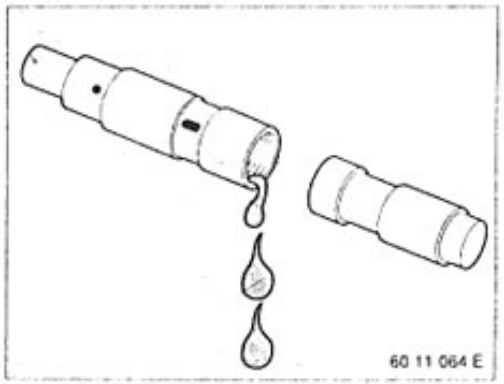
Installation:
Replace seal.
Tightening torque 11 31 7AZ*



Arrangement of components:
(1) Screw plug
(2) Sealing ring
(3) Sleeve
(4) Recoil spring
(5) Hydraulic piston

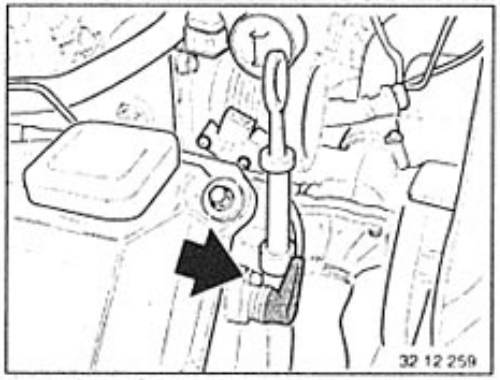
Installation:
Tapered end of recoil spring (4) points towards hydraulic piston (5).

* Refer to Technical Data

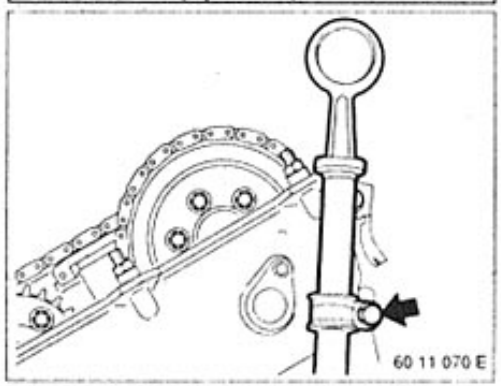


Installation:
To facilitate assembly operation, drain oil chamber between sleeve and hydraulic piston.

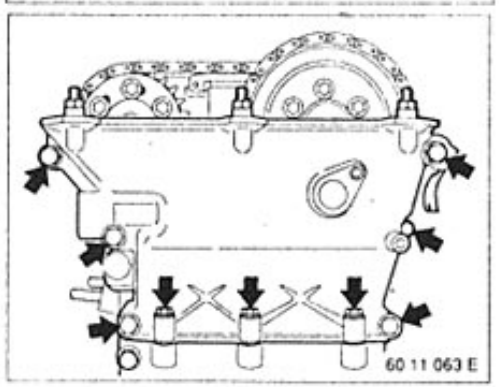
Replace the sealing ring.
Tightening torque 11 31 7AZ*



Remove camshaft sensor.

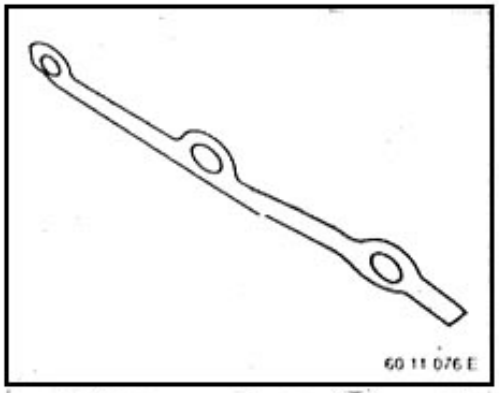


Unfasten upper screw on dipstick guide.



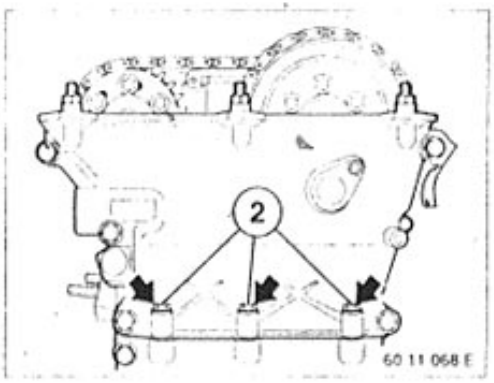
Unfasten screws in timing case cover.

* Refer to Technical Data

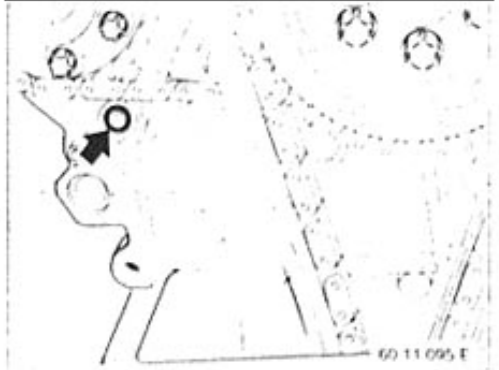


Installation:
Sealing faces clean and free of oil.
Replace gasket.

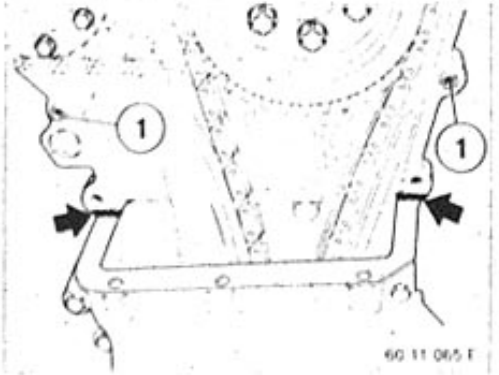
Caution!
Remove protective film.



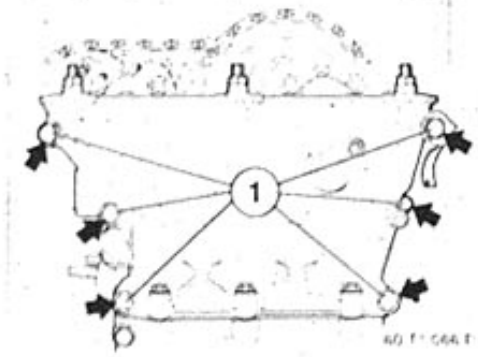
Installation:
Tighten screws on timing case cover (2) in two stages.
Then tighten the remaining screws (1) in two stages.



Caution!
Replace sealing ring in cylinder head for oil supply of chain tensioner.



Installation:
Ensure that hollow dowels are correctly located (1).
Coat the edges of the joint between cylinder head and cylinder head gasket with liquid sealing compound Hylomar SQ32 M**.



Installation:
Ensure that gaskets are correctly seated.
Fit timing case cover.
Install all screws.

Fit screw connection flush to cylinder head (1).

** Refer to BMW Parts Service

11 14 141 Replacing radial seal in lower timing case cover

M60

Refer to Repair Instructions for the 5 Series E34.

11 14 151 Replacing radial crankshaft seal

Transmission side

M60

Refer to Repair Instructions for the 5 Series E34.

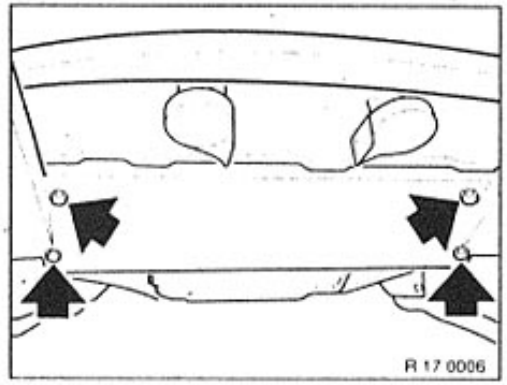
11 22 000 Removing and installing or replacing the flywheel

M60

Refer to Repair Instructions for 5 Series E34.

11 23 010 Removing and installing or replacing vibration damper

M60



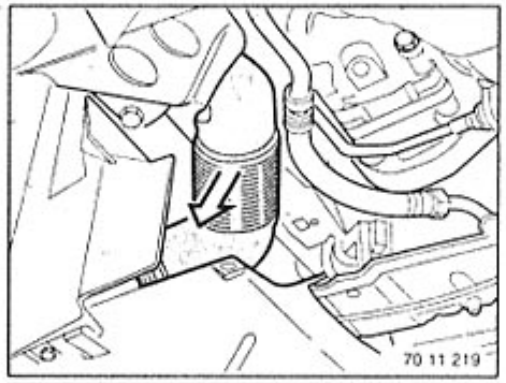
Remove underbody protection from engine.

Subsequent procedure,
see Repair Instructions for 5 Series E34.

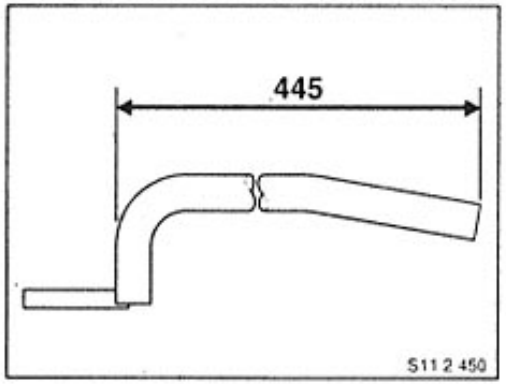
11 23 031 Removing and installing or replacing hub for vibration damper

M60

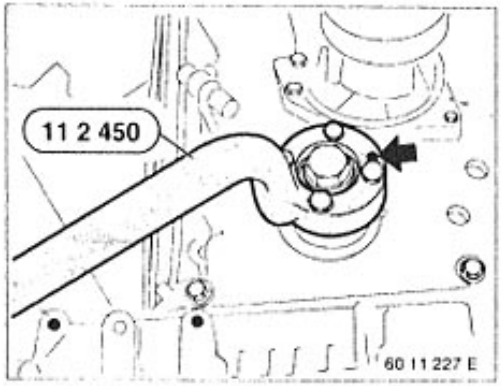
Remove vibration damper,
see 11 23 010.



Remove cooling air duct for 3-phase alternator.

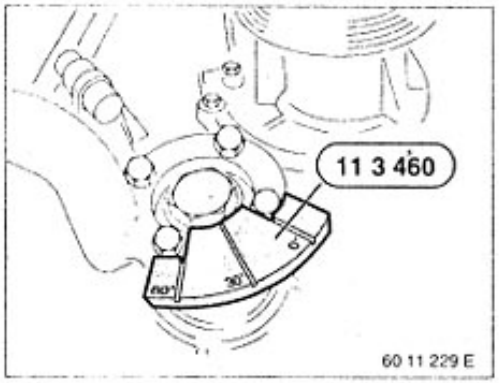


If necessary, shorten end of special tool
11 2 450 to the specified dimension.



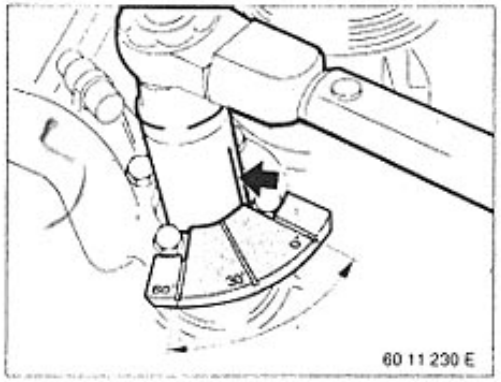
Caution!
Note dowel pin.

Screw special tool 11 2 450 firmly to hub of vibration damper.
Unfasten central screw.



Installation:
Attach special tool 11 3 460 to special tool 11 2 450.

Note:
Special tool 11 3 460 is magnetic.

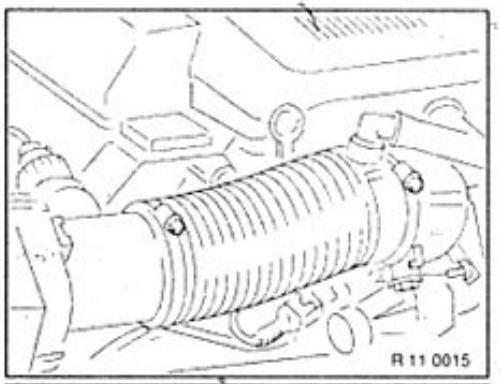


Installation:
Tighten central screw to jointing torque.
Tightening torque 11 23 2AZ*
Select 0° position and mark on the socket head.
Tighten central screw with torsion angle.
Tightening torque 11 23 2AZ*

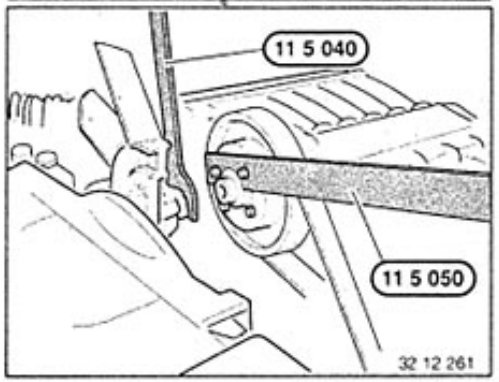
* Refer to Technical Data

11 28 010 Repiacing drive belt for alternator

M60



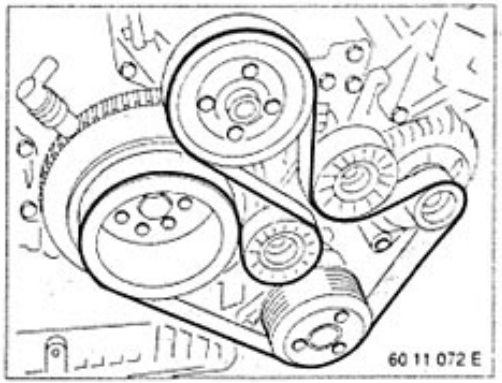
Remove hose from idle speed actuator and remove gaiter between throttle body and mass air flow sensor.



Remove fan.
Use special tools 11 5 040 and 11 5 050.

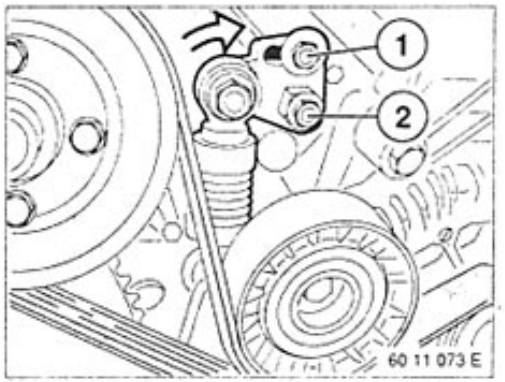
Caution!
Counterclockwise thread

Installation:
Tightening torque 11 52 1AZ*



Arrangement of drive belt guide.

* Refer to Technical Data

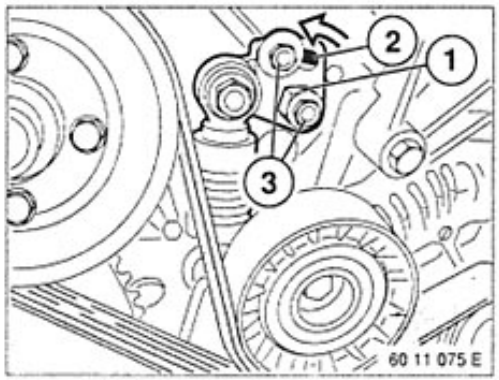


Unfasten nuts (1) and (2) and relieve tension on belt drive.
Remove Vee belt.

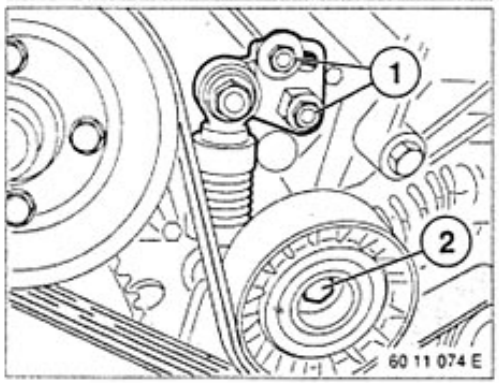
Installation:
Check Vee belt for coolant and oil residue, replacing if necessary.



Caution!
Always replace Vee belt if contaminated with hydraulic oil.



Installation:
Fit Vee belt and check that pulley wheels are correctly located.
Preload adjusting plate on hex head (1) until it contacts the end of the long bore (2) and tighten nuts (3).



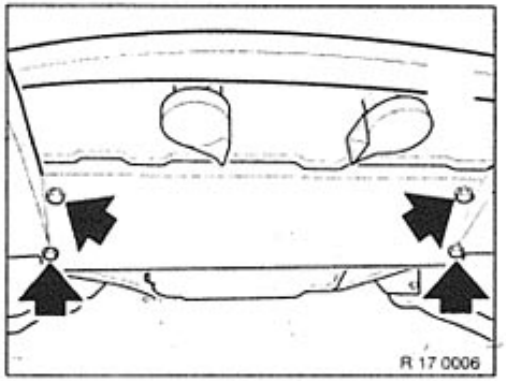
Note:
To remove the complete belt tensioning fixture, unfasten nut (1) and screw (2).

11 31 010 Adjusting timing of camshaft(s)

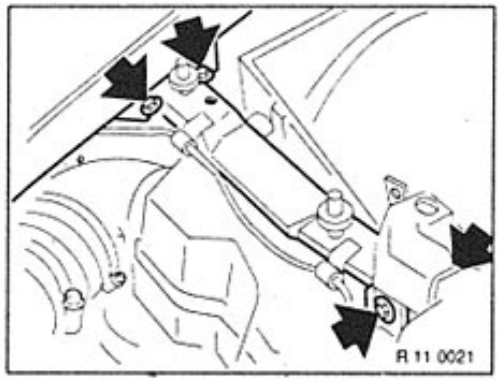
M60

Remove active carbon filter,
refer to 16 12 010

Remove pop-up-headlights,
refer to 63 12 460



Remove underbody protection from engine.

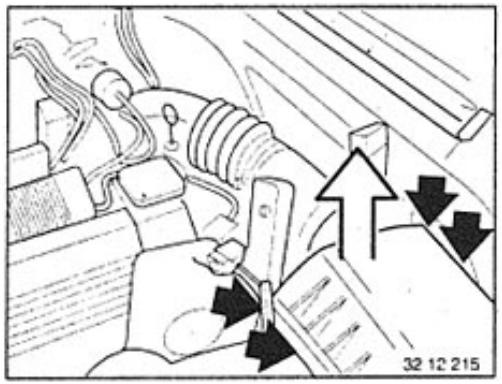


Remove support for pop-up headlights.
Remove complete lower section of air intake filter housing.

Unfasten air-conditioning compressor from mounting block,
refer to 64 52 020

Note:
Lines remain connected.

Subsequent procedure,
refer to 11 31 010
Repair Instructions for 7 Series E38



Remove complete upper section of air intake filter together with mass air flow sensor.

11 31 011 Replacing left camshaft

(inlet or exhaust side, as applicable)
Cylinder bank 5 - 8

M60

Preliminary work in accordance with "Adjusting timing of camshaft(s)",
refer to 11 31 010

Subsequent procedure,
refer to 11 31 011
Repair Instructions for 7 Series E38

11 31 015 Replacing right camshaft

(inlet or exhaust side, as applicable)
Cylinder bank 1 - 4

M60

Perform preliminary work in accordance with "Adjusting timing of camshaft(s)"
refer to 11 31 010

Subsequent procedure,
refer to 11 31 015
Repair Instructions for 7 Series E38

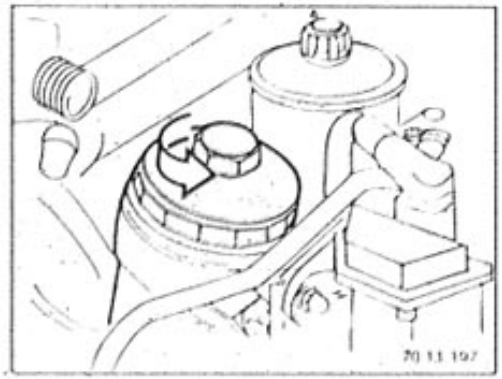
11 41 000 Removing and installing or replacing oil pump

M60

see Repair Instructions for 5 Series E34.

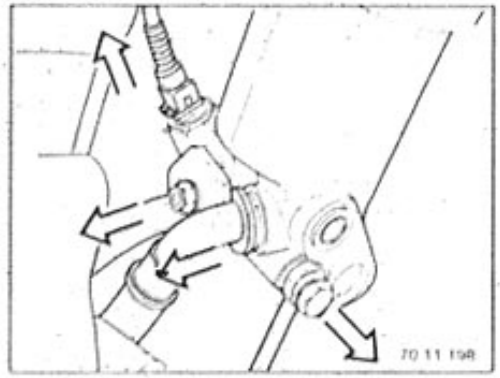
11 42 020 Removing and installing, sealing or replacing complete full-flow oil filter

M60



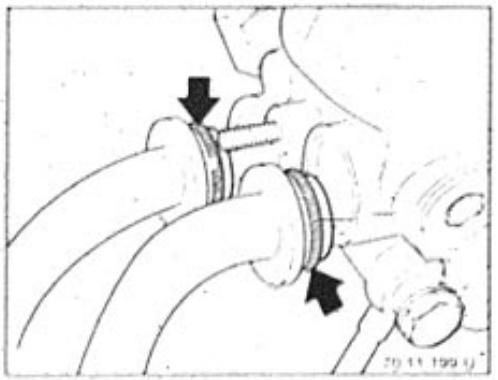
Note:
Do not damage full-flow oil filter cover: only open and tighten using a socket nut.
Unfasten full-flow filter cover to enable engine oil to flow back into the oil pan.

Installation:
Fit new seal.
Tightening torque 11 42 2AZ*



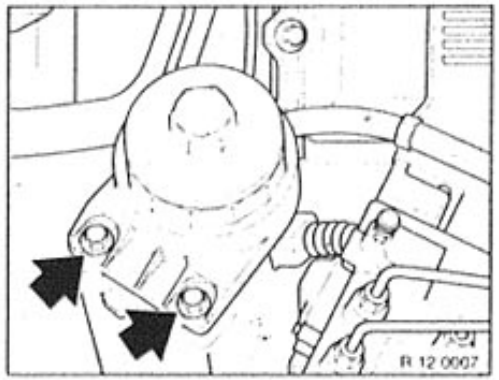
Disconnect plug connection on oil pressure switch

Remove oil lines from full-flow filter housing.



Installation:
Fit new seals.

* Refer to Technical Data



Unfasten full-flow filter housing and lift out of bracket.

Installation:
If necessary, replace oil filter.
Check oil level and top up oil if necessary.

11 51 000 Removing and installing or replacing water pump

M60

Remove coolant hose between expansion tank and water pump.

For subsequent procedure,
see Reparair Instructions for 5 Series E34.

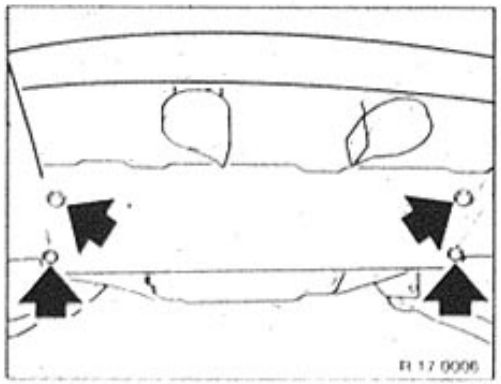
11 51 011 Replacing pulley wheel on water pump

M60

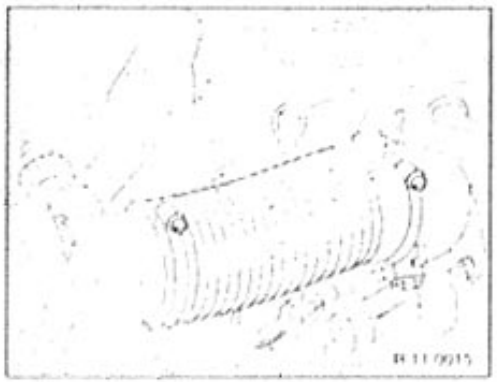
see Repair Instructions for 5 Series E34.

11 53 000 Removing and installing or replacing coolant thermostat

M60



Remove underbody protection from engine.

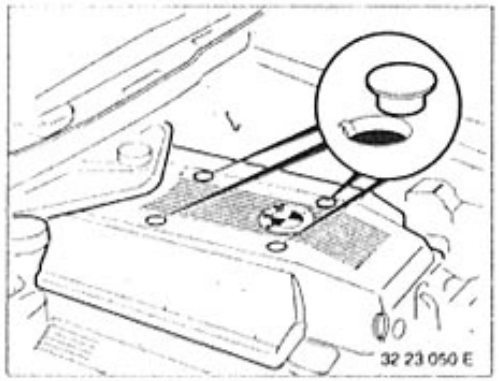


Remove hose to idle speed actuator and remove gaiter between throttle body and mass air flow sensor.

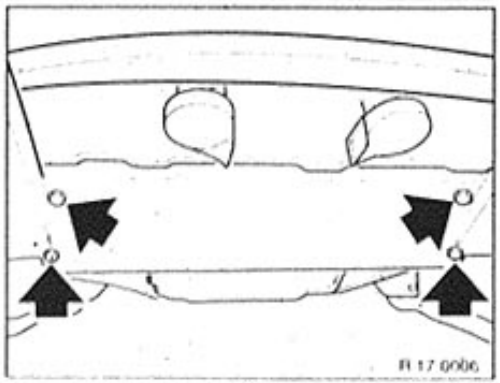
Subsequent procedure,
see Repair Instructions, 5 Series E34.

11 53 325 Removing and installing or replacing coolant manifold

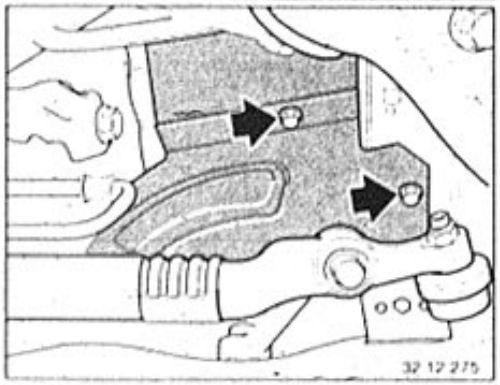
M60



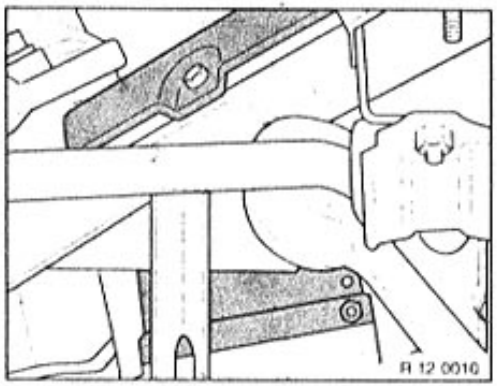
Lever clips off manifold cover.
Unfasten screws.
Remove cover together with acoustic insulation.



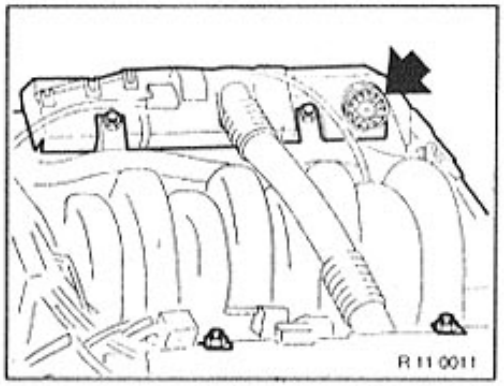
Remove underbody protection from engine.



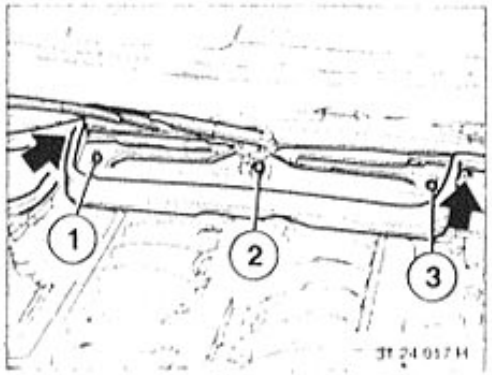
Remove left and right heat baffle plates from front axle carrier.



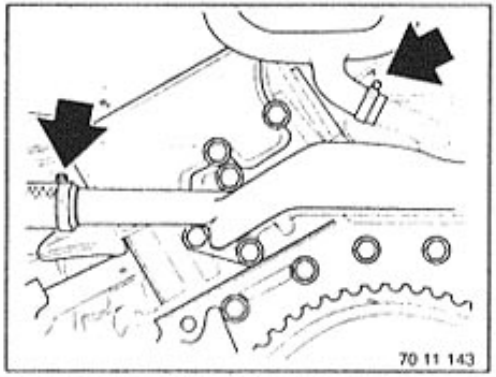
Remove rear left and right heat baffle plates.



Disconnect engine connector from left and right cable ducts.

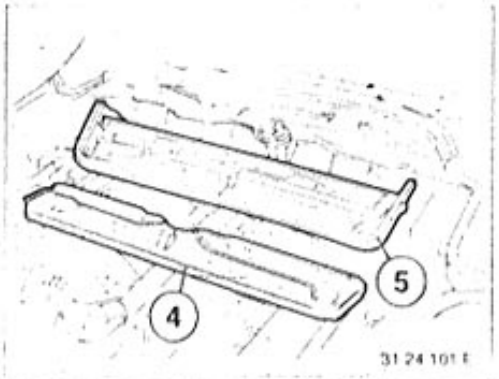


Partially remove rubber seal from air manifold.
Twist retainers (1...3).
Unscrew and remove screws on left and right sides.

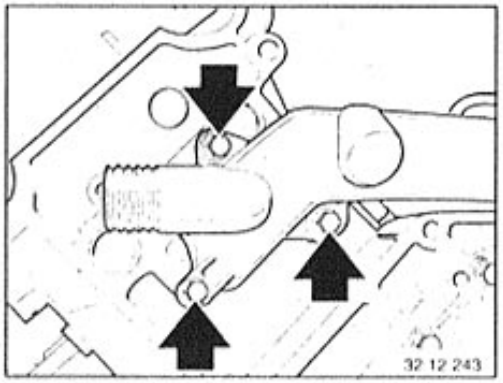


Drain off coolant,
see 17 00 039.

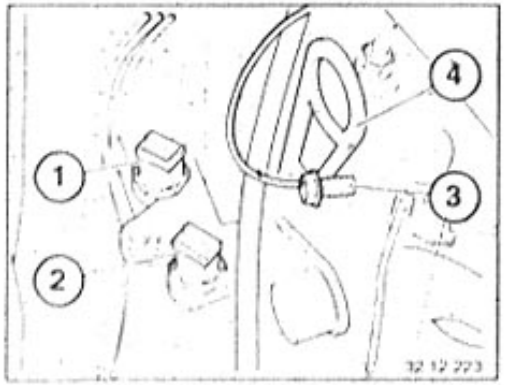
Remove coolant hoses from coolant manifold.



Lift out trim section (4) and microfilter (5).

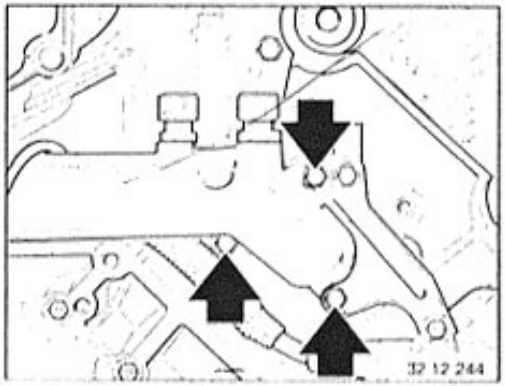


Unfasten screw connection from coolant manifold.



Disconnect plug connections:
(1) Temperature sensor for remote thermometer (black)
(2) Temperature sensor for control unit on Digital Motor Electrics (white)

Unscrew beside engine mount (4) behind shared ground wire for the ignition coils (3).



Unfasten screw connection on coolant manifold.

Installation:
Clean sealing faces and replace gaskets.

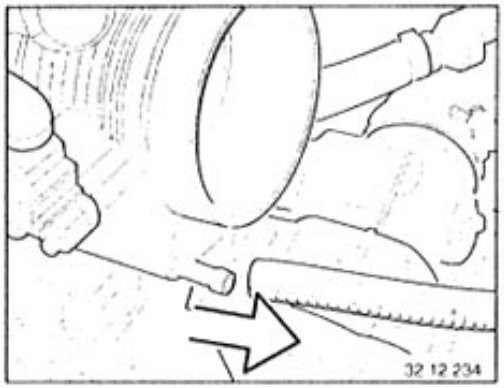
Top up coolant.
Bleed cooling system and check for leaks,
see 17 00 039.

11 61 050 Removing and installing air intake manifold

M60

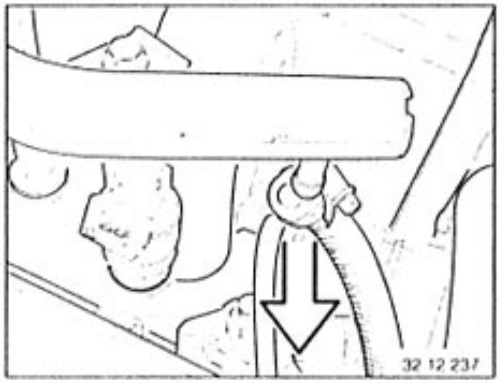
Interrogate fault memory.
Switch off ignition.

Remove left and right cable duct.
These operations are described in the section on Removing Both Cylinder Heads,
see 11 12 004.



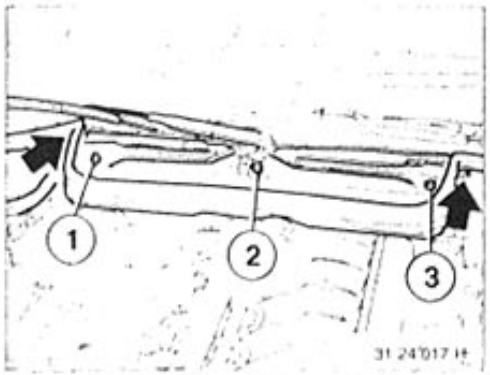
Remove tank vent hose from throttle body.

Disconnect accelerator cable and Bowden cable from ASC throttle valve.
This operation is described in Removing and Installing the Engine,
see 11 00 050.

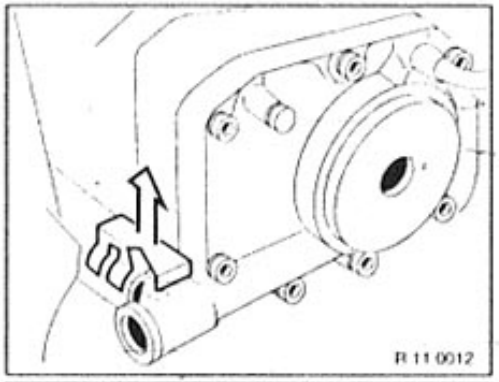


Caution!
Catch escaping fuel.

Remove fuel inlet and return lines from injection tube.

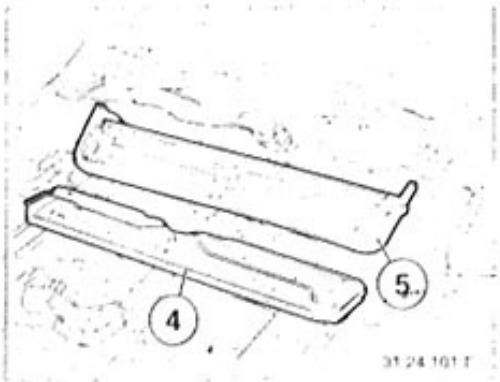


Partially remove rubber seal from air manifold.
Twist retainers (1 ... 3).
Unscrew and remove left and right screws.

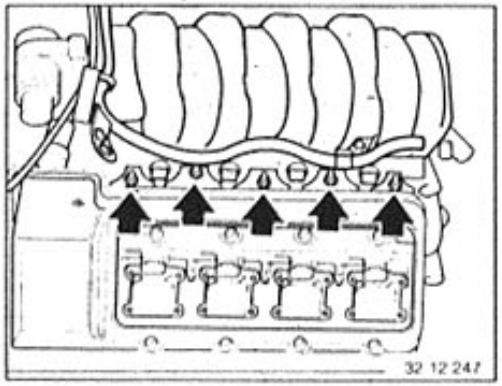


Remove clips and slide tube for engine venting forwards.

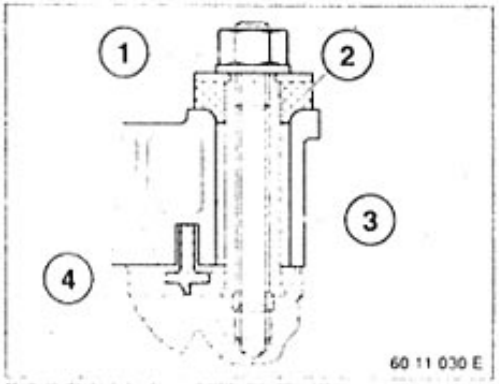
Installation:
Check seal and replace if necessary.



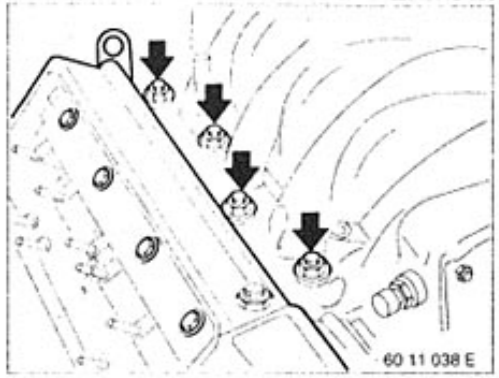
Lift out trim section (4) and microfilter (5).



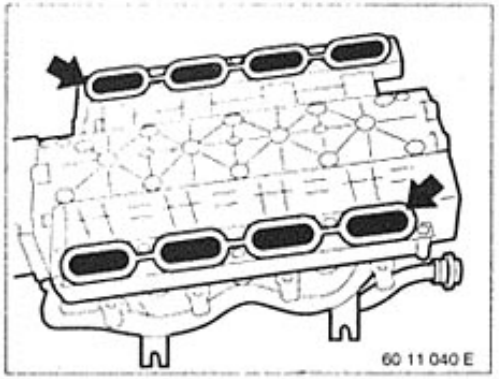
Loosen nuts.
Remove decoupling units, then remove intake air manifold by lifting upwards.



Note:
The intake air manifold is separated from the cylinder head by decoupling units and gaskets (vibration damping).
(1) Nut
(2) Decoupling unit
(3) Intake air manifold
(4) Gasket



Installation:
Fit two decoupling units on left and right with nut - not under preload - and align the intake air manifold.
Fit all the other decoupling units with nut and tighten crosswise, radiating outwards from the center.
Tightening torque 11 61 1AZ*



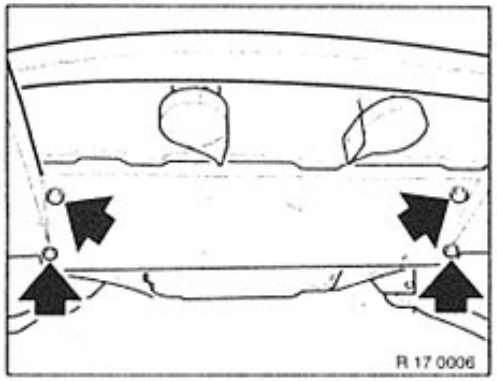
Installation:
Check gaskets and replace if necessary.
Ensure that the gaskets are correctly seated.

*** Refer to Technical Data**

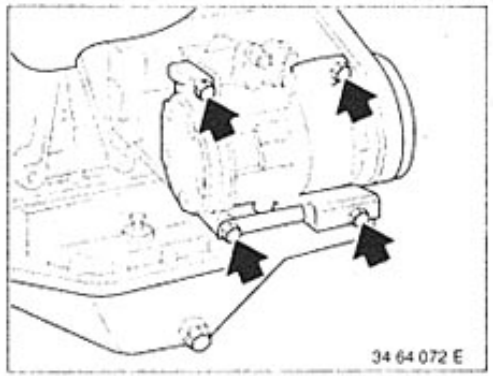
11 62 142 Removing and installing or replacing both left exhaust manifolds

M60

Remove complete exhaust unit, see 18 00 020.



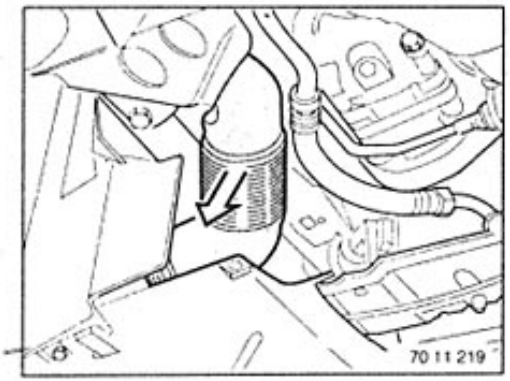
Remove underbody protection from engine.



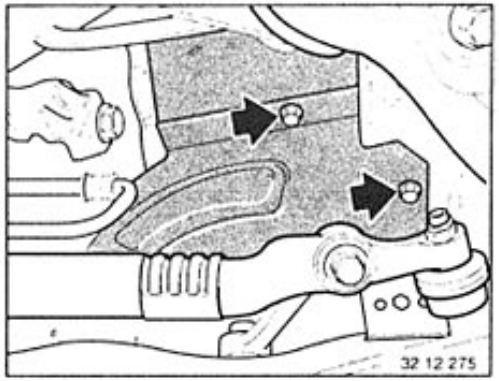
Remove drive belt from air conditioning compressor, see 64 52 020.

Unfasten air conditioning compressor from mount, see 64 52 020.

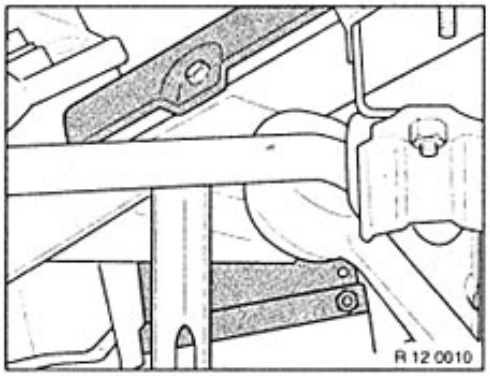
Note:
Lines remain connected.



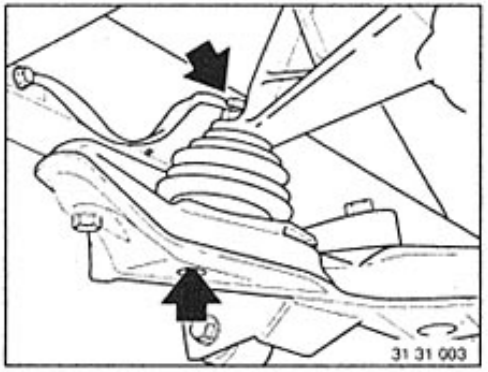
Remove cooling air guide for 3-phase alternator.



Remove left and right heat baffle plates from front axle carrier.

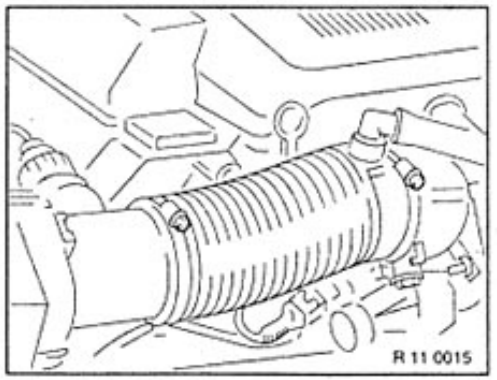


Remove left and right heat baffle plates.



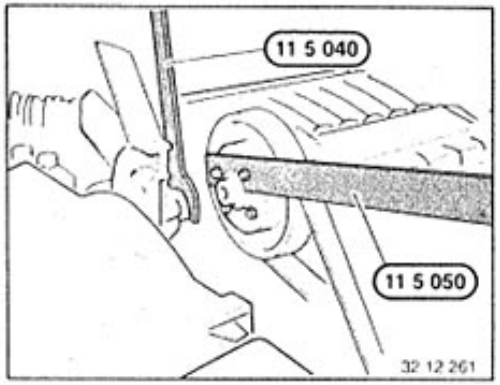
Unfasten left and right engine mount.
Remove ground tape from engine support arm.

Installation:
Tightening torque 11 81 1AZ*



Remove hose to idle speed actuator and remove gaiter between throttle body and mass air flow sensor.

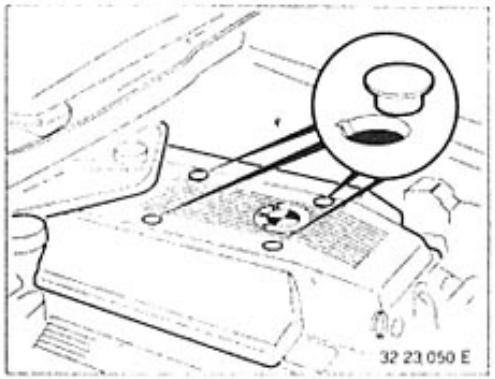
* Refer to Technical Data



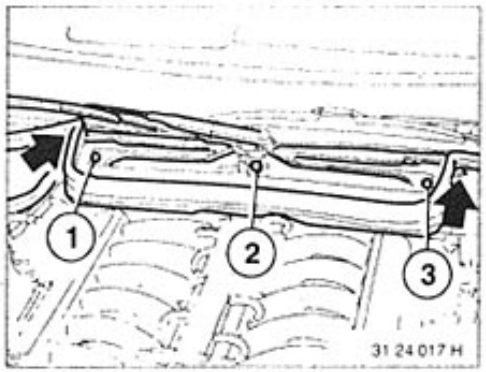
Remove fan wheel.
Use special tool 11 5 040 and 11 5 050.

Caution!
Counterclockwise thread

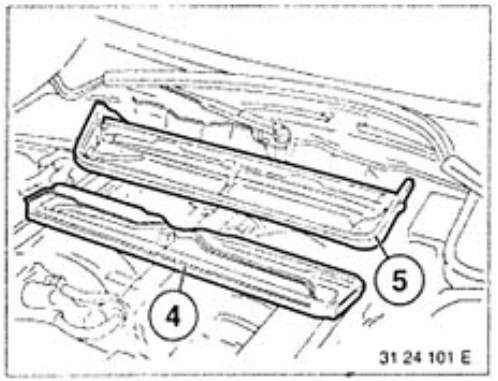
Installation:
Tightening torque 11 52 1AZ*



Lever clips out of manifold cover.
Unfasten screws.
Remove cover and acoustic insulation.

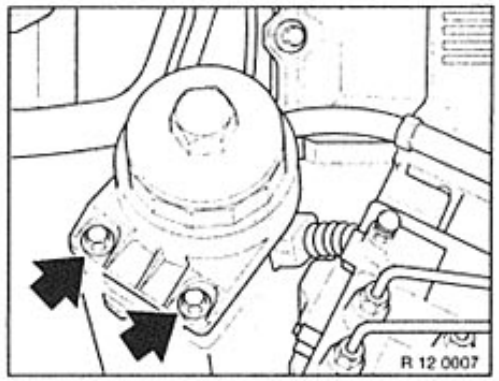


Partially remove rubber seal from air manifold.
Twist retainers (1 ... 3).
Unscrew and remove left and right screws.

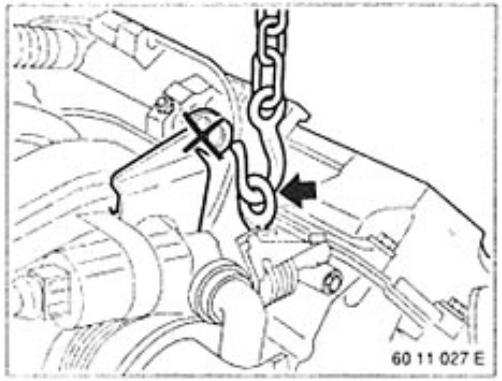


Lift out trim section (4) and microfilter (5).

* Refer to Technical Data

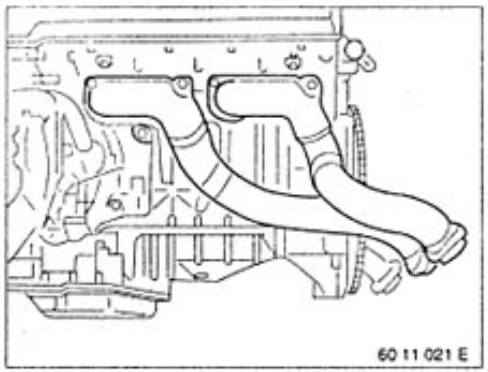


Disconnect full-flow oil filter.



Raise engine at front with special tool 00 0 200.

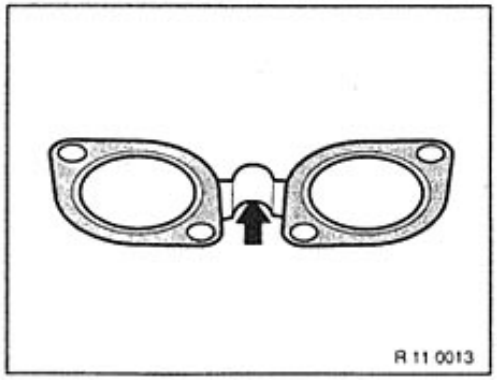
Caution!
Note distance between engine and splash guard.



Completely unfasten screw connections on both exhaust manifolds.
Remove both exhaust manifolds from below.

Note:
Unfasten screw connection on exhaust manifold for cylinders 7/8 from below.

Installation:
Tightening torque 11 62 1AZ*



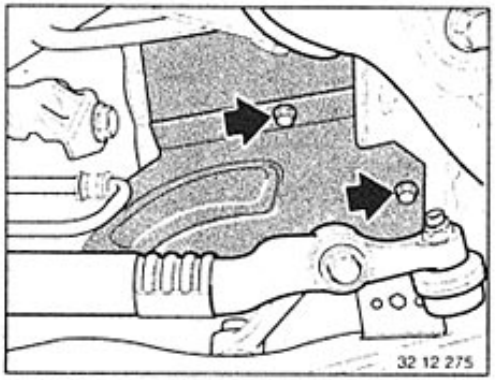
Installation:
Replace gaskets.
Sealing bead faces the exhaust manifold.

* Refer to Technical Data

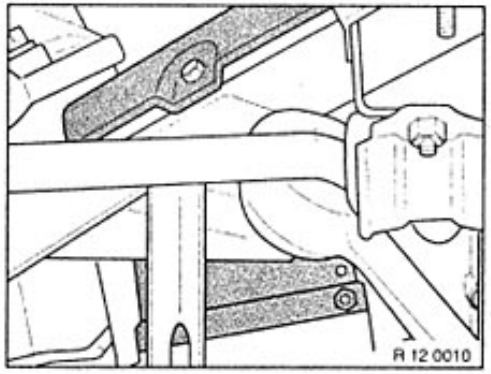
11 62 143 Removing, installing or replacing both exhaust manifolds

M60

Remove complete exhaust system, see 18 00 020.



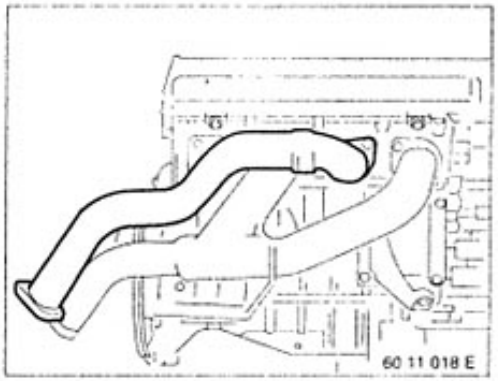
Remove left and right heat baffle plates from front axle carrier.



Remove left and right heat baffle plates from rear.

Remove active carbon filter, see 16 12 010.

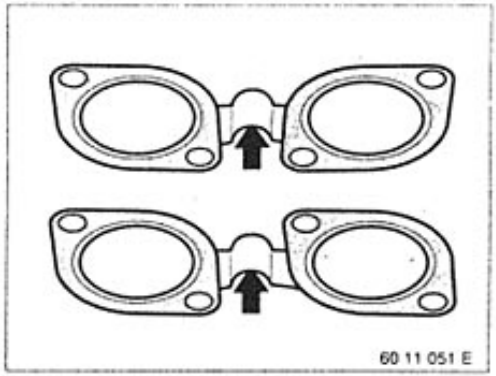
Remove both heat baffle plates from engine support.



Completely unfasten screw connection on both exhaust manifolds.
Remove both exhaust manifolds by lifting upwards.

Note:
Unfasten screw connection on exhaust manifold for cylinders 2/4 from below.

Installation:
Tightening torque 11 62 1AZ*



Installation:
Replace gaskets.
Sealing bead faces exhaust manifold.
Install gaskets from below.

* Refer to Technical Data

11 Engine M73

00 00 249	BMW engine oil service	11- 0/20
11 00 039	Compression check – all cylinders	11- 0/20
050	Engine – remove and install	11- 0/21
11 12 004	Both cylinder head covers – remove and install/seal	11- 12/20
005	Left cylinder head cover – remove and install/seal	11- 12/20
006	Right cylinder head cover – remove and install/seal	11- 12/20
105	Left cylinder head – remove and install	11- 12/20
106	Right cylinder head – remove and install	11- 12/20
11 13 010	Upper section of oil pan – remove and install/replace	11- 13/20
11 53 325	Coolant manifold – remove and install/replace	11- 53/20
11 62 142	Both left exhaust manifolds – remove and install/replace	11- 62/20
143	Both right exhaust manifolds – remove and install/replace	11- 62/21
11 72 000	Air pump – remove and install/replace	11- 72/20

For additional work, refer to “Repair Instructions for 7 Series E38”

00 00 249 BMW engine oil service

M73

Refer to 00 00 249
Repair Instructions for 7 Series E38

11 00 039 Checking compression of all cylinders

M73



Caution!
High voltage – danger of death!
Interrupt power supply to ignition coils.
Note instructions on compression testing,
refer to General Data MG12
Repair Instructions for 7 Series E38

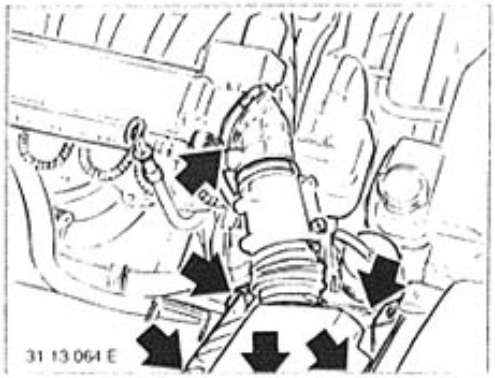
Disconnect fuel pump relay and DME master relay (installation: electronics box),
refer to Electrical Troubleshooting Manual (Schematics) for 8 Series E31
Directory of components 7000.0

After the test, interrogate fault memory and, if necessary, rectify faults. Cancel fault memory.
Subsequent procedure,
refer to 11 00 039
Repair Instructions for 7 Series E38

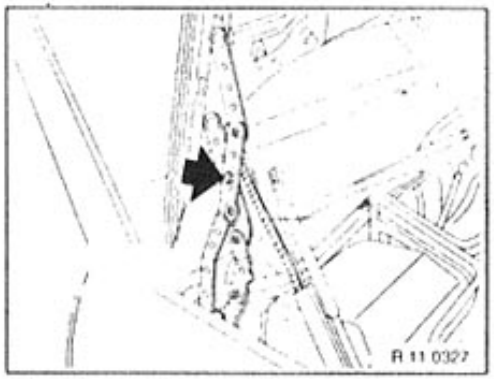
11 00 050 Removing and installing engine

M73

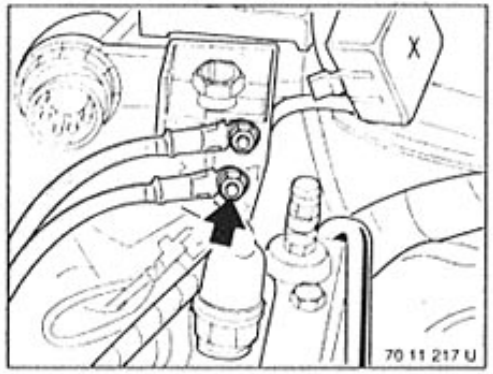
Note instructions on disconnecting and connecting battery, refer to General Data MG 12: removing battery ground wire.



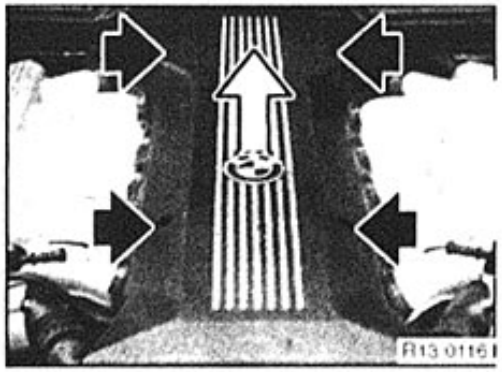
Remove upper section of intake filter housing with left and right mass air flow sensors.



Move engine hood into assembly position. Disconnect damper strut from engine hood, fully open the engine hood and secure with a screw on left and right sides.



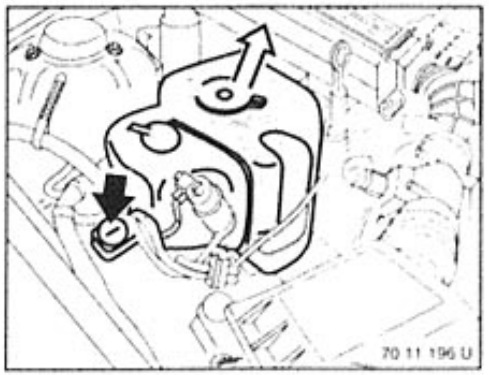
Disconnect positive battery lead from positive battery terminal.



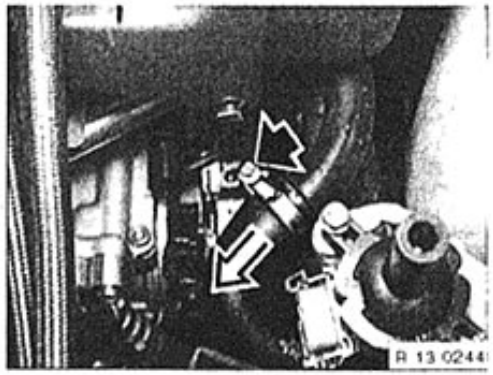
Rotate interlock through 90°. Remove cover.

Remove section of engine wiring harness from engine and place to one side,
refer to 61 11 051

Disconnect plug connection and remove hoses from tank vent valve,
refer to 13 90 500



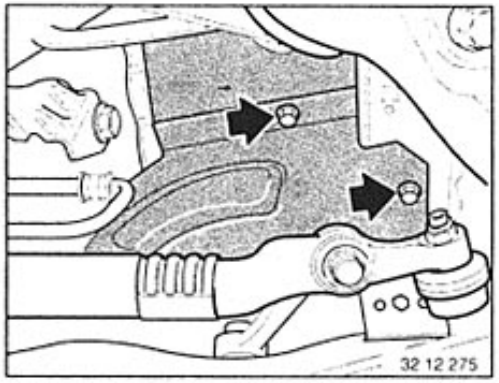
Remove windshield wash container and place to one side.



Unfasten hose clip from pressure pipe on air pump. Remove hose.

Remove complete full flow oil filter,
refer to 11 42 020
Repair Instructions for 7 Series E38

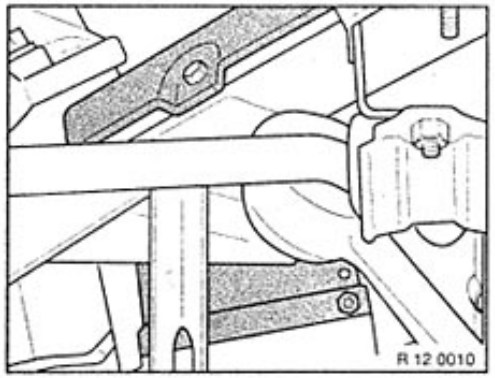
Completely remove radiator,
refer to 17 11 000



Remove left and right heat baffle plates from front axle carrier.

Remove exhaust pipes from cylinder bank 1 to 6,
refer to 18 31 010
Repair Instructions for 7 Series E38

Remove exhaust pipes from cylinder bank 7 to 12,
refer to 18 31 015
Repair Instructions for 7 Series E38



Remove left and right rear heat baffle plates.

Starter motor remove,
refer to 12 41 020

"Removing automatic transmission,"
refer to 24 00 026

Unfasten drain plugs for coolant from left and right sides of engine block.
Drain coolant and dispose of it correctly.

Installation:
Replace sealing rings.
Tightening torque,
refer to Technical Data 11 11 5AZ

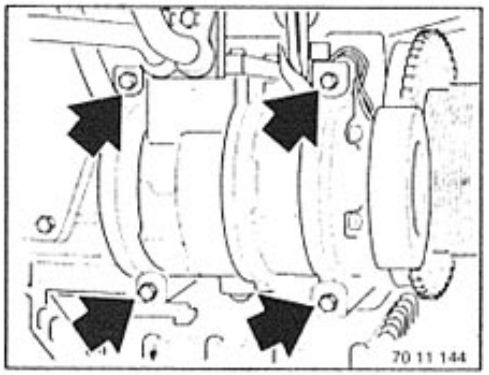
Remove alternator drive belt,
refer to 11 28 010
Repair Instructions for 7 Series E38

Remove drive belt for compressor on air conditioner,
refer to 11 28 550
Repair Instructions for 7 Series E38

Remove dipstick tube,
refer to 11 43 000
Repair Instructions for 7 Series E38

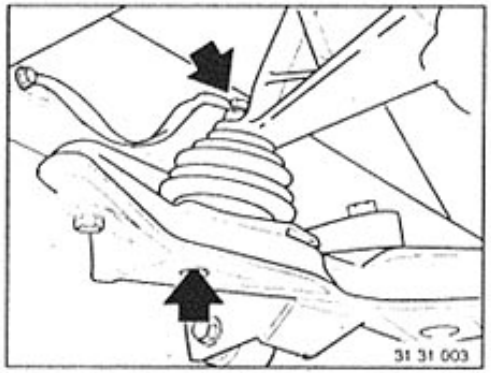
Unfasten hydraulic line from front oil pan.

Remove vane pump,
refer to 32 41 060



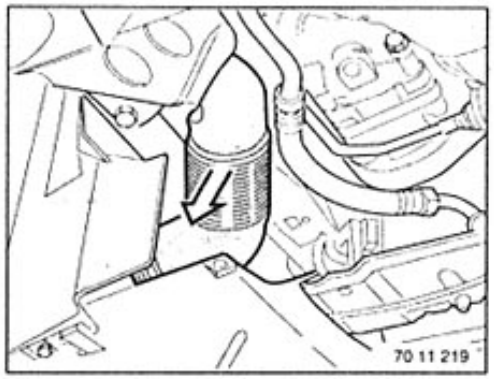
Unfasten air conditioning compressor from mount and tie to one side.

Note:
Lines remain connected.

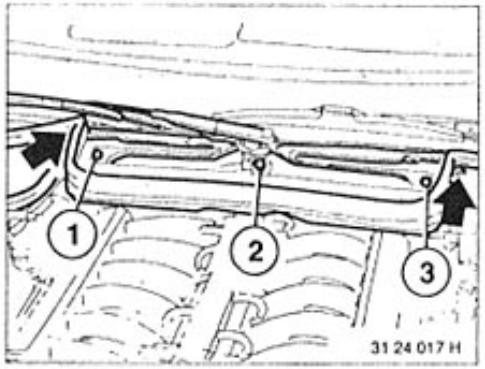


Unfasten ground strap from right engine support arm.

Unfasten both engine mounts on front axle support and on engine support arm.



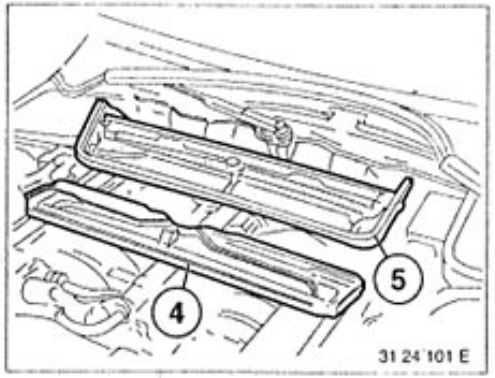
Remove cooling air guide for 3-phase alternator.



Partially remove rubber seal.
Twist retainers (1 to 3) through 90°.
Unfasten left and right screws.
Loosen top nut in centre.



Remove bracket for hydraulic lines from vane pump.



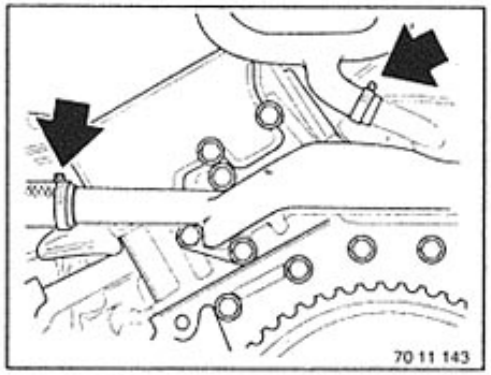
Lift off cover (4) and air manifold box (5).

Caution!
Catch fuel as it flows out and dispose of it correctly.
Remove fuel inlet and outlet lines.
This operation is described in section on replacing all injection valves,
refer to 13 64 541

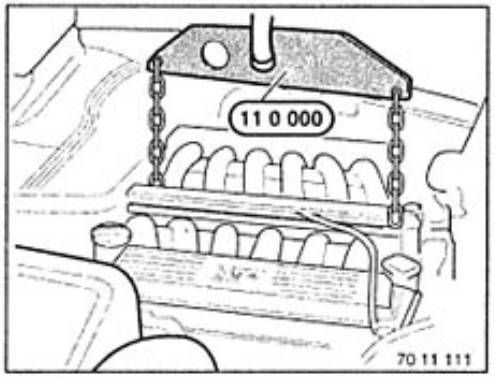
Installation:
Replace fuel hoses.



Caution!
Lift engine and turn back to the right.
Note narrow gap between exhaust manifold and steering spindle.
Lift out engine carefully.

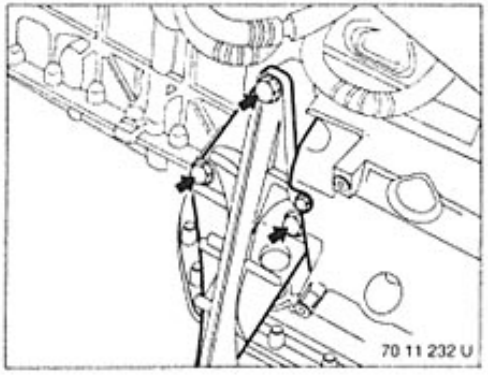


Remove coolant hoses from coolant manifold, coolant pipe and heater.



Secure engine on special tool 11 0 000.

Caution!
Only lift engine using the mounting lugs provided for this purpose.



Raise engine slightly and remove right engine support arm.

11 12 004 Removing and installing / sealing both cylinder head covers

M73

Refer to 11 12 004
Repair Instructions for 7 Series E38

11 12 005 Removing and installing / sealing left cylinder head cover

M73

This operation is described in section removing and installing / sealing both cylinder head covers,
refer to 11 12 004
Repair Instructions for 7 Series E38

11 12 006 Removing and installing / sealing right cylinder head cover

M73

This operation is described in section on removing and installing / sealing both cylinder head covers,
refer to 11 12 004
Repair Instructions for 7 Series E38

11 12 105 Removing and installing left cylinder head

M73

Remove engine,
refer to 11 00 050

Subsequent procedure,
refer to 11 12 105
Repair Instructions for 7 Series E38

11 12 106 Removing and installing right cylinder head

M73

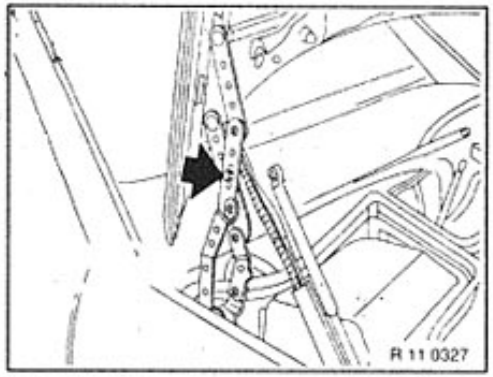
Remove engine,
refer to 11 00 050

Subsequent procedure,
refer to 11 12 106
Repair Instructions for 7 Series E38

11 13 010 Removing and installing / replacing upper section of oil pan

M73

Remove fan coupling with fan wheel,
refer to 11 52 020
Repair Instructions for 7 Series E38

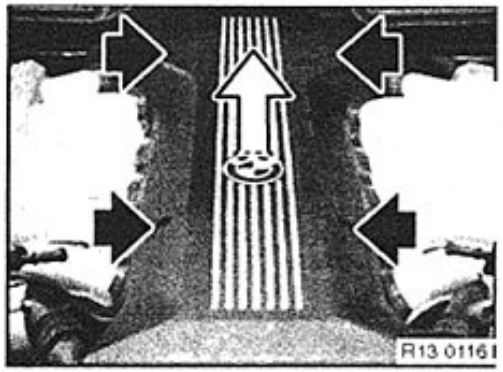


Lift engine hood into assembly position.

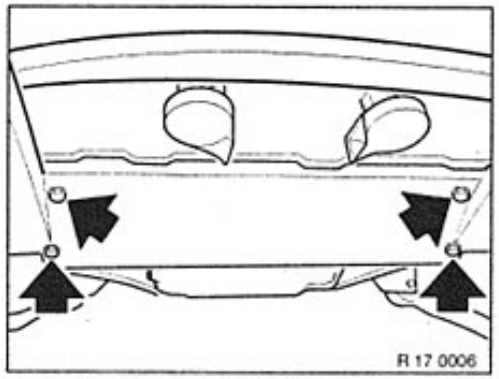
Disconnect damper strut on engine hood, open engine hood fully and secure with one screw on left and right sides.

Remove alternator drive belt,
refer to 11 28 010
Repair Instructions for 7 Series E38

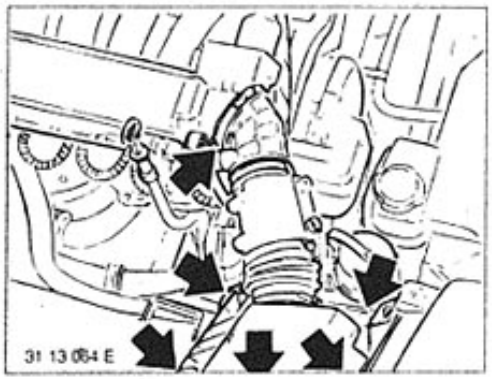
Relieve tension on drive belt for air conditioner compressor and remove adjustment plate from oil pan,
refer to 11 28 550
Repair Instructions for 7 Series E38



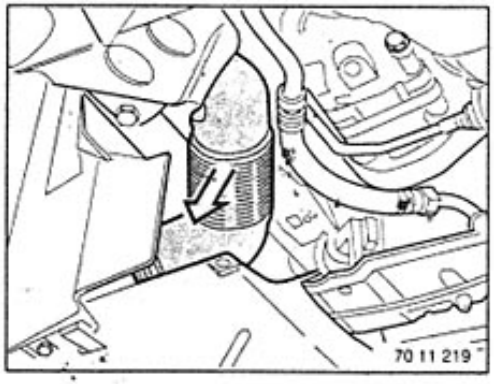
Twist interlock through 90°. Remove cover.



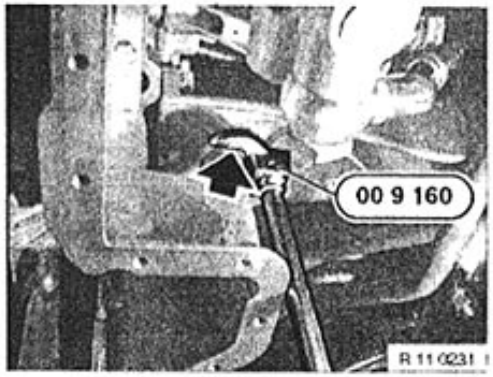
Remove front underbody protection.



Remove upper section of intake filter housing with left and right mass air flow sensors.

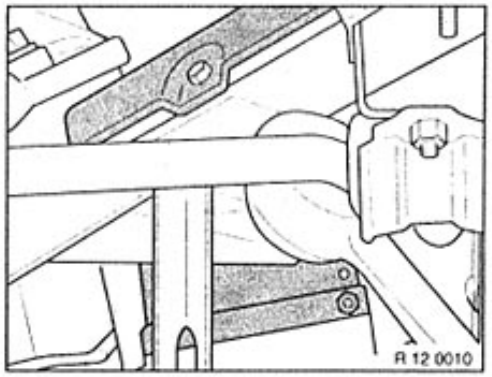


Remove coolant guide on alternator.

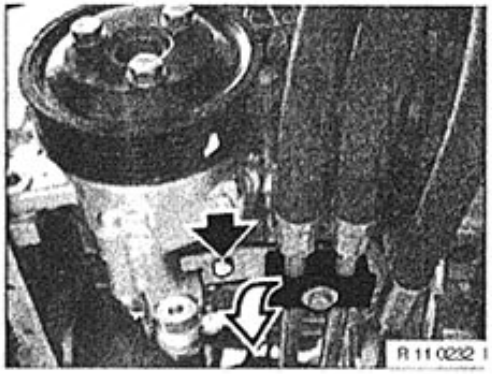


Unfasten return line of main flow fuel filter on oil pan with special tool.

Installation:
Replace sealing ring.
Tightening torque,
refer to Technical Data 11 42 5AZ



Remove left and right rear heat baffle plates.



Remove bracket for hydraulic lines from vane pump.

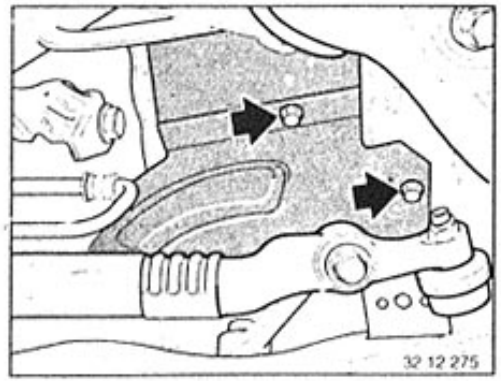
Unfasten left and right exhaust pipes from exhaust system,
refer to 18 31 010 / 015
Repair Instructions for 7 Series E38

Unfasten hydraulic line from front oil pan.

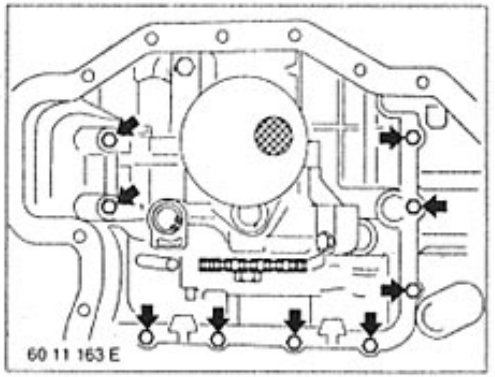
Remove vane pump,
refer to 32 41 060

Remove lower section of oil pan,
refer to 11 13 020
Repair Instructions for 7 Series E38

Remove dipstick tube,
refer to 11 43 000
Repair Instructions for 7 Series E38

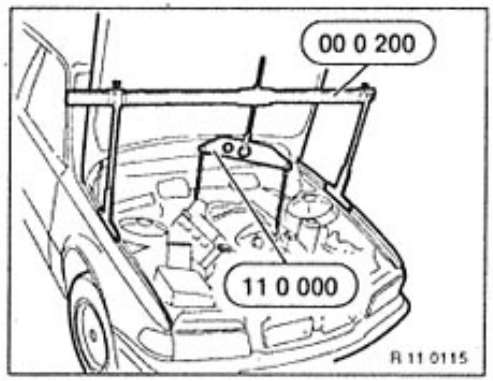


Remove left and right heat baffle plates from front axle carrier.



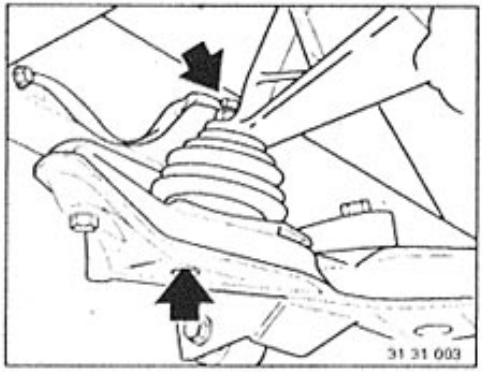
Unfasten screws inside oil pan.

Remove oil pump,
refer to 11 41 000
Repair Instructions for 7 Series E38



Assemble special tool 00 0 200 with special tool 00 0 2001 / 202 / 204 / 206 and attach.

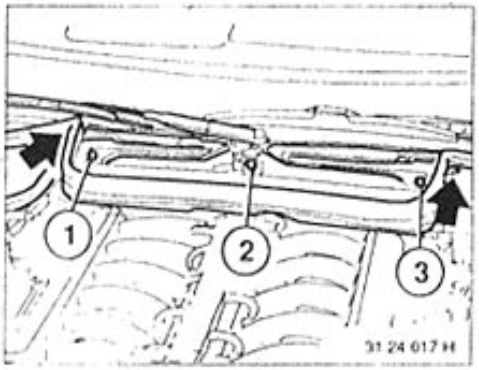
Note:
Supports must be located on screws in both side panels.
Secure special tool 11 0 000 to special tool 00 0 200.



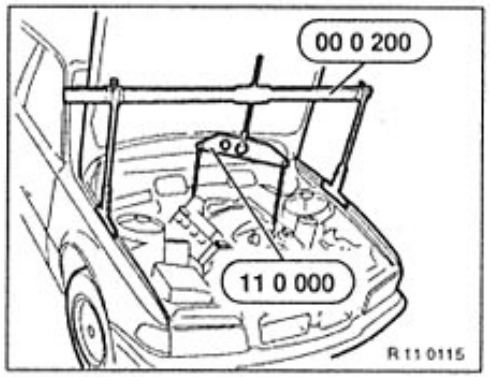
Unfasten left and right lower engine mounts.



Caution!
Only attach engine on locating lugs provided.



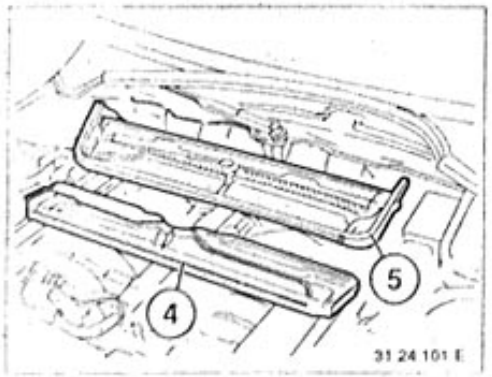
Partially remove rubber seal.
Twist retainers (1 to 3) through 90°.
Unfasten screws on left and right sides.
Loosen top nut in centre.



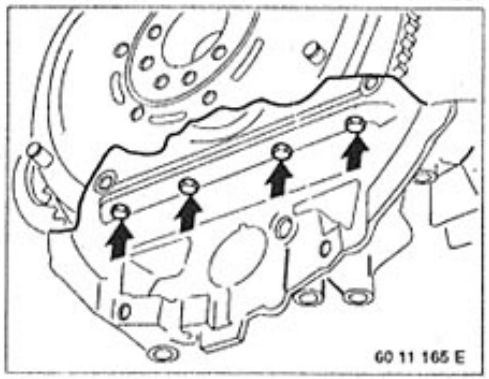
Lift engine with special tool 00 0 200 approx. 40 mm.

Caution!
Note gap between engine, heating connections and end wall.

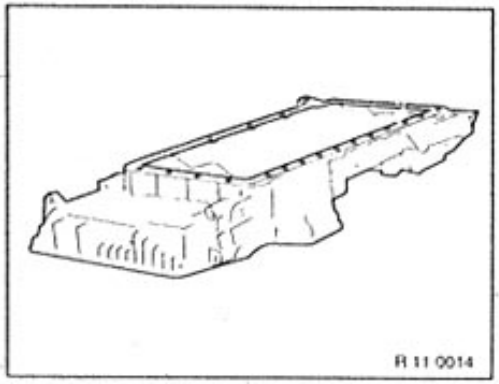
To obtain more clearance between oil pan and track rod, move steering over to right lock.



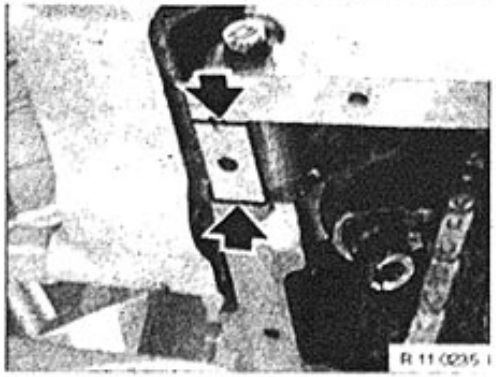
Lift out cover (4) and air manifold box (5).



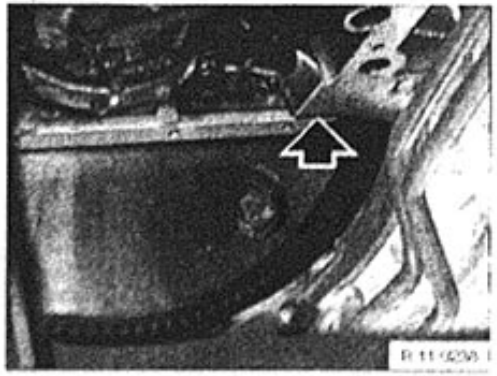
Unfasten screws on end cover.



Unfasten remaining screws in oil pan.
Pull upper section of oil pan forwards to remove.



Installation:
Clear gasket debris off left and right sealing faces and clean them.
Coat contact edges of separating plane with liquid sealing compound Hylomar SQ 32 M, refer to BMW Parts Service.



Installation:
Clean gasket debris off sealing faces on left and right end covers.
Coat contact edges of separating plane with liquid sealing compound Hylomar SQ 32 M, refer to BMW Parts Service.

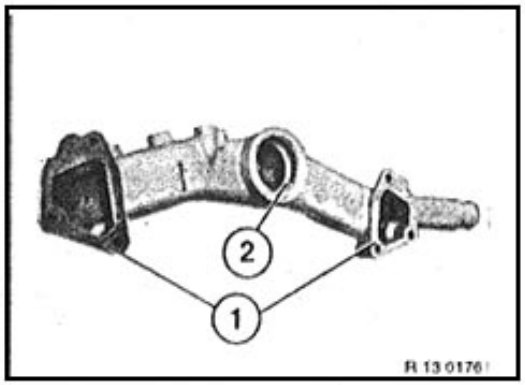
Replace gasket.

Installation:
Install all screws in oil pan.
Fit screws on transmission end without pre-load.
Tighten screws on engine end.
Tighten screws on transmission end.

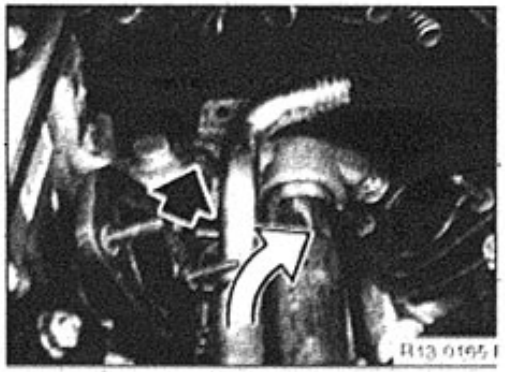
11 53 325 Removing and installing / replacing coolant manifold

M73

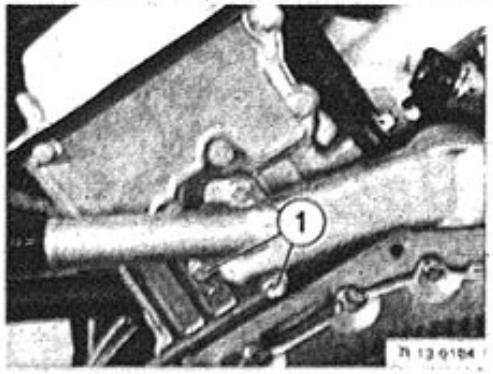
Remove engine,
refer to 11 00 050



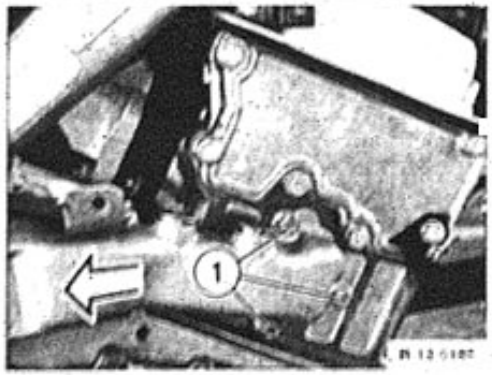
Installation:
Clean sealing faces (1) on back of cylinder heads and on coolant manifold.
Replace gaskets.
Replace O-ring (2).



Unfasten hose clips and remove coolant hoses.
Unfasten screw.



Cylinder head on cylinder bank 7-12:
Unfasten screws (1).

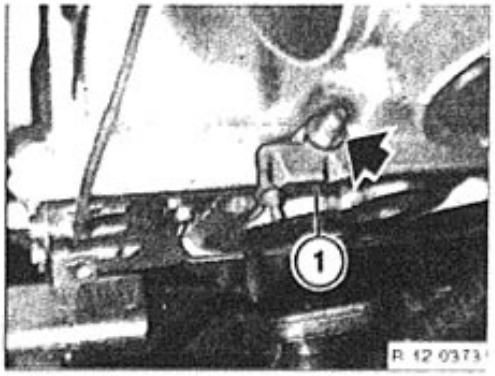


Cylinder head on cylinder bank 1- 6:
Unfasten screws (1).
Remove coolant manifold.

11 62 142 Removing and installing / replacing both left exhaust manifolds

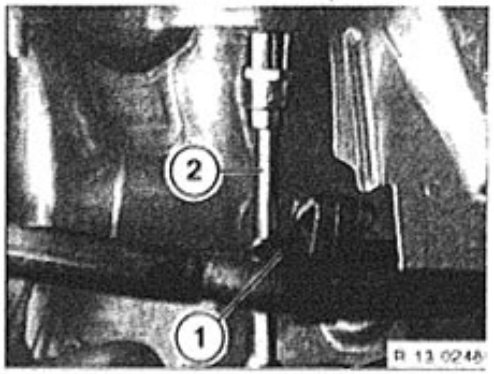
M73

Remove exhaust pipes,
refer to 18 31 010
Repair Instructions for 7 Series E38



Remove bracket (1) for distributor caps cover.

Remove non-return valve for cylinder bank 7 to 12,
refer to 11 72 054
Repair Instructions for 7 Series E38



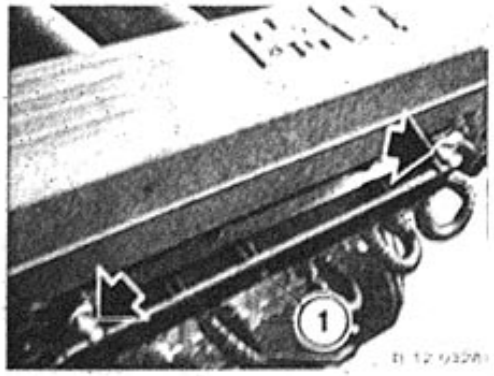
Baffle plate is secured with top nuts in exhaust manifold.

Note:
Insert tool (2) between exhaust manifold and pipe (1).

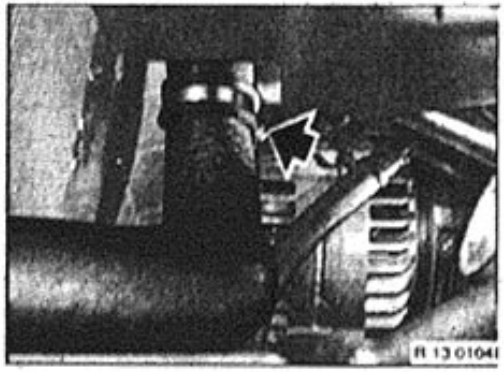
Remove left distributor cap (cylinder bank 7 to 12),
refer to 12 11 096
Repair Instructions for 7 Series E38

Note:
Do not remove ignition cable from distributor cap

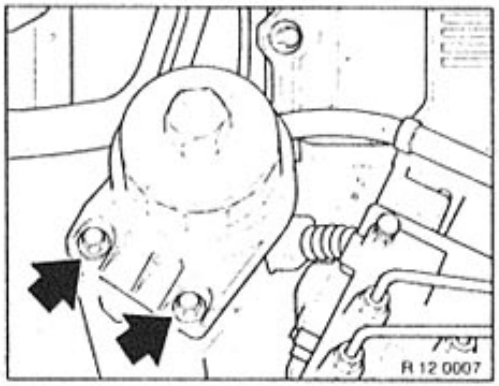
Remove pipe for secondary air induction,
refer to 11 72 194
Repair Instructions for 7 Series E38



Unfasten screw connection from ignition wiring harness.
Remove spark plug connector.
Place ignition wiring harness (1) and distributor cap to one side.

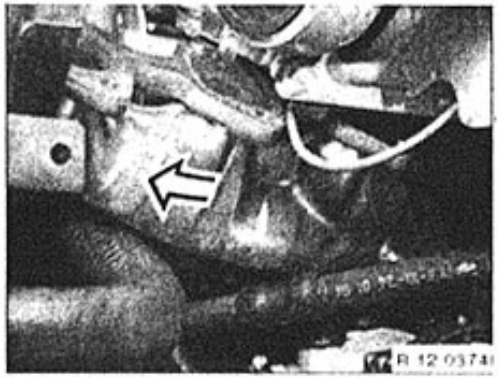


Unfasten bracket for cooling water hose.



Unfasten full flow oil filter from bracket.

Note:
Lines remain connected.



Unfasten exhaust manifold and pull forward to remove.

Subsequent procedure,
refer to 11 62 142
Repair Instructions for 7 Series E38

11 62 143 Removing and installing / replacing both right exhaust manifolds

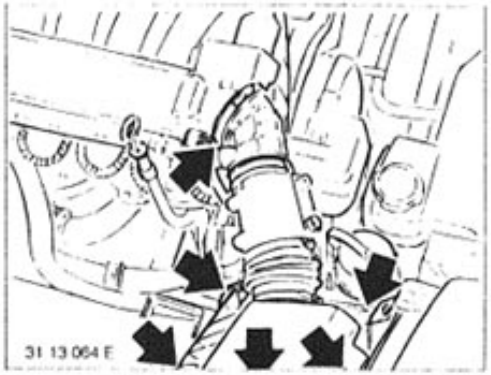
M73

Refer to 11 62 143
Repair Instructions for 7 Series E38

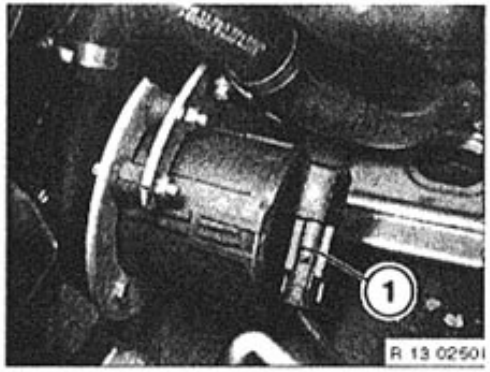
11 72 000 Removing and installing / replacing air pump

M73

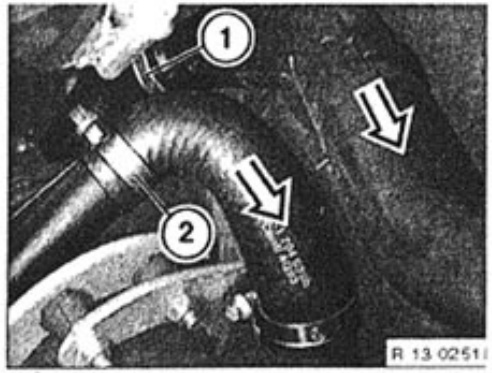
Remove right pop-up headlight, refer to 63 12 460



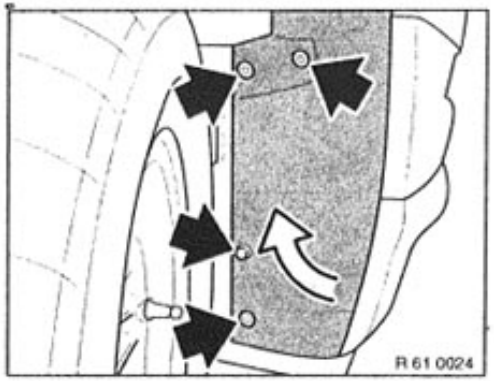
Remove upper right section of intake filter housing.



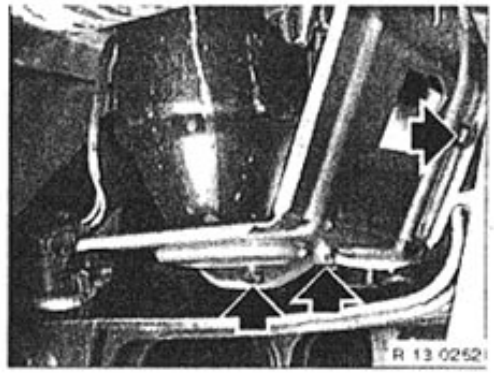
Unfasten plug connection (1).



Unfasten hose clips (1 and 2).
Remove hoses.



Partially remove internal wheel arch trim.



Remove right brake air duct.
Unfasten screws in bracket for air pump.

Lift out air pump from top.

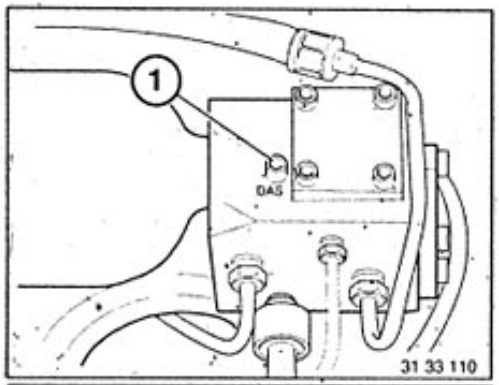
12 Engine electrical system

	Working instructions for ignition system, DME (digital engine electronics) and engine electrics	12- 0/1
	Breakerless ignition distribution	12- 0/1
	Working instructions for removing and installing electronic control units	12- 0/1
	Component test	12- 0/2
	Outside starting aid and car telephone	12- 0/2
	Synchronization of cylinder banks on M70 engine	12- 0/2
12 11 094	Both distributor caps – replace	12- 11/1
096	Left distributor cap – replace (M73)	12- 11/2
098	Right distributor cap – replace (M73)	12- 11/2
114	Both distributor rotors – replace	12- 11/3
206	Left distributor cap, ignition leads and ignition lead connector – check	12- 11/3
208	Right distributor cap, ignition leads and ignition lead connector – check	12- 11/3
12 12 011	Spark plugs – replace (M70, S70)	12- 12/1
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12 13 009	Ignition coil – check (M70, S70)	12- 13/1
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011	Ignition coil – replace (M60)	12- 13/12
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12 14 . . .	Sensor for cylinder recognition – check (M70, S70)	12- 14/1
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150	Sensor for cylinder recognition (camshaft sensor) – replace (M60)	12- 14/3
. . .	Impulse sensor – check	12- 14/4
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500	Both control units – remove and install/replace (digital motor electronics) (M73)	12- 14/8
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519	Impulse sensor – replace (cylinder bank 1-6) (M73)	12- 14/8
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400	Cooling air duct on alternator – replace (M73)	12- 31/12
12 32 000	Regulator switch – remove and install or replace	12- 32/1
501	Regulator switch for alternator – replace	12- 32/1
12 41 020	Starter motor – remove and install or replace (M70, S70)	12- 41/1
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12 71 530	Control unit for electronic engine power control – replace (M70)	12- 71/1
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12 72 520	Accelerator sensor – remove and install or replace (M70, S70)	12- 72/1
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550	Accelerator sensor kinematics – check and adjust (M70)	12- 72/5
	On-board diagnosis	12- 73/1
	Table: DME 1.7 error codes	12- 73/2

For additional work, refer to "Repair Instructions for 7 Series E38"

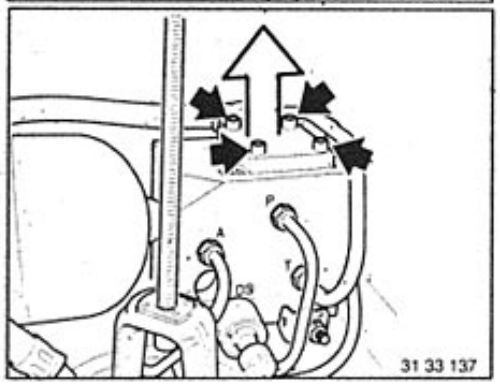
33 34 545 Replacing filter in spring accumulator unit

Switch off ignition.
Remove spare wheel.
Remove cover of spring accumulator unit.



Loosen pressure relief screw (1) half a turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



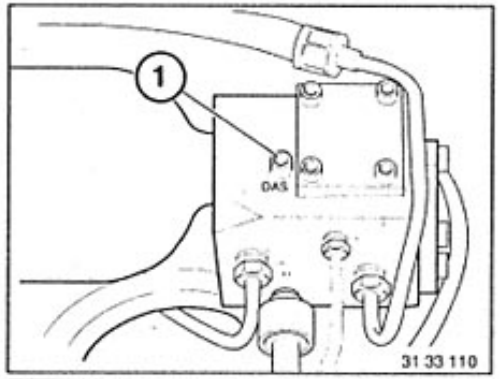
Unfasten screws and remove the filter cover.
Lift out filter element with special tool 11 3 251.

Installation:
Tightening torque 33 34 4AZ*

* Refer to Technical Data

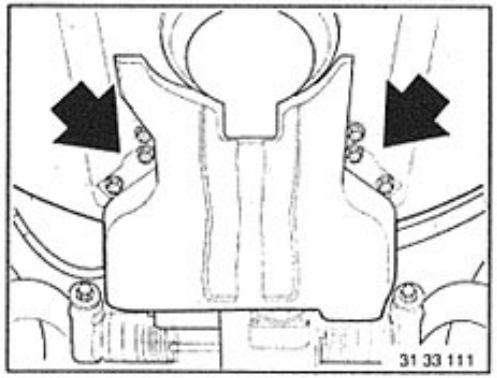
33 34 547 Replacing filter in actuator unit

Switch off ignition.
Remove spare wheel.
Remove cover from spring accumulator unit.

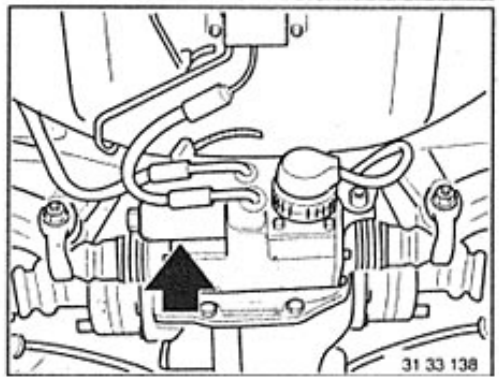


Loosen pressure relief screw (1) half a turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



Unfasten nuts and remove protective plate.



Unfasten filter bell housing and remove filter element.

Installation:
Tightening torque 33 34 7AZ*

* Refer to Technical Data

INSTRUCTIONS FOR WORKING ON IGNITION SYSTEM, DME (DIGITAL MOTOR ELECTRONICS) AND ENGINE ELECTRICAL EQUIPMENT

Caution!
Always switch off ignition before working on ignition system – dangerous high tension!

- Always remove DME master relay for the compression test to avoid activation of ignition coils by ignition final stages of the DME control unit. Dangerous high tenesion!

- Always switch off ignition before connecting / disconnecting Service Tester, other testers and adapters or replacing components!

- Secondary (high tension) side of ignition system must be loaded with at least 4 k-ohms.

- Never start engine after removing distributor cap or disconnecting wire (terminal 4) on ignition coil (terminal 4).

- Never connect a shielded capacitor or test lamp on ignition coil terminal 1.

- Never connect ignition coil terminal 1 wire to ground or B+.
  Consequently terminal 1 wire may not be used to interlock starting when service installing a burglar alarm system.

Direct Ignition System (Without Distributor):

- Engine must never be started after disconnection of the secondary circuit, i.e. disconnection of connectors on spark plugs and ground connection (terminal 4a).

- There is dangerous high tension in or on
  - ignition leads,
  - spark plug connectors,
  - spark plugs,
  - ignition coil terminal 4
    (*Caution!* approx. 40 kV high tension) and
  - terminal 1 wire from ignition coil to DME control unit
    (*Caution!* approx. 350 V high tension at terminal 1).

- Battery as well as wires on alternator and starter may not be disconnected on a running engine.

INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS

Caution!
Disconnecting the car's battery will cancel the fault memories of control units.
Consequently prior to disconnection of the car's battery fault memories should be interrogated and faults printed by the printer of a BMW Service Tester. Investigate stored faults.
Ignition must always be switched off before disconnecting or connecting control unit plugs.
Removal and installation of components, relays, fuses, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis. Consequently fault memories must always be interrogated after working on the electrical system. Stored faults must be investigated and cancelled.

Note When Replacing DME (Digital Motor Electronics) Control Unit:

Each control unit is programed with certain basic values, which serve as mean values.
The control unit receives different input values, depending on engine condition, which are compared with the stored values.
The adaptive system compares the input values with the stored map values. Appropriate correction commands are sent to the concerned drive elements.
If, for example, the DME control unit would be without current for a long time (more than an hour), its adaptive system would lose the stored values. After re-operation of a cancelled or installation of a new control unit the input values of a pertinent engine must be read in and stored for the adaptive system.This procedure could lead to erratic idling and disturbed overrunning of the engine after starting. Depending on the engine it could require some time before all values are adapted to the engine condition.

Consequently there must be conformance with the following procedures before replacing a DME control unit or operating a control unit which had been disconnected.

- Run engine to operating temperature.
- Install control unit and drive car.

CHECKING COMPONENTS

Note:
Refer to Construction Group Repair Manual.
Always conform with safety precautions and accident prevention regulations whenever carrying out tests or work on engine electric and electronic components.

Always disconnect plugs of control units or components before checking electric wires.

Testing Aids:
Concerned wiring diagrams and current flow diagrams can be found in the binders for "Car Electric/Electronic Test Plan – 8 Series E 31".

Only use appropriate test leads, adapter leads (refer to concerned repairing instructions), terminals and test clips.

Test values for checking components are contained in the Car Electric / Electronic Test Plan.
Also refer to the Technical Data microfiche for other specifications.

OUTSIDE STARTING AIR AND CAR TELEPHONE

Siemens C 2:
When starting the engine with help of the battery in a different vehicle ensure that the Siemens C 2 telephone is not damaged through overvoltage. Disconnect the sender and receiver from the electrical system prior to starting the engine with outside help.

Siemens C 3 and Motorola C 451:
Senders and receivers of Siemens C 3 and Motorola C 451 car telephones have overvoltage protection, but calls may not be made while starting the engine with outside help.

Always refer to the pertinent operating instructions of other type and other make car telephones. If in doubt, disconnect the sender/receiver from the electrical system.

SYNCHRONIZATION OF BANKS OF M 70 ENGINE CYLINDERS

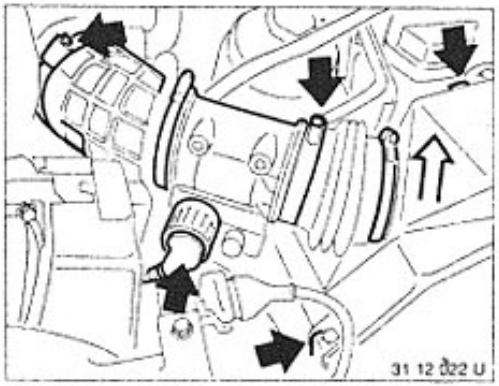
The following information is important when replacing one or both DME control units.

Each electronic control unit is programmed with certain basic values, which are only mean values.
A control unit, however, receives variable input values depending on the vehicle operating conditions, which are permanently compared with the stored values. The adaptive system first compares them, then determines corrective values required for a pertinent operating condition and finally forwards the latter values to the concerned components such as air volume meters, throttle valve assemblies, Motronic control units and so on.
If, for example, the Motronic control unit were without current for a long period of time (more than 1 hour), its adaptive system would lose the stored values.
The adaptive system would have to find a balanced level between the programmed values and engine-orientated operating condition values after restoring operation of an erased control unit or installing a new control unit.

Consequently there must be conformance with the following procedures before an EML or DME control unit is replaced or after restoring operation of a disconnected control unit.

- Run engine to operating temperature.
- Install new control unit and drive car, whereby the car must coast three times from speeds above 5,000 rpm to the idling range in transmission range 1 (approx. 10 seconds).
- Have engine run at idling speed in transmission range P or N at least 5 minutes.

These procedures serve immediate and precise synchronization of both banks of cylinders in all operating conditions.

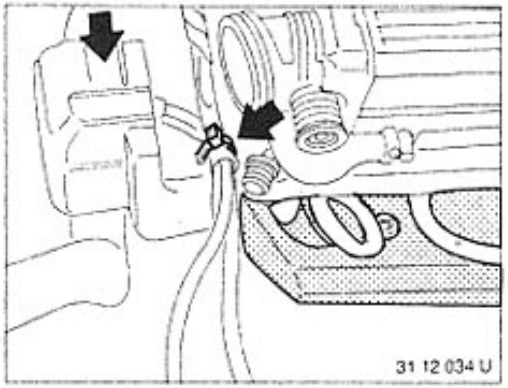


12 11 094 REPLACING BOTH DISTRIBUTOR CAPS

Remove upper air cleaner section complete with air mass sensor.

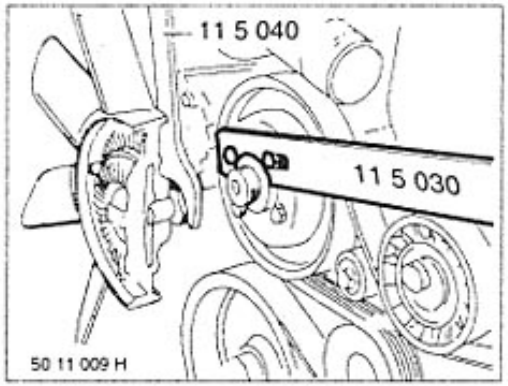
Note:
Firing order of M 70 engine is 1-7-5-11-3-9-6-12-2-8-4-10.

Numbers of ignition leads for bank of cylinders 7 ... 12 is equal to bank of cylinders 1 ... 6, i.e.
cylinder 7 = ignition lead 1,
cylinder 8 = ignition lead 2
and so on.

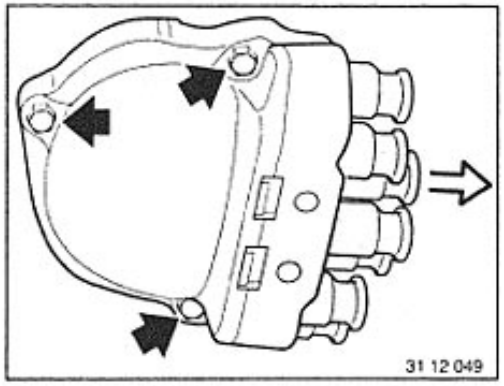


Loosen wire strap.
Take off cover.

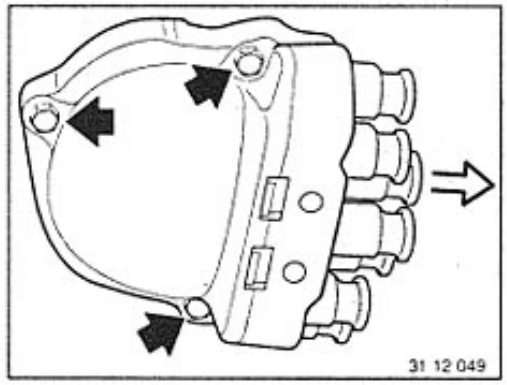
Installation:
Engage cover in holder.



Unscrew fan – left-hand threads!
Use Special Tools 11 5 030 / 040.



Pull off shielded connector.



Unscrew screws and take off distributor cap.

Caution!
Danger of cutting hands on radiator fins.

Installation:
Numbers on leads and cap (for example 5) must be the same.

ZS = ignition coil

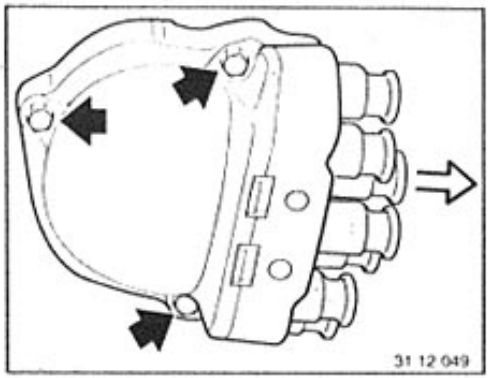
Installation:
Check seal, replacing if necessary.

12 11 096 Replacing left distributor cap (M73)

Refer to
Repair Instructions for 7 Series E38.

12 11 098 Replacing right distributor cap (M73)

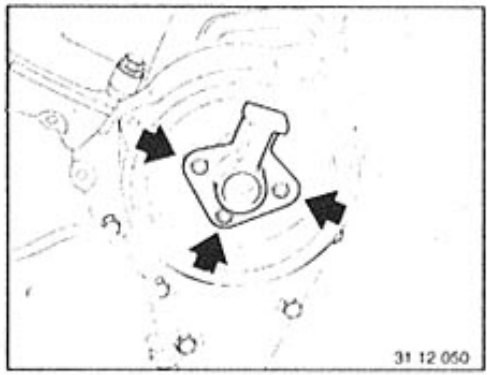
Refer to
Repair Instructions for 7 Series E38.



12 11 114 Replacing both distributor rotors

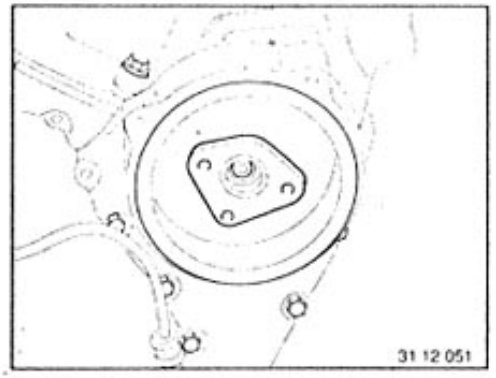
Remove distributor cap – refer to 12 11 096 or 12 11 098,
Repair Instructions for 7 Series E38.

If necessary, remove screenwash container.
Caution!
Risk of injury on radiator fins.



Unfasten screws with socket head cap wrench.

Installation:
Tightening torque,
refer to Technical Data 12 11 2AZ .



Note:
Measure resistance* and check surface and casting compound for hairline cracks and burn marks.
If unit is affected by these faults, always search for the cause of the fault and replace the relevant component.

12 11 206 Checking distributor cap, ignition leads and ignition line connector on left side

Refer to
Repair Instructions for 7 Series E38.

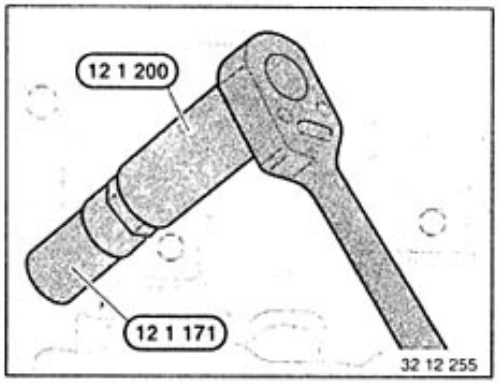
12 11 208 Checking distributor cap, ignition leads and ignition line connector on right side

Refer to
Repair Instructions for 7 Series E38.

* Refer to Technical Data

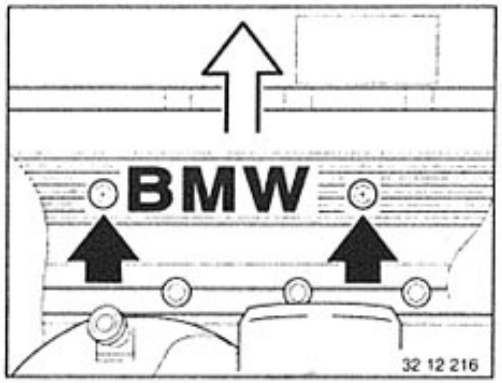
12 12 011 Replacing spark plugs (M 70, S 70)

M 70
Remove windshield wash container.
Remove spark plug connector.
Unscrew and remove spark plug with special tool 12 1 170



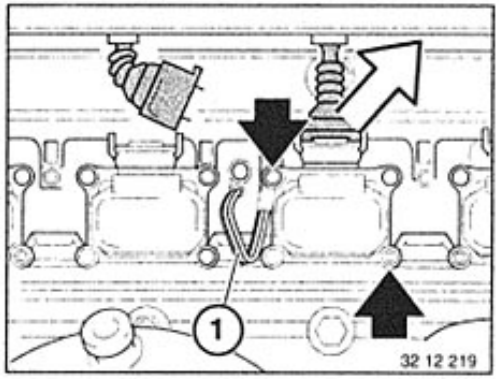
Installation:
Tighten with special tool 12 1 171 and torque limiter 12 1 200.
Complete tool 12 1 170.
Without tool 12 1 200, note tightening torque.
Tightening torque 12 12 1AZ*

* Refer to Technical Data

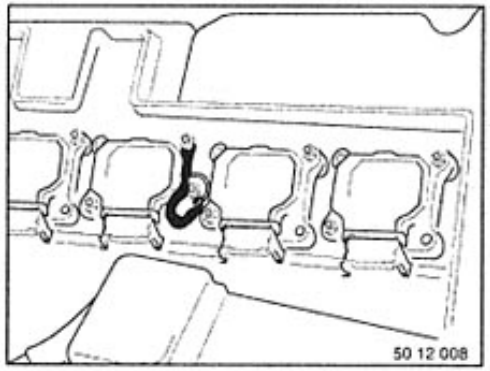


12 12 011 Replacing spark plugs (M 60)

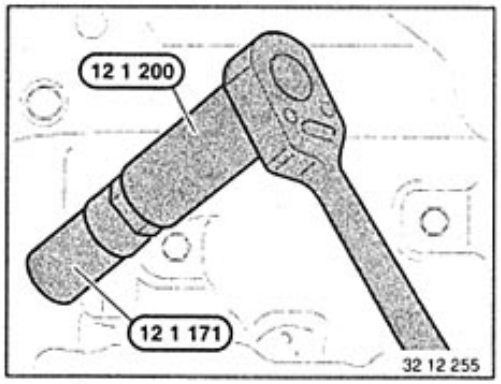
Unclip cover over screws.
Unfasten screws.
Remove cover.



Unfasten screws.
Remove ignition coil.



Installation:
With the ignition coils on cylinders 3 and 6, the ground tapes on the cylinder head cover must be secured to the ignition coils.



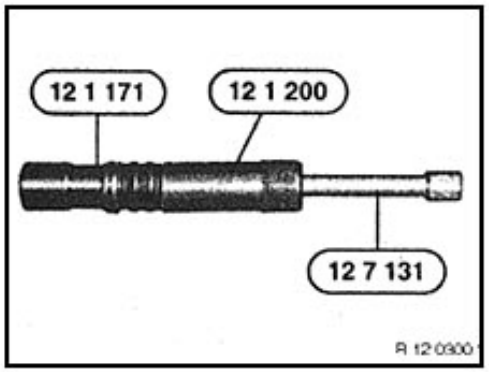
Unscrew and remove spark plugs with special tool 12 1 171.

Installation:
Tighten using special tool 12 1 171 and torque limiter 12 1 200.
Complete tool 12 1 170.
Without tool 12 1 200, note tightening torque.
Tightening torque 12 12 1AZ*

* Refer to Technical Data

12 12 011 Replacing all spark plugs (M73)

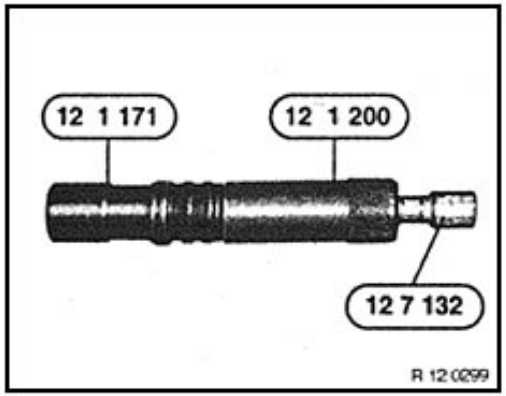
Switch off ignition.
Disconnect spark plug connector.



Cylinders 1-8:
Use special tools 12 7 131 and 12 1 171.

Installation:
Tighten down spark plug with special tool 12 1 171 and special tool 12 7 131 (extension) and special tool 12 1 200 (torque limiter). If not using special tool 12 1 200, note tightening torque.

Tightening torque,
refer to Technical Data 12 12 1AZ



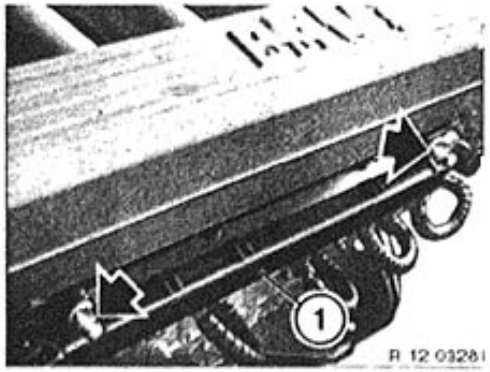
Cylinder 9-12:
Use special tools 12 7 132 and 12 1 171.

Installation:
Tighten down spark plug with special tool 12 1 171 and special tool 12 7 132 (extension) and special tool 12 1 200 (torque limiter). If not using special tool 12 1 200, note tightening torque.

Tightening torque,
refer to Technical Data 12 12 1AZ

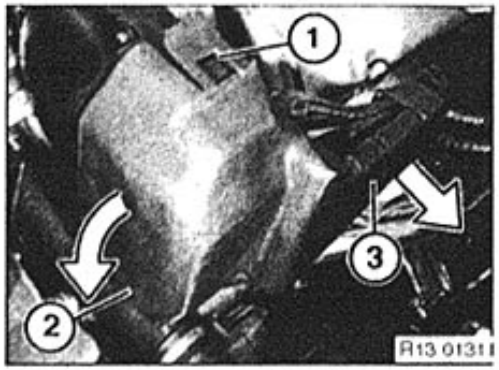
12 12 036 Replacing all ignition leads on left side (M73)

Switch off ignition.



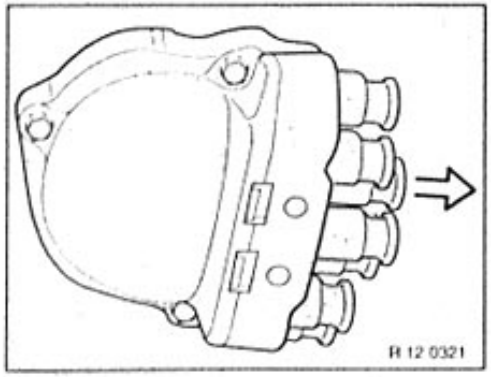
Unfasten screw connection of ignition wiring harness on manifold.

Disconnect spark plug connector.



Unfasten cable tie on protective cap on distributor cap.

Unfasten clips (1-3) and remove protective cap.



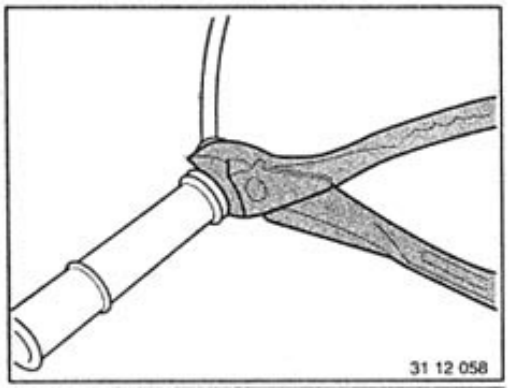
Note sequence of ignition leads on distributor cap and remove ignition leads from distributor cap.

Installation:
Note firing order when fitting the ignition leads.

Firing order,
refer to Technical Data

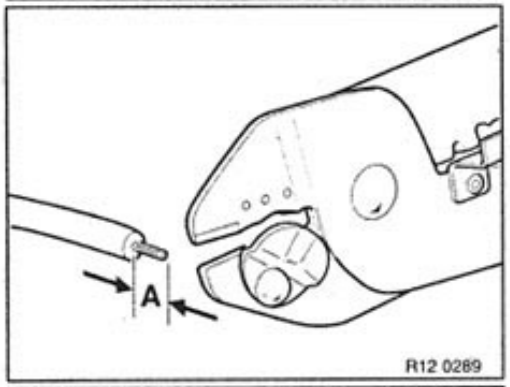
12 12 038 Replacing all ignition leads on right side (M73)

This operation is described in section 12 12 036.

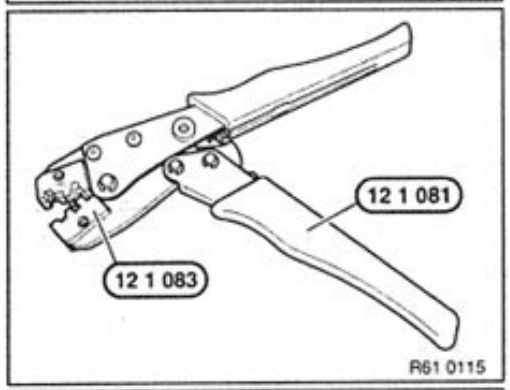


12 12 072 Replacing one spark plug connector

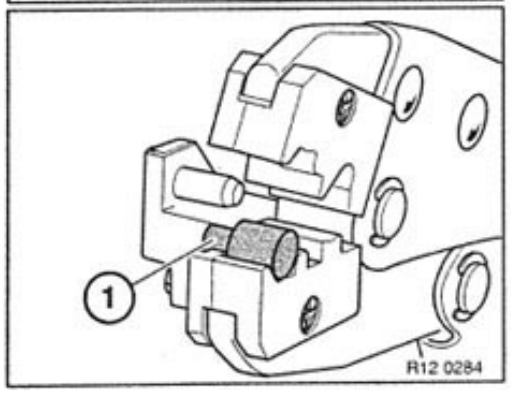
Switch off ignition.
Disconnect ignition lead directly behind the connector.



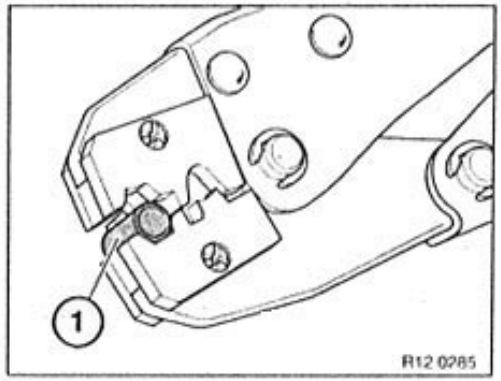
Strip insulation off a 6 mm length (A) of the ignition lead with insulation stripping pliers: wire cross section of 1.5 mm^2



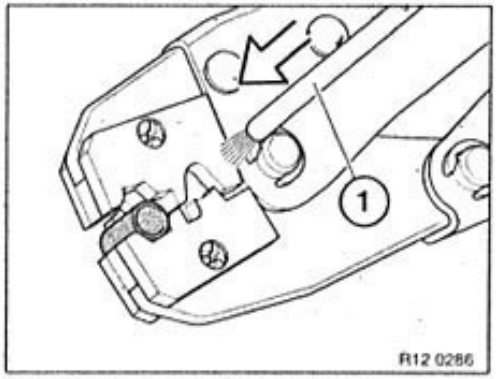
Fit special tool 12 1 083 in special tool 12 1 081.



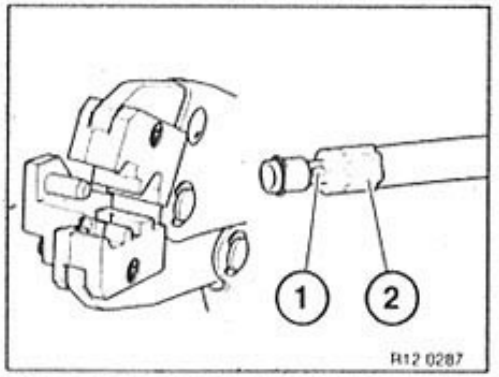
Install adapter (1) in corresponding nest in matrix.



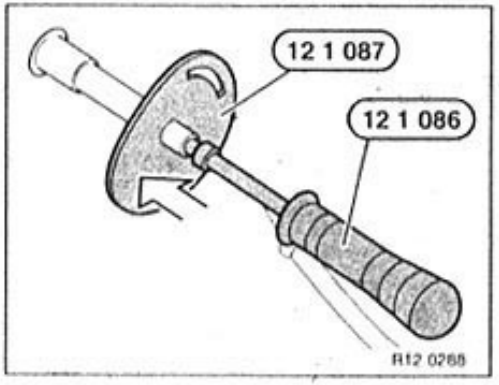
Tighten pliers by pressing handles together. This grips the adapter (1) in the matrix.



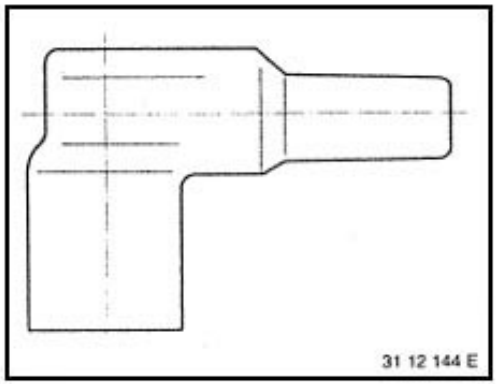
Insert stripped wires (1) firmly home in adapter. Press handles on pliers firmly together. Pliers open.

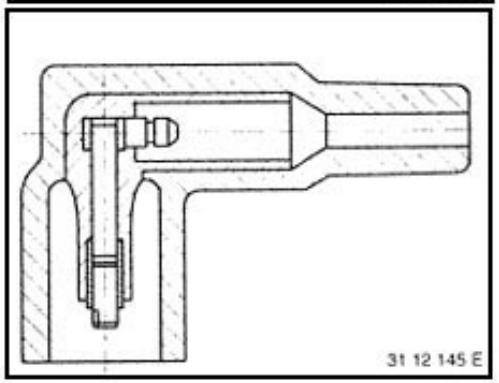


Remove crimped adapter with ignition lead. Wires (1) and insulation (2) (tension relief) must be crimped uniformly around entire circumference of adapter.



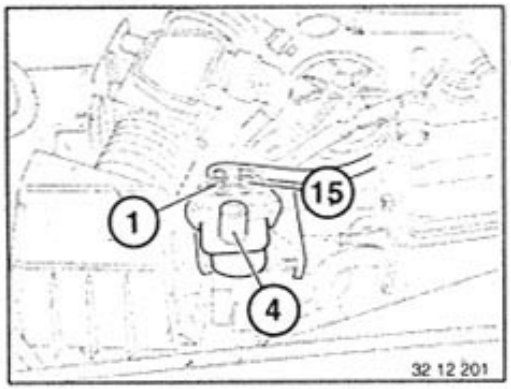
Slide special tool 12 1 087 onto spark plug connector. Spray ignition lead with special tool 12 1 088 (anti-friction agent). Insert ignition lead in special tool 12 1 086. Insert ignition lead in spark plug connector: adapter must locate audibly in spark plug connector.





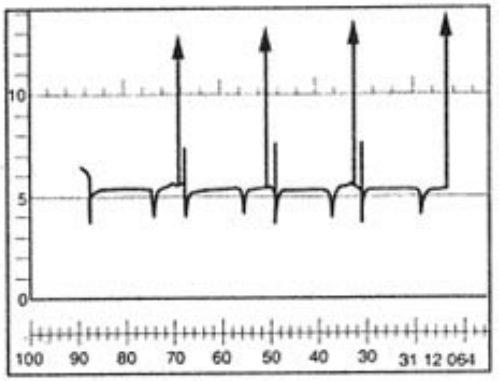
12 12 151 Replacing one suppressor plug

Assembly, refer to 12 12 072.

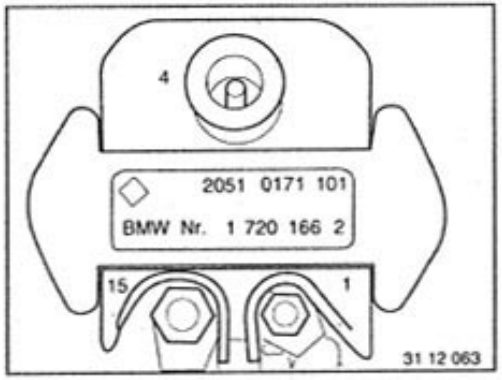


12 13 009 Checking ignition coil (M 70, S 70)

Multimeter check (M 06):
Measure resistance of primary coil
Term. 1/15 =0.5 kΩ · 10 %
and secondary coil
Term. 15/4 = 6 kΩ · 10 %



Connect BMW SERVICE TESTER to the diagnosis connector.
Perform an engine test, Test Step 09.
Note oscillogram - ignition voltage:
6 ...14 kV.
Max. permitted deviation in ignition voltage:
3 kV



Check cast compound of primary coil carrier for hairline cracks. If gray material has emerged around the edges of the coil carrier, this indicates the presence of a defective ignition output stage in the DME control unit.

Connection: near cable connector distributor - high voltage pliers to line 4 for ignition coil.
Connect trigger pliers (red) to ignition line 1 or 7.

Note: Numbering on ignition cables for cylinder bank 7...12 is the same as for cylinder bank 1...6. Cylinder 7= ignition cable 1, etc

M 70:
Measurement of the right cylinder bank 1. . .6
Use adapter cable 61 2 010 and diagnosis cable. At this point, the oscilloscope receives a trigger signal from DME 1.

For cylinder bank 7. . .12:
Connect the universal diagnosis cable of the Tester to the ignition coil:
Black clip on terminal 1, brown clip to vehicle ground

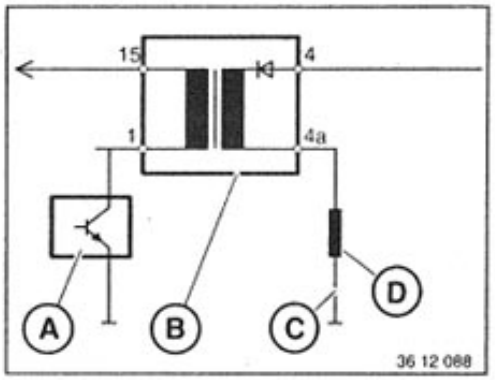
Note:
Very high ignition voltage deviations, indicated in Test Step 09, may be caused by incorrect connection of the Tester (connection to the wrong cylinder bank).

Perform measurement of left cylinder bank 7...12 with adapter cable 61 2 010 and universal diagnosis cable. Disconnect diagnosis cable from diagnosis connector to prevent oscilloscope from receiving a trigger signal from the wrong cylinder bank.

Note:
Cylinder recognition sensor on left side, on ignition line for cylinder 12.
Right side on ignition line to cylinder 6.

12 13 009 Checking ignition coil (M73)

Refer to
Repair Instructions for 7 Series E38.



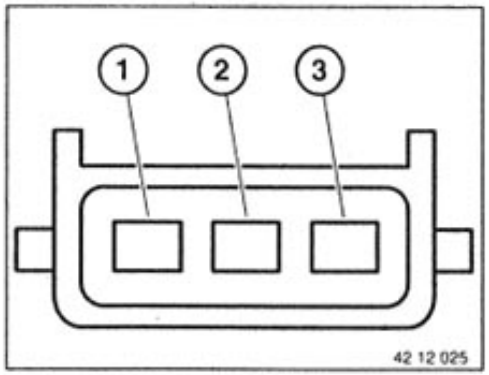
12 13 009 Checking ignition coil (M 60)

Circuit diagram for ignition coil in breakerless ignition distribution.

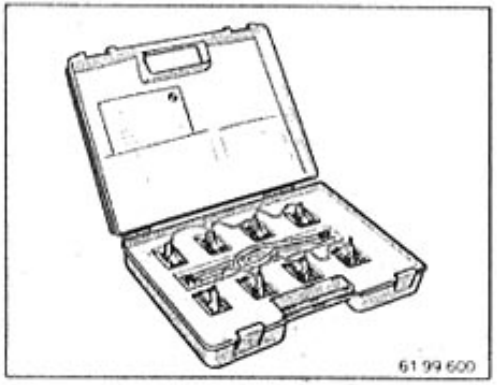
(A) Piloting of primary coil in ignition coil of DME
(B) Ignition coil
(C) Ground connection of secondary coil
(D) Measuring resistance which is installed in ground wire shared by ignition coils.
The measuring resistance is required for fault recognition in the secondary circuit of the ignition coils.
The fault is stored in the fault memory of the DME control unit.

Resistance check:
Primary coil: Nom. value 0.4 - 0.8 Ω
Secondary coil not registering on measuring instrument.
Pin allocation on ignition coil connector

(1) Terminal 15
(2) Terminal 4a
(3) Terminal 1



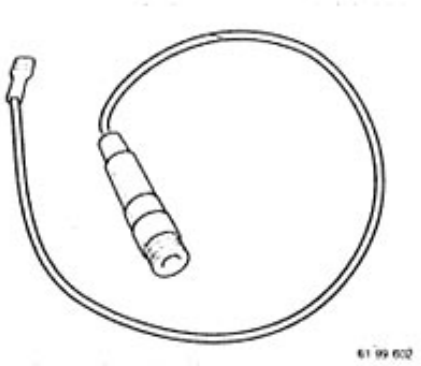
Visual inspection of the ignition coil:
Check cast compound of primary coil carrier for hairline cracks. If gray material has emerged around the edges of the coil carrier, this indicates the presence of a defective ignition output stage in the DME control unit.



12 13 . . . Check secondary voltage with the help of test adapter kit 12 7 040

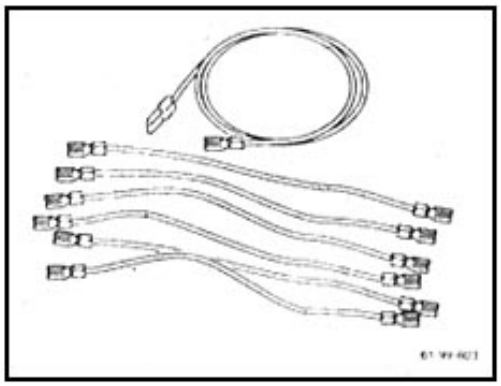
Use the adapter kit to perform the following checks:
Secondary voltage check
Comparison of ignition coils from different manufacturers
Fault in ignition coil
Fault in spark plug
Fault in injection system

Caution!
Note safety instructions on page 12-0!

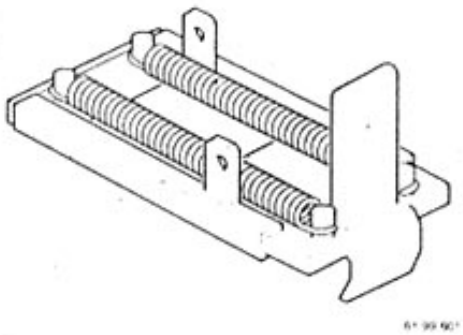


Connecting cable for BMW Service Tester 12 7 042. For connection to the Service Tester, the high voltage pliers must be unscrewed from the Service Tester line.

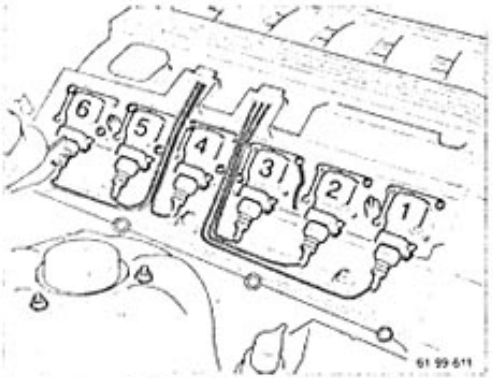
If no BMW Service Tester is available, a standard workshop oscilloscope with these measuring cables can be used. Connecting cable 12 7 042 is replaced by the measuring cable on the oscilloscope. The unit is then triggered externally by the induction pliers, attached to the primary voltage source on cylinder one.

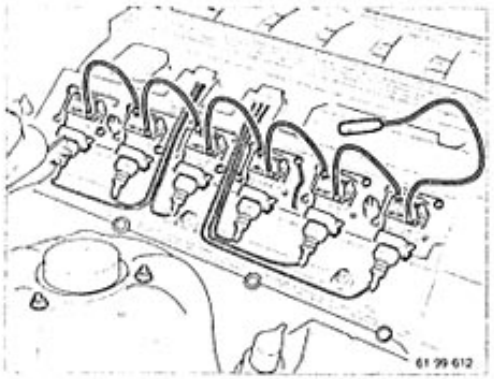


Attach connecting cable 12 7 043 to the single adapters 12 7 041 and attach connecting cable 12 7 042 for BMW Service Tester.
Connecting cable 12 7 043



Single adapter 12 7 041 for fitting to the ignition coil.

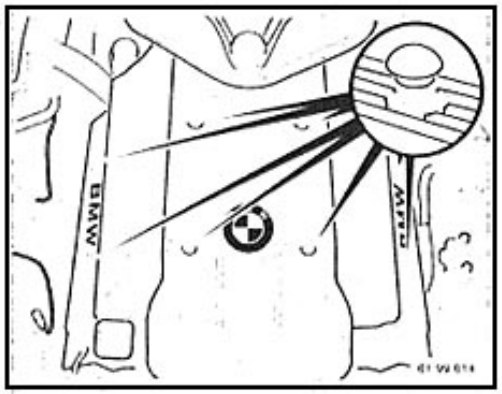




M 50:

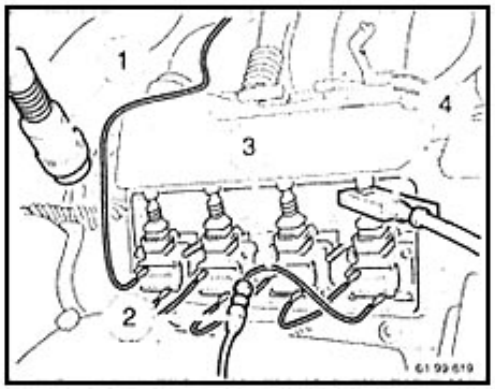
Observe all safety instructions!
Switch off ignition.
Remove ignition coil cover.
Firing sequence 1-5-3-6-2-4

Fit single adapter 12 7 041 to the ignition coils and attach to the connecting cable kit 12 7 043.

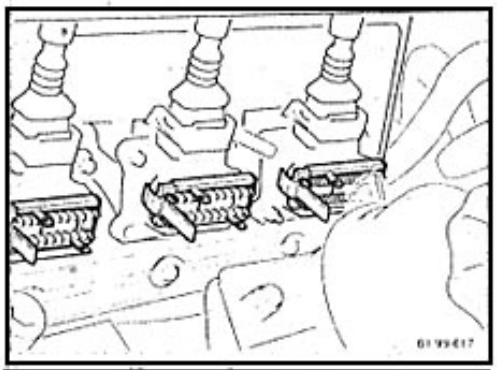


M 60:

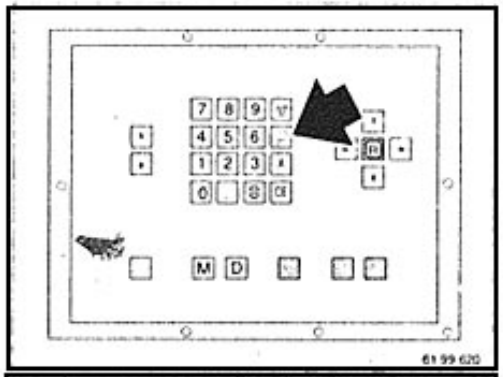
Observe safety instructions!
Switch off ignition.
Remove ignition coil cover.
Firing sequence 1-5-4-8-6-3-7-2



Connect BMW Service Tester to the diagnosis receptacle (1) on the vehicle.
Attach connecting cable 12 7 042 (2) to the high voltage connecting line (3) of the BMW Service Tester.
Connect trigger pliers (4) of the BMW Service Tester to the lead serving the ignition coil on cylinder one.

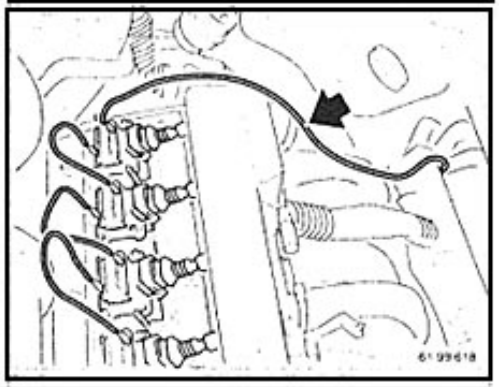


Fit single adapter 12 7 041 to the ignition coils and attach to connecting cable kit 12 7 043.

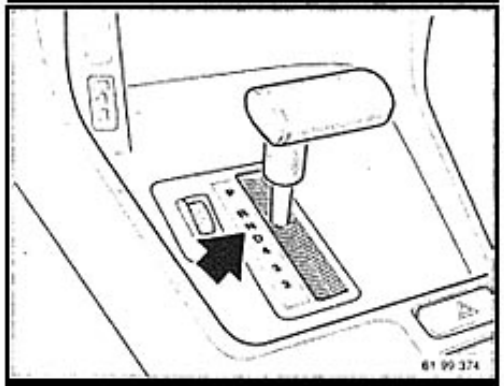


BMW Service Tester
Select test step 01 (engine). Next, select the following test step 10 (fuel mixture, exhaust).

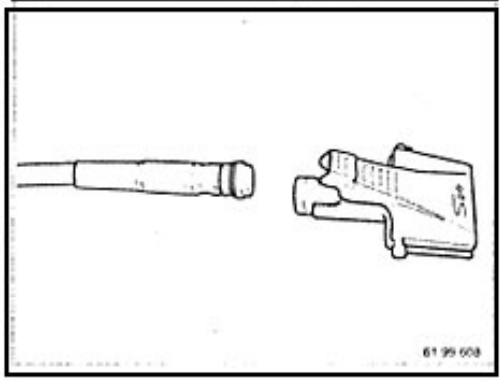
Enter the number of cylinders.



Note:
Use long connecting cable from connecting cable kit 12 7 043 for connecting the adapters of cylinder banks 1-4 and 5-8.

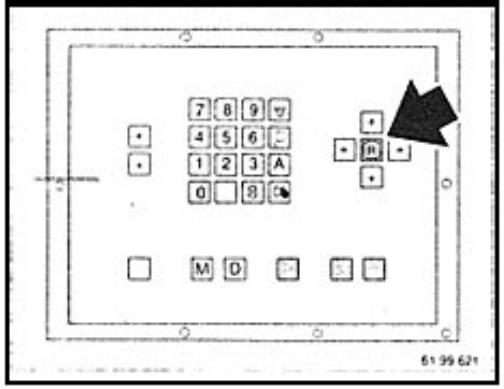


Apply handbrake and move shift lever into neutral setting. With automatic transmission, move selector lever into setting "P".

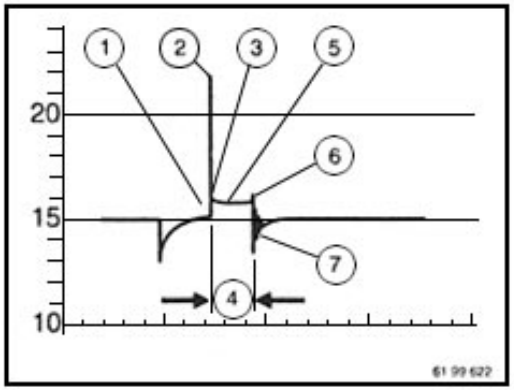


Connect BMW Service Tester:

Unscrew high voltage pliers from connecting cable of BMW Service Tester.
Attach connecting cable 12 7 042 to the high voltage adapter line of the BMW Service Tester.

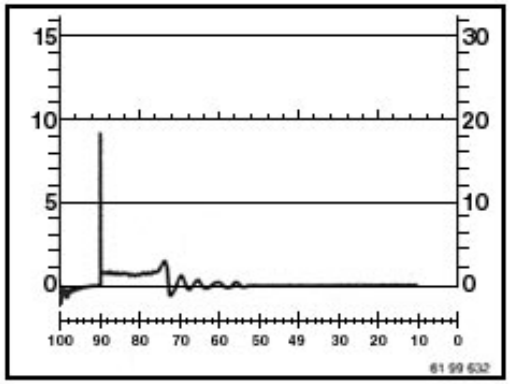


Select display modes for secondary voltage patterns on the oscilloscope by pressing the "R" button. Presentation of images (side-by-side, descending order, ascending order).



Normal oscillogram

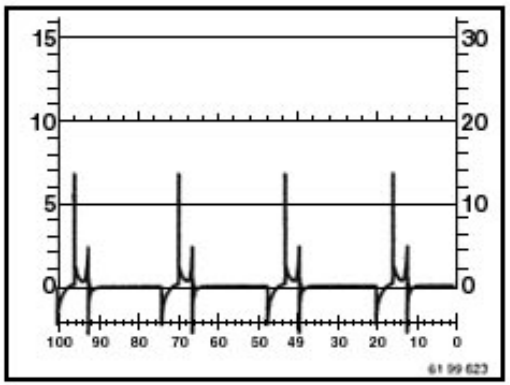
1 Start of ignition voltage spike
2 Tip of ignition voltage spike
3 Tip of combustion voltage spike
4 Combustion period
5 Combustion voltage curve
6 Start of attenuation procedure
7 Decay current



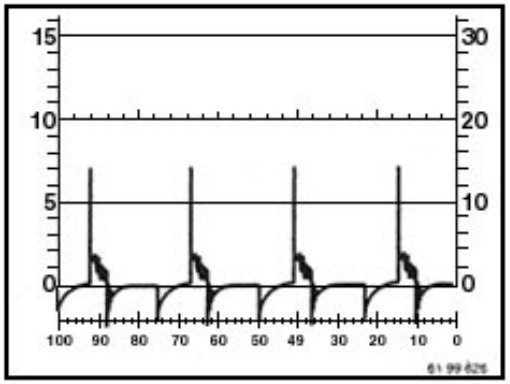
Consecutive displays
Idle speed

Large deviations in the ignition voltage patterns can be identified.
The allocation of fault detected to relevant cylinder must be performed using consecutive or side-by-side display modes.

Display side-by-side
Evaluation of combustion voltage line and attenuation procedures.
Idle speed



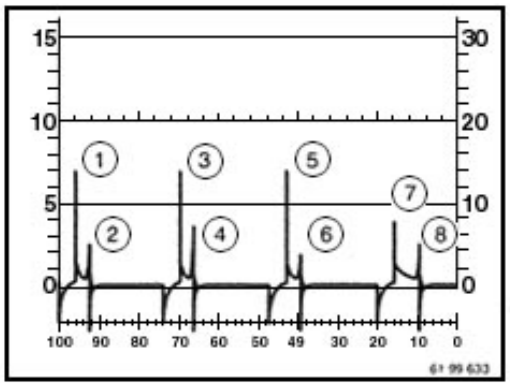
The display of ignition voltage peaks is approx. 20-25% lower than the real value.
More important than the tip of the ignition voltage spike is the uniformity of all cylinders. Deviations of 3000-4000 V are permitted.
If deviations exceed these values, refer to the following pages of "Fault Patterns".



Display at increased speed of approx. 2000 min $^{-1}$.
Evaluation of ignition voltage spikes.

Oscillogram readings of ignition coils from different manufacturers

Evaluation of ignition voltage spikes and the attenuation process at idle speed

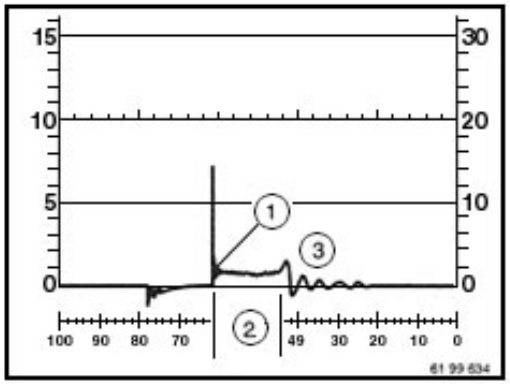


Manufacturer: Bremi
1 Normal ignition voltage spike (6000 - 9000 V)
2 Usual

Manufacturer: Beru
3 Normal ignition voltage spike
4 High start of attenuation processes

Manufacturer: May & Christe
5 Normal ignition voltage spike
6 Low start of attenuation processes

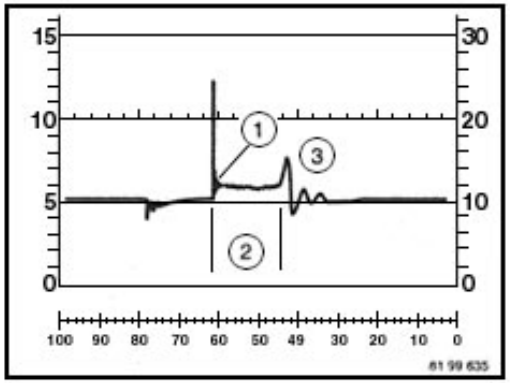
Manufacturer: Bosch
7 Low ignition voltage spike
8 Normal start of attenuation processes
Note:
At high engine speeds, the ignition voltage spike becomes shorter - significantly shorter than units from other ignition coil manufacturers.



Evaluation of combustion voltage spike at raised engine speed of approx. 2500 min -1.

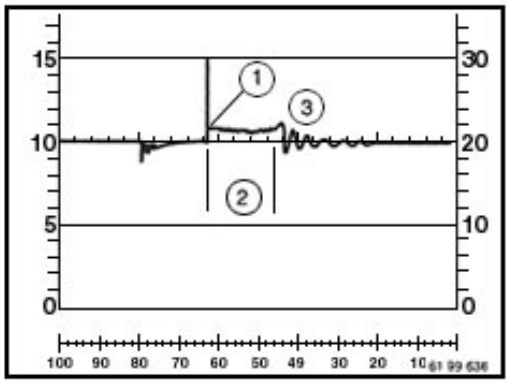
Manufacturer: Bremi

1 Normal response of combustion voltage curve
2 Normal combustion period
3 3 to 4 attenuations



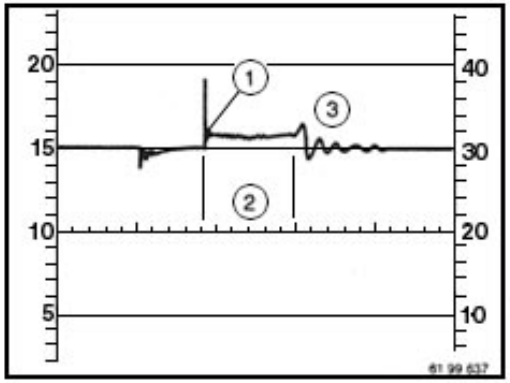
Manufacturer: Beru

1 Normal response of combustion voltage curve
2 Normal combustion period
3 At least 3 attenuations



Manufacturer: May & Christe

1 No response from the combustion voltage curve
2 Normal combustion period
3 At least 5 attenuations

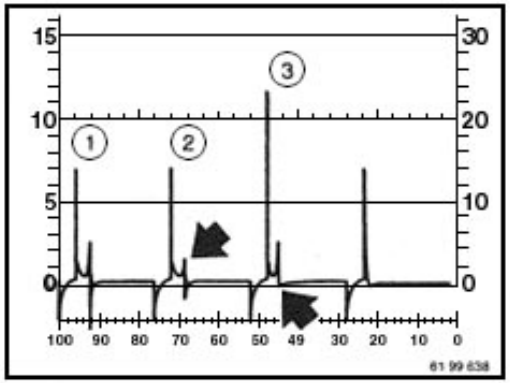


Manufacturer: Bosch

1 Normal response for combustion voltage curve
2 Long combustion period
3 At least 3 attenuations

Ignition coil fault

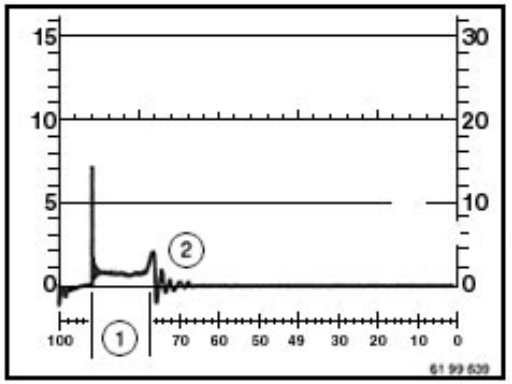
Evaluation of ignition voltage spikes and the attenuation process at idle speed.



1 Start of attenuation processes - normal size upwards and downwards

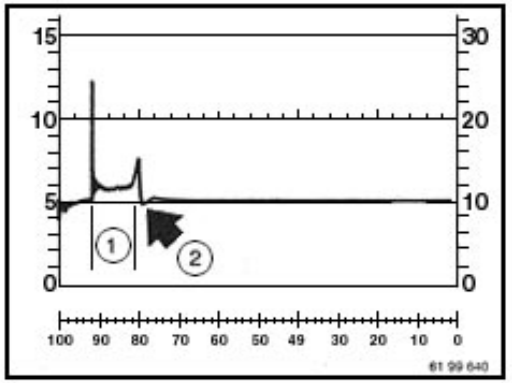
2 Start of attenuation processes severely abbreviated
Ignition coil defective!

3 Start of downwards attenuation processes missing
Ignition coil defective!
Note:
Increased ignition voltage peak no longe present.

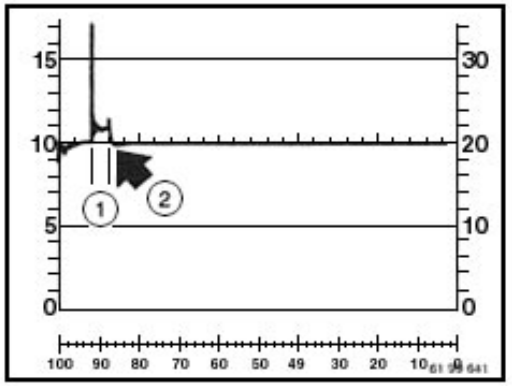


Evaluation of combustion voltage curve at idle speed

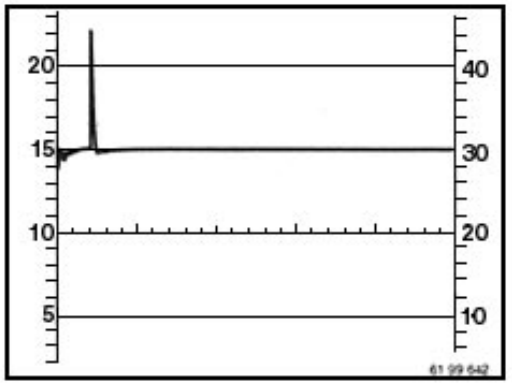
1 Normal combustion period
2 Normal attenuations after combustion voltage curve.
Ignition coil OK



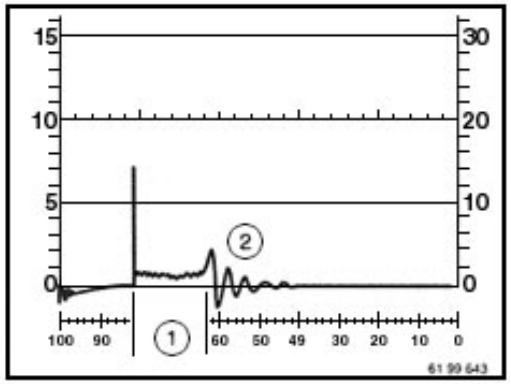
1 Shortened combustion period
2 Only slight attenuations present after combustion voltage curve.
Ignition coil defective!



Severely abbreviated combustion period
Attenuations after combustion voltage curve absent
Ignition coil defective!

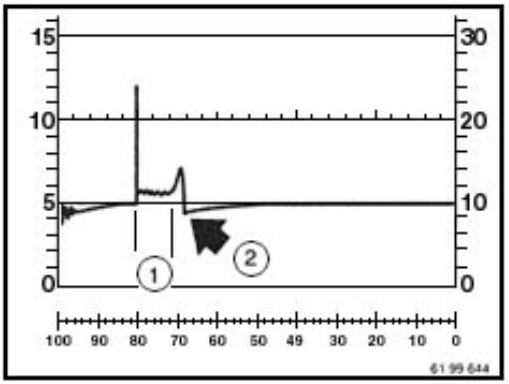


No combustion voltage curve.
Ignition coil defective!

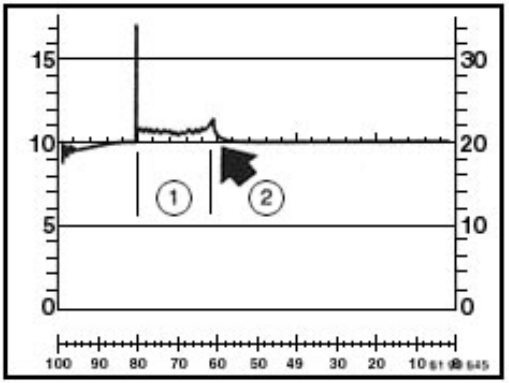


Evaluation of combustion voltage curve at raised engine speed of approx. 1500 min^{-1}

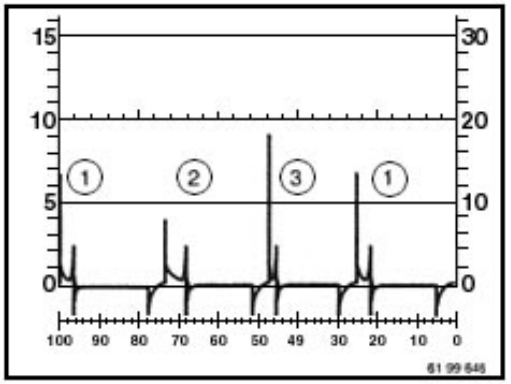
1 Normal combustion period
2 Normal attenuations after combustion voltage curve.
Ignition coil OK



1 Shortened combustion period
2 Only slight attenuations present after combustion voltage curve
Ignition coil defective!

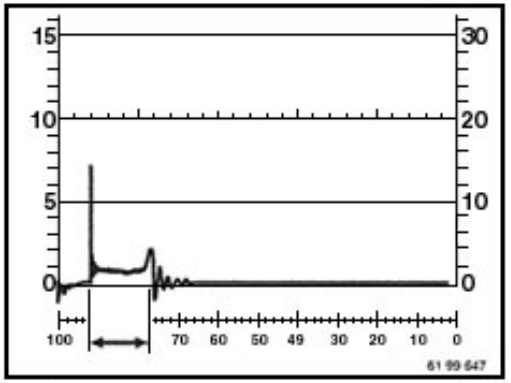


1 Normal combustion period
2 Attenuations after combustion voltage curve absent
Ignition coil defective!



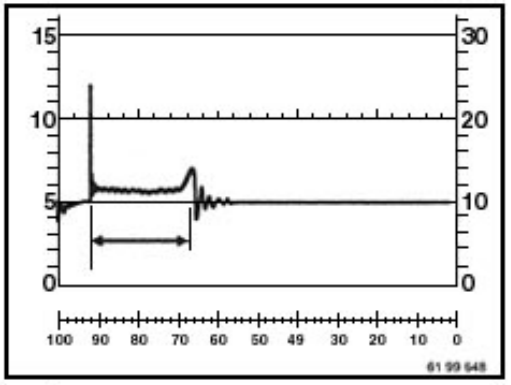
Spark plug defects

1 Normal ignition voltage spike:
spark plug OK
2 Low ignition voltage spike
Small electrode gap
3 High ignition voltage spike
Large electrode gap

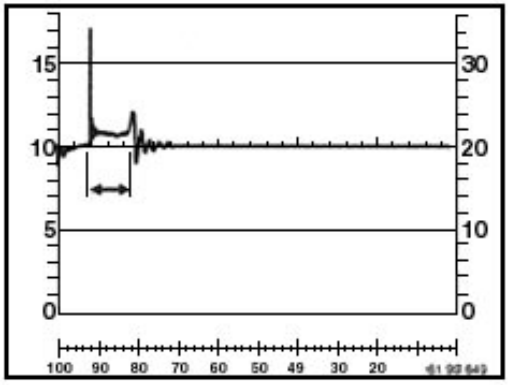


Evaluation of combustion period at idle speed

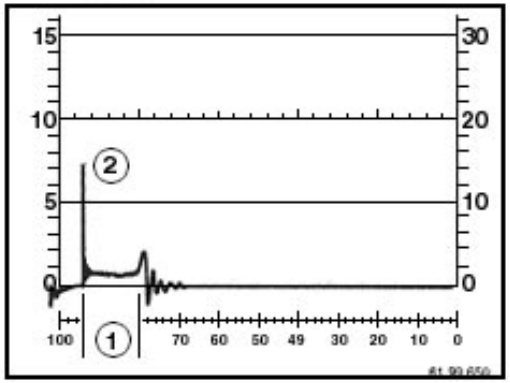
Normal combustion period
Spark plug OK



Long combustion period
Small electrode gap



Short combustion period
Large electrode gap



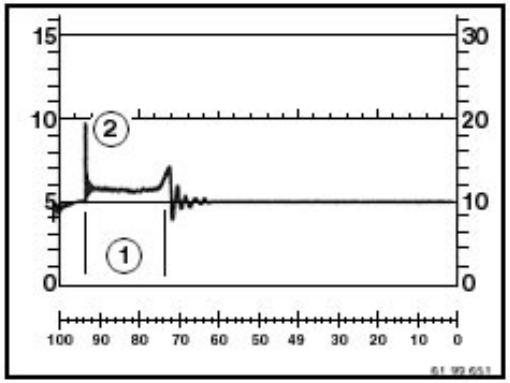
Additional fault patterns with evaluation

Evaluation of combustion period of ignition voltage spikes at idle speed

1 Normal combustion period
2 Normal ignition voltage spike
Ignition system OK

Excessive ignition voltage:

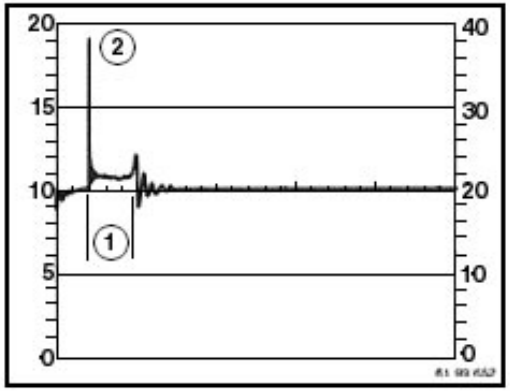
Electrode gap	large
Compression	high
Fuel mixture formation	lean
Electrode temperature	low
Electrode gap	burned out
Ignition cable	interrupted



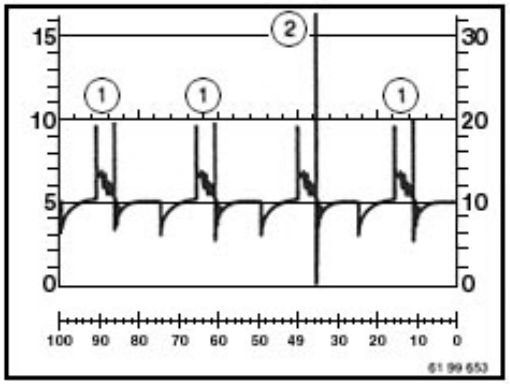
Long combustion period (1) with low ignition voltage spike (2).
Suggestive of low compression.
Fluctuating combustion period:
Suggestive of impurities in spark plug (shunt)

Excessively low ignition voltage:

Electrode gap	small
Compression	low
Fuel mixture formation	correct
Electrode temperature	high
Electrode condition	new



Short combustion period (1) with high ignition voltage spike.
Constant but brief combustion period:
Suggestive of defective ignition cable.
Note:
The combustion voltage curve may be entirely absent and the ignition voltage spike may be very high.

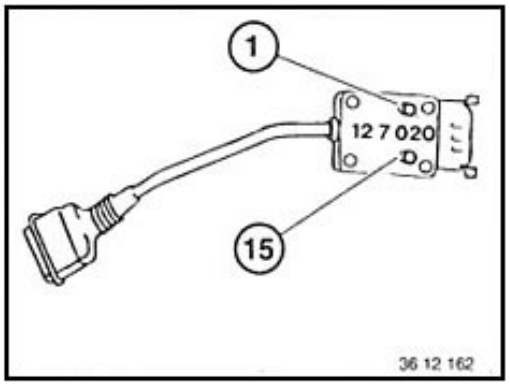


Fault in the injection system

Evaluation of ignition voltage spike when accelerator applied suddenly

1 Start of attenuation process is not significantly higher than the ignition voltage spike.
Injection system OK.

2 Start of attenuation process is significantly higher than the ignition voltage spike.
Fault in the injection system:
a) Lean fuel mixture
b) Defective injection valve
c) Low compression



Additional fault instructions on troubleshooting

For troubleshooting on the primary side of a single ignition coil, use adapter for primary voltage measurement and special tool 12 7 020.

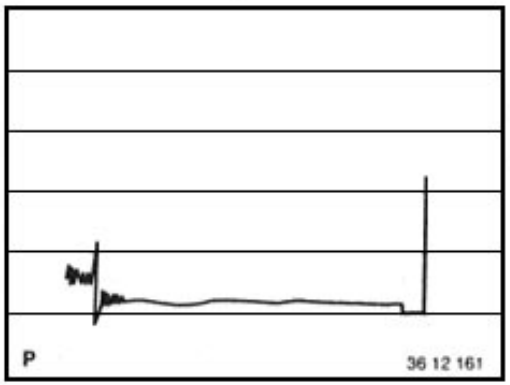
If terminal 1 signal is absent on pin 1 in the diagnosis receptacle, with the help of special tool 12 7 020, the trigger signal for the Service Tester can be prepared externally.

Connect up BMW Service Tester.
Select Engine Test Step 05.

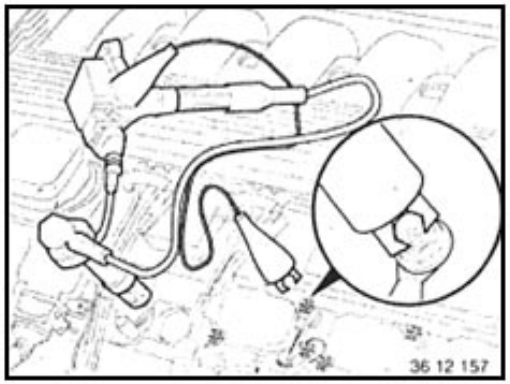
Select four-cylinder unit.
Connect universal adapter cable to tester.
Connect brown terminal to vehicle ground.
Black terminal to terminal 1 of special tool 12 7 020.

If there is no trigger signal in the diagnosis receptacle for a 6-cylinder engine, preselect two- cylinder unit on Service Tester.

Do not use red inductive pliers because only one cylinder is being measured. For this reason, an engine speed display of factor 4 is too low.
Connect special tool 12 7 020 to the ignition coil to be measured, and to the vehicle wiring harness.



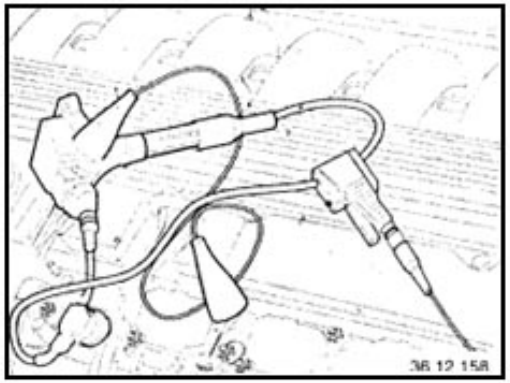
Generate standing signal on oscilloscope by pressing button R on the Service Tester.
Note:
The combustion voltage curve on the oscilloscope is very unsteady because, on a 4-valve engine, the combustion mixture swirl effect is more pronounced than in a 2-valve engine.



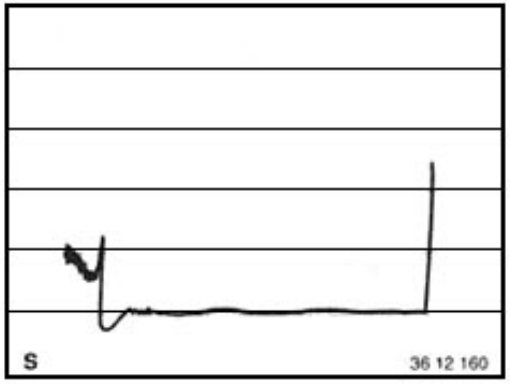
Checking secondary signal for breakerless ignition distribution (special tool 12 7 030)

Engine test step 10

Remove ignition coil. Attach special tool 12 7 030 to the ignition coil to be measured. Attach high-voltage pliers to the ignition lead.



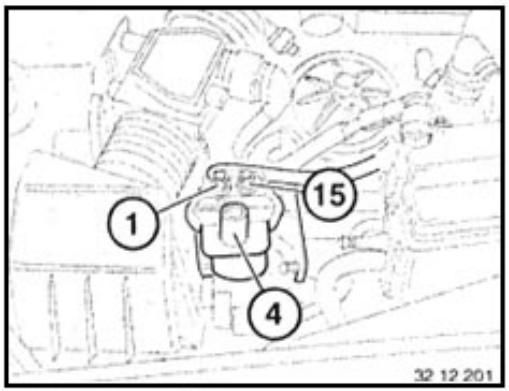
Connect ground lead of adapter to vehicle ground and the ignition coil. Connect up diagnosis connector.
In the absence of a trigger signal (terminal 1), connect black terminal of universal adapter cable to Pin 1 of the primary adapter cable.



Generate standing signal on the oscilloscope by pressing button R on the Service Tester.

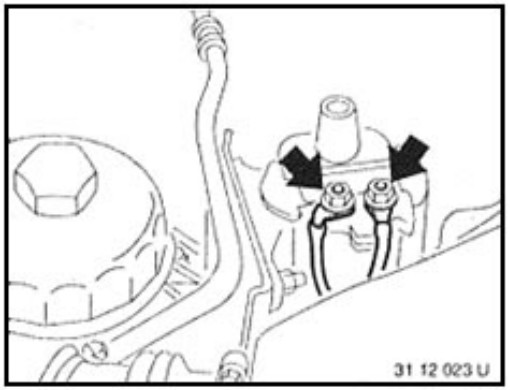
Note:
Neighboring ignition leads can give rise to interference in the oscilloscope screen display.

For additional troubleshooting steps, see fault memory in the engine control units.
Interrogate the fault memory and obtain fault messages - see Electrical Troubleshooting Manual.

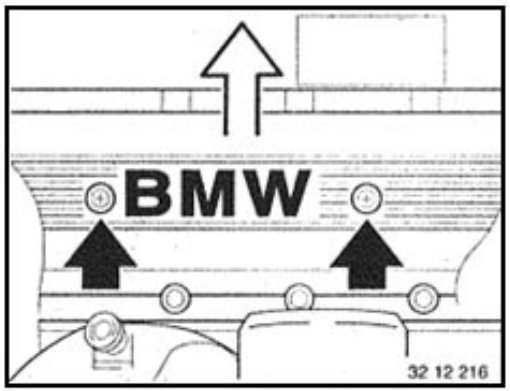


12 13 011 Replacing ignition coil (M 70, S 70)

Caution!
Only work on the ignition system with the ignition switched off - high voltage - danger of death.
Note instructions for working on ignition system - see Page 12 - 0.

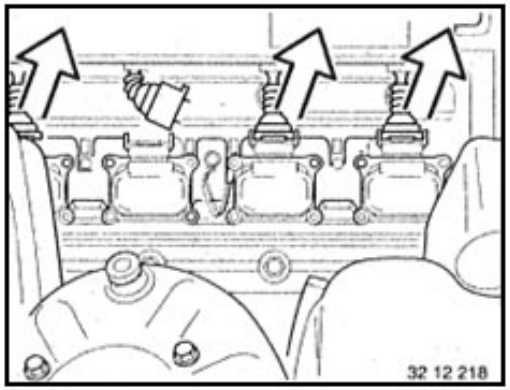


Remove protective cap and ignition lead (terminal 4).
Unfasten connections (term. 1 and term. 15).
Disconnect bracket and remove ignition coil.

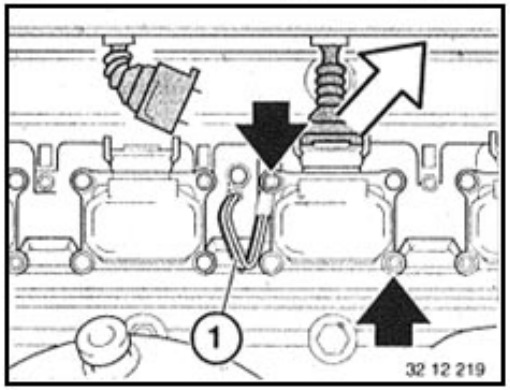


12 13 011 Replacing ignition coils (M 60)

Unclip cover over screws in cylinder head cover.
Unfasten screws.
Remove cover from cylinder head cover.



Unfasten plug connections for ignition coils.



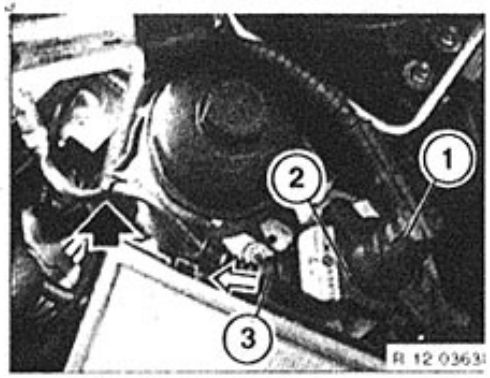
Unfasten screws of ignition coils.

Installation:
On the ignition coils for cylinders 2 and 6, the ground tapes (1) from the cylinder head cover must be secured to the ignition coil screw connections.

12 13 511 Replacing ignition coil (M73)

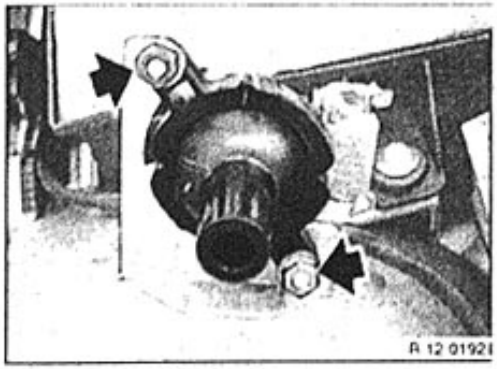
Switch off ignition.

Removal illustrated here with example of ignition coil on left side, cylinder bank 7-12.



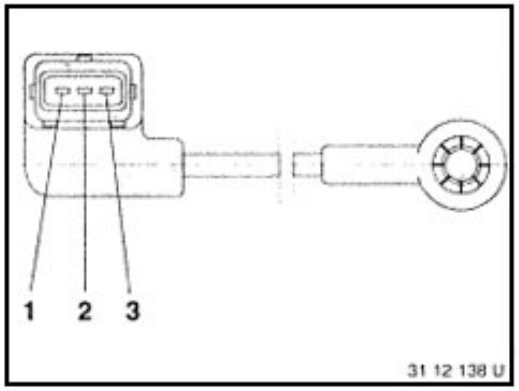
Disconnect plug connection (1). Remove cap (2). Disconnect plug connection (3).

Installation:
Note routing of line in cable clip.



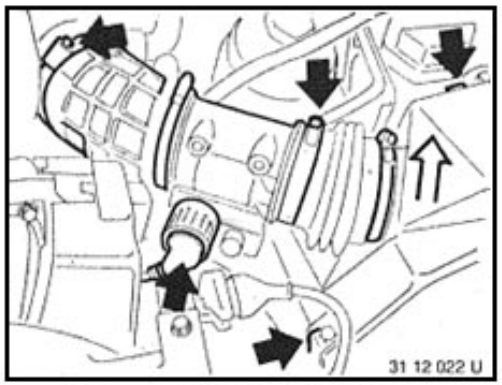
Unscrew nuts.
Ignition coil remove.

Installation:
Interrogate fault memory of control unit for Digital Motor Electronics (DME), check faults in memory, rectify them, then cancel the fault memory.



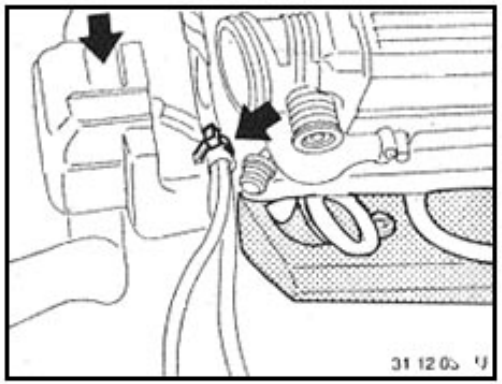
12 14 . . . Checking sender for cylinder identification (M 70, S 70)

Measure resistance in coil between pin 1 and pin 2.
Nominal value: ~ 1 Ω
Insulation resistance between pin 2 and pin 3.
Nominal value: ∞ 10 MΩ

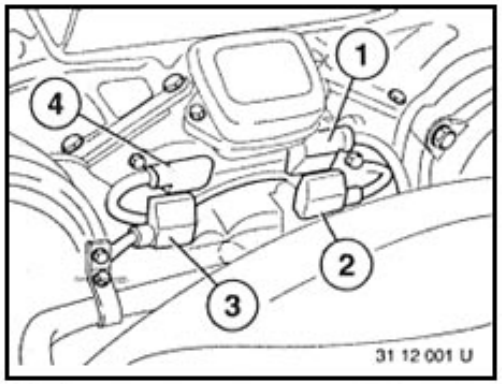


12 14 150 Replacing sender for cylinder identification (M 70, S 70)

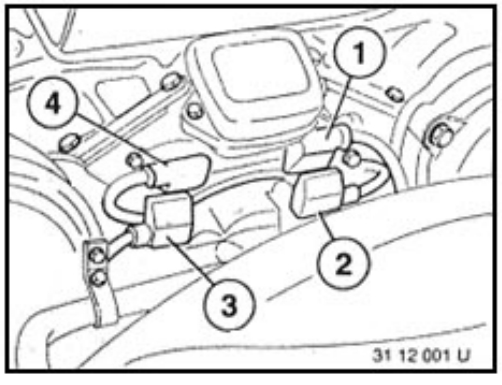
M 70:
Remove complete upper section of suction filter housing with mass air flow sensor.



Unfasten cable connector.
Remove cover from distributor cap.

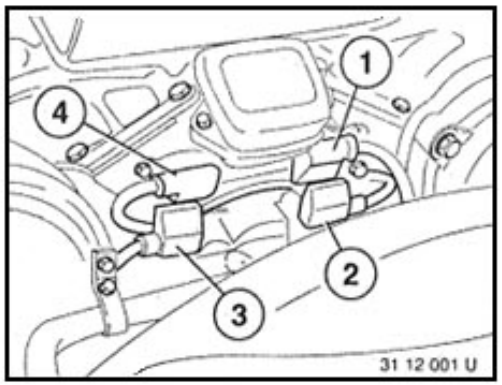


Senders are fitted to the ignition lead of cylinder numbers 6 / 12.
Disconnect suppression plug from ignition lead.
Remove sender from ignition lead.



Cylinder bank 1...6: (right cylinder bank)
Disconnect plug connection – remove cable.
Fit new sender.

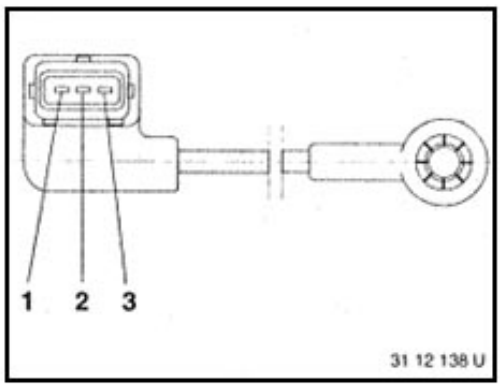
4 = inductive impulse sensor
3 = cylinder identification sender



Cylinder bank 7...12: (left cylinder bank)
Disconnect plug connection – remove cable.
Fit new sender.

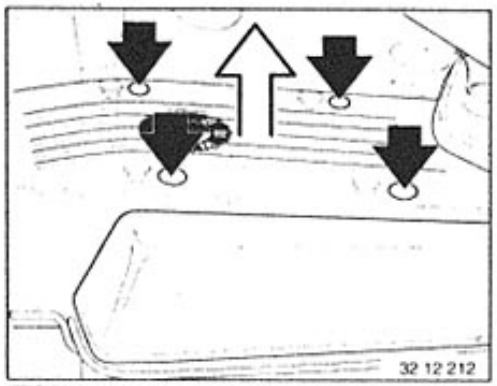
1 = cylinder identification sender
2 = inductive impulse sensor

Installation:
Fit suppression plug.
See Constr. Group Item 12 12 072



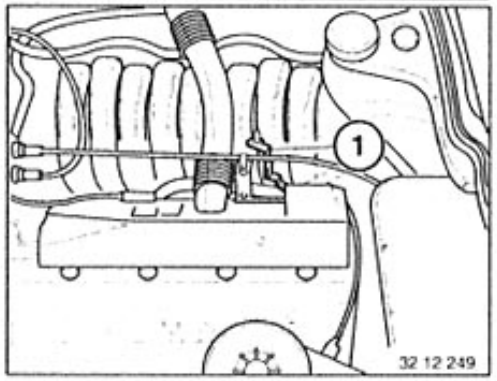
Check sender:
Measure resistance* of coil between line 1 and 2.

* Refer to Technical Data

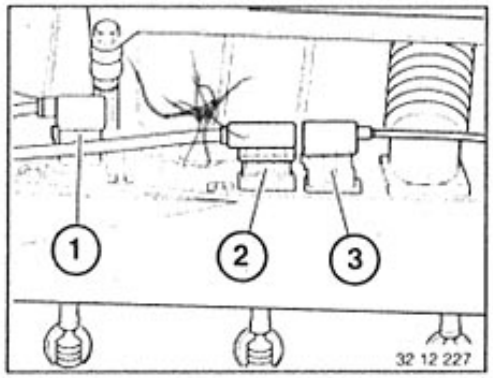


12 14 150 Replacing sender for cylinder recognition (camshaft sender) (M 60)

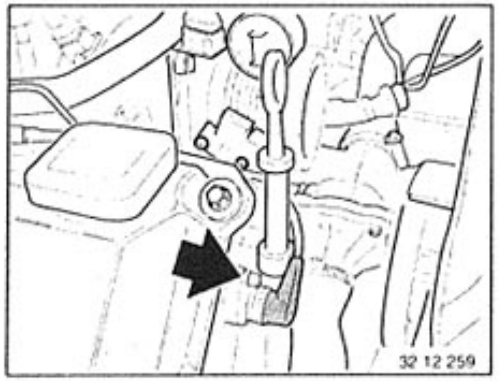
Interrogate fault memory
Switch off ignition.
Remove cover from screws on valve cover.
Unfasten screws.
Remove cover.



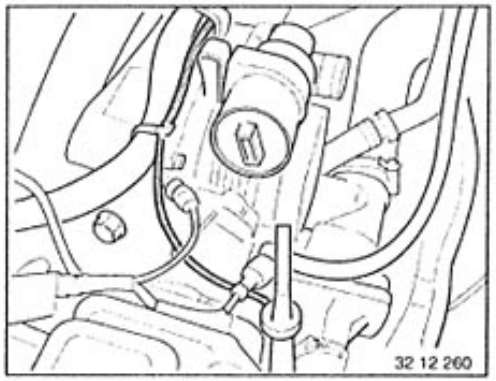
Disconnect plug connection (1).



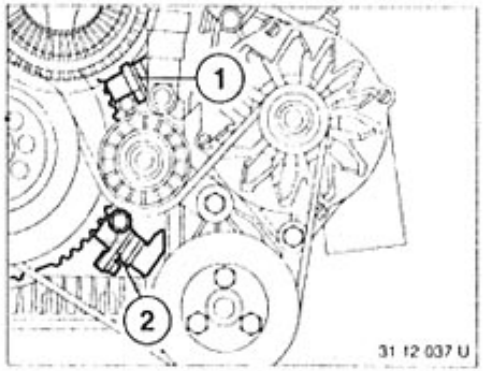
Disconnect plug connection (1).



Unfasten screw.

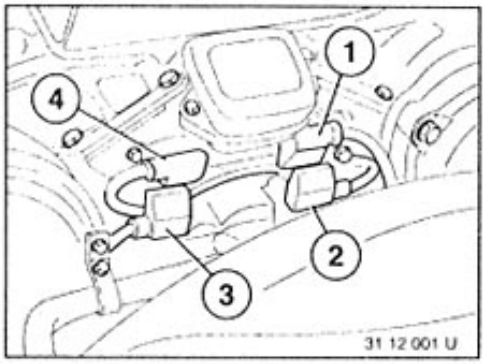


Installation:
Note wiring layout on injection pipe.



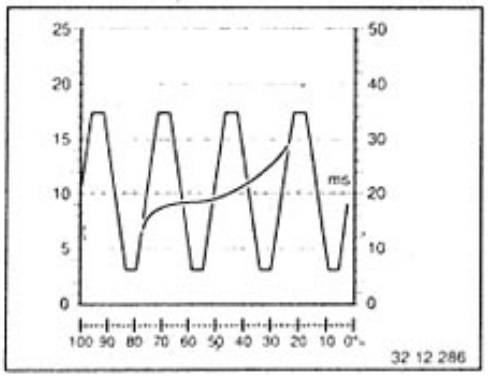
12 14 . . . Checking impulse sensor

M 70:
At top of timing case cover. Check that impulse sensor (1) for DME 1 is securely seated and free of damage.
At bottom of timing case cover.
Check impulse sensor (2) for DME 2 is securely seated and free of damage.

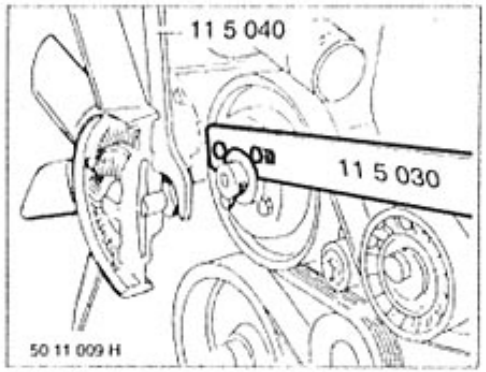


Unfasten connector (4), impulse sensor 1, right cylinder bank.
Unfasten connector (2), impulse sensor 2, left cylinder bank.

M 70, M 60:
Select multimeter test on BMW Service Tester (M 06):
Plug connection disconnected.
Resistance measurement between pins 1 and 2:
Nominal value: 520 Ω ± 5 %
Check the shielding:
between pins 1 and 3 : > 100 kΩ
between pins 2 and 3 : > 100 kΩ

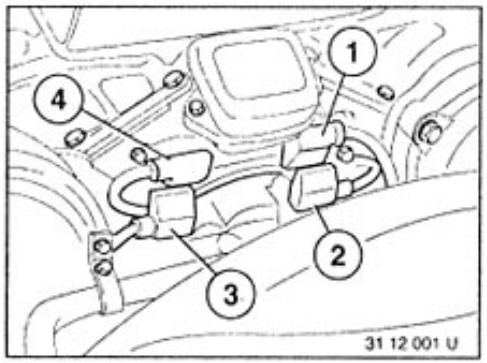


Connect oscilloscope to connections 1 and 2 of impulse sensor (M22/23).
Turn crankshaft with starter motor.
This signal should appear on the screen.

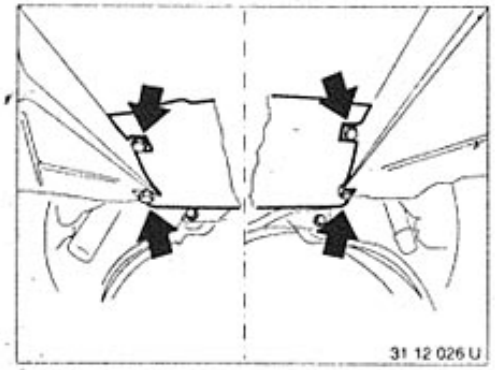


12 14 152 Replacing impulse sensor in left cylinder bank (M 70, S 70)

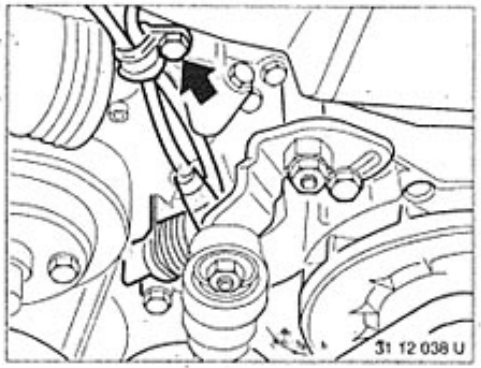
Remove fan.



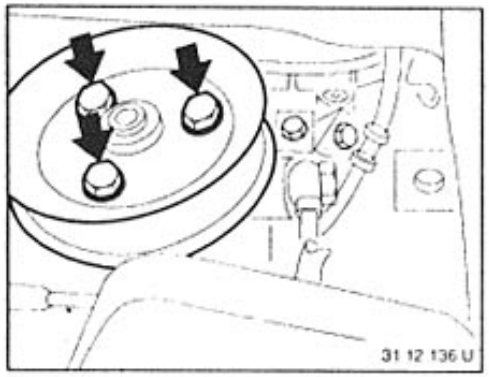
Unfasten plug connection (2) in bracket in top of timing case cover.



Remove underbody protection from assemblies.

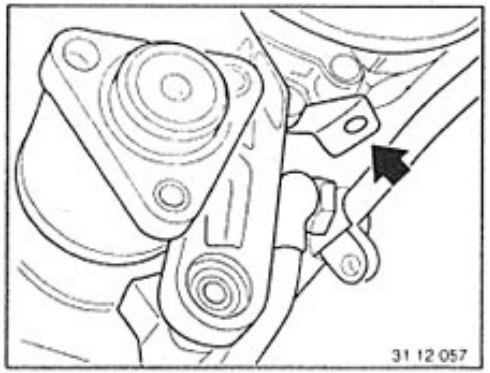


Unfasten retaining strap from top of timing case cover.

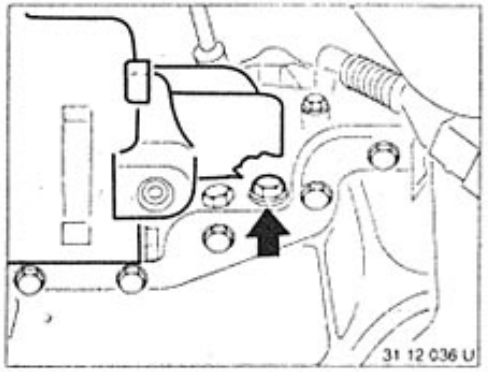


Unscrew pulley on power steering pump.

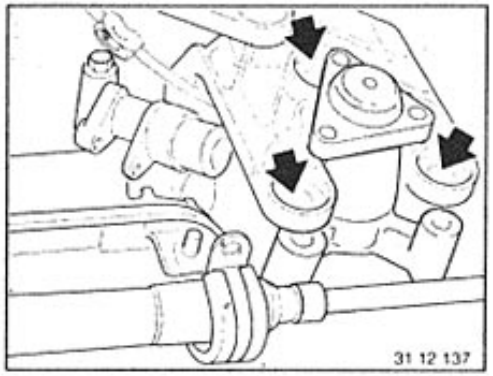
Unscrew cool air guide for alternator.



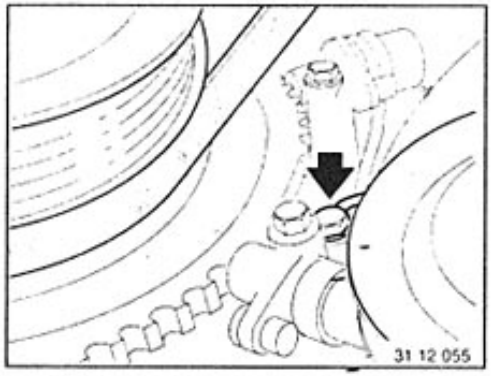
Unscrew both holders for hydraulic fluid pipes.



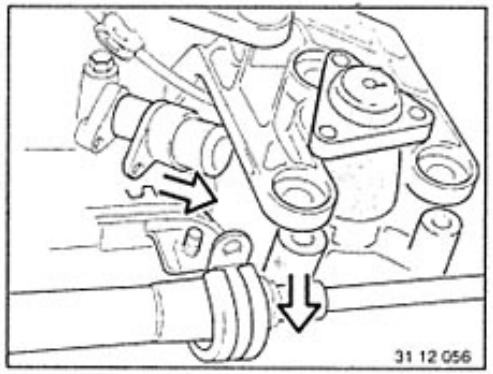
Unscrew holder for hydraulic fluid pump on engine block.



Loosen front power steering pump console bolts.

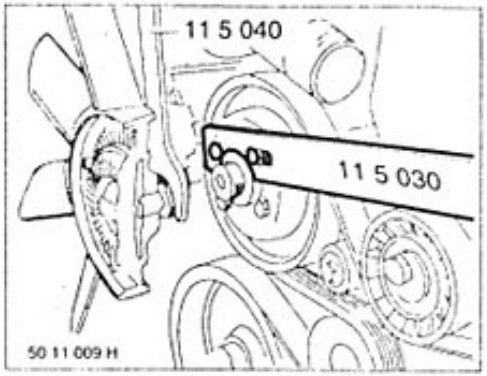


Unscrew pipe holder on lower timing case cover.
Turn increment wheel until bolt head is accessible through a tooth gap.



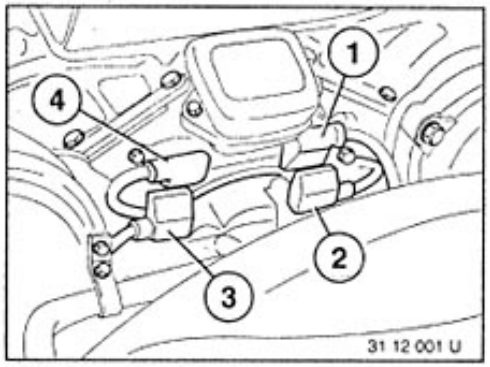
Unscrew pulse sender.
Press hydraulic fluid pump aside and remove the pulse sender.

Checking Increment Wheel:
TDC mark must be at middle of a tooth.
Beginning at the TDC mark and continuing in the engine's direction of rotation there must be a gap after 30 teeth.

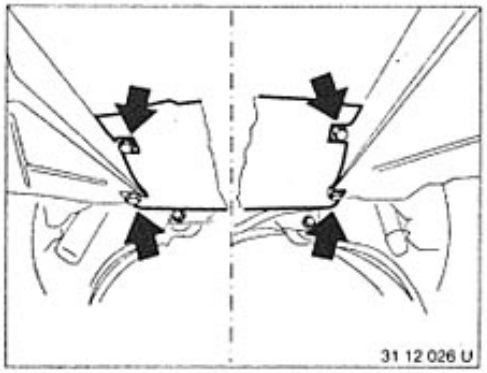


12 14 153 Replacing impulse sensor on right cylinder bank (M 70, S 70)

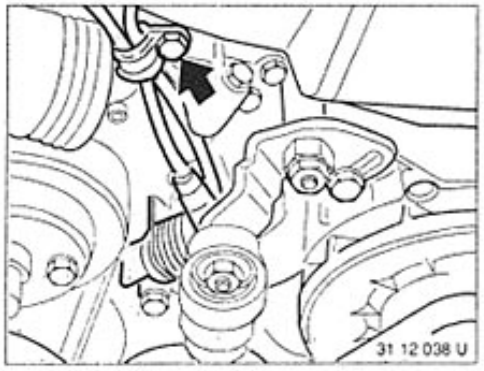
Remove fan.
Remove complete clamping fixture for toothed Vee belt.



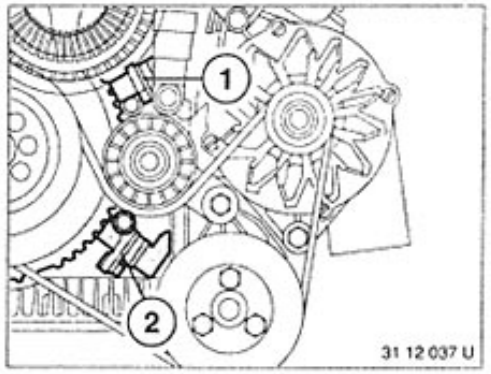
Unfasten top of plug connection (4) in bracket for timing case cover.



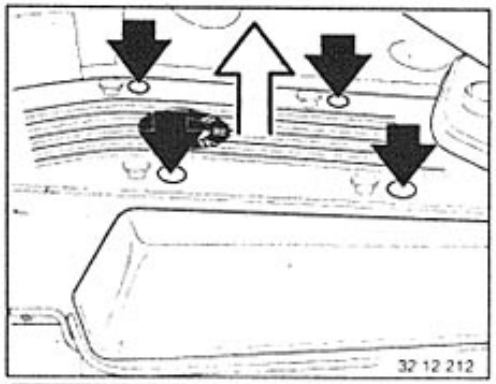
Remove underbody protection from assemblies.



Unfasten line bracket from top of timing case cover.

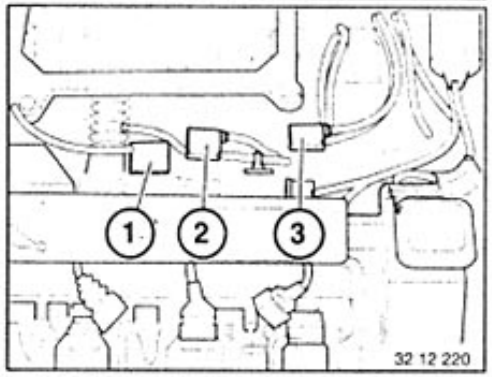


Unfasten impulse sensor (1) and remove.

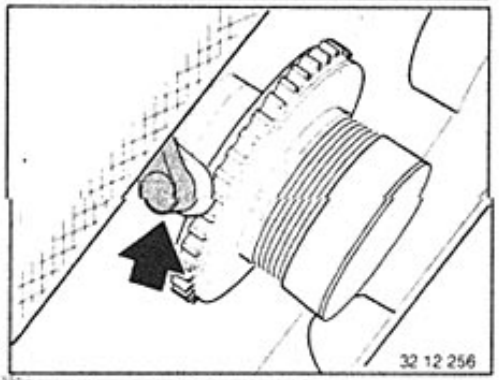


12 14 155 Replacing impulse sensor (M 60)

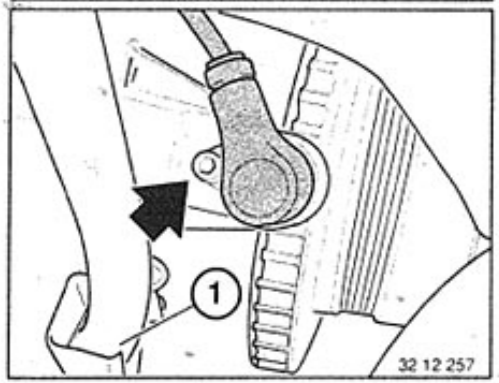
Interrogate fault memory.
Switch off ignition.
Unfasten cover from screws in valve cover.
Unfasten screws.
Remove cover.



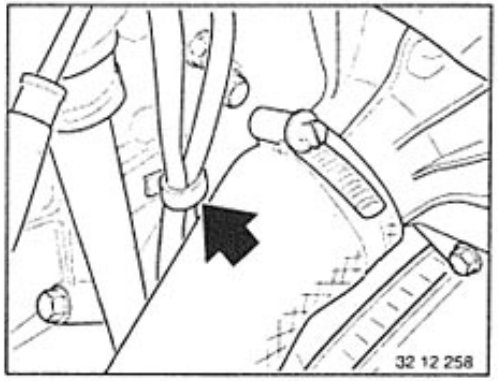
Disconnect plug connection (3).



The impulse sensor is located beside the incremental gear.



Unfasten screw (1).

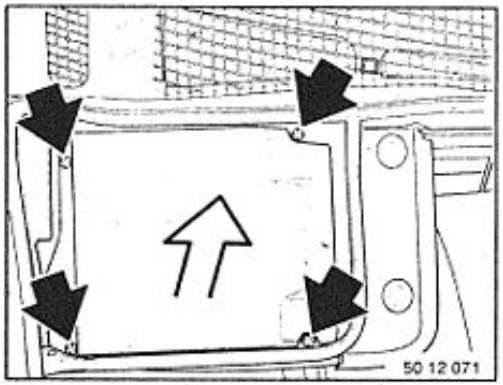


Note:
Observe pipe layout on the water pump.

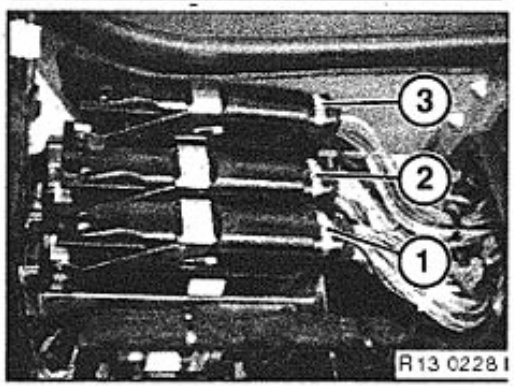
12 14 500 Removing and installing / replacing both control units (Digital Motor Electronics) (M73)

Caution!
Note instructions for removal and installation of electronic control unit!
refer to General Data MG 12.

Switch off ignition.



Unfasten screws.
Remove cover from control unit box.



Control unit (1) for DME 1 (cylinder bank 1-6)
Control unit (2) for DME 2 (cylinder bank 7-12)
Control unit (3) for EPC (electronic engine power control)

12 14 518 Replacing impulse sensor (cylinder bank 7-12) (M73)

Refer to
Repair Instructions for 7 Series E38.

12 14 519 Replacing impulse sensor (cylinder bank 1-6) (M73)

Refer to
Repair Instructions for 7 Series E38.

12 14 525 Replacing sensor for cylinder recognition (camshaft sensor) (M73)

Refer to
Repair Instructions for 7 Series E38.

12 14 610 Replacing right knock sensor (cylinder bank 1-4) (M60)

Refer to
Repair Instructions for 5 Series E34.

12 14 611 Replacing left knock sensor (cylinder bank 5-8) (M60)

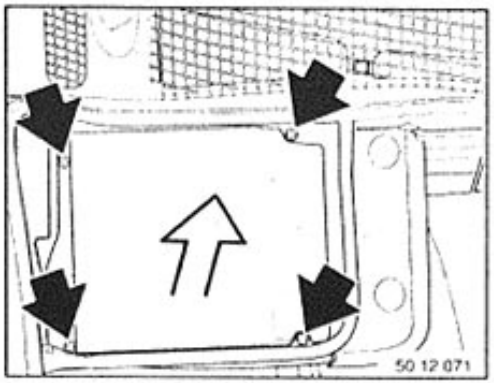
Refer to
Repair Instructions for 5 Series E34.

12 14 610 Replacing right knock sensor (cylinder bank 1-6) (M73)

Refer to
Repair Instructions for 7 Series E38.

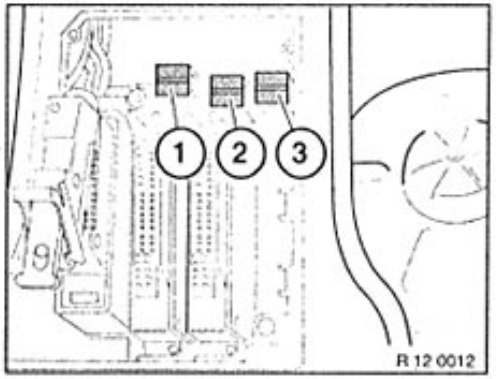
12 14 611 Replacing left knock sensor (cylinder bank 7-12) (M73)

Refer to
Repair Instructions for 7 Series E38.



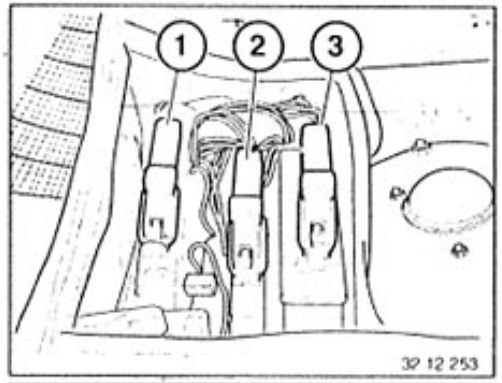
Relay / control units – allocation of engine wiring harness

Unfasten screws.
Remove cover.



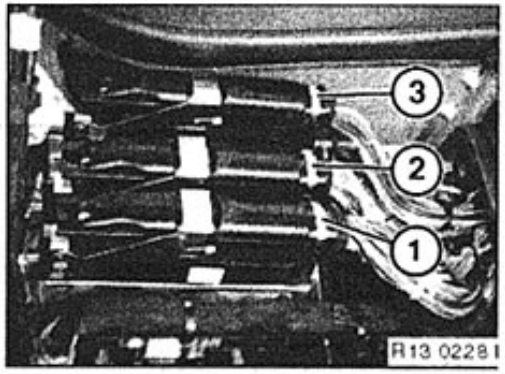
M 60:

1 Main relay for Digital Engine Control
2 Relay for electric fuel pump
3 Relay for Lambda oxygen sensor



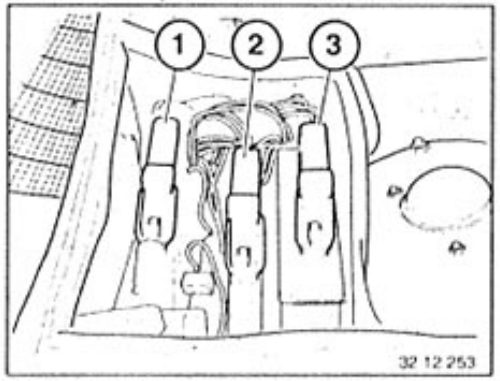
M 70, S 70:

1 Control unit for Digital Engine Control
2 Control unit for Digital Engine Control
3 Control unit for Electronic Power Control



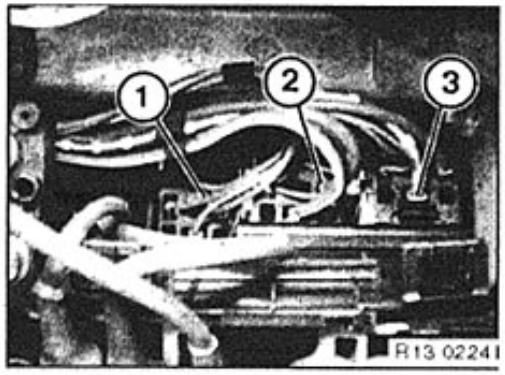
M 73:

1 Control unit for DME 1 (cylinder bank 1-6)
2 Control unit for DME 2 (cylinder bank 7-12)
3 Control unit for EPC (electronic engine power control)



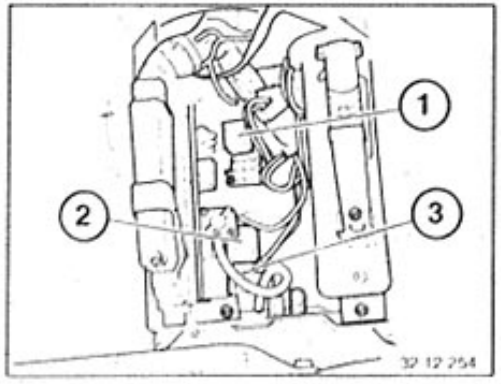
M 60:

1 Control unit for ABS
2 Control unit for Digital Engine Control
3 Control unit for automatic transmission



M 73:

1 Relay for electric fuel pump
2 Main relay for DME 1
3 Main relay for DME 2

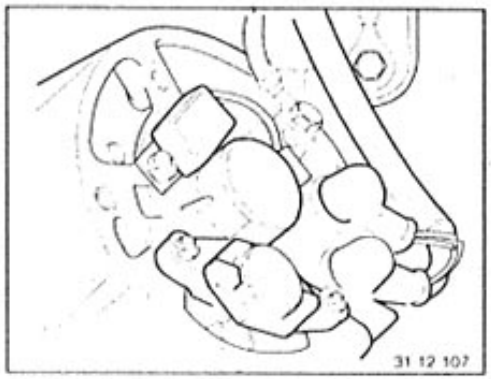


M 70, S 70:

1 Main relay for engine control unit
2 Relay for electric fuel pump
3 Relay for Lambda oxygen sensor heating

Caution!
Depending on the construction status of the vehicle, the installation location of relays and control units may vary. In the event of any doubts, test by pulling the relevant relay whether the corresponding function is interrupted.

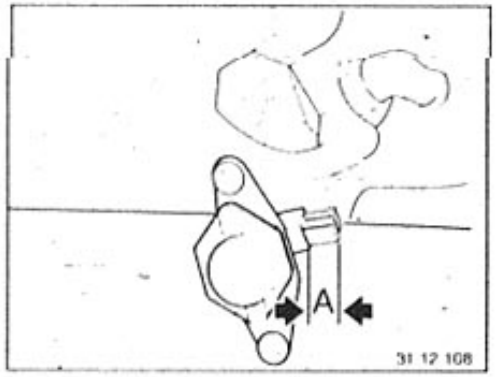
For additional instructions on troubleshooting, refer to Electrical Troubleshooting Manual for 8 Series.



12 31 009 Checking 3-phase alternator and voltage regulator

Prerequisite for this inspection:

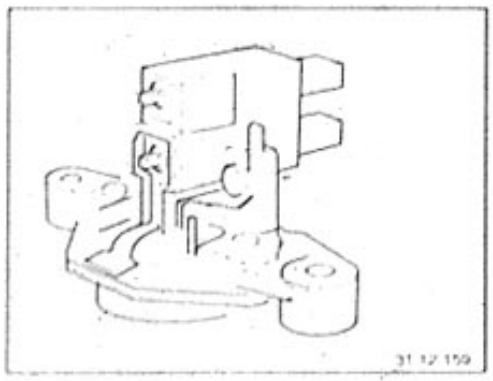
- Correct connections on the charged battery
- Correct connections on alternator and starter motor
- Good ground connection between engine and body
- Tensioned Vee belt



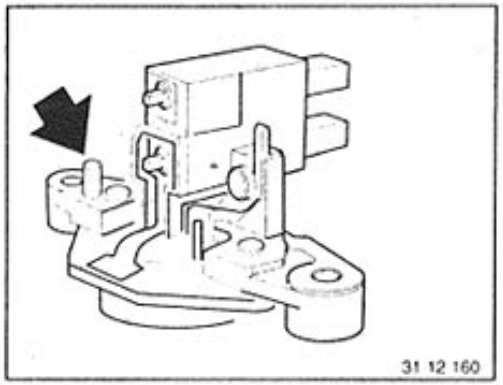
If the charge indicator lamp is lit continuously:
Remove voltage regulator and check carbon brushes, replacing if necessary 12 31 200.
Minimum length "A" 5 mm.

Caution!

There are alternators with normal regulators and alternators with constant voltage regulators.
These regulators are encoded mechanically and must not be confused with one another!

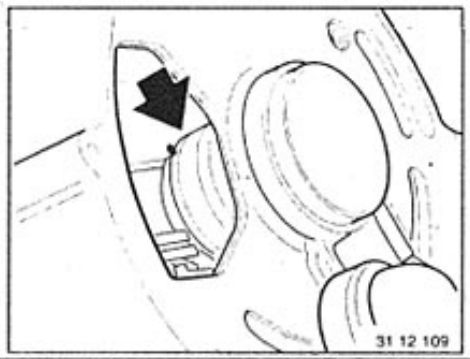


Normal regulator

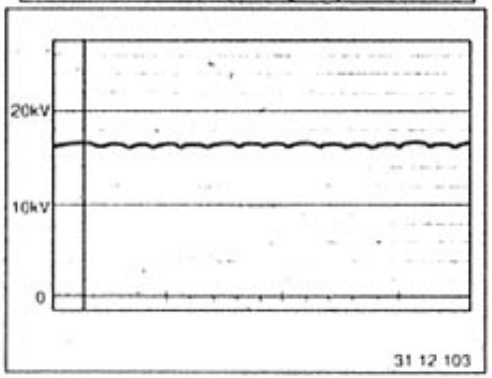


Constant voltage regulator
Can be identified by the mechanical encoding.

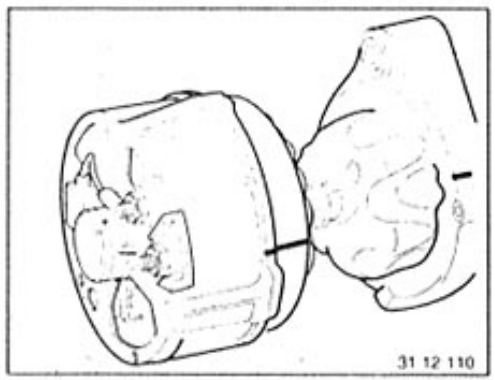
The constant voltage regulator must never be installed in vehicles whose battery is in the engine compartment. This would result in damage to the battery.



Installation:
Check slip rings for signs of wear, fine grind if necessary and polish.
Connect up BMW SERVICE TESTER.
Switch on engine and compare measuring values with nominal values.



If the charge indicator light goes out while the engine is running and the control voltage* is not reached and the oscillogram is OK (as per illustration), the voltage regulator must be replaced 12 32 000.
For additional oscillograms, refer to Electrical Troubleshooting Manual for the 7 Series.

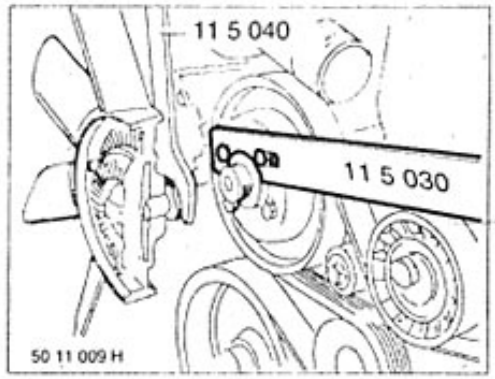


If the specified charge current is not achieved, remove the alternator, dismantle it and inspect the components.
For additional troubleshooting and notes on dismantling the alternator, refer to Construction Group Repair Instructions, Group 12.

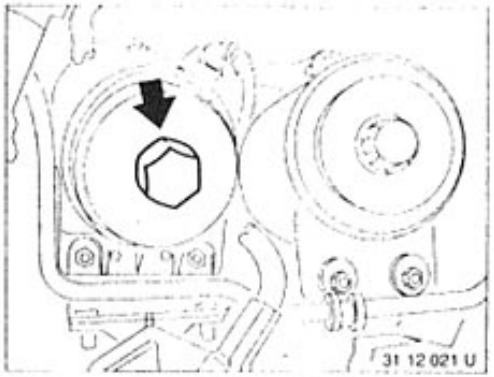
* Refer to Technical Data

12 31 020 Removing and installing or replacing 3-phase alternator (M 70, S 70)

Disconnect ground leads from the batteries.

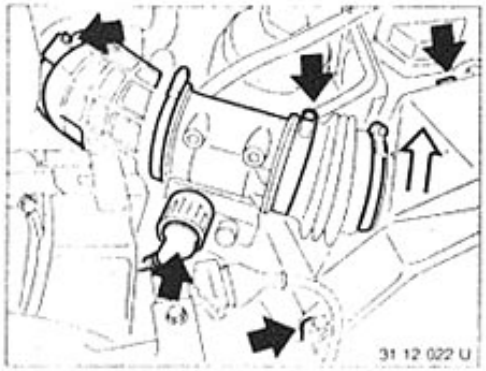


Remove viscous fan.

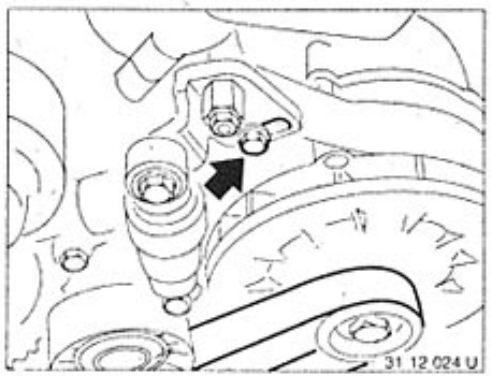


Unfasten cover from oil filter to enable engine oil to flow back into the oil pan.

Unfasten hose clip from cooling air hose on alternator.



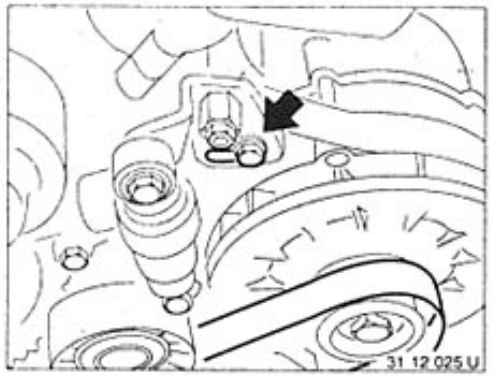
Remove complete upper section of suction filter housing together with mass air flow sensor.
Unfasten clips.
Unfasten hose clip.



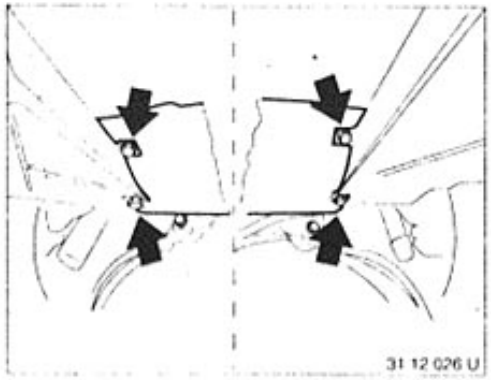
Unfasten clamping fixture for toothed Vee belts.
Remove nut from clamping fixture.
Unfasten screw.



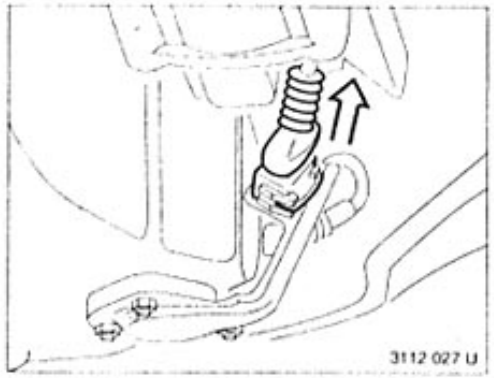
Remove cover from ignition coil.
Unscrew nuts and remove leads.



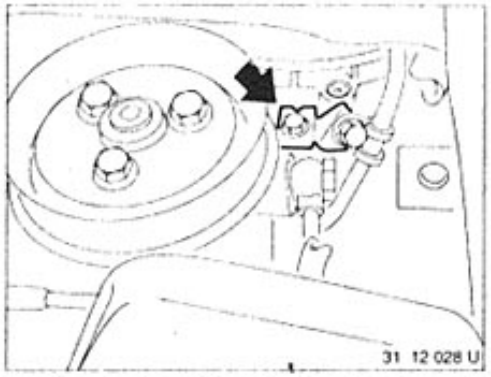
Unfasten top screw on alternator mount.
Remove toothed Vee belt.



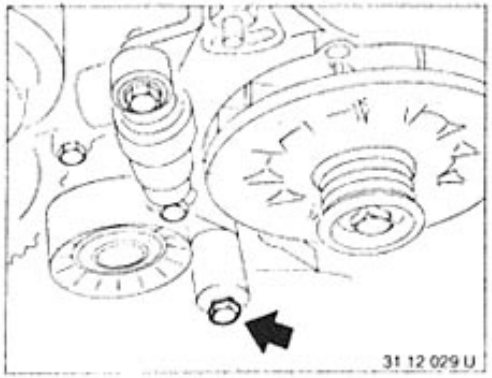
Unscrew splash guard.



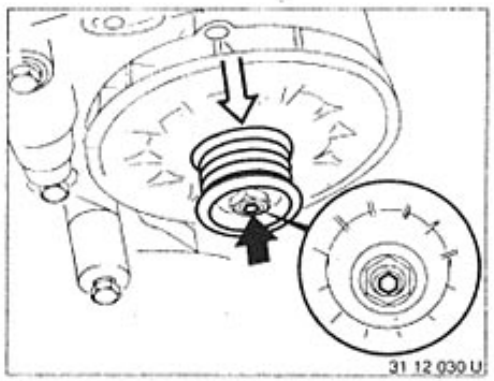
Pull off plug on oil level sender.



Unscrew hydraulic pipe holder on alternator.

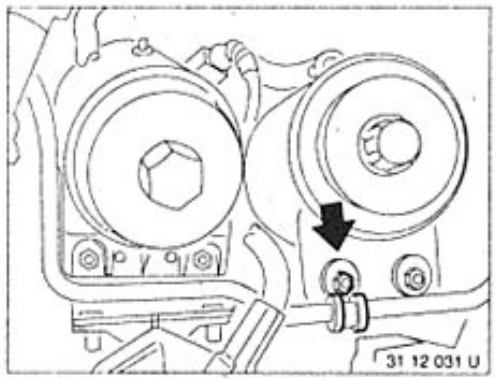


Loosen bottom tensioner bolt from underside of car.
Remove tensioner downward.
Unscrew cooling air hose on alternator.

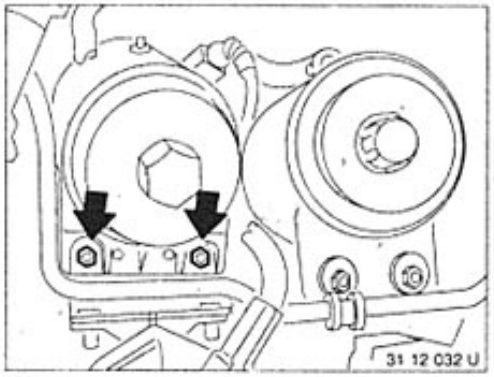


Unscrew pulley and fan from underside of car.
Unscrew both bottom bolts of alternator.

Installation:
Tightening torque*.

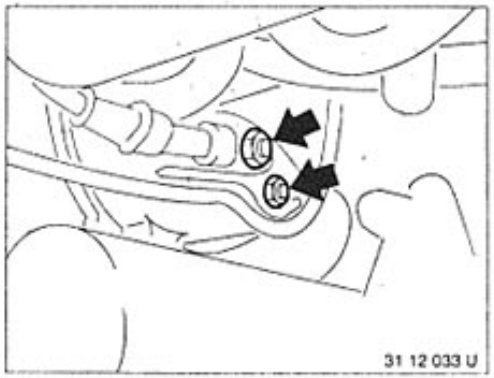


Unscrew upper hydraulic pipe holder.



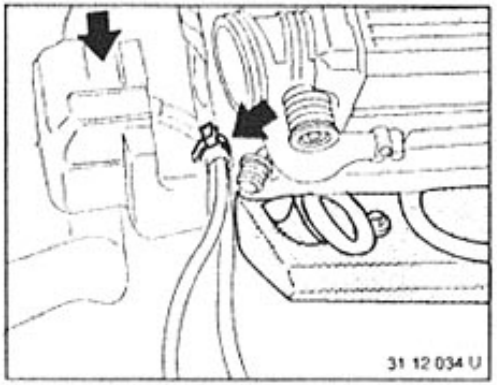
Remove complete full flow oil filter.

Installation:
Molded hoses on the oil filter impair removal and installation.
Install molded hoses straight.
Replace gaskets.
Check for correct seating of O-rings.

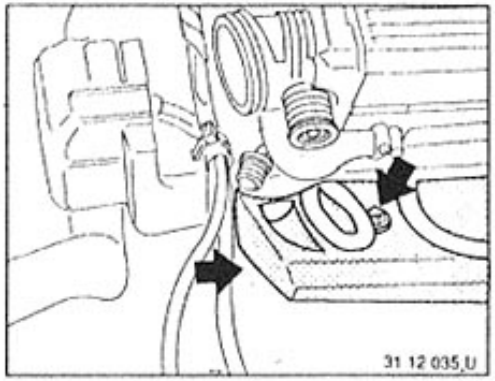


Unscrew pipes of alternator.

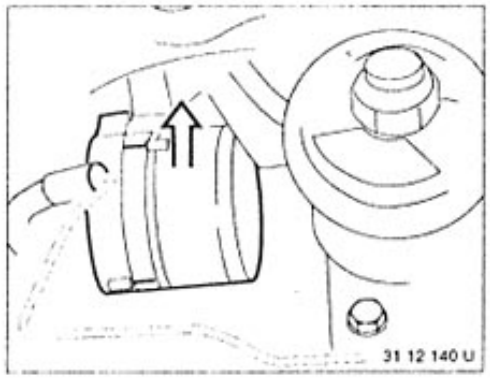
* See Specifications



Remove cover of distributor and loosen the wire strap.



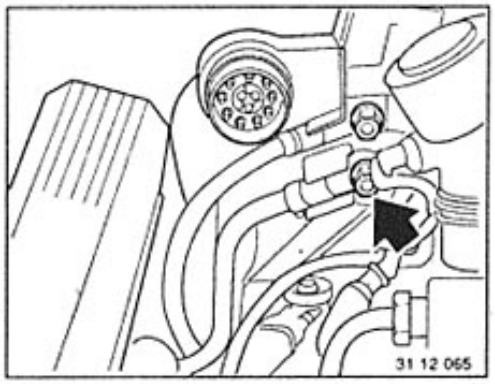
Unscrew screws.
Remove heat shield.



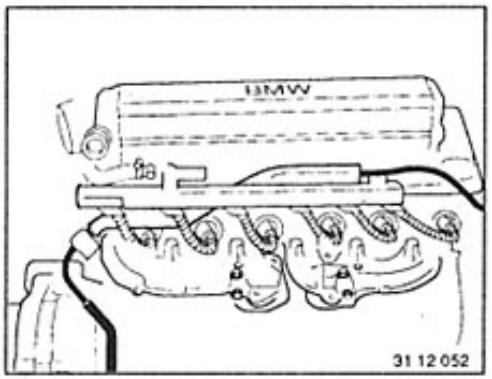
Remove alternator upwards approximately in installed position.
Press hydraulic pipe aside.

Installation:
Install alternator without pulley approximately in installed position from above, connect wires on alternator, install upper bolt, mount the pulley and then continue from the underside of the vehicle.

Check engine oil level and add engine oil if necessary.



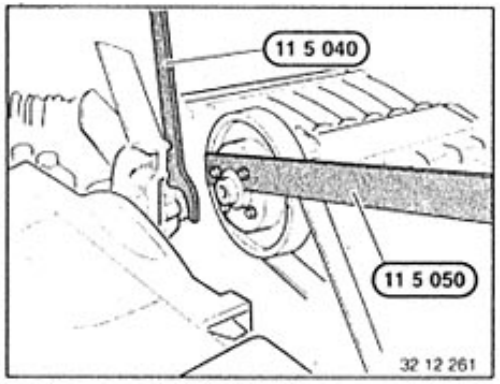
Routing of Alternator Wires:
Firewall connection at driver's side.



Routing of wires on engine.

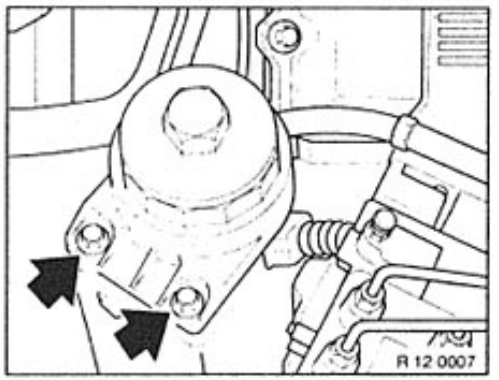
12 31 020 Removing and installing or replacing 3-phase alternator (M 60)

Interrogate fault memories of control units since the fault memories of certain control units are cancelled when the battery is disconnected.
Note General Instructions on Page 12-0!
Disconnect ground lead from battery.

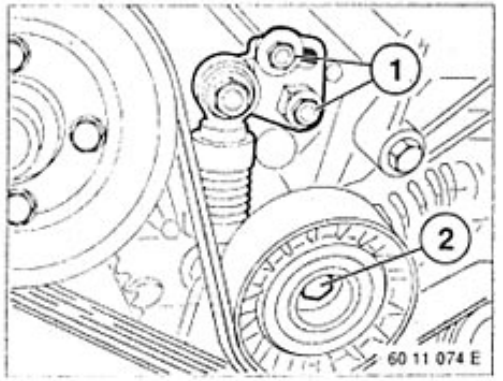


Remove fan wheel.
Unfasten fan connection with special tool 11 5 040 and counter support 11 5 050 for pulley wheel.
Tightening torque 11 52 1AZ*

Caution!
Counterclockwise thread!

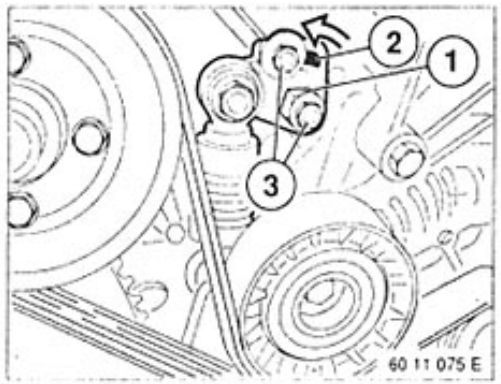


Unfasten screws and remove from bracket.

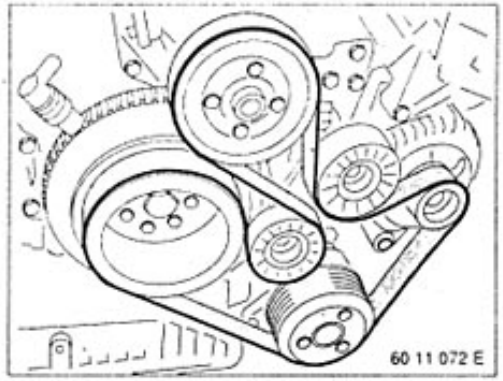


Unfasten nuts (1) and (2) and remove Vee belt tensioning fixture.

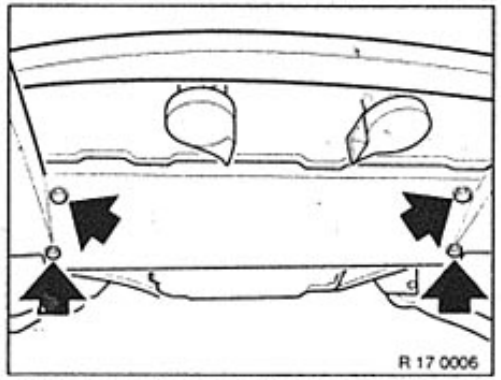
* Refer to Technical Data



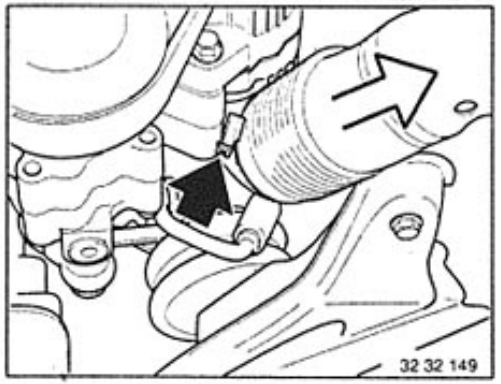
Installation:
Use hex head (1) to preload adjusting plate up to end of long bore (2), then tighten nuts (3).



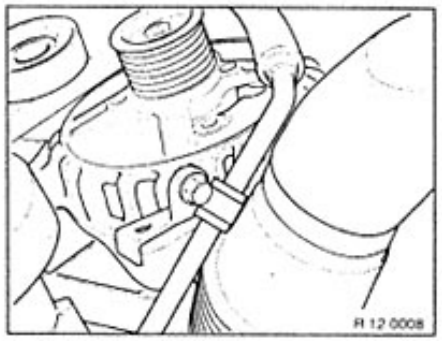
Installation:
Check toothed Vee belts for coolant and oil residue and replace if contaminated.
Fit toothed Vee belt and ensure that Vee belt and pulley wheel are located correctly.



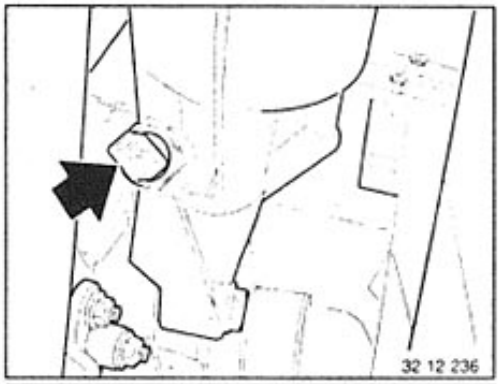
Unfasten screws.
Remove underbody protection from engine



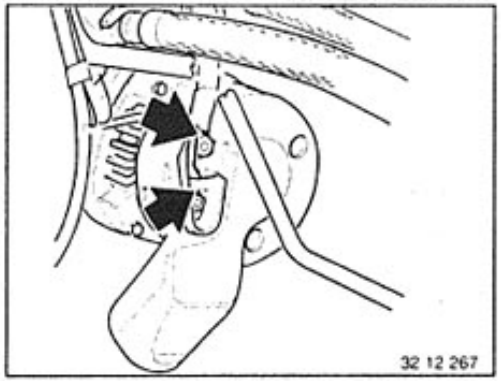
Remove alternator ventilation hose from alternator.



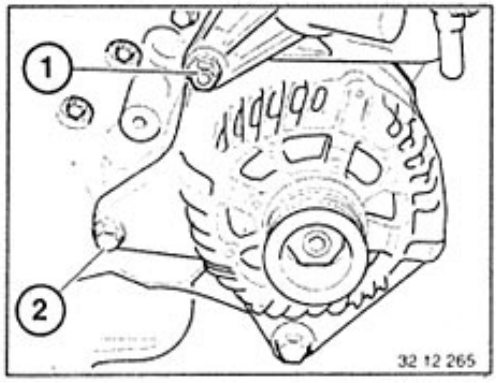
Unfasten retaining screw in alternatory hydraulic line.



Disconnect plug connection from oil pressure switch.
Unfasten cable connector.

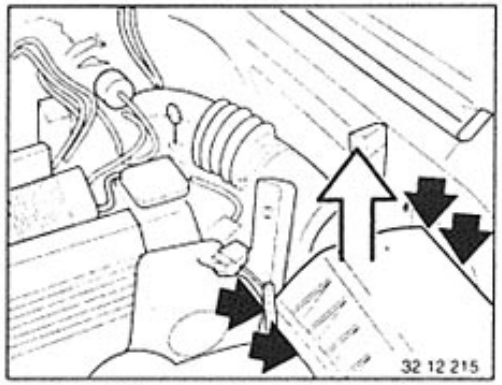


Unfasten lines on alternator.
Tightening torque 12 31 1AZ*

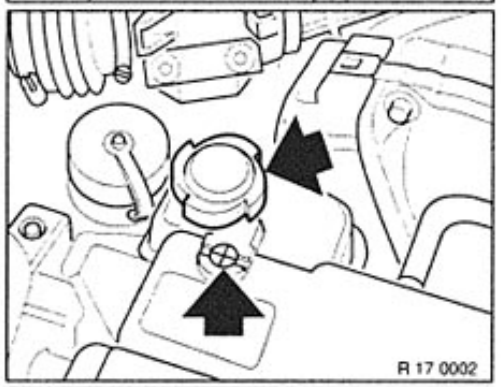


Unfasten retaining screws (1) and (2) on the alternator.

* Refer to Technical Data

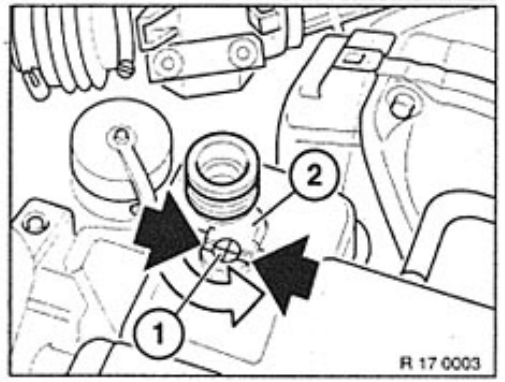


Remove upper section of suction filter with mass air flow sensor.

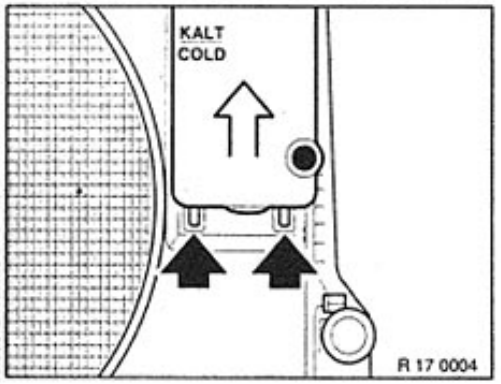


Caution!
Only unscrew sealing cover once engine has cooled down.

Installation:
Top up with specified coolant and bleed the cooling system, see 17 00 039.

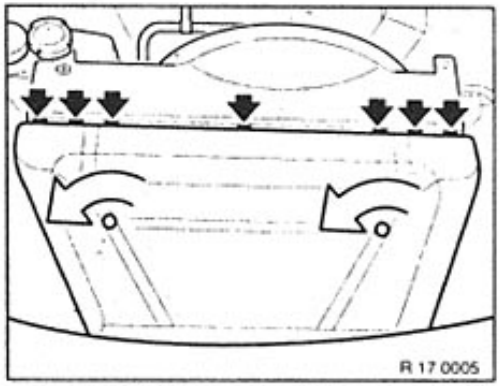


Unscrew complete vent screw (1), unfasten retainer (2) and remove.

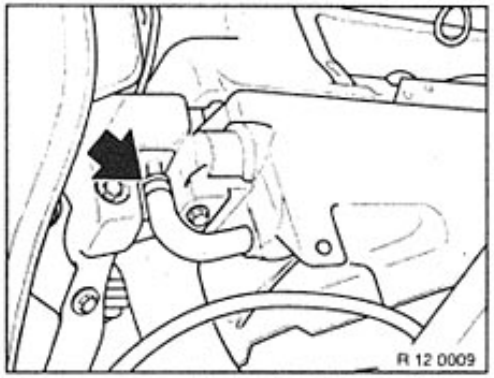


Remove expansion tank by lifting upwards

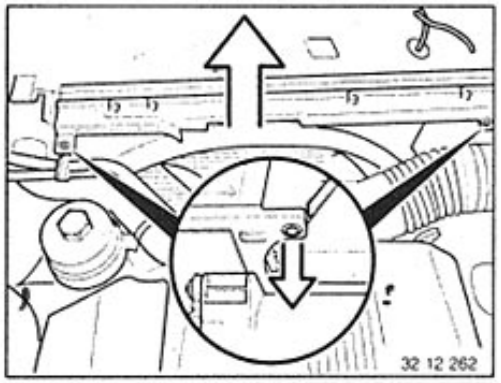
Installation:
Expansion tank must engage in radiator shroud.



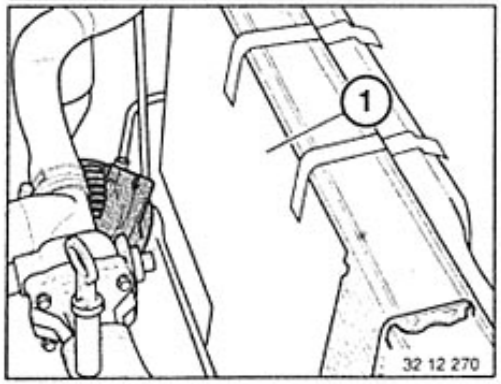
Unfasten upper section of air duct and unclip with screwdriver at specified points (arrows).



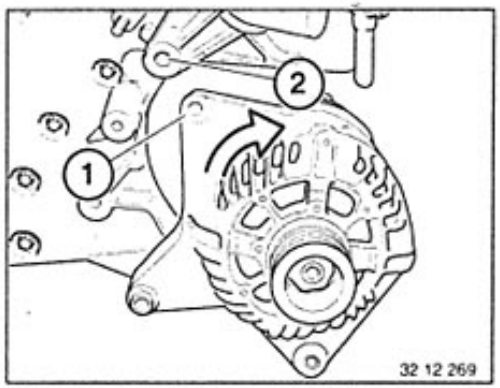
Unfasten overflow line from expansion tank.



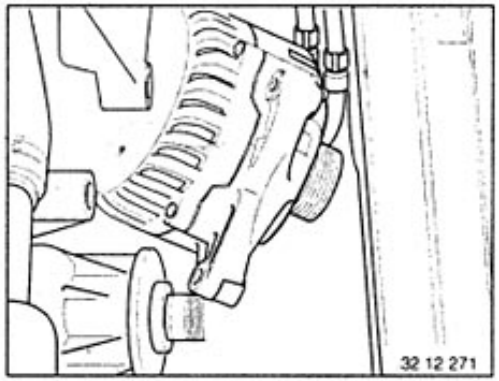
Remove clips on left and right sides.
Remove overflow line from fan shroud.
Remove fan shroud by lifting upwards.



Protect radiator and sheet metal plate (1) from damage.

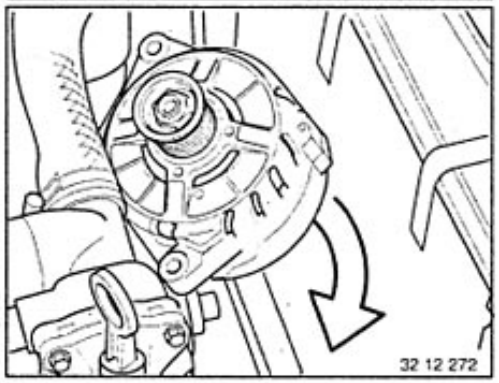


Pull alternator forwards.



Remove alternator by lifting upwards.

Caution!
Do not damage cable for actuating throttle valve for ASC+T!

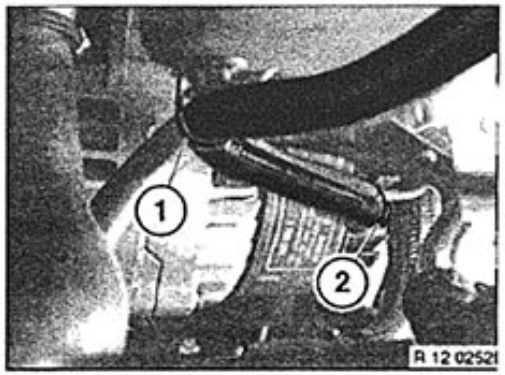


12 31 020 Removing and installing or replacing alternator (M73)

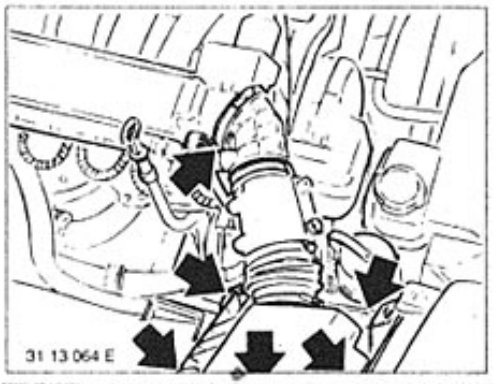
Observe notes on disconnecting and connecting battery, refer to General Data MG 12.

Switch off ignition.
Disconnect battery ground wires.

Remove alternator drive belt,
refer to 11 28 010.



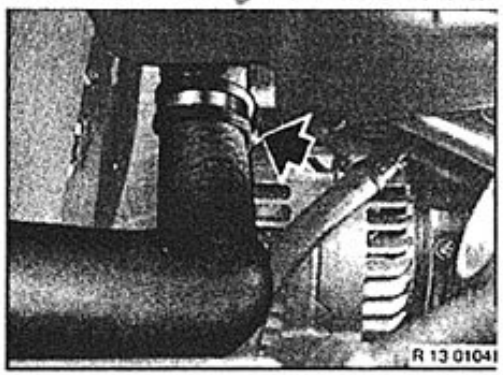
Unfasten cable ties (1 and 2) on cover of distributor cap.



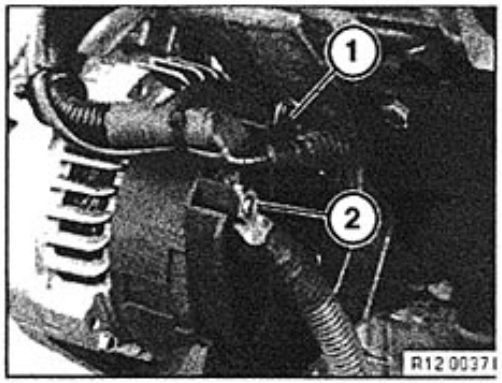
Remove upper section of intake filter housing with mass air flow sensor.



Unfasten connections on alternator.



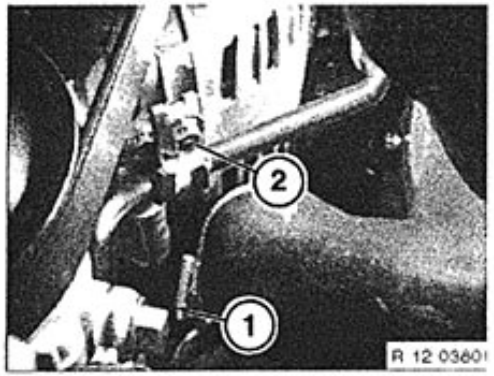
Remove bracket for coolant hose.



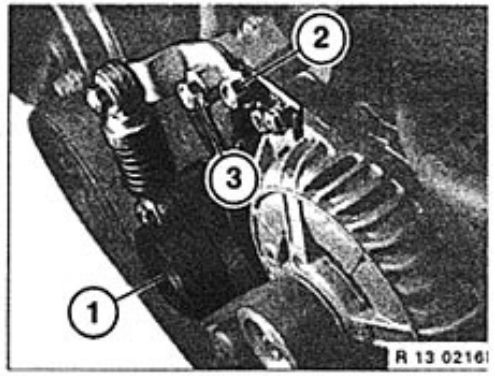
Connections illustrated here on removed alternator.

Disconnect plug connection (1).
Unfasten nut (2).

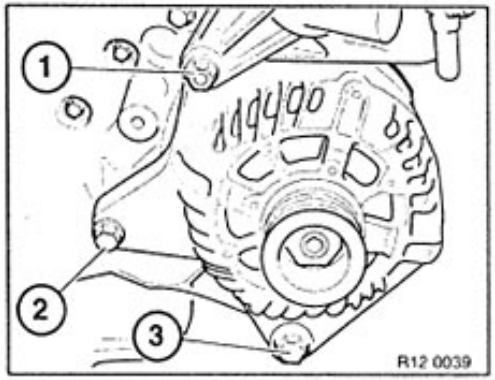
Installation:
Tightening torque,
refer to Technical Data 12 31 1AZ.



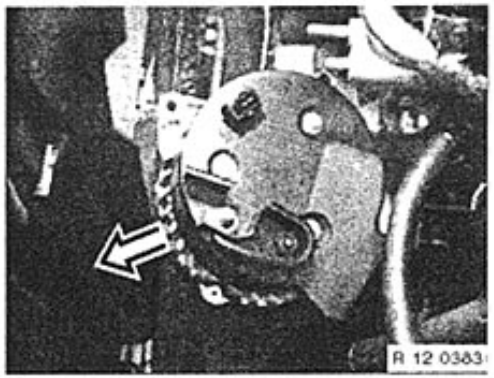
Unfasten hose clip (1) and remove cooling air hose. Unfasten screw in retaining clip (2) on hydraulic line and remove retaining clip.



Unfasten screws (1 to 3). Remove tensioning roller for ribbed vee belt.

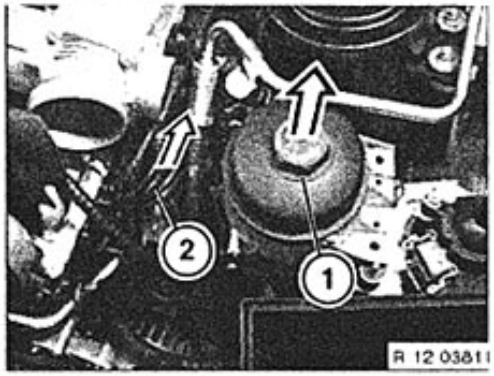


Unfasten screws (1 to 3).

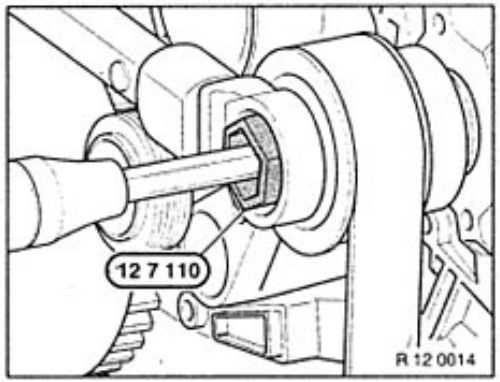


Installation:
First insert alternator in radiator shroud with pulley wheel.

Caution!
Do not damage radiator fins!



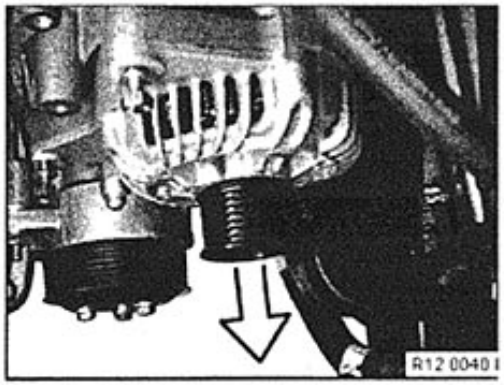
Unfasten oil filter screw connection on bracket and place oil filter to one side.
Mark sequence of ignition leads on the distributor cap and remove ignition leads from the distributor cap.
Place ignition leads (2) to one side.
Remove distributor cap,
refer to 12 11 096.



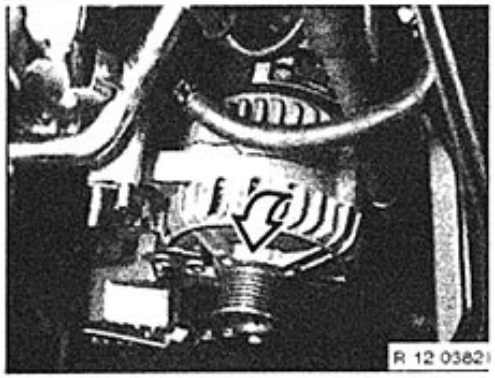
Replace alternator pulley:

Unfasten nut with special tool 12 7 110, bracing alternator shaft with internal hex wrench or internally-splined wrench.

Installation:
Tightening torque,
refer to Technical Data 12 31 3AZ.

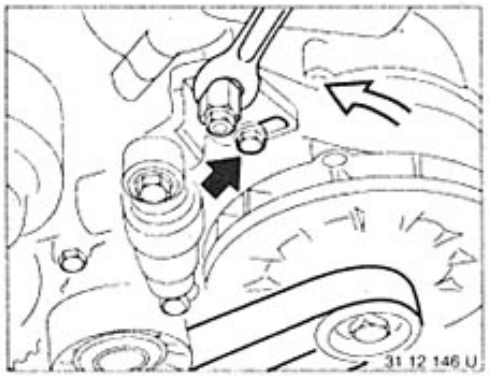


Pull out alternator.



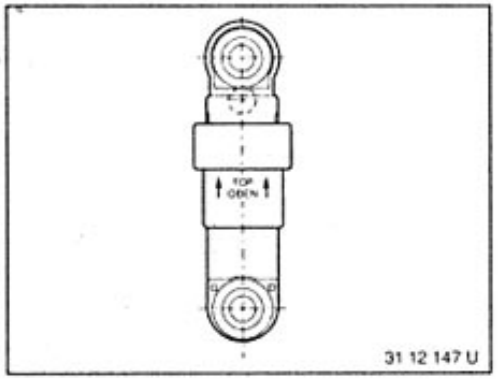
Screw alternator into radiator shroud. Remove alternator by lifting upwards.

Caution!
Avoid damage to radiator fins!



12 31. . . Tension vee-belt

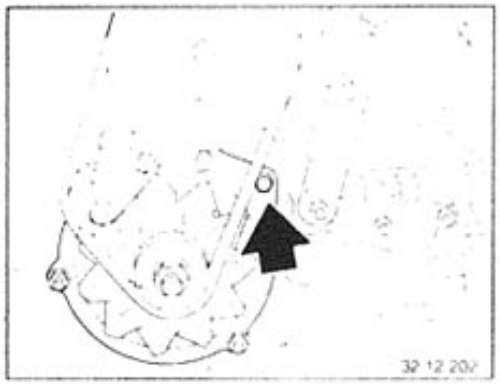
Tension clamping fixture using open-end wrench until screw in long slot is firmly abutted.
Tighten screw.
At this point, hydraulic belt tensioner is O.K.



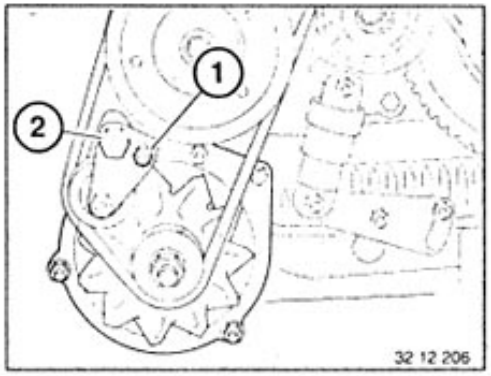
Note:
The hydraulic belt tensioner is filled with oil: always store removed elements horizontally. Incorrectly mounted elements can usually be bled by compressing several times in succession.

12 31 030 Removing and installing or replacing auxiliary alternator

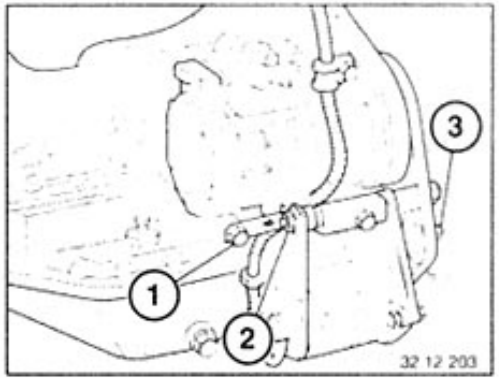
Note General Data Gr. 61 00.
Unfasten battery ground wire.
Installation:
Below the air conditioning compressor.
Unfasten ground strap from engine support.
Remove splash guard from below engine.



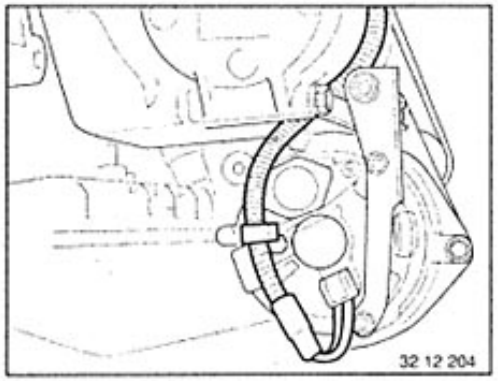
Unfasten retaining screws.



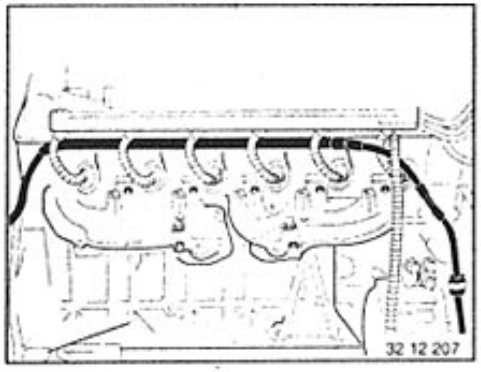
Loosen tensioning roller.
Remove Vee belt.



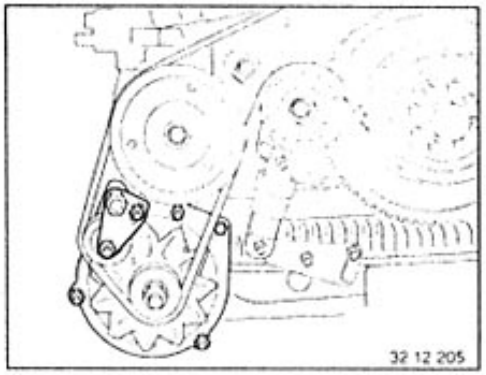
Unfasten retaining screws.
Pull complete alternator downwards to remove.



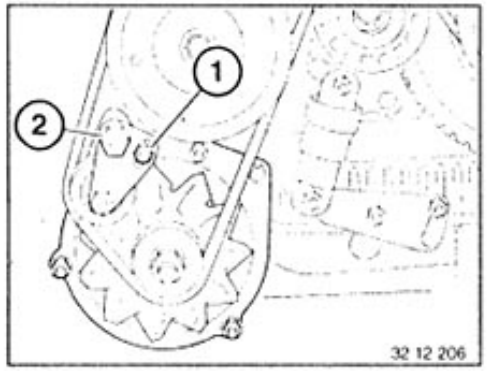
Unfasten retaining screws on lines.
Remove connector.
Remove lines.



Line routing below ignition leads on cylinders 1...6.



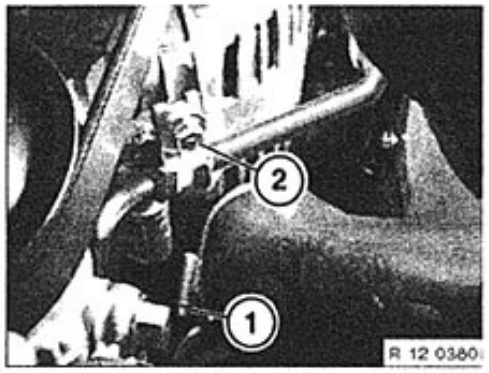
12 31 . . . Tension vee-belt for auxiliary alternator



Unfasten screws (1) and (2).
Twist outside hex head (2) on bracket of tensioning roller to 10 Nm and secure with screws (1) and (2). Vee belt is then at correct tension (preload).

12 31 230 Removing and installing / replacing bearing block on alternator (M73)

Refer to,
Repair Instructions for 7 Series E38.

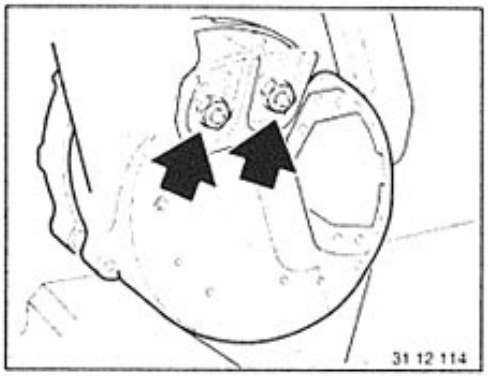


12 31 400 Replacing cooling air guide on alternator (M73)

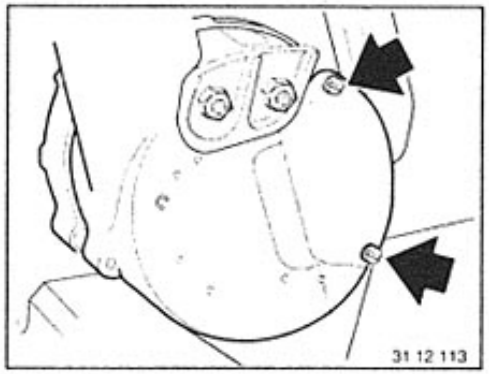
Unfasten hose clip (1) and remove cooling air guide from alternator. Unclip cooling air guide from brake air duct and remove.

12 32 000 Removing and installing or replacing regulator switch

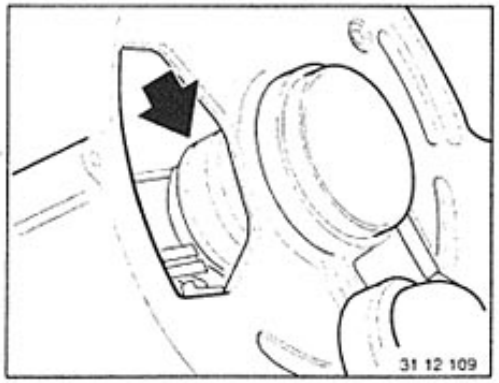
Disconnect ground wires from battery.



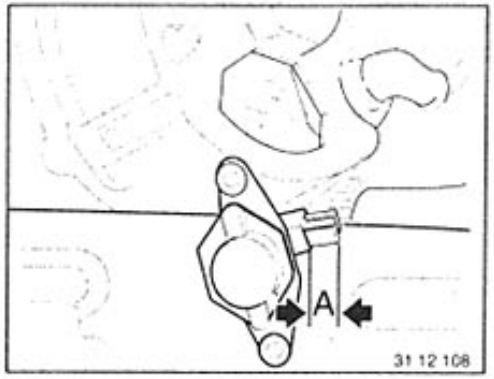
Remove 3-phase alternator, refer to 12 31 020.
Remove cover.



Unfasten screws.
Remove voltage regulator.



Check slip ring for wear and rework if necessary, refer to Construction Group Repair Manual 12 31 200.



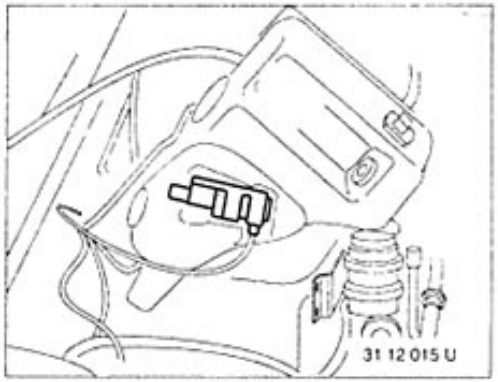
Installation:
Clean contact faces and check preload on contact springs, bending again if necessary.

12 32 501 Replacing regulator switch for alternator (M73)

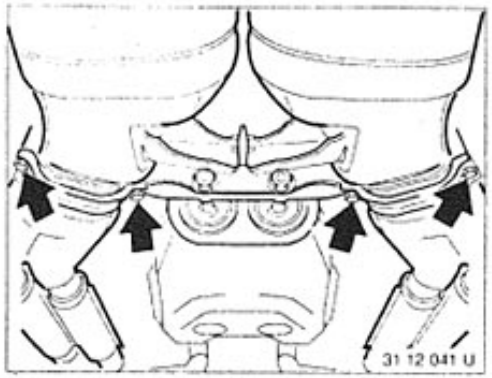
Refer to
Repair Instructions for 7 Series E38.

12 41 020 Removing and installing or replacing starter motor (M 70, S 70)

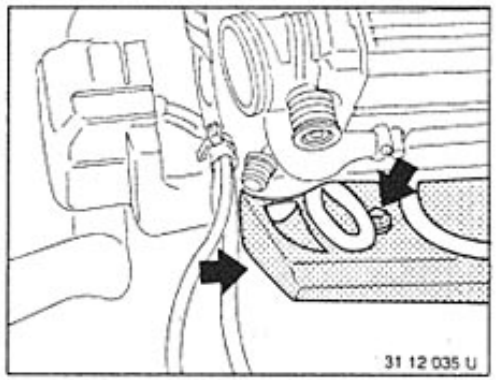
Interrogate fault memory.
Remove battery ground leads
Unless otherwise stated, the same operations apply to both automatic and manual transmissions.



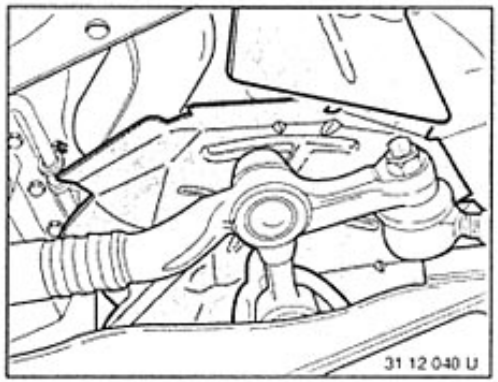
Place container to one side.



Unfasten exhaust system from transmission bracket, loosen intermediate rubber mount and remove complete exhaust system.

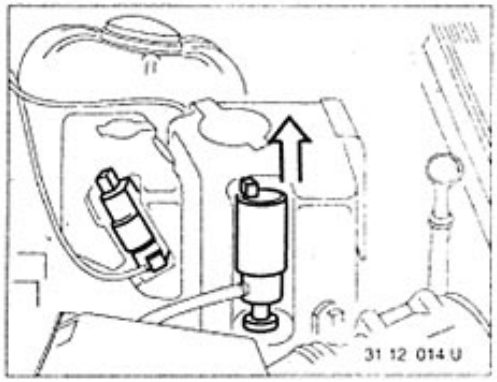


Remove heat shield from intake manifold.
Remove leads from starter support point.
Tightening torque 12 41 4AZ*



Remove heat shield from pivot lever.

Remove hoses from manifold
First remove the front tube, then the rear tube by lifting upwards.
Observe assembly instructions for Group 18.

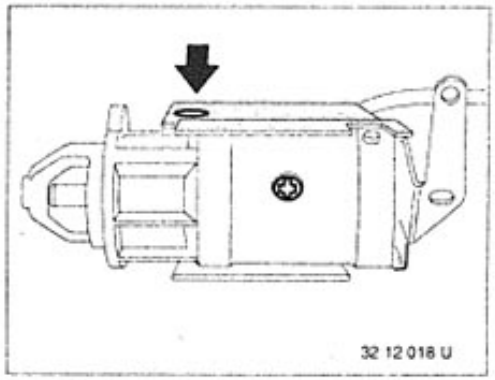


Empty water container for SRA, remove pump and place to one side.

Automatic transmission:
Extend the tool.

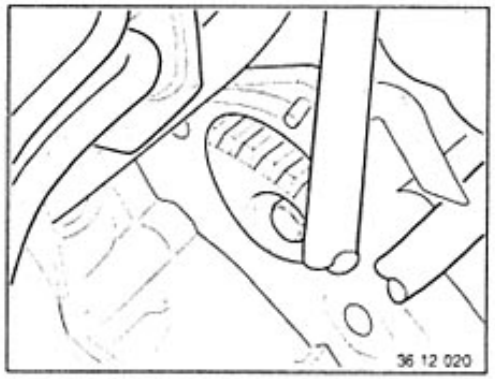
* Refer to Technical Data

Automatic transmission:
Unfasten the upper starter retaining screw.
Install tool between firewall and wiring harness of E box from above.



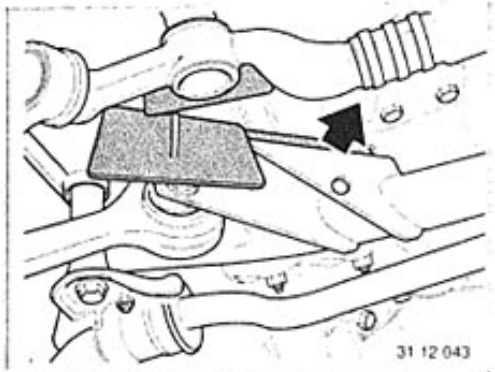
Remove starter motor by pulling downwards.
Remove heat shield.
Remove bracket.

Unfasten upper starter screw.
Remove screws from above (direction of manifold).

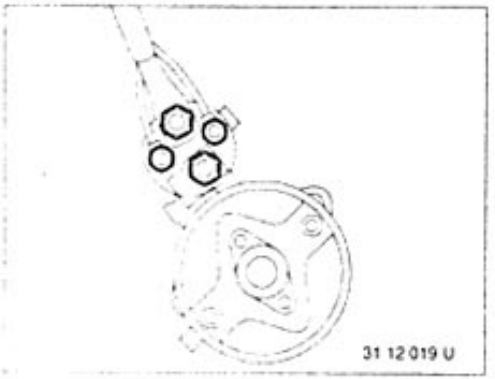


Check pinion of starter motor and starter gear ring on flywheel for signs of damage.

Note:
For additional troubleshooting notes and instructions on dismantling the starter motor, see Construction Group Repair Instructions for Group 12.

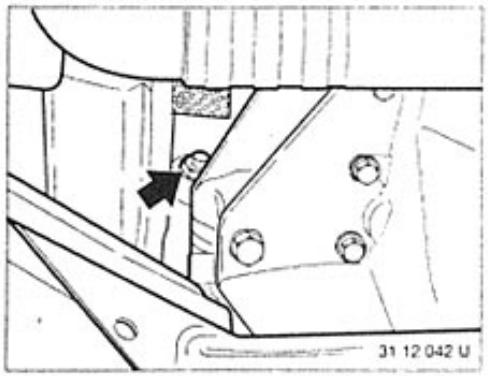


Manual transmission:
Unfasten upper starter screw from underside of vehicle.

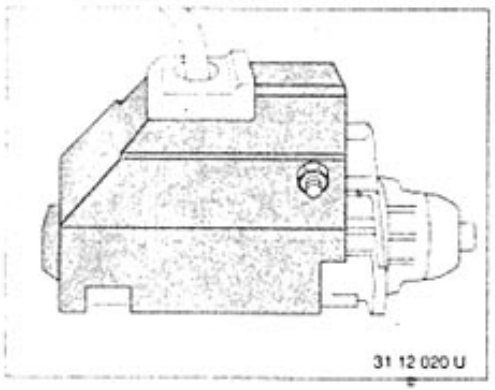


Installation:
Note correct position when installing the starter lead, otherwise it is not possible to install the heat shield.

First insert front tube from below.
Note installation location of screws and springs. For subsequent procedure, see Group 18.

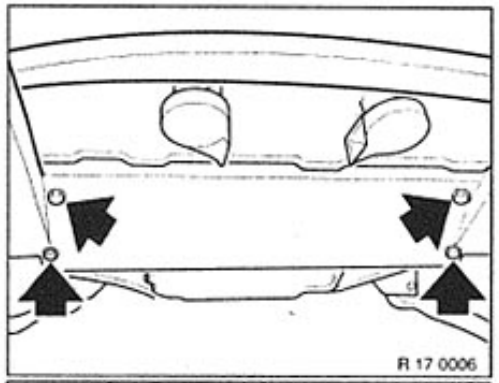


Unfasten bracket from engine mount.
Unfasten screw from underside of starter motor.

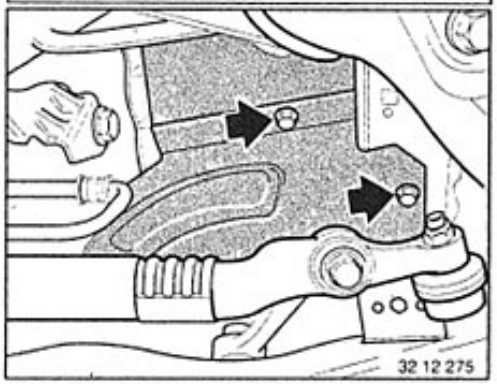


12 41 020 Removing and installing or replacing starter motor (M 60)

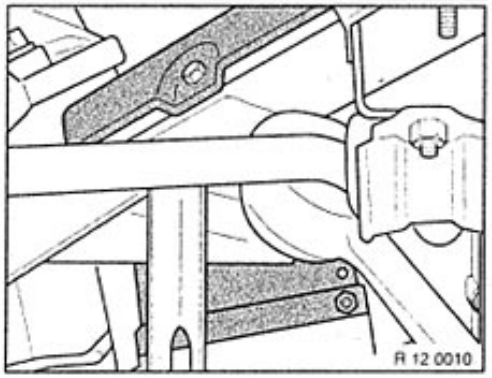
Note General Information for Group 12-0.
Disconnect battery ground lead.

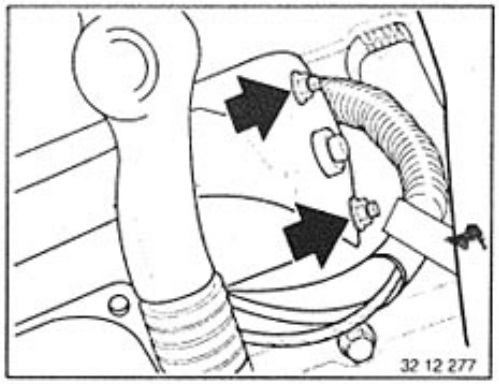


Remove underbody protection for assemblies.

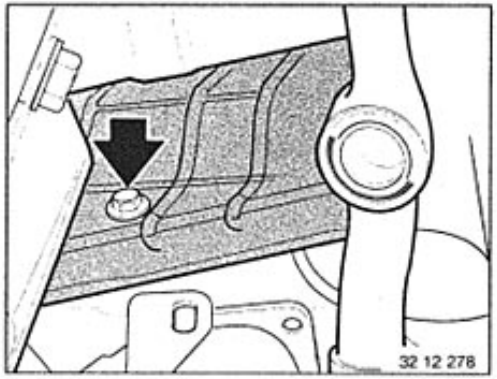


Remove right heat shield.
Unfasten screws.

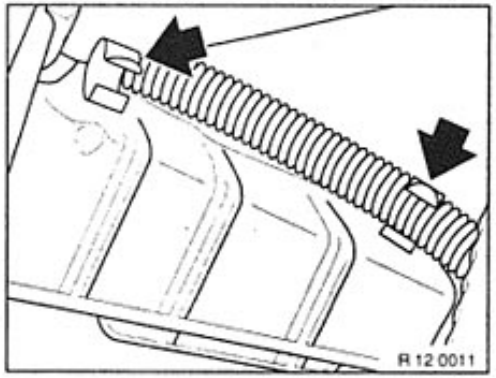




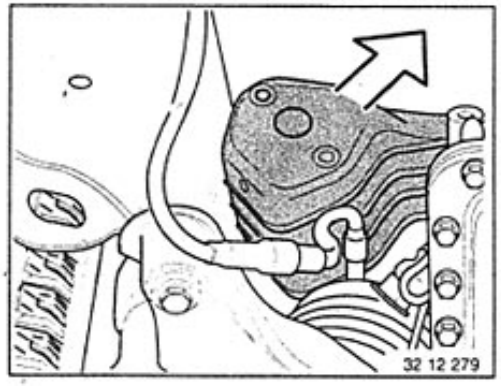
Unfasten screws.



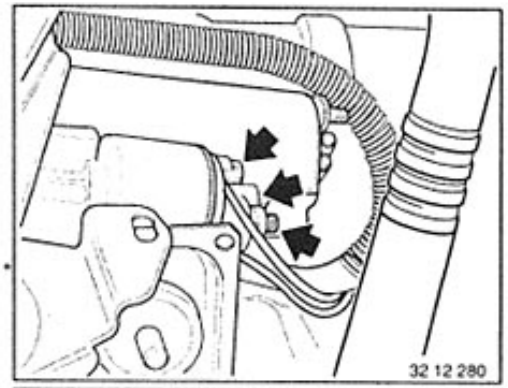
Unfasten screw.
Remove heat shield from starter motor.



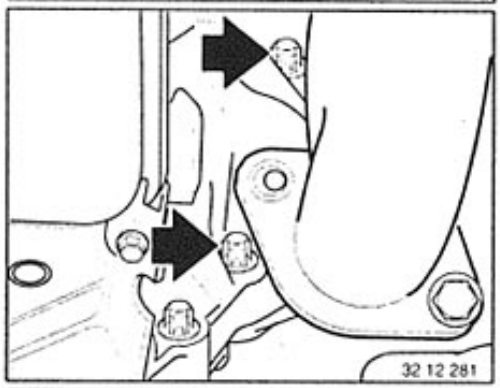
Unclip starter lead from heat shield.



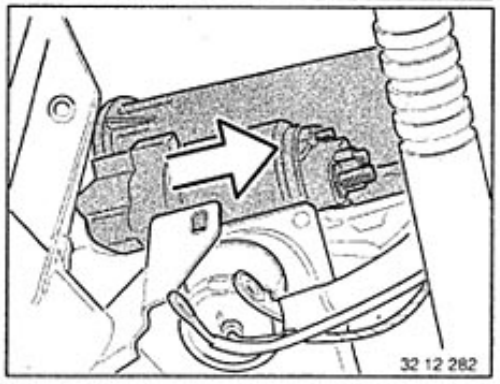
Remove heat shield from below between front axle carrier and reinforcement cross.



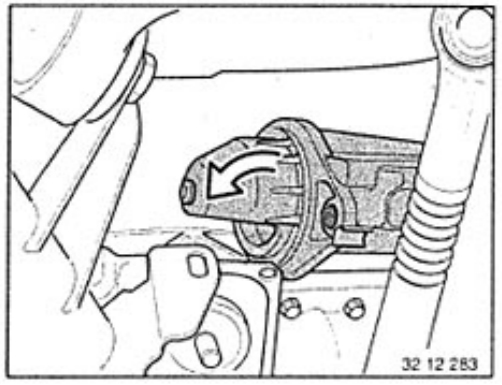
Unfasten screw connection for starter motor lead.
Tightening torque 12 41 4AZ*



Unfasten screws.
Tightening torque 12 41 1AZ*

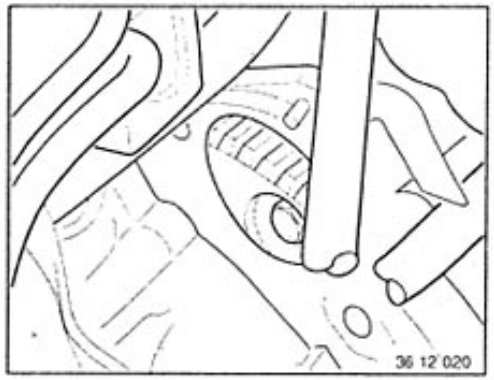


Remove starter motor from gear ring.



Remove starter motor from below between front axle carrier and reinforcement cross.

* Refer to Technical Data



Check starter motor pinion and starter gear ring on flywheel for signs of damage.

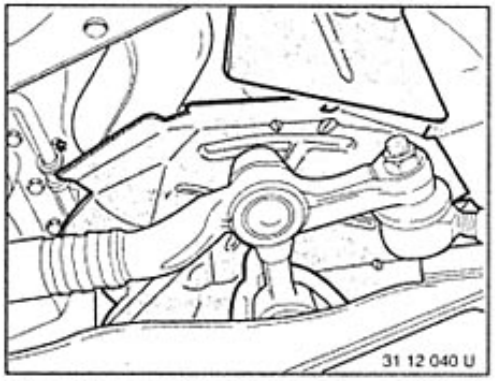
Note:
For additional troubleshooting notes and instructions on dismantling the starter motor, see Construction Group Repair Instructions, Group 12.

12 41 020 Removing and installing or replacing starter motor (M73)

Follow instructions on disconnecting and connecting battery, refer to General Data MG 12.

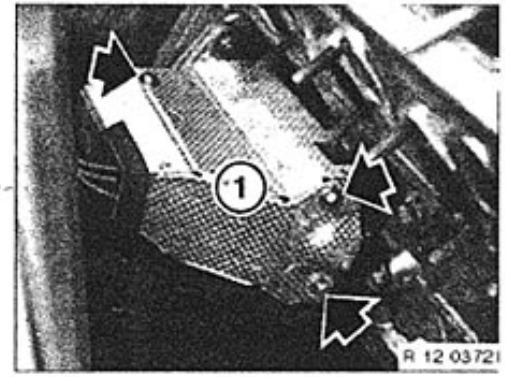
Switch off ignition.

Disconnect battery ground leads.

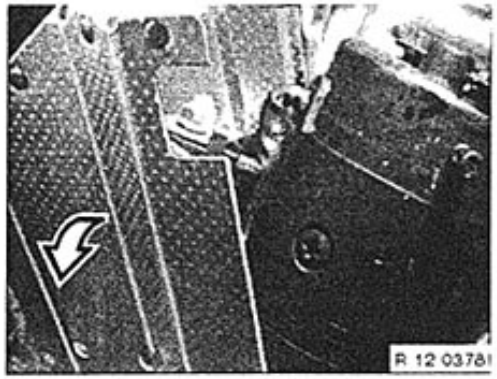


Remove heat baffle plate.

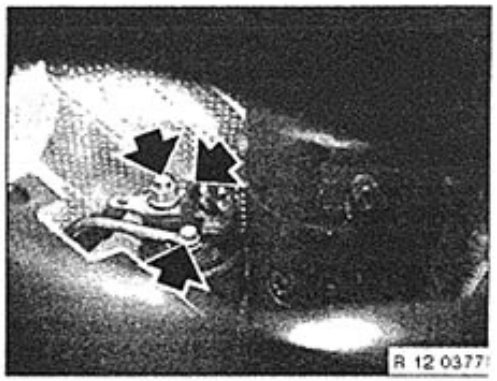
Remove right exhaust pipes.



Unfasten top screw and back screw from heat baffle plate on starter motor (illustrated here from above).

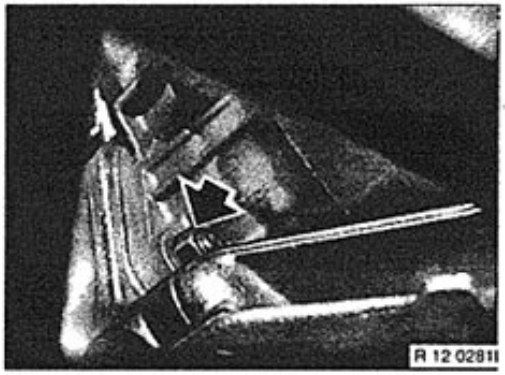


Unfasten lower screw in heat baffle plate and swivel heat baffle plate to one side.



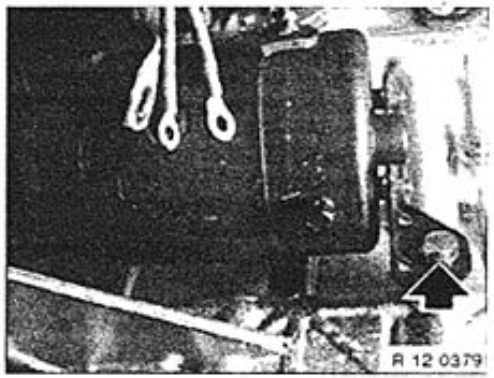
Unfasten connections on starter motor.

Installation:
Tightening torque,
refer to Technical Data 12 41 4AZ



Unfasten top and lower nuts on starter motor.

Installation:
Tightening torque,
refer to Technical Data 12 41 1AZ



Support bracket on crankcase: unfasten screw. Remove support bracket.
Remove starter motor from transmission mount.

Installation:
Check starter pinion for damage.
Check starter crown wheel on flywheel for signs of damage.

Note:
A troubleshooting operation on starter motor and its peripherals is described in Construction Group Repair Instructions MG 12.

12 41 041 Replacing engagement magnet switch

Refer to
Repair Instructions for 3 Series E36.

12 41 103 Dismantling and assembling starter motor

Refer to
Repair Instructions for 3 Series E36.

12 41 551 Replacing carbon brushes on starter motor

Refer to
Repair Instructions for 3 Series E36.

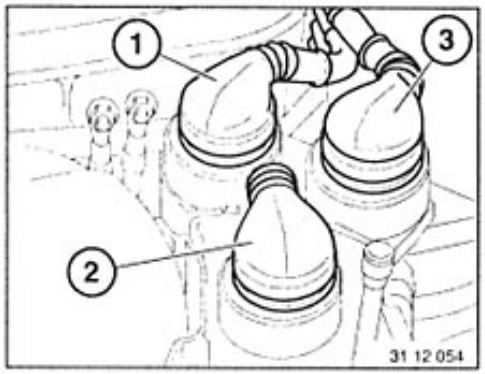
12 70 000 Function check of Electronic Engine Power Control (EML) (M73)

Connect up DIS and interrogate fault memory.

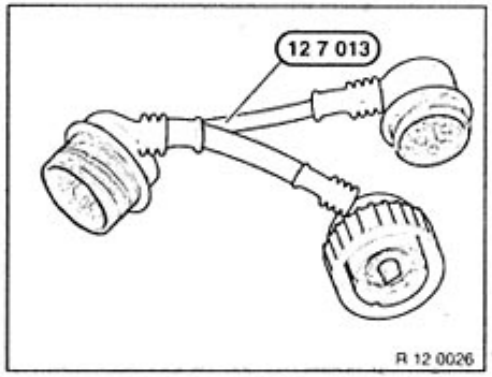
Note:
After each time the accelerator sensor is disconnected, perform a basic adaptation check of accelerator sensor. Procedure in accordance with DIS instruction.

12 70 500 Checking safety path of Electronic Engine Power Control (EML) (M70)

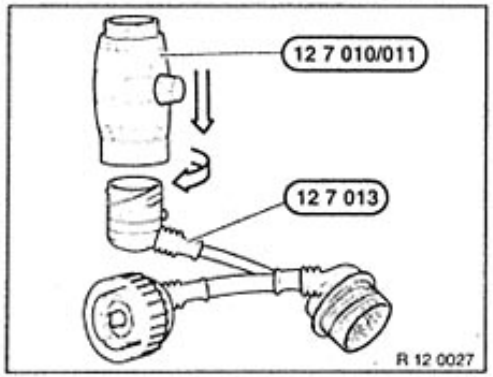
Note:
Before fitting test adapter to EML – interrogate fault memory.



1 = Plug connection DME 1
2 = Plug connection DME 2
3 = EML plug connection



Switch off ignition. Unfasten EML plug connection.
Fit test adapter 12 7 013.



Connect test adapter 12 7 013 to test adapter 12 7 010/011.
Connect BMW Service Tester (to measure engine speed).

Test sequence:
Regulate test adapter 127 010/011 in center position "-".
Disconnect gear (idle setting).
Start engine.
Govern idle speed to approx. 2000 rpm with the knurled knob on the test adapter.
Then depress footbrake immediately.
The engine speed must fall to idle speed "immediately".
If this happens, the safety path is OK.
On vehicles with a manual transmission, repeat the test with the clutch pedal.

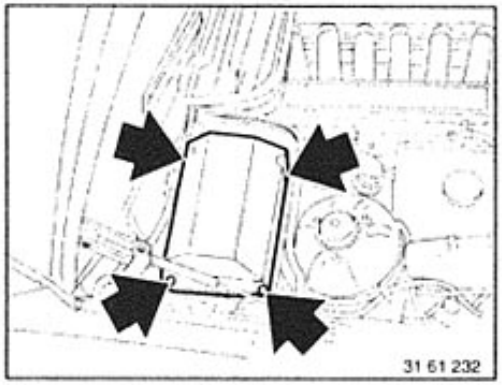
For notes on troubleshooting, see Electrical Troubleshooting Manual.

Switch off ignition.
Remove adapter.
Reinstall connector.

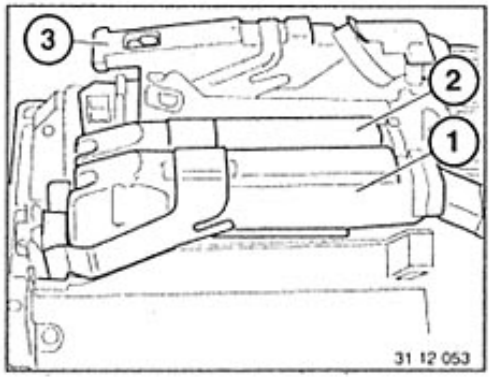
Note:
Interrogate fault memory.
Check faults in memory and rectify them.
Cancel fault memory.

12 71 530 Replacing control unit for Electronic Engine Power Control (EML)(M70)

Note instructions on removal and installation of electronic control units, refer to General Data MG 12.



Unfasten screws in cover of electronics box. Remove cover.

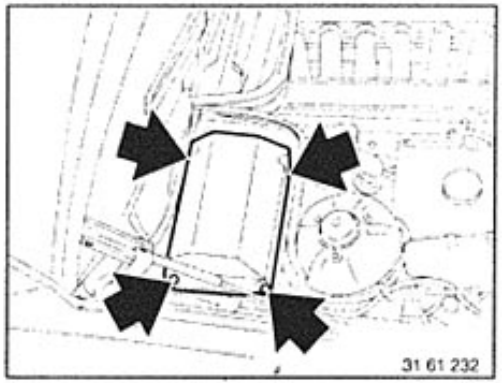


1 = DME control unit 1
2 = DME control unit 2
3 = EML control unit

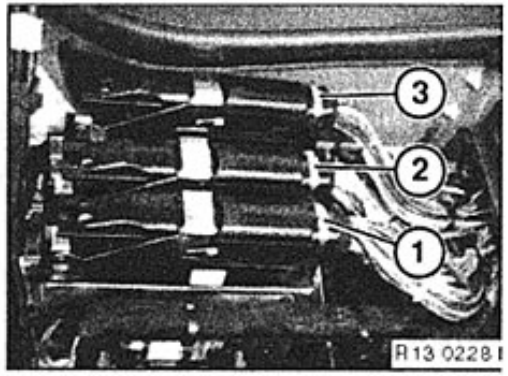
Caution!
After replacement of the EML control unit, always perform the following test:
Check safety path of the Electronic Engine Power Control. Procedure described in Repair Instructions 12 70 500.

12 71 530 Replacing control unit for Electronic Engine Power Control (M73)

Note instructions on removal and installation of electronic control units, refer to General Data MG 12.



Unfasten screws in cover of electronics box. Remove cover.

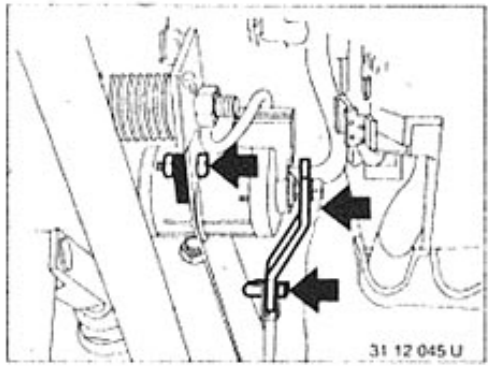


1 = DME control unit 1
2 = DME control unit 2
3 = EML control unit

Caution!
After replacement of EML control unit, always note:
Connect up DIS and follow procedure for replacing control unit.

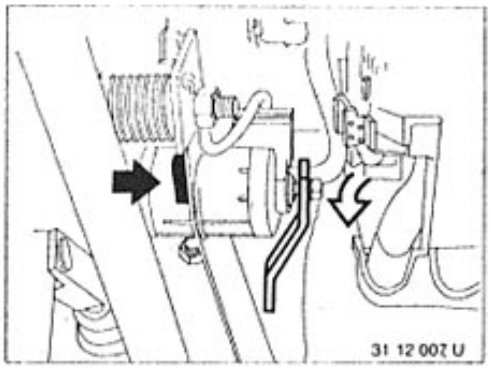
12 72 520 Removing and installing or replacing accelerator sensor (M70, S70)

Switch off ignition.
Remove trim from bottom left side of instrument panel.

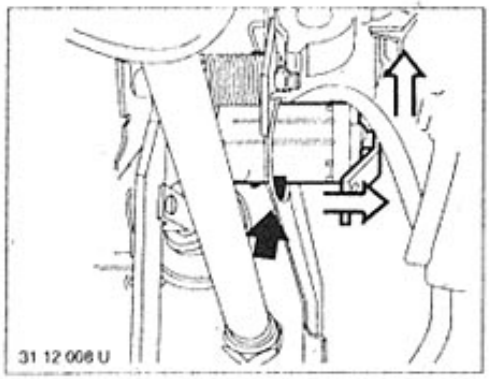


Remove accelerator sensor:
Disconnect lever from accelerator pedal.
Unfasten lever on accelerator sensor and pry off carefully.
Unfasten both screws.
Disconnect plug connection.

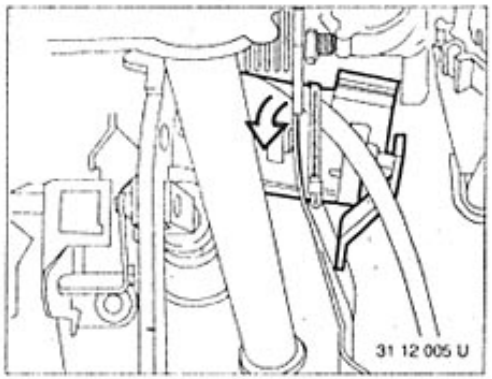
Caution!
Accelerator sensor must not be subjected to load in axial direction: this can cause premature damage to accelerator sensor.



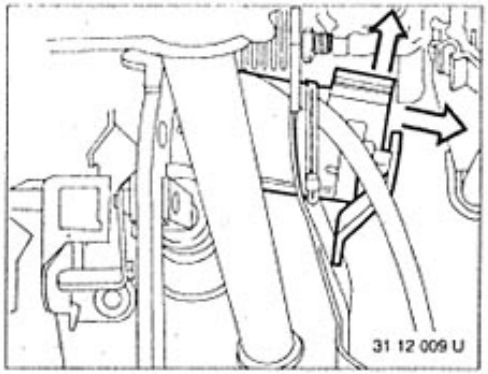
Rotate accelerator sensor approx. 45° counterclockwise to enable the front retaining lug to be withdrawn from the oval aperture in the pedal block.



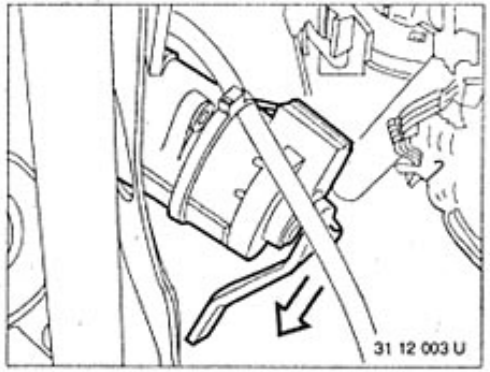
Withdraw retaining lug. Press accelerator sensor slightly towards acoustic insulation and pull out.



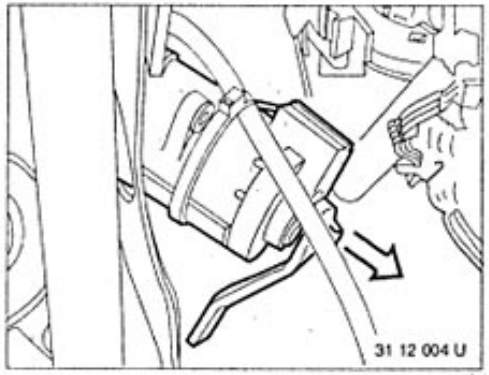
Rotate accelerator sensor clockwise until retaining lug can be withdrawn through aperture.



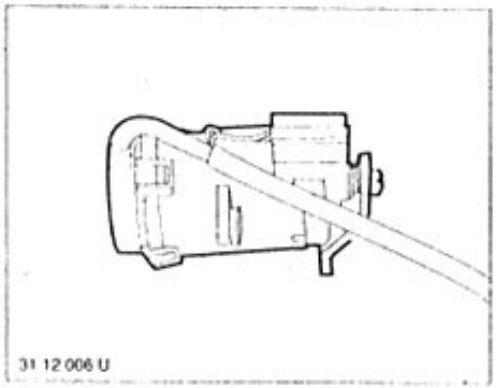
Press accelerator sensor upwards into acoustic insulation, to enable the 2nd retaining lug to be withdrawn from the pedal block.



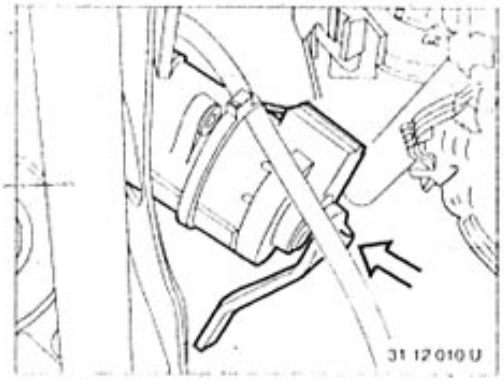
Rotate accelerator sensor approx. 60° counterclockwise, tilt obliquely downwards towards heating pipes and pull down to remove.



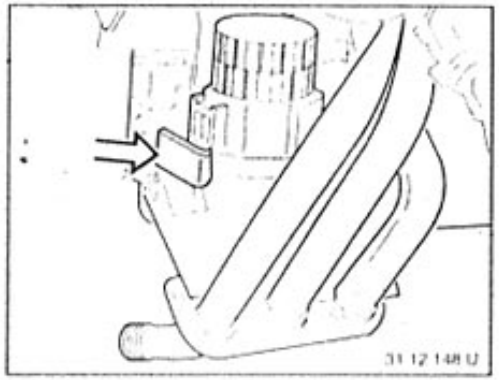
Rotate accelerator sensor in such a way that lugs are realigned over hole pattern in bracket.



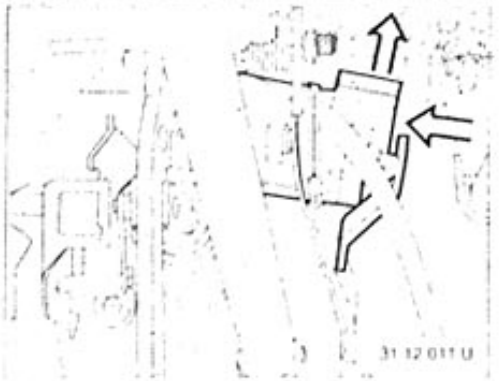
Installing Pedal Value Sender:
Installation will be easier with the lead of the pedal value sender positioned as shown.



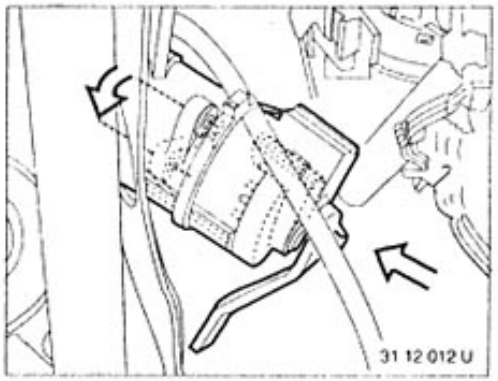
Work in pedal value sender that the electric lead outlet is inclined past the heater pipes.



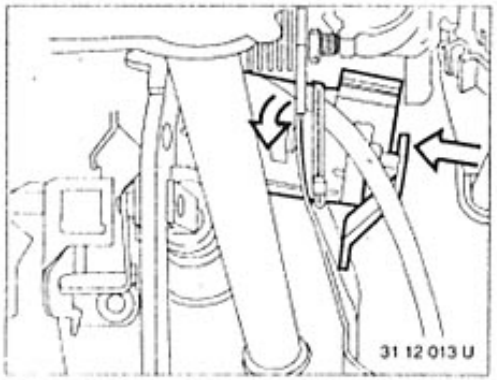
Bend clip of heater mounting screw away.



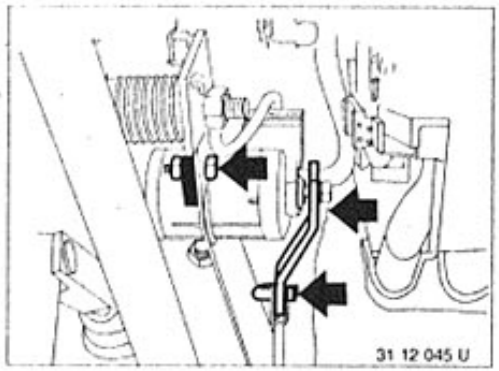
Press pedal value sender forward at an angle in direction of the firewall.
Work rear end of the pedal value sender into the pedal console.



Turn pedal value sender clockwise until the front mounting eye is on the oval opening.
Press pedal value sender up into the noise insulating sheet.
Work in eye.



Turn pedal value sender until the second mounting eye is above the oval opening.
Work in eye.



Install bolts.
Mount arm.
Secure lead with wire strap.
Tightening torque*.

Important!
Pedal value sender must not be loaded in axial direction, as pedal value sender could be damaged in advance.

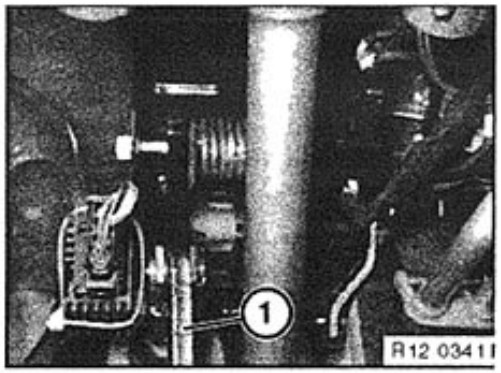
Mount plug.
Adjusting and Checking Function of Pedal Value Sender:
See Adjusting Accelerator Pedal in 12 72 ....
Check safety path – see 12 70 500.

See Specifications

12 72 520 Removing and installing or replacing accelerator sensor (M73)

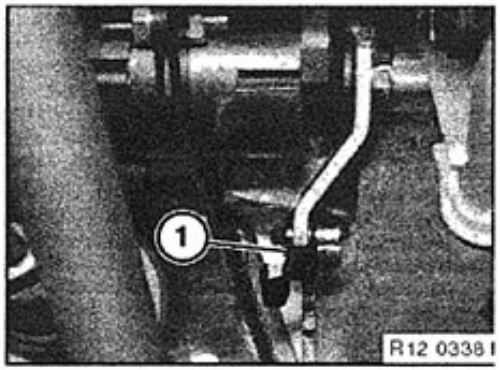
Switch off ignition.

Remove trim from bottom left side of instrument panel.

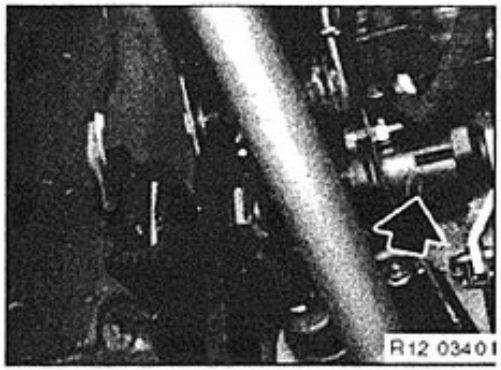


Remove brake pedal (1) from push rod, unfasten lock nut on push rod and remove push rod.
Removing and adjusting push rod, refer to 35 21 000.

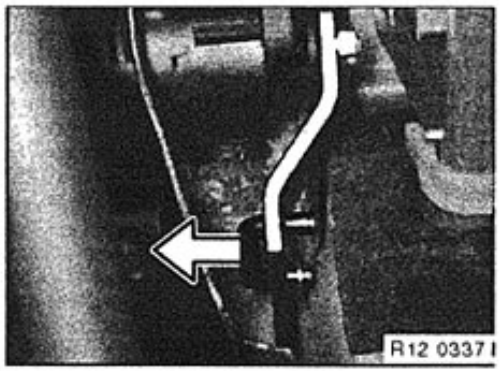
Note:
Whenever the accelerator sensor (PWG) is disconnected, basic adaptation of the accelerator sensor is required.
Procedure: Connect up DIS and select diagnosis option on EML IIIS control unit then proceed in accordance with DIS instructions.



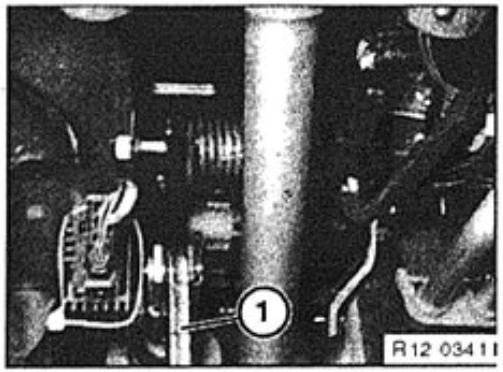
Unfasten retainer (1) from accelerator pedal linkage.



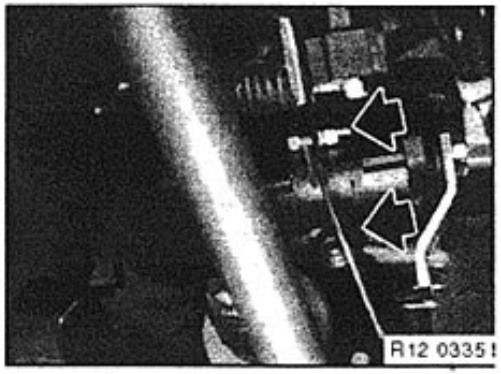
Installation: The accelerator sensor is mounted on the pedal block below the steering column.



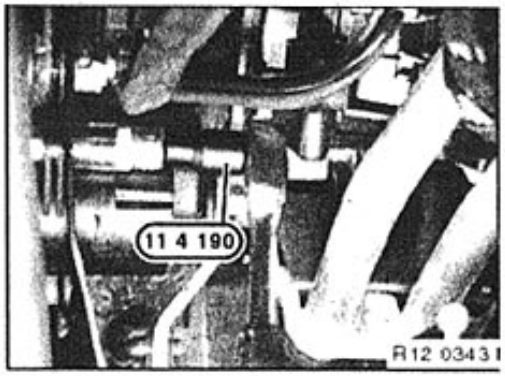
Disconnect linkage.



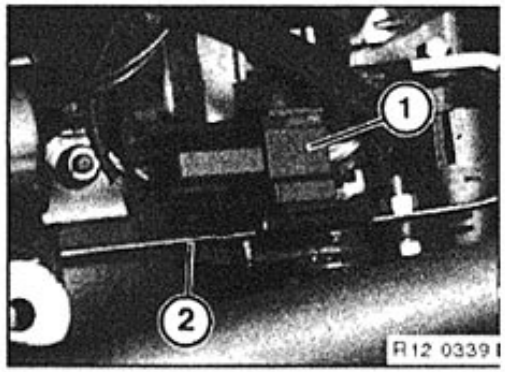
Unfasten cable tie (1) and remove brake light switch (2), refer to 61 31 310.



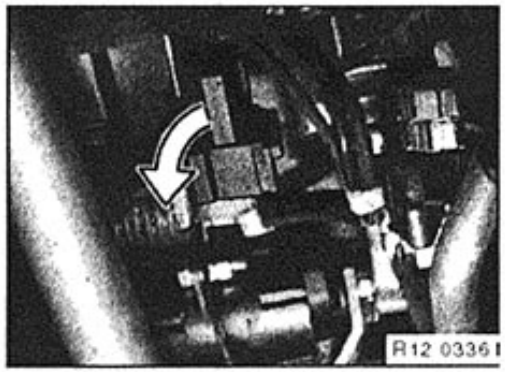
Unfasten screws on accelerator sensor with special tool 11 4 190.



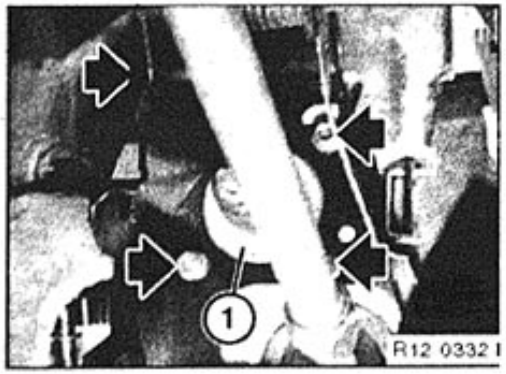
Unfasten screws on accelerator sensor with special tool 11 4 190.



Disconnect plug connection (1).

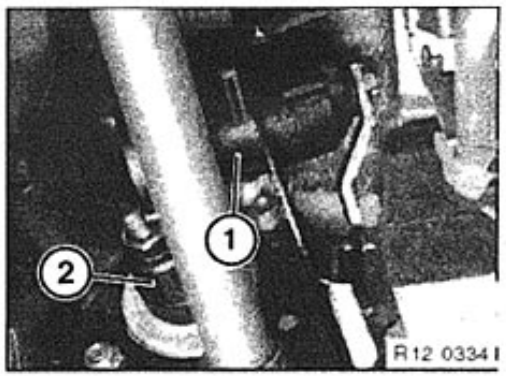


Unscrew plug connection to remove from bracket in pedal block.

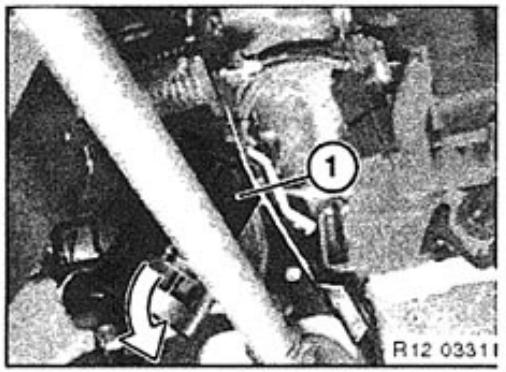


Loosen nut on pedal block to enable the brake unit (1) to be pressed approx. 5mm back into engine compartment.

Installation:
Replace self-locking nut.
Tightening torque, refer to Technical Data MG 35.

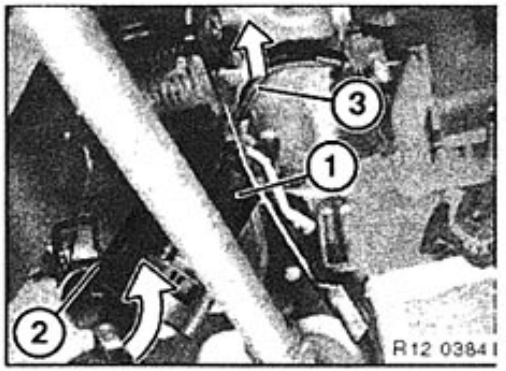


Press brake unit (2) approx. 5mm back into engine compartment and remove accelerator sensor (1).

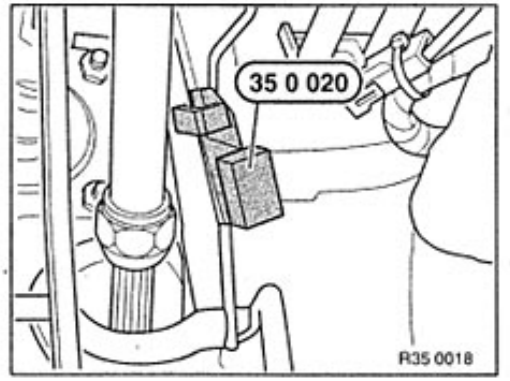


Remove accelerator sensor (1).

Caution!
Lever on accelerator sensor is preset by the factory and must not be unfastened!
If the lever on the accelerator sensor has been unfastened, the complete accelerator sensor must be replaced!

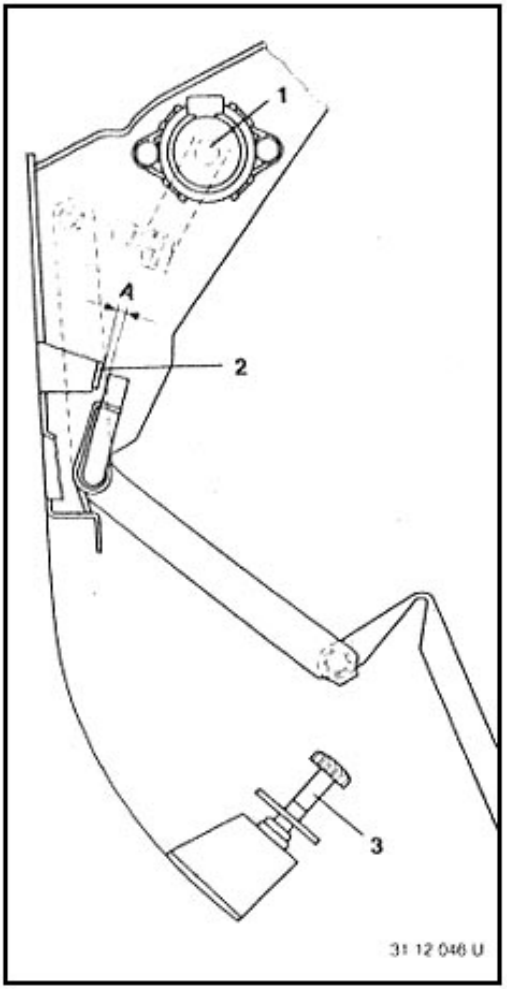


Installation:
First insert wiring harness (3) and ensure, when assembling the accelerator sensor (1), that the wiring harness is in the upper section of the aperture.
Insert accelerator sensor (1) between steering column and bracket for brake light switch, pressing pedal block approx. 5mm backwards when doing so.



Checking adjustment of switch,
refer to 35 41 480.

Installation:
After assembly of accelerator sensor, a basic adaptation procedure for the accelerator sensor must be run.
Procedure: Connect up DIS and select diagnosis mode for EML-IIIS control unit then follow subsequent procedure in accordance with DIS instruction.



12.72 550 Checking and adjusting accelerator sensor kinematics (M70)

1. Idle speed setting

Loosen hex nut (1) on accelerator sensor.
Provide a gap of A = 3 mm between accelerator pedal and idle detent (2)
(insert feeler gauge or similar item between them).
Tighten hex nut (1) on accelerator sensor (tightening torque *). Support accelerator sensor when tightening lever.

2. Full throttle setting

a) Manual transmission:
move accelerator pedal to kick-down pressure point in accelerator sensor.
In this setting, move knurled screw (3) firmly up against accelerator pedal and secure with lock nut.

b) Automatic transmission:
Actuate accelerator pedal to kick-down pressure point in accelerator sensor. In this setting, adjust knurled screw (3) with gap of 6 mm between knurled screw and accelerator pedal.
Lock off knurled screw.

Caution!
After adjustment, check accelerator sensor with diagnosis tester. Connect up tester, switch on ignition and move accelerator pedal to full throttle setting. Compare actual voltage value displayed by tester with nominal value and, if necessary, correct the setting.
Nominal value:
a) manual transmission: 3.15 ... 3.3 V
b) automatic transmission: 3.7 ... 3.8 V

Nominal value: Idle speed = min 353 mV
Idle speed = max 451 mV

Check safety path, refer to Gr. 12
Pos. 12 70 500
Note:
Before fitting test adapter – interrogate EML fault memory.

*Refer to Technical Data

On-board Diagnosis

The DME control unit recognizes exhaust relevant faults and displays them by lighting up the "Check Engine" control lamp continuously.
Check Engine control lamp – see Group 62. The fault lamp comes on after turning on the ignition and goes out when the engine runs. It is on continuously while the engine is running, if there is a fault.

Flashing codes help in locating faults precisely and eliminating them.

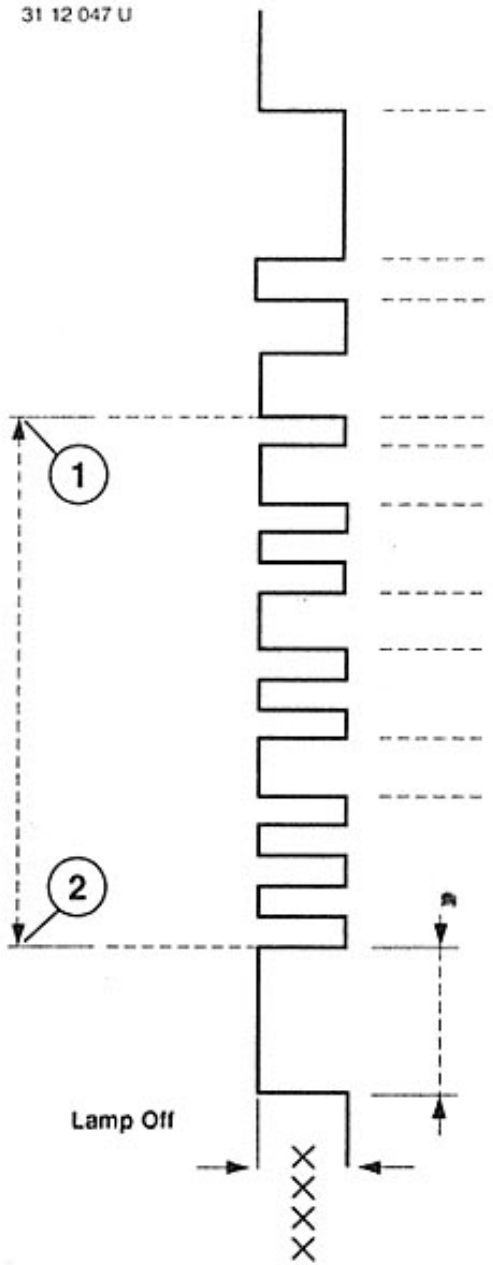
Fault Output:
Activate flashing code output: ignition ON, operate full load contact 5 times within 5 seconds.
Fault output begins.
See sample fault: faulty NTC coolant – code 1223.

1 = Start of fault code

2 = End of fault code

Note:
Each additional call must be activated again.
Code X444 - fault no longer stored.
Code X000 (long dark phase) - after fault output = end of output.

Sample Fault Code: NTC Coolant
Code 1223



5 times full load stop within 5 sec. with ignition ON

5 s Lamp ON

0.5 s Lamp OFF
2.5 s Lamp ON

2.5 s Lamp OFF

Flash 1 - 2 times*

2.5 s Lamp OFF

Flash 1 - 8 times
Note number

2.5 s Lamp OFF

Flash 1 - 8 times
Note number

2.5 s Lamp OFF

Flash 1 - 8 times
Note number

2.5 s Lamp OFF

Lamp ON

Two times for M 70
Left cylinder bank

TABLE OF FAULT CODES FOR DME 1.7

Code	Fault Branch
x111	Ignition
x211	Control unit (self test)
x215	Air mass sensor
x221	Oxygen sensor
x222	Oxygen control
x223	NTC coolant (see fault example)
x224	NTC intake air
x231	Monitor of bat. voltage supply to contr. unit
x251	Injector final stage 1 (cylinders 2,4,6)
x252	Injector final stage (cylinders 7,9,11)
x261	Elec. fuel pump relay final stage
x263	Tank venting final stage
x264	Relay 3 final stage (oxygen sensor heating)
x268	Idle speed, CO potentiometer
x278	Ignition timing correction
x512	AC compressor shutoff
x513	Final stage pin 18
x515	Converter lockup clutch
x516	Speed signal
x517	MSR signal
x518	ASC signal
x818	Final stage

Remarks:
FL = Fault lamp
VL = Full load

Table 1: CARB Flashing Code Scope

Remarks:
x= 2 for M 70 control unit of left engine side
(cyl. 7 ... 12)
x= 1 for M 70 control unit of right engine side
(cyl. 1 ... 6) and all other engines

Fault memory empty: code x444

Fault memory cancellation: versions.

1. Disconnect DME control unit on power supply by, for example, unplugging the control unit.

2. Put out cancel fault memory command with a BMW SERVICE TESTER (see car electric/electronic test plan).

3. Reactivate with ignition "ON" while flashing code x000 is being put out; close (make) the full load switch 10 seconds.

13 Fuel System

Fuel System .....
Fuel System M60 .....

13 Fuel system

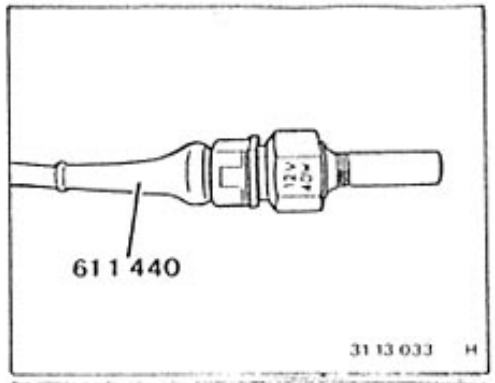
13 00 002	Function check of Digital Motor Electronics (DME)	13- 0/1
. . .	Component test	13- 0/1
	Checking coolant temperature sensor	13- 0/1
	Checking intake air temperature sensor	13- 0/1
	Tank vent valve – check	13- 0/1
054	Engine idle and exhaust contents – check	13- 0/2
060	Engine idle and exhaust contents – check	13- 0/3
13 31 029	Fuel pump delivery pressure – check	13-31/1
029	Delivery pressure of fuel pump – check (M73)	13-31/2
	Summary of fuel filter and lines	13-32/1
13 32 051	Fuel filter – replace	13-32/1
051	Fuel filter – replace (M73)	13-32/2
13 51 199	Fuel pressure regulator – check	13-51/1
630	Fuel pressure regulator – replace	13-51/1
630	Fuel pressure regulator – replace (M73)	13-51/2
13 54 535	Throttle body – replace	13-54/1
13 61 000	Control unit (for DME) – remove and install or replace	13-61/1
13 62 511	Temperature sensor for intake air	13-62/1
531	Temperature sensor for coolant – replace	13-62/1
560	Mass air flow sensor – remove and install or replace	13-62/2
511	Temperature sensor for intake air – replace (M73)	13-62/3
531	Temperature sensor for coolant – replace (M73)	13-62/3
13 63 590	Fuel pump relay – replace (M73)	13-63/1
	Summary of injection pipes with ancillary parts	13-64/1
13 64 541	All injection valves – replace	13-64/1
582	Injection valves – check for leaks and clean	13-64/3
541	All injection valves – replace (M73)	13-64/4
13 72 002	Both air filter inserts – replace	13-72/1
13 90 500	Tank vent valve – replace	13-90/1
	Arrangement of tank vent valves	13-90/1
. . .	Tank vent valve – check	13-90/2
500	Tank vent valve – replace (M73)	13-90/3

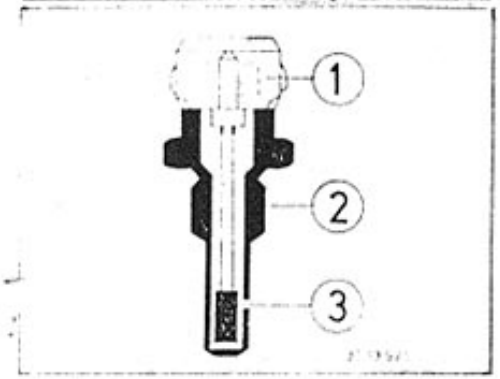
For additional work, refer to "Repair Instructions for 7 Series E38"

13 00 002 Function check of the Digital Motor Electronics (DME)

Connect up BMW Service Tester.
Carry out brief test.
Interrogate fault memories.
Interrogate status,
refer to: operating instructions for
BMW Service Tester/BMW diagnosing system

Additional information on troubleshooting, refer to:
Electrical Troubleshooting Manual file / Schematics folder





13 00 . . . Checking components

Checking coolant temperature sensor:

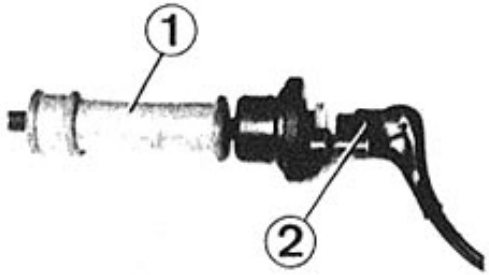
Attach Jetronic test cable 61 1 440.
Use ohmmeter to check nominal value*), to check the entire temperature range, remove the sensor, immerse in water bath up to hex head and check using an ohmmeter*.

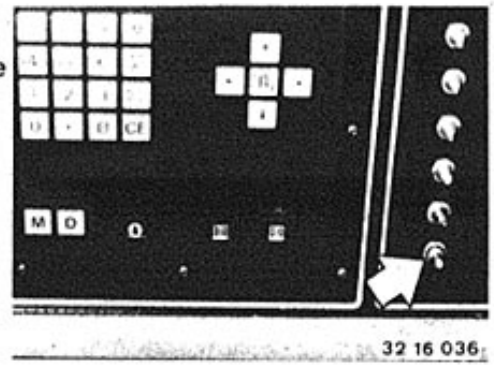
The temperature sensor measures engine temperature and transmits this to the control unit in the form of a resistance value.
The resistance value falls as temperature rises (NTC).
1 = plug connection
2 = housing
3 = NTC resistance

* Refer to Technical Data

Checking intake air temperature sensor:

Check resistance value* on temperature sensor. Check leads from control unit connector to temperature sensor connector for interrupts or short circuits**.





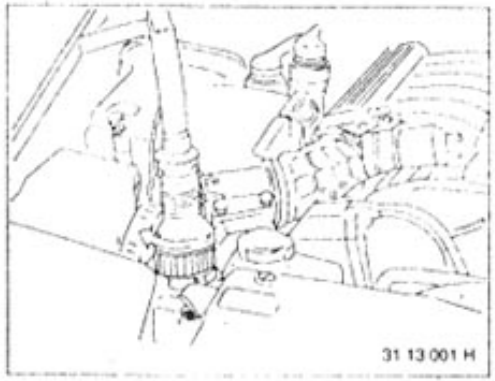
Checking tank vent valve

Attach vacuum hose (1) from BMW Service Tester to the 8 mm dia. neck.
Provide tank vent valve with 12 V voltage (2) (special tool 61 1 440).

Select multimeter function 21 on BMW Service Tester.
Set vacuum to 600 mbar - 100.
Switch off vacuum pump.

During the measuring period of approx. 20 seconds, pressure must not drop by more than 50 mbar.
When pressure losses exceed 50 mbar, a new tank vent valve must be fitted.

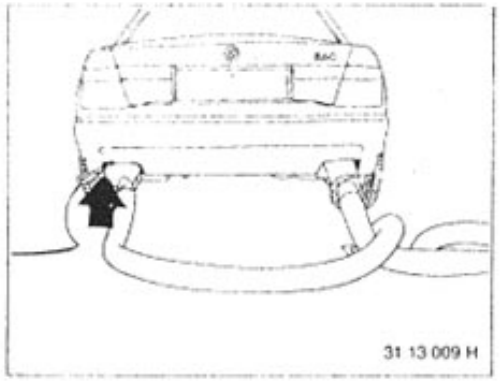
**) Refer to Schematics folder



13 00 054 CHECKING ENGINE IDLE SPEED AND CO LEVEL (M 70 Engines with M 1.7 Motronic) –Cars Prepared for Catalyst–

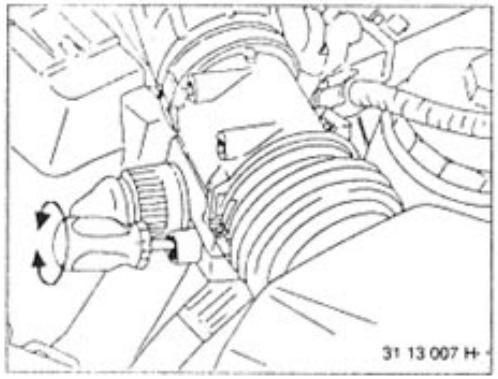
Adjusting Conditions:
Engine at operating temperature, i.e. oil temperature at least 60° C (140° F).
Engine and ignition in perfect condition.
BMW SERVICE TESTER connected to operating instructions.
Routine checking is not necessary.

1) Engine Idle Speed Checked with BMW Diagnosing System (Status Call)
Refer to calling faults in case of deviation from nominal value*.
Check intake system for leaks.



2) CO Level Test
Connect CO probe on exhaust tailpipe.
Switch off exhaust extraction systems for the time of testing.
Check idle speed CO level*, see operating instructions of BMW SERVICE TESTER or operating instructions of other tester.

Important!
Air mass sensor not on same side as tailpipe.

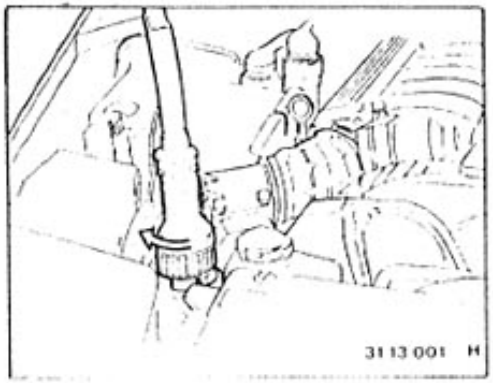


3) CO Level Correction
Remove anti-tamper lock.
Correct CO setting on the air mass sensor with a screwdriver, if necessary.

Note:
Read BMW self diagnosis before making corrections.

* See Specifications

* See Specifications



13 00 060 CHECKING ENGINE IDLE SPEED AND CO LEVEL (M 70 Engines with M 1.7 Motronic) – Cars with Catalyst –

Adjusting Conditions:
Engine at operating temperature, i.e. oil temperature at least 60° C (140° F).
Engine and ignition in perfect condition.
BMW SERVICE TESTER connected to operating instructions.
Routine checking is not necessary.

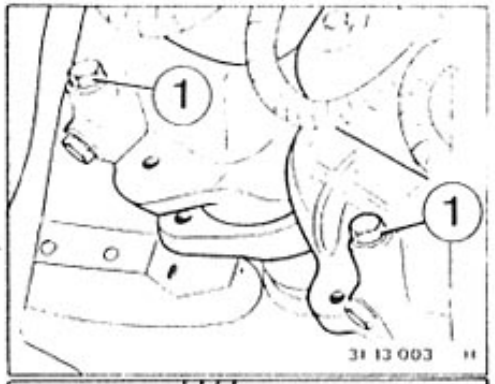


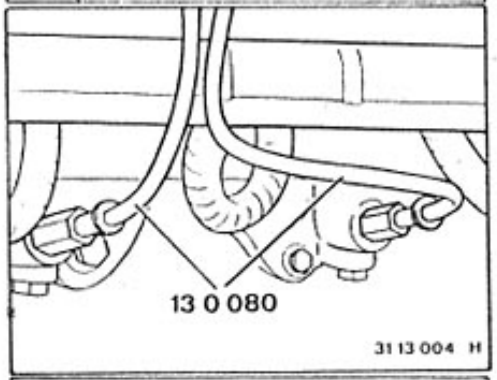
1) Engine Idle Speed* Checked with BMW Diagnosing System (Status Call)
Call faults in case of deviation from the nominal value.
Check intake system for leaks.

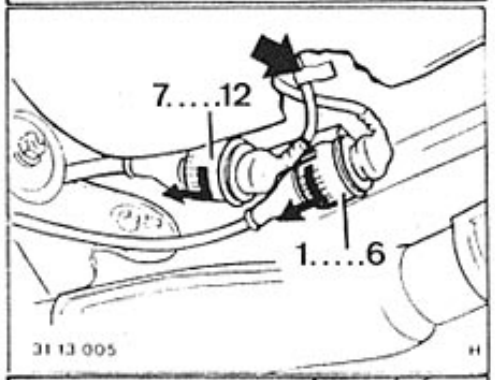
Important!
Intake pipes cross each other.

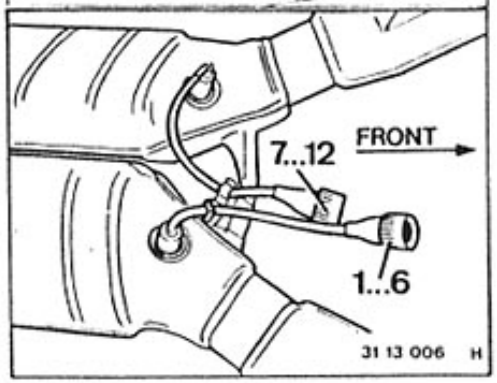
Note:
Don't turn the CO level adjusting screw on the air mass sensor.

* See Specifications









2) CO Level Test
Disconnect oxygen sensor plug connectors and mark connectors.
Unscrew bolts (1) and connect Special Tool 13 0 090 on the exhaust manifold.

Caution!
CO probes will be very hot!

Excessive CO Level:
Check
fuel injectors,
fuel pressure and
coolant/air temperature sensors.

Insufficient CO Level:
Check hoses and connections or detect air leaks.

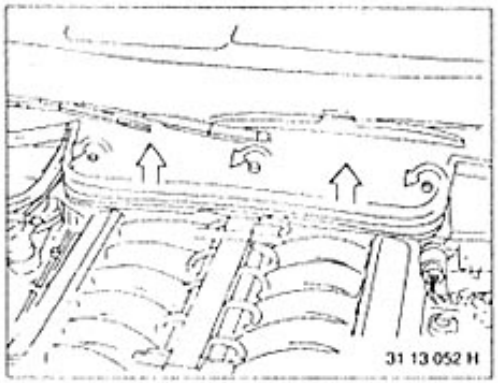
Check idle speed CO level*.
Switch off exhaust extraction systems for the time of testing.
Refer to EML and Motronic diagnosing system when nominal value is not reached.

Note:
Connect oxygen sensor after trial run.

Important!
Don't mix up oxygen sensor connections — plug with white tab is for cylinders 7 ... 12.
Read via self diagnosis if necessary. The displayed value (approx. 0.45 V) remains constant with a disconnected oxygen sensor plug, when calling on the pertinent control unit.

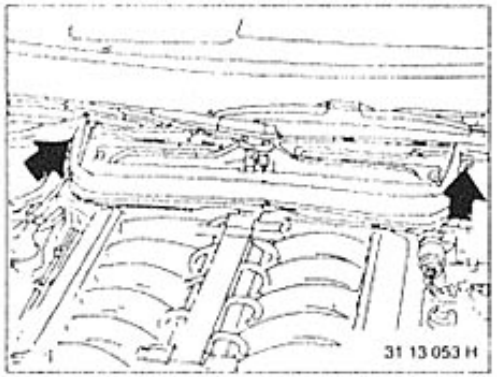
Note:
Check EML safety path – see Group 12.

* See Specifications

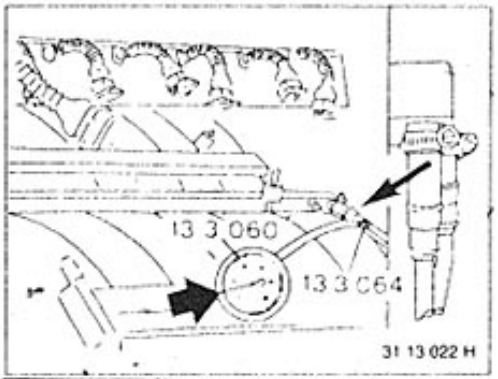


13 31 029 Checking supply pressure of fuel pump

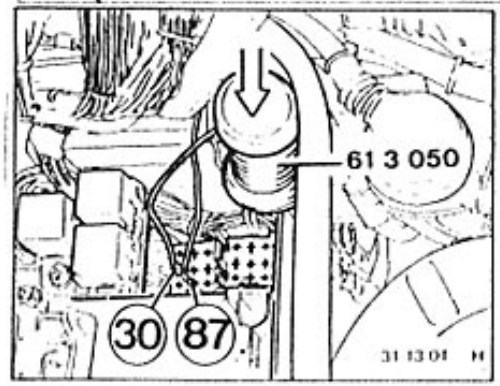
Remove cover from fresh air housing.



Remove fresh air housing.

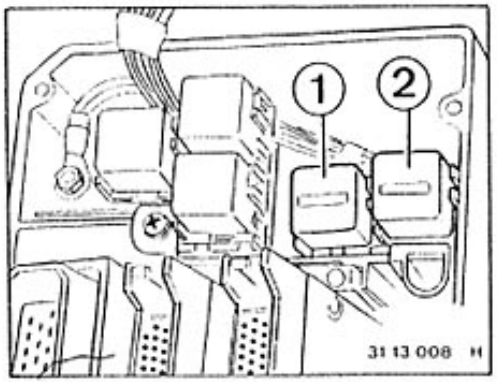


Install connection from BMW Service Tester or pressure gage 13 3 060 with connecting lead and T-piece 13 3 064 to the fuel intake line – before the fuel pressure regulator.–

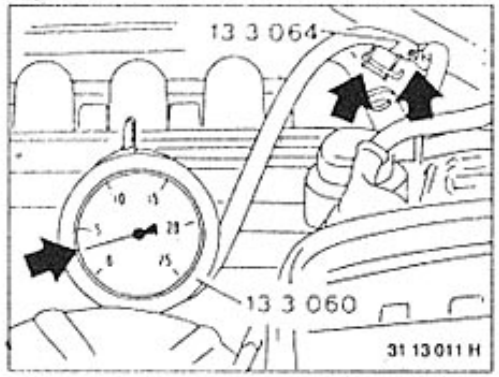


Remove relevant fuel pump relay.
Use tool 61 3 050 to bridge terminal 87 and terminal 30.
Read off system pressure*) and check layout (relay/cylinder bank).

* Refer to Technical Data Gr. 16



Layout: fuel pump relay
Relay (1= left)/right cylinder bank 1 - 6
Relay (2= right)/left cylinder bank 7 - 12

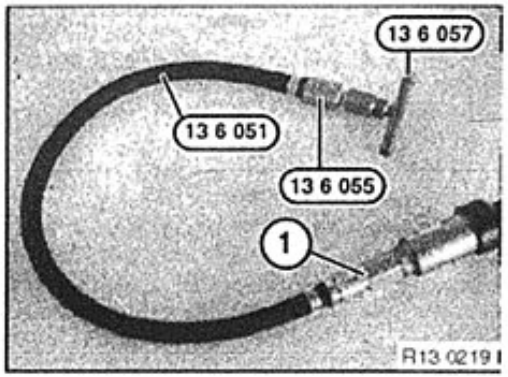


Check fuel delivery pressure;
Seal fuel line after T-piece with tool 13 3 010.
Actuate tool 61 3 050.
Check fuel delivery pressure .

* Refer to Technical Data Gr. 16

13 31 029 Checking delivery pressure of fuel pump (M73)

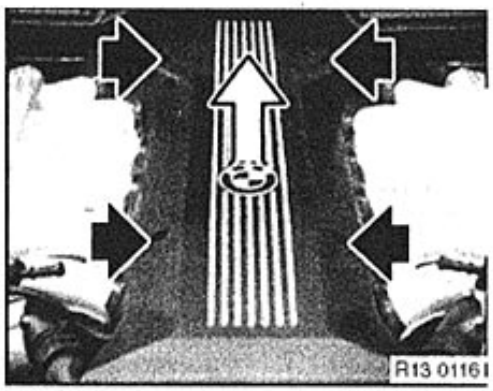
Switch off ignition.



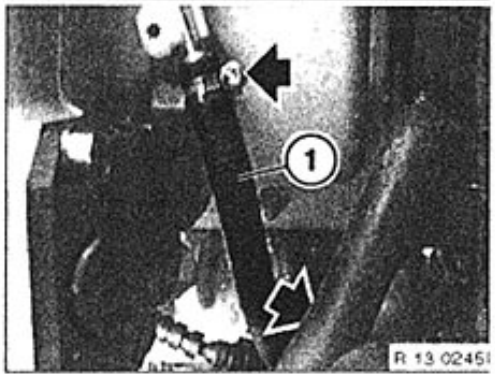
Install special tool 13 6 057 (T-piece) between the two open ends of the fuel delivery hose.

Connect special tool 13 6 057 (T-piece) to special tool 13 6 055 (reducer) and special tool 13 6 051 (hose).

Connect special tool 13 6 051 to quick-release coupling on pressure sensor (1) on DIS.
Caution:
note when removing the special tool!
Fuel in lines is under pressure (approx. 3 bar), catch escaping fuel and dispose of it correctly!



Twist screws through 90 °.
Remove cover from cylinder head cover.

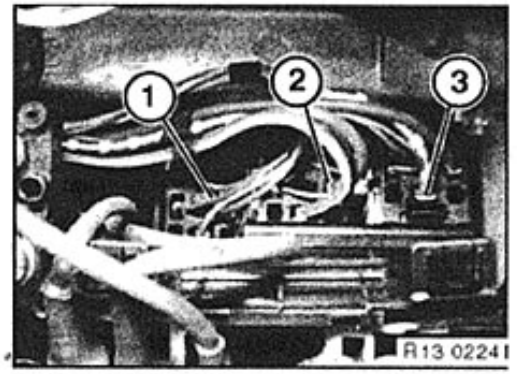


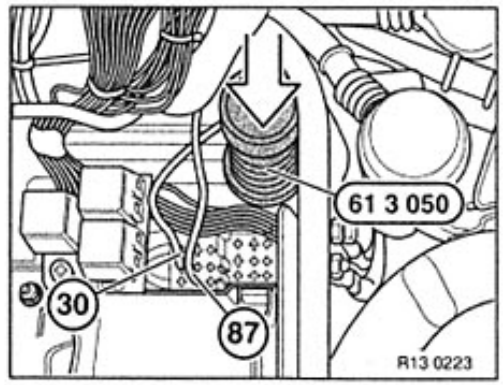
Caution!
Fuel in lines is under pressure (approx. 3 bar): catch escaping fuel and dispose of correctly!

Cut through hose to fuel delivery line (1).

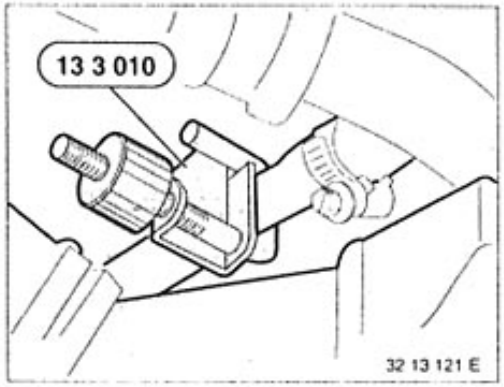
Installation:
Replace fuel hose and hose clips.

Connect up Diagnosis Information System (DIS):
Select Measuring option.
Select Pressure Check.





Remove fuel pump relay (1).
Connect special tool 61 3 050 to terminal 87 or 87b and to terminal 30.
Actuate special tool 61 3 050 for approx. 10 seconds and read off delivery pressure.
Nominal values:
Delivery pressure of fuel pump, refer to Technical Data 16 14
Fuel pressure regulator, refer to Technical Data 13 53



If delivery pressure is not reached, fuel return line must be sealed using special tool 13 3 010.

Repeat the pressure check.

If the delivery pressure is reached or exceeded:

Replace the pressure regulator.

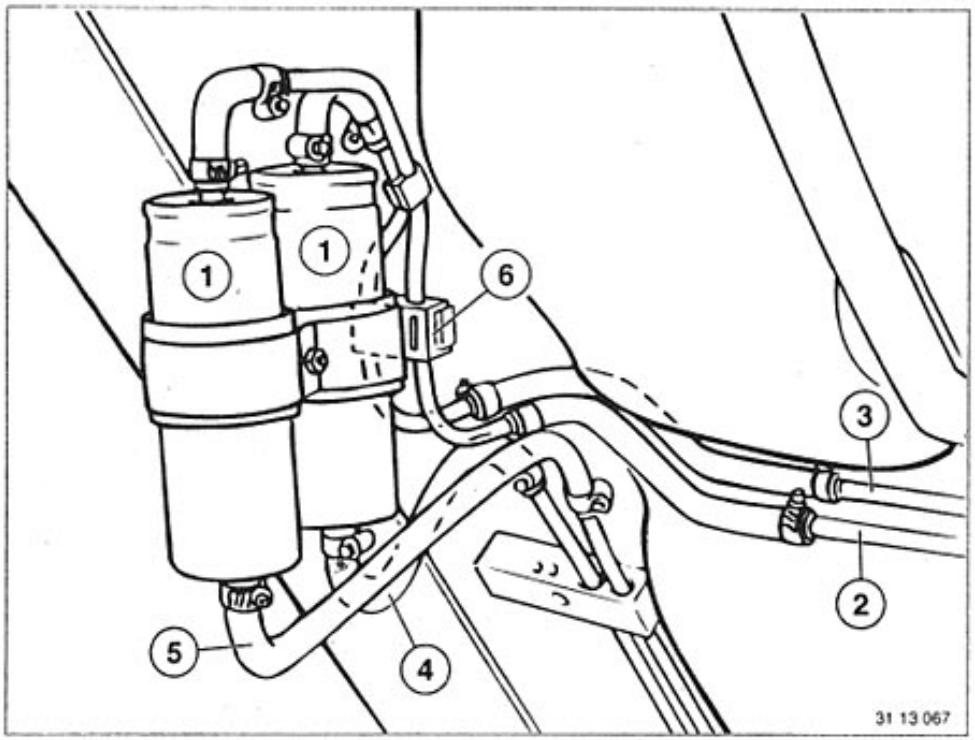
If the delivery pressure is not achieved:

Check hose routing from tank to engine on fuel pump (e.g. squashed areas, leaking).

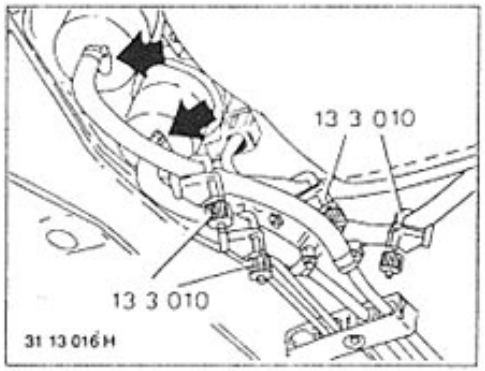
Check fuel filter (e.g. for contamination) and replace if necessary.

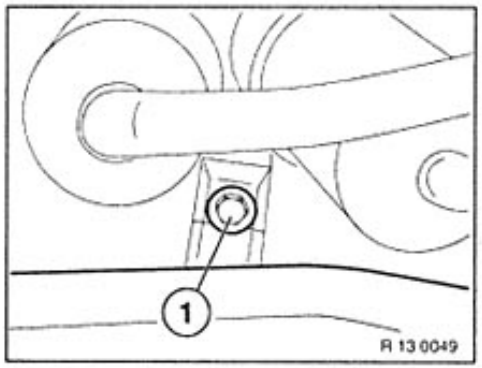
If the hose routing and fuel filter are O.K., check plug connection on the fuel pump for signs of corrosion, cleaning if ncessary, then repeat the pressure test. If the delivery pressure is still not reached after this action is taken, replace the fuel pump.

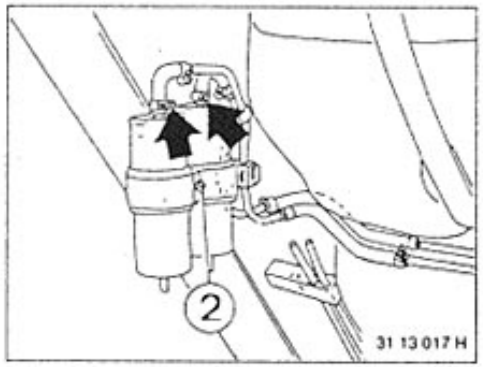
SURVEY OF FUEL FILTER AND PIPES

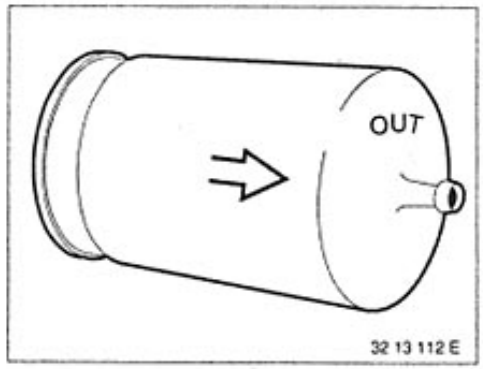


1 = Fuel filter
2 = Fuel pipe from tank
3 = Fuel pipe from tank
4 = Fuel pipe to cyl. 1...6 (right)
5 = Fuel pipe to cyl. 7...12) (left)
6 = Pipes secured on filter holder









13 32 051 REPLACING FUEL FILTER

Clamp all hoses with Special Tool 13 3 010.
Unscrew bolt (1).
Take off lower hoses.

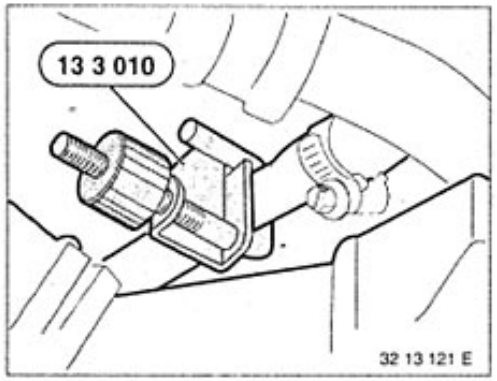
Caution!
Catch escaping fuel.

Unscrew mounting nut (2).
Take off upper hoses.

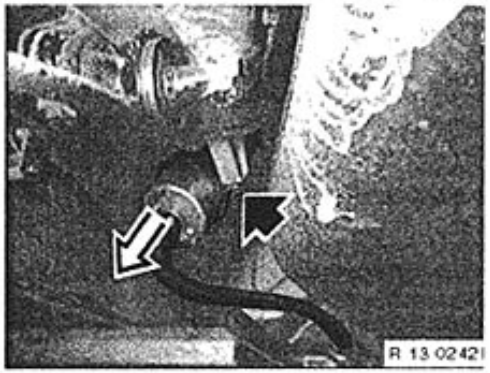
Installation:
Check direction of flow (arrow) or outlet (OUT).

13 32 051 Replacing fuel filter (M73)

Switch off ignition.



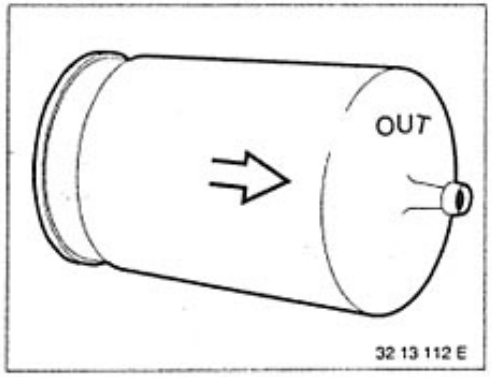
Disconnect all lines to and from fuel filter with special tool 13 3 010.



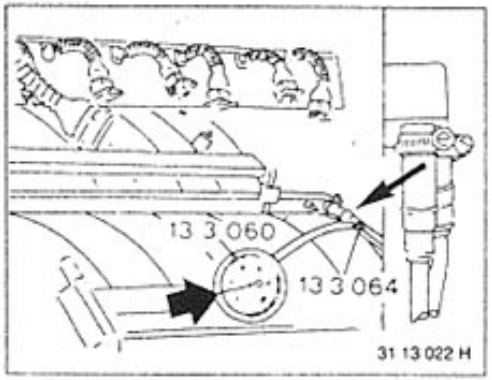
Unfasten screw and pull filter downwards to remove.
Unfasten hose clips and remove hoses.

Caution!
Catch escaping fuel and dispose of correctly.

Installation:
Fit new hose clamps.

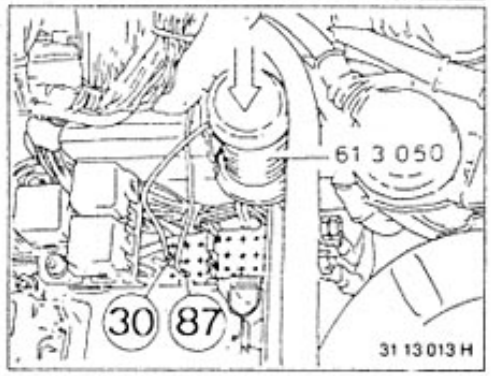


Installation:
designated by direction of flow (arrow) or letters "OUT": always take account of this during installation.

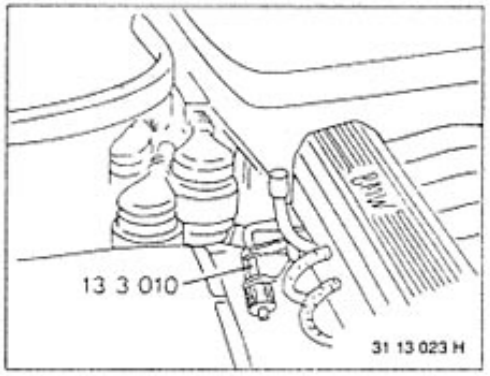


13 51 199 Checking fuel pressure regulator

Install BMW Service Tester or pressure gage 13 3 060 with connecting hose and T-piece 13 3 064 in the fuel feed line in front of the fuel pressure regulator.



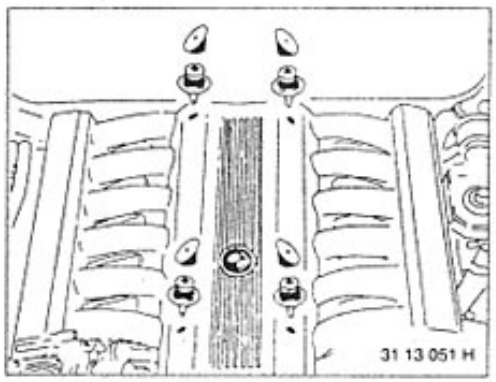
Pull off fuel pump relay.
Bridge terminals 87 and 30 with tool 61 3 050.
Check fuel injection pressure*).



If fuel injection pressure*) drops too fast, plug return hose with tool 13 3 010 and briefly operate tool 61 3 050 once again, refer to 13 31 . . .

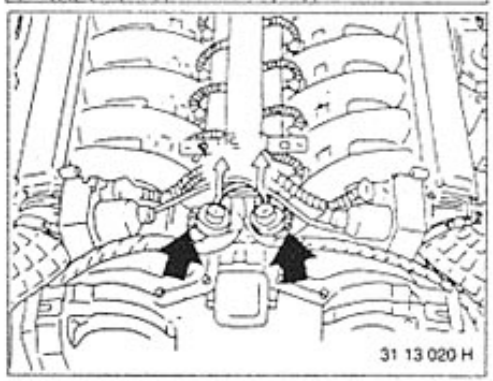
If the injection pressure is now maintained, the pressure regulator is faulty.
If the injection pressure drops, there is a leak in front of the pressure regulator.

*) Refer to Technical Data

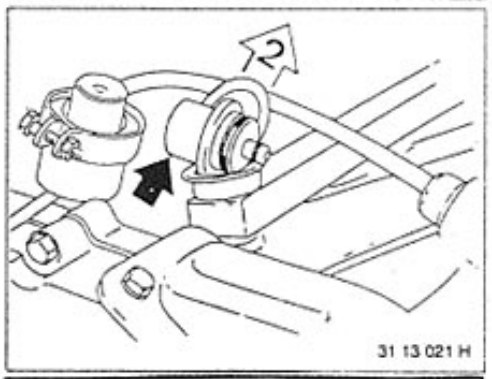


13 51 630 Replacing fuel pressure regulator

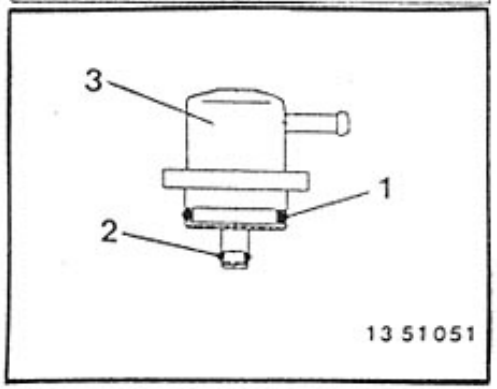
Remove cover.



Remove vacuum hose.
Unfasten screw, remove clip.



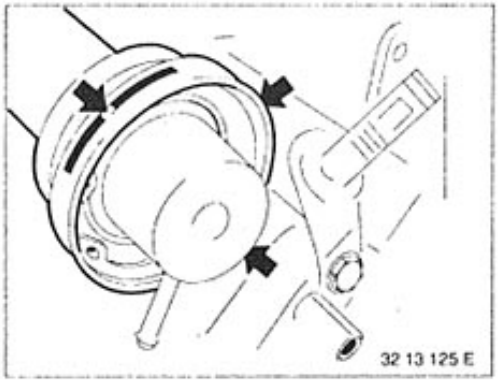
Lift up and remove pressure regulator (2).



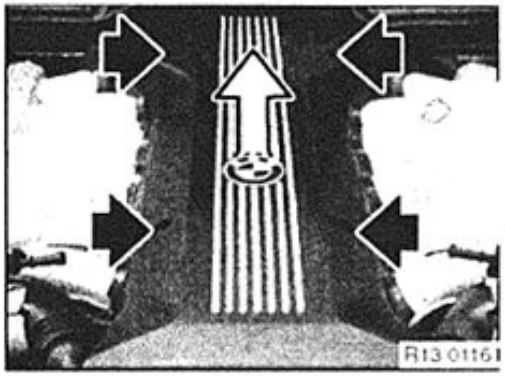
Installation:
Replace seals (1) and (2).
Check code (3).

13 51 630 Replacing fuel pressure regulator (M73)

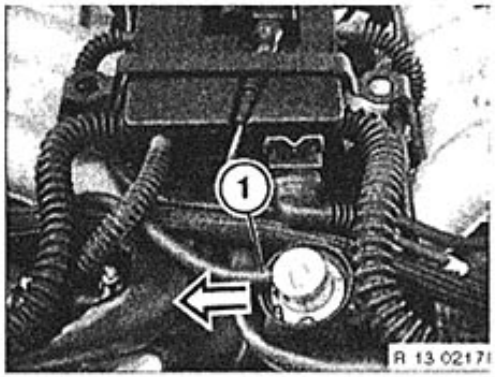
Switch off ignition.



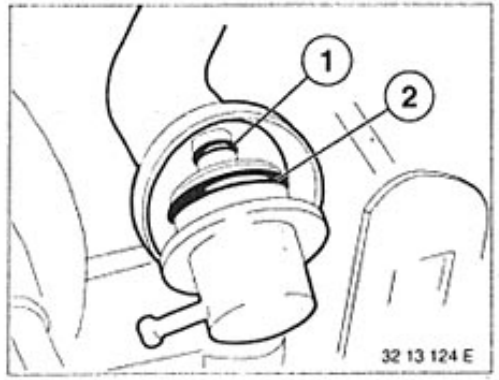
Installation:
Allow lug of retaining ring to locate in recesses in injector pipe.



Twist screws through 90°.
Remove cover from manifold.

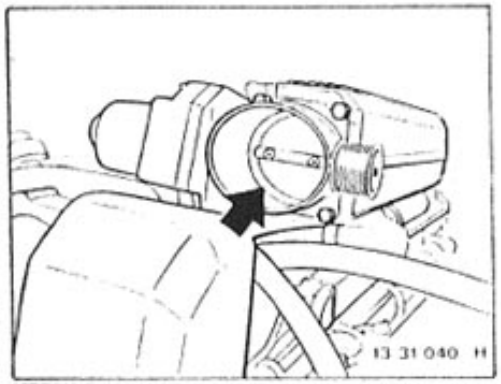


Remove vacuum hose (1).
Remove retaining rings.



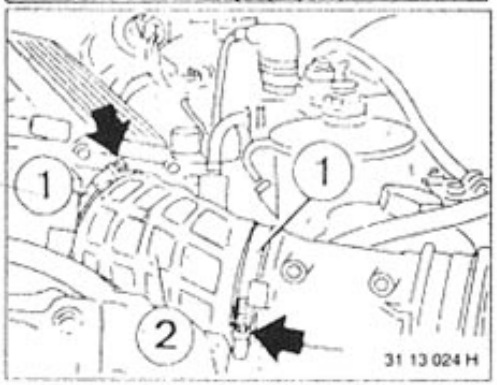
Note position of vacuum hose and note for subsequent assembly.
Twist and remove pressure regulator.

Installation:
Ensure cleanliness of sealing faces.
Replace sealing rings (1 and 2).
Coat sealing rings before assembly with anti-friction agent.

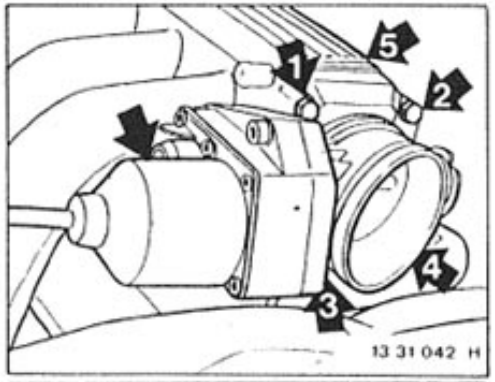


13 54 535 Replacing throttle body

Caution:
Do not reach into throttle body unit while ignition is switched on (risk of injury).

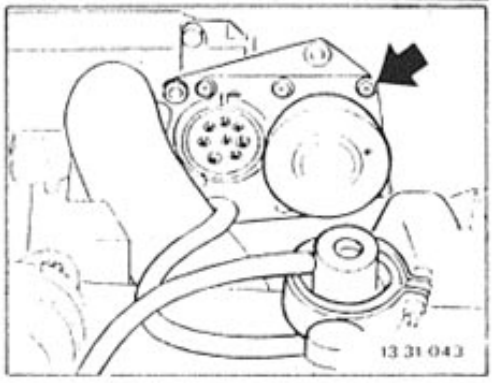


Remove feed line.
Unfasten hose clip (1) and remove hose (2).

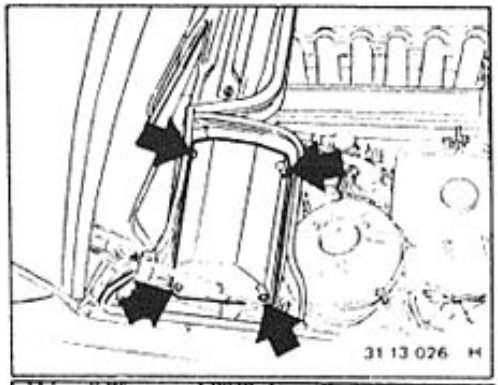


Unfasten plug connection from housing.
Unfasten screws 1 - 4.
Remove throttle body.
5 = gasket

Installation:
Fit new gasket (5).

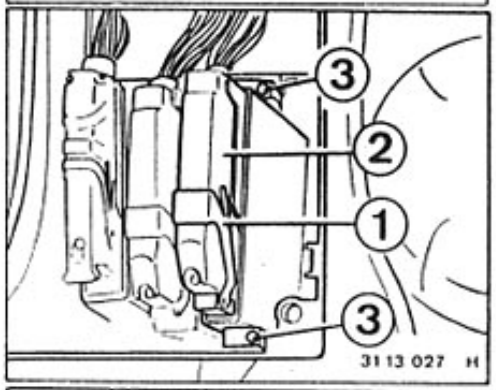


Do not dismantle EML throttle body.
Fault memory can be interrogated using EML on-board diagnosis facility.

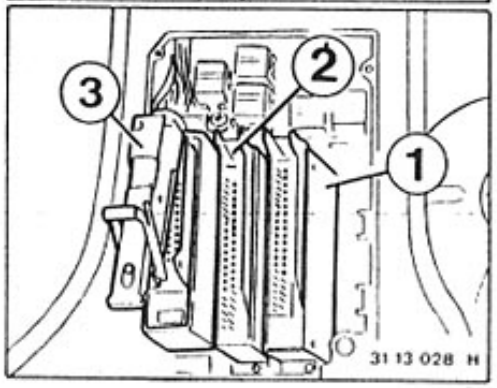


13 61 000 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT FOR DME

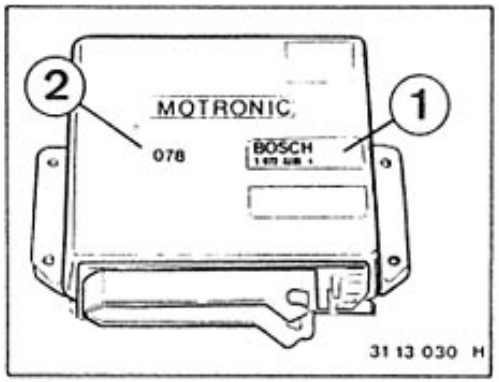
Unscrew electronic box cover screws. Take off cover.



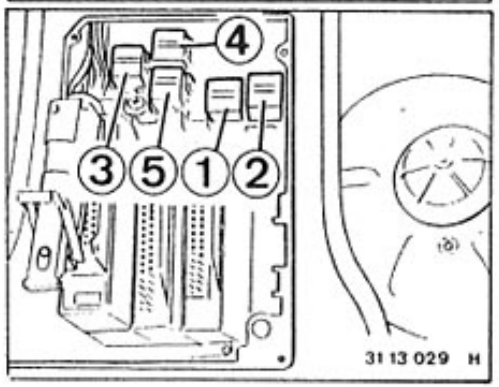
Pull up lock (1) and pull off plug (2). Loosen clamps (3) and remove control unit.



1 = DME control unit for cyl. 1...6
2 = DME control unit for cyl. 7...12
3 = EML control unit

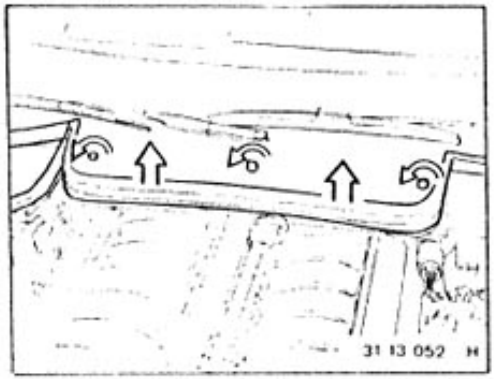


Installation:
Check code number (1)* and manufacturing date (2)*.



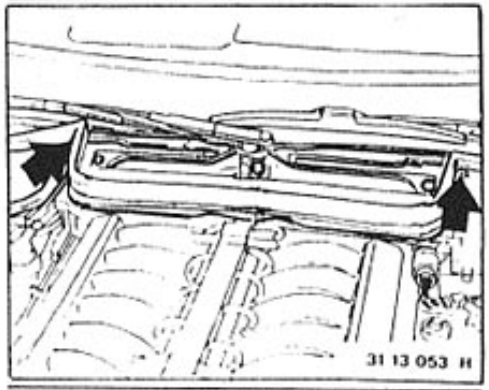
Relays in Electronic Box:
1 = Fuel pump relay for cyl. 7...12
2 = Fuel pump relay for cyl. 1...6
3 = Oxygen sensor heating relay (both)
4 = DME master relay 2 (cyl. 7...12)
5 = DME master relay 1 (cyl. 1...6)

* See Specifications

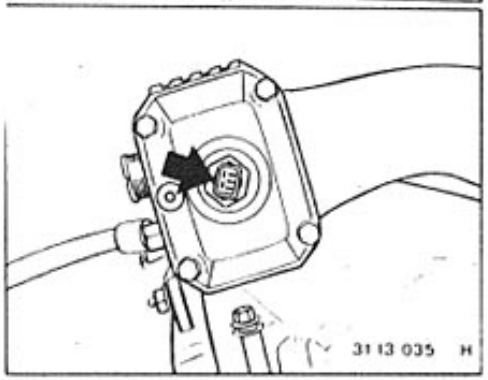


13 62 511 REPLACING INATKE AIR TEMPERATURE SENSOR

Check function – see 13 00 002.
Unscrew cover for fresh air housing.



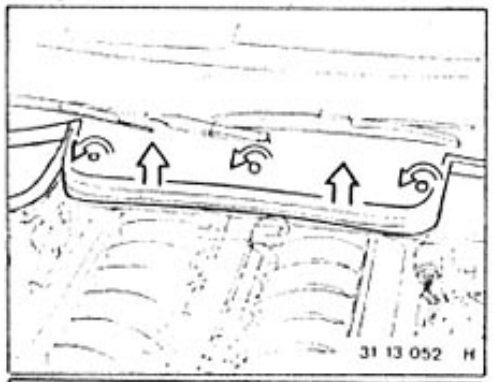
Remove fresh air housing.



Press spring-loaded lock.
Pull off plug.
Unscrew sensor.

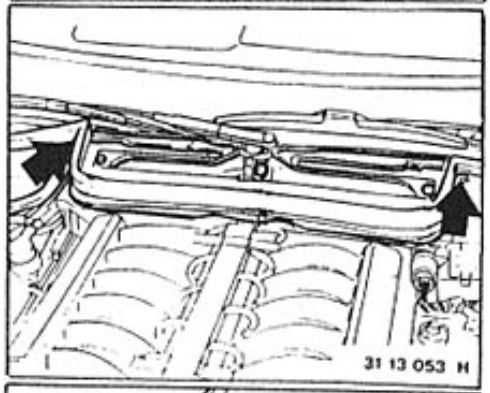
Installation:
Tightening torque*.

* See Specifications

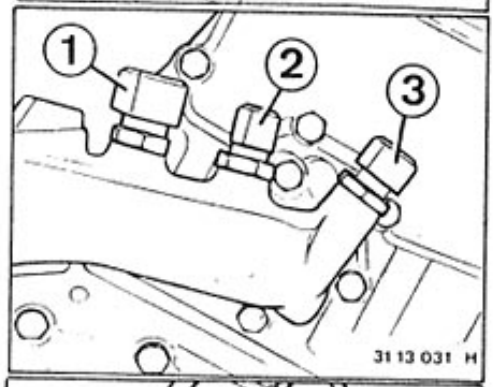


13 62 531 REPLACING COOLANT TEMPERATURE SENSOR

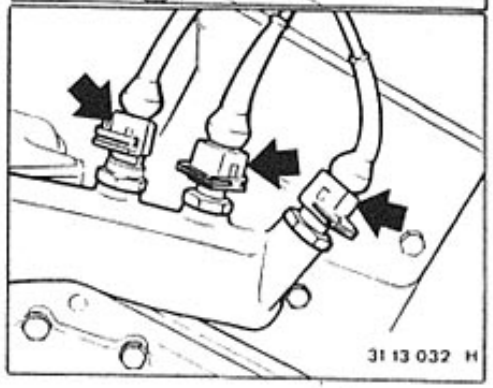
Check function – see 13 00 002.
Unscrew cover for fresh air housing.



Remove fresh air housing.



Arrangement:
1 = Temperature sensor - DME
2 = Temperature sensor - EML
3 = Temperature sensor - temp. gage



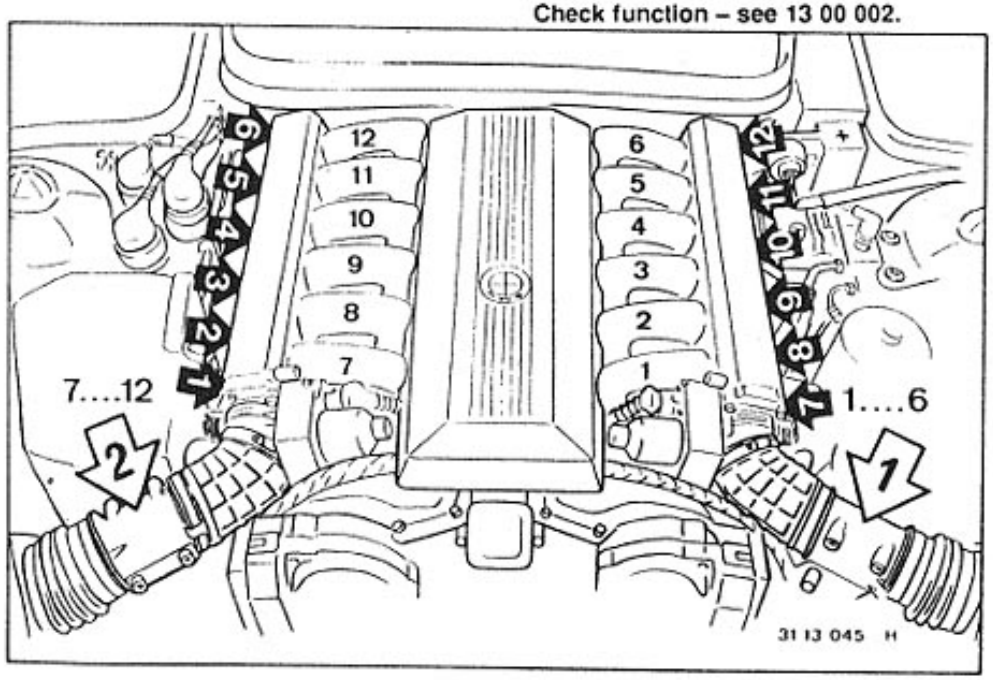
Press spring-loaded lock.
Pull off plug.
Unscrew sensor.

Installation:
Tightening torque*.

* See Specifications

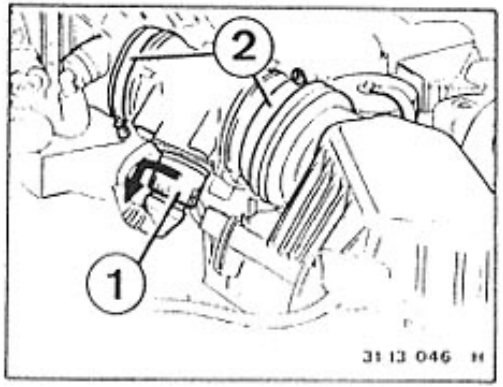
13 62 560 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT AIR MASS SENSOR

Check function – see 13 00 002.

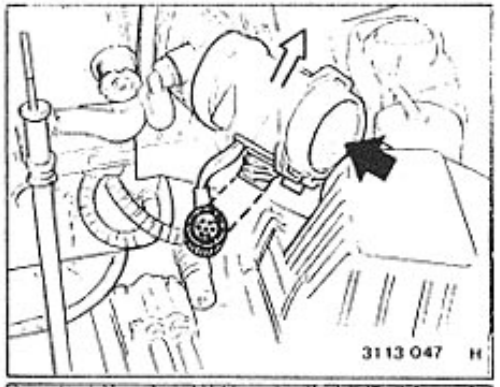


Hot Wire Air Mass Sensors:
1 = Right bank of cylinders 1...6
2 = Left bank of cylinders 7...12

Important!
Intake pipes cross; air mass sensors are inversed.



Disconnect plug (1) and loosen hose clamp (2).

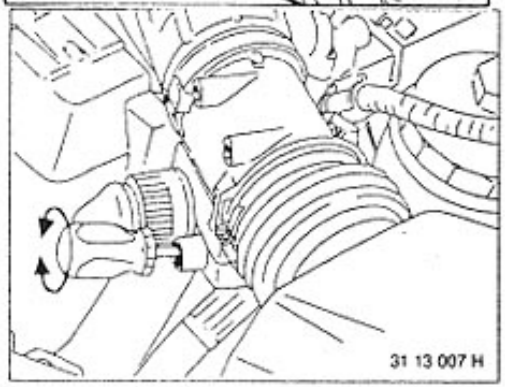


Lift out intake neck.

Installation:
Install clean filter screen only.



Cars with Catalyst:
Don't remove anti-tamper lock/correction screw.
Don't make corrections.



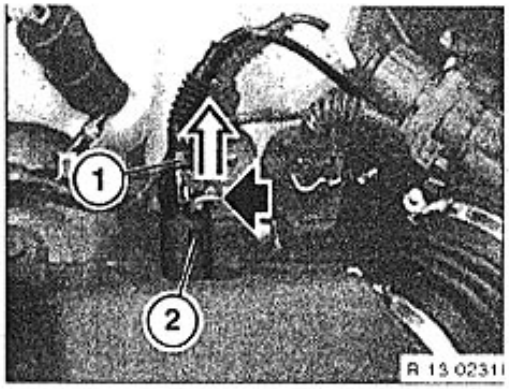
Cars Prepared for Catalyst:
CO setting* – see 13 00 060.

Installation:
Check code number and manufacturing date.

* See Specifications

13 62 511 Replacing temperature sensor for intake air (M73)

Switch off ignition.



Press down retaining spring (2).
Remove connector (1).
Unclip temperature sensor.

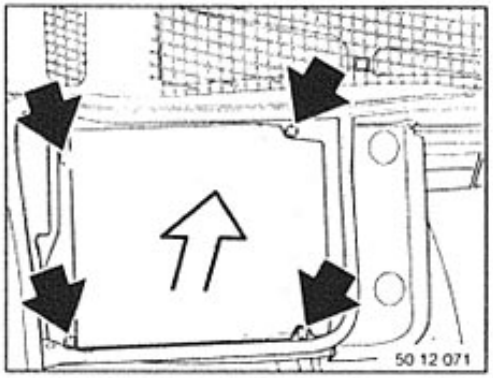
Interrogate fault memory on control unit of Digital Motor Electronics (DME), check error messages and clear fault memory.

13 62 531 Replacing temperature sensor for coolant (M73)

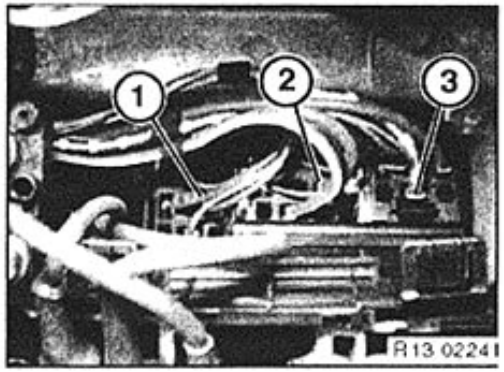
Refer to,
Repair Instructions for 7 Series E38.

13 63 590 Replacing fuel pump (M73)

Switch off ignition.



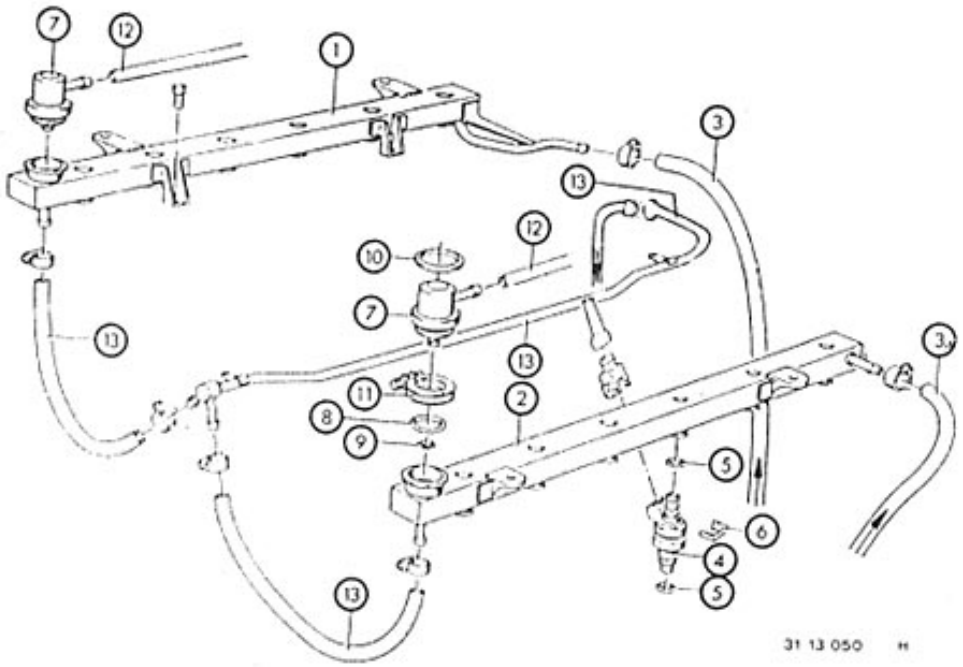
Unfasten screws.
Remove cover.



Unclip fuel pump relay (1) and receptacle from bracket. Pull relays out of relay receptacle.

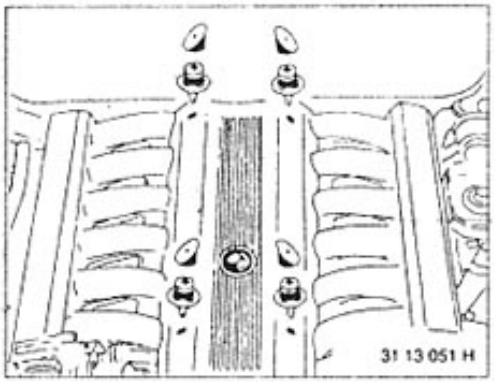
Interrogate fault memory of Digital Motor Electronics (DME), check faults in memory, rectify faults and correct fault memory.

Summary of injection pipes with accessories

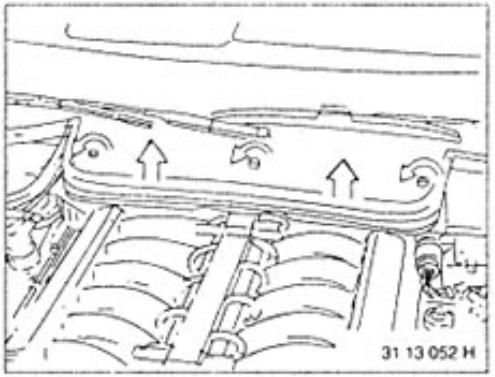


1 = cyl. 1 - 6 right injection pipe
2 = cyl. 7 - 12 left injection pipe
3 = fuel line, cyl. 1 - 6
3a = fuel line, cyl. 7 - 12
4 = injector valve
5 = seal
6 = clip (fuse)
7 = pressure regulator
8 = O-ring
9 = O-ring
10 = ring
11 = clamping strap
12 = vacuum hose
13 = return line

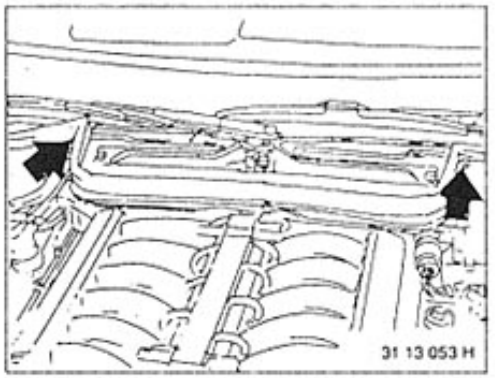
13 64 541 Replacing all injection valves



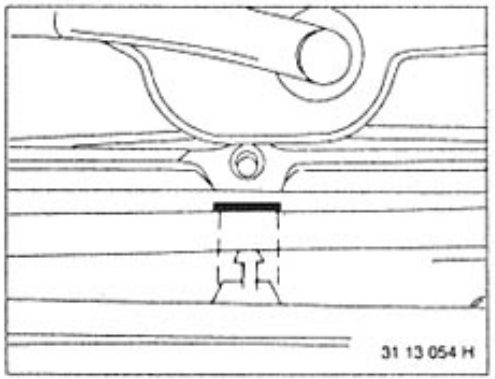
Remove protective cover.



Remove cover from fresh air housing.

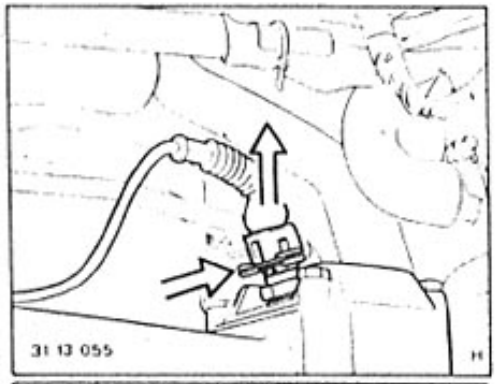


Unfasten screws.
Remove fresh air housing ...

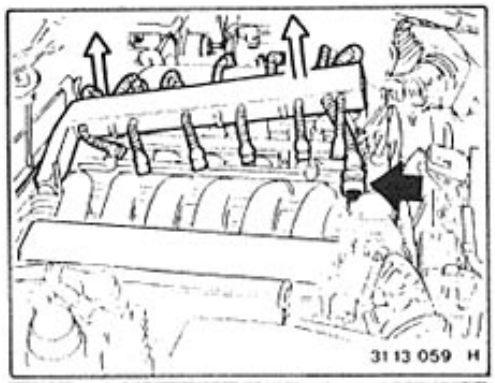


Installation:
Lower lug must locate in recess.

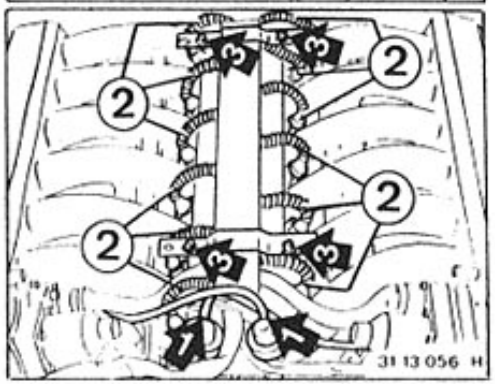
*) Refer to Technical Data



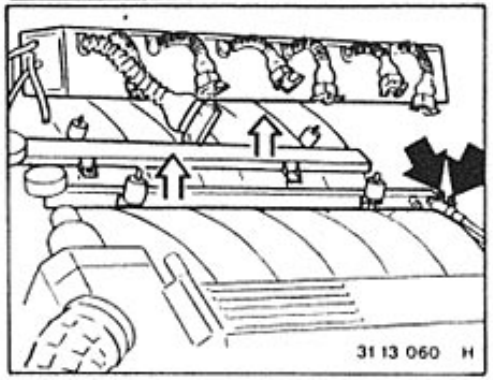
Pull off plug on air temperature sensor.



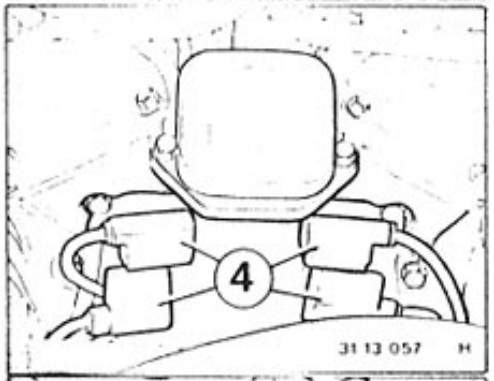
Turn and pull off throttle valve plugs.
Pull up electric lead duct.



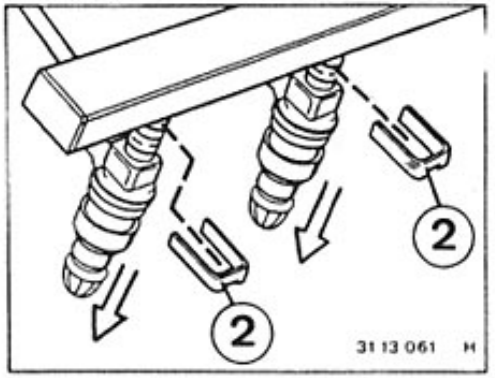
Pull off vacuum hoses (1).
Pull off fuel injector plugs (2).
Unscrew electric lead duct screws (3).



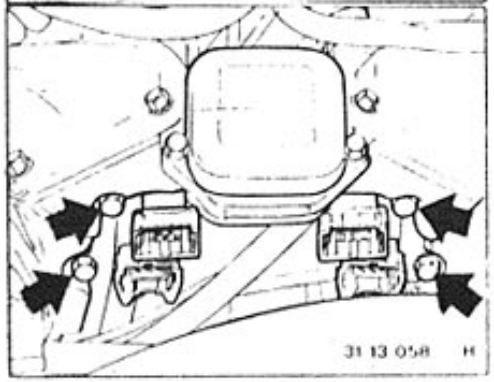
Disconnect fuel hoses.
Pull up injection pipes.



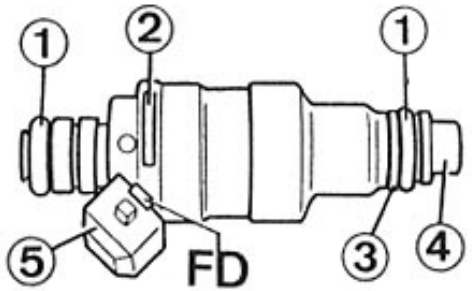
Pull off sender plugs (4).



Lift off retainers (2) and remove fuel injectors.

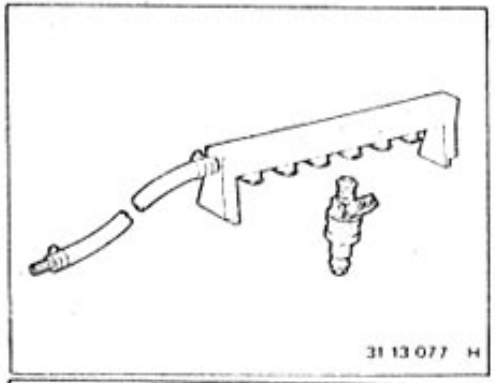


Unscrew screws.
Pull off plugs from above.



Installation:
Check/replace O-rings (1).
Check code number (2)*.
FD = Manufacturing date
Check position of plastic washer (3).
Check color* of control box (5) or injection nozzle guard (4).
Only lubricate O-rings with vaseline for installation.

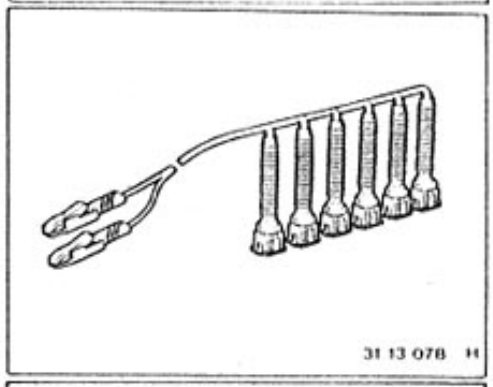
* See Specifications



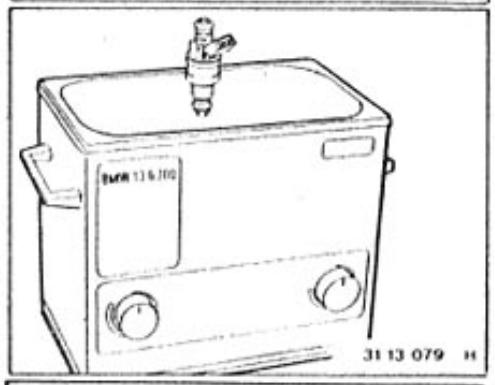
13 64 582 CHECK ALL FUEL INJECTORS FOR LEAKS AND CLEANING

Remove fuel injectors – refer to 13 64 150.

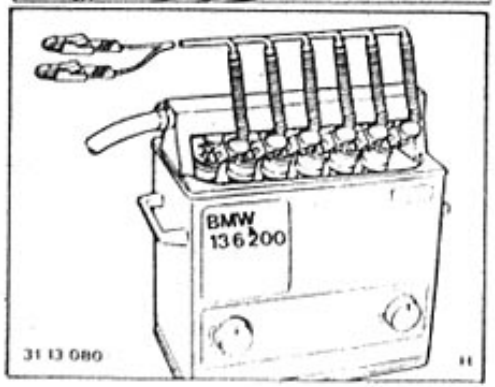
Checking Fuel Injectors for Leaks:
Clip fuel injectors in Special Tool 13 6 205 (injection pipe).
Keep to sequence of cylinders.



Connect Special Tool 13 6 206 (wire harness).
Supply 3 bar pressure to the fuel injectors.



To remove residual fuel from fuel injectors, connect wire harness on 12 V battery.
Pull wire plugs off of fuel injectors.
Set air pressure to 3 bar again.
Place fuel injectors with injection pipe in a suitable tank filled with hot water (60 ... 80° C).
Check for air leaks.
Permissible leak rate = two air bubbles per fuel injector in 15 seconds.
Note fuel injectors with greater air leak rate.



Take fuel injectors out of the water.
Remove air pressure connections.
Dry plug connections of fuel injectors with compressed air.

Cleaning Fuel Injectors:
Connect wire plugs of Special Tool 13 6 206 (wire harness) on fuel injectors and connect wire harness on 12 V battery.

Suspend fuel injectors with Special Tool 13 6 205 (injection pipe) in ultrasonic cleaner (Special Tool 13 6 200).

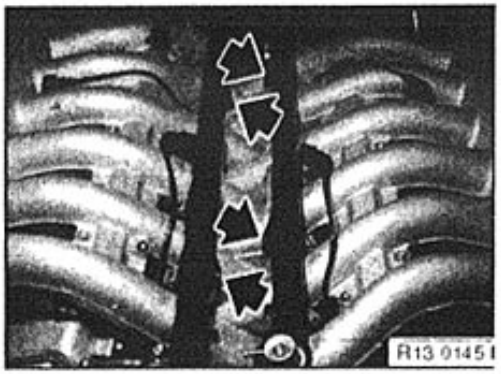
Clean and simultaneously supply current to fuel injectors in accordance with operating instructions of the cleaning machine.

Repeat leak test.

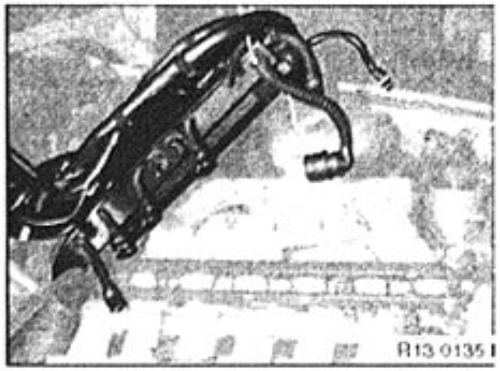
Important!
Don't carry out leak test in cleaning fluid, but instead only in a water bath.

13 64 541 Replacing all injector valves (M73)

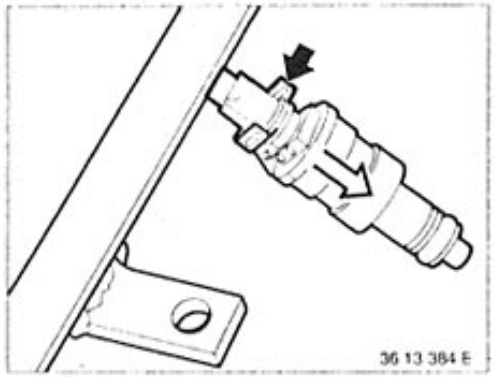
Switch off ignition.



Unfasten screws. Remove injector strip together with injector valves.



Unfasten engine wiring harness from engin and lift upwards, tying up on engine lid. Remove engine wiring harness, refer to 61 11 051.

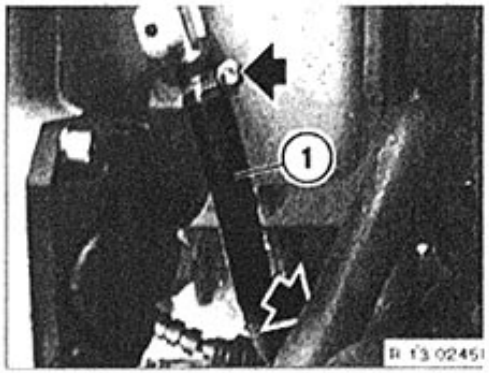


Unclip retainer.
Remove injector valves.

Installation:
Check seals on injector valves and replace if necessary.

Before installing the injector valves, coat seals with acid-free grease.

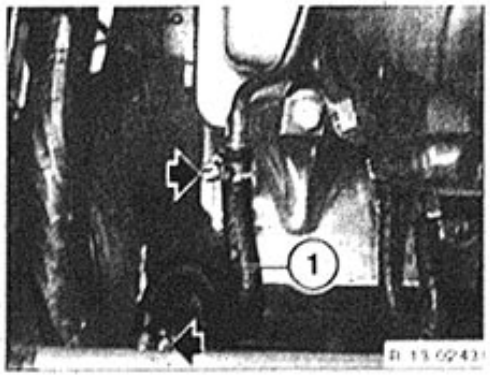
Check injector valves for leaks and clean, refer to 13 63 582.



Unfasten hose clips. Remove fuel delivery hose (1).

Caution!
The fuel in the line is under pressure (approx. 3 bar). Catch escaping fuel with suitable receptacle and dispose of it correctly.

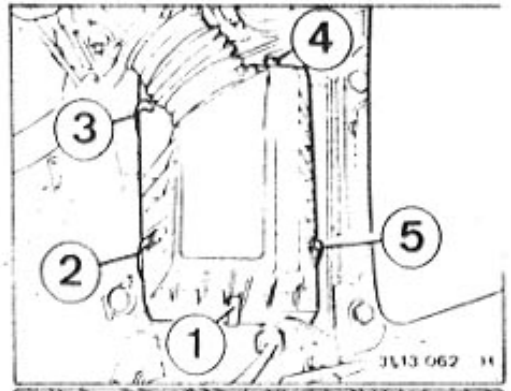
Installation:
The fuel hoses and hose clips must be replaced!

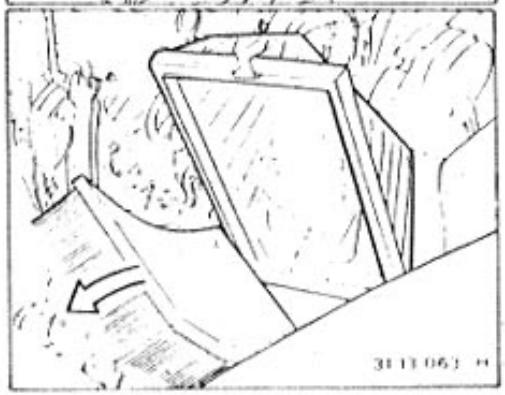


Unfasten hose clips. Remove fuel return hose (1).

Caution!
Fuel in line is under pressure (approx. 3 bar). Catch escaping fuel in suitable receptacle and dispose of it correctly.

Installation:
Fuel hoses and hose clips must be replaced!



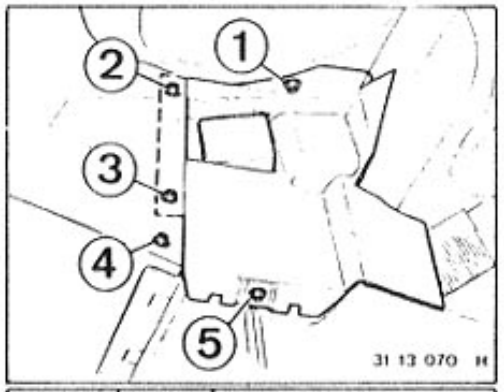


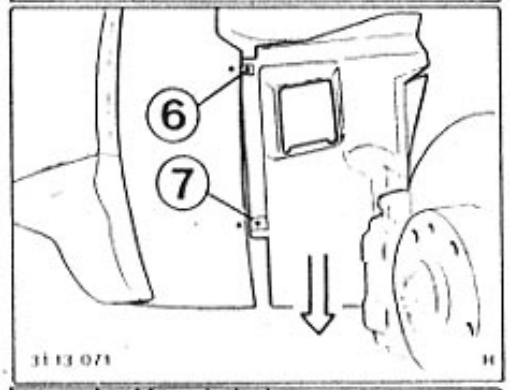
13 72 002 REPLACING AIR FILTER CARTRIDGES (BOTH)

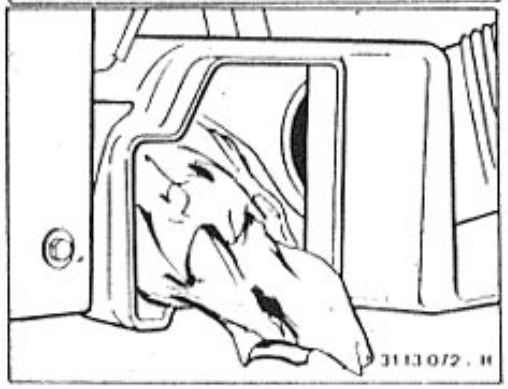
Open clips (1...5).

Lift upper section.
Take out air filter cartridge.

When replacing an air filter cartridge, it is always necessary to removed deposits of dirt from the corresponding intake manifold.







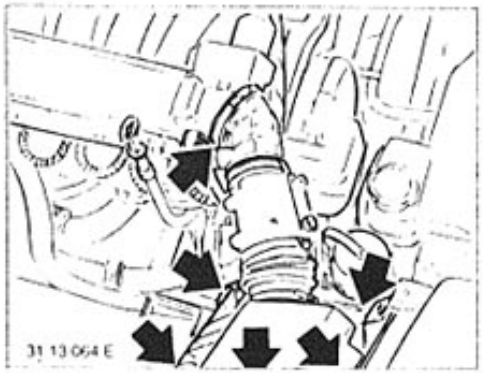
Cleaning Intake Manifold:

Unscrew screws (1...5).

Pull off cover.

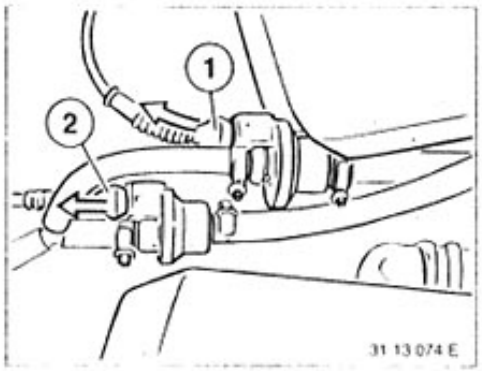
Installation:
Note self-tapping screws (6 and 7).
Insert air duct and guides correctly.

Wipe out lower manifold housing with a cloth which does not lose lint.



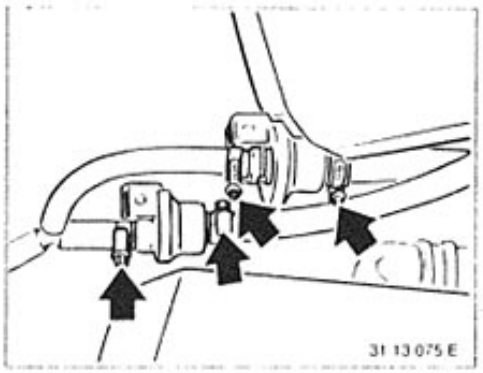
13 90 500 REPLACING TANK VAPOR VENTING VALVE

Check function - refer to 13 00 002.
Remove left air volume meter together with intake bellows and upper filter section.



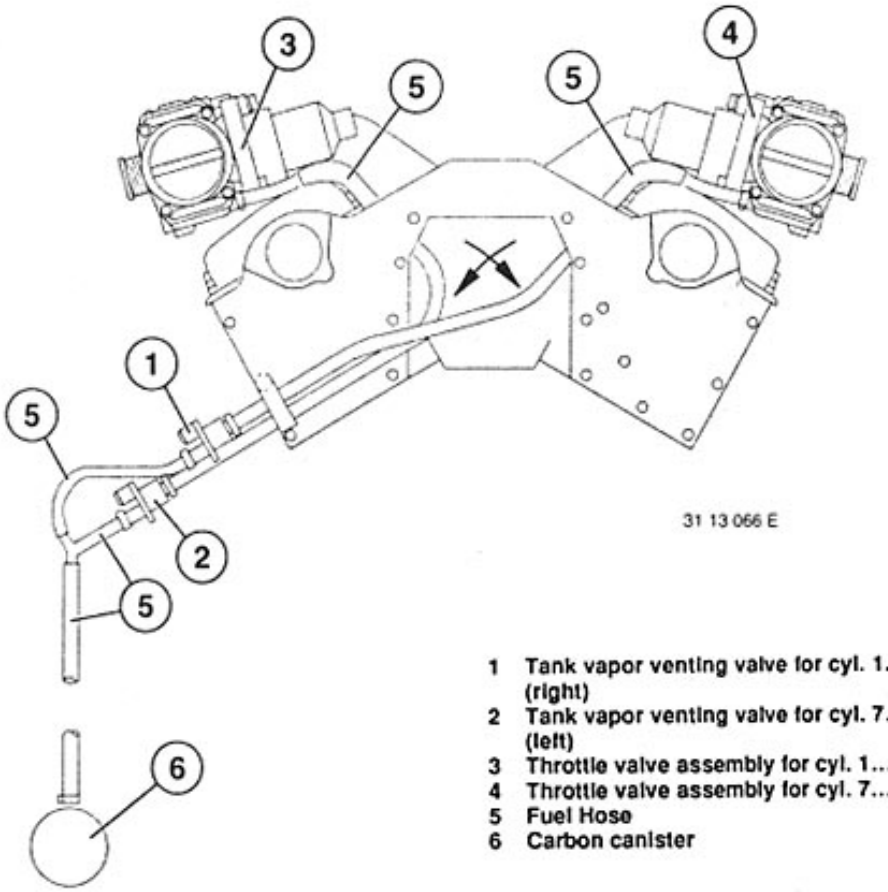
Squeeze retainers and pull off plugs.

Important!
Don't mix up plugs — mark them if necessary.



Disconnect fuel hoses, catching any escaping fuel.

ARRANGEMENT OF TANK VAPOR VENTING VALVES
(View Opposite Forward Direction)



1 Tank vapor venting valve for cyl. 1...6 (right)
2 Tank vapor venting valve for cyl. 7...12 (left)
3 Throttle valve assembly for cyl. 1...6
4 Throttle valve assembly for cyl. 7...12
5 Fuel Hose
6 Carbon canister

13 90 ... Checking tank venting valve

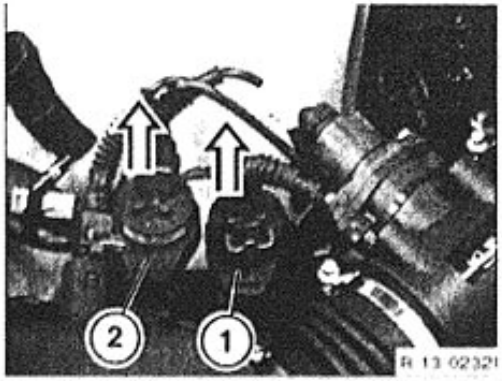
Attach vacuum hose (1) of BMW Service Tester to the 8 mm dia. neck.
Provide the tank venting valve with a 12 V power supply (2) (special tool 61 1 440).

Select multimeter function 21 on BMW Service Tester.
Set vacuum to 600 mbar · 100.
Switch off vacuum pump.

During the measuring period of approx. 20 seconds, pressure must not drop by more than 50 mbar.
If pressure falls by more than 50 mbar, a new tank venting valve must be fitted.

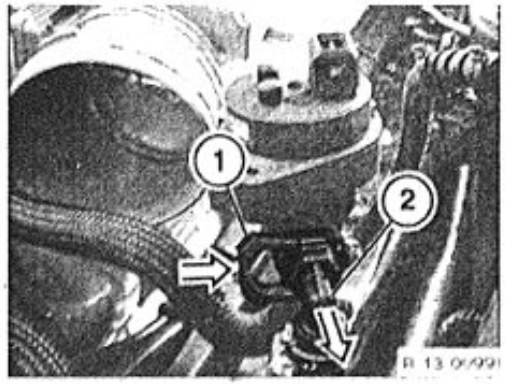
13 90 500 Replacing tank vent valve (M73)

Switch off ignition.



To prevent plug connections becoming confused on the two tank vent valves, mark them before dismantling the plug connections. Disconnect plug connections.

1 Tank vent valve 1
for cylinder bank 1-6
2 Tank vent valve 2
for cylinder bank 7-12



Open fast-release coupling on tank vent valve, press down interlock (1) and remove hose (2). Remove tank vent valve from bracket. Unfasten hose clip. Remove hose.

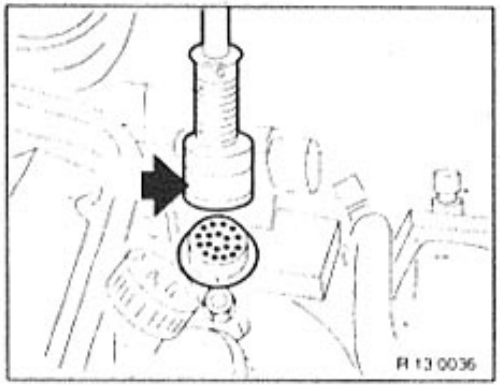
Installation:
Replace hose clip.

Interrogate fault memory of control unit on Digital Motor Electronics, rectify faults and clear the fault memory.

13 Fuel System M60

13 00 002	Function check of Digital Motor Electronics (DME)	13- 0/31
. . .	Checking components	13- 0/31
	Idle speed control valve – check	13- 0/31
	Temperature sensor for intake air – check	13- 0/31
	Temperature sensor for coolant – check	13- 0/32
	Tank vent valve – check	13- 0/32
13 31 029	Checking fuel pump delivery pressure	13- 31/31
	Summary of fuel filter and lines	13- 32/31
13 32 051	Fuel filter – replace	13- 32/31
13 41 500	Idle speed control valve – replace	13- 41/31
13 51 199	Fuel pressure regulator – check	13- 51/31
630	Fuel pressure regulator – replace	13- 51/32
13 54 030	Throttle body – remove and install/seal	13- 54/31
13 62 511	Temperature sensor for intake air – replace	13- 62/31
531	Temperature sensor for coolant – replace	13- 62/31
560	Mass air flow sensor – remove and install or replace	13- 62/32
13 64 541	All injection valves – remove and install or replace	13- 64/31
13 71 000	Suction filter housing – remove and install	13- 71/31
13 72 001	Air filter insert – replace	13- 72/31
13 90 500	Tank vent valve – replace	13- 90/31

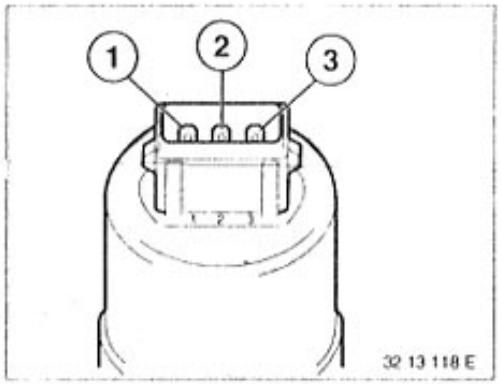
For additional work, refer to “Repair Instructions Series 7 E38”

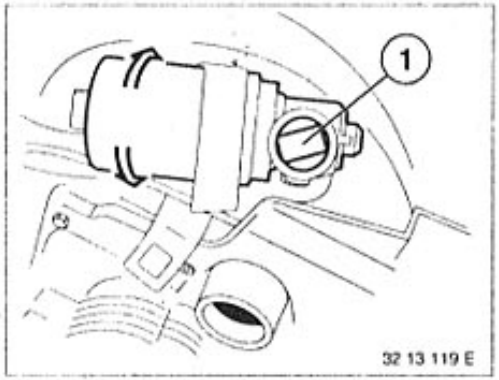


13 00 002 Checking function of digital motor electronics (DME)

Connect BMW Service Tester
Carry out brief test
Interrogate fault memories
Interrogate status
Refer to: operating instructions for BMW Service Tester / BMW diagnosing system:

Additional instructions on troubleshooting - refer to:
Electrical Troubleshooting Manual for the 8 Series E31.





13 00 ... Checking components

Checking idle speed control valve

Electrical check

Measure resistance between terminal (1) and (3), nominal value of approx. 23 Ω
Measure resistance between terminal (2) and (1) or (2) and (3).
Nominal values of approx. 12 Ω respectively

Dynamic check

Remove idle speed control valve (connector remains attached).
Completely open or close rotary piston (1).
Switch on ignition.
Rotary piston must adopt and maintain a position of approx. 50 % cross section aperture.
For additional tests, refer to BMW Diagnosing System.

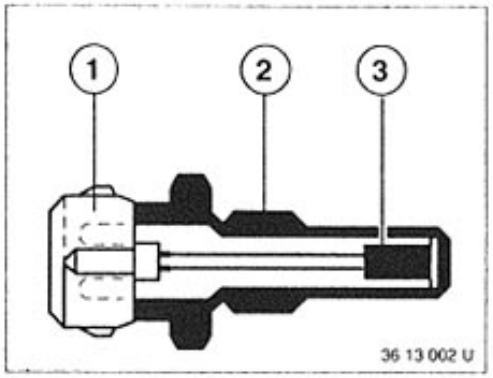
Checking temperature sensor for intake air

Check resistance value* on temperature sensor. Check leads from control unit connector to temperature sensor connector for interrupts and short-circuits**.

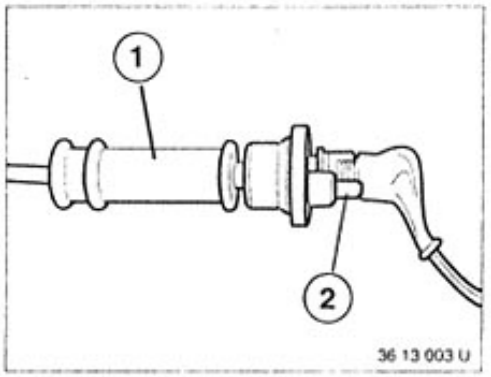
* Refer to Technical Data Gr. 12/Gr. 13
** Refer to Schematics for the 8 Series E31

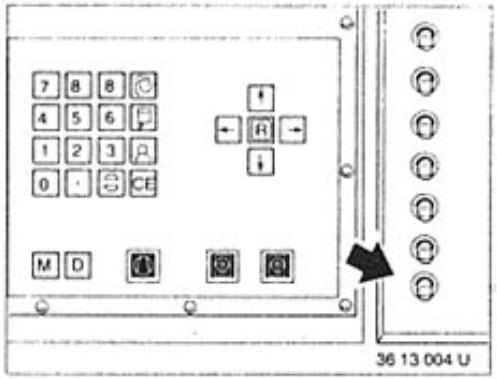
Checking coolant temperature sensor

Attach Jetronic test cable 61 1 440.
Use ohmmeter to check nominal value*) and, to check the entire temperature range, remove the sensor, immerse up to hex head in water bath and check with an ohmmeter*).



The temperature sensor measures the engine temperature and transmits this to the control unit as a resistance value.
The resistance value falls as the temperature rises (NTC).
1 = Plug connector
2 = Housing
3 = NTC resistance





Checking tank vent valve

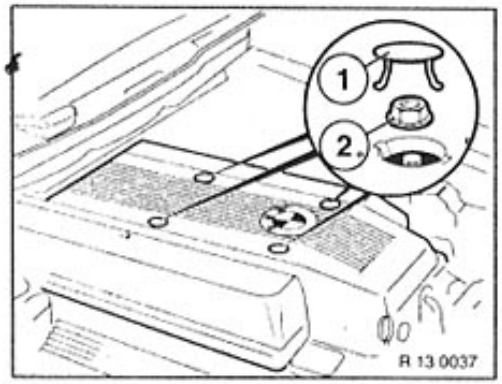
Connect vacuum hose (1) of BMW SERVICE TESTER to the 8 mm dia. neck.
Provide tank vent valve with 12 V voltage (2) (special tool 61 1 440).

Select multimeter function 21 on BMW Service Tester.
Set vacuum to 600 mbar · 100.
Switch off vacuum pump.

During the measuring period of approx. 20 seconds, the pressure drop must not exceed 50 mbar.
If pressure loss exceeds 50 mbar, the tank vent valve must be replaced.

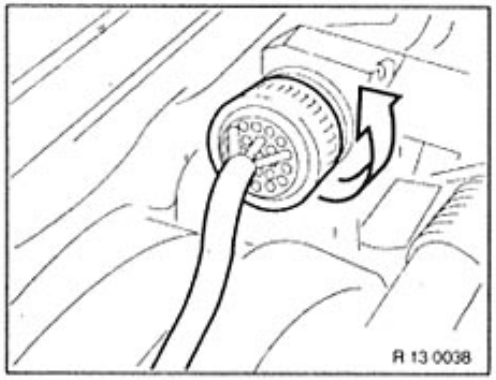
*) Refer to Technical Data Gr. 12/Gr. 13

*) Refer to Technical Data Group 12/Group 13
**) Refer to Schematics folder

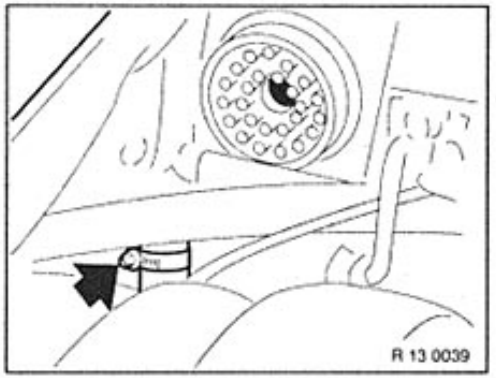


13 31 029 Checking fuel pump delivery pressure

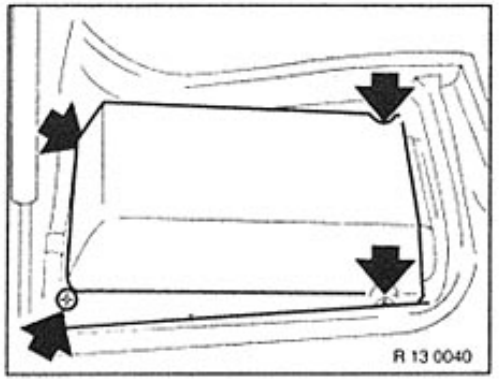
Press off sealing caps (1) and unfasten nuts (2).
Remove cover for manifold.



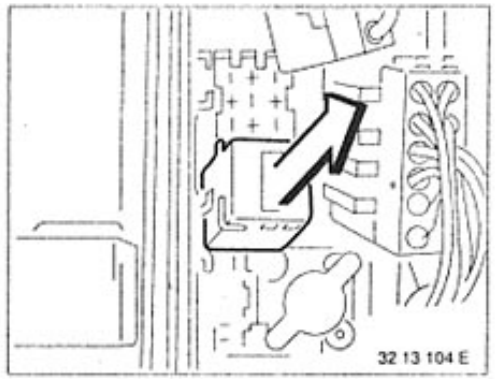
Twist engine cable connector and remove.



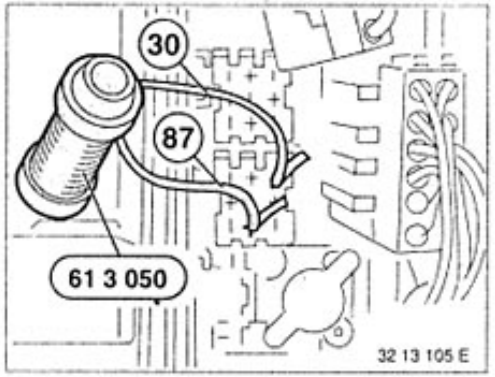
Install connection of BMW Service Tester or pressure gage 13 3 060 with connecting line and T-piece 13 3 064 in the fuel intake lead.



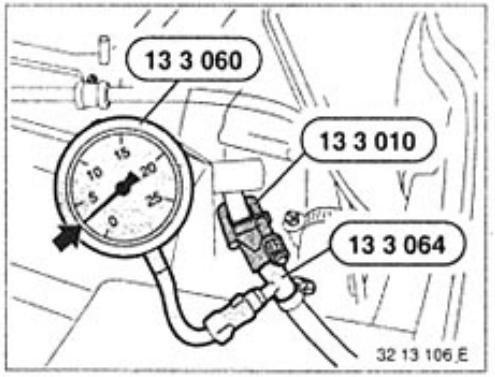
Unfasten screws.
Remove cover for E box.



Install connectors and cables to one side.
Remove fuel pump relay (orange).



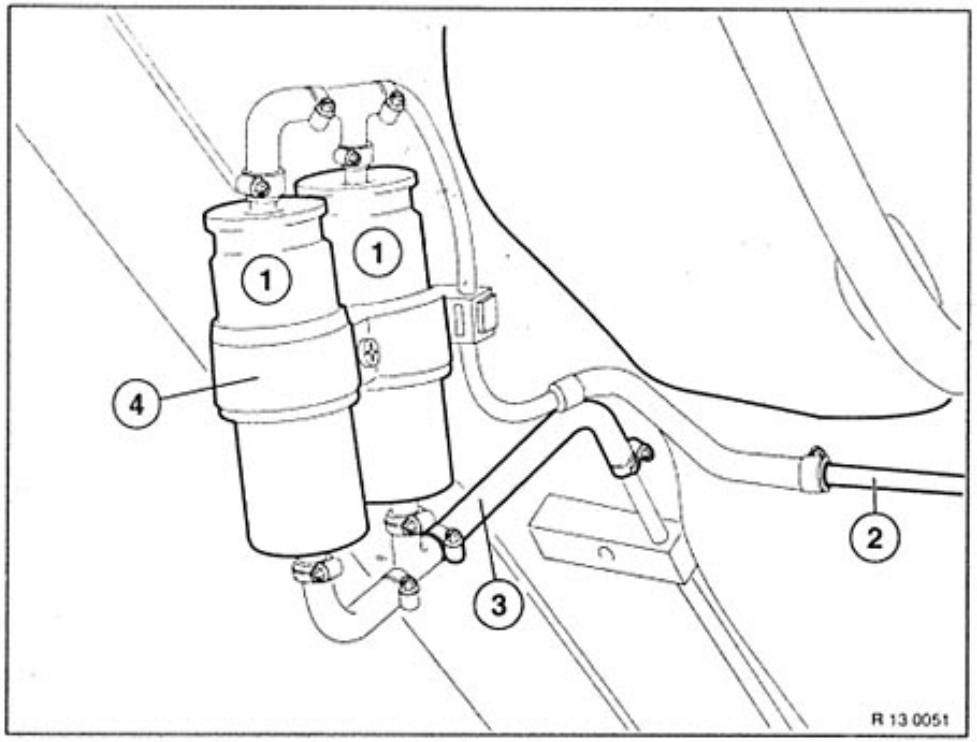
Use tool 61 3 050 to bridge terminal 87 and terminal 30. Switch on ignition, actuate tool.
Read off system pressure* and check.



Check fuel delivery pressure:
seal fuel line after the T-piece with tool 13 3 010.
Switch on ignition. Actuate tool 61 3 050 and check fuel delivery pressure*.

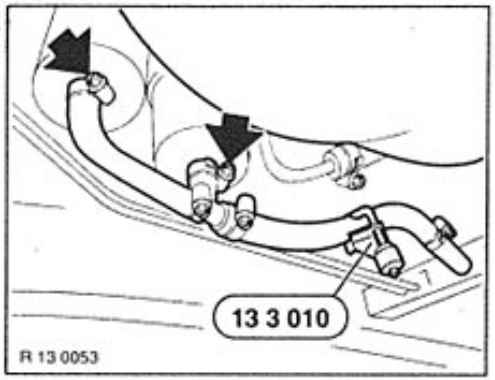
* Refer to Technical Data, Group 16

Summary of fuel filter and lines



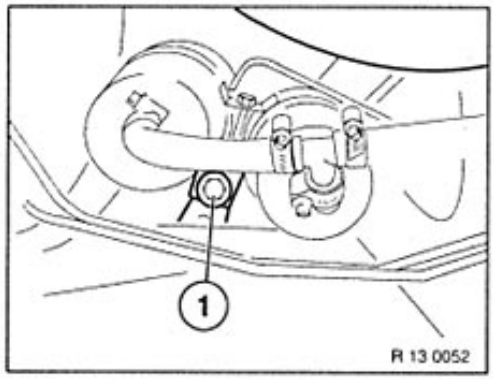
840 i

1 Fuel filter
2 Fuel line from tank
3 Intake line
4 Filter mount

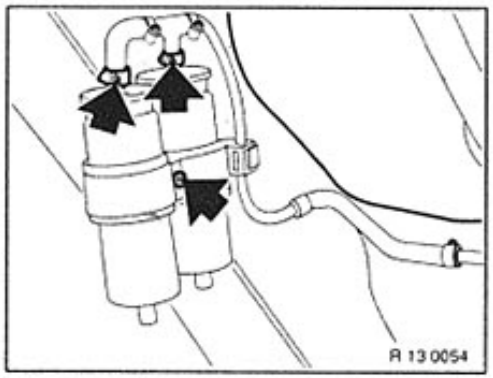


13 32 051 Replacing fuel filter

Disconnect retaining clips from lines on the body as much as necessary.
Seal fuel hoses with special tool 13 3 010.
Remove lower hoses.
Caution!
Catch escaping fuel and dispose of correctly.

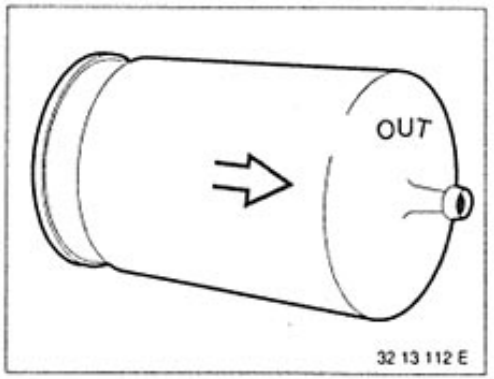


Unfasten screw (1) from filter mount.

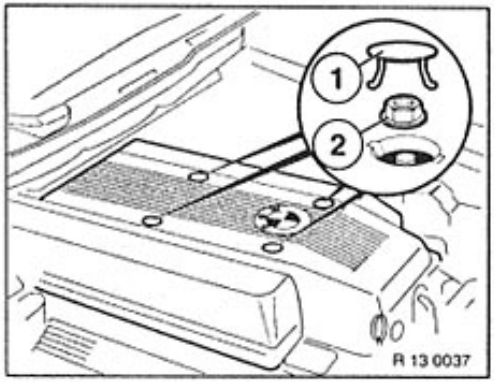


Remove hoses from fuel filter.
Unfasten retaining nut and remove filter.

Caution!
Catch escaping fuel and dispose of correctly.

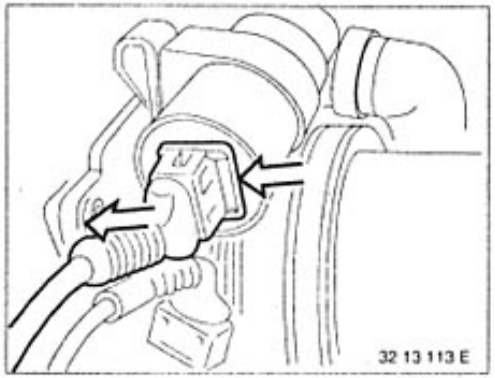


Installation:
Note direction of flow (arrow), or (OUT) outlet.

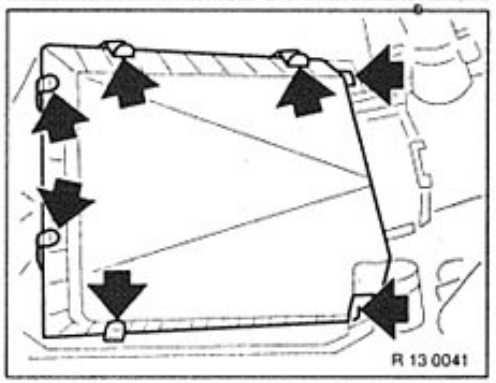


13 41 500 Replacing idling control valve

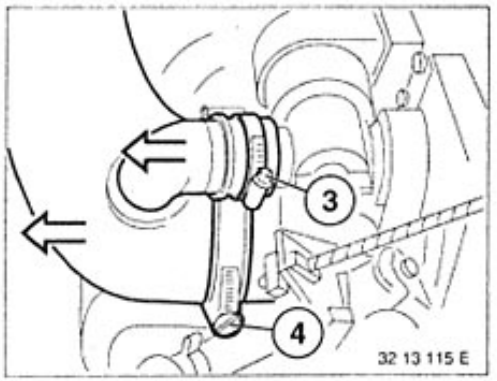
Press off sealing caps (1) and unscrew nut (2).
Remove manifold cover.



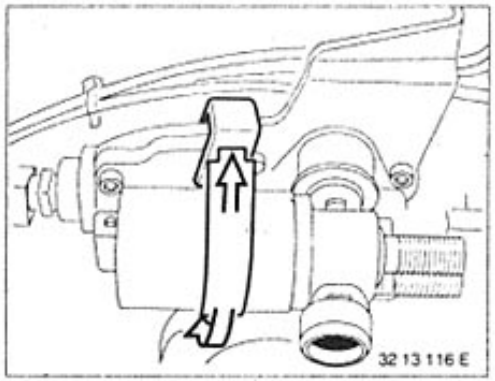
Compress retaining spring and remove connector.



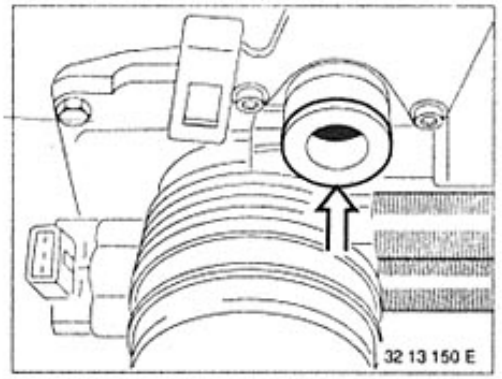
Open clips and lift out upper section of air filter housing.



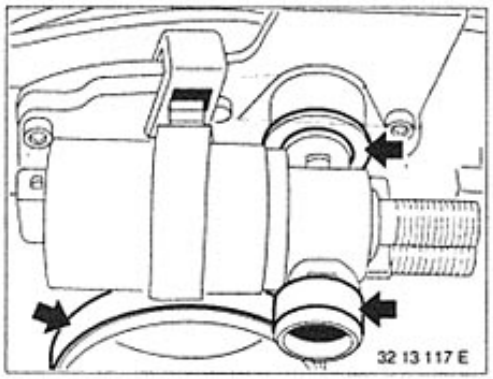
Unfasten hose clips (3 and 4).
Remove intake hoses with upper section of air filter housing.



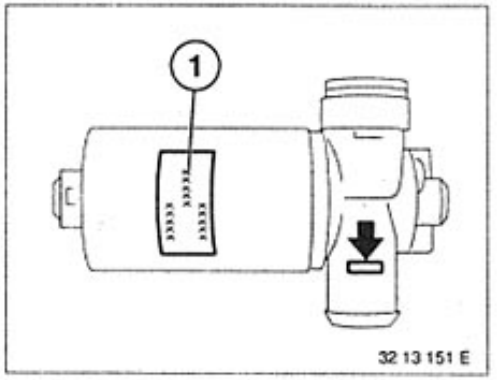
Compress retainer and disconnect.
Remove idling speed control valve.



Installation:
First install seal in throttle valve flange.



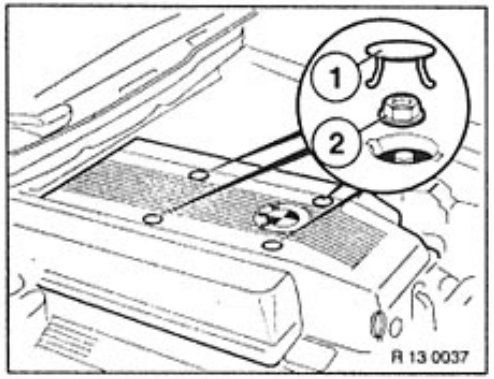
Installation:
Note seals on throttle body and on idling speed control valve.



Installation:
Check code (1)*.
Check idling speed.

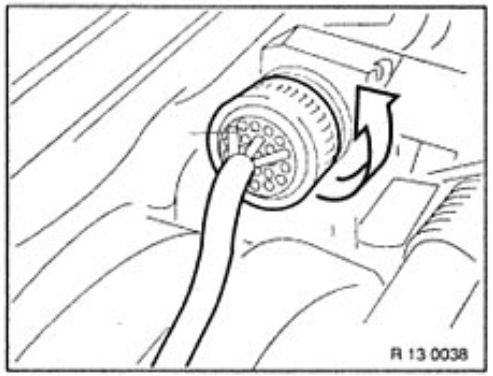
Component inspection, see 13 00 ...

* Refer to Technical Data

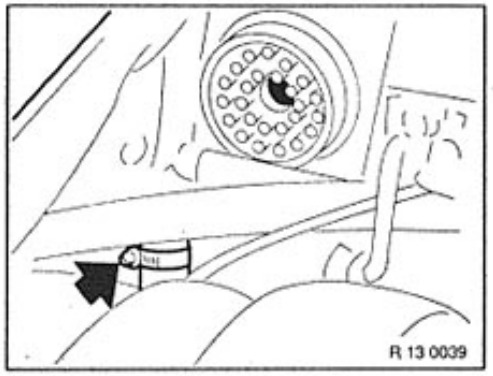


13 51 199 Checking fuel pressure regulator

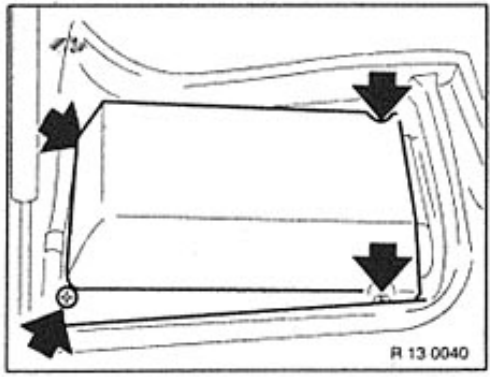
Compress sealing caps (1) and unfasten nuts (2).
Remove manifold cover.



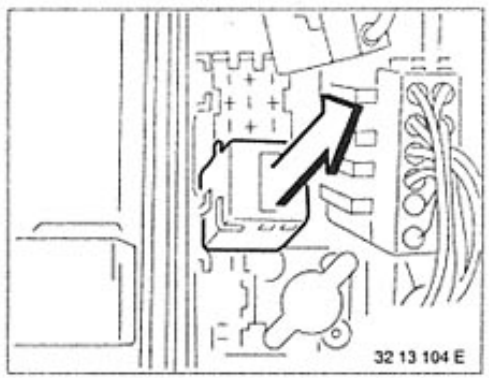
Turn and remove engine cable connector.



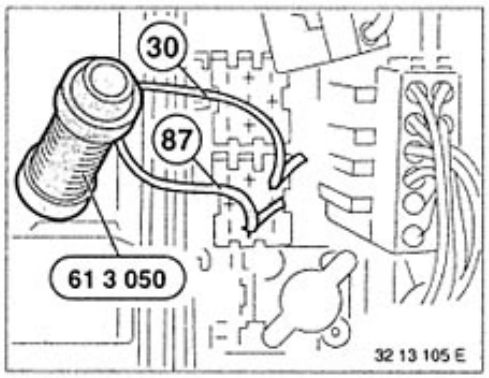
Install BMW Service Tester or special tool 13 3 060 with connecting line and special tool 13 3 064 in the fuel feed line.



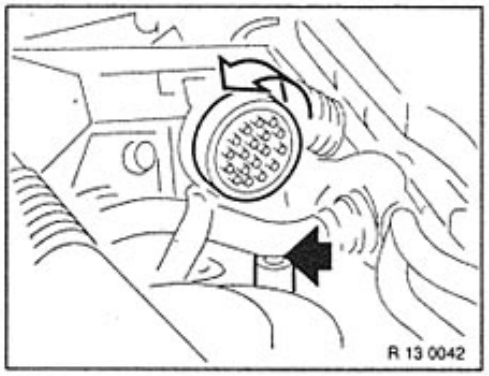
Unfasten screws.
Remove cover from E box.



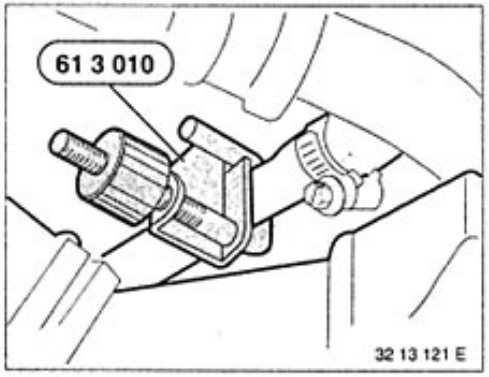
Place connector and cable to one side.
Remove fuel pump relays (orange).



Use special tool 61 3 050 to bridge terminals 87 and 30. Switch on ignition and actuate special tool.
Read off and check injection pressure*.

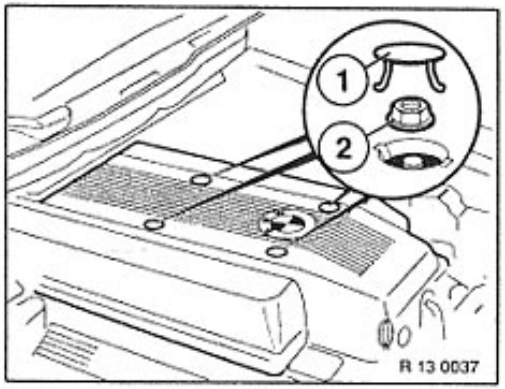


If the injection pressure* drops too fast:
Twist and remove engine cable connector on right side. Plug return line after pressure regulator with special tool 13 3 010.
Actuate special tool 61 3 050 briefly once again.



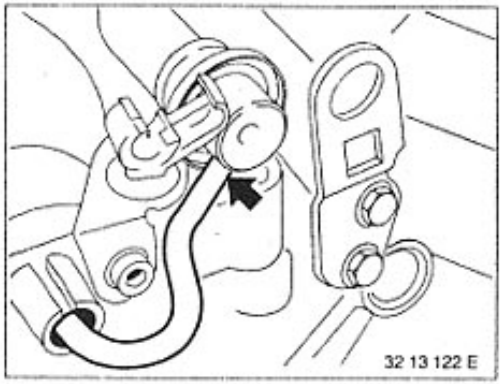
If the injection pressure now remains constant, the pressure regulator is faulty.
If the injection pressure drops, there is a leak before the pressure regulator (injection tube, hose connections, injection valves etc.).

* Refer to Technical Data Group 16

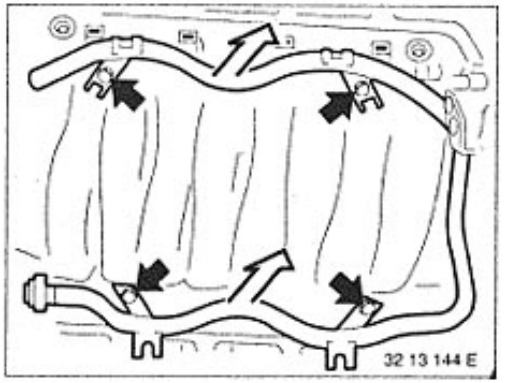


13 51 630 Replacing fuel pressure regulator

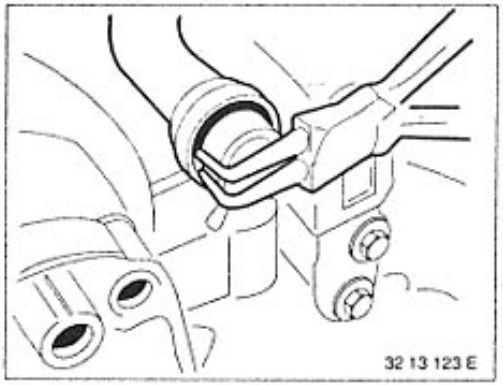
Press off sealing caps (1) and unfasten nuts (2).
Remove manifold cover.



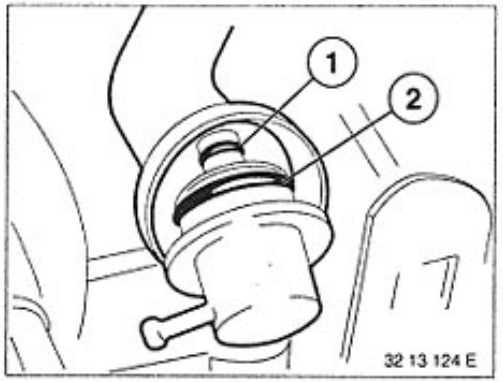
Remove vacuum hose.



Replace all injection valves, see: 13 64 541.

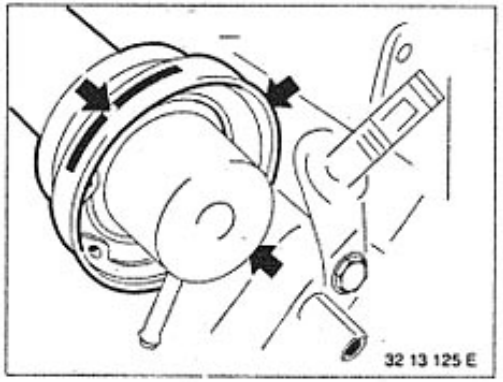


Lift out retaining ring.

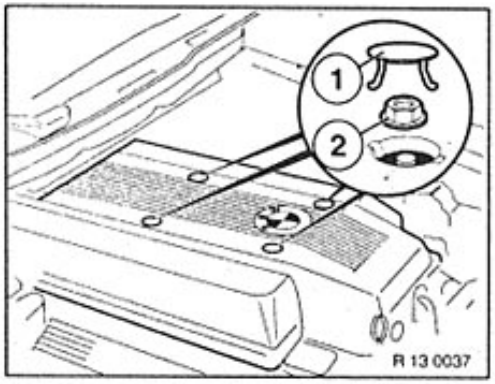


Note and mark position of vacuum connection.
Twist and remove pressure regulator.

Installation:
Fit new seals (1 and 2).

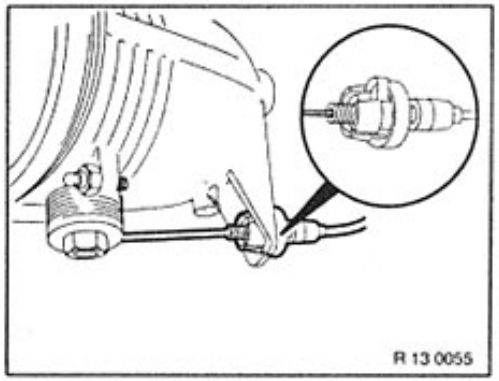


Installation:
Allow lugs on retaining ring to locate in the recesses.



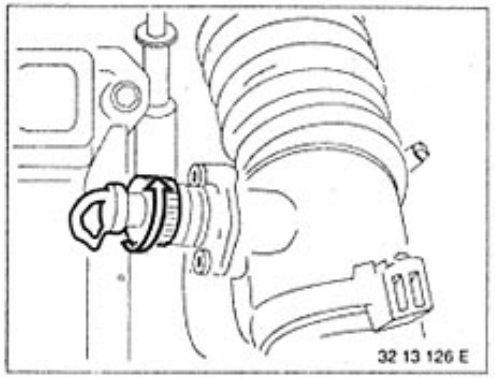
13 54 030 Removing and installing / sealing throttle body

Press off sealing caps (1) and unscrew nuts (2).
Remove manifold cover.

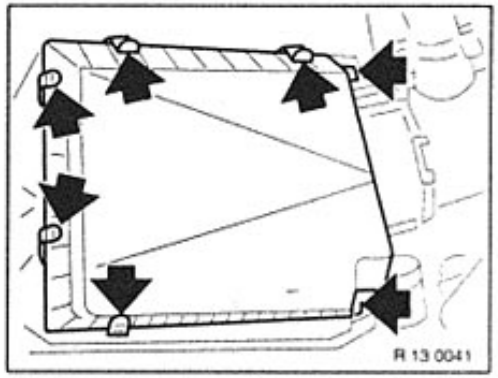


Press in plastic locking device and remove Bowden cable from ASC throttle valve.

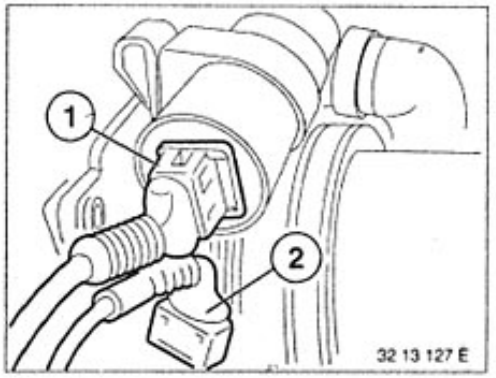
Note:
ASC troubleshooting: refer to diagnosis program selection no. 50/55, fault memory.



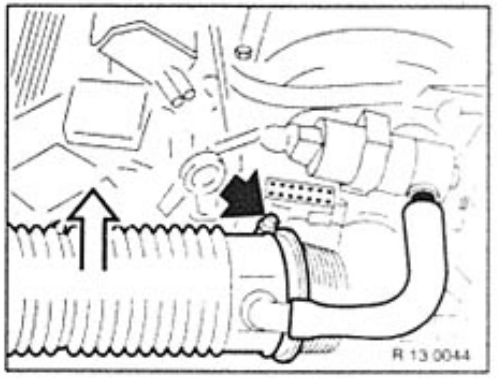
Twist and remove plug connector for mass air flow sensor.



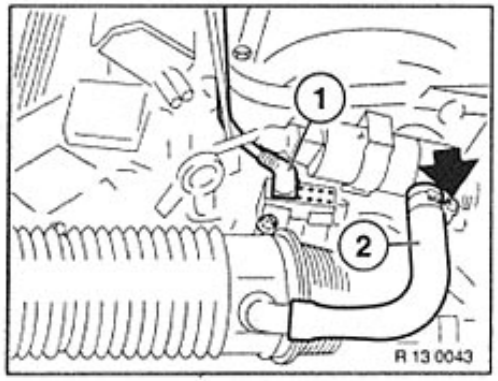
Open clips and lift up upper section of air filter housing.



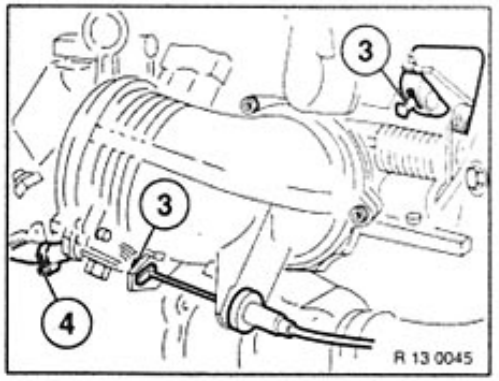
Remove connector (1) from idling speed control valve and (2) from throttle valve potentiometer.



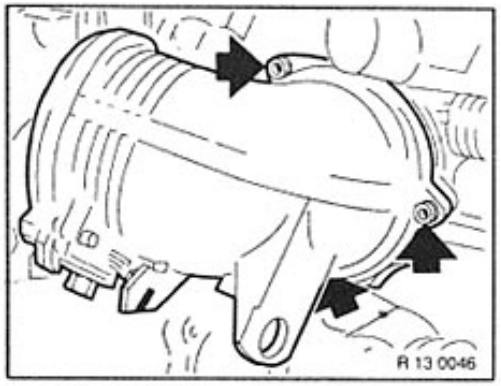
Unfasten hose connector and remove gaiter with upper section of air filter housing.



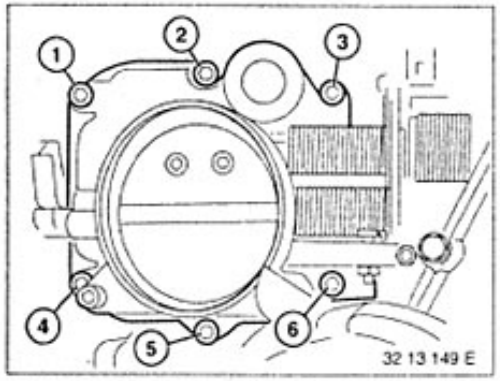
Remove connector from ASC throttle valve potentiometer. Remove idling speed hose.



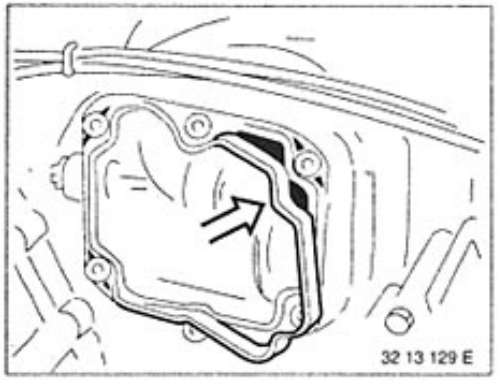
Remove accelerator cables (3).
Remove hose (4) from throttle body.



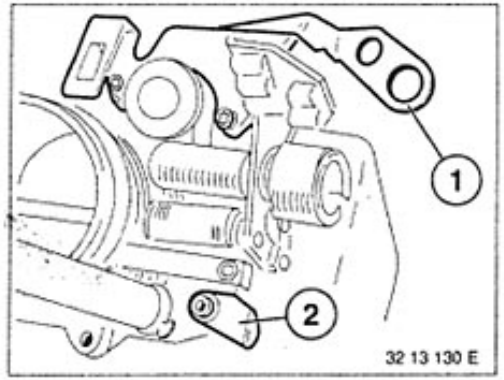
Unfasten screws and remove ASC throttle body.
Installation:
Fit new seal.



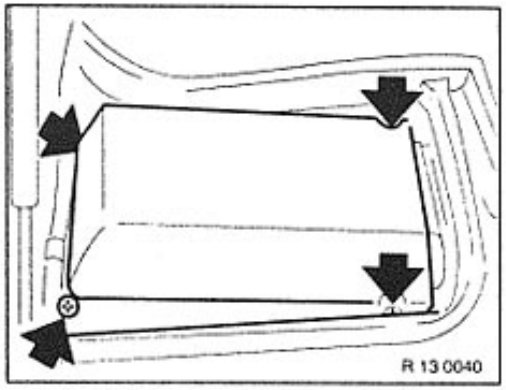
Unfasten screws (1...6) and remove throttle body



Installation:
Fit new gasket.

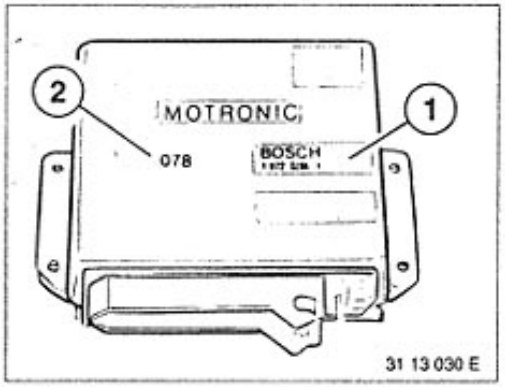


Installation:
Fit brackets (1 and 2).

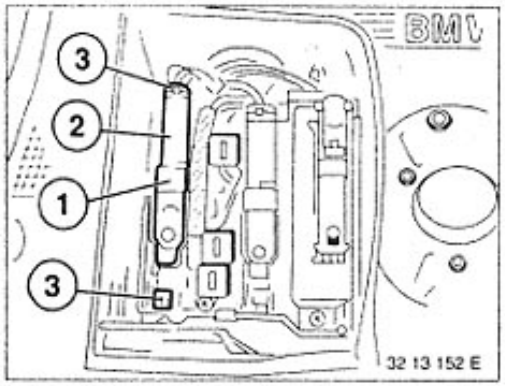


13 61 000 Removing and installing or replacing control unit (for DME)

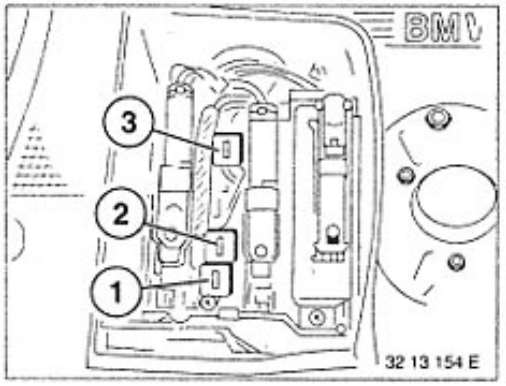
Unfasten cover screws from E box.
Remove cover.



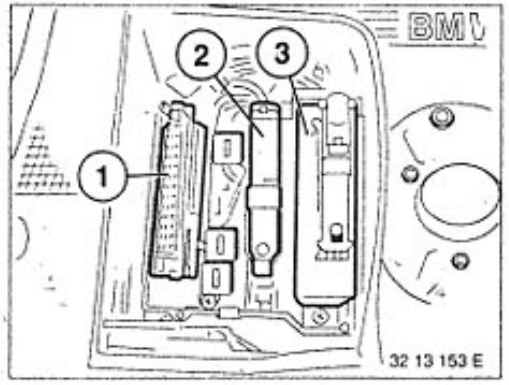
Installation:
Check code (1) *) and production date (2) *).



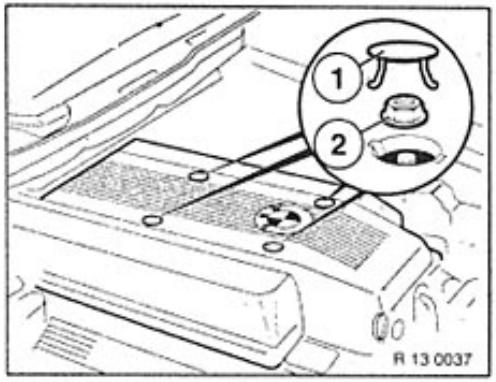
Lift up fuse (1) and remove connector (2).
Unfasten retaining clips (3) and remove control unit.



Relays in control unit for E box:
1 Fuel pump relay (orange)
2 DME main relay (white)
3 Lambda oxygen sensor heating (blue)



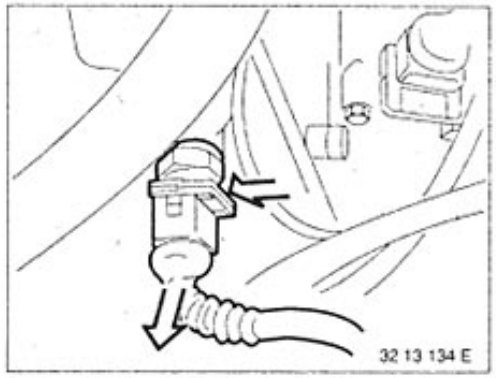
1 DME control unit
2 EGS control unit (automatic transmission)
3 ABS control unit



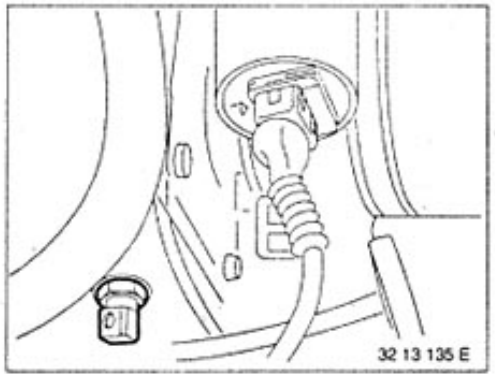
13 62 511 Replacing intake air temperature sensor

(After function check of Digital Motor Electronics (DME) 13 00 002).

Press off sealing caps (1) and unscrew nuts (2).
Remove manifold cover.



Compress retaining spring.
Remove connector.

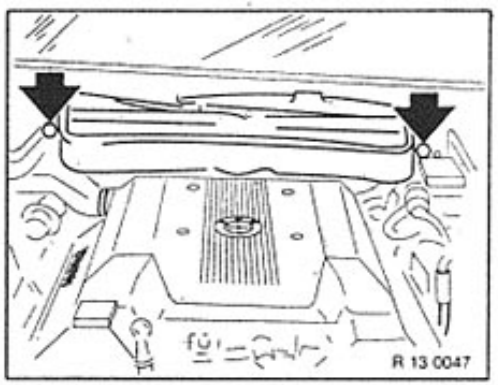


Unscrew and remove temperature sensor.

Installation:
Note tightening torque*.

Components check:
see 13 00 . . .

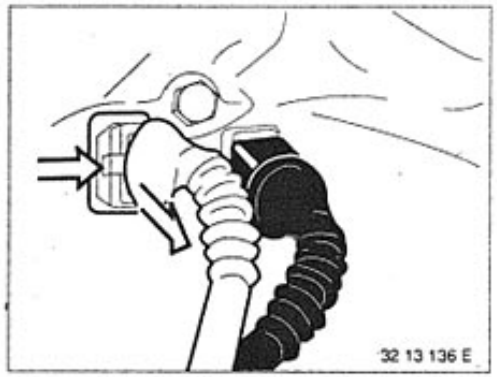
* Refer to Technical Data



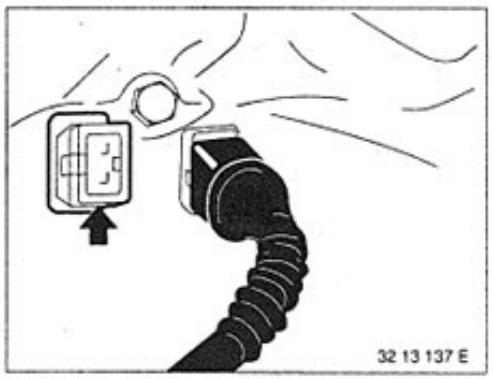
13 62 531 Replacing coolant temperature sensor

(After function check of the Digital Motor Electronics (DME) 13 00 002).

Remove air intake duct.

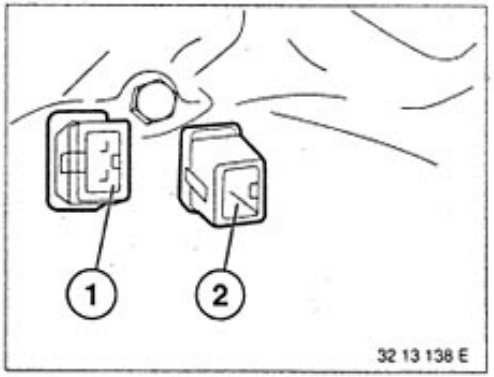


Compress retaining spring.
Remove connector (white).



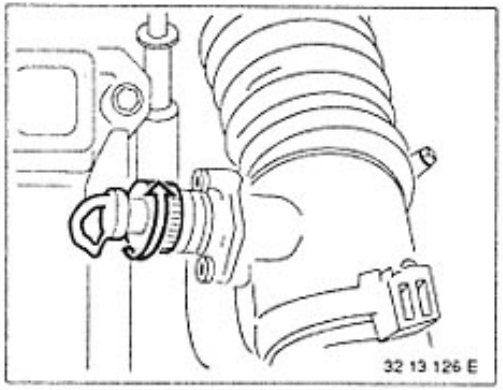
Unscrew and remove sensor.

Installation:
Note tightening torque *).



Layout:
1 DME temperature sensor (white)
2 Temperature sensor - remote thermometer (black)

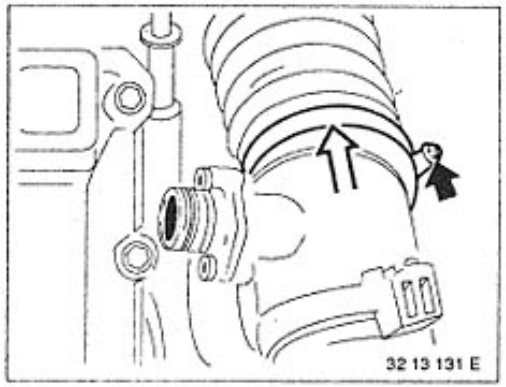
Component check:
see 13 00 . . .



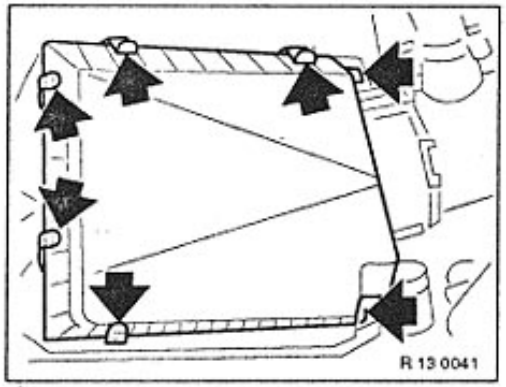
13 62 560 Removing and installing or replacing mass air flow sensor

(After function check of Digital Motor Electronics (DME) 13 00 002)

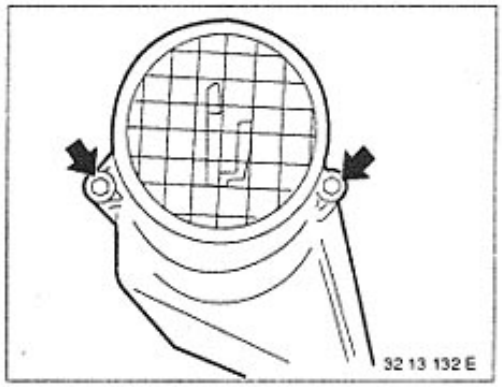
Twist and remove plug connection on mass air flow sensor.



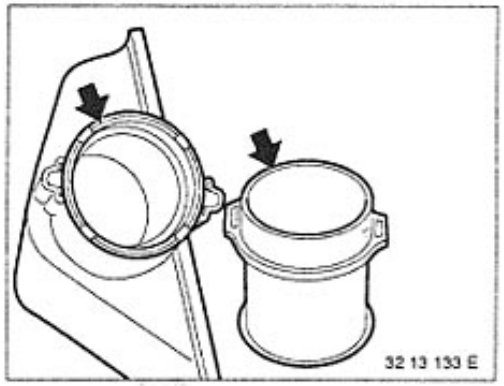
Unfasten hose connector and remove suction hose.



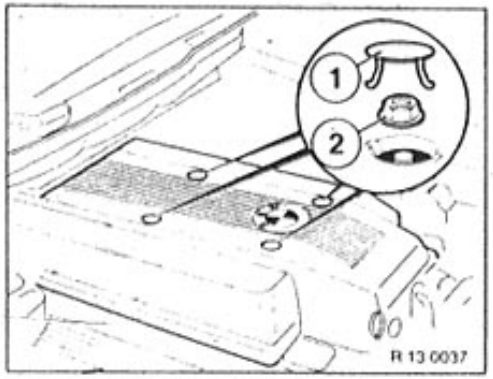
Open clips and lift off upper section of air filter housing together with mass air flow sensor.



Unfasten screws. Twist and remove mass air flow sensor housing.

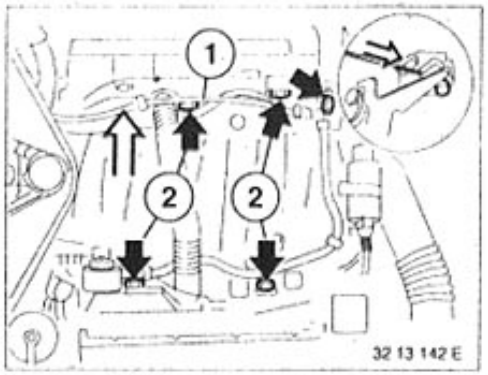


Installation:
Fit new seal. Coat sealing lip of housing with thin layer of acid-free grease.

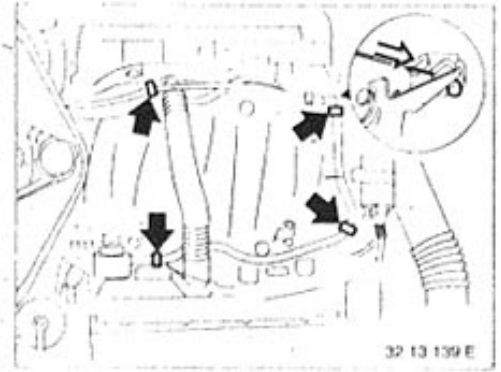


13 64 541 Removing and installing or replacing all fuel injection valves

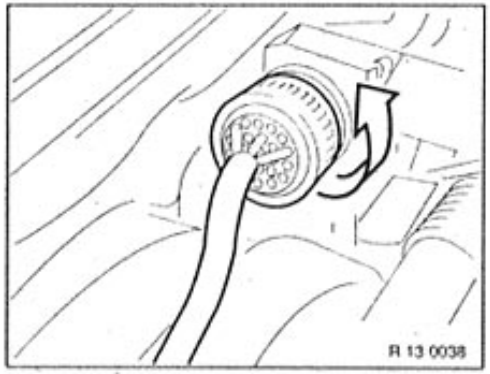
Press of sealing caps (1) and unscrew nuts (2).
Remove manifold cover.



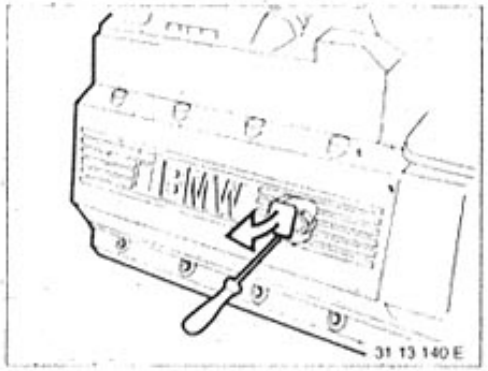
Unclip accelerator cable (1) and place to one side.
Remove cable ducts (2) and place to one side.
Remove connector from fuel injection valves.



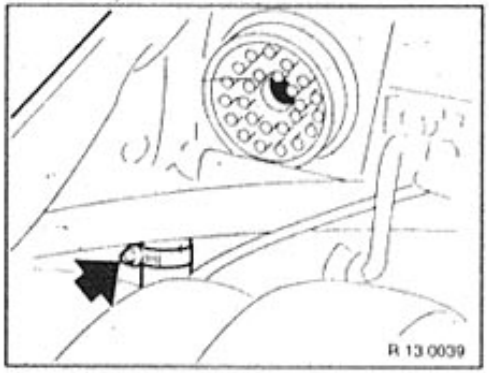
Remove ratchet tapes for cable retainer.
Disconnect accelerator cable from throttle valve lever.



Turn and remove left and right engine cable connectors.

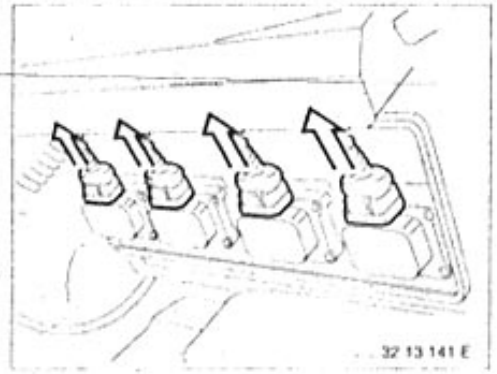


Remove cover for cylinder head covers from both sides.

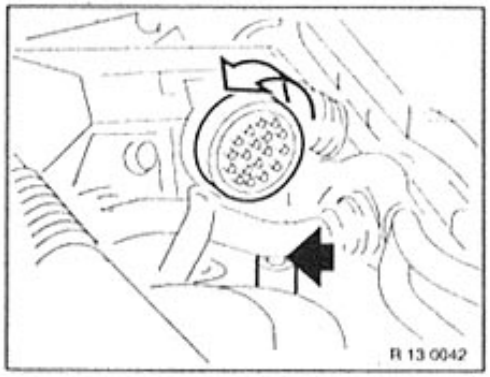


Plug fuel feed line with special tool 13 3 010 and remove.

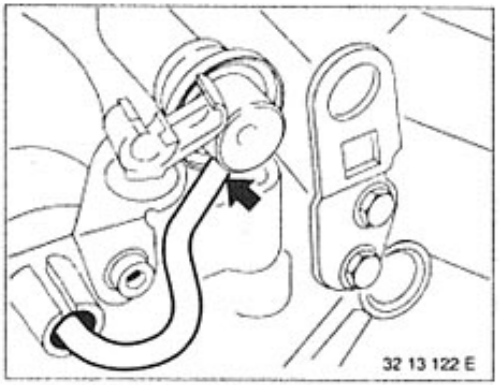
Caution!
Catch escaping fuel.



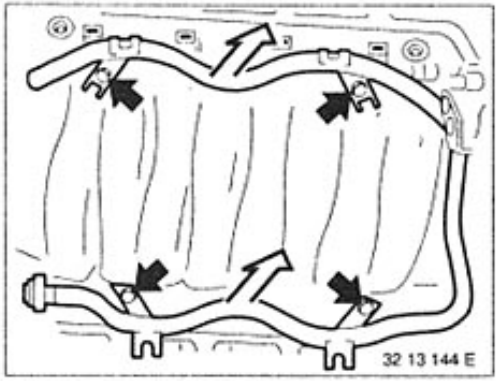
Remove cable connector from ignition coils on both cylinder heads.



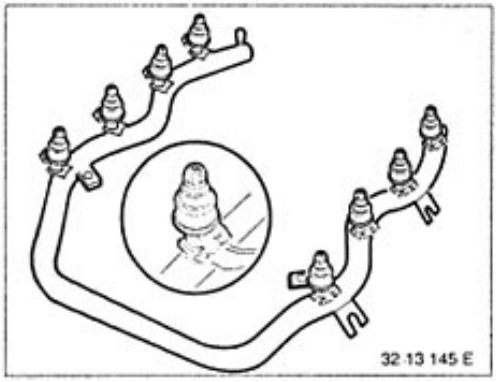
Plug fuel return line with special tool 13 3 010 and remove.



Remove vacuum hose from pressure regulator.



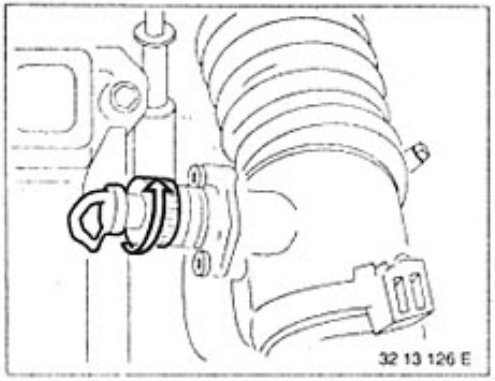
Unfasten injection pipe retainers. Remove injection tube with the fuel injection valves.



Press off clips. Remove fuel injection valves from injection pipe.

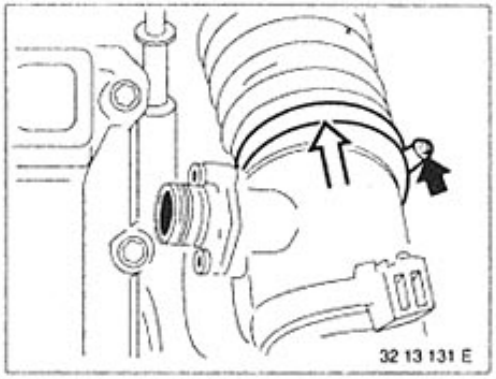
Installation:
Check seals and replace if necessary. Check injection valves for leaks and clean, see 13 64 582.
Coat seals used for installing the valves with acid-free grease.
When replacing the valves, check code no.*, color of connector housing* and production date.

* Refer to Technical Data

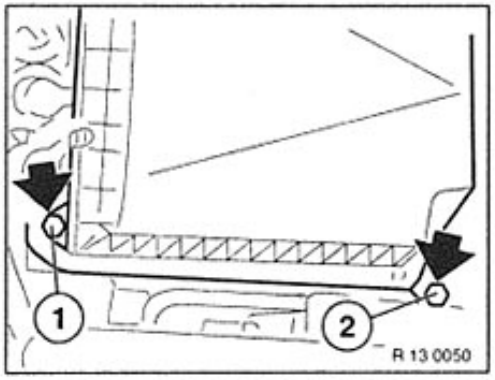


13 71 000 Removing and installing suction filter housing

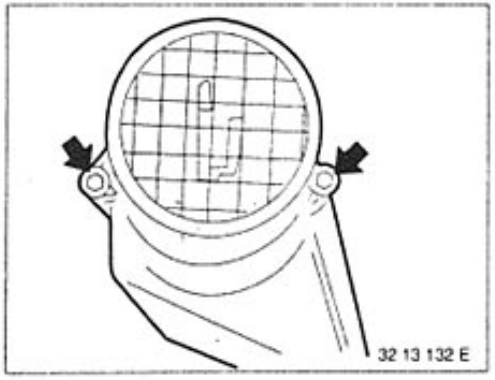
Twist and remove plug connection for mass air flow sensor.



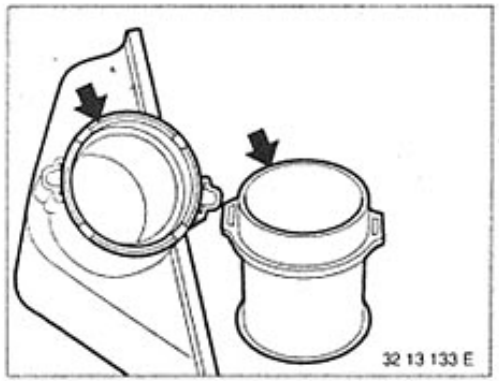
Unfasten hose clip.
Remove suction hose.



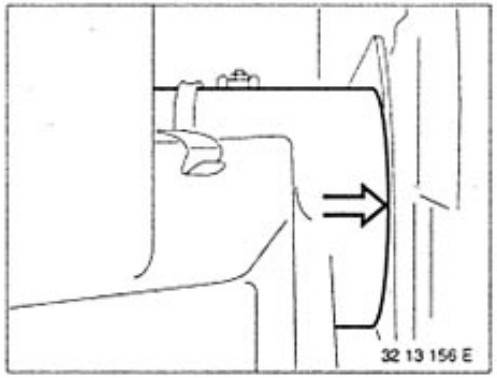
Unfasten screws (1 and 2).
Tilt filter housing and remove.



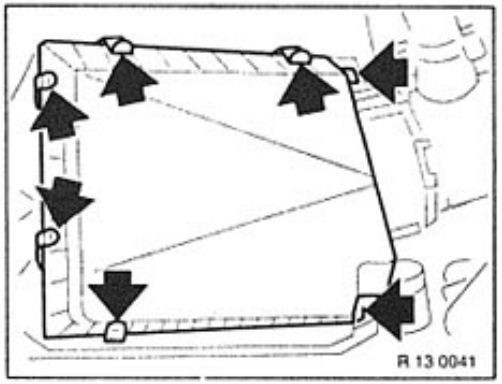
Unfasten screws. Twist mass air flow sensor housing and remove.



Installation:
Fit new seal. Apply a thin coat of acid-free grease to the sealing lip of the housing.

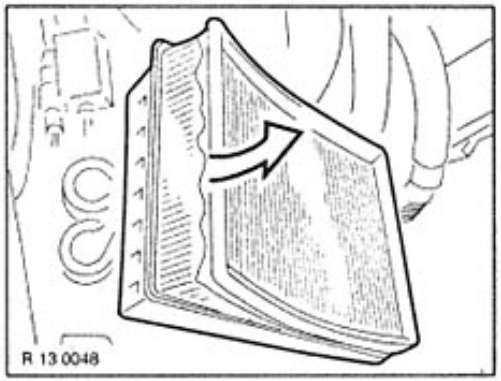


Installation:
Insert suction neck in the recess.
Fit the housing to the rubber mount.

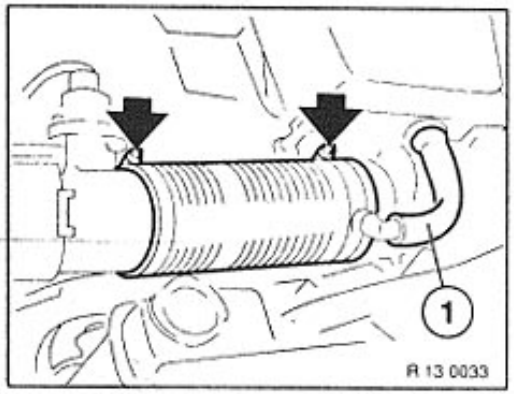


13 72 001 Replacing air filter insert

Open clips.



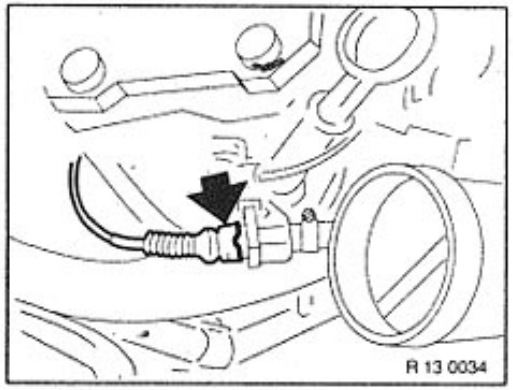
Lift upper section of air filter housing and remove air filter insert.



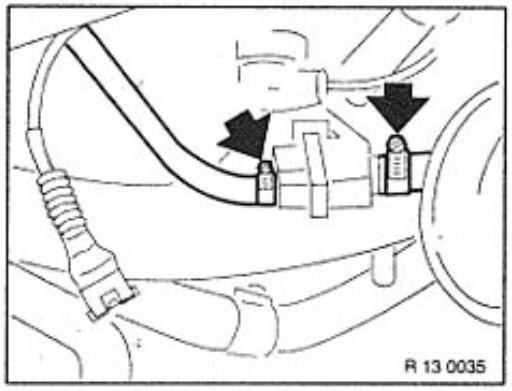
13 90 500 Replacing tank venting valve

(After function check of the Digital Motor Electronics (DME) 13 00 002).

Unfasten hose clip. Remove idle speed hose (1). Remove gaiter (2).



Compress retaining spring and remove connector.



Remove fuel lines.
Caution!
Catch any fuel which may still be in system.

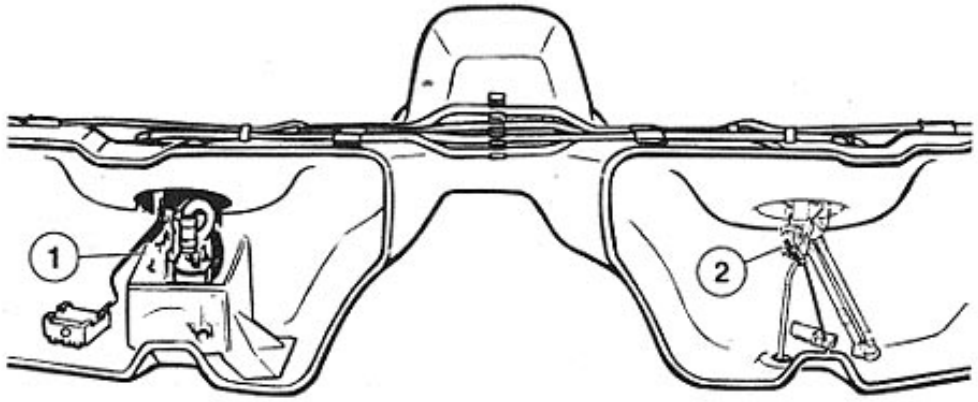
Slide tank venting valve out of rubber mount.
Components check, see 13 00 ...

16 Fuel supply system

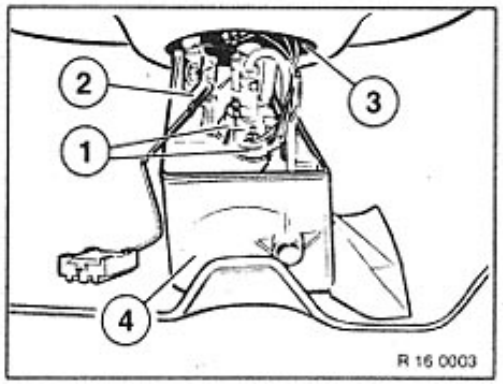
	Summary of fuel tank	16- 0/1
16 00 005	Fuel in fuel tank – draw out and top up	16- 0/2
16 11 030	Fuel tank – remove and install	16-11/1
	Fuel tank installation	16-11/3
	Summary of swing arm sensor and intank pumps	16-12/1
16 12 000	Fuel indicator sensor – remove and install or replace (right)	16-12/2
	Summary of swing arm sensor and sucking jet pump	16-12/4
001	Fuel display sensor – remove and install or replace (left)	16-12/5
	Connector allocation and hose connections	16-12/7
010	Active carbon filter – remove and install or replace	16-12/8
	Summary of tank venting	16-13/1
16 13 . . .	Float gravity valve – remove and install/replace	16-13/2
16 14 010	Fuel pump(s) – remove and install or replace	16-14/1

Fuel tank survey

(Cut away and shown in opposite direction to direction of travel)

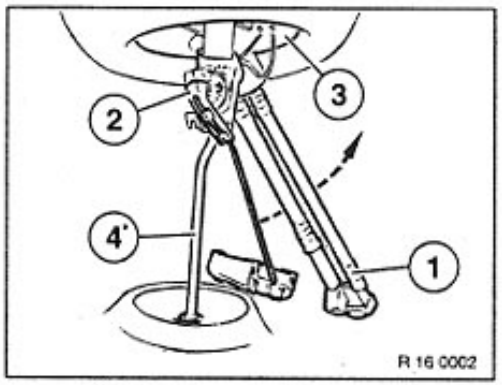


1 = (right) Fuel pump sensor unit



1 = Fuel pump
2 = Swing-arm fuel level sender unit
3 = Tank flange
4 = Fuel baffle

2 = (left) Sucking jet pump sender unit



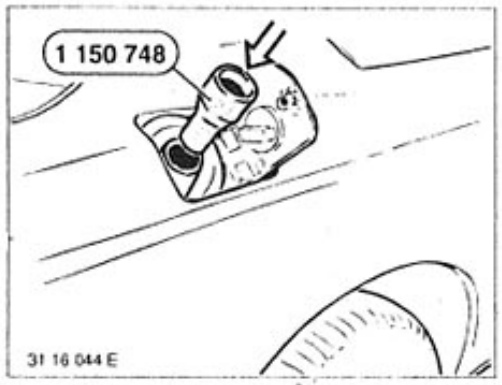
1 = Sucking jet pump
2 = Swing-arm fuel level sender
3 = Tank flange
4 = Probe (for basic setting)



16 00 005 Draining and filling fuel tank

Remove ground lead from support point in trunk.

Caution!
Fault memories in control units are cancelled: if necessary, interrogate in advance.



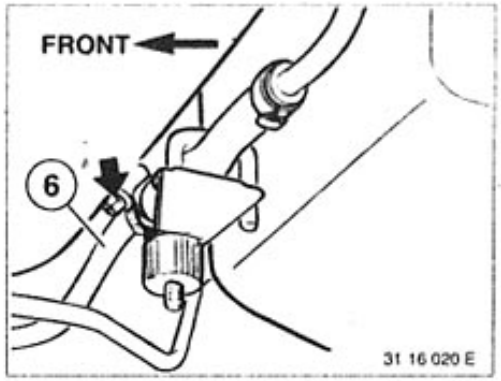
Installation:
Always use new hose clips.
Check fuel hoses for condition and leaks, replacing if necessary.
Also refer to Service Information, Group 16.

First install funnel (Parts No. 1 150 748) in filler neck.



Draw out as much fuel as possible with a scavenging pump**.

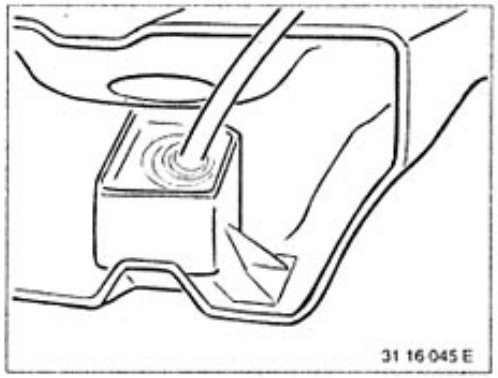
Caution!
Conform with safety regulations as well as local and national regulations.
Use suitable suction hose* and twist slightly when installing and when pulling back out.



Disconnect return hose with special tool 13 3 010 and remove return hose (6). Connect fuel suction device*, open clamp and drain off left half of tank.

Caution!
Conform with safety regulations as well as local and national legislation.
Use suitable suction hose* and connection.

Draw off fuel vapors in vehicle*



The tank can only be drained completely after removal of the sensor units (see 16 12 000/1), or after removal of the tank (16 11 030).

Installation:
Top up fuel with suction unit** through filler neck.

Caution!
Only slide hose approx. 40 cm into tank: on no account slide in as far as baffle plate.

* Refer to Workshop Equipment Service Information
** Refer to BMW Parts Service

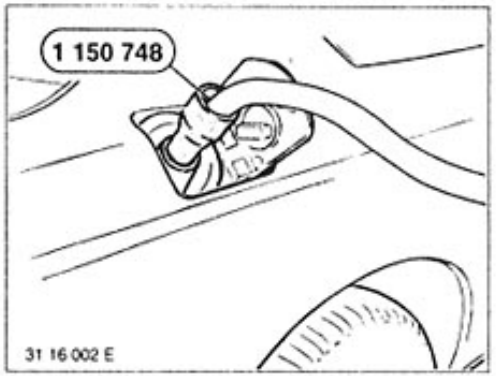
* Refer to Workshop Equipment Service Information
** Refer to BMW Parts Service



16 11 030 Removing and installing fuel tank

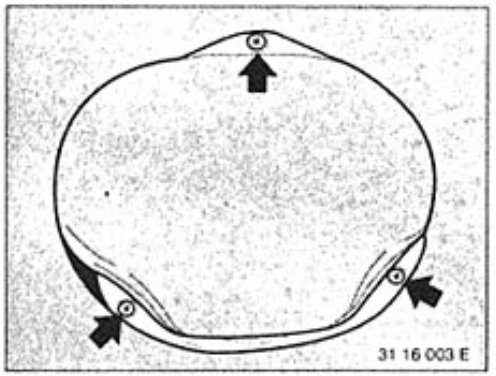
Remove ground lead from connection in trunk.

Caution!
Fault memories in control units are cancelled: if necessary, interrogate first.



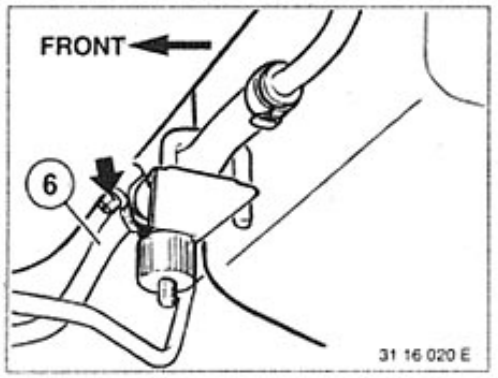
Draw off fuel with scavenging pump** as far as possible at the filler neck.

Caution!
Conform to safety regulations as well as national legislation.
Use suitable suction hose* and twist slightly when inserting and when removing.



Installation:
Always use new hose clips.
Check fuel hoses for condition and leakage, replacing if necessary.
Also refer to Service Information Group 16.

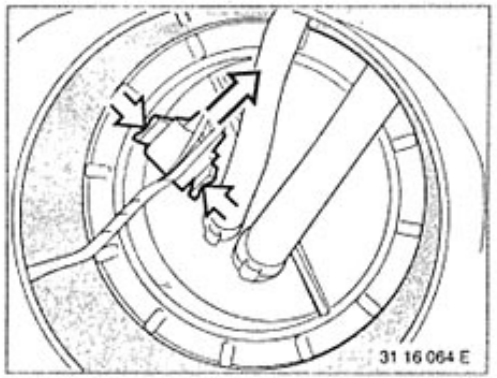
Remove left and right rear seats.
Unfasten screws.
Remove left and right cover.



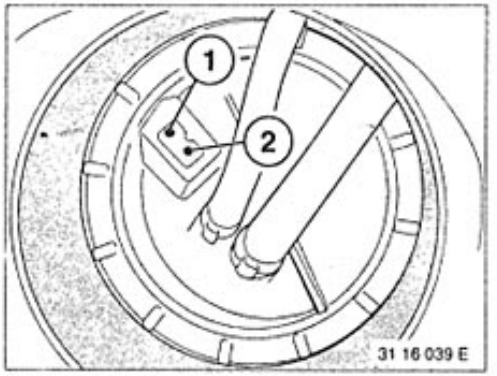
Disconnect return hose with special tool 13 3 010 and remove return line (6). Connect up fuel scavenging unit*, open clamp and drain left half of tank.

Caution!
Conform to safety regulations as well as national legislation.
Use suitable suction hose*.

* Refer to Workshop Equipment Service Information
** Refer to BMW Parts Service

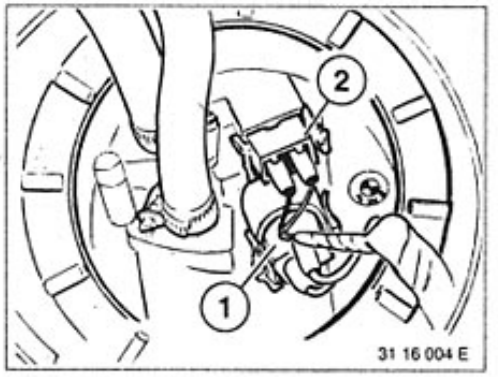


Remove connector for left swing-arm sender unit.

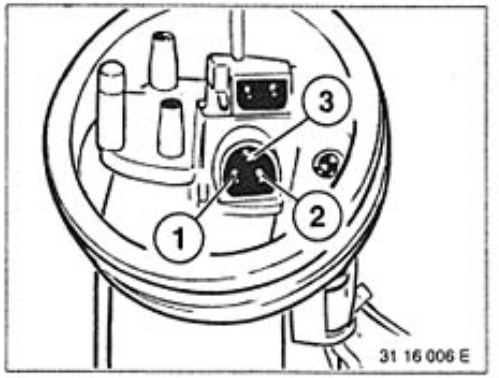


Swing-arm sender unit connection (left side of tank)

1 = Sender (black)
2 = Sender (yellow)

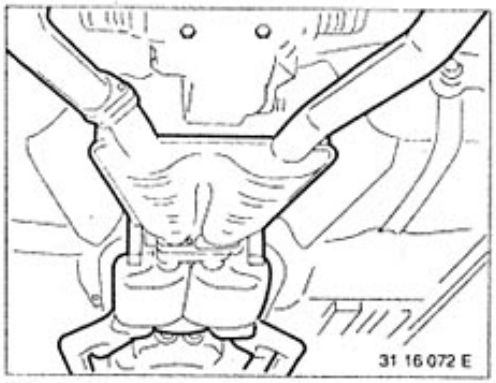


Remove connector for fuel pumps (1).
Remove connector for right swing-arm sender unit (2).



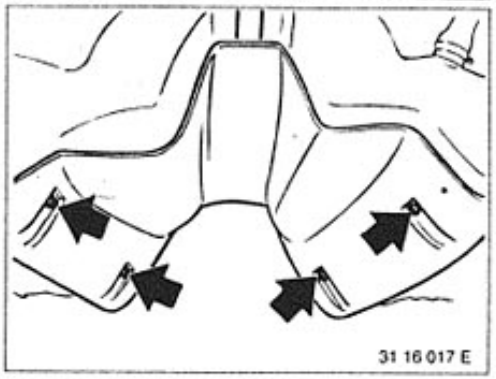
Pin allocation of fuel pump:

1 = Fuel pump 1 (gray, cylinder bank 1...6)
2 = Fuel pump 2 (purple, cylinder bank 7...12)
3 = Ground - (brown)

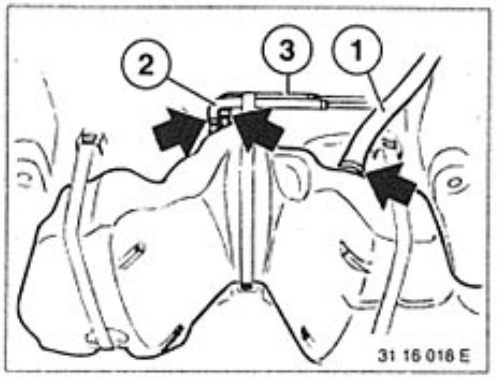


Removing and Installing Complete Exhaust System, see 18 00 020

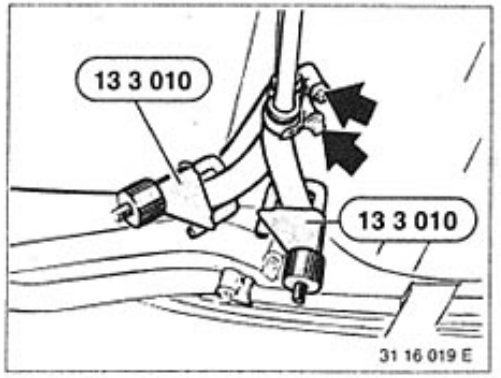
Removing and installing or replacing left or right Bowden cable on handbrake, see 34 41 600.



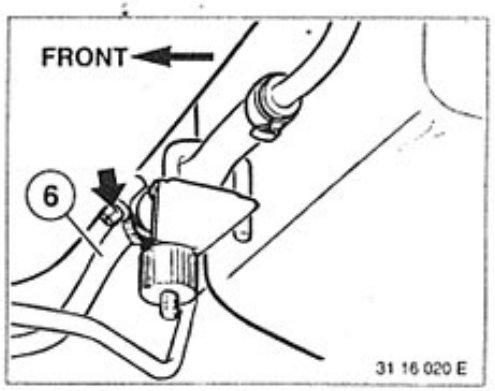
Remove and install complete propeller shaft, see 26 11 000. Unfasten nuts and remove heat shield.



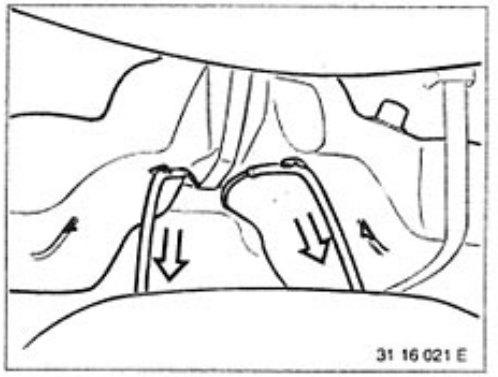
Remove filler hose (1).
Remove filler vent hose (2) and service venting hose (3).



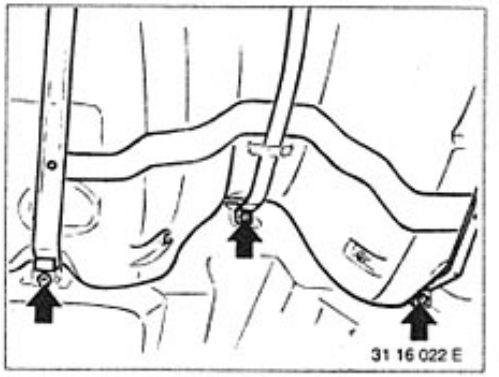
Disconnect fuel hoses with special tool 13 3 010 and remove feed lines.



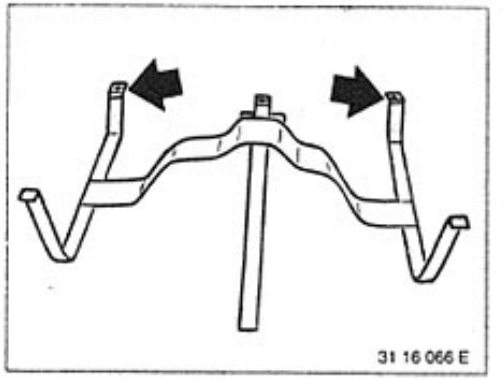
Remove suction hose from return line (6).



Withdraw cable guides from clamps.

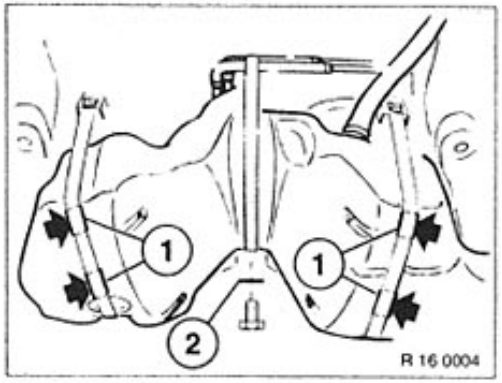


Unscrew nuts.
Disconnect retaining tapes.
Lower fuel tank.



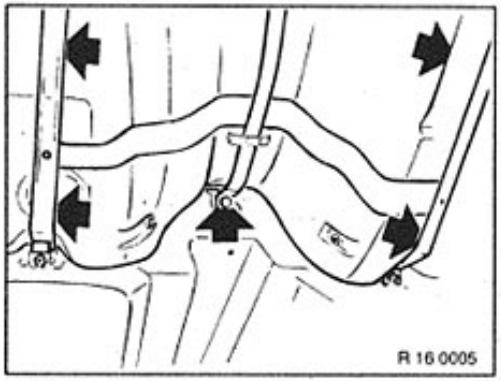
Installation:
Check hard rubber mounts and cement or replace if necessary.
Note tightening torque *.

* Refer to Technical Data

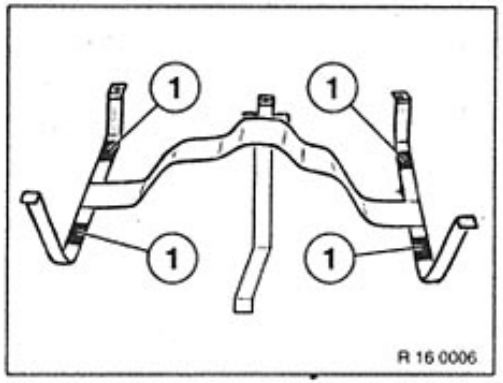


Installing fuel tank

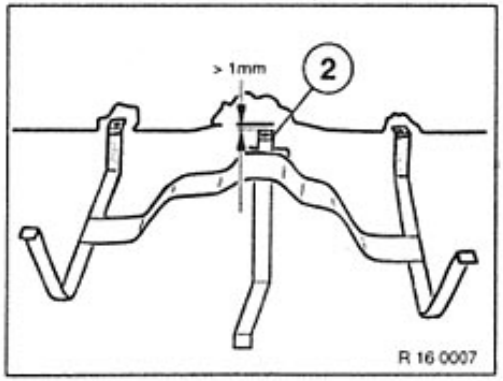
When replacing the tightening straps or replacing the fuel tank, it may be necessary to install rubber mounts (1) on the left and right tightening straps or washers (2) in the center of the tightening strap.



The fuel tank should be installed without any excess tension but also without any clearance (tight but not too tight).



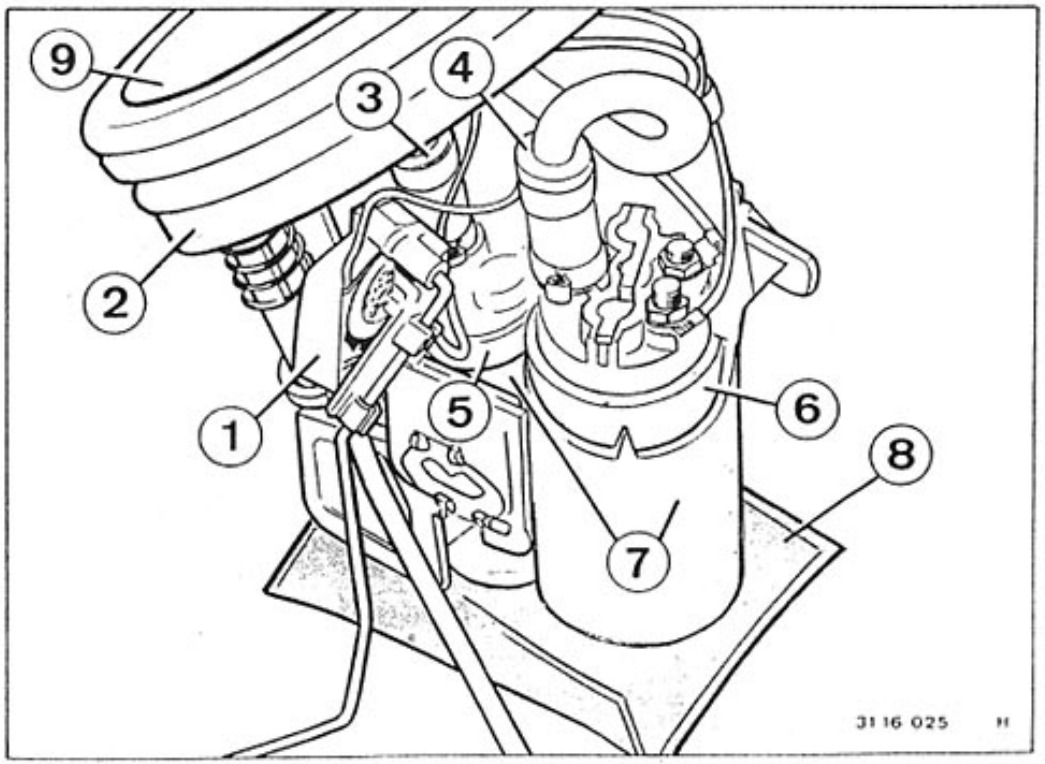
If there is a gap of more than 3 mm between the underside of the tank and the left/right tightening strap, cement damping strips to points (1).



If the gap between screw face on the body and the angle on the center tightening strap is larger than 1mm, compensate this with one or two washers at point (2).

Swing-arm fuel level sender and intank pump survey

1 = Swing-arm sender
2 = Gasket
3 = Feed pipe 1
4 = Feed pipe 2
5 = Fuel pump 1
6 = Fuel pump 2
7 = Pump carrier with rubber mounts
8 = Fuel strainer
9 = Tank flange

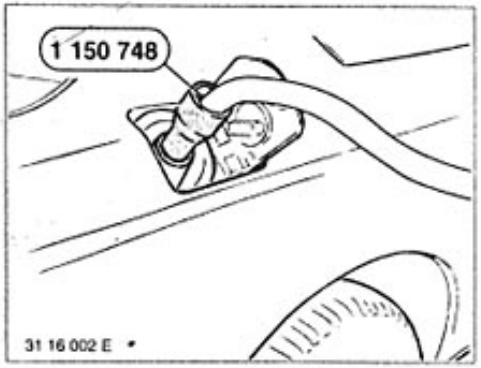


Check fuel pressure and delivery quantity, see Group 13.

Check immersed tube indicator*, refer to pin allocation and hose connections, page 16-12/7.

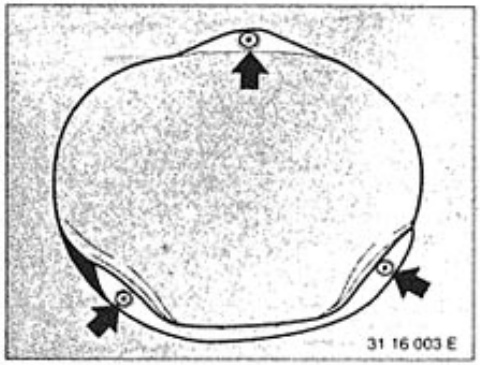
Note:
Pressure dampers and non-return valves are installed in the pumps.

* Refer to Technical Data



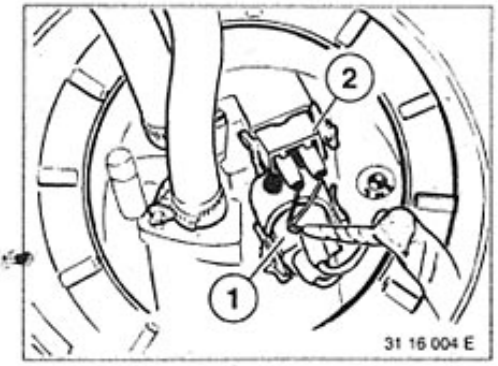
16 12 000 Removing and installing or replacing fuel level sender (right)

Draw fuel out of tank with scavenger pump** as far as possible at the filler neck.
Caution!
Conform to safety regulations as well as national legislation.
Use suitable scavenging hose* and twist slightly when inserting and withdrawing.

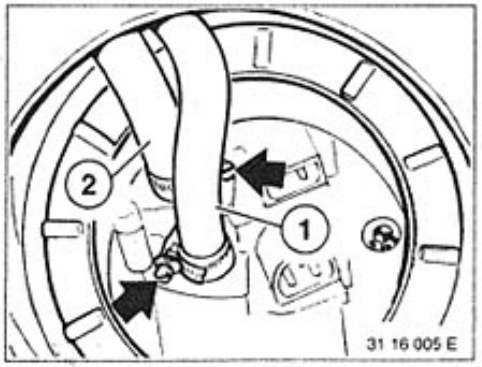


Installation:
Always use new hose clamps.
Check fuel hoses for condition and leakage, replacing if necessary.

Remove right-hand back seat.
Unfasten screws.
Remove right cover.

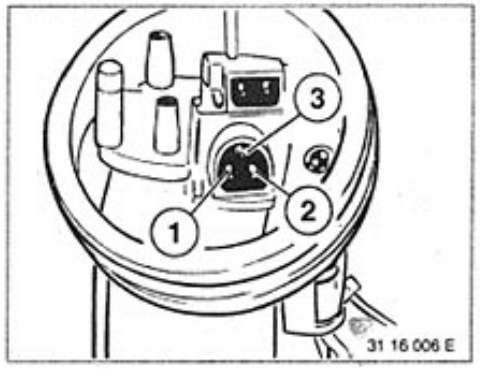


Remove connector for fuel pumps (1).
Remove connector for swing-arm fuel level sender (2).

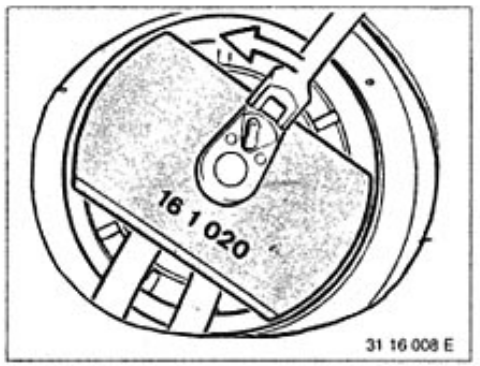


Remove fuel hoses.
Draw off fuel vapors in car*.
Note:
Place identifying marks on fuel hoses.
1 Intake pump 1 (cylinder bank 1...6)
2 Intake pump 2 (cylinder bank 7...12)

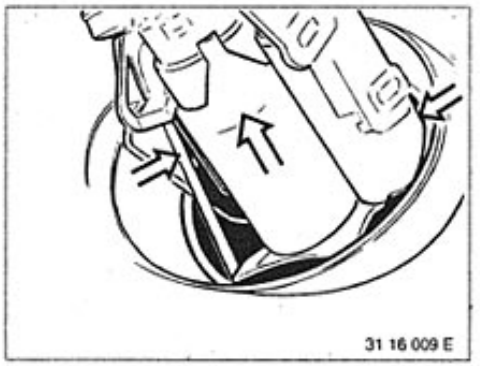
* Refer to Workshop Equipment Service Information
** Refer to BMW Parts Service



Pin allocation for fuel pump, see page 16-12/7.

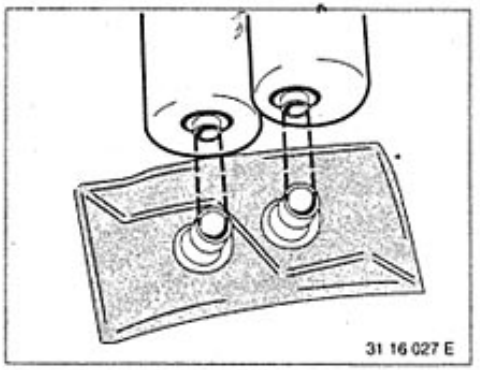


Unscrew cap nut from swing-arm sender unit on fuel pump using special tool 16 1 020.

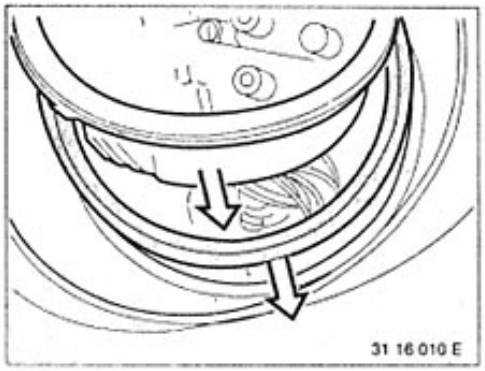


Carefully remove unit.

Installation:
Press level sensor slightly towards housing.



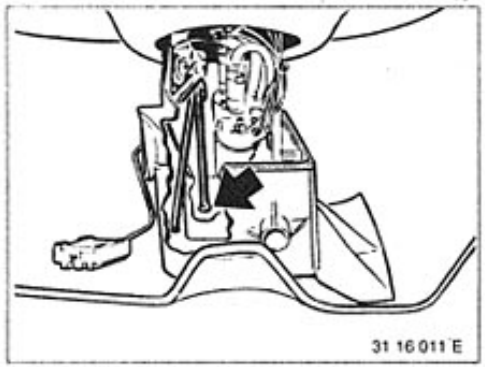
Installation:
Fit new fuel strainer.
Fit new fuel strainer and allow to engage correctly.



Important!
Always use a new seal and new coupling nut.

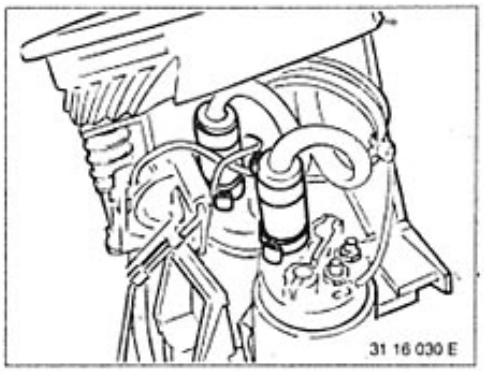
Installation:
Insert seal.
Swing strainer and float into the tank.
Press unit in vertically while slightly compressing the altitude stylus and housing.

The correct installed position is shown on page 16-12/5.

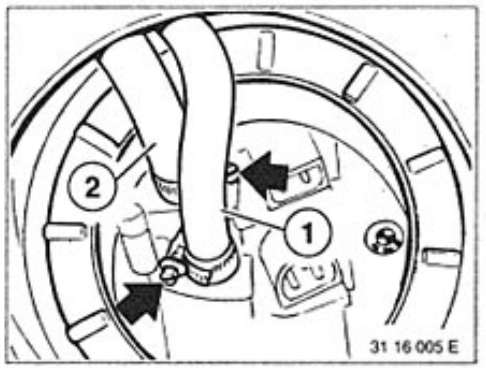


Installation:
Prior to pressing in to final position, slightly lift the unit (watch out for seal) and move back and forth slightly to guarantee that the altitude stylus is positioned vertically in the correct area and the float can be moved easily.

Installation:
Ensure that the rib on the flange is aligned with the cast tab on the tank (can be felt) in one direction before tightening the coupling nut.
Check tightening torque* of coupling nut.

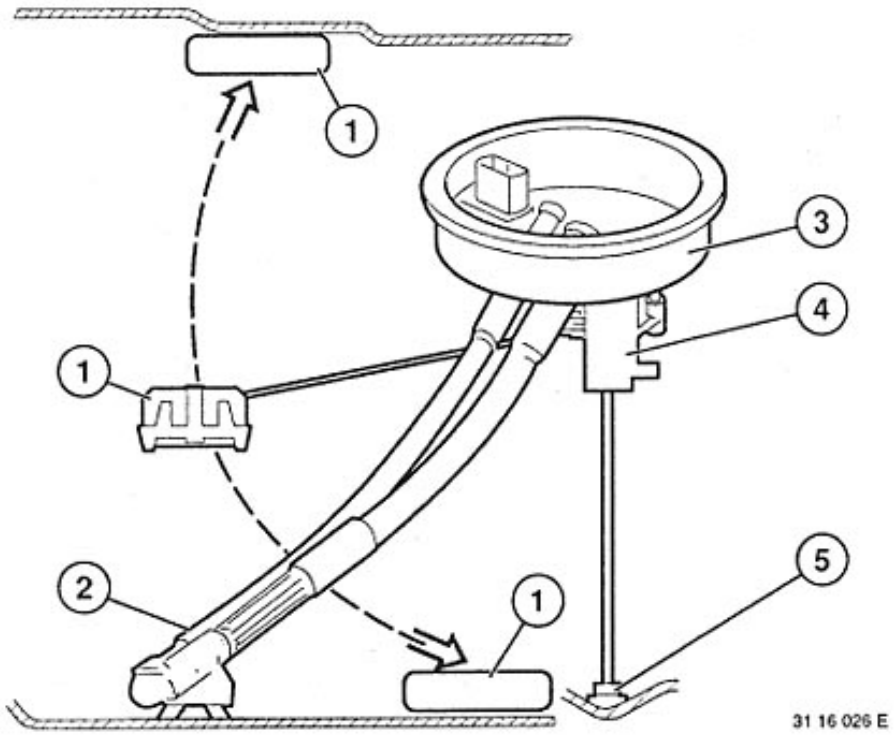


The sender for the right fuel gage makes up a single unit together with the fuel pumps and tank flange. It can only be replaced complete.



Installation:
Check fuel hoses, replacing if necessary.
Replace hose clamps.

SWING-ARM FUEL LEVEL SENDER AND EJECTOR SURVEY



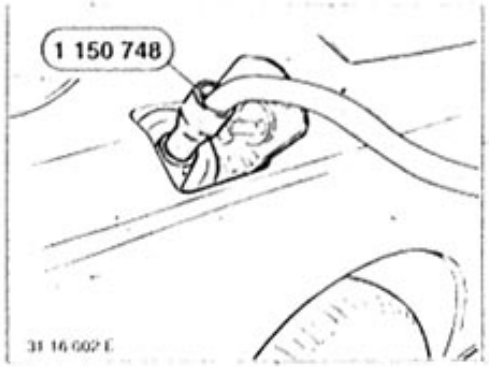
1 Float
2 Ejector
3 Tank flange
4 Swing-arm sender
5 Center and stylus (for basic setting)



16 12 001 Removing and installing or replacing fuel indicator sender (left)

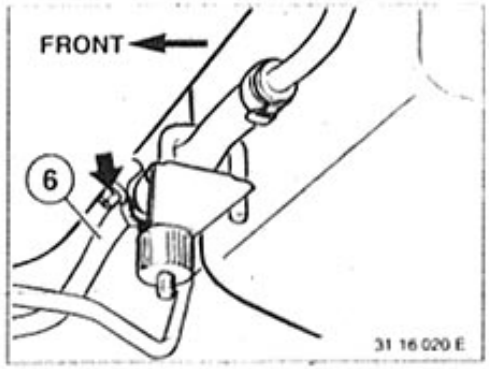
Remove ground leads from mount in trunk.

Caution!
Memories of control units will be deleted.
If necessary, read them out, first.



Draw off fuel with scavenge pump*, as far as possible at filler neck.

Caution!
Conform to safety regulations as well as national legislation.
Use suitable suction hose* and twist slightly when inserting and when withdrawing.

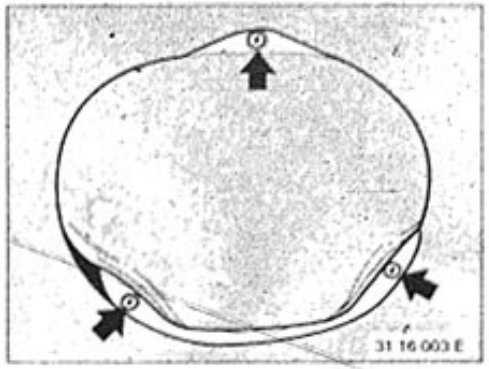


Disconnect return hose with special tool 13 3 010 and remove return line (6). Connect up fuel scavenging unit**, open clamp and drain left half of tank.

Caution!
Conform to safety regulations as well as national legislation.
Use suitable scavenging hose*.

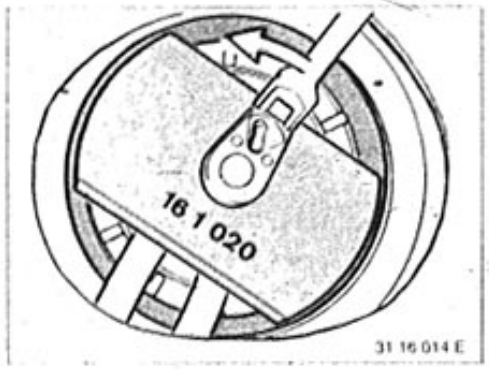
Installation:
Always use new hose clips.
Check fuel hoses for condition and leakage and replace if necessary.

* Refer to Workshop Equipment Service Information
** Refer to BMW Parts Service



Remove left-hand back seat and left cover.
Remove connector from left swing-arm fuel level sender unit.
Remove return line fuel hoses and expansion tank.

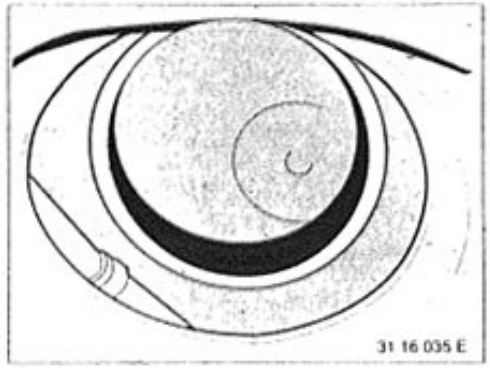
Draw off fuel vapors in car*



Remove cap nut from swing-arm fuel level sender unit with special tool 16 1 020.



Carefully remove unit, pressing level sensor slightly towards housing while doing so.



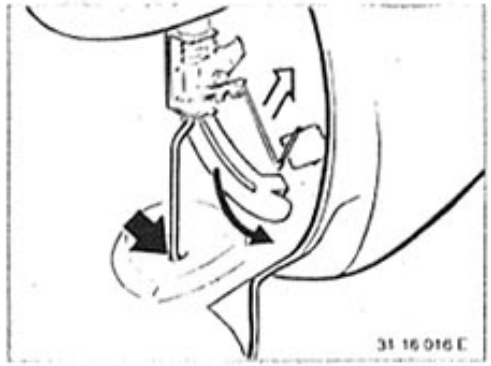
Caution!
Always use new seal and new cap nut.

* Refer to Workshop Equipment Service Information

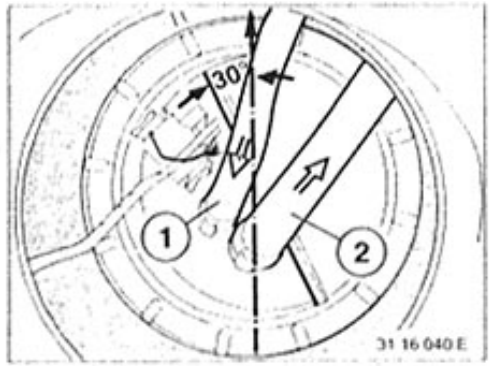


Installation:
Install seal and press unit vertically into correct position so that probe just makes contact with the base of the tank.

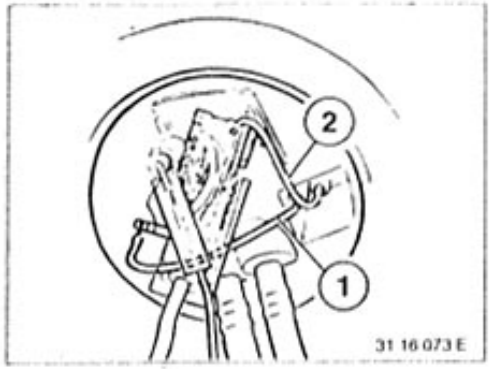
Installation position - see page 16-12/7.



Caution!
The return and sucking jet pump line is pressed onto the base of the tank with slight preload.
The level sensor must locate in the recess provided.
The swing-arm fuel level sender unit and float must be able to move freely.

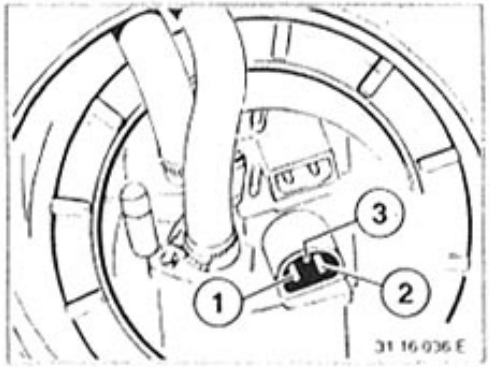


Installation:
Before tightening the cap nut, ensure that the rib on the flange points towards the cast lug on the tank (protruding), approx. 30° to direction of travel.
Note tightening torque* of the cap nuts.



The sender for left fuel level indicator forms one unit with the sucking jet pump and the tank flange. This can only be replaced as a complete unit.

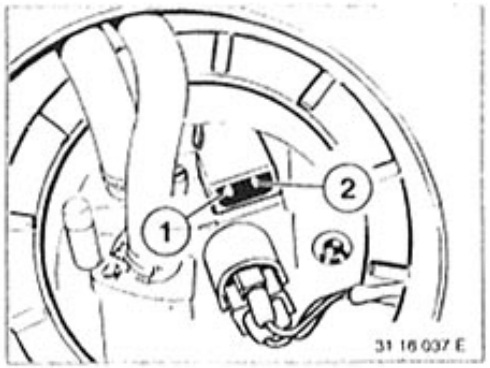
* Refer to Technical Data



Plug and Hose Connections:

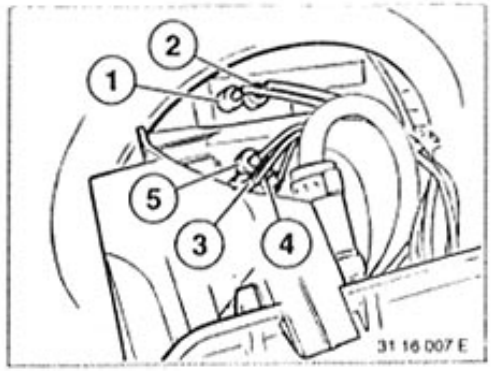
Fuel Pump Connection (Right Side of Tank)

1 = Fuel pump 1 (cyl. 1...6)
2 = Fuel pump 2 (cyl. 7...12)
3 = Ground (–) for both fuel pumps



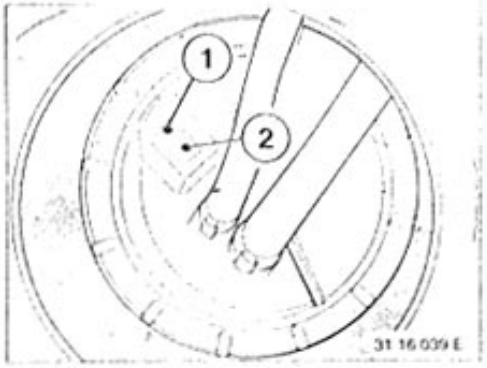
Swing-arm Sender Connection (Right Side of Tank)

1 = Sender (black)
2 = Sender (yellow)



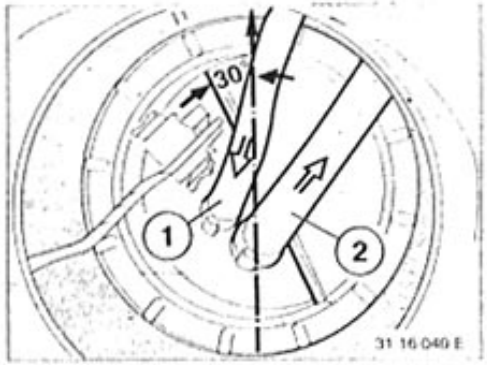
Electric Wire Connections on Inside of Tank Flange:

1 = Swing-arm sender (yellow)
2 = Swing-arm sender (black)
3 = Fuel pump 1 (gray)
4 = Fuel pump 2 (violet)
5 = Fuel pump ground (brown)



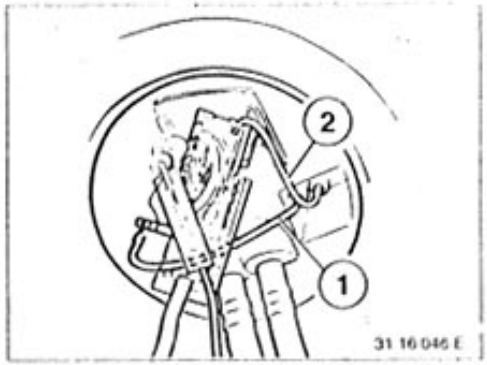
Swing-arm Sender Connection (Left Side of Tank)

1 = Sender (black)
2 = Sender (yellow)



1 = Fuel return.
2 = Fuel expansion tank from ejector

Installed position = approx. 30° to forward direction.
Cast tabs on the tank can be felt.



Electric Wire Connections on Inside of Tank Flange:

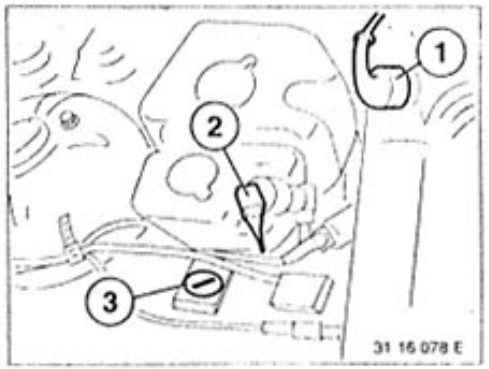
1 = Swing-arm sender (black)
2 = Swing-arm sender (yellow)

Fuel Feed

1 = Fuel pump 1 (cyl. 1...6)
2 = Fuel pump 2 (cyl. 7...12)

Arrow = Installed position
Front = Forward direction

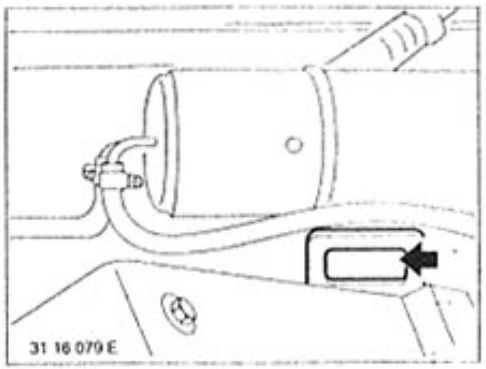
Installed position = front.
Cast tabs on the tank can be felt.



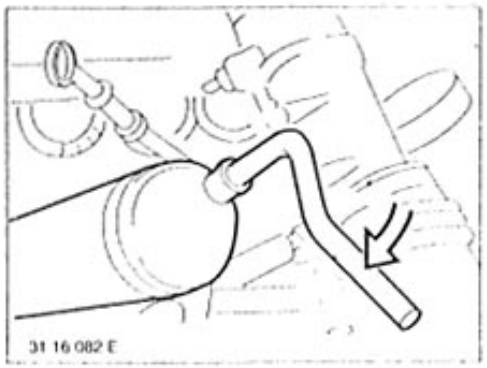
16 12 010 Removing and installing or replacing active carbon filter

Remove connectors (1) and (2). Unfasten screw (3), remove tank and place to one side.

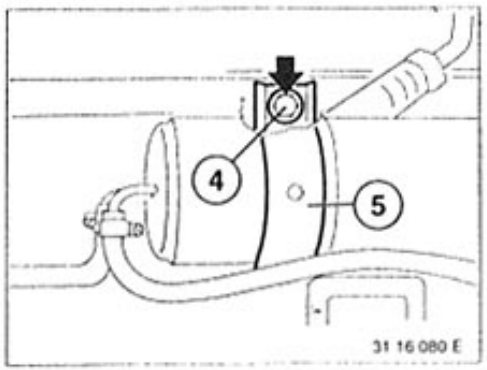
Caution!
Catch escaping fuel in a suitable receptacle.



Installation:
First install tank in retaining tab.

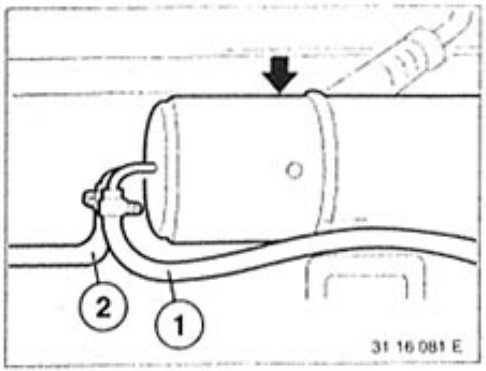


Installation:
Check that vent line is correctly located and installed.



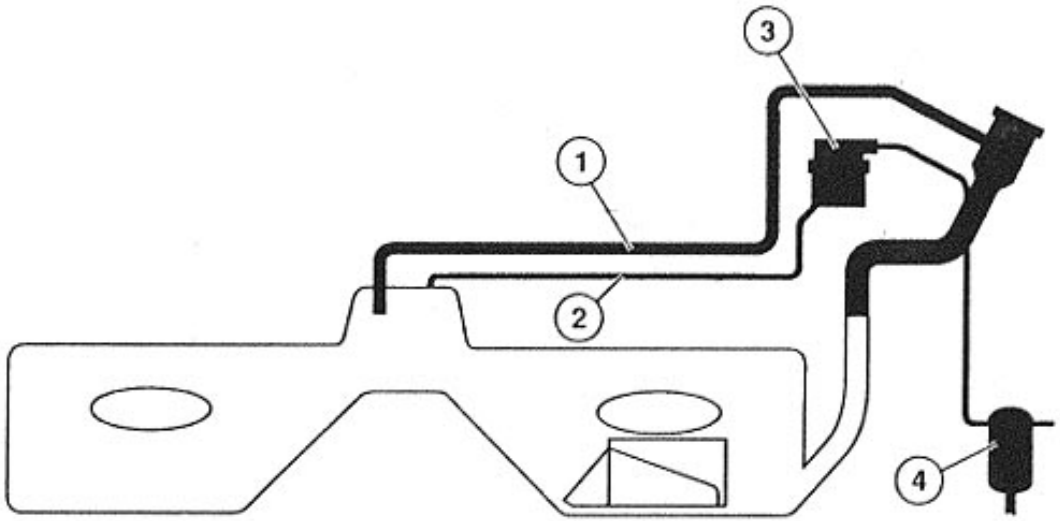
Unfasten screw (4) and disconnect bracket (5).

Replace tank venting valves, see 13 90 500.



Lift up active carbon filter, remove hose (1) to the tank venting valves and hose (2) from the gravity float valve.

Tank venting survey



31 16 074 E

1 Tank venting line

2 Tank venting line

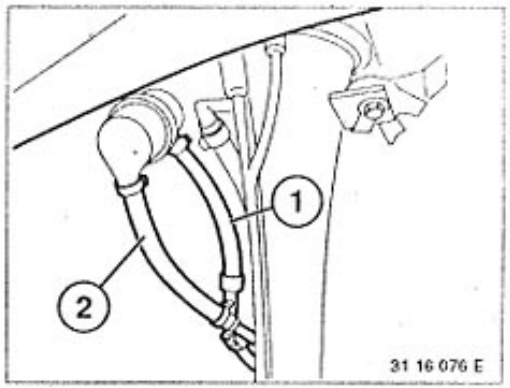
3 Gravity float valve

4 Active carbon filter

Replace tank venting valve, see 13 90 500

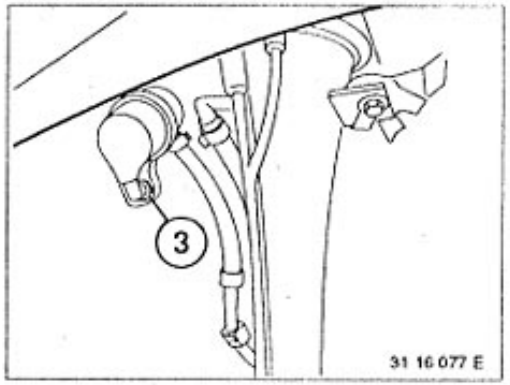
16 13 ... REMOVING AND INSTALLING OR REPLACING FLOAT GRAVITY VALVE

Checking:
The float gravity valve is faulty in case of excessively high pressure in the fuel system or leakage, fuel flows from the float gravity valve to the carbon canister (carbon canister is filled with fuel).

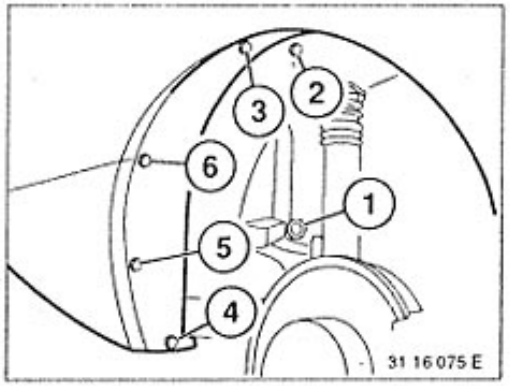


Disconnect hose (1) to the carbon canister and hose (2) to the tank.

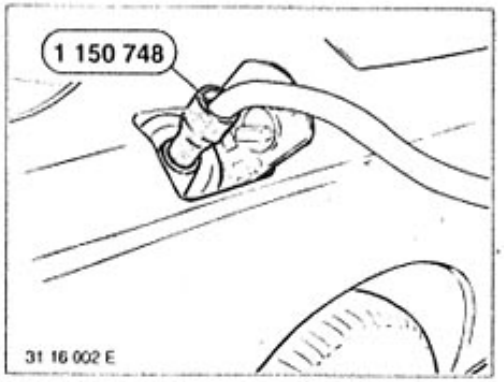
Caution!
Pipes could be filled with fuel which is under pressure.
Catch escaping fuel in a suitable container.



Unscrew nut (3).
Remove valve.

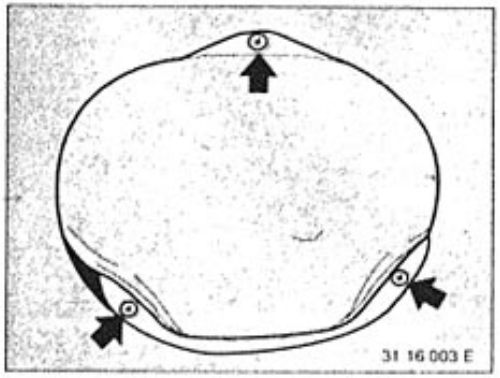


Removing and Installing:
Unscrew nuts (1 ... 6) and remove trim panel from the right rear wheel house.



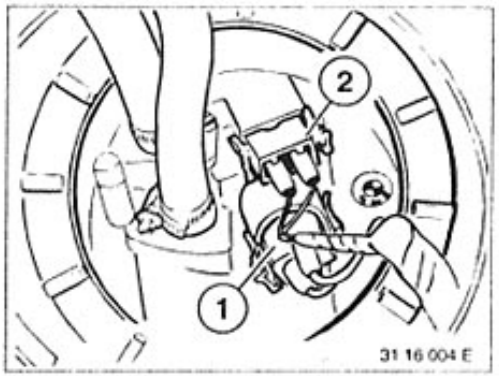
16 14 010 Removing and installing or replacing fuel pump(s)

Draw fuel out of tank with scavenge pump** as far as possible at filler neck.
Caution!
Conform to safety regulations as well as national legislation.
Use suitable scavenge hose* and twist slightly when inserting and when withdrawing.

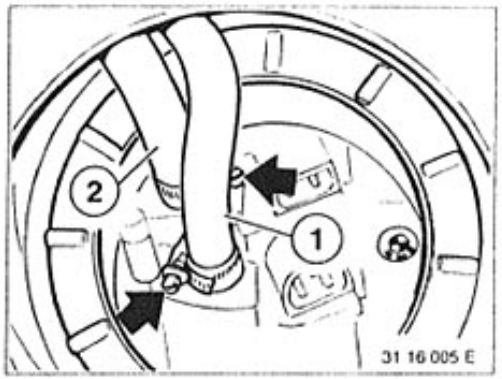


Installation:
Always use new hose clamps.
Check fuel hoses for condition and leakage, replacing if necessary.
Also refer to Service Information, Group 16.

Remove right-hand back seat.
Unfasten screws.
Remove right cover.

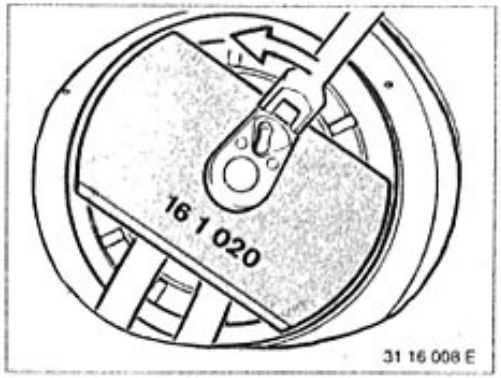


Remove connector for fuel pumps (1).
Remove connector for swing-arm fuel level sender (2).

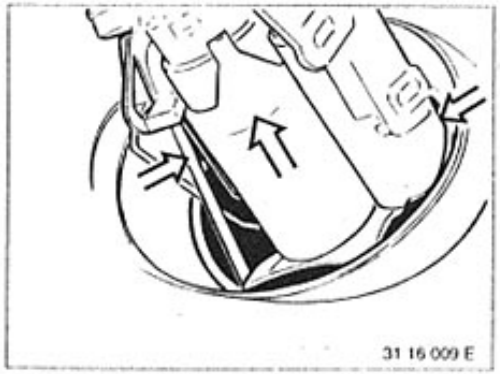


Remove fuel hoses.
Draw off fuel vapors in car*
Note:
Mark fuel hoses.
1 = Intake pump 1 (cylinder bank 1...6)
2 = Intake pump 2 (cylinder bank 7...12)

* Refer to Workshop Equipment Service Information
** Source of Suppply: BMW Parts Service

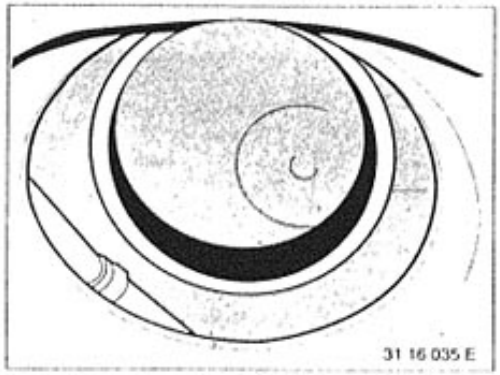


Unscrew cap nut from fuel level sender unit on fuel pump using special tool 16 1 020.

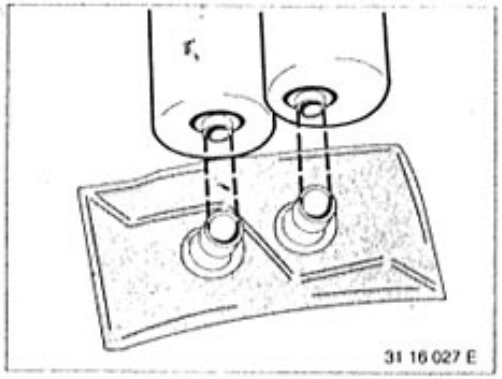


Carefully remove unit.

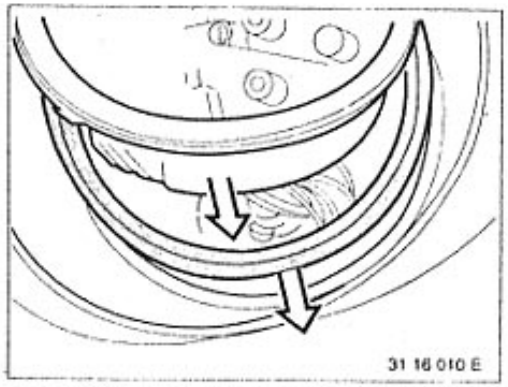
Installation:
Press level sensor slightly into housing.



Caution!
Always use new seal and new cap nut.

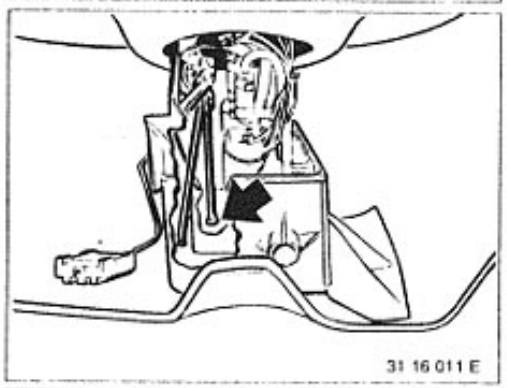


Installation:
Always use new fuel strainer.
Fit fuel strainer and allow to engage correctly.

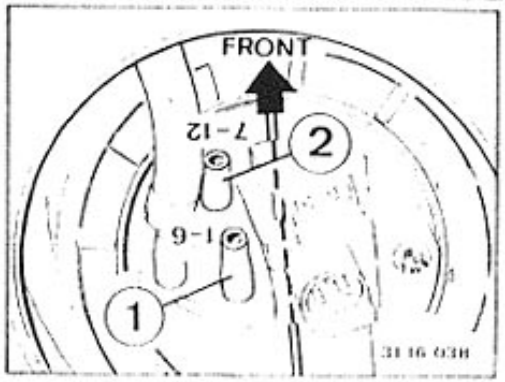


Installation:
Install seal, then swivel strainer and float into tank. Slide in unit upright, compressing level sensor and housing slightly as you do so.

Installation position, refer to page 16-12/7.



Installation:
Before pressing finally home, raise unit slightly (taking care of seal) and move gently to and fro to ensure that the level sensor is upright in the correct area and that the float is able to move freely.

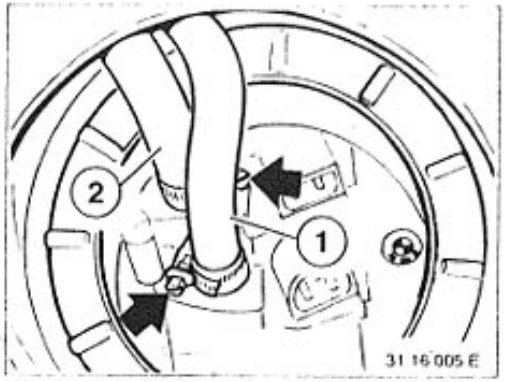


Installation:
Before tightening the cap nut, ensure that the rib on the flange and the cast lug (protruding) on the tank point in the same direction.
Note tightening torque* of cap nuts.



The sensor for the right fuel indicator forms one unit with the fuel pumps and the tank flange. This must be replaced as a complete unit.

* Refer to Technical Data

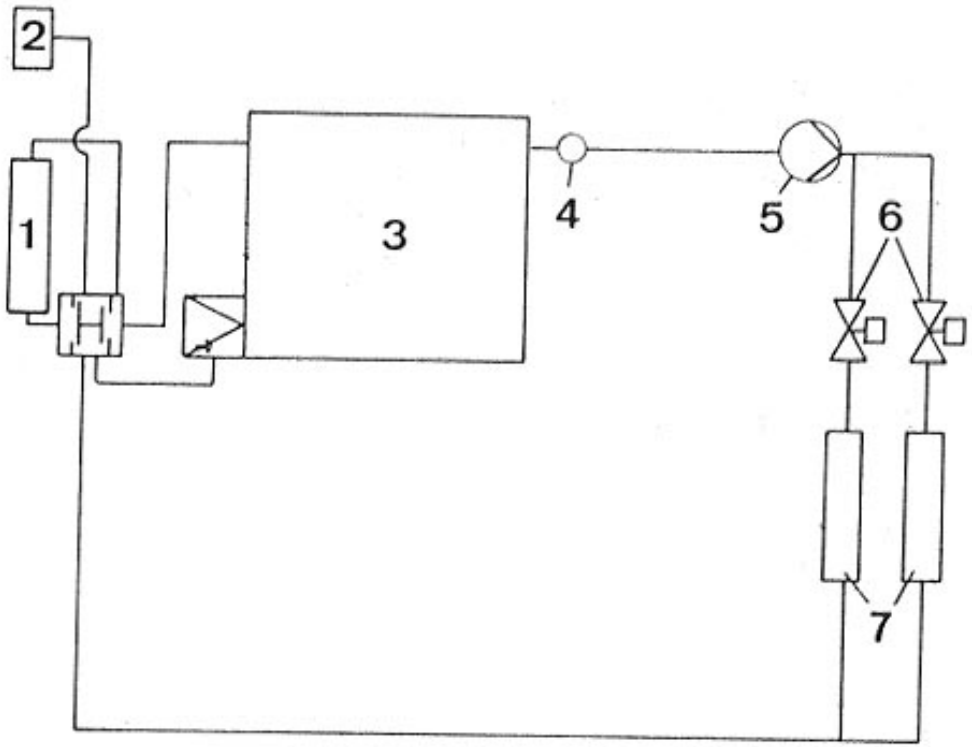


Installation:
Check fuel hoses and replace if necessary. Fit new hose clamps.

17 Radiator

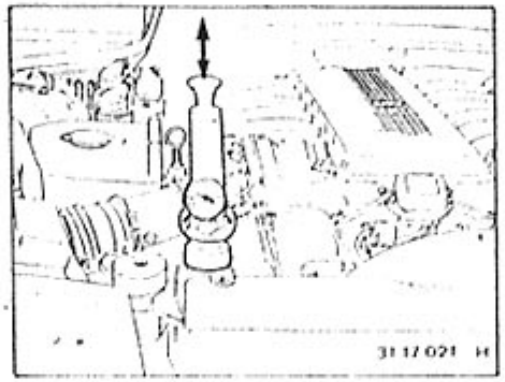
	Coolant circuit, 12-cylinder M70	17- 0/1
17 00 009	Cooling system – check for water leaks	17- 0/2
039	Cooling system – vent and check for water leaks	17- 0/3
17 11 000	Radiator – remove and install	17-11/1
100	Coolant expansion tank – remove and install	17-11/3
509	Water cooler – flush	17-11/4
17 40 000	Auxiliary fan, complete – remove and install or replace	17-40/1

COOLANT CIRCUIT OF TWELVE CYLINDER M 70 ENGINE



311 002 H

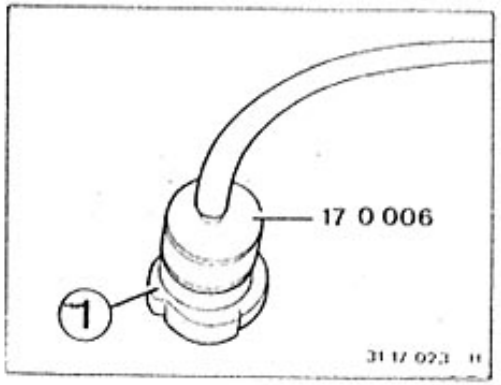
1 Radiator
2 Expansion tank
3 Engine block/cyl. head circuit
4 Temperature sensor
5 Additional water pump
6 Heater valves
7 Heat exchanger



17 00 009 Checking cooling system for leaks

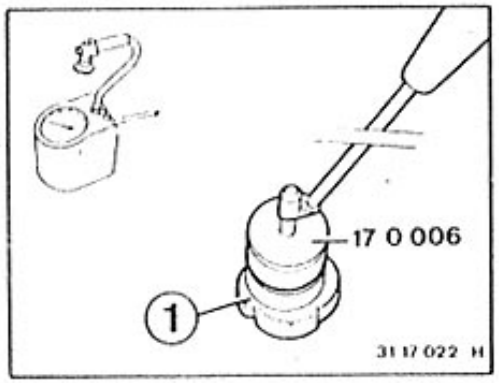
Caution: only unscrew expansion tank when engine is cold.

Attach tester 17 0 002 and adapter 17 0 005 to expansion tank and generate a pressure of 1 bar.
The cooling system does not leak if there is no significant drop in pressure (max. 0.1 bar) after about 2 minutes.



B: Check vacuum valve.

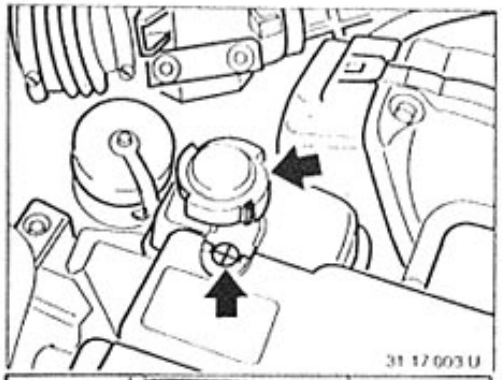
Screw cap (1) on tester 17 0 006 and connect vacuum hose to BMW Service Tester or to tool 61 6 030. Slowly build up a vacuum at the cap. Vacuum valve opens at about 0.9 bar (0.1 bar vacuum).

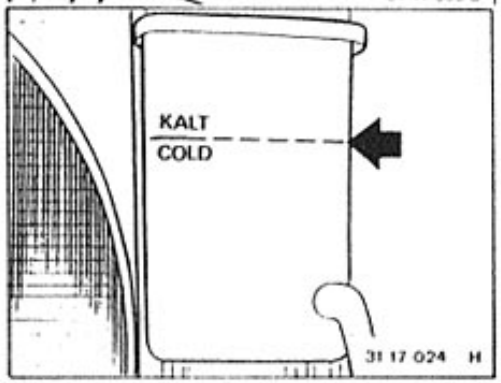


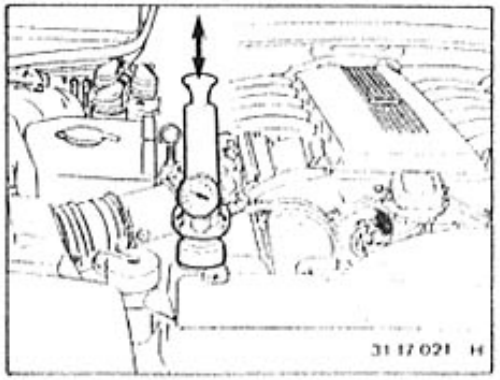
Check screw connection.

A: Check pressure valve.

Screw connection (1) to tester 17 0 006 and build up air pressure slowly.
Pressure relief valve should open at about 2 bar.







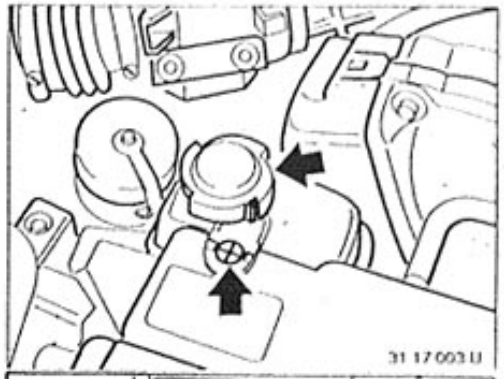
17 00 039 Bleeding cooling system and checking for leaks

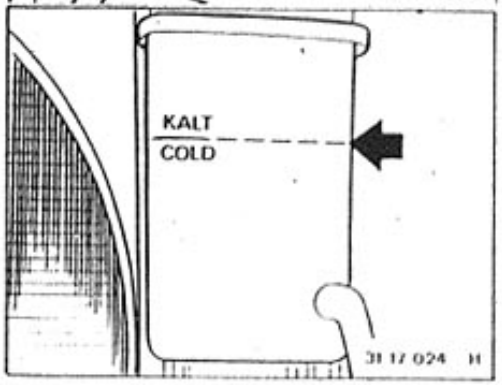
When completely refilling (engine cold): set heating valve to "WARM", open venting screw 2-3 turns and completely fill expansion tank (approx. 11...12 l).
Only use approved grade of coolant**.

Run engine for a brief period (fluid level in expansion tank falls).
Top up expansion tank as far as filler neck; total fill quantity*.
Close expansion tank. Close venting screw.

After engine has run up to temperature then been allowed to cool down (to approx. 20 °C), the coolant level should reach the mark "KALT/COLD".

Check cooling system for leaks
17 00 009.





Correct coolant level:

Set heating valve to "WARM".
Caution!
Only open expansion tank cap once engine has cooled down.
Open venting screw 2...3 turns and wait until coolant emerges without air bubbles.
Run engine for a brief period.
Top up level in expansion tank during this process.
Replace cap on expansion tank.
Close venting screw.

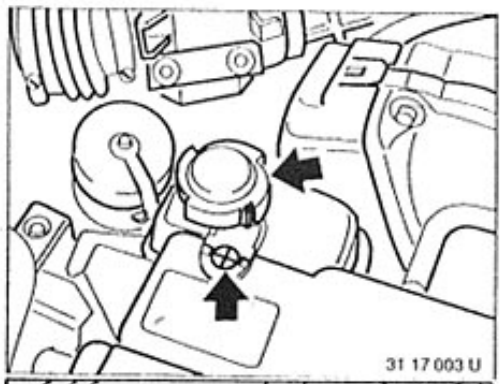
Once the engine has come up to temperature, check the coolant level.

The coolant level mark on the expansion tank indicates the coolant level at approx. 20 °C
Only use approved grade of coolant**.

Caution!
Never top up cooling system while engine is hot.

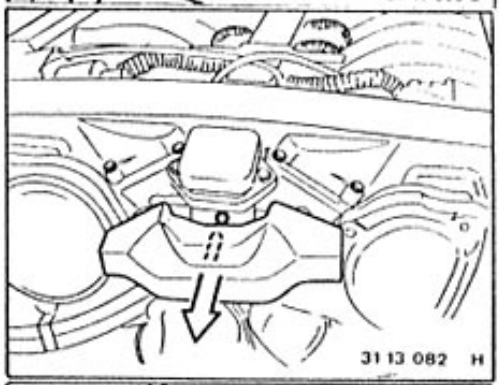
* Refer to Technical Data
** Refer to Operating Fluids Specifications

* Refer to Operating Fluids Specifications

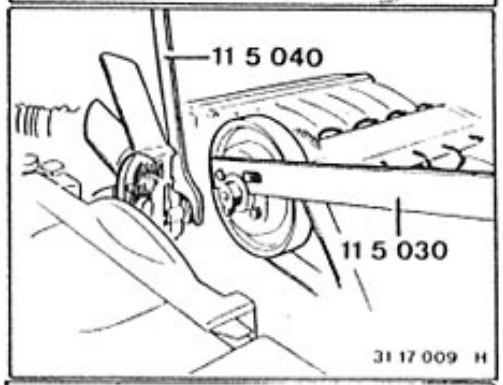


17 11 000 REMOVING AND INSTALLING RADIATOR

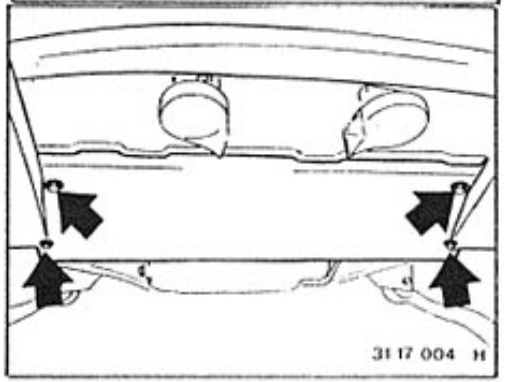
Caution!
Unscrew expansion tank cap only after engine has cooled off.
Loosen bleeder screw.



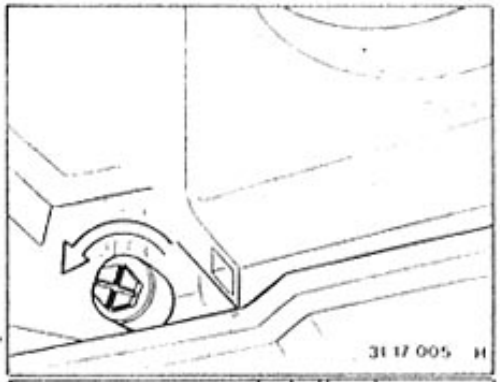
Pull off oil catch tray.



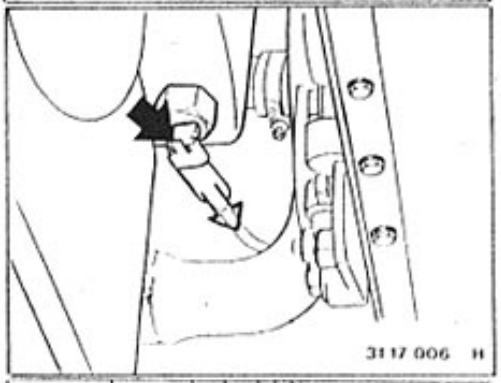
Remove fan.



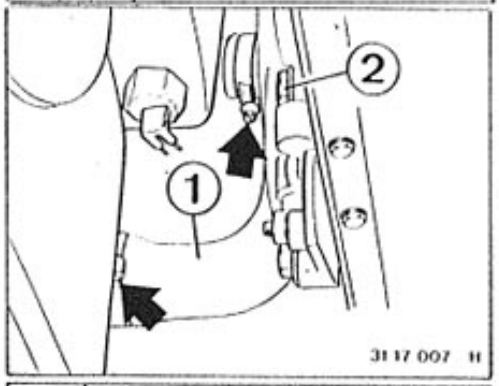
Unscrew engine splash guard.



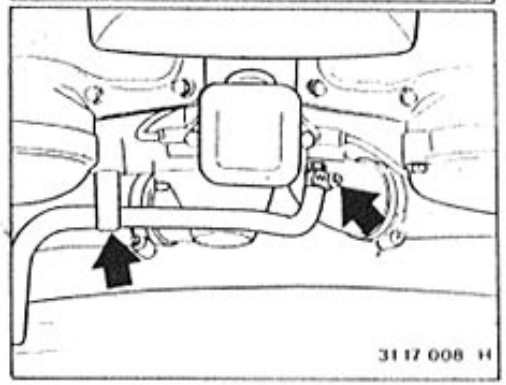
Unscrew drain plug and drain, catch and dispose coolant.



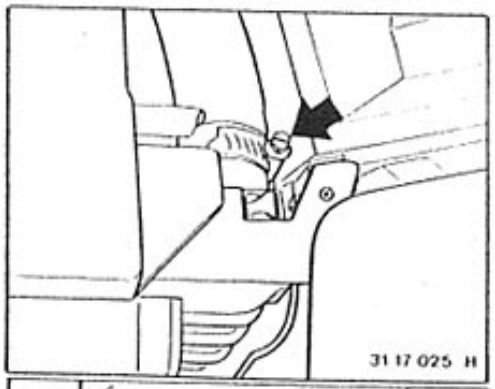
Pull off plug on level sender.



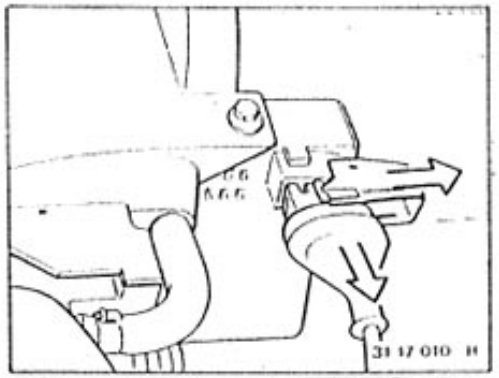
Disconnect bottom coolant hose (1) and expansion hose (2).
Catch and dispose coolant.



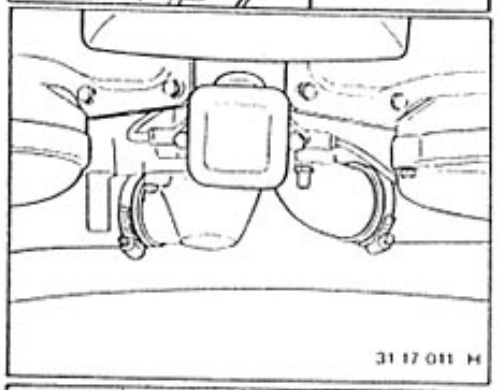
Disconnect bleeding hose.



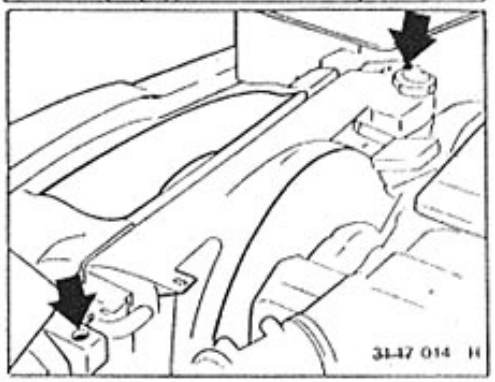
Remove upper water hose.



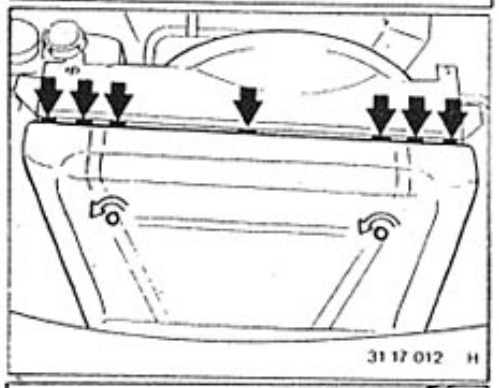
Open clips and remove connector from temperature switch.
If necessary, raise the headlight pods.



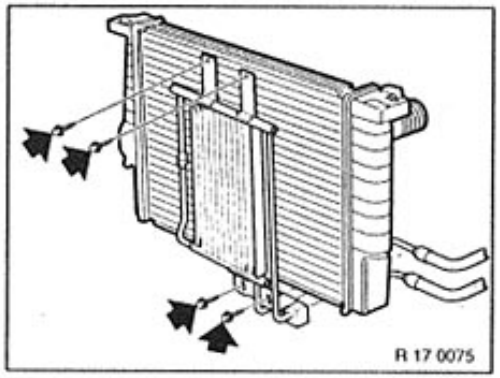
Remove water hoses from engine.



Unfasten left and right cooler brackets.
For removal, raise headlight pods.



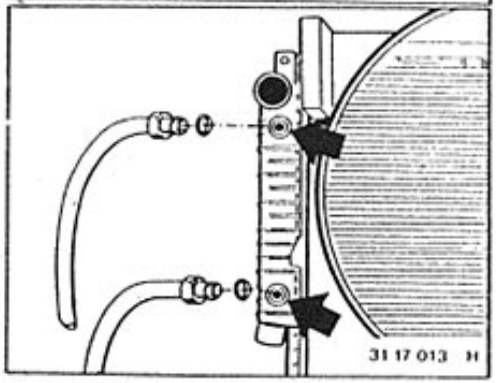
Unfasten upper section of air duct and unclip with screwdriver at specified points (arrows).



Version with separate transmission oil cooler:

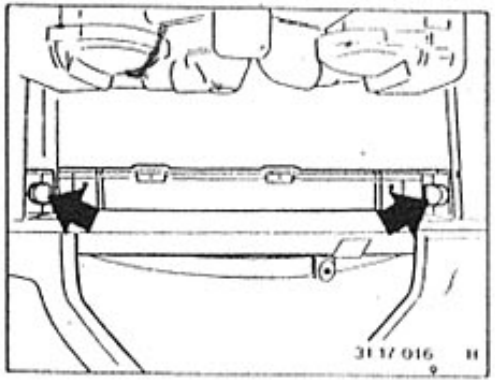
Lift radiator and press backwards.
Unfasten screws at top and bottom.

Note:
Transmission oil cooler remains in vehicle.



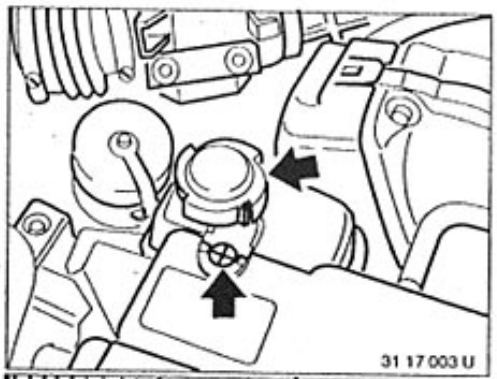
Version with integrated transmission oil cooler:

Remove transmission oil cooler lines.
Catch escaping transmission fluid and dispose of it correctly.



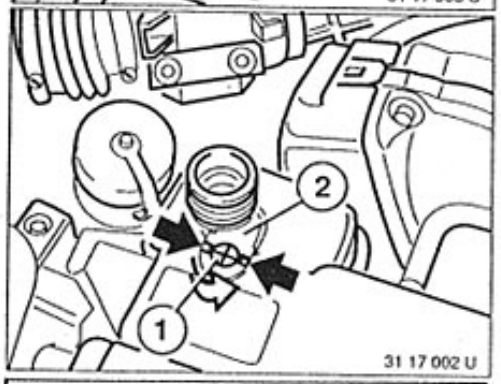
Lift out radiator.

Installation:
Ensure that mounting blocks are correctly located.
Place radiator on supports.

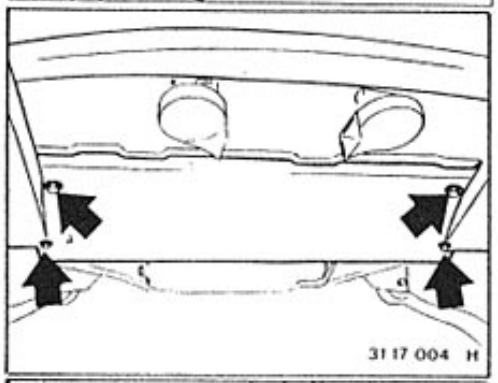


17 11 100 Removing and installing coolant expansion tank

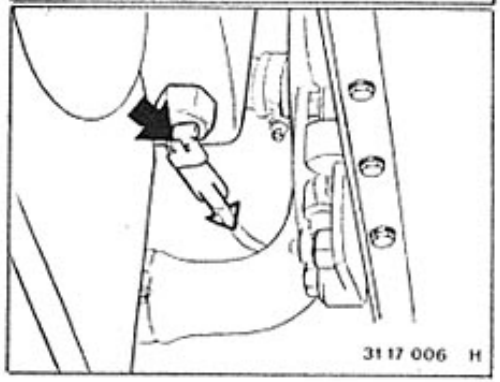
Caution!
Only unscrew sealing cap once engine has cooled down.



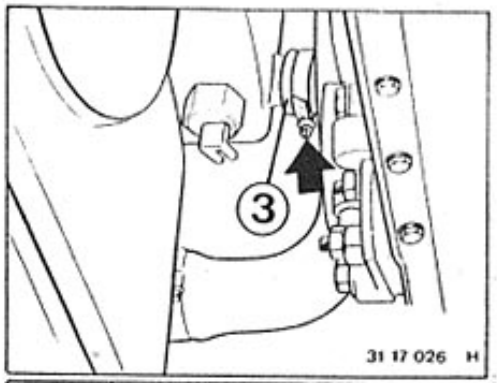
Completely unscrew venting screw (1), unfasten retainer (2) and remove.



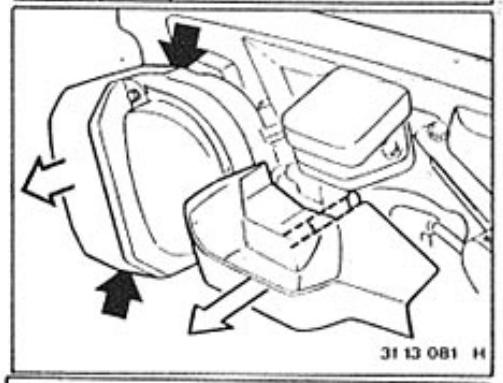
Remove underbody protection from engine.



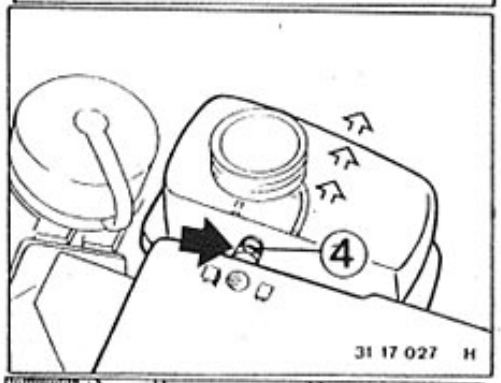
Remove connector from level sensor.



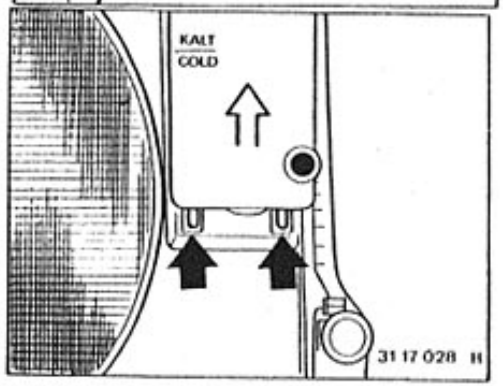
Remove expansion hose (3).
Drain off coolant, catch and dispose of correctly.



Remove distributor cable sheath.



Pull expansion tank backwards and remove venting hose (4).



Lift expansion tank up to remove.

Installation:
Expansion tank lugs must locate on radiator.

Top up with specified coolant, bleed cooling system and check for leakage 17 00 039.

17 11 509 Flushing radiator

If oil has entered the coolant circuit, the radiator and expansion tank must be flushed and cleaned with Solvethane** cleaning agent.

Follow the procedure described below:

1. Removing and installing the radiator, see 17 11 000.
   Removing and installing or replacing coolant expansion tank, see 17 11 100.

2. Fill with approx. 2 liters of Solvethane.

3. Shake radiator and tank well, then empty once the oil has separated.

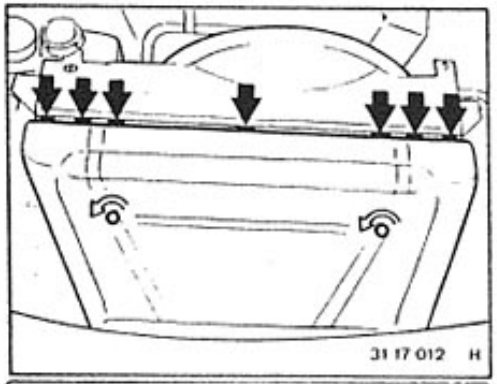
4. Reinstall the cleaned radiator and expansion tank and connect to the cooling circuit.

5. Fill the entire cooling circuit with hot water and flush, if necessary several times, to be sure of clearing the system of any cleaning residue.

6. Check drained coolant for oil residue and, if necessary, repeat process 5.
   After the cleaning operation, fill the cooling system*.
   Bleed the cooling system and check for leakage, see 17 00 039.

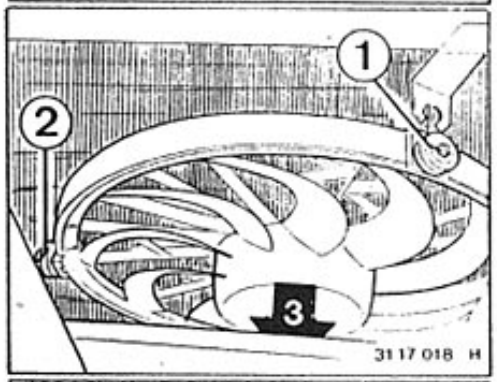
Comment:
Solvethane attacks rubber seals, hoses etc. and must therefore not be allowed to enter the cooling circuit, or to remain there. For this reason, always follow the safety regulations governing the use of Solvethane (printed on the containers).

* Refer to Operating Fluids Specifications folder
** Source of Supply: BMW Parts Service

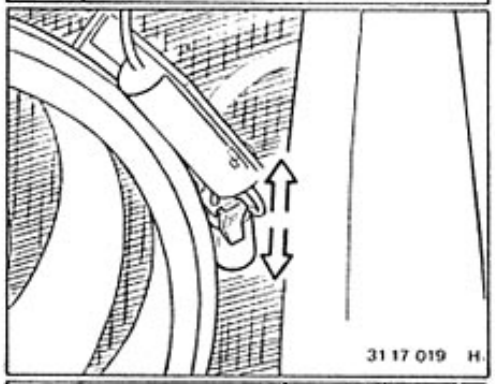


17 40 000 Removing and installing or replacing complete additional fan

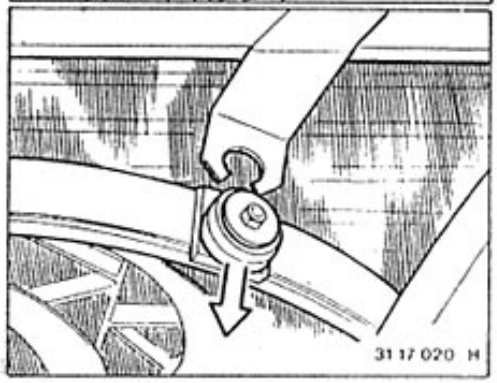
Unfasten upper section of air guide duct and unclip radiator with screwdriver



Unscrew fan console bolts (1...3).



Disconnect plug



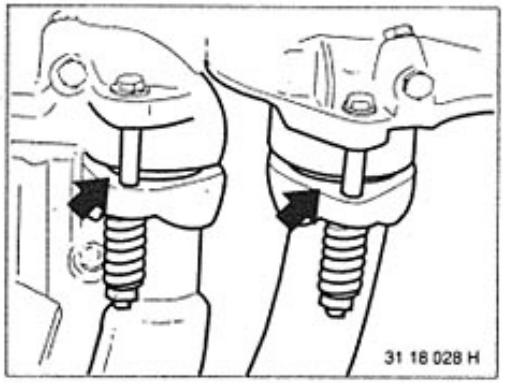
Pull fan console with fan out of retainers and lift out.

18 Exhaust system

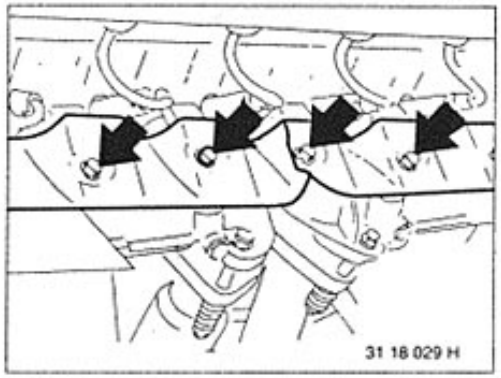
18 00 020	Exhaust system, complete – remove and install (M70)	18- 0/1
020	Exhaust system, complete – remove and install (M60)	18- 0/3
020	Exhaust system, complete – remove and install (M73)	18- 0/4
18 10 031	Rear muffler – replace (connection with clamping sleeves)	18-10/1
18 12 . . .	Dismantling exhaust assembly (M70)	18-12/2
027	Rear muffler, right – replace (connection with welded sleeve)	18-12/3
061	Center muffler – replace (M73)	18-12/4
18 21 511	All exhaust mounts – replace	18-21/1
18 32 010	Exhaust catalytic converter, left or right – remove and install or replace (M73)	18-32/1

For additional work, refer to "Repair Instructions for 7 Series E38"

18 00 020 Removing and installing exhaust assembly (M70).



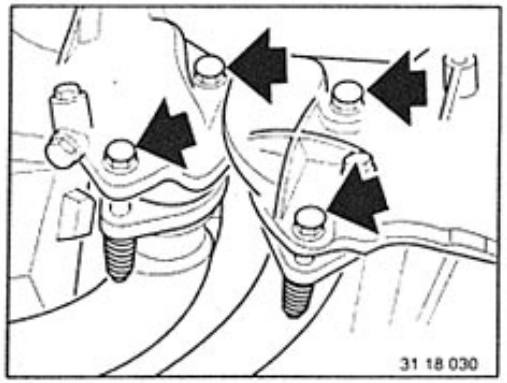
Note:
If work is carried out on the exhaust assembly or vehicle which affect the location of the exhaust pipes on the exhaust manifolds, the connection must be loosened and, after the work is complete, tightened back to specified torque.
Tightening torque 18 00 1AZ*



Aligning exhaust pipes on engine.

Remove underbody protection for engine.
Partially dismantle windshield wash container
Remove heat baffle plate from exhaust manifold.

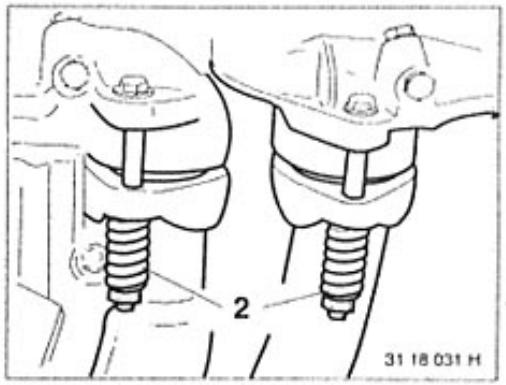
Caution!
Do not distort the heat baffle plates.
Tightening torques*.



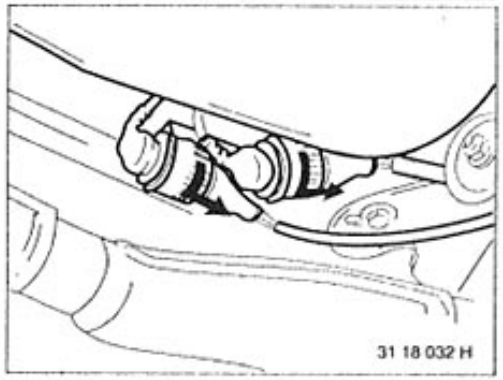
Unfasten connection of exhaust pipes on manifold.

Caution!
Do not tighten down exhaust pipes on manifold until complete exhaust assembly has been installed.

* Refer to Technical Data

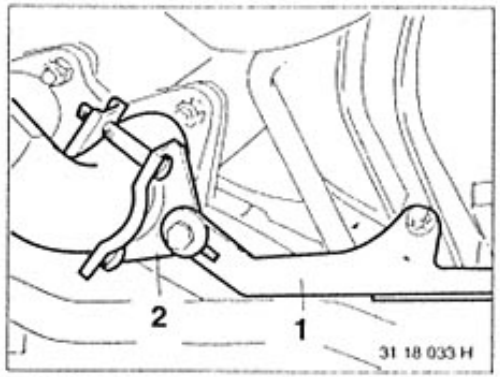


Installation:
Flanges must be aligned parallel to one another.
Springs (2) must not be preloaded in block.
Tightening torque specification 18 00 1AZ*

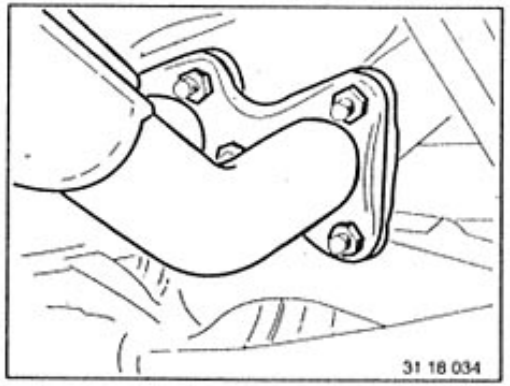


Disconnect plug for Lambda oxygen sensors.

Caution!
Identify (mark) Lambda oxygen sensors before removal: do not confuse them.



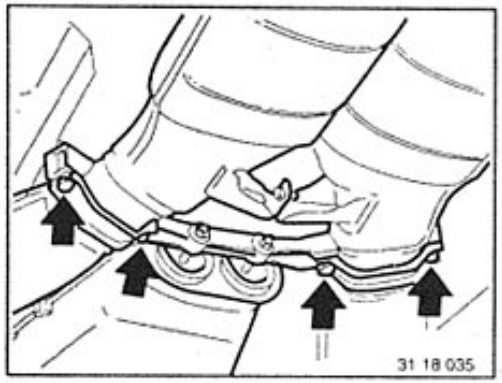
Unscrew bracket (1) from transmission.
Only loosen and displace gripper clamps (2).



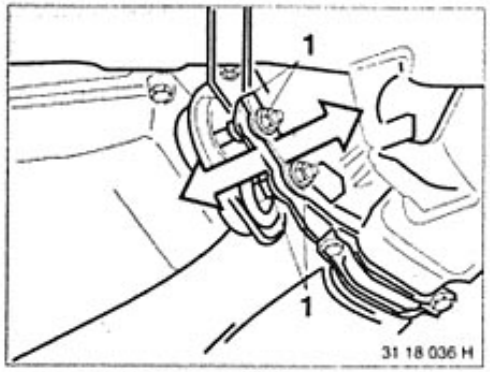
Unfasten flange connection between exhaust pipes and exhaust assembly.

Installation:
Check gaskets, replacing if necessary.
Replace self-locking nuts.

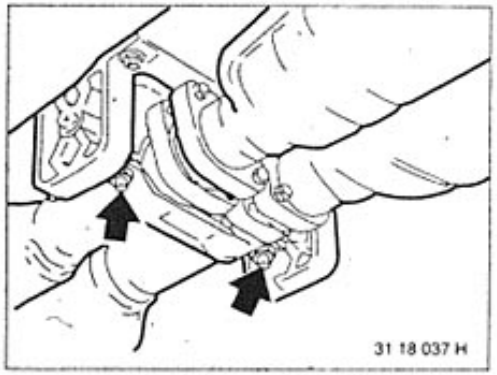
* Refer to Technical Data



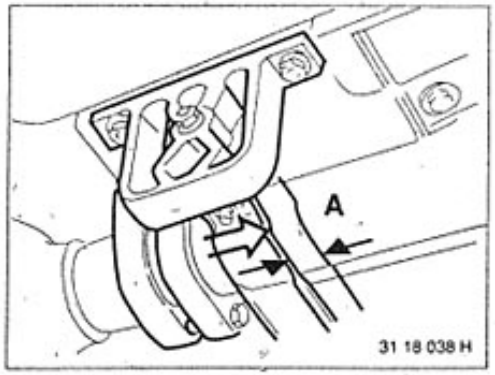
Support exhaust assembly on a lifting fixture. (weight approx. 55 Kg.)
Unscrew transmission suspension from catalytic converter.



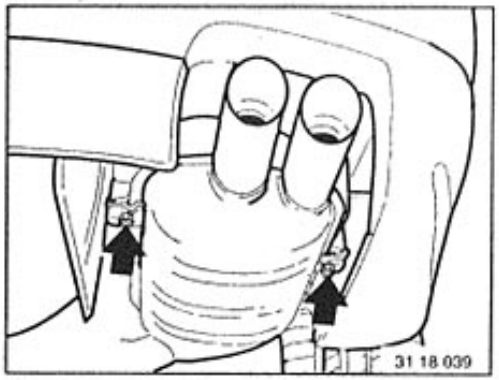
Installation:
Adjust the nuts (1) to secure the exhaust assembly without stresses.



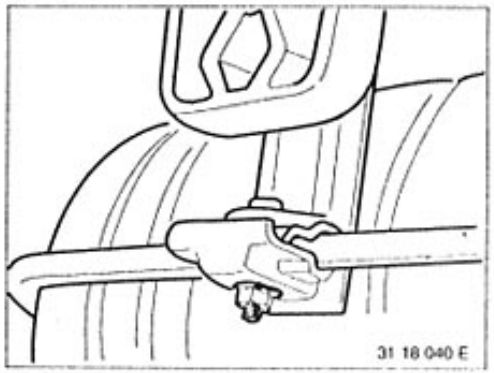
Unscrew rear suspension point for catalytic converter.



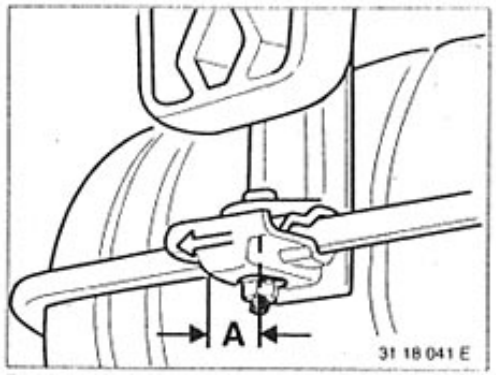
Installation:
Preload rubber mount in direction of travel
A = 10 mm.



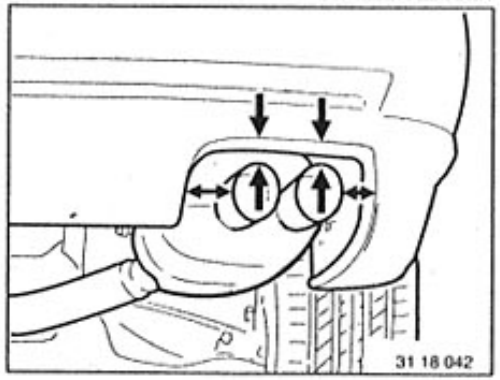
Unscrew all rear suspension points.
Remove exhaust assembly downwards.



Installation:
Arrangement of clamping brackets.

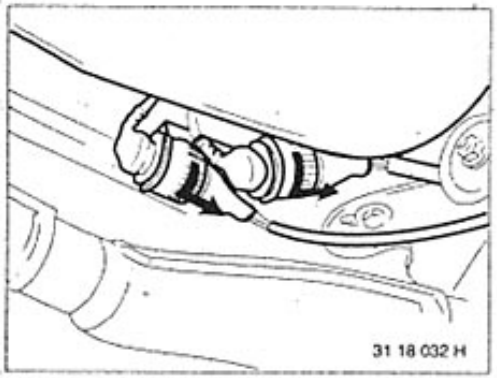


Installation:
Preload rubber mount in direction of travel
A = 15 mm.



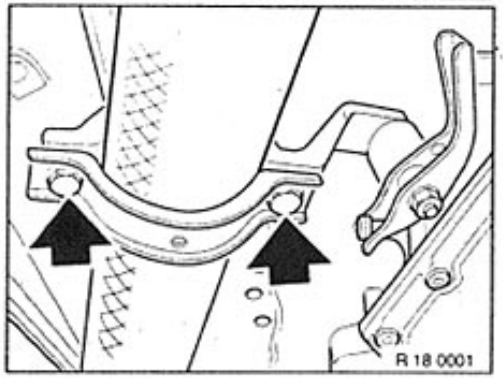
Installation:
Check location of tailpipes to body openings.
If necessary, loosen flange connections and align exhaust assembly.

18 00 020 Removing and installing exhaust assembly (M60).



Disconnect plug for Lambda oxygen sensors.

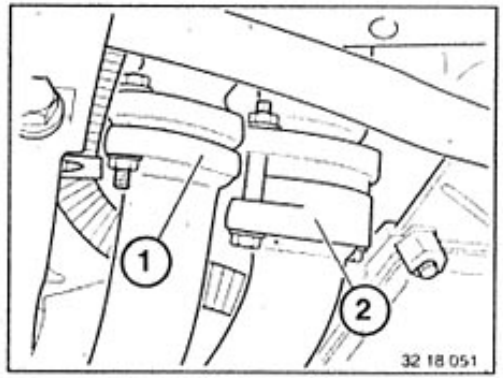
Caution!
Identify (mark) Lambda oxygen sensors before removal: do not confuse them.



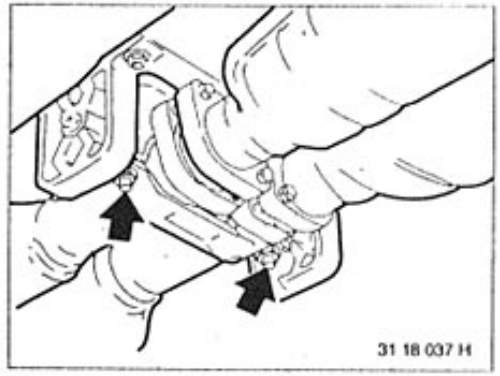
Unfasten clamps on both transmission brackets.

Support exhaust assembly with a lifting fixture. (Weight approx. 55 Kg.)

Unscrew flange connections between catalytic converter and left and right exhaust manifolds



Note tightening sequence:
1. Outer exhaust manifolds on right and left (1), flange with ball
2. Inner exhaust manifolds on right and left (2), flange with gasket.



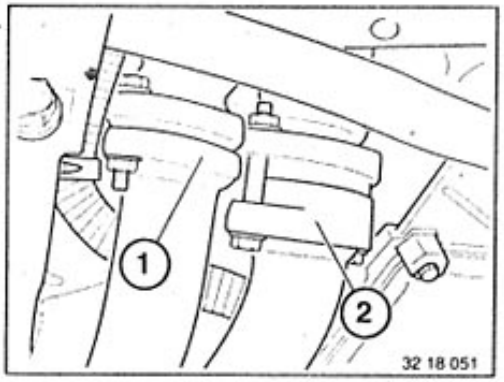
Unscrew suspension on the rear catalytic converters.
Subsequent procedure,
refer to 18 00 020 (M70).

Installation:
Check gaskets and replace if necessary.
Fit new self-locking nuts.
Coat threads with copper paste**

** Refer to BMW Parts Service

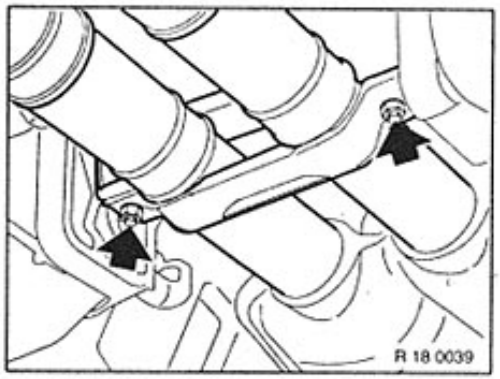
18 00 020 Removing and installing complete exhaust system (M73)

Disconnect plug connections from left and right Lambda oxygen sensors.
Unclip cable

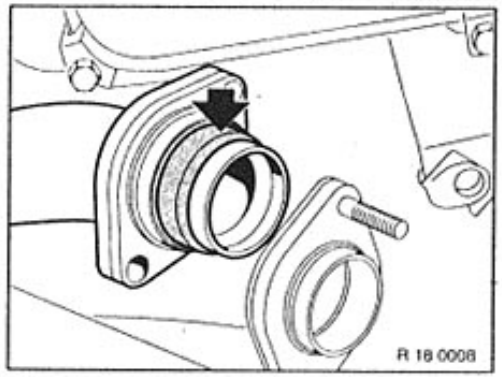


Unscrew and remove left and right catalytic converters from the exhaust manifolds.

Installation:
Replace self-locking nuts.
Coat threads with copper paste*.

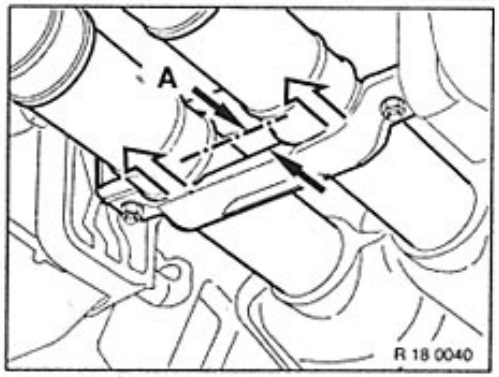


Unscrew and remove mount from the catalytic converters.

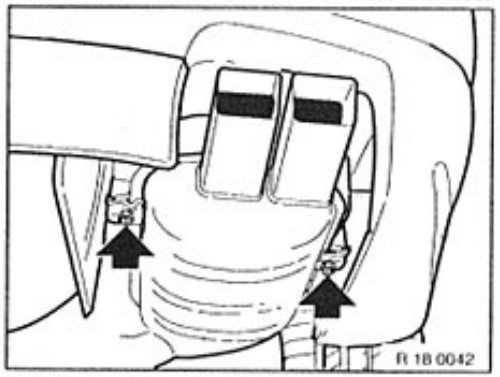


Installation:
This joint only has a seal on the inside pipes.

Check seal and replace if necessary.

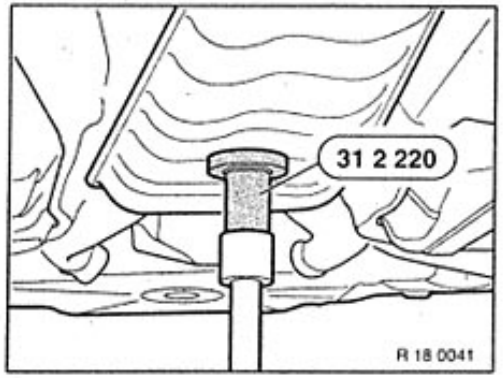


Installation:
Preload rubber mount in direction of travel A = 10 mm.

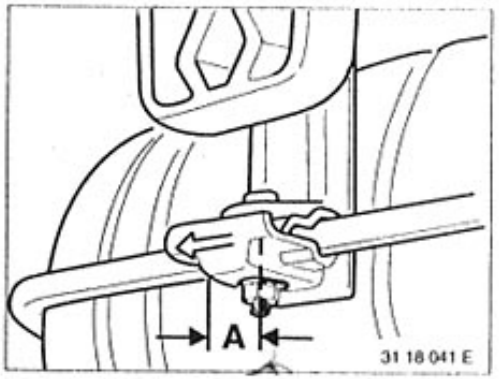


Unscrew and remove both clamping brackets from left and right rear mufflers.

Remove complete exhaust system.

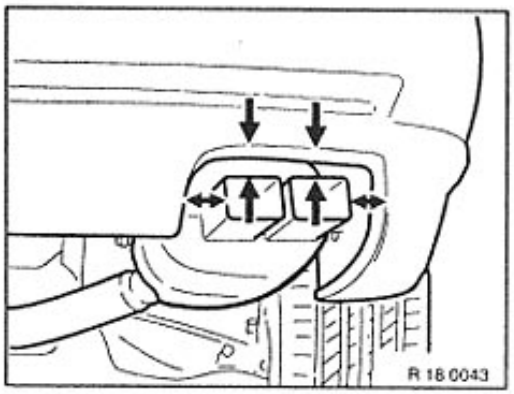


Support exhaust system with special tool 31 2 220.
(weight approx. 53 kg)



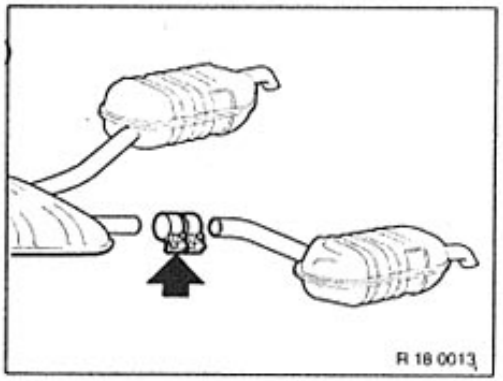
Installation:
Preload rubber mount in direction of travel A = 15 mm.

* Source of Supply: BMW Parts Service



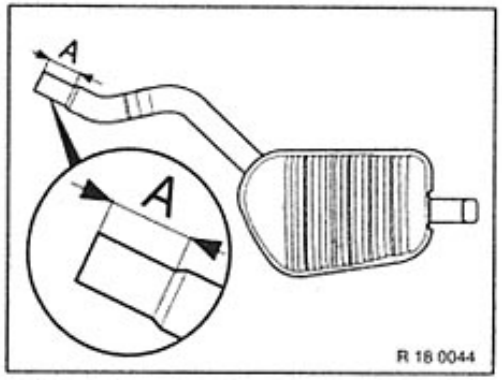
Installation:
Note position of tailpipes in the body apertures.

18 10 031 Replacing rear muffler
(connection with clamping sleeves)



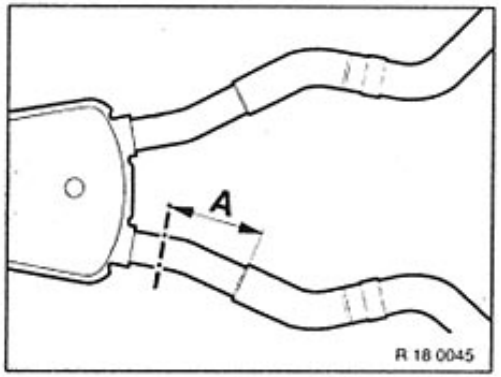
Install new rear muffler and secure with clamping sleeve.

Ensure that separating point lies in centre of clamping sleeve.

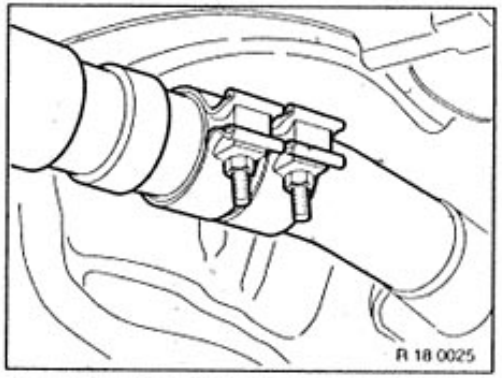


Measure length (A) of pipe section on new rear muffler.

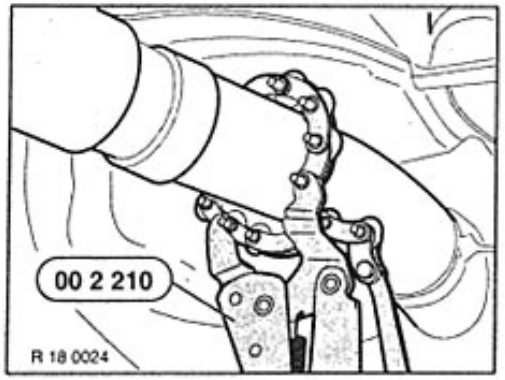
Caution!
Apertures on new rear muffler are sealed with adhesive film.
Remove adhesive film, including from contact faces of claming sleeve.



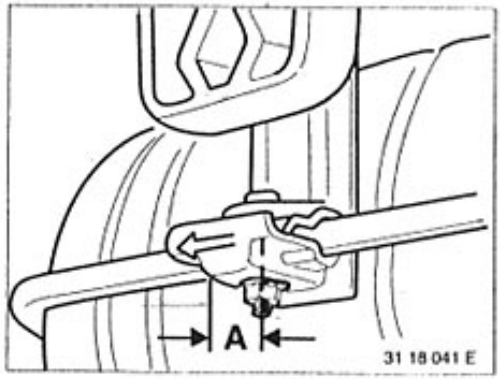
Transfer defined dimension (A) to the installed rear muffler.



Align exhaust system and clamping sleeve in such a way that sufficient space is left from adjacent components

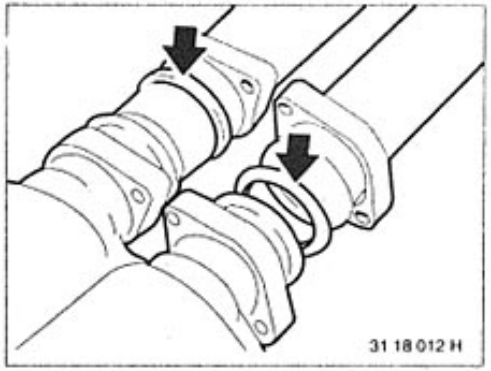


Disconnect exhaust pipe with special tool 00 2 210 and deburr.



Note:
Preload both rubber mounts on rear muffler in direction of travel A = 15 mm.

18 12 ... Dismantling exhaust assembly (M70).

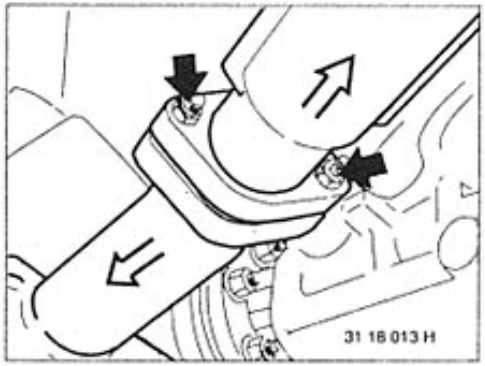


Disconnect silencer assembly.

Installation:
Check seals and replace if necessary.

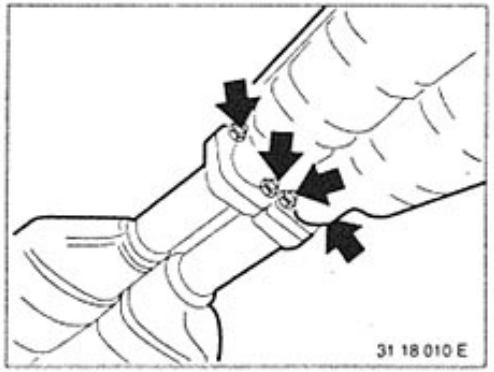
Disconnect catalytic converter from rear silencer unit.

Note:
To avoid distortion of the exhaust assembly once installed in the vehicle, do not tighten connections until assembly is complete - loosen again where applicable.

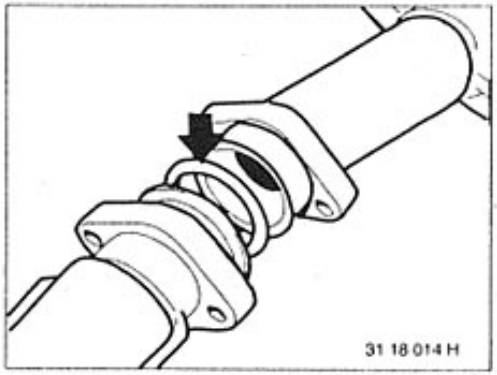


Remove back left rear muffler.

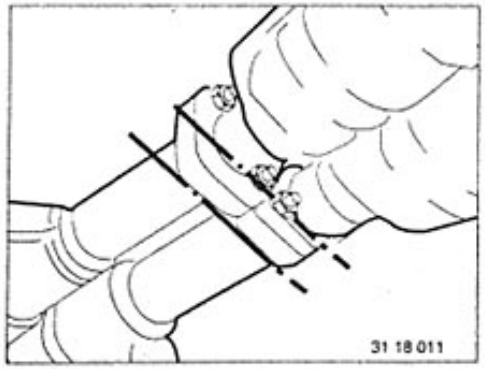
Unscrew flange.
Remove silencer unit.



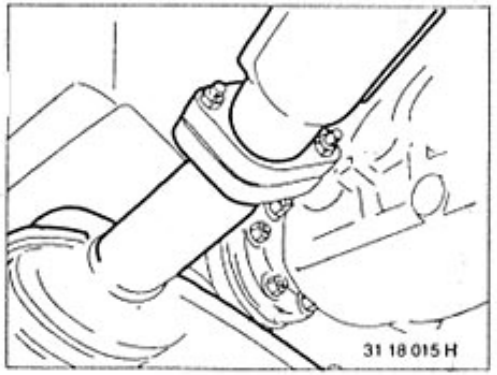
Unscrew left and right side of flange.



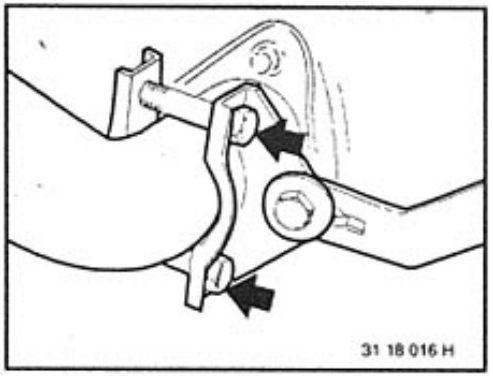
Installation:
Check seal and replace if necessary.



Installation:
Note location of flanges. Tighten screws evenly.
The gap between the flanges must be aligned parallel with one another.



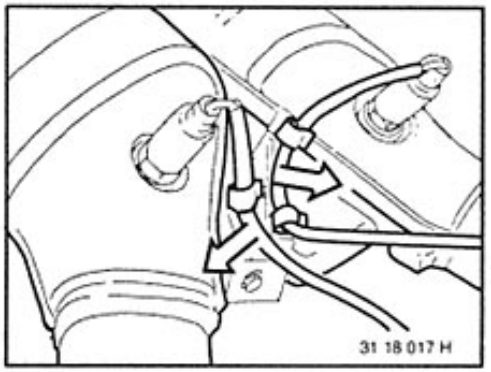
Installation:
Note position of flanges. Tighten screws evenly.
The gap between the flanges must be parallel all round.



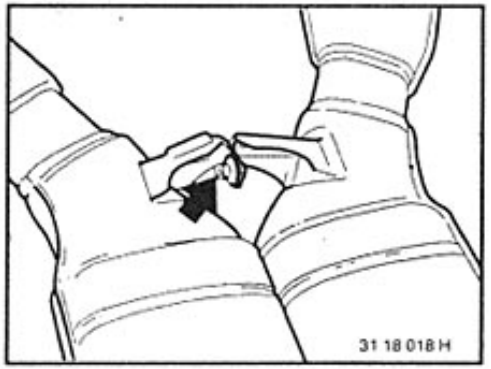
Remove left and right catalytic converters.

Unscrew bracket.

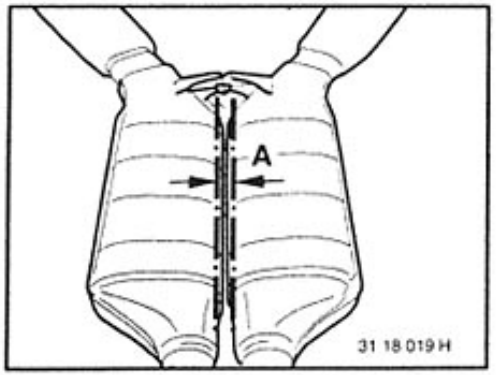
Installation:
Do not tighten bracket until installation of unit is complete.



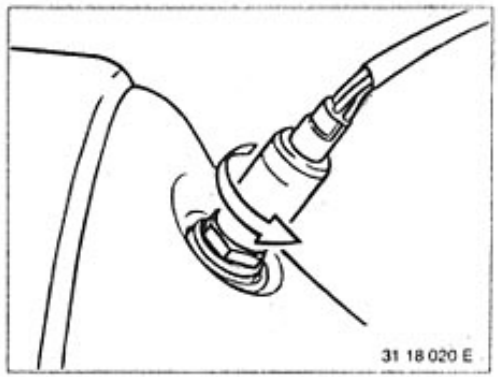
Disconnect Lambda oxygen sensor cable from bracket.



Unscrew connection.



Installation:
There must be a gap of at least A = 6 mm between the two catalytic converters.



Removing and Installing Lambda oxygen sensors.

Unscrew and remove Lambda oxygen sensor

Installation:
Coat thread with Anti-Seize**.
Tightening torque 11 78 1AZ *

Note:
Do not clean Lambda oxygen sensors and do not bring into contact with lubricant.
Protect Lambda oxygen sensors when applying underbody protection.

* Refer to Technical Data
** Refer to BMW Parts Service

18 12 027 Replacing rear right muffler
(connection with welding sleeve)

This operation is identical to
operation 18 10 031

Following operations are required:

Measure pipe section to fit new rear muffler.

Mark out separating point.

Disconnect old rear muffler
(special tool 00 2 210)

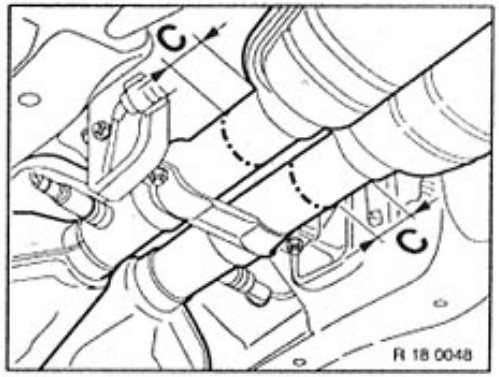
Install new rear muffler with connecting sleeve
and align.

Tack weld connecting sleeve with a few inert
gas spot welds.

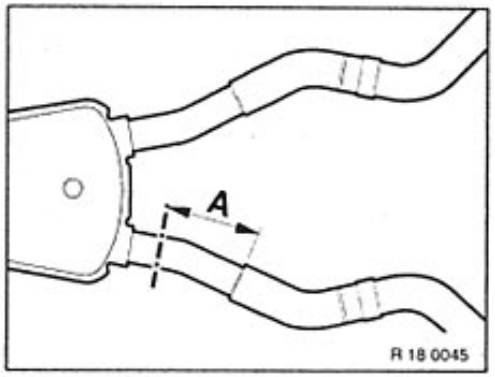
Remove exhaust system remove and weld
until gas-tight (inert gas).

Install complete exhaust system.

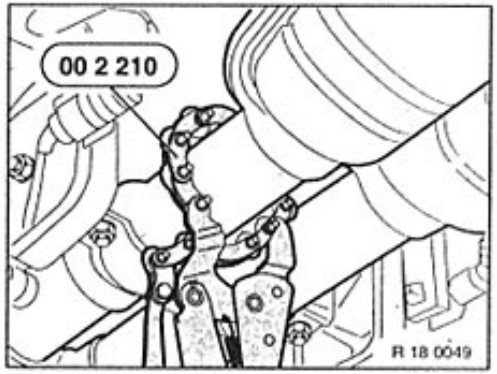
18 12 061 Replacing intemediate muffler (M73)



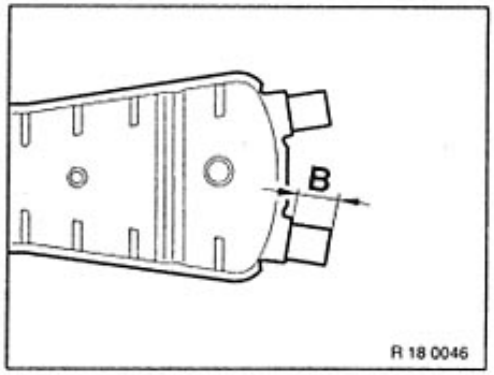
Transfer dimension (C) defined in this way to the installed intermediate muffler.



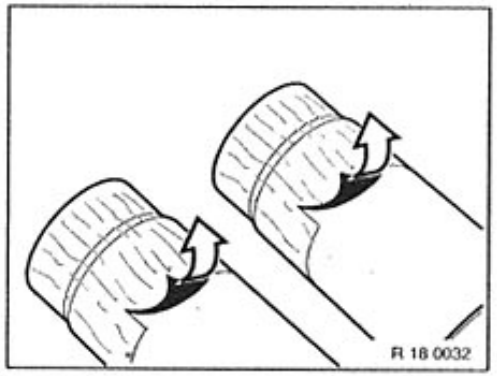
Remove both rear mufflers, refer to 18 10 031



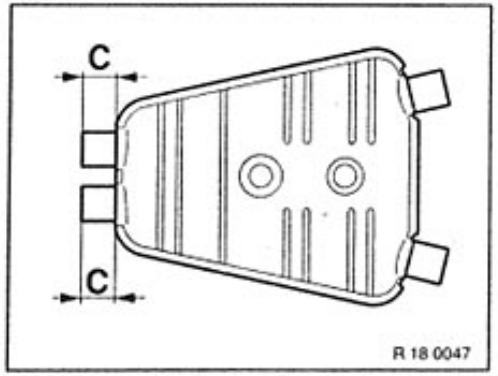
Disconnect exhaust pipes with special tool 00 2 210 and deburr.



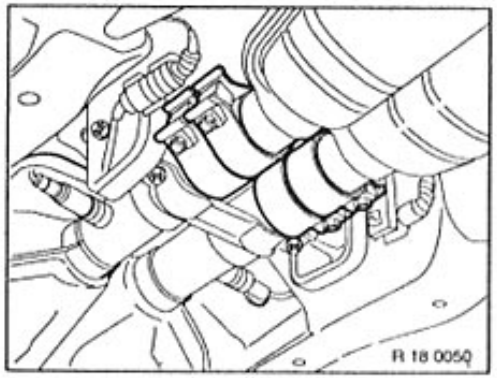
Note:
When defining the interfaces, take account of dimension (B) on new intermediate muffler.



Caution!
Apertures on new intermediate muffler are sealed with adhesive film.
Remove complete adhesive film, including on contact faces of clamping sleeves.



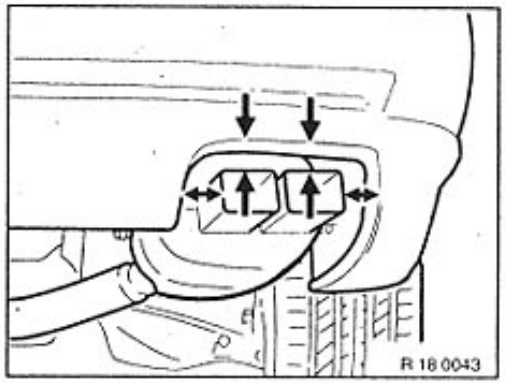
Measure off length (C) of pipe section on new intermediate muffler.



Secure new intermediate muffler with clamping sleeves on catalytic converter.
Nuts point downwards.

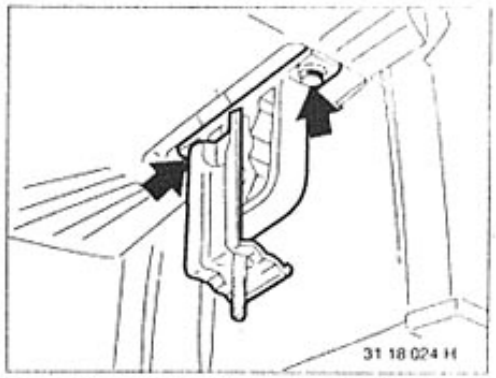
Ensure that the separating point is located in the centre of the clamping sleeve.
Ensure sufficient distance to adjacent components.

Install both rear mufflers.
refer to 18 10 031



Align exhaust system and tighten down all clamping sleeves.

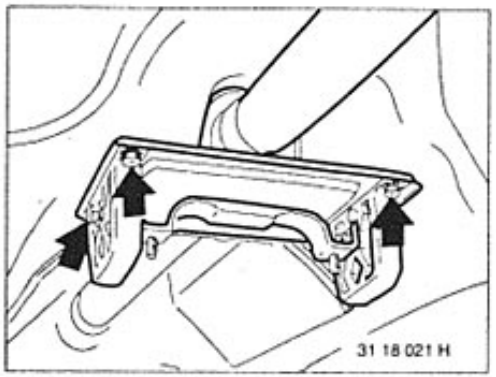
18 21 511 Replacing all exhaust mounts



Replace rear exhaust mounts:

Unscrew rubber mount and bracket.

Caution!
Screw length M8 x 16
Longer screws may touch the underside of the battery.



Replace central exhaust mount:

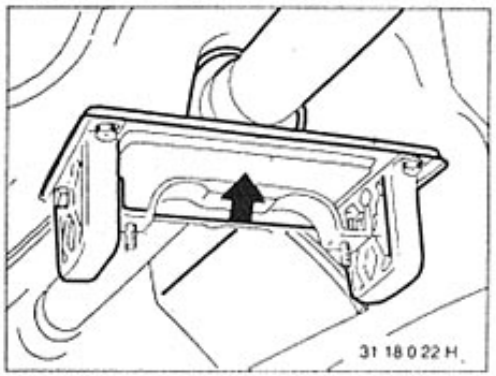
Unfasten bracket
Unscrew rubber mount.

Installation:
Do not tighten bracket until exhaust assembly has been fitted.

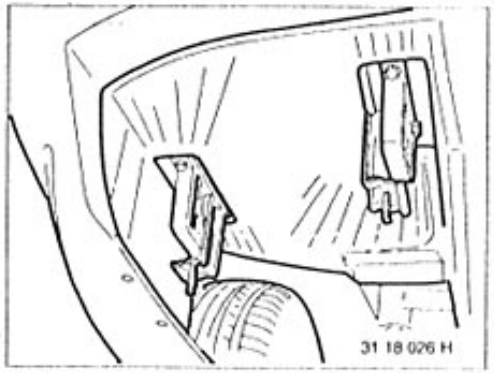


Unscrew bracket.

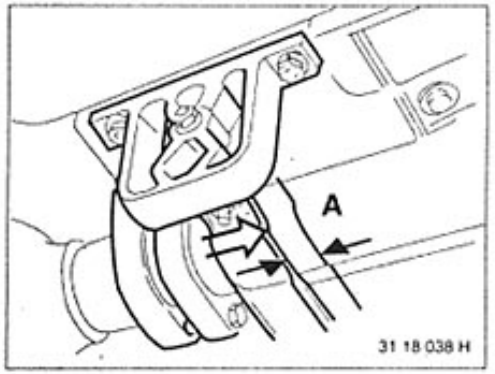
Installation:
Align bracket in upright position.



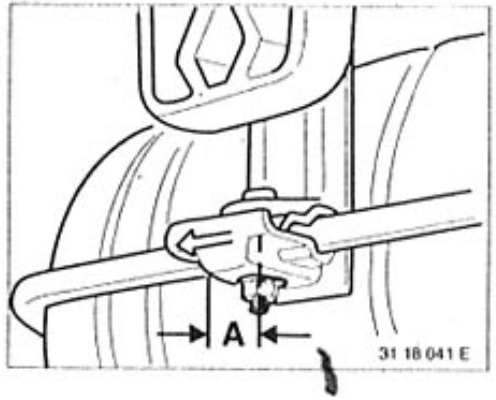
Installation:
Note reinforcement plate under rubber mount.



Arrangement of rear suspension points.



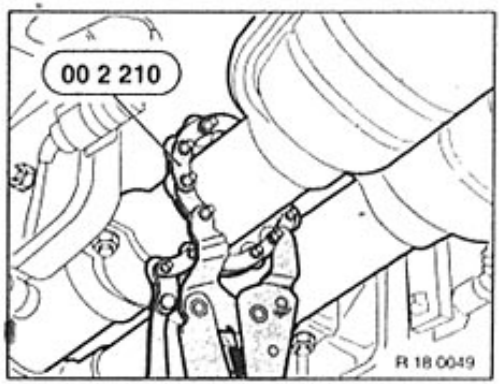
Installation:
Preload rubber mount towards front
A = 10 mm when fitting the exhaust assembly.



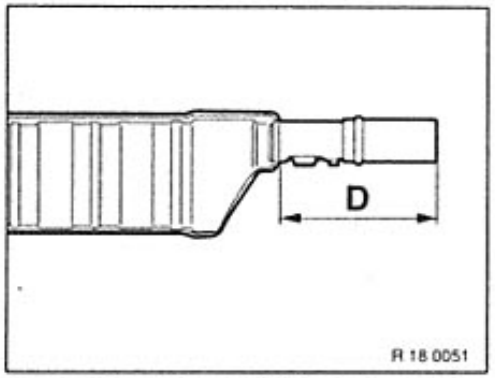
Installation:
Preload rubber mount towards front
A = 15 mm when fitting the exhaust assembly.

18 32 010 Removing and installing or replacing left or right catalytic converter (M73)

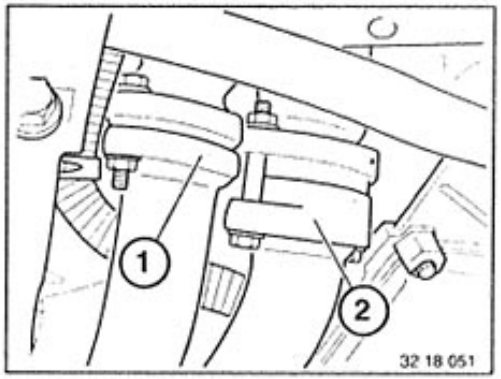
Remove Lambda oxygen sensors.
refer to 11 78 510 / 11 78 610
Repair Instructions for 7 Series E38



Disconnect exhaust pipe at separating point determined using special tool 00 2 210.

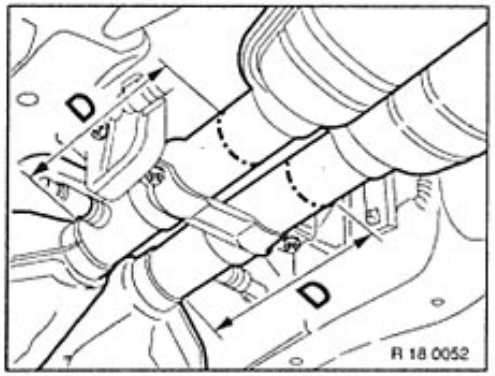


Measure length (D) of pipe section on new catalytic converter.

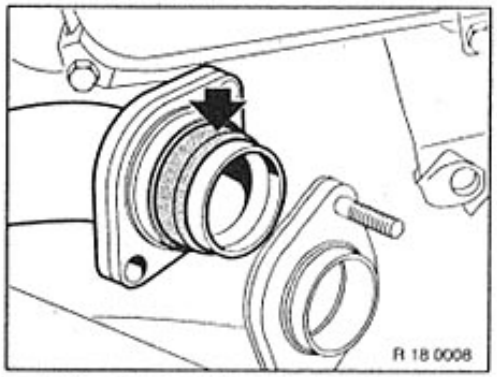


Unscrew and remove catalytic converter from exhaust manifolds.

Installation:
Replace self-locking nuts.
Coat threads with copper paste*.

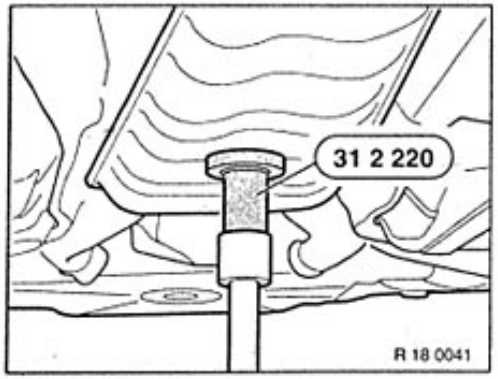


Transfer dimension (D) determined to the installed catalytic converter.

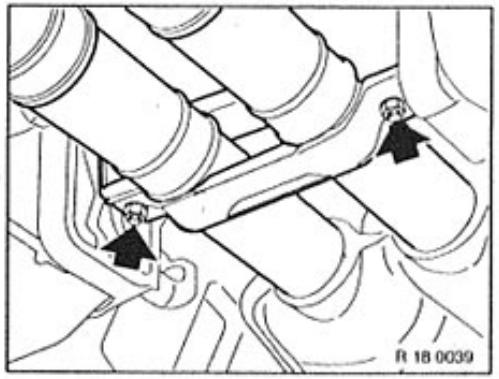


Installation:
Joint is only fitted with a sealing ring on inside pipes.

Check sealing ring and replace if necessary.



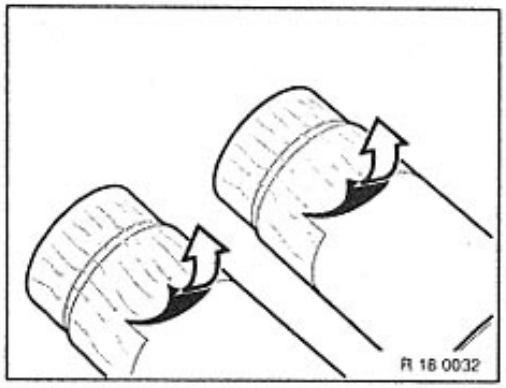
Support intermediate muffler with special tool 31 2 220.



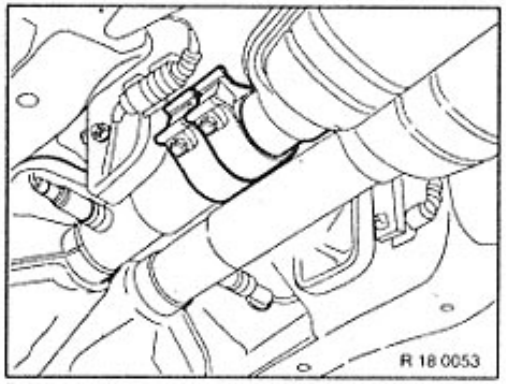
Unscrew and remove mount from catalytic converter.

Remove catalytic converter

* Source of Supply: BMW Parts Service

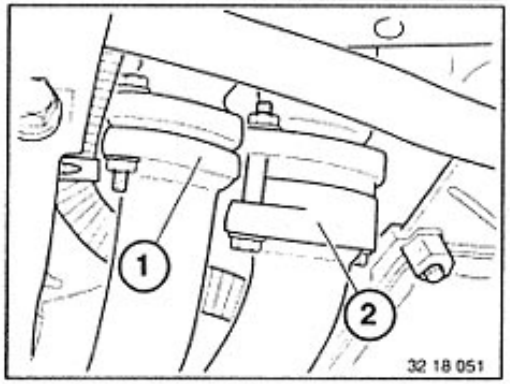


Caution!
Apertures on new catalytic converter are sealed with adhesive film.
Remove complete adhesive film, including on contact faces of clamping sleeves.

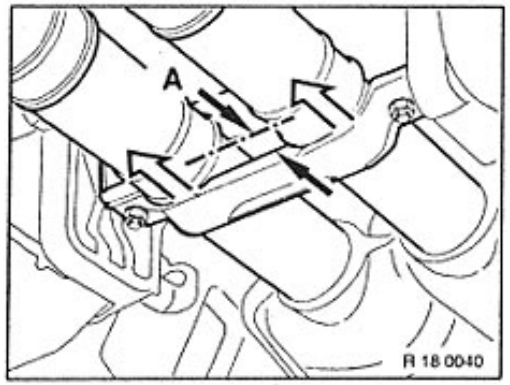


Secure new catalytic converter with clamping sleeve to intermediate muffler.
Nuts point downwards.

Ensure that separating point is in centre of clamping sleeve.
Ensure there is sufficient distance from adjacent components.



Screw on new catalytic converter with exhaust manifold.



Screw down mount on catalytic converter

Installation:
Preload rubber mount in direction of travel
A = 10 mm.

21 Clutch

Scope of repair work, refer to “Repair Instructions for 7 Series E38”

23 Manual transmission

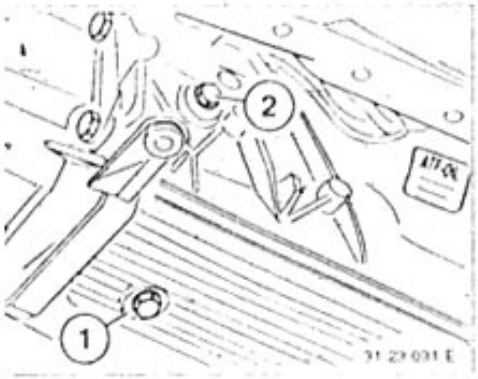
00 11 229	Oil change in manual transmission	23- 0/1
23 00 025	Transmission – remove and install (engine M70/transmission S6S 560 G)	23- 0/2
025	Transmission – remove and install (engine M60/transmission S6D 420 G)	23- 0/5
035	Exchange transmission – install	23- 0/8
23 11 612	Guide tube for clutch release mechanism – replace - transmission removed -	23-11/1
23 12 056	Radial seal for output flange – replace	23-12/1
087	Dust cover for selector shaft – replace (transmission S6S 560 G)	23-12/3
506	Radial seal for input shaft – replace - transmission removed -	23-12/5
23 21 007	Replacing output flange on transmission	23-21/1

Additional operations – refer to Construction Group Repair Instructions.

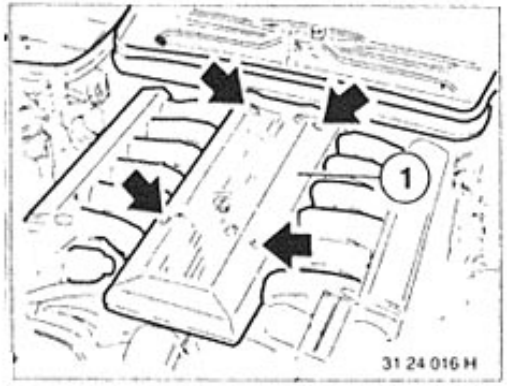
00 11 229 REPLACING OIL IN MANUAL TRANSMISSION

The oil should only be replaced at operating temperature.
Remove drain plug (1) and filler plug (2).
Drain oil.

Note
Dispose old oil.
Clean and screw in drain plug.
Tightening torque*.
Pour in new oil through filler opening.
Refer to label or Operating Fluids for grade of oil.
Oil volume*.
Oil must run out of the filler opening.
Screw in filler plug (2).
Tightening torque*.



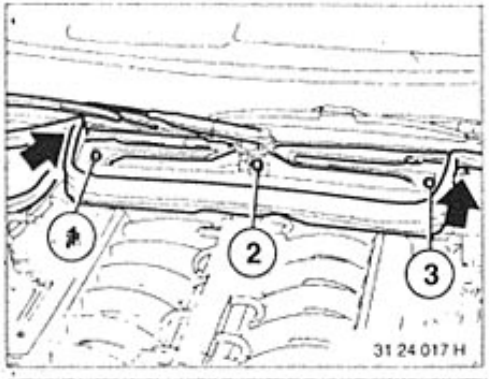
Refer to Specifications



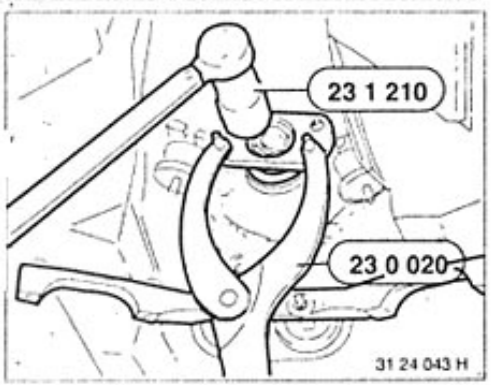
23 00 025 Removing and installing transmission (engine M 70/ transmission S 6 S 560 G)

Disconnect ground lead from terminal.

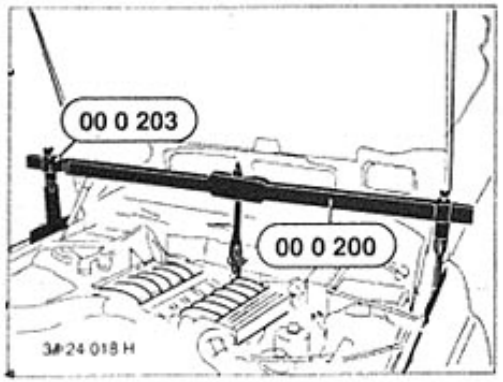
Caution!
When ground lead is disconnected, fault memories in control units are cancelled.
For this reason, first read fault memories with tester and print out any faults in the system.
Remove cover (1).



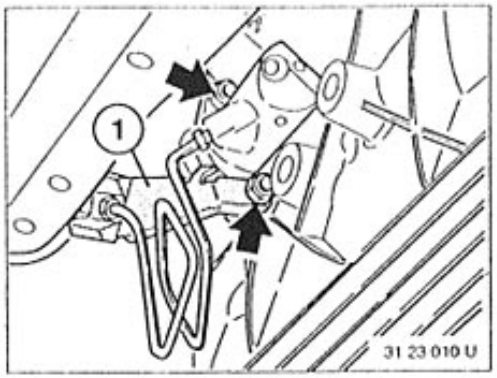
Partially remove rubber seal.
Twist mounting (1 ... 3).
Remove screws on left and right sides.



Lift off trim (4) and microfilter (5).

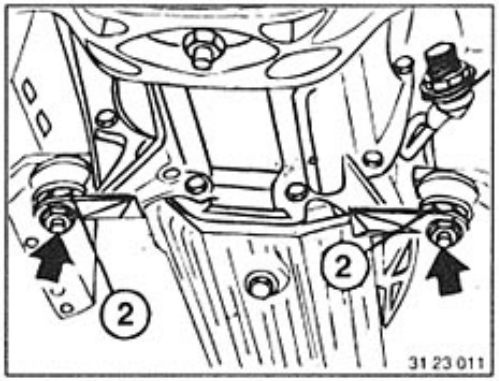


Caution!
To prevent damage (risk of leaks) to the heating pipe connections on the engine firewall, the engine must be supported on special tool 00 0 200 before the transmission is lowered.
Fit special tool 00 0 200 together with extension 00 0 203 and connect to rear lug.
Pre-tension chain.
Remove complete exhaust system 18 00 020.



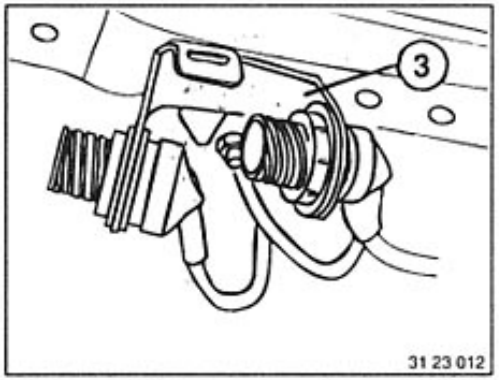
Remove clutch slave cylinder from transmission.
Pressure line remains connected.

Installation:
Secure bracket (1) for pressure line at same time.



Remove brackets on left and right for securing exhaust system.

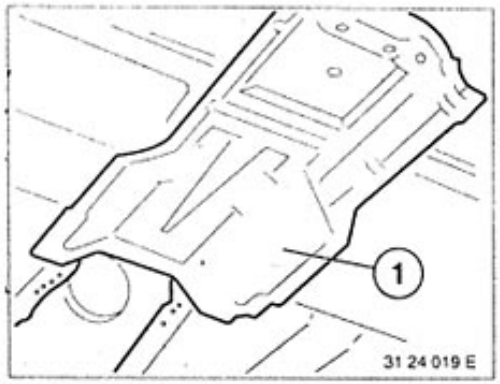
Installation:
Install rubber mount with lug (2) facing recess.



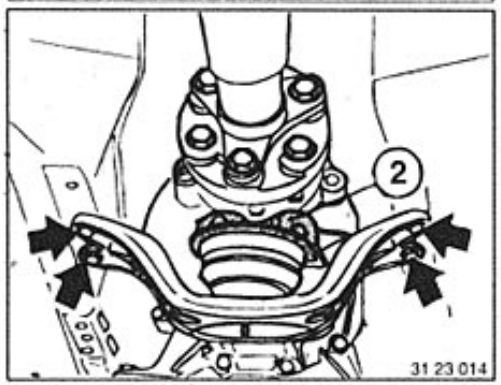
Unfasten bracket (3) for Lambda oxygen sensor plug.



Remove line for Lambda oxygen sensors from brackets.

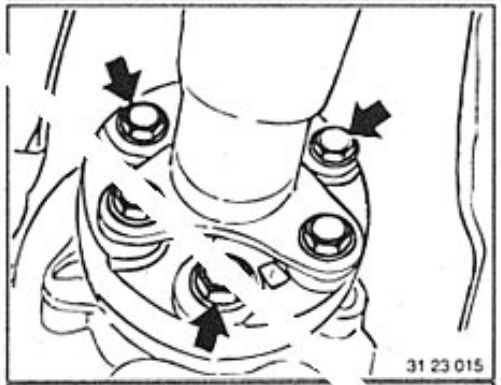


Remove heat shield (1).

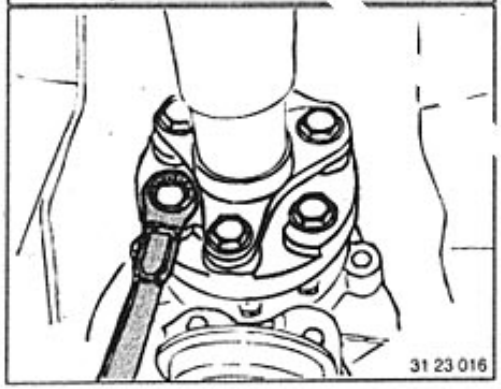


Unfasten crossmember from body.
Remove carrier (2) from transmission.

Installation:
Center transmission, see Main Group 26.
Tightening torque 24 71 2AZ*



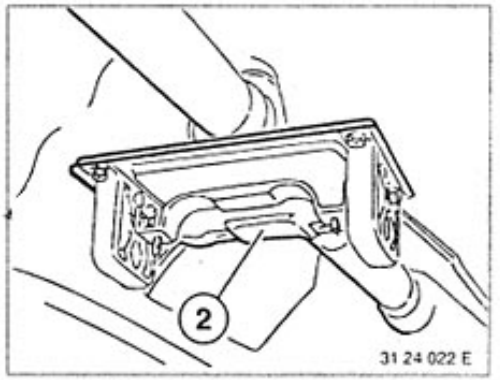
Remove flexible coupling from transmission.



Installation:
Tighten joint disk to correct torque.

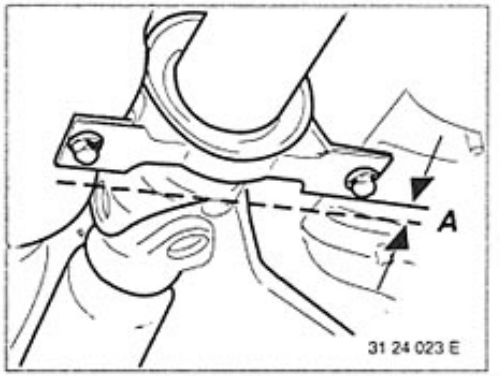
Tightening torque 26 11 1AZ*

* Refer to Technical Data



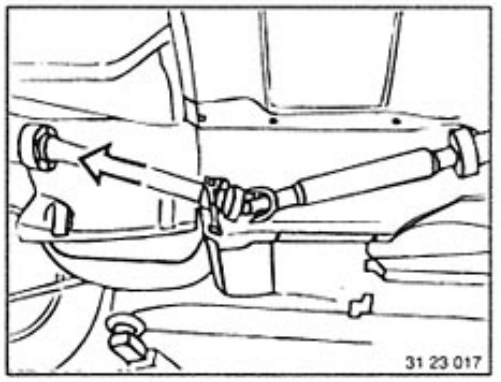
Remove exhaust bracket (2).

Installation:
Tightening torque*.



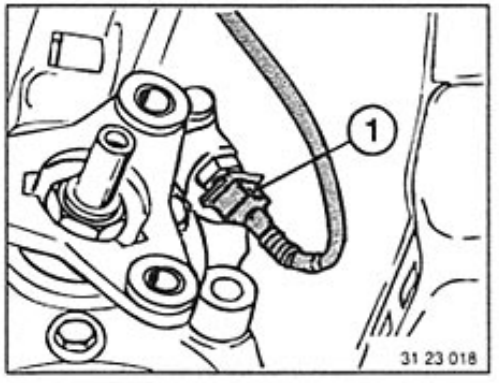
Remove center mount.

Installation:
Preload center mount in direction of travel
2 ... 4 mm (A).
Tightening torque 26 11 6AZ*



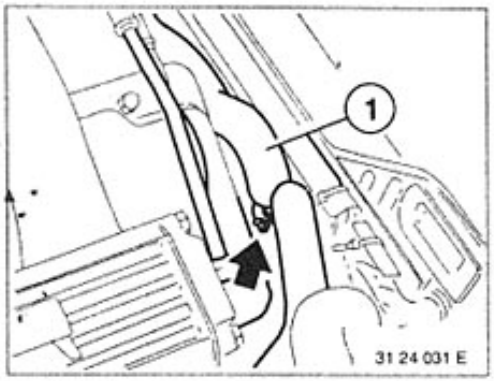
Slide propeller shaft in direction of constant velocity joint.
Tilt propeller shaft on center mount, withdrawing guide bearing from output spigot on transmission.

Caution!
Tie up propeller shaft.

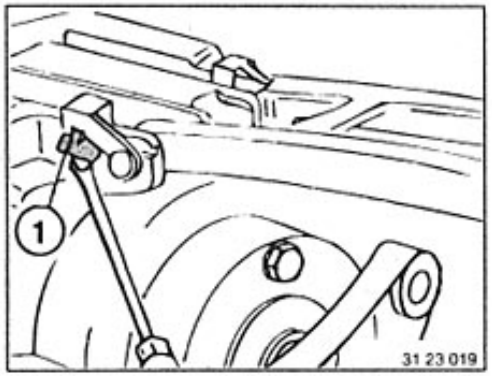


Remove plug (1) for reverse gear.

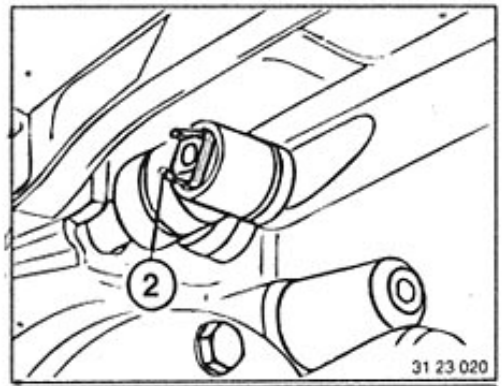
* Refer to Technical Data



Lower vehicle.
Lower engine with spindle on special tool 00 0 200 until there is a gap between engine and rear heating pipe connection (1) of approx. 1 mm (visual check).

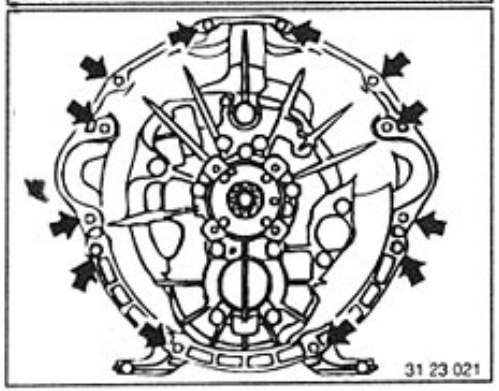


Lever retaining lug (1) out with a screwdriver and twist bolts upwards.
Remove bearing pins on left and right sides.

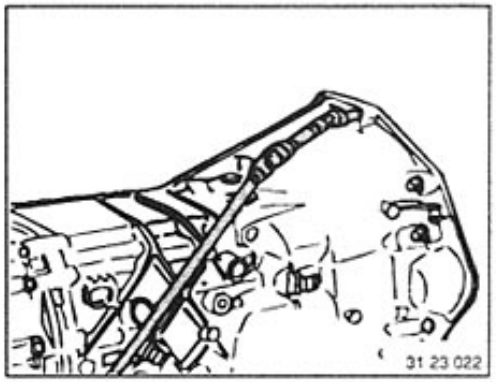


Remove (2) retaining fixture.
Pull out selector rod sideways.

Caution!
Note use of plastic washers.

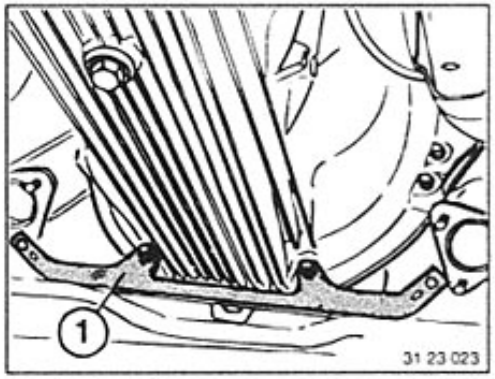


Disconnect transmission from engine flange.

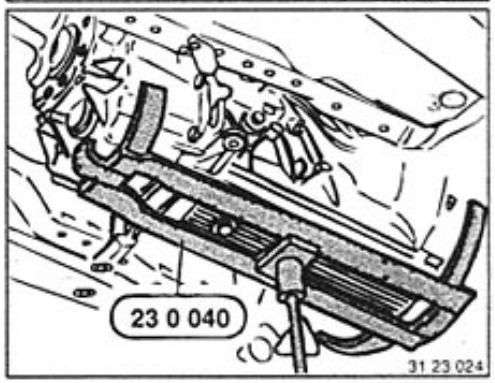


Unfasten Torx screws with Torx insert.
Use approx. 100 cm extension.

Caution!
To avoid increasing the break-loose torque, always fit washers.
Tightening torque 23 00 1AZ*

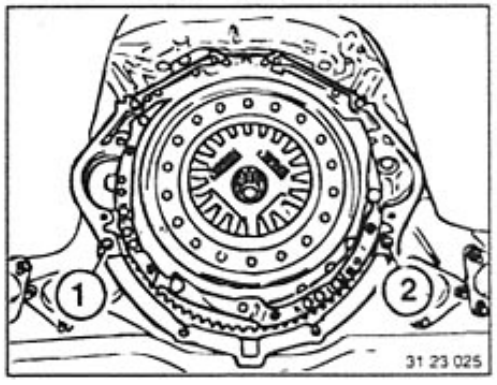


Installation:
Use to secure exhaust bracket (1).



Fit tool 23 0 040 and jack to transmission.
Remove transmission from engine.

Caution!
The lifting fixture may only be moved when fully lowered while transmission is attached.

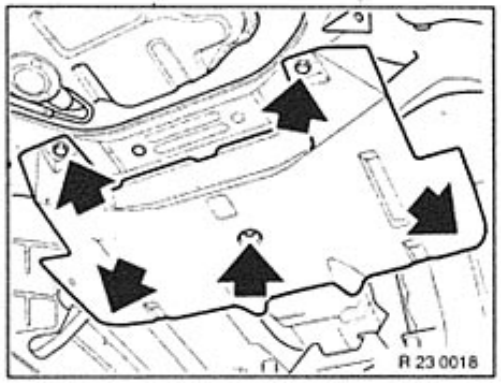


Caution!
Before fitting the transmission, check that guide sleeves (1 and 2) are fitted. If necessary, convert or replace guide sleeves on transmission.
After installation, check oil level and top up if necessary.

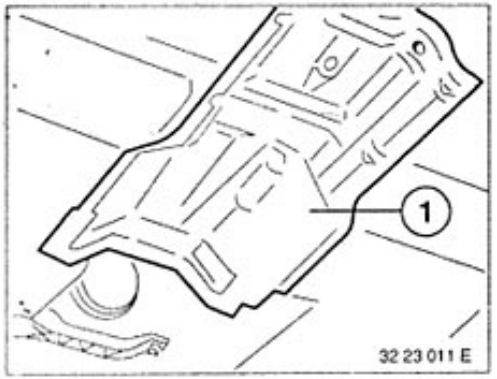
* Refer to Technical Data

23 00 025 Removing and installing transmission (engine M 60/ transmission S 6 D 420 G)

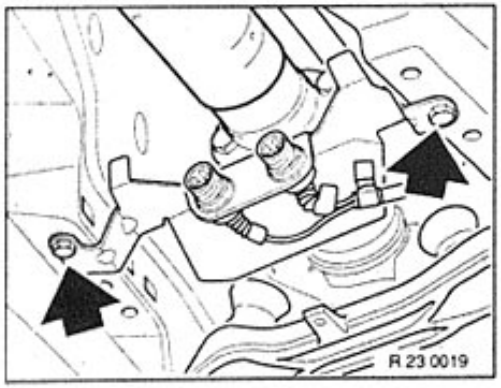
Disconnect ground lead from battery.
Caution!
When ground lead is disconnected, the fault memories in the control units are cancelled. For this reason, first read out the fault memory using the tester and print out any faults which appear.
Remove complete exhaust system 18 00 020.



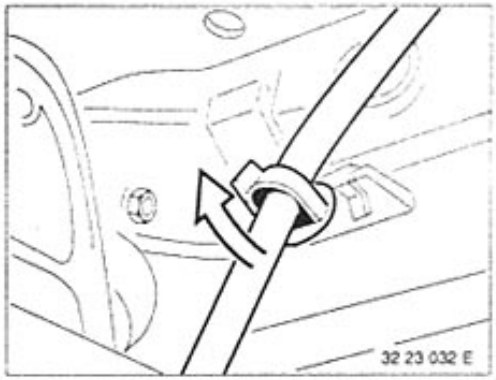
Remove splash guard.



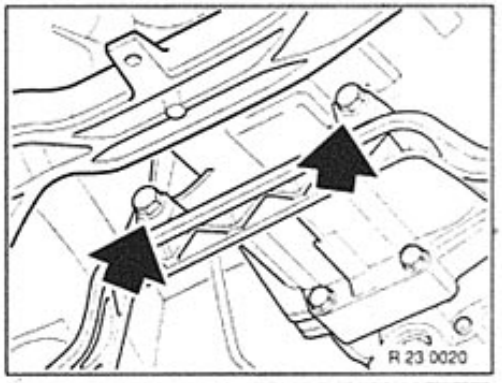
Remove heat shield (1).



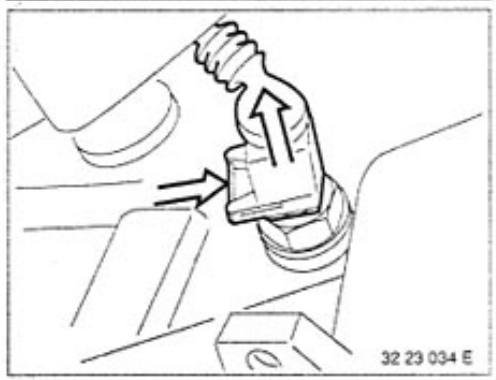
Remove bracket for Lambda oxygen sensor plug.



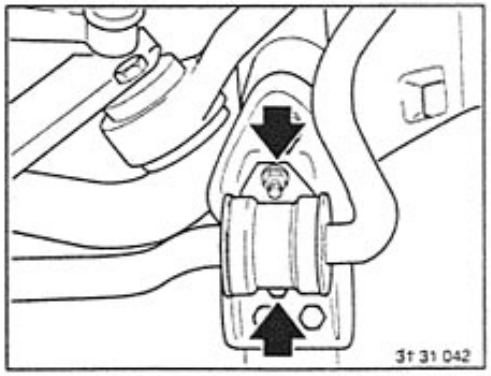
Unclip cable bracket from transmission.



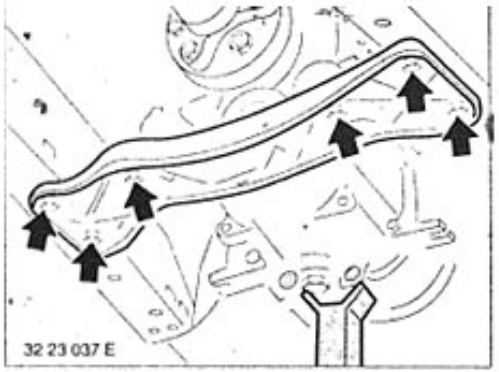
Remove exhaust bracket from transmission.



Remove plug for reversing lights.

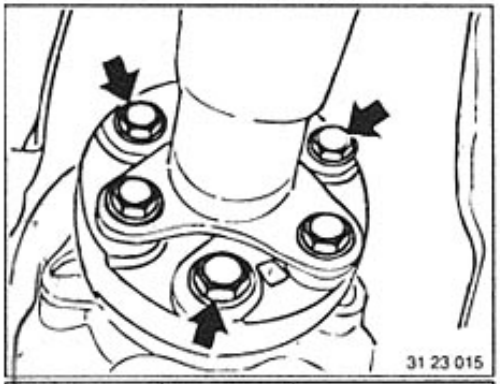


Unscrew stabilizer on left and right sides and leave hanging downwards.

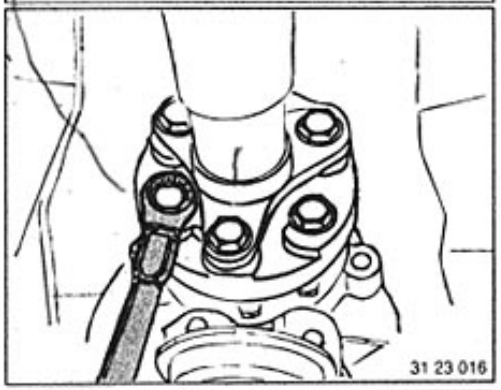


Support transmission.
Unscrew crossmember.

Installation:
Center the transmission (see Gr. 26)
Tightening torque 23 71 2AZ*

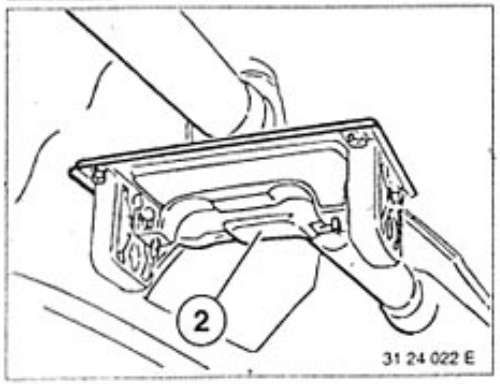


Unscrew joint disk from transmission.



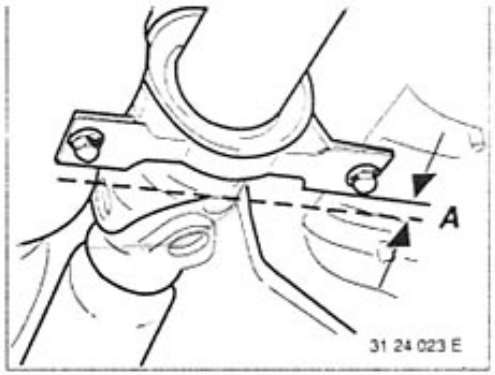
Installation:
Replace stop nuts.
Tightening torque 26 11 1AZ*

Caution!
To prevent torsional stress on joint disk, only tighten nuts on side of flange, provided that the design permits this.



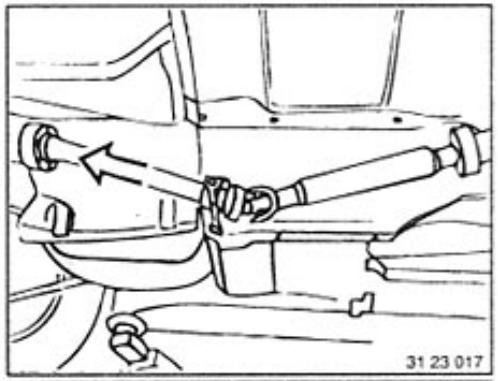
Remove exhaust bracket (2).

* Refer to Technical Data



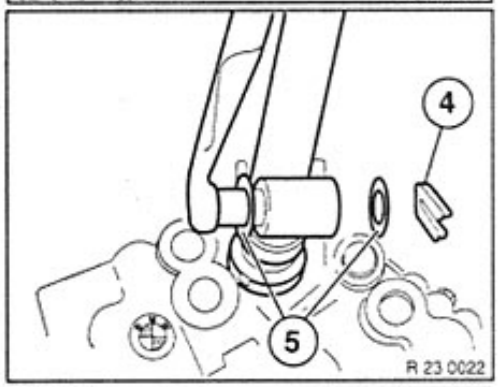
Remove center mount.

Installation:
Preload center mount in direction of travel 2...4 mm.
Tightening torque 26 11 6AZ*



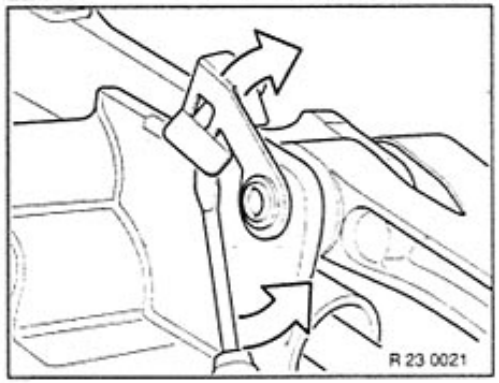
Slide propeller shaft in direction of constant velocity joint.
Tilf propeller shaft on center mount, removing guide bearing from output spigot of transmission while doing so.

Caution!
Tie up propeller shaft.



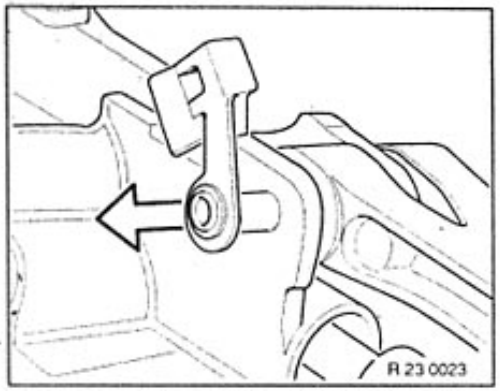
Lower transmission.
Lift out retaining fixture (4) and remove disk (5).
Note O-rings.

Remove selector rod.



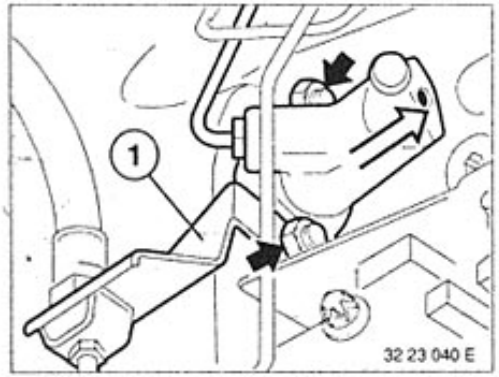
Lift spring off lug of housing with screwdriver and tilt upwards.

* Refer to Technical Data



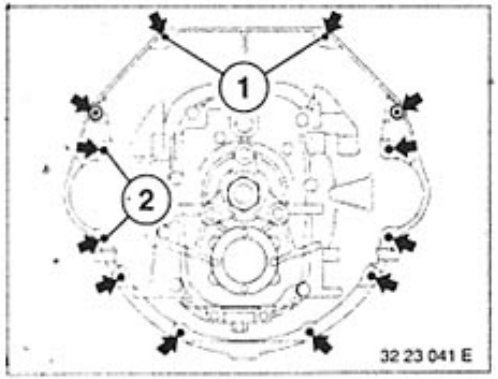
Remove bearing pin.
Remove shift console

Installation:
Apply light coat of Molykote- Longterm 2** grease.



Remove clutch slave cylinder.
Pressure line remains connected.

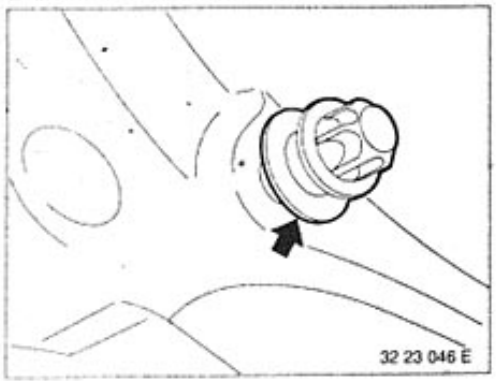
Installation:
Secure bracket (1) for pressure line.



Disconnect transmission from engine flange. (Torx- screws).

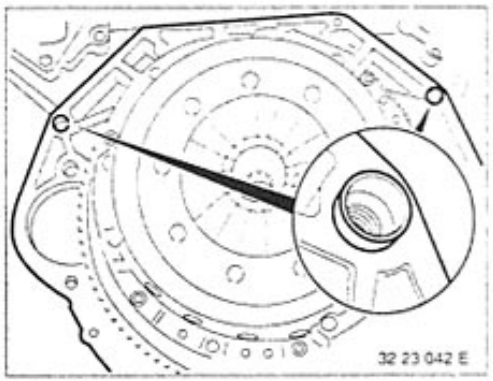
Lift transmission out backwards.

Note:
The screws (1) = Torx E 10
all others are Torx E 12
The screws opposite the starter motor are fitted with nuts on the front side.

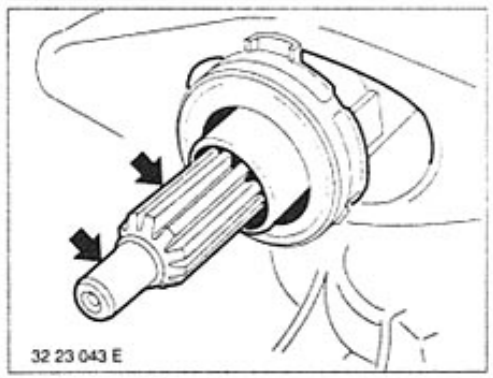


Installation:
Note that washers are fitted to the Torx screws.
Tightening torque 23 00 1AZ*

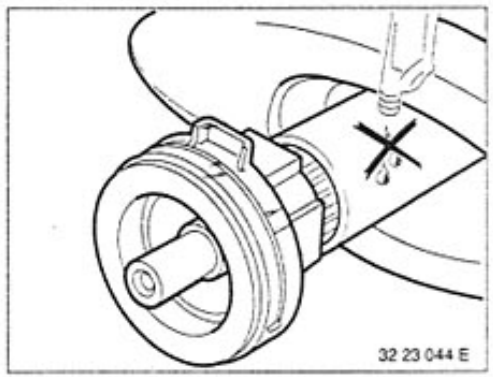
* Refer to Technical Data
** Source of Supply: BMW Parts Service



Note hollow bushes.
If necessary, move or replace hollow bushes on transmission.

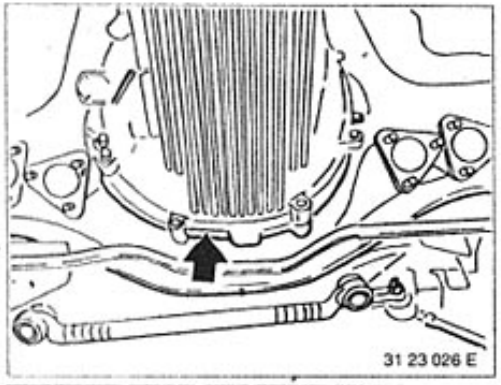


Installation:
Apply light coat of Klüber Mikrolupe GL 261** to wedge tapers and guide spigot.



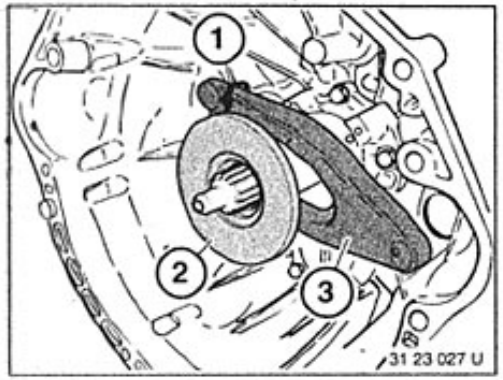
Caution!
From 3. 92, release bearings will be fitted with plastic guides.
No grease should be applied to sliding face of guide sleeve on bearings with plastic guides.
If this advice is ignored, the bearing can stick to the guide sleeve.

** Source of Supply: BMW Parts Service



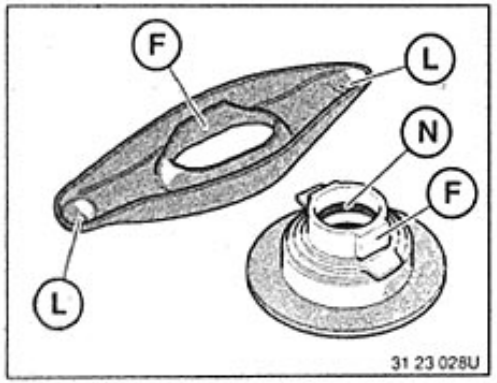
23 00 035 Installing replacement transmission

Remove transmission 23 00 025.
Transmission designation:
BMW Code* on front section of housing.

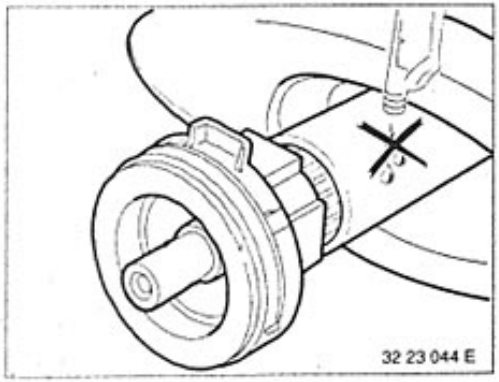


Lift retaining spring (1) off release lever.
Fit release unit (2) and release lever (3).

Note:
Apply light coat of Microlupe GL 261** to the taper grooves and guide spigot of the transmission input shaft.



Installation:
Fill lube groove (N) with Molykote Longterm 2.
Apply light coat of Molykote Longterm 2 ** grease to guides (F) and bearings (L).
If this advice is ignored, the bearing can seize on the guide sleeve.

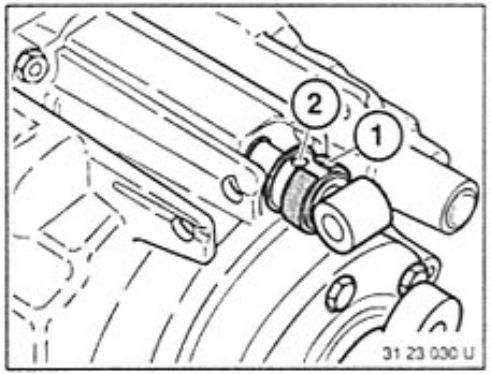


Caution!
From 3. 92, release bearings are being fitted with plastic guides.
No grease should be applied to sliding face of guide sleeve on bearings with plastic guides.
If this advice is ignored, the bearing can seize on the guide sleeve.

* Refer to Parts Catalogue
** Source of Supply: BMW Parts Service



Fit mounts on Lambda oxygen sensor line.



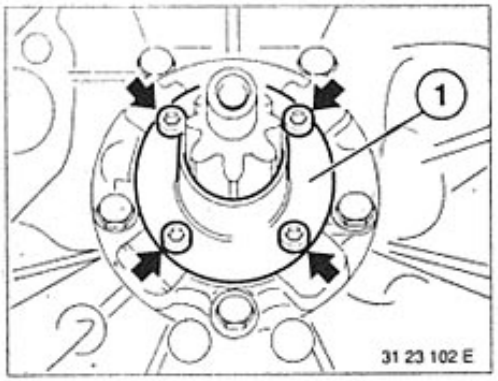
Fit selector rod joint.
Slide back retaining sleeve (1).
Drive out cylinder pin (2).

Caution!
The transmission is supplied with an oil fill.
After installation of the transmission, it is then only necessary to perform an oil level check.

23 11 612 Replacing guide tube for clutch release mechanism

- transmission removed -

Remove and install clutch release unit / lever.
This work is described in section on removing, installing or replacing the clutch release unit / lever.
Refer to 21 51 000.

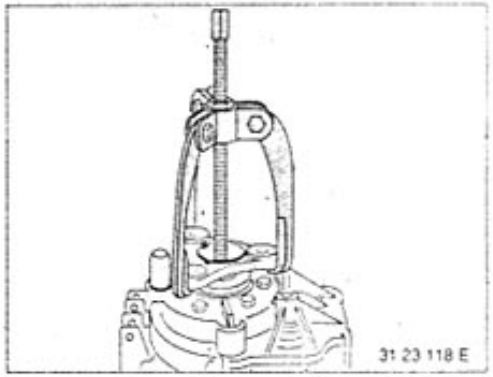


Unfasten screws.
Lift up guide tube (1).

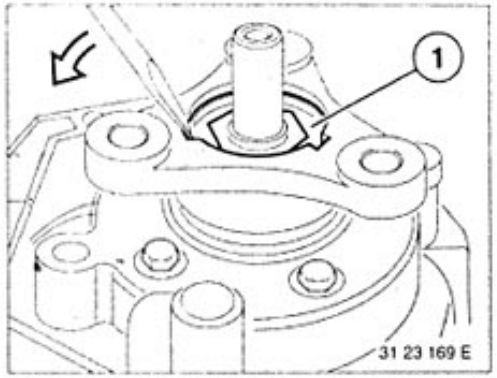
Installation:
Tightening torque 10 Nm *

23 12 056 Replacing radial seal for output flange

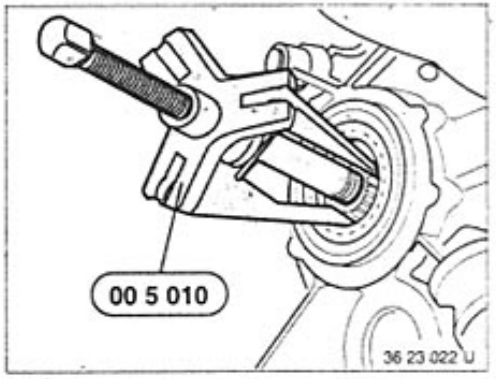
Remove front propeller shaft and center mount.
Tie propeller shaft to one side.
This work is described in section on removing and installing the complete propeller shaft.
See 26 11 000.



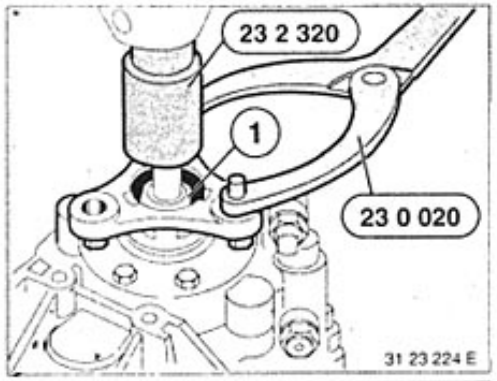
Remove output flange with standard extractor tool.



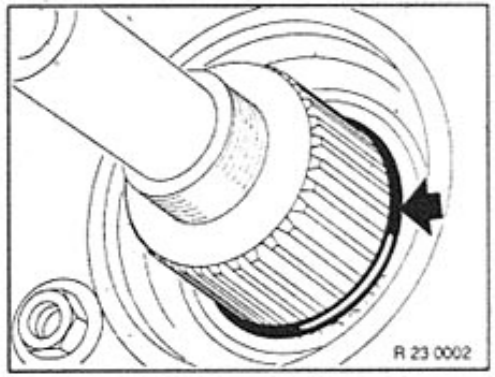
Lift out retaining plate (1).



Remove radial seal with special tool 00 5 010.

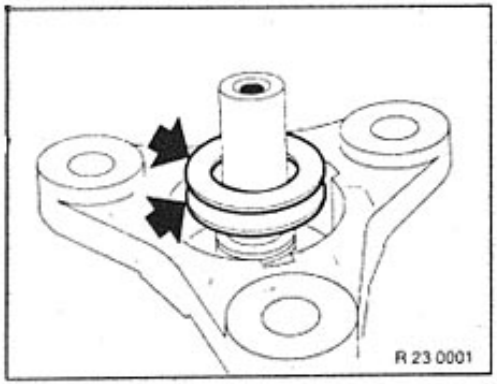


Brace output flange with special tool 23 0 020.
Use socket wrench insert 23 2 320 to unfasten collar nut (1).

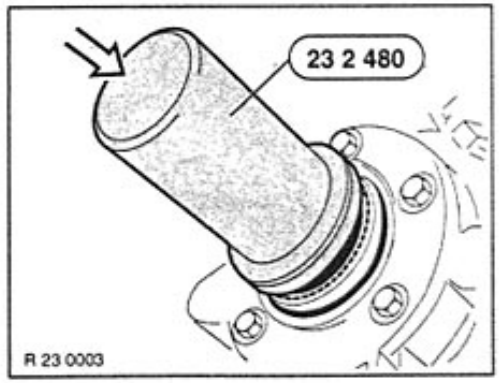


Only on transmission S6S 560 G:

Fit new O-ring to the output shaft

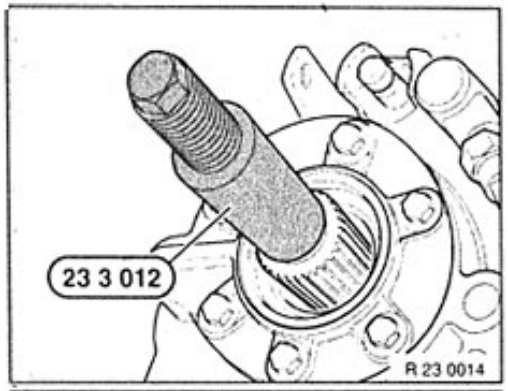


Note:
Two washers are located beneath the collar nut.
Refit spacers of same thickness.

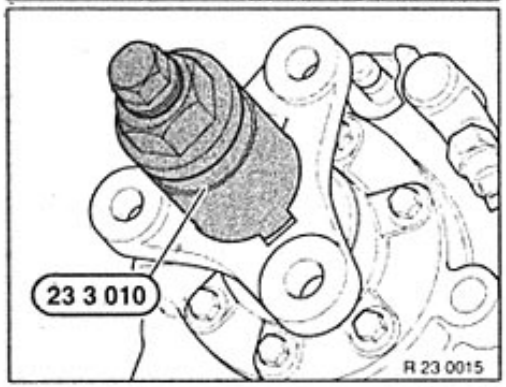


Coat sealing lip of radial seal with oil.
Drive radial seal firmly home with special tool 23 2 480.

Caution!
Use plastic hammer to drive home.

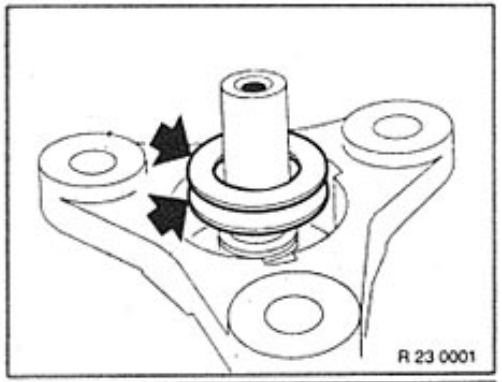


Screw spindle 23 3 012 of special tool 23 3 010 to the output shaft.

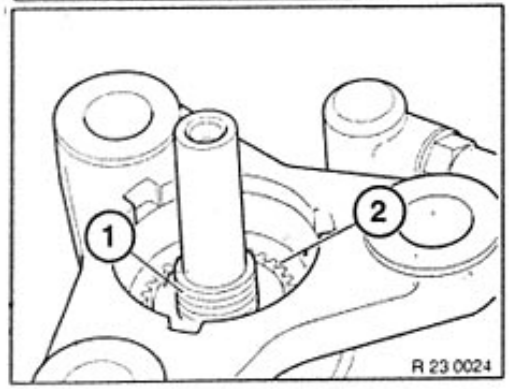


Apply oil to taper shaft.
Fit output flange top spline and attach with special tool 23 3 010.
(Brace output flange with special tool 23 0 020).
Tightening torque 180 ... 200 Nm.

Remove special tool.

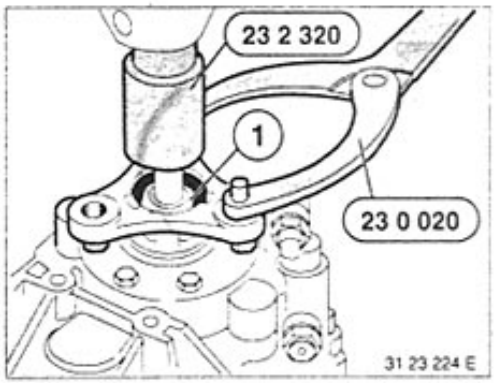


Install shims (1) (2 off).



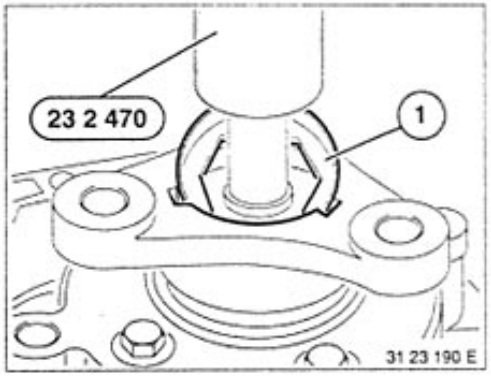
Coat thread (1) with screw retaining compound Loctite 243.

On transmission S6S 420G,
also coat locating face (2) with Loctite 518 for sealing purposes.



Brace output flange with special tool 23 0 020.
Tighten collar nut (1) with socket wrench insert 23 2 320.

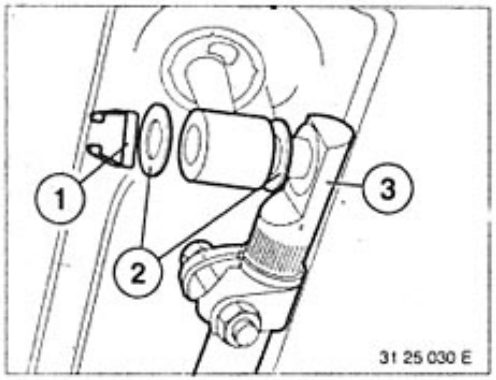
Tightening specification:
1. 190 Nm preload
2. loosen
3. 120 Nm tighten



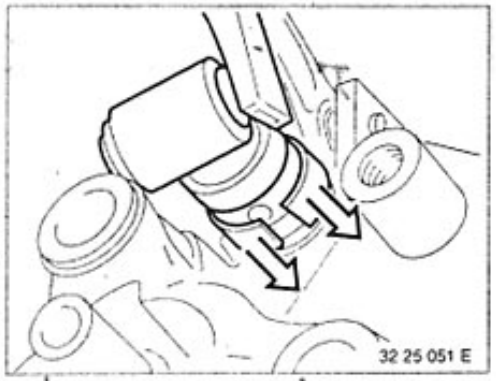
Drive new retaining plate (1) into place with special tool 23 2 470.

23 12 087 Replacing gaiter on selector shaft
(transmission S6S 560 G)

Remove front propeller shaft and center bearing.
Tie propeller shaft to one side.
This work is described in the section on removing and installing the complete propeller shaft.
See 26 11 000.

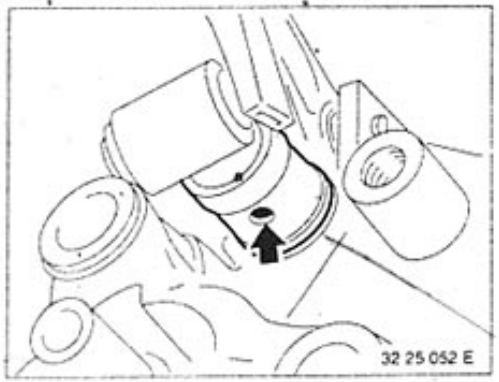


Lift out retaining fixture (1).
Remove disk (2).
Remove selector rod (3).

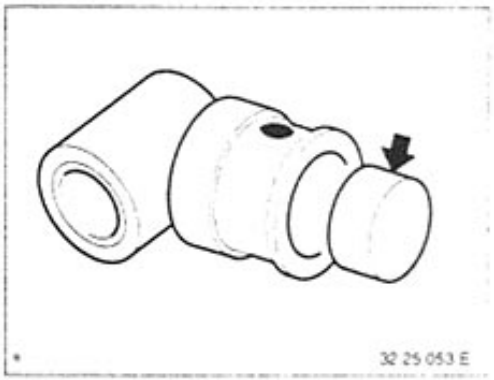


o Removing selector rod joint

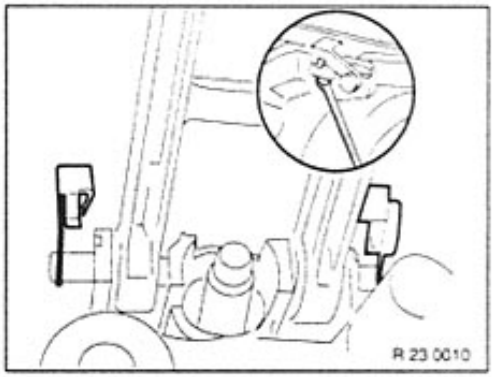
Select " R " gear.
Lift retaining sleeve out of groove and slide forwards.



Drive out pin.
Withdraw selector rod with joint.

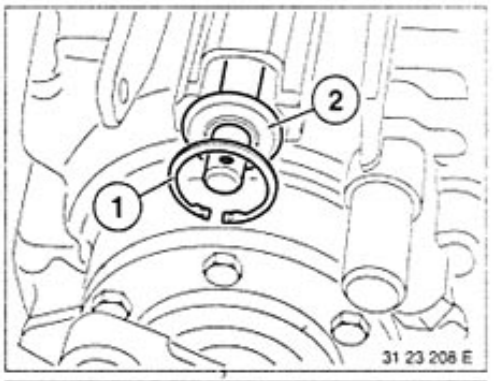


Installation:
Inspect damping disk in the joint, replacing if necessary.

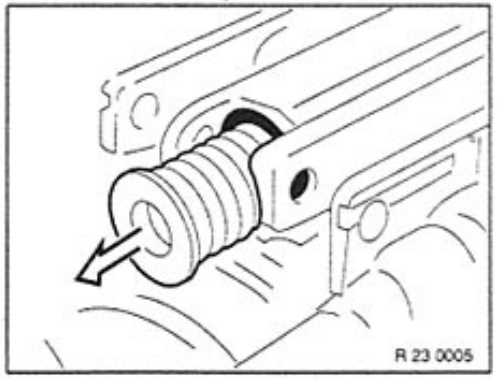


o Replacing gaiter.

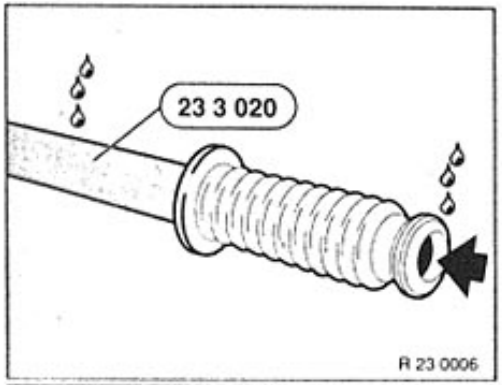
Lift retaining lugs on retaining pins in shift console with a screwdriver and bend clips upwards.
Withdraw bearing pin.



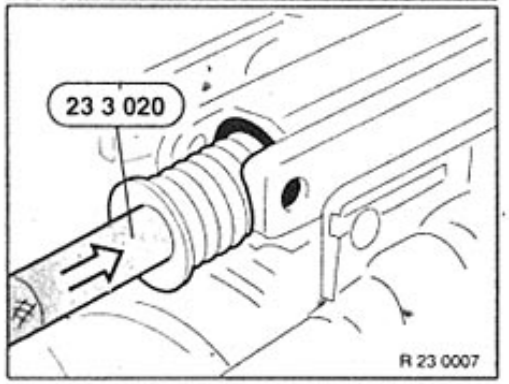
Move selector rod into idle setting.
Lift out retaining ring (1).
Remove disk (2).



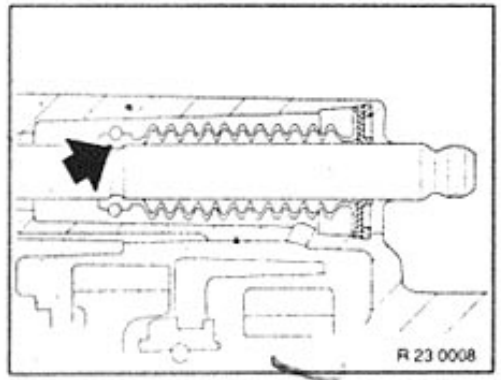
Remove gaiter.



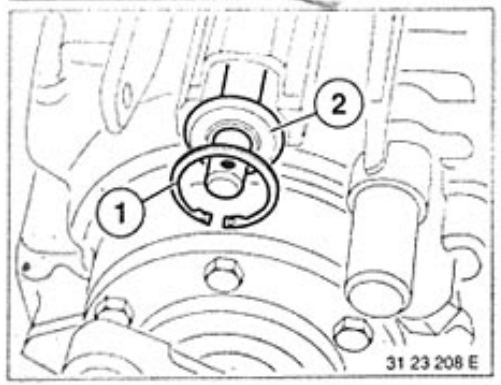
Apply light coat of oil to inside edge of gaiter beside hose spring.
Slide special tool 23 3 020 into gaiter.



Slide gaiter firmly home on selector shaft with special tool 23 3 020.



Grip gaiter.
Slowly unscrew special tool 23 3 010.
Pull gently on gaiter to check that the gaiter on the hose spring has engaged in the groove on the selector shaft.

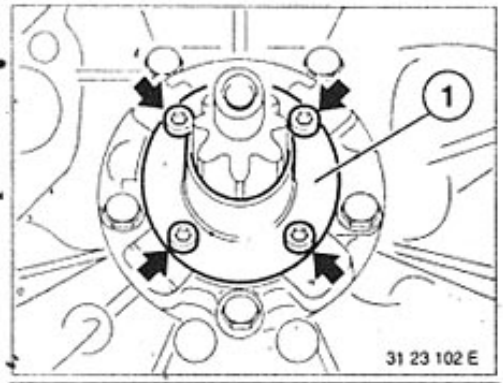


Fit disk (2).
Install retaining ring (1).

23 12 506 Replacing radial seal on input shaft

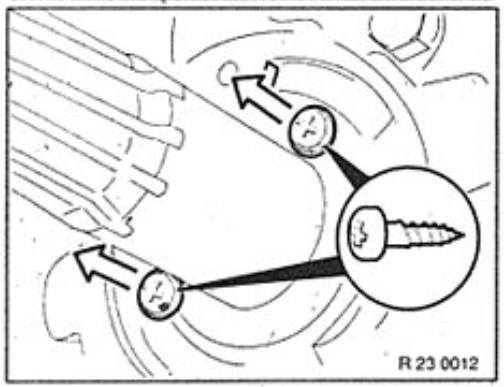
- transmission removed -

Clutch release mechanism / remove and install lever.
This work is described in the section on removing, installing or replacing the clutch release mechanism / lever.
See 21 51 000.



Remove guide tube (1).

Installation:
Tightening torque 10 Nm *

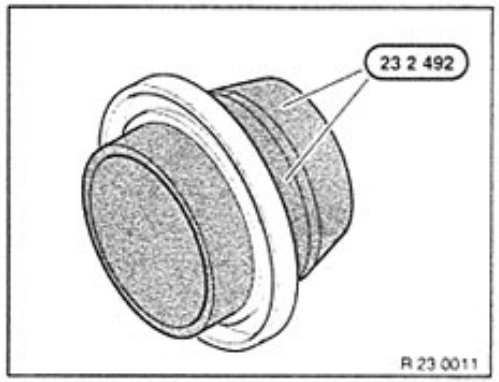


o Removing radial seal.

Locate bores in radial seal with a scribing tool and punch out.

Insert suitable size of self-tapping screw in the holes.
Remove radial seal by pulling self-tapping screws (pliers).

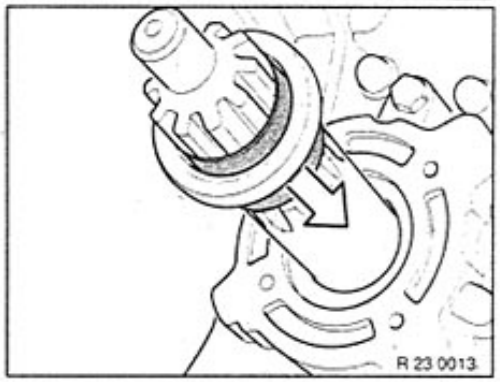
Caution!
Do not damage the surface of the shaft



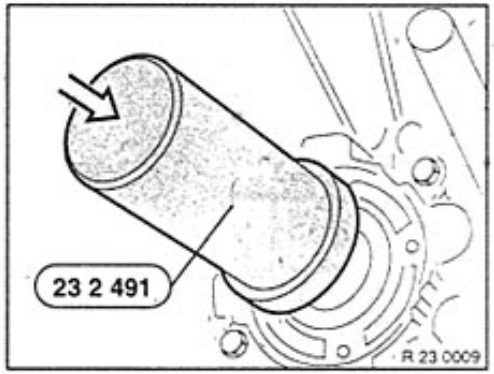
o Installing radial seal

Assemble cap and sleeve of special tool 23 2 492.

Coat radial seal with oil and slide onto sleeve.
Remove cap.



Slide sleeve and radial seal onto input shaft.



Drive radial seal firmly home with special tool 23 2 491.

Remove special tool 23 2 492 (sleeve) from input shaft.

Caution!
Use plastic hammer to drive seal home.

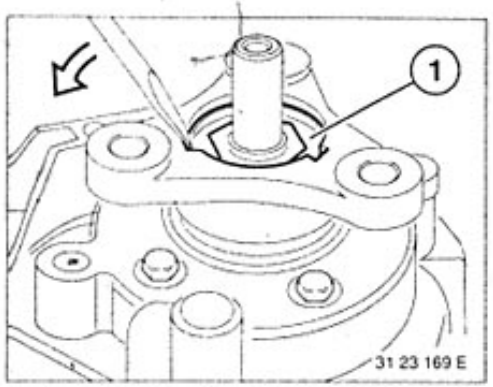
Note:

After installation of the transmission it may be necessary to check the oil level.

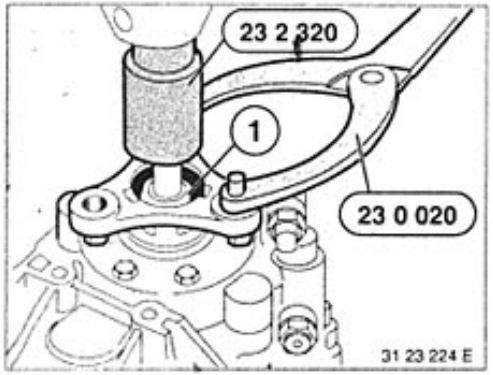
* Refer to Technical Data

23 21 007 Replacing output flange on transmission

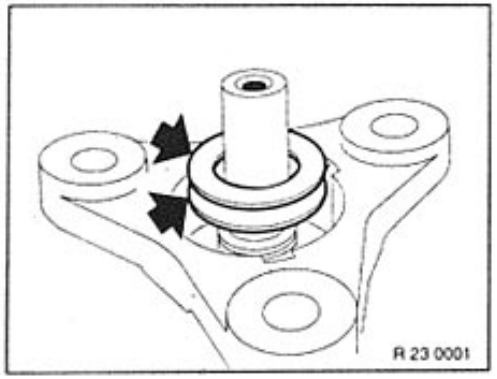
Remove front propeller shaft and center bearing, see 23 00 022.



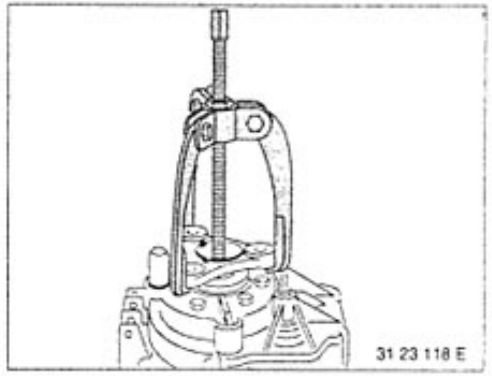
Lift out tab washer (1).



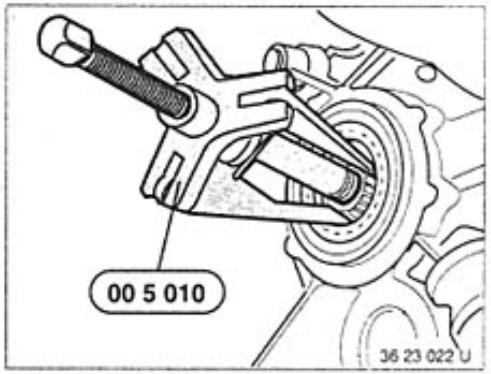
Brace output flange with special tool 23 0 020. Use socket wrench insert 23 2 320 to unfasten collar nut (1).



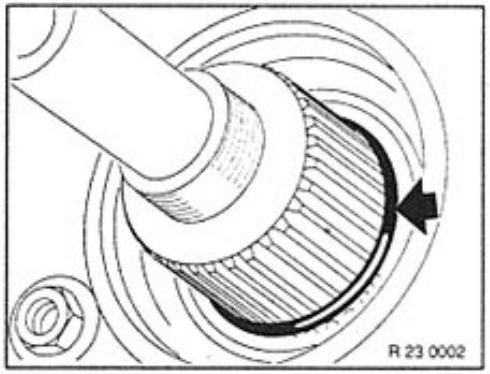
Remove spacers (2 off).



Remove output flange using standard extractor tool.

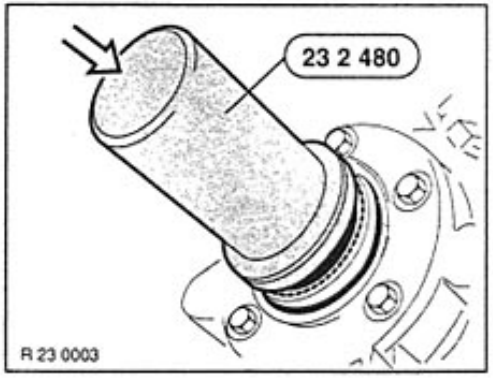


Remove radial seal using special tool 00 5 010.



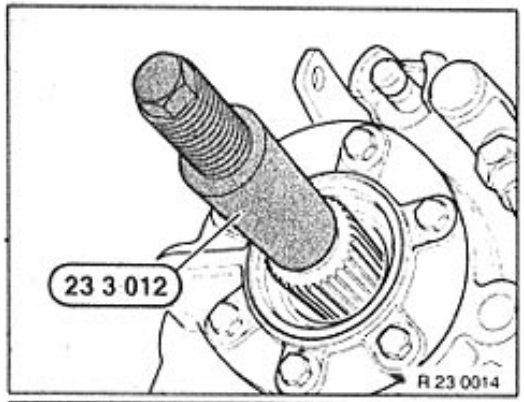
Only on transmission S6S 560G:

Fit new O-ring to the output shaft

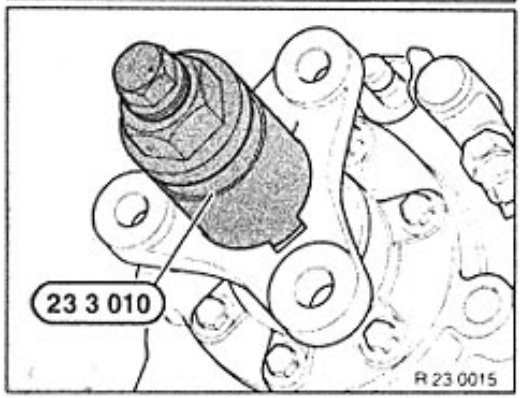


Apply coating of oil to sealing lip of radial seals.
Drive radial seal down flush using special tool 23 2 480.

Caution!
Use plastic hammer to drive seal home.

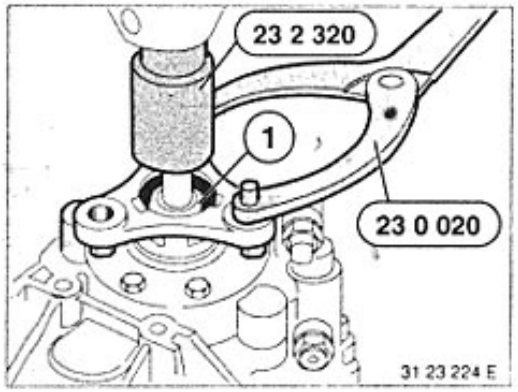


Screw spindle 23 3 012 of special tool 23 3 010 onto the output shaft.



Coat taper shaft with oil.
Place output flange on spline and mount using special tool 23 3 010.
(Brace output flange with special tool 23 0 020).
Tightening torque 180 ... 200 Nm.

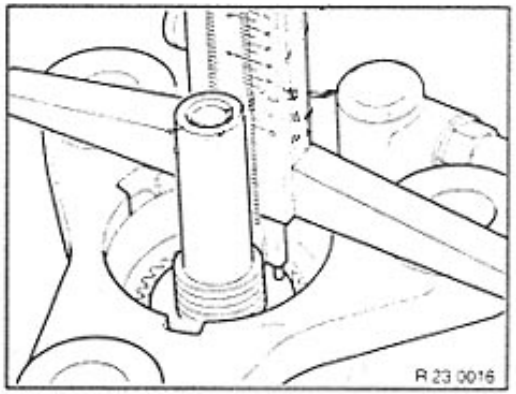
Remove special tool.



Screw on collar nut and press flange down once again.

Tightening torque 180 ... 200 Nm.

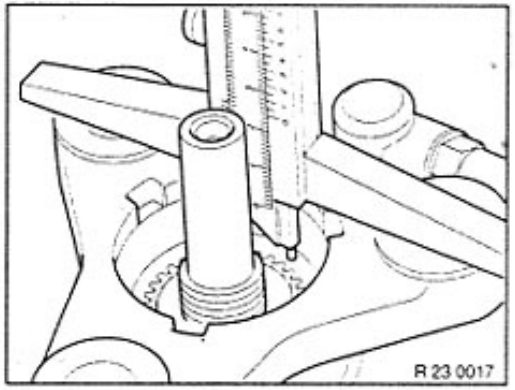
Remove collar nut once again.



o Calculate thickness of shims (2 off).

Determine dimension "A" between face of flange and step on the output shaft.

Example: "A" = 26.6 mm



Determine dimension "B" between face of flange and locating face of collar nut.

Example: "B" = 24.1 mm

Example of calculation:

Transmission S6S 560 G

A = 26.6 mm
minus B = 24.1 mm
Difference = 2.5 mm

Minus clearance 0.05 ... 0.14 mm

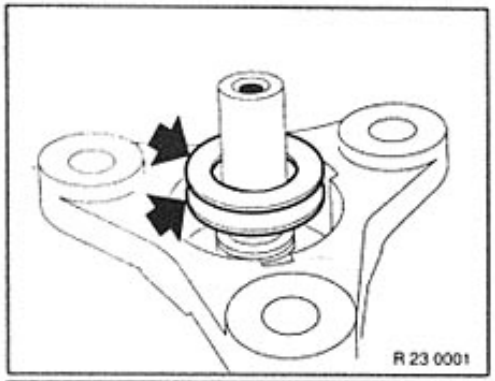
Total thickness of shim: 2.45 ... 2.36 mm

Transmission S6D 420 G

A = 26.2 mm
minus B = 22.7 mm
Difference = 3.5 mm

Minus clearance 0.05 ... 0.22 mm

Total thickness of shim: 3.45 ... 3.28 mm

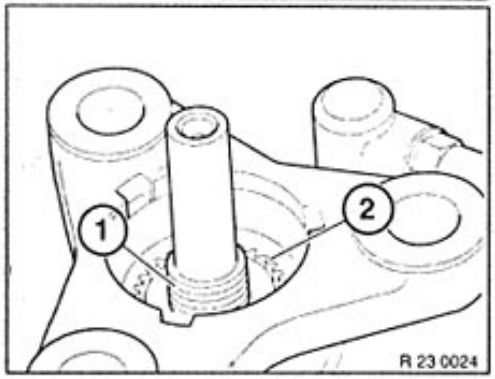


Example:

Transmission S6S 560 G:
Required thickness of shim = 2.4 mm
Thickness of shim 1.1 and 1.3 mm

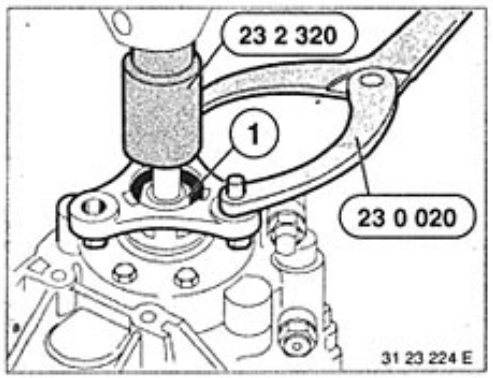
Transmission S6D 420 G:
Required thickness of shim = 3.4 mm
Thickness of shim 2.0 and 1.4 mm

Insert shims.



Coat thread (1) with Loctite 243 screw adhesive.

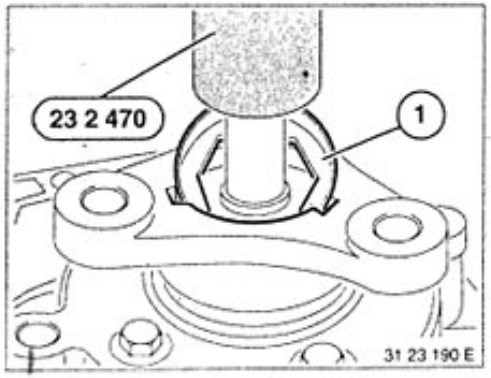
On transmission S6S 420G:
also coat locating face (2) with Loctite 518 for sealing purposes.



Brace output flange with special tool 23 0 020.
Use socket wrench insert 23 2 320 to tighten collar nut (1).

Tightening specification:

1.	190 Nm	initial tightening torque
2.		loosen
3.	120 Nm	tightening torque



Drive in new tab washer (1) with special tool 23 2 470.

24 Automatic transmission

4 HP-24 / EH

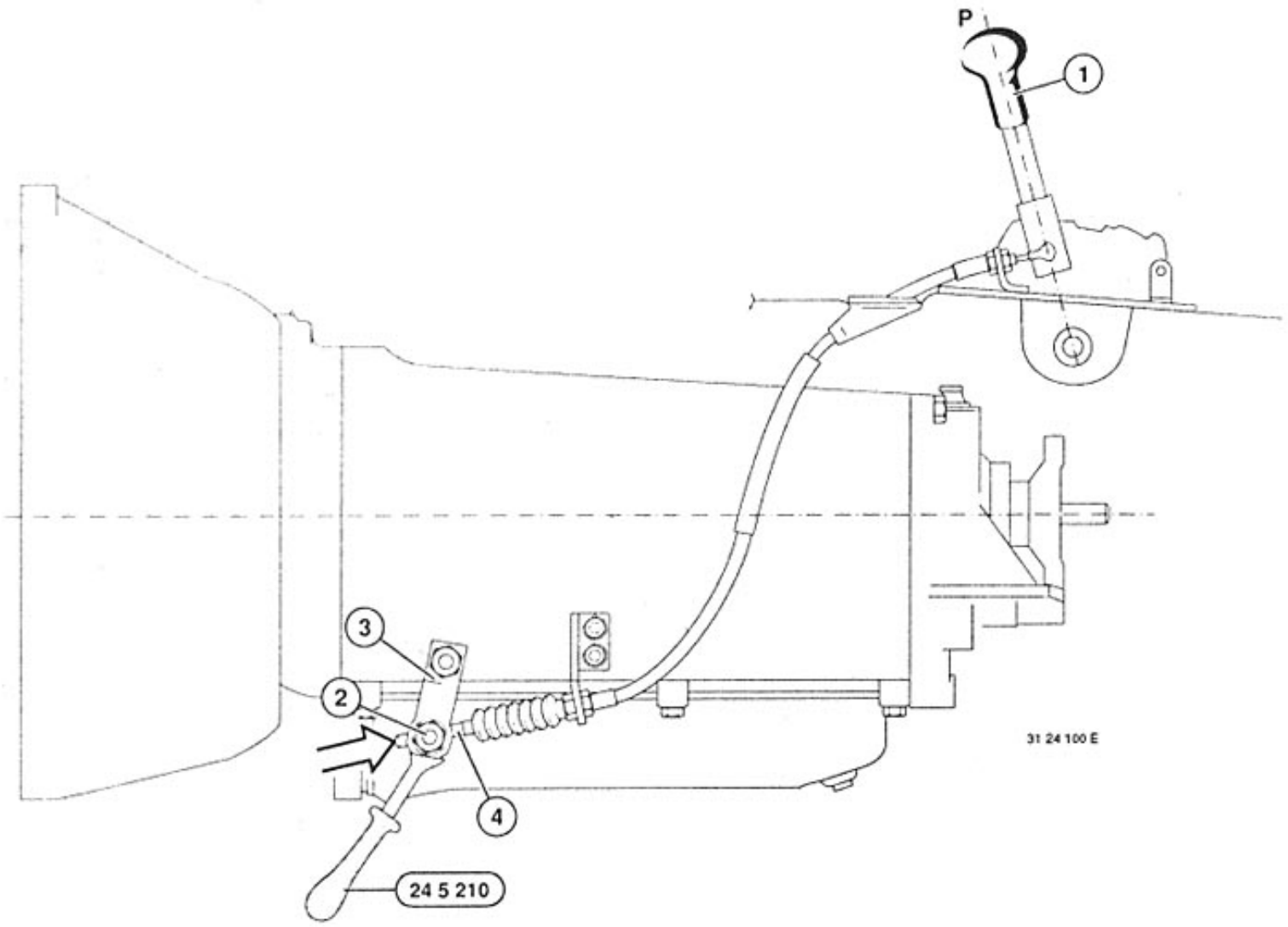
24 00 008	Shift lever – adjust	24-00/1
014	Hydraulic pressure values – check	24-00/2
024	Transmission – remove and install	24-00/3
044	Exchange transmission – install	24-00/6
00 11 239	Oil change in automatic transmission	24-00/7
24 11 004	Oil pan – remove and install/seal	24-11/1
054	Transmission extension – remove and install/seal	24-11/2
24 12 014	Radial seal for output flange – replace	24-12/1
104	Radial seal for manual shift valve shaft – replace	24-12/2
504	Radial seal for torque converter – replace	24-12/3
24 30 004	Shift unit – remove and install/replace	24-30/1
24 31 154	Transmission oil screen – remove and install/replace	24-31/1
24 34 004	Parking interlock (pawl / leg spring) – remove and install/replace	24-34/1
24 34 851	All solenoid valves – replace	24-34/2
860	Pressure regulator – replace	24-34/3
870	Impulse sensor for output speed – replace	24-34/3
24 35 500	Wiring harness in automatic transmission – replace	24-35/1
24 40 004	Torque converter – remove and install/replace	24-40/1
24 61 500	Control unit (EH) – remove and install/replace	24-61/1
	Troubleshooting	24-90/1

Additional operations – see Construction Group Repair Instruction. Microfilm HG 24.

5 HP-30

00 11 239	Oil change in automatic transmission	24/0-51
24 00 007	Shift lever – adjust - transmission A5S 560 Z -	24/0-52
026	Automatic transmission – remove and install (A5S 560 Z / M60 engine)	24/0-53
026	Automatic transmission – remove and install (A5S 560 Z / M73 engine)	24/0-57
046	Exchange transmission – install	24/0-60
24 11 008	Transmission oil pan – remove and install/seal	24/0-60
24 12 016	Radial seal for output flange – replace	24/0-60
106	Radial seal for manual shift valve shaft – replace	24/0-60
506	Radial seal for torque converter – replace	24/0-60
24 13 156	Output flange – replace	24/0-60
706	Bearing on transmission extension – replace	24/0-60
24 30 006	Shift unit – remove and install/replace	24/0-60
24 31 156	Transmission oil strainer – remove and install/replace	24/0-61
24 34 006	Parking interlock (pawl / leg spring) – remove and install or replace	24/0-61
857	Solenoid valves and/or pressure regulator – replace	24/0-61
873	Impulse sensor – replace (turbine speed)	24/0-61
874	Impulse sensor – replace (output speed)	24/0-61
24 35 501	Wiring harness in automatic transmission – replace	24/0-61
24 40 007	Torque converter – remove and install/replace	24/0-61
24 61 501	Control unit (EGS) – remove and install or replace	24/0-61-51

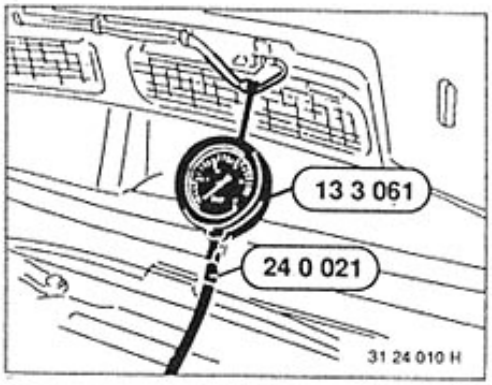
24 00 006 ADJUSTING SELECTOR LEVER



Move selector lever (1) to "P".
Loosen nut (2).
Important!
It is absolutely essential to counterhold on the clamping bolt with Special Tool 24 5 210 in order to avoid deformation of the cable.

Note:
Special Tool 24 5 210 can only be applied with the selector lever at "P".

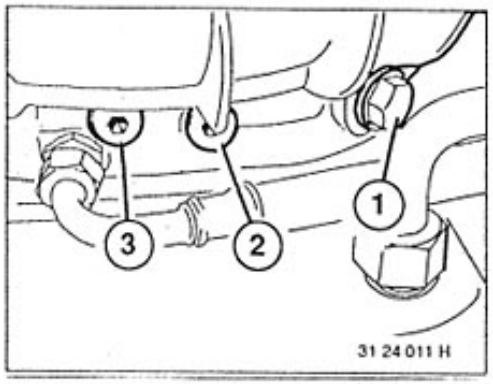
Push lever (3) forward (park position).
Press cable rod (4) opposite forward direction.
Clamp cable rod (4) with nut (2) (counterhold with Special Tool 24 5 210).
Tightening torque = 10 ... 12 Nm.



24 00 014 CHECKING HYDRAULIC PRESSURE VALUES

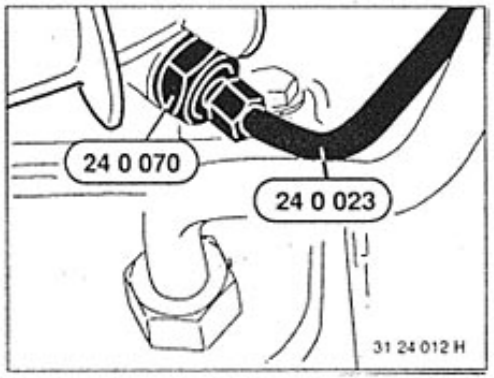
Connect hose 24 0 021 with pressure tester 13 3 061.

Test:	Pos.	Gear	Speed (rpm)	Pressure in bar (psi)
Pump pressure	D	1st	700 ... 1000	6.0 ... 7.5 (85 ... 107)
	D	2nd/3rd/4th	approx. 4000	4.6 ... 5.8 (65 ... 82)
	R	R	700 ... 1000	11 ... 13 (156 ... 185)
Conv. pressure	D	4th	Converter locked	max. 0.7 (10)

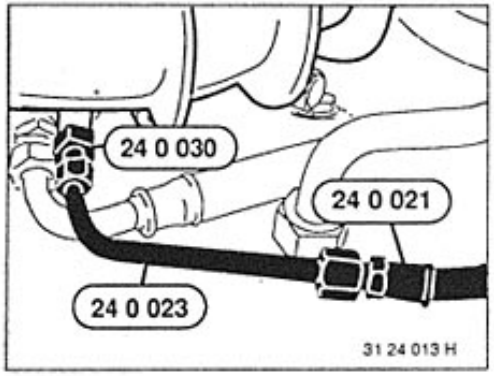


Remove concerned plugs for testing.
1 Pump pressure
2 Clutch A
3 Converter pressure

Installation:
Tightening torque*.

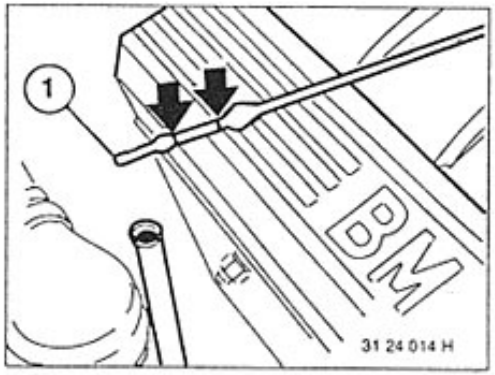


A) Pump Pressure:
Mount Special Tool 24 0 070 with seal on transmission.
Connect Special Tool 24 0 023 in conjunction with hose 24 0 021.

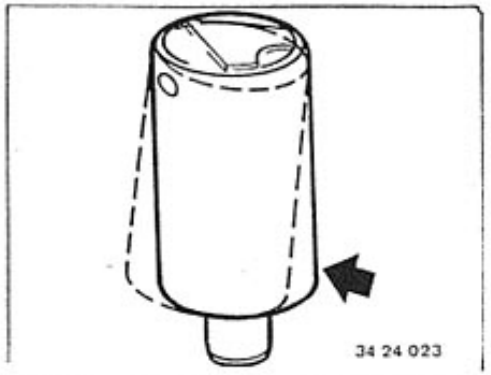


B) Converter Pressure:
Mount Special Tool 24 0 030 on the transmission.
Connect Special Tool 24 0 023 in conjunction with hose 24 0 021.

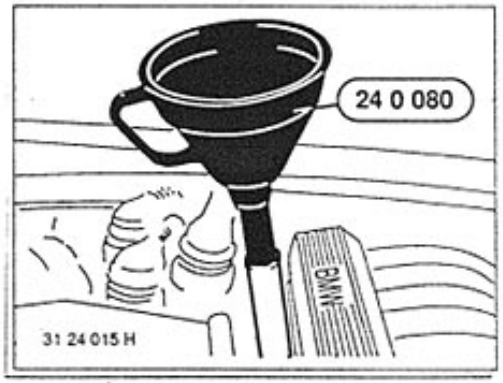
* See Specifications



Check/correct oil level with selector lever at P, engine running at idle speed and car parked on level floor.
Oil level should not be below ball (1) after a test drive and an oil temperature of approx. 40° C (105° F).
Oil level should be between min. and max. marks at an oil temperature of approx. 80° C (175° F).
Amount of oil between min. and max. marks = approx. 0.3 ltr. (0.6 pint).
Never wipe off oil dipstick with a cloth losing lint.



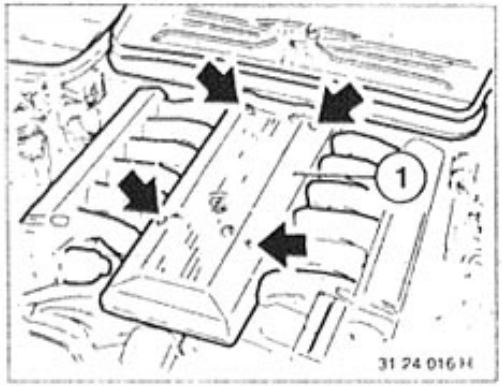
Important!
Oil Dipstick with Lock:
Oil dipstick can be pulled out only after tilting the grip.



Important!
Oil Level Too High:
Strong foaming, splash loss, high temperature when driving fast, oil lost via.vent.

Oil Level Too Low:
Valves rattling, foaming, engine slipping when driving in curves, general operating disturbances.

Only pour in ATF with Special Tool 24 0 080 (funnel).

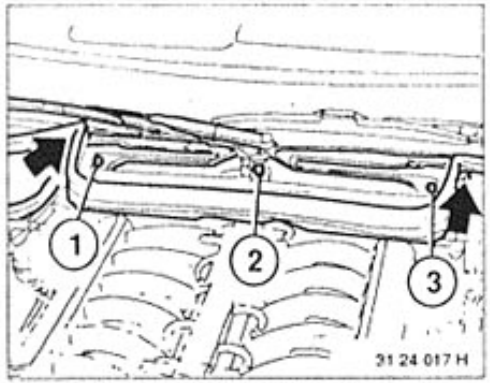


24 00 024 REMOVING AND INSTALLING TRANSMISSION

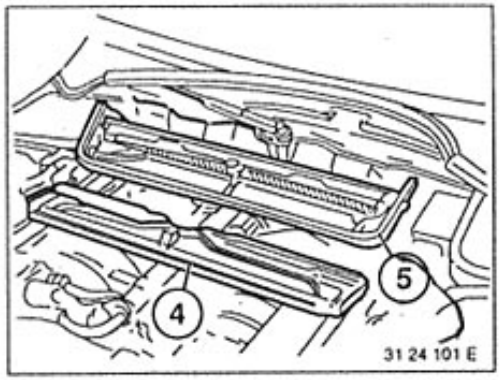
Disconnect ground lead.

Important!
Disconnection erases the fault memories of control units, so that they must first be read with a tester and faults printed if applicable.

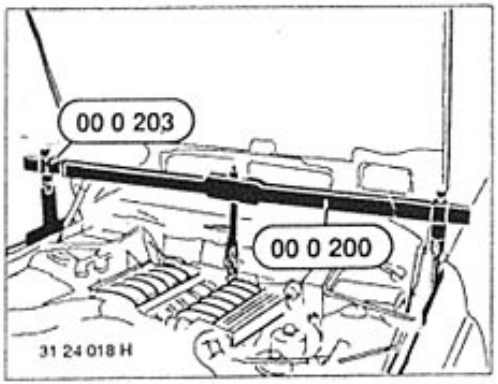
Unscrew cover (1).



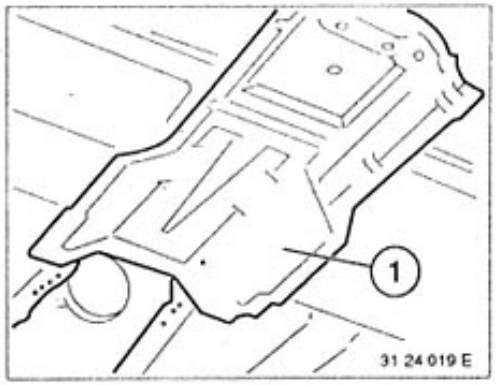
Pull off rubber seal partially.
Turn retainers (1 ... 3).
Unscrew left and right bolts.



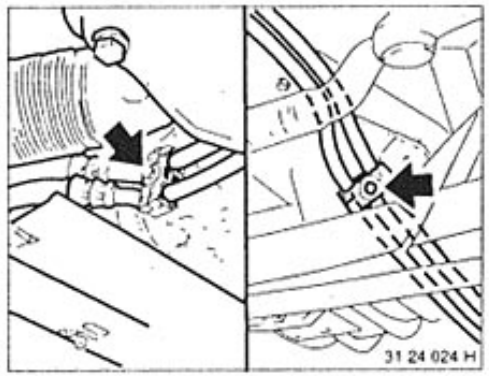
Lift out panel (4) and microfilter (5).



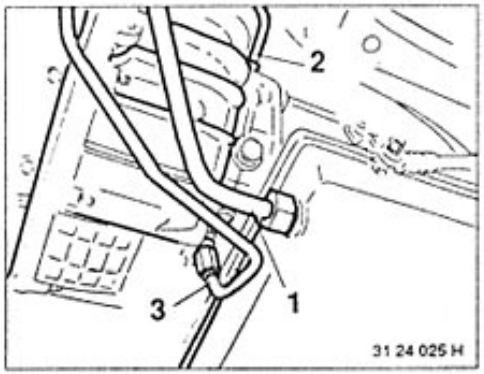
Important!
Support engine with Special Tool 00 0 200 before lowering the transmission to avoid damaging (danger of leaks) heater pipe connections on the engine compartment wall.
Set up Special Tool 00 0 200 in conjunction with 00 0 203 and attach on the rear eye.
Tension the chain.



Remove exhaust assembly – see 18 00 020.
Remove heat shield (1).



Unscrew mounting straps of oil cooler pipes on the engine.



Drain oil.

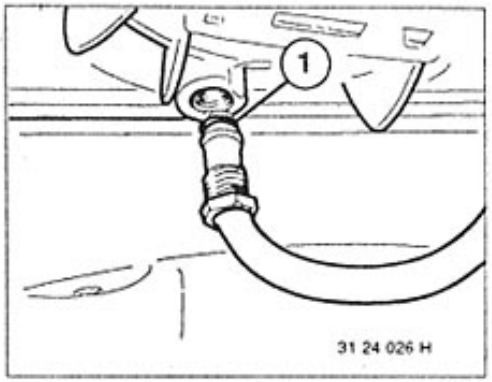
Important!
Never reuse drained oil.

Installation:
Transmission will have to be disassembled if the oil smells burnt and is black.

Important!
Oil cooler and pipes must be cleaned with compressed air and flushed twice with ATF if the transmission was faulty.

Remove oil filler pipe (1).
Unscrew oil cooler pipes (2 and 3) on transmission.
Tightening torque*.

* See Specifications

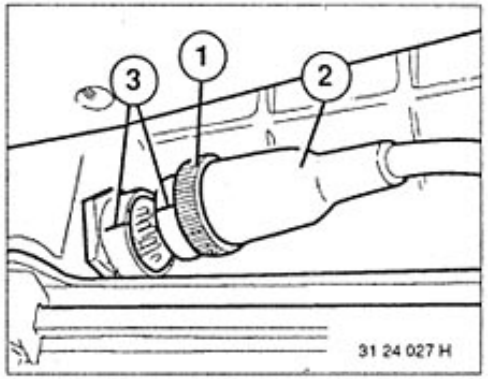


24 00 024 REMOVING AND INSTALLING TRANSMISSION

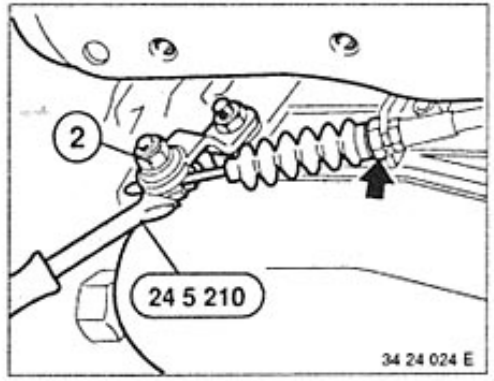
Disconnect ground lead.

Important!
Disconnection erases the fault memories of control units, so that they must first be read with a tester and faults printed if applicable.

Unscrew cover (1).

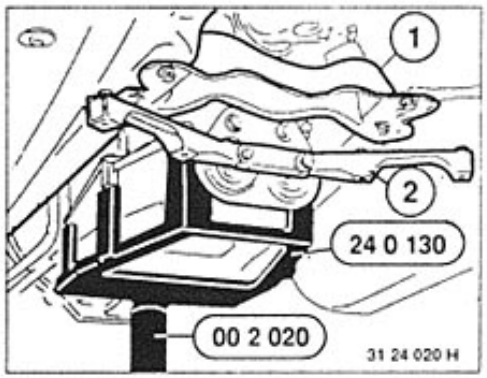


Pull off rubber seal partially.
Turn retainers (1 ... 3).
Unscrew left and right bolts.

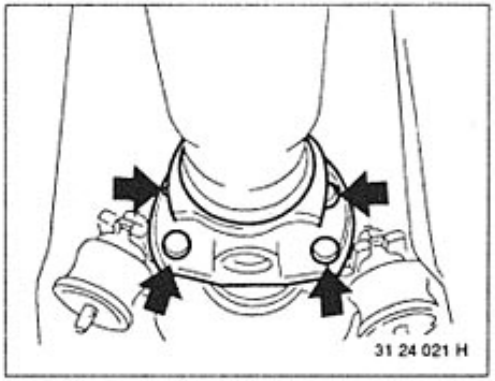


Lift out panel (4) and microfilter (5).

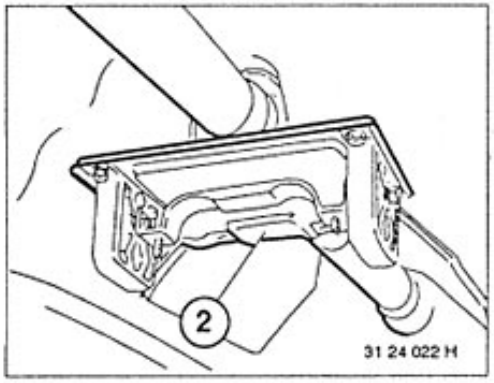
Important!
Support engine with Special Tool 00 0 200 before lowering the transmission to avoid damaging (danger of leaks) heater pipe connections on the engine compartment wall.
Set up Special Tool 00 0 200 in conjunction with 00 0 203 and attach on the rear eye.
Tension the chain.



Remove complete exhaust assembly - refer to 18 00 020.
Remove heat shield (1).



Loosen mounting straps of oil cooler pipes on the engine.

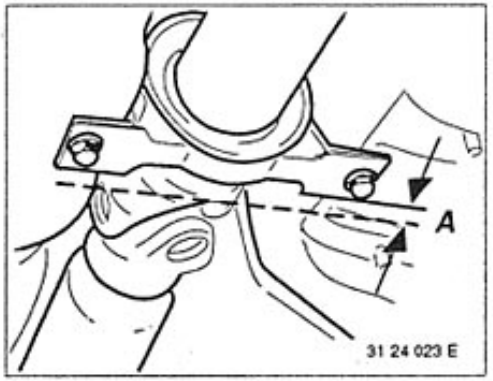


Drain ATF.

Important!
Never reuse drained ATF.

Installation:
The transmission will have to be disassembled if the ATF smells burnt and is black.

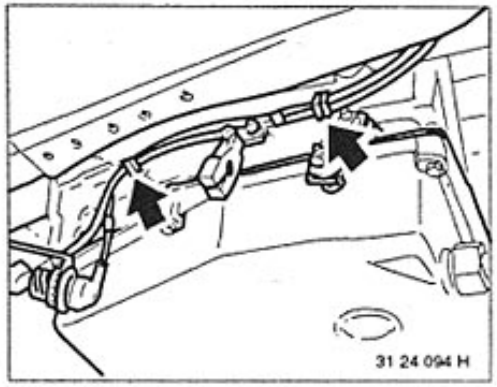
Important!
Oil cooler and pipes must be cleaned with compressed air and flushed twice with ATF if the transmission was faulty.



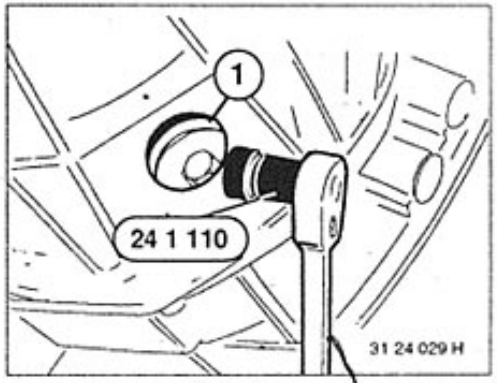
Remove oil filler pipe (1).
Unscrew oil cooler pipe (2 and 3) on transmission.

Installation:
Tightening torque*.

* Refer to Specifications

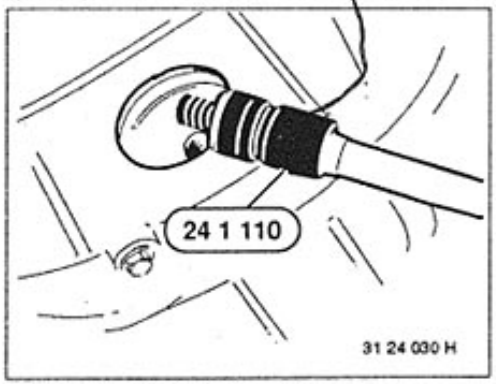


Installation:
Note O-rings (1).
Check condition of O-rings, replacing if necessary.



Turn bayonet fastener (1) anticlockwise.
Pull off plug (2).
Lift wire harness out of holder.

Installation:
Connect plug (2) that marking lines (3) are aligned.



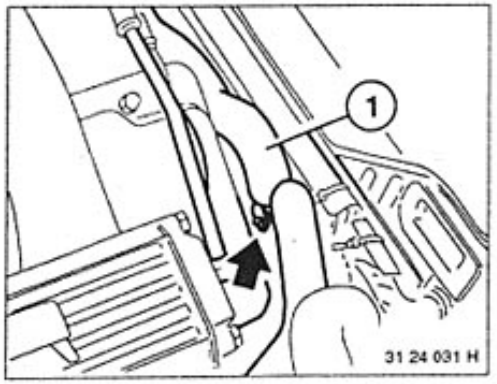
Unscrew nut (1).

Important!
It is absolutely essential to counterhold on the clamping bolt with Special Tool 24 5 210 in order to avoid deformation of the cable.

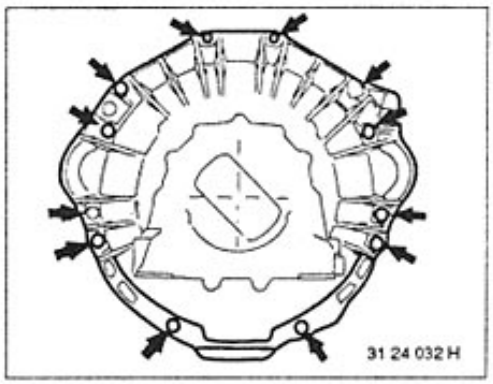
Note:
Special Tool 24 5 210 can only be applied with the selector lever at "P".

Disconnect cable at holder.
Pull out cable.

Installation:
Tightening torque*.
Adjust selector lever - refer to 24 00 008.

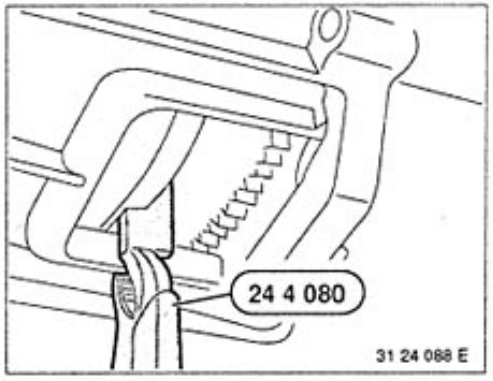


* Refer to Specifications



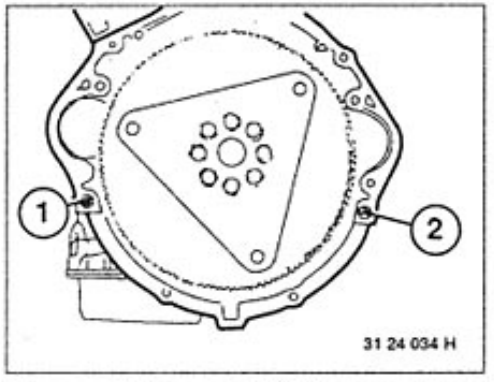
Support transmission with Special Tools 24 0 130 and 00 2 020.
Unscrew cross member (1) and exhaust suspension (2).
Lower the lifting fixture.

Installation:
Center transmission - refer to Group 26.
Tightening torque*.



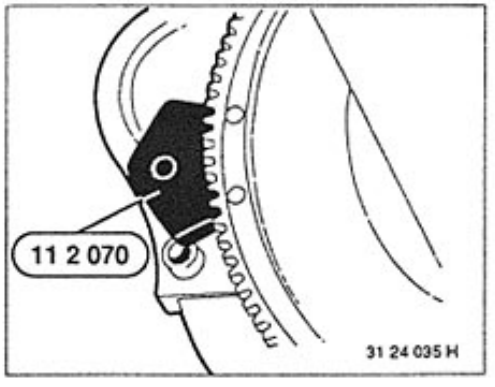
Unscrew propeller shaft at transmission.

Installation:
Tightening torque*.



Unscrew exhaust holder (2).

Installation:
Tightening torque*.



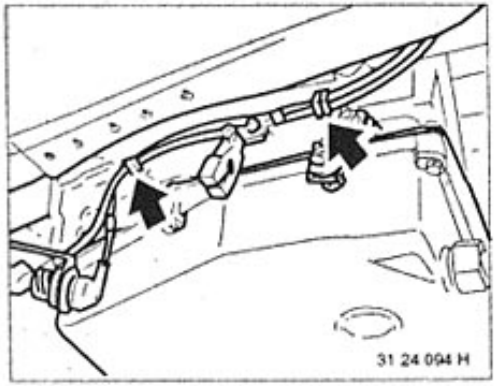
Unscrew center mount.

Installation:
Preload center mount forward by distance A = 2 ... 4 mm.

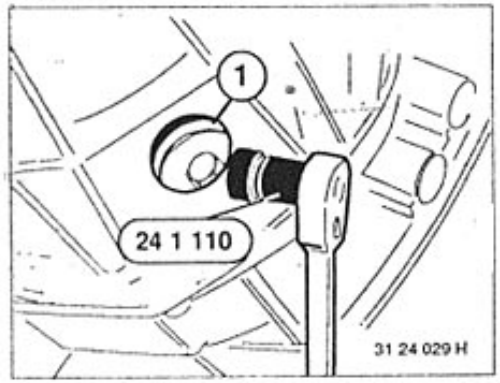
Important!
Don't let the propeller shaft fall into the joints – suspend it from car on a piece of wire.

Tightening torque*.

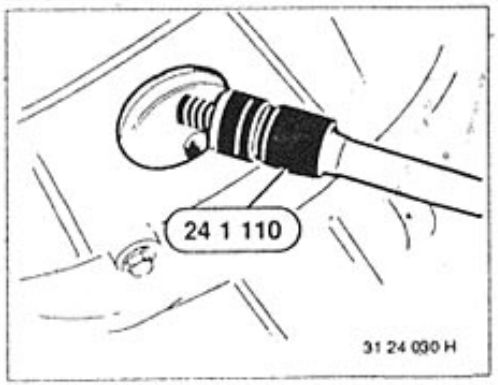
* Refer to Specifications



Take electric leads for oxygen sensors out of holders on transmission.

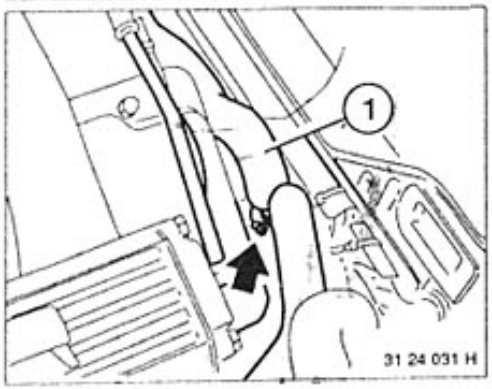


Lift cap off of opening (1) in the engine oil pan.
Unscrew torque converter from the drive plate at three points using Special Tool 24 1 110.
Turn the flywheel for this step.



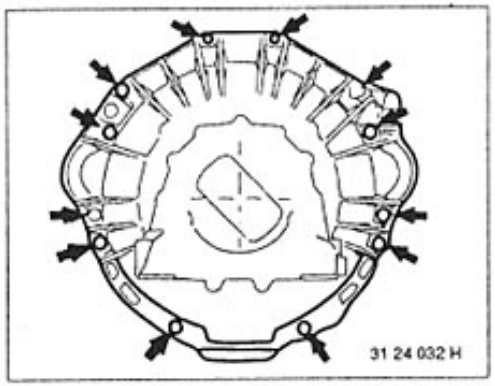
Installation:
Install bolt using Special Tool 24 1 110 and tighten using a torque wrench.
Tightening torque*.

Important!
Only use size M 10 x 16 mm bolts together with spring washers.
Non-conformance would lead to transmission damage.



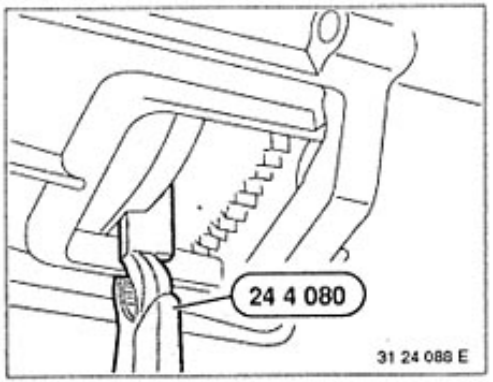
Lower the engine using the spindle of Special Tool 00 0 200 until there is a gap of approx. 1 mm between the engine and rear heater pipe connection (1) (check visually).

Refer to Specifications



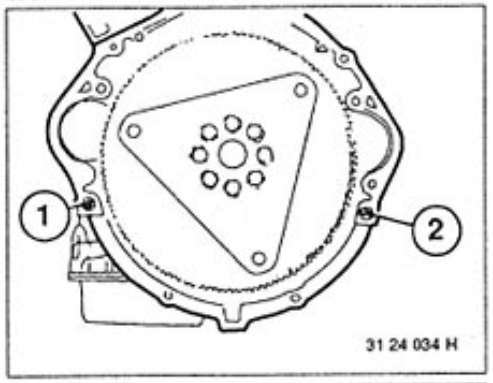
Unscrew Torx bolts using a Torx socket.
Use an approx. 100 cm long extension.

Important!
Washers must be used to avoid increasing the breaking-loose torque.
Tightening torque*.

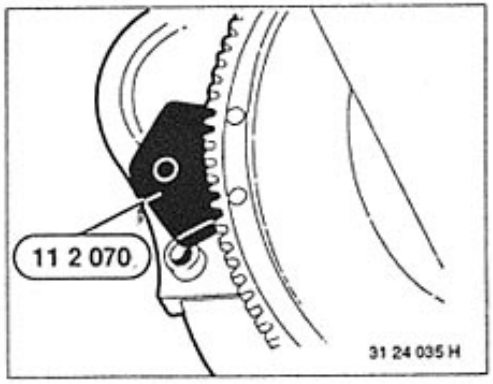


Apply Special Tool 00 2 020 on the transmission with help of Special Tool 24 0 130.
Prevent the torque converter from sliding out by mounting and clamping Special Tool 24 4 080 on the transmission case and torque converter.
Pull transmission off of engine.

Important!
The lifting fixture with mounted transmission may only be moved in completely lowered position.

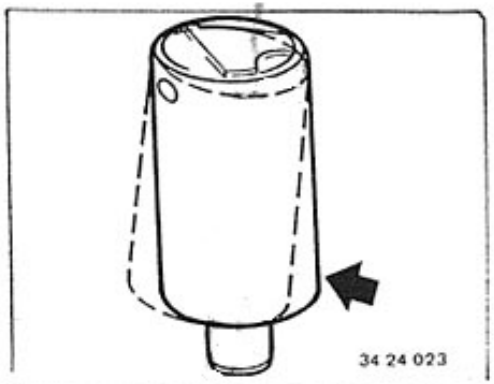


Important!
Make sure that guide sleeves (1 and 2) are not missing prior to attachment of the transmission.
As applicable, transfer guide sleeves from the old transmission or install new guide sleeves.



Installation:
Check drive plate for ruptures and cracks, replacing if necessary.
Hold flywheel tight using Special Tool 11 2 070.
Important!
Replace expansion bolts and install new bolts with bolt cement**.
Only coat threads.
Clean tapped bores thoroughly.
Tightening torque*.

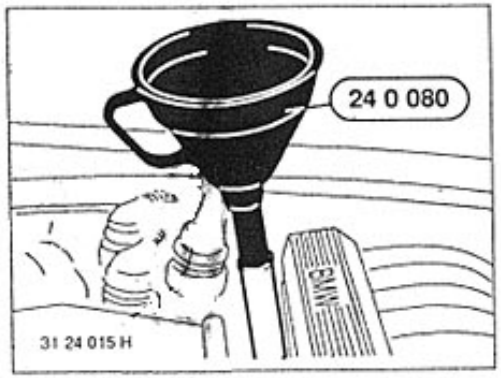
* Refer to Specifications
** Source of Supply: BMW Parts



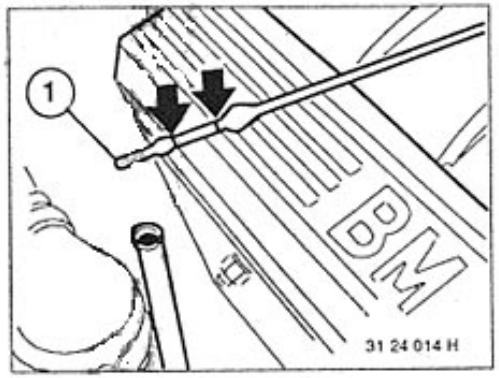
00 11 239 REPLACING AUTOMATIC TRANSMISSION FLUID

ATF should only be replaced at operating temperature.
Pull out oil dipstick.

Important!
Oil Dipstick with Lock:
Oil dipstick can be pulled out only after tilting the grip.



Unscrew drain plug.
Drain ATF.
Replace seal.
Screw in drain plug.
Tightening torque*.
Pour in ATF with help of Special Tool 24 0 080 (funnel).
Amount of ATF*.

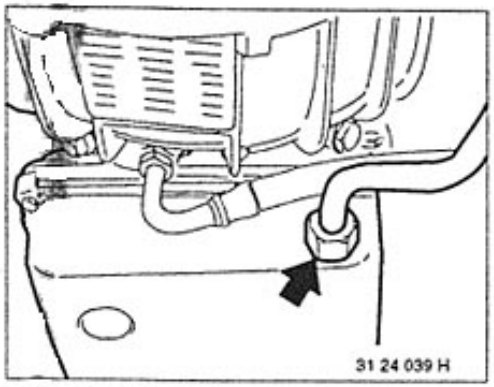


Check/correct oil level with selector lever at P, engine running at idle speed and car parked on level floor.
Oil level should not be below ball (1) after a test drive and at oil temperature of approx. 40° C (105° F).
Oil level should be between min. and max. marks at oil temperature of approx. 80° C (175° F).
Amount of oil between min. and max. marks = approx. 0.3 ltr. (0.6 pint).
Never wipe off the oil dipstick with a cloth losing lint.

Important!
Oil Level Too High:
Strong foaming, splash loss, high temperature while driving fast, oil lost via vent.

Oil Level Too Low:
Valves rattling, foaming, engine slips when driving in curves, general operating disturbances.

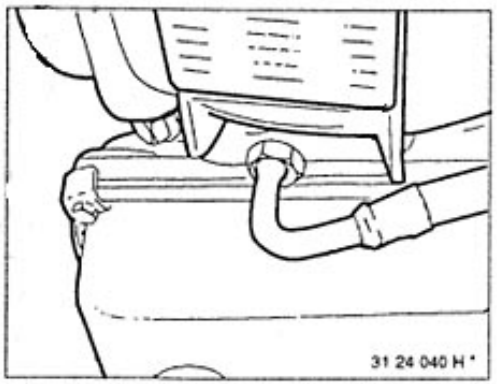
* See Specifications



24 11 004 REMOVING AND INSTALLING OIL SUMP

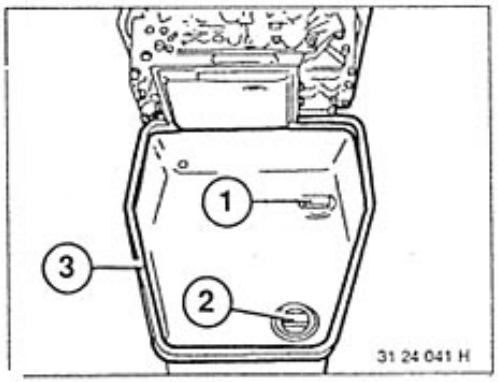
Drain oil.
Important!
Never reuse drained oil.
Installation:
Transmission will have to be disassembled if the oil smells burnt and is black.

Unscrew oil filler pipe on oil sump.
Unscrew oil sump.



Installation:
Mount oil sump with brackets that the short legs press on the oil sump.
Tightening torque*.

Important!
The two brackets with straight legs must be mounted on the sides.



Clean oil sump.

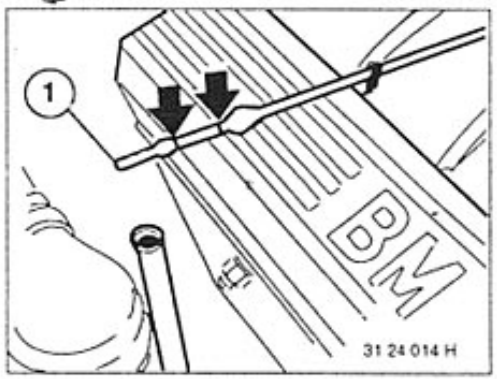
Important!
Place magnets (1 and 2) in oil sump.
Install gasket (3).

* See Specifications



Pour in oil*.

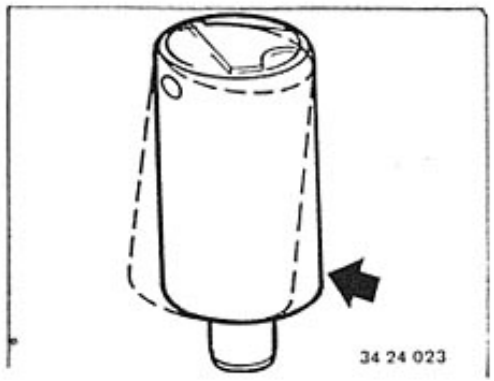
Important!
Only pour in transmission oil with help of Special Tool 24 0 080 (funnel).



Check/correct oil level with selector lever at P, engine running at idle speed and car parked on level floor.
Oil level should not be below ball (1) after a test drive and with the oil temperature at approx. 40° C (105° F).
Oil level should be between min. and max. marks at oil temperature of approx. 80° C (175° F).
Amount of oil between min. and max. marks = 0.3 ltr. (0.6 pint).
Never wipe off the oil dipstick with a cloth losing lint.

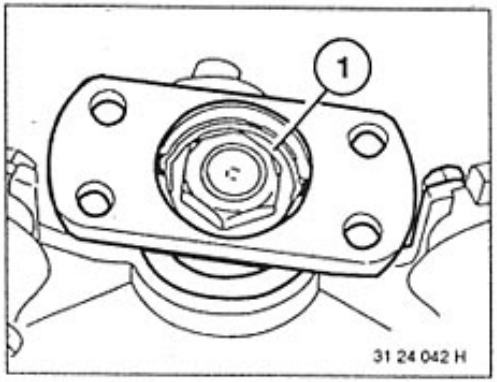
Oil Level Too High:
Strong foaming, splash loss, high temperature when driving fast, oil lost via vent.

Oil Level Too Low:
Valves rattling, foaming, engine slipping, general operating disturbances.



Important!
Oil Dipstick with Lock:
The oil dipstick can be pulled out only after tilting the grip.

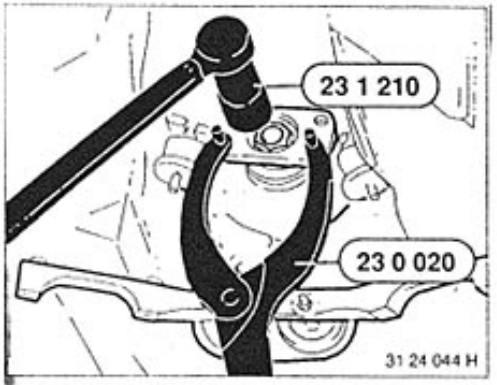
* See Specifications



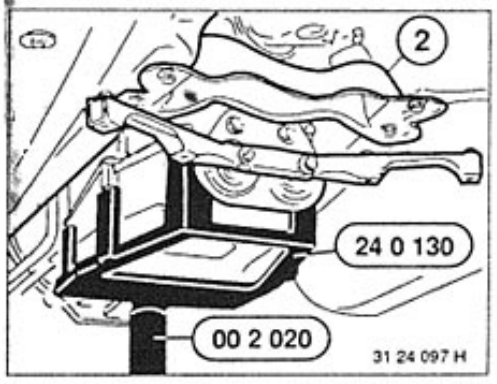
24 11 054 REMOVING AND INSTALLING OR SEALING TRANSMISSION EXTENSION

Unscrew propeller shaft – see 24 00 024.
Lift out lockplate (1).

Installation:
Replace lockplate.

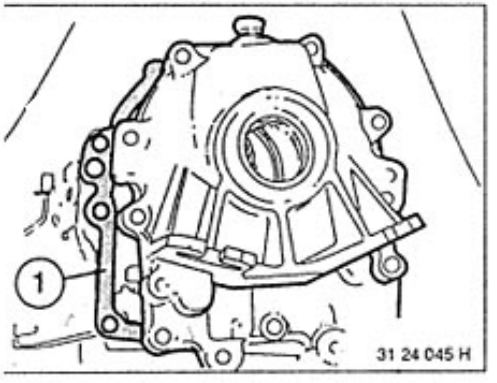


Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.
Tightening torque*.
Pull off output flange.



Support transmission with Special Tools 24 0 130 and 00 2 020.
Remove cross member (2).

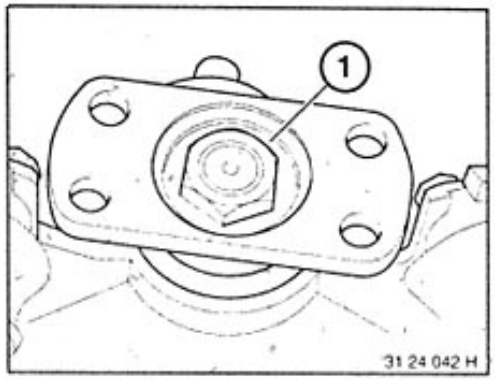
Installation:
Center transmission – see Group 26.
Tightening torque*.



Unscrew transmission extension.

Installation:
Replace gasket (1).
Tightening torque*.

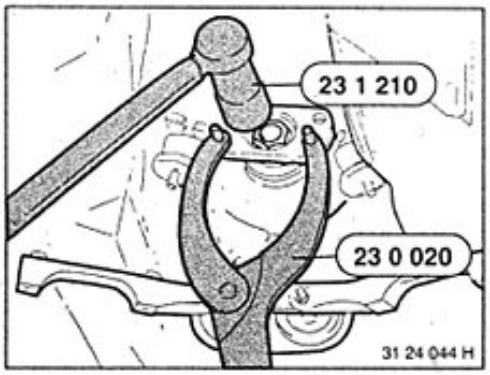
* See Specifications



24 12 014 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

Unscrew propeller shaft – see 24 00 024.
Lift out lockplate (1).

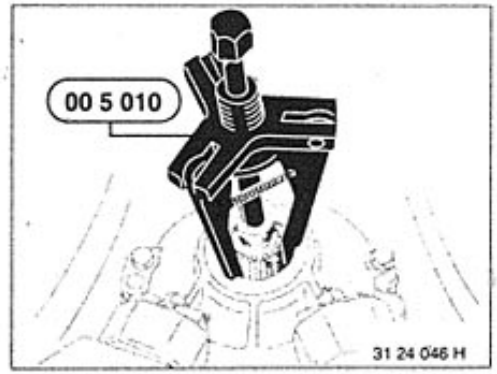
Installation:
Replace lockplate.



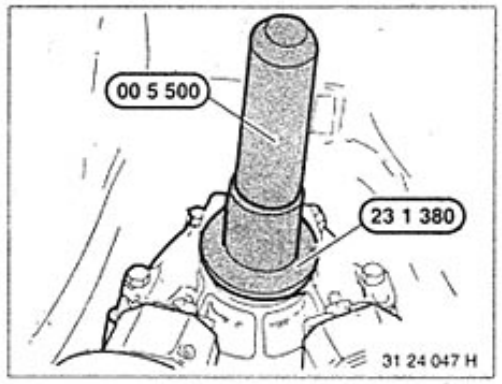
Hold output flange with Special Tool 23 0 020.
Unscrew collar nut with Special Tool 23 1 210.

Installation:
Tightening torque*

Pull off output flange.

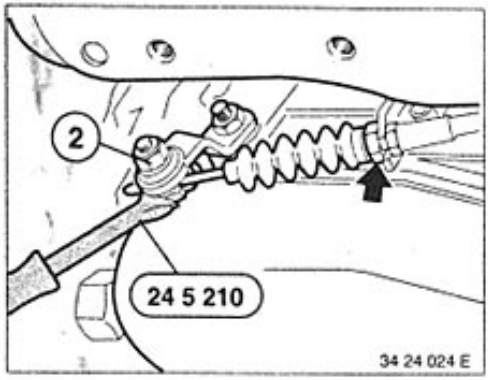


Pull out radial oil seal with Special Tool 00 5 010.



Lubricate sealing lip with ATF.
Drive in radial oil seal with Special Tools 23 1 380 and 00 5 500.

* See Specifications



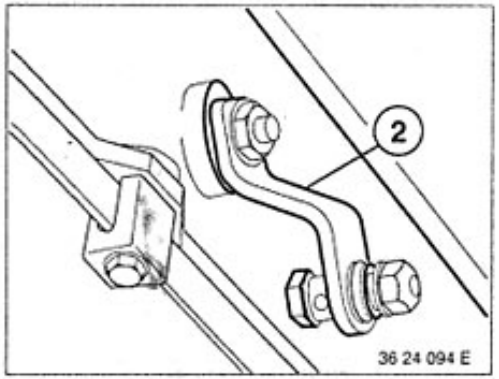
24 12 104 Replacing radial seal for manual shift valve shaft

Loosen nut (2).

Caution!
Always brace clamping screw with special tool 24 5 210 to avoid deformation of the cable.

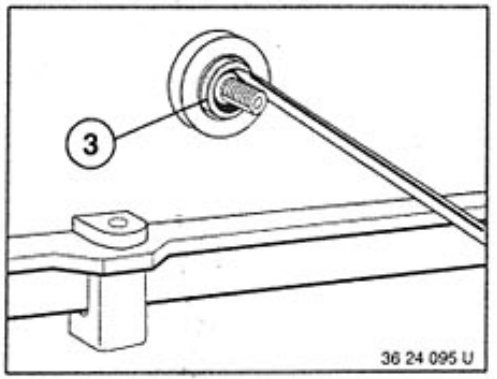
Note:
Special tool 24 5 210 can only be applied in position P.
Unscrew cable from holder.
Pull out cable.

Installation:
Adjust shift mechanism 24 00 006.



Remove lever (2).

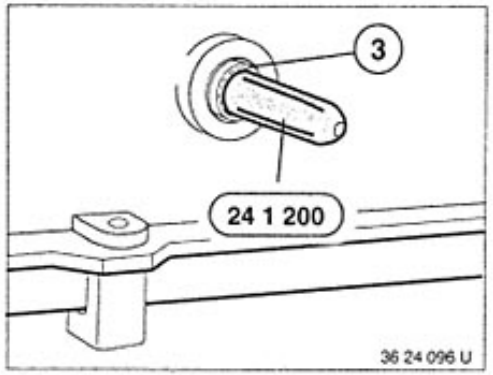
Installation:
Tightening torque 24 51 1AZ*.



Lever out radial seal (3) using a narrow screwdriver.

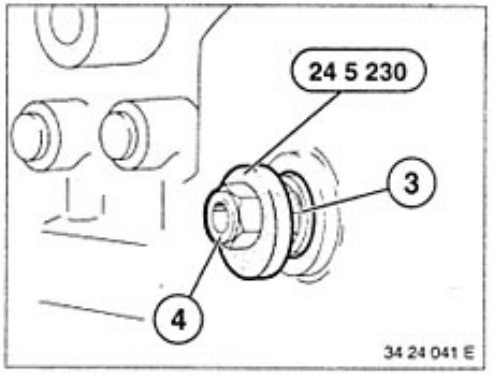
Caution!
Do not damage the shaft.

* Refer to Technical Data

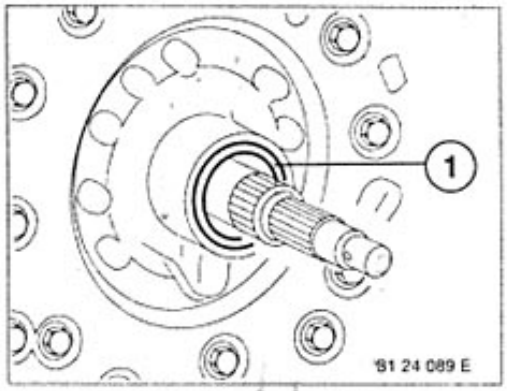


Attach special tool 24 1 200 to the selector shaft.

Lubricate sealing lip of radial oil seal with ATF.
Slide radial seal (3) up to housing.
Remove special tool 24 1 200.



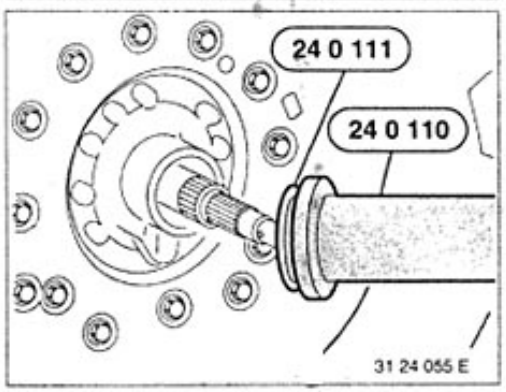
Fit special tool 24 5 230 to the manual shift valve shaft.
Turn nut (4) on the lever mount.
Press in radial seal (3) with the special tool 24 5 230 and the help of the nut (4).



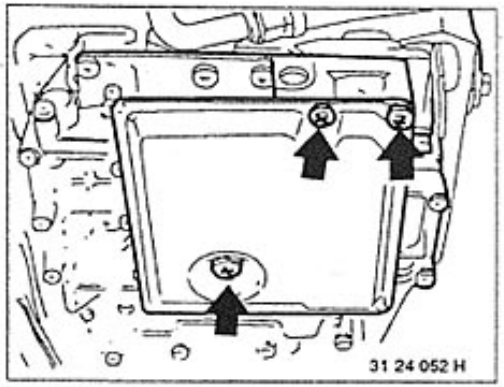
24 12 504 Replacing radial seal for torque converter

- transmission removed -

Remove and install torque converter, see 24 40 004.
Lift out radial seal (1).



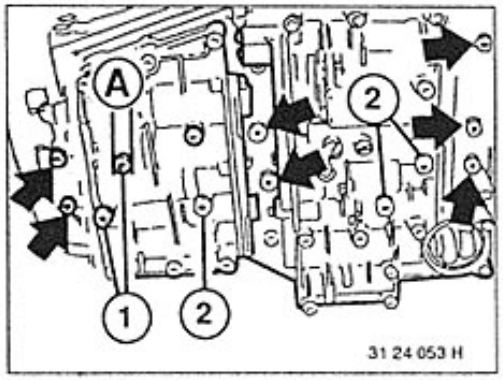
Lubricate sealing lip with ATF.
Drive radial seal into place with special tool 24 0 110 in conjunction with auxiliary ring 24 0 111 until it seats securely.
Press-in depth approx. 1 mm.



24 30 004 REMOVING AND INSTALLING VALVE BODY

Remove oil sump – see 24 11 004.
Unscrew oil filter screen.

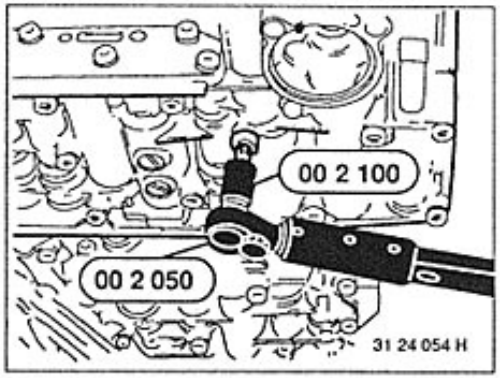
Installation:
Check that length of bolts is 65 mm.
Tightening torque*.



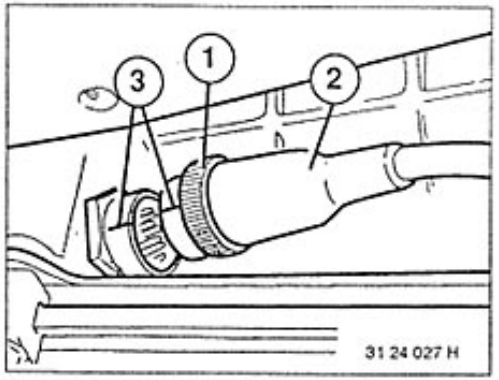
Remove valve body.
Unscrew Torx bolts with Special Tool 00 2 100.

Important!
Only unscrew bolts with head size A = 12 mm (0.472").

Installation:
Length of bolts is different.
Bolts (1) are 65 mm long.
Bolts (2) are 60 mm long.

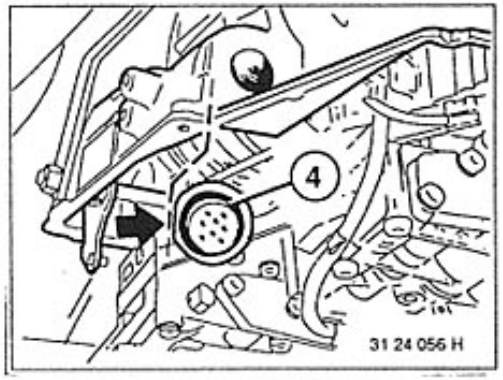


Installation:
Tighten Torx bolts with Special Tools 00 2 100 and 00 2 050.
Tightening torque*.



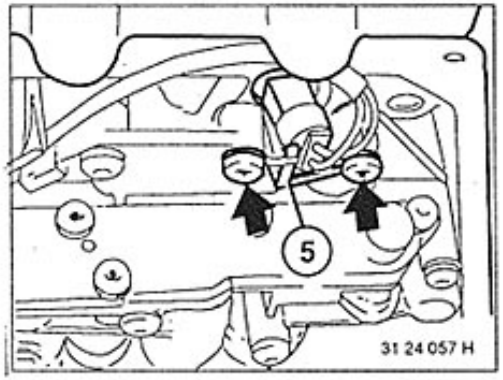
Turn bayonet retainer (1) anticlockwise.
Pull off plug (2).
Unscrew nut.

Installation:
Connect plug (2) that marking lines (3) are aligned.



Pull out socket toward inside.

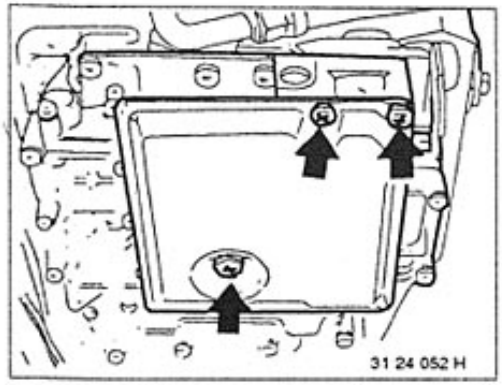
Installation:
Check O-ring (4), replacing if necessary.
Insert socket that its flat side faces out toward the housing.
Tightening torque*.



Note:
Also mount pulse sender on the valve body.
Have tabs of holder (5) engage in the grooves on the plug.

* See Specifications

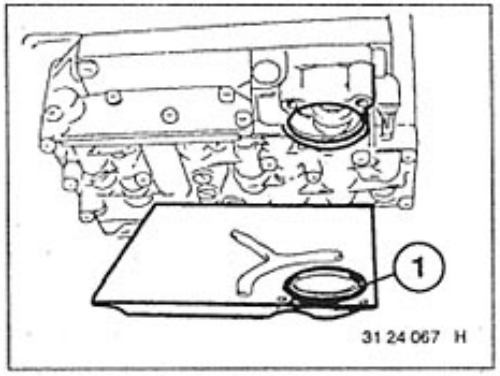
* See Specifications



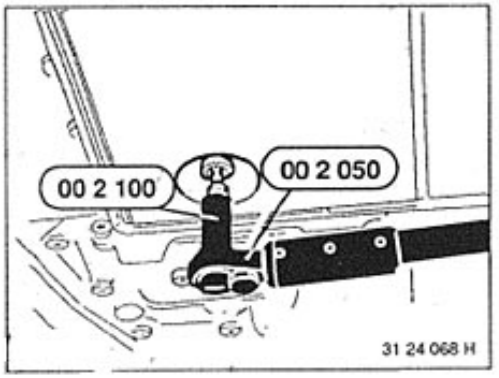
24 31 154 REMOVING AND INSTALLING OR REPLACING TRANSMISSION OIL FILTER SCREEN

Remove oil sump – see 24 11 004.
Unscrew oil filter screen.

Installation:
Clean oil filter screen.
Replace an oil filter screen which is starting to gum up with a burnt brown residue.
Check that length of bolts is 65 mm.
Tightening torque*.

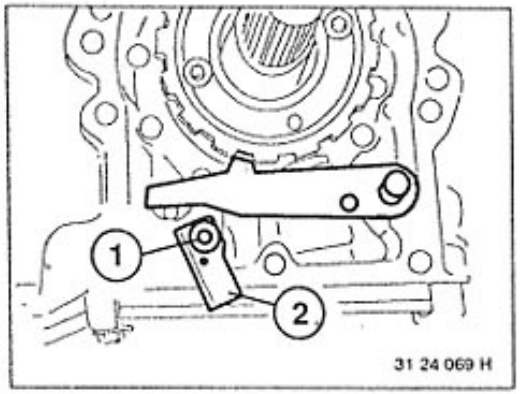


Check rubber ring (1), replacing if necessary.



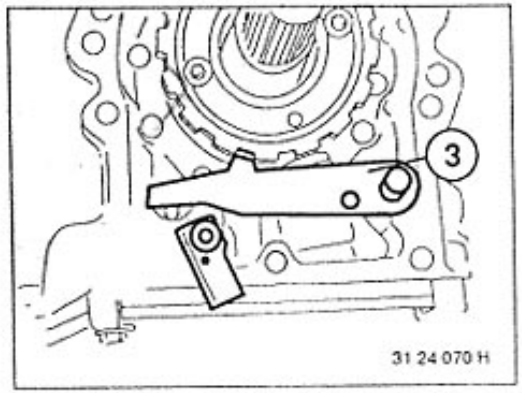
Installation:
Tighten Torx bolts with Special Tools 00 2 100 and 00 2 050.
Tightening torque*.

* See Specifications



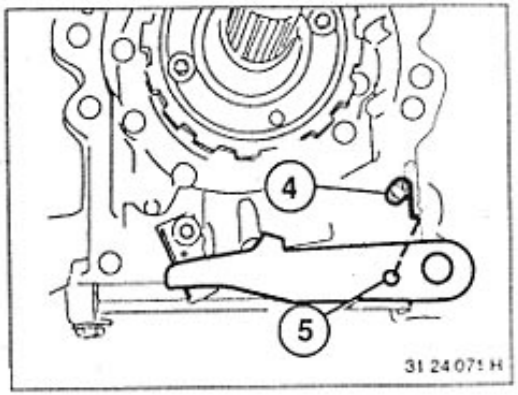
24 34 004 REMOVING AND INSTALLING OR REPLACING PARKING LOCK (PAWL / SPRING)

Unscrew transmission extension – see 24 11 054.
Loosen bolt (1).
Swing holder (2) down.

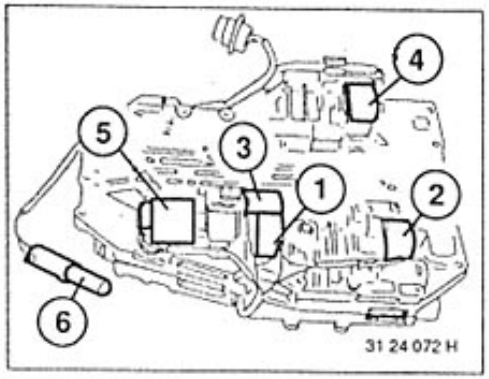


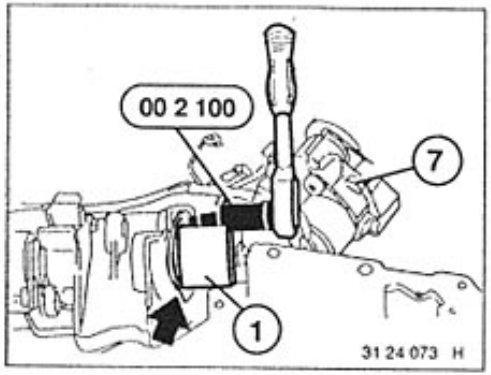
Pull off pawl (3).

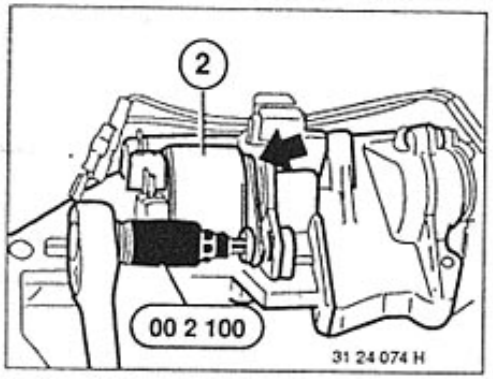
Caution!
Spring force.



Installation:
Check installed position of spring (4).
End of spring (4) must be attached on bore (5) on the pawl.







24 34 851 REPLACING ALL SOLENOID VALVES
– Valve Body Removed –

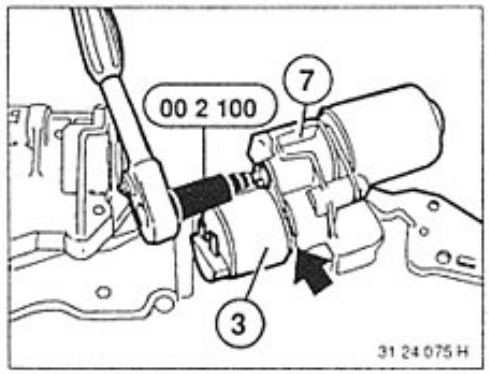
Arrangement:
1 Solenoid - 1st/2nd + 3rd/4th gears
2 Solenoid - 2nd/3rd gears
3 Solenoid - converter lockup clutch
4 Solenoid - reverse gear lock
5 Pressure regulator
6 Pulse sender

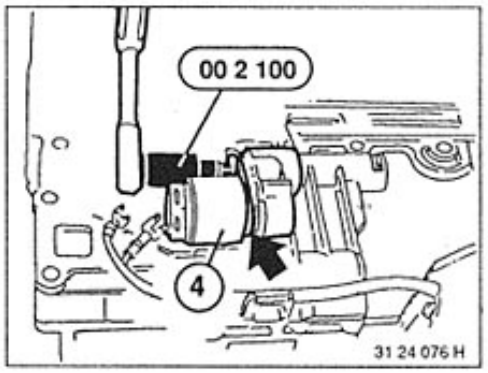
a) Solenoid (1) - 1st/2nd + 3rd/4th Gears
Unscrew governor housing (7).
Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out solenoid valve.

Installation:
Install holder with tabs facing collar on solenoid valve.
Plug jacks must have sufficient spacing to the housing or arrow on housing must be between plug jacks.
Tightening torque*.

b) Solenoid (2) - 2nd/3rd Gears
Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out solenoid valve.

Installation:
Install holder with tabs facing collar on solenoid valve.
Plug jacks must have sufficient spacing to the housing or arrow on housing must be between plug jacks.
Tightening torque*.





c) Solenoid (3) - Conv. Lockup Clutch
Unscrew governor housing (7).
Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out solenoid valve.

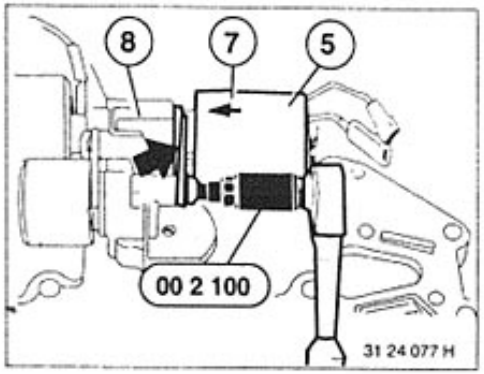
Installation:
Install holder with tabs facing collar on solenoid valve.
Plug jacks must have sufficient spacing to the housing or arrow on housing must be between plug jacks.
Tightening torque*.

d) Solenoid (4) - Reverse Gear Lock
Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out solenoid valve.

Installation:
Install holder with tabs facing collar on solenoid valve.
Plug jacks must have sufficient spacing to the housing or arrow on housing must be between plug jacks.
Tightening torque*.

* See Specifications

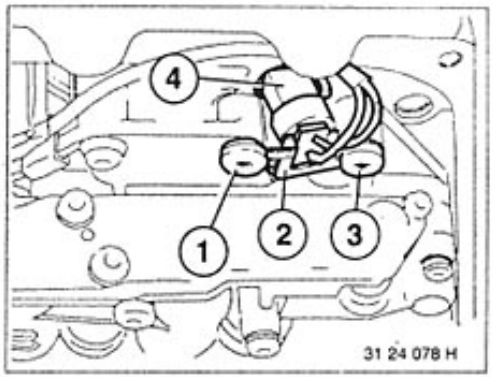
* See Specifications



24 34 860 REPLACING PRESSURE REGULATOR
– Valve Body Removed –

Pull off wire plug.
Unscrew Torx bolt with Special Tool 00 2 100.
Take off holder.
Pull out pressure regulator (5).

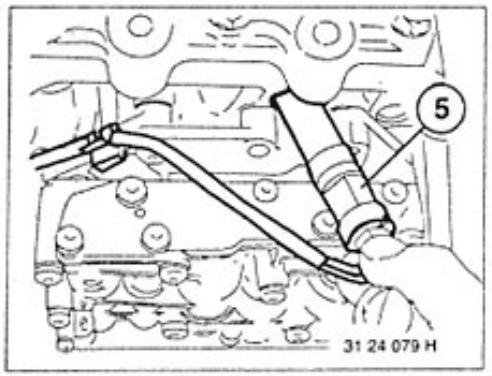
Installation:
Arrow (7) on pressure regulator must be aligned with rib (8).
Install holder with tabs facing collar on pressure regulator.
Tightening torque*.



24 34 870 REPLACING OUTPUT SPEED PULSE SENDER
– Oil Sump Removed –

Unscrew Torx bolts (1 and 3) with Special Tool 00 2 100.
Take off holder (2).

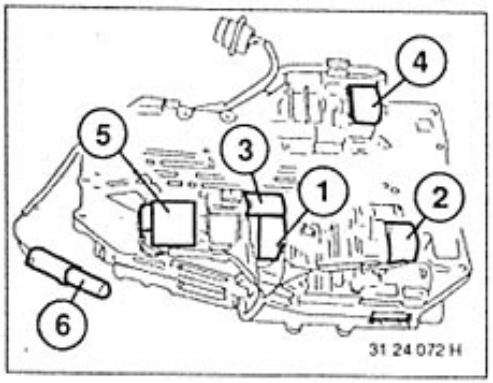
Installation:
Have tabs of holder (2) engage in grooves of plug (4).



Pull out pulse sender.
Pull off plug (5).

Installation:
Tightening torque*.

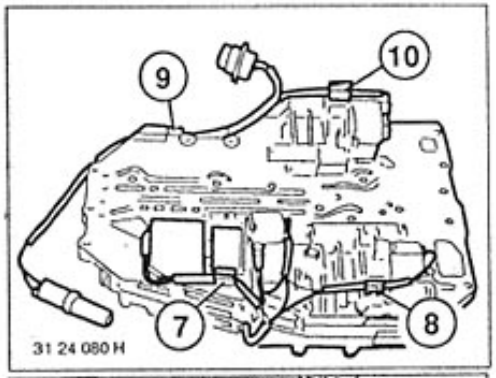
* **See Specifications**



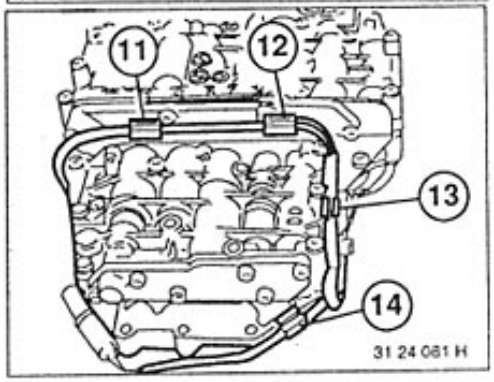
24 35 500 REPLACING WIRE HARNESS IN AUTOMATIC TRANSMISSION

Remove valve body – see 24 30 002.
Pull off wire harness plugs on solenoids (1 ... 4), pressure regulator (5) and pulse sender (6).
Lift wire harness out of holders.

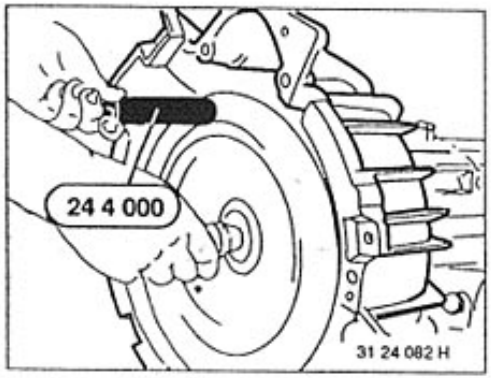
Installation:
Check colors of wires.
Solenoid (1) – gray / violet
Solenoid (2) – green / violet
Solenoid (3) – red /violet
Solenoid (4) – orange / violet
Pressure regulator (5) – blue / violet
Pulse sender (6) – brown / brown
Push on plugs against the stop and check for tight fit.



Route wire harness and clamp in holders (7 ... 10).



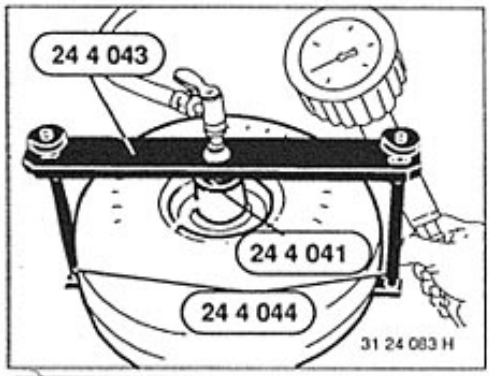
Turn valve body around.
Route wire harness and clamp in holders (11 ... 14).



24 40 004 REMOVING AND INSTALLING TORQUE CONVERTER

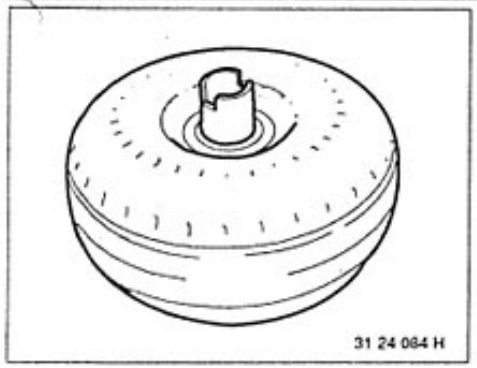
Remove transmission – see 24 00 024.
Pull torque converter out of primary pump carefully with Special Tool 24 4 000.

Caution!
Escaping oil.

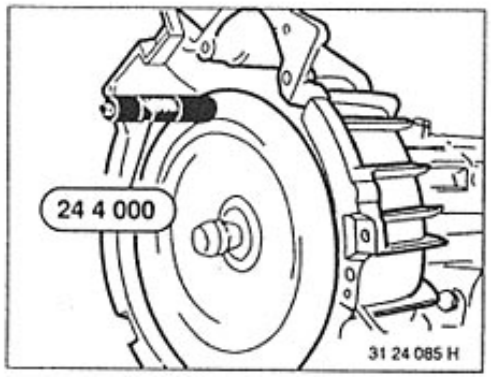


Installation:
Check torque converter for leaks with Special Tools 24 4 041, 24 4 043 and 24 4 044.
Test pressure: 0.5 bar (7 psi).

Caution!
Always use Special Tool 24 4 043 to prevent injury.

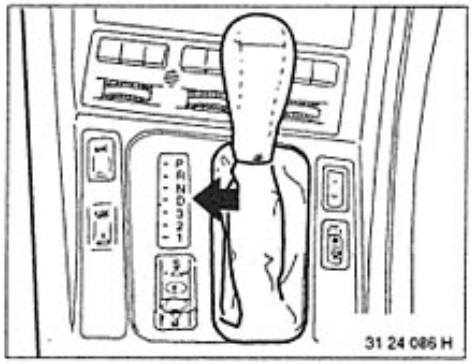


Torque converter must be replaced when bearing surface on converter shaft is damaged.

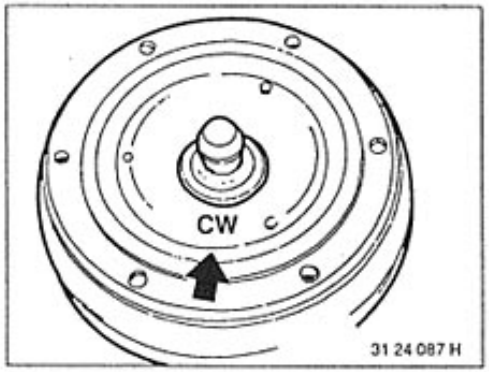


Turn slightly to guide openings on converter into primary pump carefully, using Special Tool 24 4 000.

Important!
Be careful not to damage converter bearings and seal while guiding in. Converter is in its correct installed position, if drive ring is below the case edge.



Checking Installed Torque Converter:
Engine and transmission oil must have operating temperature.
Engine must produce full rated power.
Start engine.
Pull on parking brake and operate brake pedal firmly.
Move selector lever to D and press accelerator pedal to full throttle.
Read stall speed* from tachometer.



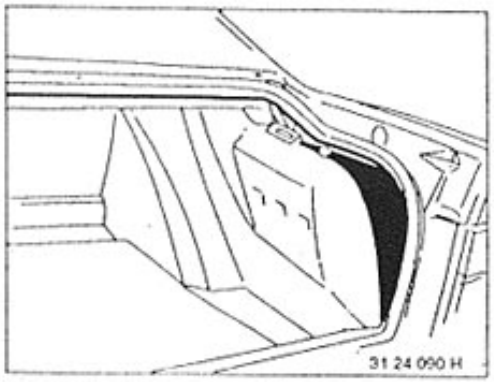
Important!
Never test stall speed longer than 10 seconds to prevent damage from excessive heat.

Stall Speed Much Above Specified Value*:
a) Converter oil volume insufficient – correct the oil level.
b) Slip in clutches – check clutches.

Stall Speed Much Below Specified Value*:
a) Engine power insufficient – check engine.
b) Converter or pump faulty – replace converter or check pump.

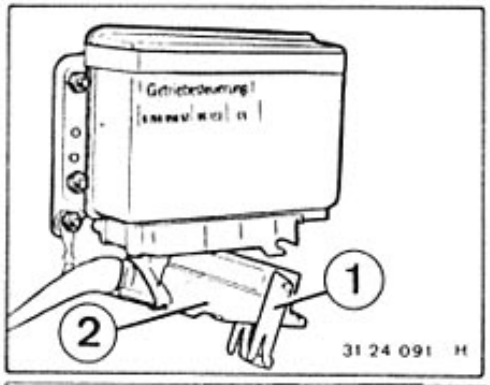
Torque converters cannot be cleaned with conventional workshop equipment and must be replaced when a transmission had been faulty or an oil filter screen was worn.
Converter identification*.

* See Specifications



24 61 500 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT (EH)

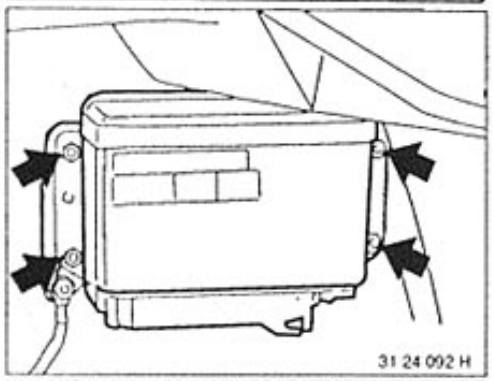
Control unit is located in trunk at rear right.
Lift out cover.



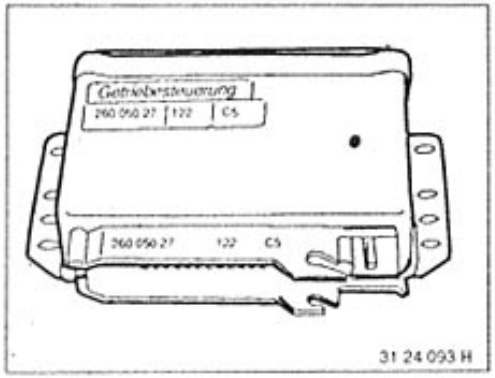
Swing down spring-loaded reatiner (1).
Pull out plug (2) forward.

Installation:
Spring-loaded retainer (1) must be engaged.

Note:
Plug (2) may only be disconnected or connected after switching off the ignition.



Unscrew control unit on holder.



Check code* on data plate.
See Parts Catalog for cross reference of types and models.

* See Parts Catalog

TROUBLESHOOTING AUTOMATIC TRANSMISSION 4 HP 24 / EH

Condition	Cause	Correction
Position P Park will not engage	a) Selector linkage between selector lever and transmission maladjusted.	a) Adjust selector lever – see 24 00 006.
	b) Excessive friction in parking lock mechanism.	b) Replace parking lock parts (connecting rod, pawl) – see 24 34 004.
Park does not hold (slips out)	a) Selector linkage between selector lever and transmission maladjusted.	a) Adjust selector lever – see 24 00 006.
Engine cannot be started in N or P, or can be started in all positions	a) Selector linkage between selector lever and transmission maladjusted.	a) Adjust selector lever – see 24 00 006.
	b) Transmission switch faulty. Starter interlocking relay or supply lead faulty.	b) Replace transmission switch – see 25 16 080. Replace / repair switch or supply lead.
Position R No reverse gear	a) Selector linkage between selector lever and transmission maladjusted.	a) Adjust selector lever – see 24 00 006.
	b) Oil filter screen dirty.	b) Replace oil filter screen; exchange transmission if bits of liners are in oil sump.
	c) Clutch B destroyed. Then also no 3rd gear.	c) Disassemble clutches – see 24 23 022.
	d) Clutch D destroyed. Then also no engine braking in position 1, 1st gear.	d) Disassemble clutches – see 24 23 022.
	e) Clutch E destroyed. Then also no engine braking in 2nd + 3rd gears as well as in pos. 1, 1st gear.	e) Disassemble clutches – see 24 23 022.
Slipping or shaking when moving off	a) Clutch B or E or brake D damaged.	a) Disassemble clutches – see 24 23 022.
Hard engaging jolt P–R or N–R or definite double knock in P–R or N–R shift (engine speed < 1500 rpm).	a) Damper B faulty. Then shift 2–3 also incorrect.	a) Exchange valve body – see 24 30 004. Check transmission electronics.
Backup lights do not light up (electrical system okay).	a) Transmission switch faulty.	a) Replace transmission switch – see 25 16 080.
Car moves or creeps	a) Selector linkage between selector lever and transmission maladjusted.	a) Adjust selector lever – see 24 00 006.
	b) Clutch A faulty (bonded).	b) Replace clutch A – see 24 23 022.

Condition	Cause	Correction
Position D No power flow	a) Oil filter screen dirty.	a) Replace oil filter screen – see 24 31 154; replace transmission if bits of liners are in oil sump.
	b) Clutch A faulty.	b) Replace clutch A – see 24 23 022.
	c) 1st gear one-way clutch slips.	c) Disassemble transmission – see 24 00 082.
	d) Selector linkage between selector lever and transmission maladjusted.	d) Adjust selector lever – see 24 00 006.
Slipping or shaking when moving off.	a) Clutch A damaged.	a) Replace clutch A – see 24 23 022.
Hard engaging jolt N–D (engine speed > 1500 rpm).	a) Clutch A damaged.	a) Replace clutch A – see 24 23 022.
	b) Damper A faulty.	b) Replace valve body – see 24 30 004.
No shift (warm or cold state)		
— Shift 1–2 / 2–1	a) Kickdown switch faulty (only kickdown shifts).	a) Replace kickdown switch – see 35 41 480.
	b) Transmission electronics faulty.	b) Check transmission electronics.
	c) Solenoid valve (1) faulty.	c) Replace solenoid valve – see 24 34 851.
	d) Control valve 1-2 / 3-4 seized.	d) Replace valve body – see 24 30 004.
	e) Shift valve 1-2 seized.	e) Replace valve body – see 24 30 004.
— Shift 1–2	a) Brakes C' and/or C faulty.	a) Disassemble clutches – see 24 23 022.
— Shift 2–3 / 3–2	a) Solenoid valve (2) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Shift valve 2-3 seized.	b) Replace valve body – see 24 30 004.
— Shift 2–3	a) Clutch B faulty.	a) Replace clutch B – see 24 23 022.
— Shift 3–4 / 4–3	a) Solenoid valve (1) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Control valve 1-2 / 3-4 seized.	b) Replace valve body – see 24 30 004.
	c) Shift valve 3-4 seized.	c) Replace valve body – see 24 30 004.

Condition	Cause	Correction
No shift (warm or cold state)		
— Shift 3–4	a) Brake F faulty.	a) Disassemble clutches – see 24 23 022.
	b) Program switch faulty.	b) Replace program switch – see 61 31 265.
— Shift 1–2 Engine speed does not exceed stall speed in drive and full load.	a) Pulse sender faulty.	a) Replace pulse sender – see 24 34 870.
Car moves off in 2nd gear	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Solenoid valve (1) faulty.	b) Replace solenoid valve – see 24 34 851.
	c) Shift valve 1-2 seized.	c) Replace valve body – see 24 30 004.
Car moves off in 3rd gear	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Solenoid valve (1 or 2) faulty.	b) Replace solenoid valve – see 24 34 851.
	c) Shift valves 1-2 and 2-3 seized.	c) Replace valve body – see 24 34 004.
Car shifts 1–3	a) Shift valve 2-3 seized.	a) Replace valve body – see 24 30 004.
	b) Transmission electronics faulty.	b) Check transmission electronics.
	c) Solenoid valve (2) faulty.	c) Replace solenoid valve – see 24 34 851.
Shift Points*		
Zero load shift not okay	a) Control unit faulty.	a) Replace control unit – see 24 61 500.
No kickdown shift	a) Kickdown switch faulty.	a) Replace switch – see 35 41 480.
Only kickdown shifts.	a) Kickdown switch faulty.	a) Replace switch – see 35 41 480.

* See Specifications

Condition	Cause	Correction
Shift Transitions Zero load shifts too hard	a) Control unit faulty.	a) Replace control unit – see 24 61 500.
	b) Damper faulty.	b) Replace valve body – see 24 30 004.
	c) Modulation pressure too high.	c) Replace valve body – see 24 30 004.
	d) Plates damaged.	d) Disassemble transmission – see 24 00 082.
Full load and kickdown shifts too long	a) Control unit faulty.	a) Replace control unit – see 24 61 500.
	b) Damper faulty.	b) Replace valve body – see 24 30 004.
	c) Modulation pressure too low.	c) Replace valve body – see 24 30 004.
	d) Plates damaged.	d) Disassemble transmission – see 24 00 082.
Full load and kickdown shifts too hard	a) Modulation pressure not correct.	a) Replace valve body – see 24 30 004.
	b) Damper faulty.	b) Replace valve body – see 24 30 004.
	c) Control unit faulty.	c) Replace control unit – see 24 61 500.
Position 3, 3rd Gear No engine braking	a) Clutch E damaged.	a) Disassemble clutches – see 24 23 022.
Position 2 Manual downshift 3–2 not okay	a) Locking valve 2 sticks.	a) Replace valve body – see 24 30 004.
	b) Governor sticks.	b) Replace governor – see 24 32 004.
	c) Transmission electronics faulty.	c) Check transmission electronics.
	d) Solenoid valve (2) faulty.	d) Replace solenoid valve – see 24 34 851.
No engine braking	a) Brake C' or clutch E damaged.	a) Disassemble clutches – see 24 23 022.
Position 1 Manual downshift 2–1 not okay	a) Locking valve 1 sticks.	a) Replace valve body – see 24 30 004.
	b) Transmission electronics faulty.	b) Check transmission electronics.
	c) Solenoid valve (1) faulty.	c) Replace solenoid valve – see 24 34 851.

Condition	Cause	Correction
No engine braking	a) Brake D or clutch E damaged.	a) Disassemble clutches – see 24 23 022.
Converter Lockup Clutch		
Shift speed not correct	a) Converter lockup hysteresis valve sticks.	a) Replace valve body – see 24 30 004.
	b) No 4th gear.	b) Replace valve body – see 24 30 004.
	c) Control unit faulty.	c) Replace control unit – see 24 61 500.
Shift transition too hard	a) Converter lockup damper faulty.	a) Replace valve body – see 24 30 004.
	b) Converter not okay.	b) Replace torque converter – see 24 40 004.
No shift	a) Valve body not okay.	a) Replace valve body – see 24 30 004.
	b) Converter lockup clutch faulty.	b) Replace torque converter – see 24 40 004.
	c) No 4th gear.	c) Replace valve body – see 24 30 004.
	d) Transmission electronics faulty.	d) Check transmission electronics.
	e) Solenoid valve (3) faulty.	e) Replace solenoid valve – see 24 34 851.
	f) Torque converter faulty.	f) Replace torque converter – see 24 40 004.
Converter lockup clutch always closed. (engine dies in driving position)	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Solenoid valve (3) faulty.	b) Replace solenoid valve – see 24 34 851.
General information		
Shifts only as position	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Program switch faulty.	b) Replace program switch – see 61 31 265.
Fault indicator lights up	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Solenoid valve (2) faulty.	b) Replace solenoid valve – see 24 34 851.
Fault indicator lights up while driving	a) Transmission electronics faulty.	a) Check transmission electronics.
	b) Plug on transmission has poor contact.	b) Check plug connection.

Condition	Cause	Correction
Noise and then power flow interruption after long	a) Oil filter screen on valve body dirty.	a) If oil sump does not contain bits of burnt clutch liners, only replace oil filter screen. Otherwise exchange the transmission.
No power flow in forward or reverse, loud noise.	a) Drive plate between converter and engine torn off.	a) Replace drive plate or converter – see 11 22 051 or 24 40 004.
Noise Loud noise in all position, especially with cold oil. Oil pump suction noise.	a) Oil level too low. b) Valve body leaks.	a) Correct the oil level. b) Replace valve body – see 24 30 004.
Loud, screeching noise depending on speed in all positions, especially with warm oil, occurring after long drive; sometimes accompanied by power flow interruption.	a) Oil filter screen dirty.	a) If oil sump does not contain bits of liners, only replace oil filter screen. Otherwise exchange the transmission.
Loud noise with converter lockup clutch closed	a) Torsion damper faulty.	a) Replace torque converter – see 24 40 004.
Leakage Oil drips out of converter bell housing	a) Seal in pump housing damaged. b) Pump housing leaks. c) Converter leaking at welded seam. d) Radial oil seal for torque converter leaks.	a) Replace seal – see 24 31 004. b) Replace pump assembly – see 24 31 004. c) Replace converter – see 24 40 004. d) Replace radial oil seal – see 24 12 504.
Leak between transmission case and oil sump	a) Oil sump mounting bolts not tightened correctly. b) Oil sump gasket damaged.	a) Tighten bolts*. b) Replace gasket – see 24 11 004.
Leak between transfer plate and transmission case (especially in area of pump pressure bore)	a) Mounting bolts on converter bell housing loose. b) Gasket damaged.	a) Tighten bolts*. b) Replace gasket.
Oil loss on transmission plug	a) O-ring faulty.	a) Replace O-ring – see 24 30 004.
Oil loss on output	a) Radial oil seal on output damaged.	a) Replace radial oil seal – see 24 12 014.

* See Specifications for tightening torque

Condition	Cause	Correction
Oil loss through or on vent	a) Oil level too high.	a) Correct the oil level.
	b) Wrong oil (strong foaming).	b) Replace oil; if necessary remove transmission and drain complete oil including oil of torque converter.
	c) Vent cap missing.	c) Mount cap or replace vent.
	d) O-ring on vent damaged.	d) Remove transmission extension and replace O-ring.
	e) Preload of circlip insufficient.	e) Replace circlip.
Oil loss on cooler pipe	a) Connection loose.	a) Tighten bolts*.
	b) Cooler pipe damaged.	b) Replace cooler pipe.
	c) Cooler leaks.	c) Replace cooler – see 17 11 000.
Oil loss on transfer plate	a) Plug on transfer plate leaks.	a) Tighten plug*.
		b) Replace seal.
Leak between transmission case and transmission extension	a) Mounting bolts loose.	a) Tighten bolts*.
	b) Gasket damaged.	b) Replace gasket – see 24 11 054.

* See Specifications for tightening torque

Condition	Cause	Correction
Position R No reverse gear	a) Solenoid valve (4) faulty. b) Wire to solenoid valve (4) grounded out. c) Reverse gear locking valve seized. d) Damper B malfunctions.	a) Replace solenoid valve – see 24 34 851. b) Replace wire harness – see 24 35 500. c) Replace valve body – see 24 30 004. d) Replace valve body – see 24 30 004.
No reverse or forward gear	a) Main pressure valve seized, spring broken.	a) Replace valve body – see 24 30 004.
Insufficient power transmission.	a) Pressure too low in clutch B or E, brake D	a) Replace valve body – see 24 30 004.
Hard jolt when moving into position R	a) Damper B malfunctions b) Modulation pressure too high.	a) Replace valve body – see 24 30 004.
Position D No forward gear	a) Main pressure valve seized, spring broken	a) Replace valve body – see 24 30 004.
Insufficient power transmission	a) Pressure too low in clutch A	a) Replace valve body – see 24 30 004.
No shift function	a) Pulse sender faulty. b) Wire to pulse sender grounded out.	a) Replace pulse sender – see 24 34 870. b) Replace wire harness – see 24 35 500.
No shift function 1–2 / 2–1	a) Solenoid valve (1) faulty. b) Wire to solenoid valve (1) grounded out. c) Shift valve 1-2, control valve 1-2 / 3-4, pressure reducing valve 1 seized.	a) Replace solenoid valve – see 24 34 851. b) Replace wire harness – see 24 35 500. c) Replace valve body – see 24 30 004.

Condition	Cause	Correction
Position D		
No shift function 2–3 / 3–2	a) Solenoid valve (2) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Wire to solenoid valve (2) grounded out.	b) Replace wire harness – see 24 35 500.
	c) Shift valve 2-3 seized.	c) Replace valve body – see 24 30 004.
No shift function 3–4 / 4–3	a) Solenoid valve (1) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Control valve 1-2 / 3-4 seized.	b) Replace valve body – see 24 30 004.
Upshifts 1–2 / 2–3 / 3–4 too long	a) Pressure regulator faulty.	a) Replace pressure regulator – see 24 34 860,
	b) Wire to pressure regulator grounded out.	b) Replace wire harness – see 24 35 500.
	c) Damper faulty.	c) Replace valve body – see 24 30 004.
	d) Modulation valve, pressure reducing valve 1 and 2 stick.	d) Replace valve body – see 24 30 004.
Upshifts 1–2 / 2–3 /3–4 too hard	a) Pressure regulator faulty.	a) Replace pressure regulator – see 24 34 860.
	b) Modulation valve sticks.	b) Replace valve body – see 24 30 004.
	c) Damper faulty.	c) Replace valve body – see 24 30 004.
Downshift 4–3 too hard	a) Plate F dirty.	a) Replace valve body – see 24 30 004.
Manual downshifts 4–3 / 3–2 too hard	a) Damper E or C' faulty.	a) Replace valve body – see 24 30 004.

Condition	Cause	Correction
Position 1		
Manual downshift 2–1 not okay	a) Pressure regulator faulty.	a) Replace pressure regulator – see 24 34 860.
	b) Damper D faulty.	b) Replace valve body – see 24 30 004.
	c) Modulation valve sticks.	c) Replace valve body – see 24 30 004.
Converter Lockup Clutch		
No converter clutch locking	a) Solenoid valve (3) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Converter clutch damper faulty.	b) Replace solenoid valve – see 24 34 851.
	c) Converter pressure valve seized.	c) Replace valve body – see 24 30 004.
	d) Pressure reducing valve 1 seized.	d) Replace valve body – see 24 30 004.
No converter clutch unlocking	a) Solenoid valve (3) faulty.	a) Replace solenoid valve – see 24 34 851.
	b) Wire to solenoid valve (3) grounded out.	b) Replace wire harness – see 24 35 500.
Main pressure too high in all positions	a) Pressure regulator faulty.	a) Replace pressure regulator – see 24 34 860.
	b) Main pressure valve seized.	b) Replace valve body – see 24 30 004.
	c) Modulation pressure too high.	c) Replace valve body – see 24 30 004.

00 11 239 Oil change in manual transmission
(Engine M60 transmission A5S 560 Z)

See Repair Instructions for 5 Series E34

24-0/52

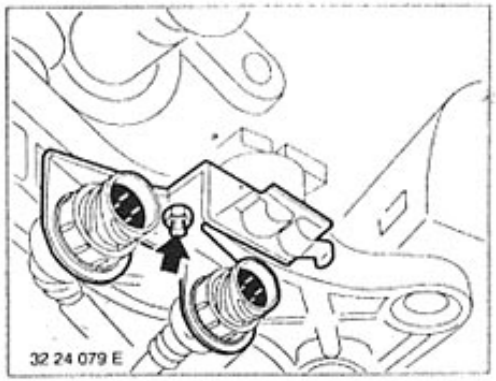
24 00 007 Adjusting the shift lever
- transmission A5S 560 Z -

Refer to Repair Instructions for 5 Series E34

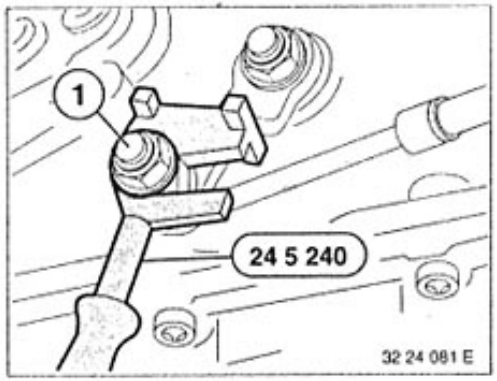
24 00 026 Removing and installing automatic transmission (A5S560Z/ M60 Engine)

Disconnect ground lead from battery.
Caution!
When ground lead is disconnected, the fault memories in the control units are cancelled. For this reason, first read fault memories with tester and print out any faults in the system.

Remove complete exhaust system 18 00 020.
Remove engine splash guard.
Remove fan coupling 11 42 020



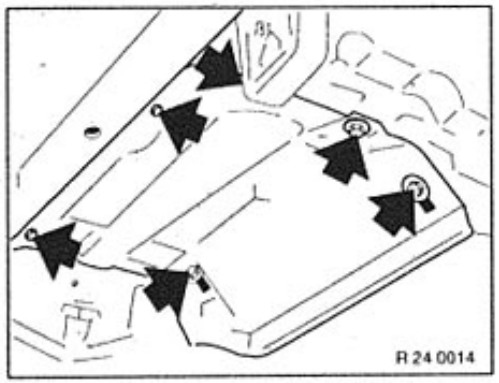
Remove bracket for Lambda oxygen sensor plug.



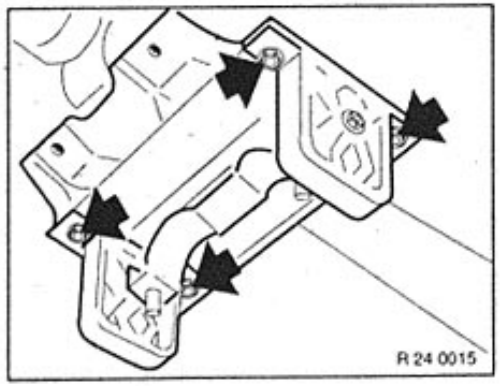
Unfasten nut (1).

Caution!
To prevent distortion of cable, always brace with special tool 24 5 240 on clamping screw.
Tightening torque 25 16 2AZ*

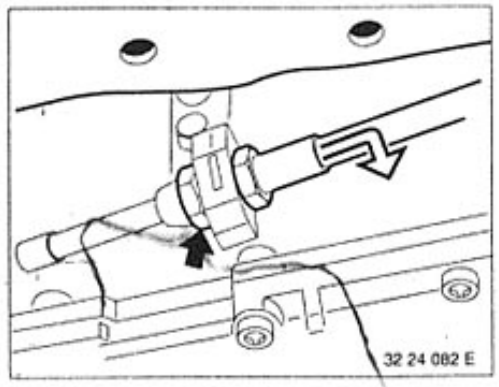
Note!
The special tool 24 5 240 can now be fitted in setting "P".



Remove heat shield.



Remove central exhaust bracket.

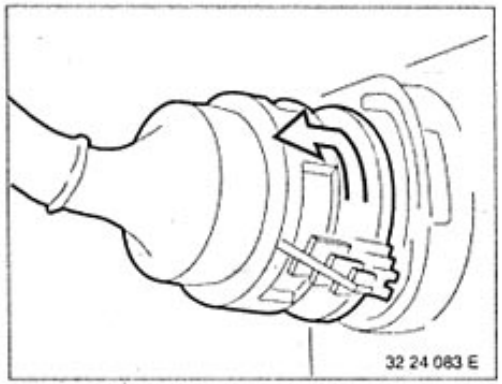


Remove cable sleeve from counter support.
Pull out cable.

Installation:
Tightening torque 25 16 1AZ*

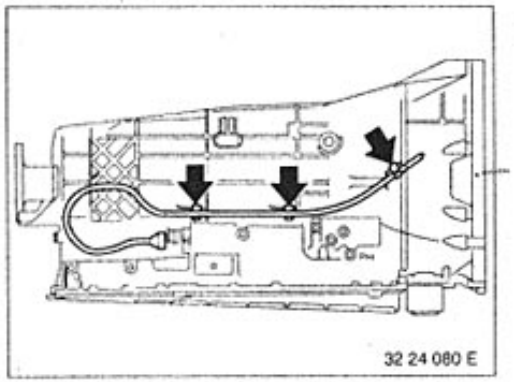
Adjust shift mechanism 24 00 007

* Refer to Technical Data

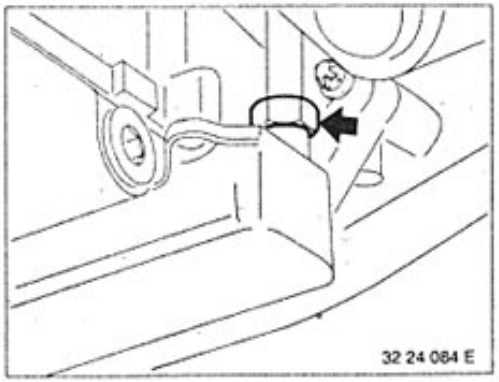


Twist bayonet connection counter-clockwise.
Pull off plugs.
Lift cable harness out of holder.

Installation:
Fit connector in such a way that marker lines are aligned with one another.



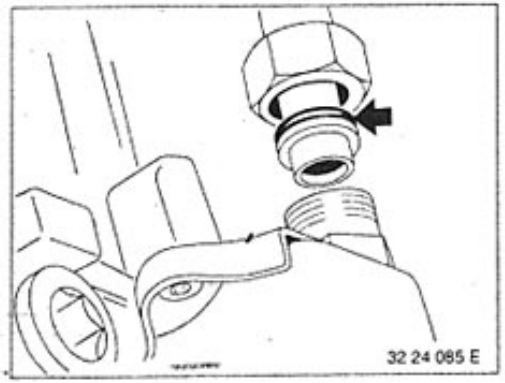
Unclip cable bracket from transmission.



Unscrew left and right coolant lines from transmission oil cooler and jam to one side behing the exhaust pipes.

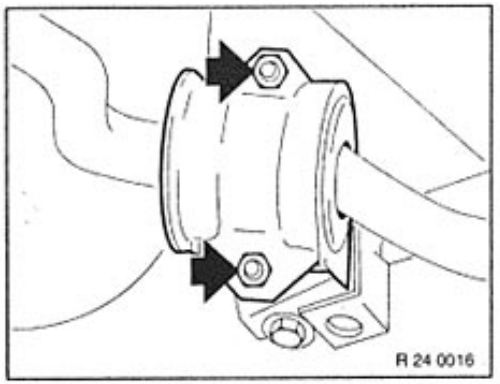
Note:
When the screw connections are opened, approx. 1 liter of coolant escapes.

Top up coolant, see 17 00 005

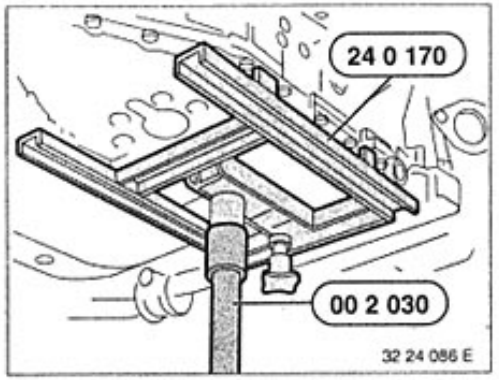


Installation:
Replace O-rings.
Tightening torque 17 22 5AZ*

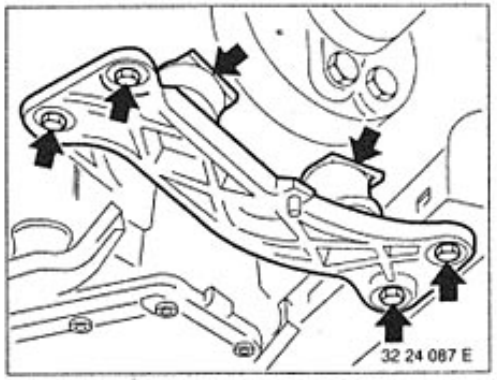
* Refer to Technical Data



Unscrew stabilizer on left and right sides and leave hanging downwards.

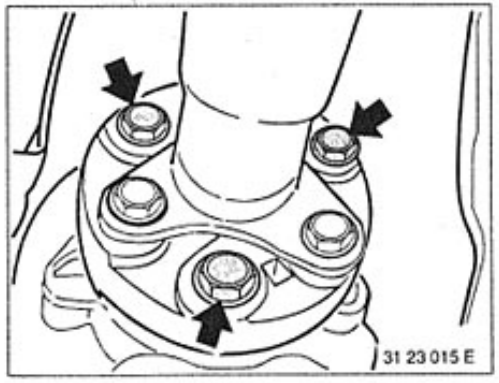


Support transmission with tool 24 0 170 together with lifting fixture 00 2 030.



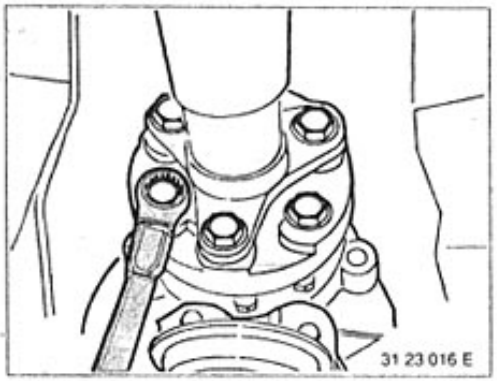
Unscrew crossmember.

Installation:
Balance the transmission, see Gr. 26.
Tightening torque 24 71 1AZ*



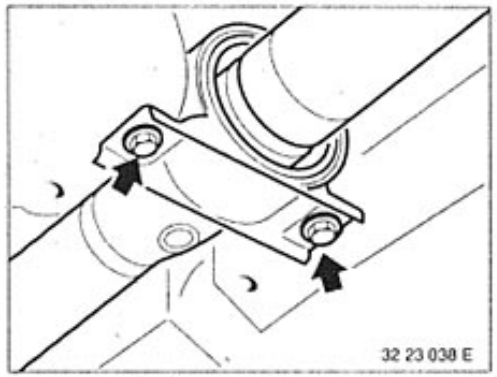
Unscrew joint disk from transmission.

* Refer to Technical Data



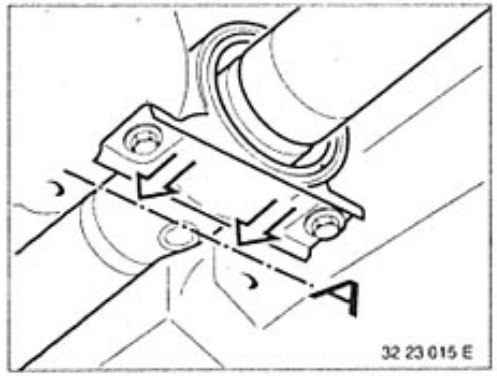
Installation:
Replace stop nuts.
Tightening torque 26 11 1AZ*

Caution!
To avoid torsion stress on the joint disc, only turn nuts on flange side - if design permits this.

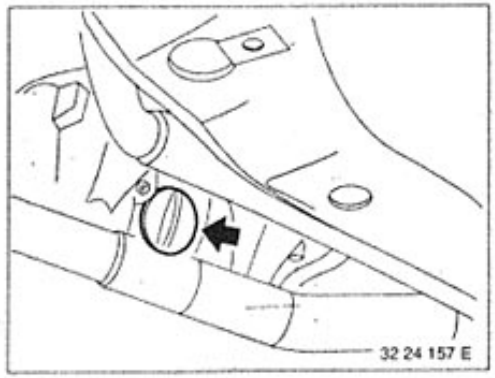


Remove center mount.
Bend propeller shaft downwards and remove from centering spigot on transmission.

Caution!
Do not allow the propeller shaft to drop into the joints.
Tie up propeller shaft.

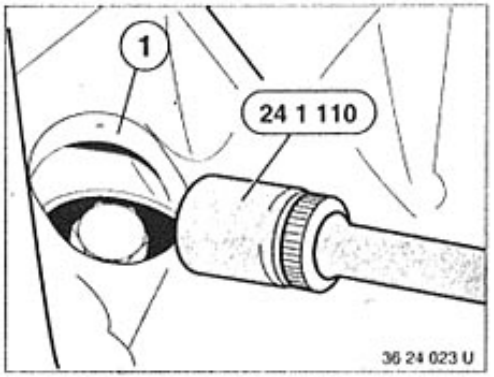


Installation:
Preload center bearing in direction of travel (A) = 2 ... 4 mm.
Tightening torque 26 11 6AZ*

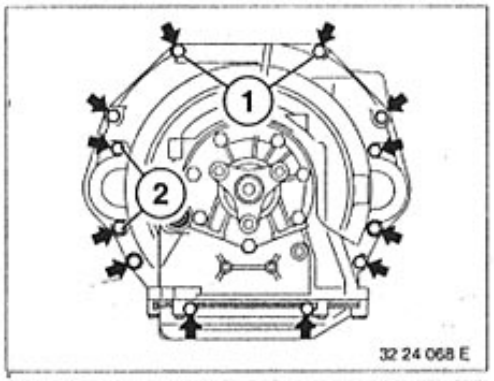


Lift cover off opening in oil pan.

* Refer to Technical Data

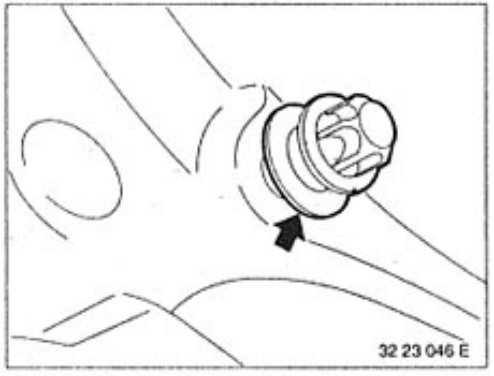


Unfasten torque converter from drive plate with special tool 24 1 110. (3 screws).
To do this, turn flywheel repeatedly, each time by 1/3 turn.

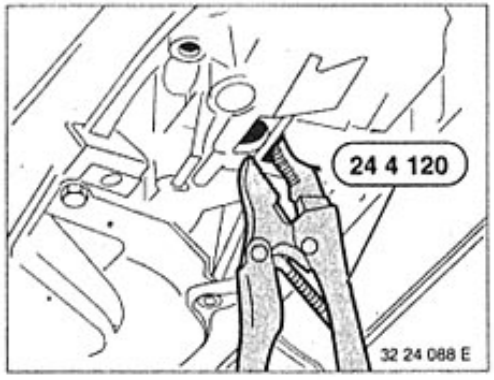


Lower transmission.
Disconnect transmission from engine flange. (Torx screws).

Note:
The screws (1) = Torx E 10
all other Torx E 12
The screws opposite the starter motor have nuts fitted to their front faces.



Installation:
Note that washers are fitted to the Torx screws.
Tightening torque 24 00 1AZ*



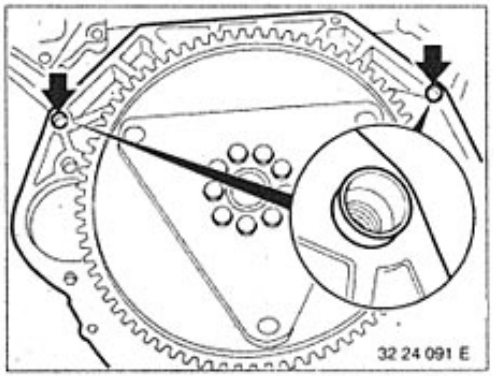
Protect converter from slipping out by placing special tool 24 4 120 on transmission case with flat side of retaining tab (1) facing torque converter and clamp in place.
Remove transmission from engine.

Caution!
To transport the transmission, lower transmission fully onto lifting fixture.

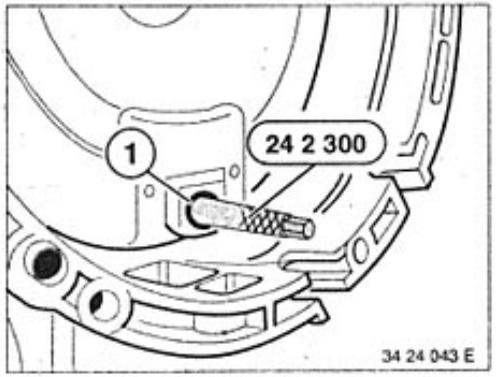
Transmission weight approx. 120 Kp

* Refer to Technical Data

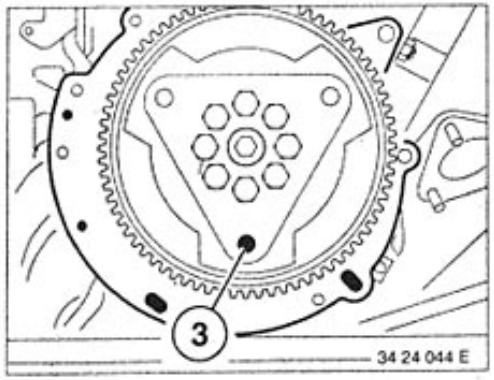
Caution!
When putting down transmission without mount, do not place onto oil cooler.



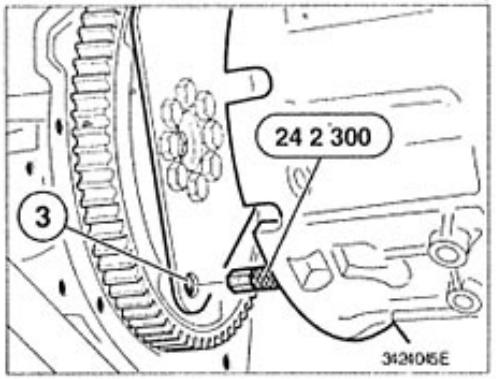
Note hollow bushes.
If necessary, move or replace hollow bushes on transmission.



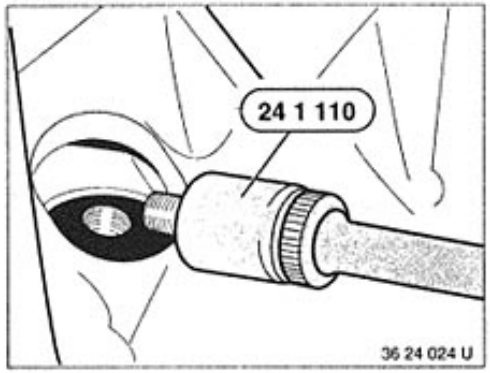
Installation:
Turn the torque converter on the transmission until bore (1) faces down perpendicular to the tab.
Screw special tool 24 2 300 into the tab.



Installation:
Bore (3) on drive plate must point perpendicularly to center of opening in oil sump.



Installation:
Lift automatic transmission until bore (3) in drive plate is reached.
Guide transmission in carefully with special tool 24 2 300 in bore (3) on the drive plate.
Bolt transmission case to engine.
Unscrew special tool 24 2 300 from the tab and pull forwards.
Bolt torque converter to flywheel.



Installation:
Install bolt using special tool 24 1 110 and tighten using a torque wrench.
Tightening torque 24 40 1AZ*

Caution!
Only use original screws **.

If necessary, check / top up transmission fluid see 00 11 239

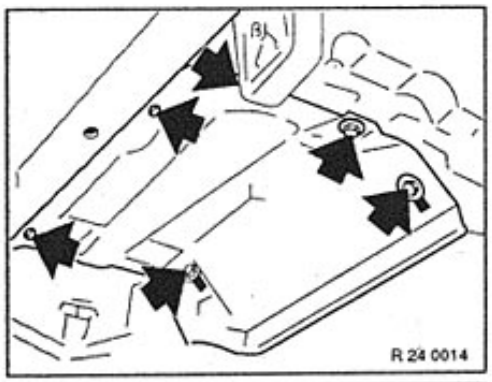
* Refer to Technical Data
** BMW Parts Service

24 00 026 Removing and installing automatic transmission (A5S560Z / M73 Engine)

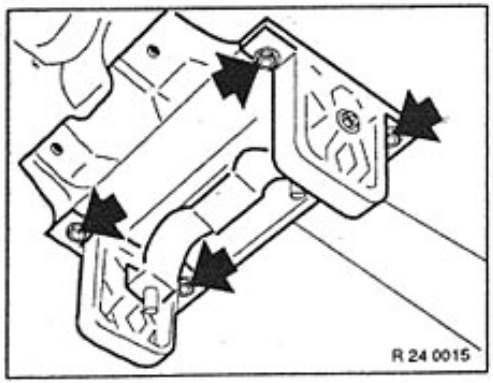
Note:
After completion of the work, check transmission oil level and top up if necessary, refer to 00 11 239 (A5S560Z)

Disconnect battery,
refer to instructions on disconnecting and connecting battery in MG 12.

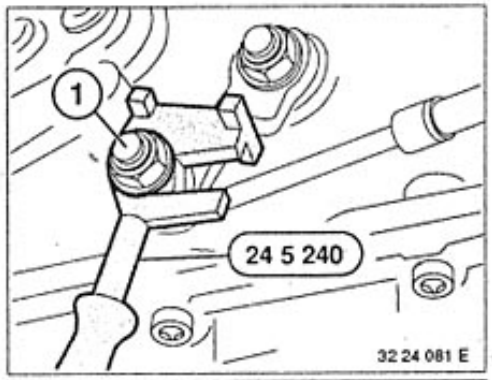
Remove complete exhaust system,
refer to 18 00 020.



Remove heat shield.



Remove exhaust bracket.

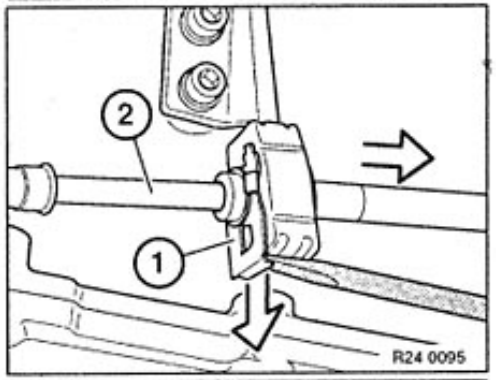


Fit special tool 24 5 240 to the shift lever.

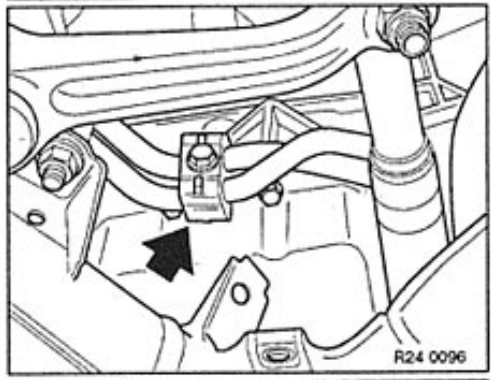
Note:
Only possible to fit it in setting "P".

Unscrew nuts (1).

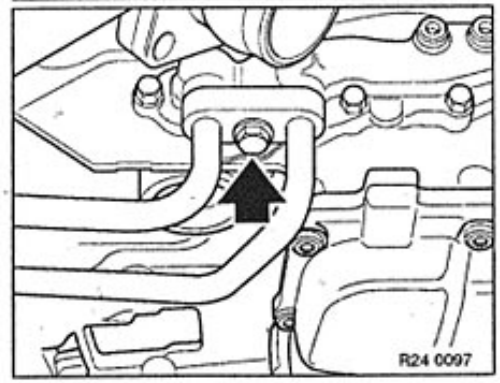
Installation:
Adjust shift lever,
refer to 24 00 007.



Pry out retaining plate (1) with a screwdriver.
Remove cable (2) in direction of arrow.

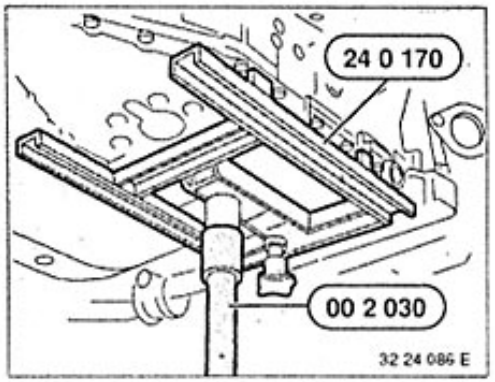


Remove heat shield from beneath steering gear.
Remove bracket for oil lines from the engine oil pan.

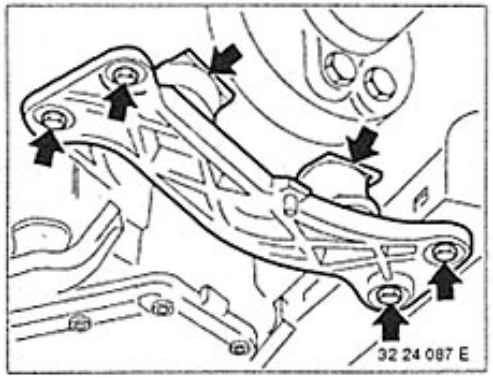


Place drip tray under unit.
Unfasten screw and remove oil lines.

Installation:
Replace O-rings.



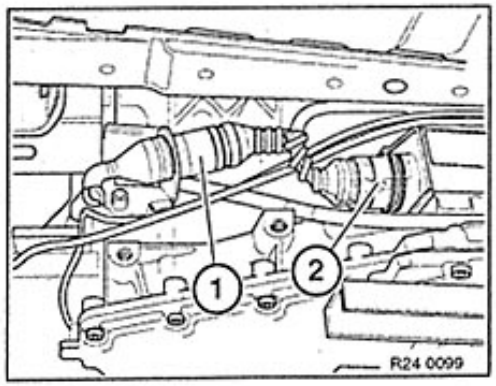
Support transmission using special tools 00 2 030 / 24 0 170.



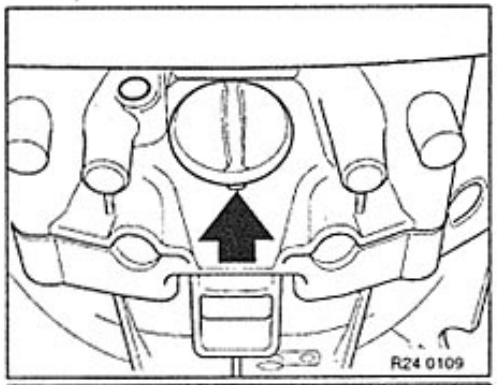
Unfasten screws and remove transmission cross-member.

Installation:
Tightening torque,
refer to Technical Data 24 71 1AZ.

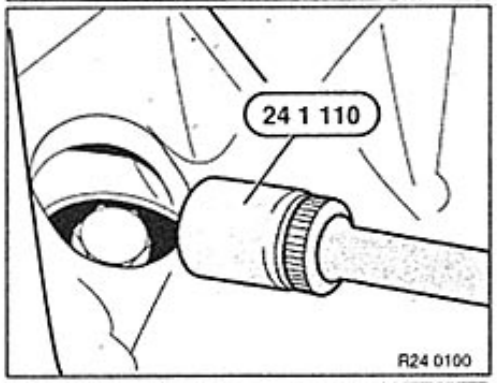
Disconnect flange on transmission propeller shaft and tie to one side,
refer to 26 11 000.



Unlock cable connectors (1 ... 2) and disconnect.
Unclip cable from transmission case.

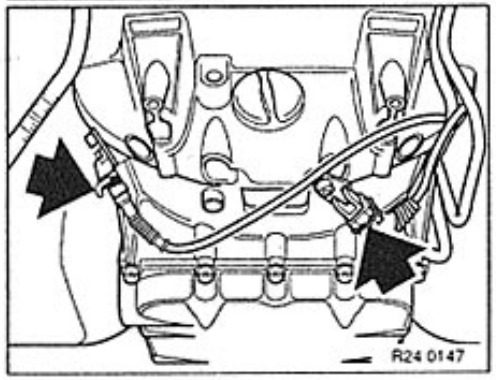


Lift out cover.

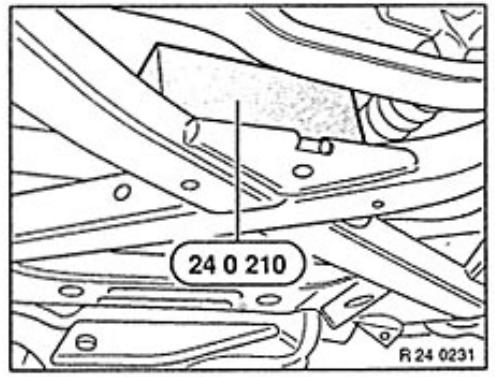


Unfasten 4 retaining screws for torque converter with special tool 24 1 110.

Installation:
Tightening torque,
refer to Technical Data 24 40 1AZ.



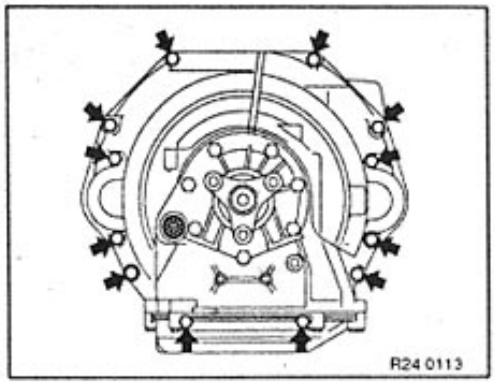
Remove impulse sensor.



Insert special tool 24 0 210 between engine oil pan and reinforcement bracket.

Lower transmission until engine just makes contact with special tool.

Caution!
Do not lower workshop hoist any further or the engine oil pan may be damaged.

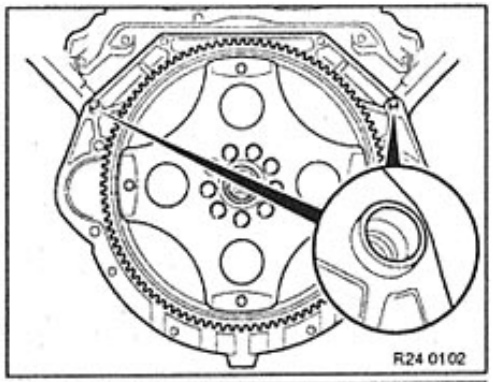


Unfasten screws.

Caution!
When removing the transmission, ensure that the torque converter remains in the transmission.
Avoid damaging impulse teeth on the flywheel.

Pull transmission as far backwards as possible and lower carefully.

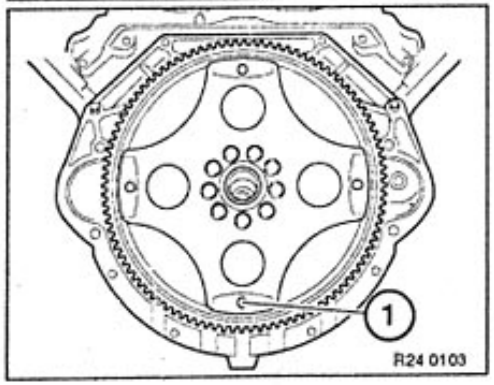
Installation:
Only fit screws together with washers.
Tightening torque,
refer to Technical Data 24 00 1AZ.



Installation:
Note dowel sleeves.

If necessary, pull dowel sleeves out of transmission case and install in engine block.

Replace damaged dowel sleeves.



Installation:
One of the four bores (1) in the drive plate must be accessible from aperture in oil pan.

24 00 046 Installing replacement transmission

Refer to Repair Instructions for 5 Series E34

24 11 008 Removing / sealing transmission oil pan

Refer to Repair Instructions for 5 Series E34

24 12 016 Replacing radial seal for output flange

Refer to Repair Instructions for 5 Series E34

24 12 106 Replacing radial seal for hand selector valve shaft

Refer to Repair Instructions for 5 Series E34

24 12 506 Replacing radial seal for torque converter

Refer to Repair Instructions for 5 Series E34

24 13 156 Replacing output flange

Refer to Repair Instructions for 5 Series E34

24 13 706 Replacing mount for transmission extension

Refer to Repair Instructions for 5 Series E34

24 30 006 Removing and installing / replacing shift unit

Refer to Repair Instructions for 5 Series E34

24 31 156 Removing and installing / replacing transmission oil screen

Refer to Repair Instructions for 5 Series E34

24 34 006 Removing and installing or replacing parking interlock (pawl / leg spring)

Refer to Repair Instructions for 5 Series E34

24 34 857 Replacing solenoid valves and / or pressure regulator

Refer to Repair Instructions for 5 Series E34

24 34 873 Replacing impulse sensor (turbine speed)
(oil pan removed)

Refer to Repair Instructions for 5 Series E34

24 34 874 Replacing impulse sensor (output speed)
(oil pan removed)

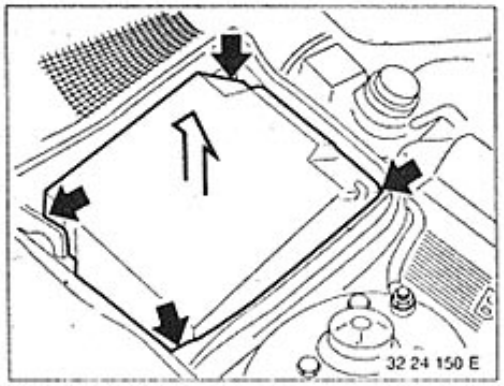
Refer to Repair Instructions for 5 Series E34

24 35 501 Replacing wiring harness in automatic transmission
(shift unit removed)

Refer to Repair Instructions for 5 Series E34

24 40 007 Removing and installing / replacing automatic transmission

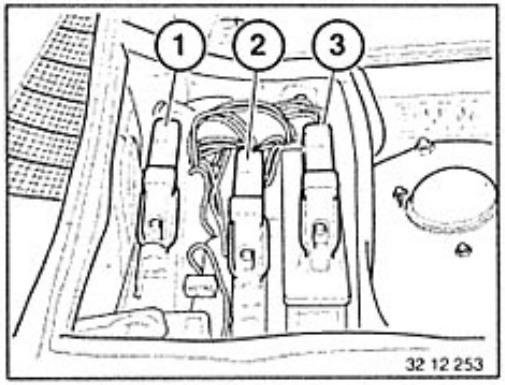
Refer to Repair Instructions for 5 Series E34



24 61 501 Removing and installing or replacing control unit (EGS)

Unscrew cover from E box (right side, viewed in direction of travel).

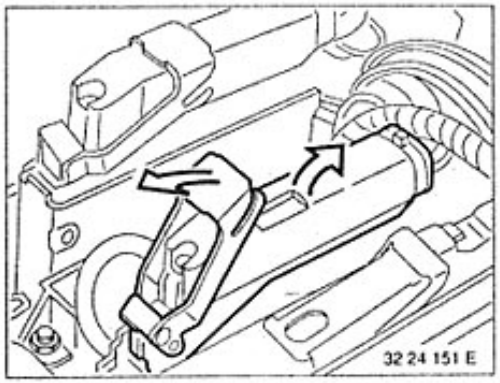
Installation:
Note seals on wiring harnesses and cooling air duct.



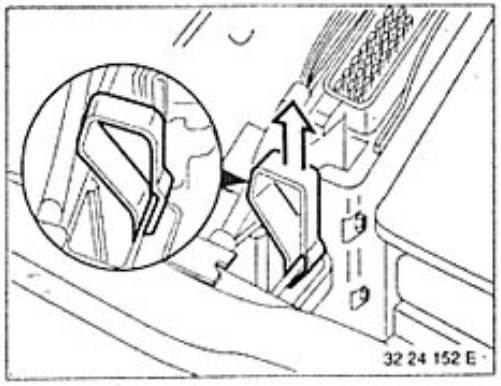
Configuration of control units:

1 Control unit for ABS
2 Control unit for DME
3 Control unit for automatic transmission (EGS)

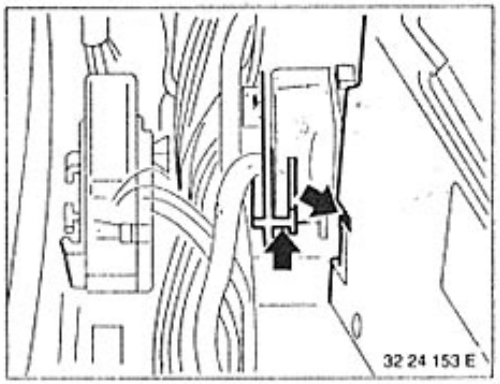
Note:
Depending on the construction status of a vehicle, the arrangement of these control units may vary.
Note lettering on control unit.



Remove connector from control unit.



Remove clips.



Remove control unit.

Installation:
Attach control unit by fitting recesses in case to retaining lugs on equipment carrier.

Code is on identification plate.
Allocation and model, see Parts Catalogue.

Additional instructions: see Electrical Troubleshooting Manual

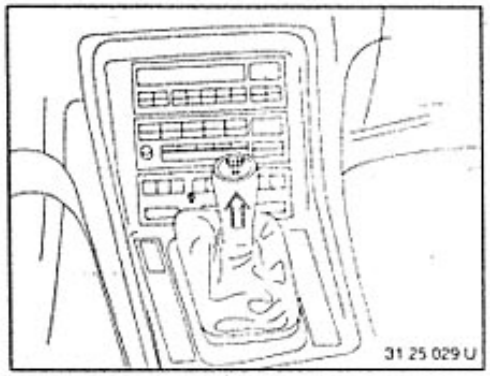
25 Gear shift mechanism

Manual transmission

25 11 000 Shift lever – remove and install 25- 11/1
001 Shift lever, complete – replace 25- 11/2
005 Shift lever – adjust 25- 11/3
041 Ball shell for shift lever – replace 25- 11/4
071 Knob for shift lever – replace 25- 11/4
111 Shift rod joint – replace 25- 11/5

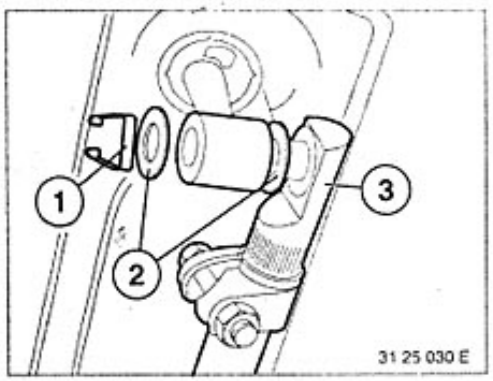
Automatic transmission

25 16 050 Shift lever with mount – remove and install 25- 16/1
051 Shift tower – remove and install/replace (step shift) 25- 16/3
056 Shift tower – remove and install/replace (shift lock / interlock) 25- 16/5
061 Handle for shift lever – replace 25- 16/7
080 Shift lever – remove and install/replace 25- 16/8
130 Shift lock solenoid – remove and install/replace 25- 16/9
202 Cable for gear selector lever – replace 25- 16/10
202 Cable for gear selector lever – replace (step shift) 25- 16/11



25 11 000 Removing and installing shift lever

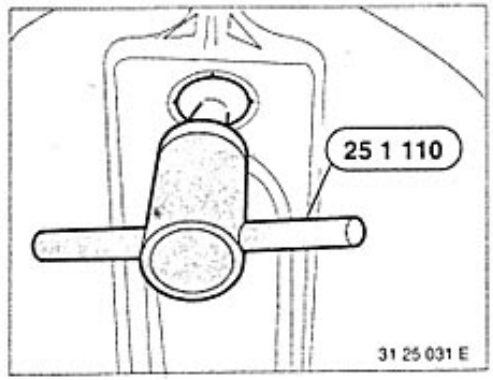
Lift cover off retaining tabs.
Pull off shift lever knob by hand with a sudden jerk.
Pulling-off force: approx. 40 kp.
Remove complete exhaust assembly 18 00 020. Remove heat shield.
Remove propeller shaft from transmission and center mount (see 26 11 000).



Lift out retainer (1).
Remove disk (2).
Remove shift rod (3).

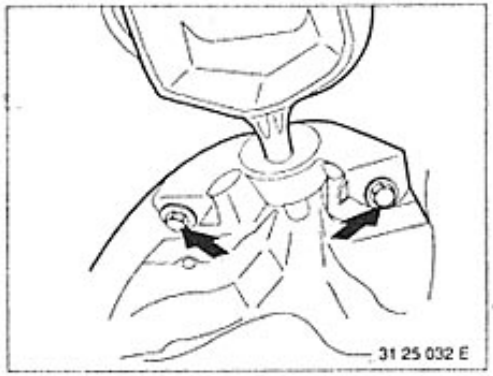
Installation:
Coat bearing with Klüber Polylup GLY 801*.

Note:
On vehicles with an M60 engine and an S6S 420 D transmission, the shift rod is attached from left to right.

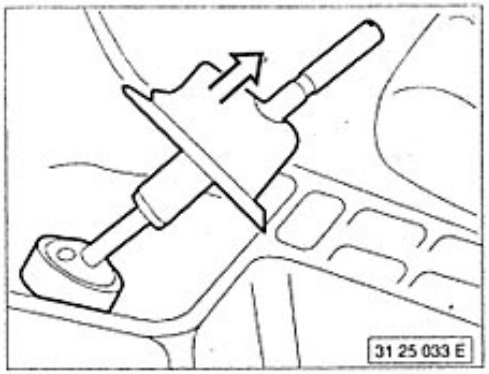


Fit pin wrench 25 1 110 and rotate 90° anticlockwise.
Press bearing shell upwards.

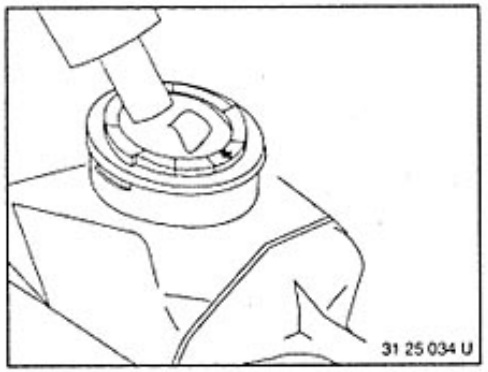
* Source of Supply: BMW Parts Service.



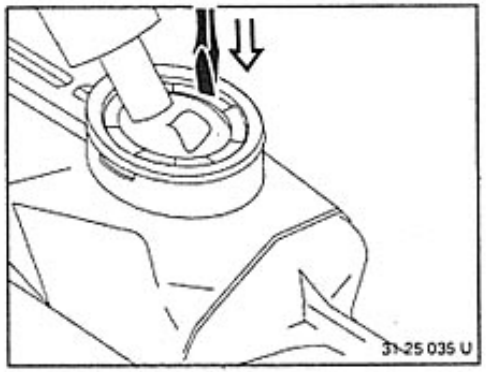
Remove support bearing from body.



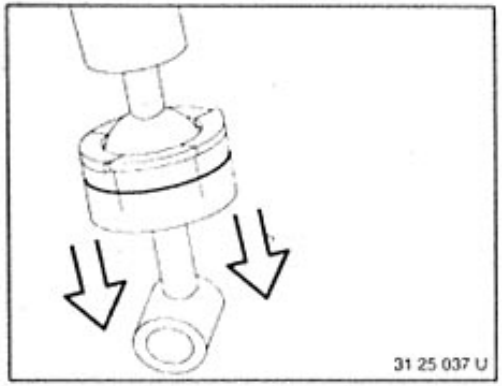
Remove rubber grommet from body opening and lift out upwards together with shift lever.



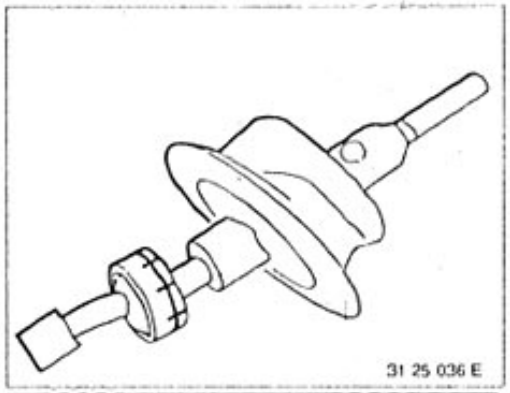
Install shift lever with bearing shell.
Install bearing shell with tabs or arrows pointing towards bearing pin.



Press down on bearing shell at point of retaining tabs until they are heard to engage.



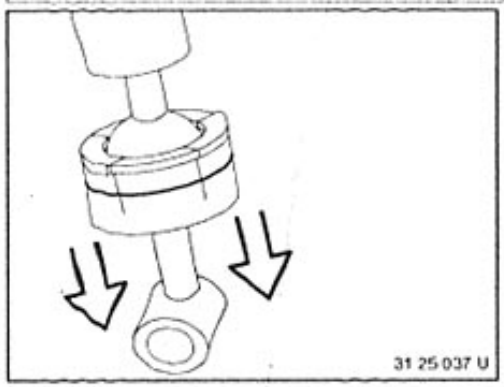
Installation:
Button in inner dust cover over the shift arm and outer dust cover in the body opening.



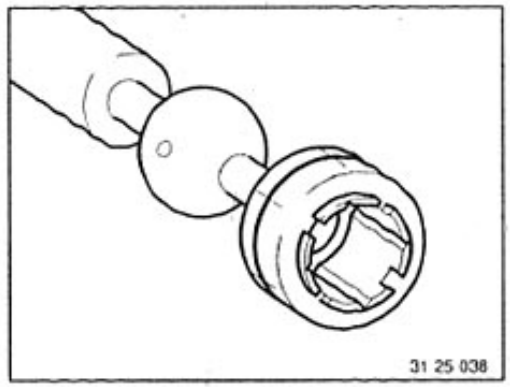
25 11 001 Replacing complete shift lever

Remove shift lever 25 11 000.
Remove rubber grommet from shift lever.

Installation:
Fit rubber grommet to shift lever with tire fitting compound.



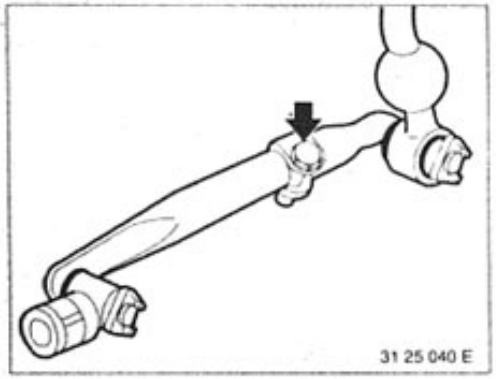
Press bearing shell downwards to remove.



The bearing shell can be removed from the shift lever through the slots in the bearing shell.

Installation:
Coat bearing shell and ball with Klüber Polylup GLY 801*

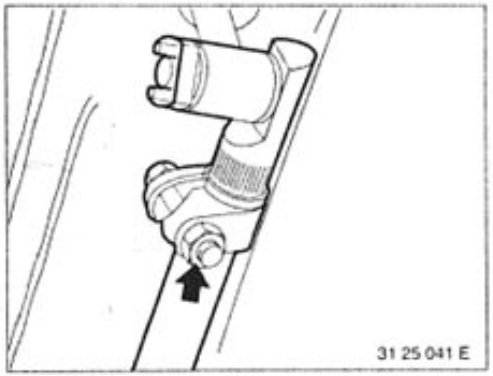
* Source of Supply: BMW Parts Service



25 11 005 Adjusting shift lever

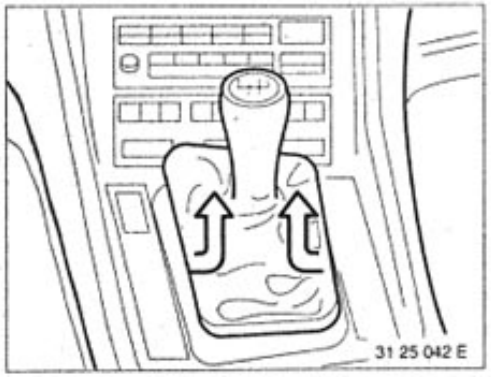
Note:
The shift rod is fitted with a clamping fixture to compensate for unfavourable tolerances.

Note:
On vehicles with an M60 engine and an S6S 420 D transmission, the shift rod is mounted from left to right.

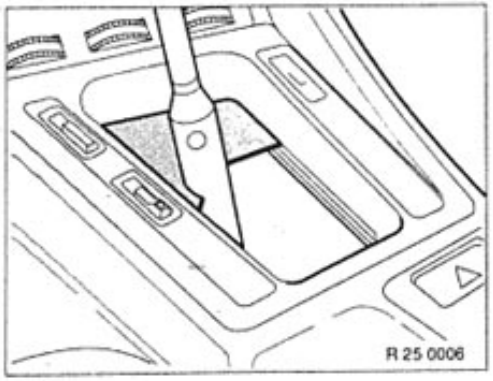


Move manual transmission into "Reverse" position.

Loosen clamping screw on the shift rod.

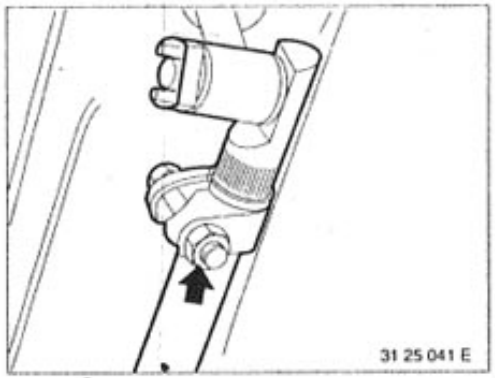


Unclip shift lever dust cover from console and push upwards to remove.



Insert template in the console aperture and press shift lever into "Reverse" setting.

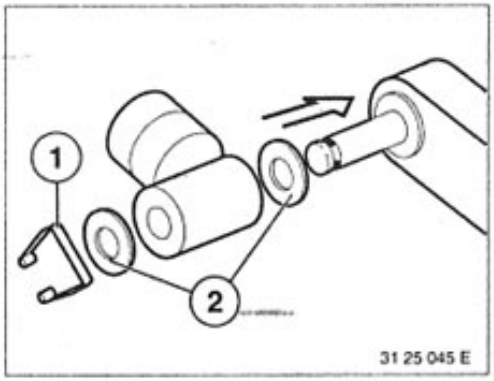
Note:
Refer to BMW Service Information for sample template.



Tighten clamping screw.

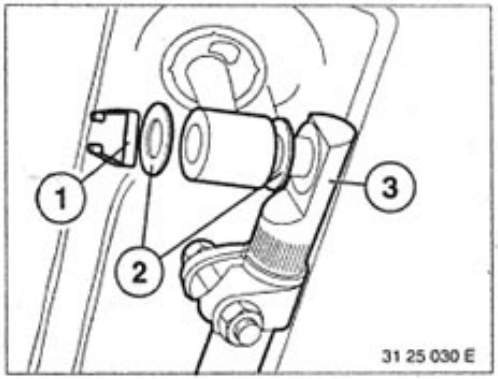
25 11 111 Replacing shift rod joint

Remove propeller shaft from transmission and center bearing (see 26 11 000).



Lift out retainer (1).
Remove disks (2).
Remove shift rod.

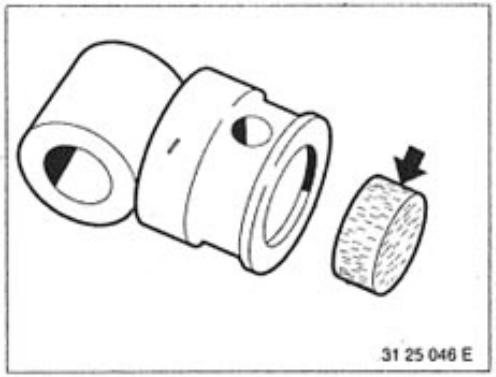
Installation:
Check disks (2) and replace if necessary.
Coat bearing points with Klüber Polylup GLY 801*



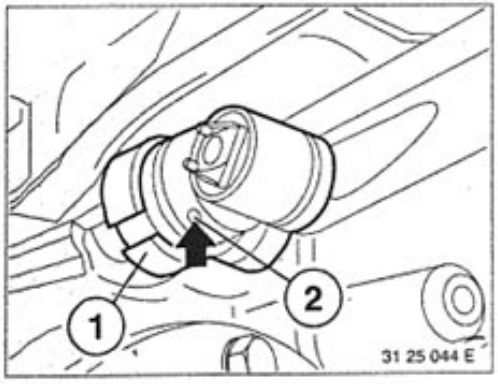
Remove shift rod from shift lever.
Remove retainer (1).
Remove disk (2).
Pull out shift rod (3).

Installation:
Coat bearing with Klüber Polylupe GLY 801*.

Note.
On vehicles with an M60 engine and an S6S 420 D transmission, the shift rod is installed from left to right.

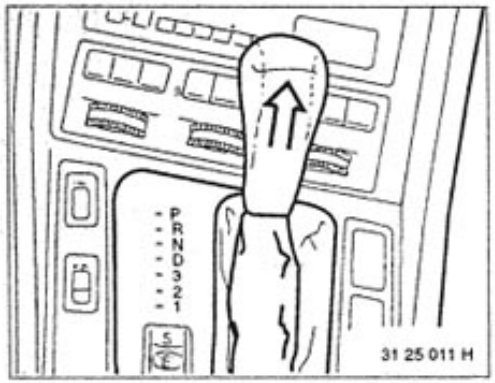


Installation:
Check damping disk in joint and replace if necessary.



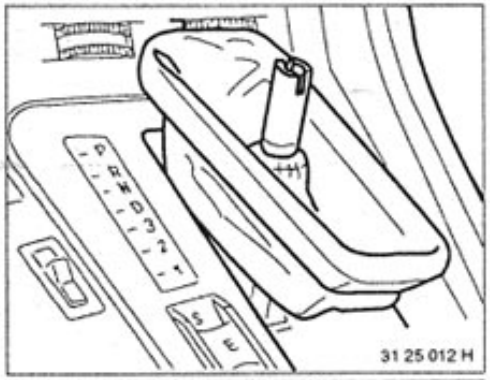
Lift retaining sleeve (1) out of groove and slide backwards.
Push pin (2) out upwards.
Remove shift rod with joint.

* Source of Supply: BMW Parts Service

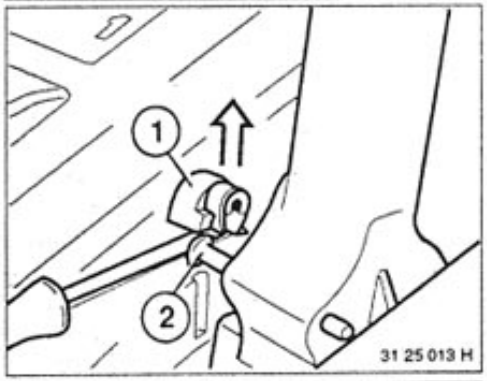


25 16 050 Removing and installing shift lever with shift tower

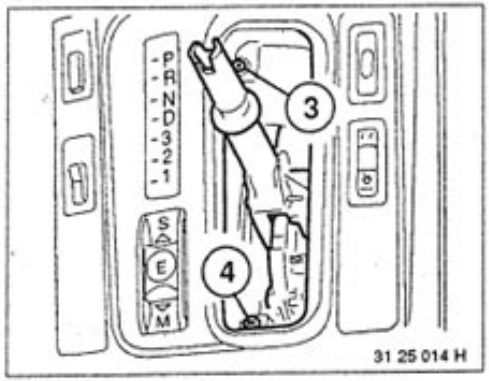
Remove selector lever handle by tugging firmly by hand.
Removal force approx. 25 kp.



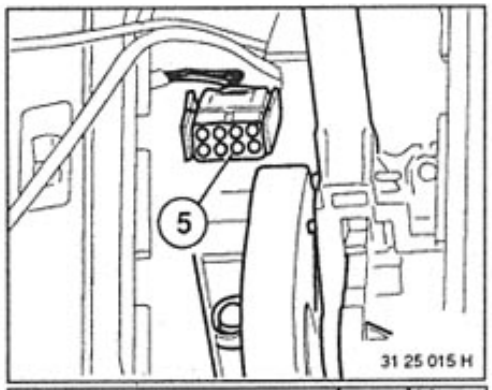
Lift off cover



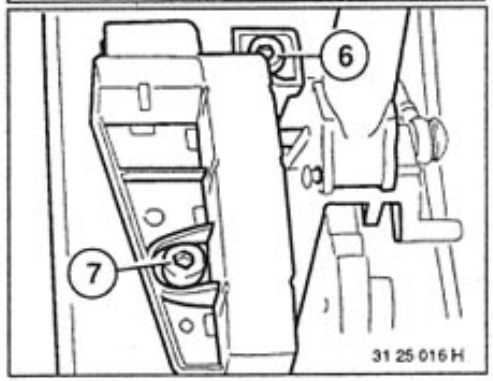
Press driver clip (1) upwards with a screwdriver until pin (2) can be moved.
Pin (2) remains in shift lever.



Unscrew and remove screws (3 and 4).

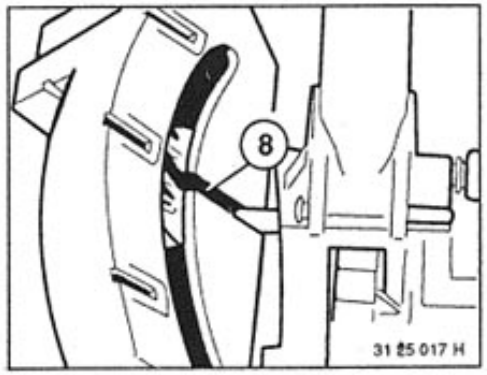


Lift out finisher.
Remove connector (5) from transmission switch.

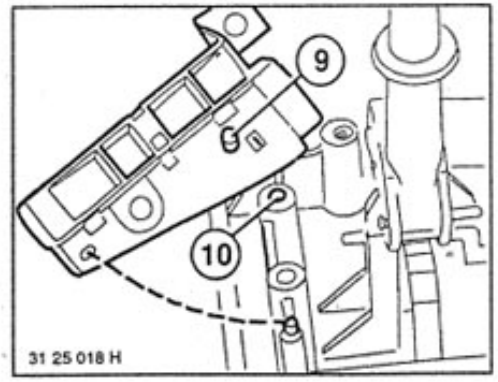


Unfasten screws (6 and 7).

Installation:
Screws are micro-encapsulated and must be replaced each time they are dismantled.
Tightening torque*

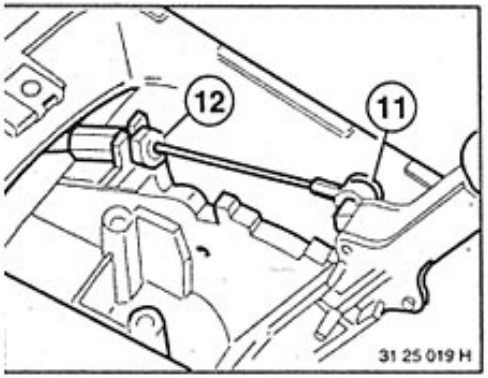


Move selector lever until transmission switch can be removed from driver pin through groove (8).



Installation:
Lug (9) on transmission switch must engage in bore (10).

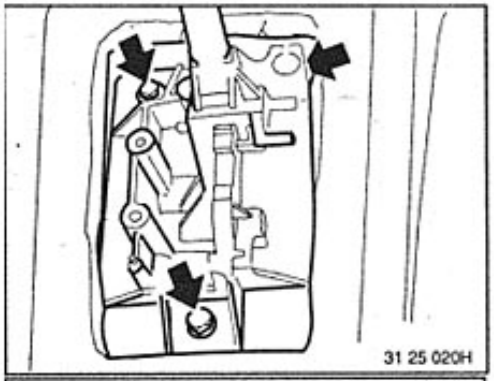
* Refer to Technical Data.



Press off retainer (11).

Installation:
Replace retainer (11).
Unscrew nut (12).
Disconnect cable.

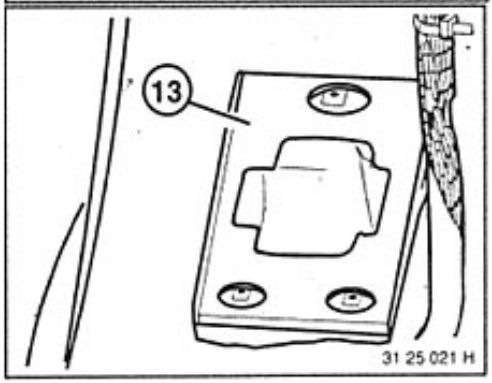
Installation:
Adjust shift mechanism 24 00 006.



Unfasten screws.
Remove shift tower with selector lever.

Installation:

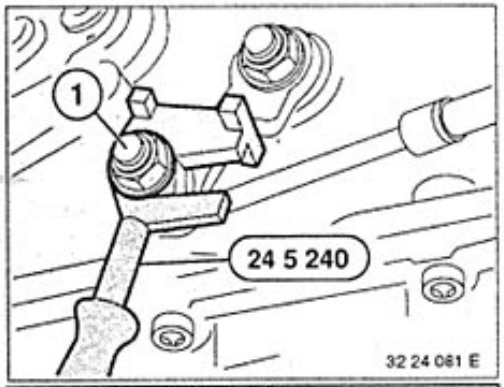
Tightening torque *



Installation:
Check that gasket (13) can be reused and replace if necessary.

* Refer to Technical Data

25 16 051 Removing and installing / replacing shift tower (step gear selection)

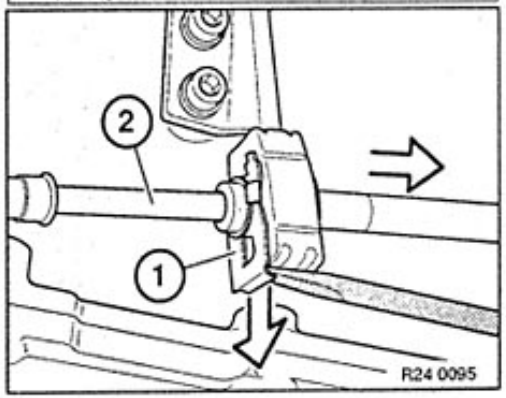


Fit special tool 24 5 240 to the shift lever.

Note:
Only possible to fit in setting "P".

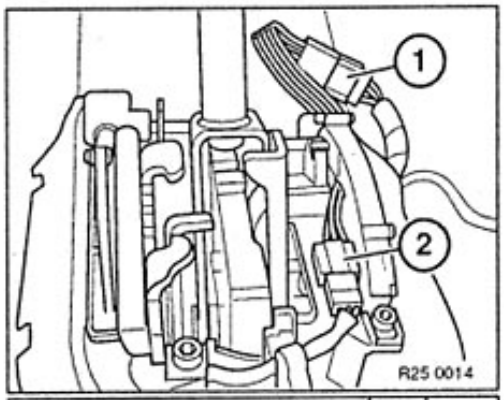
Loosen nut (1).

Installation:
Adjust shift lever,
refer to 24 00 007

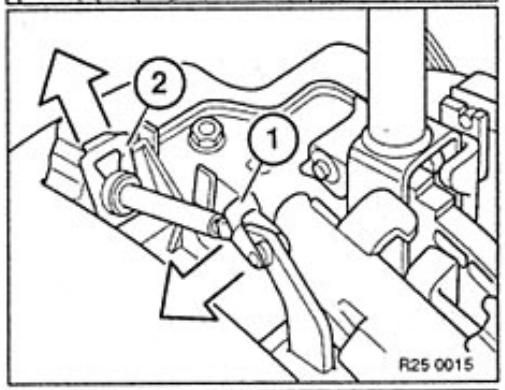


Pry out retaining clip (1) with a screwdriver.
Pull cable (2) out of bracket.

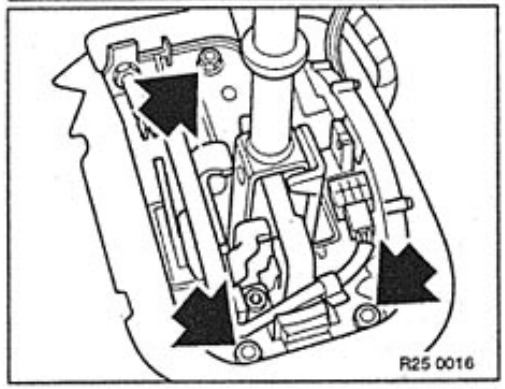
Remove finisher from centre console,
refer to 51 16 200.



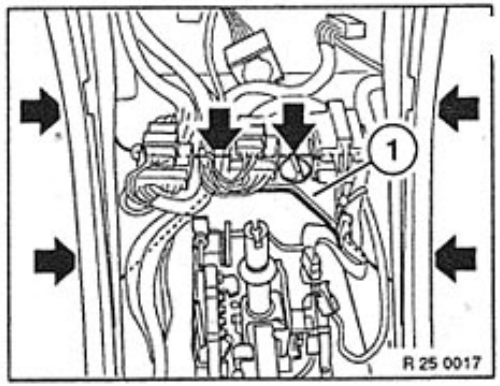
Disconnect connectors (1) and (2).



Release pin (1) and remove.
Remove retaining clip (2).
Press cable out of guide.

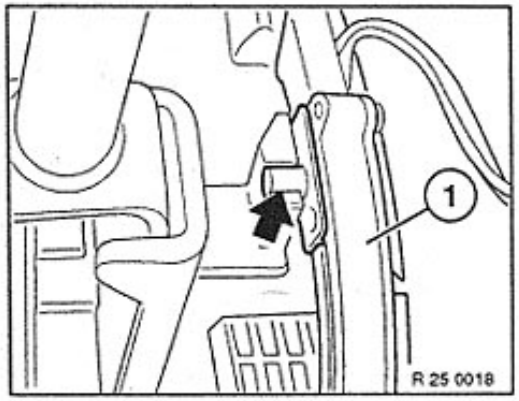


Unfasten screws.



Unfasten screws.
Press reinforcement plate (1) forwards and remove shift tower.

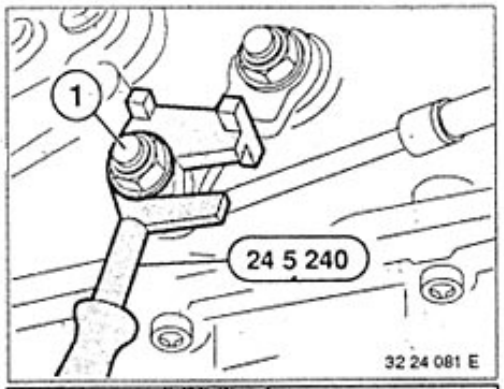
Note:
If necessary, unfasten cable and cable connector from reinforcement plate.



If necessary, fit position switch (1) to the new shift tower.

Installation:
The pin on the switch must be in the recess on the shift lever.

25 16 056 Removing and installing / replacing shift tower (Shift-Lock / Interlock)

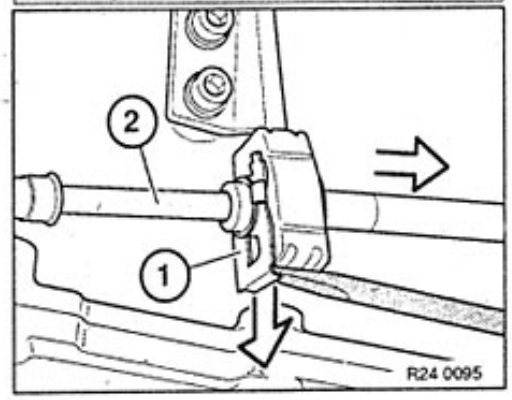


Fit special tool 24 5 240 to the shift lever.

Note:
Can only be fitted in setting "P".

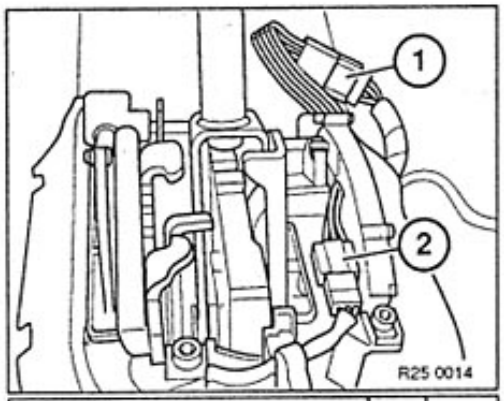
Loose nut (1).

Installation:
Adjusting shift lever,
refer to 24 00 007

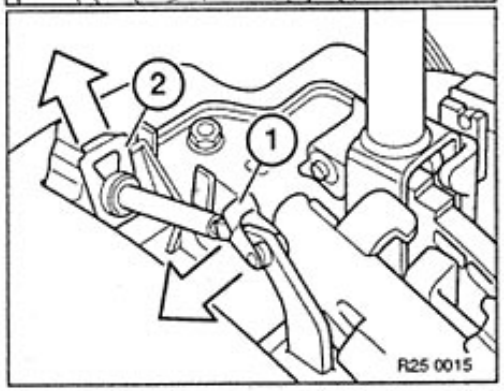


Pry out retaining clip (1) with a screwdriver.
Pull cable (2) out of bracket.

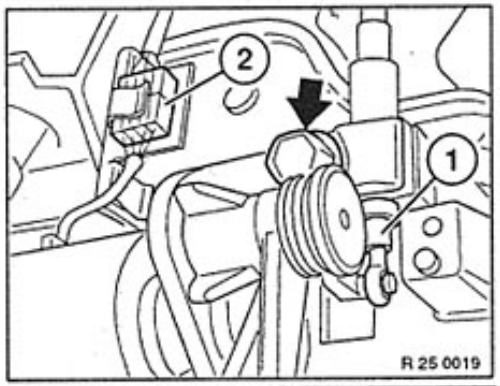
Remove finisher from centre console,
refer to 51 16 200.



Unfasten cable connectors (1) and (2).

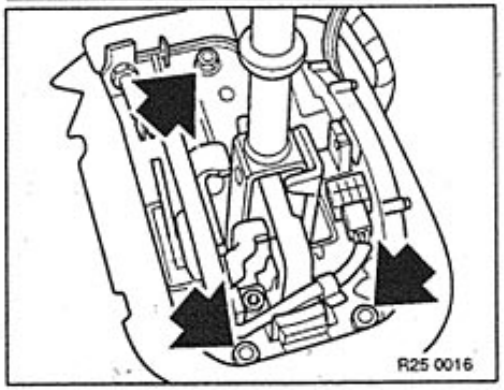


Release pin (1) and remove.
Remove retaining clip (2).
Press cable out of guide.

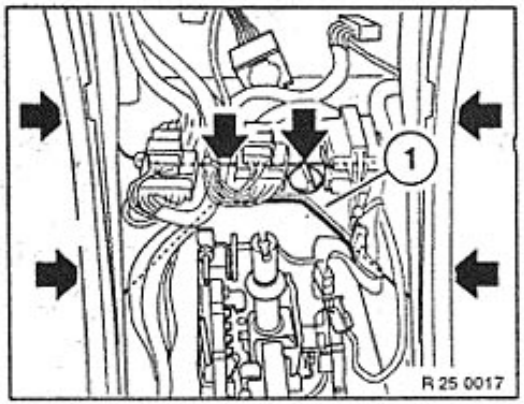


Unfasten screw.
Remove interlock cable.
Unfasten cable connector (2).

Installation:
Adjust interlock cable, refer to 25 16 . .
Repair Instructions for 3 Series E36.

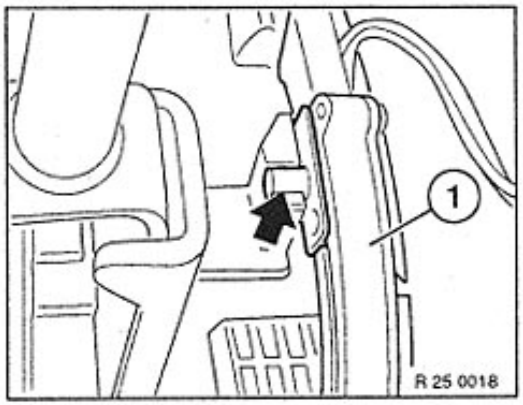


Unfasten screws.



Unfasten screws.
Press reinforcement plate (1) forwards and remove shift tower.

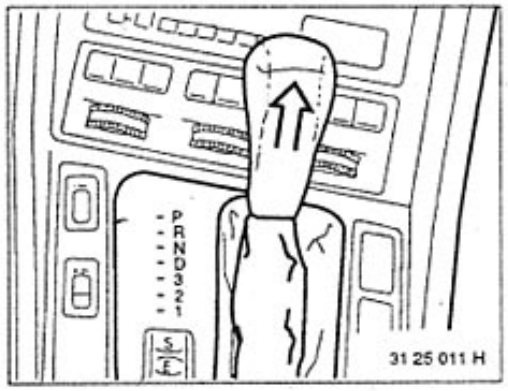
Note:
If necessary, unfasten cable and connector from reinforcement plate.



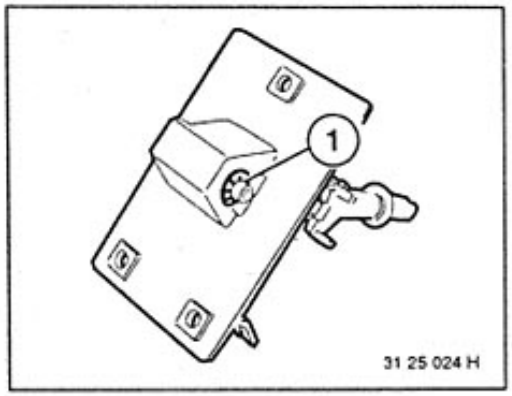
If necessary, fit position switch (1) to new shift tower.

Installation:
Pin in switch must be in recess on shift lever.

25 16 061 Replacing handle on shift lever



Remove selector lever handle by tugging firmly.



25 16 080 Removing and installing / replacing shift lever

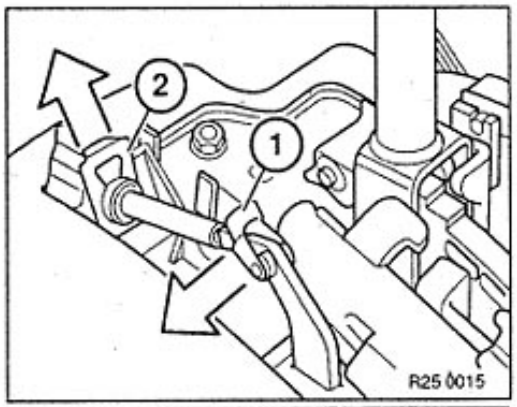
Remove shift tower 25 16 050.
Pry out retainer (1).

Installation:
Replace retainer (1)
Drive out bearing pin.

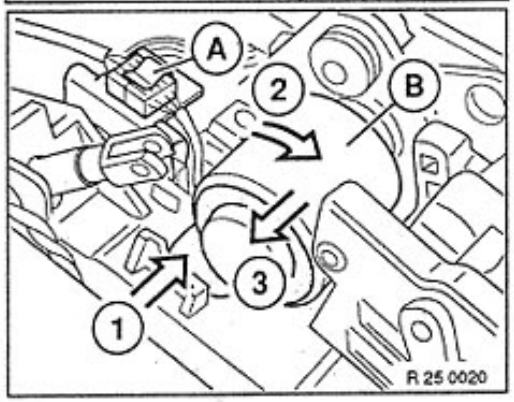
Installation:
Coat bearing points with Klüber Polylup GLY 801 **.

26 16 130 Removing and installing / replacing shift lock solenoid

Remove finisher from centre console, refer to 51 16 200.

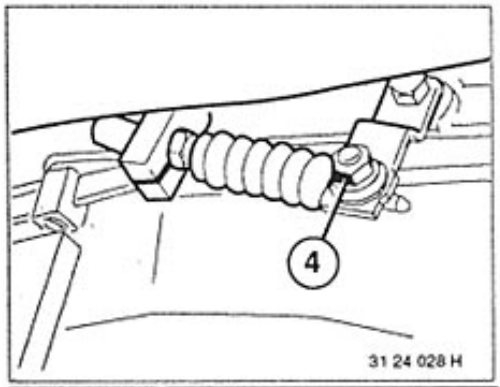


Release pin (1) and remove.
Remove retaining clip (2).
Press cable out of guide.



Disconnect cable connector (A).

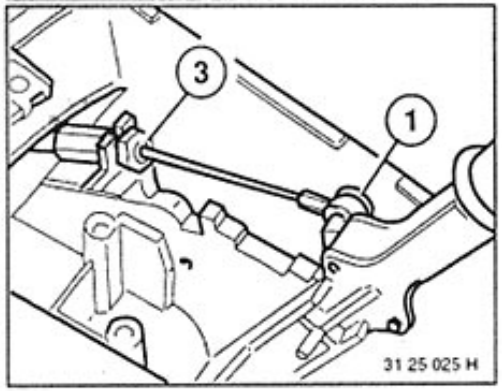
1. Press locking fixture in direction of arrow.
2. Twist electromagnet (B) approx. 90 ° in direction of arrow.
3. Pull out electromagnet (B) in direction of arrow.



25 16 202 Replacing cable for gear selector lever

Unfasten nut (4) (brace).
Remove cable from support bearing.
Pull out cable.
Tightening torque*

Installation:
Adjust shift mechanism 24 00 006.



Remove selector lever handle, cover and finisher (refer to 25 16 050)
Press of retainer (1).

Installation:
Replace retainer (1).
Unscrew nut (3).
Disconnect cable.
Tightening torque*

Cut open carpet from above cable and up to rubber seal.
Pull cable upwards to remove.

Installation:
Ensure that rubber seal is perfectly located.

* Refer to Technical Data
** Refer to BMW Parts Service

25 16 202 Replacing cable for gear selector lever (step shift mechanism)

Operation is identical to "Removing and Installing Shift Tower", refer to 25 16 051/ 25 16 056.

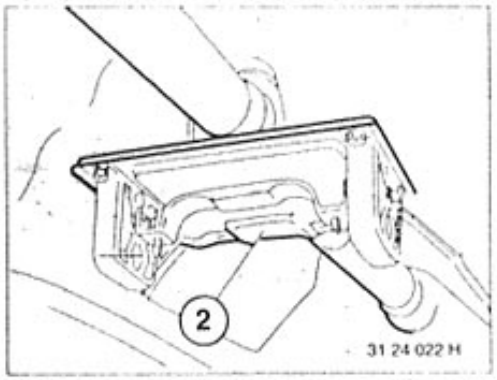
26 Propeller shaft

26 11 000	Propeller shaft – remove and install	26-11/1
030	Propeller shaft – balance (center and adjust deflection angle)	26-11/3
051	Propeller shaft joint disc, front – replace	26-11/5
090	Propeller shaft center – remove and install/replace	26-11/6
160	Propeller shaft c.v. joint – replace	26-11/7
665	Dust cover – replace	26-11/9
26 12 001	Propshaft center, complete – replace	26-12/1
011	Grooved ball bearing in propeller shaft center bearing – replace	26-12/1
500	Propeller shaft center bearing – pre-load/check	26-12/1
	Propeller shaft – troubleshoot	26-90/1



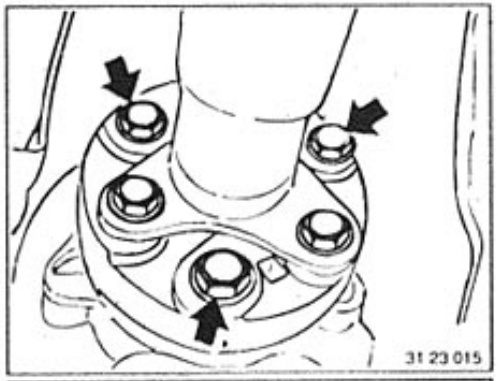
26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT

Remove exhaust assembly – see 18 00 020.
Remove heat shield (1).

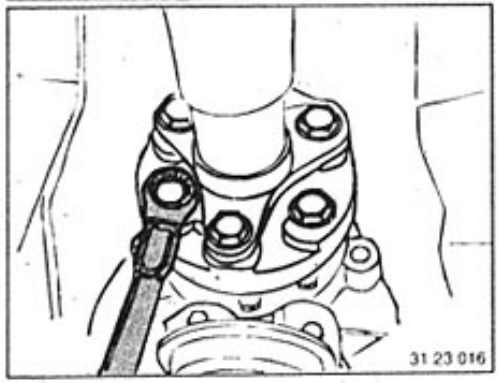


Unscrew exhaust holder (2).

Installation
Tightening torque*.

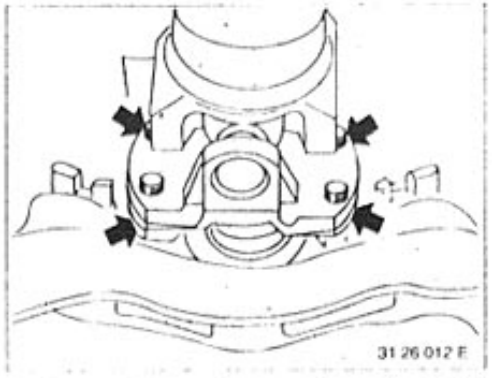


Version with Joint Disc:
Unscrew joint disc on transmission.



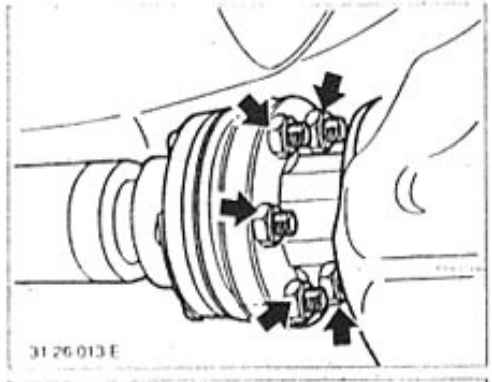
Installation:
Replace stop nuts.
Tighten bolts with specified torque*.

* See Specifications



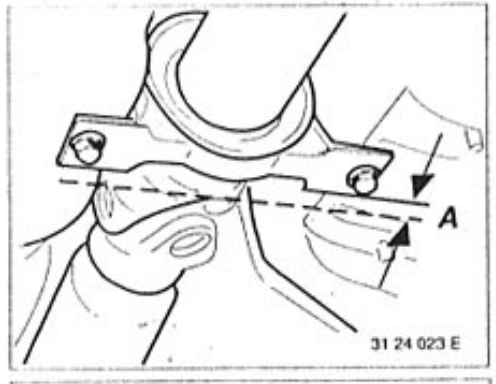
Version with Universal Joint:
Unscrew universal joint on transmission.

Installation
Tightening torque*.



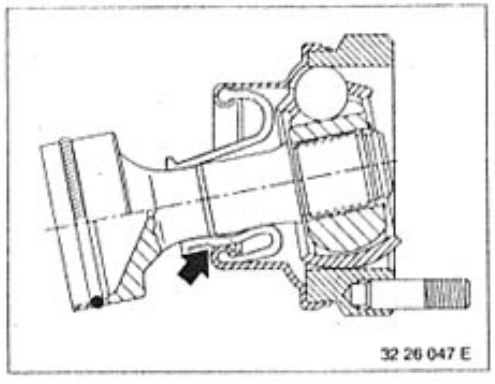
Unscrew constant velocity joint on final drive.

Installation
Replace stop nuts.
Tightening torque*.



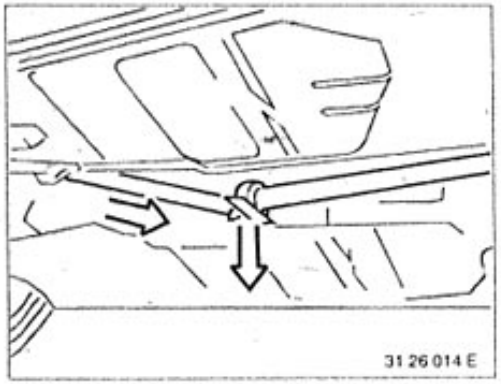
Unscrew center mount.

Installation:
Preload center mount forward by distance A = 2 ... 4 mm (0.079 ... 0.157").
Tightening torque*.

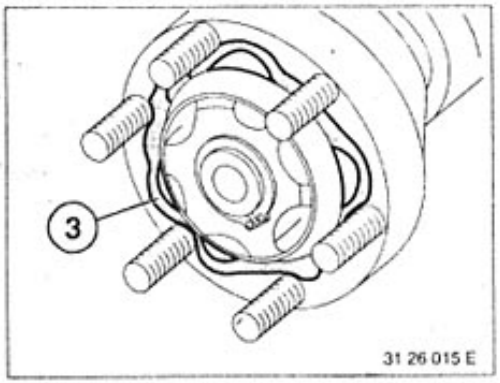


Important!
Never let the propeller shaft fall into the joints. This could lead to damaging the rubber cover of a constant velocity joint in particular or even the joints.

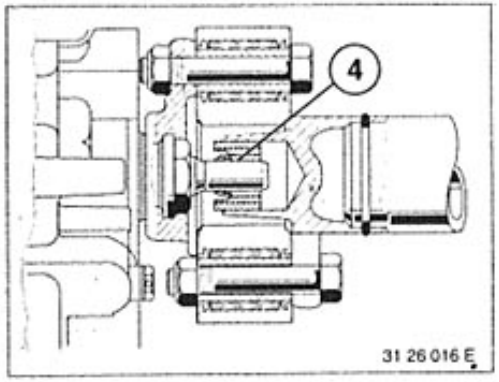
* See Specifications



Bend the propeller shaft down on the center mount and pull it off of the centering pin on a manual transmission or constant velocity joint on the final drive.



Important!
Check gasket (3).
Inspect gasket (3), replacing if necessary.
The constant velocity joint is not encapsulated, so that the joint must be protected against dirt with a transport cap or similar item.
Check / correct the grease* filling prior to installation.



Installation:
Check center (4).
Replace a damaged center.
Coat center with Molykote Longterm 2 prior to installation.

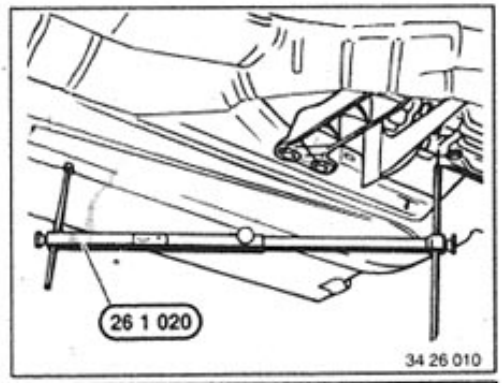
* See Specifications

26 11 030 BALANCING PROPELLER SHAFT (CENTERING AND ADJUSTING DEFLECTION ANGLES)

Vibration or Noise:

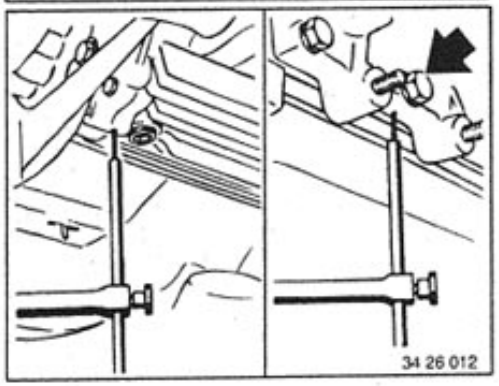
Requirements:
Propeller shaft in perfect optical condition.
Balance the propeller shaft if balance plates are missing or there is suspicion of propeller shaft imbalance (refer to operating instructions supplied with the balancing machine).

Important!
Test run a jacked-up car only with supported wheel suspension on the driven wheels (deflection angle of output shaft).
Never exceed the top speed specified for a car in jacked-up state or on a dynamometer test stand.
Conform with safety precautions!



Centering Propeller Shaft:

Loosen exhaust assembly, engine rubber mounts and transmission cross member.
Apply Special Tool 26 1 020.

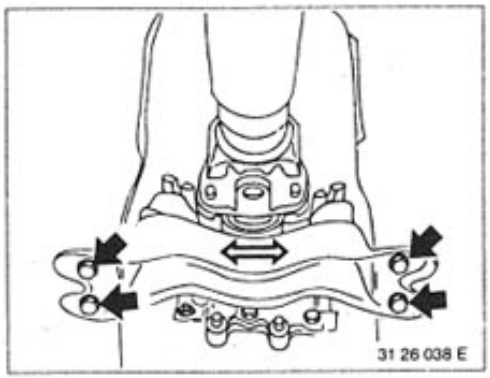


Application Points:
Bore in engine carrier at rear.

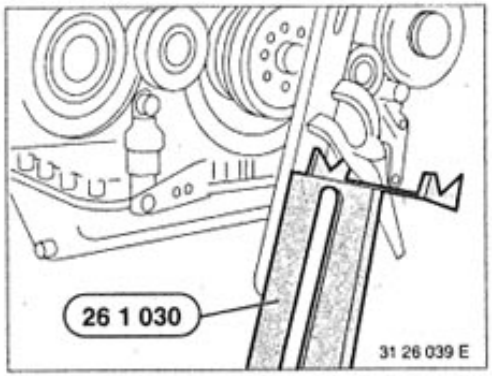
Manual Transmission:
– cast rib at center

Automatic Transmission:
– center bolt of transmission extension

Punch mark measuring points.

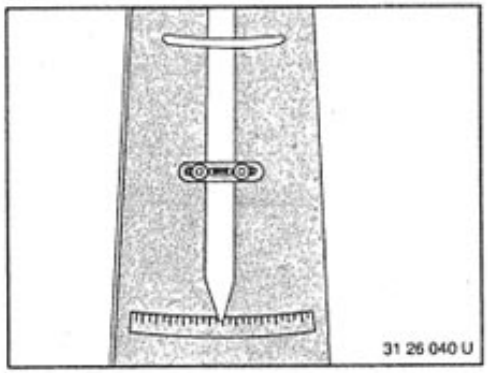


Move transmission sideways until special tool gage shows same distance on the left and right sides.
Mount cross member.
Tightening torque*.



Checking Deflection Angle of Propeller Shaft:

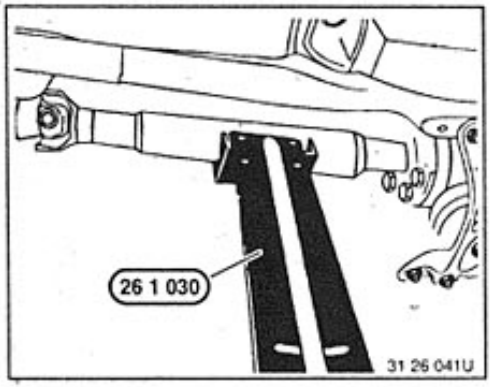
Unscrew splash guard.
Clamp helping rail (steel ruler) on pulley in vertical position with a clamping pliers.
Apply Special Tool 26 1 030 on the helping rail.



Set the indicator perpendicular with help of the water scale.
Read degrees.

Note:
Always apply the special tool with the scale in the same direction (e.g. scale right).
One graduation = 5'.
The position of the car is not important, since only separate angles are compared.

* See Specifications

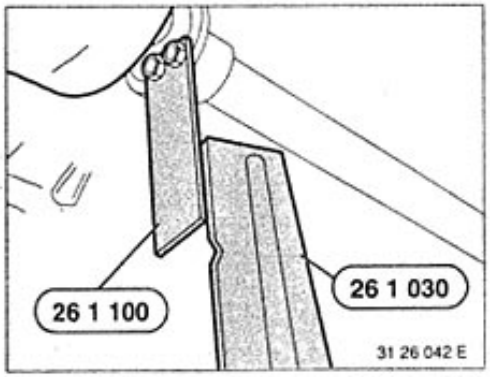


Place special tool on front propeller shaft section and measure the angle. Determine deflection angle* of joint coupling and, if necessary, correct by installing max. 3 mm (0.118") thick shims on transmission suspension or on center mount.

Example:

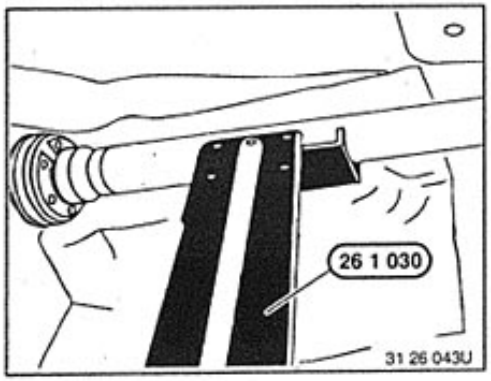
Engine angle	2° 16'
Propeller shaft angle	– 2° 06'
Joint coupling defl. angle	+ 0° 10'

Note:
When correcting deflection angles by installing shims, remember that this will change the deflection angle of neighboring joints. In general a small as possible deflection angle on joints would be ideal.



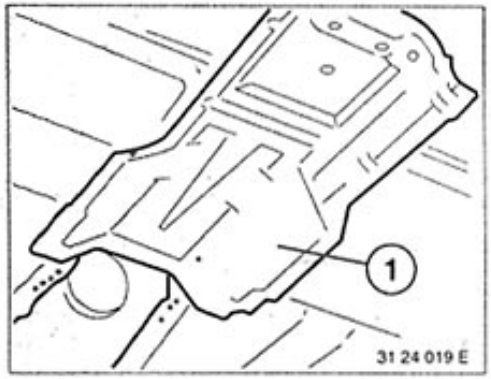
Unscrew two nuts on constant velocity joint.
Mount Special Tool 26 1 100 on constant velocity joint.
Place Special Tool 26 1 030 on Special Tool 26 1 100.
Measure the deflection angle*.

Installation:
Replace stop nuts.
Tightening torque*.



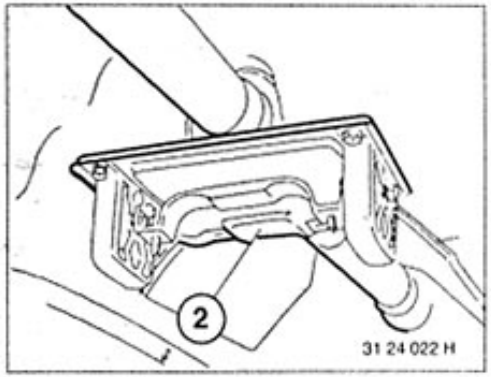
Place special tool on rear propeller shaft section and measure the angle. Determine deflection angle* of center mount and, if necessary, correct by installing max. 3 mm (0.118") thick shims on the transmission suspension or center mount.

* See Specifications



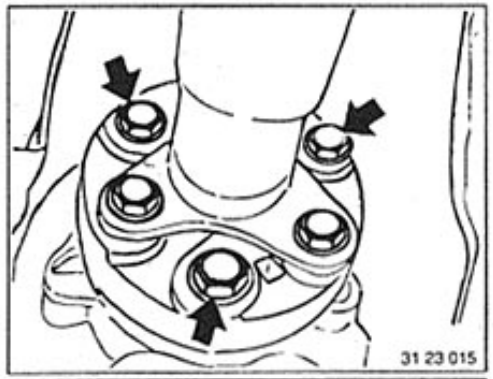
26 11 051 REPLACING JOINT DISC FOR FRONT END OF PROPELLER SHAFT

Remove exhaust assembly – see 18 00 020.
Remove heat shield (1).

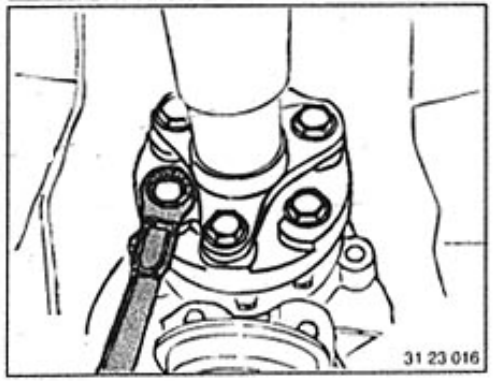


Unscrew exhaust holder (2).

Installation:
Tightening torque*.

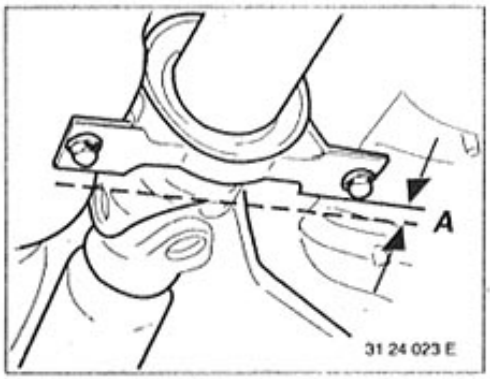


Unscrew joint disc on transmission.



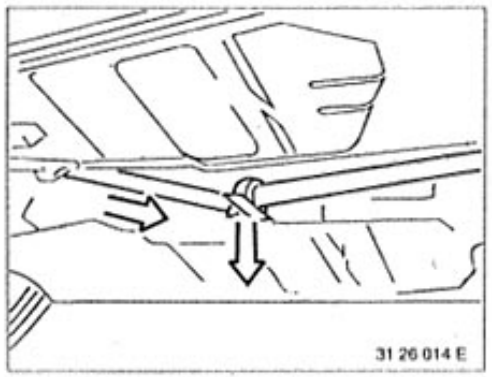
Installation:
Replace stop nuts.
Tighten bolts with specified torque*.

* See Specifications

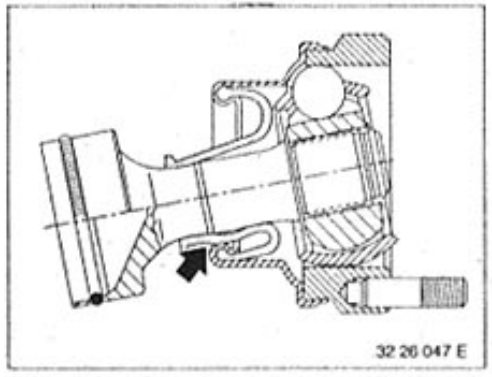


Unscrew center mount.

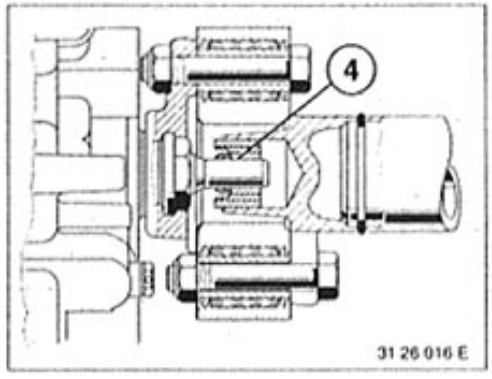
Installation:
Preload center mount forward by distance A = 2 ... 4 mm (0.079 ... 0.157"). Tightening torque*.



Bend propeller shaft down at the center mount and pull it off of the centering pin on a manual transmission.

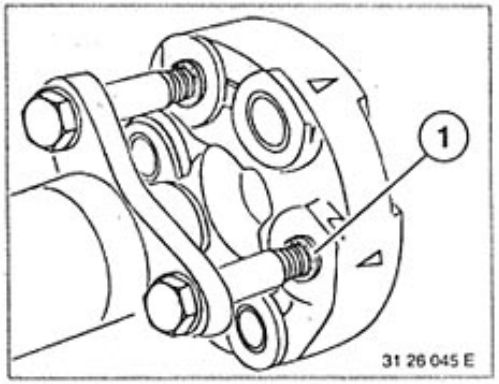


Important!
Never let the propeller shaft fall into the joints. This would lead to damaging the rubber cover of a constant velocity joint in particular.



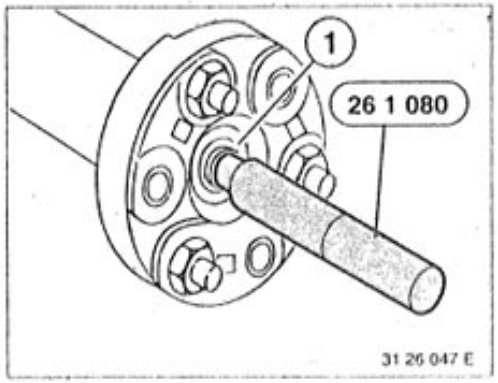
Installation:
Check center (4).
Replace a damaged center.
Coat the center with Molykote Longterm 2 prior to installation.

See Specifications



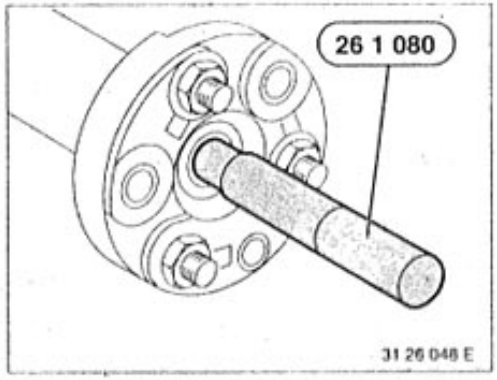
Replace joint disc.

Important!
The joint disc must be installed that the arrows or embossment (1) on the sleeve face the flange arms.
Tightening torque*.

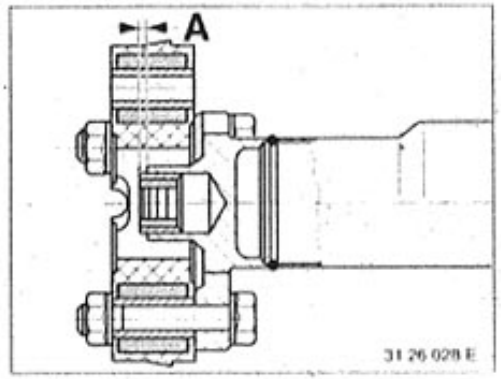


26 11 090 REMOVING AND INSTALLING OR REPLACING CENTER FOR PROPELLER SHAFT

Unscrew propeller shaft at transmission and center mount - refer to 26 11 000.
After unscrewing, suspend front end of propeller shaft from car on a piece of wire and bolt propeller shaft to center mount.
Fill center with viscous grease and drive out using Special Tool 26 1 080.
Pressure on the grease filling will force out center bearing (1).



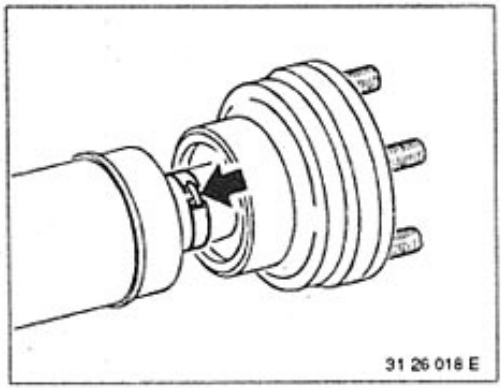
Lubricate center with Molykote Longterm 2 and drive it in using Special Tool 26 1 080.**
The sealing lip faces out.



Protrusion A = 4.2 mm.

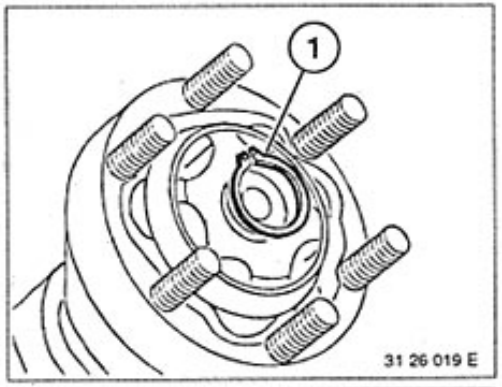
* Refer to Specifications

** Source of Supply: BMW Parts



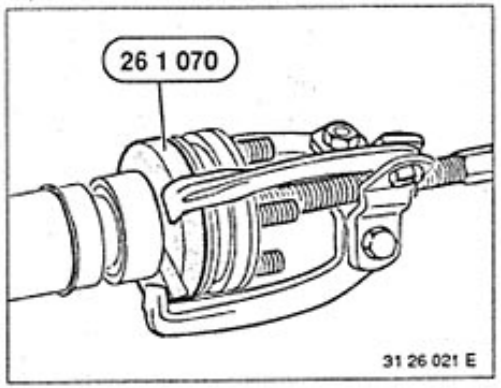
26 11 160 REPLACING CONSTANT VELOCITY JOINT FOR PROPELLER SHAFT

Remove propeller shaft - refer to 26 11 000.
Remove hose clamp.

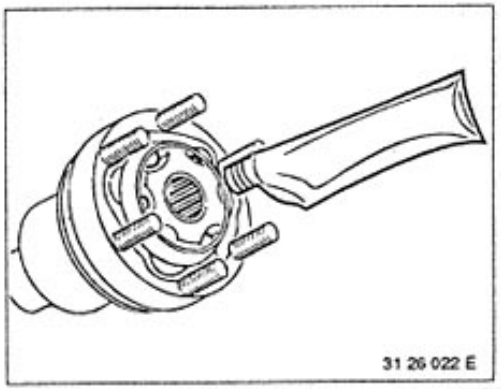


Lift out circlip (1).

Installation:
Replace circlip.

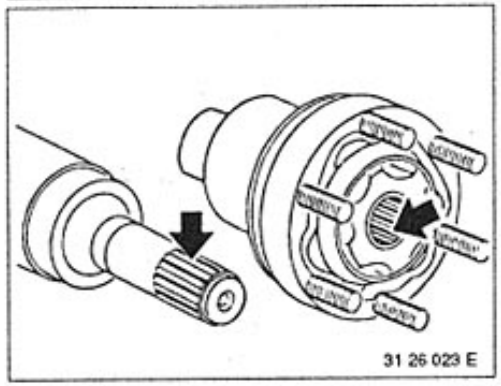


Push back cover.
Apply Special Tool 26 1 070.
Pull off constant velocity joint using a standard puller.



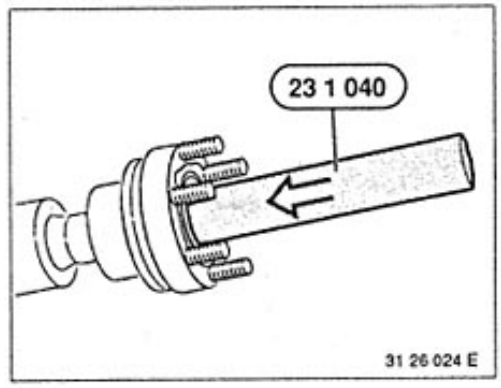
Fill new constant velocity joint with 80 grams of grease**.

Note:
Don't cant the inner race with the cage as the balls would fall out.



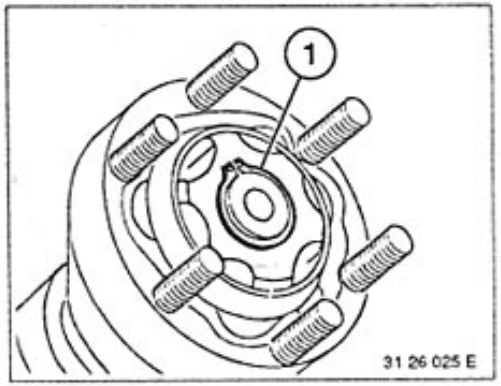
Clean splines to remove grease and then apply a coat of bolt cement**.

Important!
Keep bolt cement out of the ball grooves.



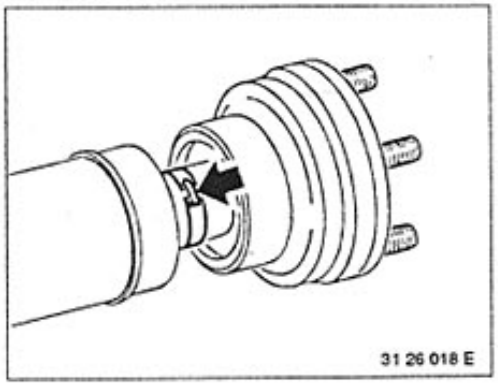
Knock constant velocity joint on to the propeller shaft using Special Tool 23 1 040.

** Source of Supply: BMW Parts



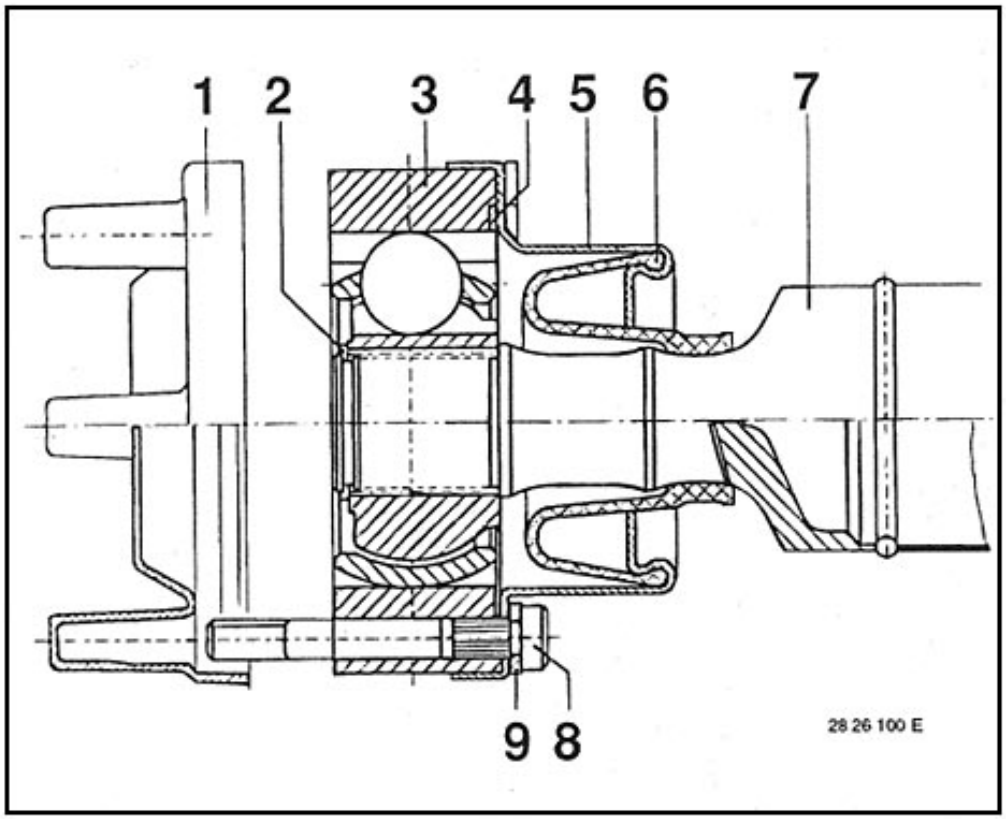
Install circlip (1).

Note:
Check for correct and tight fit.

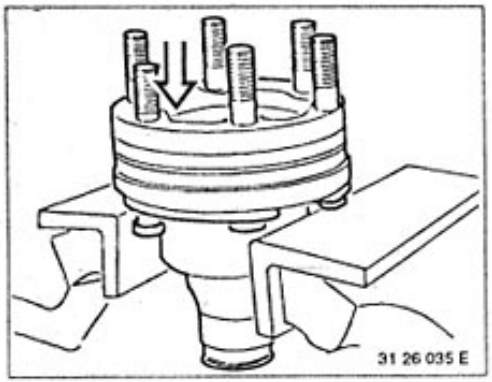


Pull dust cover on to propeller shaft.
Install and tighten hose clamp on the dust cover.

CONSTANT VELOCITY JOINT

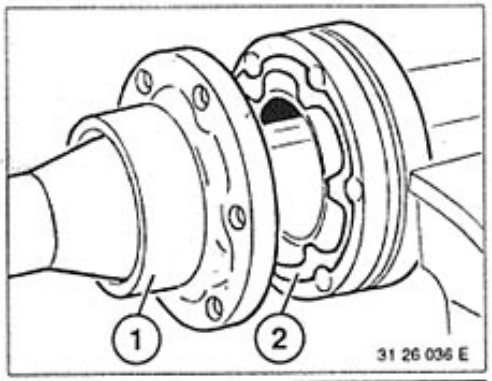


1 Transport cap
2 Circlip
3 Constant velocity joint
4 Gasket
5 End cover
6 Dust cover
7 Propeller shaft
8 Bolt
9 Washer

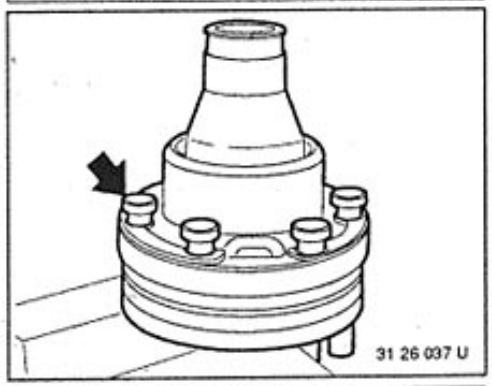


26 11 665 REPLACING DUST COVER
- Constant Velocity Joint Removed -

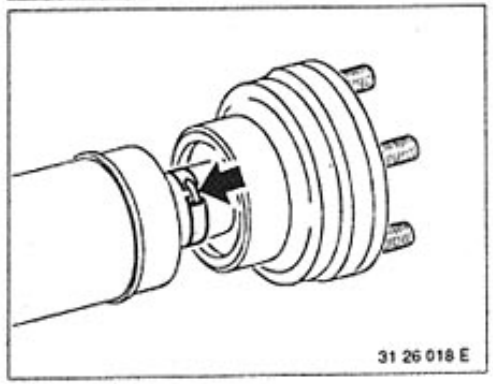
Knock out fillister head bolts using a plastic hammer.
Remove washers.



Pull or knock off end cover (1).
Check gasket (2) between constant velocity joint and end cover.
Check / correct grease filling*.

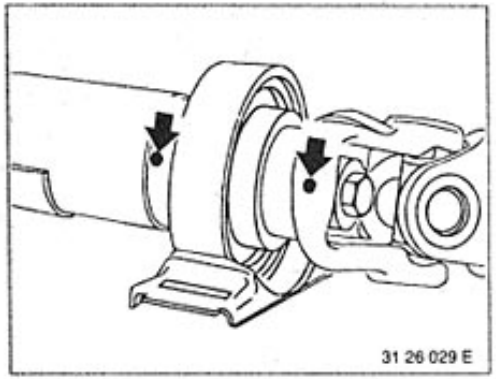


Mount new end cover with dust cover on propeller shaft or constant velocity joint.
Install washers and fillister head bolts.
Knock in fillister head bolts to fit tight using a plastic hammer.



Pull dust cover onto propeller shaft.
Install and tighten hose clamp on dust cover.

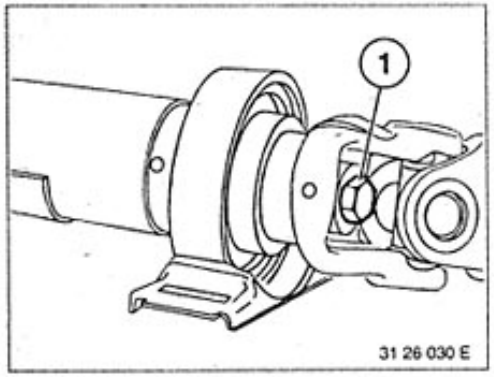
* Refer to Specifications



26 12 001 REPLACING PROPELLER SHAFT CENTER MOUNT ASSEMBLY

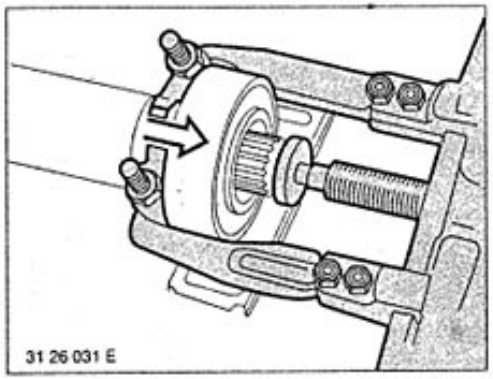
Remove propeller shaft – see 26 11 000.
Mark position of front propeller shaft section to rear propeller shaft section.

Important!
Propeller shaft was balanced in assembled state so that propeller shaft sections must not be turn when installed.

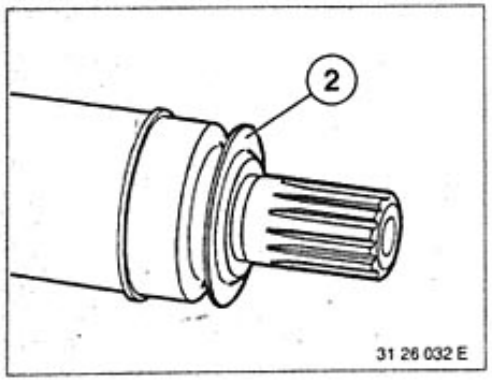


Unscrew bolt (1).
Pull off front propeller shaft section.

Installation:
Assemble propeller shaft that punch marks are opposite each other.
Lock bolt (1) with a bolt cement**.
Tightening torque*.

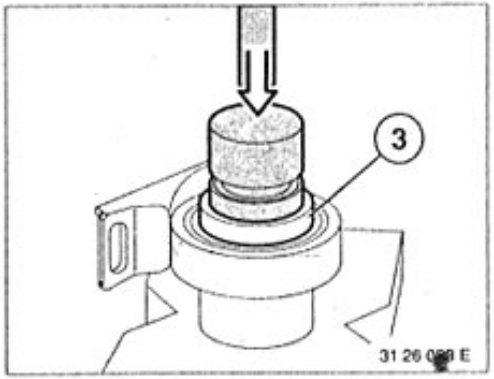


Pull off center mount complete with the grooved ball bearing, using a standard puller.

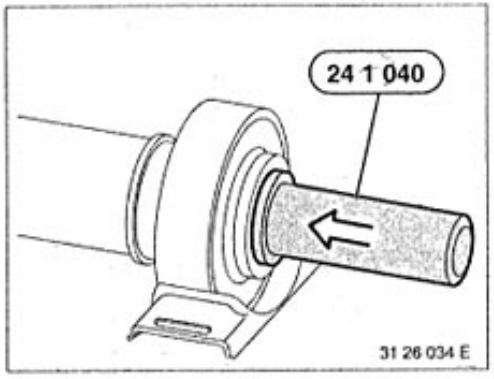


Installation:
Check installed direction of dust cover (2).

* See Specifications
** Source of Supply: HWB



Press grooved ball bearing (3) into center mount.



Knock in center mount bearing with Special Tool 24 1 040.

Important!
Check for free movement of the center mount bearing.

26 12 011 REPLACING GROOVED BALL BEARING IN PROPELLER SHAFT CENTER MOUNT

Contained in "Replacing Propeller Shaft Center Mount Assembly" – see 26 12 001.

26 12 500 CHECKING PRELOAD OF PROPELLER SHAFT CENTER MOUNT

Contained in "Removing and Installing Propeller Shaft" – see 26 11 000.

TROUBLESHOOTING PROPELLER SHAFT

Condition	Cause	Correction
Drumming noise from non-moving car	a) Propeller shaft without influence.	a) Check engine tuning, remove tension in exhaust assembly.
Vibration when moving off in forward or reverse (center mount knocks through)	a) Propeller shaft not aligned precisely.	a) Align propeller shaft – see 26 00 030.
	b) Runout on centering pin, transmission or final drive flanges.	b) Check runout* of centering pin and flanges with a dial gage. Align/replace final drive flange.
	c) Center mount rubber damaged.	c) Replace center mount – see 26 12 011.
	d) Universal joint worn or seized.	d) Check clearance and movement, replacing propeller shaft if necessary – see 26 11 000.
	e) Engine/transmission suspension not okay.	e) Check and align or replace mounts.
	f) Joint disc rubber damaged.	f) Replace joint disc – see 26 11 051.
Vibration at 40 ... 50 km/h (25 ... 30 mph)	a) Propeller shaft not aligned precisely.	a) Align propeller shaft – see 26 00 030.
	b) Runout on centering pin, transmission or final drive flanges.	b) Check runout* of centering pin and flanges with a dial gage. Align/replace final drive flange.
	c) Center mount rubber damaged.	c) Replace center mount – see 26 12 011.
	d) Universal joints worn or seized.	d) Check clearance and movement, replacing propeller shaft if necessary – see 26 11 000.
	e) Joint disc rubber damaged.	e) Replace joint disc – see 26 11 051.

* See Specifications

TROUBLESHOOTING PROPELLER SHAFT

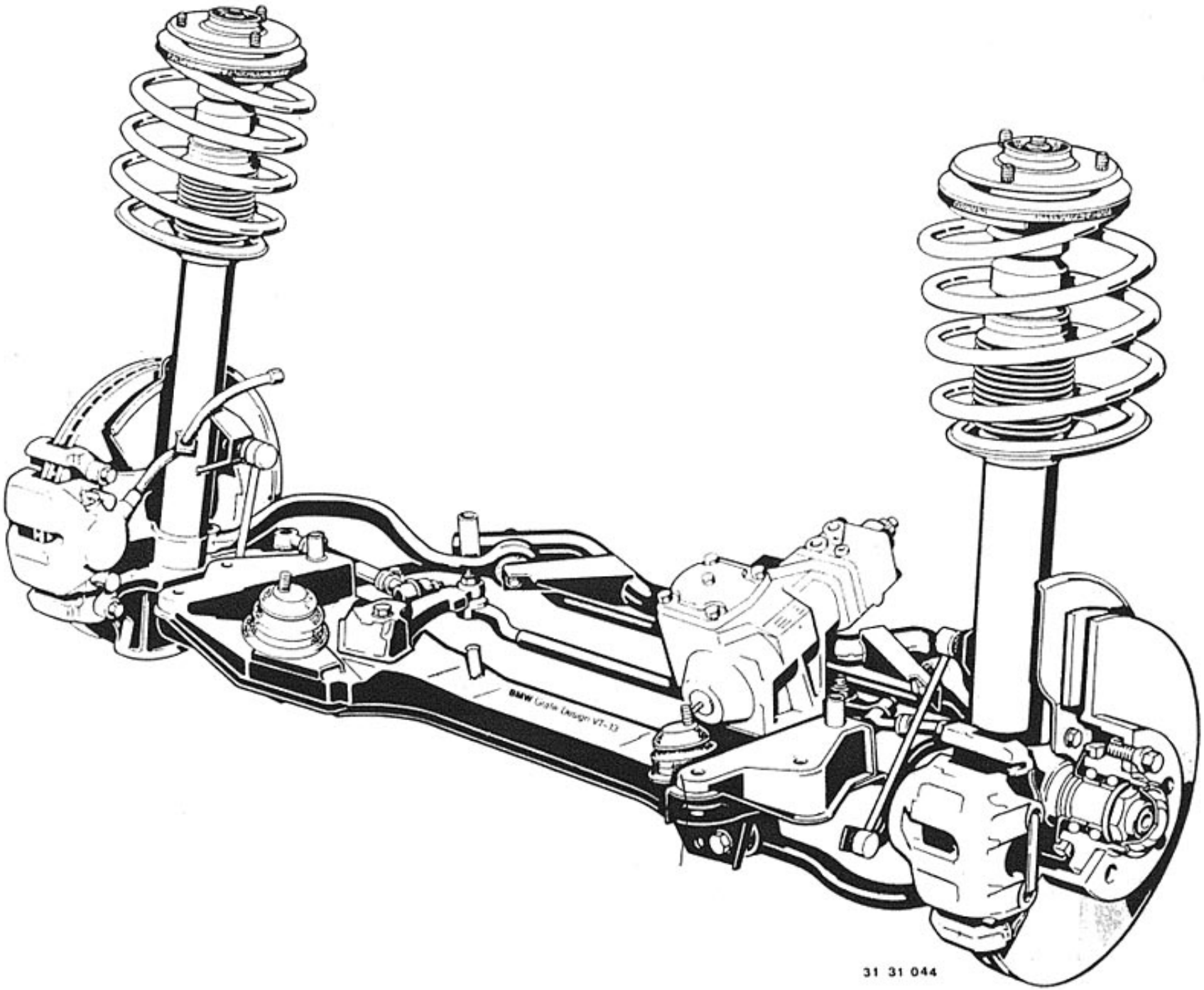
Condition	Cause	Correction
Drumming noise from 60 km/h (35 mph) on	a) Propeller shaft not aligned precisely or installed with tension.	a) Align propeller shaft – see 26 00 030.
	b) Center bearing damaged.	b) Replace center – see 26 11 501.
	c) Runout on centering pin, transmission or final drive flanges.	c) Check runout* of centering pin and flanges with a dial gage. Align/replace final drive flange.
	d) Offcenter due to worn flange bores (loose bolts).	d) Replace transmission or final drive flange.
	e) Excessive propeller shaft imbalance; balance plates missing.	e) Check clearance and movement, replacing propeller shaft if necessary – see 26 11 000.
	f) Universal joints worn or seized.	f) Check clearance and movement, replacing propeller shaft if necessary – see 26 11 000.
Center mount loud while operating car	a) Center mount not perpendicular to propeller shaft; no or insufficient preload	a) Align center mount to be perpendicular to propeller shaft; preload forward by 2 ... 4 mm (0.079 ... 0.157").
	b) Center mount grooved ball bearing not okay.	b) Replace grooved ball bearing – see 26 12 011.

* See Specifications

31 Front axle

	Front axle suspension layout	31- 0/1
	Layout of struts and control arms	31- 0/2
	Layout of struts and control arms, version with reinforcement cross	31- 0/3
31 10 000	Front axle, complete – remove and install	31-10/1
31 11 001	Front axle carrier – replace	31-11/1
31 12 001	Control arm, left or right – replace	31-12/1
090	Traction strut, left or right – remove and install or replace	31-12/2
147	Rubber mount on traction strut – replace	31-12/3
31 21 180	Bearing (wheel hub) for front wheel – replace	31-21/1
	Layout of spring strut shock absorber	31-31/1
31 31 000	Spring strut shock absorber, front, left or right, complete – remove and install	31-31/2
031	Spring strut shock absorber, front, left or right – replace	31-31/3
31 33 001	Spring strut shock absorber, front thrust bearing, left or right – replace	31-33/1
100	Coil spring for spring strut shock absorber, front, left or right – remove and install or replace	31-33/1
31 35 000	Stabilizer, front – remove and install or replace	31-35/1
	Front axle – troubleshoot	31-90/1
	Shock absorber – troubleshoot	31-90/3

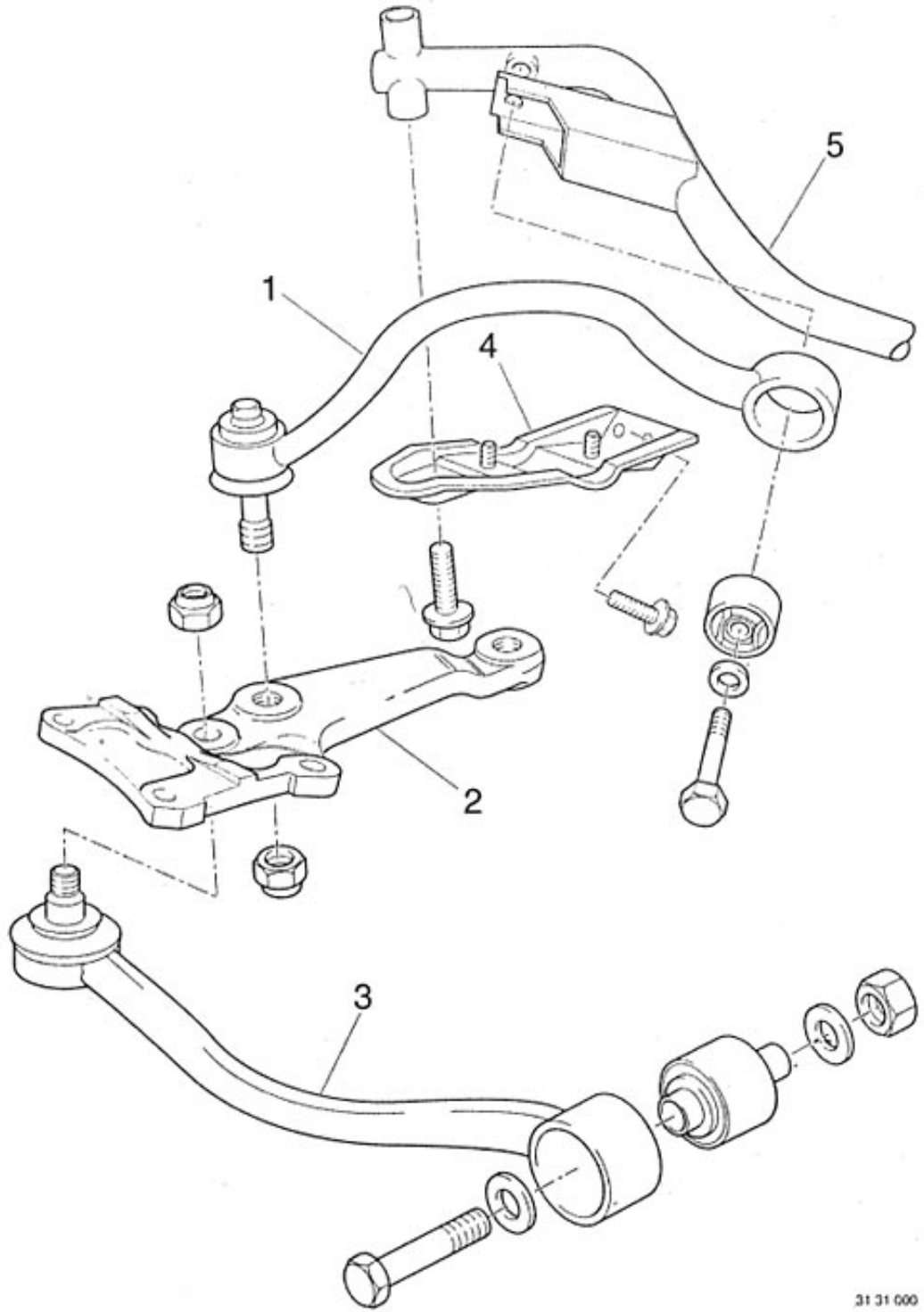
FRONT AXLE LAYOUT DRAWING



31 31 044

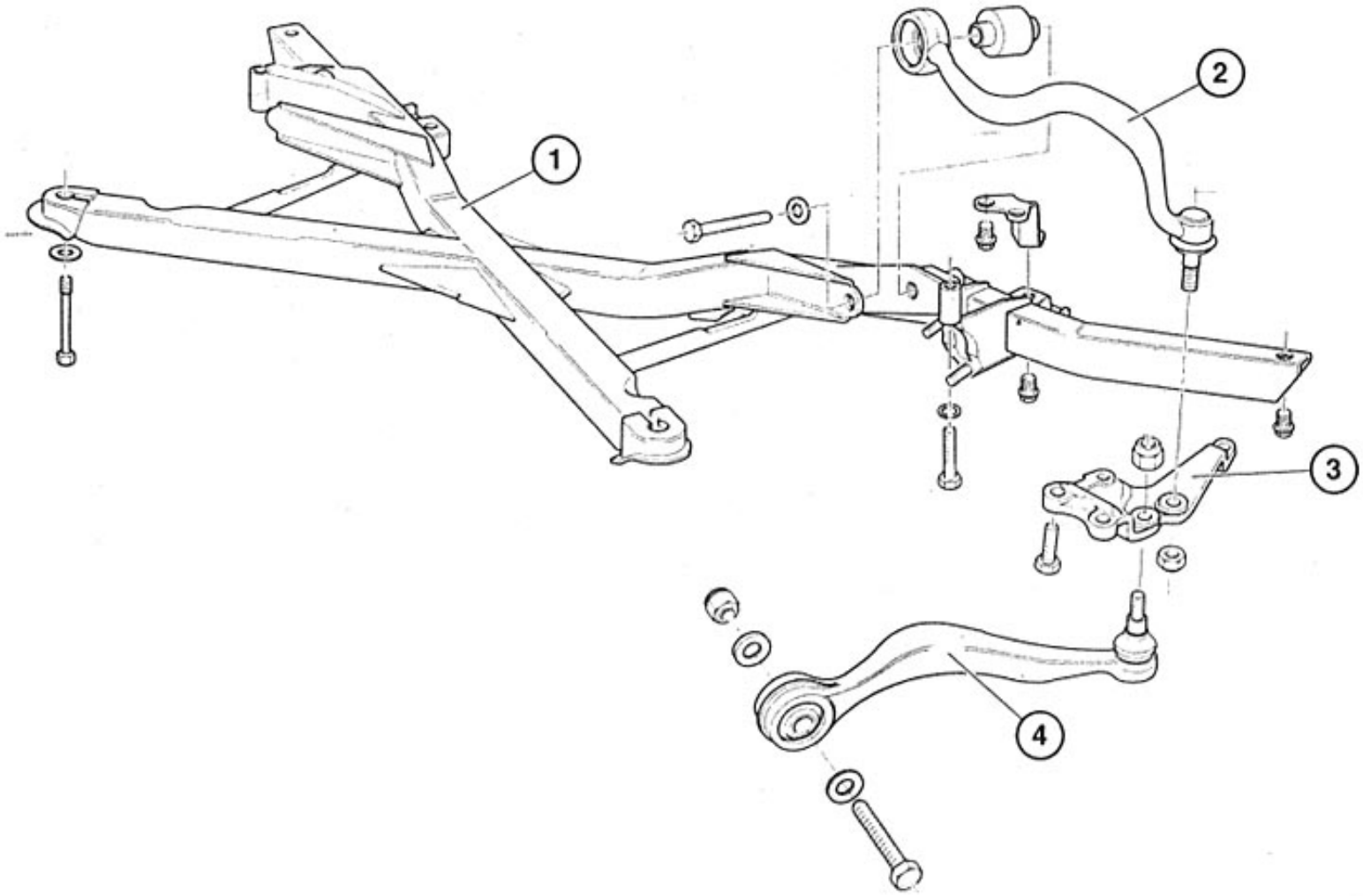
LAYOUT DRAWING OF STRUTS AND ARMS

1 Thrust strut
2 Tie rod arm
3 Control arm
4 Support
5 Connecting pipe



LAYOUT DRAWING OF STRUTS AND ARMS (Version with Reinforcement Cross)

1 Reinforcement cross
2 Thrust strut
3 Tie rod arm
4 Control arm

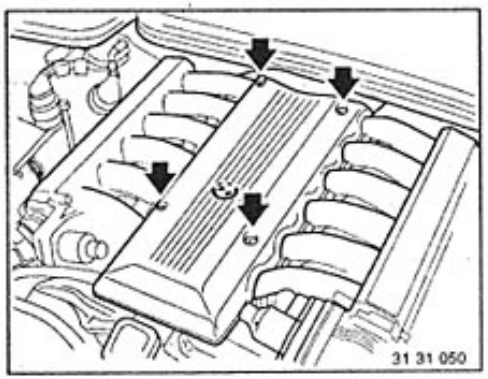


31 31 054

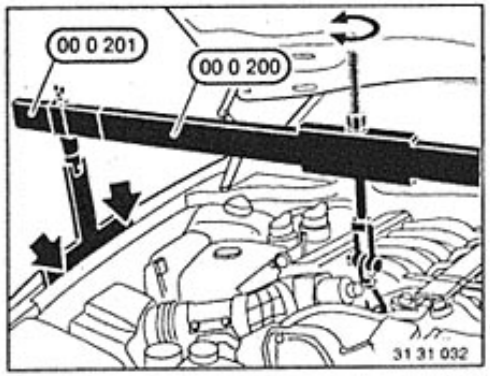
31 10 000 REMOVING AND INSTALLING FRONT AXLE ASSEMBLY

Unscrew brake calipers (pipes remain connected) - refer to Group 34.
Unscrew ABS pulse senders - refer to Group 34.
Disconnect EDC wire - refer to Group 37.

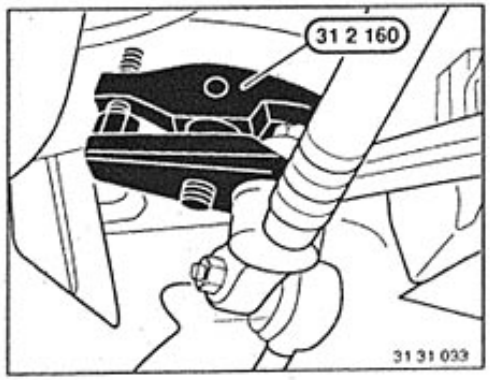
Note:
Check and adjust wheel alignment after installation of the front axle - refer to Group 32.



Unscrew cover.



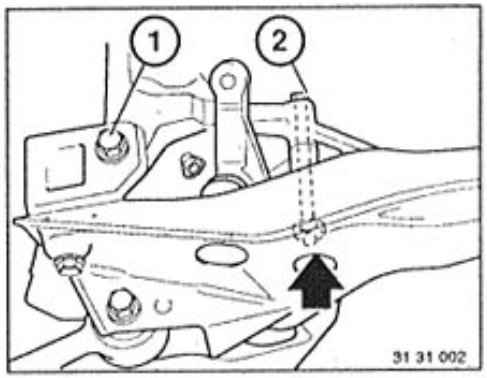
Suspend engine from Special Tools 00 0 200 and 00 0 201.
Supports must bear on the bolts of both side panels.



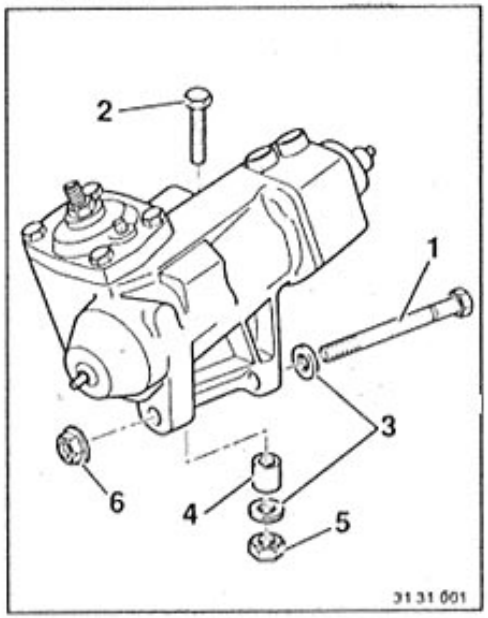
Unscrew nut.
Press tie rod off of the steering drop arm using Special Tool 31 2 160.

Installation:
Replace self-locking nut.
Tightening torque*.

* Refer to Specifications

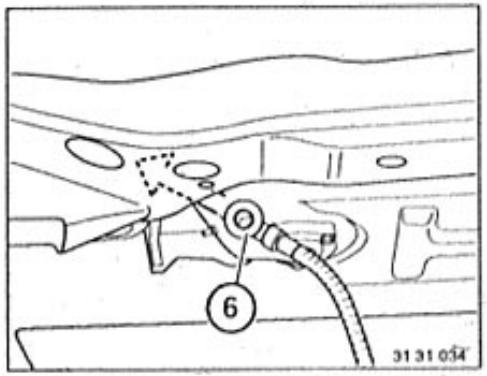


Unscrew bolts (1 and 2).
Suspend steering gear from car — pipes remain connected.



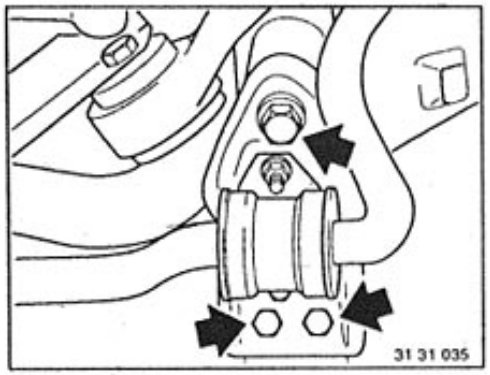
Installation:
1 Bolt
2 Bolt (only use 10.9 strength class)
3 Washer
4 Sleeve
5 Nut (replace)
6 Nut with washer (replace)

Tightening torque*.



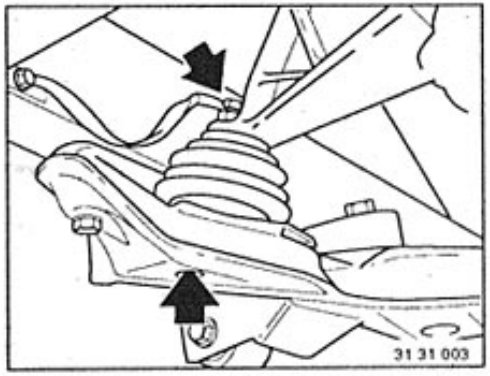
Installation:
Install nut (6) using a flexible magnetic lifter.

* Refer to Specifications



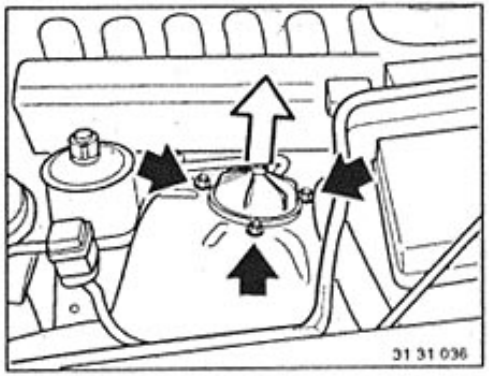
Unscrew left and right bolts.

Installation:
Tightening torque*.



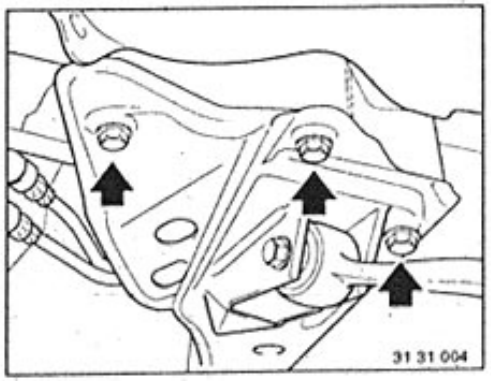
Unscrew left and right engine mounts on front axle.
Also unscrew right engine mount at top.

Installation:
Tightening torque*.



Take off cap.
Unscrew left and right nuts.

Installation:
Replace self-locking nuts.
Tightening torque*.

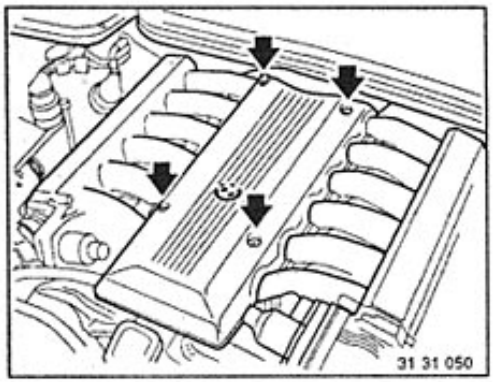


Place garage jack underneath front axle carrier.
Unscrew left and right bolts and lower the front axle slowly.

Important!
Spring struts must not fall out or down – this would damage the ball joints.

Installation:
Tightening torque*.

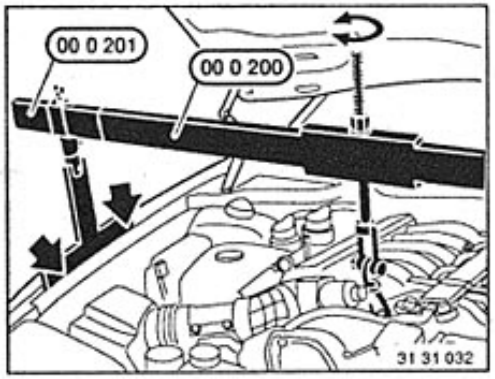
* See Specifications



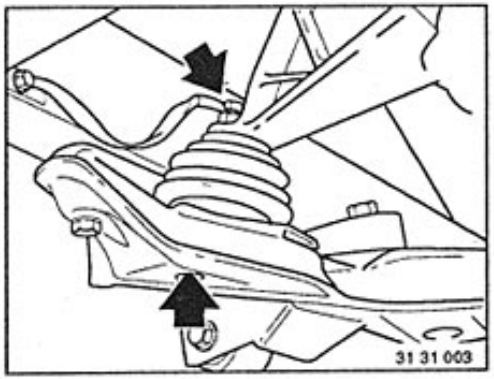
31 11 001 REPLACING FRONT AXLE CARRIER

Note:
The steering drop arm must be adjusted (refer to Group 32) after installation of a new front axle carrier.
Check and adjust wheel alignment after installation of the front axle - refer to Group 32.

Unscrew cover.

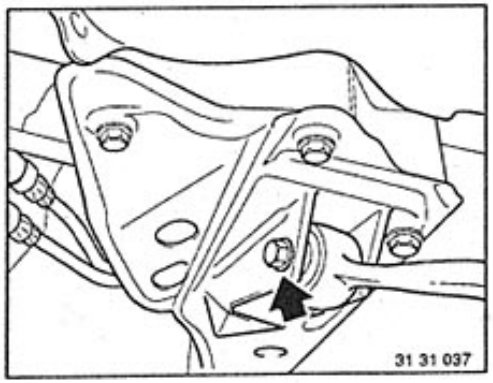


Suspend engine from Special Tools 00 0 200 and 00 0 201.
Supports must bear on the bolts of both side panels.



Unscrew left and right engine mounts at the front axle carrier.
Also unscrew right engine mount at top.

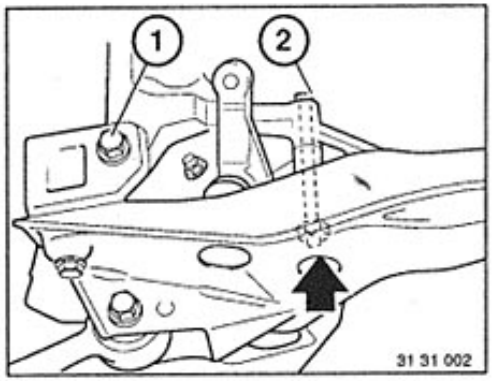
Installation:
Tightening torque*.



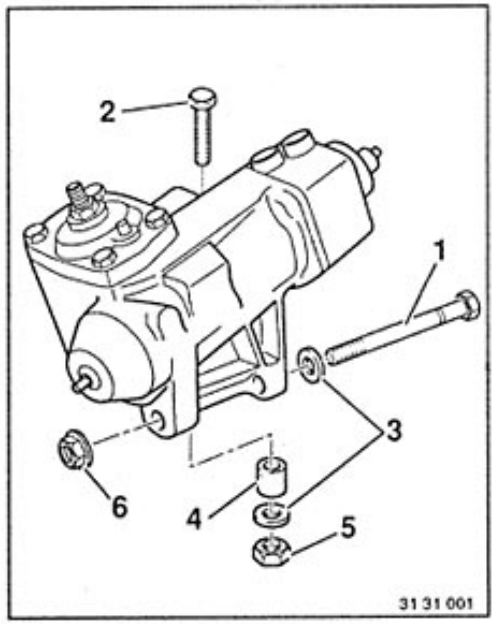
Unscrew left and right control arms.

Installation:
Replace self-locking nuts.
Use washers on both sides.
Tightening torque*.

* **Refer to Specifications**

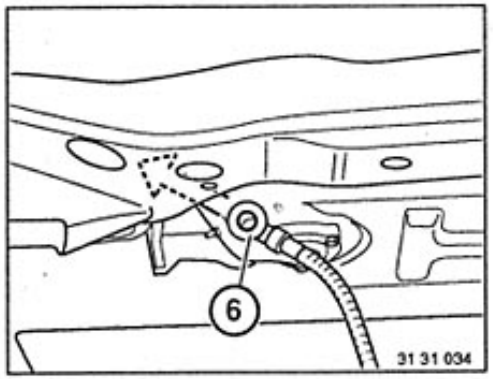


Unscrew bolts (1 and 2).
Suspend steering gear from car — pipes remain connected.



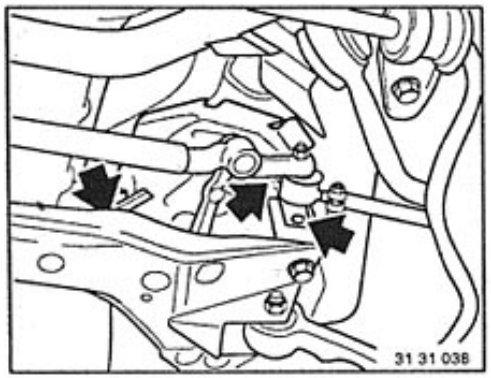
Installation:
1 **Bolt**
2 **Bolt (only use 10.9 strength class)**
3 **Washer**
4 **Sleeve**
5 **Nut (replace)**
6 **Nut with washer (replace)**

Tightening torque*.

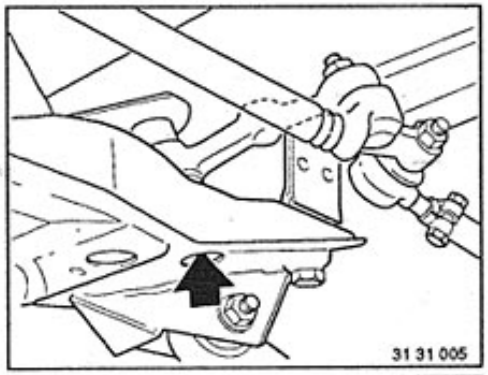


Installation:
Install nut (6) using a flexible magnetic lifter.

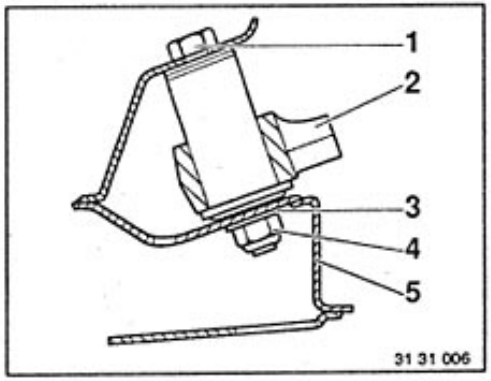
* **Refer to Specifications**



Unscrew heat shield.



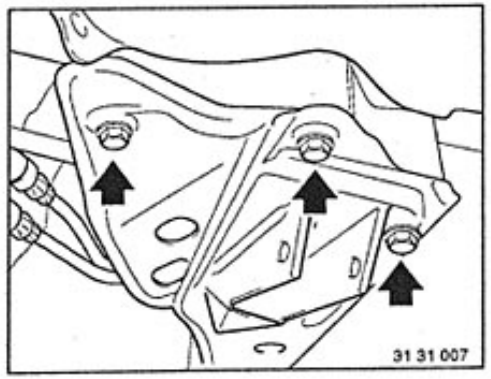
Unscrew steering guide arm.



Installation:

1 Bolt
2 Steering guide arm
3 Washer
4 Self-locking nut
5 Front axle carrier

Replace self-locking nut.
Tightening torque*.



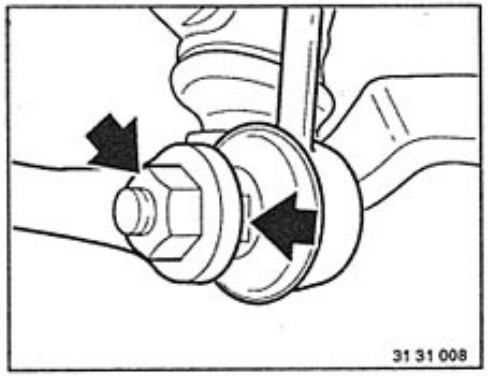
Unscrew left and right bolts and take off front axle carrier.

Installation:
Tightening torque*.

* See Specifications

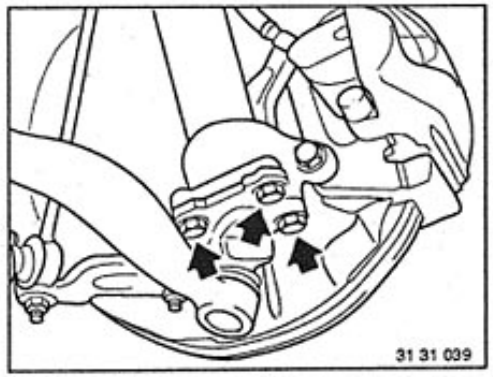
31 12 001 REPLACING LEFT OR RIGHT CONTROL ARM

Remove front wheel - refer to Group 36.



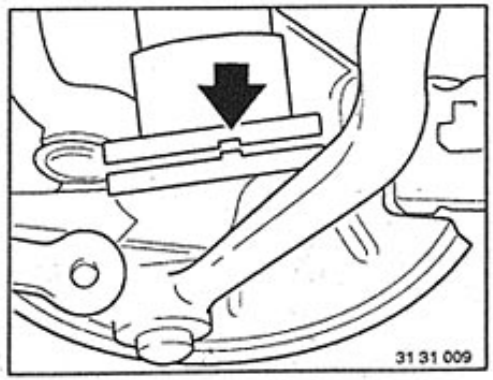
Unscrew thrust rod at stabilizer, while counterholding with a fork wrench.

Installation:
Wrench surface on ball head must be parallel to the absorber axis.
Tightening torque*.



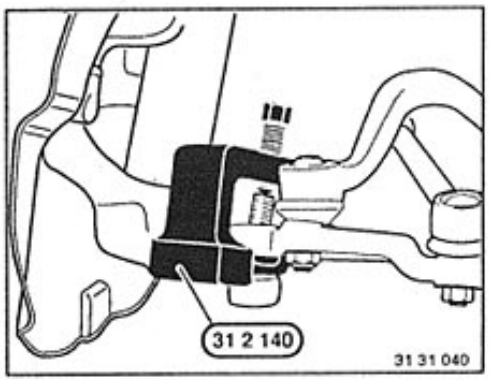
Unscrew bolts.

Installation:
Clean threads of bores and bolts.
Install bolts with bolt cement**.
Tightening torque*.



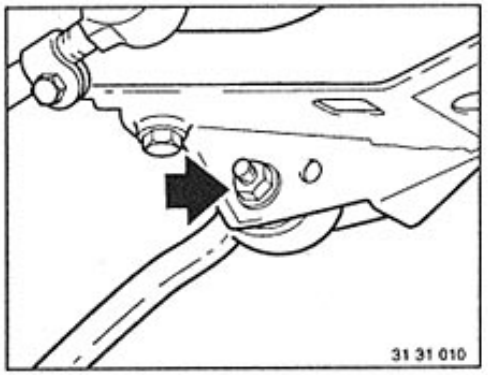
Check for correct installed position.

* Refer to Specifications
** Source of Supply: BMW Parts



Unscrew nut.
Pry off ball joint using Special Tool 31 2 140.

Installation:
Remove grease from ball pin and bore.
Replace self-locking nut.
Tightening torque*.



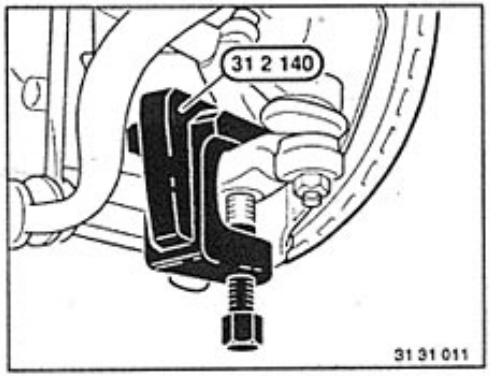
Unscrew bolt.

Installation:
Use washers on both sides.
Replace self-locking nut.
Tightening torque*.

* Refer to Specifications

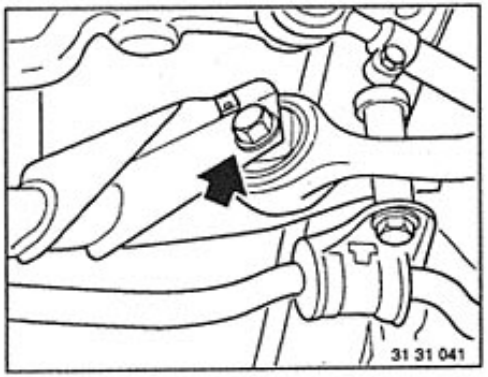
31 12 090 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT THRUST STRUT

Remove front wheel – see Group 36.



Unscrew nut.
Pry off ball joint with Special Tool 31 2 140.

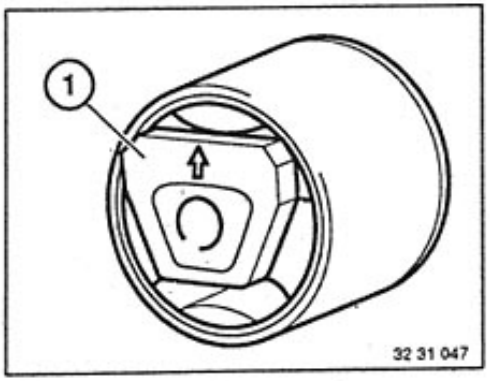
Installation:
Remove grease from ball pin and bore.
Replace self-locking nut.
Tightening torque*.



Unscrew heat shield if necessary.
Unscrew thrust strut.

Installation:
Use washer.
Replace self-locking nut.
Tightening torque* for car in normal position*.

Important!
Thrust strut mounts must always be installed or replaced in pairs.



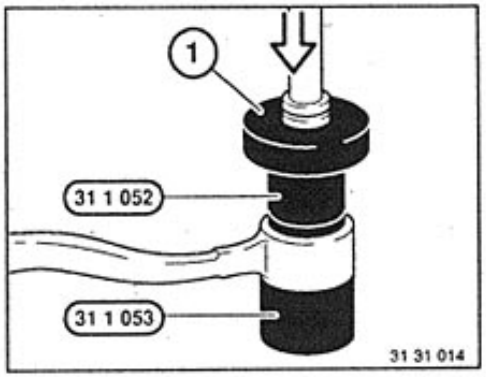
Note:
Hydraulic thrust strut mounts – recognized on plastic clip (1) – cannot be checked.
Both mounts must be replaced is fluid is running out of a hydraulic mount.

* See Specifications

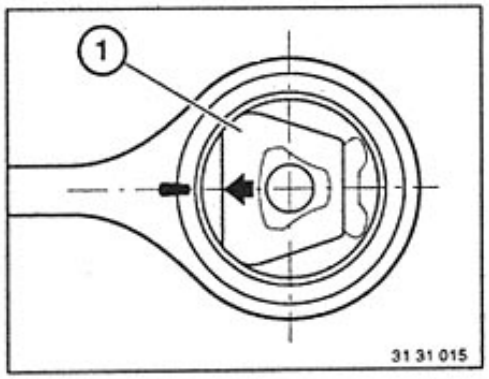
31 12 147 REPLACING THRUST STRUT RUBBER MOUNTS

Always replace both mounts!

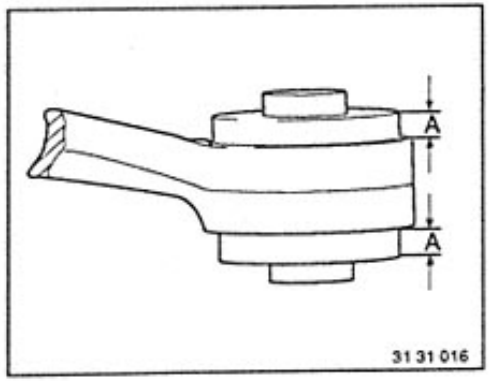
Remove thrust strut – see 31 12 090.



Press rubber mounts out (and in) on a press with Special Tools 31 1 052 / 053 and thrust pad (1).



Installation:
Remove grease from rubber mounts and thrust strut bore.
Arrow on plastic clip (1) faces mark on thrust strut.
Special tool must bear on the mount outer sleeve while pressing in.

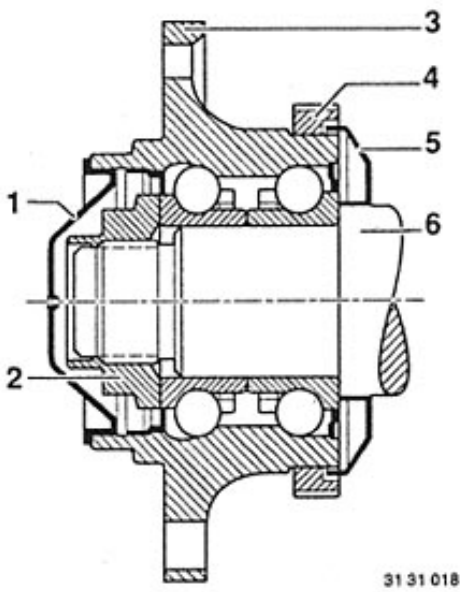


Installation:
Protrusion (A) equal on both sides.

31 21 180 REPLACING BEARINGS (WHEEL HUB) FOR FRONT WHEEL

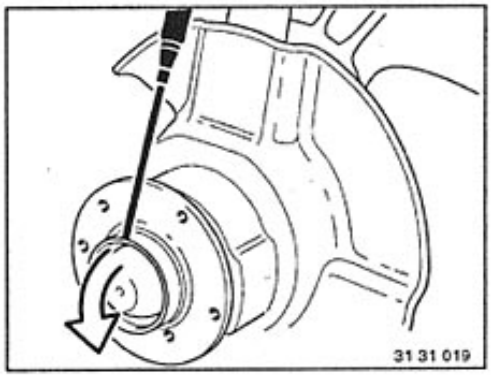
Important!
Never reuse bearing unit after removal.

Unscrew brake disc (line remains connected) – see Group 34.

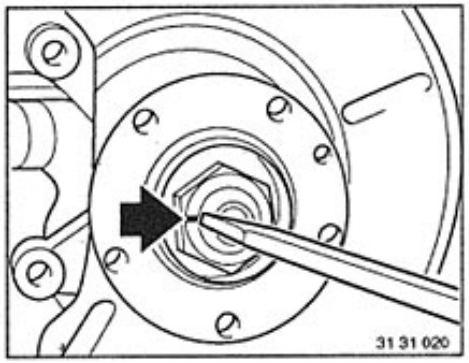


Wheel Bearings:

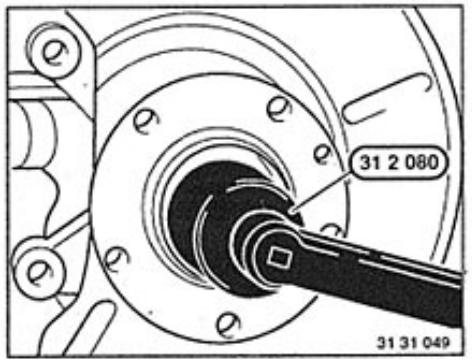
1 Grease cap
2 Collar nut
3 Bearing unit
4 Pulse gear
5 Dust cover
6 Stub axle



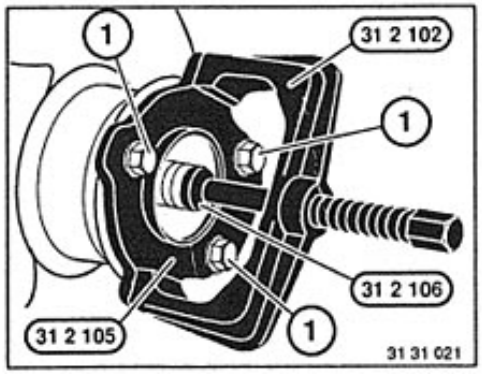
Pry off grease cap with a screwdriver.
Never reuse cap!



Chisel off lock of collar nut.

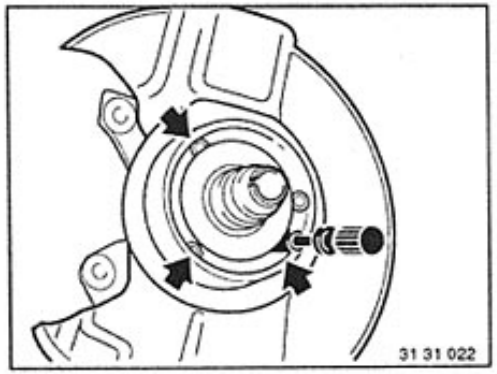


Unscrew nut with Special Tool 31 2 080.
Never reuse nut!

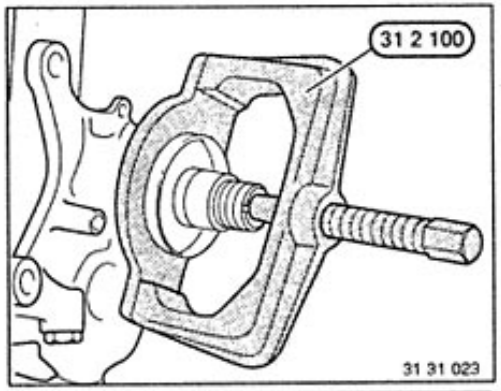


Pull off bearing unit with Special Tools 31 2 102 / 105 / 106 and wheel bolts (1).

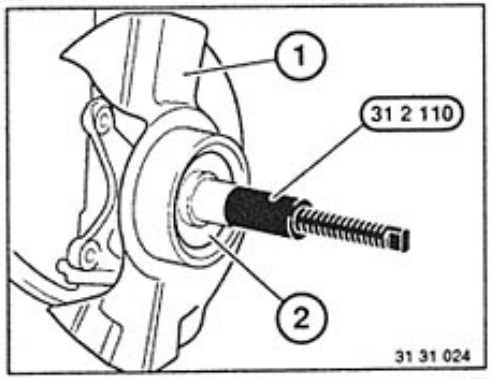
Never reuse bearing unit!



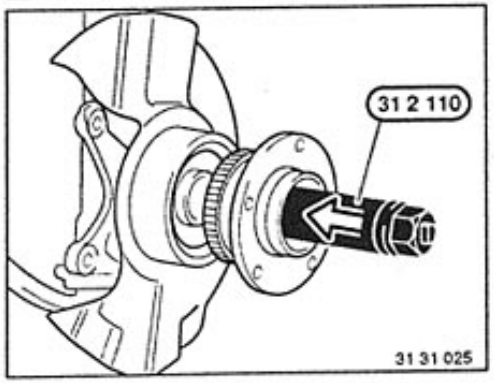
If bearing inner race remains on the stub axle, bend dust cover, insert wrench key and unscrew guard.



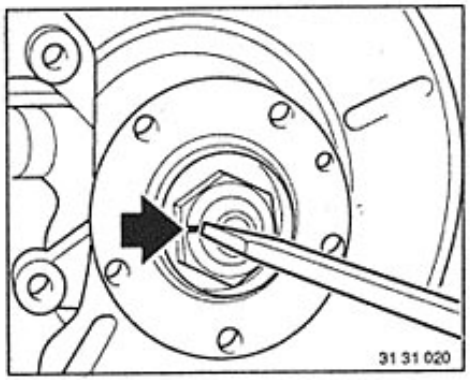
Pull off bearing inner race and dust cover using Special Tool 31 2 100.



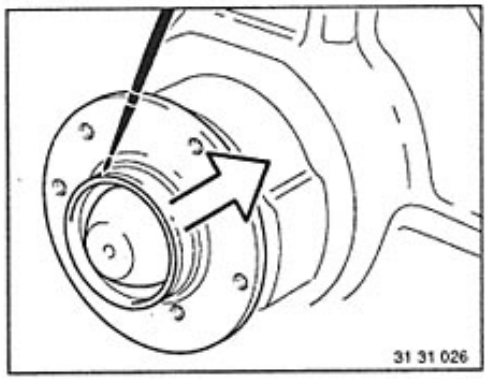
Screw on guard (1).
Install new dust cover (2).
Screw on Special Tool 31 2 110 whole length of threads.



Slide and pull on new bearing unit using Special Tool 31 2 110.



Screw on new collar nut to correct tightening torque* and lock by punching.

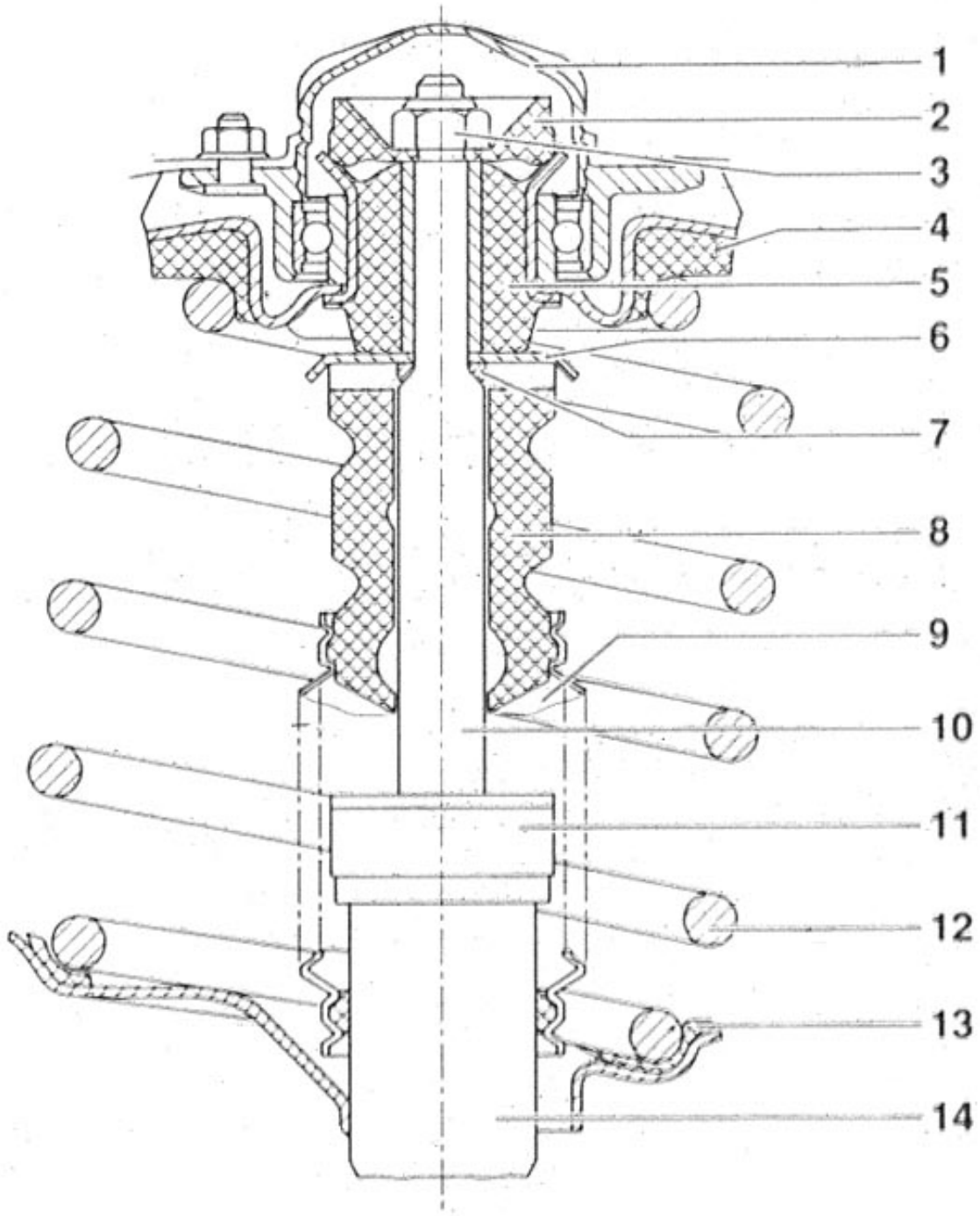


Install new cap with sealing compound**.

* Refer to Specifications
** Source of Supply: BMW Parts

SPRING STRUT ASSEMBLY DRAWING

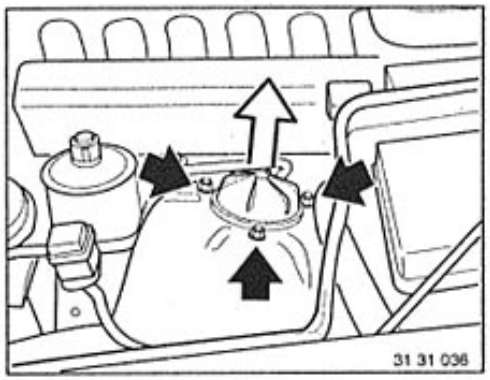
1 Cap
2 Stop washer
3 Nut
4 Upper spring ring
5 Mount
6 Support
7 Ring for hollow piston rod
8 Rubber damper
9 Dust cover
10 Shock absorber
11 Screw-on ring
12 Coil spring
13 Lower spring ring
14 Spring strut



31 31 028

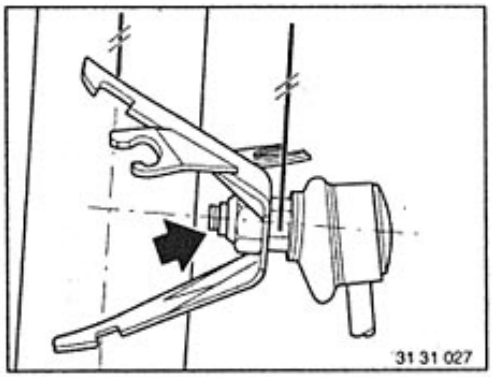
31 31 000 Removing and installing complete front left or right spring strut shock absorber

Remove brake caliper (line remains connected), refer to Gr. 34.
Remove ABS impulse sensor, refer to Gr. 34.
EDC – disconnect line, refer to Gr. 37.



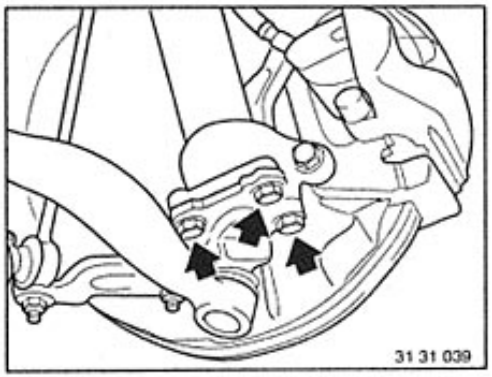
Lift off cap.
Support spring strut shock absorber.
Remove spring strut shock absorber support bearing from wheel arch.

Installation:
Replace self-locking nut.
Tightening torque*.



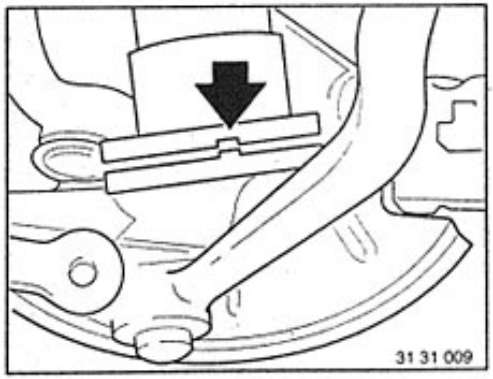
Unfasten stabilizer pressure rod – brace with open-end wrench.

Installation:
Wrench face on ball pin parallel to damper shaft.
Replace self-locking nut.
Tightening torque*.



Unfasten screws.

Installation:
Clean thread in bore and on screws.
Secure screws with screw cement**.
Tightening torque*.



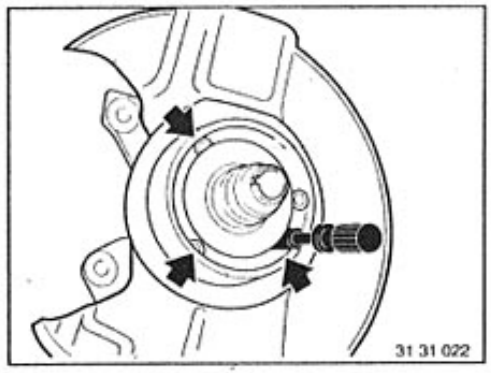
Ensure unit is correctly installed.

* Refer to Technical Data
** Source of Supply: BMW Parts Service

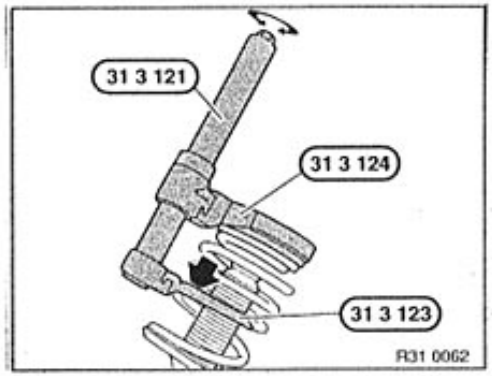
31 31 031 Replacing left or right front spring strut shock absorber

Note:
The shock absorber and spring strut form one unit and cannot be replaced separately.

To know whether a spring strut shock absorber has to be replaced, it must either be checked installed with a Shock Tester or removed and checked in a shock absorber testing machine.
Also refer to Service Information bulletin 37 01 92 (502).

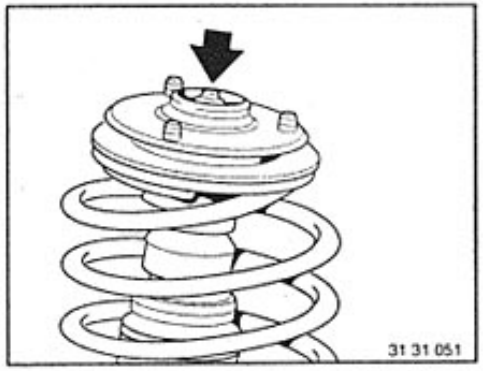


Only remove bearing (wheel hub) from front wheel 31 21 180 if dust shield is to be reused.

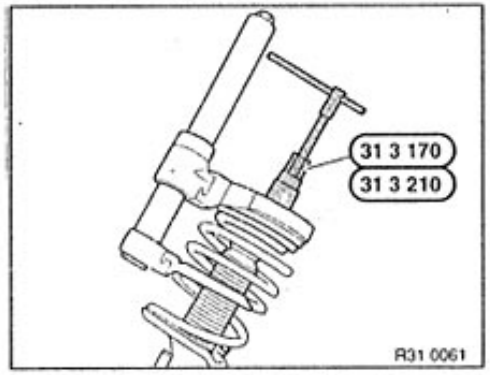


Coil spring with special tool 31 3 121/ 123/ 124.

Caution!
Lowest coil of spring must be securely mounted in tool and thrust bearing should be flush.

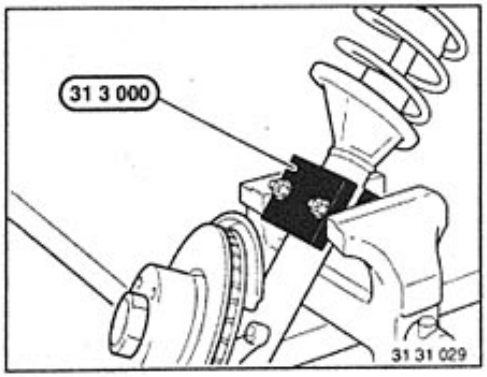


When replacing a spring strut, always fit a new spring strut with the same designation (K) (color spot).



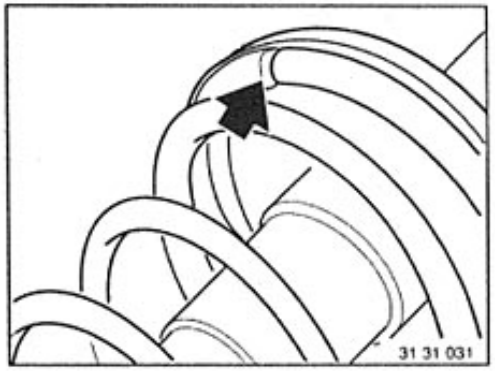
Unscrew and remove self-locking nut with special tool 31 3 170/210 and brace piston rod.

Installation:
Replace self-locking nut.
Tightening torque*.



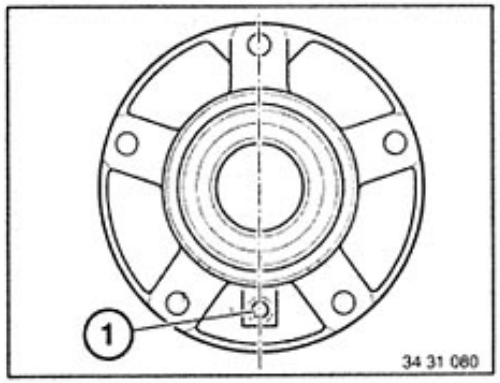
Removing and installing a spring strut 31 31 000.
Grip spring strut shock absorber in vise with special tool 31 3 000.

* Refer to Technical Data



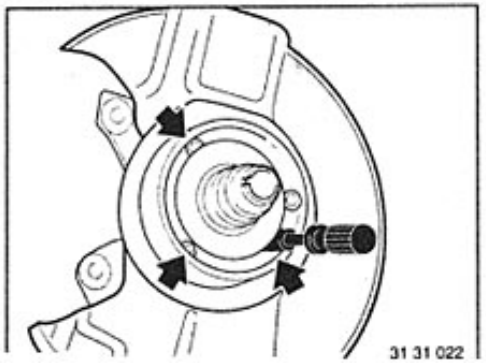
Remove coil spring and additional spring from spring strut shock absorber.
Fit the parts removed to the new spring strut shock absorber.

Installation:
Note configuration, see Page 31 - 31/1.
Check spring mount at top and bottom, also collar and auxiliary spring, replacing if necessary.
The end of the coil spring must contact the stop in the lower plate spring.



Caution!
On vehicles constructed before introduction of the standard wheel bearing, not only the spring strut shock absorber has to be replaced: also replace parts indicated in Parts Microfilm.

The standard wheel bearing can be identified by the bore (1) in the center for securing the brake disks.



Fit protective plate and new bearing (wheel hub) to front wheel 31 21 180.

After assembly, align front axle if necessary.

* Refer to Technical Data

31 33 001 Replacing left or right front spring strut shock absorber thrust bearing

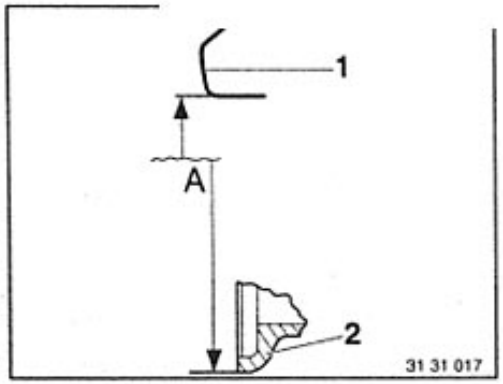
Operation identical to replacing spring strut shock absorber: 31 31 031.

31 33 100 Removing and installing or replacing coil spring for left or right front spring strut shock absorber

Operation identical to replacing spring strut shock absorber: 31 31 031.

Caution!
On one axle, only fit springs in pairs with the same BMW no. (1) (located on end of spring).

Allocation of springs by vehicle model and, if applicable, special equipment, e.g. air-conditioning, sports, ... and date of introduction - refer to Parts Microfilm.



- Move vehicle into normal position*.
- Determine actual ride level setting (A) – measurement from lower edge of wheel arch (1) to rim flange (2) at height of wheel centre. Obtain mean value in each case after raising and lowering the vehicle body on each wheel and calculating a mean value for each axle.
- Determine any difference from nominal ride level setting*.
- Identifying which spring is installed – refer to 31 33 100.
- Determine correction spring from table. Figures indicate the difference in ride level setting (nominal values mm) between each of the different springs.

Example:

The vehicle is equipped with coil spring BMW No. 1 137 954 and is 6 mm too low – possibly because of a high proportion of custom items. By installing spring with BMW No. 1 137 955, the nominal ride level setting is achieved.

Note:
It is no longer possible to perform an additional correction of ride level by inserting springs of different thicknesses.

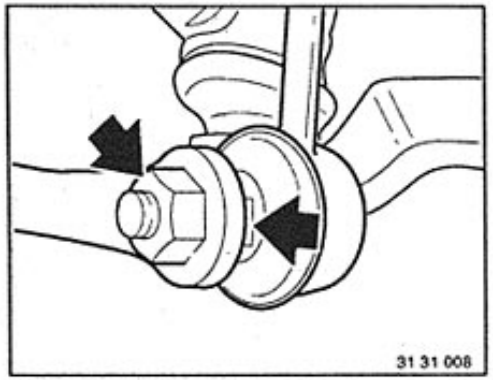
Table for Serie 840i, 850i, and EDC III ab 4/92:

A	Equipment after correction
B	Equipment when delivered
a	Raised suspension
b	Lowered suspension

*Refer to Technical Data

Table for EDC III
850i until 4/92:

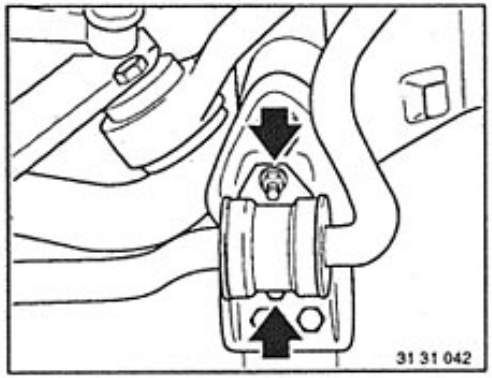
Explanation, refer to pages 31- 33/2



31 35 000 REMOVING AND INSTALLING FRONT STABILIZER

Unscrew left and right thrust struts.

Installation:
Wrench surface on ball pin must be parallel to the absorber axis.
Replace self-locking nut.
Tightening torque*.



Unscrew left and right nuts.
Take off stabilizer.

See Specifications

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Grinding noise (louder in curves)	a) Wheel bearings faulty	a) Replace wheel bearings
Vibration	a) Imbalance of wheels	a) Balance wheels
	b) Lateral and radial runout of rims	b) Replace rims, if necessary
	c) Radial runout of tires	c) Match or replace tires
Steering wheel shake	a) Imbalance of wheels	a) Balance wheels
	b) Radial and lateral runout of rims	b) Replace rims, if necessary
	c) Shock absorbing effect insufficient	c) Replace shock absorbers
	d) Thrust strut mounts faulty	d) Replace thrust strut mounts
	e) Wrong thrust strut mounts installed	e) Replace thrust strut mounts
	f) Steering gear play excessive	f) Adjust pressure point
Rattling noise	a) Shock absorber cartridge in spring strut loose	a) Tighten screw-on ring (inspect threads)
	b) Ball joint on control arm worn	b) Replace control arm
	c) Ball joint on thrust strut worn	c) Replace thrust strut
	d) Stabilizer rubber mounts worn	d) Replace rubber mounts
	e) Ball joints of thrust rod worn	e) Replace thrust rod
	f) Front axle carrier mounted loose on body	f) Tighten (inspect threads)

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Body swing long time after driving on rough road	Shock absorbing effect insufficient (see "Troubleshooting Shock Absorbers" on page 31-90/3)	Replace shock absorbers
Body wip when driving over successive rough road surfaces		
Body rise while accelerating		
Wheel jump even on normal road surfaces		
Car breaking out while braking		
Breaking out (skidding) in curves due to poor track holding		

TROUBLESHOOTING SHOCK ABSORBERS

The condition of shock absorbers can only be checked with a shock absorber tester in car or with a shock absorber testing machine after removal.

Condition	Cause	Correction
Shock absorbers knocking (bottoming)	a) Rubber dampers faulty	a) Check or replace rubber dampers
	b) Shock absorbing effect insufficient	b) Replace shock absorbers
Shock absorber noise	a) Shock absorber cartridge loose	a) Tighten screw-on ring; inspect threads
	b) Installed shock absorbers had been stored laying down with piston rods run in	b) Store shock absorbers standing upright with piston rods run out at room temperature for 24 hours
	c) Shock absorbers faulty	c) Replace shock absorbers
Poor handling	a) Weak shock absorbers	a) Replace shock absorbers
Flat spots on tire treads	a) Shock absorbers faulty	a) Replace shock absorbers

32 Steering and wheel alignment

	Notes	32- 0/1
	General instructions and terms	32- 0/2
32 00 150	Electronic chassis alignment check (with KDS)	32- 0/4
610	Front wheel alignment (with KDS)	32- 0/5
620	Rear wheel alignment (with KDS)	32- 0/6
	Front wheel (alignment) – troubleshoot	32- 0/90
	Rear wheel (alignment) – troubleshoot	32- 0/91
32 13 006	Power steering unit – bleed	32- 13/1
. . .	Pressure point – adjust	32- 13/2
060	Power steering gear – remove and install	32- 13/3
	Design and function of re-circulating ball power steering unit	32- 13/5
631	Radial seal for segment shaft and steering worm – replace and seal intermediate cover	32- 13/8
	Power steering unit – troubleshoot	32- 13/90
32 21 080	Idler arm – remove and install	32- 21/1
091	Fluid block for idler arm – replace	32- 21/2
101	Track rod lever, left or right – replace	32- 21/3
151	Track rod end, left or right – replace	32- 21/4
281	Track rod, center – replace	32- 21/5
500	Pitman arm – remove and install	32- 21/6
510	Pitman arm – adjust	32- 21/7
32 31 082	Steering angle sensor – remove and install or replace	32- 31/0
090	Steering column, complete – remove and install	32- 31/1
595	Steering column, complete – disassemble and assemble	32- 31/3
800	Control unit for electrical steering column adjustment – replace	32- 31/6
32 32 001	Steering lock, complete – replace	32- 32/1
050	Lock cylinder for steering lock – remove and install or replace	32- 32/3
170	Cable for interlock – replace	32- 32/3
32 33 000	Removing and installing steering wheel	
	– without airbag	32- 33/1
	– with airbag	32- 33/1
	– with airbag II	32- 33/2
	Airbag system	32- 34/1
	Airbag II	32- 34/2
	Basic / central airbag unit	32- 34/2
	Function	32- 34/3
	Safety regulations for handling airbag gas generators	32- 34/3
32 34 020	Airbag unit – remove and install or replace	32- 34/4
504	Additional work with passenger airbag	32- 34/4
510	Replacing contact ring (airbag)	32- 34/5
65 77 010	Airbag diagnosis unit – remove and install or replace	32- 34/6
012	Control unit, airbag II – remove and install or replace	32- 34/7
016	Basic / central airbag unit – remove and install	32- 34/7
018	Basic / central airbag unit – replace	32- 34/7
015	Condenser for airbag diagnosis unit – replace	32- 34/8
020	Airbag, one front sensor – remove and install or replace	32- 34/9
32 41 005	Power steering unit – function check (H 31 system)	32- 41/1
060	Vane pump (tandem pump) for power steering unit – remove and install	32- 41/4
	Layout of vane pump	32- 41/6
553	Vane pump – disassemble and assemble - vane pump removed -	32- 41/7
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555	Tandem pump – disassemble and assemble - pump removed -	32- 41/10
	Layout of power steering unit – parts and lines	32- 41/12
	Layout of oil container	32- 41/13
	Layout of oil container with ASC + T	32- 41/14

32-0/1

GENERAL INFORMATION

Steering Gear:
The steering gear could be damaged from impact forces if a car is involved in an accident or operated under conditions similar to an accident. There must always be conformance with factory specifications in the interest of safety – refer to Service Information 32 01 88 (828).

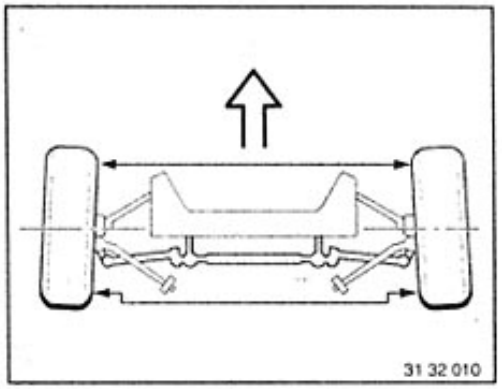
Tie Rod Joint:
Refer to Service Information 32 03 87 (733) for an evaluation of wear on ball joints.

Servotronic:
Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

Airbag:
Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

Electric Steering Wheel Adjustment:
Troubleshoot on electronic components - refer to Car Electric/Electronic Test Plan.

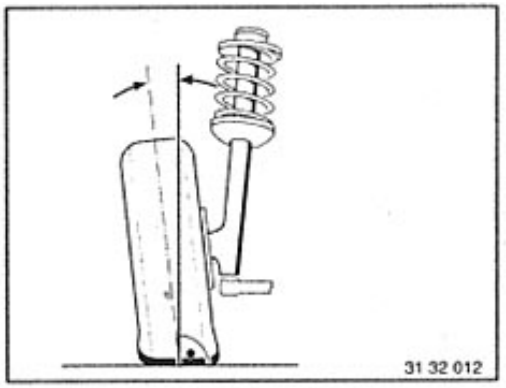
Car with Interlock System:
The function must be checked if a component of the interlock system had been removed and installed or the installed position of the interlock cable was changed - refer to 33 32 170.



GENERAL INFORMATION AND DEFINITIONS

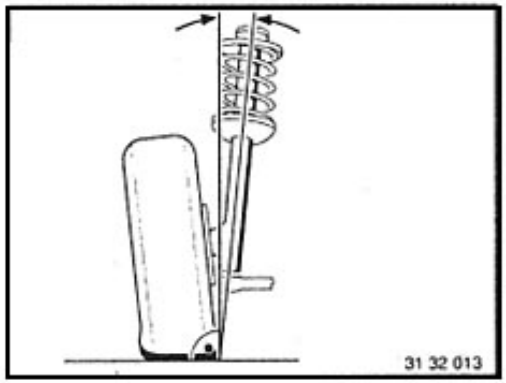
Toe

Is the reduction in distance of front of front wheels to rear of front wheels. Toe prevents the wheels from running apart while driving and consequently wheel shimmy and grinding, excessive tire wear, excessive loads on steering linkage and joints as well as hard steering of car. Toe is measured in "straight ahead position".



Camber

Is the inclination of a wheel from a perpendicular line.

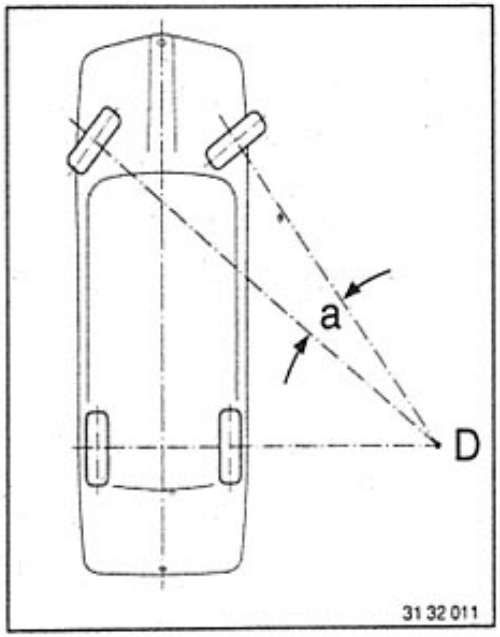


King Pin Inclination

Is the angle, by which the king pin* is inclined inward from a perpendicular line to the lateral axis of the car.
The king pin inclination produces returning forces, which return the road wheels and steering wheel to straight ahead after driving through a curve or around a corner.

Camber and king pin inclination determine the location of the wheel contact point with the road surface.
King pin inclination reduces the leverage, on which frictional forces are engaged, which makes it easier to turn the wheels to left or right lock. In addition, the jolts from rough road surfaces do not have as strong influence on the steering.

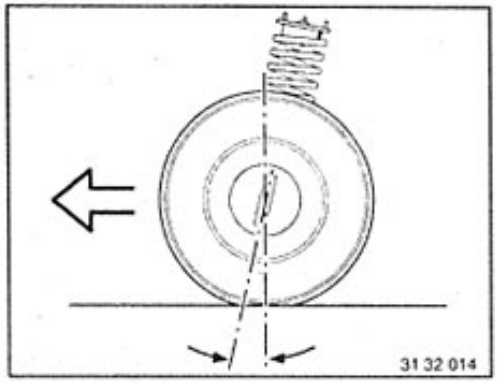
The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



Toe Difference Angle

Is the angular position of the wheel on the inside of a curve to the wheel on the outside of a curve when driving in a curve. The steering is designed that the angular position of the wheels changes as steering lock progresses. The toe difference angle provides information on the pertinent operation of the steering trapezoid for left or right steering lock from the center position. A correctly adjusted toe difference angle produces equal values for left and right lock in due consideration for factory manufacturing tolerances.

a = Toe difference angle
D = Turning circle center point

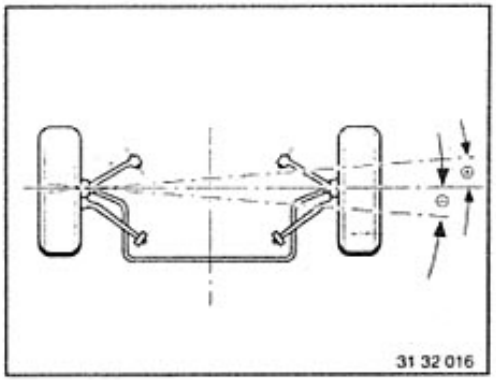


Caster

is the inclination of the king pin* in forward direction as seen from the side.

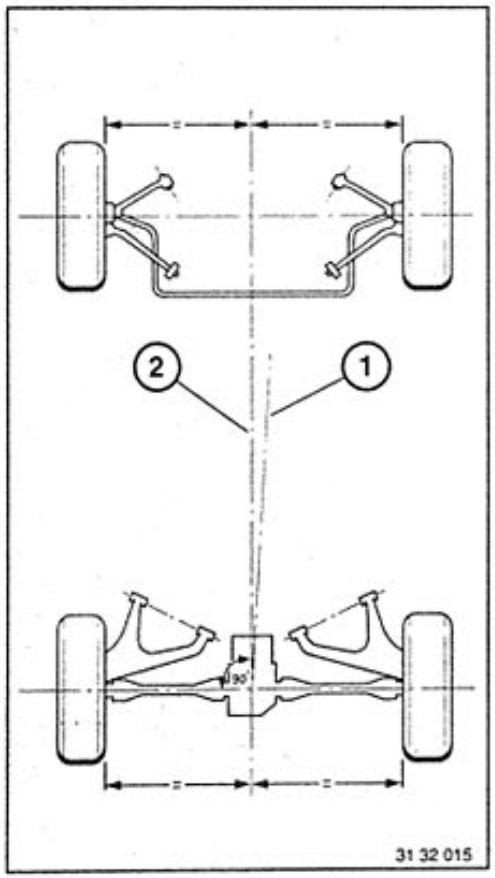
The wheels are pulled and not pushed because of caster. In a similar manner to king pin inclination, when driving in curves or around corners returning forces are produced to help return the wheels to straight ahead position.

The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



Wheel Offset

is the angle, by which one front wheel is displaced more toward front or rear than the other front wheel.



Geometrical Axis 1

is the bisecting line of an angle from the total rear wheel toe.
Front wheel measurements are taken in reference to this axis.

Symmetrical Axis 2

is a center line running through the front and rear axles.

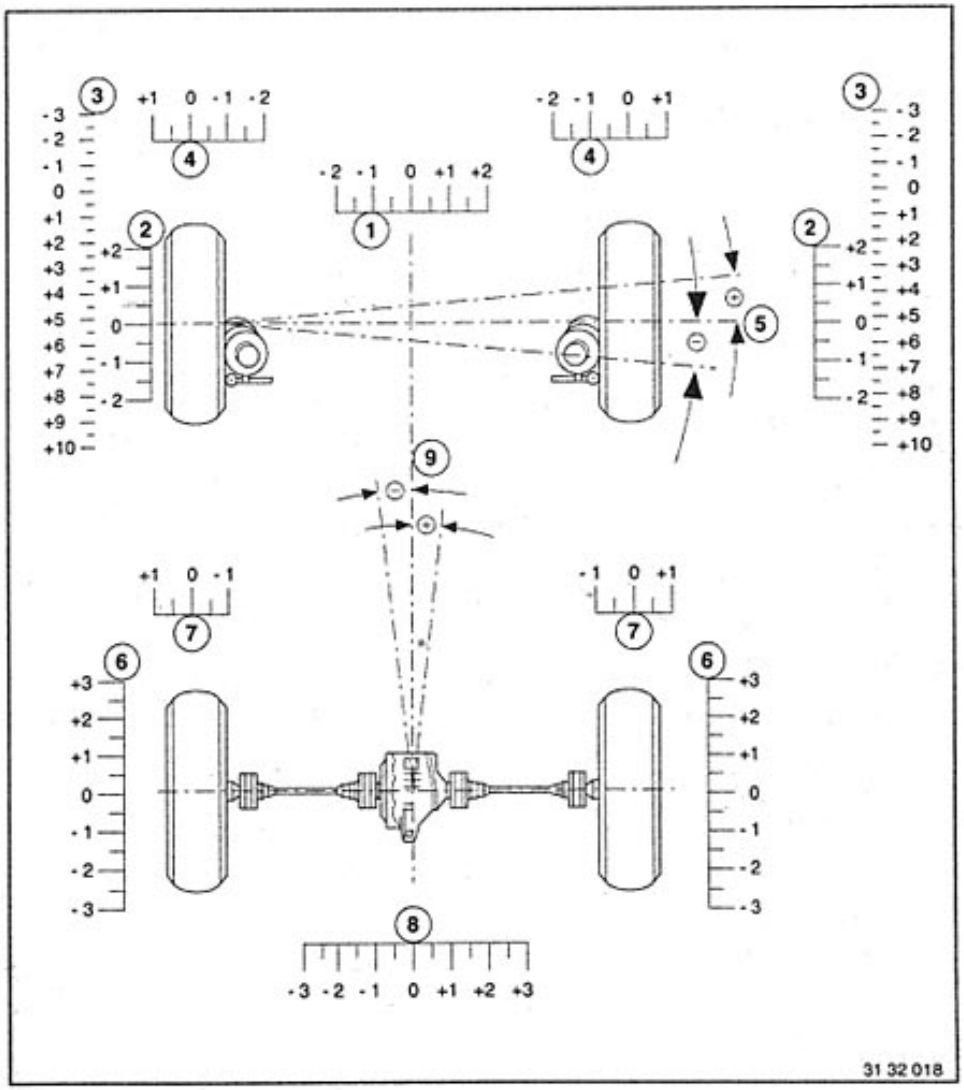
32 00 150 CHECKING WHEEL ALIGNMENT WITH ELECTRONIC TESTER (with KDS)

Requirements to be fulfilled prior to checking wheel alignment:

1. Good, uniform tire treads.
2. Specified tire pressure**.
3. Wheel rims in perfect condition*.
4. Specified wheel bearing play*.
5. Car loaded down to normal position*.
6. Specified ride level height*.

Always check wheel alignment only with a recommended electronic tester (see Workshop Equipment) and also use turntables on the rear wheels.

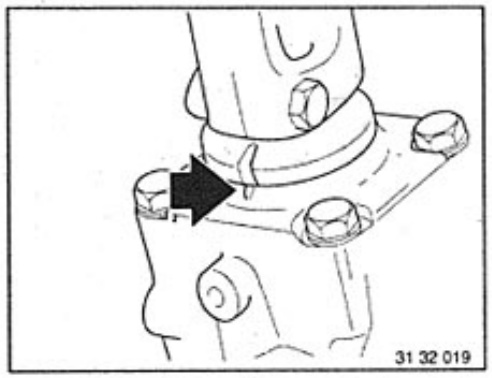
1 = Toe
2 = Camber
3 = Caster (with 10° or 20° wheel lock)
4 = Toe difference angle (with 20° wheel lock)
5 = Wheel offset
6 = Camber
7 = Rear wheel position
8 = Toe
9 = Geometrical axis



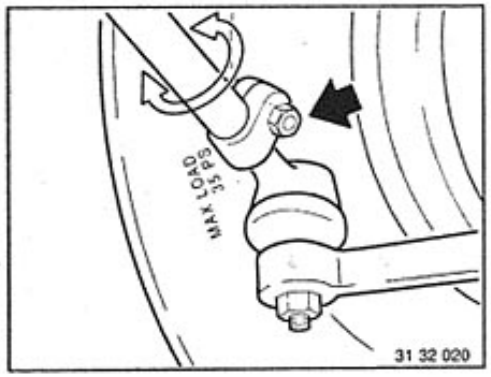
* Refer to Specifications of Gr. 31/32/33/36
** Refer to Service Information of Gr. 36

32 00 610 Adjusting front axle (with KDS)

Caution!
On vehicle with
Electronic Damper Control or
Active Rear Axle Kinematics or
Dynamic Stability Control, a "steering angle check" with the BMW Service Tester must be performed after each wheel adjustment check.



Adjust differential toe and camber angles.
Move steering gear into straight-ahead position (marking on housing and steering shaft).



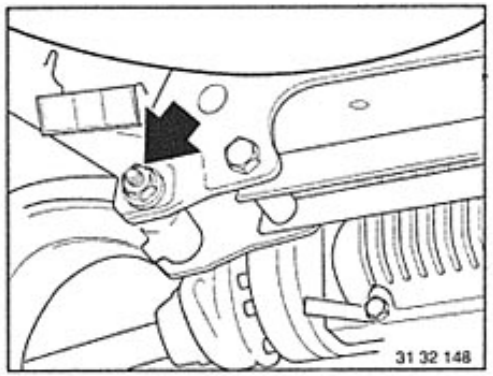
Loosen both clamping screws on track rod.
Check toe of left and right wheel against nominal value* by rotating the threaded sleeve

Installation:
Ensure that ball joints are not twisted.
Tightening torque*.

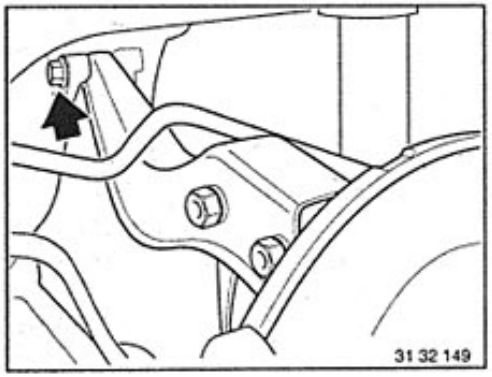
* See Technical Data

32 00 620 Adjusting rear axle (with KDS)

Caution!
On vehicles with Active Rear Axle Kinematics (AHK), an actuator member check must be performed wiht the BMW Service Tester before each wheel alignment check.

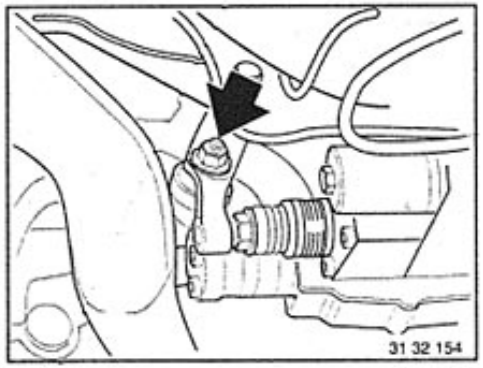


Adjusting toe-in.
Replace nut on support arm mount and tighten to tightening torque*.
Loosen nut one 1/2 turn and adjust toe-in to nominal value* by rotating the eccentric screw.
Tighten nut to tightening torque*.
If the nut has to be tightened down more than 5 times, it must be replaced – the self-locking characteristics become too impaired.



Adjusting camber always also involves a change in toe-in which is why camber must always be adjusted first.

Adjusting camber:
Replace nuts on trailing arm mount and tighten to tightening torque*.
Now loosen nut 1/2 a urn and adjust camber to nominal value* by rotating eccentric screw.
Tighten nut to tightening torque*.
If a nut is tightened down more than 5 times during the adjustment check, it must be replaced – the self-locking characteristics become too impaired.



Adjusting toe-in on vehicles with Active Rear Axle Kinematics:

Replace nut on support arm mount on idler arm and tighten down to tightening torque*.
Loosen nut one 1/2 turn and adjust toe-in to nominal value* by rotating the eccentric screw.
Tighten down nut to tightening torque*.
If the nut has to be tightened down more than 5 times, it must be replaced – the self-locking characteristics become too impaired.

* Refer to Technical Data

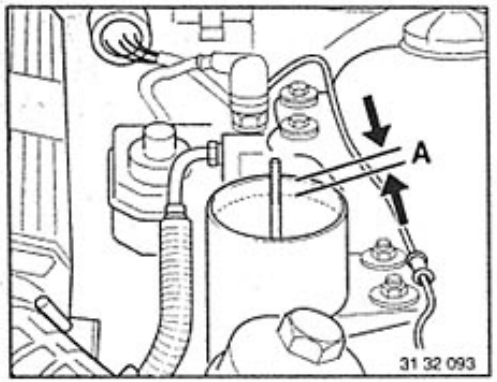
* Refer to Technical Data

TROUBLESHOOTING FRONT WHEEL ALIGNMENT

Condition	Cause	Correction
1 Toe deviation	a) Car not in normal position b) Tie rod(s) bent c) Track arm on spring strut bent d) Tie rod ball joints worn e) Rubber mount in control arm faulty	a) Ride level height, see Specifications of Group 31 b) Replace tie rod(s) c) Replace track arm d) Replace tie rod(s) or ball joints e) Replace rubber mount
2 Camber deviation Camber is given by design and cannot be adjusted.	a) Rubber mount in control arm faulty b) Control arm deformed c) Spring strut deformed d) Guide joint worn e) Spring force insufficient f) Front axle carrier deformed g) Spring strut mount holder deformed h) Distortion in floor assembly (engine carrier)	a) Replace rubber mount b) Replace control arm c) Replace spring strut d) Replace control arm e) Replace coil springs Ride level height, see Specifications of Group 31 f) Replace front axle carrier g) Repair front end h) Repair body
3 Caster deviation Caster is given by design and cannot be adjusted.	a) Rubber mount for thrust strut faulty b) Thrust strut deformed c) Control arm deformed d) Spring strut deformed e) Wheel house deformed (spring strut mount) f) Distortion in floor assembly (engine carrier)	a) Replace rubber mount b) Replace thrust strut c) Replace control arm d) Replace spring strut e) Repair front end f) Repair body
4 Toe difference angle deviation	Assuming camber and caster are correct: a) Tie rods not adjusted uniformly b) Track arm on spring strut bent	a) Adjust toe on left and right sides to same value b) Replace track arm
5 Wheel offset deviation	Assuming front wheels have equal single toe to geometrical axis: a) Front axle carrier deformed b) Engine carrier deformed c) Control arm deformed d) Thrust strut deformed	a) Replace front axle carrier b) Repair body c) Replace control arm d) Replace thrust strut

TROUBLESHOOTING REAR WHEEL ALIGNMENT

Condition	Cause	Correction
6 Camber deviation	a) Car not in normal position Spring force insufficient b) Rubber mounts on rear axle carrier faulty c) Rear axle carrier deformed d) Control arm deformed e) Guide arm deformed f) Distortion in floor assembly	a) Ride level height, see Specifications of Group 33 b) Replace rubber mounts c) Check or replace rear axle carrier d) Check or replace control arm e) Check or replace guide arm f) Repair body
7 Rear wheel position deviation	a) Rear axle carrier displaced laterally b) Distortion in floor assembly	a) Check / replace rubber mounts on rear axle carrier b) Repair body
8 Toe deviation	a) Car not in normal position or spring force insufficient b) Rubber mounts in rear axle carrier faulty c) Support arm deformed d) Fluid blocks in trailing arm faulty e) Rear axle carrier deformed f) Trailing arm deformed g) "Active rear axle kinematic" system not OK	a) Ride level height, see Specifications of Group 33 b) Replace rubber mounts c) Replace support arm d) Replace fluid blocks e) Check or replace rear axle carrier f) Check or replace trailing arm g) Repair "active rear axle kinematic" system
9 Deviation from geometrical axis	Assuming total rear wheel toe is correct: a) Distortion in floor assembly	a) Repair body



32 13 006 FILLING AND BLEEDING POWER STEERING

Filling and Checking Procedures:

1. Filling with Engine Stopped:

   Fill oil tank up to (A) = approx. 25 mm below edge.

2. Filling and Bleeding with Engine Running:

2.1 Filling:

   Pour in the remaining amount* of oil uniformly while starting the engine.

2.2 Bleeding:

   Turn steering wheel two times each against left and right locks, operate brake pedal five times, wait about 30 seconds and operate brake pedal five more times.

3. Checking Oil Level with Engine Stopped:

   Operate brake pedal until reservoir is empty (reservoir is empty when oil level no longer rises - visual check - or when suddenly more force is required to press down the pedal - force check).

   Lift rear axle until wheels have cleared ground. Reservoirs of ride level height control are empty after 2 minutes.

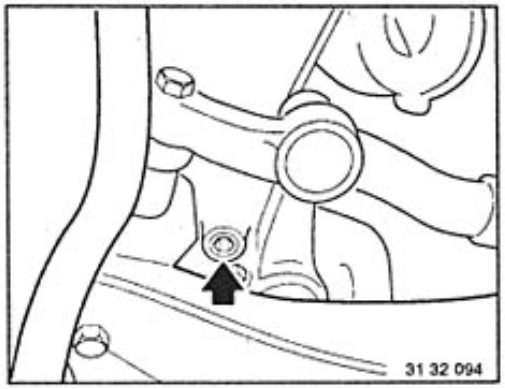
   If applicable, discharge the reservoir of "active rear axle kinematic" with help of the pressure discharging plug - refer to 33 34 . . ..

   Oil level must be about 10 mm below upper edge of tank.

   Correct deviation in oil level with the engine stopped by adding hydraulic fluid*.

   Cars with ASC+T - refer to 34 00 040.

* Refer to Specifications



32 13 ... ADJUSTING PRESSURE POINT

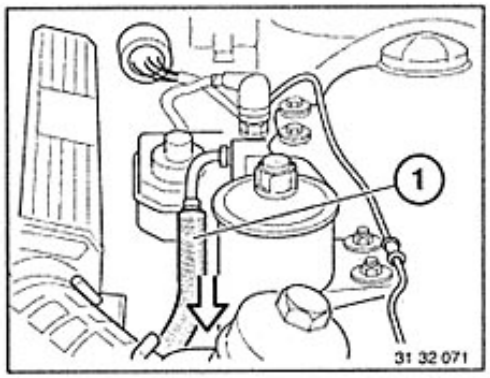
Important!
The pressure point of steering gears with automatic pressure point adjustment – recognized on punch-locked socket head bolt – should only be adjusted after a repair – see 32 13 631.

32 13 060 Removing and installing power steering gear

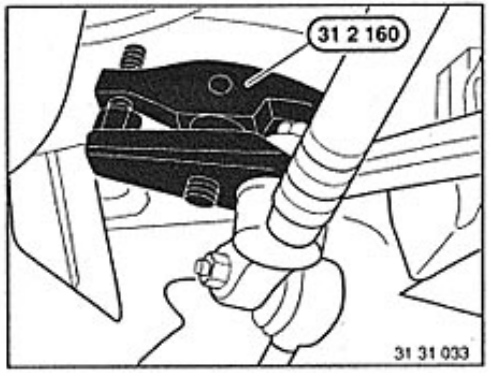
Airbag vehicle – remove steering wheel 32 33 000.

Bleed pressure accumulator = actuate brake pedal approx. 10 times.
Draw off hydraulic fluid from container – do not reuse.

Installation:
Topping up and bleeding hydraulic system 32 16 006.
Vehicle with:
Electronic Damper Control or
Active Rear Axle Kinematics or
Dynamic Stability Control
– perform steering angle check with BMW Service Tester.

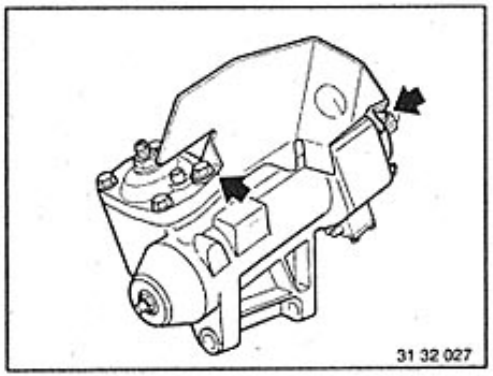


Installation:
Slide heat shield (1) downwards.

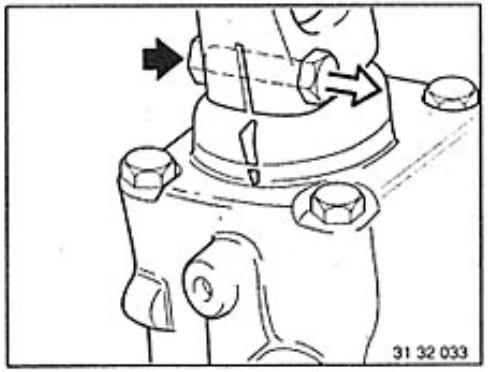


Unfasten nut.
Push track rod off pitman arm using special tool 31 2 160.

Installation:
Fit new self-locking nut. Taper and cone free of grease.
Tightening torque*.

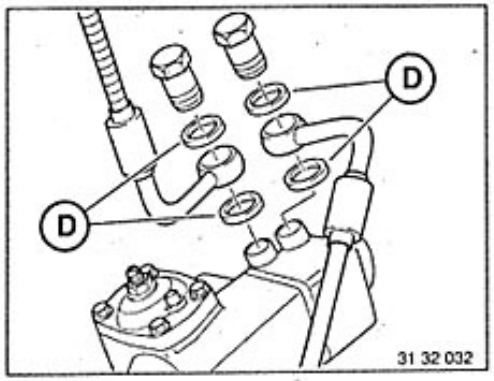


Remove heat shield from steering gear



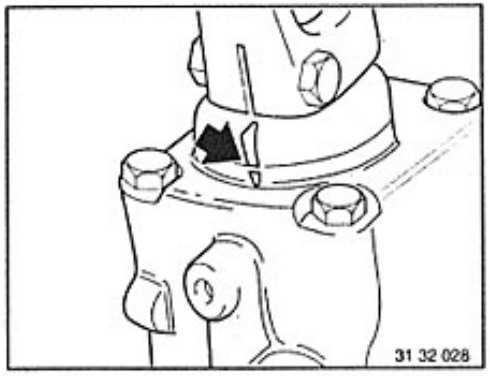
Unfasten screw.
Slide universal joint on steering gear.

Screw must locate in retaining groove in steering unit.
Tightening torque*.



Remove hydraulic leads.
Seal bores with dust caps.

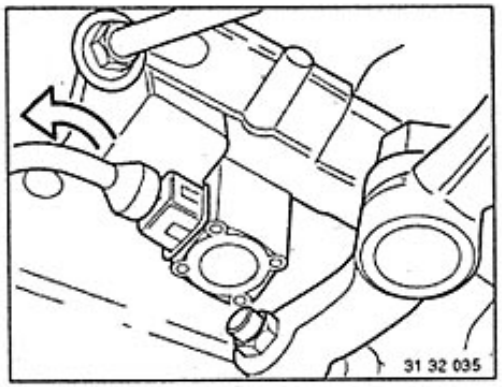
Installation:
Fit new sealing rings (D).
Tightening torque*.



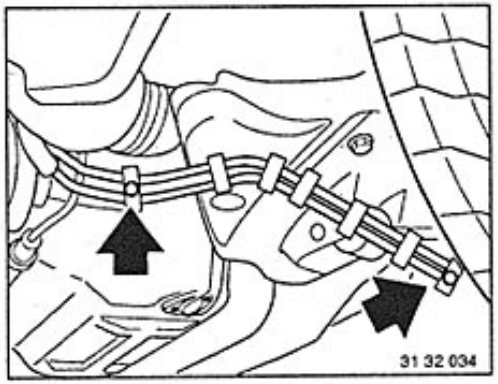
Installation:
Ensure that steering wheel and steering gear are in straight-ahead position.
Turn steering gear to left or right lock, then turn back approx. 1.7 turns until marks are aligned.

* Refer to Technical Data

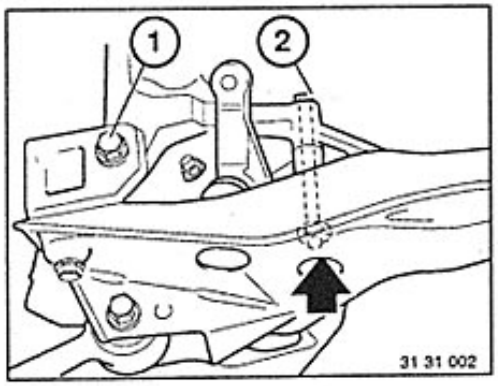
* Refer to Technical Data



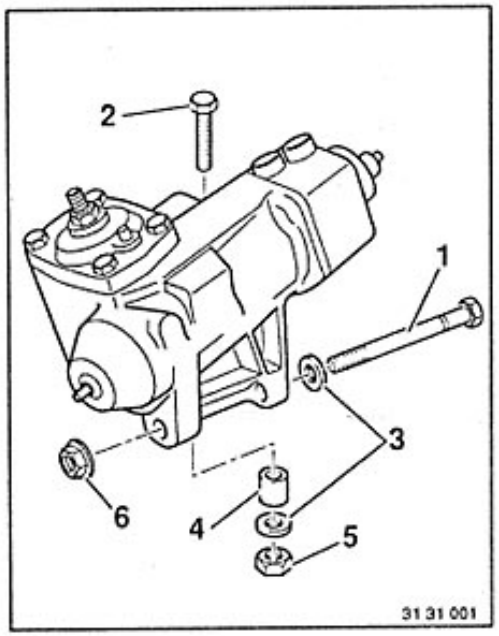
* If applicable, pull plug off of the Servotronic converter.



Loosen mounting clamps of oil cooler pipes.

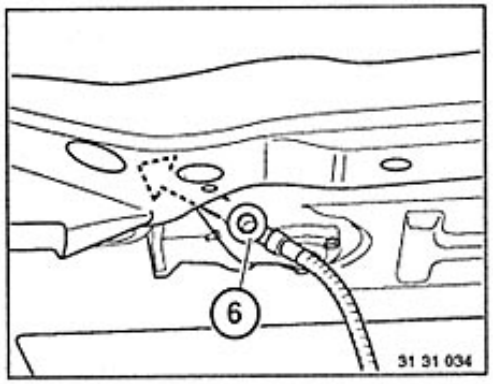


Unscrew bolts (1 and 2).
Pull back the disconnected tie rod — turn the left front wheel against lock if necessary.
Take out the steering gear downwards — if necessary, move the steering drop arm into a more favorable position by turning the steering stub.



Installation:
1 Bolt
2 Bolt (only use 10.9 strength class)
3 Washer
4 Sleeve
5 Nut (replace)
6 Nut with washer (replace)

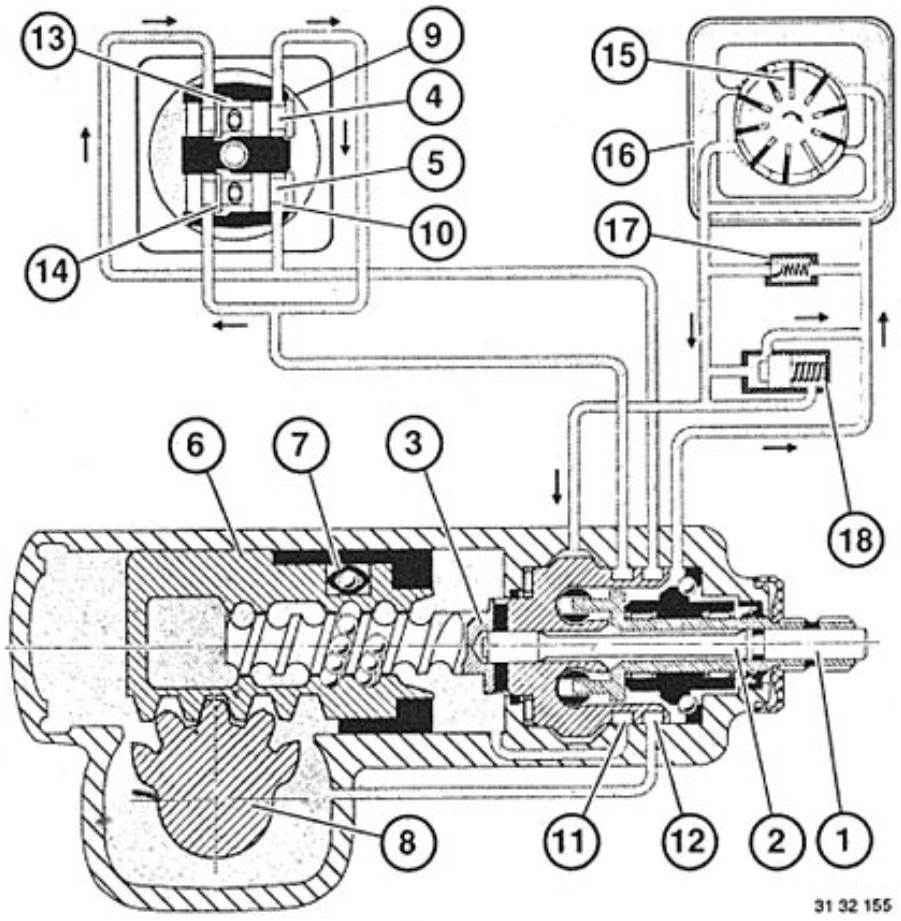
Tightening torque*.



Installation:
Install nut (6) using a flexible magnetic lifter.

* Refer to Specifications

DESIGN AND DESCRIPTION OF BALL AND NUT POWER STEERING



The housing contains a complete mechanical steering gear, the control valve and operating cylinder. Steering spindle (1) is connected elastically with worm (3) via torsion bar (2) and with valve pistons (4 and 5) without play. The valve pistons are installed transversely in the worm head. The connection between piston (6) and worm (3) is accomplished with an infinite line of balls. When turning the worm the balls are taken up at one end by circulating tube (7) and put out again at the other end of the balls. Piston (6) and sector shaft (8) are meshed. The special shape of teeth on the sector shaft permits zero-play adjustment with an adjusting screw.

In neutral position of valves (4 and 5) the oil flow delivered by the pump passes through the steering and can flow through the opened feed and return control edges to the cylinder chamber and return flow. Hydraulic support cuts in when force is transmitted from the steering wheel or from the steering drop arm via the sector shaft and pistons to the worm. Torsion bar (2) then serves as a link. It deforms itself in the elastic range and returns the valve pistons to neutral position after releasing the steering wheel. Moving valves (4 and 5) will let the oil flow into only one of the operating cylinder chambers and in this manner support the rotating motion of the steering spindle and/or counteract the jolt from rough roads.

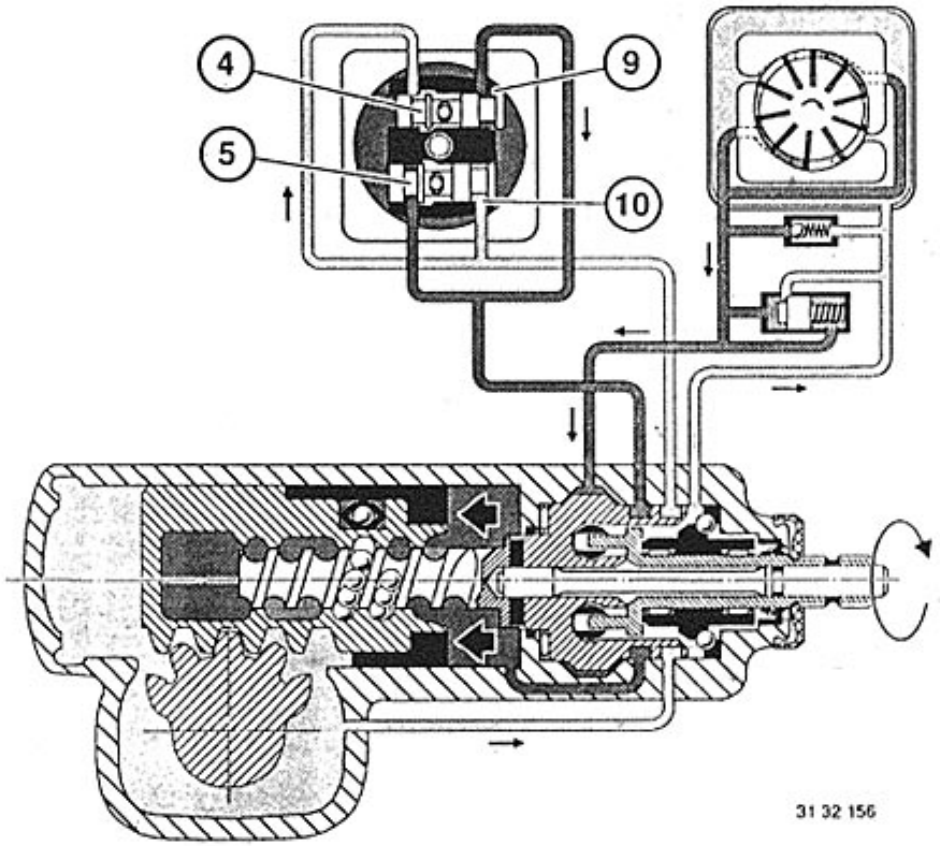
Steering Wheel in Neutral Position:

Oil flows from the impeller pump into the worm head, through feed grooves (9 and 10) to radial grooves (11 and 12). From here via connecting bores to the right and left cylinder chambers and via opened return flow grooves (13 and 14) back to the oil tank. The valve is also illustrated in cross section.

15 = Pump
16 = Oil tank
17 = Pressure relief valve
18 = Control valve

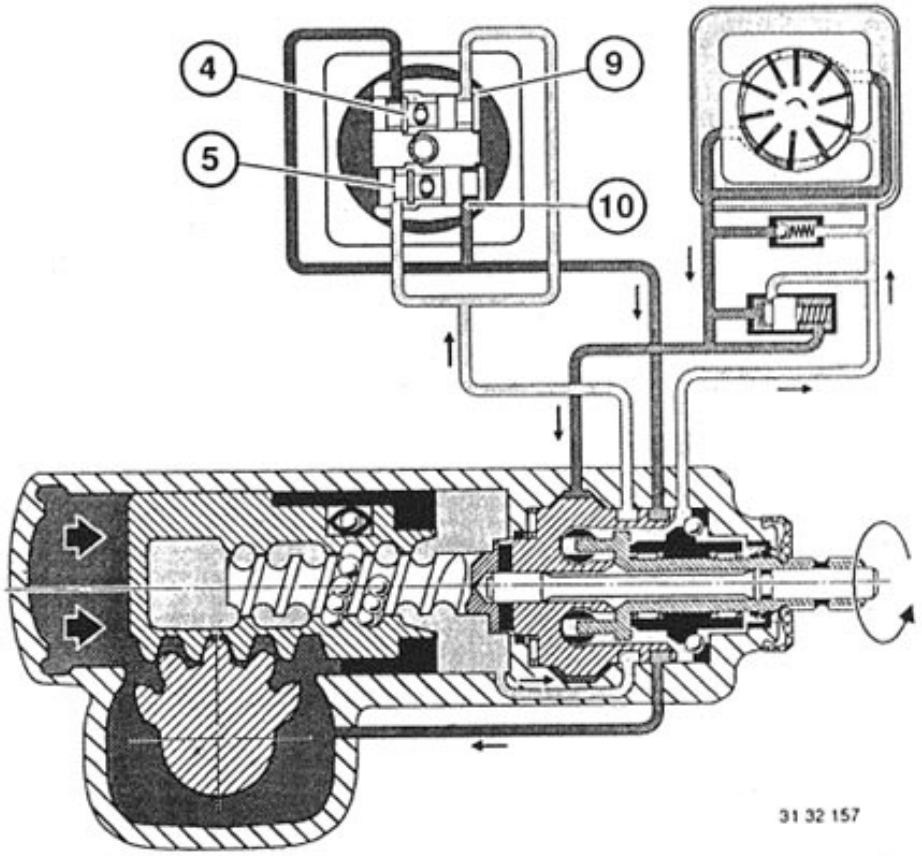
Steering Wheel Turned Clockwise:

Valve piston (4) is displaced to the right and feed groove (9) opened. Valve piston (5) is displaced to the left and feed groove (10) closed. This lets the oil flow into the right cylinder chamber. Oil in the left cylinder chamber is forced out and flows back into the oil tank.



Steering Wheel Turned Counterclockwise:

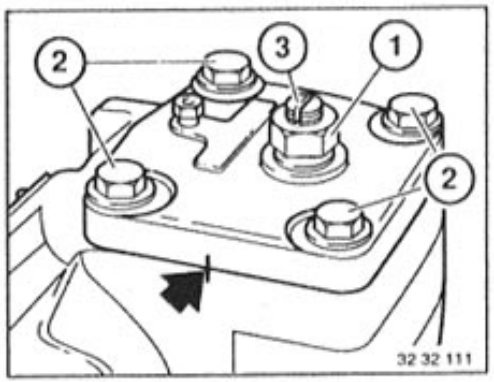
Valve piston (5) is displaced to the right and feed groove (10) opened. Valve piston (4) is displaced to the left and feed groove (9) closed. This lets the oil flow into the left cylinder chamber. Oil in the right cylinder chamber is forced out and flows back into the oil tank.



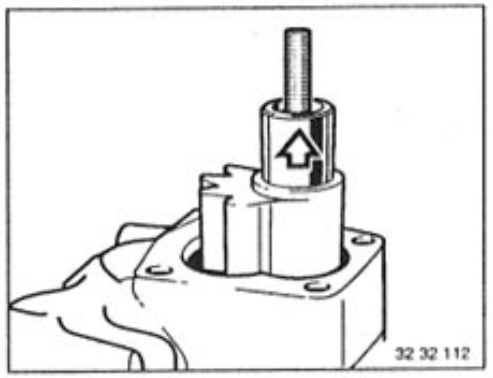
32 13 631 REPLACING RADIAL OIL SEAL FOR SECTOR SHAFT AND STEERING WORM AND SEALING INTERMEDIATE COVER – Power Steering Gear Removed –

Note:
Cleanliness is very important when working on steering gears.

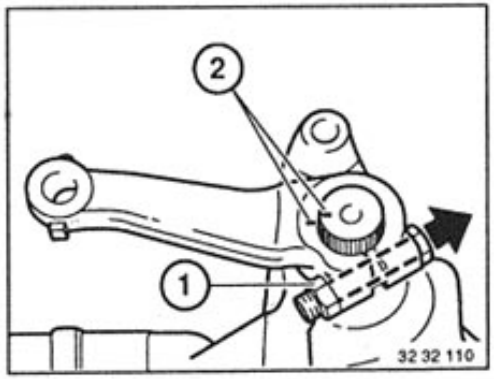
Drain hydraulic fluid in steering gear.



Mark position of cover to case.
Unscrew nut (1).
Unscrew bolts (2) and lift off cover by turning adjusting screw (3).

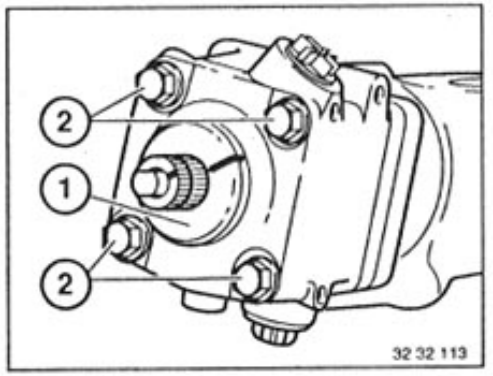


Pull sector shaft out of case.

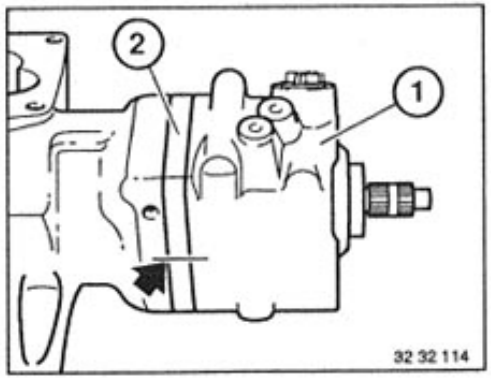


Mark position of sliding steering drop arm to sector shaft before unscrewing bolt (1) – if applicable, adjust steering drop arm – see 32 21 510.

Installation:
Slide on steering drop arm up to the mark – mark (2) must also be aligned.
Replace self-locking nut.
Tightening torque*.

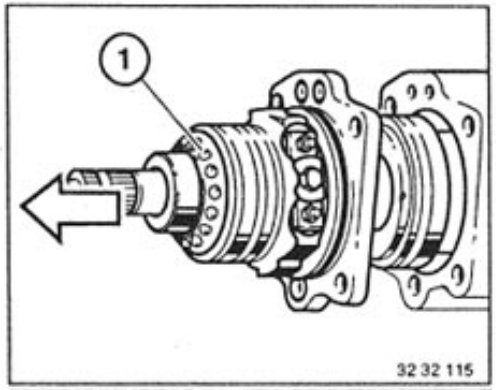


Pull off cap (1).
Unscrew bolts (2).

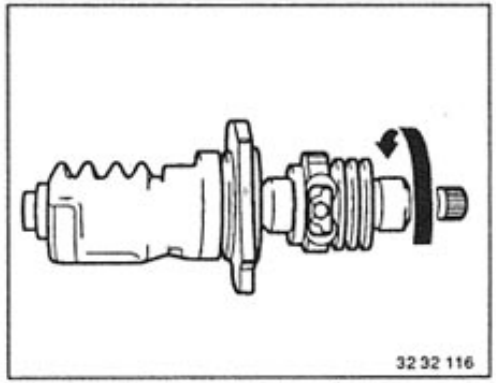


Mark position of valve housing (1) and intermediate cover (2) to case, and remove.

* See Specifications

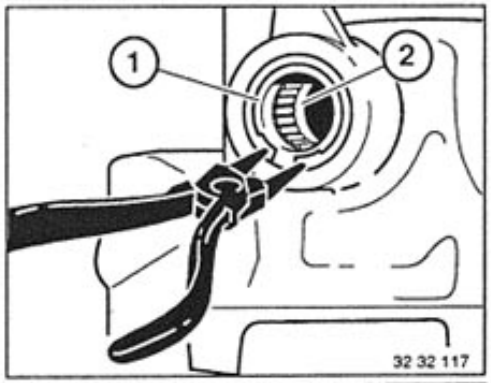


Take off ball bearing (1).
Pull out worm and piston.

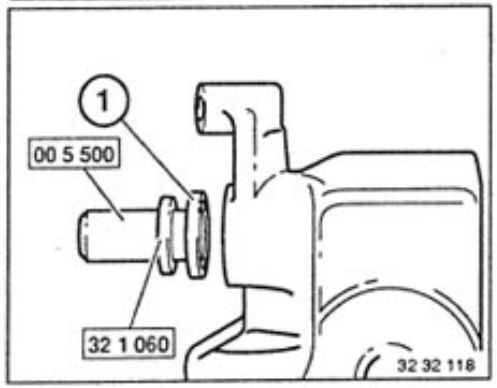


Unscrew worm clockwise.

Important!
23 loose balls.

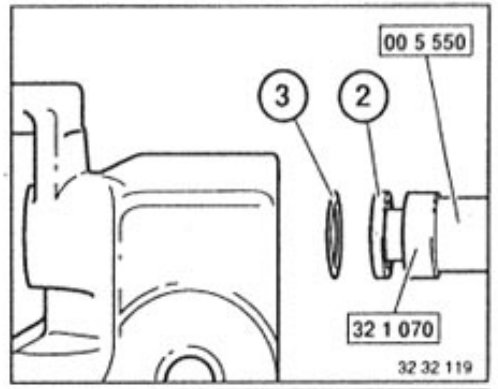


Lift out circlip.
Press out outer radial oil seal (1) and inner radial oil seal (2).

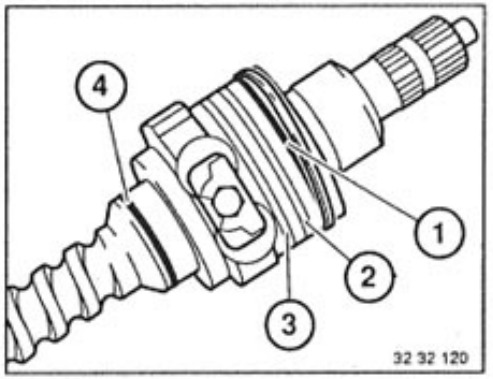


Lubricate sealing lips of radial oil seals with grease.
Drive in outer radial oil seal (1) that sealing lip faces inside of case with Special Tools 00 5 500 and 32 1 060.

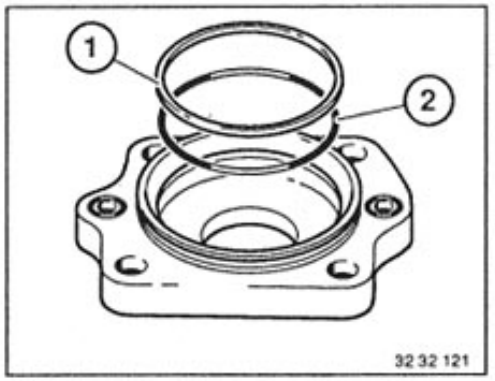
Important!
Install circlip.



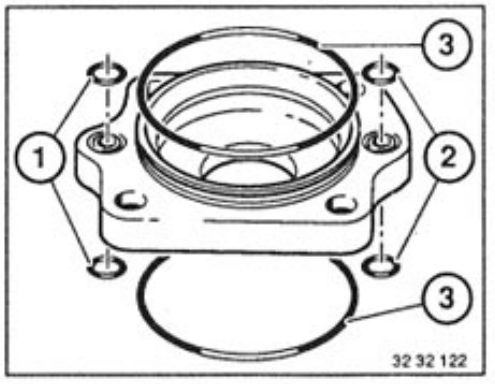
Insert support ring (3).
Drive in radial oil seal (2) that sealing lip faces inside of case with Special Tools 00 5 550 and 32 1 070.



Replace seals (1 ... 3) and O-rings located underneath.
Replace O-ring (4).
Coat seals with hydraulic fluid*.

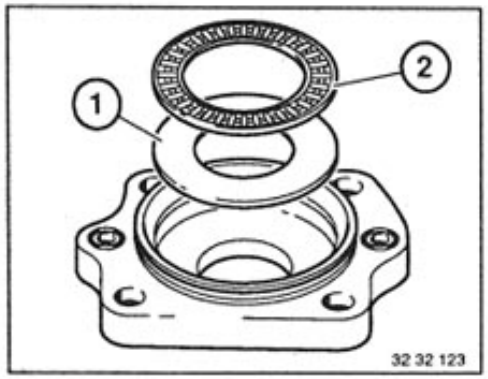


Replace seal (1) and O-ring (2) located underneath.
Coat seal with hydraulic fluid*.

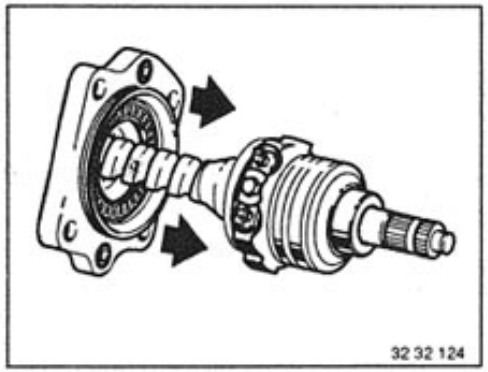


Replace O-rings (1 ... 3) on both sides.
Install O-rings (1 and 2) with grease.

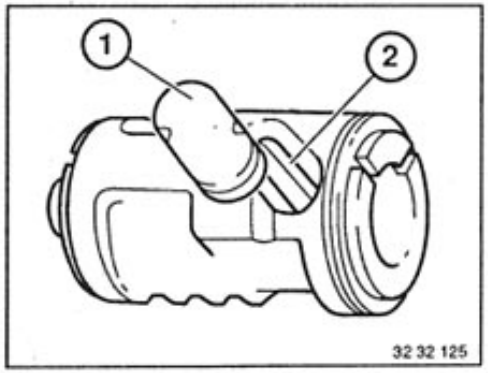
* See Operating Fluids



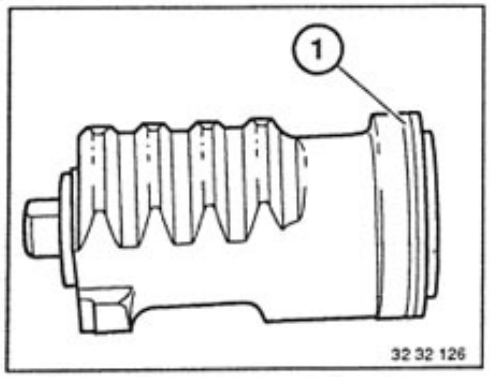
Place bearing ring (1) and axial bearing (2) in intermediate cover (with a small amount of grease).



Mount intermediate cover on the worm head (do not damage seal of worm).

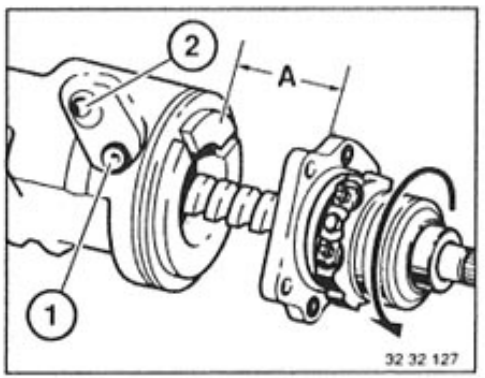


Pull off cap (1) and remove circulating pipe (2).

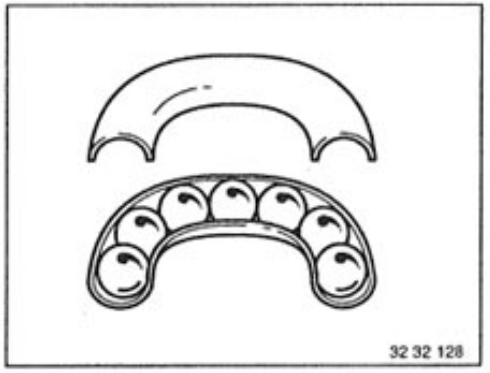


Replace seal (1) and O-ring located underneath.
Coat seal with hydraulic fluid*.

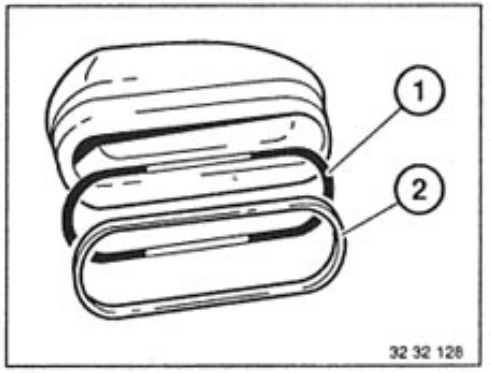
* See Operating Fluids



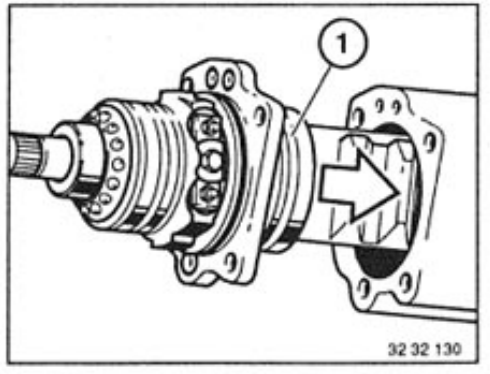
Slide worm head into piston.
A = about 6 cm (2.362").
Slide 16 balls into threads of worm through hole (1) and turn the worm until the balls are forwarded to hole (2).



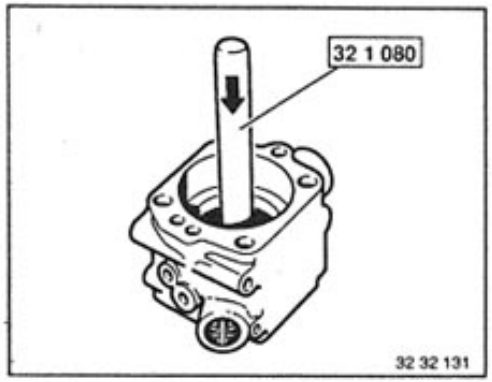
Install 7 balls in half of circulating pipe (grease both outer balls) and install circulating pipe in piston.



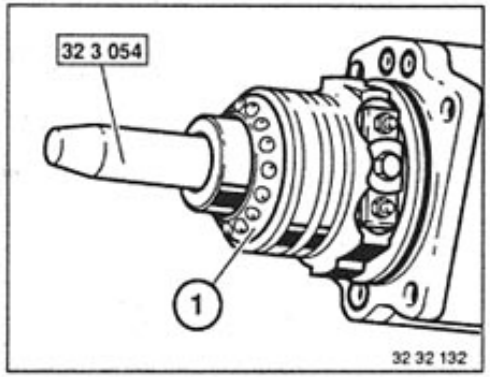
Place O-ring (1) and seal (2) in cap.
Press cap into piston.



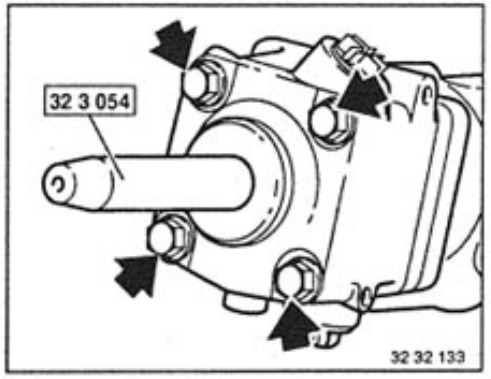
Slide piston into steering case, being careful not to damge seal (1).



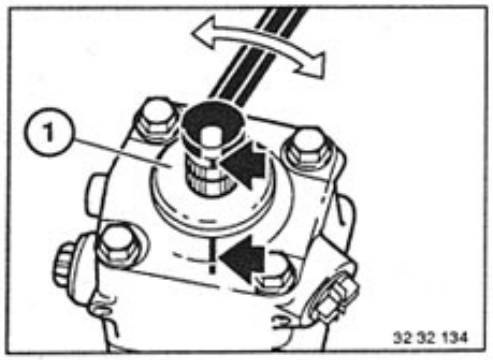
Replace radial oil seal (sealing lip greased) in valve housing with Special Tool 32 1 080.
Sealing lip faces inside of case.



Install ball bearing (1) and Special Tool 32 3 054.

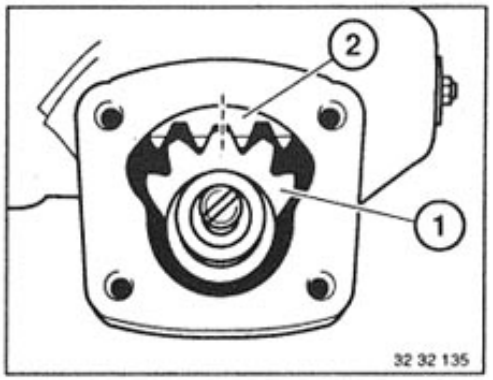


Slide valve housing over seals of worm head carefully and tighten bolts.
Tightening torque*.
S = washer
Remove Special Tool 32 3 054.

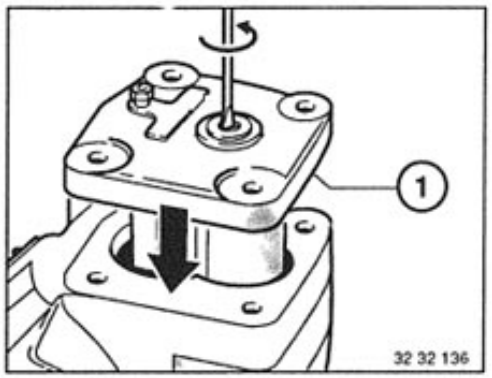


Turn steering to a final position.
Turn back about 2 turns until marks on spindle and case are aligned = straight ahead position.
Press grease-filled cap (1) on spindle.
Marks on spindle, cap and case must be aligned.

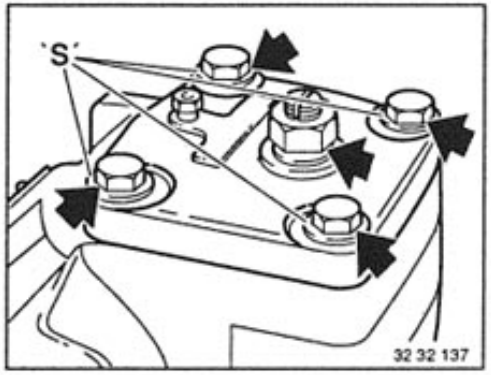
* See Specifications



Guide in sector shaft (1) carefully that radial oil seal is not damaged.
Center tooth of sector shaft (1) must be in middle of teeth of piston (2).

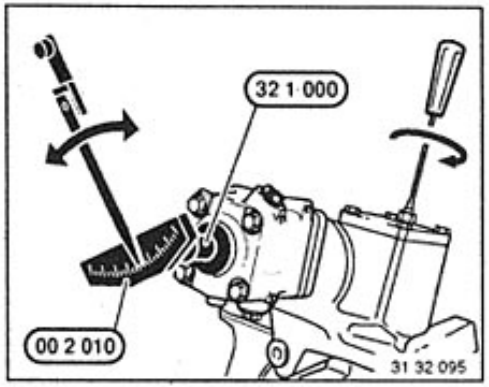


Replace O-ring (1) in cover.
Position cover by turning the adjusting screw on the case counterclockwise.



Tighten cover bolts.
Tightening torque*.
S = washer
Tighten lock nut – sealing surface facing cover – finger tight.

* See Specifications



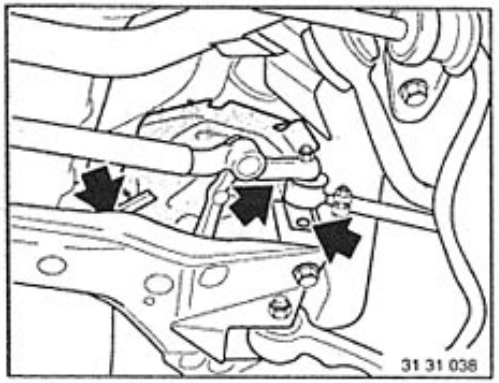
Adjusting Pressure Point:
Mount Special Tool 32 1 000 on the spindle and apply friction torque tester 00 2 010.
Measure friction torque about 1/2 turn before reaching final lock.
Move steering gear to straight ahead position.
Turn adjusting screw until a friction torque 0.4 to 0.6 Nm (0.3 to 0.4 ft. lbs.) higher than the previously measured friction torque is measured while "passing" the pressure point.
Total friction torque must not exceed 1.4 Nm (1 ft. lbs.).
Tighten locknut with a tightening torque of 25 Nm (18 ft. lbs.).
Recheck friction torque.

Install steering drop arm.
Check function after installation of the steering gear.

TROUBLESHOOTING POWER STEERING

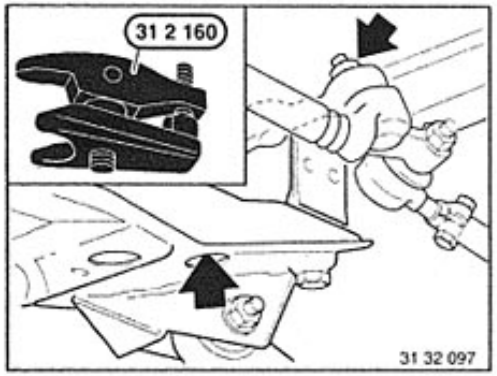
Condition	Cause	Correction
Steering is hard to turn left or right from center	Pressure point adjusted too tight	Adjust pressure point
Steering runs automatically to final position onesidedly	Valve setting for hydraulic center incorrect	Replace steering gear (adjustments can only be made in the factory)
Excessive steering wheel play	a) Steering gear loose on front axle carrier b) Universal joints have excessive play c) Joint disc loose d) Tie rod ends worn e) Play between worm and piston f) Worm has axial play g) Insufficient oil in system	a) Tighten steering gear b) Replace universal joints c) Tighten joint disc d) Replace tie rod ends e) Replace steering gear f) Replace steering gear g) Add oil*; bleed hydraulic system - see 32 13 006
Steering wheel shakes	a) Imbalance or radial runout of wheels b) Toe, camber, caster or king pin inclination incorrect c) Thrust strut bent d) Rubber mount for thrust strut faulty e) Control arm bent f) Weak shock absorbers g) Bearing sleeve in steering guide arm faulty	a) Balance wheels; replace rims and/or tires in case of radial runout b) Check/adjust front wheel alignment with optical tester c) Replace thrust strut d) Replace rubber mount e) Replace control arm f) Replace shock absorbers g) Replace bearing sleeve
Steering difficult to move against left or right lock	a) Pressure does not build up in lower chamber b) Pressure does not build up in upper chamber c) Insufficient oil in system d) Control valve in power pump seized e) Filter clogged f) Valve piston seized or leaks g) Piston seal damaged h) Teflon rings in worm head leak i) Teflon ring in intermediate cover leaks k) System filled with strong foaming, unsuitable oil	a) Replace steering gear b) Replace steering gear c) Add oil*; bleed hydraulic system - see 32 13 006 d) Replace power steering pump e) Replace filter and clean pipes f) Replace steering gear g) Replace steering gear h) Replace steering gear i) Replace steering gear k) Fill hydraulic system with specified oil*
Loss of hydraulic fluid	a) Hose connection leaks b) Oil tank seal leaks c) Radial oil seal for sector shaft faulty d) Radial oil seal for steering spindle leaks e) O-ring in cover leaks f) O-rings in intermediate cover leak	a) Tighten hose connections or replace hoses b) Replace seal c) Seal steering gear d) Seal steering gear e) Seal steering gear f) Seal steering gear
No straight ahead	Height of steering drop arm not correct	Adjust steering drop arm - see 32 21 520

* Refer to Specifications



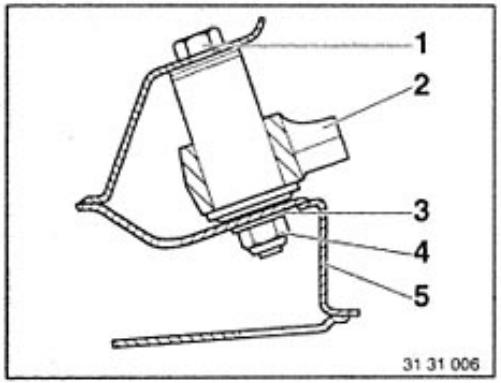
32 21 080 Removing and installing idler arm

Remove heat shield.



Unfasten nut and press off ball joint with special tool 31 2 160.
Remove idler arm.

Installation:
Bore and taper free of grease. Replace self-locking nut.
Tightening torque 32 21 3AZ*.

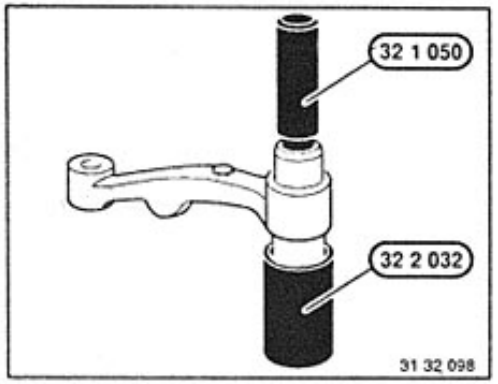


Installation:
Replace self-locking nut.
Tightening torque 32 21 7AZ*

1 Screw
2 Idler arm
3 Washer
4 Self-locking nut
5 Front axle carrier

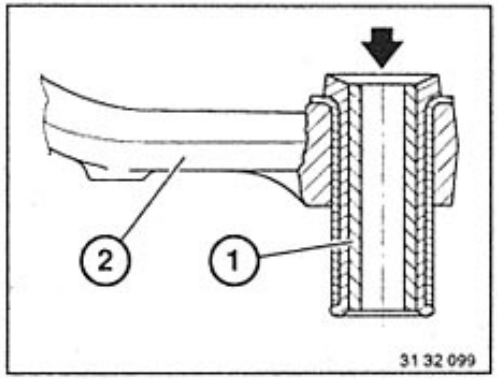
Caution!
If the idler arm is replaced, check/adjust alignment of the pitman arm 32 21 510.

* Refer to Technical Data

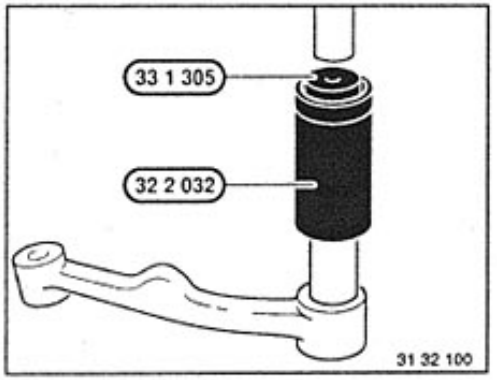


31 21 091 REPLACING DAMPER FOR STEERING GUIDE ARM

Remove steering guide arm – see 32 21 080.
Press out damper with Special Tools 32 1 050 and 32 2 032.

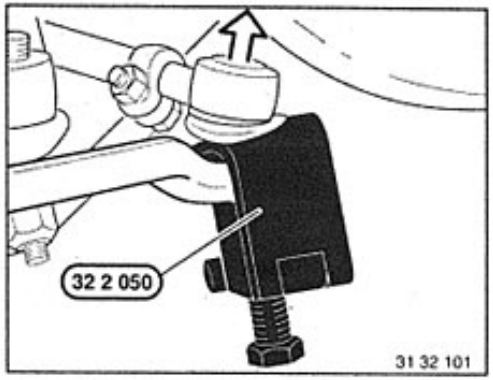


Note pressing-in direction.
1 = Damper
2 = Steering guide arm.



Press in new damper against the stop with Special Tools 33 1 305 and 32 2 032.

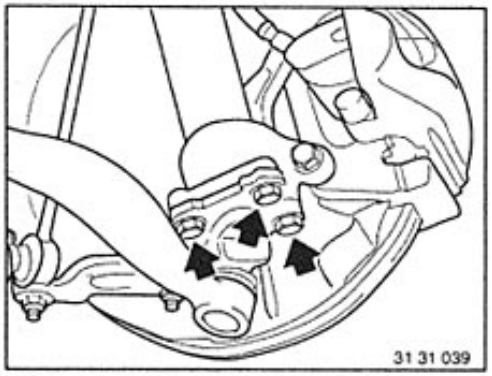
Important!
Adjust steering drop arm after installation – see 32 21 510.



32 21 101 Replacing left or right tie rod lever

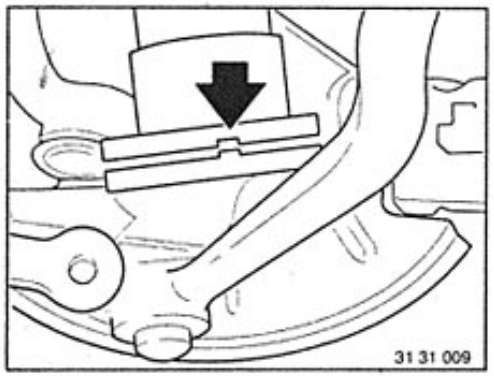
Remove front wheel, see Gr. 36.
Unfasten nut.
Press ball joint off tie rod lever with special tool 32 2 050.

Installation:
Bore and taper free of grease.
Tightening torque 32 21 3AZ*.
Replace self-locking nut.
Perform front wheel alignment check 32 00 . . .

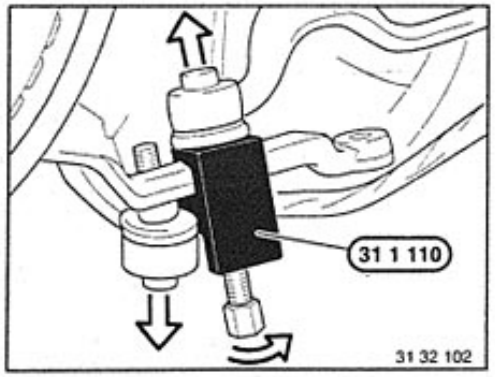


Unfasten screws.

Installation:
Clean thread of bores and screws.
Secure screws with screw cement**.
Tightening torque 32 21 9AZ*.



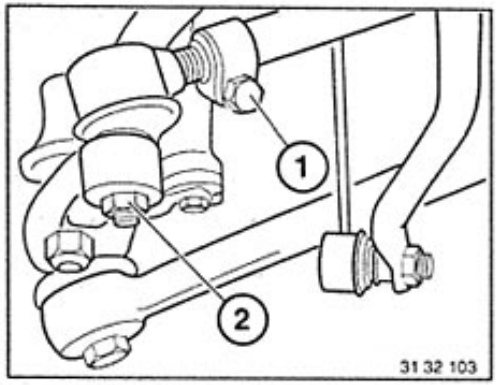
Ensure unit is correctly installed.



Unfasten nut from control arm and traction strut.
Press off ball joint with special tool 31 1 110.

Installation:
Remove grease from bore and taper.
Replace self-locking nut.
Tightening torque 32 21 9AZ/11AZ*

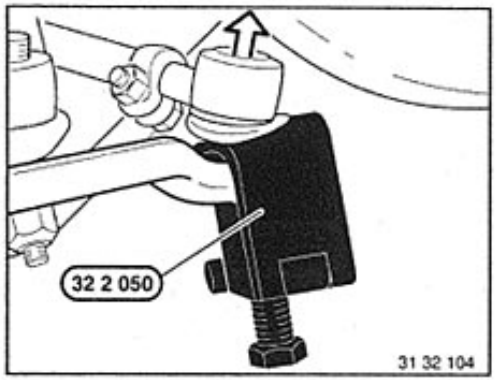
* Refer to Technical Data
** Source of Supply: BMW Parts Service



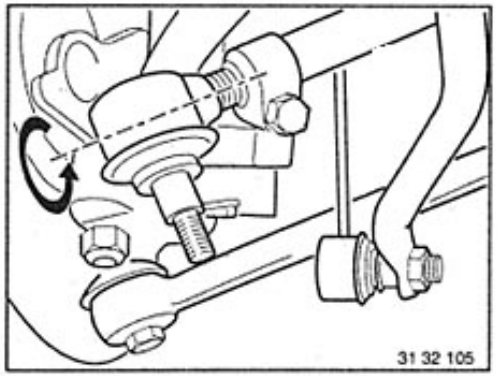
32 21 151 Replacing left or right track rod end

Remove front wheel, see Gr. 36.
Unfasten clamping screw (1).
Unfasten nut (2).

Installation:
Remove bore and taper. Replace self-locking nut.
Tightening torque 32 21 3AZ/4AZ*.
Perform front axle alignment check 32 00 . . . .

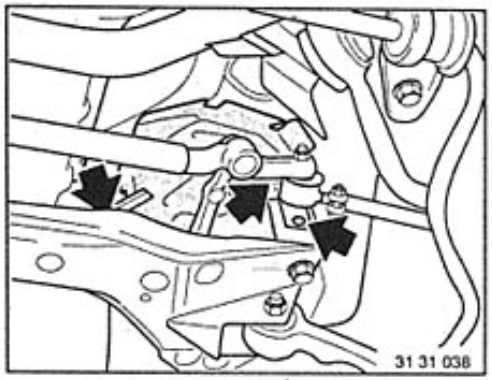


Press off ball joint using special tool 32 2 050.



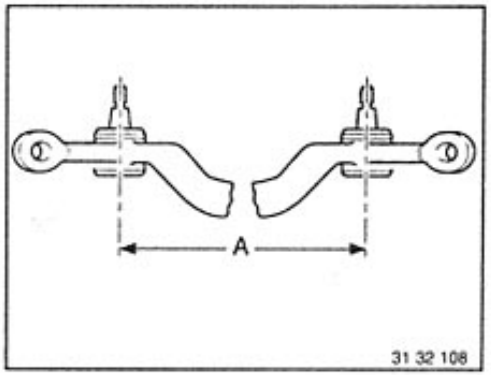
Unscrew and remove track rod end.

* Refer to Technical Data

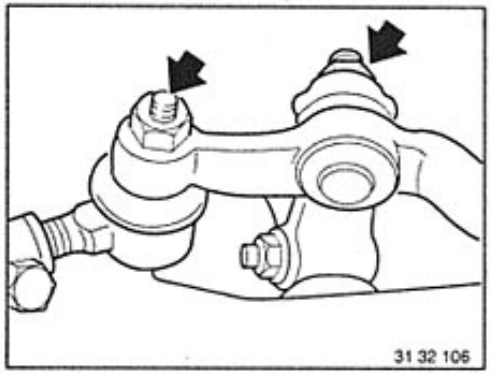


32 21 281 Replace center track rod

Remove heat shield from right side.

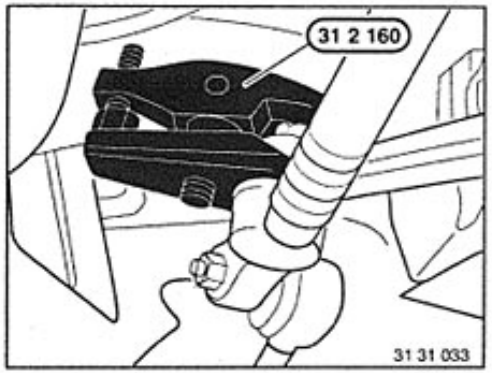


Inspection dimension A = 534 ± 1 mm.

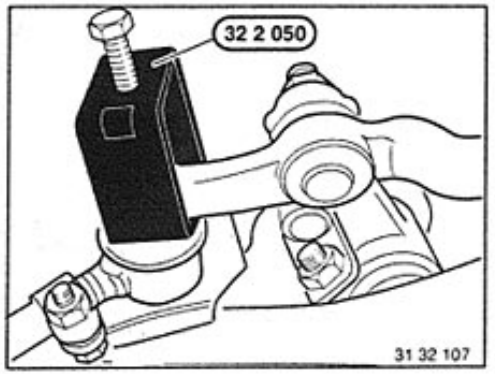


Unfasten nut on left and right sides.

Installation:
Remove grease from bore and taper.
Replace self-locking nut.
Tightening torque 32 21 3AZ*.
Adjust pitman arm 32 21 510.
Perform alignment check of front axle 32 00 . . . .



Press center track rod off pitman arm and idler arm using special tool 31 2 160.

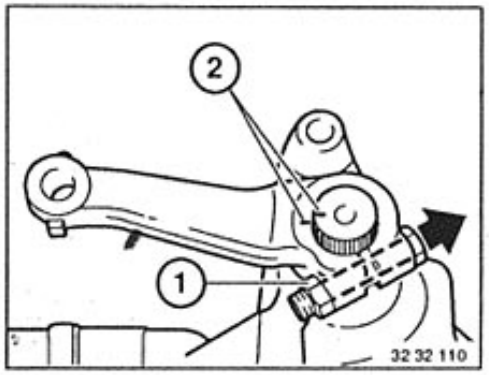


Press off lateral track rods using special tool 32 2 050.

* Refer to Technical Data

32 21 500 REMOVING AND INSTALLING STEERING DROP ARM
– Steering Gear Removed –

Mark position of sliding steering drop arm on the sector shaft prior to unscrewing bolt (1).
If necessary, adjust steering drop arm – see 32 21 510.

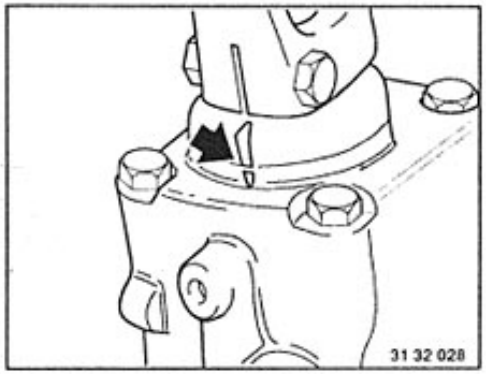


Installation:
Slide on steering drop arm up to the mark, whereby marks (2) must also be aligned.
Replace self-locking nut.
Tightening torque*.

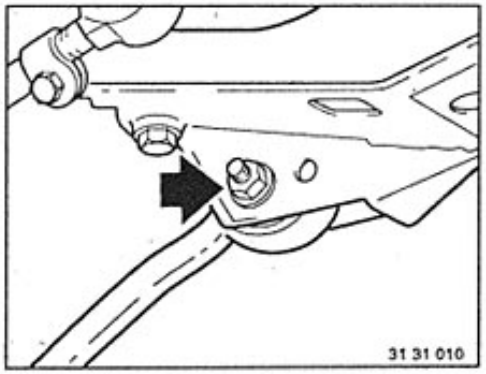
* See Specifications

32 21 510 ADJUSTING STEERING DROP ARM

Adjusting the steering drop arm moves the left and right tie rods to correct height. This guarantees the same amount of toe on left and right wheels when the car's suspension is bottomed.
It also optimizes directional stability on rough road surfaces.

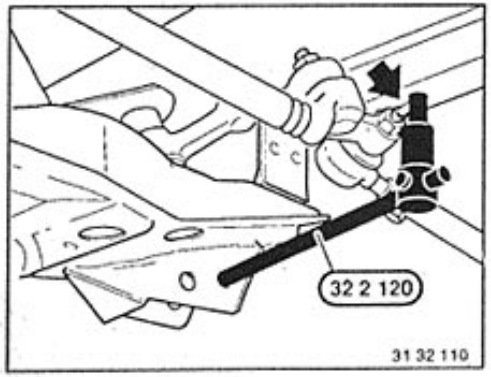


Set steering gear to straight ahead position (marks on spindle and case aligned).



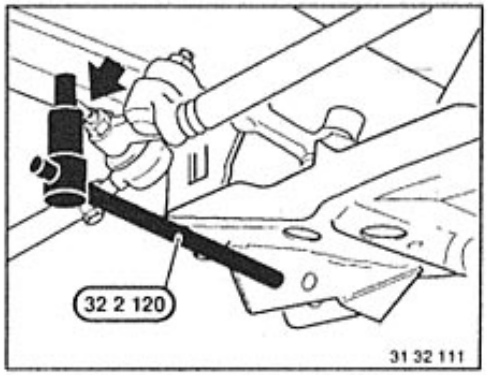
Unscrew left and right control arms on front axle carrier.

Installation:
Replace self-locking nuts.
Tightening torque*.

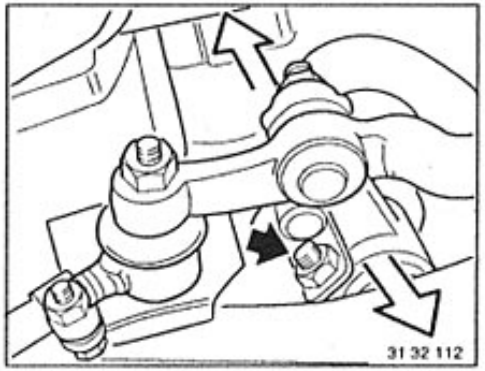


Mount Special Tool 32 2 120 on the side of the steering guide arm on the control arm mount.
Align the master mandrel with the centering bore in the pivot pin and clamp.

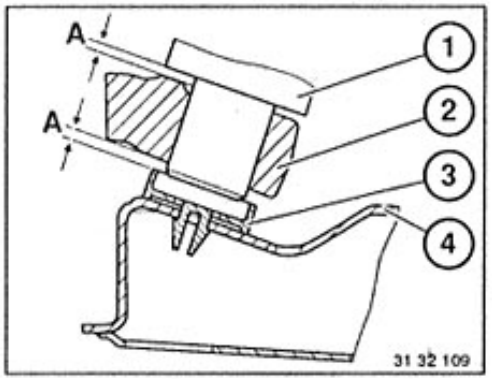
* Refer to Specifications



Mount the special tool on the other side — without changing the master mandrel.



Loosen bolt.
Move the steering drop arm until the centering bore is aligned with the master mandrel as precisely as possible; max. permissible deviation = ± 1.5 mm.
Tighten nut to correct tightening torque*.
Repeat the measurement, if necessary.



Important!
Turn steering gear from stop to stop — steering drop arm must move easily.

Distance A = 0.5 mm.

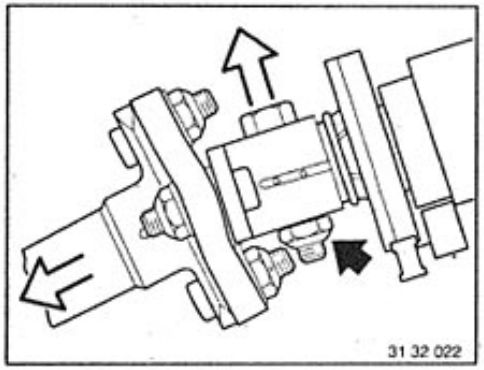
1 Steering gear
2 Steering drop arm
3 Spacer
4 Front axle carrier

* Refer to Specifications

32 31 082 Removing and installing or replacing steering angle sensor

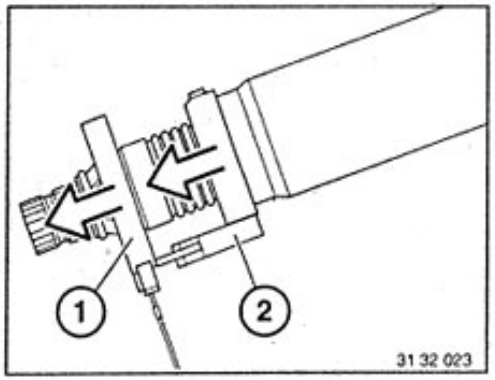
Disconnect battery, refer to Gr. 61
Remove lower trim from instrument panel, refer to Gr.51
Remove airbag steering wheel 32 33 000.

Caution!
On vehicles with
Electronic Damper Control or
Active Rear Axle Kinematics (AHK) or
Dynamic Stability Control,
a "steering angle adjustment "must be conducted after assembly using the BMW Sevice Tester.



Remove clamping screw.
Press steering spindle downwards.

Installation:
Clamping screw is located in retaining groove of steering spindle.
Replace self-locking nut.
Tightening torque 32 31 1AZ *.



Remove steering angle sensor (1) from steering spindle.

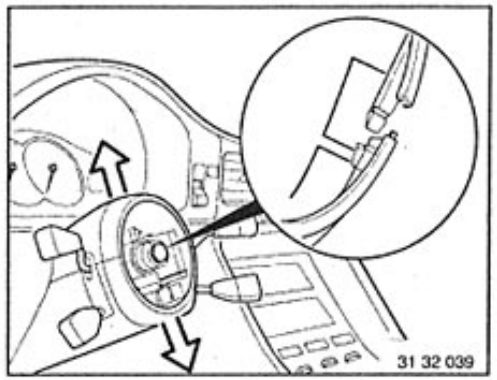
Installation:
The pin on the steering angle sensor (1) must locate in the rotary fixture (2).

*Refer to Technical Data

32 31 090 Removing and installing complete steering column

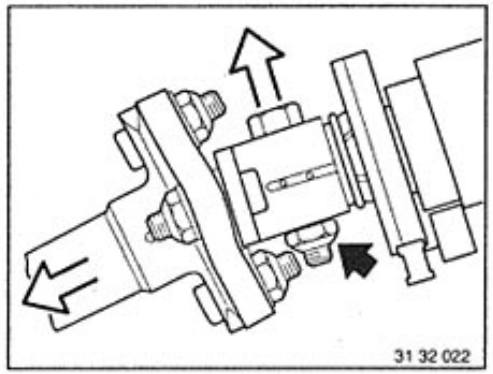
Disconnect ground lead from battery.
Remove steering wheel 32 33 000.
Remove lower trim from instrument panel, refer to Gr. 51.

Caution!
On vehicles with
Electronic Damper Control or
Active Rear Axle Kinematics (AHK) or
Dynamic Stability Control,
a "steering angle check" must be performed using the BMW Sevice Tester.



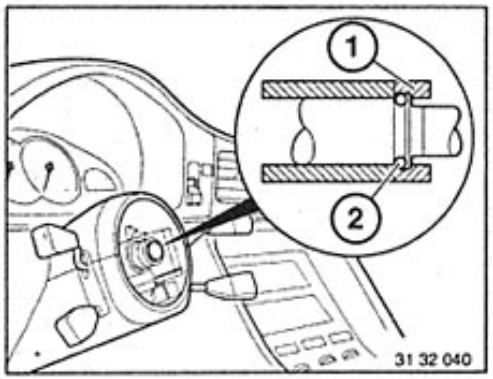
Remove lower section of steering column trim from upper section
If necessary, unscrew and remove cable from interlock.

Installation:
Check that locking fixture is correctly seated.



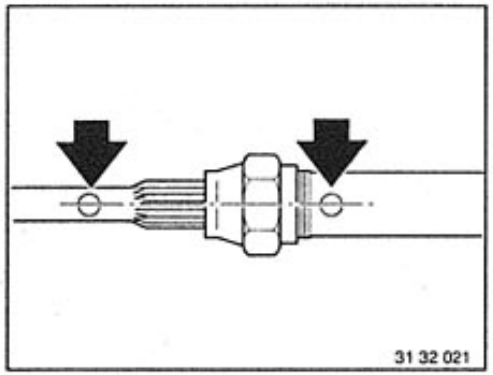
Remove clamping screw.
Press steering spindle downwards.

Installation:
Clamping screw is located in retaining groove of steering spindle.
Replace self-locking nut.
Tightening torque*.

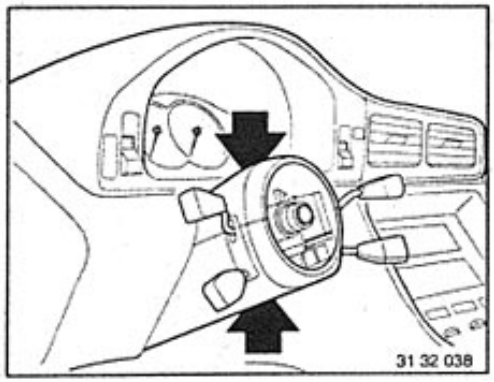


Remove end collar (1).

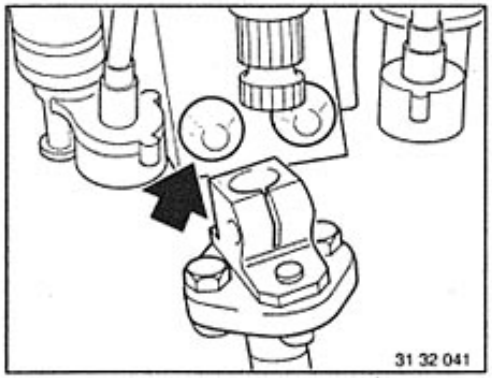
Installation:
Note position of end collar (1) relative to sna ring (2).



Note:
Allocation of gear teeth marked with spot of paint.
Adjusting nut tightened down to point that displacement force equals 40 ± 25 N.



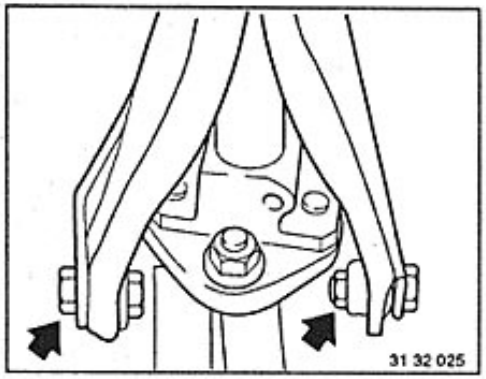
Unfasten screws.



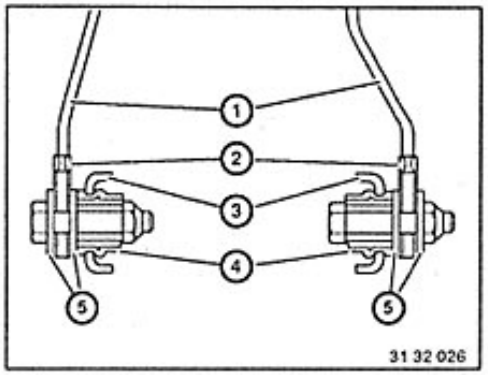
Unfasten tear-off screw with chisel or mill off screw head.

Installation:
Fit spacer tube.
Tighten down tear-of screws to tearing point.

* Refer to Technical Data

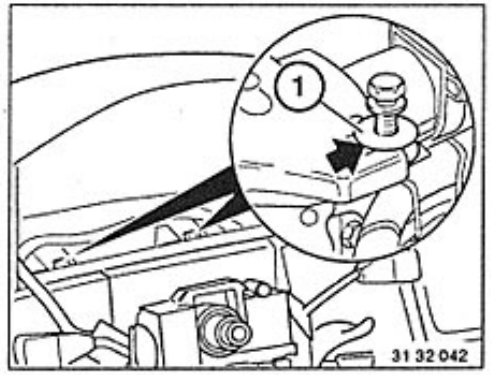


Installation:
1 Lever (left, right)
2 Sliding cover
3 Steering column slide
4 Rubber mount
5 Washer
Replace self-locking nuts.
Tightening torque*.

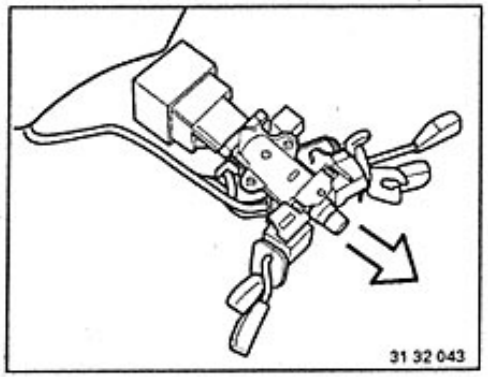


Remove instrument cluster – see Group 62.
Loosen bolts.

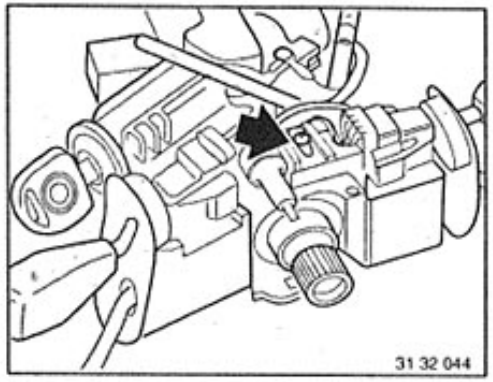
Installation:
Hooks of the steering column must be located in guide sleeves (1).
Pull steering column up and tighten the bolts.
Tightening torque*.



Pull off plugs on potentiometers.
Discoonect all wires leading to the steering column on the plugs.
Press down and remove steering column.



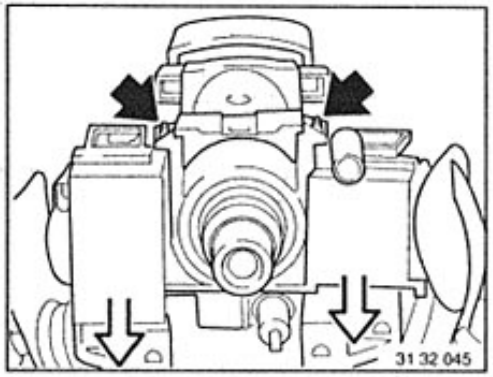
* See Specifications



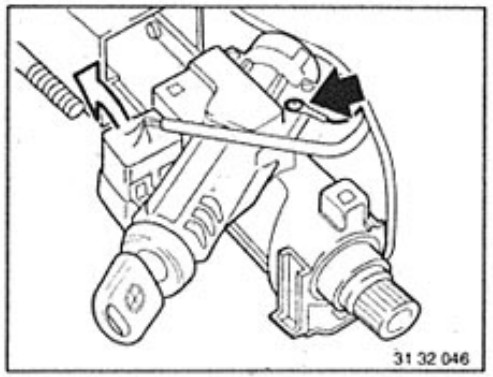
32 31 595 Dismantling and assembling complete steering column

Remove steering column 32 31 090.

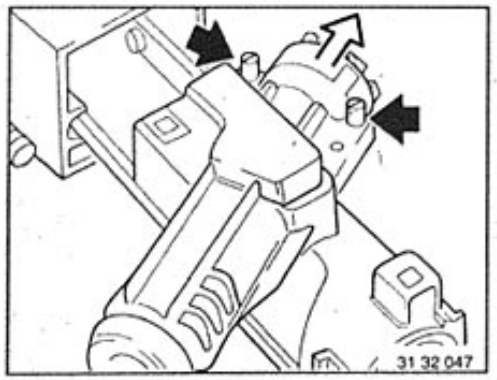
Unfasten screw.



Press locking hook and remove switch.

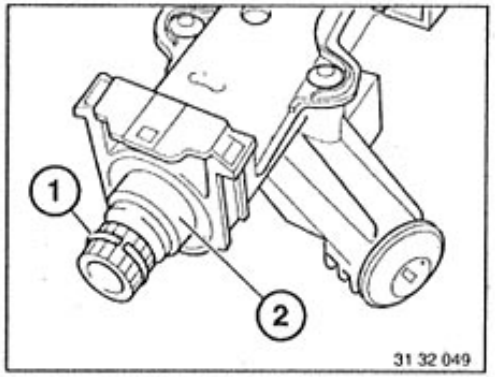


Remove ground cable.
Turn relay base and remove.

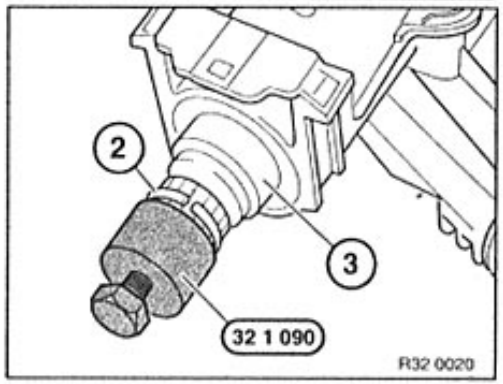


Unfasten both Maden screws.

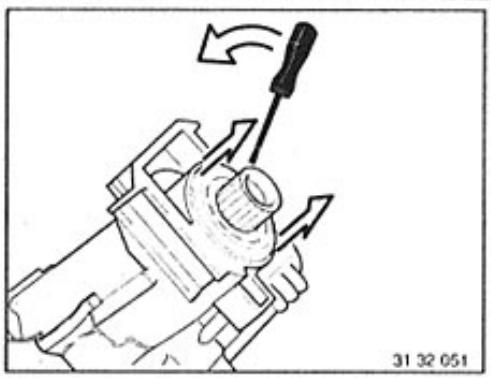
Installation:
Secure Maden screws with paint.



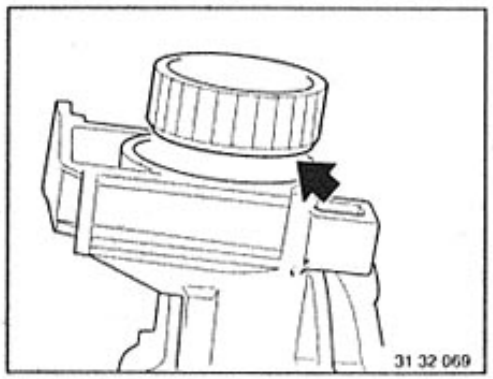
Lift out snap ring (1) and remove with bush (2).



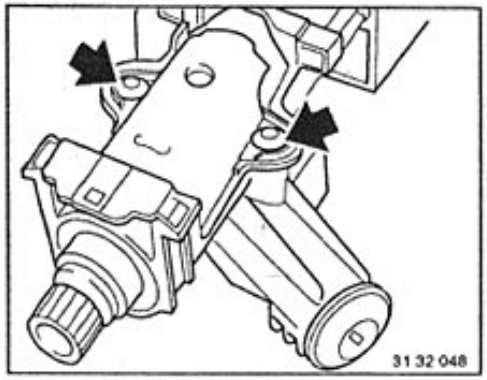
Installation:
Fit bush (3).
Tighten down snap ring (2) with special tool 32 1 090 and steering wheel retaining screw until they engage in groove.



Lift out and remove steering spindle bearing.
Remove inner steering sleeve.

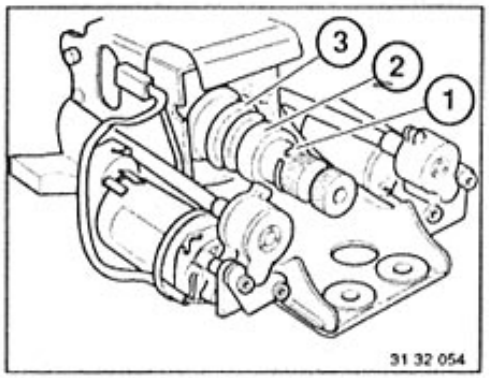


Installation:
Install bearing sleeves with the tapered side facing the steering lock.

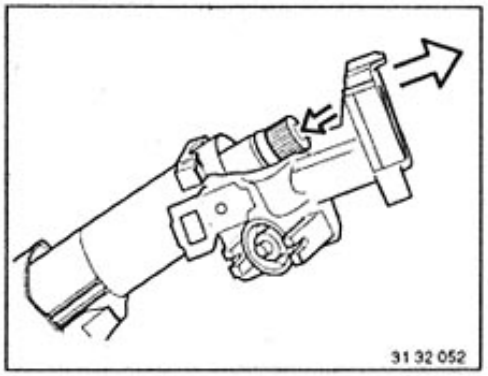


Remove shear-off bolts.

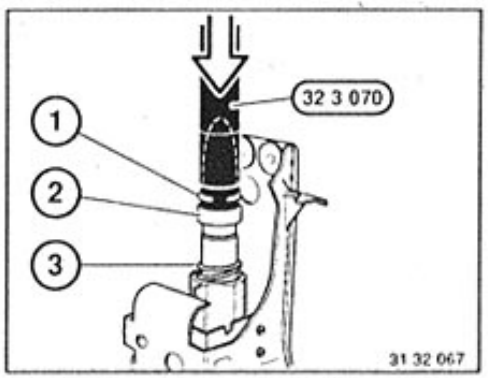
Installation:
Tighten Torx bolts until they shear off.



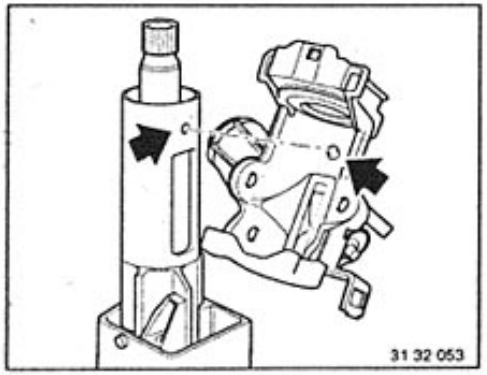
Lower Steering Spindle Bearing:
Lift out circlip (1) and remove collar (2) and spring (3).
Take off steering spindle.



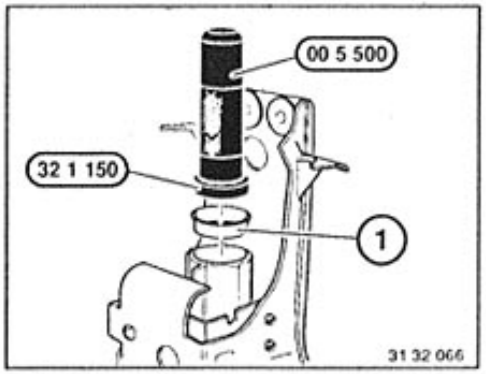
Turn steering lock to "R" position.
Press down on steering spindle and remove the steering lock.



Installation:
Mount spring (3) and collar (2).
Recess in the collar must face the circlip.
Install circlip (1) with Special Tool 32 3 070.



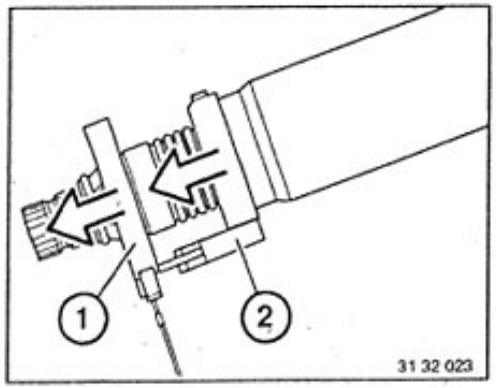
Installation:
Dowel pin must be in the bore.



Knock lower steering spindle bearing out of the outer sleeve.

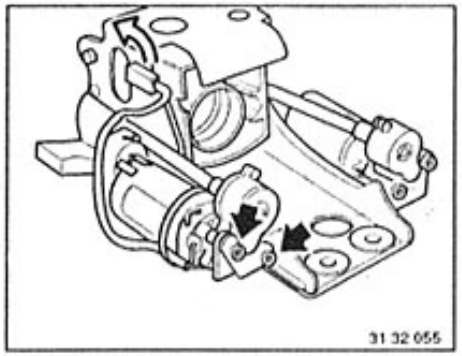
Installation:
Press contact ring out of the new bearing.
Drive in new bearing (1) with Special Tools 32 1 150 and 00 5 500.

Important!
Press contact ring – for horn ground – into the bearing again.

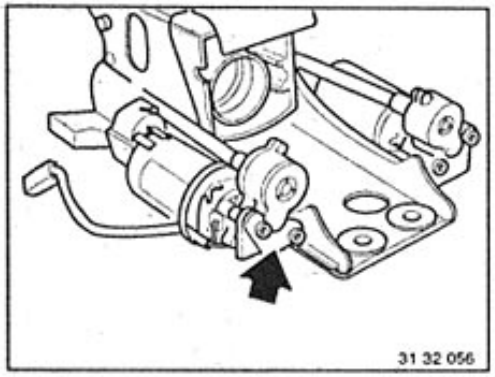


Pull steering angle sensor (1) off of the steering spindle.

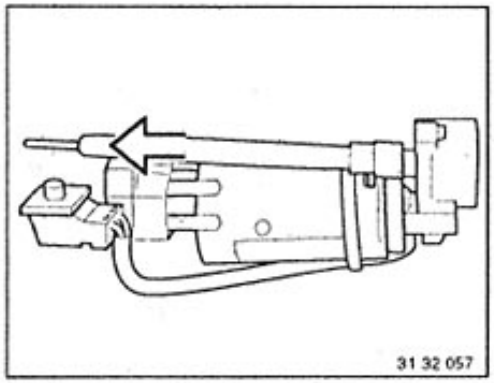
Installation:
Pin of steering angle sensor (1) must fit in turning lock (2).



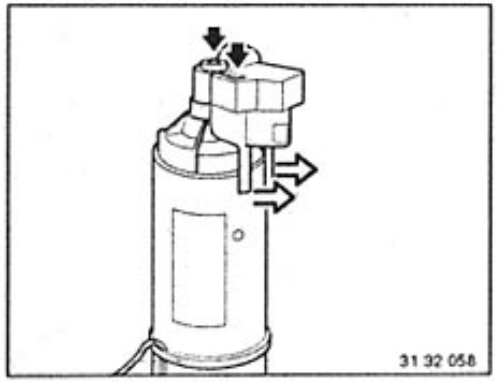
Unscrew screws.
Turn plug out of the holder.
Take off gearbox motor.



Installation:
If applicable, use washer.

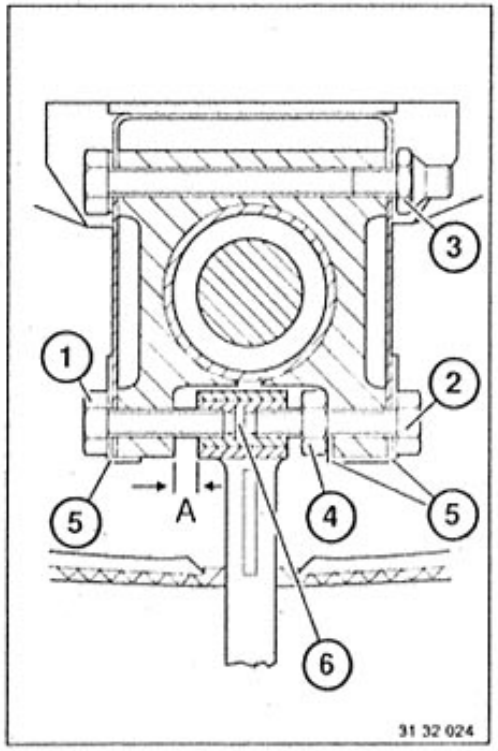


Pull off shaft.



Unscrew screws, press hooks towards outside and take off potentiometer.

Mechanical Steering Column Adjustment:
Unbend lockplates (5).
Unscrew bolts (1 ... 3).
Bolt (1) = left-hand threads.

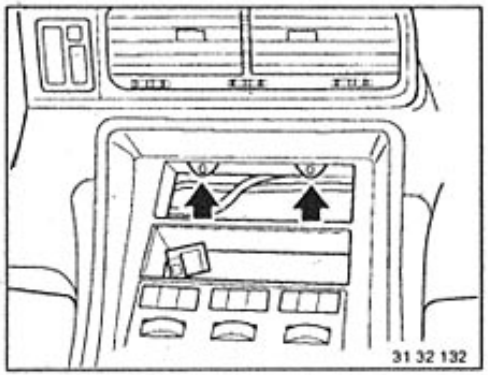


Assembling Procedures (Note Order):

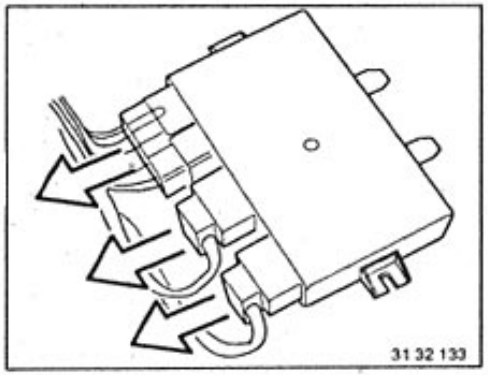
1. **Screw in left M 8 x 32 bolt (1) together with lockplate (5) – tightening torque = 15 Nm.**
   Distance A between lever and clamp = 6 ± 1 mm.
2. **Screw in M 8 x 40 bolt (2) together with lockplate (5) and nut (4) – tightening torque = 7 Nm.**
3. **Tighten nut (4) – tightening torque = 15 Nm.**
4. **Tighten hexagon nut (3) – lever (6) in "CLOSED" position.**
   Tightening torque = 15 Nm.
5. **Bend lockplate (5).**

32 31 800 REPLACING CONTROL UNIT FOR ELECTRIC STEERING COLUMN CONTROL

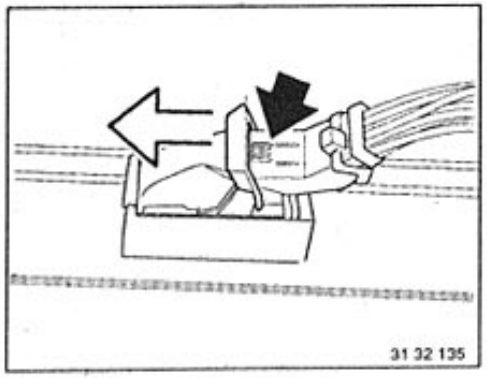
Remove multi-information display – see Group 65.



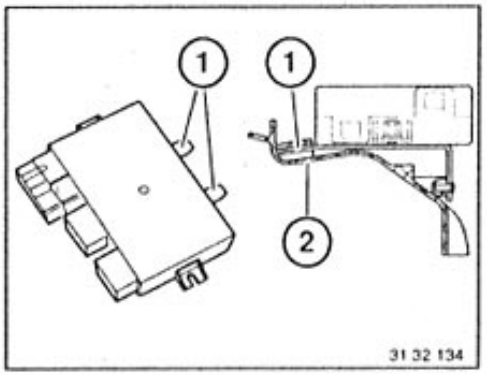
Unscrew screws.



Pull out control unit and pull off plugs.
Transfer holder.



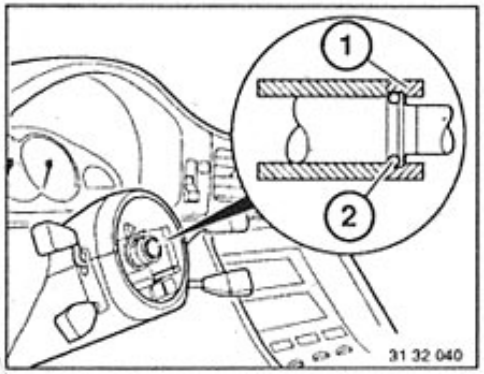
Important!
Press down on retainer and lift lever.



Installation:
Tabs (1) must be located in slots (2) of the heater housing.

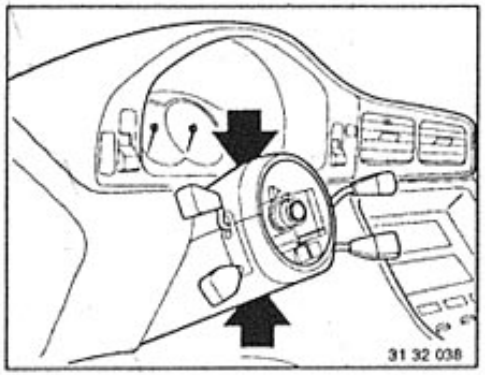
32 32 001 REPLACING COMPLETE STEERING LOCK

Set steering column to "lowered" and "run out" position.
Disconnect battery ground lead.
Remove steering wheel – see 32 33 000.
Remove bottom dashboard trim panel – see Group 51.

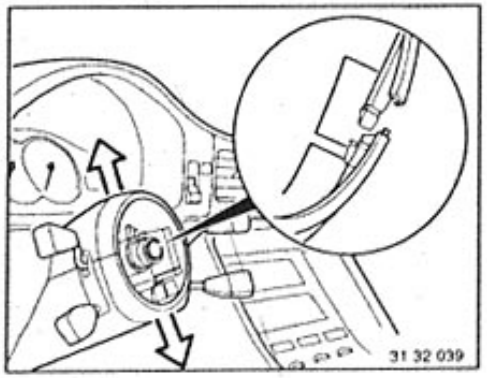


Take off collar (1).

Installation:
Recess in collar (1) must be above circlip (2).

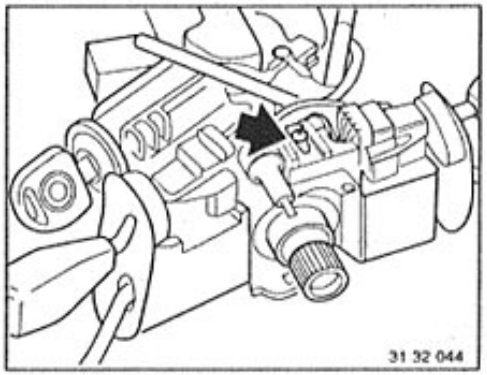


Unscrew screws.



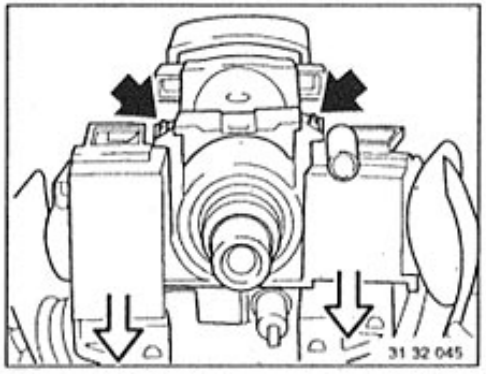
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.

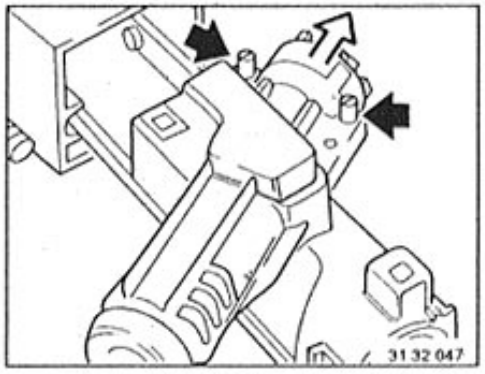


Remaining procedures are shown on a removed steering column for better understanding.

Unscrew screw.

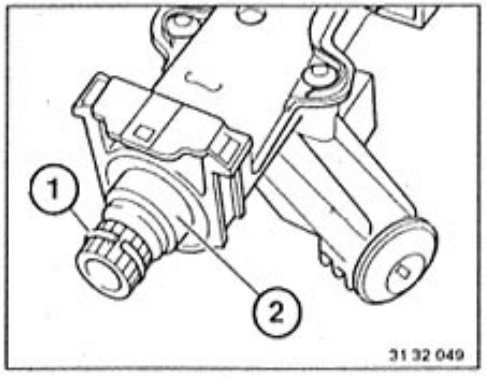


Compress retainers and pull off switch.

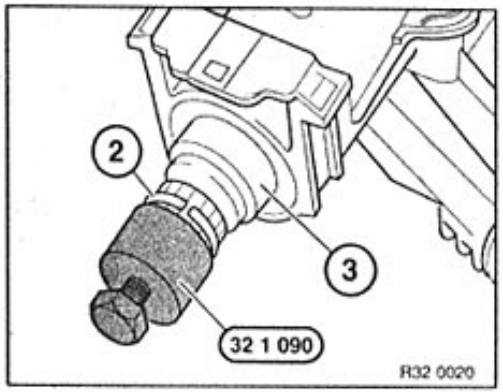


Unscrew both setscrews.

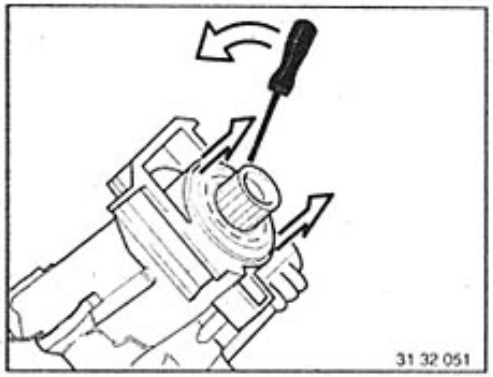
Installation:
Lock setscrews with paint.



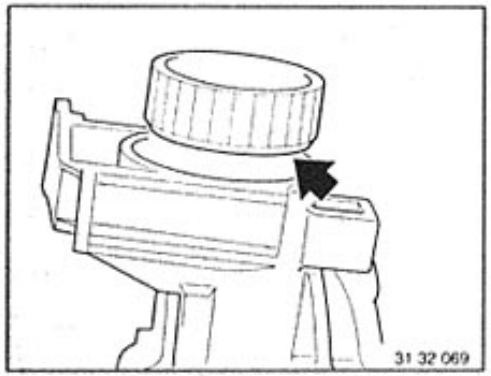
Lift out and remove circlip (1) with sleeve (2).



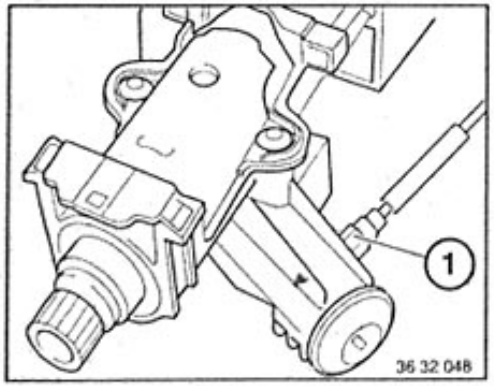
Installation:
fit bush (3).
Draw snap ring (2) with special tool 32 1 090 and steering wheel retaining screw firmly home in groove.



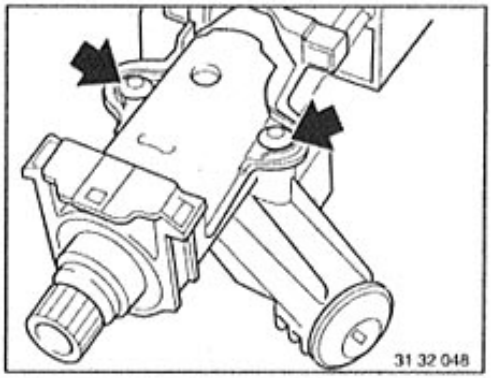
Lift out and remove steering spindle bearing.
Remove inner steering sleeve.



Installation:
Install bearing sleeves with the tapered side facing the steering lock.

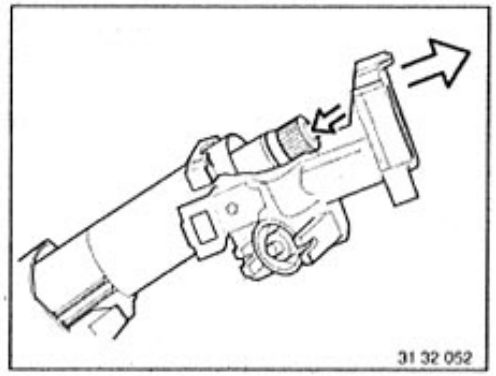


If necessary, unscrew and remove cable (1) from interlock.

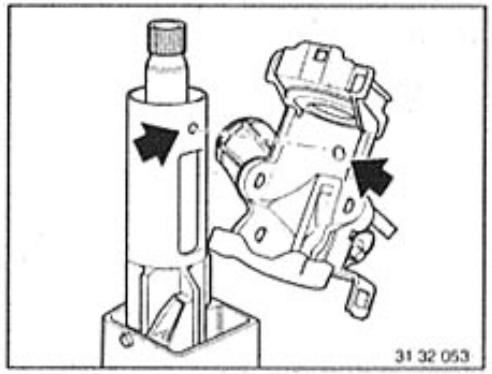


Unfasten tear-off screws.

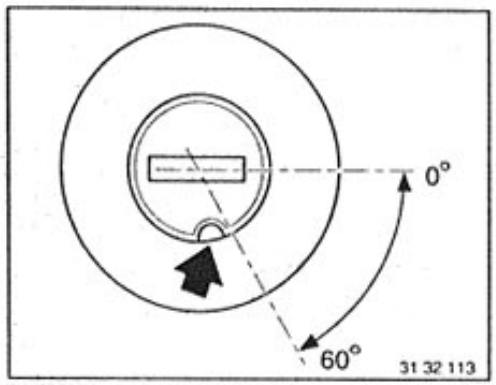
Installation:
Tighten down Torx threaded dowels until they tear off.



Rotate steering lock into position "R".
Press steering spindle downwards and remove steering lock.

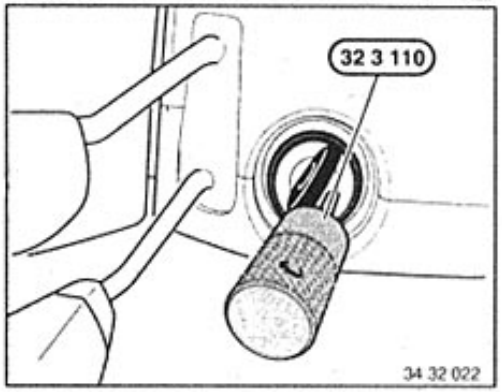


Installation:
Reamed bolt must locate in bore.



32 32 050 Removing and installing or replacing steering lock cylinder

Using ignition key, move lock cylinder into position "R" = 60°.



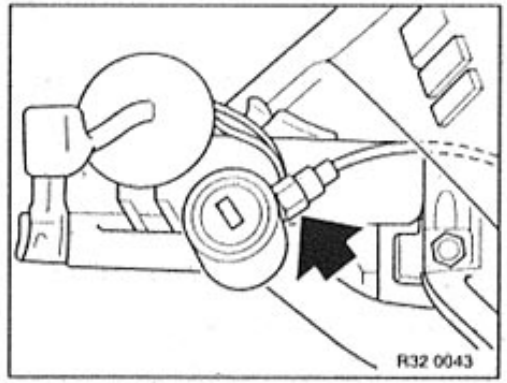
Press special tool 32 3 110 or a piece of Ø 1.2 mm wire into bore of lock cylinder and pull out lock cylinder.

32 32 170 Removing and installing or replacing interlock cable

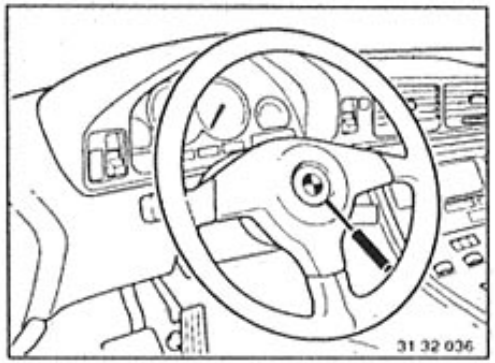
Caution!
After fitting interlock, check function, refer to 25 16 ... Repair Instructions for 3 Series E36.

Remove shift lever cover and unfasten interlock cable from shift tower
Secure new interlock cable to existing cable with wire or similar material

Installation:
Adjusting interlock cable, refer to 25 16 ... Repair Instructions 3 Series E36.
Tightening torque 8 Nm.



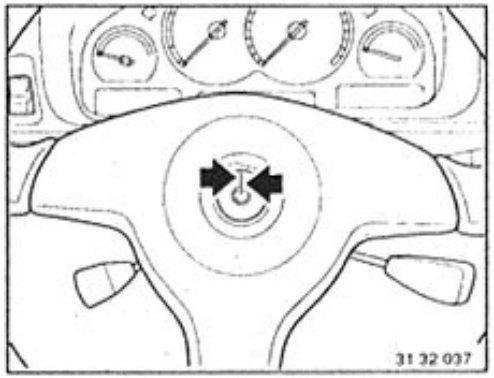
Remove lower section of steering column trim
Unfasten interlock cable on steering lock and remove, inserting new interlock cable at the same time.



32 33 000 REMOVING AND INSTALLING STEERING WHEEL

Without Airbag (SRS):

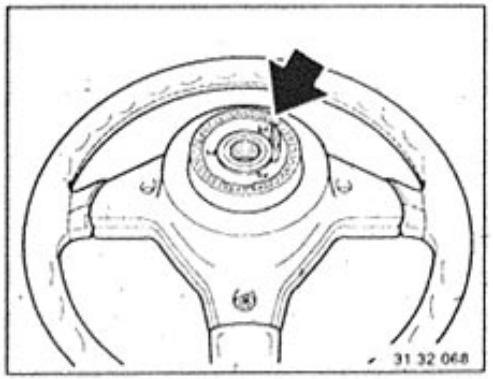
Lift out BMW emblem.



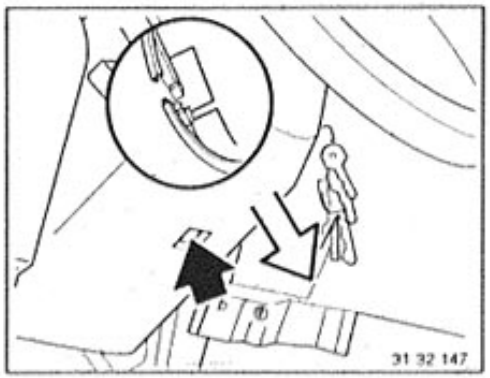
Unscrew screw.
Mark position of steering wheel to steering spindle.
Pull off steering wheel.

Installation:
Tightening torque*.

Important!
Don't damage the turn signal self-cancelling cams – set turn signals to center position.

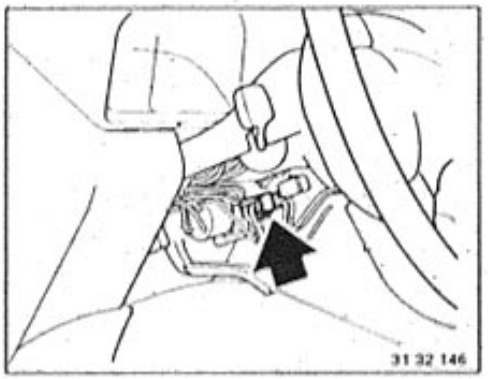


Installation:
Coat slip ring with grease**.



Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.

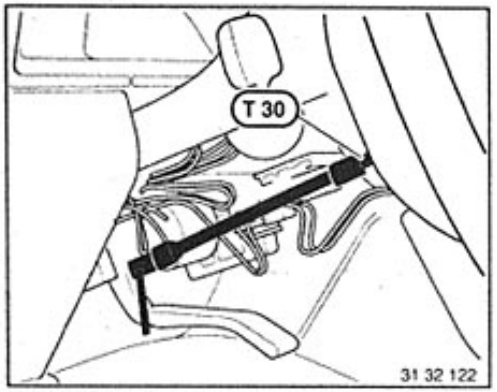


Turn plug (orange) out of the holder and disconnect.

With Airbag (SRS):

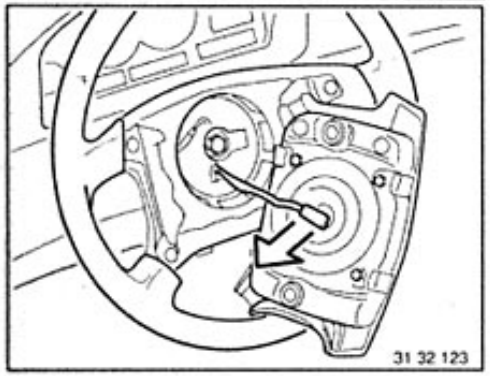
Caution!
Conform with safety precautions! Incorrect handling could cause activation of the airbag and lead to injuries. Disconnect battery and cover ground pole or terminal.

See Specifications
See Operating Fluids



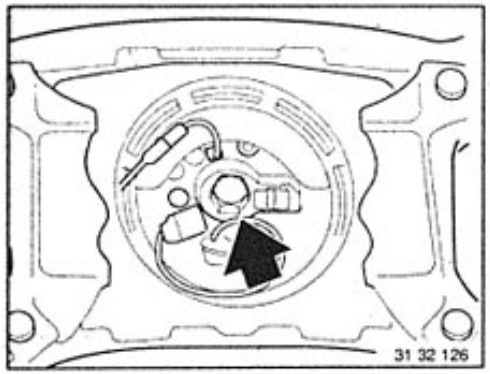
Until mod.95
Loose screws (Innentorx T 30).

Installation:
First tighten the right screw, viewed in direction of travel.
Do not jam cable. Tightening torque*.



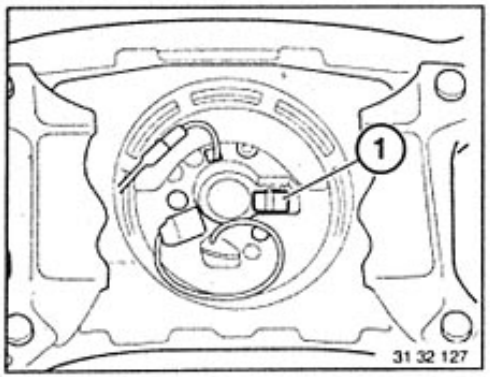
Unfasten connector and remove airbag unit.

Caution!
Airbag must always be placed with padded side facing upwards (trunk).



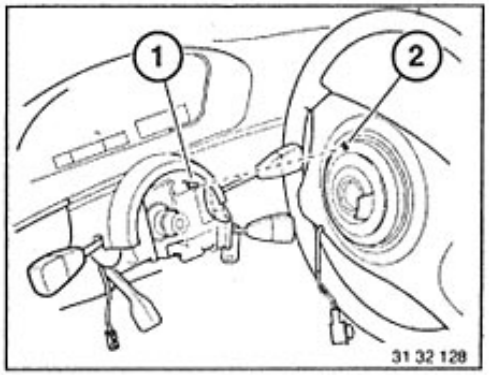
Move steering wheel into straight-ahead setting (marking on steering gear and on steering spindle).
Unfasten screw, mark relative position of steering gear to steering spindle

Installation:
Tightening torque 32 33 1AZ*.

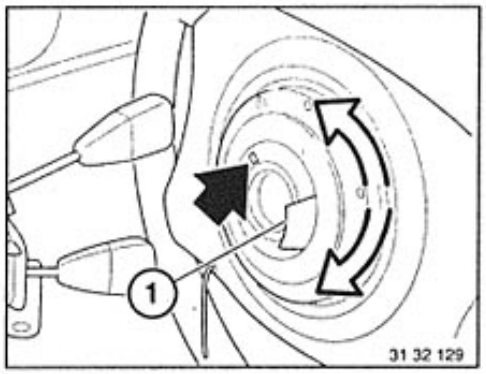


Note:
When the screw is loosened, the torsion spring (1) becomes effective, securing the contact ring in its center position.

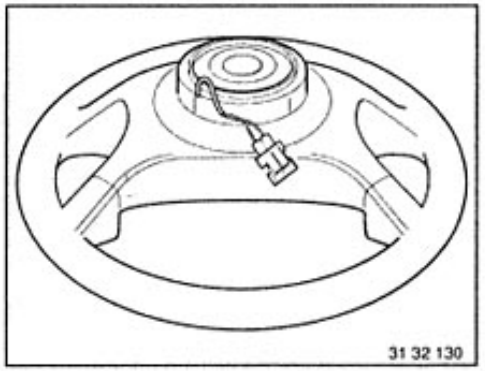
* Refer to Technical Data



Installation:
Locating pin (1) must engage in recess (2).
Tightening torque*.

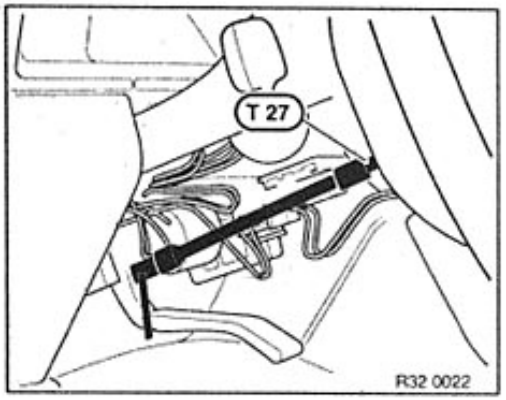


If necessary, adjust contact ring:
Press down spring (1) – turn contact ring to left or right stop, turn back approx. 3 complete turns until marker arrows for center position are aligned, then release spring (1).



Installation:
Coat slip ring with grease**.

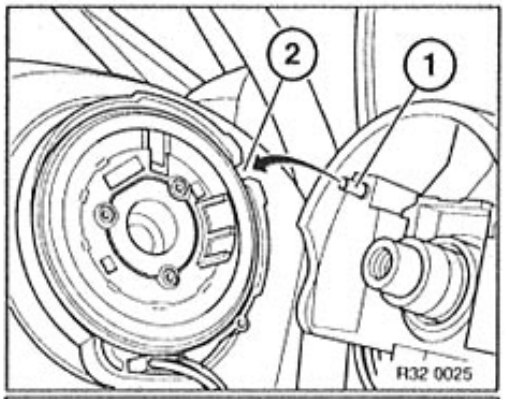
* Refer to Technical Data
** Refer to Operating Fluids Specifications



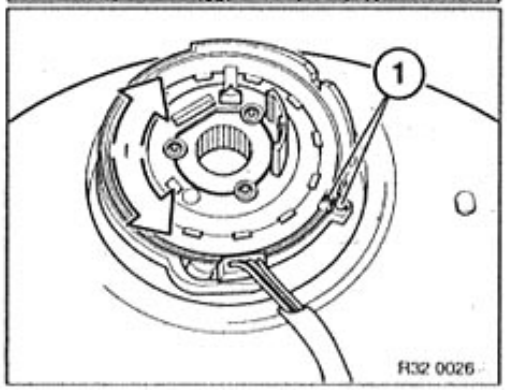
From mod. 95
Unfasten both screws (internal Torx T 27).
Remove connector from squib, pull off horn contact and remove airbag unit.

Caution!
Airbag unit must be stored with pad facing upwards (trunk).

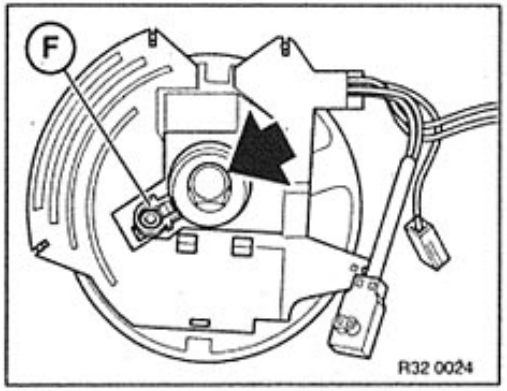
Installation:
Do not jam cable. Tightening torque, refer to Technical Data 32 34 1AZ.



Installation:
Detent pin (1) must engage in recess (2).



Installation:
If necessary, adjust contact ring:
Press down on spring (F).
Determine centre position of contact ring by halving total number of turns. Ensure all marks (1) are accurately aligned.
Release spring (F).



Move steering wheel into straight-ahead position (marks on steering gear and steering spindle must be aligned).

Unfasten screw, mark position of steering wheel relative to steering spindle and remove.

Note:
When screw is unfastened, torsion spring (F) becomes active, securing the contact ring in centre position.

Installation:
Tightening torque, refer to Technical Data 32 33 1AZ.

- with Airbag II

Refer to Repair Instructions for 3 Series E36.

32-34/1

AIRBAG SYSTEM (SRS)

Components:

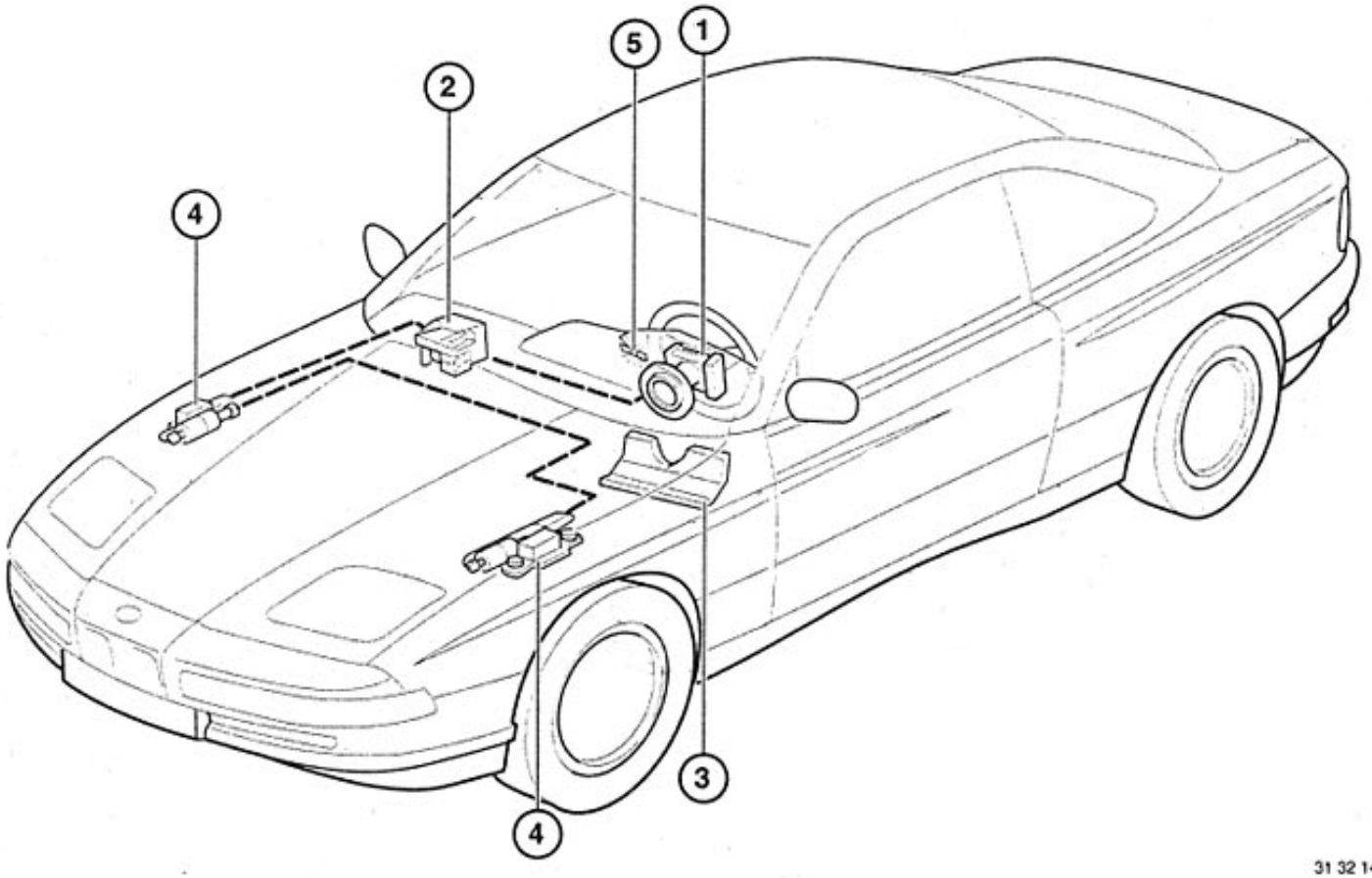
1 **Steering wheel with airbag unit (airbag, gas generator, ignition pill and contact ring)**

2 **Diagnosis unit**

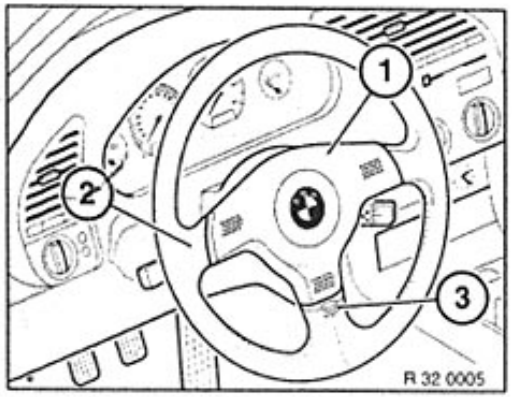
3 **Knee guard (US model)**

4 **Two crash sensors (left and right on wheel house)**

5 **Airbag control lamp (in instrument cluster)**



31 32 144



Airbag II

Components:

1 Airbag unit (airbag, gas generator, ignition squib)
2 Steering wheel (contact rings or coil springs, electronics)
3 Indicator lamp

Basic / central airbag unit

Components:

Basic airbag unit, EEC / Central airbag unit US (under the oddments tray beside the handbrake lever)

Steering wheel with airbag unit (airbag, gas generator, ignition squib and contact ring).

Airbag indicator lamp (in the instrument cluster)

Passenger airbag unit (airbag, gas generator, ignition squib)

Knee guard (US model)

Function

The system is triggered by sensors when vehicle retardation is equivalent to a direct head-on collision at no less than 18 km/h with a solid obstacle (i.e. one which does not yield).

This closes the circuit, igniting the gas generators. This sudden combustion causes non-toxic gases to be released by the solid fuel mixture. These completely inflate the folded airbag in the steering wheel and instrument panel within the space of approx. 30 ms.
When fully inflated, the airbag minimizes injuries to head and upper torso in head-on collisions. Discharging takes place through two holes on the side of the airbag facing away from the driver / passenger.

Monitoring:

The airbag system is monitored continuously by a diagnosing unit from ignition lock position "1". The control lamp comes on and goes out again after about 6 seconds to indicate that the system is ready for use.

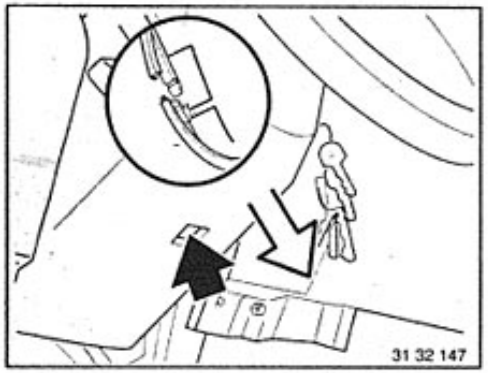
If this lamp comes on again, there is a detected fault in the system.
Self – diagnosis – interrogate the fault memory with the BMW DIAGNOSING SYSTEM.
Airbag II troubleshooting, refer to Repair Instructions for 3 Series E36.

Safety rules for handling airbag gas generators

Refer to Repair Instructions for 3 Series E36.

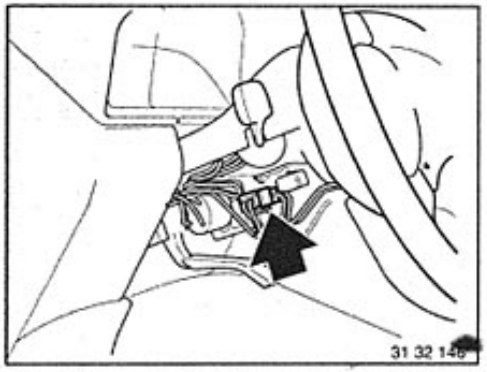
32 34 020 Removing and installing or replacing airbag

Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.
Disconnect battery and cover ground terminal.

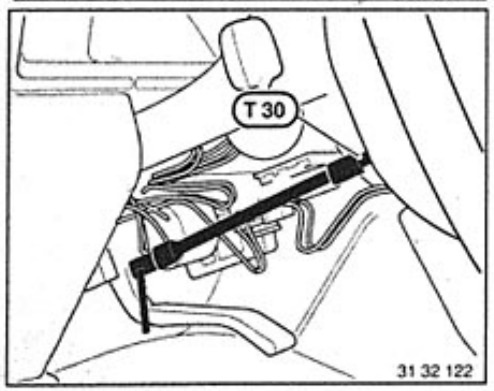


Unfasten screw.
Remove lower section of steering column trim from upper section.

Installation:
Check that locking fixture is correctly seated.



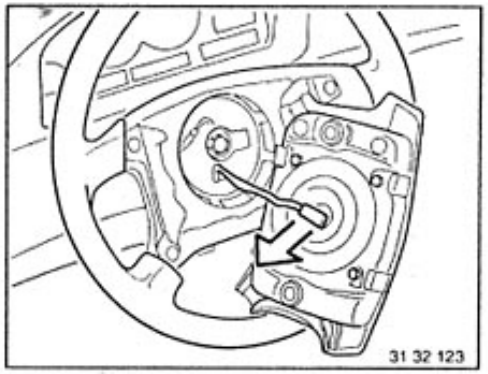
Twist plug connection (orange) out of bracket and disconnect.



Loose screws (Innentorx T 30, from mod. 95 T 27).

Installation:
First tighten right screw in direction of travel.
Do not jam cable.
Tightening torque*.

* Refer to Technical Data



Unfasten connector and remove airbag unit.

Caution!
Airbag must always be laid aside (in trunk) with impact pad facing up.

Airbag II:

Refer to Repair Instructions for 3 Series E36.

32 34 504 Additional work with passenger airbag
– Steering wheel removed –

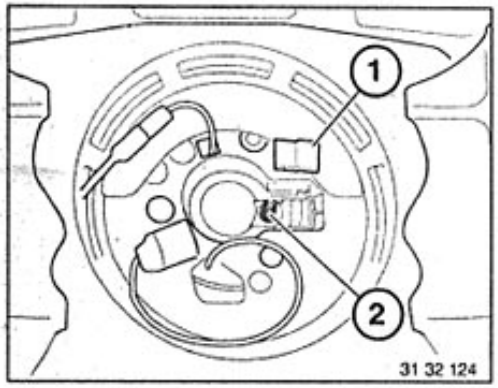
Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.

Lift cover off airbag.
Unfasten screws, lift off passenger airbag and remove connector.

Caution!
Only place passenger airbag to one side (in trunk) with impact pad facing up.

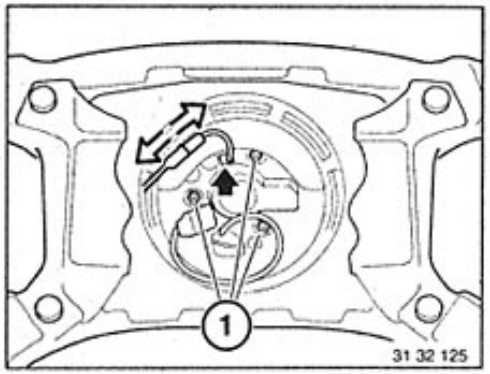
32 34 510 Replacing contact ring (Air-bag)

Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.
Remove steering wheel 32 33 000.



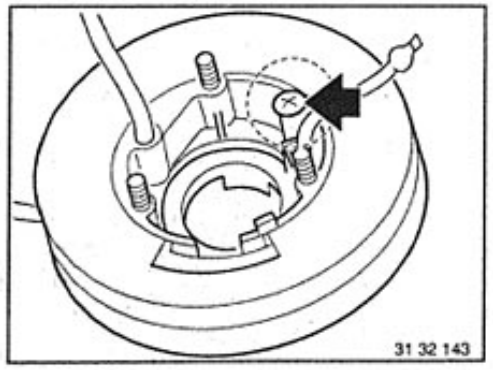
Lift out interlock (1) with screwdriver.

Installation:
Install spring (2) in bore and fit interlock.
Press interlock down until it engages.

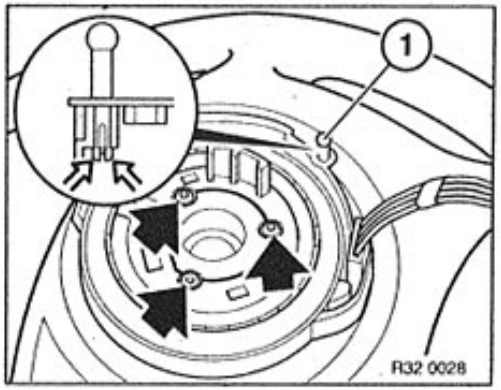


Disconnect plug connection.
Unfasten nuts (1) and remove contact ring.

Installation:
Insert horn cable through rectangular aperture.
Secure nuts with paint.



Caution!
A new contact ring is secured in centre position with a screw. This screen must be removed once the contact ring has been screwed to the steering wheel.

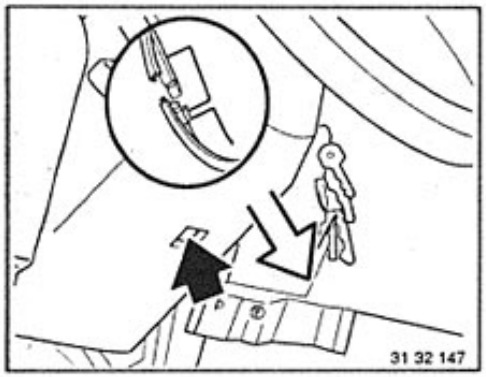


from mod. 95
Unfasten screws and remove contact ring.
Caution!
Do not remove anti-twist retainer (1) until contact ring is screwed to steering wheel.

Press together both ends and remove anti-twist retainer (1).

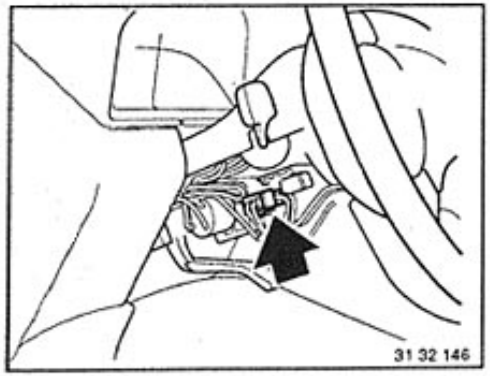
65 77 010 REMOVING AND INSTALLING OR REPLACING AIRBAG DIAGNOSIS UNIT

Caution!
Conform with safety precautions! Improper handling could cause activation of the airbag and lead to injuries. Disconnect battery and cover negative pole or terminal.

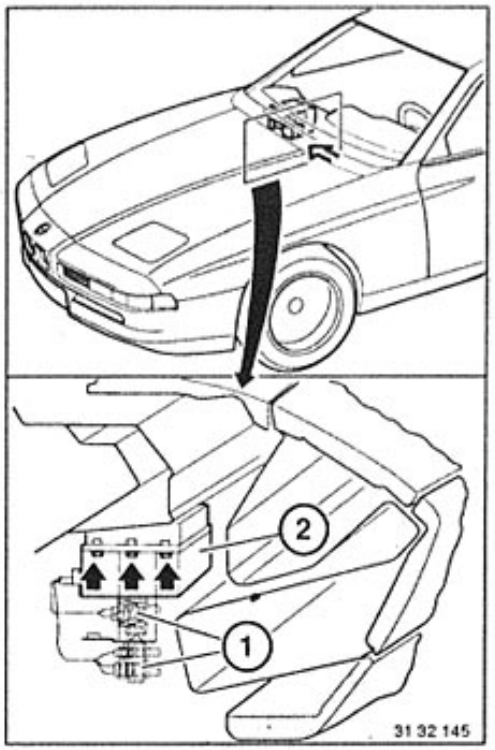


Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.



Twist plug (orange) out of the holder and disconnect.



Remove trim panel for dashboard at bottom right.

Disconnect (orange) plugs (1).
Unscrew screws.
Remove diagnosis unit (2).

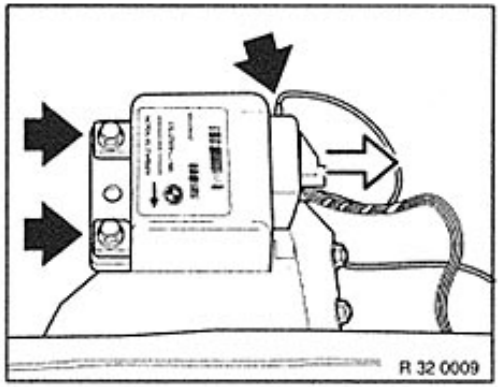
Installation:
Arrow on unit faces forward.

65 77 012 Removing and installing or replacing control unit for airbag II

see Repair Instructions for 3 Series E36.

65 77 016 Removing and installing basic / central airbag

Caution!
Observe safety regulations!
Incorrect handling can trigger the airbag, possibly causing injury.
Disconnect battery and cover ground terminal.
After assembly, perform function check.



Remove oddments tray, see 51 16 200.
Unfasten screws, disconnect cable connector and remove basic / central airbag unit.

Installation:
Arrow on unit points in direction of travel.

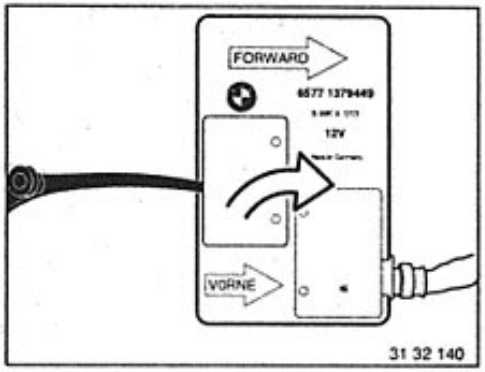
65 77 018 Replacing basic / central airbag unit

Remove and install basic / central airbag unit, see 65 77 016.

Code new unit wity MoDiC.

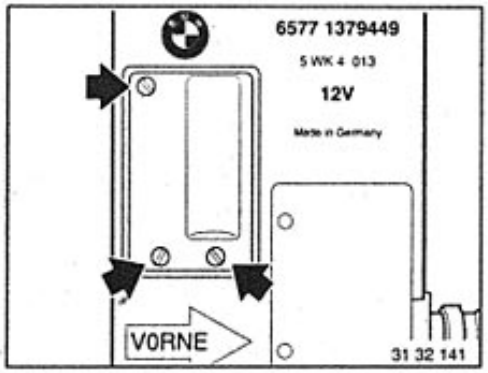
65 77 015 REPLACING CAPACITOR OF AIRBAG DIAGNOSIS UNIT

Remove diagnosis unit – see 65 77 010.

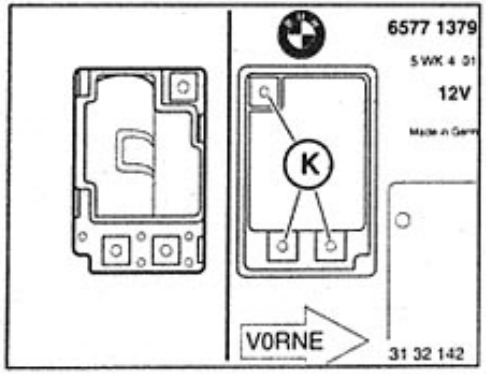


Open cover with a feeler gage blade (0.20 mm) or small screwdriver.

Installation:
Install new cover.



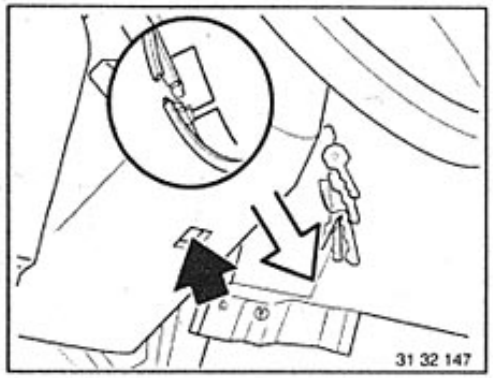
Unscrew screws and take off capacitor.



Installation:
Clean contact surfaces (K).

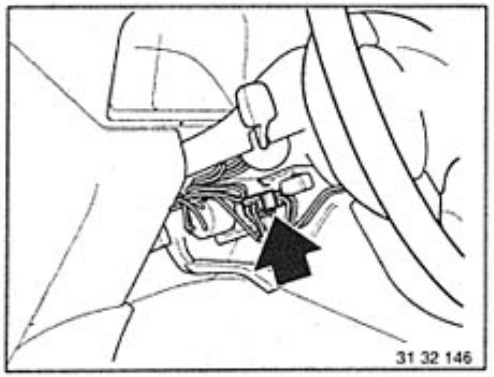
65 77 020 Removing and installing or replacing one front airbag sensor

Caution!
Observe safety instructions!
Incorrect handling can trigger the airbag, possibly causing injury.
Disconnect battery and cover ground terminal.

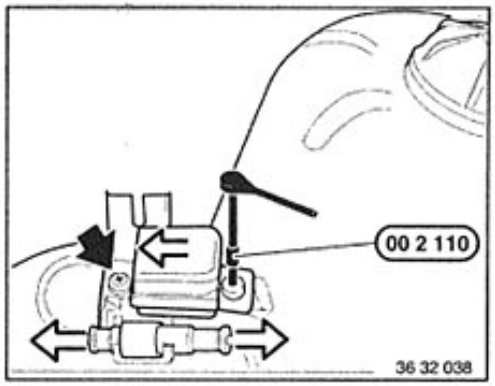


Unfasten screw.
Remove lower section of steering column trim from upper section.

Installation:
Ensure that locking fixture is correctly located.



Twist connection (orange) out of bracket and unfasten.



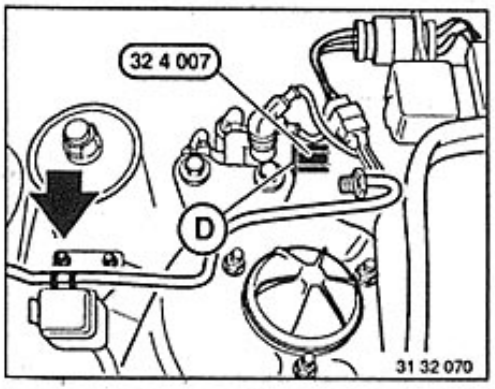
Unfasten connector and unscrew screws using tool 00 2 110.

Installation:
Arrow on sensor points in direction of travel.
Tightening torque*.

* Refer to Technical Data

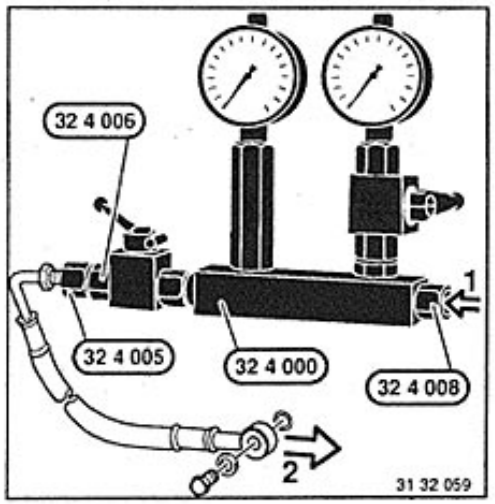
32 41 005 CHECKING OPERATION OF POWER STEERING (H-31 System)

– Engine at Operating Temperature –
Check hydraulic fluid level in tank.
Check all hose connections and equipment (pump, brake booster, power flow regulator and steering gear) for leaks before checking operation.



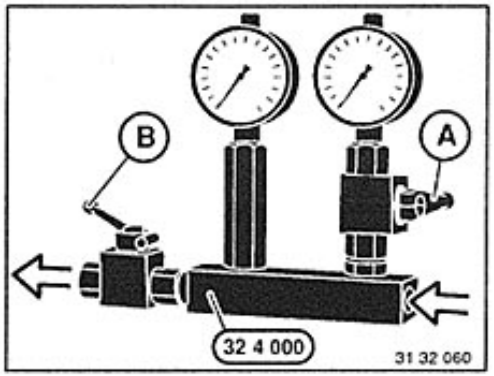
Discharging Pressure:
Stop engine and operate brake pedal about 20 times.
Unscrew pipe on power flow regulator and connect Special Tool 32 4 007.

D = Gasket



Install Special Tools 32 4 000 / 005 / 006 / 008 between pump (1) and power flow regulator (2).

Note:
Special Tool 54 3 100 could also be used instead of Special Tool 32 4 000.



A = Shutoff valve (low pressure from 0 to 15 bar / 0 to 213 psi)
B = Shutoff valve (high pressure from 0 to 150 bar / 0 to 2133 psi)

Caution!
Shutoff valve (A) must always be closed for high pressure tests to avoid damaging the pressure tester.

Open valve (B).
Close valve (A).
Start engine and fill tank with hydraulic fluid*.

Bleeding System:
Turn steering wheel twice each against left and right locks.
Operate brake pedal 5 times, wait 30 seconds and operate pedal another 5 times.

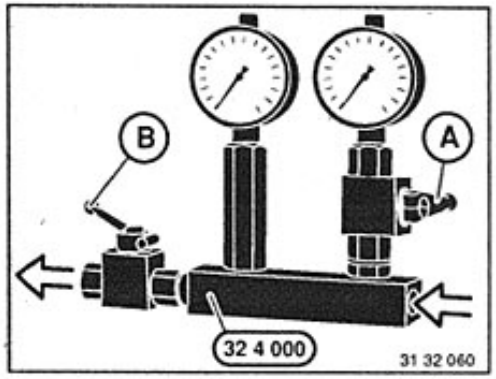
Hydraulic fluid temperature should be approx. 50° C (122° F) for all tests.
If necessary, increase the temperature by turning the steering wheel against locks with the engine running.

1. Checking Flow Pressure:
Open valve (B).
Close valve (A) and run engine.
Open valve (A) and read pressure when pressure is less than 15 bar (213 psi). Max. permissible flow pressure of 8 bar (114 psi) must not be exceeded. Pressure greater than 8 bar (114 psi): check power flow regulator and steering gear.

32 41 505 CHECKING POWER FLOW REGULATOR AND STEERING GEAR

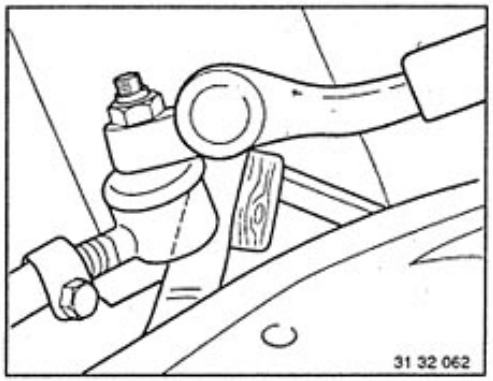
Discharge pressure. Install pressure tester between power flow regulator and steering gear. Bleed system. Carry out test as described above. With pressure less than 8 bar (114 psi), replace power flow regulator – see 34 33 100. With pressure more than 8 bar (114 psi), replace steering gear – see 32 13 060. Recheck flow pressure between pump and power flow regulator.

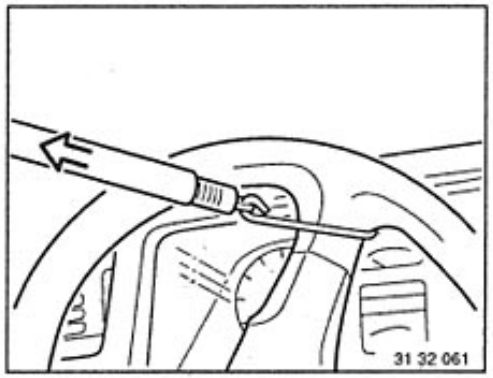
* See Operating Fluids



2. Checking Pump:
Install pressure tester between pump and power flow regulator.
Close valve (A).
Start engine.
Close valve (B) max. 10 seconds and read pressure.
Rated pump pressure* æ 10 % should be reached.
Rated pressure* exceeded, replace pump – see 32 41 061.
Rated pressure* not reached, check drive belt tightness – see 32 41 109.
Repeat test.
Rated pressure* still not reached, replace pump – see 32 41 061.

3. Checking Reservoir Charge Pressure:
Pressure tester between pump and power flow regulator.
System bled.
Engine not started.
Vlave (B) open.
Valve (A) closed.
Start engine and observe pressure tester.
Pressure must rise to max. 57 bar (811 psi) and then drop immediately to less than 8 bar (114 psi).
If max. permissible pressure of 57 bar (811 psi) is exceeded or there is no immediate pressure drop after reaching the maximum permissible pressure, replace power flow regulator – see 34 33 100.





4. Power Steering:
Pressure tester between pump and power flow regulator – system bled – valve (B) open – valve (A) closed – engine not started.
Lift car.
Stop steering from reaching final left lock by 1/2 to 3/4 steering wheel turn with a piece of wood or something similar.

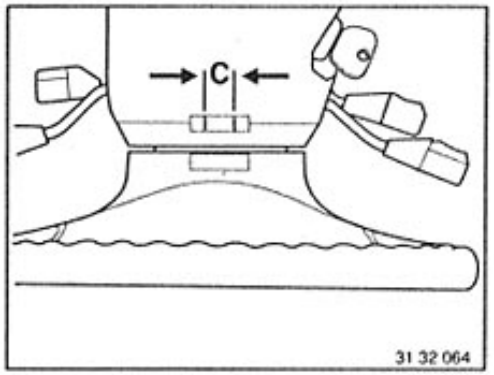
Start engine.
Pull steering wheel against final left lock with a force of 100 N (22 lbs.) (force meter) about 5 seconds and read pressure.
If pressure values are lower than pump pressure determined in point 2, replace steering gear – see 32 13 060.

* See Specifications

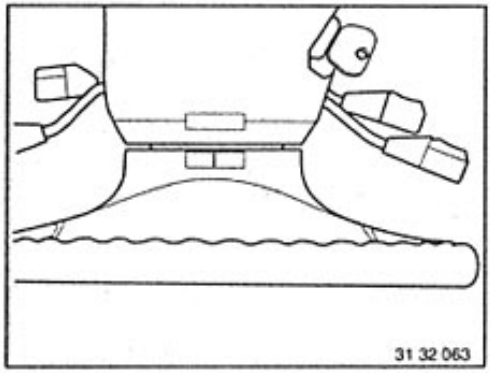
5. Check mechanical backlash in the steering unit:

- Pressure point is set 32 13 014
- No backlash in steering column

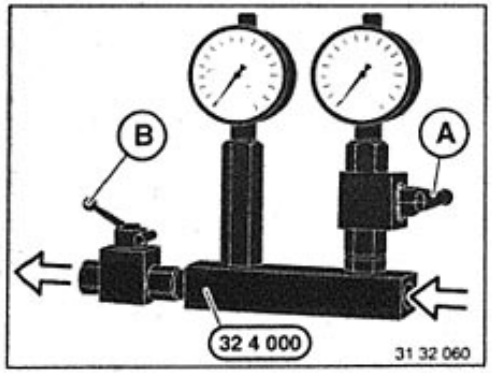
Pressure measuring device between pump and 3-phase controller– System vents – Valve (B) open – Valve (A) closed – Engine not switched on.
Ensure that pitman arm is in straight-ahead position.



Turn steering wheel to left until pressure measuring device indicates 1 bar rise in pressure over throughput pressure.
Mark position of steering wheel hub.
Repeat procedure with steering wheel on right-hand lock.
If max. perm. travel (C) = 7 mm is exceeded, the steering gear must be replaced – 32 13 060.
Remove retaining fixture and pressure measuring device.
Vent hydraulic system and, if necessary, top up hydraulic fluid.



Attach paper strip to steering wheel hub and upper section of trim.
Fit marker to steering wheel hub (center).



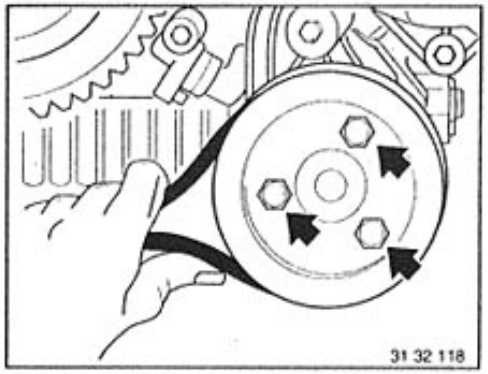
Switch on engine and open valve (A).
Read off throughput pressure.

* Refer to Operating Fluids Specifications

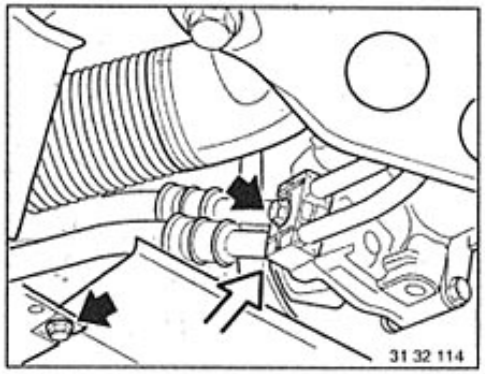
32 41 060 Removing and installing vane pump (tandem pump) for power steering unit

Drain pressure accumulator – Depress brake pedal approx. 20 times.
Draw hydraulic fluid out of container – and do not reuse.
After assembly of power steering unit, bleed: refer to 32 13 006.

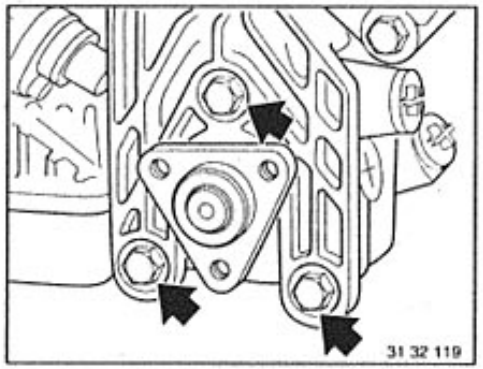
Remove ribbed vee belt.



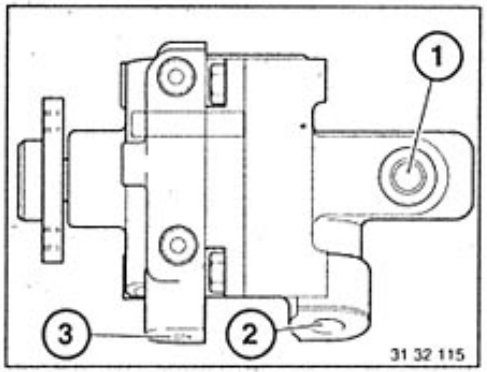
Grip pulley with help of ribbed vee belt.
Unfasten screws.



Remove splash guard.
Unfasten oil cooler line.



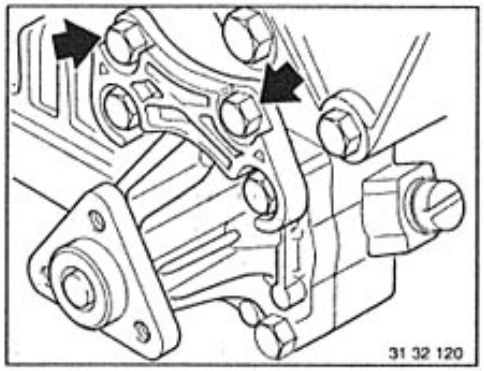
Tandem pump:
Unfasten screws.



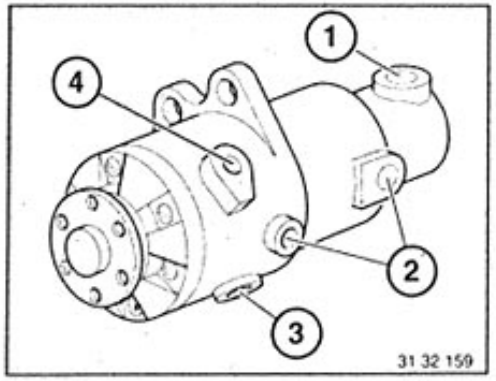
Remove lines.

Installation:
Replace gaskets.
Tightening torque*.
Bleed hydraulic system 32 13 006.

1 to steering unit
2 to container
3 to ASC +T plunger unit

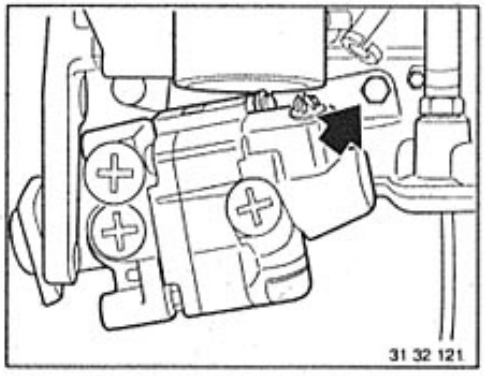


Vane pump:
Unfasten screws.



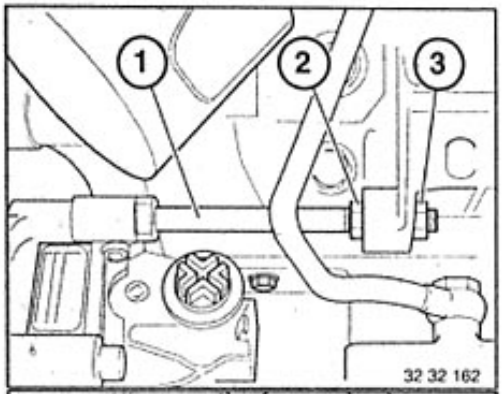
Three-circuit pump:

1 to steering unit
2 to container
3 to ASC +T plunger unit
4 to accumulator charging unit for Active Rear Axle Kinematics (AHK)



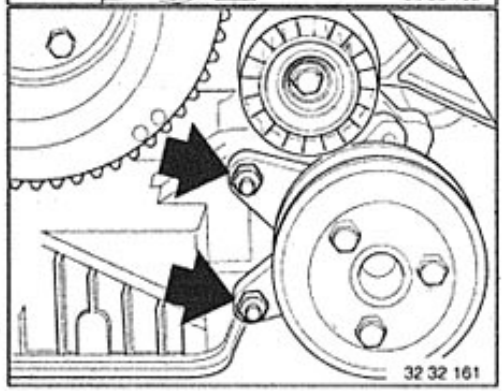
Unfasten screw.
Remove vane pump or tandem pump.

* Refer to Technical Data



from mod. 94:
Loose nut (3).

Installation:
Secure support (1) to pump.
Tightening torque, refer to Technical Data 32 41 2AZ.
Tighten nut (2) hand-tight against engine support screws.
Tighten down nut (3). Tightening torque, refer to Technical Data 32 41 2 AZ.

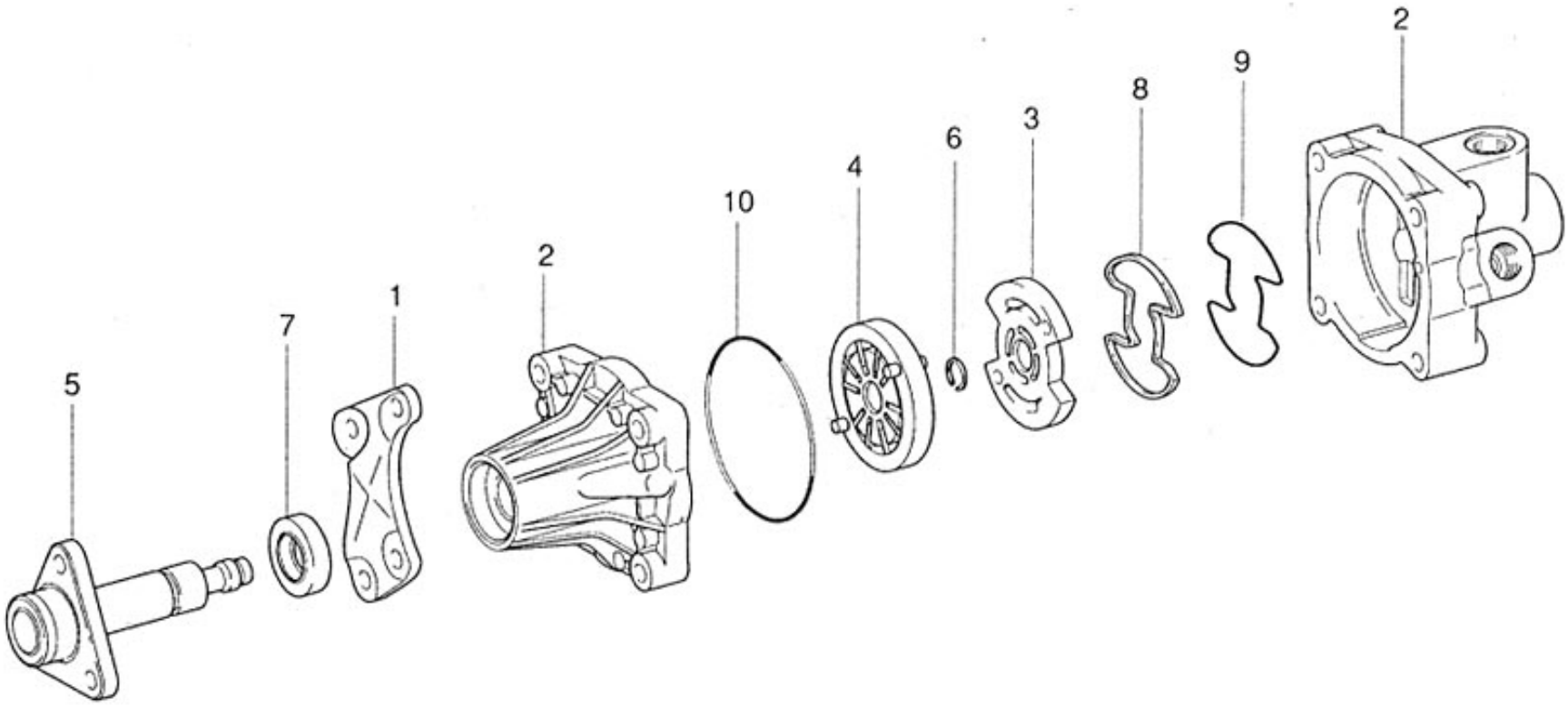


Unfasten retainer on oil pan and remove pump.

Installation:
Tightening torque, refer to Technical Data 32 41 2AZ.

POWER STEERING IMPELLER PUMP

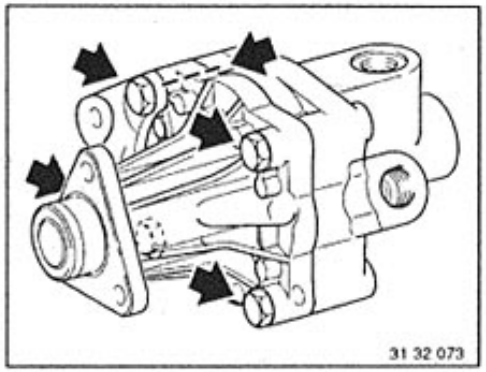
1 Holder
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Circlip
7 Radial oil seal
8 Seal
9 Guide
10 O-ring



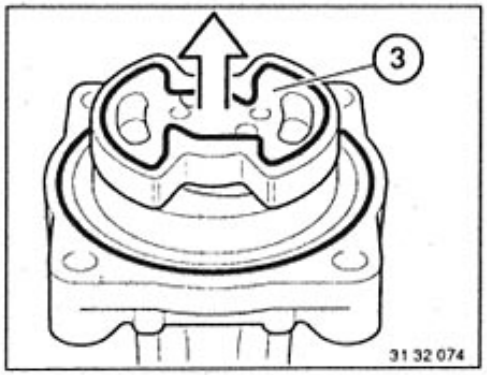
31 32 072

32 41 553 DISASSEMBLING AND ASSEMBLING POWER STEERING IMPELLER PUMP
– Pump Removed –

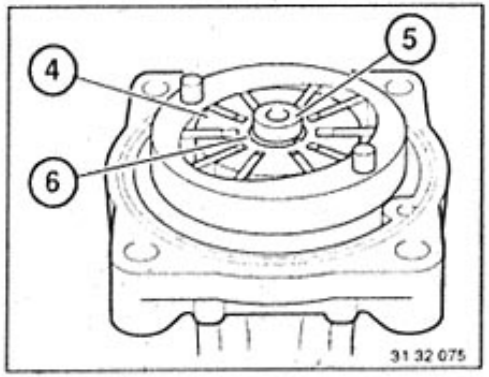
Absolute cleanliness is essential when working on pumps.



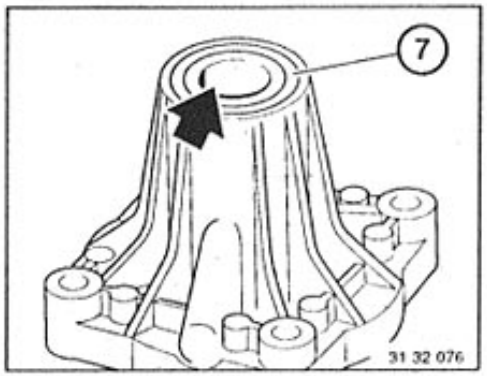
Mark position of holder (1) to pump body (2).
Unscrew bolts and separate housing.



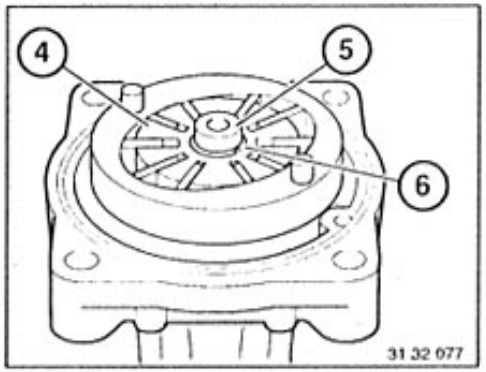
Take off face plate (3).



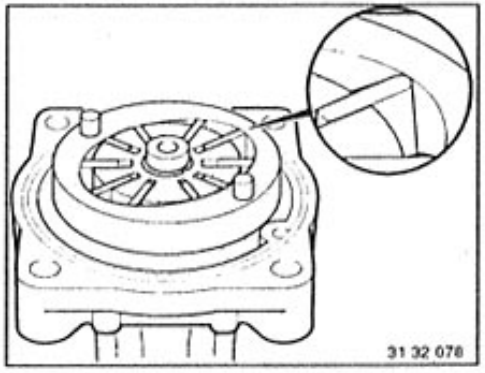
Press down rotor (4) on shaft (5).
Remove circlip (6) and pull shaft out of body.
Remove rotor (4).



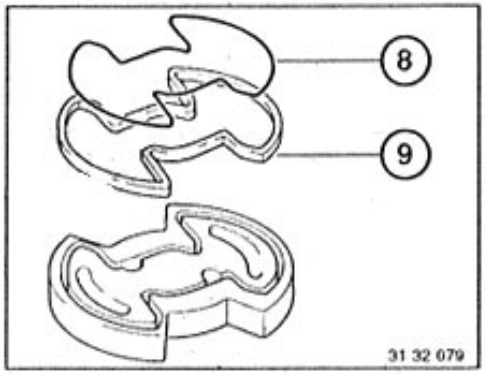
Assembling:
Clean and lubricate all parts with hydraulic fluid.
Replace radial oil seal (7) – sealing lip faces in – and pack space between sealing and dust lips with grease.



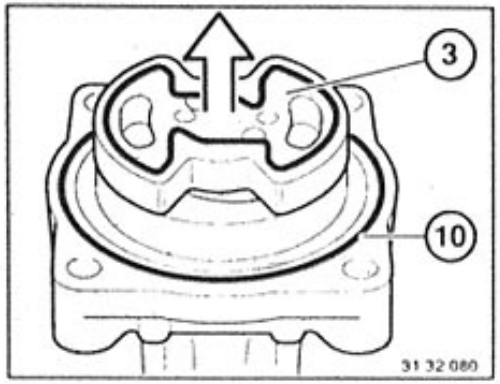
Insert shaft (5) in body.
Mount rotor (4) with recess for circlip facing up and install circlip (6) in radial groove of the shaft.



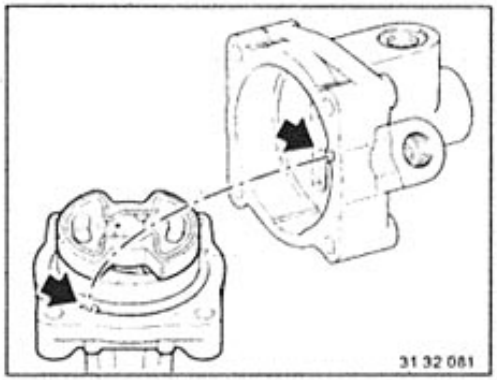
Install the impeller with the polished, rounded outside surfaces facing the cam ring.
Check that impeller moves easily.



Install seal (8) with wide end facing down and guide (9) in face plate (3).



Install face plate (3) on dowel pins.
Replace O-ring (10).



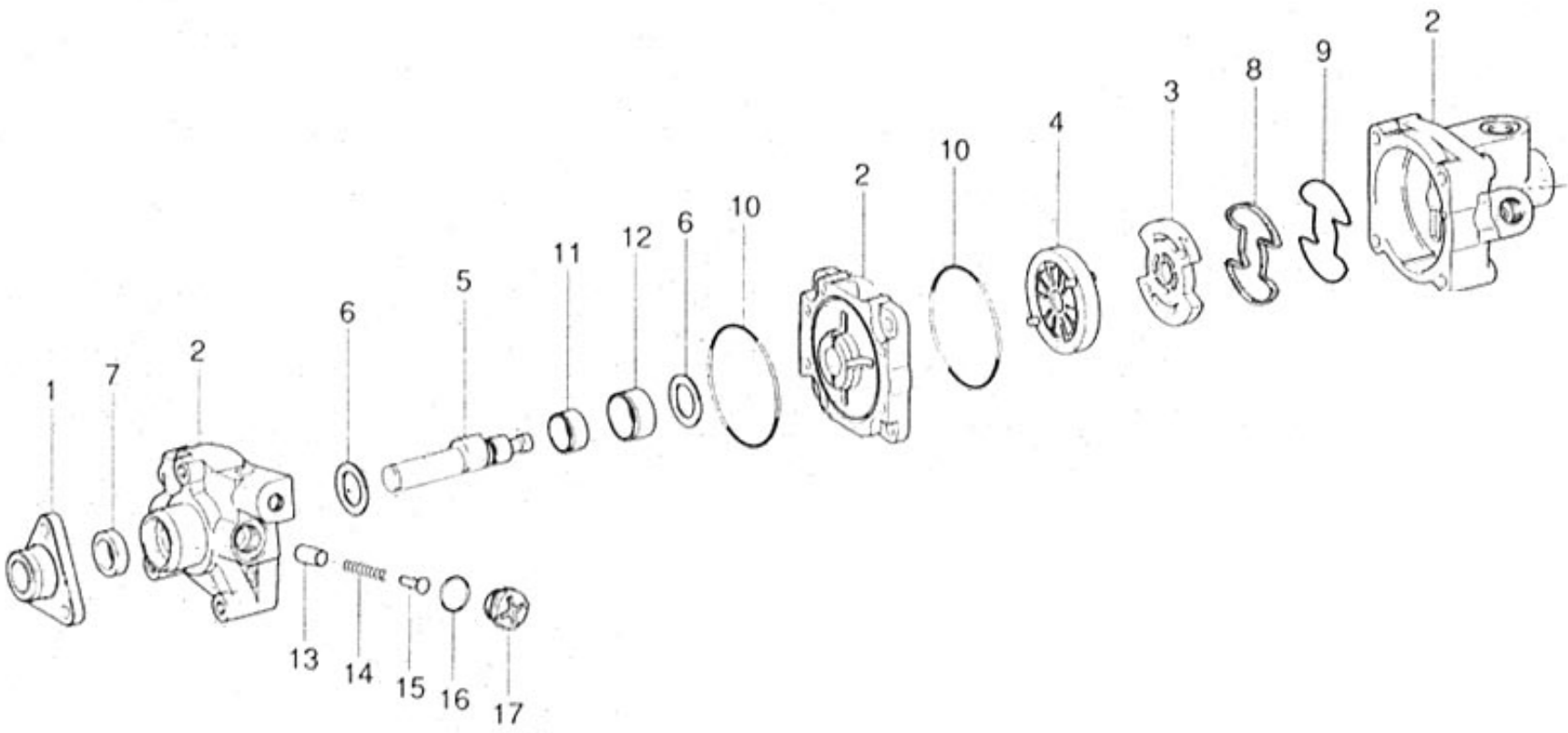
Mount body (checking that bores are aligned) and bolt down with the holder. Tightening torque = 16 ... 19 Nm (12 ... 14 ft. lbs.).

Check function after installation of the power steering impeller pump.

32-41/9

TANDEM PUMP

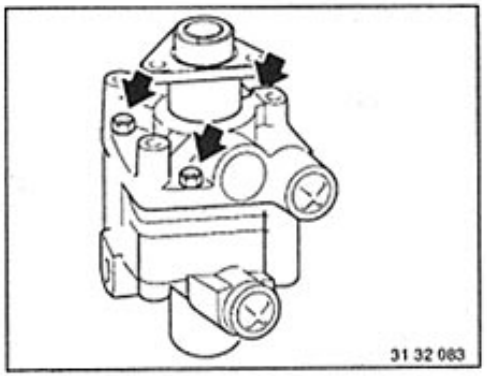
1 Flange
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Axial washer
7 Radial oil seal
8 Seal
9 Guide
10 O-ring
11 Sleeve
12 Slide
13 Piston
14 Spring
15 Shaft
16 O-ring
17 Plug



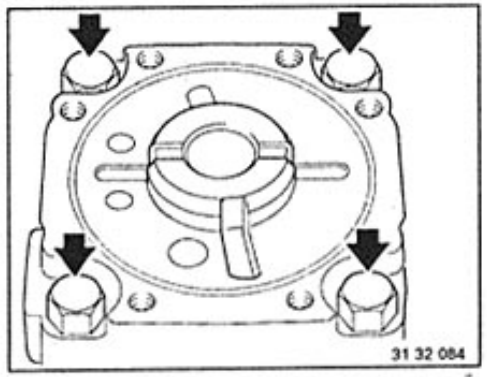
31 32 082

32 41 555 DISASSEMBLING AND ASSEMBLING TANDEM PUMP – Pump Removed –

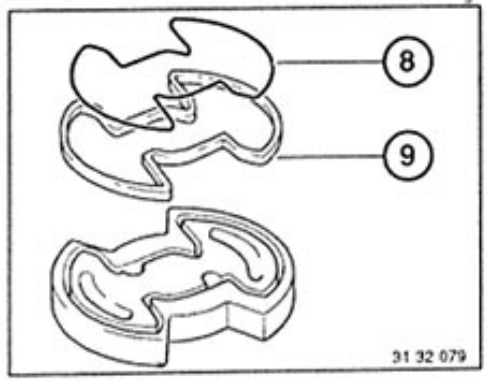
Absolute cleanliness is required when assembling the pump.
Lubricate all parts with hydraulic fluid.



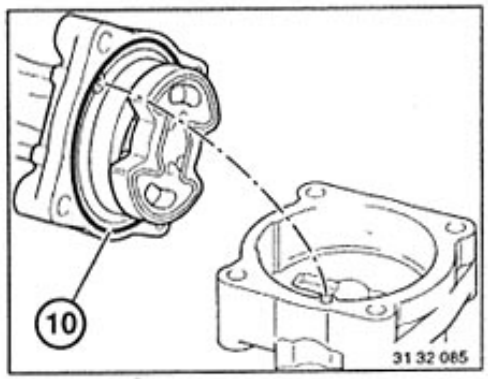
Mark position of the flange to the shaft and body sections to each other.
Unscrew bolts.
Take off body.



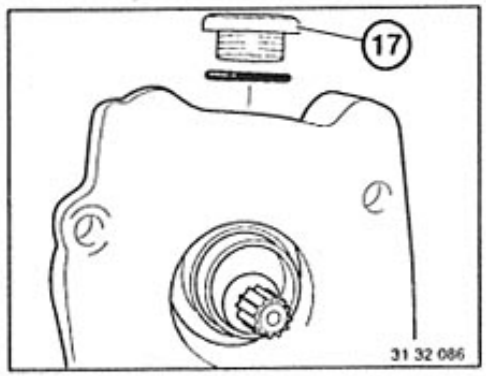
Unscrew bolts.
Take off body (4).



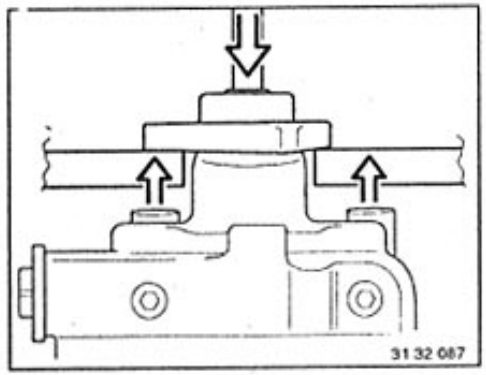
Replace seal (8) (wide end facing plate) and guide (9).



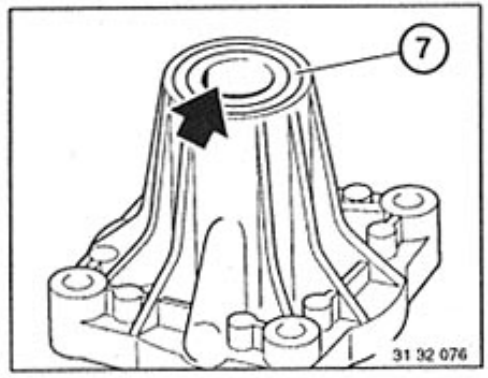
Replace O-ring (10).
Bolt body – bore to bore.
Tightening torque = 14 $^{+5}$ Nm (10 $^{+4}$ ft. lbs.).



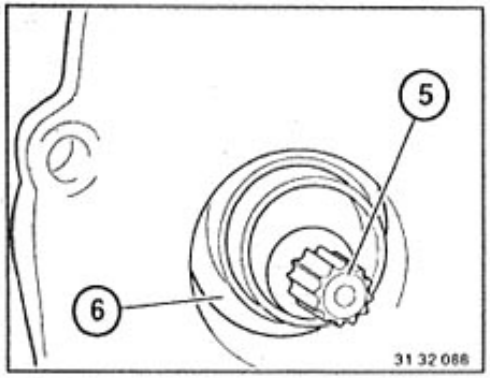
Unscrew both plugs (17).
Take off piston and sliding ring with sleeve.



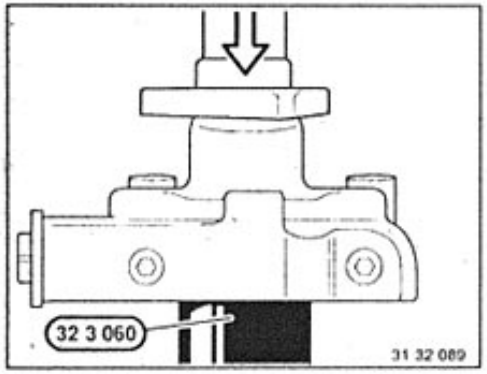
Press triangular flange off of the shaft with a press, while supporting on the flange.



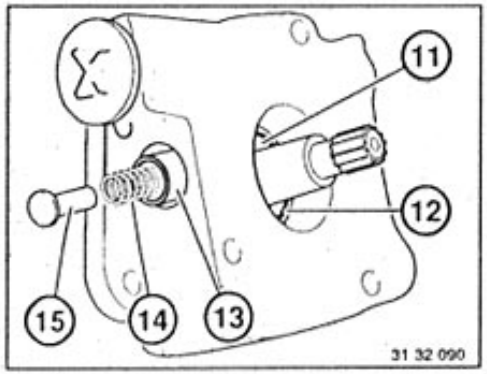
Replace radial oil seal (7) – sealing lip facing in and filled with grease.



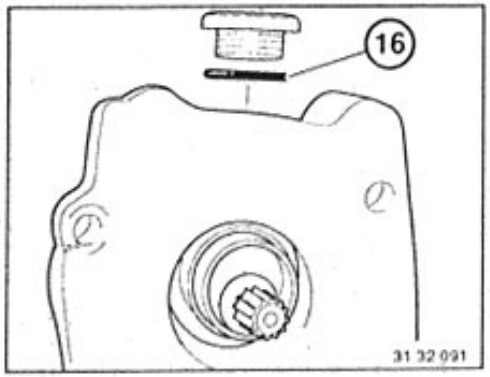
Install axial washer (6) and run in shaft (5).



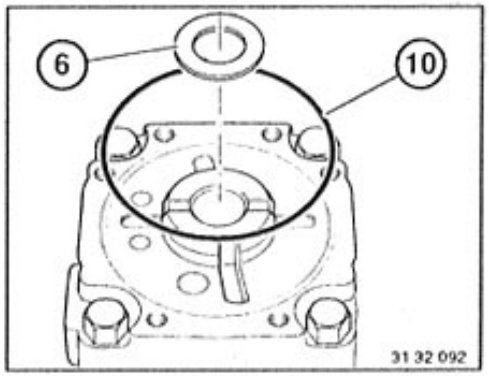
Press on flange with Special Tool 32 3 060.
Shaft protrusion = approx. 1 mm (0.039").
Check marks.



Insert sleeve (11) and sliding ring (12).
Slide in both pistons (13), spring (14) and shaft (15).

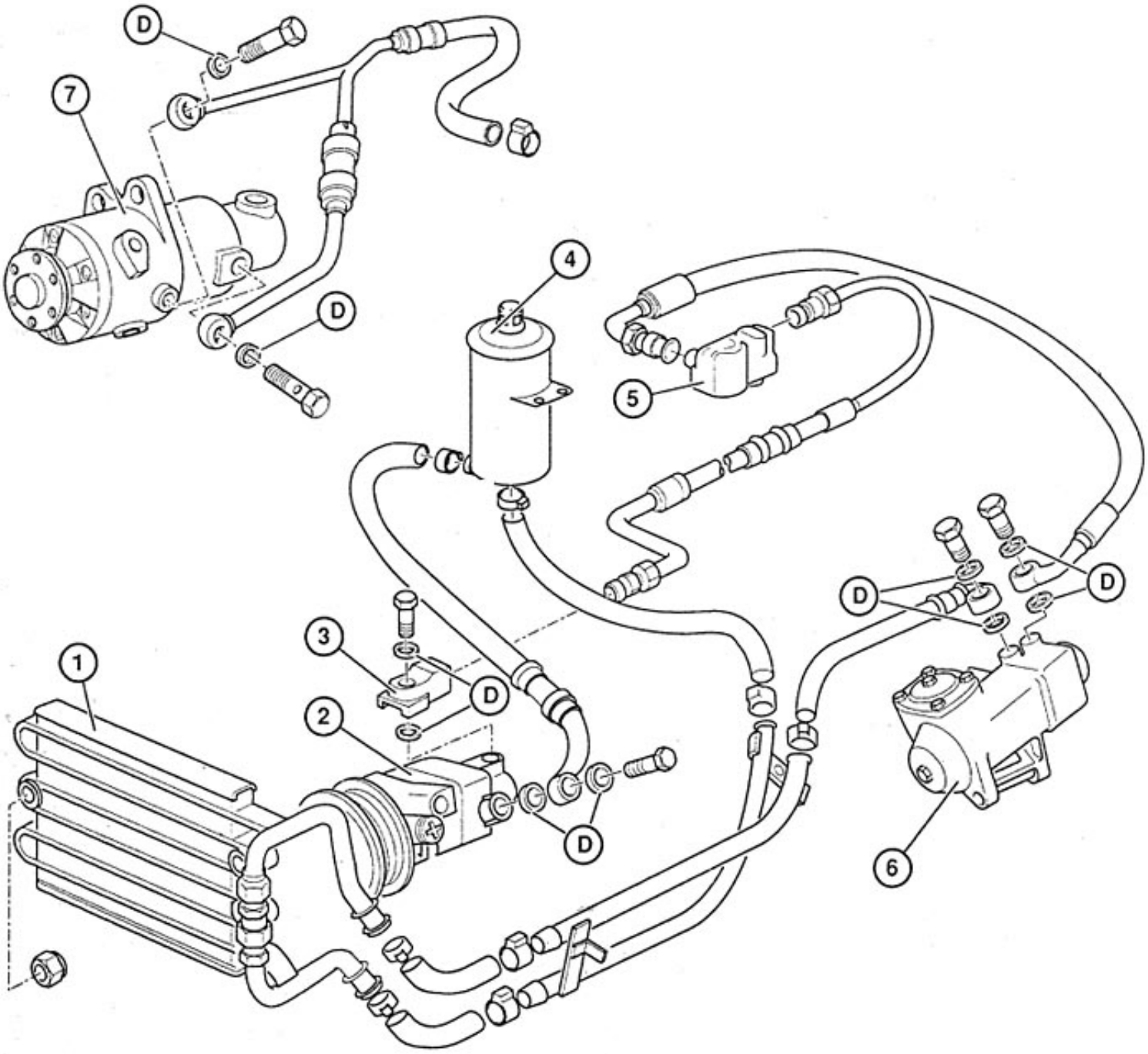


Replace O-ring (16).
Tighten plugs (17) with a torque of 50 Nm (36 ft. lbs.).



Replace O-ring (10).
Insert axial washer (6).
Mount and bolt body.
Tightening torque = 8 Nm (6 ft. lbs.).
Other jobs – see 32 41 553.

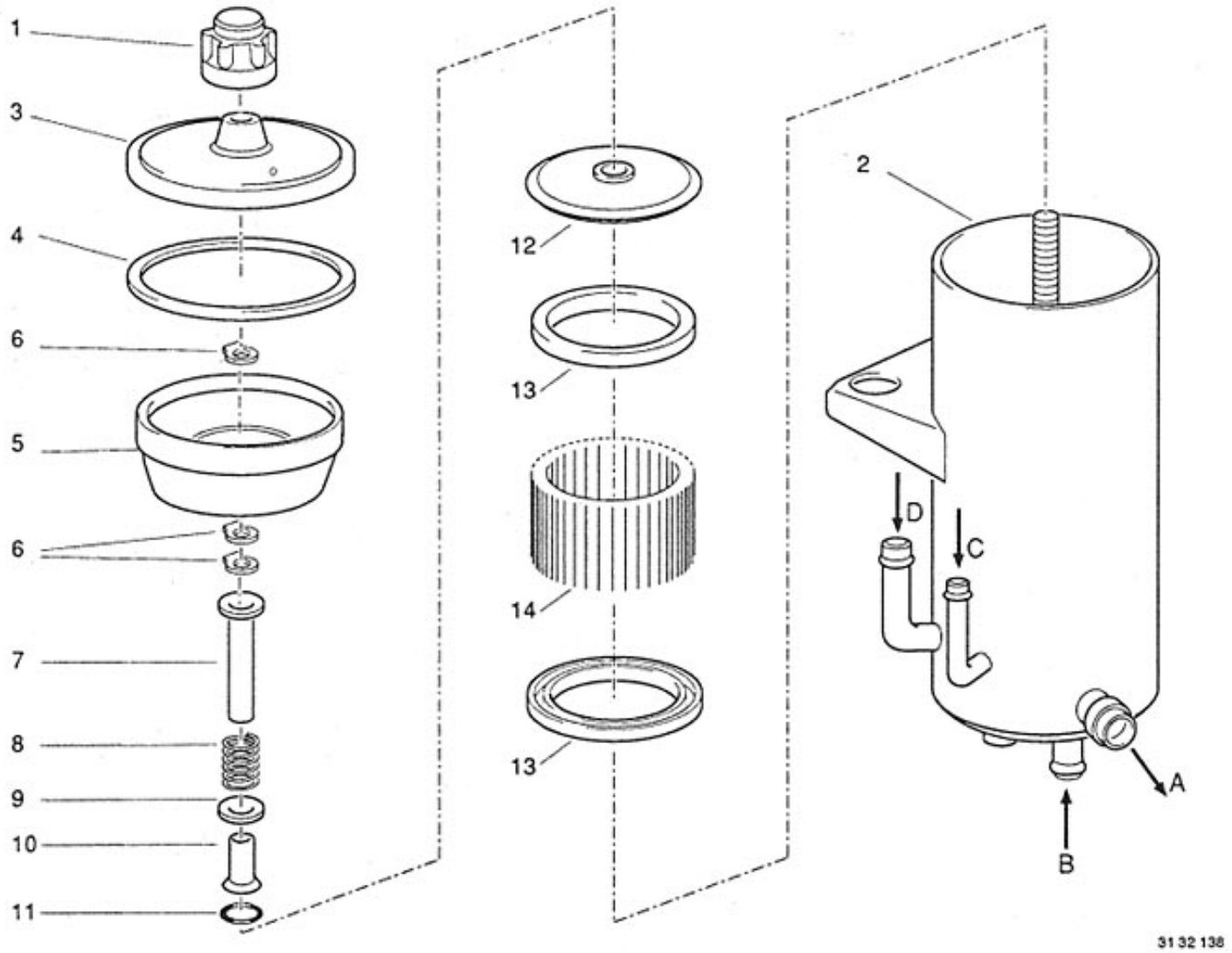
POWER STEERING COMPONENTS AND PIPES



1 Oil cooler
2 Power pump/tandem pump
3 Adapter
4 Oil supply tank
5 Power flow regulator
6 Steering gear
7 Triple-circuit pump for version with AHK (active rear axle kinematic)
D Seals

31 32 158

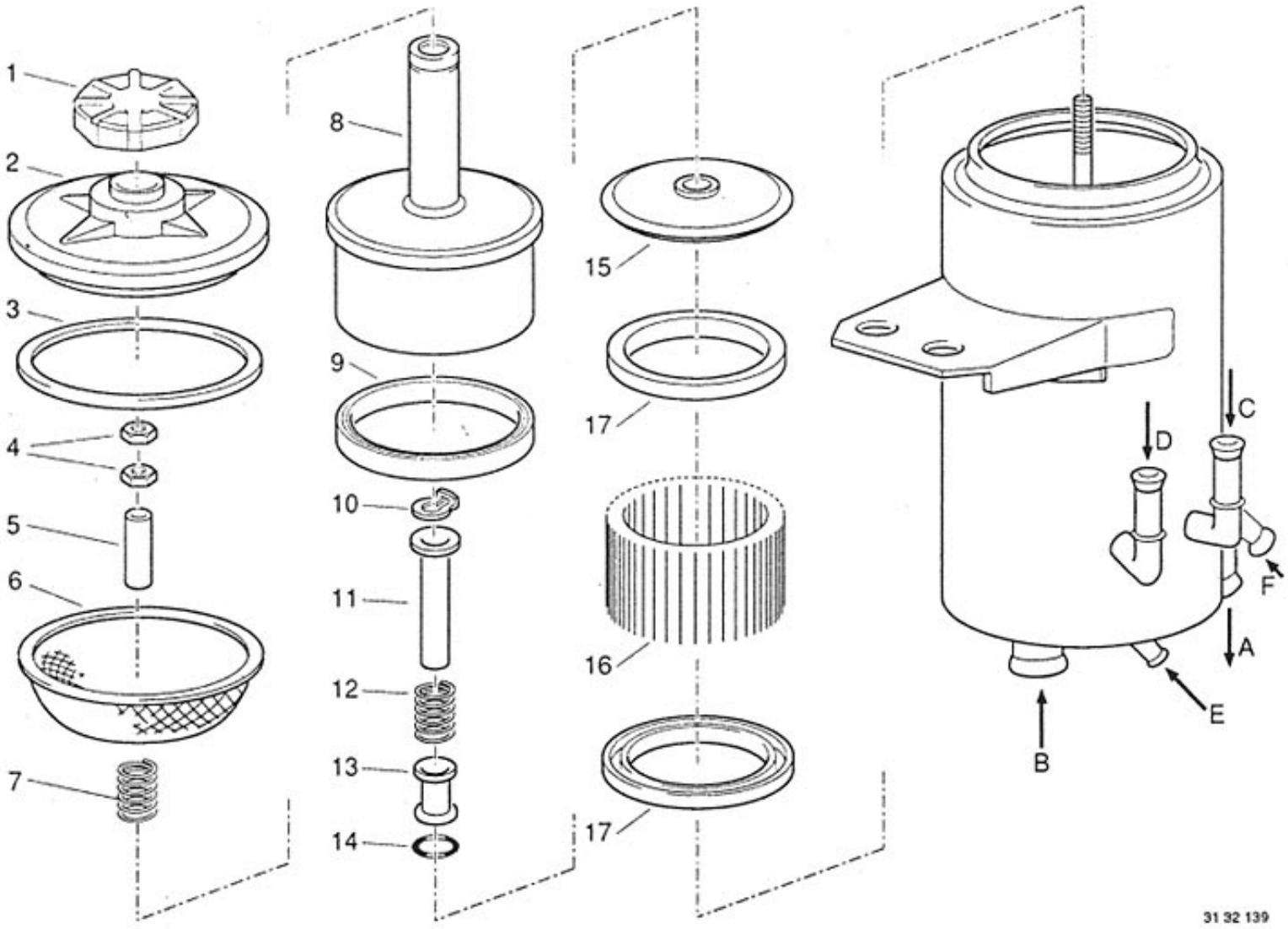
OIL SUPPLY TANK



1 Cap
2 Tank
3 Cover
4 Seal
5 Oil strainer
6 Retainer
7 Guide pipe
8 Spring
9 Washer
10 Sleeve
11 O-ring
12 Pressure relief valve
13 Seal
14 Filter element

A To pump
B From steering gear
C From charging valve (power flow regulator)
D From brake booster

OIL SUPPLY TANK (with ASC + T)



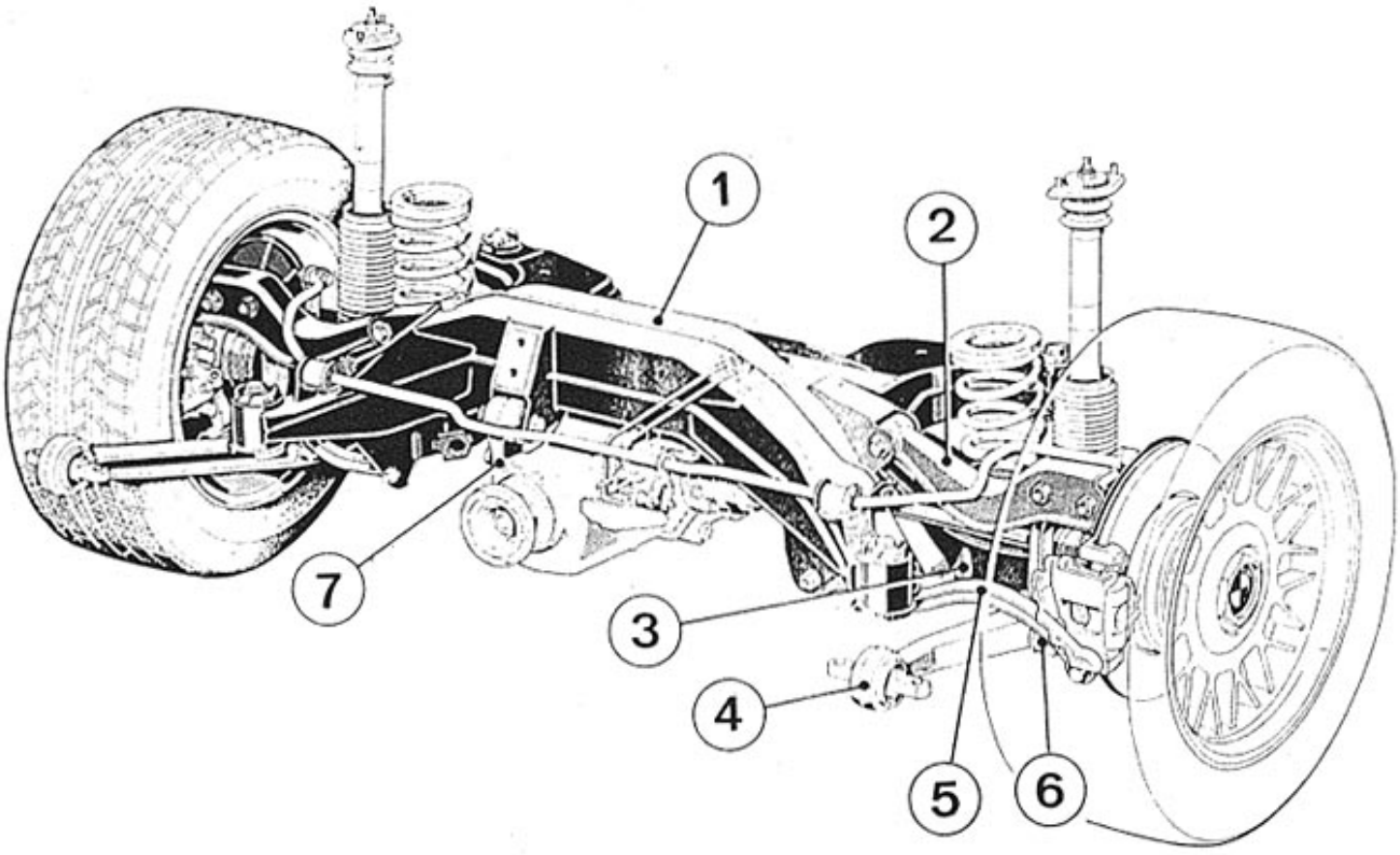
1	Cap
2	Cover
3	Seal
4	Nut
5	Pipe
6	Oil strainer
7	Spring
8	Oil strainer
9	Seal
10	Retainer
11	Guide pipe
12	Spring
13	Spacer
14	O-ring
15	Pressure relief valve
16	Filter element
17	Seal

A	To pump
B	From steering gear
C	From charging valve (power flow regulator)
D	From brake booster
E	From ASC+T (recirculation)
F	From ASC+T (return)

33 Rear axle

	Rear axle layout	33- 0/1
	Layout – rear axle – components	33- 0/2
	Running-in specifications when exchanging / repairing final drive	33- 10/1
33 10 010	Final drive – remove and install or replace	33- 10/2
33 11 151	Shaft seal for driver flange – replace	33- 11/1
33 15 005	Cooling circuit for final drive oil cooling – remove and install or replace	33- 15/1
33 17 006	All rubber mounts on final drive mounting (front and back) – replace	33- 17/1
503	All rubber mounts on final drive rear mounting – replace	33- 17/2
010	Final drive bracket – replace	33- 17/3
510	Final drive bracket rubber mounts – replace	33- 17/3
33 21 000	Output shaft – remove and install or replace	33- 21/1
031	Dust cover – replace	33- 21/2
33 31 000	Rear axle carrier, complete (with final drive and control arms) – remove and install	33- 31/1
33 32 021	Semi-trailing arm – replace	33- 32/1
551	Rubber mount for semi-trailing arm – replace	33- 32/2
051	Traction strut – integral link – remove and install or replace	33- 32/3
651	Rubber mount in the traction strut of integral link – replace	33- 32/3
071	One upper control arm – replace	33- 32/4
671	One rubber mount in upper control arm – replace	33- 32/4
091	Traction strut – remove and install or replace	33- 32/5
691	Rubber mount on traction strut – replace	33- 32/5
111	Supporting arm – remove and install or replace	33- 32/6
711	Ball joint in supporting arm – replace	33- 32/6
131	Wheel carrier – remove and install or replace	33- 32/7
719	Ball joint in lower wheel carrier – replace	33- 32/7
725	Ball joint in upper wheel carrier – replace	33- 32/8
33 33 101	Two rubber mounts for rear axle carrier – replace	33- 33/1
	Active Rear axle Kinematics (AHK)	33- 34/1
	General instructions on AHK	33- 34/1
	Layout of AHK	33- 34/2
	Layout: actuator unit with supporting arm	33- 34/3
	Layout: hydraulic lines	33- 34/4
	Hydraulic circuit diagram – AHK	33- 34/5
33 34 000	AHK hydraulic system – function check	33- 34/6
005	AHK hydraulic system – bleed	33- 34/7
015	Double joint, left or right – remove and install or replace	33- 34/8
020	Intermediate lever, left or right – remove and install or replace	33- 34/9
520	Accumulator charge unit – remove and install or replace	33- 34/10
530	Actuator unit – remove and install or replace	33- 34/11
540	Pressure sensor – remove and install or replace	33- 34/12
545	Filter in accumulator charge unit – replace	33- 34/13
547	Filter in actuator unit – replace	33- 34/13
550	Control unit (AHK) – remove and install or replace	33- 34/14
33 41 151	Wheel bearing in rear axle shaft, left or right – replace	33- 41/1
33 52 000	Shock absorber, rear – remove and install or replace	33- 52/1
33 53 000	Coil spring, left or right – remove and install	33- 53/1
	Rear axle – troubleshoot	33- 90/1

REAR AXLE ASSEMBLY DRAWING



330301

1 = Rear axle carrier

2 = Upper control arm / camber adjustment

3 = Lower support arm / toe adjustment

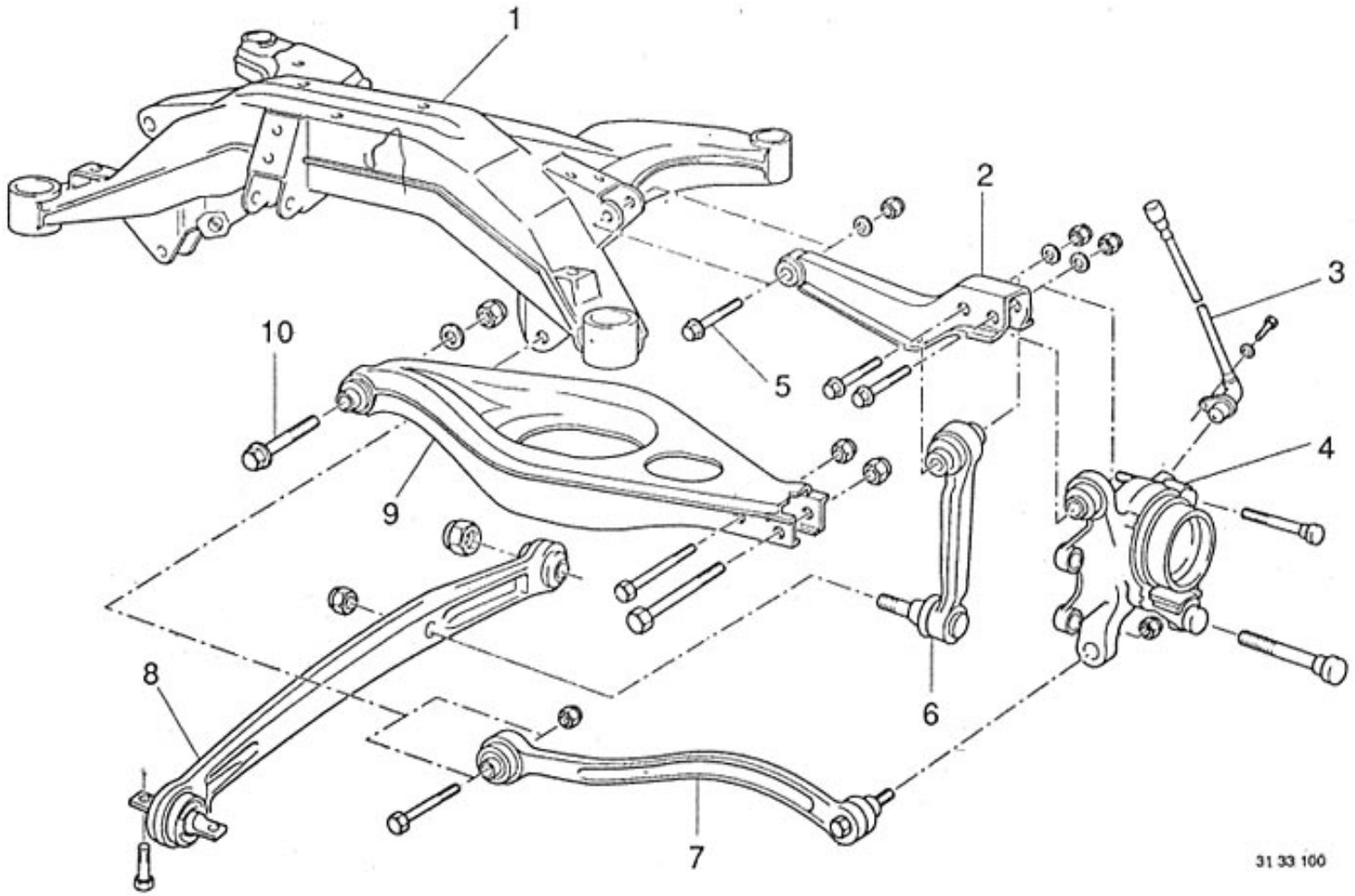
4 = Trailing arm

5 = Front control arm / guide arm

6 = Push rod / integral arm

7 = Final drive holder

REAR AXLE COMPONENTS



1 = Rear axle carrier

2 = Upper control arm

3 = ABS sensor

4 = Wheel carrier

5 = Camber adjusting bolt

6 = Push rod / integral

7 = Guide arm

8 = Trailing arm

9 = Lower support arm

10 = Toe adjusting bolt

BREAKING-IN PROCEDURES AFTER REPLACING/REPAIRING FINAL DRIVE

Strict conformance with these breaking-in procedures is required for preloading the tapered roller bearing.

During the first 1,000 km the car must be driven at different engine speeds and road speeds, but never faster than 2/3rds of the max. permissible speed.

If there is no conformance with these breaking-in procedures there could be seizure between the tapered rollers and inner race guide band, which in turn will continuously cause noise, overheating and oil leakage.

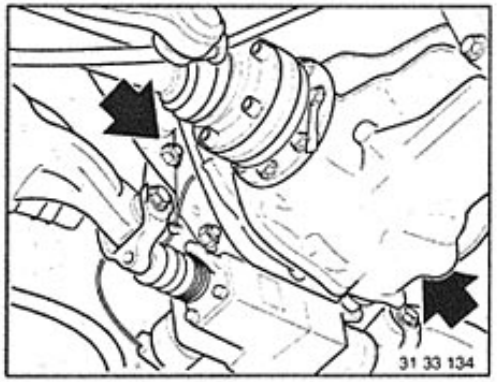
Install a label or tag to remind the driver of the breaking-in specifications and next oil change.

33 10 010 Removing and installing or replacing final drive

Note:
When replacing unit, carefully note ratio embossed on type plate.

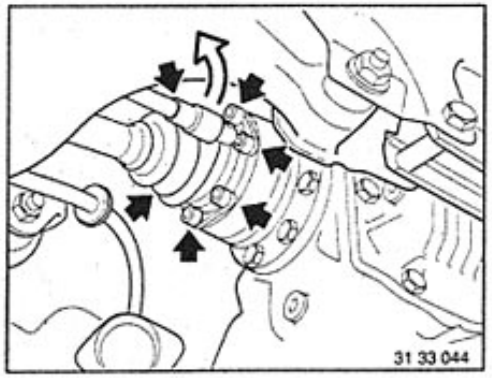
When work is complete:
Check oil level and, if necessary, top up oil in final drive **.

Disconnect propeller shaft from final drive, see 26 11 000.



Vehicles with AHK (Active Rear Axle Kinematics) up to 9.92:
Unfasten screw connection (intermediate lever with rear axle carrier).
Partially remove screws.

Installation:
Replace self-locking nut.
Tightening torque 33 34 11AZ*



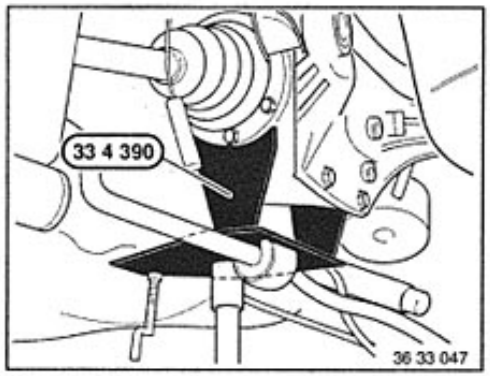
Unfasten screws.
Lift wheel carrier with hydraulic lifter 00 2 030 until the output shaft can be removed from the driver flange.

Installation:
Fit washers.
Tightening torque 33 21 1AZ*

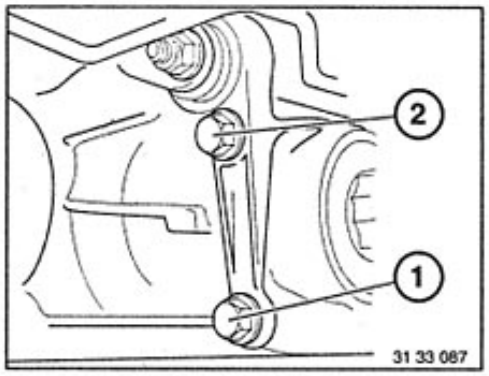
* Refer to Technical Data
** Refer to BMW Parts Service

If transmission oil cooler is fitted:
drain off oil in final drive.
Disconnect oil lines (to cooling circuit) on final drive.

Installation:
Screw-in plug: tightening torque 33 11 6AZ*
Replace O-rings.
Oil lines: tightening torque 33 11 7AZ*

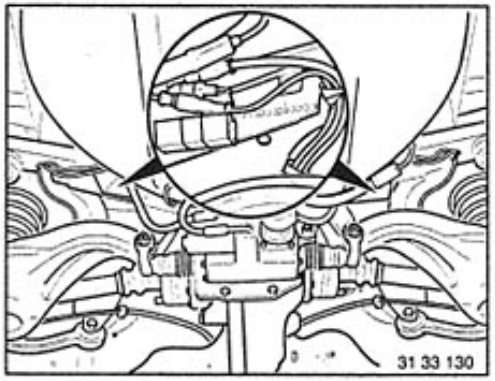


Support final drive with hydraulic lifter 00 2 030 in conjunction with special tool 33 4 390.



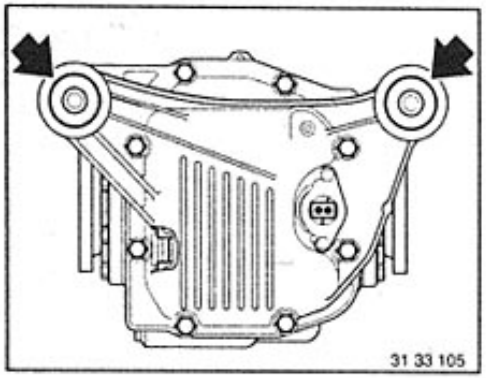
Unfasten screws (1...2).

Installation:
Tightening torque 33 17 7AZ*



Remove plug connector (EDC/ABS/brake lining wear indicator) from the housings on the rear axle carrier.
Remove expanding rivets from case mounting and remove final drive case.

* Refer to Technical Data



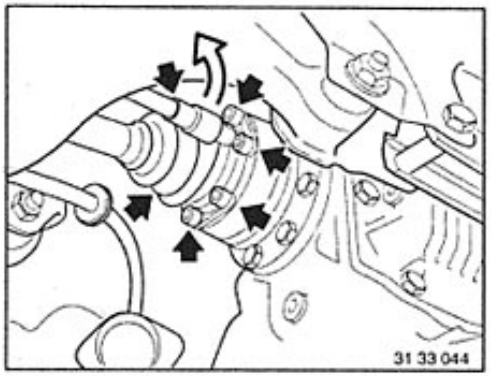
Unfasten screw connection on rear axle carrier and remove screws as far as possible.
Lower final drive until propeller shaft can be removed from the output flange.
Remove cable connector from speedo impulse sensor.
Continue lowering final drive and remove completely.

Installation:
Tightening torque 33 17 1AZ*

* Refer to Technical Data

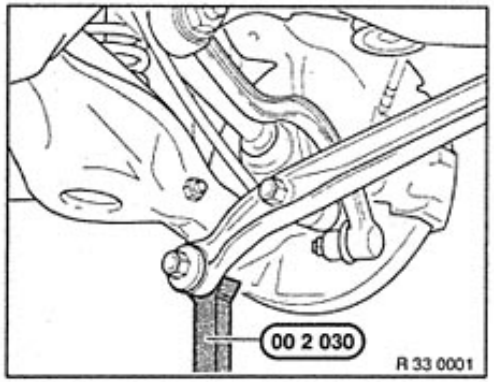
33 11 151 Replacing shaft seal for drive flange

Remove rear section of exhaust unit, see 18 00 020.

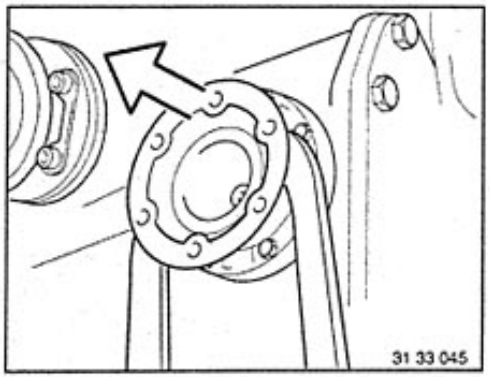


Unfasten screws.

Installation:
Fit washers.
Tightening torque 33 21 1AZ*

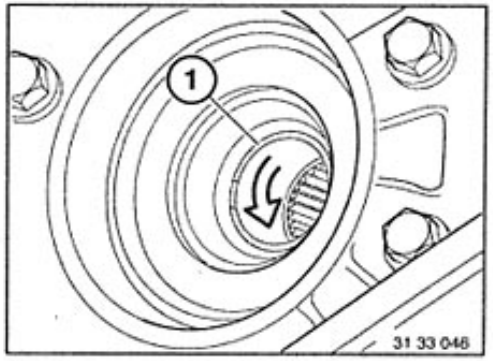


Lift wheel carrier with hydraulic lifter 00 2 030 until the output shaft can be removed from the driver flange.



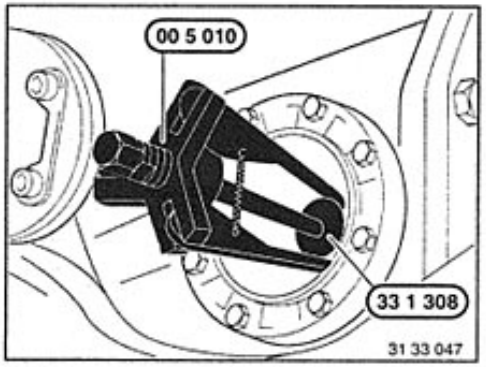
Press off drive flange using pry bar.

* Refer to Technical Data

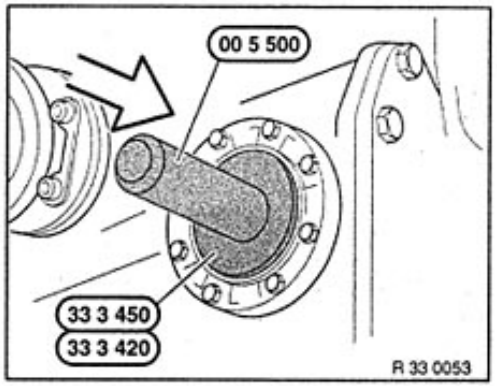


Installation:
Place round wire snap ring (1) in groove of final drive case prior to installation and in such a manner that both ends of ring are recessed in groove.
This prevents lateral bending of the ring. Turn in drive flange by hand with light pressure until the round wire snap ring is heard to engage.

Caution!
Replace stretched snap rings.



Pull out shaft seal with special tool 00 5 010 and special tool 33 1 308.



Installation:
Coat plate housing flange and sealing lips of shaft seal with final drive oil.
Drive shaft seal firmly home with special tool 00 5 500 /
33 3 450 (cover with 8 screws) or
33 3 420 (cover with 6 screws).
Replace drive flange if the bearing surface is seriously scored.

* Refer to Technical Data

33 15 005 Removing and installing or replacing cooling circuit for cooling oil in final drive

Note:
When work is complete, test drive the vehicle, then check final drive oil level and top up if necessary.

Unfasten heat shield on the spare wheel recess.
Disconnect cooling circuit at joints.

Installation:
If necessary, replace O-rings.
Tightening torque 33 11 7AZ*.

Unfasten retaining points of cooling circuit on spare wheel recess and towing console.

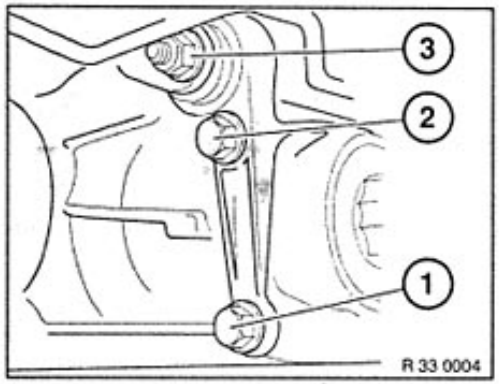
Installation:
Fill cooling circuit with final drive oil** prior to installation.

* Refer to Technical Data
** Refer to BMW Operating Fluids

33 17 006 Replacing all rubber mounts for final drive suspension (front and rear)

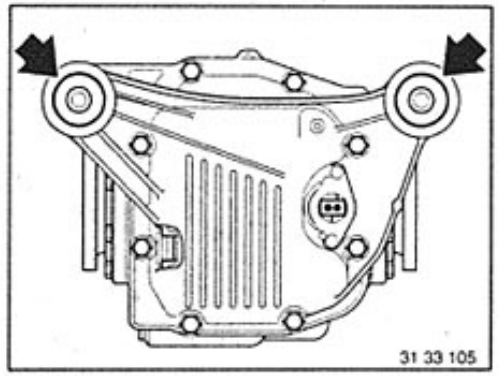
(rubber mount in rear axle carrier)

Remove rear axle, see 33 31 000.



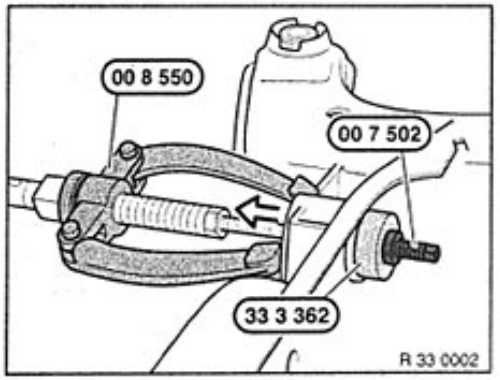
Unfasten screws (1...3).
Pull rubber mounts in and out, see 33 17 510.

Installation:
(1...2) Tightening torque 33 17 7AZ*
(3) Tightening torque 33 17 8AZ*

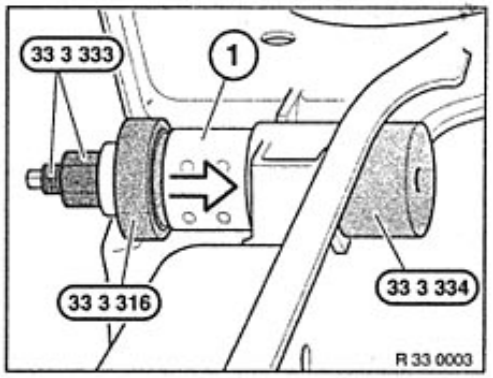


Unfasten screws.
Lower final drive until there is enough room for the special tool.

Installation:
Tightening torque 33 17 1AZ*



Remove rubber mount using special tool 00 7 502/00 8 550/ 33 3 362.



Note:
The stepped side of the rubber mount must point towards the final drive.

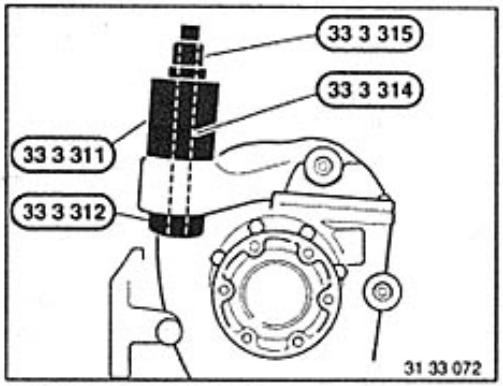
Coat new rubber mount (1) with Circolight** and pull in flush with special tool 33 3 316/ 333/ 334.

* Refer to Technical Data

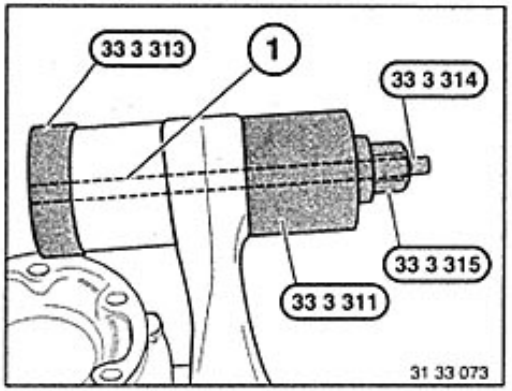
** Refer to BMW Parts Service

33 17 503 Replacing all rear rubber mounts for final drive suspension
(final drive removed)

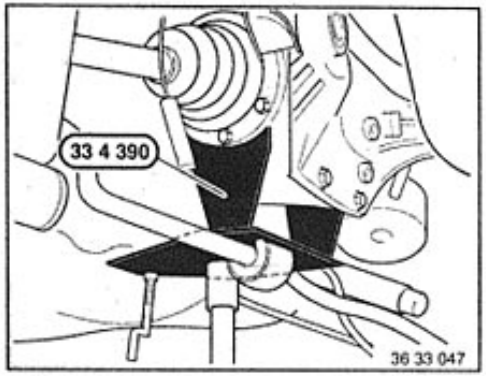
(rubber mount in final drive cover)



Pull out rubber mount with special tool 33 3 311/ 312 / 314 / 315.

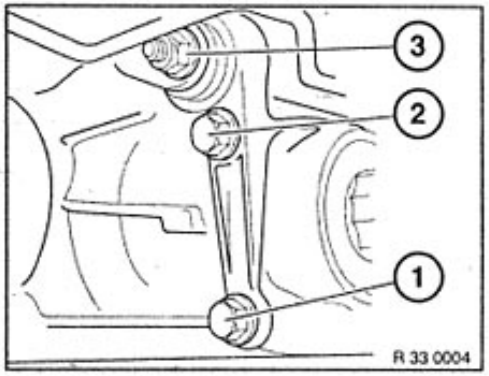


Pull in rubber mount (1) mit special tool 33 3 311/ 313 / 314 / 315.



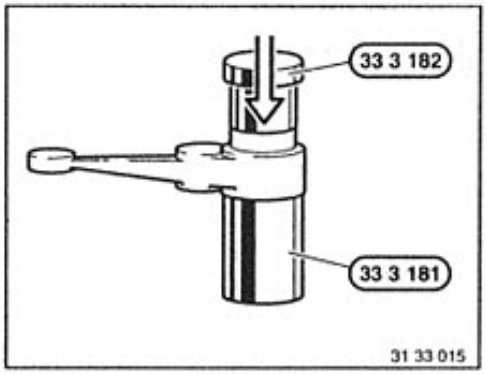
33 17 010 Replacing final drive bracket

Brace final drive with hydraulic lifter 00 2 030 and special tool 33 4 390.



Unfasten retaining screws (1 ...3).

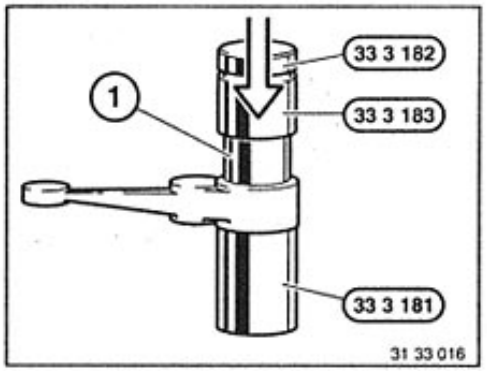
Installation:
(1...2) Tightening torque 33 17 7AZ*
(3) Tightening torque 33 17 8AZ*



33 17 510 Replacing rubber mount on final drive bracket

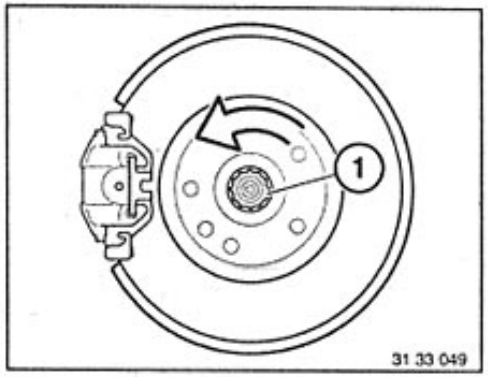
(final drive bracket removed)

Press out rubber mount with special tool 33 3 181 /182.



Press in new rubber mount (1) with special tool 33 3 181 / 182 / 183 from the tapered side of the final drive bracket.

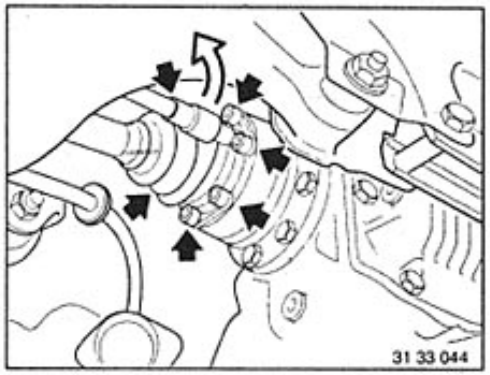
* Refer to Technical Data



33 21 000 Removing and installing or replacing output shaft

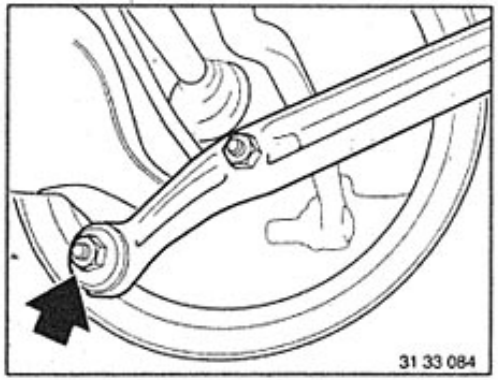
Unfasten collar nut (1).
Remove back wheel, see Gr. 36.

Installation:
Replace collar nut
Tightening torque
Secure collar nut



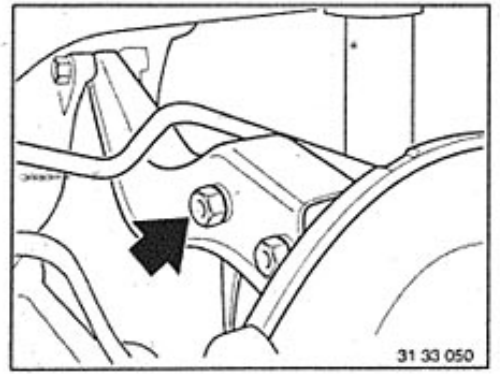
Remove output shaft from final drive output flange.

Installation:
Tightening torque *



Automatic transmission
Unfasten semi-trailing arm and push inwards to provide sufficient space for pressing out the output shaft.
Brace wheel carrier with special tool 00 2 020.

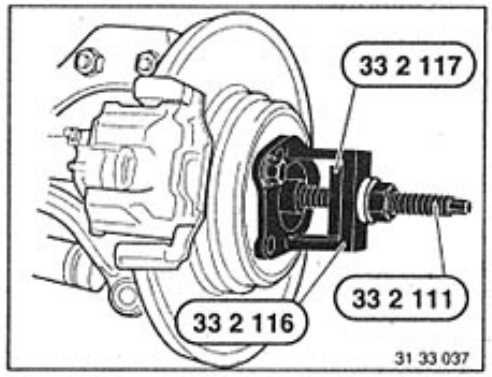
Installation:
Tightening torque *
Replace self-locking nut



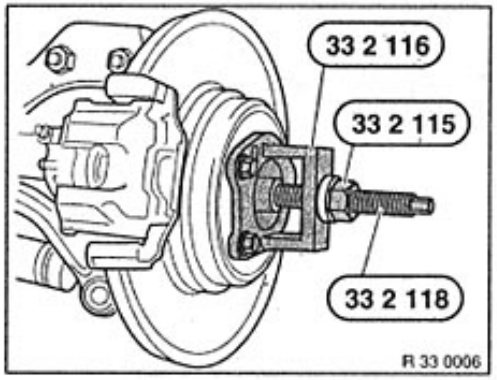
Manual transmission:
Unfasten top of integral link and slide to make sufficient room for pressing out the output shaft.
Brace wheel carrier with special tool 00 2 020.

Installation:
Tightening torque*
Replace self-locking nut.

* Refer to Technical Data



Press output shaft out of drive flange hub with special tool 33 2 111, 116, 117.



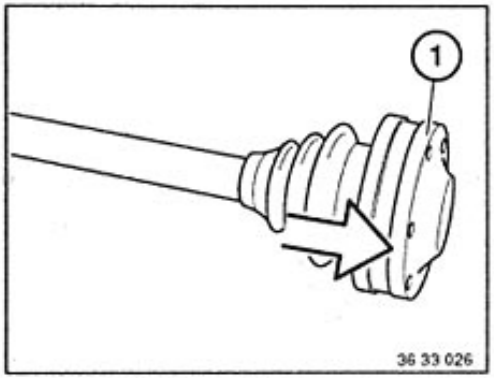
Pull in output shaft with special tool 33 2 115, 116 , 118.

Installation:
Tightening torque* .

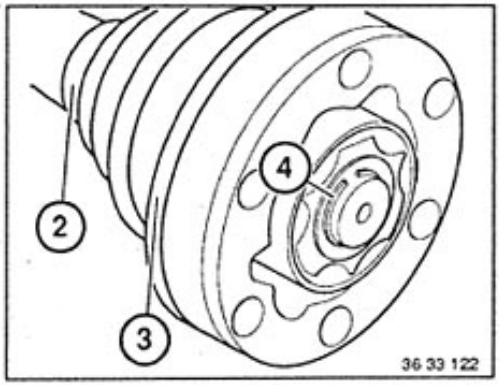
* Refer to Technical Data

33 21 031 REPLACING DUST COVER

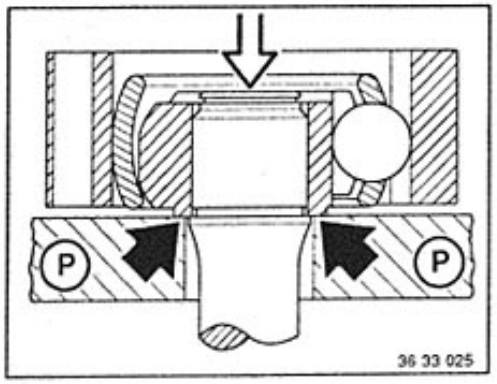
Remove output shaft - refer to 33 21 000.
Clean output shaft.
Use dust cover from repair kit.



Pry off sealing cover (1).



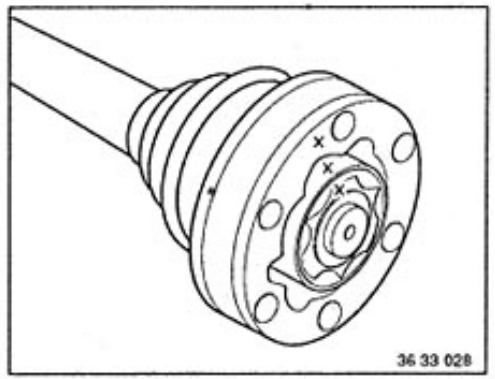
Loosen hose clamps (2).
Press off cap (3) together with dust cover.
Remove circlip (4).



Press splined shaft out of constant velocity joint.

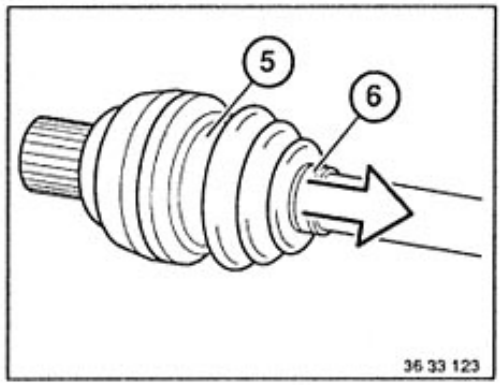
Important!
Bearing inner race must bear on the counterpressure plate (P).
Don't disassemble the joint.
Check joint for dirt or damage.

Pull off dust cover.



Note:
If the joint has to be disassembled (dirt), mark the position of the ball hub, ball cage and joint to each other on the face with an electric scriber.

Important!
Ensure cleanliness when assembling.



Loosem hose clamps (5 and 6).
Pull off dust cover over splined shaft.

Note:
Clean constant velocity joint in assembled state thoroughly.
Fill joint with new grease*.

Pull on new dust cover.

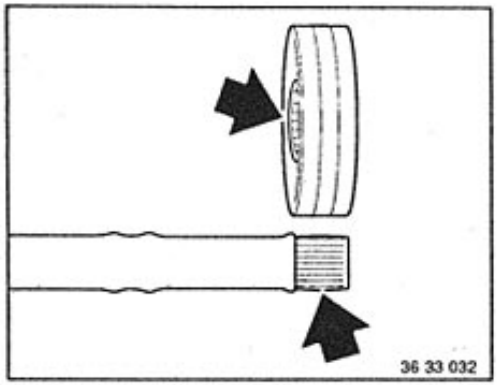
Note:
Wrap adhesive tape around splines of the splined shaft for protection of new dust covers.
Lubricate the splined shaft lightly with grease to make installation easier.

Install new hose clamps (5 and 6).

Install the transmission-end dust cover.
Remove adhesive tape.

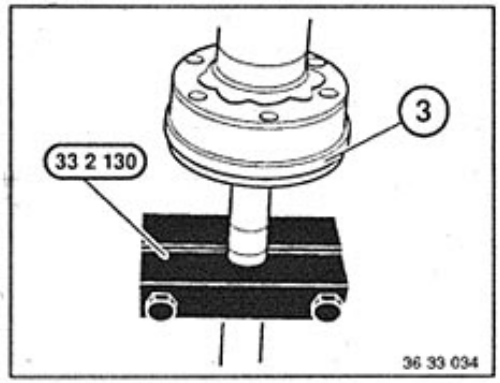
Coat sealing surface of cap (3) with sealant** and press it onto the constant velocity joint using a pressure ring.

* Refer to Specifications
** Source of Supply: BMW Parts

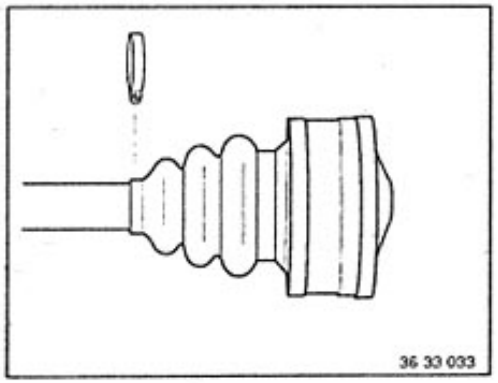


Remove grease from splines of the splined shaft and constant velocity joint.
Coat splines with Loctite No. 270**.

Important!
Keep Loctite out of ball grooves.



Apply Special Tool 33 2 130.
Press constant velocity joint and cap (3) onto the splined shaft.
Install a new circlip.



Fill joint with grease*.
Pull dust cover onto cap (3).
Install new hose clamps (large and small).

Note:
The lock of the large diameter hose clamp must be located between two bores of the constant velocity joint.

Coat sealing surfaces of sealing cover (1) with sealant** and press on cover using a pressure ring.

* Refer to Specifications
** Source of Supply: BMW Parts

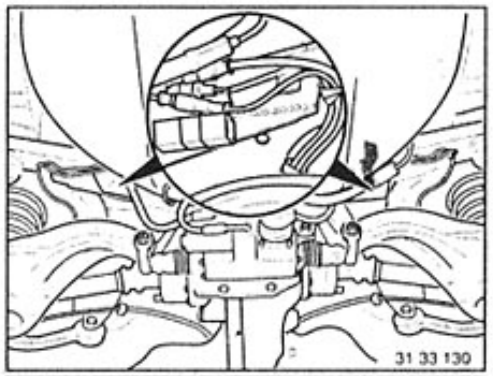
33 31 000 Removing and installing complete rear axle carrier (with final drive and trailing arms) (without chassis alignment check)

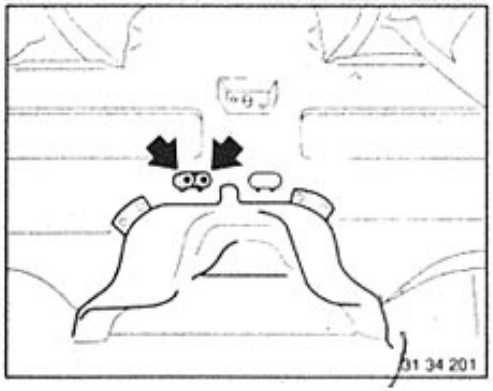
Note:
When operation is complete, perform a chassis alignment check, see 32 00 150.

Unfasten Bowden cables on handbrake lever, see 34 41 000.
Remove wheels, see 36 10 300.
Unfasten brake calipers and tie up, (do not disconnect brake line), see 34 21 745.
Remove both rear mufflers, see 18 00 020.
Unfasten propeller shaft on final drive, see 26 11 000.

Active Rear Axle Kinematics (AHK):
Relieve accumulator pressure, disconnect hydraulic lines to the actuator unit and remove cable connector, see 33 34 530 .

Installation:
When operation complete, bleed the hydraulic system, see 33 34 005 .





850CSi:
Drain off oil in final drive.
Disconnect oil lines (to cooling circuit) on final drive.

Installation:
Tightening torque of screw-in plug 33 11 6AZ*
Replace O-rings.
Tightening torque of oil lines 33 11 7AZ*

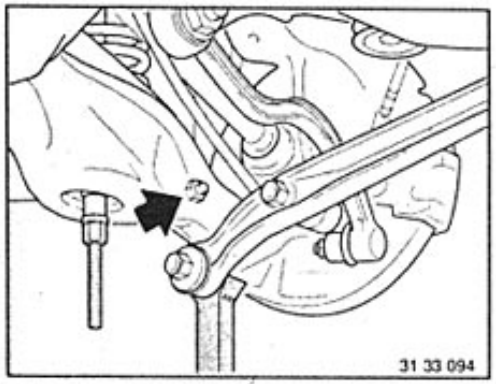
Caution!
After test driving the 850CSi, always check the final drive oil level and top up if necessary.

Remove plug connector (EDC/ ABS/ brake lining wear indicator) from the protective housings on the rear axle carrier and disconnect.

Unfasten connector to speedo sensor.

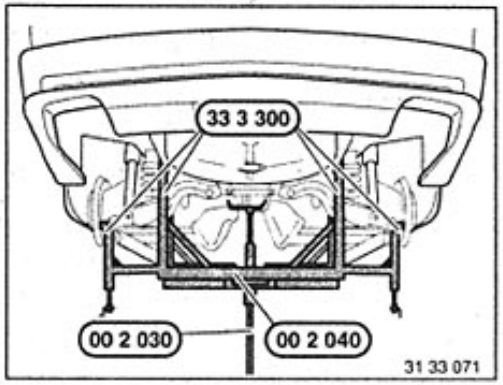
Unfasten heat shield and pull handbrake Bowden cables out of guide tubes.

* Refer to Technical Data



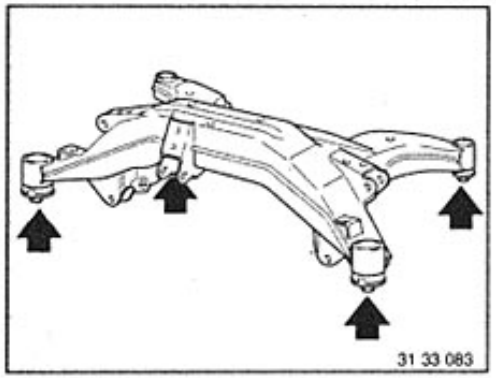
Disconnect shock absorbers:
Brace wheel carrier with workshop hoist 00 2 030.
Unfasten screw connection from shock absorber.
Lower workshop hoist.

Installation:
Replace self-locking nut.
Tightening torque 33 52 1AZ*



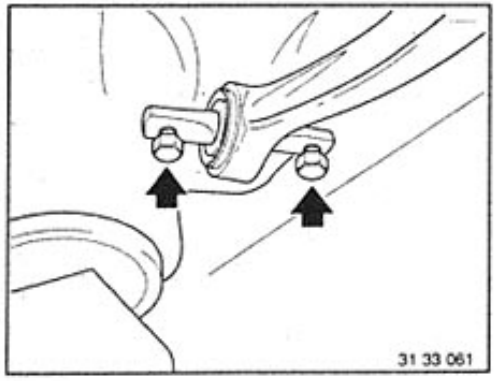
Brace rear axle with special tool 00 2 030/040 33 3 300.

Note:
If necessary, remove power cable and retaining clips located beside the support points.



Unfasten screws.

Installation:
Thrust washers, rear 70 mm dia.
Thrust washers, front 75 mm dia.
Tightening torque 33 33 3AZ*



Unfasten screws.

Installation:
Tightening torque 33 32 2AZ*

* Refer to Technical Data

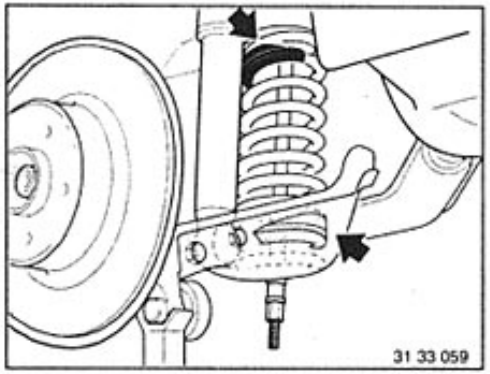
Slowly lower rear axle, ensuring that oil lines and power cables have unrestricted movement.
Remove propeller shaft from input flange.

Installation:
Place gasket in the constant velocity joint and fit propeller shaft on input shaft when raising the rear axle.
Secure constant velocity joint with two nuts.

When installing the springs, ensure that the springs are mounted flush on the spring pads.

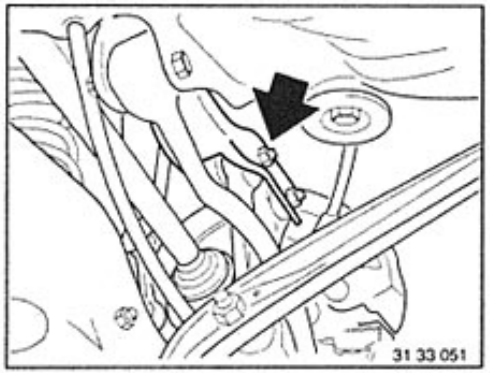
33 32 021 REPLACING TRAILING ARM

Remove rear wheel – see Group 36.



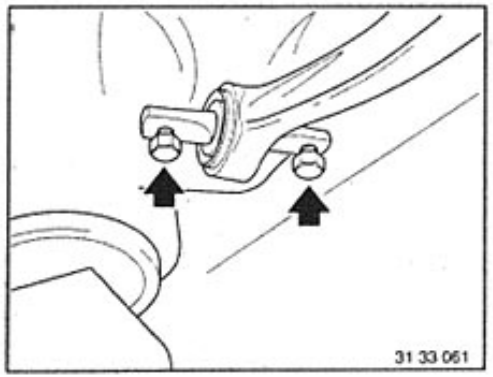
Tension rear spring with Special Tool 33 2 300.
Support wheel carrier with Special Tool 00 2 020 to take tension off of the trailing arm.

Installation:
Check wheel alignment after installation – see Group 32.



Unscrew integral arm at top.

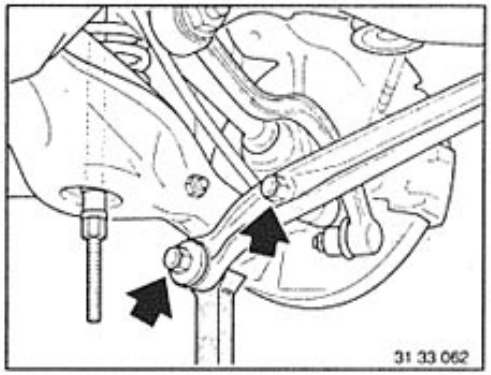
Installation:
Tightening torque* with car loaded down to normal position*.



Unscrew front bolts.

Installation:
Tightening torque*.

* See Specifications

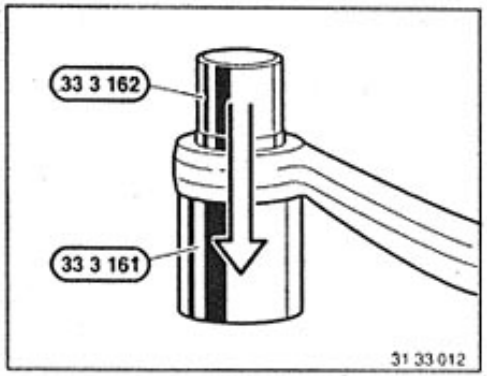


Unscrew rear nuts.

Installation:
Tightening torque* with car loaded down to normal position*.

Press integral arm out of trailing arm in a press.

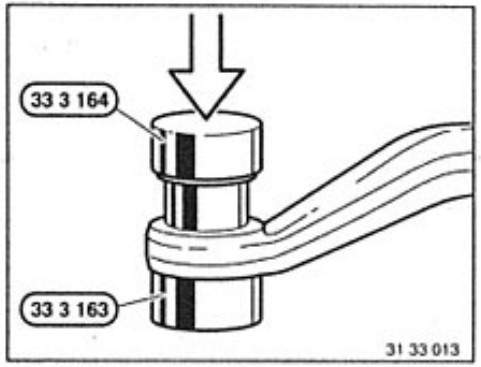
* See Specifications



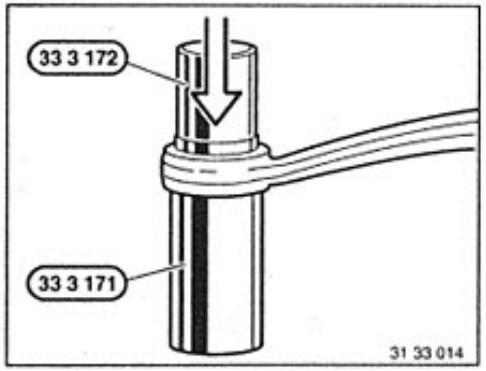
33 32 551 Replacing rubber mount for semi-trailing arm

- Semi-trailing arm removed-

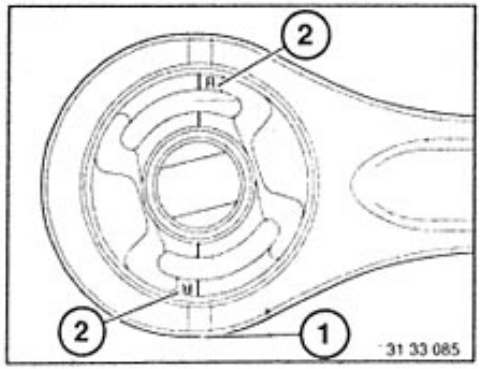
Press out rear rubber mount with special tool 33 3 161, 162.



Press in new rear rubber mount with special tool 33 3 164 ,163, starting from chamfered end.



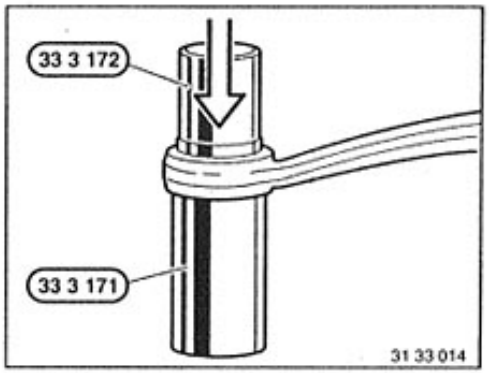
Press out front rubber mount with special tool 33 3 172, 171 without guide sleeve.



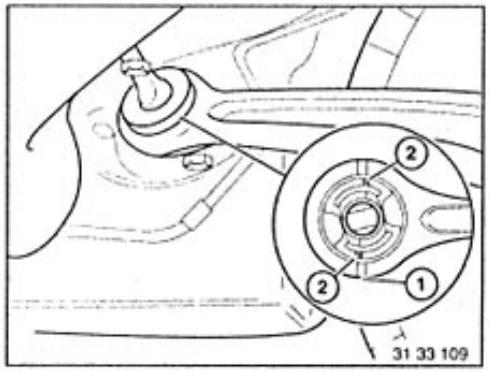
Installation:

Align marker dash (2) on rubber mount, designated with "R" for right semi-trailing arm with notch (1).

Align marker dash (2) on rubber mount, designated with "L" for left semi-trailing arm, with notch (1)



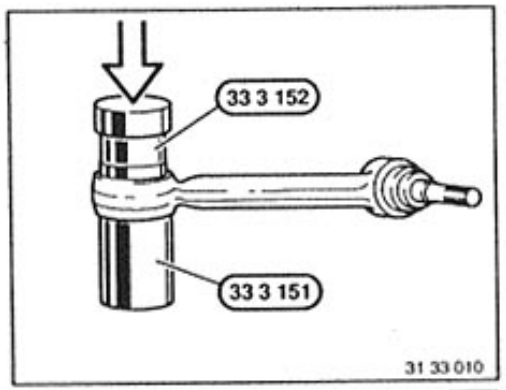
Press in front rubber mount with special tool 33 3 171, 172 and 173 with guide sleeve.



Correct installation location of right semi-trailing arm mount in direction of travel, (viewed from inside to outside).

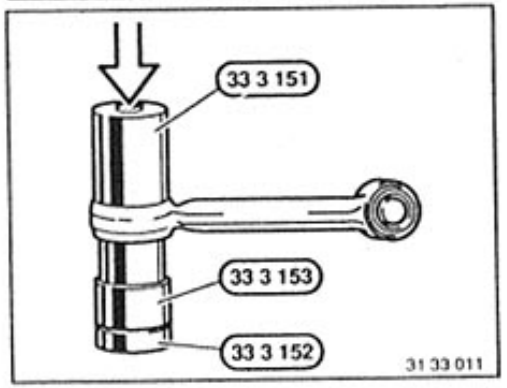
33 32 051 REMOVING AND INSTALLING OR REPLACING INTEGRAL ARM THRUST STRUT

Remove trailing arm – see 33 32 021. Procedures are identical with those for "Replacing Trailing Arm" in 33 32 021.



33 32 651 REPLACING RUBBER MOUNT IN INTEGRAL ARM THRUST STRUT
– Trailing Arm Removed –

Remove trailing arm – see 33 32 021. Press out rubber mount with Special Tools 33 3 152 and 151.

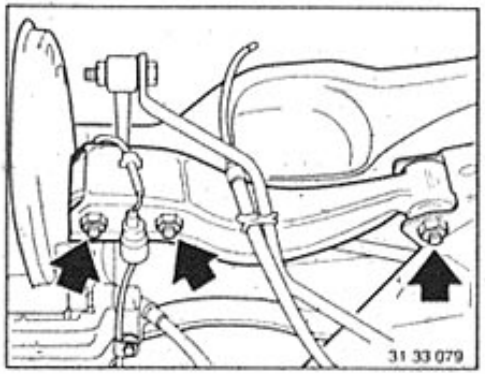


Press in new rubber mount with Special Tools 33 3 153, 152 and 151.

33 32 071 Replacing one upper control arm
(without chassis alignment check)

Note:
When operation complete, perform chassis alignment check, see 32 00 150.

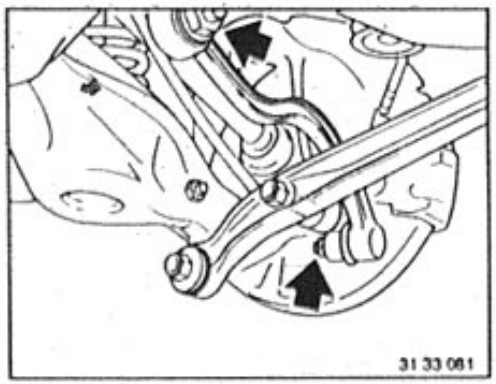
Remove wheel, see 36 10 300



Unfasten screws.
Unclip ABS sensor lead.
If necessary, unfasten stabilizer link on stabilizer.
Remove control arm.

Installation
Tightening torque 33 32 8AZ / 10AZ / 14AZ*

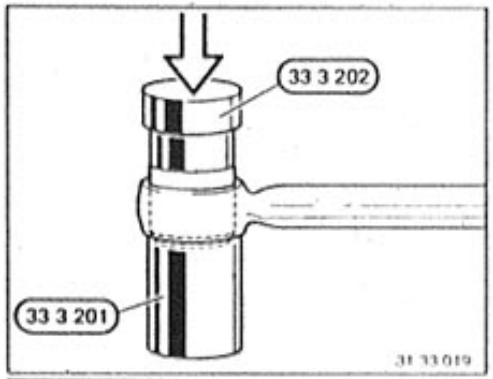
* Refer to Technical Data



33 32 091 REMOVING AND INSTALLING OR REPLACING GUIDE ARM

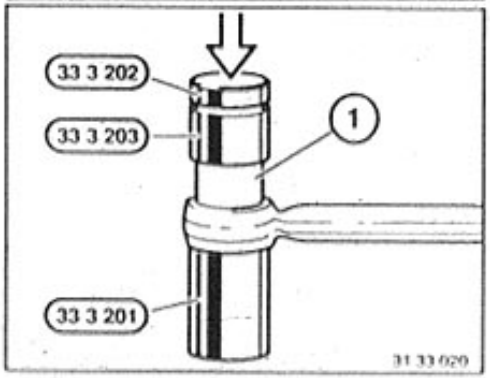
Unscrew bolts.
Remove guide arm.

Installation:
Tightening torque* with car loaded down to normal position*.
Check wheel alignment after installation – see Group 32.



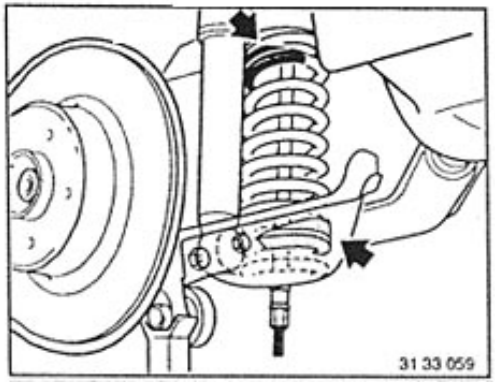
33 32 691 REPLACING GUIDE ARM RUBBER MOUNT
– Guide Arm Removed –

Remove guide arm – see 33 32 091.
Press out rubber mount with Special Tools 33 3 202 and 201.



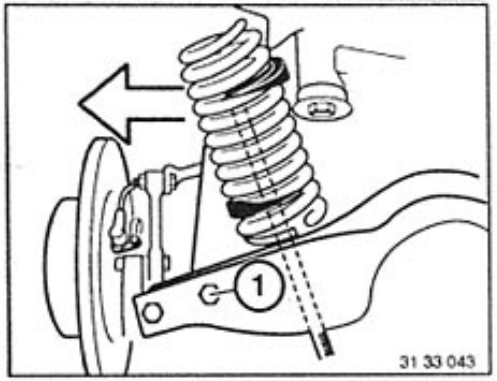
Press in new rubber mount (1) with Special Tools 33 3 202, 203 and 201.

* See Specifications



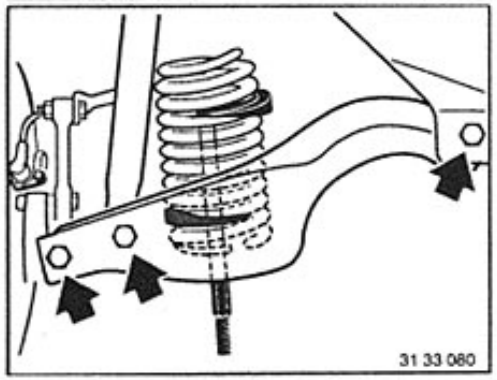
33 32 111 REMOVING AND INSTALLING OR REPLACING SUPPORT ARM

Compress and remove coil spring – see 33 53 000.



Unscrew bottom shock absorber bolts.

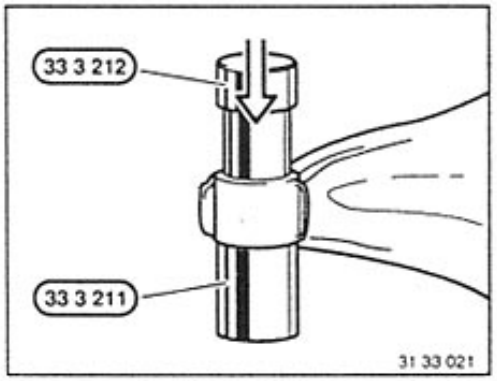
Installation:
Tightening torque*.



Unscrew bottom support arm bolts.

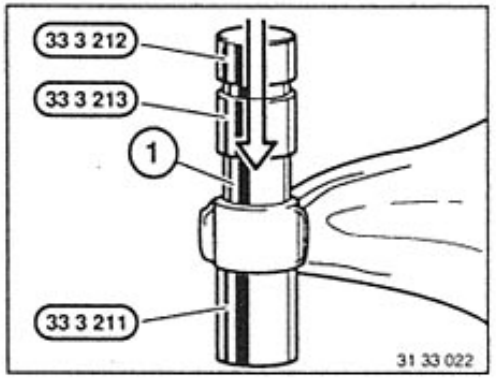
Installation:
Tightening torque*.

Important!
Check wheel alignment after installation – see Group 32.



33 32 711 REPLACING BALL JOINT IN SUPPORT ARM
– Support Arm Removed –

Remove support arm – see 33 32 111.
Press out ball joint with Special Tools 33 3 212 and 211.



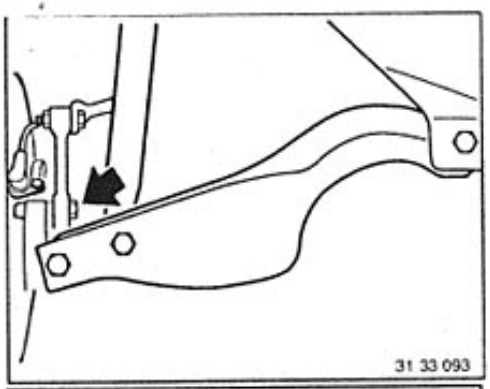
Press in new ball joint (1) with Special Tools 33 3 211, 212 and 213.

* See Specifications

33 32 131 REMOVING AND INSTALLING OR REPLACING WHEEL CARRIER

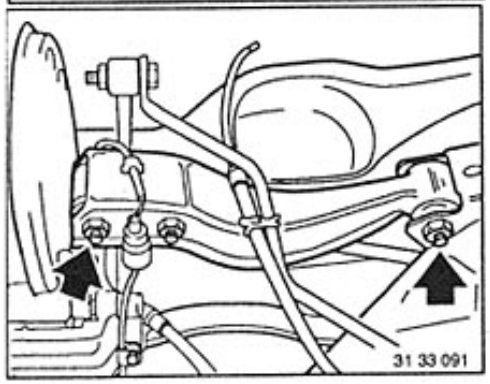
Important!
Check wheel alignment after installation – see Group 32.

Remove rear wheel – see Group 36.
Remove output shaft – see 33 21 000.
Remove brake caliper – see 34 21 745.
Remove ABS sensor – see 61 12 522.
Loosen parking brake cables – see Group 34.
Remove brake disc – see Group 34.
Remove expander lock – see 34 41 220.
Remove guide arm – see 33 32 091.



Unscrew stabilizer.

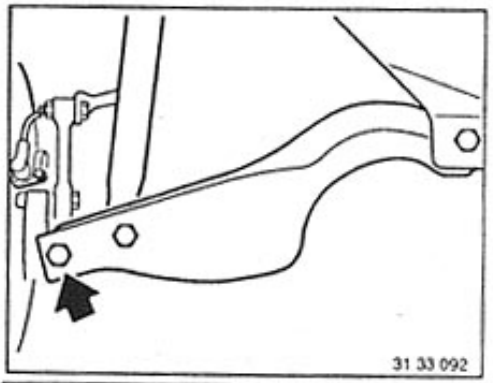
Installation:
Tightening torque* with car loaded down to normal position*.



Unscrew upper control arm bolts.

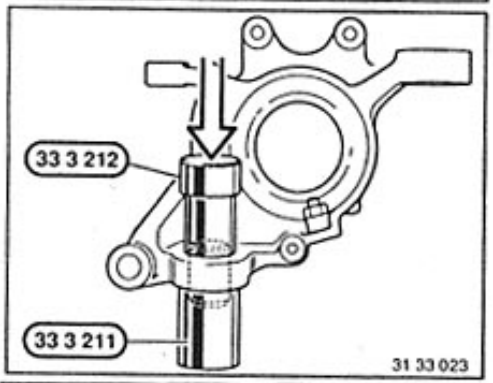
Installation:
Tightening torque* with car loaded down to normal position*.

* See Specifications



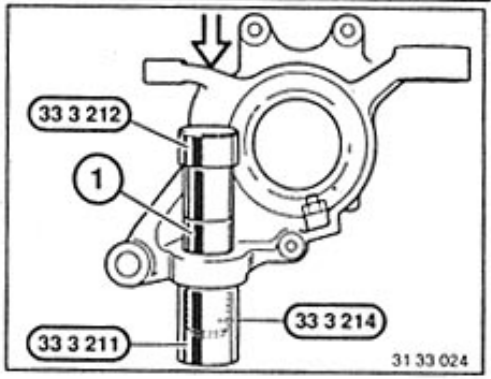
Unscrew lower control arm bolts on outside.
Unscrew guide arm bolt on outside.

Installation:
Tightening torque* with car loaded down to normal position.



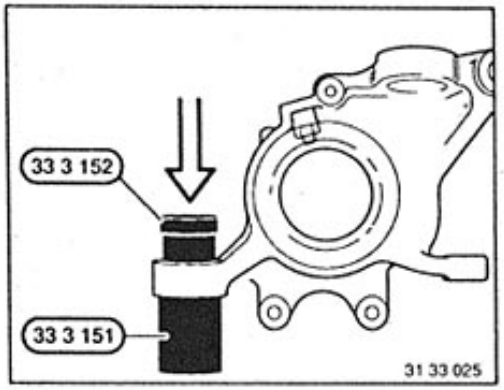
33 32 719 REPLACING LOWER BALL JOINT IN WHEEL CARRIER – Wheel Carrier Removed –

Remove wheel carrier – see 33 32 131.
Press out lower ball joint with Special Tools 33 3 212 and 211.



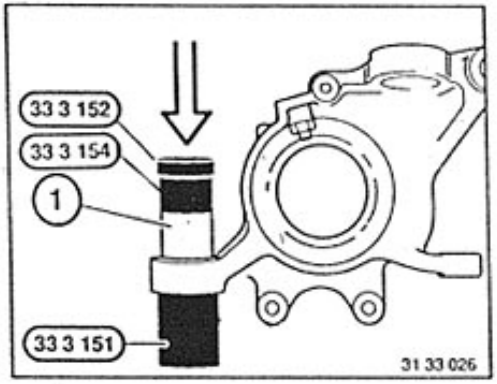
Press in new ball joint with Special Tools 33 3 212, 211 and 214.

* See Specifications



33 32 725 REPLACING UPPER BALL JOINT IN WHEEL CARRIER
– Wheel Carrier Removed –

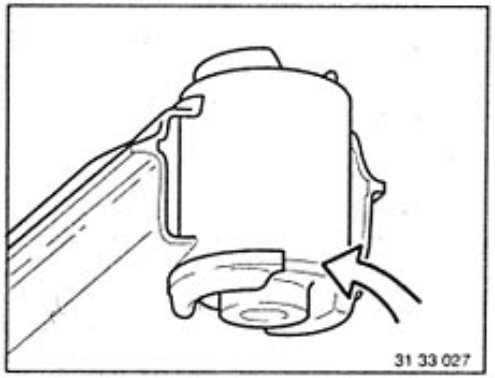
Press out upper ball joint bearing with Special Tools 33 3 152 and 151.



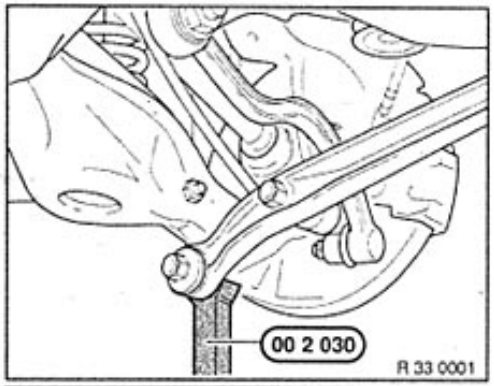
Press new ball joint bearing (1) into wheel carrier with Special Tools 33 3 151, 152 and 154.

33 33 101 Replacing two rubber mounts for rear axle carrier

Remove both rear mufflers,
see 18 00 020.
Unfasten propeller shaft from final drive,
see Gr.26.
If necessary, unfasten hydraulic lines from actuator unit, see 33 34 530.
If necessary, unfasten cooling circuit at joints,
see 33 15 005.

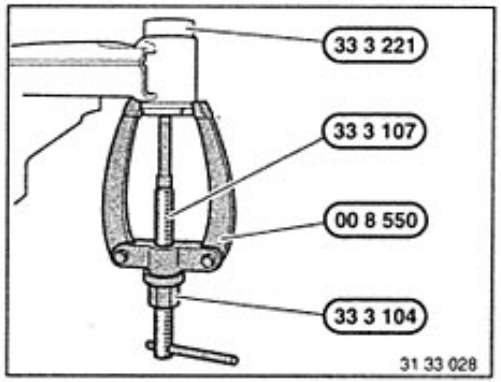


Note:
To enable the special tool 00 8 500 to be fitted better, the recesses of the metal bush on the rubber mount must be driven inwards.



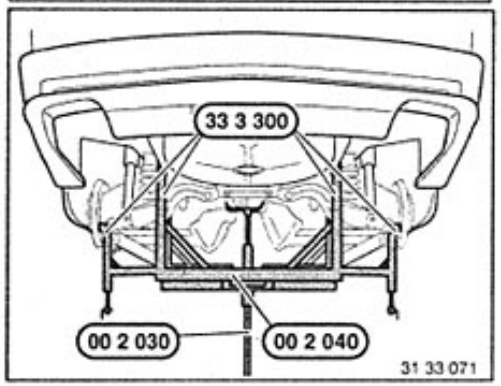
Disconnect shock absorber:
Brace wheel carrier with workshop hoist 00 2 030.
Unfasten screw connection on shock absorber.
Lower workshop hoist.

Installation:
Replace self-locking nut.
Tightening torque 33 52 1AZ*

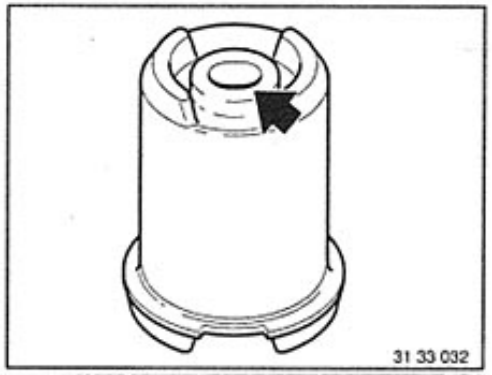


Lower rear axle until the extractor tool can be fitted.

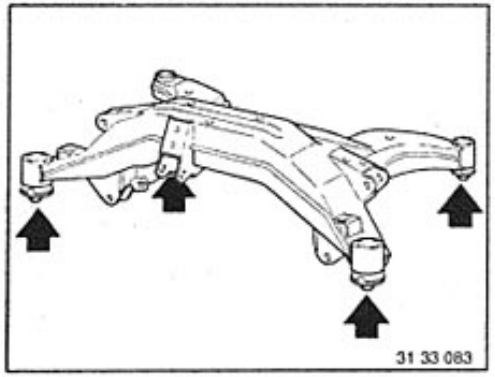
Front rubber mount:
Fit special tool 33 3 221/ 00 8 550 / 33 3 107 / 104.
Heat bush using standard hot air blower.
Pull out rubber mount.



Support rear axle with workshop hoist 00 2 030 and special tool 00 2 040 / 33 3 300.

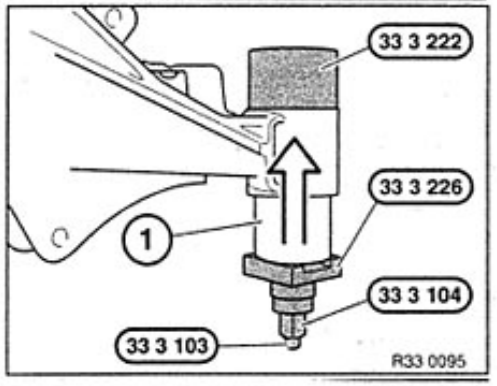


Installation:
Note installation position:
slot at right angles to direction of travel.



Unfasten screws.

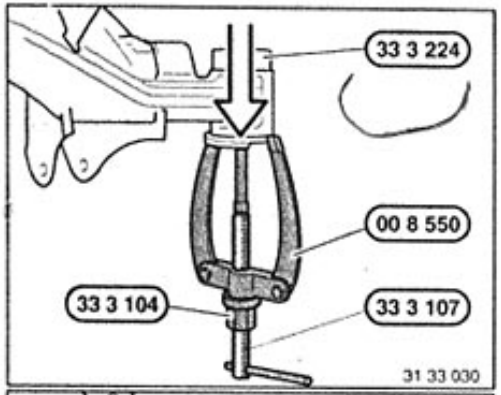
Installation:
Thrust washers, rear 70 mm dia.
Thrust washers, front 75 mm dia.
Tightening torque 33 32 2AZ*



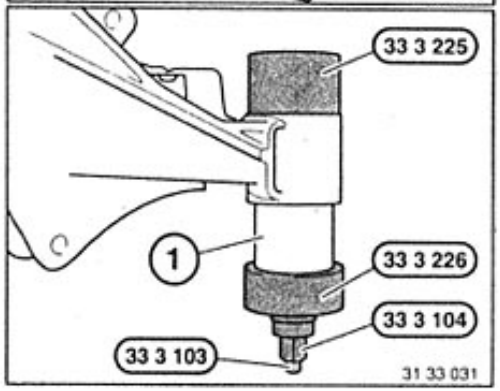
Coat new rubber mount (1) with Circolight* and pull in using special tool 33 3 222 / 223 / 103 / 104.

* Refer to Technical Data

* Refer to BMW Parts Service



Rear rubber mount:
Fit special tool 33 3 224 / 00 8 550 / 33 3 107 / 104.
Heat bush using standard hot air blower.
Pull out rubber mount.



Coat new rubber mount (1) with Circolight* and pull in with special tool 33 3 225 / 226 / 103 / 104.

* Refer to BMW Parts Service.

ACTIVE REAR AXLE KINEMATIC (AHK)

In comparison with conventional rear axles, active rear axle kinematic makes it possible to actively control the build-up of lateral force on the rear axle by way of selective steering.. This considerably reduces the hazard of swerving.

Example:
In case of a sudden obstacle avoidance maneuver (panic steering) normally steered vehicles will react with swerving motion under certain conditions, which can even be amplified by "correcting on the steering wheel".
The occurring tendency to swerving is reduced considerably under certain conditions in vehicles with AHK.

Design:
Input variables of the system are steering wheel angle and road speed. They are measured twice (redundant) in the interest of driving safety. An electronic control unit also fitted with redundant microprocessors calculates an optimal steering angle for the rear wheels depending on the pertinent driving condition.
Corrections are carried out by an electric/hydraulic drive unit. The drive unit is immediately arrested by hydraulic/mechanical clamps in case of serious system disturbance.
Rear wheels are brought to and arrested in straight ahead position in case of less serious disturbance.
In other words, driving safety is never impaired.
The disturbance is always reported to the driver by a warning lamp in the instrument cluster.

Self-test:
The AHK system activates a self-test after each engine start to check the operation of electric, hydraulic and mechanical components.
The mechanical clamp of the setting cylinder, among others, is briefly activated on the drive unit.
Switching the mechanical clamp on and off produces a "pounding sound" which might be heard in the passenger compartment.
After conclusion of the self-test the AHK system is active; but the AHK system remains inactive if a fault is recognized.

General Information About AHK (Active Rear Axle Kinematic)

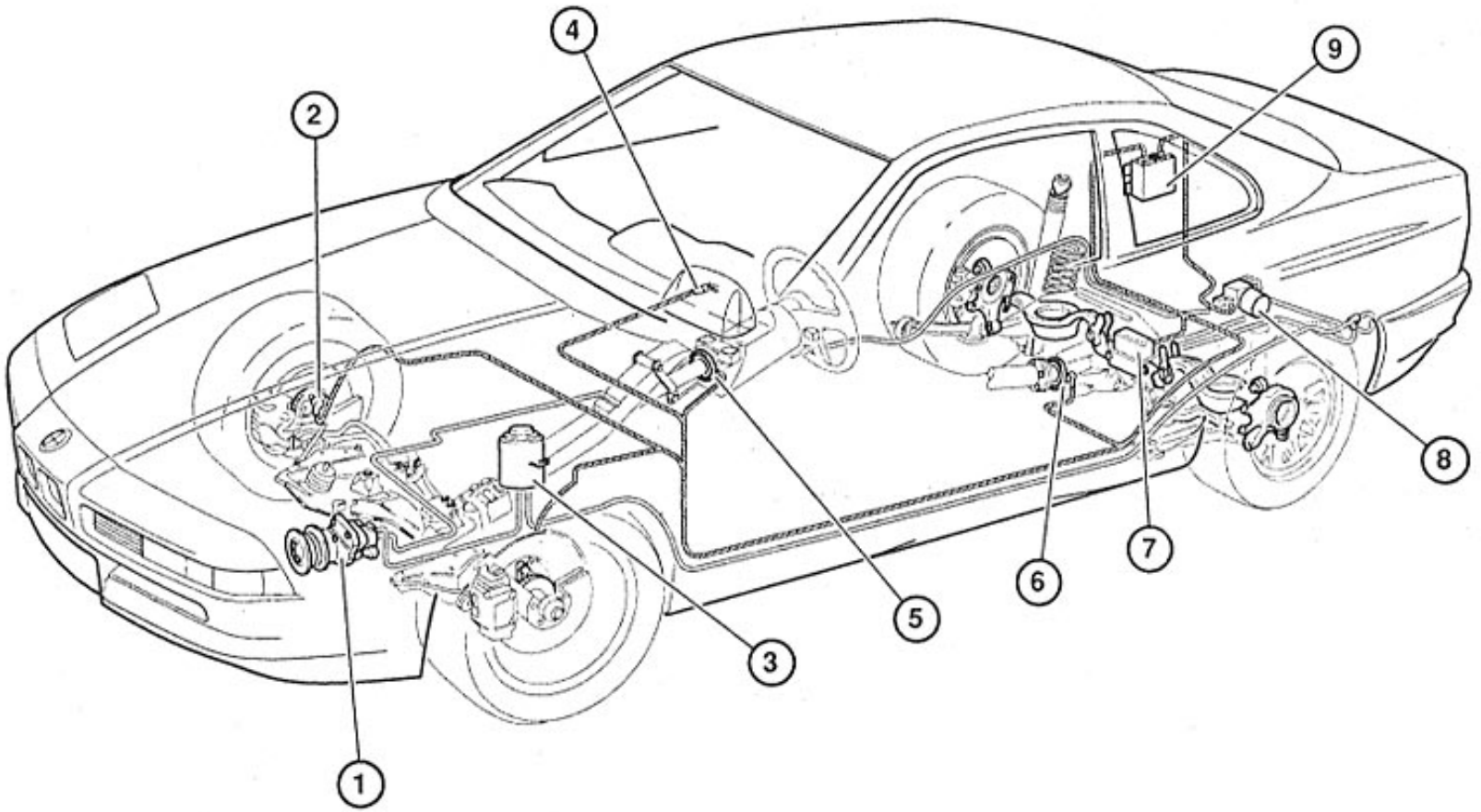
There must be conformance with the following points when carrying out repairs as the AHK system must fulfill very strict safety specifications.

- Read fault memory, investigate and eliminate stored faults before working on AHK.
  Erase fault memory.
- Discharge pressure reservoir by loosening the pressure discharging plug about one half turn before working on the reservoir charging unit and drive unit.
- Ensure absolute cleanliness and only use rags which do not lose lint.
- Filter elements of the reservoir charging unit and drive unit must be replaced after a mechanical defect on the hydraulic pump.
- Plug removed hydraulic pipes and equipment immediately with suitable rubber or plastic caps.
- Always use a torque wrench to tighten bolts and nuts to specified torque values.
- Switch off the ignition before working on the electrical system.

A fault could be stored in the fault memory by carrying out the following jobs:
Performance test on dynamometer
Electronic balancing of rear wheels on vehicle (finish balancing).

Read and, if applicable, erase the fault memory after carrying out this work.

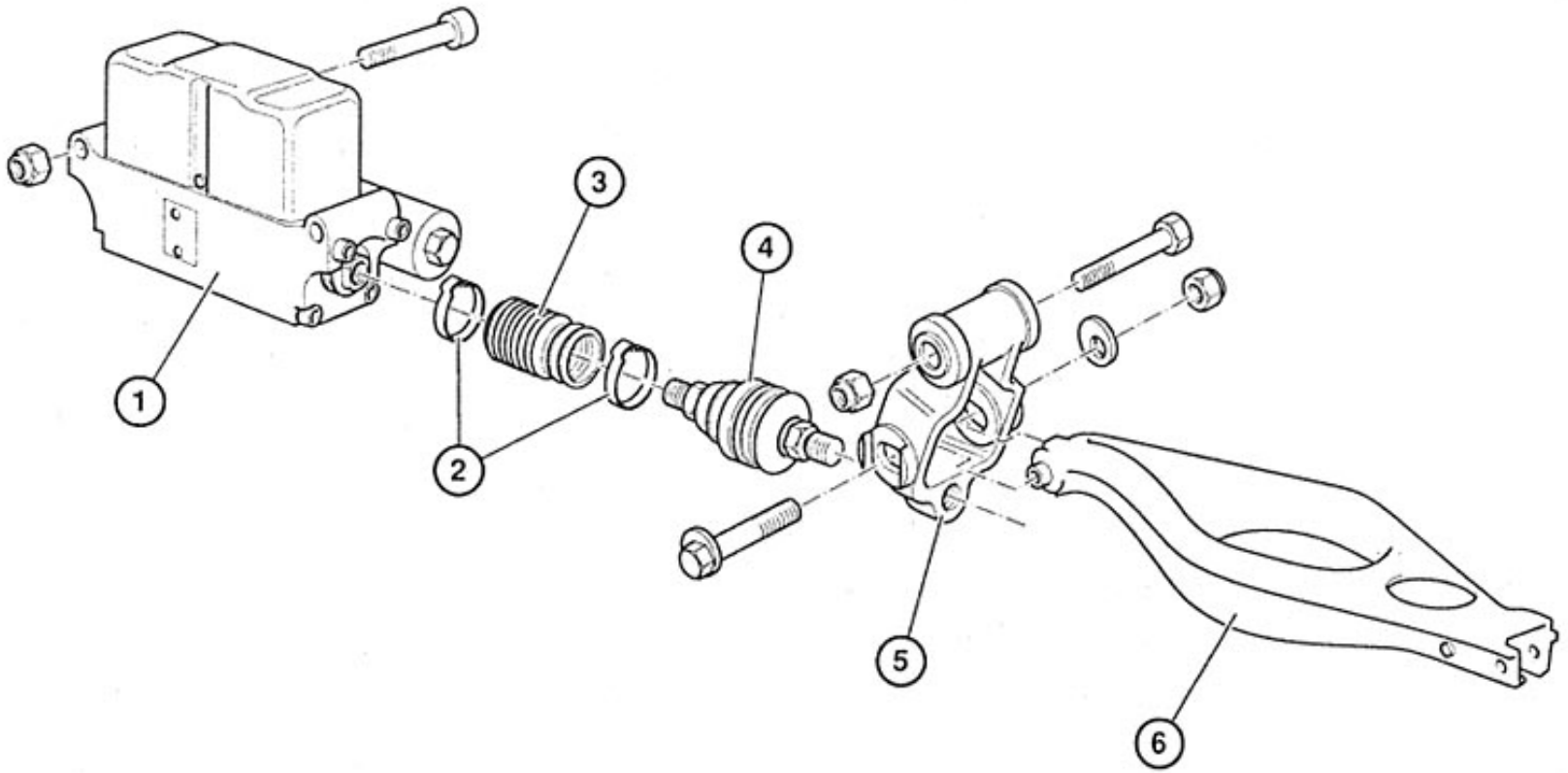
LAYOUT DRAWING OF AHK (Active Rear Axle Kinematic)



31 33 122

1 Triple-circuit pump
2 Wheel speed sensor (from ABS)
3 Supply tank
4 Warning lamp
5 Steering wheel angle sensor
6 Speedometer sender
7 Drive unit
8 Reservoir charging unit
9 AHK control unit

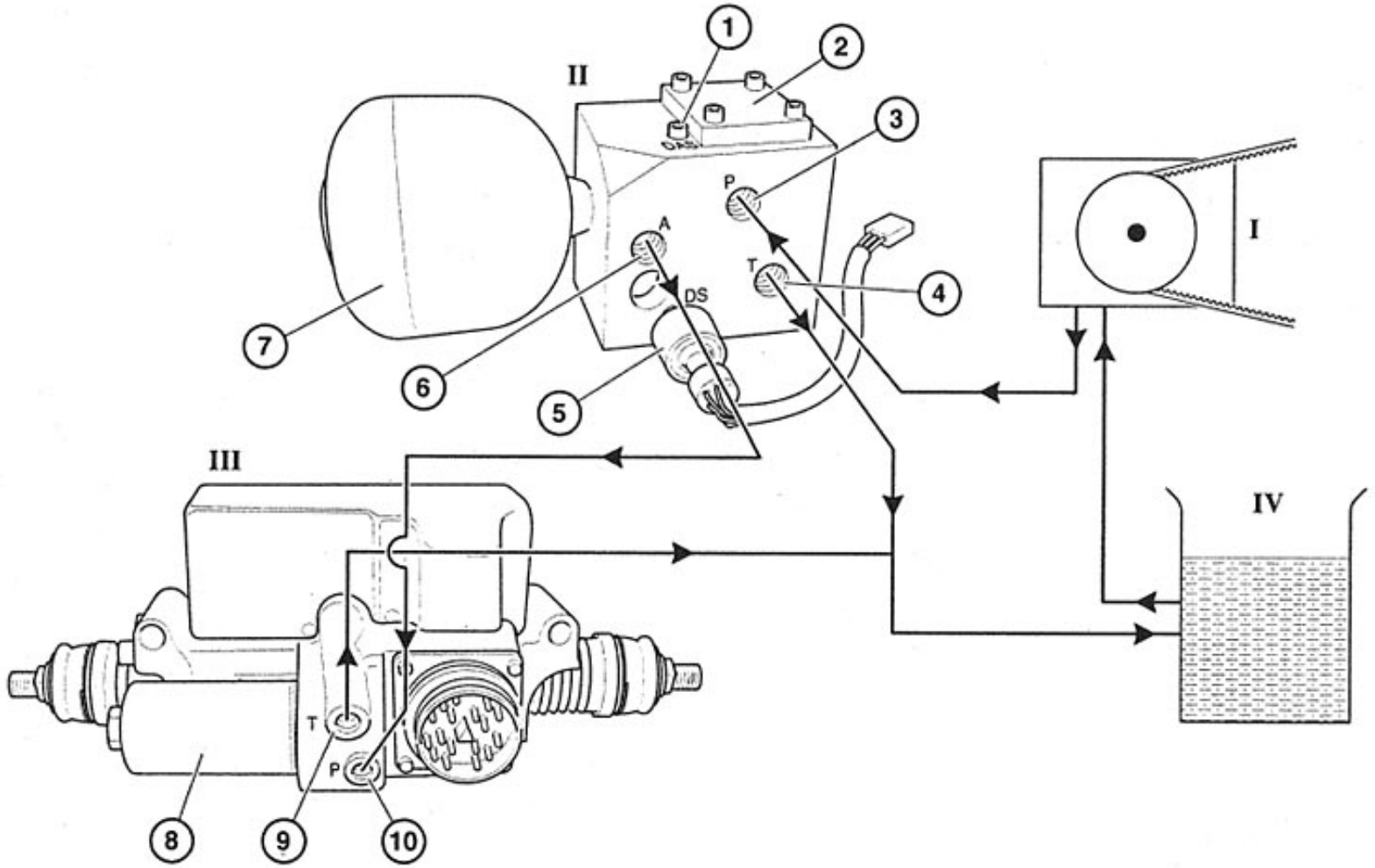
LAYOUT DRAWING OF DRIVE UNIT AND SUPPORT ARM



31 33 124

1 Drive unit
2 Clamp
3 Dust cover
4 Double joint
5 Intermediate arm
6 Lower support arm

LAYOUT DRAWING OF HYDRAULIC PIPES



31 33 125

I Triple Circuit Pump

II Reservoir Charging Unit

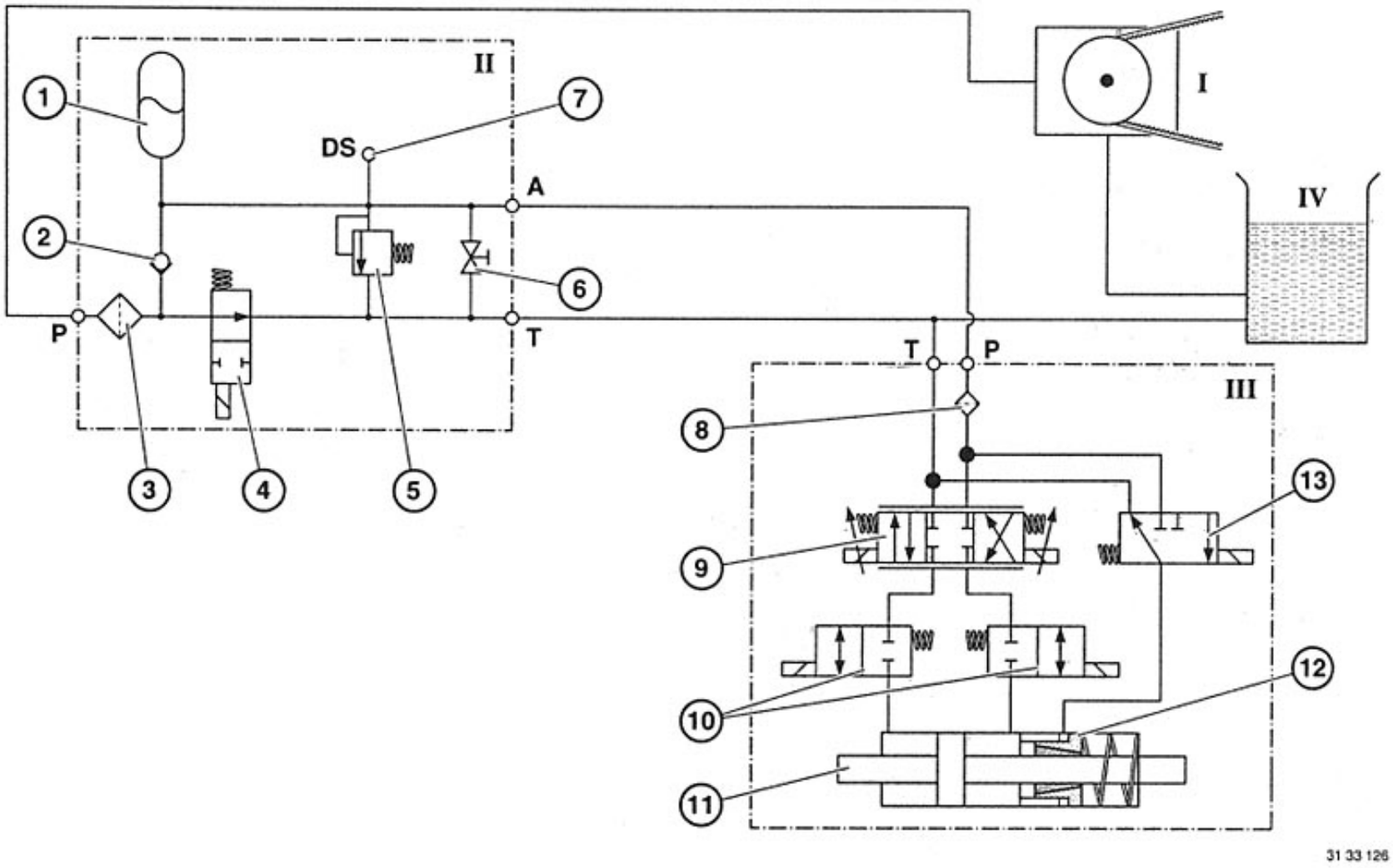
1 (DAS) pressure discharging plug
2 Filter element
3 (P) pressure inlet from pump
4 (T) tank connection to hydr. fluid tank
5 (DS) pressure sensor
6 (A) pressure outlet to drive unit
7 Pressure reservoir

III Drive Unit

8 Filter element
9 (T) tank connection to hydr. fluid tank
10 (P) pressure inlet from reservoir charging unit

IV Hydraulic Fluid Tank

AHK (Active Rear Axle Kinematic) HYDRAULIC DIAGRAM



31 33 126

I Triple Circuit Pump

II Reservoir Charging Unit

1 Pressure reservoir
2 Non-return valve
3 Filter
4 Reservoir charging valve
5 Pressure relief valve
6 Pressure discharging plug
7 Pressure sensor connection

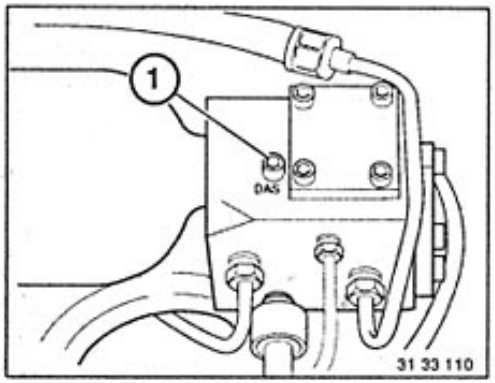
III Drive Unit

8 Filter
9 Proportioning valve
10 Hydraulic shutoff valves
11 Setting cylinder
12 Mechanical clamp
13 Mechanical clamping valve

IV Hydraulic Fluid Tank

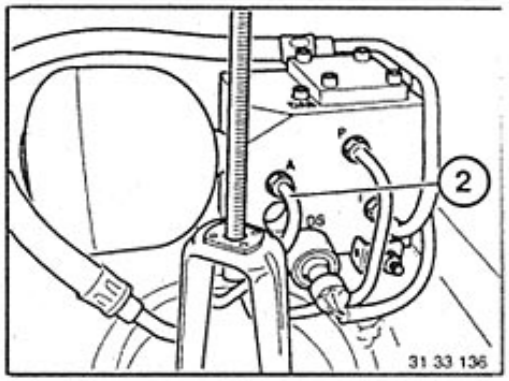
33 34 000 CHECK FUNCTION OF AHK HYDRAULIC SYSTEM (with BMW Service Tester)

Note:
This job is required to troubleshoot the AHK hydraulic system — refer to BMW Diagnosing System.



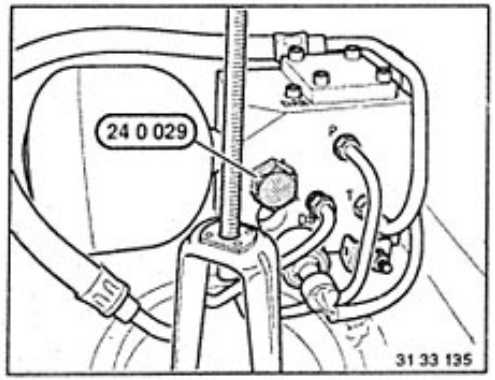
Loosen pressure discharging plug (1) one half turn – pressure is discharged from the reservoir.

Installation:
Tightening torque*.



Unscrew hydraulic pipe (2) from the reservoir charging unit.

Installation:
Tightening torque*.



Plug pressure connection (A) using Special Tool 24 0 029.

Caution!
Discharge pressure from the reservoir before unscrewing the special tool.

* **Refer to Specifications**

33 34 005 Bleeding AHK hydraulic system

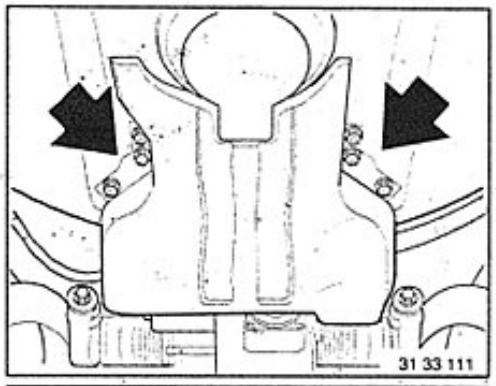
Perform hydraulic load test, refer to BMW diagnosis system, menu item "Special Functions".

Note:
The air inclusions are carried along by the increased flow rate in the load test and are transported to the expansion tank.

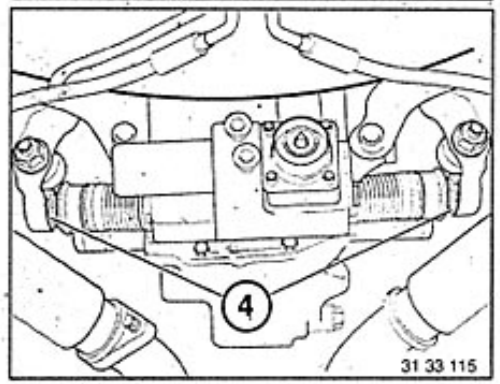
Check the hydraulic fluid level, see 32 13 006.

33 34 015 Removing and installing or replacing left or right double joint
(without chassis alignment check)

When operation is complete, perform a chassis alignment check, see 32 00 150.



Unfasten nut and remove protective plate.

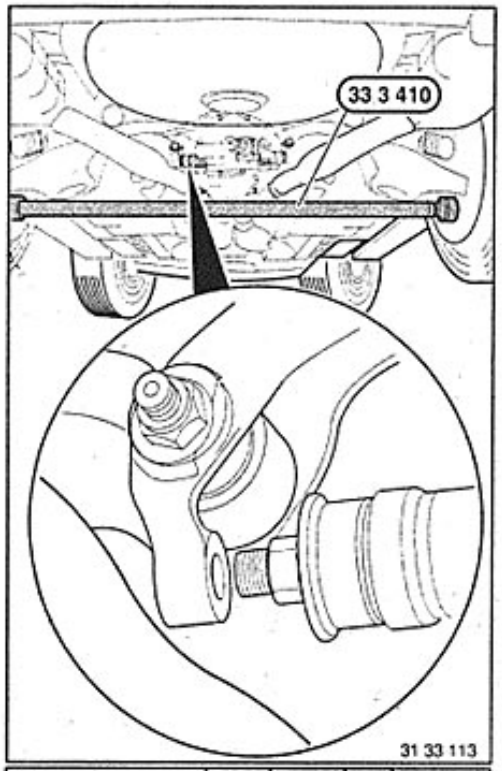


Unfasten ball joint (4).

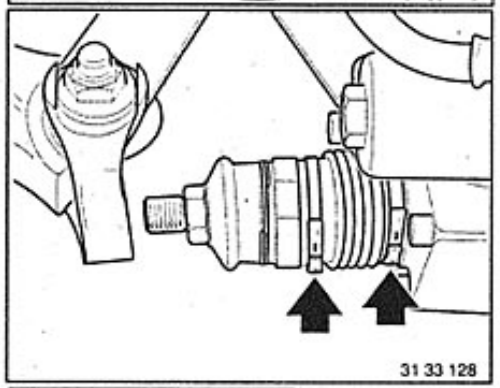
Caution!
Do not damage thread.

Installation:
Grip center section of double joint while screwing in the ball joint (4) to avoid damaging the thread.
Tightening torque 33 34 9A 7*

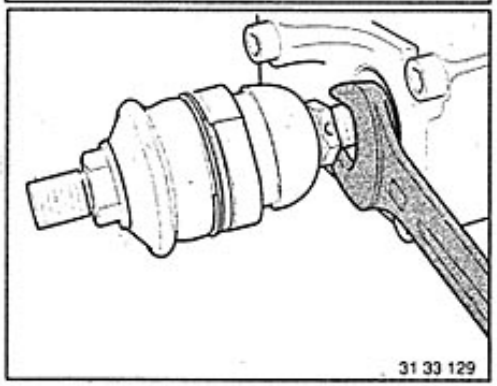
* Refer to Technical Data.



Force rear wheels apart by pressing on trailing arm with special tool 33 3 410 until the thread for the left or right double joint is exposed.



Open tightening straps and remove.



Slide gaiter to one side, brace piston rod with open-end wrench and unfasten double joint.

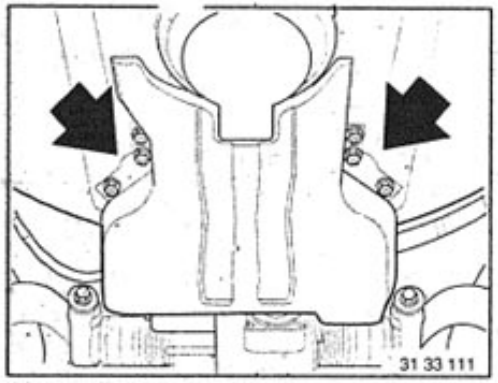
Installation:
Tightening torque 33 34 8 AZ*

* Refer to Technical Data.

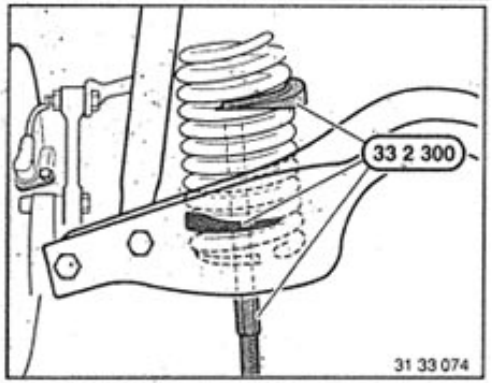
33 34 020 Removing and installing or replacing left or right intermediate lever
(without chassis alignment check)

When operation is complete, perform chassis alignment check, see 32 00 150.

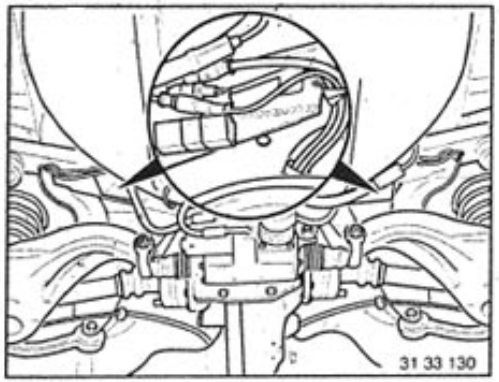
Remove both rear mufflers, see 18 00 020.



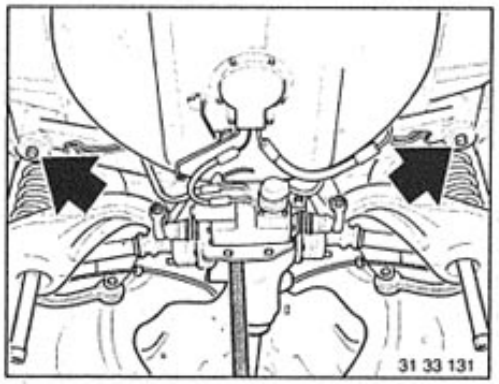
Unfasten nuts and remove protective plate.



Preload left and right springs with special tool 33 2 300, see 33 53 000 .



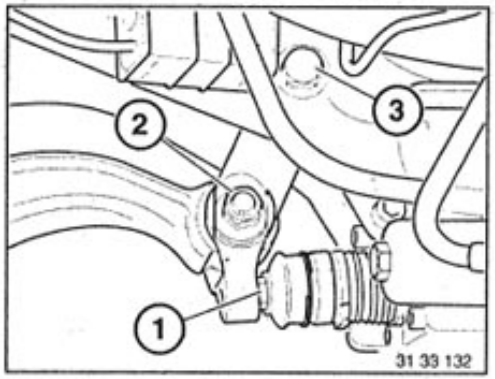
Remove plug connector (EDC /ABS /brake lining wear indicator) from the protective housings on the rear axle carrier.



Support rear axle carrier on a workshop hoist. Unfasten screws and lower rear axle carrier.

Caution!
Cables and hydraulic lines must not be subjected to traction load.

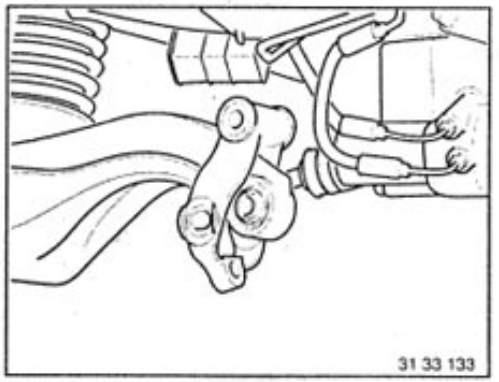
Installation:
Tightening torque 33 33 3AZ



Unfasten screws (1. . . 3).

Note:
Pull rear axle carrier down slightly to enable screw (3) to be unscrewed and removed.

Installation:
Replace self-locking nut.
Grip center section of double joint while screwing in the ball joint (1) to avoid damage to the thread.
(1) Tightening torque 33 34 9AZ*
(2) Tightening torque 33 34 10AZ*
(3) Tightening torque 33 34 11AZ*



Swivel lower support arm to one side and remove intermediate lever.

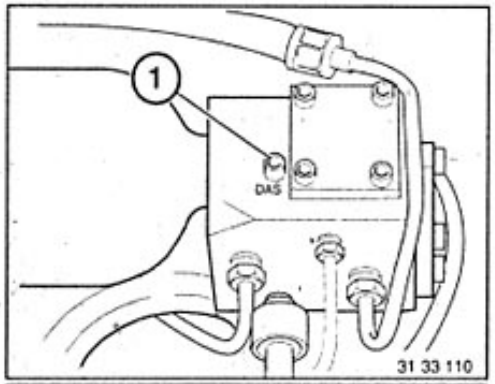
* Refer to Technical Data.

33 34 520 Removing and installing or replacing spring accumulator unit

When operation is complete:
bleed hydraulic system, see 33 34 005.
Perform leak test, see BMW diagnosis system, menu item "Special Functions".

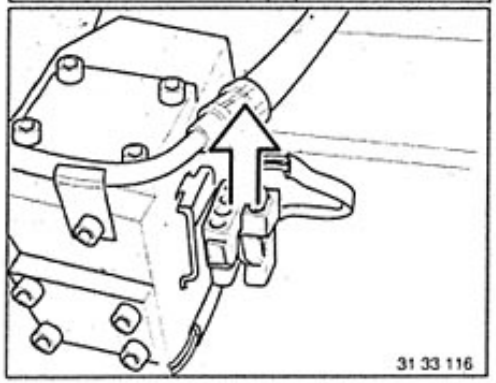
Visual inspection for leaks:
- Hydraulic lines and screw connections
- Filter cover
- Pressure sensor
- Spring accumulator spring connection

Remove spare wheel.
Remove cover from the spring accumulator unit.

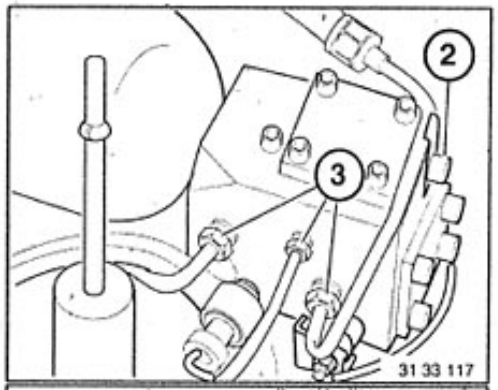


Loosen pressure relief screw (1) half a turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



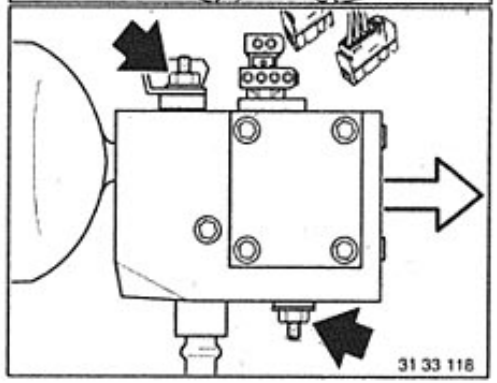
Disconnect plug connections.



Unfasten screw (2).
Unfasten hydraulic lines (3).

Note:
Seal hydraulic lines with a rubber cap.

Installation:
(3) Tightening torque 33 34 3AZ*
Hydraulic lines must not contact any body components and should be laid without any torsional stresses.



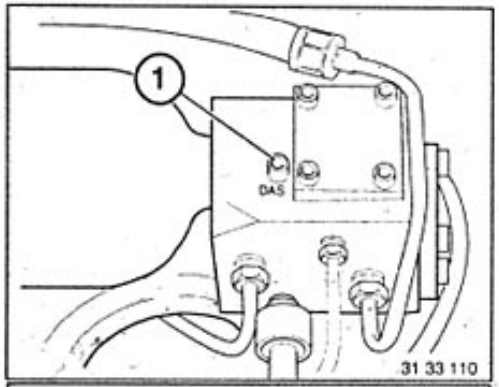
Unfasten screws and slide spring accumulator unit out to the right.

* Refer to Technical Data

* Refer to Technical Data

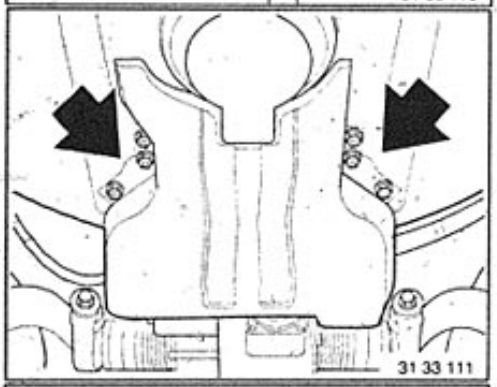
33 34 530 Removing and installing or replacing actuator unit (without chassis alignment check)

When operation is complete:
perform chassis alignment check,
see 32 00 150.
Perform leak check, see BMW diagnosis system.
Visual inspection for leakage:
Hydraulic lines and screw connections
Filter bell/ actuator cylinder

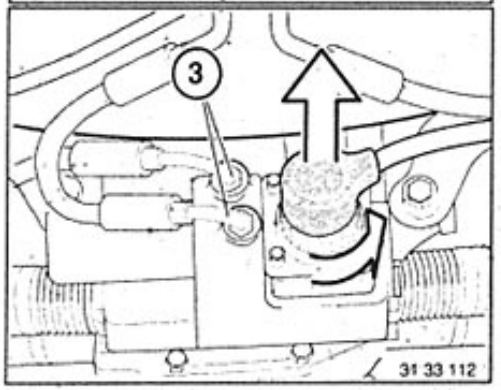


Remove spare wheel.
Remove cover from spring accumulator unit.
Loosen pressure relief screw (1) one half turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



Unfasten nuts and remove protective plate.

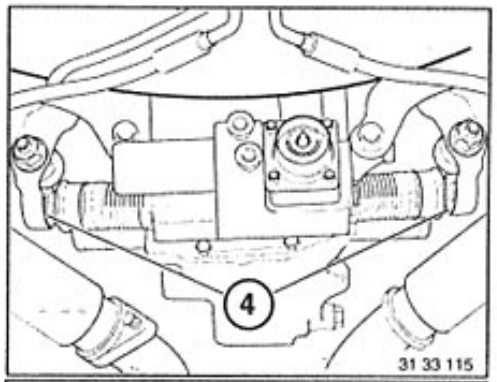


Unlock connector and remove.
Unfasten hydraulic lines (3).

Note:
Seal hydraulic lines with a rubber cap.

Installation:
Tightening torque 33 34 3AZ*

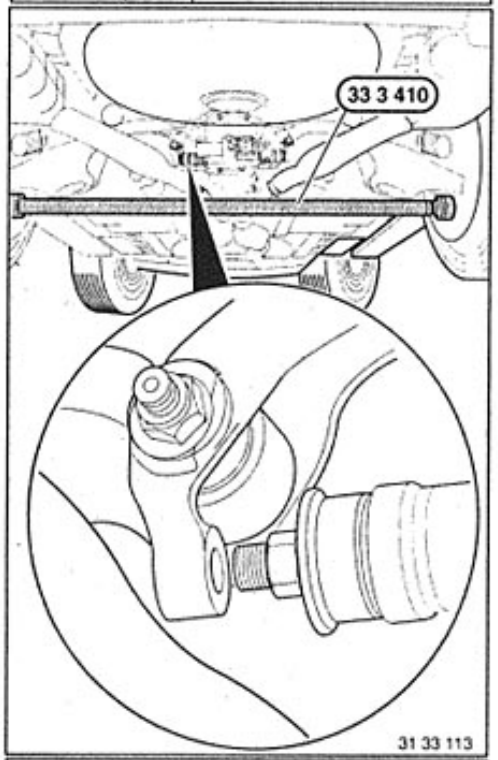
* Refer to Technical Data



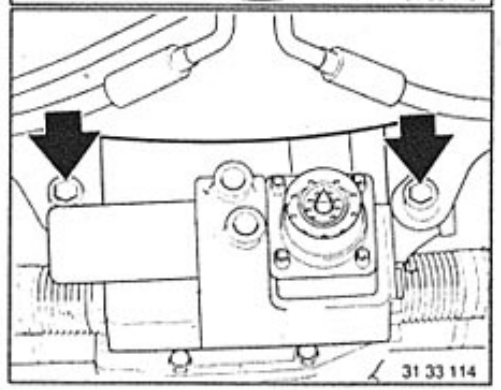
Unfasten ball joint (4).

Caution!
Do not damage the thread.

Installation:
Grip center section of double joint while screwing in the ball joint (4) to avoid damaging the thread.
Tightening torque 33 34 9AZ*



Force apart rear wheels by pressing on semi-trailing arm with special tool 33 3 410 until the threads for the left and right double joints are exposed.



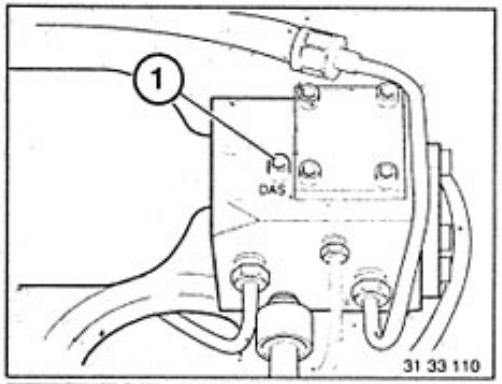
Unfasten retaining screws and remove actuator unit.

Installation:
Tightening torque 33 34 6AZ*

* Refer to Technical Data

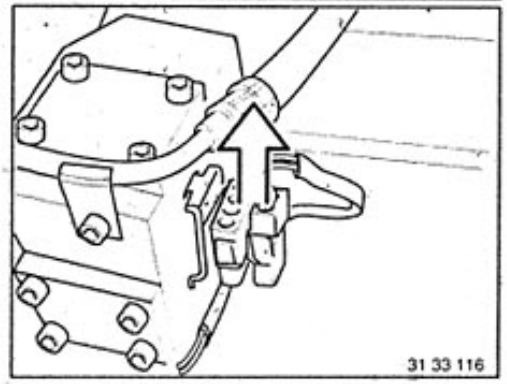
33 34 540 Removing and installing or replacing pressure sensor

Switch off ignition.
Remove spare wheel.
Remove cover from spring accumulator unit.

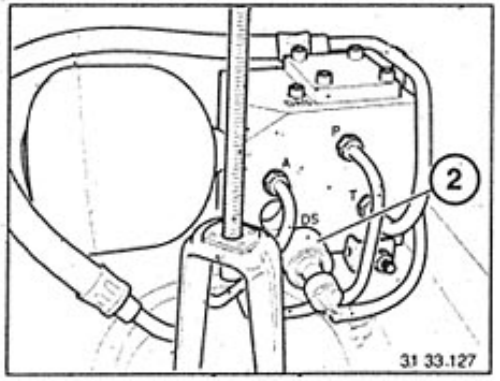


Loosen pressure relief screw (1) half a turn to relieve pressure in the spring accumulator unit.

Installation:
Tightening torque*



Remove connector from pressure sensor.



Unfasten pressure sensor (2).

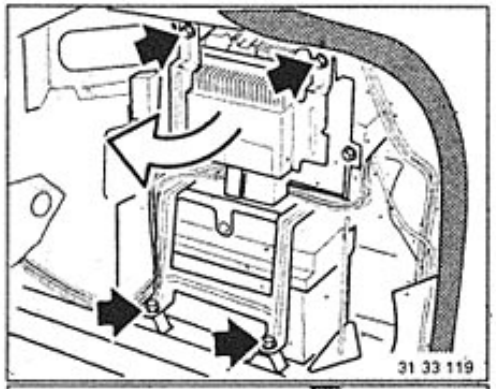
Installation:
Tightening torque*

* Refer to Technical Data.

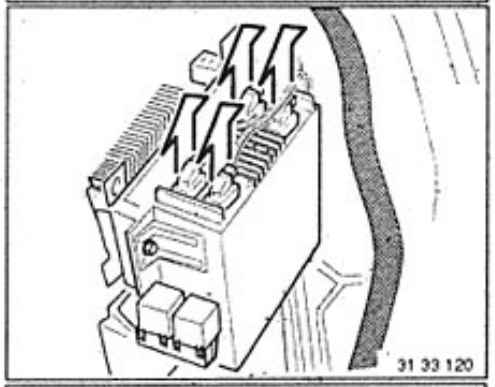
33 34 550 REMOVING AND INSTALLING OR REPLACING AHK CONTROL UNIT

Remove right trim panel in trunk - refer to Group 51.

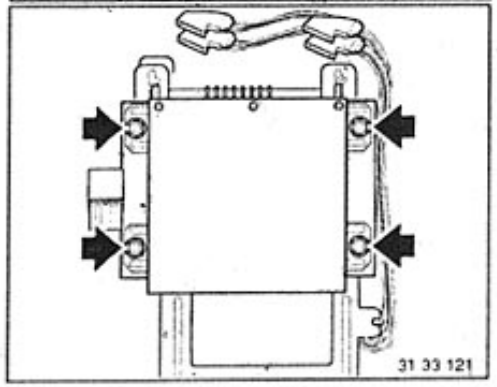
Important!
Switch off ignition before removing or installing control unit.
After conclusion of work, trim drive element and steering angle - refer to BMW Diagnosing System.



Unscrew mounting bolts and remove control unit holder.



Disconnect plugs.

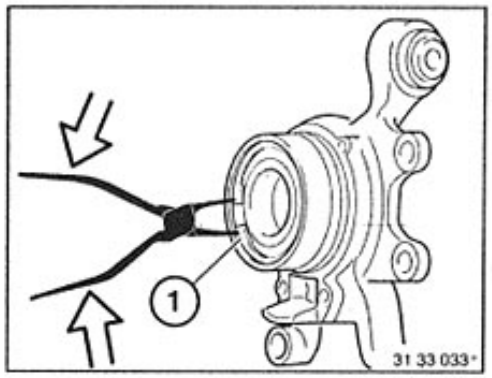


Unscrew bolts and remove control unit.

33 41 151 Replacing wheel bearing on left or right rear axle shaft

Remove output shaft, see 33 21 000.
Remove brake disc, see 34 21 320.
Remove ABS sensor, see 61 12 522.

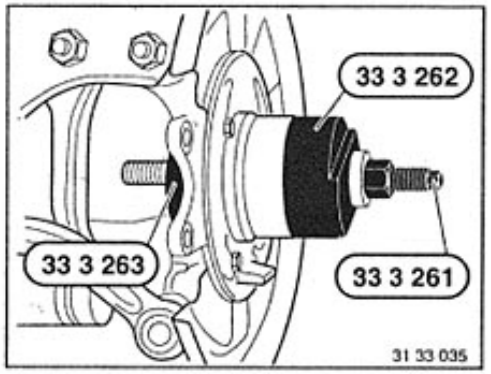
Note:
If necessary, when operation is complete, adjust the handbrake, see 34 10 014.



Lift out retaining ring (1).

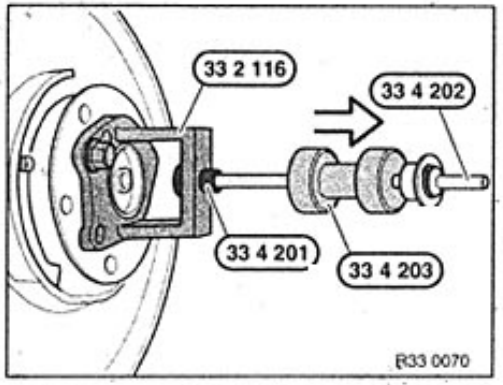
Unfasten stabilizer arm on stabilizer of wheel carrier.

Installation:
Tightening torque 33 55 1AZ*

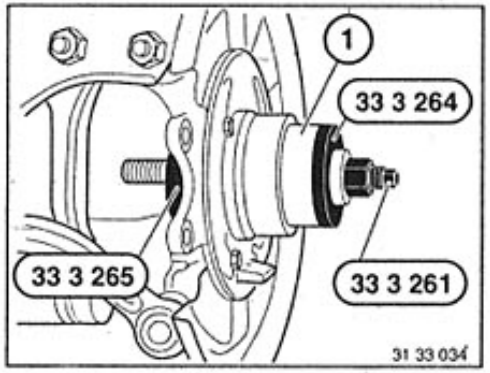


Remove taper ball bearing with special tool 33 3 261 / 262 / 263.

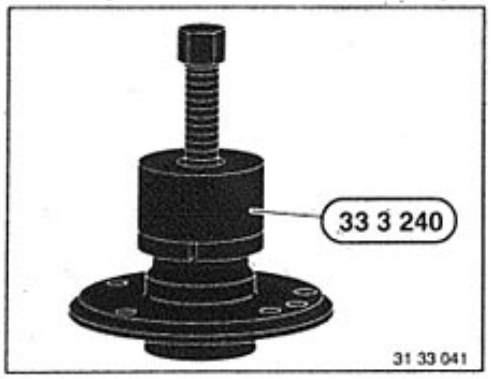
Caution!
Do not reuse taper ball bearing.



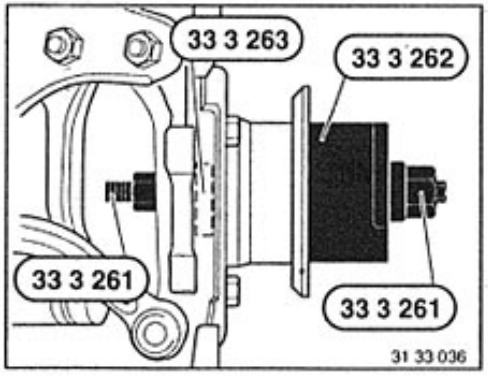
Secure special tool 33 2 116 with wheel studs to drive flange.
Drive out hub of driver flange with special tool 33 4 201 / 202 / 203.



New pull in taper ball bearing (1) with special tool 33 3 261 / 264 / 265.
Fit retaining ring.

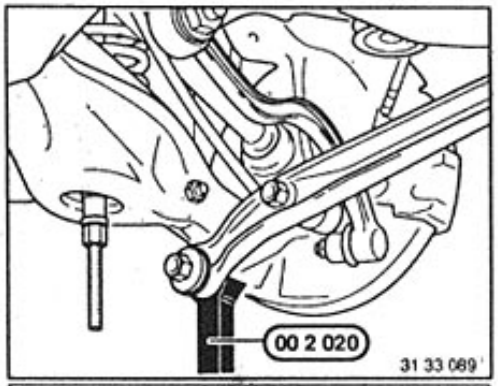


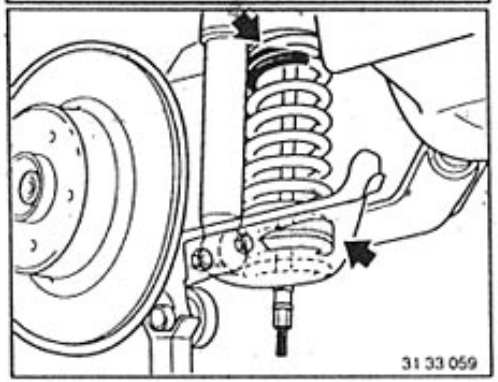
Remove inner bearing race from the drive flange hub with special tool 33 3 240.



Pull in drive flange hub with special tool 33 3 261/ 262 / 263 / 264.

* Refer to Technical Data





33 52 000 REMOVING AND INSTALLING OR REPLACING REAR SHOCK ABSORBERS

Wheel suspension must be unloaded for removal and installation.

Note:
Rear springs do not have to be compressed when wheel suspension is loaded for removal and installation.

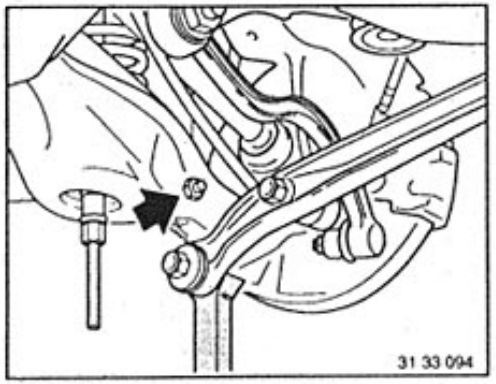
Lift car and support trailing arms with Special Tool 00 2 020.

Compress rear springs with Special Tool 33 2 300.

Caution!
Shock absorbers have the same effect as elastic straps.

Take mats out of trunk.
Unscrew shock absorber bolt at top.

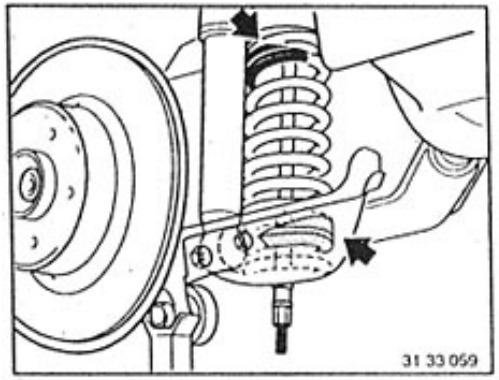
Installation:
Tightening torque*.



Unscrew shock absorber bolt at bottom.

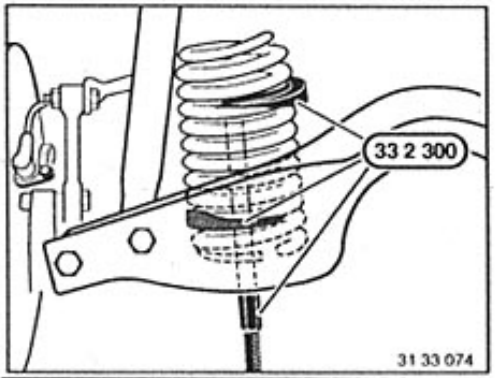
Installation:
Replace self-locking nuts.
Tightening torque* with car loaded down to normal position.

* See Specifications

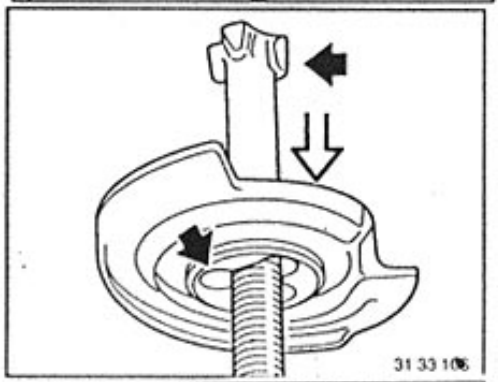


33 53 000 REMOVING AND INSTALLING LEFT OR RIGHT COIL SPRING

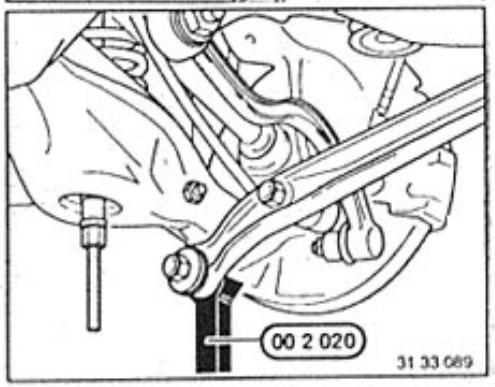
Compress rear spring with Special Tool 33 2 300.



Place spring tensioning plate in the middle of the coil spring.
Turn up upper spring tensioning plate completely; turn down lower spring tensioning plate completely.

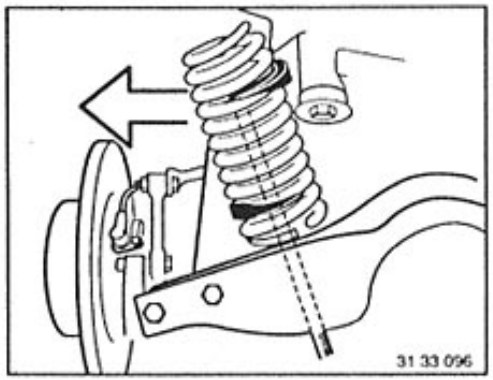


Slide in and turn the tensioning shaft until crosshead (1) is inserted perfectly in the openings of the upper spring retainer.
Compress spring.



Support trailing arm with Special Tool 00 2 020, lifting slightly if the coil spring is turned while compressing.

Installation:
Check for correct position of the rubber liners.



Lift out rear spring.

Important!
Only replace coil springs in pairs.
Check code*.

Note:
Always store shock absorbers standing upright. If shock absorbers have been stored laying down and with the piston rod run in, this could lead to a knocking noise when used in car again.

TROUBLESHOOTING REAR AXLE

Condition	Cause	Correction
Load change knock	Backlash excessive Output shaft faulty Play in propeller shaft slide	Adjust backlash – see 33 12 551 Replace output shaft – see 33 21 000
Traction or compression noise	Backlash excessive or insufficient	Adjust backlash – see 33 12 551
Drumming	Propeller shaft Rubber mounts on rear axle carrier faulty	See "Troubleshooting Propeller Shaft" Replace rubber mounts – see 33 33 ...
Oil loss	Radial oil seals leak Vent clogged Wrong oil grade*	Replace radial oil seals Clean vent Replace final drive oil
Vibration	Imbalance of wheels Ouput shaft faulty Propeller shaft	Balance wheels or replace rims Replace output shaft – 33 21 000 See "Troubleshooting Propeller Shaft"
Rattling noise	Shock absorbers installed loose Upper shock absorber rubber ring faulty Lower shock absorber rubber ring faulty Rubber mounts on rear axle carrier faulty	Tighten shock absorbers Replace rubber ring Replace shock absorber – see 33 52 ... Replace rubber mounts – see 33 33 ...
Grinding noise only wheh driving in curves	Wheel bearings faulty	Replace wheel bearings – see 33 41 ...

* See Operating Fluids

TROUBLESHOOTING REAR AXLE WITH AHK

If faults are reported in the instrument cluster, the fault memory must always be read. Troubleshoot with BMW Service Tester.

Condition	Cause	Correction
Loud droning noise from rear end of car	Air in drive unit	Bleed hydraulic system - refer to 33 34 005.
Knocking noise from rear end of car at intervals of about 30 seconds	Reservoir charging unit touches body Hydraulic pipes touch body	Loosen spare wheel bolt slightly. Route hydraulic pipes correctly and without tension.
Slurping or whining noise from engine compartment	a) Leak in hydraulic system b) Low hydraulic fluid level in tank	Eliminate leak. Correct hydraulic fluid level - refer to Group 32. Bleed hydraulic system - refer to 33 34 005.

34 Brakes

	General information	34- 0/1
	General information , ABS	34- 0/2
34 00 015	Brake booster – check	34- 0/3
	Function check – 3-phase alternator	34- 0/4
019	Foot-operated brakes – check (high pressure and low pressure tests)	34- 0/4
047	Brake system with ABS – bleed	34- 0/5
	Automatic stability control and traction (ASC + T) duties and function description	34- 0/6
040	Bleeding ASC + T mineral oil circuit	34- 0/7
048	Bleeding brake system with ABS/ASC + T	34- 0/8
34 10 014	Parking brake – adjust	34- 10/1
34 11 000	Brake pads of both front disc brakes – remove and install or replace	34- 11/1
220	Both front brake discs – remove and install or replace	34- 11/2
519	Brake caliper, front, left or right – remove and install or replace	34- 11/3
552	Brake caliper, front, left or right – overhaul	34- 11/4
599	Both front brake discs – check runout and thickness deviation	34- 11/5
667	Both front brake discs – fine-grind both sides	34- 11/5
34 21 200	Brake pads of both rear disc brakes – remove and install or replace	34- 21/1
320	Both rear brake discs – remove and install or replace	34- 21/2
745	Brake caliper, rear, left or right – remove and install or replace	34- 21/2
812	Brake caliper, rear, left or right – overhaul	34- 21/3
879	Both rear brake discs – check for runout and thickness deviation	34- 21/3
947	Both rear brake discs – fine-grind both sides	34- 21/3
	The operating principle of the master brake cylinder	34- 31/1
34 31 000	Master brake cylinder – remove and install	34- 31/2
34 32 362	Brake pipes – replace	34- 32/1
941	All front brake hoses – replace	34- 32/2
983	Both rear brake hoses – replace	34- 32/3
	Function of complete system H 31	34- 33/1
	Function check	34- 33/1
34 33 505	Brake unit (brake booster) with master cylinder – remove and install	34- 33/2
100	3-phase alternator – remove and install	34- 33/3
110	Hydraulic accumulator – remove and install	34- 33/3
34 41 000	Handbrake lever – remove and install	34- 41/1
100	Handbrake Bowden cable, left or right – remove and install or replace	34- 41/2
220	All handbrake shoes – remove and install or replace	34- 41/3
	Brake system – troubleshoot	34- 41/4
	1. Antilock braking system (ABS) – operating method and design	34- 50/1
	2. Function and inspection of ABS indicator lamp	34- 50/3
	Automatic Stability Control (ASC)	34- 50/4
	Automatic Stability Control plus Traction (ASC + T)	34- 50/5
34 50 511	ASC + T brake intervention – check	34- 50/6
34 51 520	Hydraulic unit, complete – remove and install or replace (for ABS)	34- 51/1
	ABS / ASC – components	34- 51/2
525	Hydraulic unit, ASC + T – remove and install or replace	34- 51/3
525	Hydraulic unit – remove and install or replace (for ASC + T)	34- 51/5
540	ASC + T filter – remove and install/replace	34- 51/6
	Oil circuit / ASC + T	34- 52/1
34 52 510	Control unit – remove and install/ replace (for ABS / ASC)	34- 52/2
515	Control unit – remove and install/replace (ASC + T)	34- 52/3
525	One front impulse sensor – replace	34-52/3.1
61 12 535	One rear impulse sensor – replace	34-52/3.1
	Automatic Stability Control (wiring diagram from ABS hydraulic unit to ASC + T hydraulic unit)	34- 52/4
61 31 570	Relay on hydraulic unit (for ABS) – replace	34- 52/5
	Layout of ABS / ASC + T	34- 52/6
	Circuit diagram for ABS - ASC-DKZ system (from 9/88)	34- 52/7
	Circuit diagram for ASC + T	34- 52/8
	Display and switch mode for ASC + T	34- 52/9
	Operating circuit diagram / plunger hydraulics for ASC + T	34- 52/10

34-0/1
General information

The brake system is one of the most important safety systems on a motor vehicle.
For this reason, particular care must be taken with all work on the brake system and account should be taken of the following points:

- The brake fluid must be replaced at least every two years.
  Caution: never reuse drained brake fluid.
  Brake fluid must not be poured down drains, onto open ground or into systems not suited to this substance. There is an inherent risk of contaminating ground water because brake fluid is listed as a water source contaminant.

- Brake disks must not be scored or cracked and, in addition, minimum disk thickness, disk runout, parallelism and surface roughness of friction faces must not fall above or below specified values. Brake drums must not be out of roundness, scored or cracked. Brake lining thickness must not fall below the specified minimum level*. Always replace brake disks, brake drums and brake linings in pairs (i.e. either side of same axle).

- Only loosen or tighten screw connections on brake pipes with a special brake pipe wrench (this avoids damage to the pipes).

- When dismantling the brake system, seal all brake pipes and individual components to prevent particles of dirt from entering the brake system. Ensure unit is kept clean and always use non-fluffing cloths.

- All moving parts in the brake system must move easily (adjustment fixtures, brake caliper guides, handbrake cables and actuation).

- After every operation on the brake system, it must be bled. This should be followed by a low pressure and a high pressure test.
  On vehicles with ASC+T, also perform a "brake application" function test.
  Check all connecting parts for leakage.

- Oils or grease must not enter the brake system under any circumstances since these destroy all rubber components and can cause the brake system to fail.

- When cleaning brake components (with brake cleaning fluid)**, brake cleaning fluid must never be allowed to enter the brake system.
  The chlorinated hydrocarbons frequently contained in brake cleaning fluids lead to corrosion of brake components.

- When repairing brake calipers, only use approved, glycol-based assembly compounds.

- Brake pipes and hoses must be routed correctly and must not make contact with other parts or chafe at any point.

- If the system is bled using a bleeding device, always follow the manufacturer's operating instructions.

- Do not allow brake fluid to make contact with the paint on the vehicle. Brake fluid damages the paintwork.

- Wash off brake dust or remove with suction: do not blow away with compressed air.
  Brake linig dust is a health hazard!

- If brake fluid enters the eyes, flush immediately with large quantities of fresh water. If eyes are irritated, seek appropriate medical attention without delay.

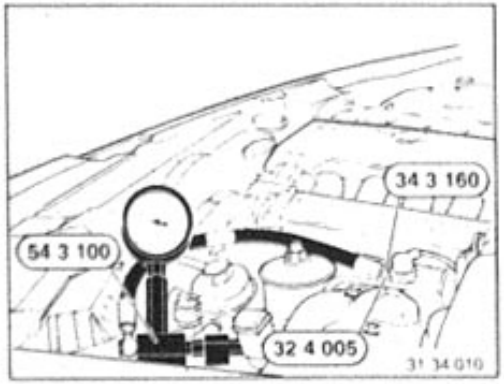
- To avoid damage to the skin, keep contact time of brake fluid on the skin as short as possible. Use soap and water to clean skin coated with brake fluid.

* Refer to Technical Data
** Source of supply: BMW Parts Service

General information on ABS

Basically, ABS does not require servicing but there must be conformance with the following points when working on cars equipped with ABS:

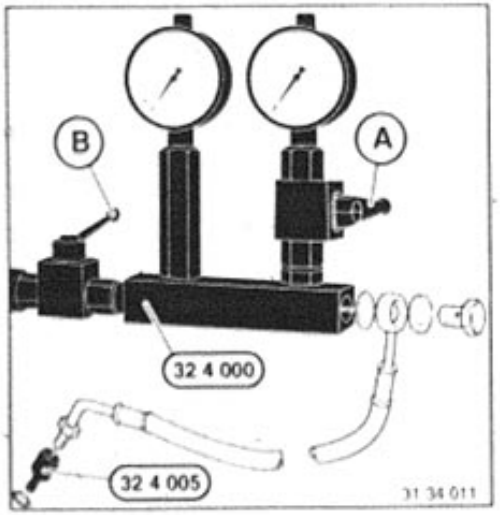
- Plug must be pulled off the electronic control unit (ignition switched off) when welding with an electric welder.
- Electronic control unit may be subjected to max. 95°C briefly or to max. 85°C for about 2 hours when painting car.
- If battery was removed, ensure that terminals are firmly seated after installation.
- The brake lines on the hydraulic unit must not be confused: to avoid this, mark them prior to disassembly.
- Entire ABS system must be checked in accordance with the "Electrical Troubleshooting Manual" if one of the following ABS components was removed or replaced:
  - Hydraulic unit
  - ABS control unit
  - Wheel speed sensor
  - ABS wiring harness
  - Valve control relay
  - Electric motor relay



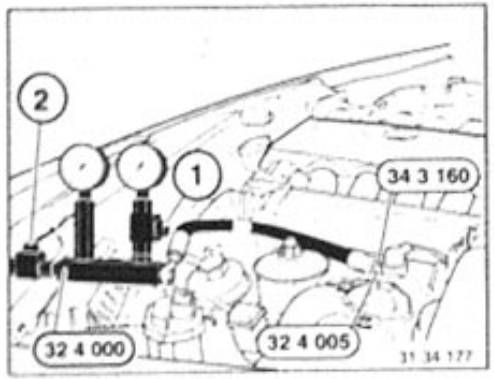
34 00 015 CHECKING BRAKE BOOSTING SYSTEM

Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the engine stopped and a force equal to full stop braking.
Pull off wires and unscrew hydraulic pressure switch.
Mount Special Tools 34 3 160 and 32 4 005.

Installation:
Tightening torque*.



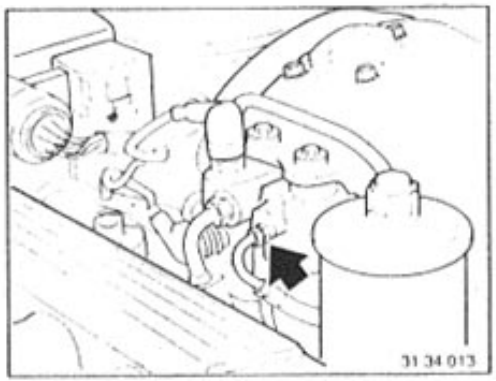
Connect pressure tester (Special Tool 32 4 000 or alternatively 54 3 100) to Special Tools 34 3 160 and 32 4 005.



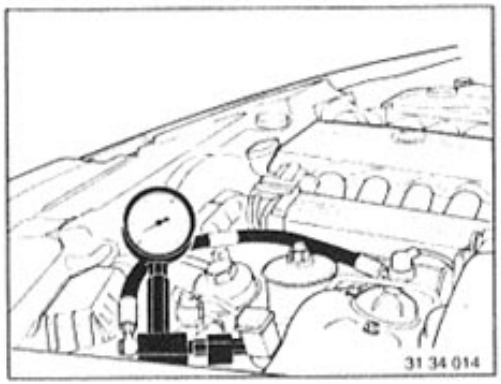
Close both valves (1 and 2).

Checking Power Flow Regulator and Brake Booster for Leaks:
Start engine and observe the pressure gage.
Stop engine after reaching the upper switching-off pressure*.

* Refer to Specifications

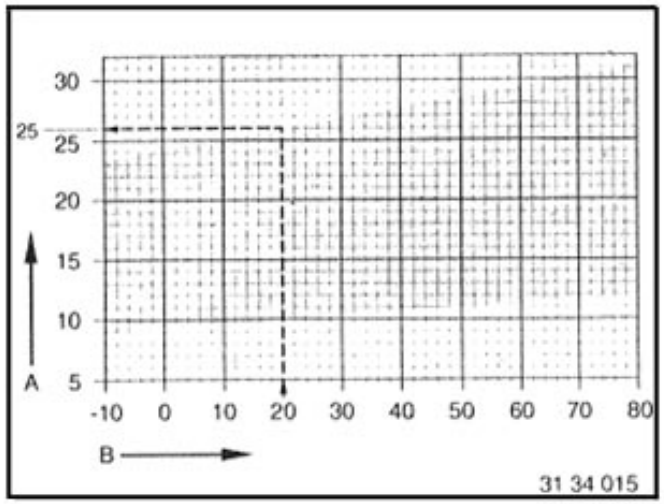


If the reservoir pressure (pressure gage) drops by more than 5 bar within 5 minutes, disconnect the return pipe at the power flow regulator.
If leak oil runs out of the return pipe bore in the power flow regulator, the power flow regulator leaks and must be replaced.
If no leak oil runs out and the reservoir pressure still drops, the brake booster has an internal leak and must be replaced.

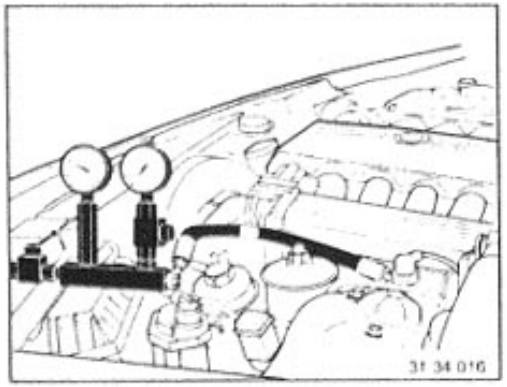


Hydraulic Reservoir Function Test:
Operate the brake pedal about 20 times to drop the reservoir pressure (pressure gage) to zero.
Start engine and observe the pressure gage.
Pressure gage should immediately display a value shown in the diagram.
If this value is not reached or exceeded, replace the hydraulic reservoir.

Gas Charging Pressure/Hydraulic Reservoir Temperature Diagram

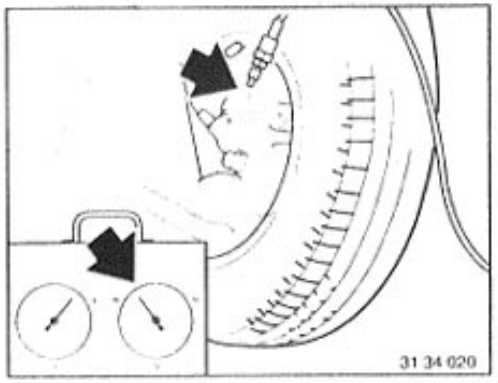


A Gas charging pressure in bar
B Hydraulic reservoir temperature in °C
Permissible gas charging pressure of hydraulic reservoir depending on pertinent temperature conditions.



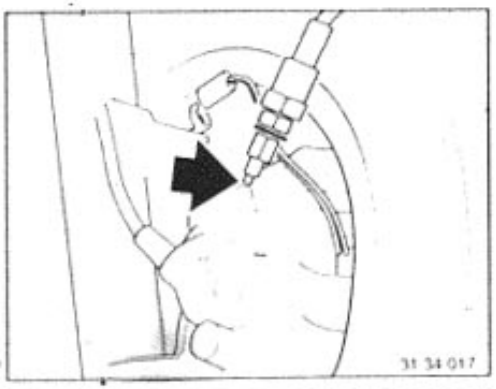
Checking Function of Power Flow Regulator:

Start engine. Pressure continues rising up to the upper switching-off pressure*. Drop the reservoir pressure (pressure gage) to switching-on pressure* by operating the brake pedal with the engine running. Afterwards the power flow regulator switches again to "charging reservoir" (pressure rises again). Replace the power flow regulator, if test values are not reached. Drop the reservoir pressure (pressure gage) to zero by operating the brake pedal about 20 times.
Remove pressure tester and check oil level in supply tank.



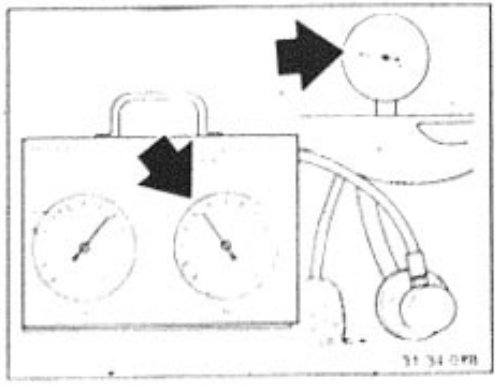
34 00 019 CHECKING SERVICE BRAKE (HIGH AND LOW PRESSURE TESTS)

High Pressure Leak Test:
Discharge the hydraulic reservoir by operating the brake pedal 20 times with the engine stopped and a force equal to full stop braking.
Test both brake circuits.
1st circuit = front right and rear left
2nd circuit= front left and rear right
Unscrew bleeder screw of the 2nd brake circuit. Connect and bleed a pressure tester.



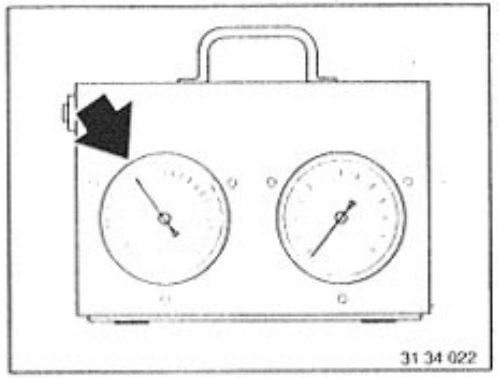
Checking Function of Brake Booster with Tandem Brake Master Cylinder:

Unscrew bleeder screw on caliper. Connect and bleed a pressure tester.



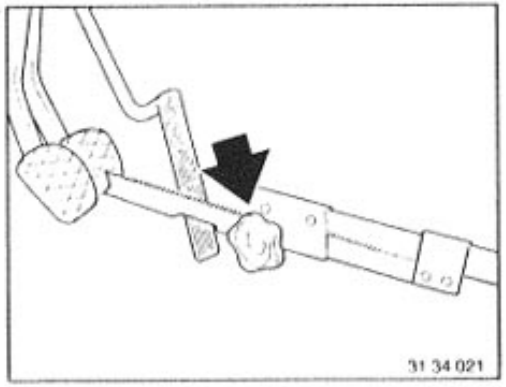
Mount a pedal force meter on brake pedal. Apply a force* on brake pedal with the engine running (full hydraulic reservoir). In so doing the hydraulic line pressure of the service brakes must reach the specified value*. The brake booster must be replaced, if thee values are not reached with the service brakes in perfect operating condition.
Note:
This test does not include the service brake leak test.

* See Specifications



Apply a force* on the brake pedal. In so doing the hydraulic line pressure of the service brakes must show specified pressure*. Pressure may drop by max. 8 % after 2 minutes. Perform same test on the 1st brake circuit.

Caution!
Engine must be stopped for the high pressure leak test.



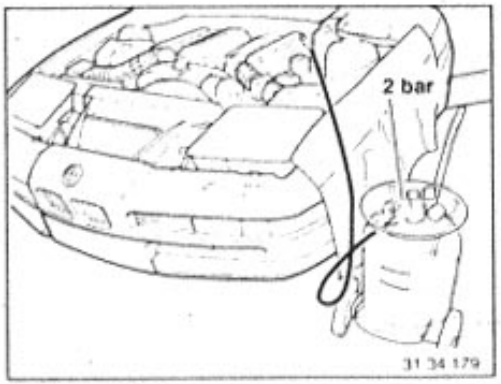
Low Pressure Test:
Test both brake circuits. Take back the pedal prop until testing pressure in the brake system is 2 to 5 bar (28 to 71 psi). Car and tester must remain still, since any motion would produce wrong readings. Pressure must remain constant during the 5 minute test. Check rubber parts, if the pressure drop is considerable. Bleed calipers after finishing the test.

* See Specifications

34 00 047 Bleeding ABS brake system

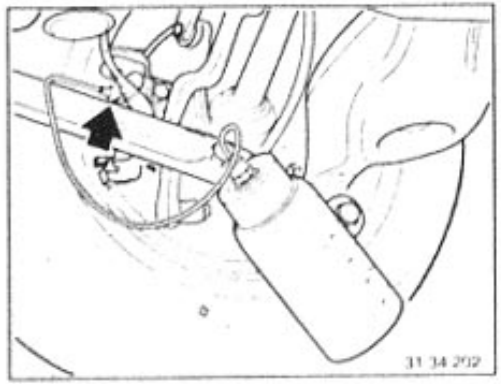
Note:
Only use approved brake fluid*.
Observe correct brake fluid change intervals *

Caution!
Note general instructions

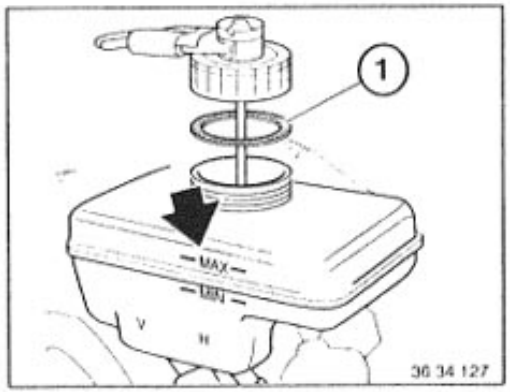


Connect bleeder unit ** to expansion tank.

Note:
Follow relevant manufacturer's operating instructions.
Fill pressure must not exceed 2 bar.



Connect bleeder hose and receptacle to rear right brake caliper.
Open bleed valve and fully depress brake pedal at least 12 times (brake fluid must emerge without bubbles).
Hold brake pedal down (fully depressed).
Close bleeder valve.
Release brake pedal.
Follow same procedure on rear left, front right and front left wheel brakes.



Switch off bleeder unit and remove from expansion tank.
Check brake fluid level.
Close expansion tank (note rubber seal (1) in cover).

* Refer to BMW Operating Fluids
** Refer to BMW Workshop Equipment Planning documentation

AUTOMATIC STABILITY CONTROL AND TRACTION (ASC + T)

Purpose of ASC + T:
- Easier moving off for driver
- Guarantee of directional stability and steerability
- Improvement of traction (+ T)
- Information for driver

Description of Operation:
The system has the task of regulating the slip of driven wheels to the lowest possible value regardless of the road surface condition.

Engine torque is reduced via DME (ignition timing correction) and EML (throttle valve correction) during regulation. If this is not sufficient, the drive wheel rotating too fast will be slowed down by the wheel brake via a hydraulic element of the plunger hydraulic unit.

The system is switched on automatically after starting the engine and can be switched off manually. The ASC lamp is off with the system switched on.

The ASC lamp in the instrument cluster flashes to inform the driver when regulation has been activated.
If the ASC lamp is on continuously, the system was switched off automatically because of a fault or was switched off manually.

Note:
Troubleshooting – see Car Electric/Electronic Test Plan.

Important!
Pull off the ASC + T control unit plug before starting the engine for the first time after working on the oil supply tank, tandem pump, high pressure filter, ASC + T hydraulic control unit and corresponding connection lines.
Reconnect control unit plug with the ignition turned off after the engine has run 1 minute.

Switch off ASC+T when testing on a brake roller test stand pr dynamometer test stand!

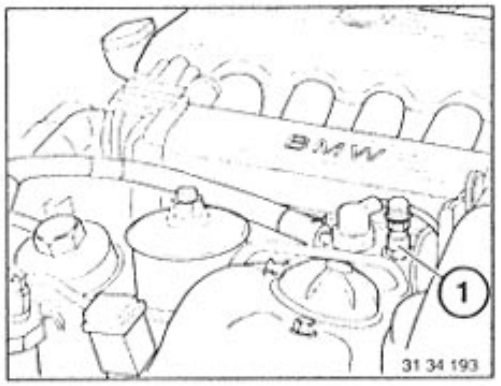
34 00 040 Bleeding ASC + T mineral oil circuit

1. Fill mineral oil circuit

Caution!
Before the mineral oil circuit is filled with hydraulic oil*, ensure that the brake system is filled with brake fluid.
Filling brake system, refer to 34 00 048, section 1.

Disconnecting control unit ABS/ASC+T, refer to 34 52 510.

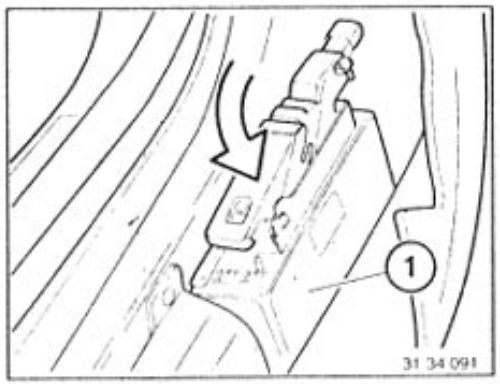
Topping up with hydraulic fluid*, refer to 32 13 006.



Fit special tool 34 3 110 to the bleeder screw on the hydraulic plunger unit and insert end of hose in hydraulic oil tank.
Open bleeder screw and flush plunger hydraulic unit until hydraulic oil emerges without bubbles (at least 15 seconds).
Close bleeder screw.

Note:
Tightening torque 34 32 1AZ*

Check hydraulic fluid level and top up if necessary, refer to 32 13 006.



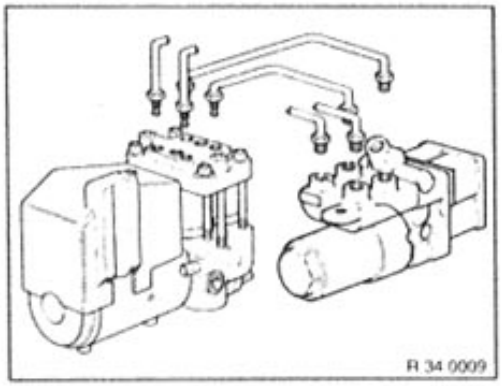
Bleed 2nd mineral oil circuit

Switch off ignition.
Attach control unit connector to (1) ABS/ASC+T control unit.

Switch on engine and run at idle speed for at least 60 seconds (automatic charging of the ASC +T plunger accumulator).

* Refer to BMW Service Operating Fluids

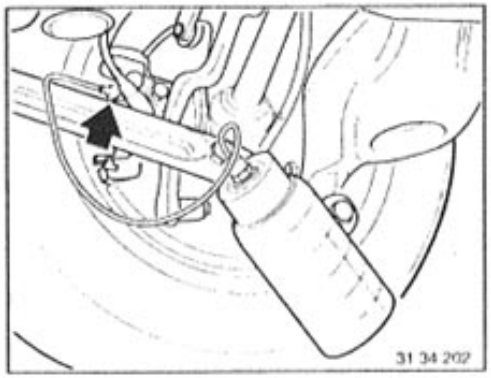
* Refer to Technical Data



34 00 048 Bleeding brake system with ABS/ASC+T

ABS/ASC+T with plunger hydraulic unit

Note:
Apply the relevant filling and bleeding specification when exchanging or repairing parts in the tandem master brake cylinder and ASC+T plunger hydraulic unit (both included in each case).
For other operations on the brake system (e.g. exchange of brake calipers), the specification used until now - "Bleeding ABS brake system" (see 34 00 047) should also be applied to ASC+T vehicles.



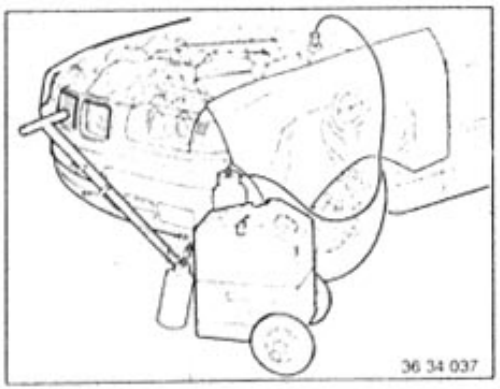
1. Fill brake system with brake fluid *

Connect bleeder hose and receptacle to rear right brake caliper.
Open bleeder valve and flush until brake fluid emerges without bubbles, for at least 4 minutes, then close the vent screw.
Follow same procedure on rear left, front right and front left wheel brakes (minimum flush time per front wheel brake: 1 minute)

2. Bleed brake system

Caution!
Before bleeding the system, ensure that the mineral oil side of the ASC+T plunger hydraulic unit was bled. This applies especially after exchange or repair work on mineral oil assemblies and lines from the expansion tank and up to and including the plunger hydraulic unit.
If necessary, bleed the ASC+T mineral oil circuit before bleeding the brake system, see 34 00 040.

Correct bleeding of the ASC+T hydraulic unit is only possible using the ABS/ASC tester 34 5 110.



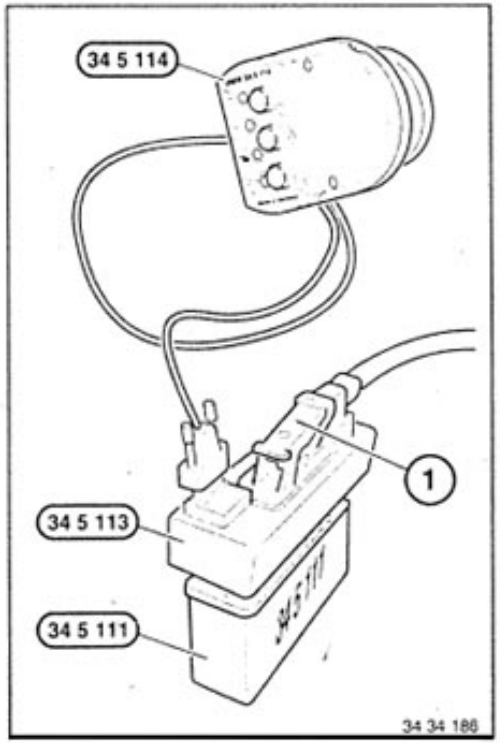
Connect bleeder unit to expansion tank.

Note:
Follow relevant manufacturer's operating instructions.
Set charge pressure to 2.5 - 3 bar.

* Refer to BMW Operating Fluids

2.1 Bleed rear axle brake circuit:

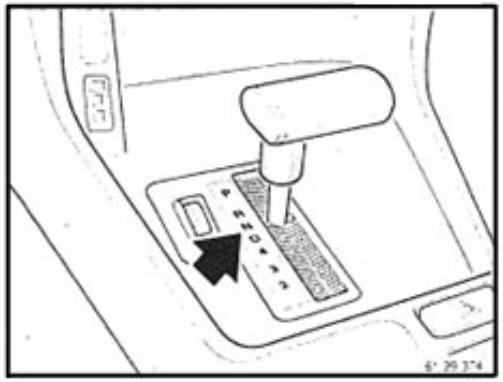
Disconnect ABS/ASC+T control unit, see 34 52 510.



Connect test adapter 34 5 113 to tester 34 5 111.

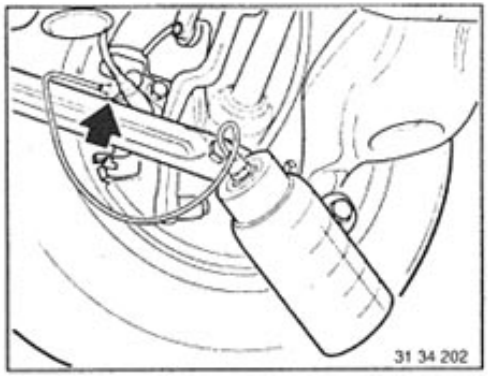
Connect diagnosis connection cable 34 5 114 to test adapter 34 5 113.

Connect control unit connector (1) to test adapter 34 5 113.



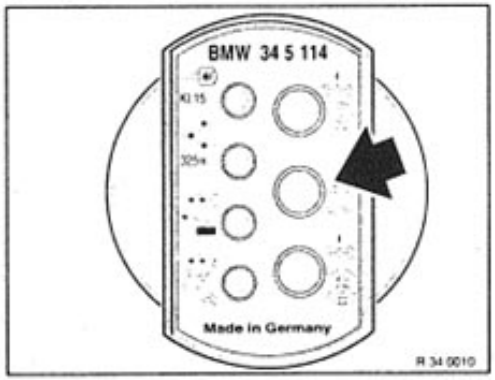
Move shift lever into neutral or selector lever into setting "P" or "N".

Switch on engine.



Connect bleeder hose and receptacle to rear right brake caliper.
Open bleeder valve and fully depress brake pedal at least 20 times (brake fluid must emerge without bubbles).

Release brake pedal



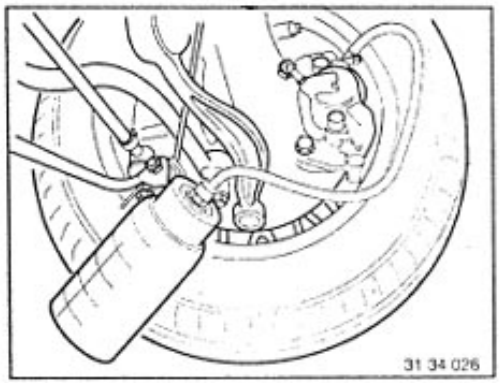
Press red button to start bleeding operation (duration approx. 60 seconds).

Caution!
Brake fluid must emerge without bubbles: if necessary, repeat bleeding operation.

Close bleeder valve.

Follow same procedure on rear left wheel brake.

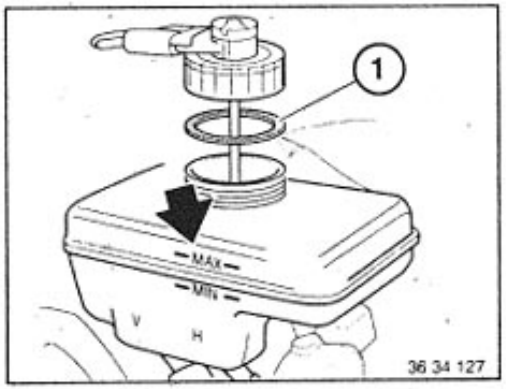
Switch off engine.



2.2 Bleed front axle brake circuit:

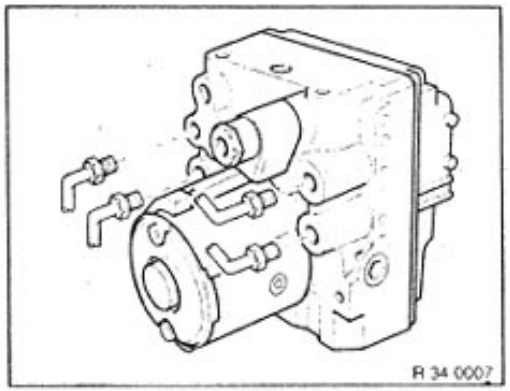
Connect bleeder hose and receptacle to front right brake caliper.
Open bleeder valve and fully depress brake pedal at least 12 times (brake fluid must emerge without bubbles).
Hold down brake pedal (fully depressed), close bleeder valve and release brake.

Bleed front left wheel brake using same procedure.



Remove bleeder unit.
Check brake fluid level and correct if necessary.
Close expansion tank (note rubber seal (1) in cover).

Switch off ignition.
Remove control unit connector from test adapter and attach to ABS/ASC+T control unit, see 34 52 5100.



34 00 048 Bleeding brake system with ABS/ASC+T

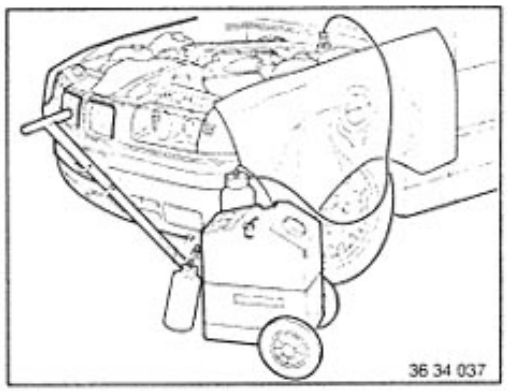
ABS/ASC+T from model year '94

Note:
Follow the filling and bleeding specification when exchanging or repairing:
- tandem master brake cylinder
- ABS/ASC+T hydraulic unit
- and components installed between these assemblies.

For other operations on brake system (e.g. exchange of brake calipers), follow specification "Bleeding ABS brake system", see 34 00 047.

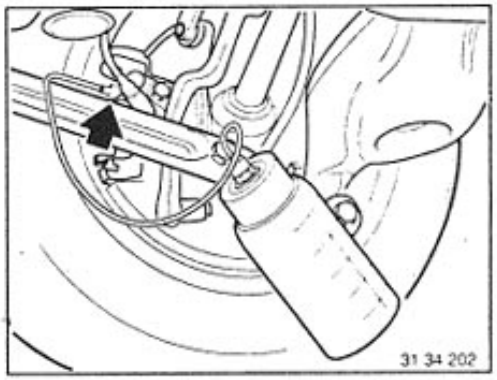
Caution!
Follow general instructions.

Attach BMW Service Test/MoDIC to diagnosis connector.
Call up diagnosis program (ABS/ASC/ABD).

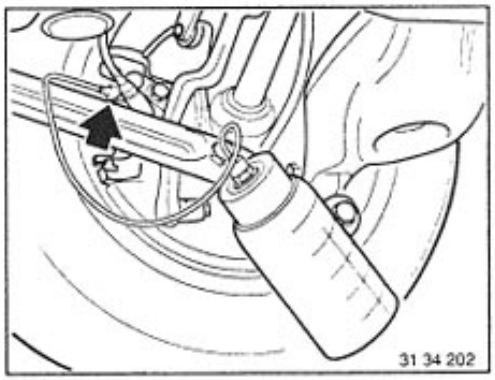


Connect bleeder unit to expansion tank and switch on.

Note:
Follow relevant manufacturer's operating instructions.
The charge pressure must not exceed 2 bar.

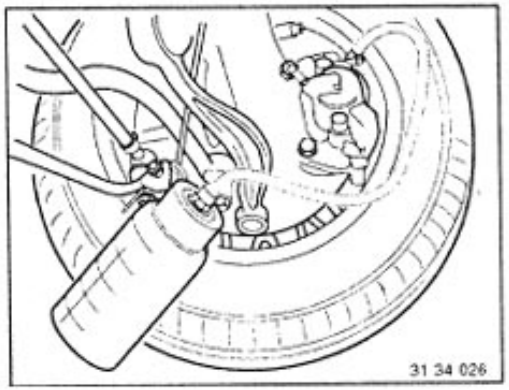


Connect bleeder hose and receptacle to bleeder valve on the rear right brake caliper.
Open bleeder valve and flush until clear brake fluid emerges without any air bubbles.
Close bleeder valve.
Repeat same procedure on rear left, front right and front left wheel brakes.



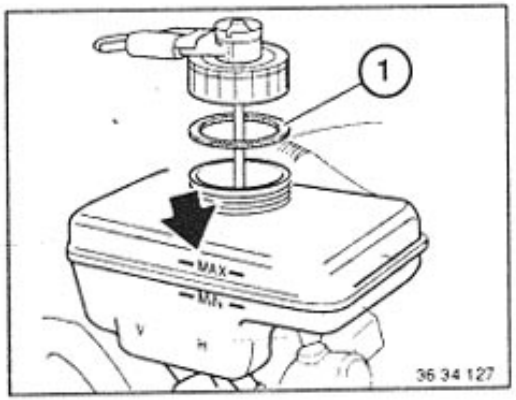
Bleed rear axle brake circuit:

Attach bleeder hose and receptacle to the bleeder valve on the rear right brake caliper.
Open bleeder valve.
Perform bleeding routine on BMW diagnosis system.
Close bleeder valve.
Follow same procedure on rear left wheel brake.



Bleed front axle brake circuit:

Attach bleeder hose and receptacle to the bleeder valve on the front right brake caliper.
Open bleeder valve.
Fully depress brake pedal at least 12 times.
Brake fluid must emerge clear and without air bubbles.
Hold down brake pedal (fully depressed).
Close bleeder valve.
Release brake pedal.
Follow same procedure on front left wheel brake.



Switch off bleeder unit and disconnect from expansion tank.
Check brake fluid level.
Close expansion tank (note rubber seal (1) in cover).

Remove BMW Service Test/MoDIC and replace cover on diagnosis connector.

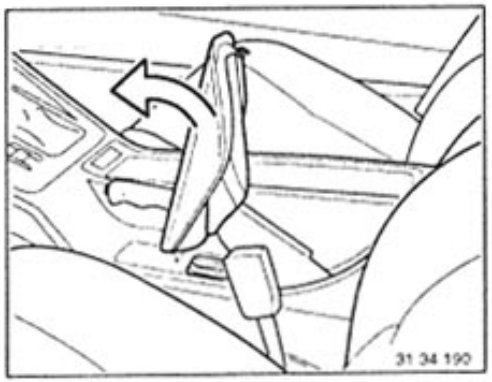
34 10 014 ADJUSTING PARKING BRAKE

Test Specifications

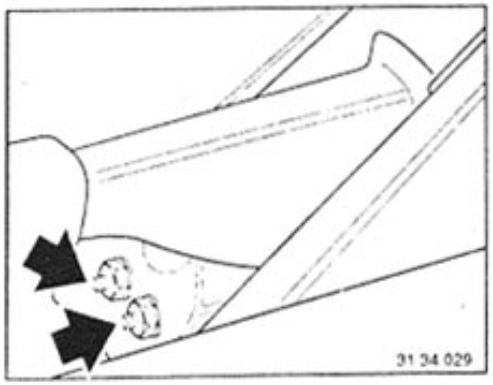
- There should not be braking effect when parking brake lever is pulled up one tooth.
- The wheel peripheral force may deviate from the larger value by max. 30 % in comparison with the opposite wheel (measured on dynamometer).
  Adjustment is necessary in case of greater brake force difference.
- It should be possible to hold the car with the parking brake.
- The parking brake must be adjusted if the parking brake lever travel is greater than ten teeth.

Note:
The parking brake can only be adjusted correctly if the parking brake cables and all moving parts of the parking brake move easily and function correctly.

Basic parking brake adjustment is necessary:
- After replacing brake shoes
- After replacing brake drums
- After resetting slack control device
- In case of excessive parking brake lever travel (ten teeth).



Lift dust cover off.

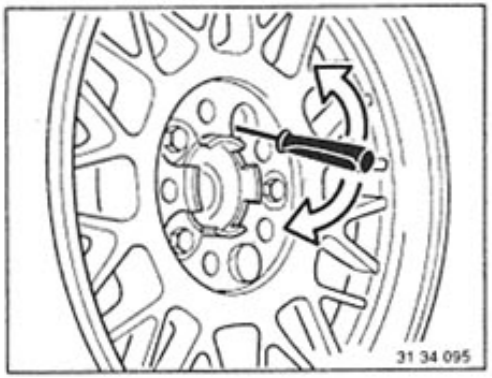


Unscrew the adjusting nuts and loosen the cable completely.



Unscrew and remove one wheel bolt from each rear wheel.
Turn wheel until the tapped bore is positioned at top.

Installation:
Install and tighten wheel bolt.
Tightening torque*.



Turn adjusting screw using a screwdriver until the wheel or brake disc can no longer be turned.

Loosen the adjusting screw 8 catches afterwards.

* Refer to Specifications

2. Adjusting Cables

2.1 By Hand

Pull parking brake lever up four teeth and turn the adjusting nuts until it is just possible to still turn the rear wheels.

Release the parking brake lever; it must be possible to turn the wheels easily.

Switch ignition on; the control lamp must not be on with a released parking brake lever.

1 tooth: No braking effect.
Control lamp could be on.

2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever – refer to Group 61.

2.2 On Dynamometer

0 teeth: (parking brake lever released) wheel peripheral force at idling speed in cars
a) without limited slip differential < 150 N
b) with limited slip differential < 200 N

1 tooth: No braking effect.
Control lamp could be on.

2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever – refer to Group 61.

Checking of braking force difference with
duo-servo parking brake in 3rd tooth

The left/right brake force display must be 600 + 50 N.

3. Breaking In Specifications for Duo-Servo Parking Brake

The following breaking in procedures are applicable in case of insufficient braking effect or after replacing brake discs and/or brake shoes.

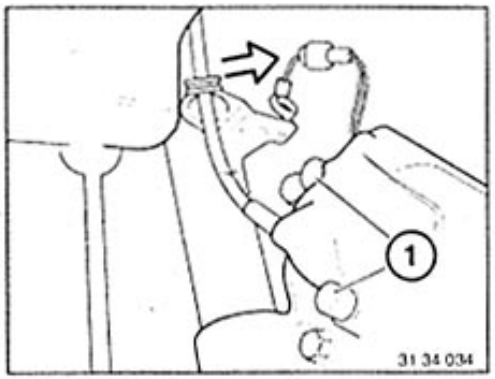
With car moving approx. 40 km/h pull up the parking brake lever until braking of the car is noticed.
Then pull up the parking brake lever into the next catch and drive approx. 400 meters in this position.
(A basic requirement is that the parking brake is adjusted uniformly.)

Note:
The parking brake is completely independent of the service brake and consequently is only subjected to limited wear.
Quite often dirt and corrosion will cause the braking effect of the parking brake to give in the course of time.

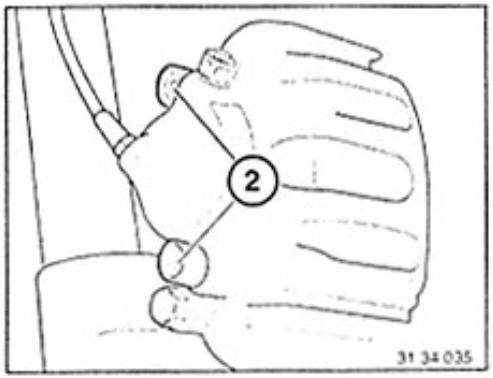
34 11 000 Removing and installing or replacing brake blocks on both front disc brakes

Note:
When operation is complete, actuate brake pedal several times until brake linings locate against brake disc.

Remove wheels, see 36 10 300.

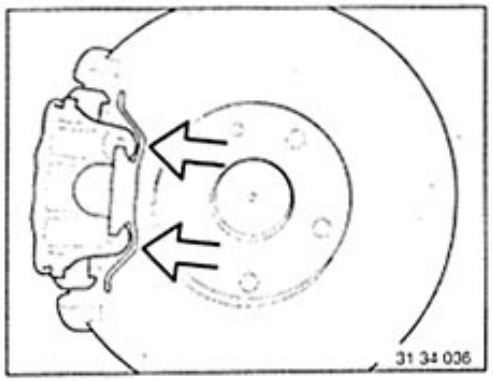


Press off plastic caps (1).
Left:
remove connector for wear indicator display.



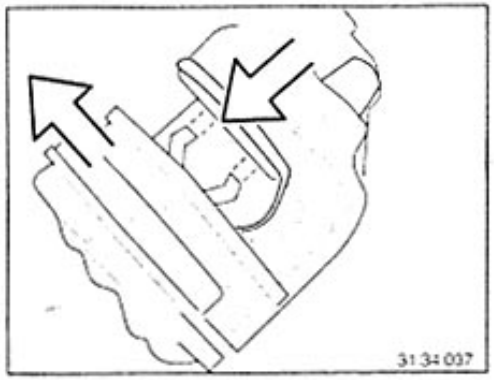
Unfasten guide bolts (2).

Installation:
Only clean guide bolts, do not grease.
Check thread.
Replace guide bolts that are not in perfect condition.
Tightening torque 34 11 3AZ*

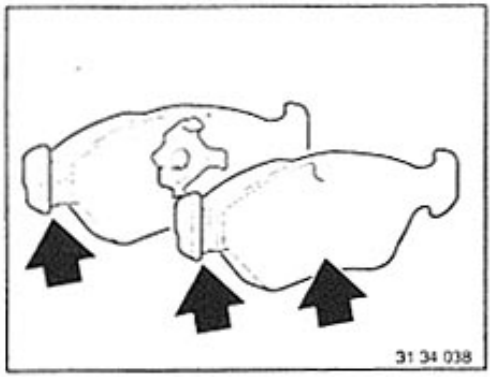


Lift out retaining spring.
Pull out brake caliper forwards.

* Refer to Technical Data

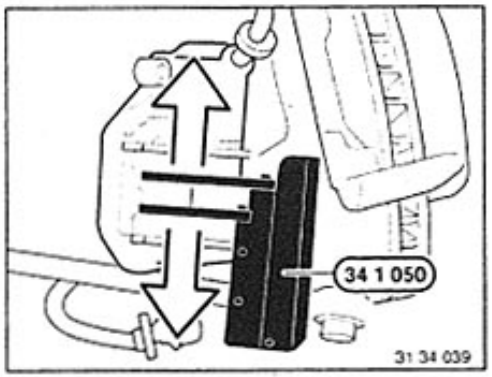


Remove outer brake lining.
The inside brake lining is seated in the piston with the spring.



Caution!
Only install new brake linings * if brake disc thickness is greater than or equal to minimum thickness (MIN TH)*.

Apply light coat of Plastilube** to brake piston contact points on baseplate of brake lining.



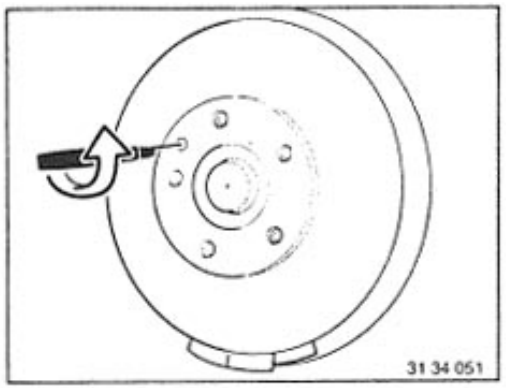
Installation:
Press in piston firmly with tool 34 1 050.
Clean brake lining guides on brake caliper and brake carrier with a brush**.
Check dust cover for signs of damage.
Apply light coat of Plastilube** to guides.

* Refer to Technical Data
** Refer to BMW Parts Service

34 11 220 Removing and installing or replacing both front brake discs

Remove wheels, see 36 10 300.

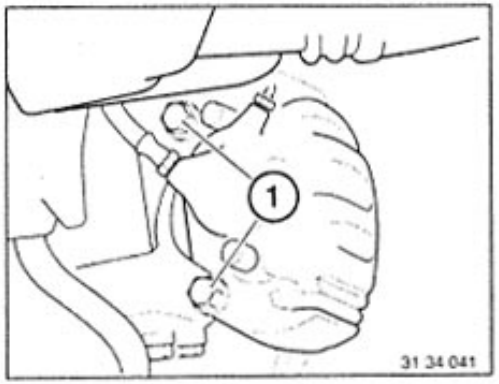
Caution!
If brake disc thickness (MIN TH)* falls below minimum, the old brake lining kit can still be used up.
New brake linings* must only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.
Always replace both brake discs on an axle at the same time.



Unfasten screw and remove brake disc.

Note:
The brake discs on the 850 CSi are directional. If the last digit in the parts number is an odd number, this denotes the left brake disc: an even number denotes the right brake disc.

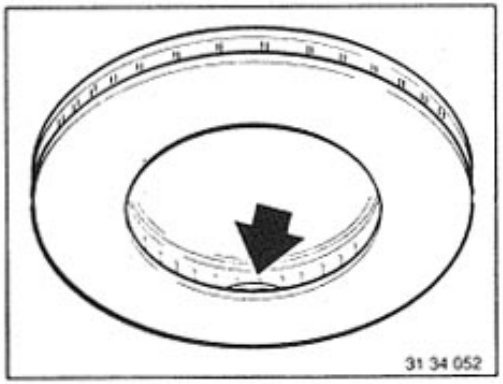
Installation:
Tightening torque 34 11 1AZ*.



Unfasten screws (1), remove brake caliper and tie up with wire.

Note:
Brake line remains connected.

Installation:
Tightening torque 34 11 2AZ*.



Caution!
Internally-vented brake discs are balanced. Under no circumstances remove or relocate the balancing clips.

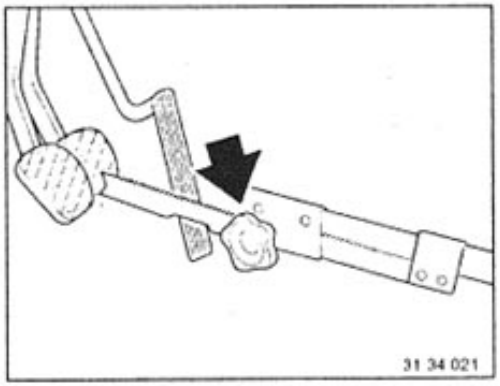
* Refer to Technical Data

* Refer to Technical Data

34 11 519 Removing and installing or replacing front left or right brake caliper
(without bleeding brakes)

When operation is complete, bleed the brake system, see 34 00 047 for ABS, or 34 00 048 for ABS/ASC+T.

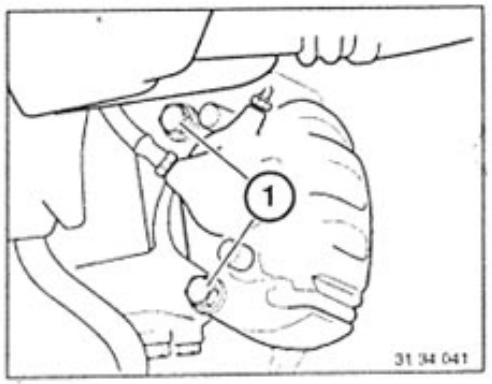
Remove wheels, see 36 10 300.



Install pedal support and gently depress brake pedal. This prevents brake fluid from escaping out of the expansion tank when the brake lines are disconnected, something which would enable air to enter the brake system.

Separate brake line at connection with brake hose.

Installation:
Tighten brake hose on brake caliper.
Move wheels into straight-ahead position.
Screw brake hose onto brake line, taking care not to twist brake hose.
Tightening torque 34 32 1AZ*



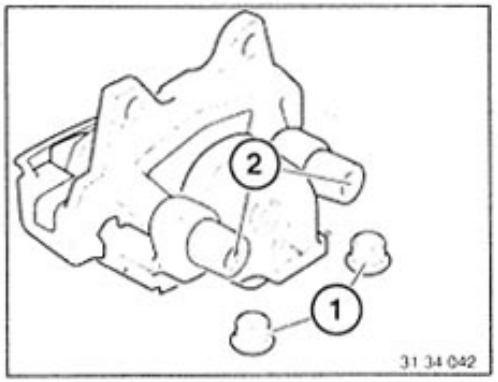
Unfasten screws (1).
Left: disconnect wear indicator display.
Pull out brake caliper forwards.

Installation:
Tightening torque 34 11 2AZ*

* Refer to Technical Data

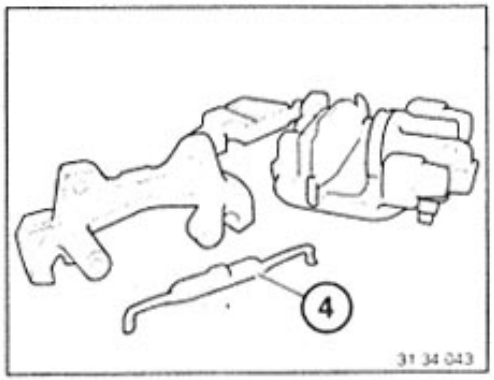
34 11 552 Overhauling front left or right brake caliper
(brake caliper removed)

Use repair kit



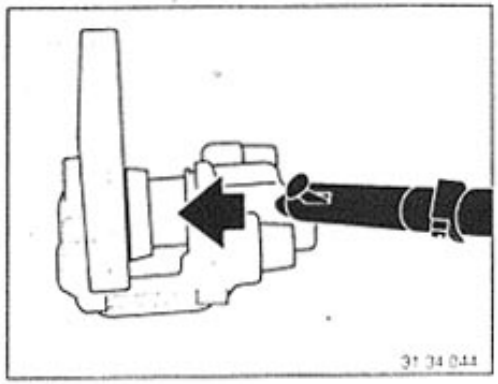
Press off plastic caps (1).
Unfasten guide screws (2).

Installation:
Only clean guide screws - do not grease.
Check guide screws and replace if necessary.
Tightening torque 34 11 3AZ*



Dismantle brake caliper and remove brake linings.

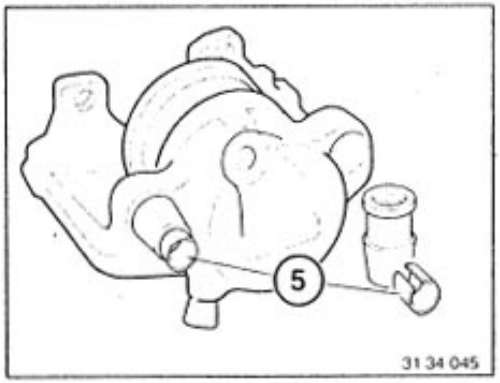
Installation:
Before installing retaining springs (4), completely press out brake linings.



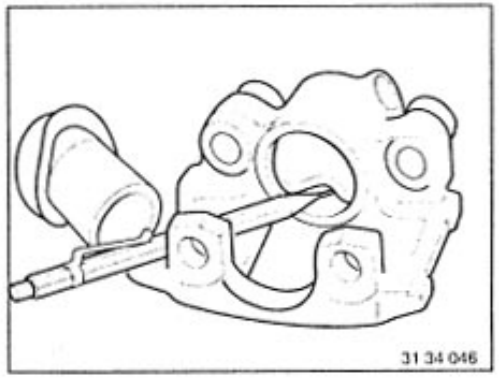
To protect the piston, install a protective plate (hardwood, hard felt or similar) in the caliper duct.
Press piston out through connecting bore using compressed air.

Caution!
Compressed air at 10 bar (atmospheres) produces a force of approx. 1250 N.

* Refer to Technical Data

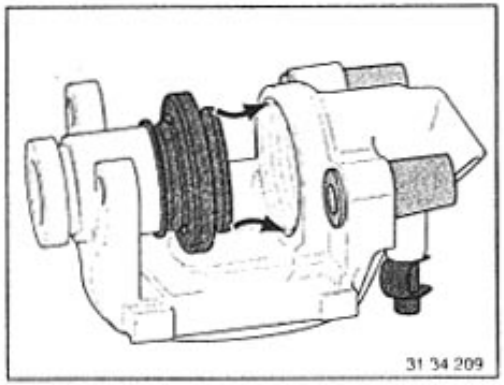


Check guide sleeves (5) and, if necessary, fit repair kit guide sleeve.



Carefully remove sealing ring with a plastic needle.
Clean cylinder bores and components with spirits and dry with compressed air.
Carefully check cylinder bore, piston and flange faces for signs of damage. Metal-cutting machining of cylinder and piston is not permitted.

Installation:
Apply light coat of Ate brake cylinder compound to all parts and install.



First fit protective rubber cap to the piston.
Insert sealing bulge of protective cap in the groove of the cylinder bore and press in piston with a hardwood plate.

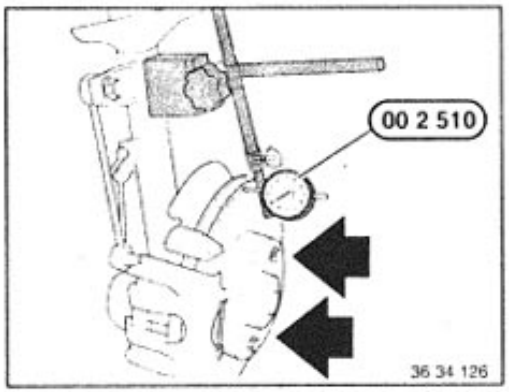
Caution!
Do not tilt piston.

Assemble brake caliper.

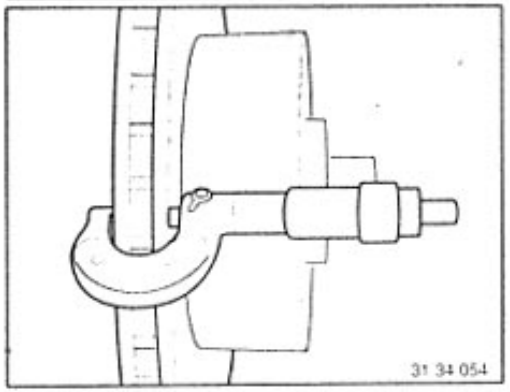
34 11 599 Checking both front brake discs for runout and thickness deviation
(front wheels removed)

Wheel bearing clearance must conform to specification*.

Secure brake disc with 2 M 12 x 1.5 screws.
Press back brake linings (brake disc must not make contact).



Secure dial gage 00 2 510 with magnetic stand to spring strut shock absorber.
With slight preload, apply measuring tip to outer edge of brake disc.
Rotate brake disc slowly and read off end float*.



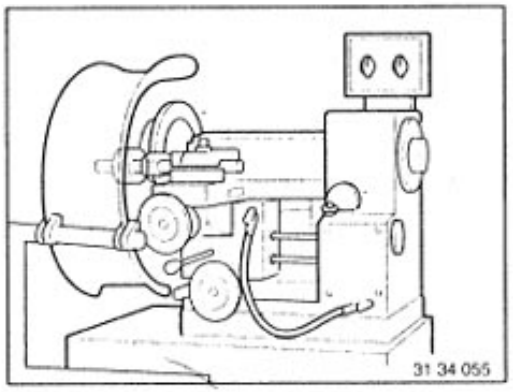
Read off thickness deviation * on braking surface at approx. 8 points using the micrometer.

* Refer to Technical Data

34 11 667 Fine grinding both sides of both front brake discs
(brake discs removed)

Caution!
Note MAX. machining size* per friction ring side and minimum thickness of brake discs (MIN TH)*.
Always fine-grind both sides of both brake discs on one axle.

Note:
Only fit one more set of brake linings to brake discs which have been machined to minimum thickness (MIN TH)*.



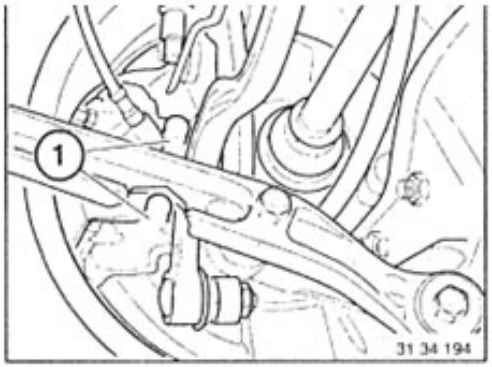
Machining equipment**
Follow instructions in equipment manufacturer's operating manual**.

* Refer to Technical Data
** Refer to BMW Workshop Equipment Planning documentation

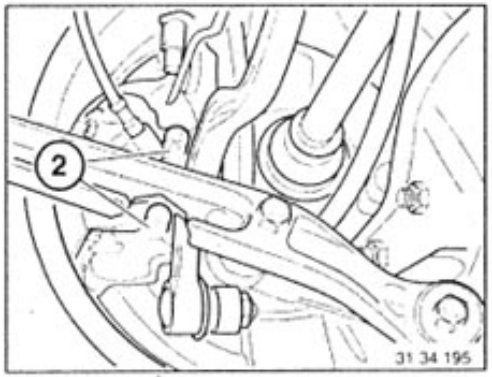
34 21 200 Removing and installing or replacing brake pads on both rear disc brakes

Note:
When operation is complete, actuate brake pedal several times to enable the brake linings to bed down on the brake disc.

Remove wheels, see 36 10 300.

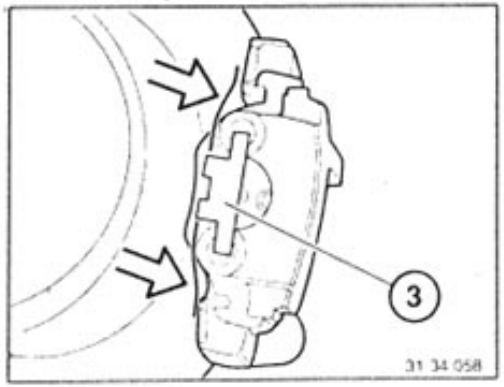


Press off plastic caps (1).
Right:
Remove connector for wear indicator



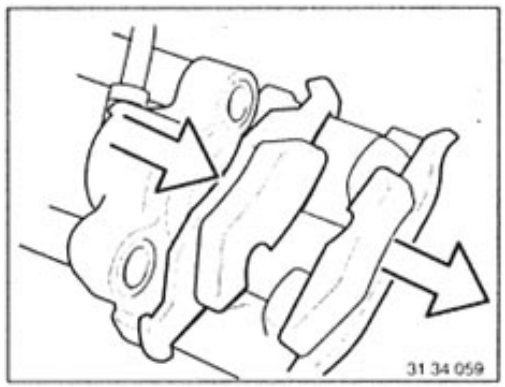
Unfasten guide screws (2).

Installation:
Only clean guide screws, do not coat with grease.
Check thread.
Replace guide screws which are not in perfect condition.
Tightening torque 34 21 5AZ*

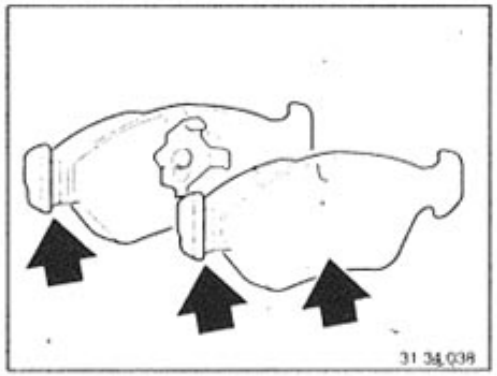


Lift out retaining spring (3).
Pull brake caliper out forwards.

* Refer to Technical Data

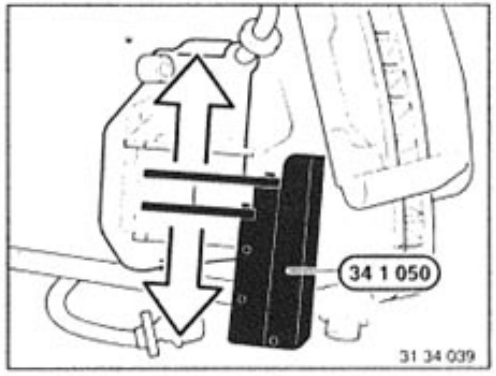


Remove outer brake lining.
The inner brake lining locates against the spring in the piston.



Caution!
New brake linings* can only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.

Apply light coat of Plastilube** to brake piston contact points on brake lining baseplate.



Installation:
Press piston fully back using special tool 34 1 050.
Clean brake lining guides on brake caliper and brake carrier with a brush**.
Check dust cover for signs of damage.
Apply light coat of Plastilube** to guides.

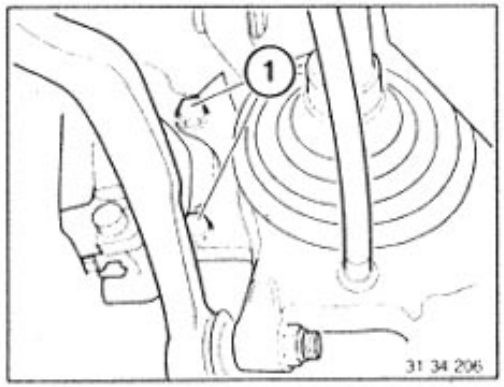
* Refer to Technical Data
** Refer to BMW Parts Service

34 21 320 Removing and installing or replacing both rear brake discs

Remove wheels, see 36 10 300.

Caution!
If the brake disc thickness falls below the minimum level (MIN TH)*, the old brake lining kit can be used up.
New brake linings* may only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.
When replacing, always replace both brake discs on one axle.

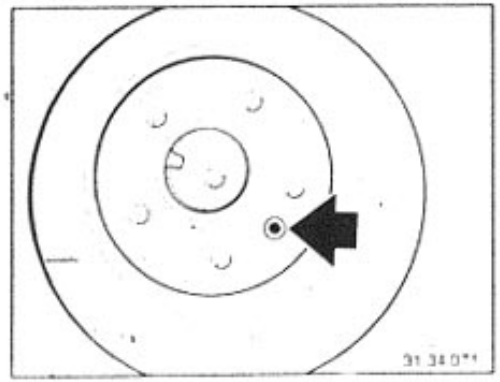
After completion of operation, adjust handbrake, see 34 10 014.



Unfasten screws (1), remove brake caliper and tie up with wire.

Note:
Brake line remains connected.

Installation:
Tightening torque 34 21 4AZ*



Unfasten screw and remove brake disc.

Note:
If necessary, release handbrake cables, see 34 41 100.

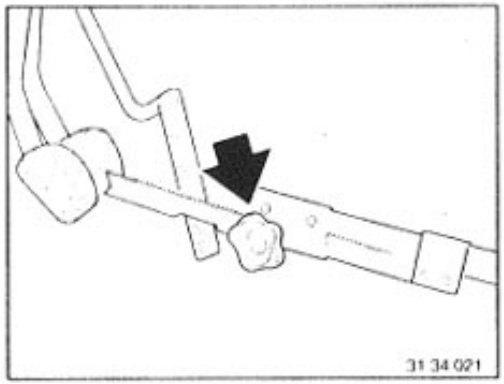
Installation:
Tightening torque 34 21 1AZ*

* Refer to Technical Data

34 21 745 Removing and installing or replacing left or right brake caliper
(without bleeding the brakes)

When operation is completed, bleed the brake system, see 34 00 047 for ABS or 34 00 048 for ABS/ASC+T.

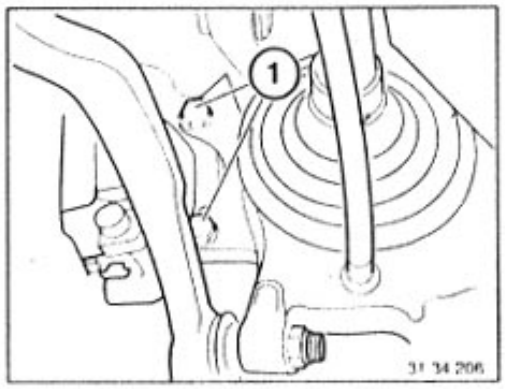
Remove wheel, see 36 10 300.



Install pedal support and press brake pedal down gently.This prevents brake fluid from escaping out of the expansion tank when the brake lines are disconnected, something which would enable air to enter the brake system.

Disconnect brake line at its connection with the brake hose.

Installation:
Tighten brake hose to the brake caliper.
Screw brake hose to the brake line, taking care to avoid twisting the brake hose.
Tightening torque 34 32 1AZ*



Unfasten screws (1).
Disconnect wear indicator.
Remove brake caliper by pulling forwards.

Installation:
Tightening torque 34 21 4AZ*

* Refer to Technical Data

34 21 812 Overhauling left or right brake caliper
(brake caliper removed)

Operation is identical to 34 11 552.

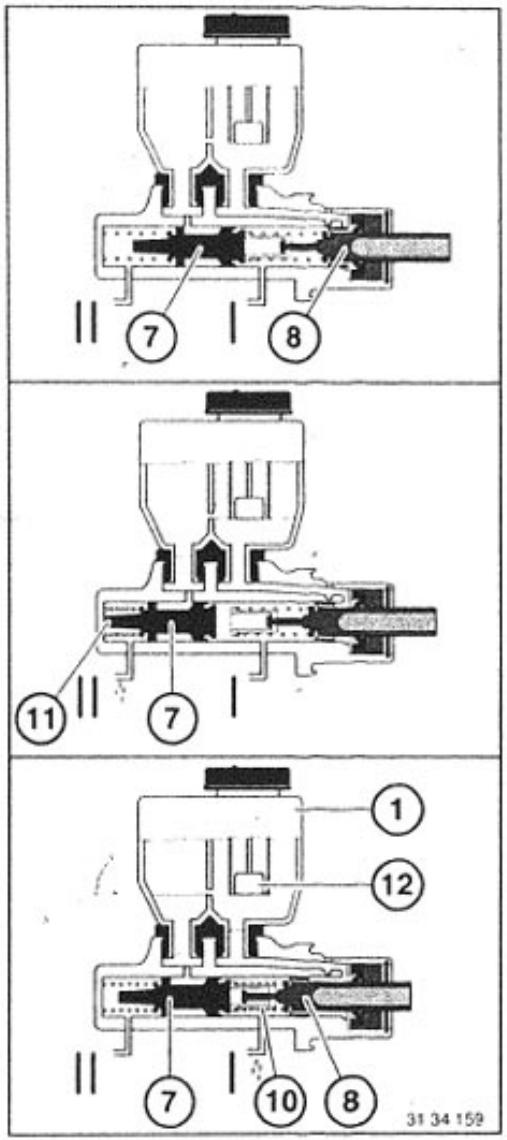
34 21 879 Checking both rear brake discs for runout and thickness deviation
(rear wheels removed)

Operation is identical to 34 11 599.

Note:
Secure magnetic stand to upper control arm.

34 21 947 Fine grinding both sides of both rear brake discs
(brake discs removed)

Operation is identical to 34 11 667.

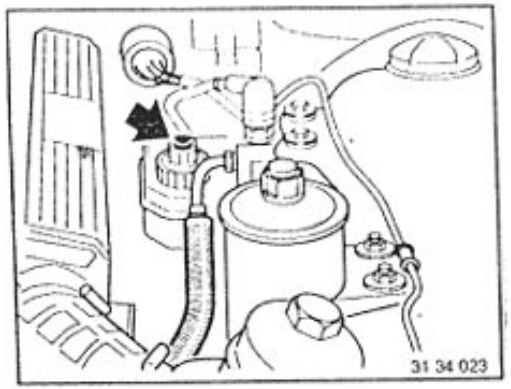


DESCRIPTION OF BRAKE MASTER CYLINDER OPERATION

The operating force applied on push rod piston (8) produces hydraulic braking pressure in the first pressure chamber of the tandem master cylinder and the connected brake circuit I. This pressure also acts on the second, intermediate piston and moves it in the tandem master cylinder. In this manner (almost) equal hydraulic braking pressure is also produced in the second pressure chamber and connected brake circuit II.

If braking pressure cannot be built up due to an assumed leak in brake circuit II, intermediate piston (7) is pushed out of the first pressure chamber without mentionable resistance (only low spring force has to be overcome) by an initially low hydraulic pressure far enough that pin (11) of the intermediate piston bears on the bottom of the cylinder. Stroke of the first pressure chamber is held in this position and normal braking pressure can be built up in this brake circuit. Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.
If brake circuit I (push rod piston brake circuit) leaks due to an assumed damage, so that braking pressure can no longer be built up, push rod piston (8) is pushed so far without mentionable resistance (only low spring force has to be overcome) until it bears on stop sleeve (10). In this manner there is mechanical connection with intermediate piston (7), so that normal braking pressure can be built up in brake circuit II (intermediate piston brake circuit). Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.

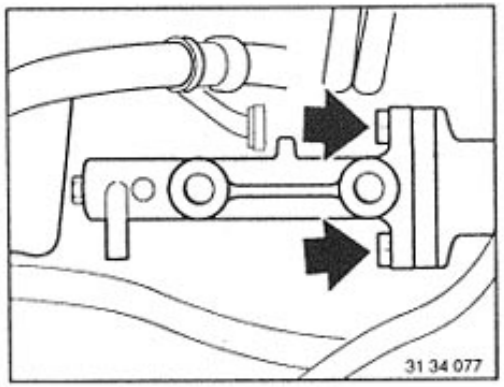
A tandem master cylinder can be operated direct via the brake pedal or via a brake booster (hydraulically, with vacuum or pneumatically).
Connection of brake circuits on a tandem master cylinder depends on the brake circuit division of a pertinent car.
Brake fluid tanks (1) on the tandem master cylinder contains the brake fluid reservoir and corrects the hydraulic fluid level in the brake system.
They are normally divided into two supply chambers (one for each brake circuit) and can be equipped with an electric float warning device (12) for indication of brake fluid loss.



34 31 000 REMOVING AND INSTALLING BRAKE MASTER CYLINDER

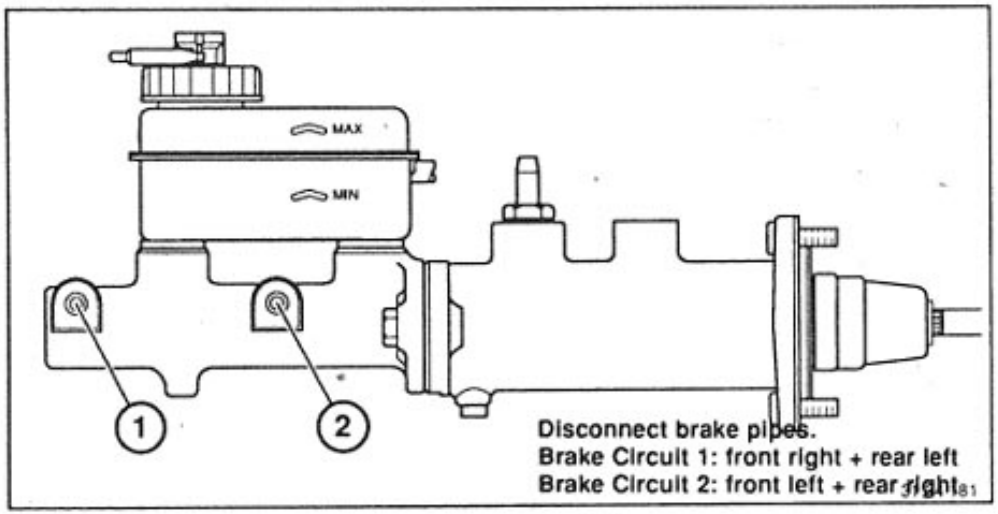
Draw brake fluid take out of tank with a standard syringe.
Pull off brake fluid tank.

Installation:
Bleed brakes – see 34 00 047.



Unscrew tandem brake master cylinder on the brake booster.

Installation:
Tightening torque*.
Only install a brake master cylinder with the same diameter – identification is located raised on the body.



Disconnect brake pipes.
Brake Circuit 1: front right + rear left
Brake Circuit 2: front left + rear right

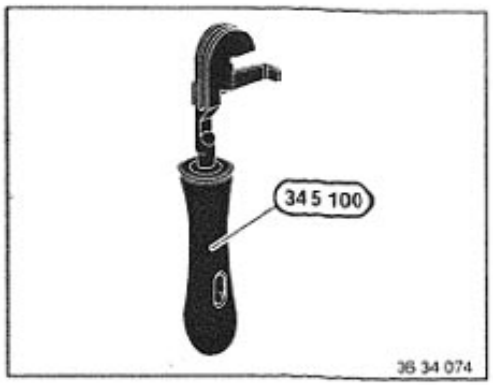
Installation:
Tightening torque*.

* See Specifications

* See Specifications

34 32 . . . Replacing all brake lines

The brake lines are now only supplied as straight units, cut to the correct length and fitted with a connection nipple.



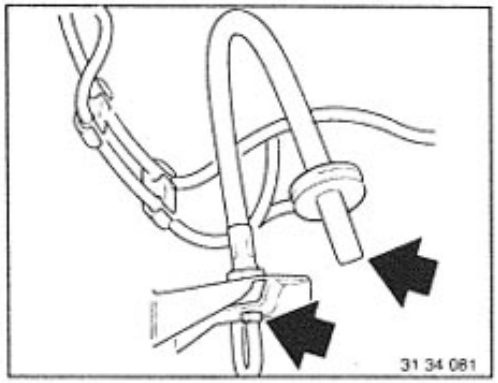
The new brake lines are bent to the correct angle using special tool 34 5 100.
The removed brake line can be used as a sample for the bending operation.

Caution!

- Avoid damaging the protective layer on the brake line when bending.
- Do not bend brake lines sharply or fold backwards.
- Only tighten down screw connections on brake lines using torque wrench.
  Tightening torque 34 32 1AZ*

After completion of the work, bleed braking system, refer to 34 00 046/047.

* Refer to Technical Data



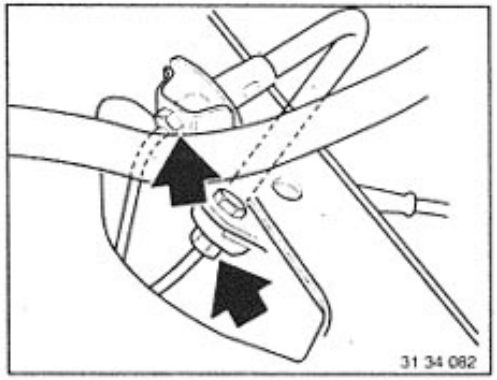
34 32 941 Replace all front brake hoses

Draw off brake fluid in expansion tank with a suction device which must only ever come into contact with brake fluid. Unfasten brake hose.

Installation:
First tighten brake hose on brake caliper.
Move wheels into straight-ahead setting.
Screw brake hose onto brake line, taking care not to twist brake hose.
Tightening torque 34 32 1AZ*

Bleeding brake system, refer to 34 00 047 for ABS and 34 00 048 for ABS/ASC+T respectively.

* Refer to Technical Data



34 32 983 Replacing both rear brake hoses

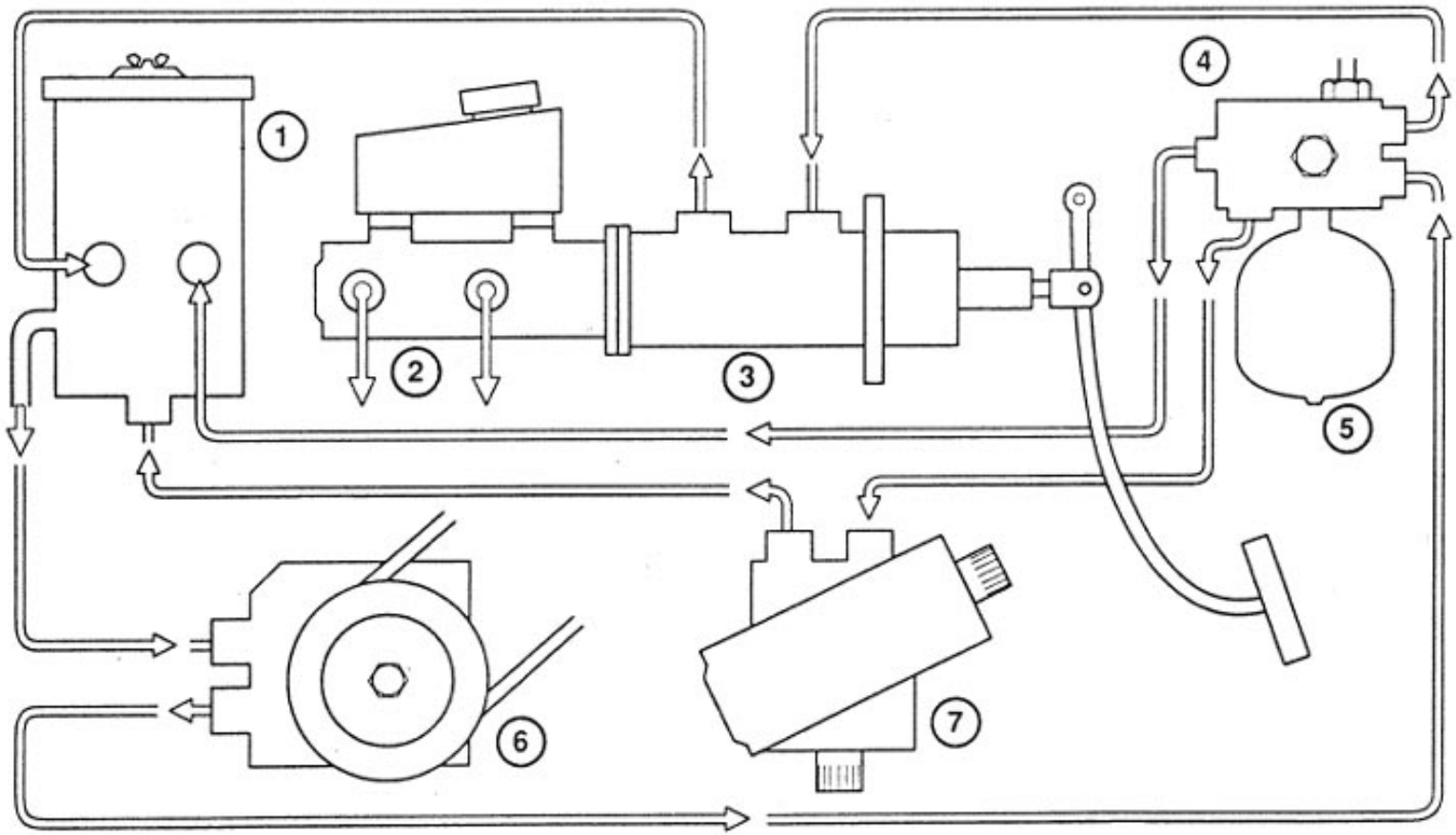
Draw off brake fluid in expansion tank with a suction device which must only ever come into contact with brake fluid. Unfasten brake hose.

Installation:
Never twist brake hose during assembly.
Tightening torque*.

Bleeding brake system, refer to 34 00 047 for ABS or 34 00 048 for ABS/ASC+T respectively.

* Refer to Technical Data

1 = Supply tank
2 = Tandem master cylinder and tank
3 = Hydraulic booster
4 = Pressure controlled flow regulator
5 = Hydraulic reservoir
6 = Power steering



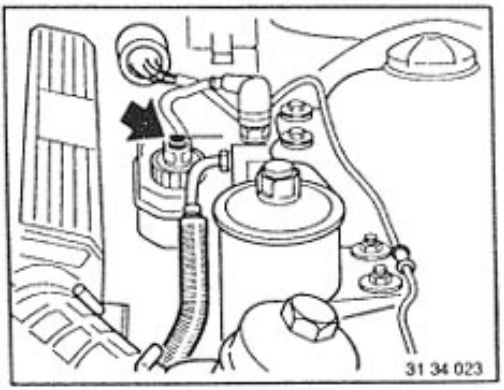
31 34 158

DESCRIPTION OF ENTIRE H 31 SYSTEM

The power flow regulator (or pressure controlled flow regulator) taps a slight delivery flow = 0.7 ltr. (1.5 pints)/minute from the operating circuit of the power steering (circulating system) and charges the hydraulic reservoir in a pressure range without impairing the function of the power steering.
The hydraulic oil volume stored under pressure is available for the booster to support the operating force and is called by operating the bolted standard tandem brake master cylinder.
If the power steering pump fails, sufficient reserve pressure will be stored in the hydraulic reservoir to be able to execute several braking actions with full brake boosting support.
After consumption of this reserve pressure, the brakes can still be applied, but without boost and therefore with considerably more force on the brake pedal.

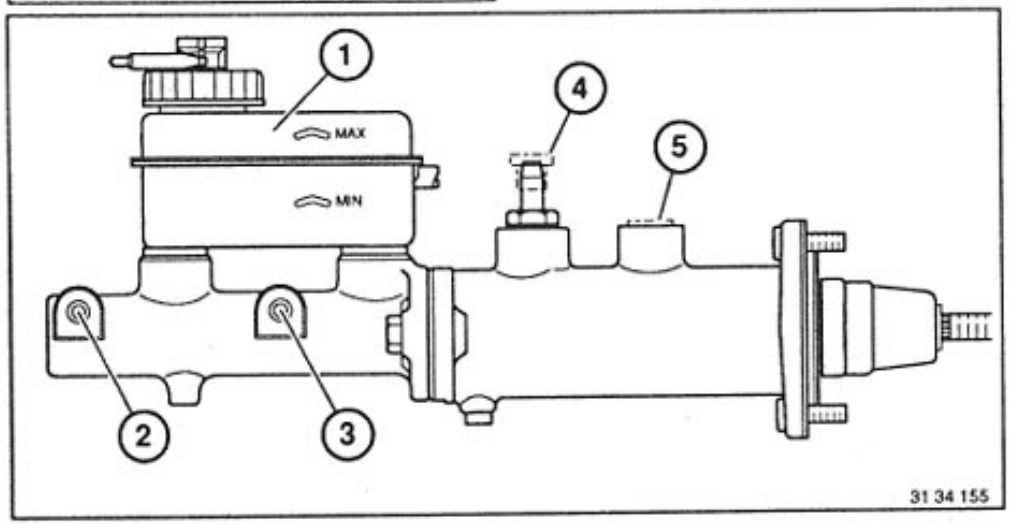
FUNCTION TEST

Operate brake pedal 20 times with the engine stopped.
Hold brake pedal down and start engine.
System is okay, if brake pedal gives.
If brake pedal does not give, there could be a fault in the power steering pump, power flow regulator, hydraulic reservoir or hydraulic brake booster.



34 33 505 REMOVING AND INSTALLING BRAKE BOOSTER WITH BRAKE MASTER CYLINDER

Discharge hydraulic reservoir by operating brake pedal about 20 times with same force required for full stop braking and with the engine stopped.
Draw brake fluid out of tank with a syringe reserved exclusively for use with brake fluid.
Disconnect plug.



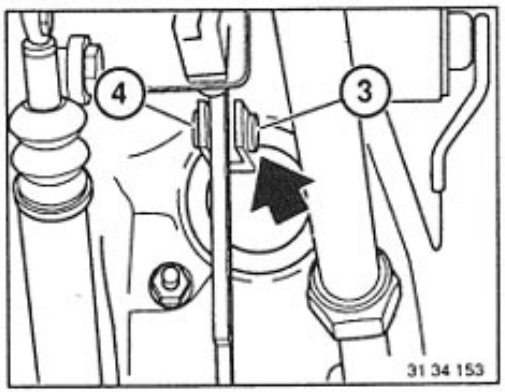
Disconnect brake pipes (2 and 3).

1 Supply tank (pulled off)
2 Brake pipe front right (left rear brake circuit)
3 Brake pipe front left (right rear brake circuit)
4 Booster return
5 Pressure pipe from power flow regulator

Pull off hose for clutch hydraulic system.

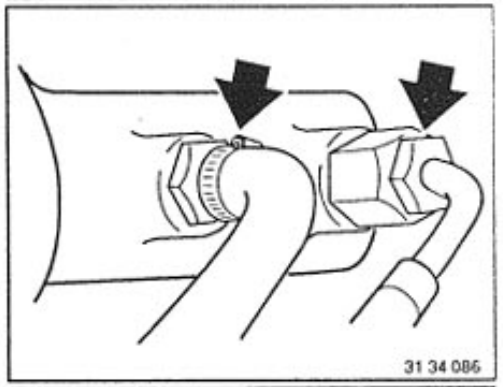
Installation:
Tightening torque*.
Bleed brakes – see 34 00 047.
Cars with ASC+T – see 34 00 ...

* See Specifications



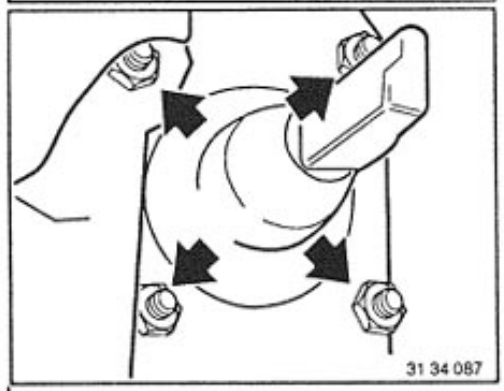
Remove dashboard trim panel at bottom left – see 51 45 180.
Press off clip (3) and pull out pin (4).

Installation:
Stop light switch (self-adjusting) – see Group 61.



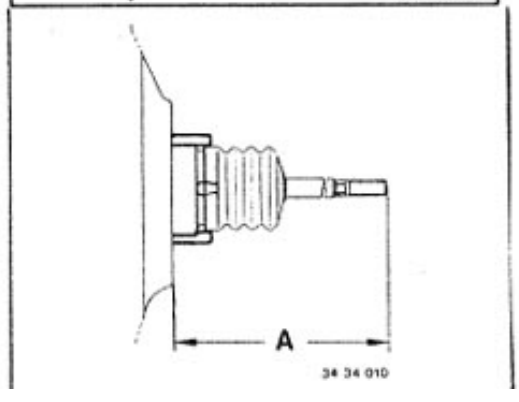
Unscrew hydraulic hoses on brake booster.

Installation:
Make sure that all pipes and hoses are clean before connecting.
Tighten return pipe with Special Tool 34 3 153 and pressure pipe with Special Tool 34 3 152, both in conjunction with a torque wrench.
Tightening torque*.



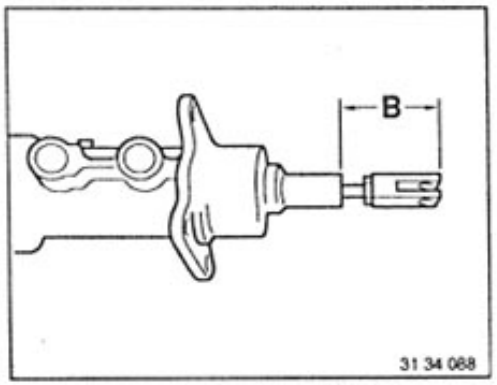
Unscrew brake booster on pedal console.
Remove brake booster and tandem brake master cylinder.

Installation:
Replace self-locking nuts.
Tightening torque*.

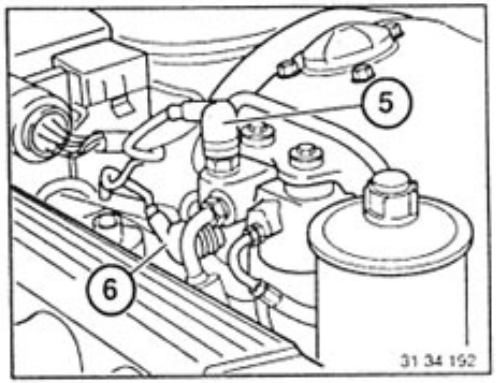


Basic setting distance A = 143 ± 1 mm (5.630 ± 0.039") measured from firewall to center of swivel head/operating pin – also refer to Group 35.

* See Specifications

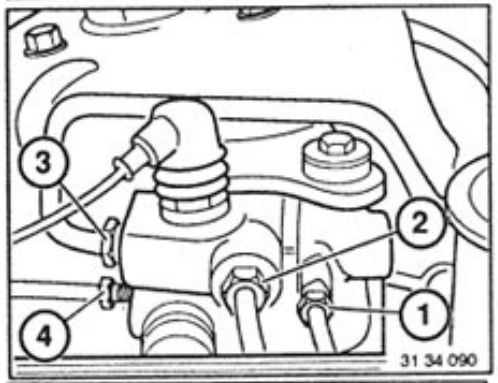


Installation:
Unscrew swivel on brake booster.
Install swivel on new brake booster and adjust to same distance B.
If necessary, check control distance A on brake pedal in installed state – see 35 21 000.

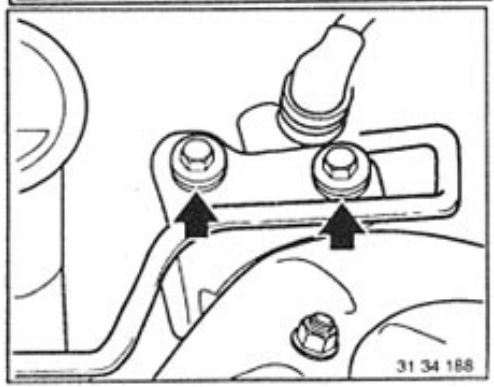


34 33 100 REMOVING AND INSTALLING POWER FLOW REGULATOR

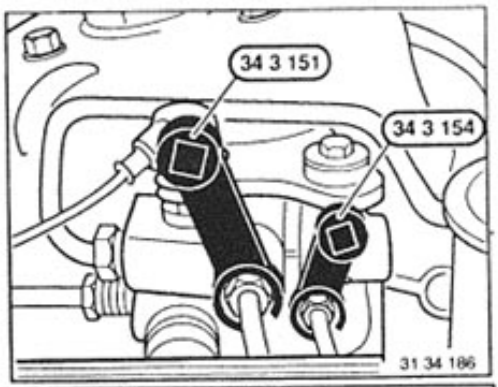
Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the force required for full stop braking and with the engine stopped.
Pull off wires on circulating pressure warning switch (5) and hydraulic pressure switch (6).



Unscrew
pipe (1) from power flow regulator to tank,
pipe (2) from power flow regulator to power steering gear,
pipe (3) from power flow regulator to power steering pump and
pipe (4) from power flow regulator to brake booster.

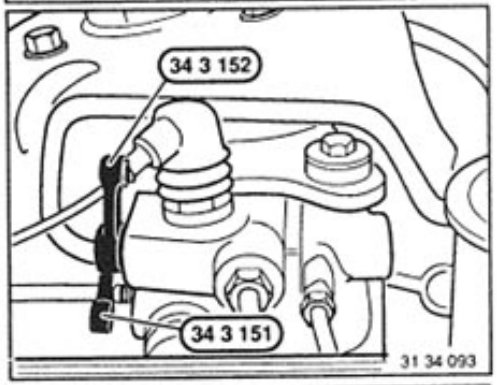


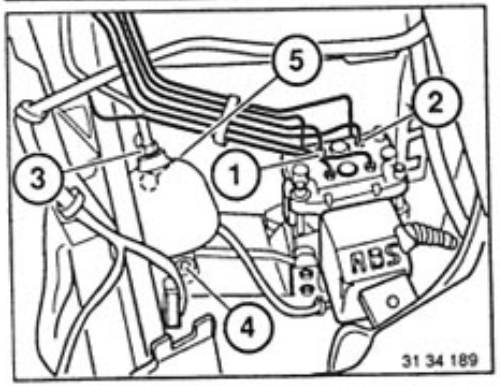
Unscrew power flow regulator mounting bolts.



Important!
Fine particles of dirt could impair the function of the power flow regulator in the H 31 system, which in turn could lead to failure of hydraulic steering and braking support.
Make sure that all pipes and hoses are clean before connecting.

Installation:
Tighten pipe (1) with Special Tool 34 3 154, pipes (2 and 4) with Special Tool 34 3 151 and pipe (3) with Special Tool 34 3 152, in each case together with a torque wrench.
Tightening torque*.
Bleed power steering – see 32 13 006.



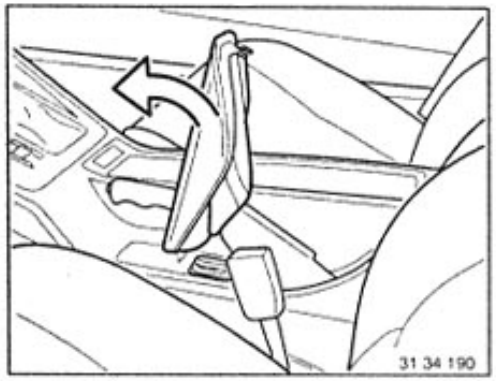


34 33 110 REMOVING AND INSTALLING HYDRAULIC RESERVOIR

Discharge pressure – see 34 33 100.
Remove left front wheel house trim panel – see Group 51.
Unscrew coupling nuts (3).
Unscrew bolts (4 and 5).

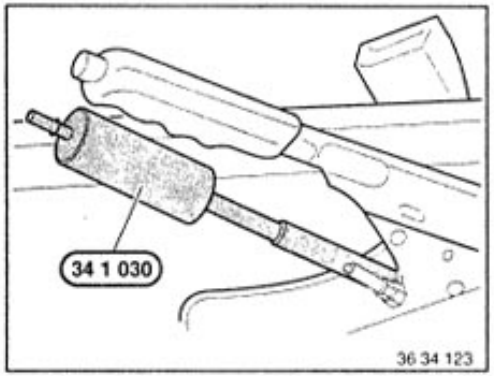
Installation:
Hydraulic reservoir tightening torque*.

* See Specifications



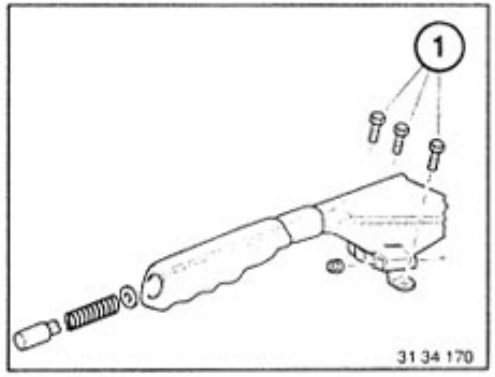
34 41 000 Removing and installing handbrake lever

Lift out dust cover.
Remove oddments tray, see 51 16 200.

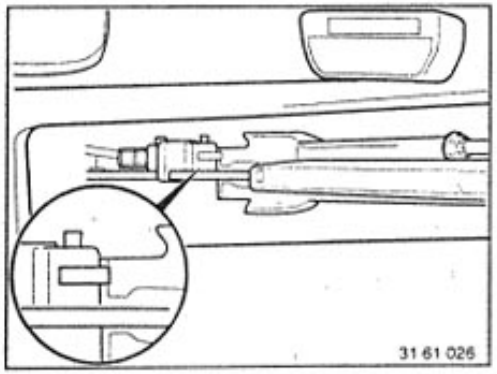


Unfasten lock nut with special tool 34 1 030, unscrew adjusting nut.

Installation:
Adjust handbrake, see 34 10 014.



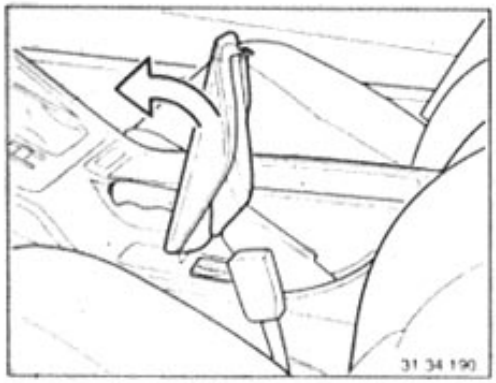
Unfasten screws (1).



Caution!
Do not damage switch for handbrake indicator light when removing and installing the handbrake lever.

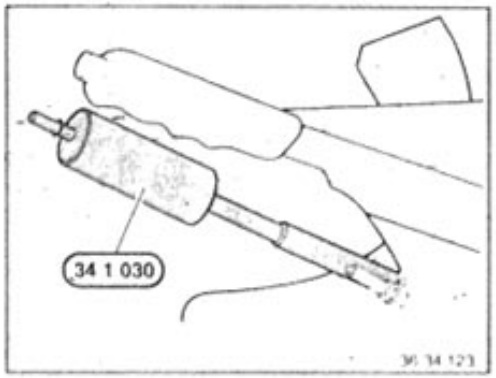
Remove the handbrake lever.

Installation:
Adjust switch for handbrake indicator light, see 61 31 320.



34 41 100 Removing and installing or replacing left or right Bowden cable for handbrake

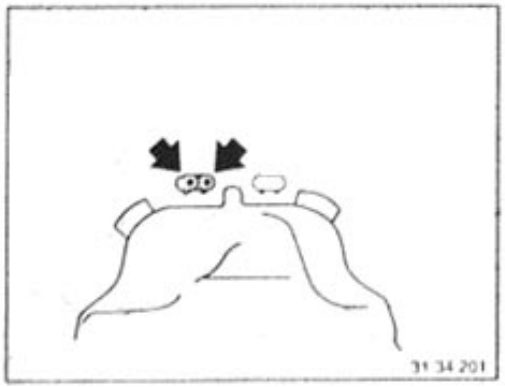
Lift out dust cover.



Unfasten lock nut with special tool 34 1 030, unscrew adjusting nut.
Move handbrake lever into release setting.

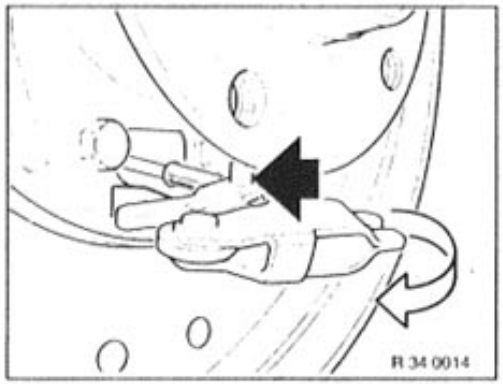
Installation:
Adjust handbrake, see 34 10 014.

Remove both rear mufflers, see 18 00 020.
Loosen heat shield under the tank and press down slightly.



Press handbrake Bowden cable out of tank mount and pull out of guide tube.

Remove handbrake shoes, see 34 41 220.



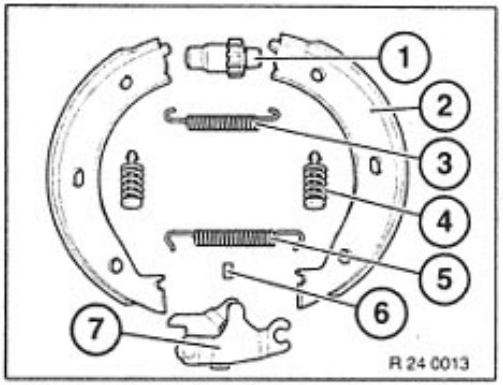
Fold open brake shoe expander, press out pin and remove brake shoe expander from Bowden cable.

Installation:
The inside lever on the brake shoe expander must point to the left.

Remove handbrake Bowden cable from the wheel carrier and the guide on the rear axle carrier.

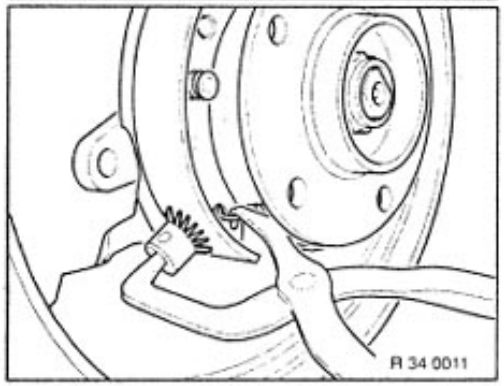
34 41 220 Removing and installing or replacing all handbrake shoes

Remove rear brake discs, see 34 21 320.

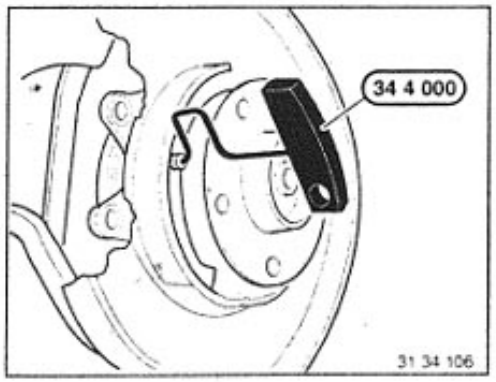


Arrangement of components: (applies to left and right side)

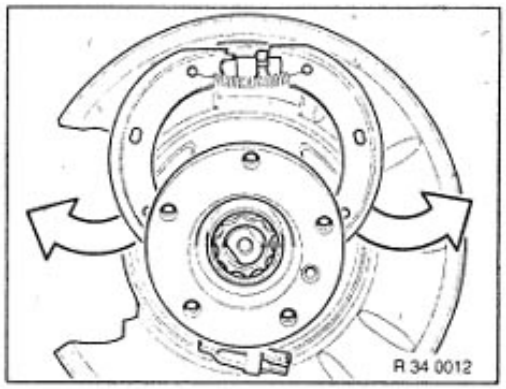
1 Adjusting screw
2 Brake shoe
3 Upper tension spring
4 Clamping pin with compression spring
5 Lower tension spring
6 Pin
7 Brake shoe expander



Disconnect lower tension spring with brake spring pliers.



Twist clamping pins with special tool 34 4 000 90° and remove.



Pull lower brake shoes apart and remove from wheel hub.

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brakes pull to one side	a) Tire inflation pressure incorrect b) Uneven tire tread wear c) Oil on pads/liners d) Pad/liner type not as specified e) Caliper recesses dirty f) Rear wheel geometry incorrect g) Corrosion in calipers h) Shock absorbers without action i) Pad of one caliper worn k) Pad glazed	a) Correct tire inflation pressure b) Change or replace tires c) Replace brake pads/liners and eliminate cause d) Replace brake pads/liners e) Remove, clean and install calipers f) Check/adjust wheel alignment g) Remove and install, repair or replace calipers h) Check or replace shock absorbers i) Replace brake pads; check calipers k) Replace brake pads; check calipers
Brakes excessively hot while driving	a) Compensation bore in master cylinder clogged b) No play between push rod and master cylinder piston c) Rubber parts swollen from contact with wrong type of brake fluid d) Vent hole in brake fluid tank clogged e) Corroded calipers f) Parking brake lever not released fully	a) Check or replace master cylinder b) Adjust push rod c) Replace master cylinder or remove and install, repair or replace brake calipers d) Clean brake fluid tank e) Remove and install, repair or replace calipers f) Check parking brake and parking brake cables, repairing if necessary
Braking effect insufficient inspite of great force on pedal Brake pedal travel - normal - short - long	a) Brake pads coated with oil or burnt; wrong type of brake pads b) Brake booster malfunctions c) One brake circuit failed due to leaks or damage	a) Replace brake pads b) Check brake boosting system c) Check brake system for leaks

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brake pedal motion too soft and spongy	a) Air in brake system b) Insufficient brake fluid in brake fluid tank c) Overheated brake fluid - vapoor lock due to excessive water content in brake fluid or excessive brake loads	a) Add or replace brake fluid and bleed brakes b) See a) c) See a)
Brake pedal travel excessive even though brakes have been bled and adjusted	a) Primary cup in master cylinder damaged b) Separating cups on floating piston of tandem master cylinder leak c) Leak in brake system	a) Overhaul or replace brake master cylinder b) See a) c) Check brake system for leaks
Uneven pad wear	a) Wrong type of brake pads b) Caliper recesses dirty, caps damaged c) Corrosion in calipers d) Rubber ring for piston control swollen	a) Replace brake pads b) Remove and install, repair or replace calipers c) See b) d) See b)
Brake pads worn at angle	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Corrosion in calipers d) Brake disc wear angular e) Pads worn less than minimum thickness	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Remove and install, repair or replace calipers d) Grind or replace brake discs e) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized brake pads, pads stuck on brake disc	a) Caliper recesses dirty, caps damaged b) Corrosion in calipers c) Compensation bore in master cylinder clogged	a) Remove and install, repair or replace calipers b) See a) c) Overhaul or replace master cylinder
Brakes squeal or knock	a) Wrong type of brake pads b) Caliper recesses dirty c) Brake disc not aligned with caliper d) Brake disc runout e) Excessive thickness deviation within braking surface f) Rust on edges of brake discs g) Pads loose h) Wheel bearing play excessive	a) Replace brake pads b) Remove and install, repair or replace calipers c) Check caliper installation and caliper guide bolts d) Check brake disc runout, replacing discs if necessary e) Measure brake disc thickness and grind or replace f) Grind or replace brake discs g) Replace brake pads h) Replace wheel bearings
Brake pedal dead travel excessive	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface e) Brake system has a leak f) Air in brake system g) Wrong type of brake pads	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure brake thickness deviation and grind or replace discs e) Check brake system for leaks f) Bleed brakes g) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in calipers	a) Caliper recesses dirty, caps damaged b) Brake disc not aligned with caliper c) Corrosion of pistons in calipers	a) Remove and install, repair or replace calipers b) Check caliper installation and caliper guide bolts c) See a)
Pulsating effect on brake pedal	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure disc thickness and grind or replace
Parking brake effect insufficient	a) Oil on brake shoes b) Excessive dead travel between brake shoes and brake drums c) Excessive dead travel in cables d) Cables maladjusted e) Corroded transmitting elements	a) Replace brake liners and eliminate cause b) Adjust parking brake c) See b) d) See b) e) Remove and install parking brake and expander locks; check cables, replacing if necessary

1. ANTIBLOCK SYSTEM (ABS) – DESCRIPTION AND DESIGN

DESCRIPTION

The basis of a braking action is the friction between the tires and road surface. To brake a vehicle the tires have to transmit a frictional force to the road surface. In so doing there will be slip between the tires and road surface, i.e. the tire peripheral velocity will be slower than the road speed of the vehicle.

Figure 730 34 112 shows the relation between the frictional force and slip for a typical case on a dry road surface. The transmitted braking force reaches its maximum value in shaded area A. This is also the control range of ABS. When a wheel is locked, i.e. when there is 100 % slip, the frictional force will normally be lower than when a wheel is rolling.

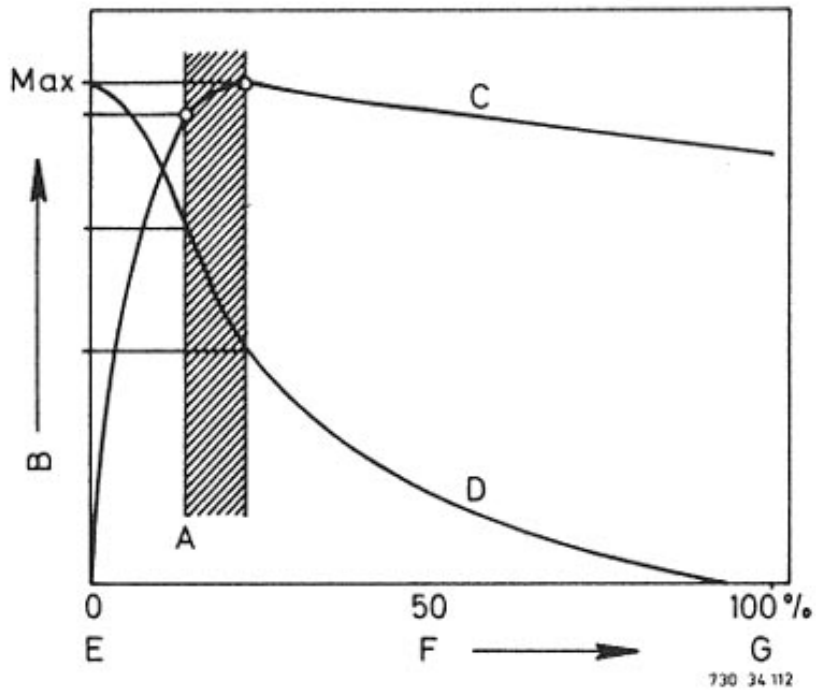
Consequently the ABS must control the brake pressure in the wheel brake cylinder in such a manner that the slip remains in the shaded area, because here the highest frictional force is available.

The amount of slip, with which there is maximum frictional force, and the amount of frictional force itself depend chiefly on the tires (type, treads, rubber composition), the road surface (material, surface condition, wet, ice), the road speed and the slip angle of the wheels.

The ABS detects the frictional conditions between the tires and road surface prevailing at the moment. It automatically adjusts to each change in road surface/tire relation and makes use of the highest coefficient of friction, without that the vehicle slips or skids because of wheel locking.

Non-uniform friction conditions between the separate wheels will be held under control just as also instantaneous changes in the road surfaces, e.g. through patches of ice.

BRAKING AND LATERAL FORCES IN RELATION TO SLIP



A ABS operating range
B Braking and lateral force
C Braking force
D Lateral force
E Rolling wheel
F Slip
G Locked wheel

DESIGN

ABS consists of a control unit, hydraulic unit, speed sensors and a wire harness. Components are described separately below.

Speed Sensors:
Each speed sensyr has a gear wheel, which runs past the permanently magnetized edge of the speed sensor and is installed in the wheel hub.
The rotary motion of the wheels is recorded by inductive sensors and an electric signal is sent to the electronic control unit.

Electronic Control Unit:
The electronic control unit is located in the car's side member, see layout drawing on page 52/6. In a small multi-channel computer acceleration, deceleration and slip factors are derived from the electric signals of the speed sensors, which are proportional to wheel velocity. By logical connection of these factors there are control commands for the electromagnetically operated valves in the hydraulic unit.

The signal processing in the computer determines the control behavior of the system. The expected degree of dependability is based on digital engineering with highly integrated circuitry.

The control unit contains electronic monitoring circuits, which control the function prior to each trip and the ABS wire harness with equipment constantly during a trip. If the control unit detects a defect in the wire harness or electrical part of the equipment, the monitoring circuit will switch off the ABS and guarantee normal use of the brake system. An ABS indicator lamp reports this condition to the driver.

Hydraulic Unit:
The hydraulic unit is located in the engine compartment and integrated in the conventional brake system.
To control the brake pressure in the wheel brake cylinders, the brake hydraulic unit has three-way valves which permit three brake pressure conditions.
Pressure build-up, pressure holding and pressure drop. These three pressure phases adapt themselves in the sequences and length to the requirements of the desired control characteristic and power flow between the road surface and tires.
In principle control procedures are as follows.
As soon as wheel deceleration or slip indicates the locking of a wheel, the brake pressure is first held. If the wheel still tends to lock, the pressure will be dropped so long until the wheel accelerates or the slip limit is exceeded. Afterwards the pressure is raised again and the control phases begin from new.
An electrically driven return delivery pump returns the brake fluid taken from the wheel brake cylinder while dropping the pressure to the appropriate brake circuit.
The pump is designed as a two-piston pump so that the circuits of a dual brake circuit system remain fully separated.

Wire Harness:
The control unit is connected with the speed sensors and electric part of the hydraulic unit via a special wire harness for the sake of signal input and order output. These wires as well as electric power supply are integrated in the main wire harness.

2. Function and Checking of ABS Control Lamp

The ABS control lamp lights up after switching the ignition on.
The control lamp must go out after starting the engine if ABS is okay.

The procedure is repeated each time the ignition is switched off and on.

The causes for faulty display — control lamp does not light up, does not go out or lights up while driving (even sporadically) — can be determined by reading the fault memory with a BMW Service Tester, refer to Car Electric/Electronic Test Plan.

The control unit automatically switches to "conventional brakes" in case of an electric or electronic fault in ABS.
This means that the car can still be braked, but without regulation (the wheels could lock!).

AUTOMATIC STABILITY CONTROL (ASC)

Description

Automatic Stability Control (ASC) is a control system to improve active safety in that it reduces the slip of driven wheels on roads with insufficient traction (prevents spinning of the wheels).

It employs Electronic Engine Power Control (EML) and Digital Motor Electronics DME) for regulation.

The sensors of ABS are used to recognize the speed of individual wheels.

ASC is integrated with ABS in one control unit, but is a completely independent system.

While ABS exploits the maximum friction force while braking the car, this is reached with ASC while accelerating.

As soon as the driven wheels turn 0.25 km/h (0.15 mph) faster than the non-driven wheels, ASC regulates the throttle valve position smaller via EML. In order to have fast regulation, the ignition timing is retarded in steps or there is ignition blend-out by DME. DME also adapts the fuel injection signal to protect the engine and catalyst.

ASC is combined with Engine Drag Torque Control (MSR), which prevents sliding of the driven wheels in case of sudden engine overrun.

Engine Drag Torque Control (MSR)

Again with the help of wheel sensors ASC recognizes the difference in speed between driven (engine braked) wheels and non-driven (unbraked) wheels. ASC switches off overrun cut-out when values are below the slip limits.

Displaying and Switching Logic

The system is switched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or it had been switched off by hand.

Troubleshooting:
See Car Electric/Electronic Test Plan.

AUTOMATIC STABILITY CONTROL PLUS TRACTION (ASC + T)

General

This system has the task of regulating the slip of driven wheels to the lowest possible value regardless of road surface conditions.

During regulation the engine torque is reduced with help of DME (ignition timing control) and EML (throttle valve control). If this measure is not sufficient, the driven wheel turning too fast is slowed down by the wheel brake via a hydraulic element.

Displaying and Switching Logic

The system isswitched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or was switched off by hand.

Safety Information

ASC must be switched off before testing a car on a brake or dynamometer test stand.

Either the ignition or ASC must be switched off before towing a car with a lifted front end.

Throttle Valve Control by EML

The throttle valve is regulated with help of Electronic Engine Power Control (EML).
If unwanted drive slip occurs during a certain driving situation, ASC calculates the maximum transmittable drive torque and informs EML about the throttle valve position required for the duration of regulation.
EML continuously reports the current throttle valve position to ASC via the DKV wire. If the throttle valve angle has to be reduced, EML receives this information via the DKR wire.
If a larger throttle valve angle is requested by ASC, this is reported via the DKE wire to EML (only when a control unit with engine drag torque control is installed in the car).

Ignition Timing Control by DME

Retarding the ignition timing is another measure for reduction of the engine torque.
In ASC mode (regulation) Digital Motor Electronics (DME) receives a digital signal from ASC and retards the ignition timing afterwards.
Troubleshooting:
See Car Electric/Electronic Test Plan.

34 50 511 Checking ASC+T braking action
(without test equipment)

Vehicle on a lifting platform (wheels free).

Test sequence:
- Back left wheel is free to rotate.

- Move shift lever into neutral setting or move selector lever into "N" setting.

Switch on engine.

- Govern engine speed using accelerator pedal to 2000 · 100 rpm.

- Quickly spin left rear wheel by hand in direction of travel (possibly holding right rear wheel firmly during test to prevent it from turning).

Reaction:
- Left rear wheel is tangibly braked.

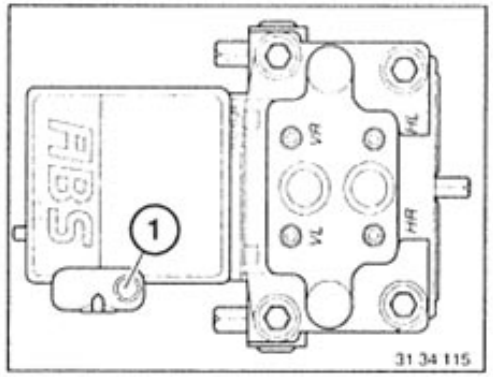
Test sequence:
- Repeat test on rear right wheel.

34 51 520 Removing and installing or replacing complete hydraulic unit (for ABS)

When operation is complete:
- Venting brake system, refer to 34 00 047 for ABS or 34 00 048 for ASC+T.
- Perform final ABS inspection, refer to BMW Diagnosis System.

Disconnect battery ground lead.
Observe General Information, Gr. 61!

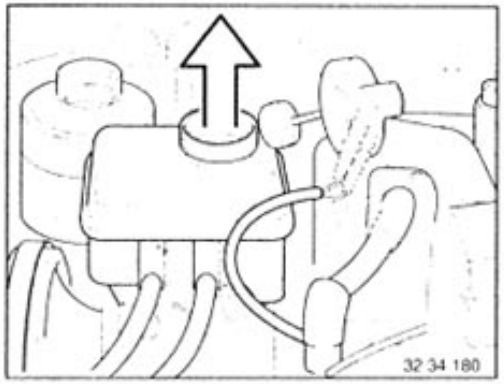
Removing front left headlight, refer to 63 12 460.
Removing air filter housing, refer to Gr. 13.
Remove cover from front left wheel arch.
Remove air intake (for cooling brakes).



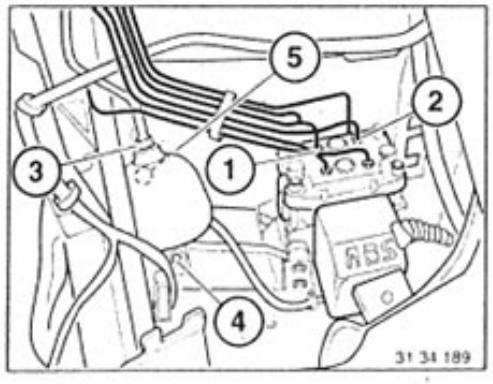
Caution!
Do not confuse brake lines and, if necessary, mark before removal.

Remove brake lines FL, FR, RL, RR.
Seal brake lines and ABS hydraulic unit with suitable plugs.

Installation:
FL to front left brake caliper
FR to front right brake caliper
RL to rear left brake caliper
RR to rear right brake caliper
Tightening torque 34 32 1AZ*



Draw brake fluid out of the expansion tank.
Use a suction lifter to do this: it must only make contact with brake fluid.

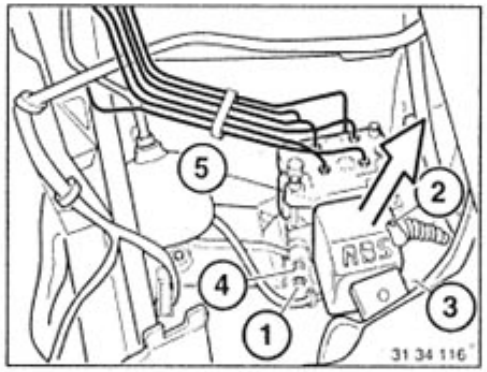


Remove brake lines (1 and 2).

Caution!
Catch brake fluid and do not allow to contact clothing or paintwork.

Installation:
Line to (1) rear master brake cylinder.
Line to (2) front master brake cylinder.
Tightening torque 34 32 1AZ*

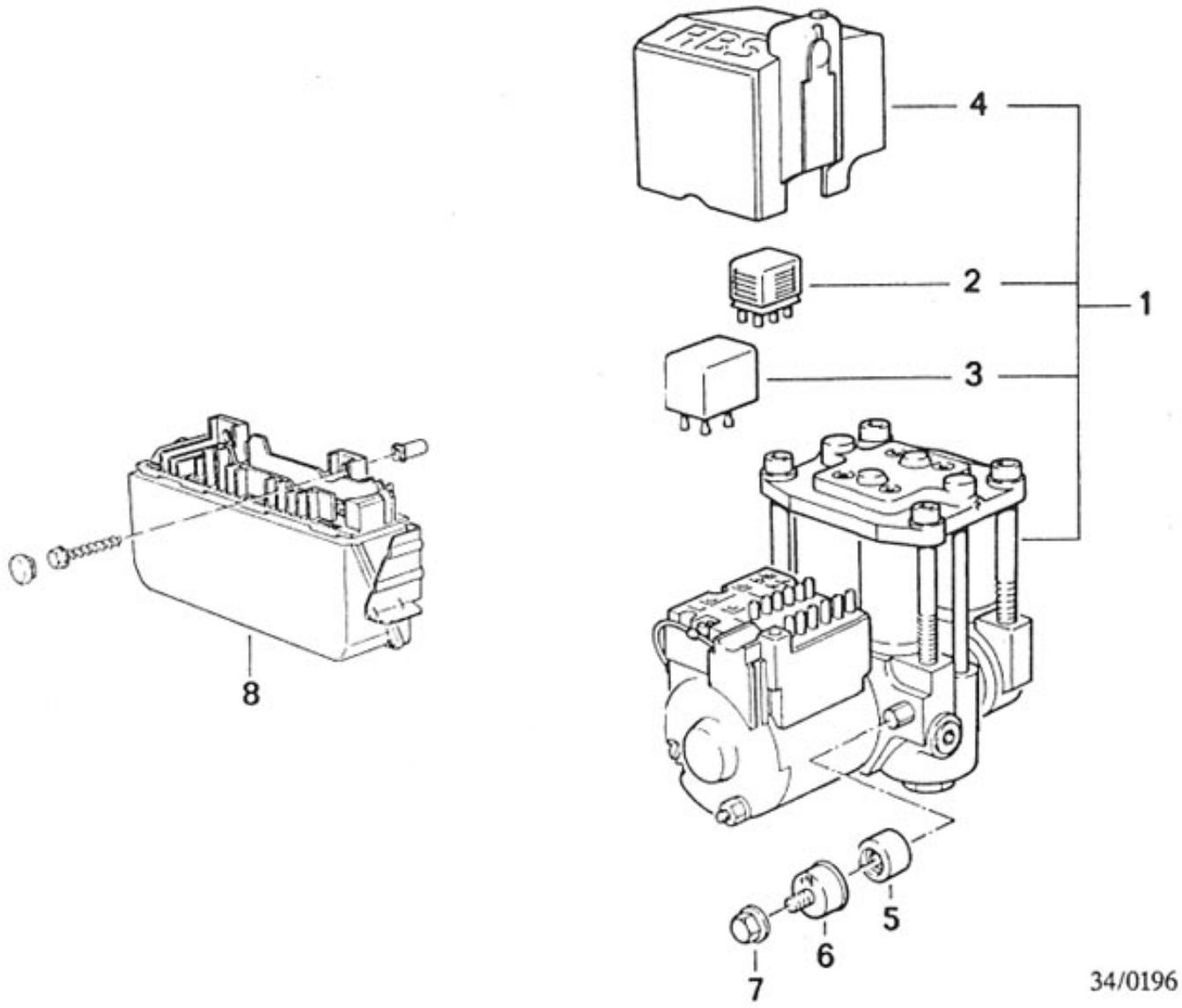
* Refer to Technical Data



Unfasten nuts (3 . . . 5).
Remove ground cable (1).
Unfasten screw (2) and remove cover.
Remove multi-pin plug.
Remove hydraulic unit.

* Refer to Technical Data

ABS / ASC COMPONENTS



1 Hydraulic control unit
2 Valve relay
3 Motor relay
4 Cover
5 Rubber sleeve
6 Sleeve cover
7 Cap
8 ABS/ASC control unit or ASC+T control unit

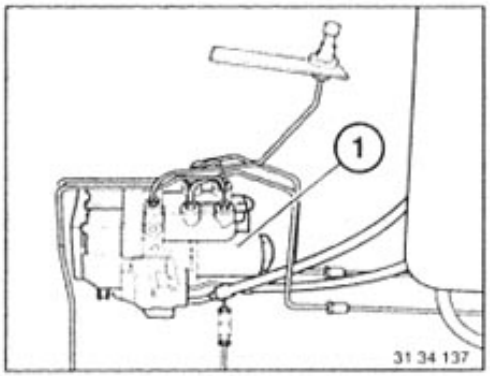
34 51 525 Removing and installing or replacing hydraulic unit for ASC + T

(brake unit and master brake cylinder removed)

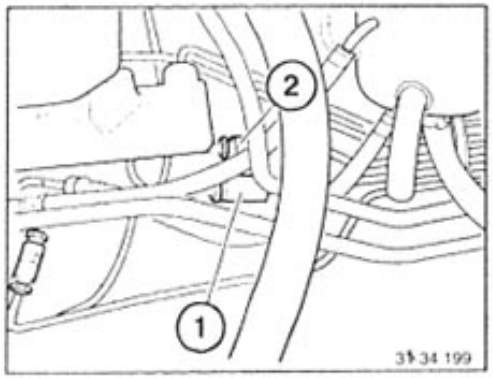
After completion of work:

- Bleeding brake system, refer to 34 00 048.
- Perform final inspection of ABS/ASC+T, refer to BMW Diagnosis System.
- Checking ASC+T brake intervention, refer to 34 50 511.

Disconnect battery,
refer to instructions on disconnect and reconnecting the battery, MG 12 .

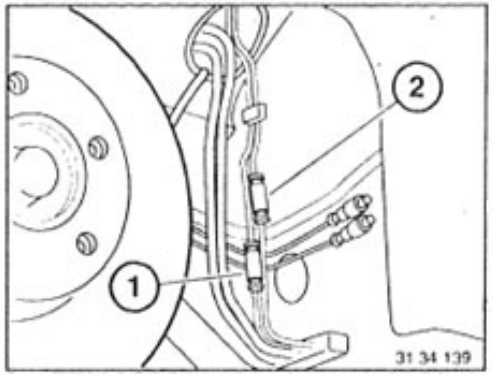


1 Hydraulic plunger unit



Disconnect brake lines between ABS and hydraulic plunger unit on adapters (1. . .2).

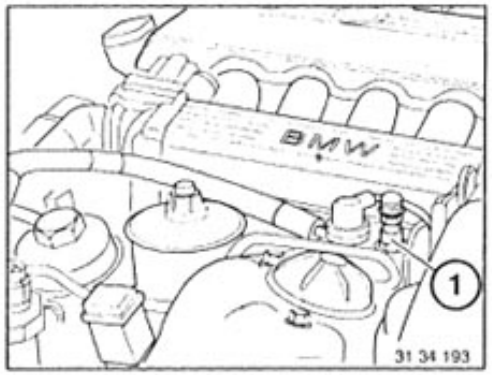
Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.



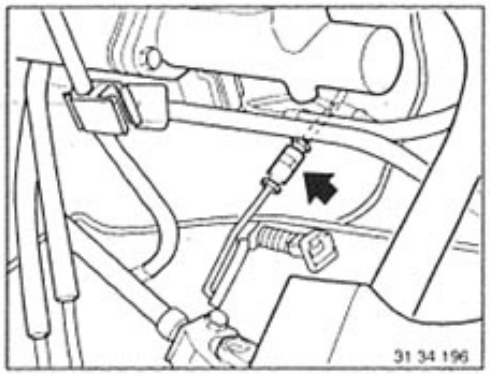
Remove trim from front left wheel arch.

Disconnect brake lines on adapters (1. . .2).

Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.

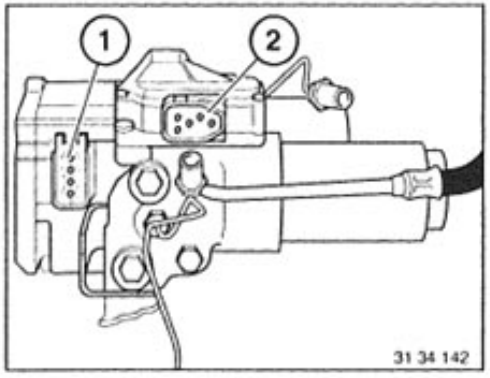


Relieve pressure on the bleed screw (1) of the plunger unit and unfasten bleed line.

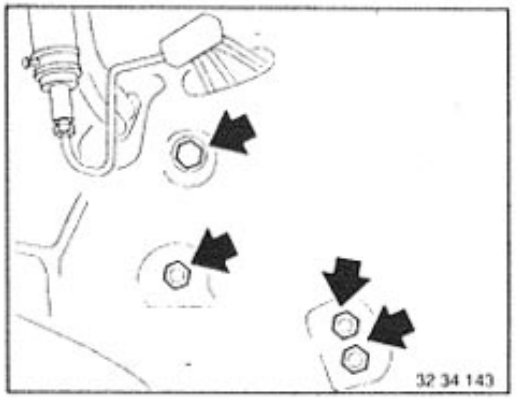


Unfasten pressure line from tandem pump on adapter.

Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.



Remove connector (1) for solenoid valves and connector (2) for pressure sensor.

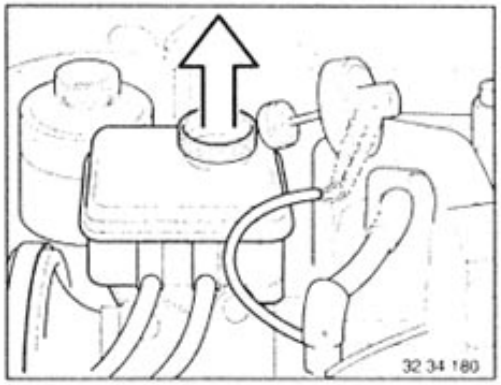


Unfasten retaining screws on hydraulic plunger unit and remove hydraulic plunger unit.

34 51 525 Removing and installing or replacing hydraulic unit (for ASC+T)
(from model year 94)

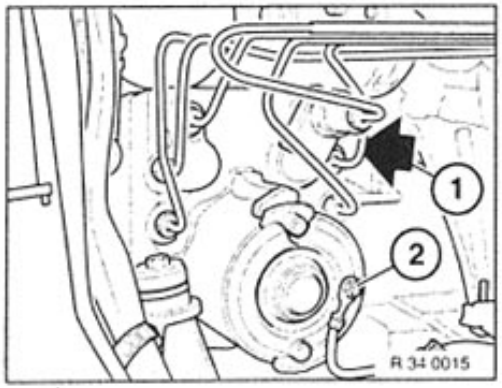
After completion of the work:
Bleeding brake system, refer to 34 00 048.
Perform ABS/ASC+T or ABS/DSC final inspection, refer to BMW Diagnosis System.

Note:
Switch off ignition.

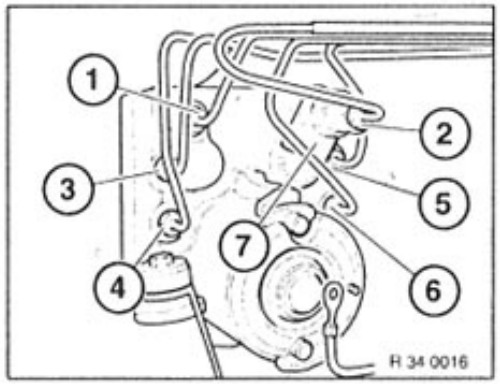


Draw brake fluid out of the expansion tank.
Use a suction lifter to do this: it must only make contact with brake fluid.

Remove front left wheel, see 36 10 300.
Remove front left cover from wheel arch.
Remove air intake (for cooling brakes).



Unlock and remove conne (1).
Unfasten nut (2) and rem ground cable.



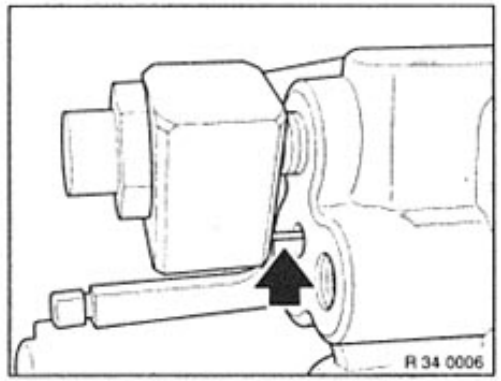
Caution!
Do not confuse brake lines: if necessary, mark them before disconnecting them.

Unfasten brake lines (1 . . . 6).
Seal brake lines and hydraulic unit with suitable plugs.

Brake line:

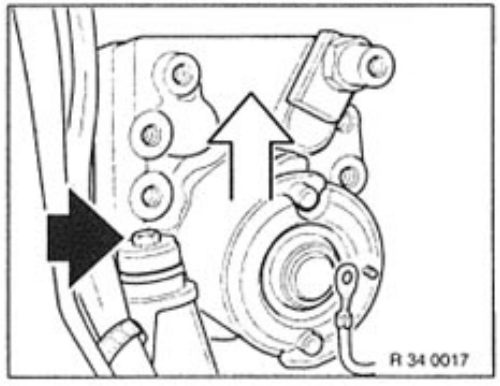
1 (V)	from master brake cyl. connection (V)
2 (H)	from master brake cyl. connection (H)
3 (FR)	to front right brake caliper
4 (FL)	to front left brake caliper
5 (RR)	to rear right brake caliper
6 (RL)	to rear left brake caliper
7	Diaphragm pressure damper

Installation:
Tightening torque 34 32 1AZ*



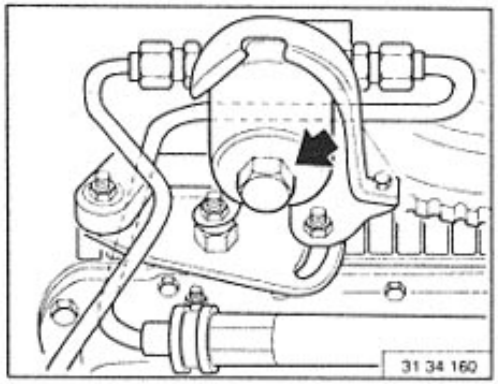
Note:
Note installation position of diaphragm pressure damper.
The pin must enter the bore.

Installation:
Tightening torque 34 50 2AZ*



Unfasten screw, press brake lines to one side and lift out hydraulic unit.

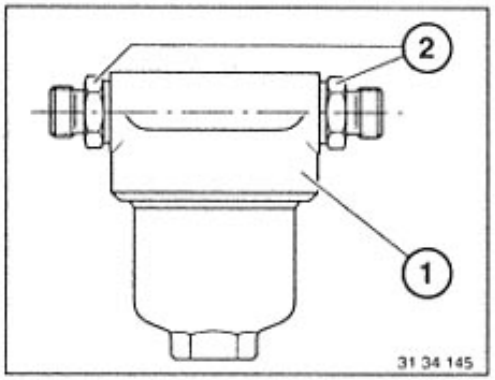
* Refer to Technical Data



34 51 540 Removing and installing or replacing ASC +T filter

Unfasten filter bell, replace filter element and O-ring.

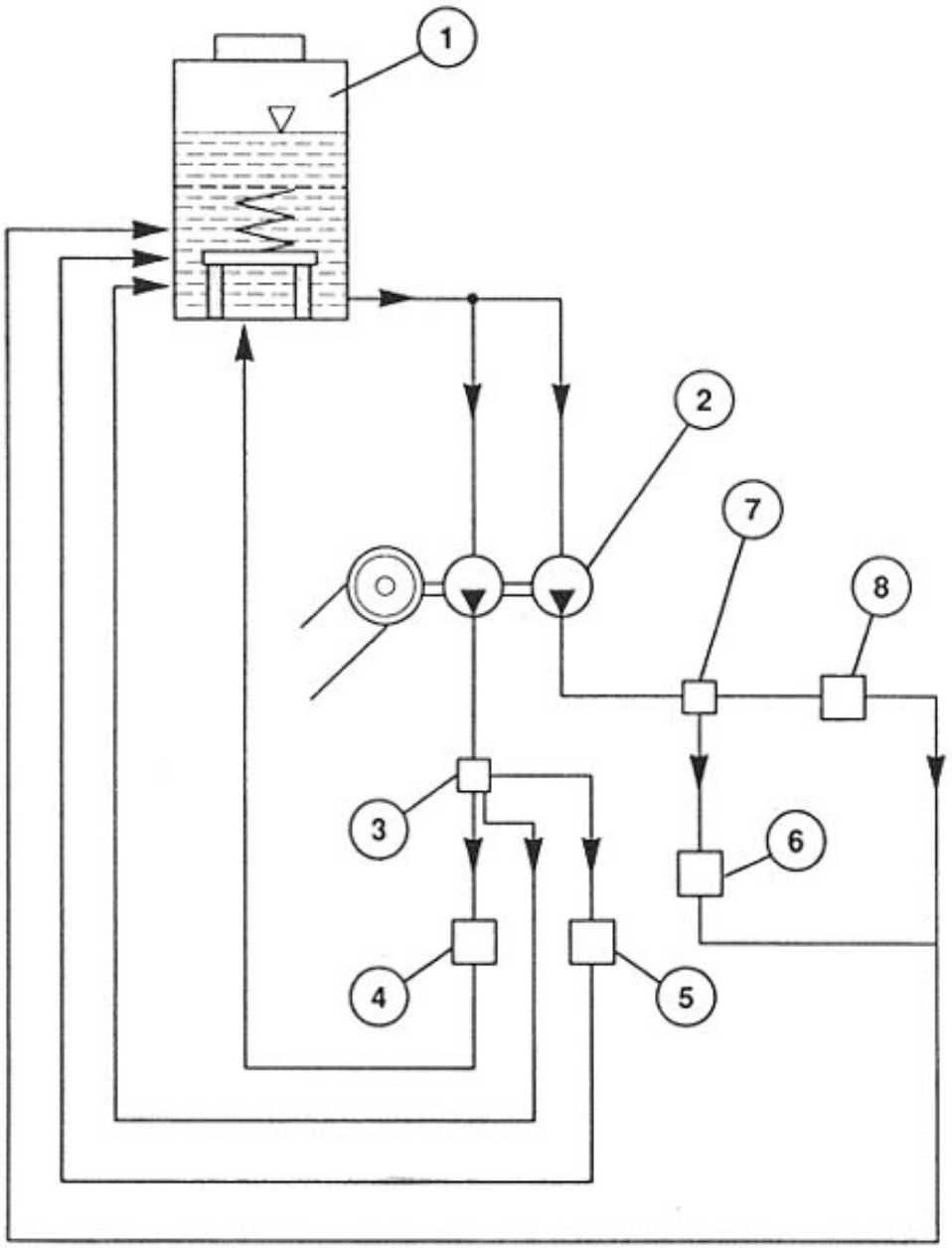
Note:
Filter change intervals: see Gr. 00.



Installation:
1 Tightening torque 34 50 1AZ*
2 Tightening torque 34 50 2AZ*

* Refer to Technical Data

ASC + T OIL CIRCUIT

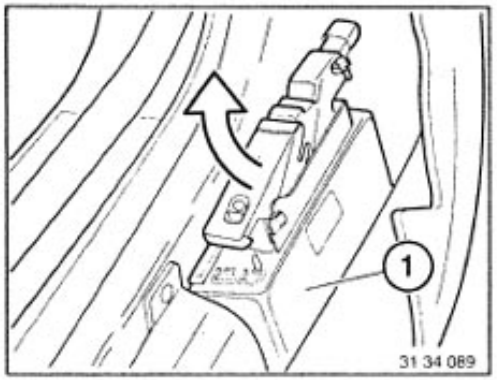


32 34 167

1 Tank
2 Dual pump
3 Charging valve
4 Power steering
5 Brake booster
6 ASC plunger
7 ASC charging valve
8 Ride level height control

34 52 510 Removing and installing / replacing control unit (for ABS)

Remove cover strip from left door spoiler.
Remove loudspeaker cover from front left footwell.
Fold away carpet from door spoiler.



Caution!
Only remove and install control unit when ignition is switched off.

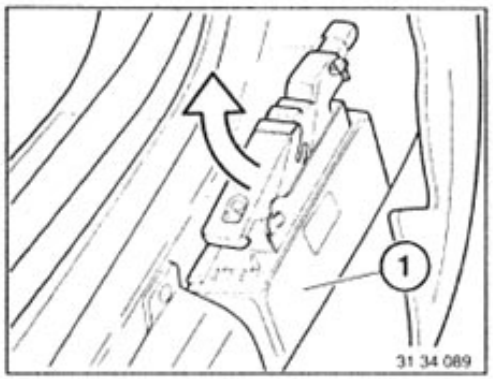
Unlock cable connector and remove from control unit (1).

Unfasten retaining screws from control unit and lift out control unit.

Installation:
Encode new control unit,
refer to BMW Diagnosis System.

34 52 515 Removing and installing / replacing control unit (ASC+T)

Remove cover strip from left door spoiler.
Remove loudspeaker cover from front left footwell.
Fold away carpet from door spoiler.

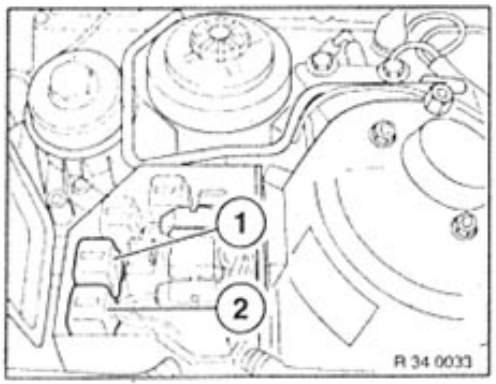


Caution!
Only remove and install control unit when ignition is switched off.

Unlock cable connector and remove from control unit (1).

Unfasten retaining screws from control unit and remove control unit.

Installation:
New control unit:
- Encoding control unit, refer to BMW Diagnosis System.
- On vehicles with Dynamic Stability Control (DSC), a steering angle adjustment must also be made, refer to BMW Diagnosis System.



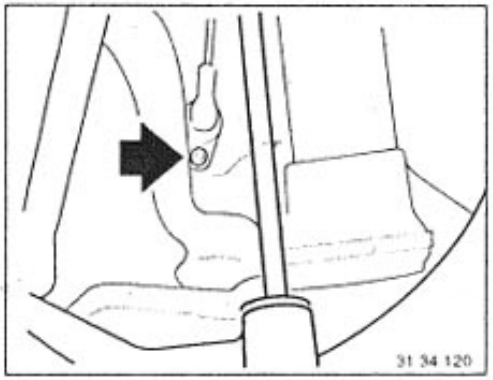
Vehicles with ABS/ASC+T from 12/94:

If the ABS/ASC+T control unit is replaced, the ABS engine relay (2) must also be replaced.

Note:
- Valve relay (1) clicks when ignition is switched on and off.
- Engine relay (2) does not demonstrate any reaction when switching the ignition on and off.

34 52 525 Replacing one front impulse sensor

Switch off ignition.



Unfasten socket head cap screw.
Remove cable from retaining clips and pull out impulse sensor.

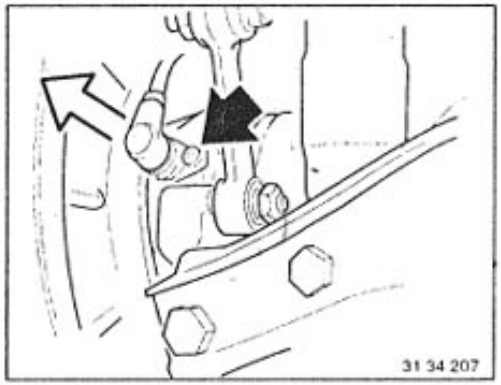
Installation:
Clean impulse sensor and insert bore and apply light coat of Staborax NBU 12K*.

Remove inside trim section from wheel arch, pull cable connector for impulse sensor out of bracket and disconnect.

* Refer to BMW Parts Service

61 12 535 Replace one back impulse sensor

Switch off ignition.



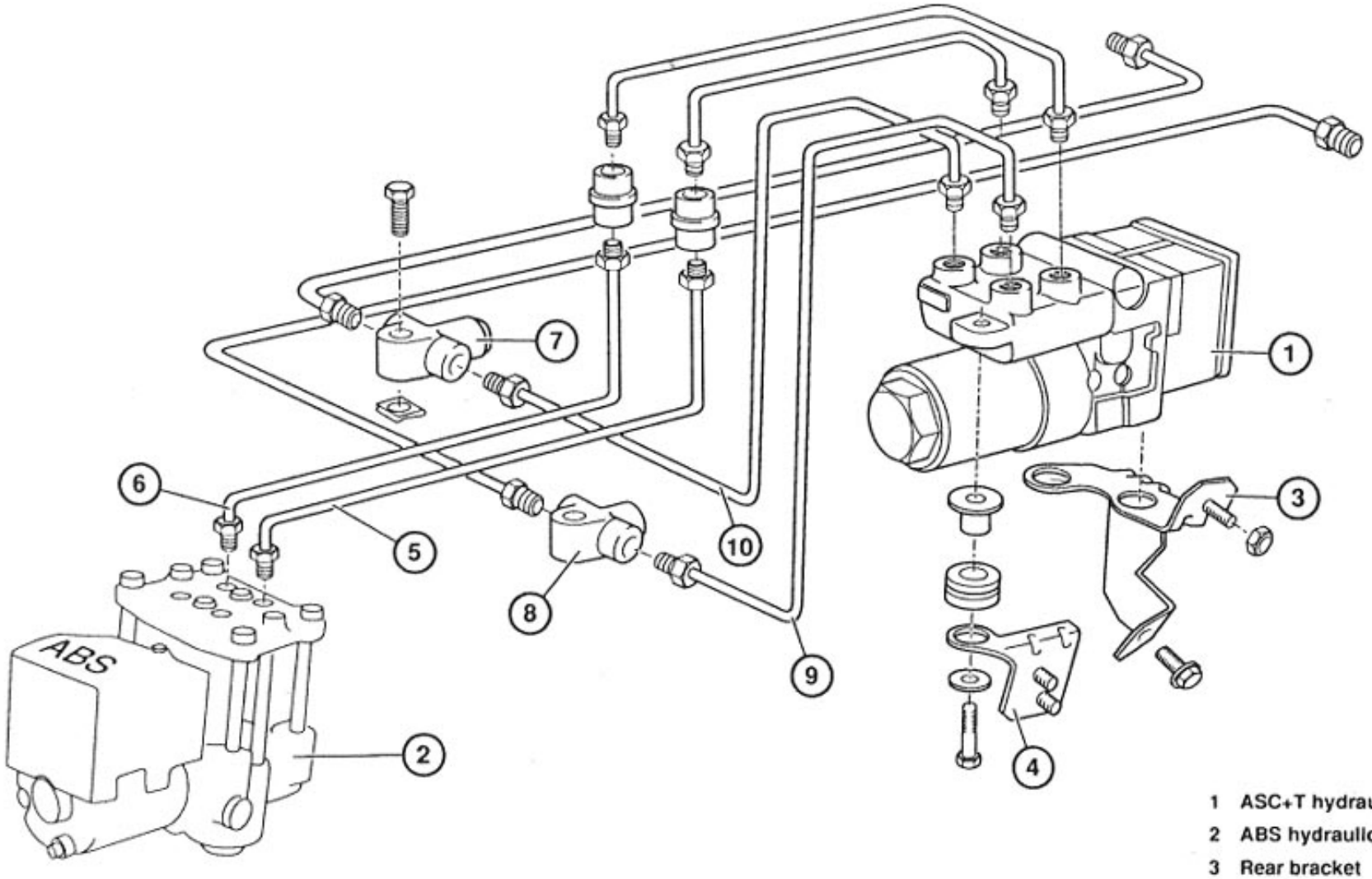
Unfasten socket head cap screw.
Lift cable out of retaining clips and pull out impulse sensor.

Installation:
Clean impulse sensor and bore and apply light coat of Staborax NBU 12K*.

Remove cable connector for impulse sensor from bracket on rear axle carrier and disconnect.

* Refer to BMW Parts Service

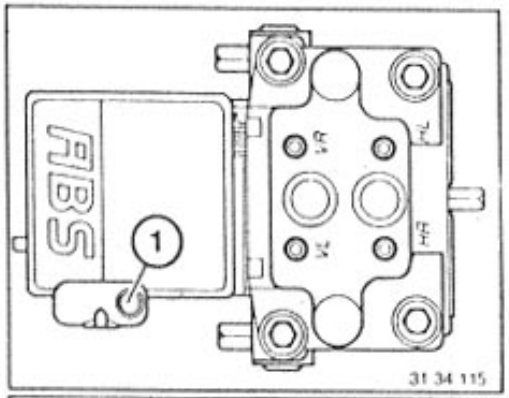
AUTOMATIC STABILITY CONTROL (Pipe Routing from ABS Hydraulic Unit to ASC+T Hydraulic Unit)



32 34 168

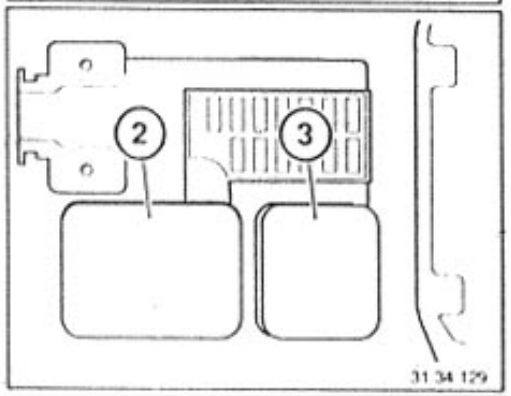
1 ASC+T hydraulic control unit
2 ABS hydraulic control unit
3 Rear bracket
4 Front bracket
5 Left rear pipe (M 10 threads)
6 Right rear pipe* (M 12 threads)
7 Right rear connector (M 12 x 1)
8 Left rear connector (M 10 x 1)
9 Right rear pipe (RZ)
10 Left rear pipe (RZ)

* ABS end (M 10 threads)

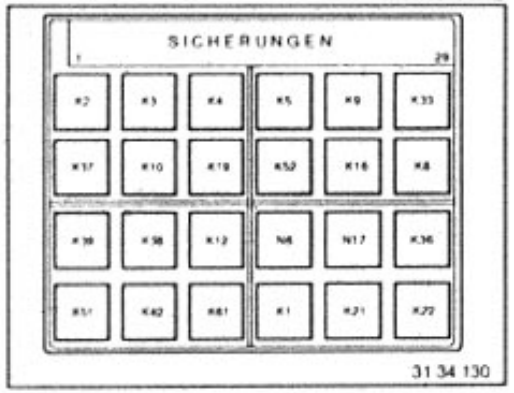


61 31 570 REPLACING RELAYS ON HYDRAULIC CONTROL UNIT (FOR ABS)

Unscrew screw.
Pull off cover.

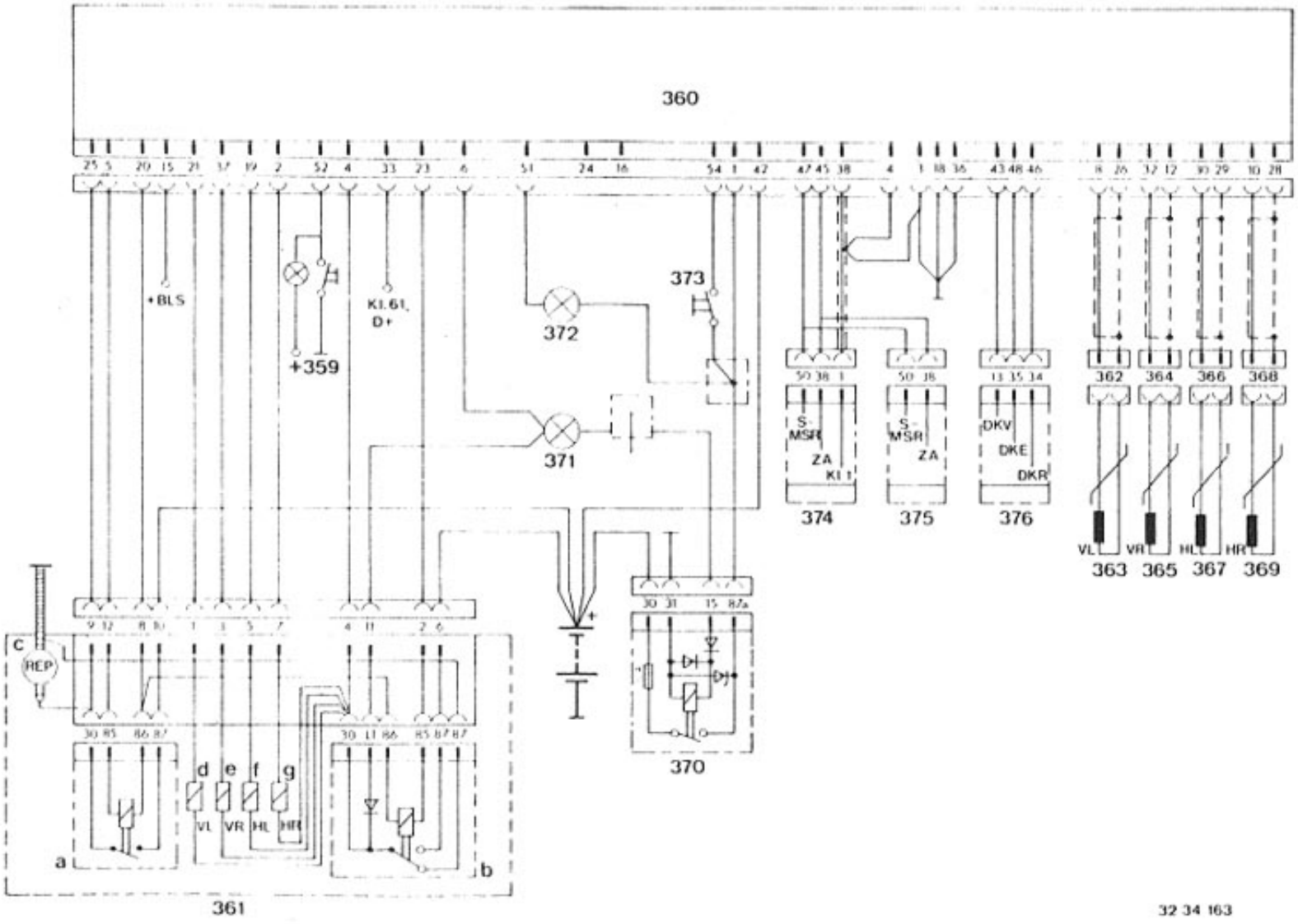


Pull out motor relay (2) or valve relay (3).



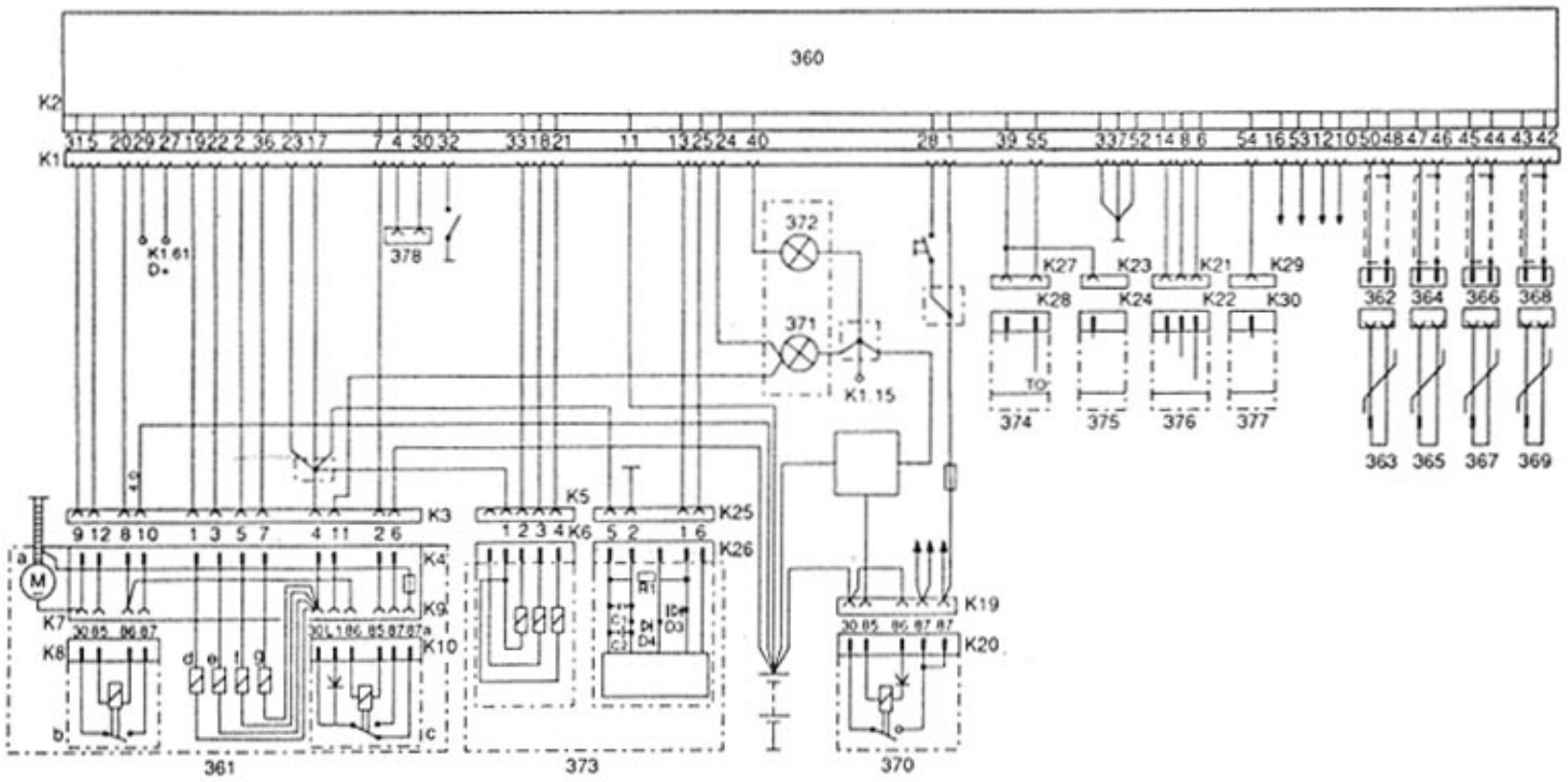
Replacing Electronic Relay for ABS:
Remove cover from relay plate in the engine compartment.
Pull out and replace ABS electronic relay/overload cutout K 10 (Bosch) with Special Tool 61 1 250 – see Group 61.

WIRING DIAGRAM FOR ABS/ASC-DKZ (Since 9.88)



KL 61	Terminal 61 (charge control)
+ BLS	Stop light switch
360	Electronic control unit
361	Hydraulic control unit
a	Return delivery pump motor
b	Motor relay
c	Valve relay
d	Valve - left front
e	Valve - right front
f	Valve - left rear
g	Valve - right rear
362	Conn. -signal sender left front
363	Signal sender left front
364	Conn. - signal sender right front
365	Signal sender right front
366	Conn. - signal sender left rear
367	Signal sender left rear
368	Conn. - signal sender right rear
369	Signal sender right rear
370	Master relay (DME)
371	ABS lamp

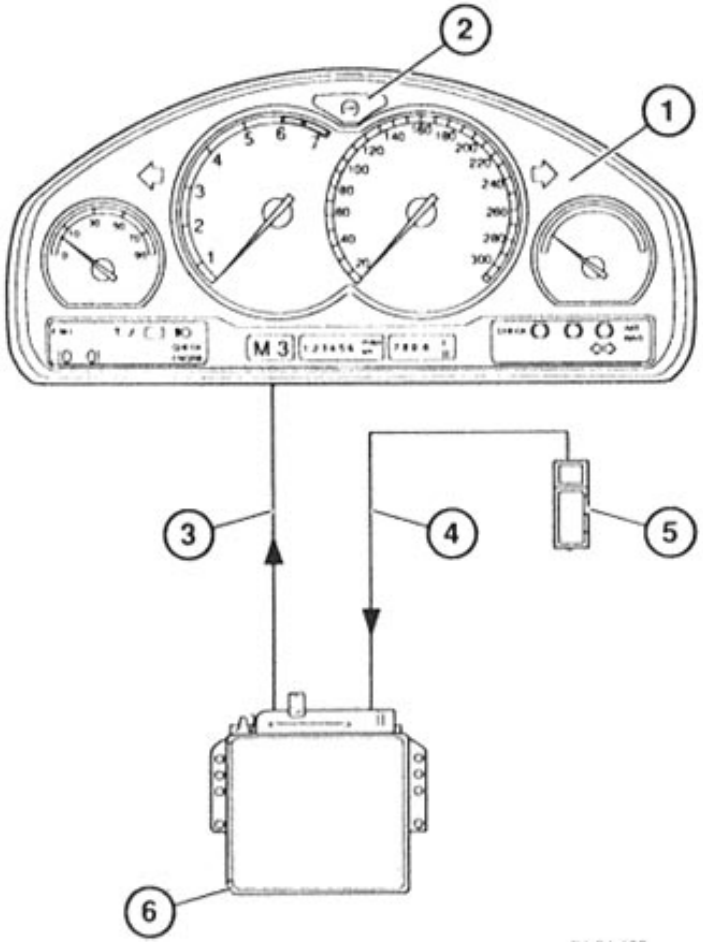
WIRING DIAGRAM FOR ASC+T



31 34 169

KL 61	Terminal 61 (charge control)	365	Signal sender right front
+ BLS	Stop light switch	366	Conn. - signal sender left rear
360	Electr. control unit ABS/ASC+T	367	Signal sender left rear
361	Hydr. control unit	368	Conn. - signal sender right rear
a	Return delivery pump motor	369	Signal sender right rear
b	Motor relay	370	Master relay (DME)
c	Valve relay	371	ABS lamp
d	Valve - left front	372	ASC lamp
e	Valve - right front	373	Plunger hydraulic control unit
f	Valve - left rear	374	DME
g	Valve - right rear	375	DME
h	Plunger relay	376	EML
i	Pressure sender relay	377	Transmission control
362	Conn. - signal sender left front	378	Diagnosis
363	Signal sender left front	379	DME
364	Conn. - signal sender right front		

ASC+T DISPLAYING AND SWITCHING MODE



1 Instrument cluster

2 ASC lamp

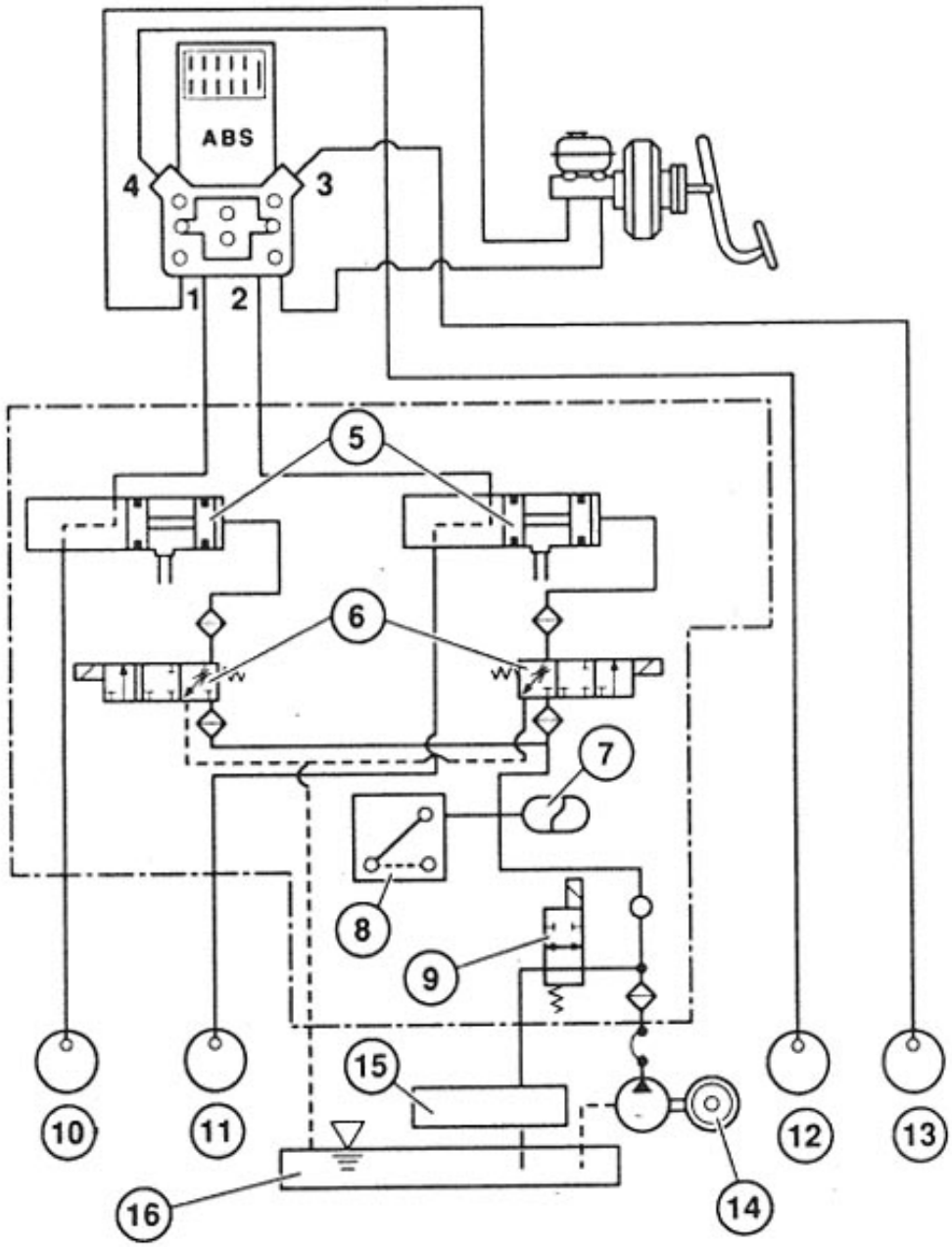
3 ASC active display / fault display / passive display

4 Switching signal

5 ASC passive push button switch

6 Control unit

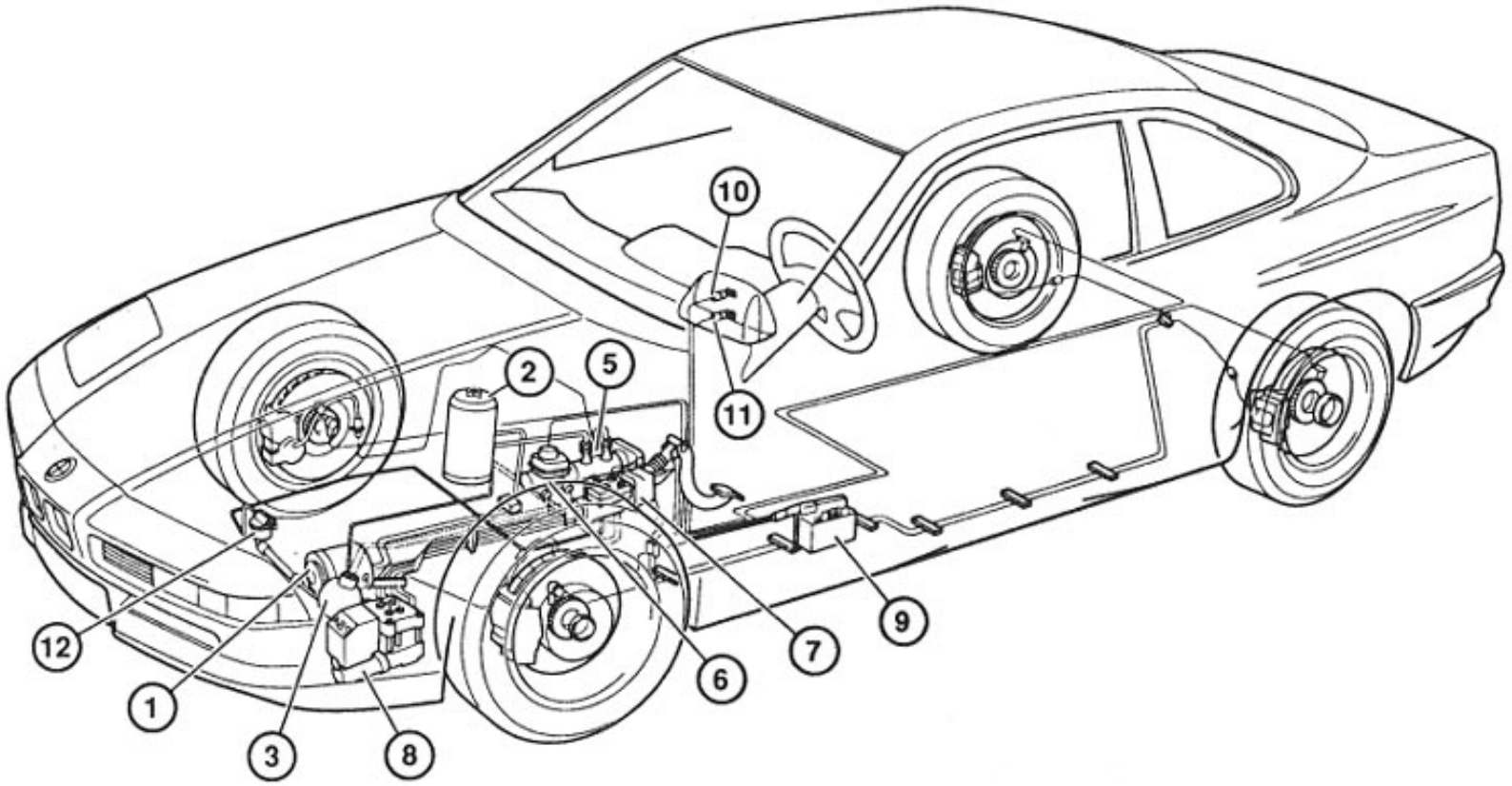
PLUNGER HYDRAULIC DIAGRAM
ASC+T
(Diagonal Brake Circuit Division)



32 34 166

1 Right rear pipe
2 Left rear pipe
3 Right front pipe
4 Left front pipe
5 Plunger piston
6 Solenoid valves
7 Pressure reservoir
8 Pressure switch
9 Charging valve
10 Right rear brake
11 Left rear brake
12 Left front brake
13 Right front brake
14 Tandem pump
15 Consumer
16 Oil supply tank

LAYOUT OF ABS/ASC+T



31 34 157

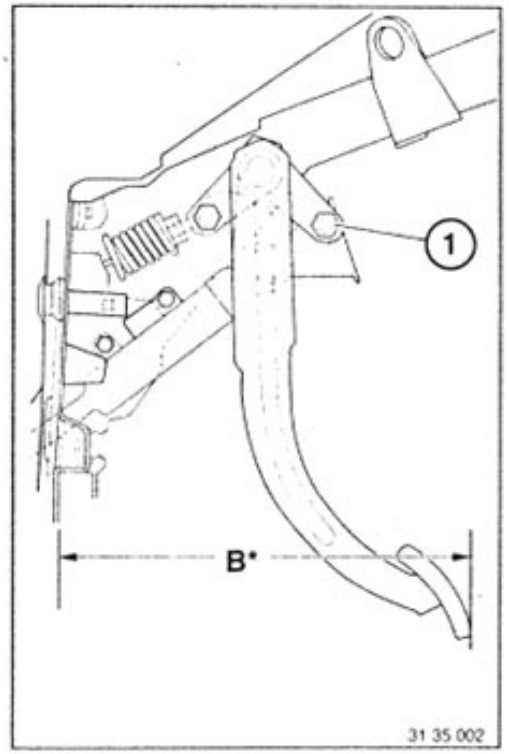
1 Tandem hydraulic pump
2 Supply tank
3 Pressure reservoir
4 Pressure control valve
5 Brake booster
6 Brake master cylinder
7 ASC+T (plunger hydr. control unit)
8 ABS (hydraulic control unit)
9 ABS/ASC or ASC+T control unit
10 ASC (control lamp)
11 ABS (control lamp)
12 ASC+T hydraulic filter

35 Pedals

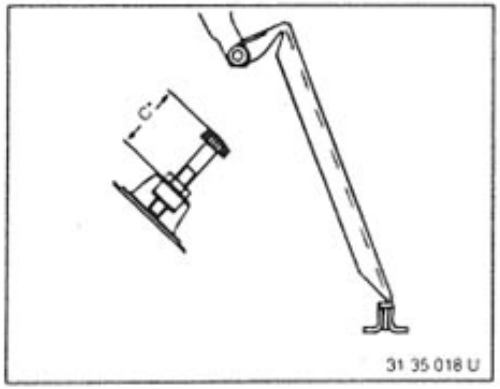
	Layout of pedals	35-00/1
	Control dimensions for spacing between pedals	35-00/2
35 11 000	Console for pedals, complete unit – remove and install	35-11/1
001	Console for pedals – replace	35-11/2
35 21 000	Brake pedal – remove and install or replace	35-21/1
35 41 000	Accelerator pedal – remove and install or replace	35-41/1
010	Accelerator pedal – remove and install or replace	35-41/2
480	Kick-down switch – remove and install or replace	35-41/3

35-00/1

Arrangement of pedals



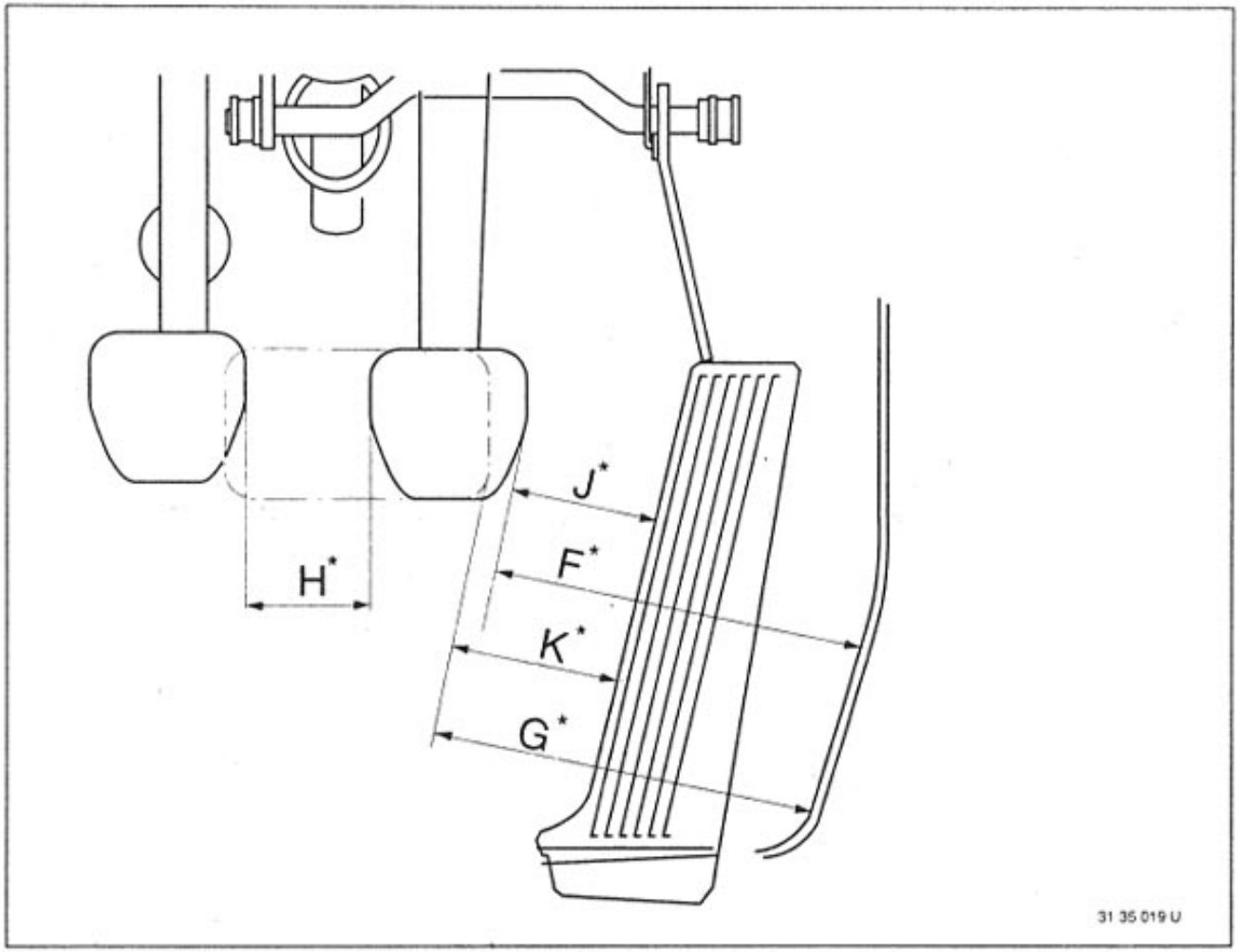
Brake pedal



Accelerator pedal

* Refer to Technical Data

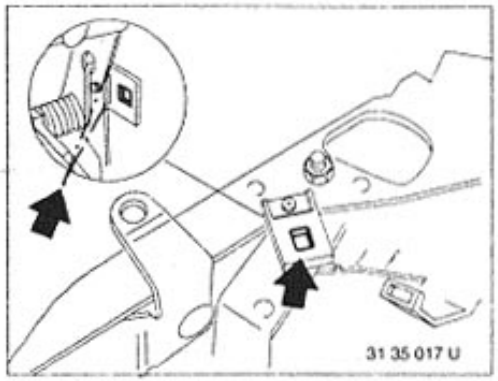
CONTROL DISTANCES FOR SIDE SPACING OF PEDALS



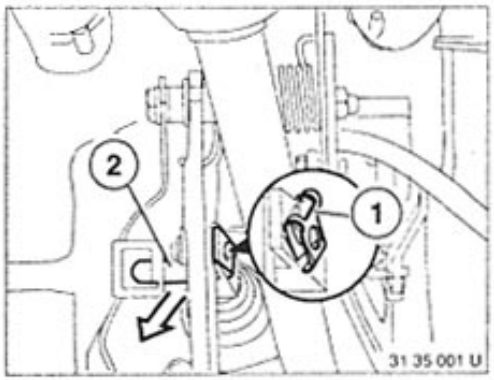
* See Specifications

35 11 000 Removing and installing complete mounting bracket for pedals

Removing accelerator pedal shaft, refer to 35 41 010.
Removing complete steering column, refer to Group 32.
Removing brake light switch, refer to Group 61.
Unfastening lines from clutch master cylinder.
Disconnect plug connection to accelerator sensor.



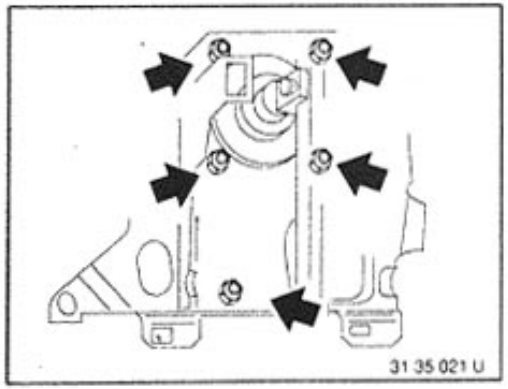
Unscrew bracket.



Remove clip (1) and pull out pin (2).

Installation:
Apply light coating of grease** to sliding face of pin and contact face of brake light switch.

Caution!
Stroke limitation should take place in master brake cylinder and must not occur in brake light switch.

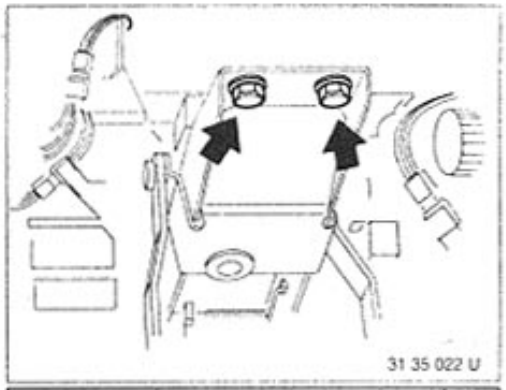


Unfasten nuts on end wall.

Installation:
Replace self-locking nuts, tightening torque*

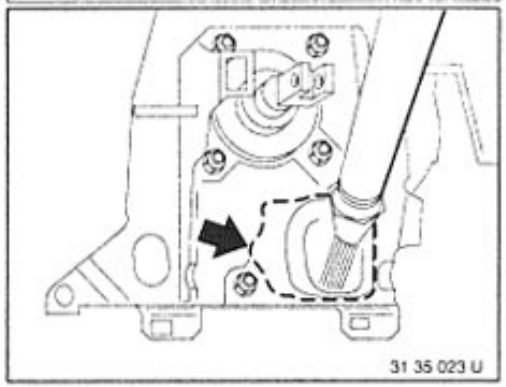
Note:
To illustrate them more clearly, accelerator and steering column are shown as removed units.

* Refer to Technical Data
** Refer to Operating Fluids Specifications



Unfasten screws.

Installation:
Tightening torque *



Cut away antidrumming lining.

Pull mounting bracket upwards to remove.

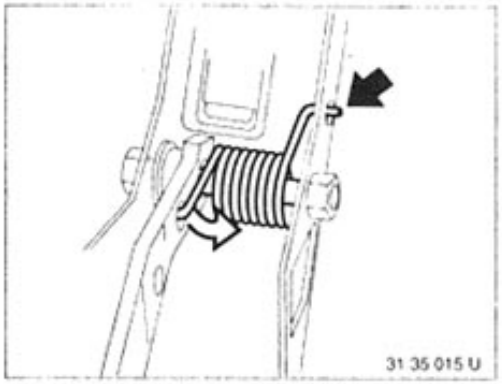
Installation:
Do not jam noise insulation on end wall!

* Refer to Technical Data

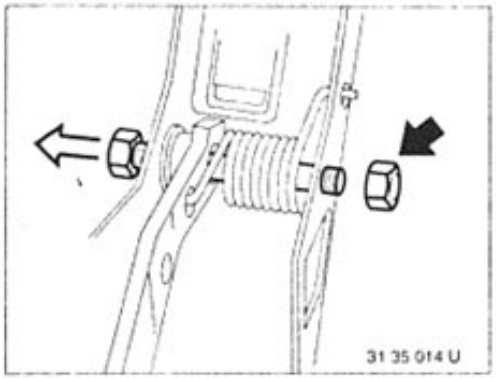


35 11 001 REPLACING CONSOLE FOR PEDALS

Automatic:
Remove pedal console – see 35 11 000.
Remove pedal value sender – see Group 12.

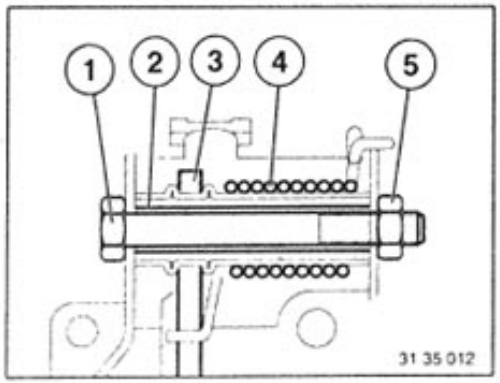


Disconnect spring.



Unscrew nut and take off brake pedal.

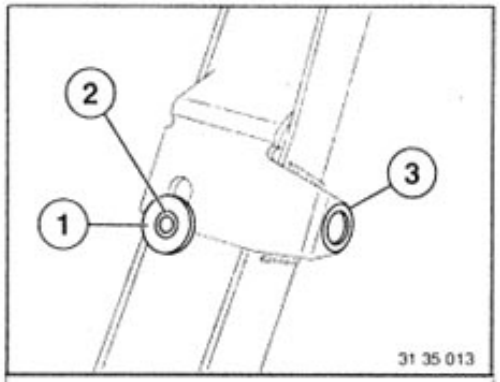
Installation:
Replace self-locking nut.
Tightening torque*.



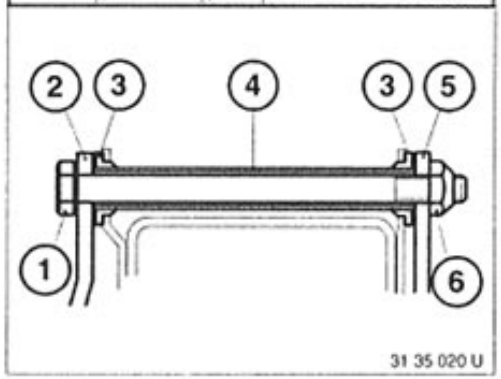
Installation:
1 Bolt
2 Sleeve
3 Brake pedal
4 Spring
5 Self-locking nut

Important!
Lubricate sleeve (2) with grease**.

* See Specifications
** See Operating Fluids



Remove guide sleeve (1) and spacer (2).
Take off bearing sleeve (3).



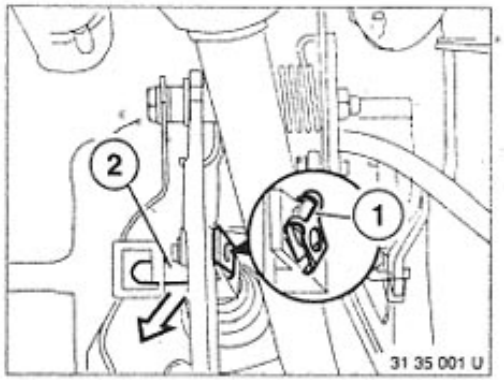
Mechanical Steering Column Control:
Transfer levers.

Installation:
1 Bolt
2 Lever, left
3 Bearing sleeve
4 Spacer
5 Lever, right
6 Self-locking nut
Replace self-locking nut (6).
Tightening torque*.

* See Specifications

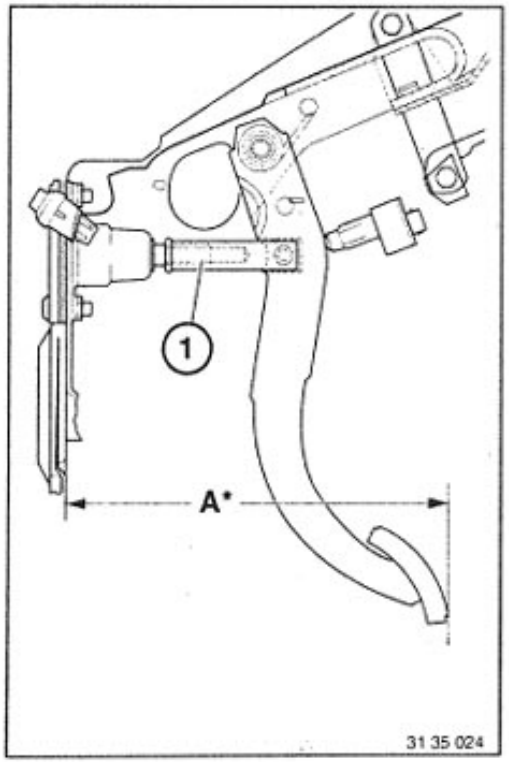
35 21 000 Removing and installing or replacing brake pedal

Remove lower left section of trim from instrument panel, see Group 51.
Remove brake light switch, see Group 61.



Remove clip (1), swivel pin and angle bracket (2) downwards, remove pin.

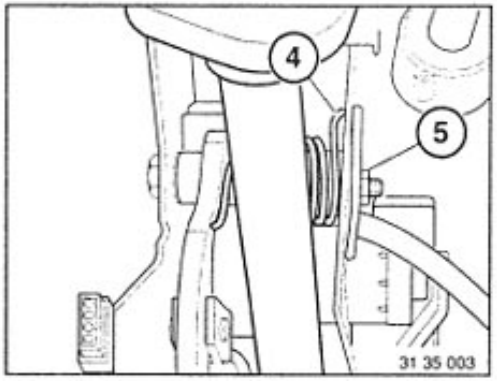
Installation:
Ensure that clip (1) is correctly located!
Apply light coat of grease** to sliding face and contact face of brake light switch.



Installation:
Adjust brake pedal on push rod (1) of master brake cylinder to dimension (A)*.

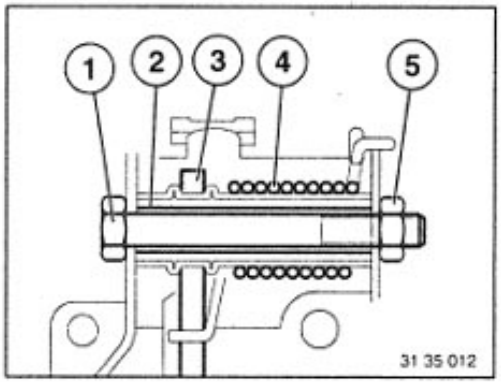
Caution!
Stroke restriction must take place in the master brake cylinder and not, for instance by the brake light switch.

* Refer to Technical Data
** Refer to Operating Fluids



Disconnect torsion spring (4) from brake pedal.
Unfasten nut (5) and remove bearing screw.
Remove brake pedal with spacer sleeve and torsion spring.

Installation:
First attach torsion spring (4) to pedal unit.
Replace self-locking nut (5), tightening torque *.



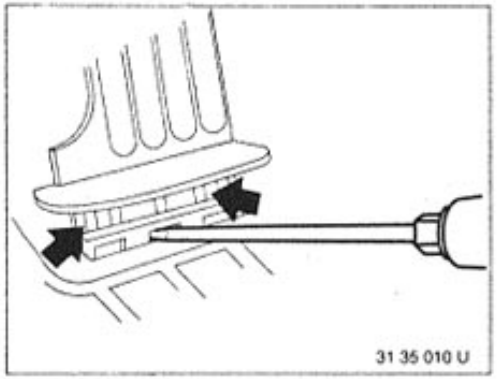
1 Hex screw
2 Spacer sleeve
3 Brake lever
4 Torsion spring
5 Self-locking nut

Installation:
Apply light coat of grease** to the hex screw (1) and the spacer sleeve (2).

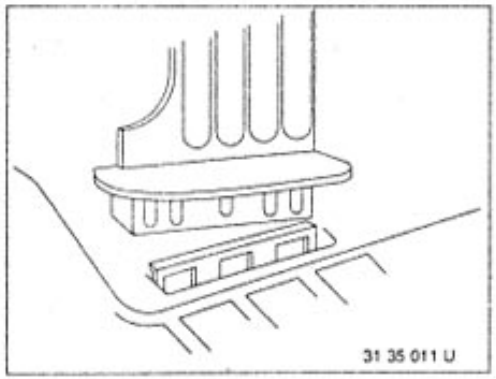
* Refer to Technical Data
** Refer to Operating Fluids

35 41 000 REMOVING AND INSTALLING OR REPLACING ACCELERATOR PEDAL

Installation:
Always replace a removed accelerator pedal.
Retaining clips of the old pedal could be damaged and cause the accelerator pedal to slide out of the plate – this could lead to an accident!

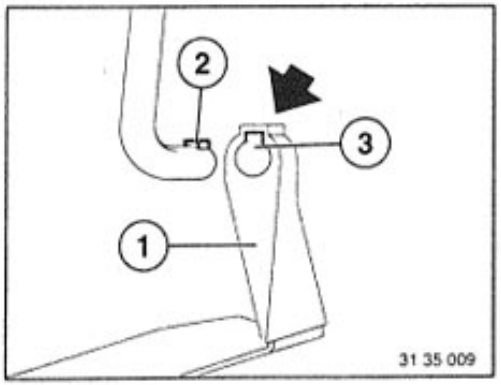


Press down on carpet, bend clips forward and lift out accelerator pedal from above.



Installation:
Install accelerator pedal with pocket at plate on the floor and let the clips engage.

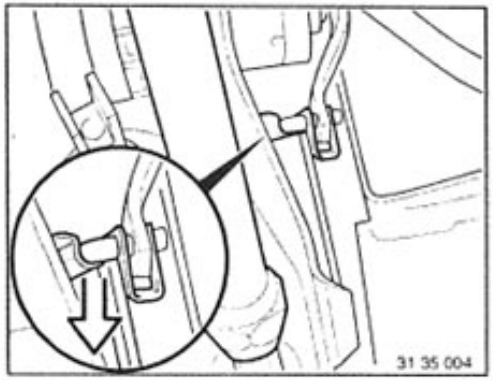
Important!
Always check for correct engagement of the clips.



Turn accelerator pedal (1) until linkage tab (2) of the accelerator shaft engages in opening (3).
Pull accelerator pedal off of the accelerator shaft.

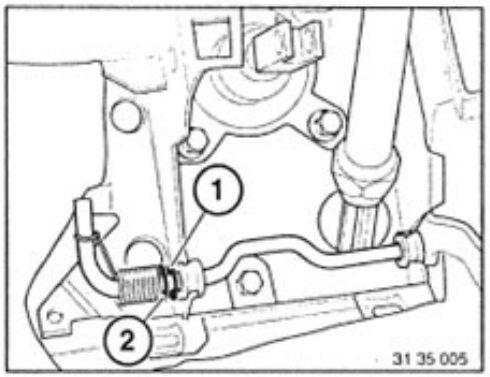
Installation:
Lubricate sliding surface on the accelerator shaft lightly with grease.**

**** See Operating Fluids**



35 41 010 Removing and installing or replacing accelerator pedal (gas pedal)

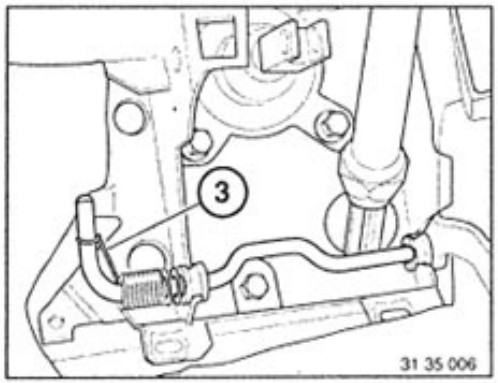
Remove lower left section of trim from instrument panel, see Group 51.
Disconnect clip, remove plunger rod.
Removing accelerator sensor, refer to Gr. 12.



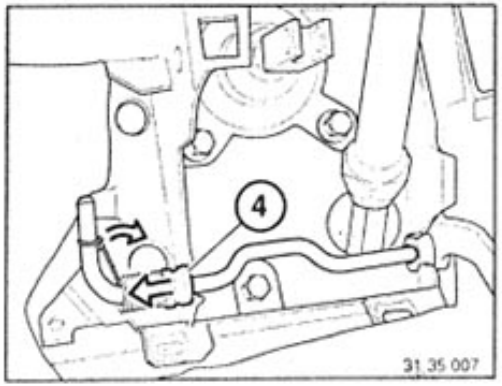
Remove retaining disc (1).

Installation:
Ensure disc is correctly located (2)!

Note:
Brake pedal and brake light switch have been removed to illustrate matters more clearly.



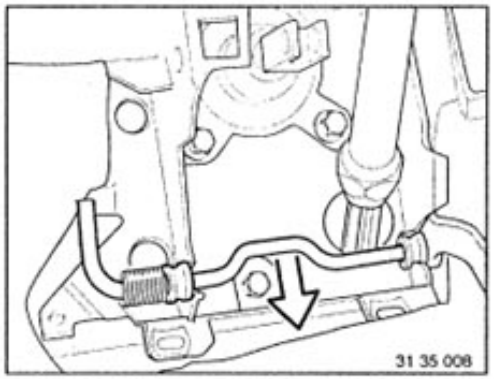
Remove torsion spring (3) from the accelerator pedal shaft.



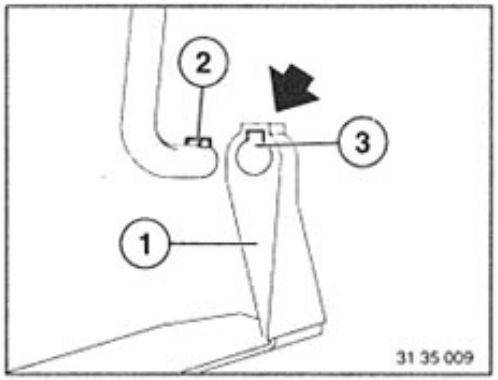
Slide left bearing bush (4) out of mounting bracket sideways, lift accelerator pedal shaft out to left.
Repeat procedure on right side.

Installation:
Check bearing bushes and replace if necessary.
Apply light coat of grease to sliding faces of accelerator shaft beside bearing bushes (4) on left and right sides**.

** Refer to Operating Fluids Specifications



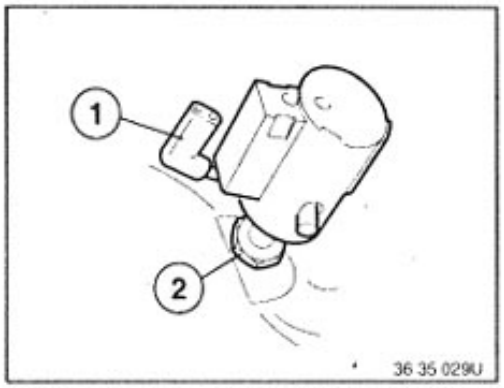
Remove torsion spring (3) from mounting bracket and lift out accelerator pedal shaft.



Rotate accelerator shaft and insert lug (2) through recess (3) in accelerator pedal (1).

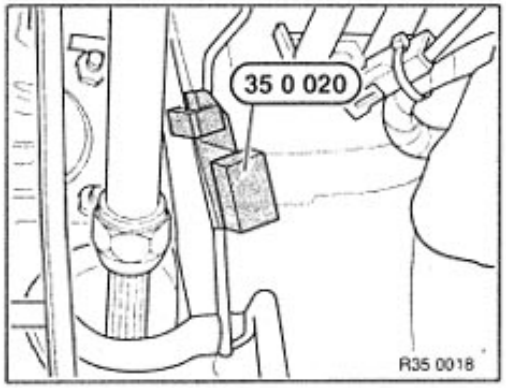
35 41 480 Replacing kick-down switch

Check switch, refer to BMW Diagnosis Program.



Remove flat-pin connector (1).
Unfasten nut (2) and twist switch to remove.

Installation:
Adjust Bowden cable for throttle valve actuation, refer to Repair Instructions Series 7 E38.

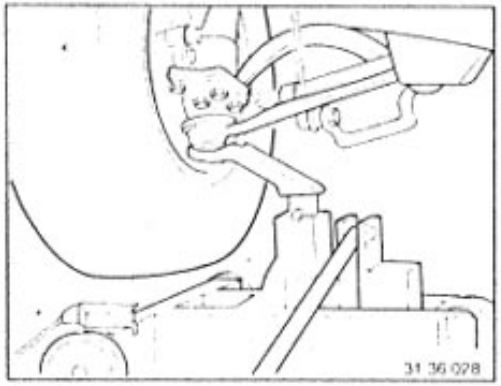


Vehicle with M 73 engine:

Installation:
Remove bottom left trim section from instrument panel.
Attach special tool 35 0 020 to the pedal bearing block.
Completely screw in kick-down switch.
Completely depress accelerator pedal and twist kick-down switch until it abuts against the accelerator pedal.
Fit lock nut (2).
Remove special tool.
Checking switch, refer to BMW Diagnosis Program.

36 Wheels and tires

36 10 008	Front wheel, left or right – balance electronically	36-10/1
058	Rear wheel, left or right – balance electronically	36-10/2
209	Wheel, front or rear – check lateral and radial runout	36-10/3
300	Wheel, front or rear – remove and install	36-10/4
508	Wheel – balance dynamically	36-10/5
713	Wheel – check lateral and radial runout in balancing machine	36-10/6
715	Rim – check lateral and radial runout	36-10/7
36 12 001	Tire for front, rear or spare wheel – replace	36-12/1
36 13 . . .	Wheel bolt lock – service install	36-13/1

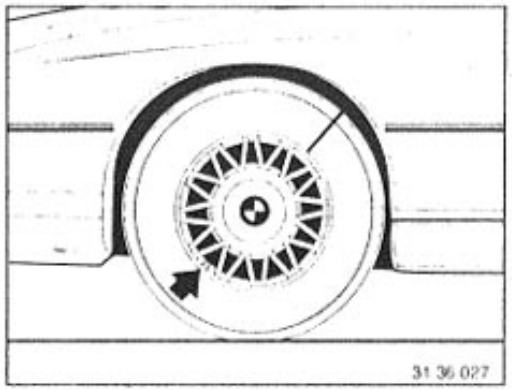


36 10 008 BALANCING LEFT OR RIGHT FRONT WHEEL ELECTRONICALLY (Finish Balancer)

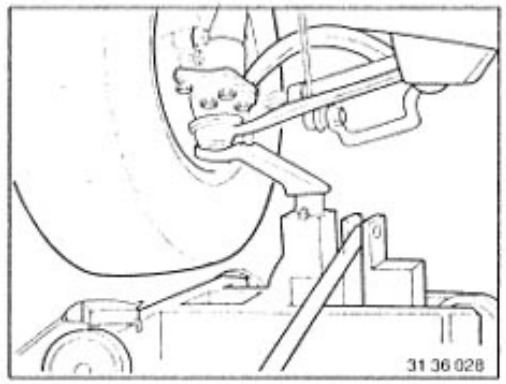
Prior to electronic balancing, always first balance the wheels stationary – see 36 10 508.

Set up gage for balancing on control arm end.
Use a suitable take-up fork or additional fork (see Service Information or Workshop Equipment/Planning).

Set up gage on the control arm as close as possible to the control arm end.



Make a chalk mark on the side of the tire, opposite the valve.



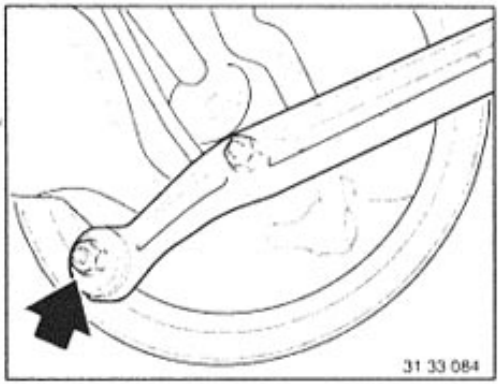
Connect leads for tester.

Important!
Balance wheel according to instructions supplied with pertinent balancing machine.
Balancing must be performed on a solid foundation (concrete floor without cellar).
Also refer to Service Information of Group 36.

If more than 15 grams of imbalance are displayed for one wheel during finish balancing, the possible causes (e.g. inaccurate stationary balancing, centering, etc.), also refer to Service Information 36 0 483 (196), must be eliminated before finish balancing and a previously finish balanced wheel must be rechecked.

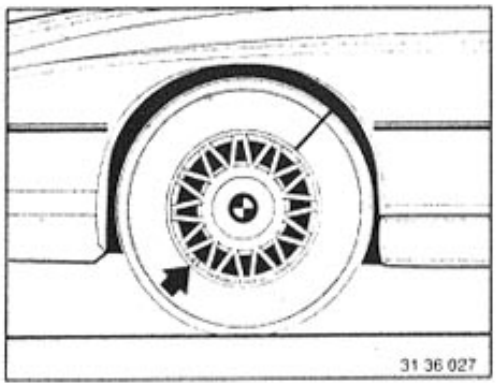
36 10 058 BALANCING LEFT OR RIGHT REAR WHEEL ELECTRONICALLY (Finish Balancer)

Prior to electronic balancing, always first balance the wheels stationary – see 36 10 508.



Set up gage for balancing on trailing arm as close as possible to the wheel. Use a suitable take-up fork or additional fork (see Service Information or Workshop Equipment/Planning).

Apply a workshop jack underneath the final drive with light pressure to deaden the final drive's own oscillation.



Make a chalk mark on the side of the tire, opposite the valve.
Check whether the rear wheels can be turned easily.

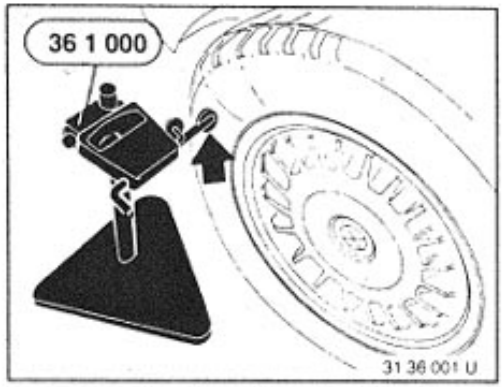
Connect leads for tester.

Important!
Balance wheel according to instructions supplied with pertinent balancing machine.
Balancing must be performed on a solid foundation (concrete floor without cellar).
Also refer to Service Information of Group 36.

Important!
Switch off ASC+T before finish balancing.

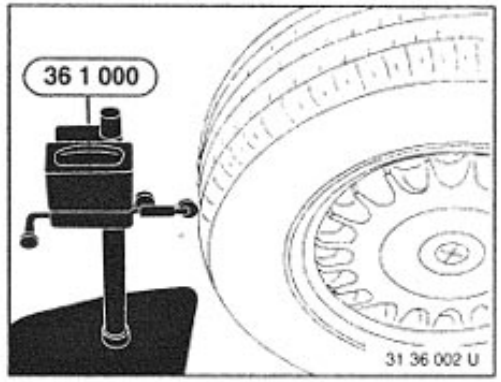
Balancing is performed with engine force at approx. 100 km/h (60 mph). This requires that the engine run smoothly and without misfire, doors, engine hood and trunk lid be closed and driver be seated in car as quietly as possible.
Exhaust extraction hoses must not touch the car's tail panel.

If more than 15 grams of imbalance are displayed for one wheel during finish balancing, the possible causes (e.g. inaccurate stationary balancing, centering, etc.), also refer to Service Information 36 0 483 (196), must be eliminated before finish balancing and a previously finish balanced wheel must be rechecked.

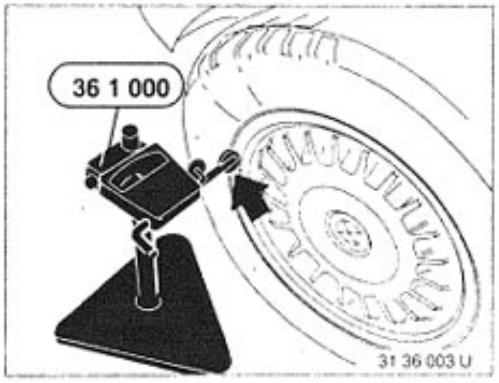


36 10 209 CHECKING WHEEL FOR LATERAL AND RADIAL RUNOUT

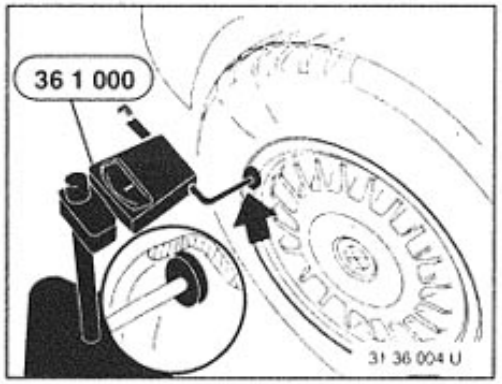
Wheel bearings must be in perfect condition.
Lift car.
Check wheel for lateral runout* with Special Tool 36 1 000.



Check wheel for radial runout* with Special Tool 36 1 000.



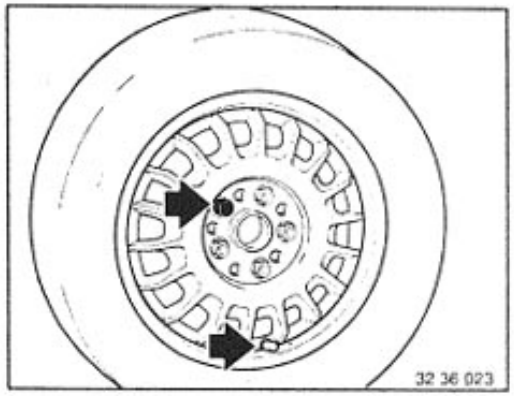
If necessary, remove balance weights.
Check lateral runout* of rim with Special Tool 36 1 100.



Check radial runout* of rim with Special Tool 36 1 000.

* See Specifications

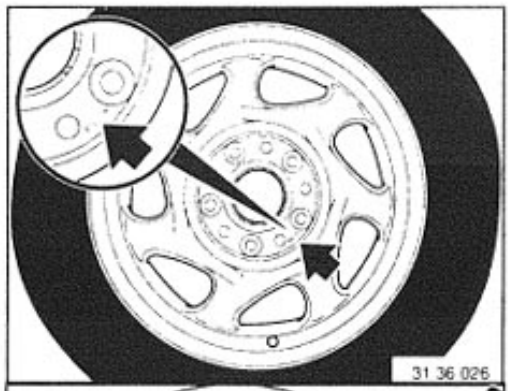
* See Specifications



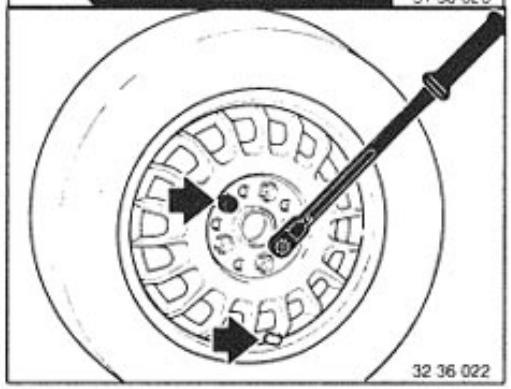
36 10 300 Removing and installing front wheel or rear wheel

Caution!
Wheel is electronically balanced.
To avoid clamping errors and imbalance, follow the procedure described below:

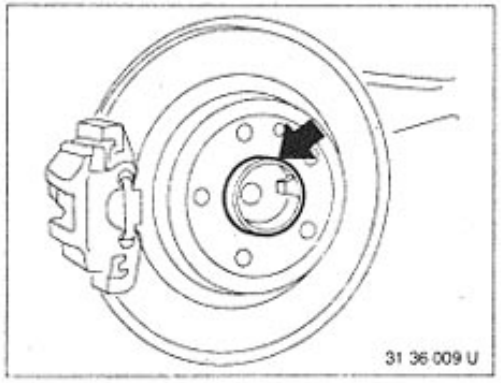
- Unfasten wheel studs.
- Wheel setting with valve pointing downwards, fitted in same position.
- If several wheels are removed at once, mark the location of wheels on the tires (e.g. with chalk).
- Mark position of wheel relative to wheel hub (to avoid clamping errors).
- Mark position of wheel lock relative to wheel (to avoid balancing problems).
- Unfasten wheel studs.



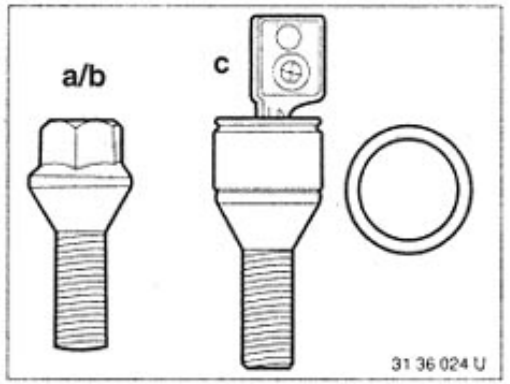
On directional wheels, note the location of the designation.
The arrow on the wheel indicates the direction of rotation.
If no designation can be found, check the parts number of the wheel in the Parts Catalogue and determine the correct location.



Tighten disc wheels crosswise.
Tightening torque*.
If new disc wheels are being fitted for the first time, recheck the tightening torque * after 1 000 km.
An appropriate note should be attached within the driver's field of view.



Installation:
Before fitting each wheel, clean all dirt or old grease residue off the wheel centering bead and contact faces of disc wheels and coat centering point with Plastilube **. Check wheel stud thread and taper for wear and replace wheel studs if necessary.
Apply light coat of grease to wheel stud thread but the taper must remain free of grease during assembly.

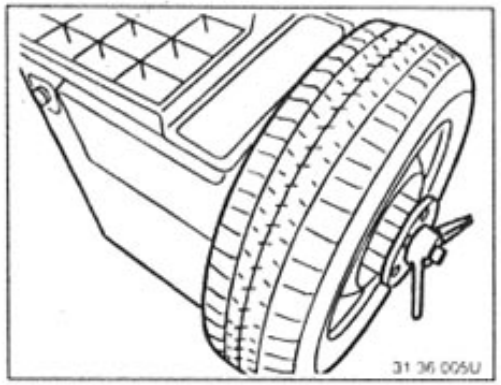


a) Wheel stud galvanized
b) Wheel stud with black chrome coating
c) Locking wheel stud with black chrome coating

Note for anti-theft wheel studs:
In the event of a missing adapter, use a suitable adapter from the
wheel stud adapter set
special tool 36 1 300
to unfasten the anti-theft wheel studs.

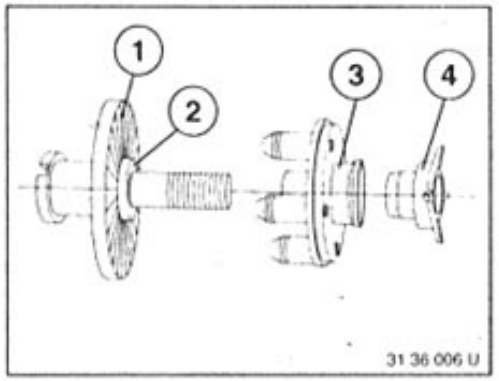
** Refer to Operating Fluids

* Refer to Technical Data



36 10 508 BALANCING WHEEL DYNAMICALLY (Wheel Removed)

Remove old balancing weights, stones in treads and large pieces of dirt. Check tire pressure, condition of tires, tires for damage or flat spots (caused by long parking of car with hot tires). If necessary, check wheel for radial and lateral runout – see 36 10 209.



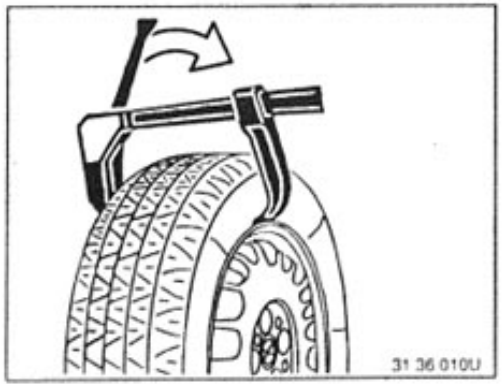
Use suitable center of pertinent balancing machine supplier.

1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

Also refer to Workshop Equipment and Planning.

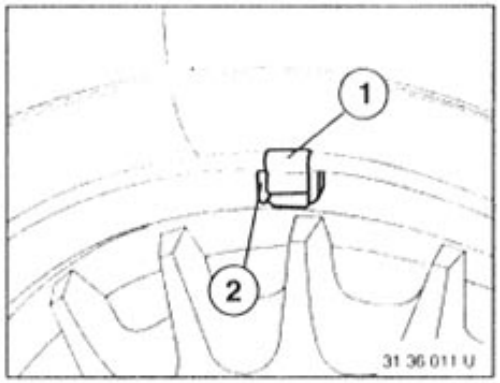
Important!
It is necessary to mount the wheel on the balancing machine in the same manner as it will be mounted on the car afterwards (e.g. valve facing down), in order to avoid clamping-over errors.

Balance wheel according to instructions supplied with the pertinent balancing machine.



Pry the tire wall away from the rim flange slightly with a tire pliers** at a suitable point and insert a retainer in the case of light alloy rims.
Remove the tire pliers and slide a balance weight underneath the retainer and let it engage.

** See Workshop Equipment/Planning

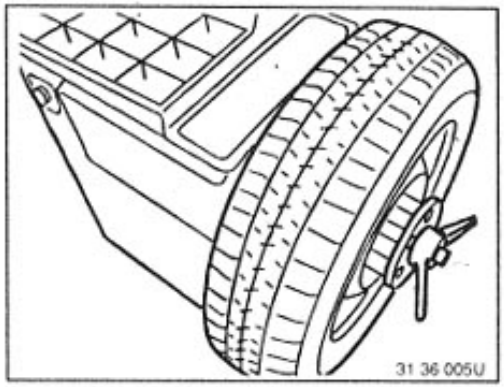


Arrangement of Balance Weights for Cast Light Alloy Wheel Rims:

1 = Spring clip
2 = Balance weight

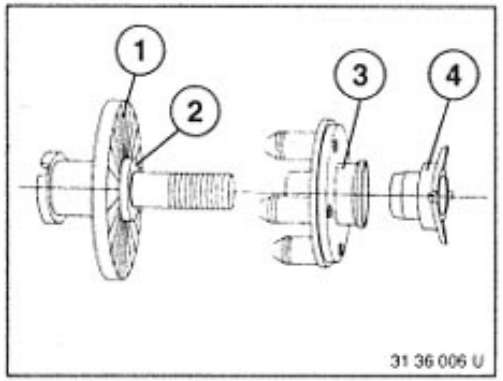
Max. imbalance per wheel and side*.

* See Specifications



36 10 713 CHECKING ONE ROAD WHEEL FOR RADIAL AND LATERAL RUNOUT ON BALANCING MACHINE (Wheel Removed)

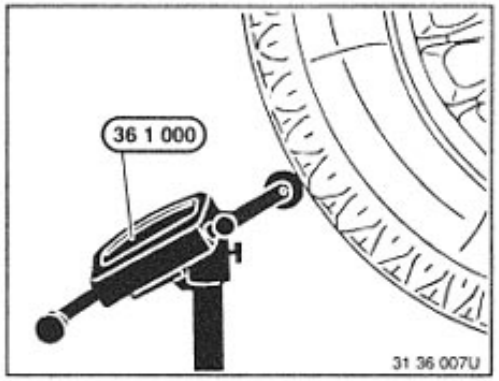
Remove wheel – see 36 10 300.
Mount wheel on balancing machine.
Wheel must be mounted on the balancing machine as it is mounted on the car (valve facing down) to avoid clamping-over errors.



Use suitable center of pertinent balancing machine supplier.

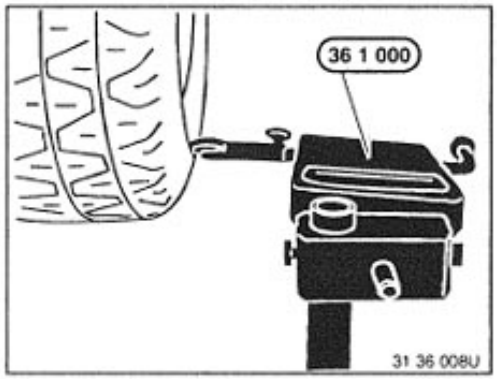
1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

Also refer to Workshop Equipment and Planning.



Set up Special Tool 36 1 000 on tire tread surface.
Turn wheel by hand and read maximum tire radial runout*.

Note:
Special tool must be perpendicular to the tire tread surface.



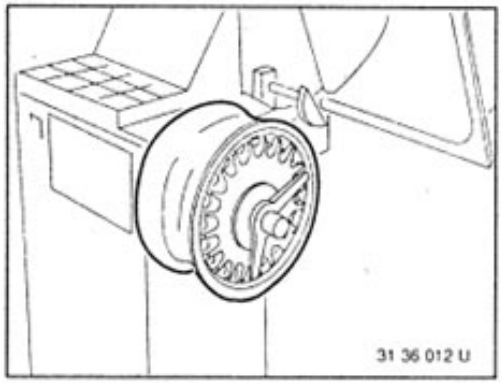
Set up Special Tool 36 1 000 on side surface of tire.
Turn wheel by hand and read maximum tire lateral runout*.

Note:
Special tool must be perpendicular to side surface of tire.
Never measure on tire data surface!
If necessary, check radial and lateral runout of wheel rim – see 36 10 715.

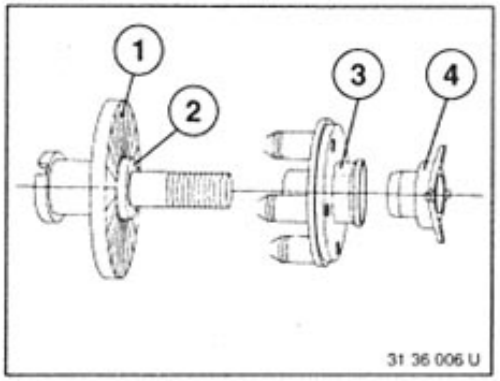
* See Specifications

36 10 715 CHECKING WHEEL RIM FOR RADIAL AND LATERAL RUNOUT

Remove wheel – see 36 10 300.
Check front or rear wheel for radial and lateral runout – see 36 10 209.
Take tire off of wheel rim.
Remove old balancing weights.
Remove dirt on rim well and rim flange.



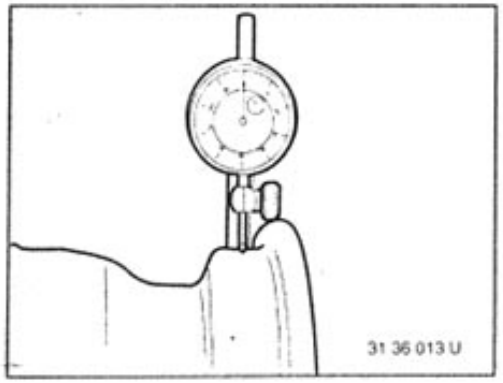
Mount wheel rim on balancing machine.



Use suitable center of pertinent balancing machine supplier.

1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

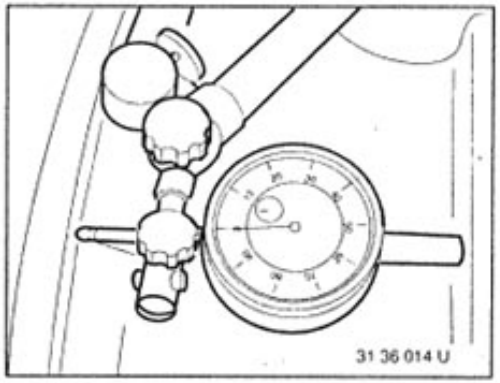
Also refer to Workshop Equipment and Planning.



Apply dial gage on rim well.
Turn wheel by hand and measure the maximum radial runout*.
Measure on both sides of rim well.

Note:
Dial gage must be perpendicular to the rim well.

* See Specifications

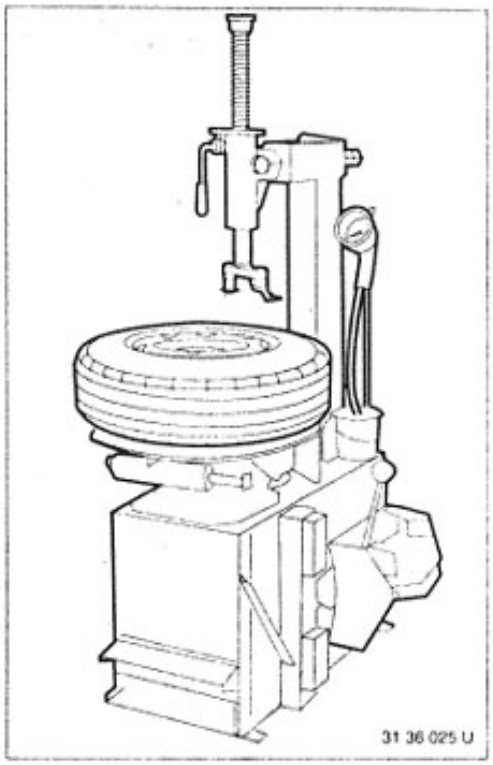


Apply dial gage on rim flange.
Turn wheel by hand and measure the maximum lateral runout*.
Measure on both rim flanges.

Note:
Dial gage must be perpendicular to the rim flange.

Important!
Avoid clamping-over errors when mounting afterwards – also refer to 36 10 508.

* See Specifications



36 12 001 Replacing tire on front, back or spare wheel

Refer to operating instructions supplied with pertinent tire mounting machine for correct mounting of tires. However, also make sure that the equipment is in perfect condition and that the wheel rim and tire are not damaged.

General tire removing / mounting instructions

Removing:

Begin the removal of a tire at the valve.
After pressing the tire off the rim flange, remove balance weights, press tire bead into well and coat thoroughly with tire mounting paste **.
Clean disc wheel thoroughly and inspect for damage before fitting the tire.
The valve and valve insert must be replaced each time a tubeless tire is removed and installed.

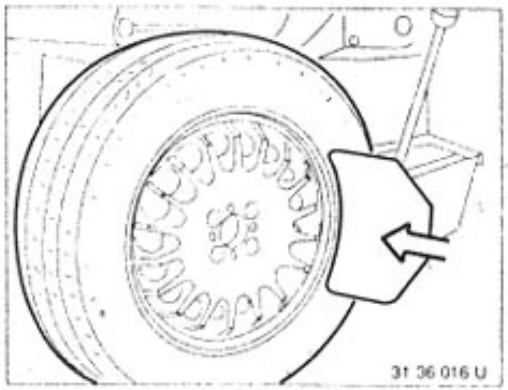
Caution!
It will be necessary to loosen the bead at several points on the bead periphery from the inside and outside with the pressing-off horn before pressing off the tire.
If it is very difficult to press off the tire, loosen tire from rim flange as well as possible with the pressing-off horn and then apply a coat of tire mounting paste between the tire and rim flange.
Repeat this step around the entire tire periphery.
Then press of tire completely.

Mounting:

Coat tire bead with tire mounting paste **.
Make sure tire is mounted on correct side, especially in case of asymmetric tires.
The "outside" of these tires is marked.
Mount tire with as little as possible stress on the beads, as otherwise there would be danger of damaging the tire.
Have the tire bead – coming from the well – first jump over the hump of the rim shoulder.
Build up pressure in steps while observing continuously.
Maximum "jumping pressure": 3.3 bar.
If the tire is not seated on the rim correctly, increasing the inflation pressure will not improve tire seating!
Instead it will be necessary to press off both tire beads, apply another coat of mounting paste and then reinflate the tire.
Only after the bead bears correctly on the rim shoulder should the pressure be slowly increased until the tire "seats".
Maximum "seating pressure": 4.0 bar.
Refer to Service Information of Group 36 for approved tires and tire sizes as well as special equipment.

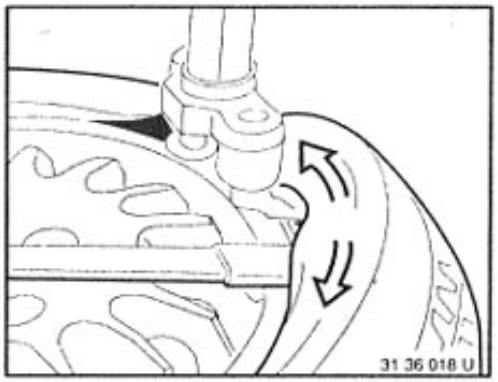
** Refer to BMW Parts Service

** Refer to BMW Parts Service

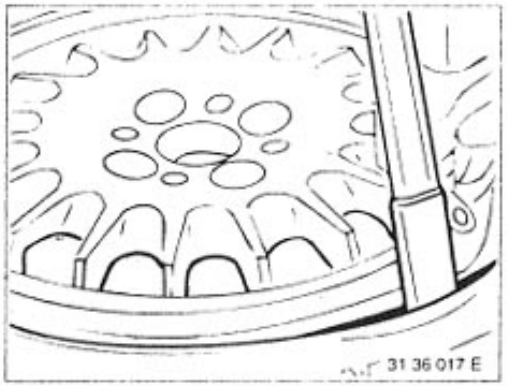


Mounting tires with a mounting machine:

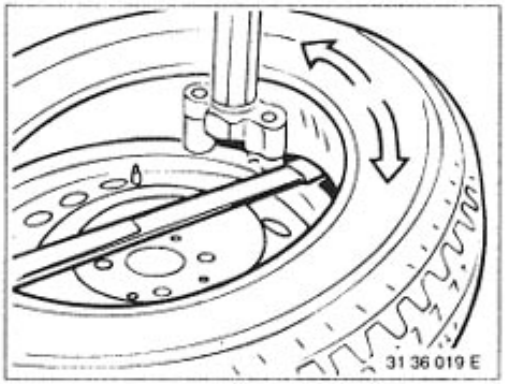
Unscrew valve and deflate tire.
Press off bead from rim flange all around on outside and inside using pressing-off horn of machine.
If tire beads fit too tight, first only loosen tire from flange at several points with the pressing-off horn prior to the actual pressing-off operation.
Push both tire beads into rim well completely until they are loose.
Pull off balance weights on rim and clean rim to remove large pieces of dirt.
Coat tire beads with mounting paste **.
Clamp wheel on mounting machine.
Narrow rim shoulder always faces up.



Let mounting machine run back a short distance (counterclockwise) so that the tire bead can slide fully on to the mounting finger.
Then let mounting machine run forward (clockwise) a short distance.
In so doing always check whether the bottom bead is in the well and the tire is given enough time to move.
Stop the machine and let it run back slightly if the bead jams.

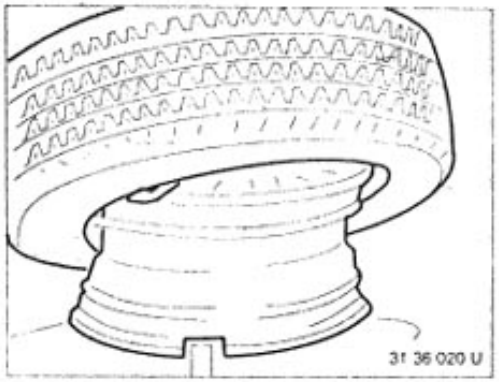


Swing mounting pillar into position or fold and let it engage.
Adjust mounting head, whereby it must be pressed on the rim edge fully and turn down the lever for the clamp fixture; normally the distance of the mounting head will set in automatically.
Valve should be about 10 cm to the right of the mounting head.
Lift tire bead over mounting finger using tire irons.
It is recommended to use coated or shrink-fit hose covered tire irons for light alloy rims.

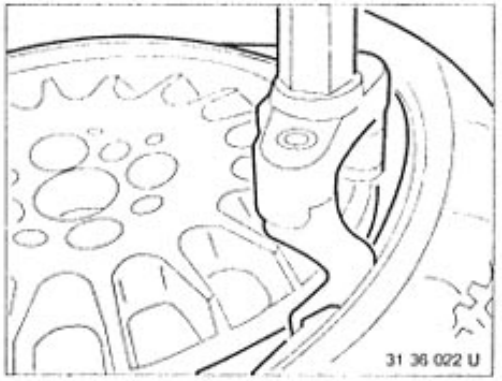


If the upper bead is pulled off the rim, now also lift the bottom bead over the mounting finger with the tire iron.
Let machine run back a short distance again and then forward (clockwise) briefly until there is complete separation of the tire from the rim.

** Refer to BMW Parts Service



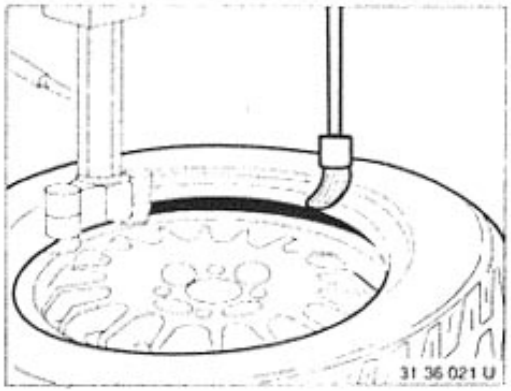
Release lock and tilt back or swing away the mounting pillar.
Unclamp and clean the rim.
Replace the valve.
Coat the rim flange and tire beads with mounting paste **.
Clamp the rim on the mounting machine.
Slide on the tire with the lower bead over the rim flange partially.
Valve is 10 cm to the right of the mounting head.



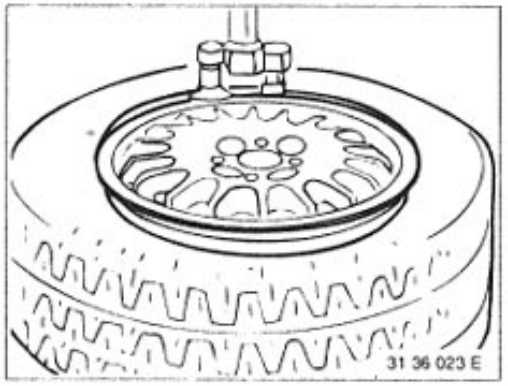
Press the upper tire bead underneath the mounting finger. Tire bead should seat in rollers next to the mounting finger.

Caution!
Do not pinch or damage the bead.

Run the mounting machine forward (clockwise) a short distance, while checking that the lower tire bead remains in the well.



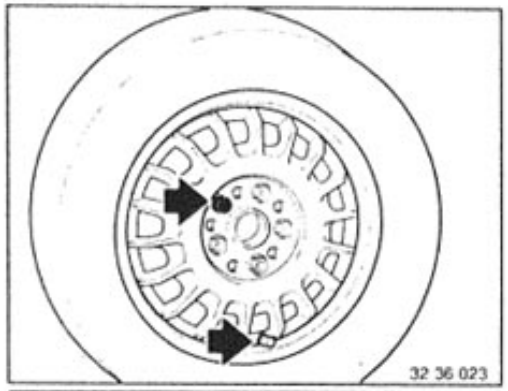
Swing or tilt the mounting pillar into position and lock.
Check adjustment of the mounting finger, readjusting if necessary and clamp.
Press the tire underneath the mounting finger by hand.
Tire bead should seat in the roll next to the mounting finger.
Let the mounting machine run forwards (clockwise) a bit at a time.
The lower tire bead will drop into the well.

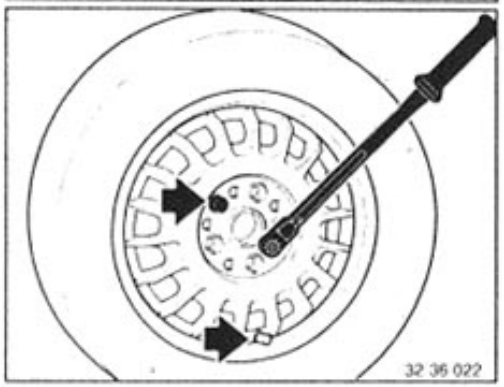


After mounting, first release the clamps and then inflate the tire (without valve).
Increase pressure up to 3.3 bar (330 kPA) in gradual steps (jumping pressure).
If the tire bead does not slide on to the rim edge all around, do not increase the pressure. Instead, deflate the tire and press off the tire bead, then coat the rim flange with mounting paste ** and reinflate to a pressure of 3.3 bar.
If the beads bear perfectly on the rim shoulders, increase the pressure to maximum 4.0 bar to "seat" the tire.
Screw in the valve and correct the tire pressure.

** Refer to BMW Parts Service

** Refer to BMW Parts Service





36 13 ... SERVICE INSTALLING ONE WHEEL BOLT LOCK

- Loosen wheel bolts.
- Lift car so that wheel can be turned easily.
- Loosen wheel bolts enough that wheel can be turned easily on the wheel hub.
- Position wheel with its valve facing down.
- Remove top wheel bolt and install wheel bolt lock.

Imbalance could be produced by play in the center and the wheel's own weight.
This imbalance is reduced to a minimum by installing a slightly heavier wheel bolt lock in the top wheel bolt position.

- Tighten wheel bolts crosswise hand tight in this position (wheel bolt lock at top, valve at bottom).
- Lower car and tighten wheel bolts crosswise.
  Tightening torque*.

If a customer complains about wheel imbalance after installation of the wheel bolt lock to these instructions, the wheels must be finish balanced.

* See Specifications

37 Integrated suspension system

	Electronic Damper Control EDC III	37- 0/1
	General information on EDC	37- 0/1
	Layout of EDC III model 850i	37-10/1
31 31 000	Spring strut shock absorber - (EDC) front – remove and install	37-14/1
33 52 000	Spring strut shock absorber - (EDC) rear – remove and install or replace	37-14/1
37 14 007	Longitudinal acceleration sensor – remove and install or replace	37-14/2
017	Body acceleration sensor, front – remove and install or replace	37-14/3
027	Body acceleration sensor, rear – remove and install or replace	37-14/4
050	Control unit – remove and install or replace	37-14/5

ELECTRONIC ABSORBER CONTROL EDC III

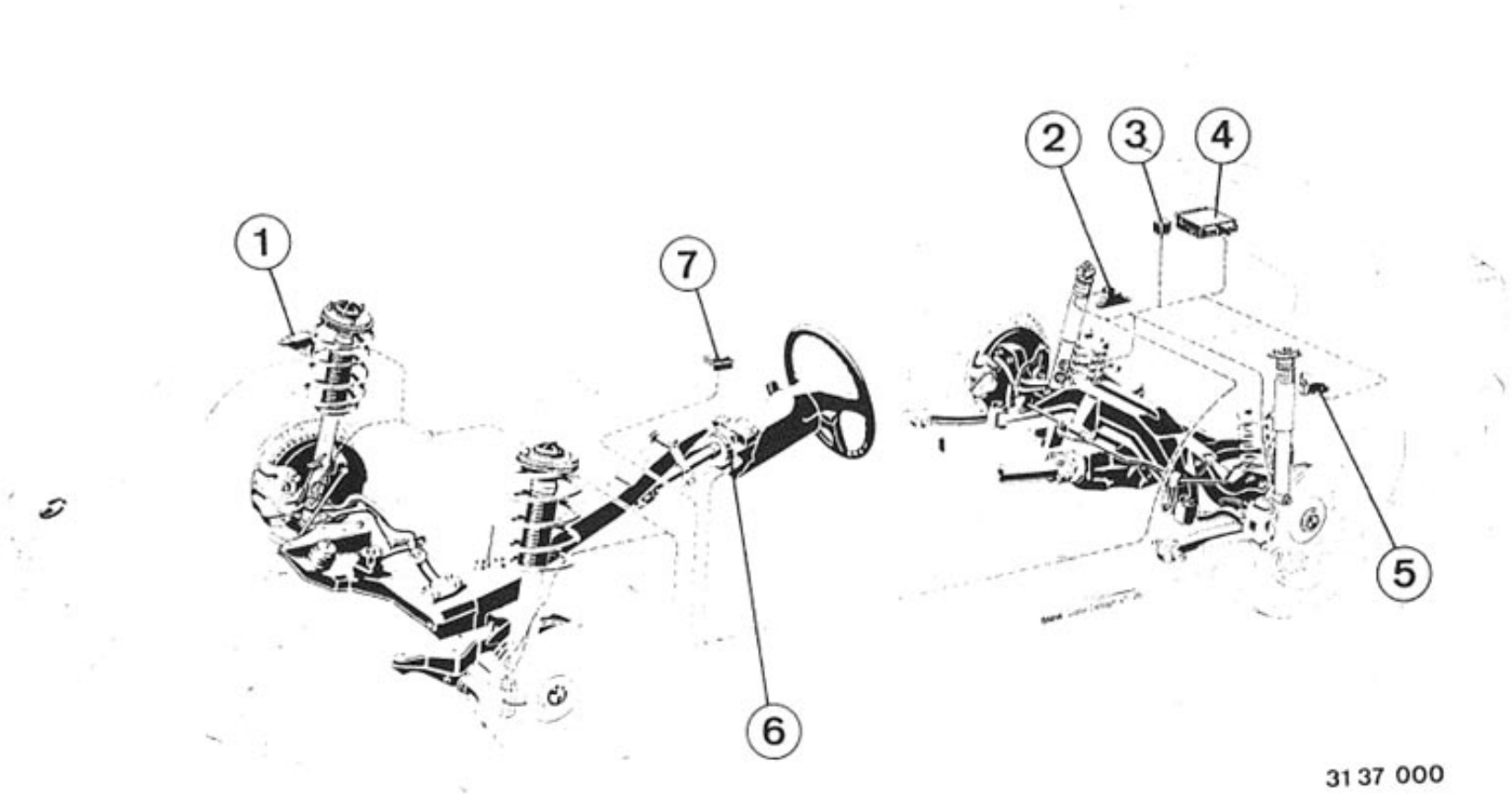
Program versions "Sport" (S) or "Comfort" (K) can be selected with the program button.
Suspension is adjusted automatically between medium and hard for (S) or soft, medium and hard for (K) depending on driving conditions.
The system tests itself after switching on the ignition.
If the system is okay, a control lamp corresponding with the selected program will light up in the program button.
Solenoid valves on the shock absorbers are activated by the control unit and adapt the absorbing force to the driving conditions. For this purpose the control unit processes electronic speed signals and signals from the following components.

Front body acceleration sensor, rear body acceleration sensor, axial acceleration sensor, steering angle sensor and road speed signal.

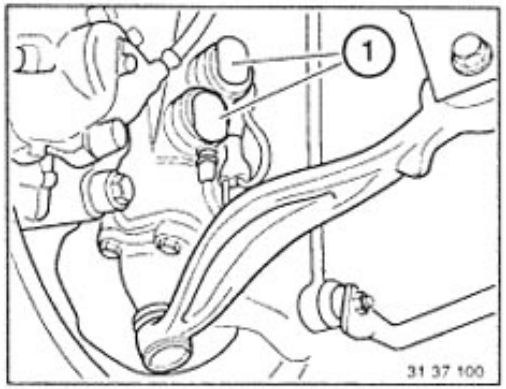
GENERAL INFORMATION ON EDC

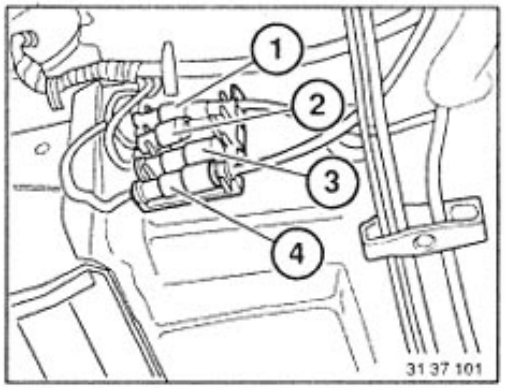
- EDC III is protected with fuse no. 32.
- Covers on the solenoid valves must not be opened.
- Shock absorbers must not be placed on solenoid valves or their connections.
- Shock absorbers may only be stored standing upright.
- Recommendation: only replace both shock absorbers of one axle.
- Fault memory must be cancelled with the BMW diagnosing system after elimination of faults and disconnection of electric connections with the ignition switched on.
- Steering angle offset must be performed with the BMW diagnosing system according to instructions in the EDC III diagnosis test program after working on the steering.
- Troubleshooting – see Car Electric/Electronic Test Plan of Gr. 37.

EDC III LAYOUT IN 850 I MODEL



1 Body acceleration sensor
2 Body acceleration sensor
3 Relay (power saver)
4 EDC III control unit
5 Axial acceleration sensor
6 Steering angle sensor
7 EDC III program button



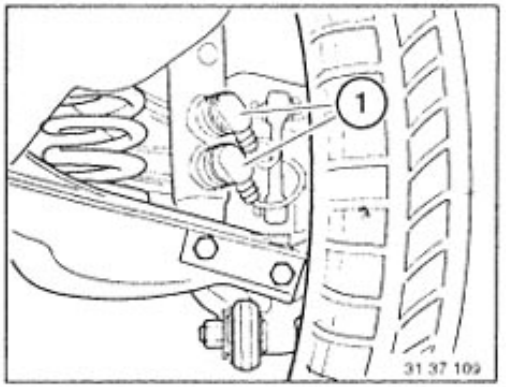


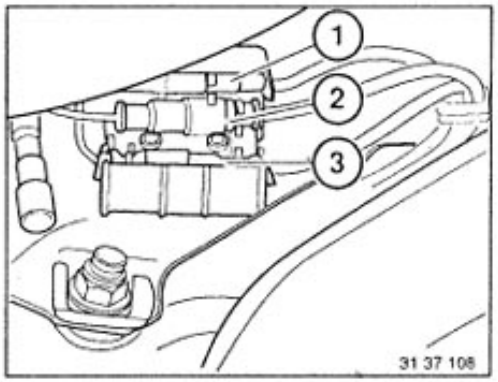
31 31 000 REMOVING AND INSTALLING OR REPLACING FRONT SPRING STRUT SHOCK ABSORBER (EDC)

Refer to page 37-00/1 for general information about EDC.
1 = Solenoid valves
Switch off ignition.
Disconnect plugs.
Location:
Firewall left/right front outside behind a cover.
Other steps - refer to Group 31.

Remove cover - refer to Group 51.

1 = ABS plug (white)
2 = Not used
3 = Not used
4 = EDC plug





33 52 000 REMOVING AND INSTALLING OR REPLACING REAR SPRING STRUT SHOCK ABSORBER (EDC)

Refer to page 37-00/1 for general information about EDC.
1 = Solenoid valves
Switch off ignition.
Disconnect plugs.
Location:
Protection box on rear axle carrier.
Other steps - refer to Group 33.

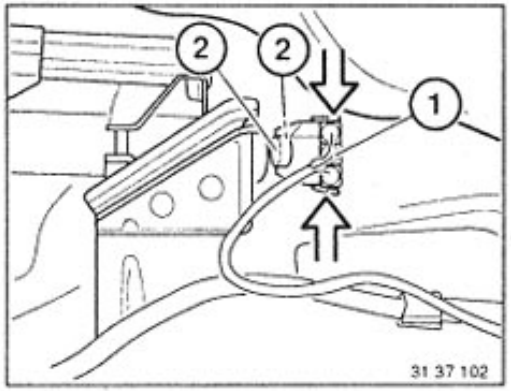
Open protection box.

1 = Brake pad wear indicator
2 = EDC plug
3 = ABS plug

37 14 007 REMOVING AND INSTALLING OR REPLACING AXIAL ACCELERATION SENSOR

Refer to page 37-00/1 for general information about EDC.

Location:
Inside of left rear wheel house, in front of car jack mounting point.

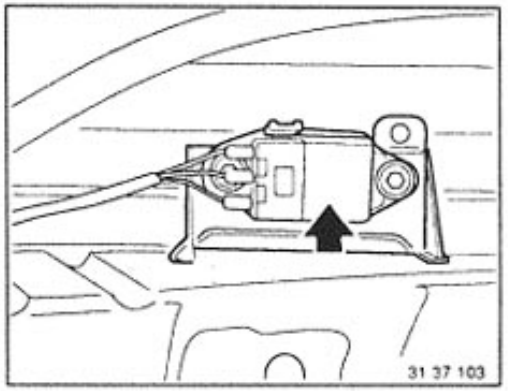


Switch off ignition.
Disconnect plug.
Unscrew screws.

Installation:
Tightening torque = 6.5 Nm.

Pin Connections:
31 = Ground
15 = > 11.8 V
A = Signal

Note:
Remove road speed sensor - refer to Group 62.

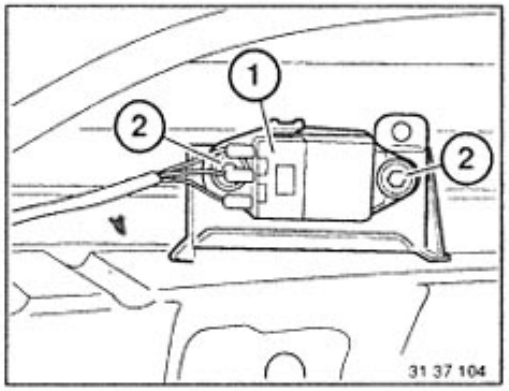


37 14 017 REMOVING AND INSTALLING OR REPLACING FRONT BODY ACCELERATION SENSOR

Refer to page 37-00/1 for general information about EDC.

Location:
In right wheel house.

Remove cover - refer to Group 51.



Switch off ignition.
Disconnect plug (1).
Unscrew screws (2).

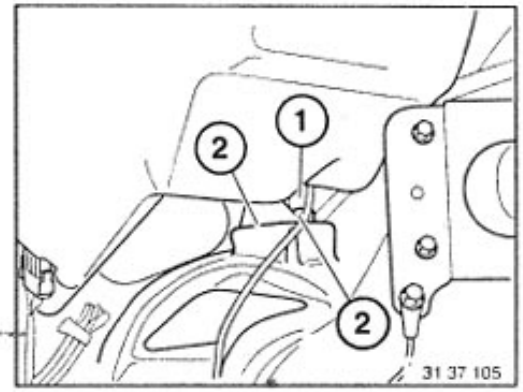
Installation:
Tightening torque = 6.5 Nm.

Pin Connections:
31 = Ground
15 = > 11.8 V
A = Signal

37 14 027 Removing and installing or replacing rear body acceleration sensor

Observe general instructions on EDC.

Installation:
In right-hand inside wheel arch, in front of spring strut shock absorber.
Remove and install cover, see Gr. 51



Switch off ignition.
Unfasten connector (1), disconnect screws (2).

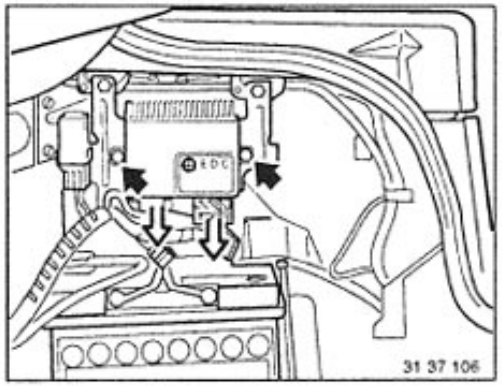
Installation:
Note tightening torque of 6.5 Nm.

Pin allocation:
31 = ground
15 = >11.8 V
A = signal

37 14 050 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT

Refer to page 37-00/1 for general information about EDC.

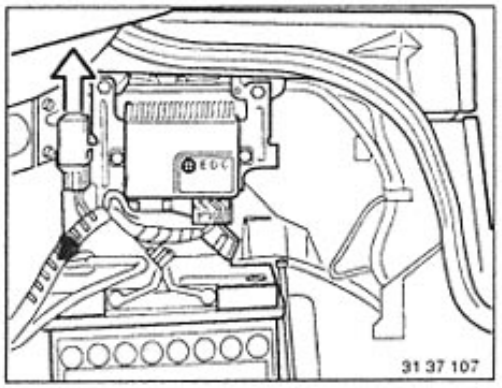
Location:
In trunk at right rear, behind trim panel.



Switch off ignition.
Disconnect plug.
Unscrew nuts.

1 = Power saving relay
2 = EDC III control unit

Note:
Troubleshoot - refer to Car Electric/Electronic Test Plan, Group 37.



Remove power saving relay.

41 Body

	Notes on body repairs	41- 0/1
	Removal of PVC material in repair area	41- 0/2
	Welding galvanized sheet metal	41- 0/2
	Cementing of body components	41- 0/2
	Recommended working methods and tools	41- 0/4
	Gaps of doors, engine hood and trunk lid	41- 0/5
	Windows and door joints	41- 0/6
	Frame control dimensions, BMW 8 Series E 31	41- 0/7
	Chassis number – emboss	41- 0/13
41 11 028	Engine support (partial replacement of front axle), left – replace	41- 11/1
043	Engine support, front left (without wheel arch) – replace	41- 11/4
051	Engine support, left – replace	41- 11/10
141	Cover for side member, left or right (partial replacement B pillar before A pillar) – replace	41- 11/15
41 12 535	Trunk floor, complete rear section (tail panel removed) – replace	41- 12/1
548	Crossmember, rear – replace (tail panel removed)	41- 12/5
41 14 160	Wheel arch outer section and side panel, rear right – replace	41- 14/6
180	Wheel arch, complete unit and side panel, rear right – replace	41- 14/13
41 21 510	Door pillar, front left – replace (roof frame, outside or roof frame partial replacement removed)	41- 21/1
41 22 000	Roof frame partial replacement, outside (windshield panel) left or right – replace	41- 22/1
050	Roof frame, outer, left or right – replace (roof outer skin panel removed)	41- 22/4
541	Roof frame, front – replace (roof outer skin panel removed)	41- 22/7
571	Roof frame, rear – replace (roof outer skin panel removed)	41- 22/8
41 31 010	Roof outer skin panel – replace (on version with slide/tilt sunroof)	41- 31/1
41 34 041	Rear apron – replace	41- 34/1
41 35 110	Side panel, complete rear right section – replace (up to roof connection)	41- 35/1
294	Side panel, rear left or right – replace (partial replacement of B pillar – wheel arch)	41- 35/5
337	Side panel, rear left – replace (partial replacement up to wheel arch)	41- 35/9
341	Side panel, rear left and tail panel – replace (partial replacement up to wheel arch)	41- 35/14
41 51 004	Front door, left or right – adjust	41- 51/1
101	Front door, left or right – replace	41- 51/1
41 61 014	Hood lid – adjust	41- 61/1

General information about body repairs

Body repair instructions are meant for skilled workers who are highly qualified, work conscientiously and accept full responsibility for their work.

The instructions are therefore limited to information and factory-approved repairing methods as well as associated tips and data to make the work easier.

The body repair operations described here refer to complete or partial replacement of parts with Original BMW parts or sections of parts. Necessary straightening and dent removing operations must be adapted to the prevailing damaged condition. Welded and spot-welded seams affected by this must be inspected and repaired where necessary.

The quantity and location of welded spots, inert gas welded seams and brazed connections can be taken from the cut-out part. Use inert gas plug welding for spot-welded connections which are not easily accessible.

Most pictures were taken using an unfinished body shell. All vehicle parts which are in the repair zone and subjected to damage from heat, flying sparks and dust must be removed or covered.

In spite of continuous control over welding operations during standard production, there could be isolated cases of faulty welding. Such welding will be subsequently repaired by inert gas spot welding or by 15 mm long inert gas welded seams on flange end in inaccessible zones. Consequently, the presence of repaired welding seams on the body does not necessarily indicate repairs carried out by a third party.

For example:
Left engine carrier is resistance spot-welded - right engine carrier is repaired with inert gas welding.

Caution!
Steering gear must be checked and, if necessary, replaced after an accident or driving conditions similar to an accident - see SI 320188 (828).
All welding seams sealed off with body sealing compound in original condition must be sealed off again conscientiously immediately after the repair work. Damaged anti-drumming compound must be replaced.

New sheet metal parts or the cavities, seams, cracks and folds formed by new sheet metal parts must be sealed with a body sealing compound immediately.

Disconnect battery ground lead on body support point. Protect electrical leads from damage and the effect of heat.

Caution!
Disconnecting the vehicle battery cancels the fault memory of the control units.
For this reason, before disconnecting the vehicle battery, interrogate the fault memory and print out the results on the BMW SERVICE TESTER. Investigate fault messages in memory.
Only ever connect and disconnect the control unit connector when the ignition is switched off.

The removal and installation of components, relays, fuses etc. can cause faults to be stored in the fault memories of equipment with a diagnosis capability. After working on the electrical system, it is always necessary to interrogate the fault memory.
Investigate any fault messages and cancel once rectified.

On vehicles with an airbag system, note relevant instructions in Gr. 32!

Observe the fire and accident prevention regulations!

Welding can be carried out with installed control units if

- there is a maximum distance of about 1 meter between the welding and ground connections and
- there is good electrical contact between welding and ground connections (no rubber mounts or similar),
- otherwise attention must be paid to the heat developed, especially in the case of autogen welding (decision must be made from case to case).

Source of supply for workshop equipment, auxiliary items, sealants, adhesives and similar materials: BMW Parts Service

REMOVING PVC MATERIAL IN REPAIR ZONE

Body protection after repairing begins already with the professional removal of PVC undercoating, anti-drumming compound and seam sealing compound in the repair zone.

Remove PVC material with a rotating steel brush, or heat PVC to maximum 180° C with a hot air blower and scrape off with a spatula. Burning off the PVC material or heating it above 180° C with a gas flame torch or similar tool would produce strong corrosion-promoting hydrochloric acid. Health impairing vapors would also be set free.
New undercoating would not have sufficient adhesion on burnt PVC material and consequently undersurface rusting would be possible.

WELDING GALVANIZED SHEET METAL

Hot galvanized and galvanized sheet metal us used to a greater extent for components of the body, which are especially subject to corrosion.

Conformance with the following points is necessary when working with these parts.
The welding smoke contains poisonous zinc oxide, so that especially good extraction is necessary in the welding bay.
Do not grind off zinc coat for resistance spot welding and inert gas welding.
The zinc coat must be ground off for brazing jobs.

If at all possible welded connections should be made with resistance spot welding.
Welding current is boosted by at least 10 % as compared with blank sheet metal.
Apply as high as possible electrode contact force (make break out test on sample sheet metal).
A coat of spot welding paste can be applied for better sealing.

Inert gas welding should be preferred to autogen welding in areas not accessible for resistance spot welding, because of the lower heat dispersion.
Machining or forming of galvanized sheet metal in warm state is normal.
Make sure of thorough extraction of the poisonous vapors.
Remove burnt residual zinc completely.
Align, grind down and tin out visible joints as normally.
Coat ground-through zinc layer with zinc dust paint.

CEMENTING BODY PARTS

Proceed as described below when using cement, BMW 51 0 032:

1. Ambient and material temperature must not be below 18° C during application and up to hardening.
2. Remove oxide, rust, paint or scale from cementing surfaces.
3. Roughen cementing surfaces with a steel brush or sandpaper to improve adhesion.
4. Remove grease from cementing surfaces.
   Use universal thinner or acetone to degrease surfaces and allow treated surfaces to air-dry about 1 to 2 minutes so that cementing surfaces are completely dry.
5. Place double-cartridge 51 0 032 in double-cartridge gun 51 0 031, remove cap and mount mixing tube.
6. Eject about 2 cm of the mixed cement and then first apply the mixed cement one-sidedly on the cementing surface. Thickness of coat: about 2 mm; if necessary spread mixed cement on the cementing surface with a spatula.
   Potlife of mixed cement at 18 to 25° C: about 1 to 2 hours.
7. Press parts together, hold and punctate.
   Extract produced vapors!
8. Remove excessive cement with paper or cloths.
   Hardening time of mixed cement at 20° C: about 15 to 20 hours.
   Hardening can be sped up by applying heat, e.g. in a spraying booth.
   Hardening time at

40° C	=	3 to 6 hours
60° C	=	50 to 60 minutes
80 to 100° C	=	15 to 30 minutes

   Important!
   Do not select hardening temperature above 120° C.
   Keep loads and stress off of cemented parts until completely hardened.

Protective Measures:

Avoid direct contact of cement with eyes and skin.
Do not eat, drink or smoke while carrying out cementing work.
Clean and rub in hands with skin protection creme after finishing work.

Source of Supply for Workshop Equipment, Tools, Sealing Compounds, Cement and Similar Items: BMW Parts

* Source of Supply for Cement: Cartool (also refer to Service Information 1 05 91 (386))

First Aid:
In case of contact of cement with eyes, rinse out eyes immediately with running water for about 10 to 15 minutes. If necessary, go to a physician.

In case of contact of cement with skin, clean concerned surface immediately with water and soap and apply a skin creme. If necessary, go to a physician and fill out a safety data sheet.

If cement is swallowed, rinse out mouth and throat thoroughly with running water and go to a physician.

If vapors are inhaled, provide fresh air, keep quiet, breathe intensively and call in a physician.

Immediately remove clothes dirtied with resin residue and wear again only after having them cleaned.

Toxicology Information:
Could have sensibilisating effect and cause allergic skin reactions.

Disposal:
Small amounts of mixed and hardened resin residue may be disposed as household refuse.

Important!
These precautions are applicable for regulations valid in Germany. Always apply possibly deviating regulations valid in other countries.

Recommended working methods and tools

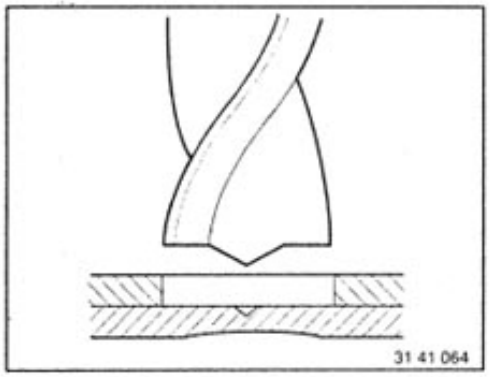
1. Cutting Out Damaged Parts:

Determine the location of joints in accordance with the replacement part before starting the operation.
Cut out the damaged part roughly within these joints.

Caution!
Be careful not to damage sheet metal underneath!

Remove sealing compound, anti-drumming compound and, if applicable, paint to neutralize the joints. Drill off welding spots. When drilling off, make sure that the drilled holes are produced in the cut out part. Do not drill in the remaining connection flanges.

Grind off welded seams carefully with a disc grinder. Heat brazed connections with an autogen torch! Do not overheat! Take off scrap metal. Remove remaining spongy brazing solder with a steel brush. Straighten and grind off all joint surfaces thoroughly.



2. Installing New Parts:

Prepare joints in accordance with relevant repair instructions.

Repairs to suspension points for engine or transmission and running gear parts must be carried out on a straightening bench using the set of attachments for a certain vehicle type. Other attachments are also available for various body parts. Check curvature and dimensions of windshield and rear window by installing the original windows. Refer to relevant drawings for gaps in doors, engine hood and trunk lid.

Coat joints required for resistance spot welding with zinc dust paint. Only remove protective paint from galvanized replacement parts. Drill 8 mm dia. holes in joints not accessible for spot welding tongs, using the spacing of drilled-off spots and plug spot weld these joints.

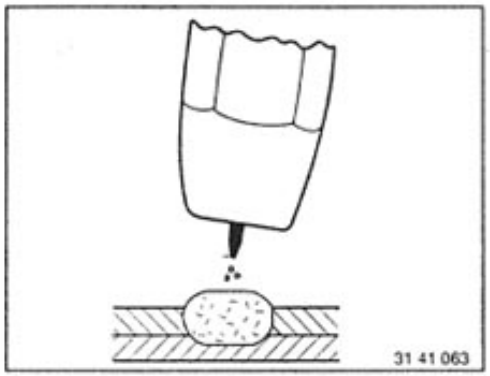
Produce inert gas welded seams according to the cut-out part.

Produce brazed joints with heat dispersion limited to a minimum and without overheating. Joining methods which deviate from standard production will be described in the repair instructions. Grind down welded seams on visible outside surfaces.

Caution!
Do not grind down thickness of sheet metal.

Grind down and fill in irregularities with tin. After tinning, the surface should be prepared to such an extent that only a coat of fine filler has to be applied in the workshop.

All welded seams sealed off with body sealing compound in original state must be sealed off again thoroughly immediately after repairing. Replace damaged anti-drumming compound. New sheet metal parts or cavities, seams, creases and folds formed by the new sheet metal parts must be sealed with a body sealing compound immediately.



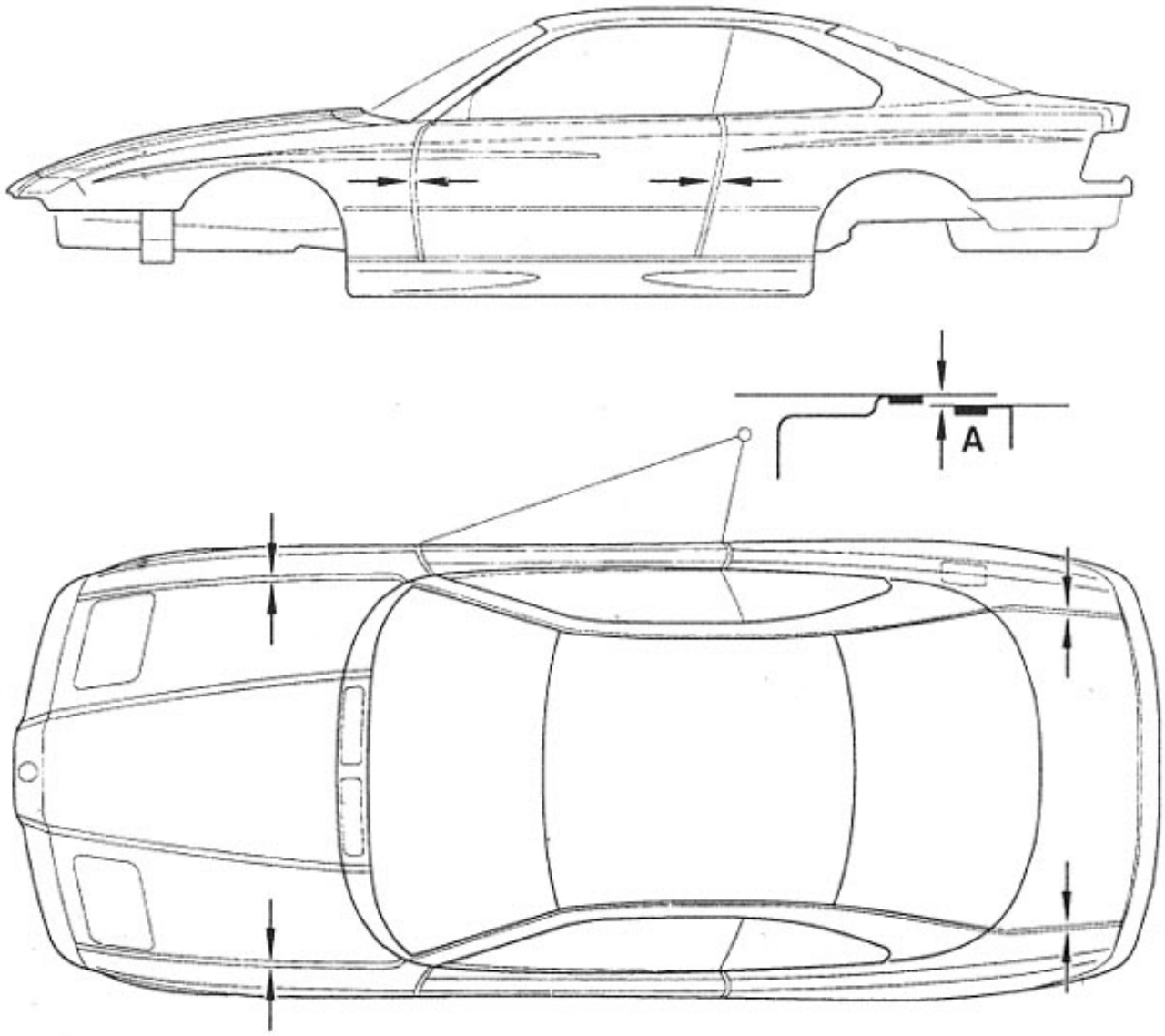
Source of supply for workshop equipment, auxiliary materials, sealants, adhesives and similar items: HWB (a division of BMW AG)

41-0/5

GAPS OF DOORS / ENGINE HOOD AND TRUNK

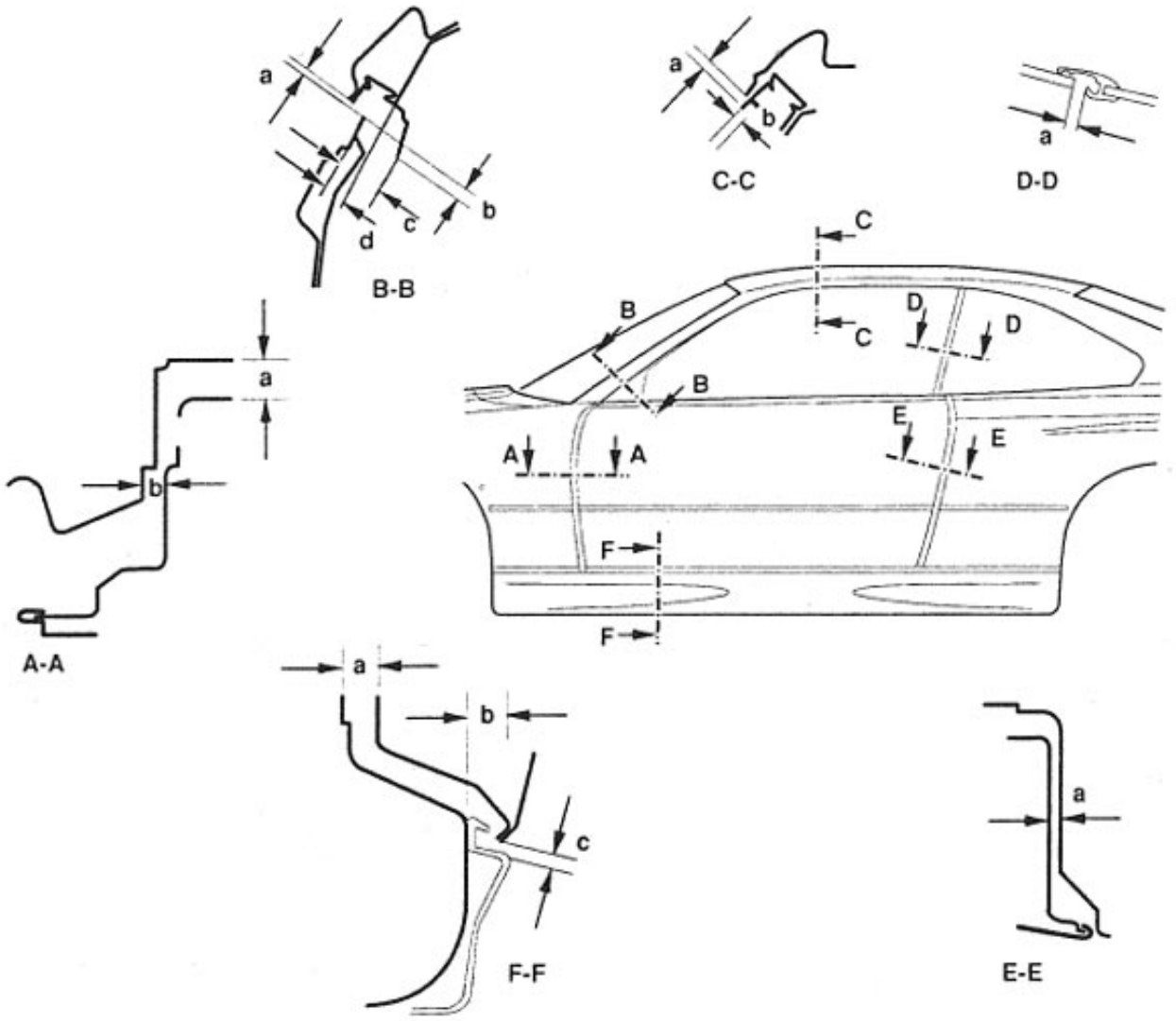
Door gaps and hood/lid gaps: 5.5 $^{+0.5}/_{-0.1}$ mm.

Max. permissible parallel deviation: 1.0 mm.
Plane displacement A for adjacent body parts at rear = max. 1 mm toward inside.



31 41 079

WINDOW AND DOOR GAPS



31 41 044

All dimensions in mm.

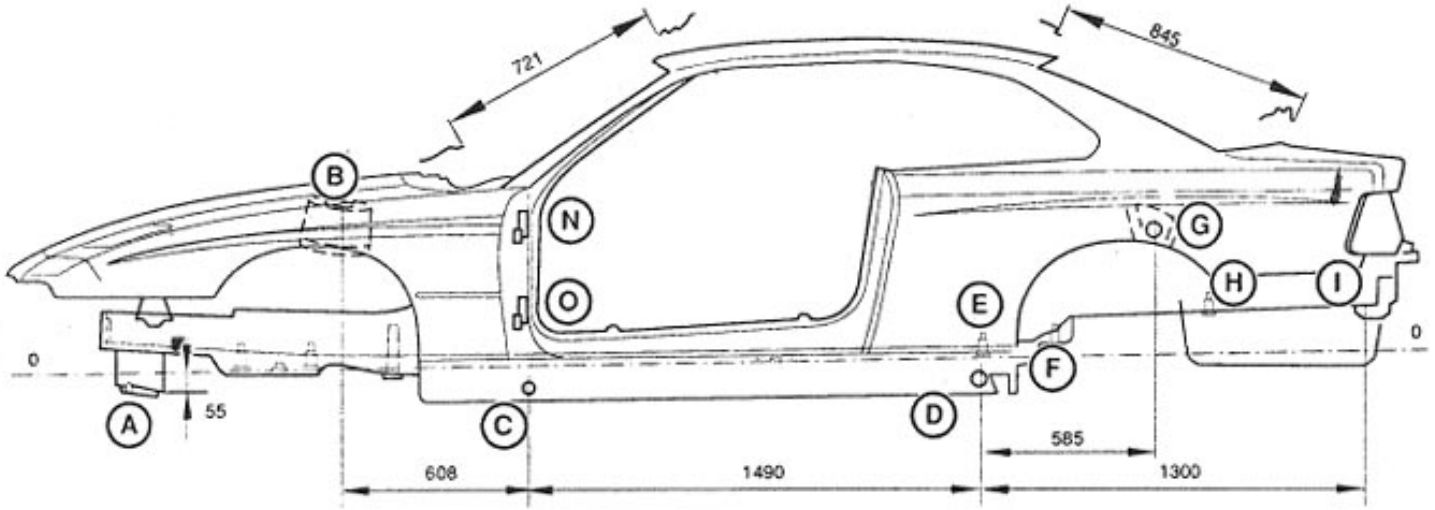
41-0/7

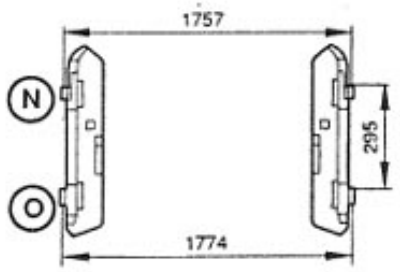
Frame alignment control dimensions for BMW 8 series / E 31

Dimensions in mm, tolerance ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

A = bore of front crossmember, 16 mm dia.
B = Front spring mount
C = Front car jack take-up
D = Rear car jack take-up
E = Rear axle take-up, side, semi-trailing arm
F = Rear axle take-up, side, front
G = Shock absorber mount
H = Rear axle mount, side, rear
I = Bore of rear crossmember, 12 mm dia.
N = Hinge axis, upper
O = Hinge axis, lower





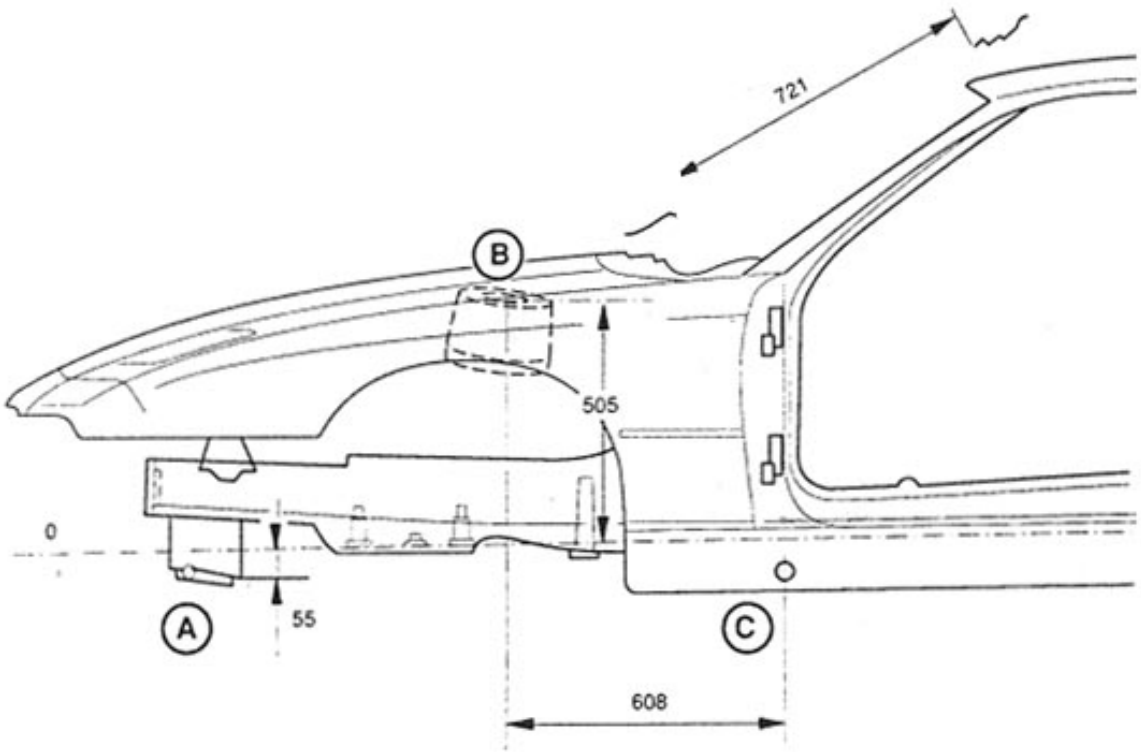
31 41 089

FRAME ALIGNMENT CONTROL DIMENSIONS FOR BMW 8 SERIES / E 31

Dimensions in mm, tolerance: ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

A Front cross member bore, 16 mm dia.
B Front spring mount
C Front car jack take-up

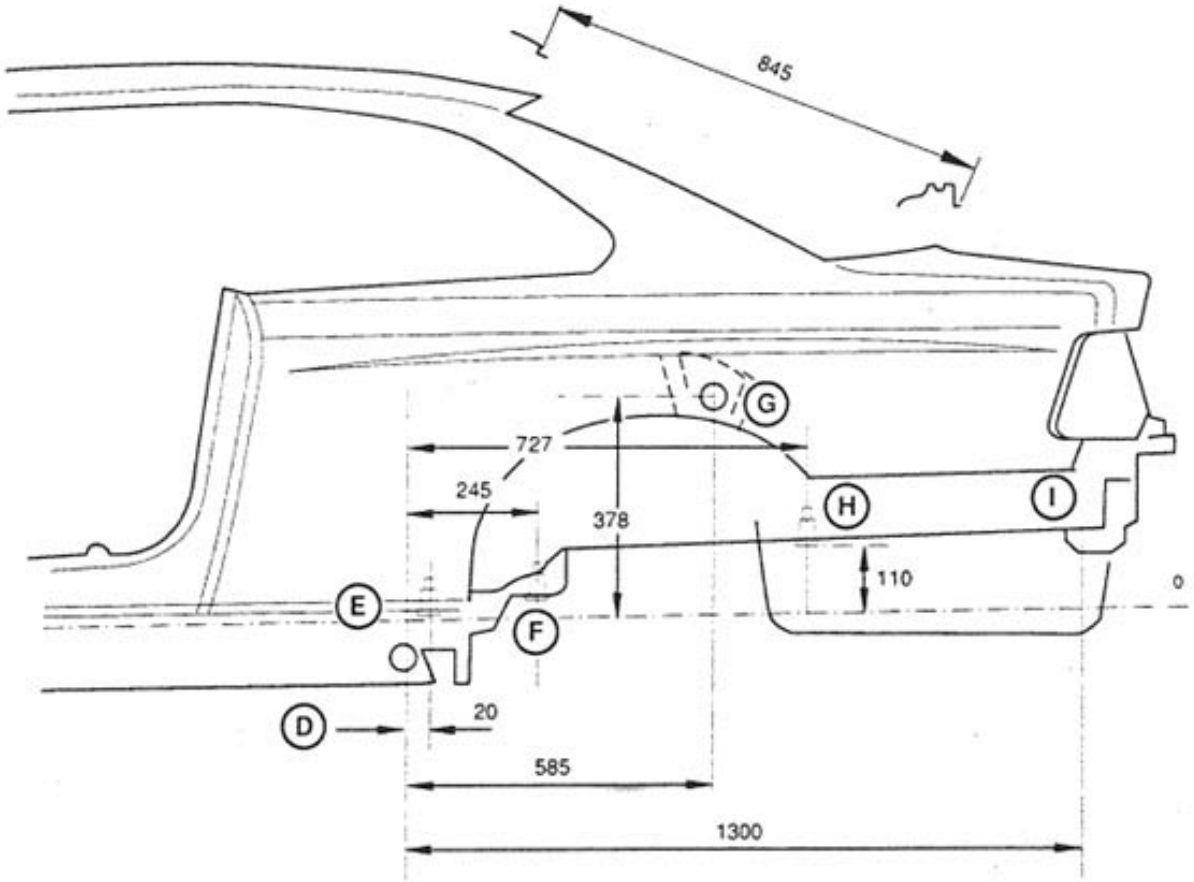


FRAME ALIGNMENT CONTROL DIMENSIONS FOR BMW 8 SERIES / E 31

Dimensions in mm, tolerance: ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

D Rear car jack take-up
E Side rear axle take-up, trailing arm
F Side rear axle take-up, front
G Shock absorber mount
H Side rear axle take-up, rear
I Rear cross member bore, 12 mm dia.



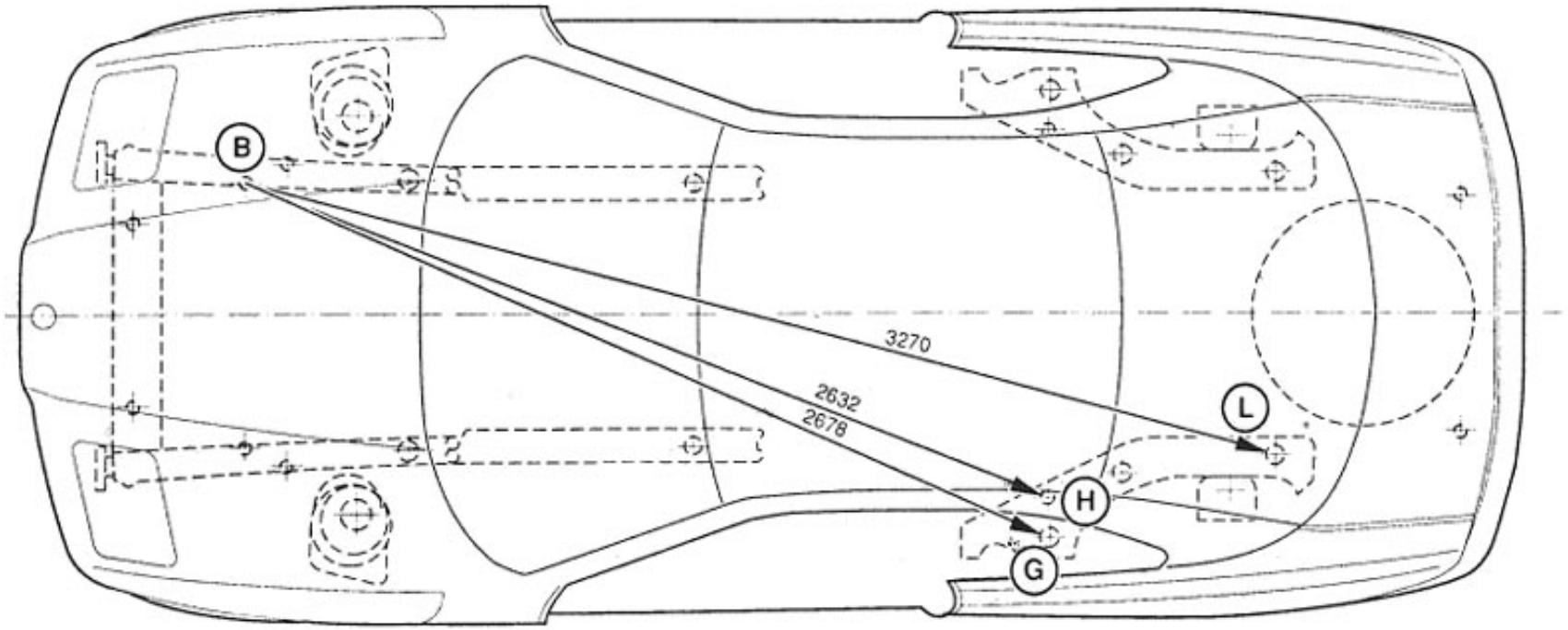
31 41 088

FRAME ALIGNMENT CONTROL DIMENSIONS FOR BMW 8 SERIES / E 31

Dimensions in mm, tolerance: ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

B Front axle take-up, front
G Side rear axle take-up, trailing arm outside
H Side rear axle take-up, trailing arm inside
L Side rear axle take-up, rear

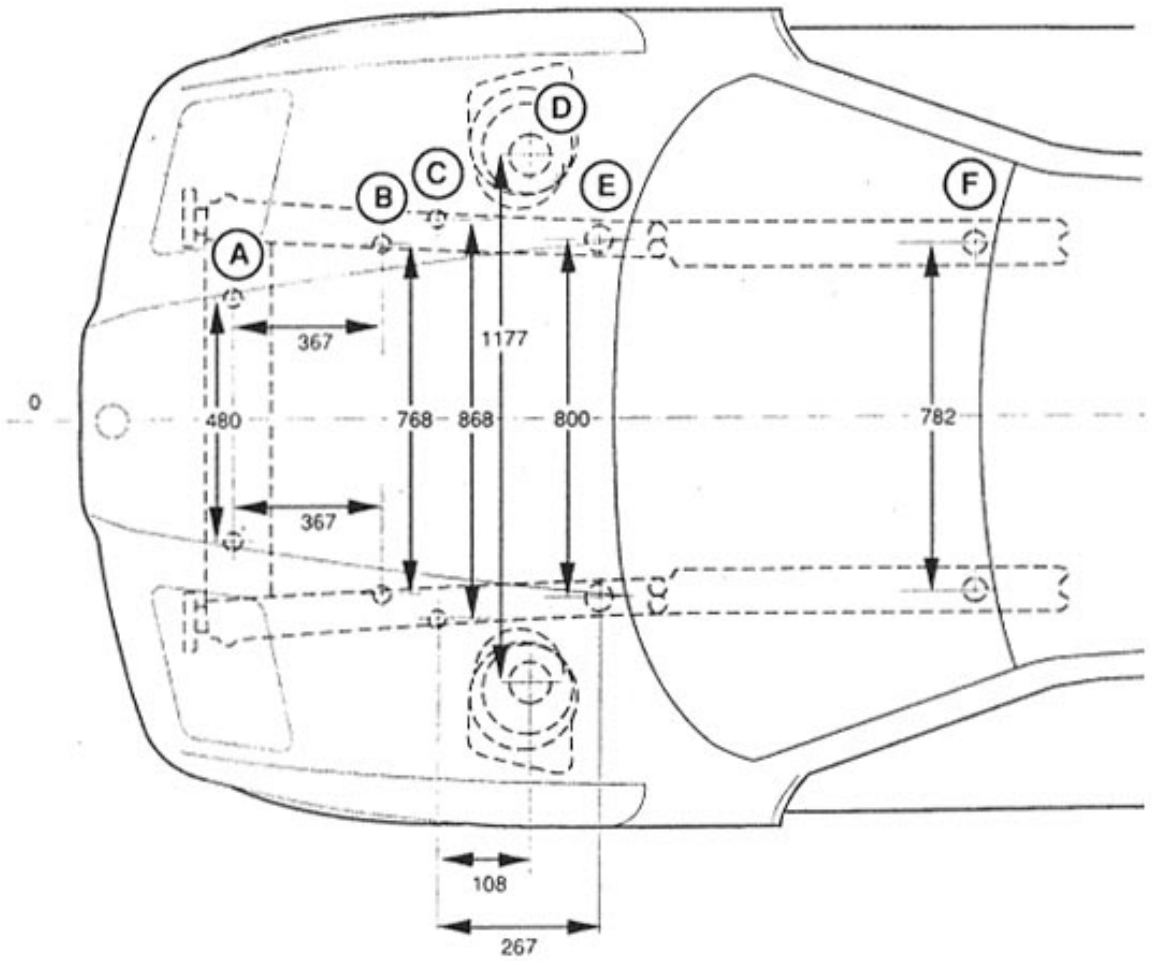


FRAME ALIGNMENT CONTROL DIMENSIONS FOR BMW 8 SERIES / E 31

Dimensions in mm, tolerance: ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

A Front cross member bore, 16 mm dia.
B Front axle take-up, front
C Front axle take-up, center
D Front axle spring mount
E Thrust strut take-up
F Rear engine carrier bore, 6 mm dia.



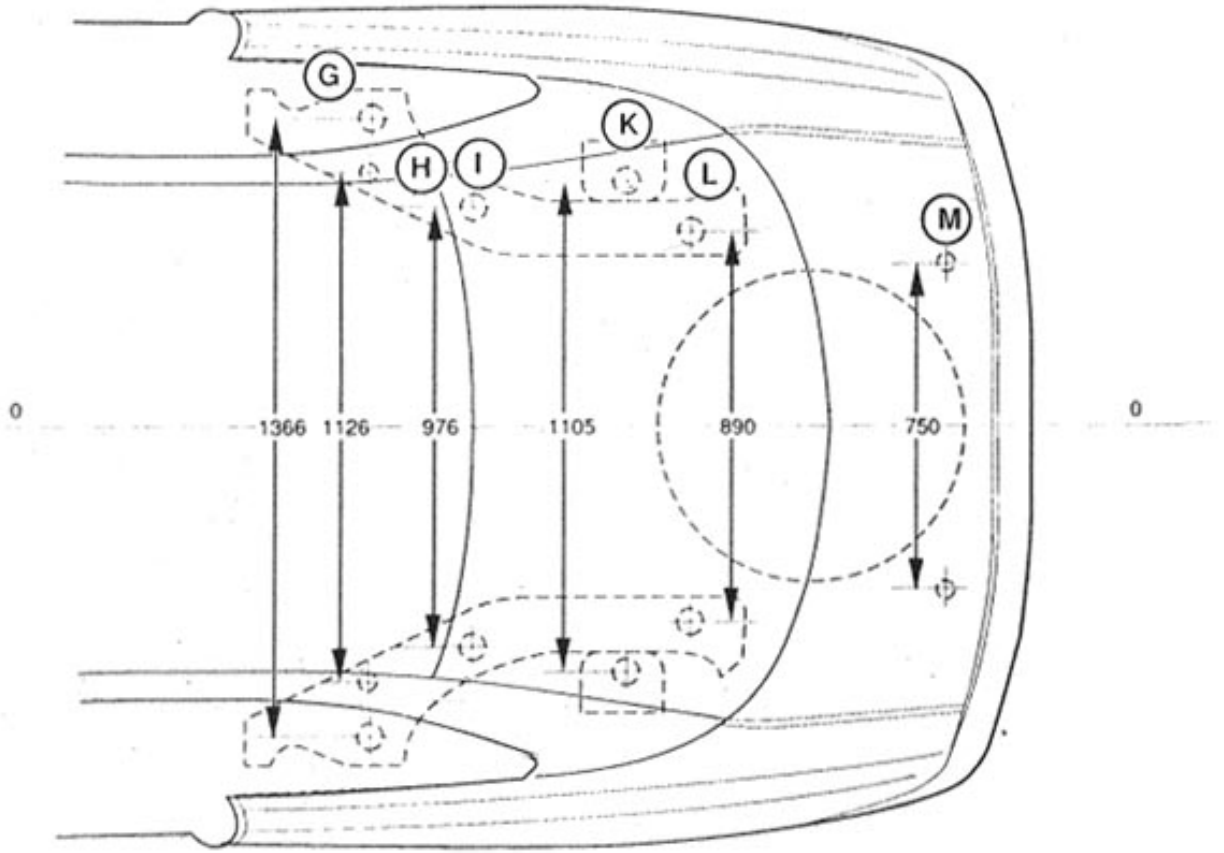
31 41 091

FRAME ALIGNMENT CONTROL DIMENSIONS FOR BMW 8 SERIES / E 31

Dimensions in mm, tolerance: ± 2.0 mm.

Note:
Only use the following values for a rough inspection.
Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.

G Side rear axle take-up, trailing arm outside
H Side rear axle take-up, trailing arm inside
I Side rear axle take-up, front
K Shock absorber mount
L Side rear axle take-up, rear
M Rear cross member bore, 12 mm dia.

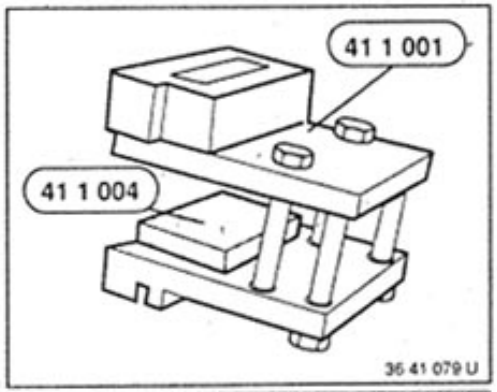


31 41 092

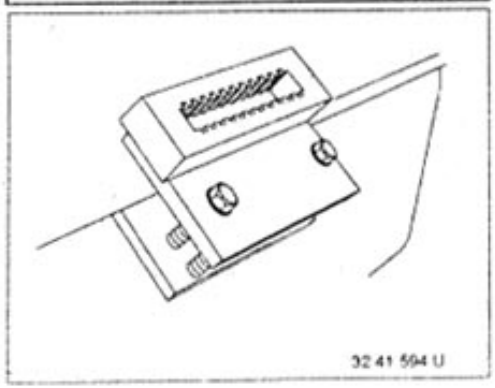
DIE-STAMPING CHASSIS NUMBER

If the die-stamped chassis number is removed during repairs, it must be die-stamped again.

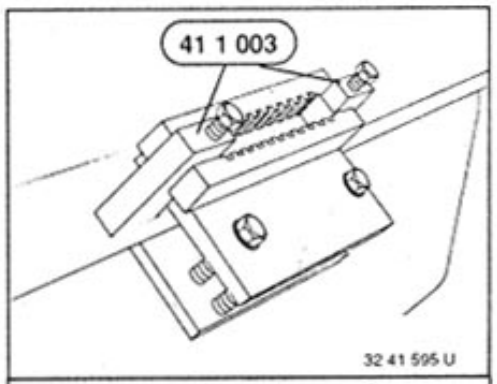
Note:
The chassis number can also be die-stamped on a completely assembled vehicle.



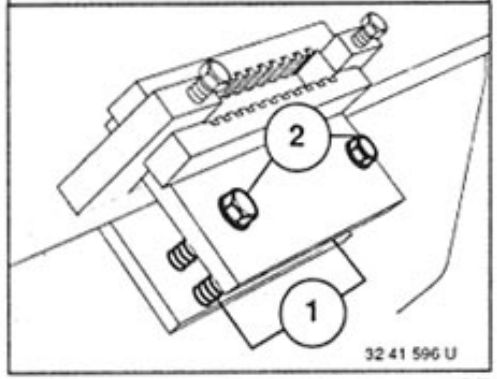
Assemble Special Tools 41 1 001 and 41 1 004 (additional plate) in such a manner that the additional plate faces the stamp guide.
Screw in bolts only enough that the spacers can still be inserted later.



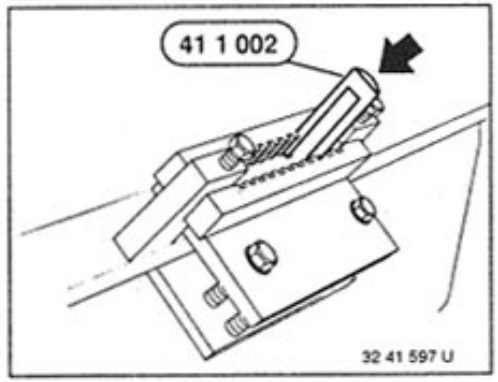
Apply Special Tool 41 1 001 and have Special Tool 41 1 004 bear on the surface for the chassis number.



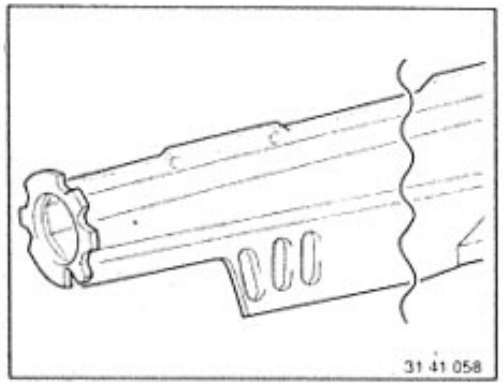
Insert Special Tools 41 1 003 (spacers) on left and right sides and clamp.



Align Special Tool 41 1 001 parallel with bolts (1).
Tighten bolts (2).



Place die-stamp numbers (Special Tool 41 1 002) in Special Tool 41 1 001 separately and die-stamp number.
Die-stamp a "+" in front of and behind the chassis number instead of the BMW emblem for clear identification of component or body replacements by a workshop.



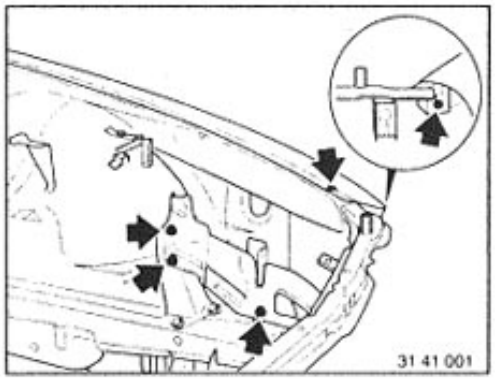
41 11 028 Replacing left engine support (partial replacement before front axle)

Follow instructions on body repair!

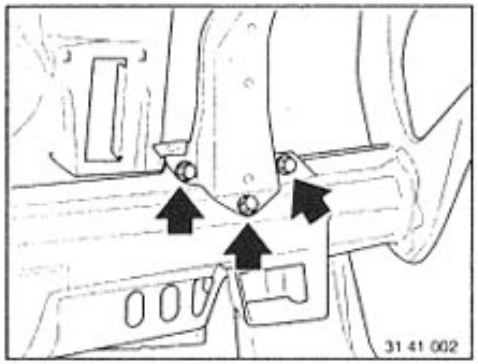
Place vehicle on straightening bench.

Remove or detach the following components:
- bumper
- headlight with frame
- radiator
- radiator loop for power steering unit
- condenser for air-condition system
- fan shroud
- volume air flow sensor with air filter
- internal cover of wheel arch

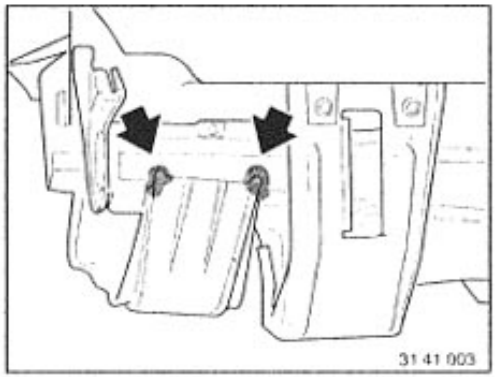
Remove or cover up other vehicle components in the repair zone and which may be at risk from heat, sparks and dust.



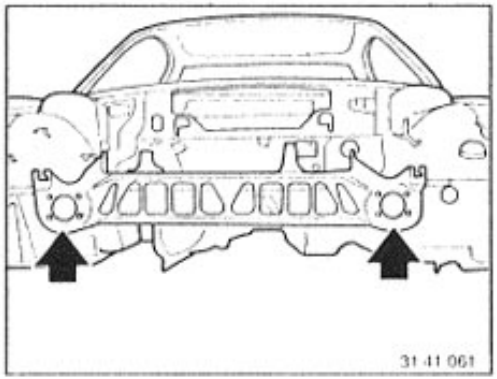
Unscrew and remove support for front bumper bracket.



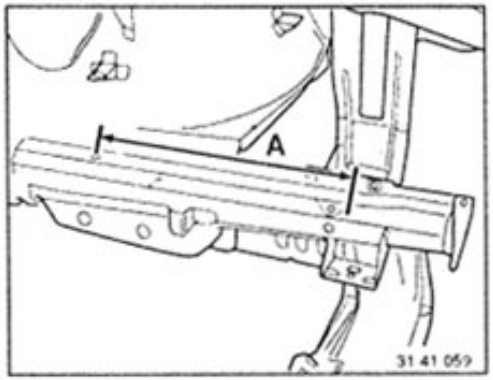
Unscrew bracket.



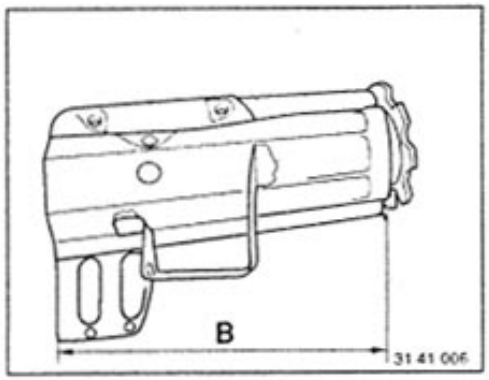
Grind down welding seams on crossmember.



Drill out points between left and right front crossmembers.

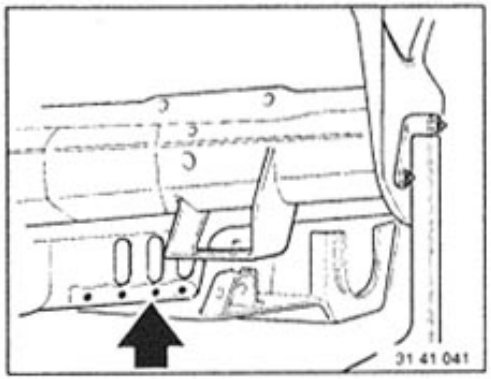


Mark cutting point of engine carrier, distance (A) = max. 355 mm (13.976").

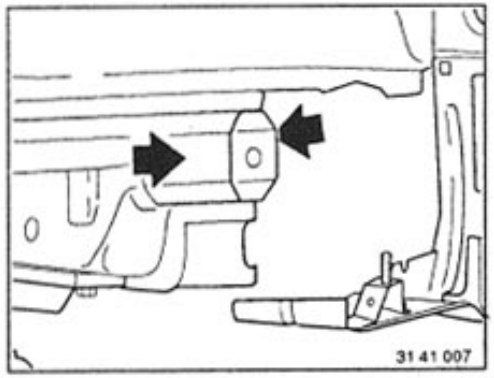


Cut new engine carrier section to distance B and fit.

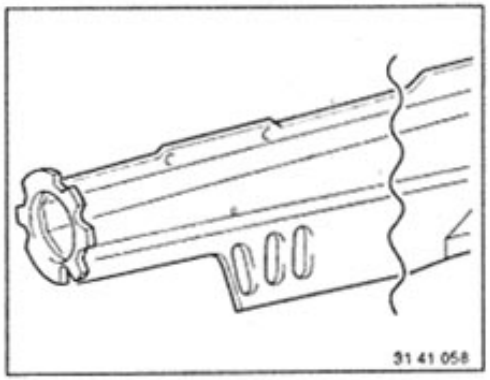
Distance (B) = at least 230 mm (9.055").



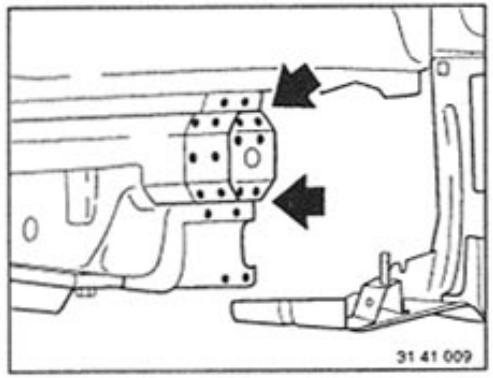
Drill off spot welding on ABS hydraulic control unit holder.



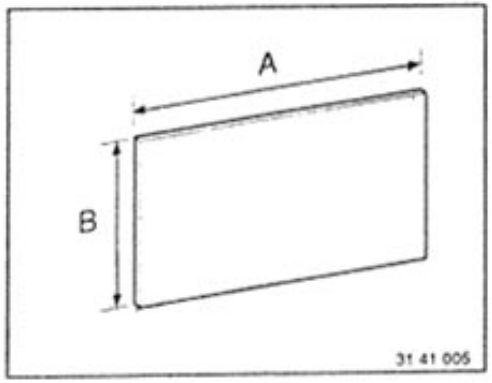
Clean surface for plug welding and mating surfaces on old and new engine carrier sections.
Clean mating surface for cross member bracket on wheel house.



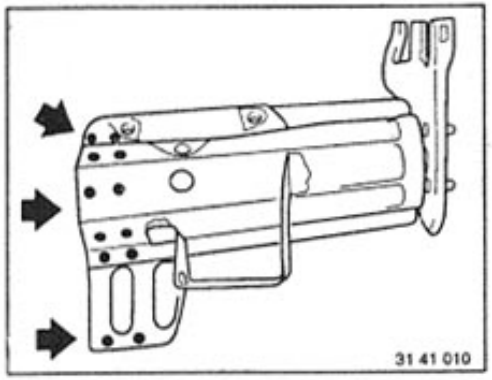
Cut off engine carrier.



Drill holes for plug welding of reinforcement plates on the engine carrier.



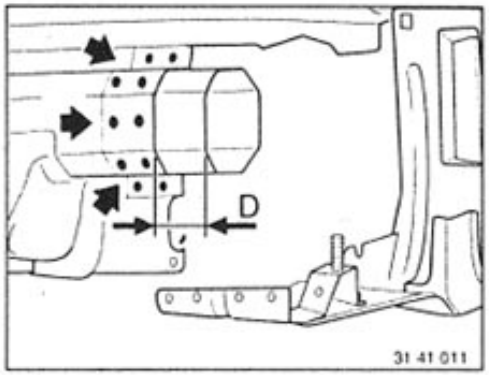
Produce reinforcement plates.
Change distances for new cutting point!
A = 60 mm (2.362")
B = 1 x 20 mm (0.787")
1 x 23 mm (0.906")
4 x 30 mm (1.181")
2 x 40 mm (1.575")



Drill holes for plug welding of reinforcement plates on the engine carrier section.

Coat reinforcement plates with zinc dust paint.

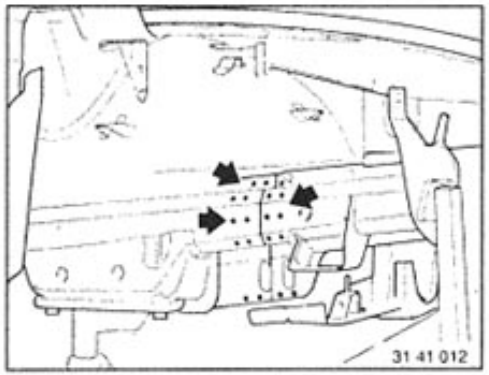
Grind down connecting points.



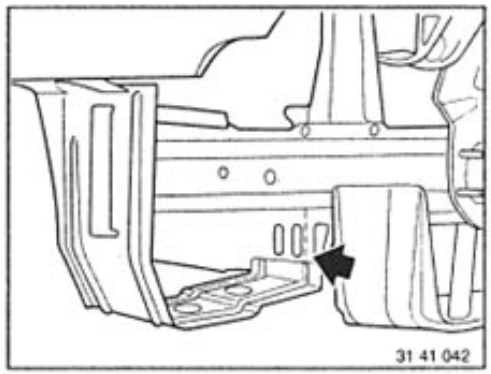
Slide reinforcement plates 30 mm into old engine support, adjust and plug weld.

Dimension (D) = 30 mm

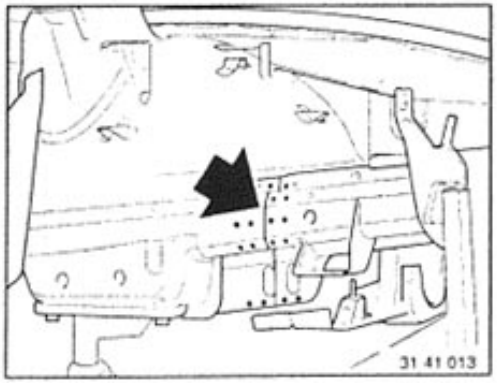
Expose bores concealed by reinforcement plates.



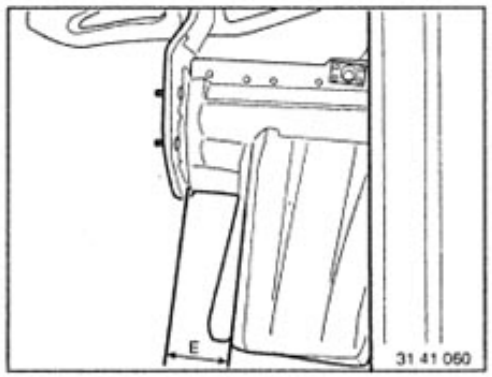
Adjust engine support partial replacement Spot weld the unit, correcting welded seam distance if necessary.



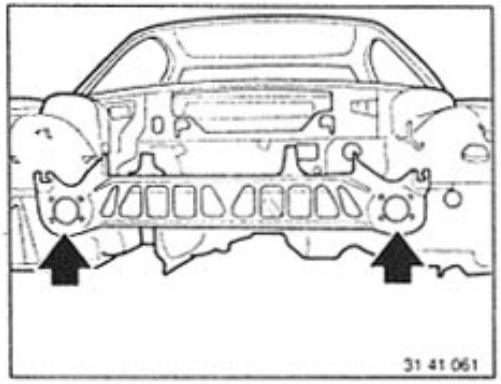
Ajdust bracket of hydraulic unit for ABS to engine support and plug weld through holes. Grind down welding holes.



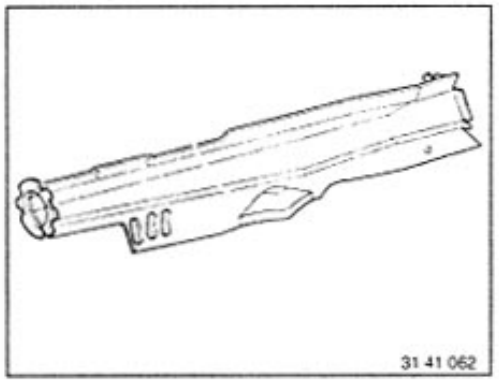
Weld both engine carrier parts into welded seam.



Adjust crossmember and weld into place.
Dimension (E) = 54 mm



Weld front crossmember between left and right engine supports.

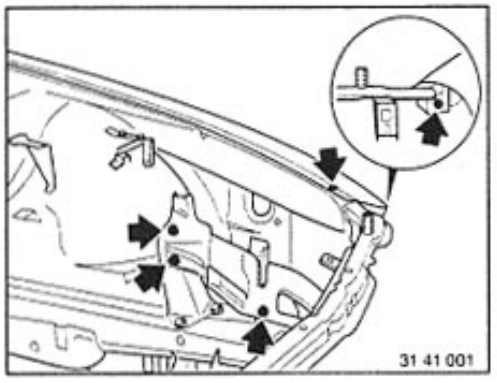


41 11 043 Replacing front left engine support (without wheel arch)

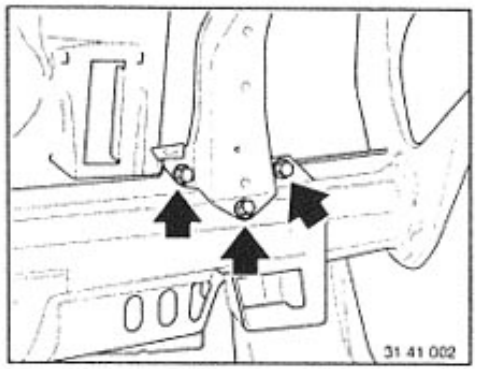
Note introduction 41-0!

Place vehicle on straightening bench.

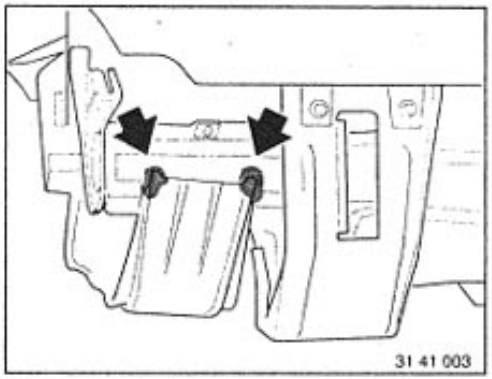
Remove or cover vehicle components in the repair zone which could be damaged by heat, sparks or dust.



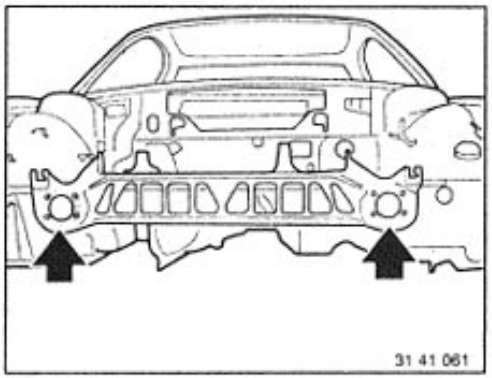
Unscrew mount for front bumper bracket.



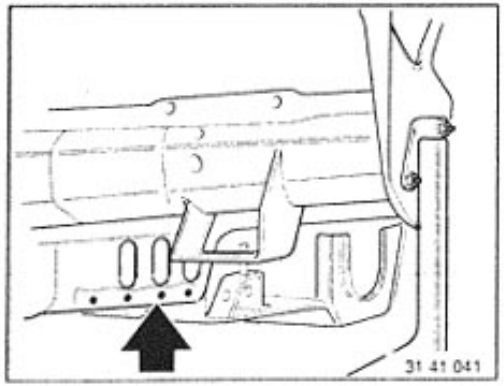
Unscrew bracket.



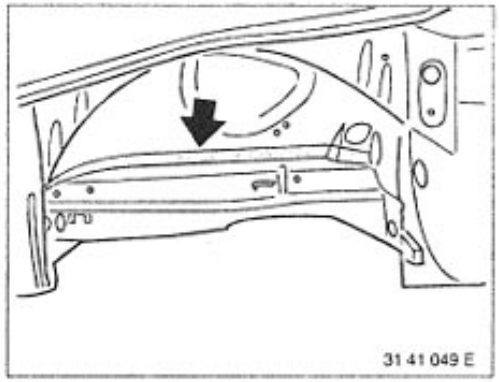
Grind off cross member welding seams.



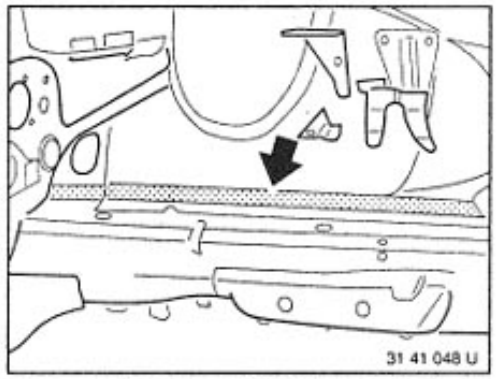
Drill off spot welding on front cross member between left and right engine carriers.
Take off cross member.



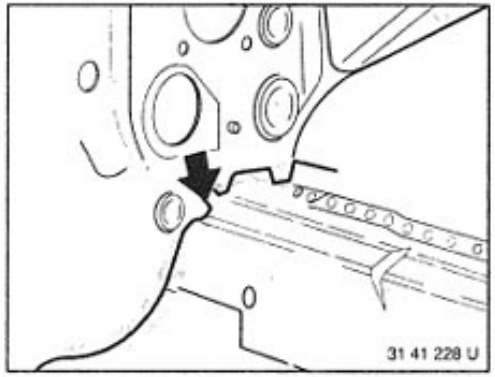
Drill off spot welding on holder for ABS hydraulic control unit.



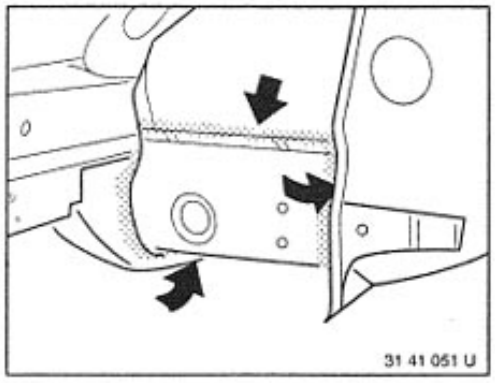
Clean mating surfaces in wheel house.



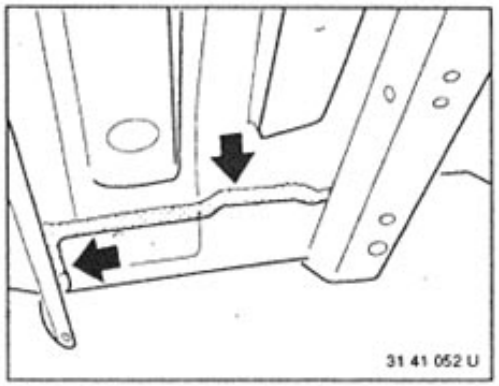
Clean mating surface in engine compartment.



Uncover firewall connection.



Uncover reinforcement connections between A-pillar and engine carrier in the wheel house.

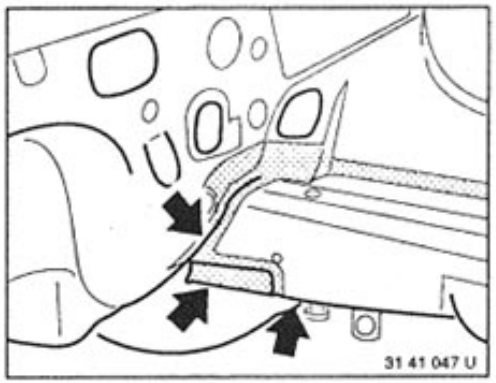


Uncover reinforcement connections between A-pillar and engine cover on un-, derside.

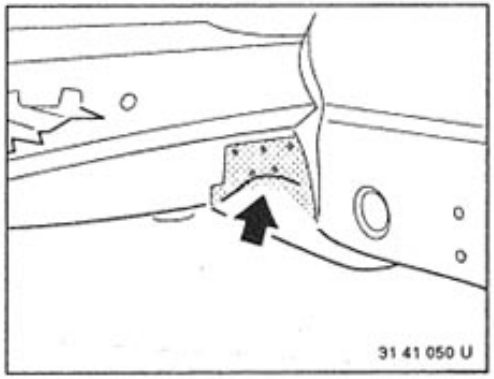
Drill off spot welding.

Cut off inert gas welding.

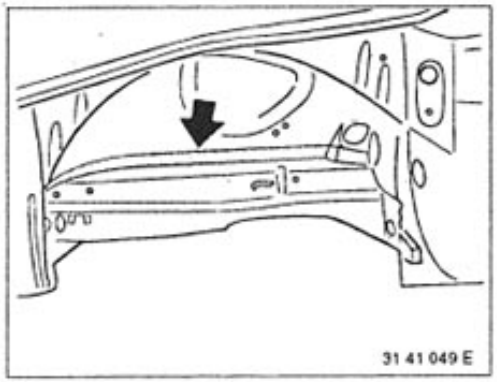
Remove scrap metal.
Clean welded surfaces.



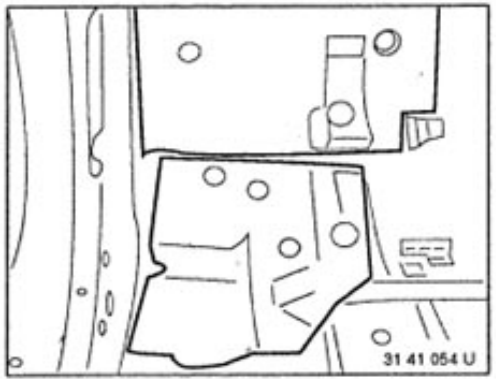
Drill off front engine carrier section spot welding on firewall and rear engine carrier section.



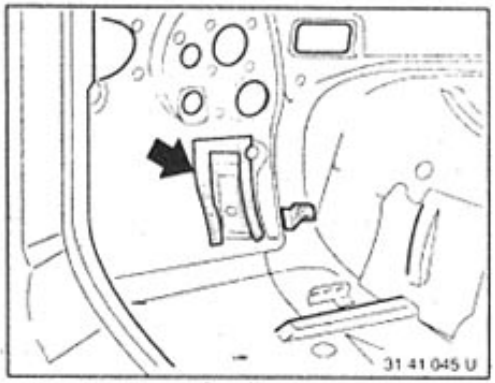
Drill off front engine carrier section spot welding on rear engine carrier section in the wheel house.



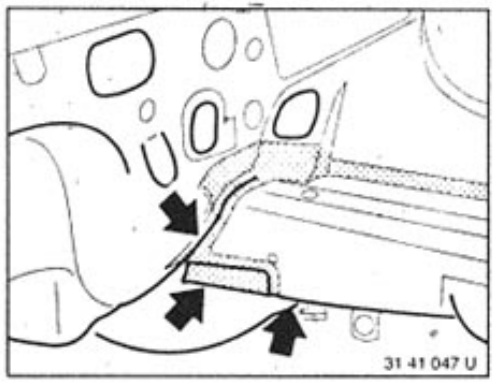
Drill off spot welding on wheel house.



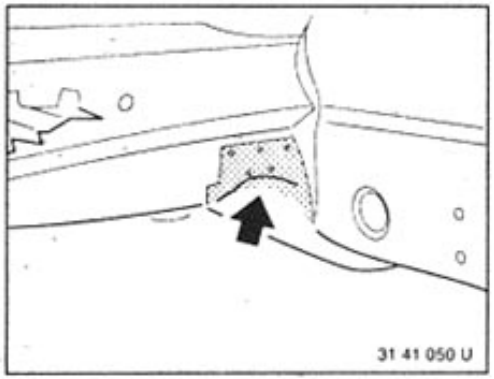
Remove noise insulation sheet on inside of car.



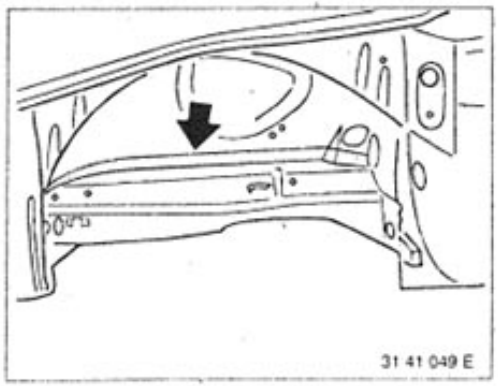
Drill off engine carrier spot welding on firewall from the passenger compartment.



Cut off engine carrier at point of connection.



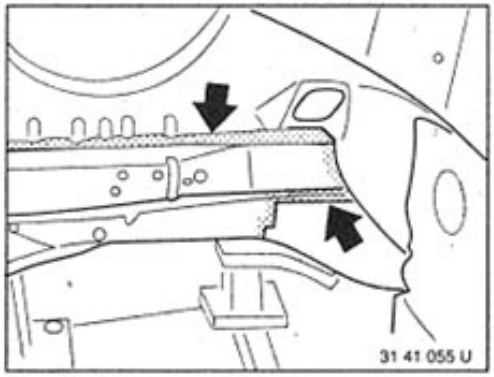
Straighten and grind mating surfaces.



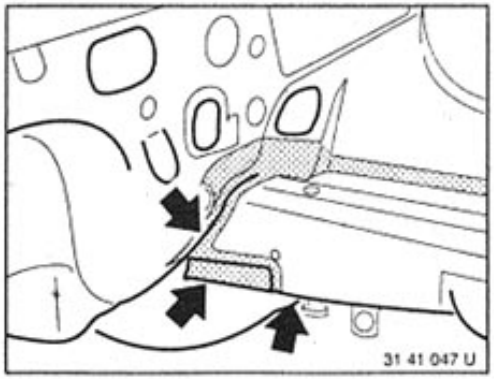
Clean mating surface in wheel house.

Clean welding surfaces on new part.

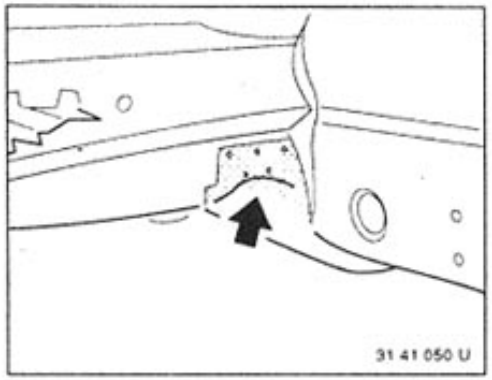
Coat welding surfaces with zinc dust paint.



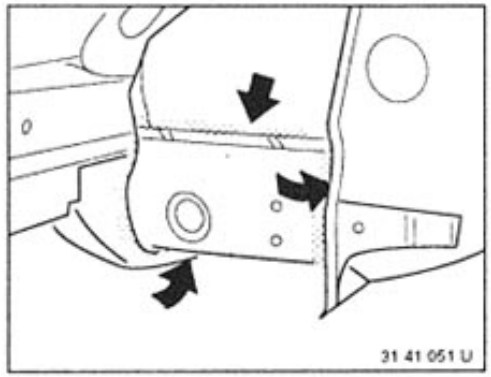
Fit in front engine carrier section on wheel house and rear engine carrier section.



Weld front engine carrier section on firewall and rear engine carrier section.

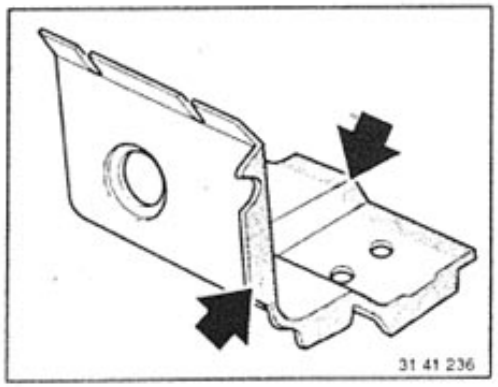


Weld front engine carrier section on rear engine carrier section in the wheel house.

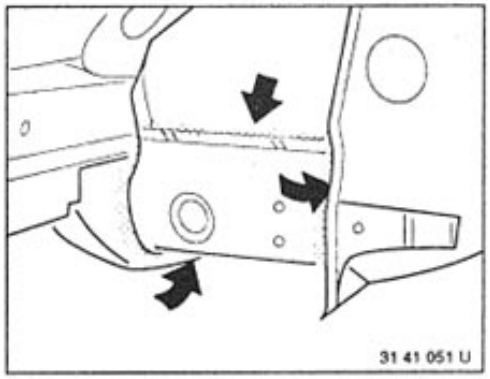


Fit in reinforcement between A-pillar and engine carrier.
Mark and clean welding surface.

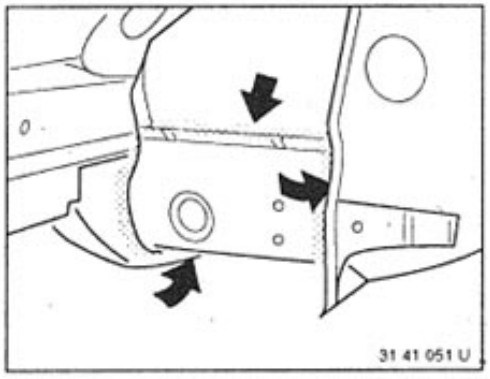
Clean mating surfaces on reinforcement.



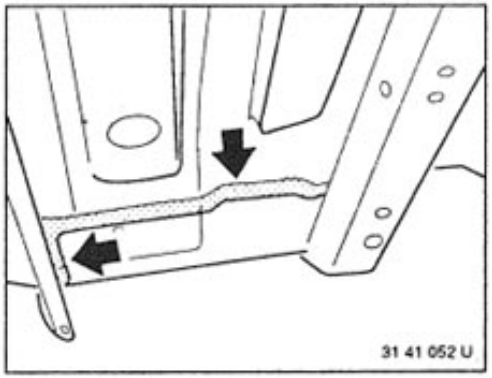
Drill holes in reinforcement for plug welding A-pill connection and floor plate assembly.



Fit in reinforcement between A-pillar and engine carrier.

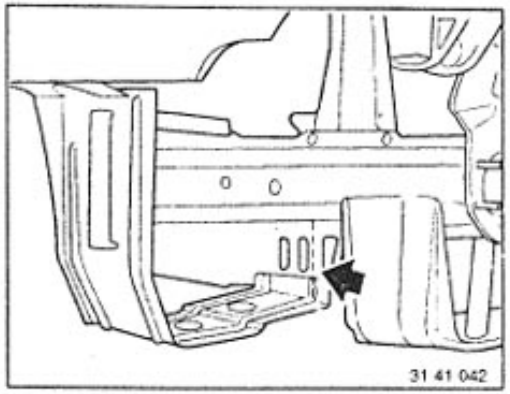


Weld reinforcement between A-pillar and engine carrier.

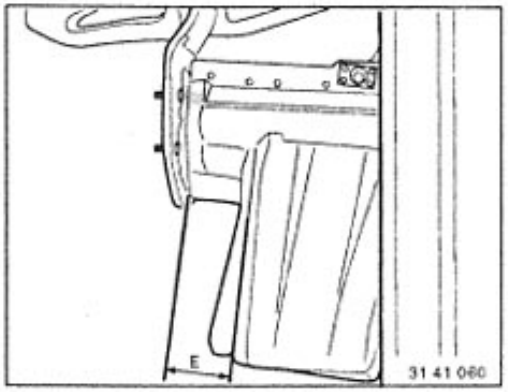


Weld reinforcement between A-pillar and engine carrier on the underside.

Grind welded surfaces smooth.

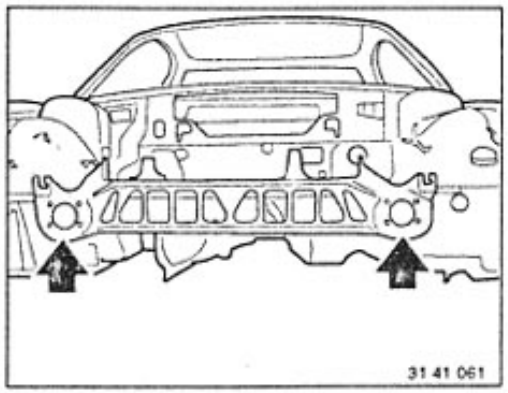


Fit in and weld holder for ABS hydraulic control unit on engine carrier.

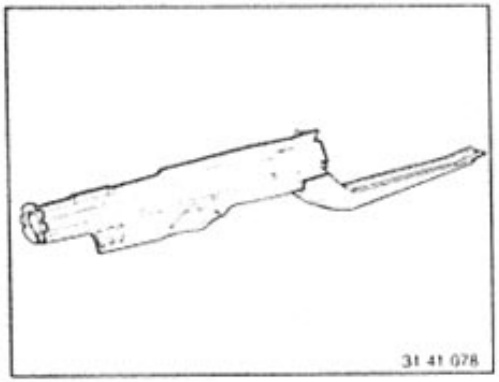


Fit in and weld cross member.

Distance (E) = 54 mm (2.126").



Weld front cross member between left and right engine carriers.

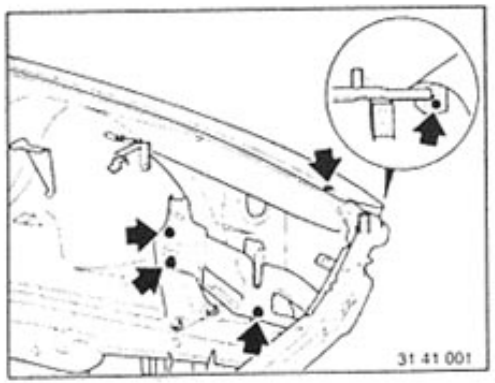


41 11 051 Replace left engine support

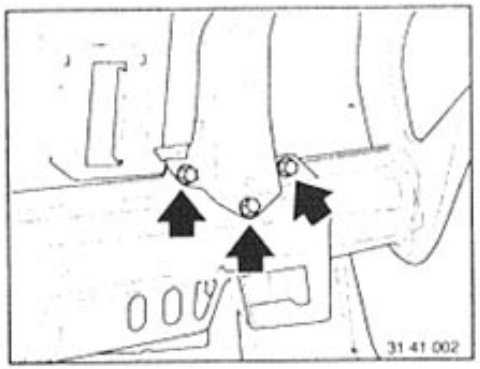
Follow instructions on body repair!

Place vehicle on straightening bench.

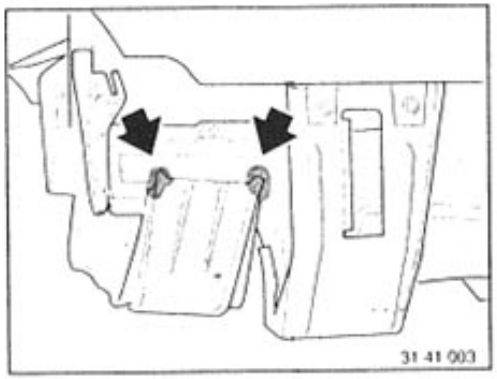
Remove or cover vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



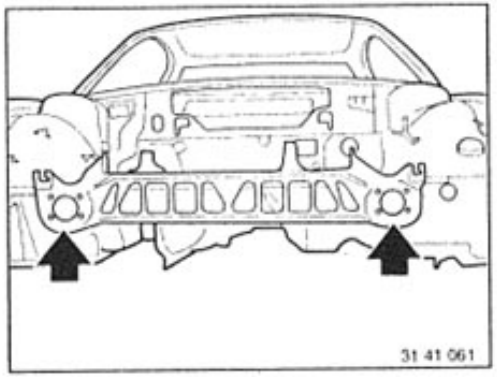
Remove mount for front bumper bracket.



Unscrew and remove bracket.

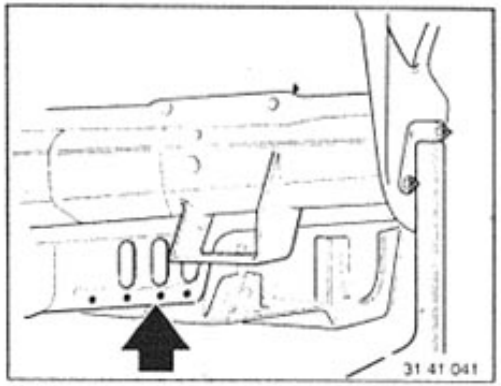


Grind down welded seams on crossmember.

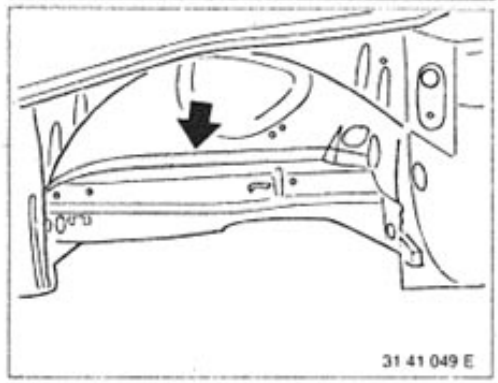


Drill out holes in front crossmember between left and right engine supports.

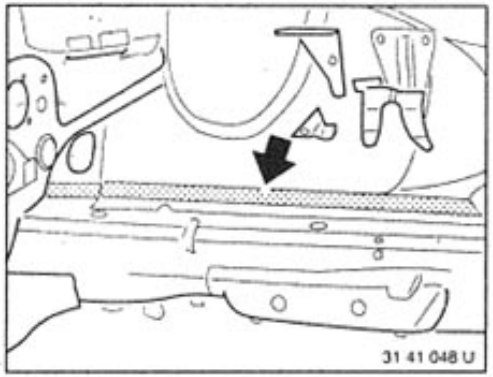
Remove crossmember.



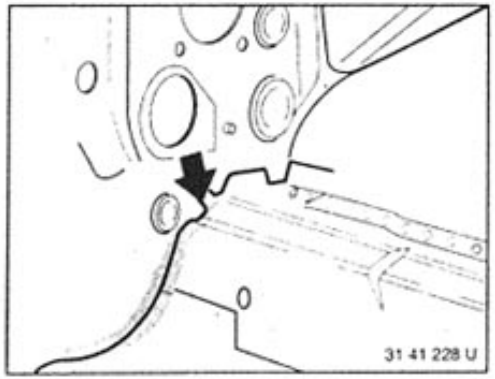
Drill off spot welding on holder for ABS hydraulic control unit.



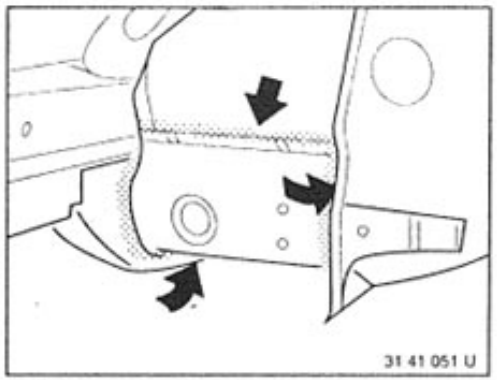
Clean mating surface in wheel house.



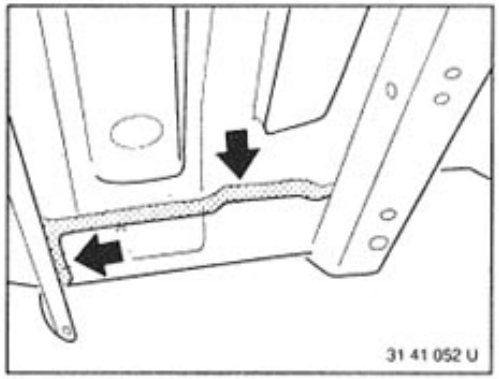
Clean mating surface in engine compartment.



Uncover firewall connection.



Uncover connections of reinforcement between A-pillar and engine carrier in the wheel house.

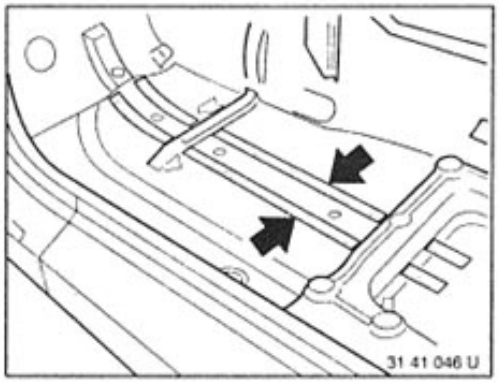


Uncover connections of reinforcement between A-pillar and engine carrier on underside.

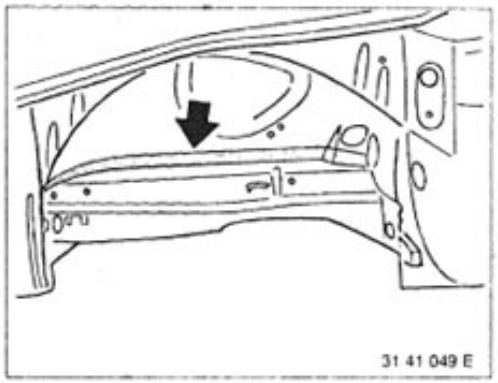
Drill off spot welding.

Cut off inert gas welded sections.

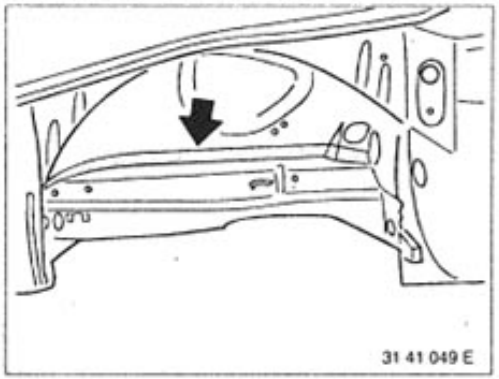
Remove scrap sheet metal parts.
Clean welded areas.



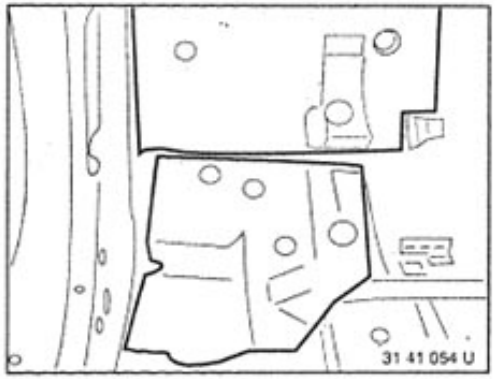
Clean connecting faces and drill out welding points.



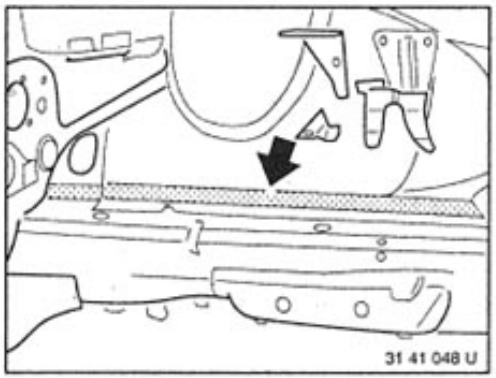
Drill out welding points on wheel arch.



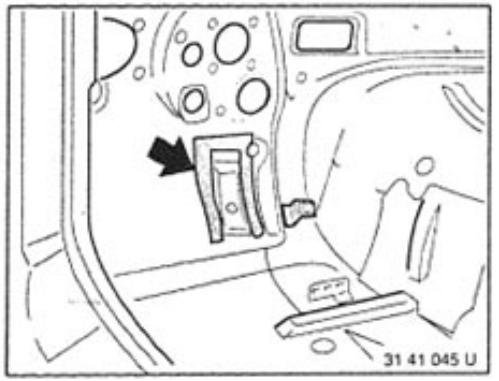
Straighten connecting point in wheel arch.



Remove acoustic insulation from interior.

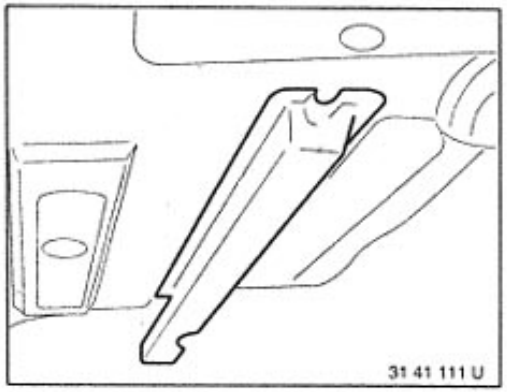


Straighten connecting point in engine compartment.

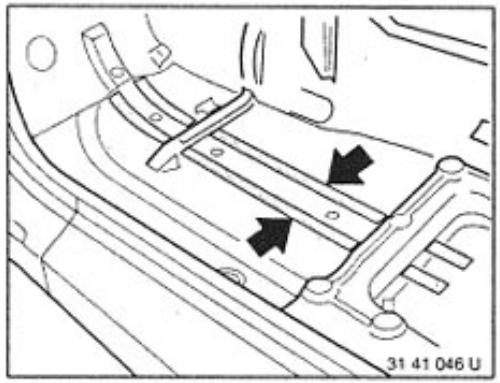


Drill out welding points on engine support wall facing passenger compartment.
Remove engine support.

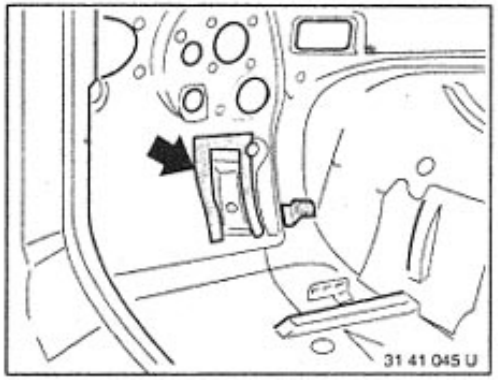
Clean welded faces of new part.
Coat welding faces with zinc dust paint.



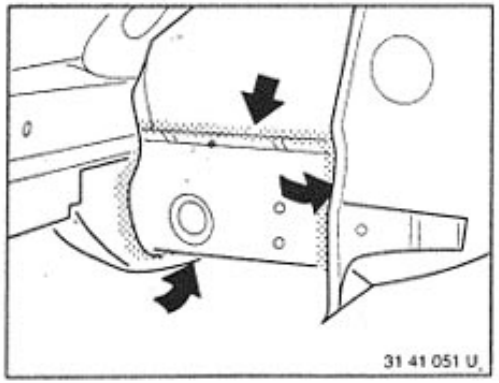
Adjust engine support on straightening bench.



Weld up engine support in interior.

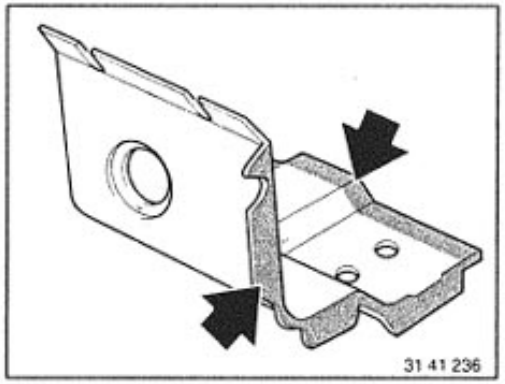


Weld up engine support on sidewall.

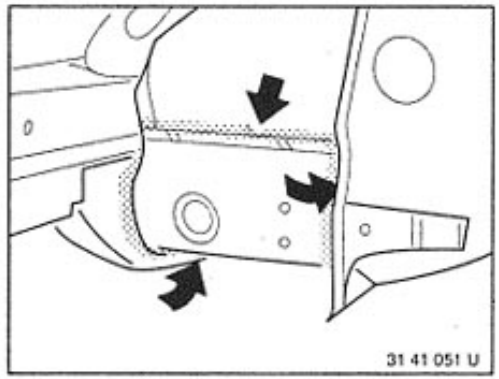


Adjust reinforcement between A pillar and engine support.
Mark out welded area and clean.

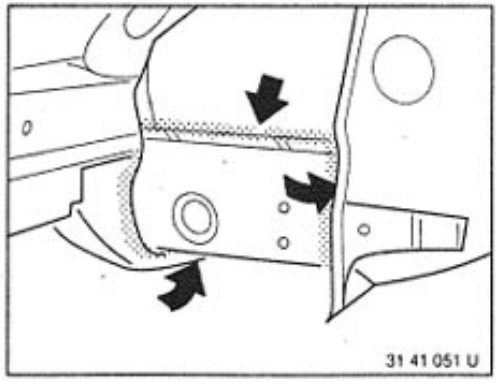
Clean reinforcement on connecting faces.



Drill out holes for plug welding connection in A pillar and floor assembly.

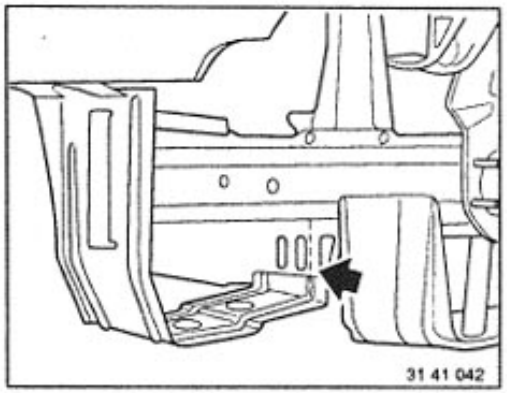


Adjust reinforcement between A pillar and engine support.

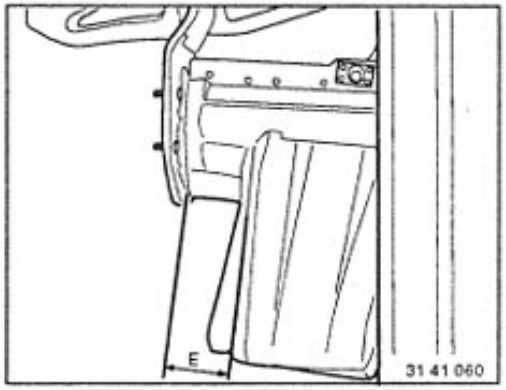


Weld up reinforcement between A pillar and engine support on floor assembly.

Grind down welded faces.

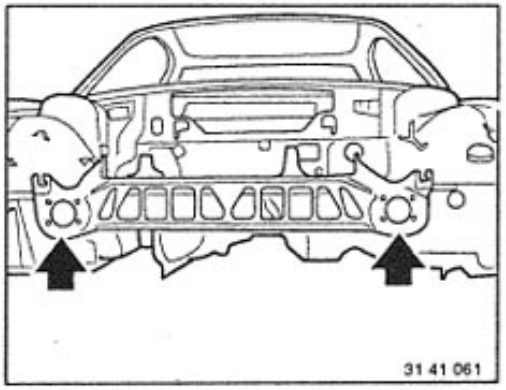


Fit in and weld holder for ABS hydraulic control unit on the engine carrier.

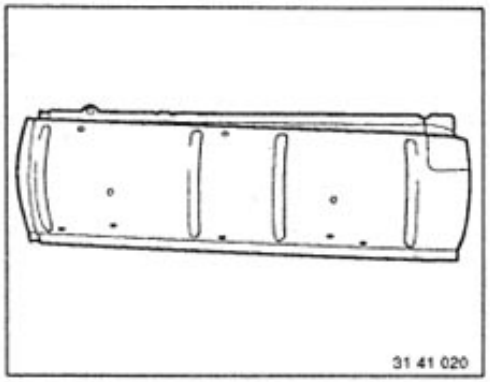


Fit in and weld cross member.

Distance (E) = 54 mm (2.126").



Weld front cross member between left and right engine carriers.



41 11 141 REPLACING COVER FOR LEFT OR RIGHT SIDE MEMBER (Partial Replacement of B-Pillar in Front of A-Pillar)

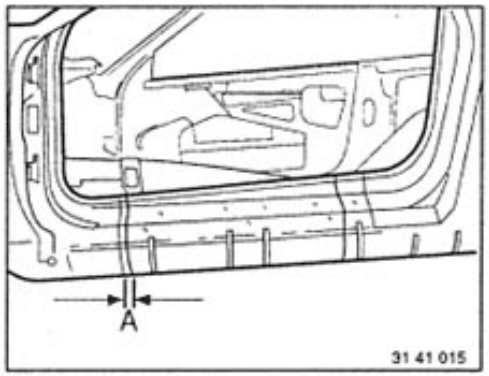
Refer to Introduction on page 41-0!

Remove or disconnect following parts.

- Seats, front and rear
- Outside side member plate
- Side member
- Rear side trim panel partially
- Wire harness cover
- Relay module

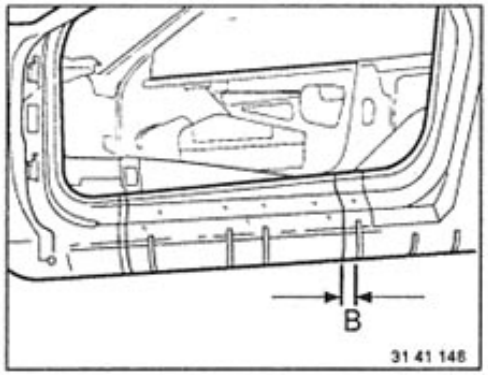
Remove or cover other parts of car, which are located in the repair zone and could be subjected to heat, sparks or dust.

Remove left door.



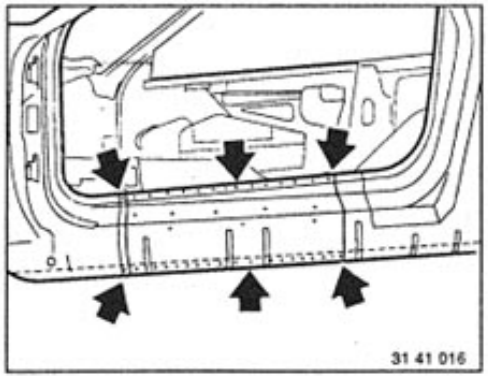
Cut out front section roughly.

Distance (A) = approx. 20 mm (0.787").

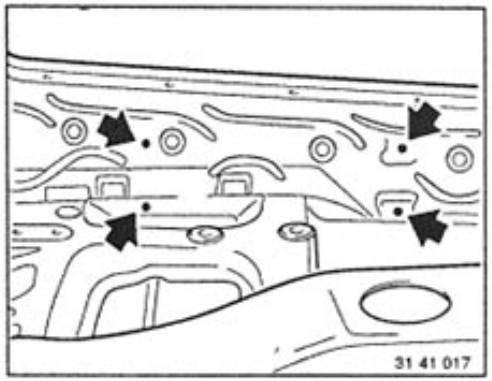


Determine location of rear cutting point with help of the new section; note the edging surface.
Cut off section.

Distance (B) to bead = approx. 25 mm (0.984").

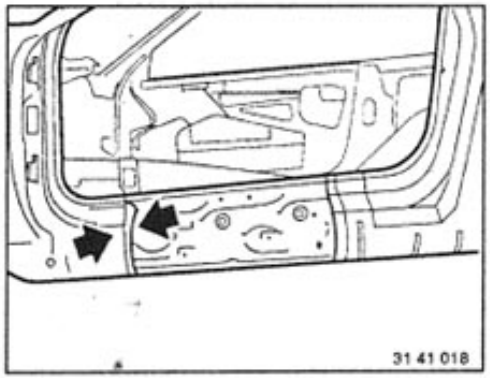


Drill off spot welding.

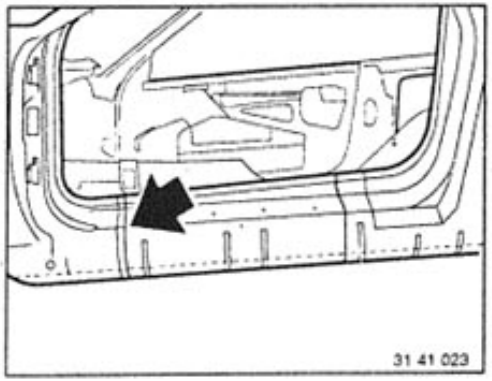


Drill offspot welding for reinforcement plates in the side mamber from the inside.

Take off side member.

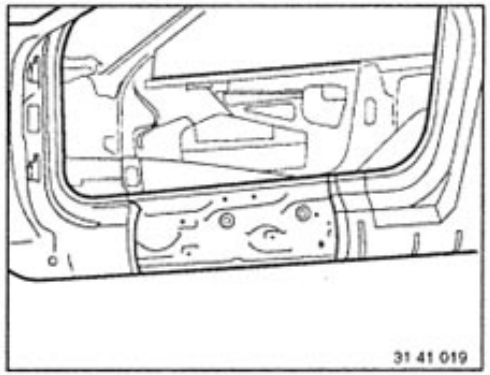


Drill off spot welding on remaining front section.

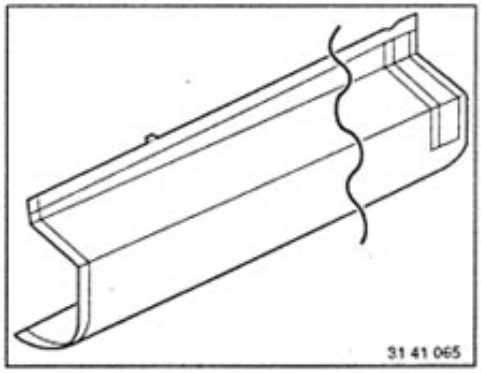


Remove brazing solder from connection between remaining front section and front mating surface.

Straighten front and rear mating surfaces.
Straighten inside of side member panel.
Clean mating surfaces.



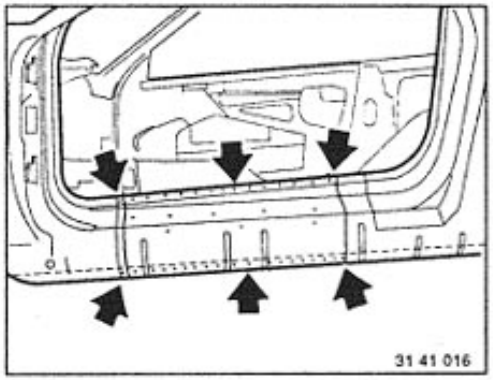
Shoulder rear mating surface.



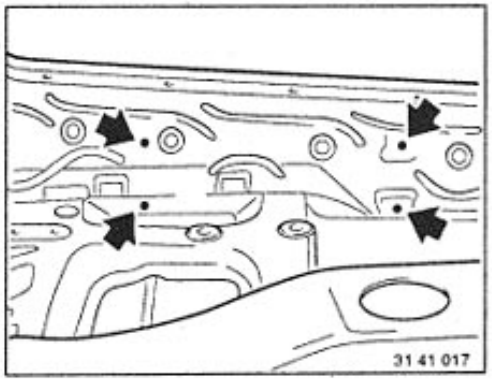
Cut new part to size.

Fit in new part.
Clean welding surfaces on new part.
Drill and deburr holes for plug welding (take location from old part).

Coat welding surfaces with zinc dust paint.
Fit in and clamp new part.

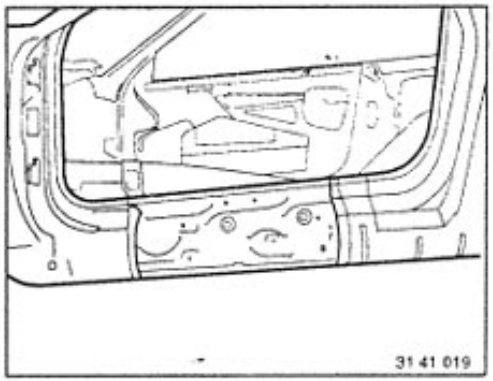


Tack weld new part.

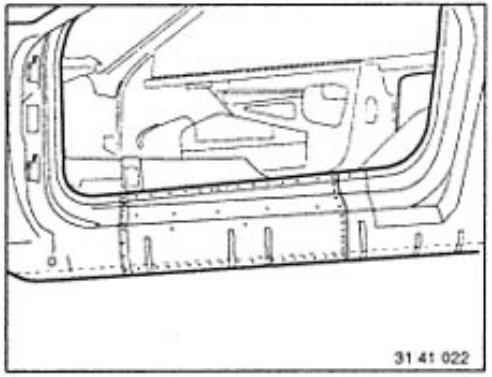


Plug weld new part.

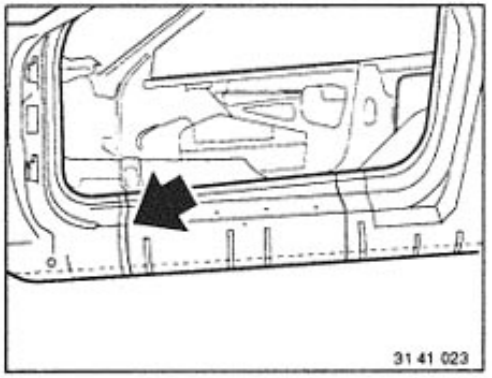
Grind welding spots smooth.



Clean rear seam for floating.

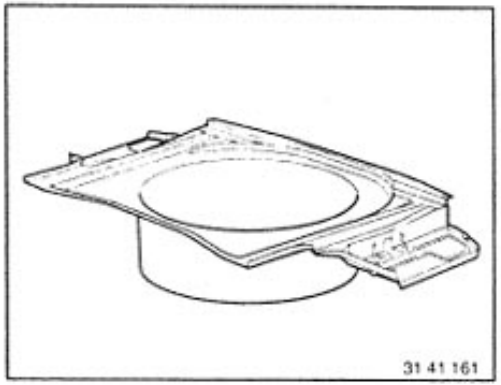


Float rear seam.
Grind floated seam smooth.



Clean front seam for brazing.
Braze front seam.
Grind front seam smooth.

Seal off seams.
Coat side member surface with Body-Plast.



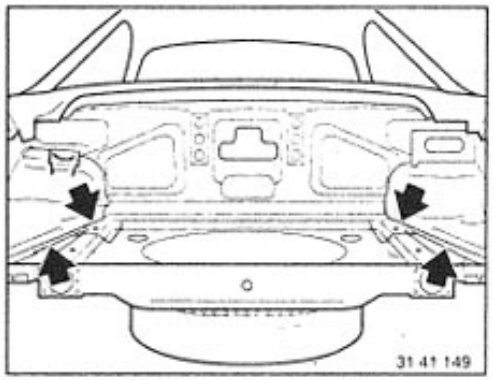
41 12 535 Replacing complete rear trunk floor (rear apron removed)

Body repair instructions: see 41-0/1.

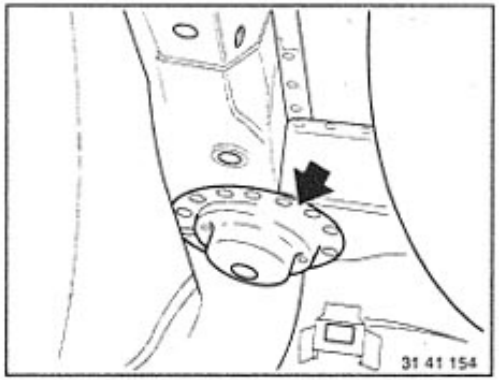
Place vehicle on straightening bench.

Remove or unfasten the following components:
Fuel tank
Rear axle carrier
Heat shield on exhaust system
Upper shock absorber
Spare wheel

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.

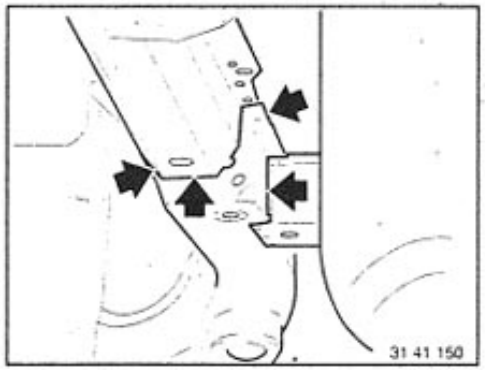


Expose joints in luggage compartment

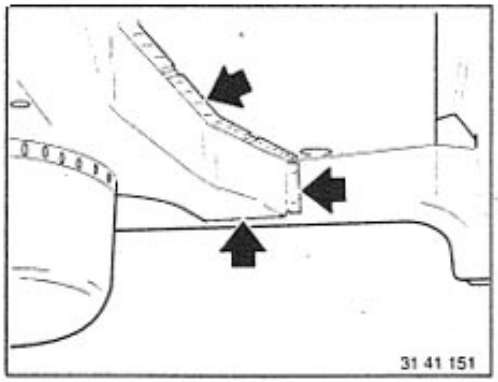


Expose joints on spring reinforcement (spring seat) and drill out spots.

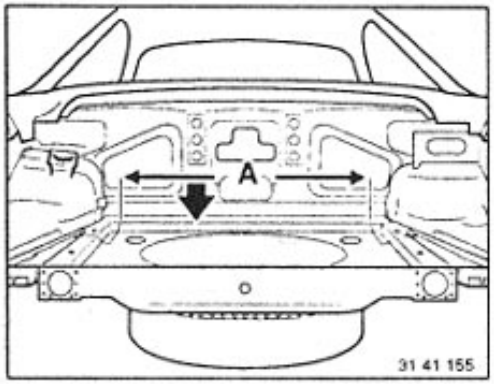
Caution!
To center spring reinforcement accurately on the contact face of the side member, use set of attachments!



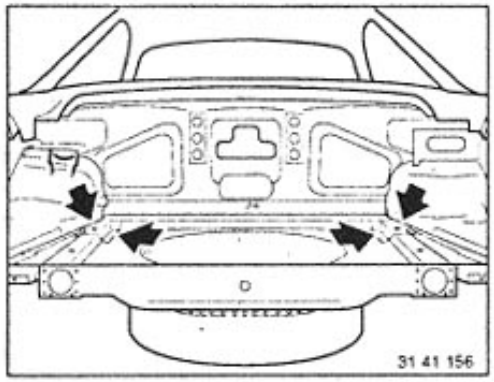
Expose joints in wheel arch on side member and crossmember.



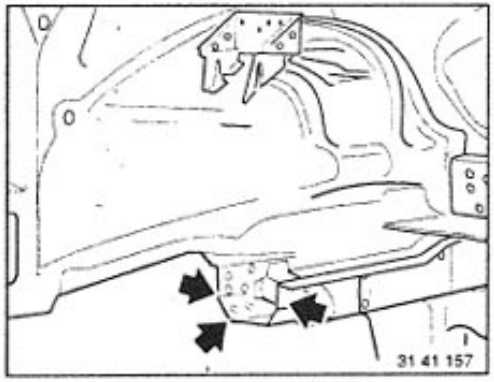
Expose crossmember joints on side member.



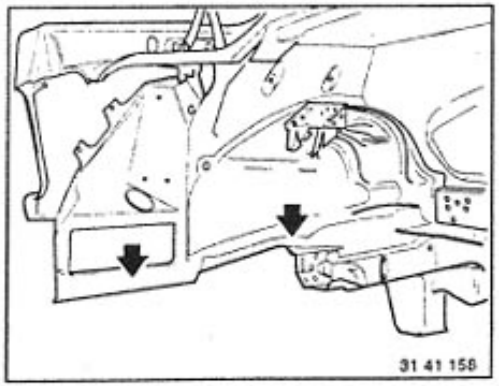
Cut out trunk floor roughly, allowing trunk floor to protrude above side member.
Drill out points in section "A".
Remove trunk floor.



Drill out spots in trunk floor over the side member and remove scrap sheet metal.

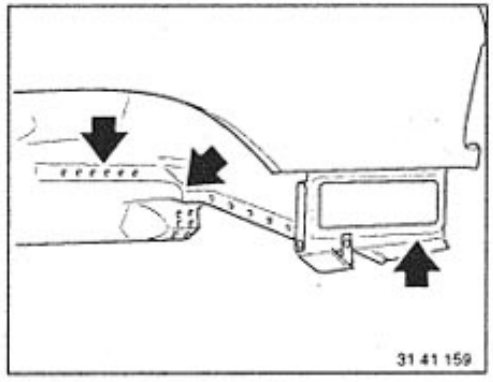


Expose contact faces of side member.
Drill out welding points of scrap sheet metal parts on side member.
Remove scrap sheet metal.
Grind down joints.

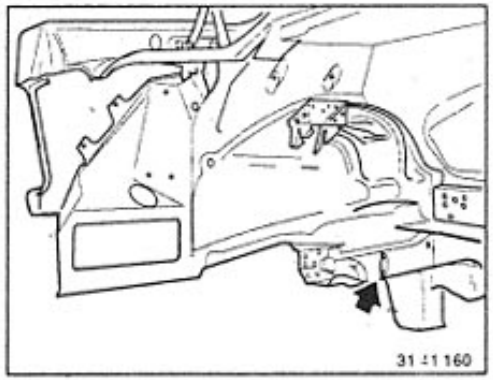


Expose connecting points on wheel arch extension and inside of wheel arch.
Drill out spots.
Remove scrap sheet metal.

Grind down welding surfaces (trunk floor, side member, outer and inner wheel arch).

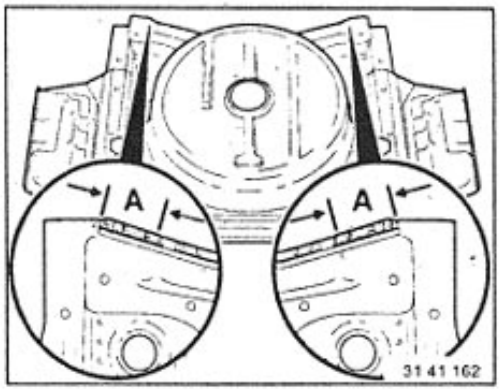


Clean joint on wheel arch extension.
Grind down welding surface.

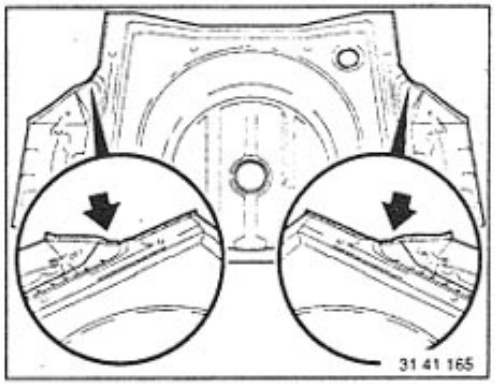


Installation:
Remove underbody protection from both side members.
It is then easier to install the trunk floor.

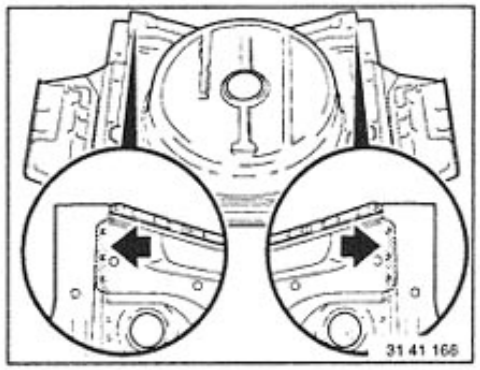
Align connecting faces.



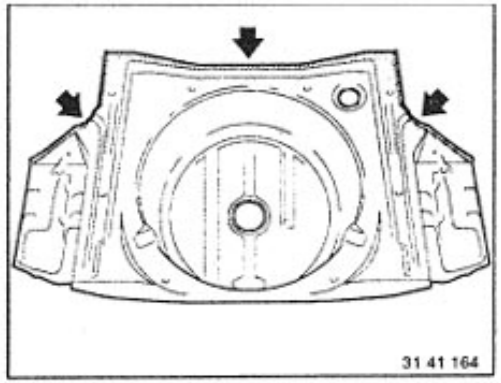
Installation:
To facilitate installation of the new trunk floor, drill out welding points in section "A" on left and right sides of upper trunk floor of front side member.
Lift up crossmember from trunk floor in section "A" approx. 10 mm.



Drill holes for plug welding wheel arch joint to new trunk floor.

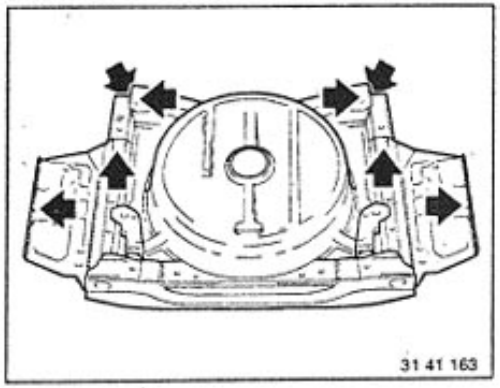


Drill holes for plug welding in front crossmember.

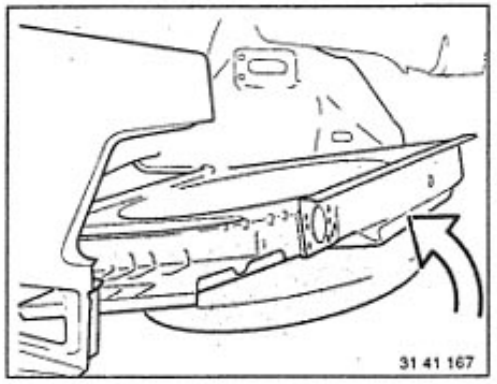


Clean both sides of welding faces on new section of trunk floor.

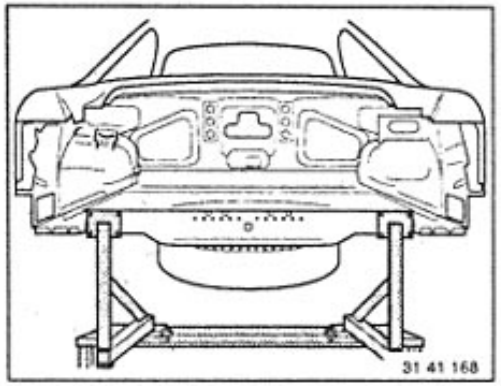
Coat welding surfaces with zinc dust paint.



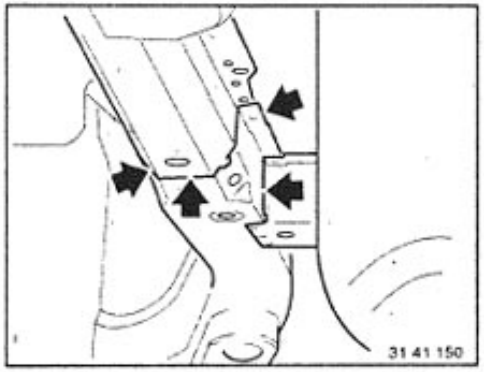
Clean both sides of welding surfaces on new trunk floor section.



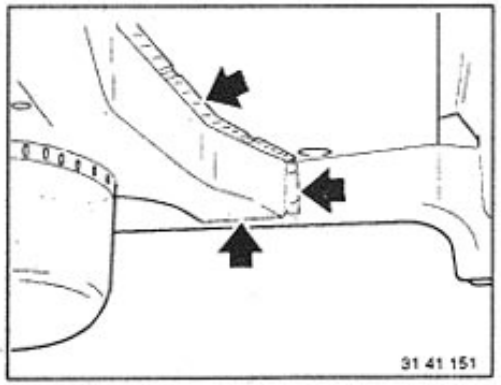
Install trunk floor from above at oblique angle. Gradually work in trunk floor to joints on side member and rear floor section.



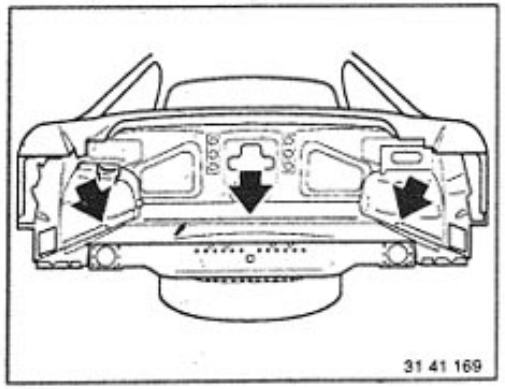
Fit set of attachments.
Secure trunk floor (with tongs)



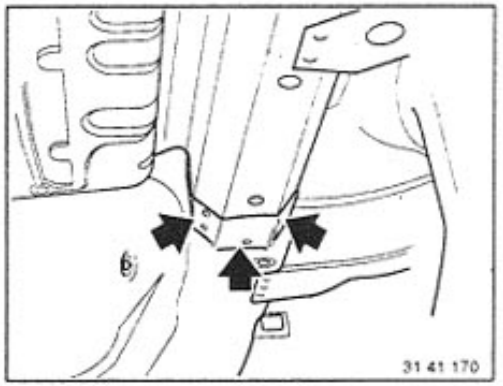
Align joints in side member and crossmember.
Tack weld joints.



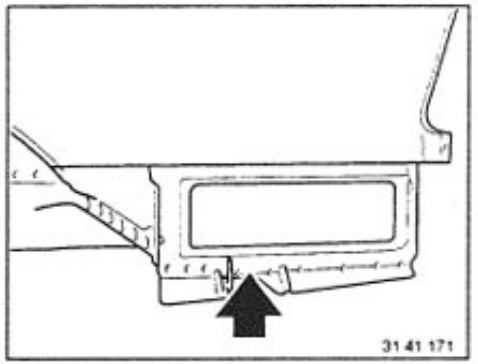
Align joints in side member and crossmember.
Tack weld joints.



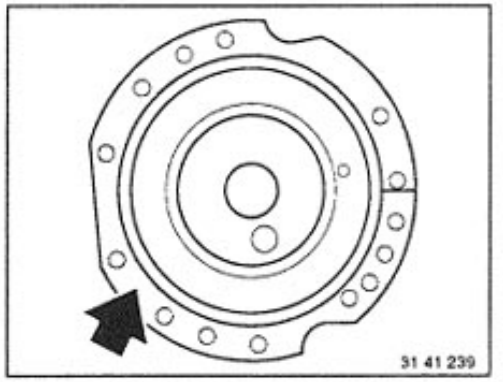
Align joints in trunk floor section.
Tack weld trunk floor section.
Check for correct position and weld up trunk floor.



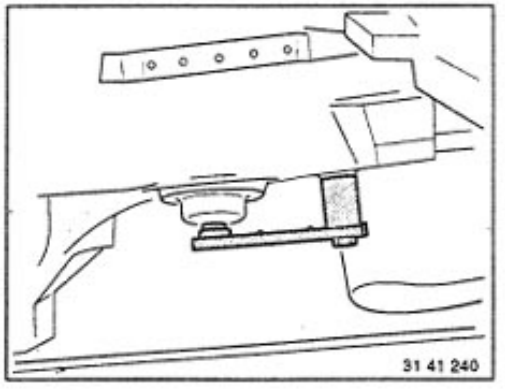
Align side member on joint of trunk floor.
Weld up drilled spots on side member.



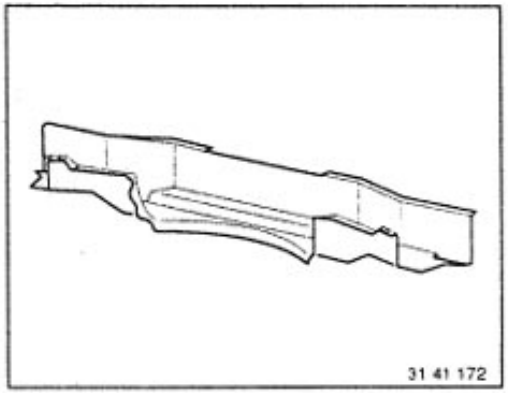
Spot weld wheel arch extension.
Grind down welding surfaces.



If new spring reinforcement is fitted (spring seat):
Drill out holes for plug welding.



Align spring reinforcement (spring seat) with set of attachments and weld up.
Grind down welding surface.



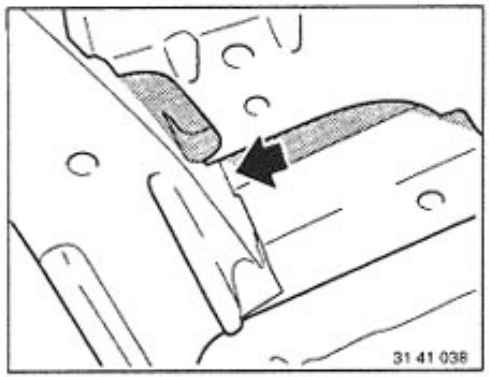
41 12 548 Replacing rear crossmember (tail panel removed)

Note Introduction 41-0!

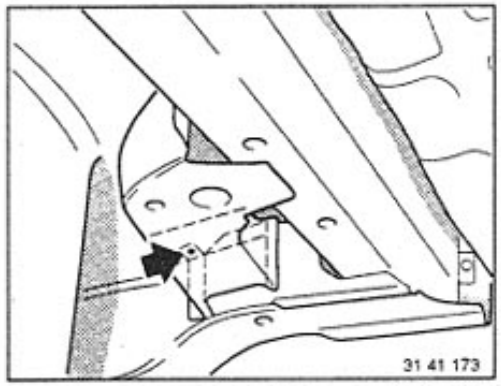
Remove or detach the following parts:
Scope: see "Replacing Tail Panel"
and, in addition:
Complete exhaust system
Heat shield of exhaust system
Place vehicle on straightening bench

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.

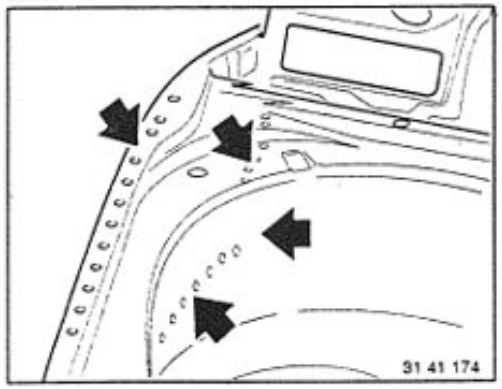
Disconnect rear muffler bracket at readily accessible point.



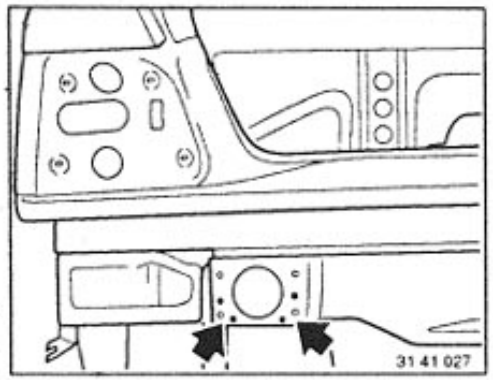
Mill away welded seam at joint between rear section of side member and crossmember.



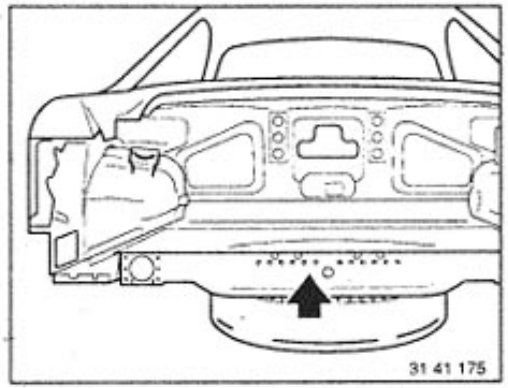
Drill out welding spot in bracket of rear muffler and crossmember at rear of trunk floor section.



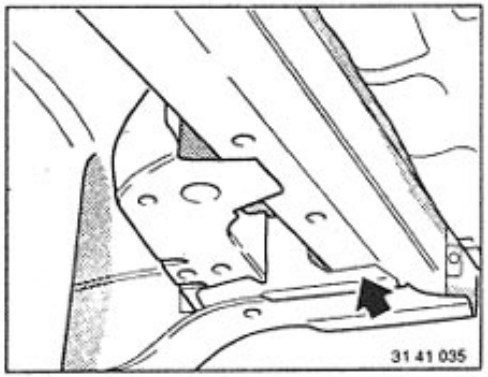
Drill out welding spots in crossmember of trunk floor in the spare wheel recess.



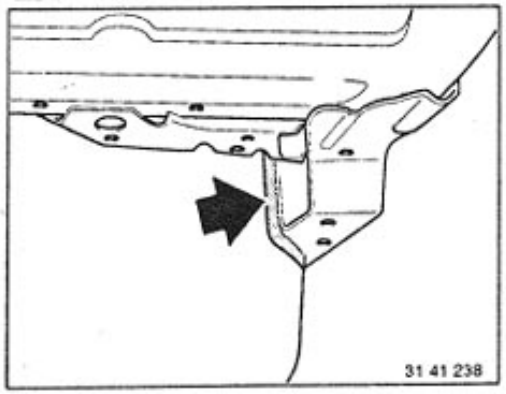
Drill out spots on side member.



Drill out spots in rear trunk floor.

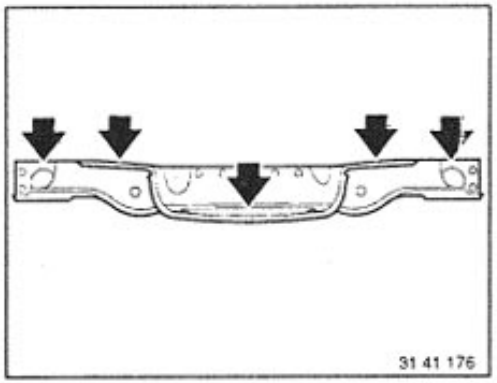


Disconnect crossmember from rear section of side member.

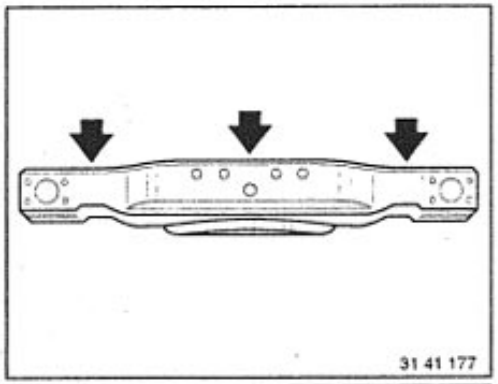


Grind down welded seams on outside of spare wheel recess.

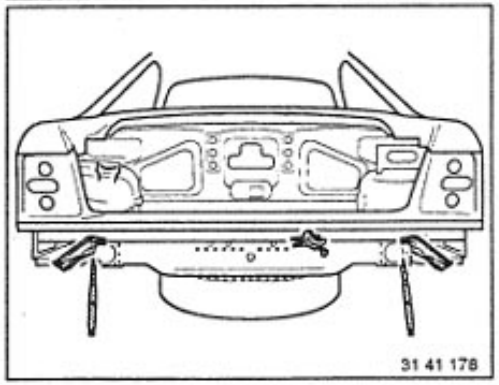
Remove crossmember.
Remove scrap sheet metal from rear muffler bracket on side member.
Clean welding surface.
Align joint



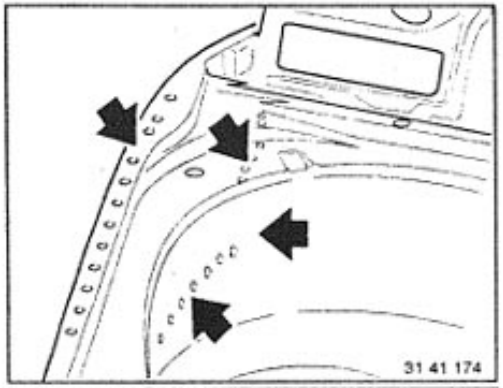
Clean welding surfaces on new part and coat with zinc dust paint.



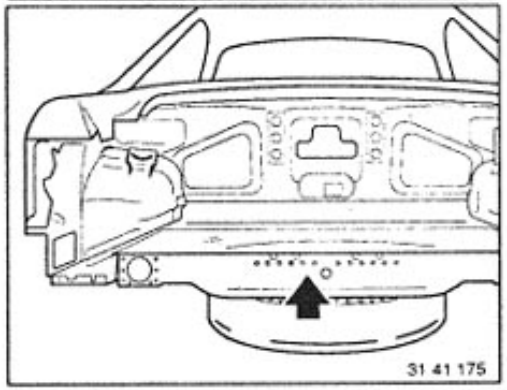
Clean welding surfaces on new part and coat with zinc dust paint.
Coat welding surfaces on joints with zinc dust paint.



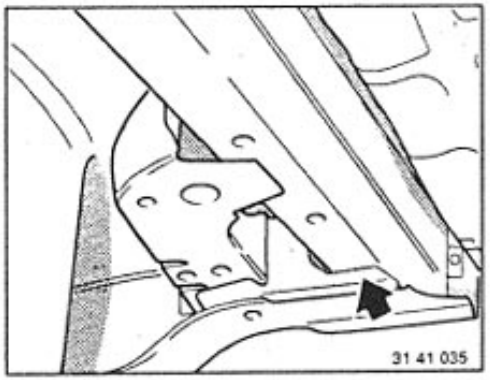
Adjust crossmember with attachments and secure (with tongs).



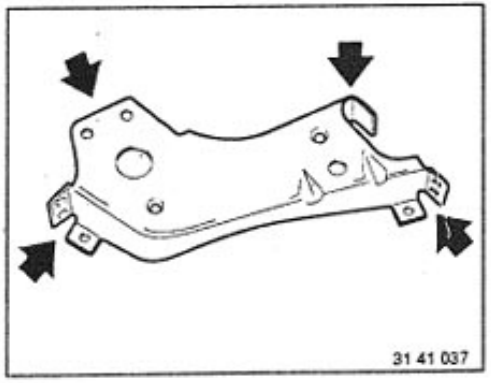
Weld up crossmember in trunk floor and in spare wheel recess.



Weld up crossmember on the rear trunk floor.

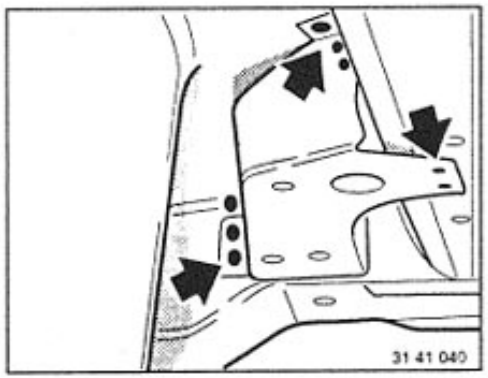


Weld up crossmember on rear section of side member.

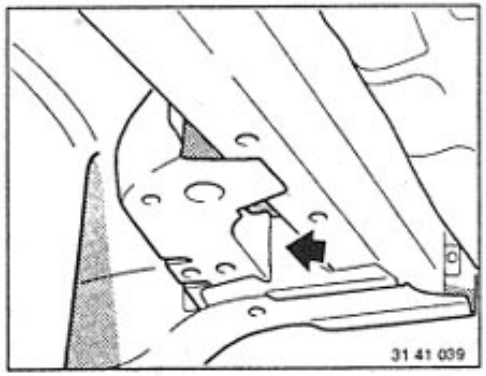


Drill out holes for plug welding rear muffler bracket.

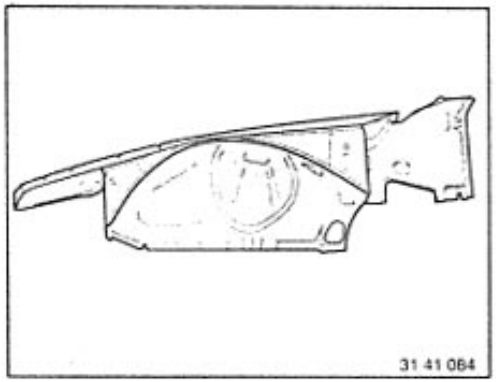
Clean joints on rear muffler bracket and adjust rear muffler bracket to fit.



Spot weld relevant points on rear muffler bracket.



Perform inert gas welding on rear muffler bracket.



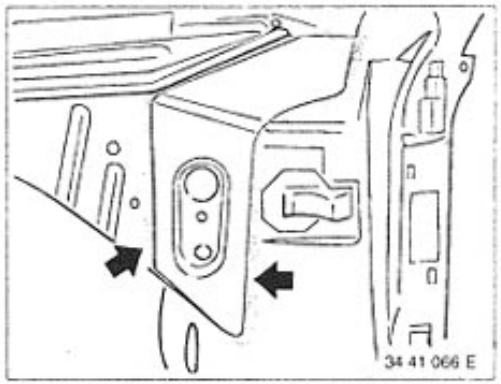
41 14 021 Replacing front left wheel arch - partial replacement -

Body repair instructions - see 41-0/1.

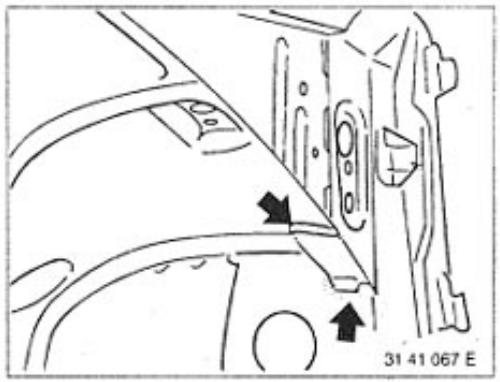
Place vehicle on straightening bench.

Remove or detach the following vehicle parts:
front axle with engine and transmission
impact absorber
bumper
front side panel
radiator
hydraulic accumulator
front seat
hood lid
interior carpet

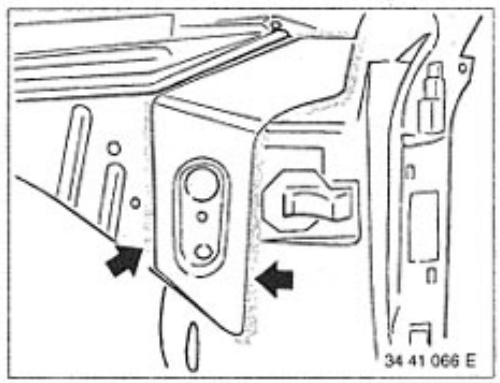
Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



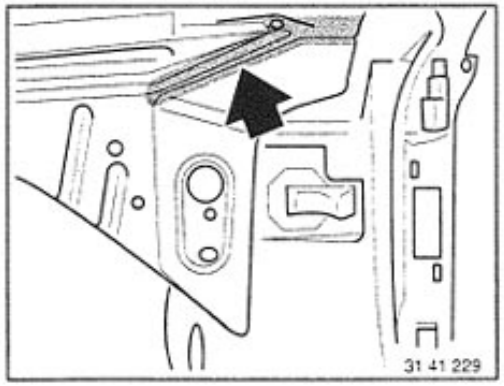
Expose joints on closing plate on A pillar.



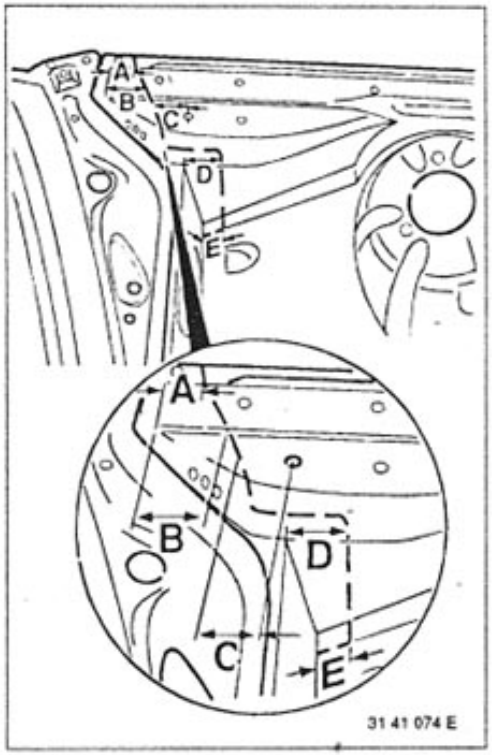
Expose joints on closing plate in wheel housing.



Drill out welding spots and grind down welded seams.

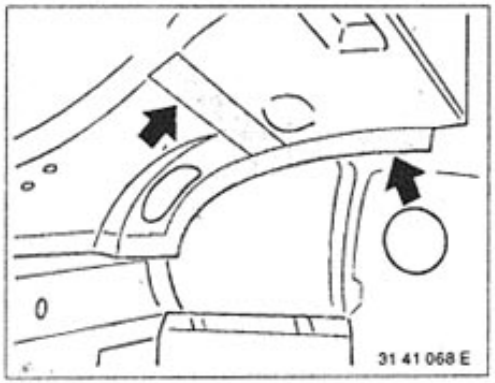


Drill out welding spots.

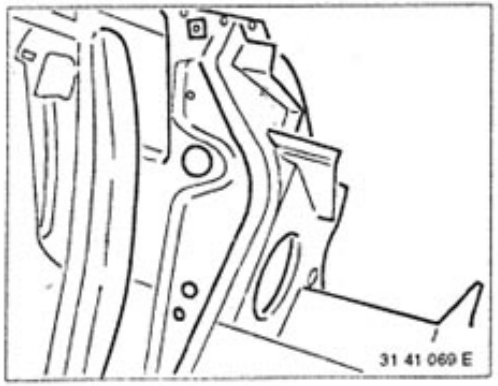


Determine, mark out and clean locating point for partial replacement.

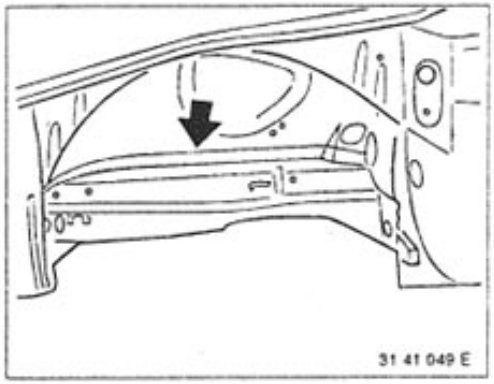
Dimension A = 30 mm
Dimension B = 35 mm
Dimension C = 20 mm
Dimension D = 35 mm
Dimension E = 35 mm



Clean joints for partial replacement on front panel.

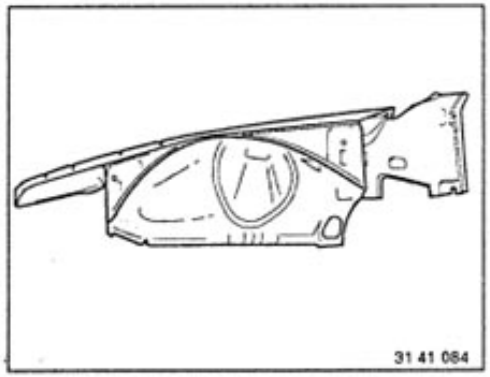


Detach connecting point for partial replacement.

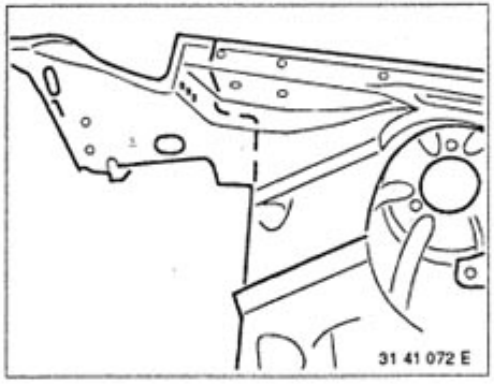


Clean joint in wheel arch and drill out welding spots on engine support.

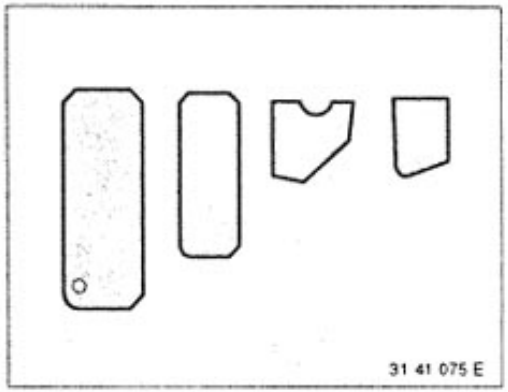
Remove wheel arch.
Clean joints.



Cut out new wheel arch roughly.



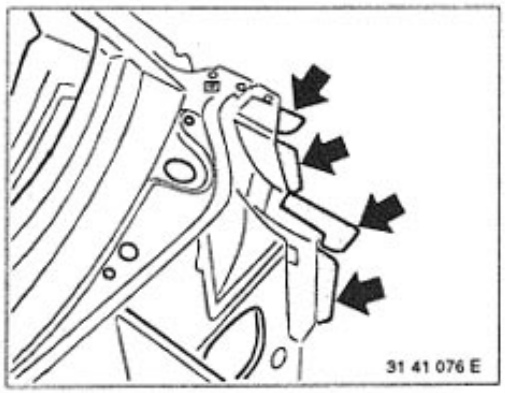
Adjust wheel arch.
Determine locating point and mark out.



Manufacture reinforcement plates (depending on line of cut).
Ensure adequate level of overlap (min. 30 mm at all points)!

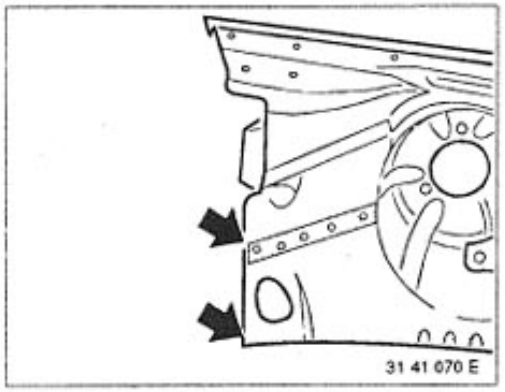
Drill holes for plug welding in the reinforcement plates.

Coat welding surfaces with zinc dust paint.

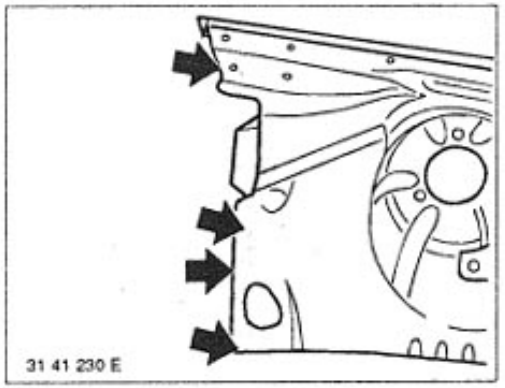


Weld reinforcement plates to body.

Grind out welding spots.



Clean connecting faces on wheel arch / carrier plate.



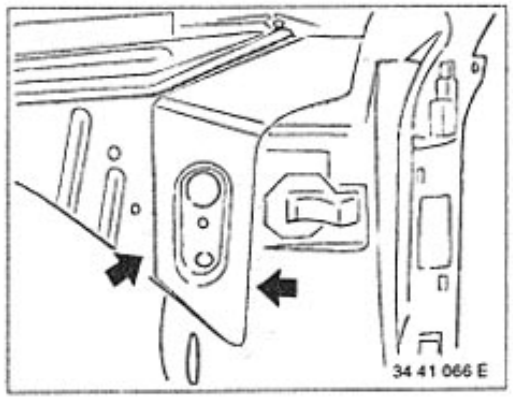
Clean connecting faces on wheel arch.

Adjust wheel arch to fit.
Mark out spots for plug welding and drill out.

Tack weld wheel arch and adjust joints if necessary.

Weld up wheel arch.

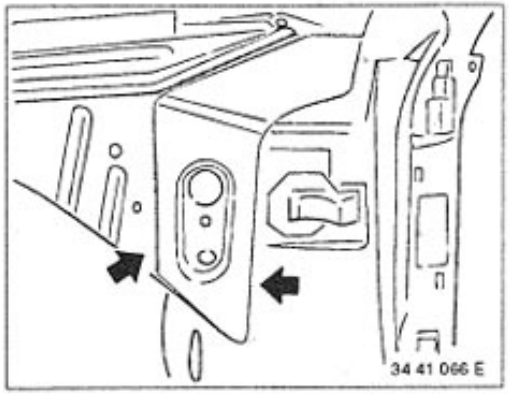
Grind down welding seams.



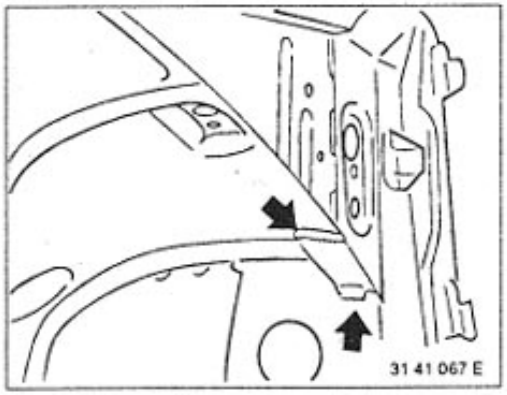
Clean welding surfaces on closing plate and body.

Adjust closing plate.

Tack weld closing plate.



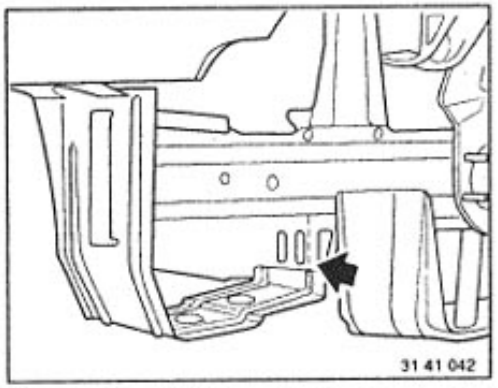
Weld closing plate to A pillar.



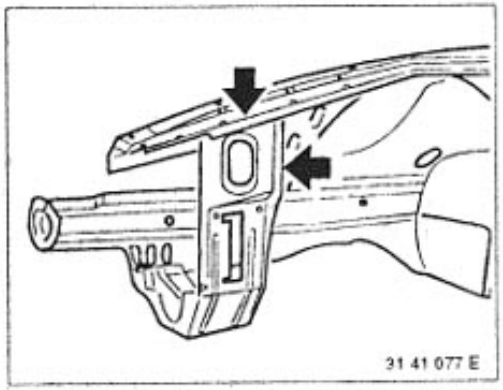
Weld closing plate to wheel arch.

Grind down welding surfaces.

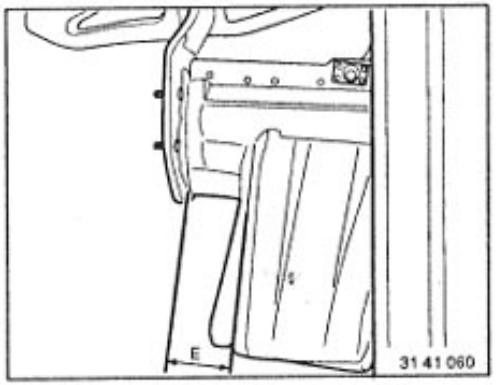
Solder contact surface.
Grind down soldered surface.



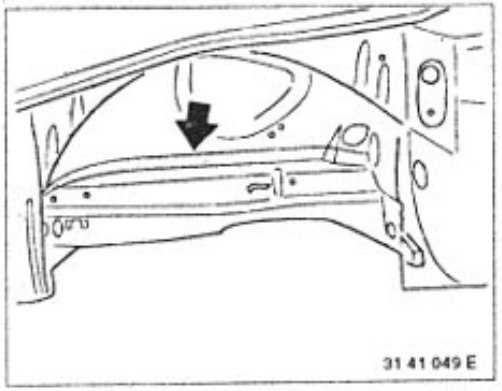
Adjust ABS hydraulic unit to fit engine support and weld up.



Adjust bracket on ABS hydraulic unit to fit wheel arch and weld up.

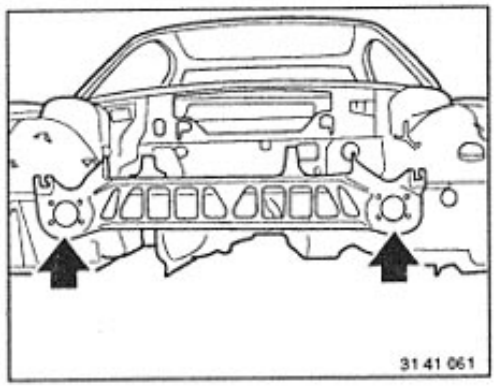


Adjust crossmember and weld up.
Dimension (E) = 54 mm



Weld wheel arch to engine support (plug welding).

Grind down welding surface.



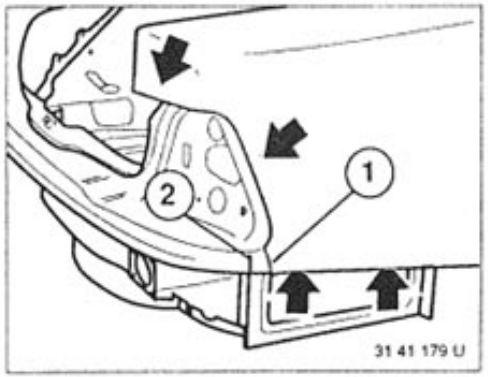
Weld front crossmember between the left and right engine supports.

41 14 160 Replacing rear right wheel arch outer section and side panel

Body repair instructions: see 41-0/1.

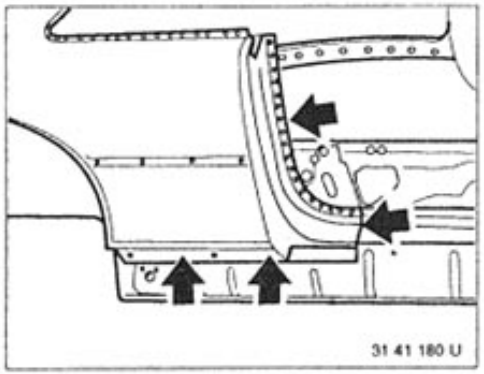
Remove or disconnect the following parts:
Rear window
Trunk lid
Fuel tank
Rear wheel
Bumper
Battery
Front seat
Interior carpet (partial)

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.

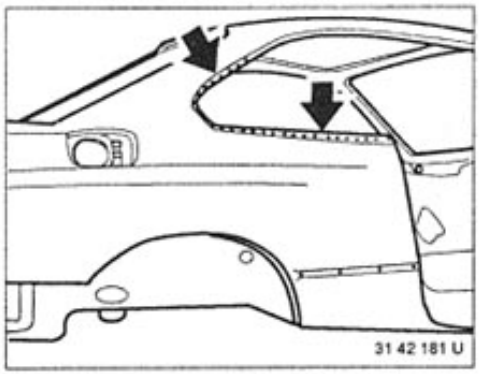


Expose joints on side panel beside lamp support and wheel arch extension.
Roughly cut out joint on side panel beside lamp support.

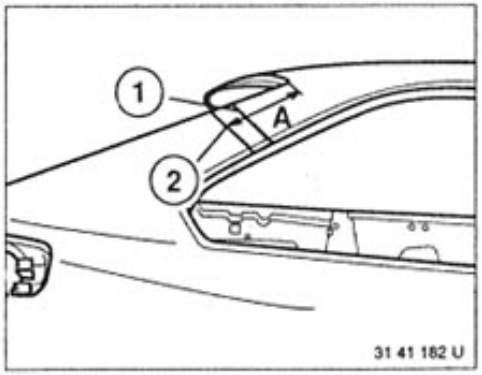
1 = Joint for cut
2 = Bead in rear side panel



Drill out welding spots in door opening.

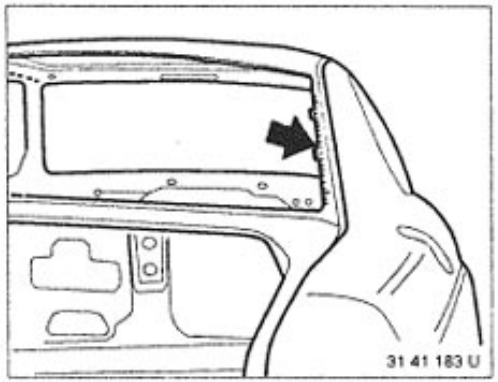


Drill out welding spots in side window.

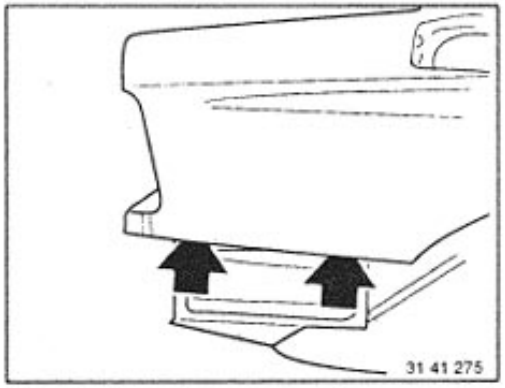


Expose contact face of C pillar on roof frame.
Determine location of joint and separate.

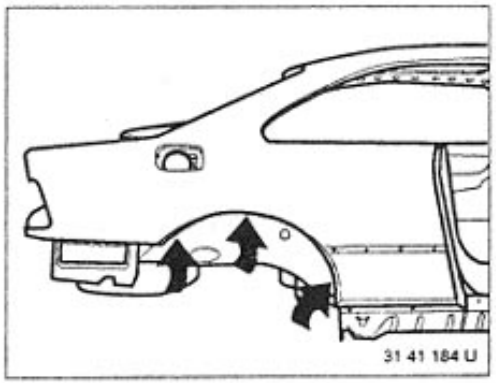
Dimension (A) = 170 mm.
1 = Joint
2 = Separating point for partial replacement



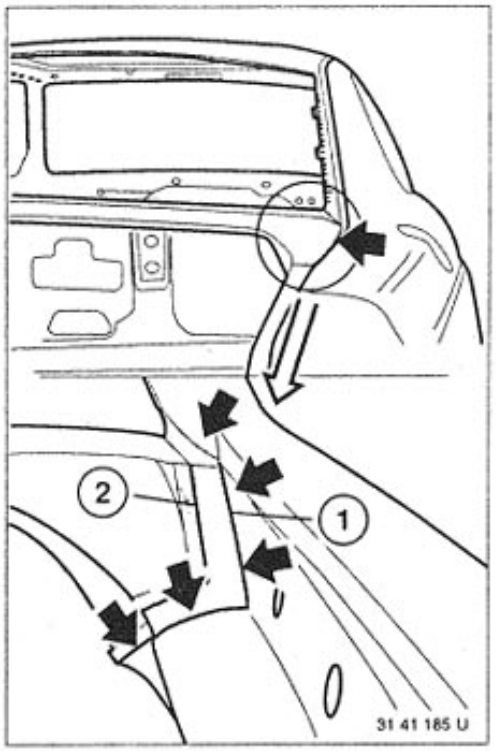
Drill out welding spots on rear window.



Expose welding spots in wheel arch extension and drill out.



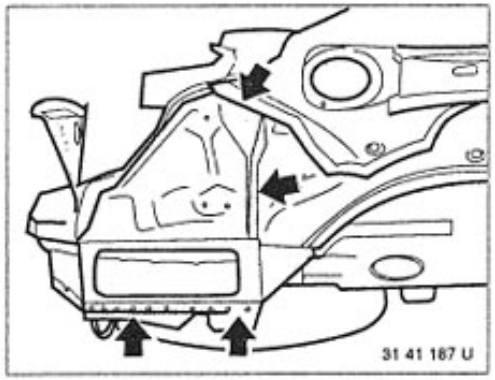
Expose joint in side panel of wheel housing and separate roughly.



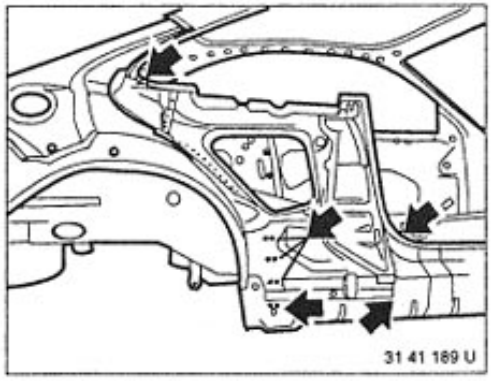
Expose joint on windshield and separate.

Caution!
Detach along welded seam on edge, otherwise part becomes too short.

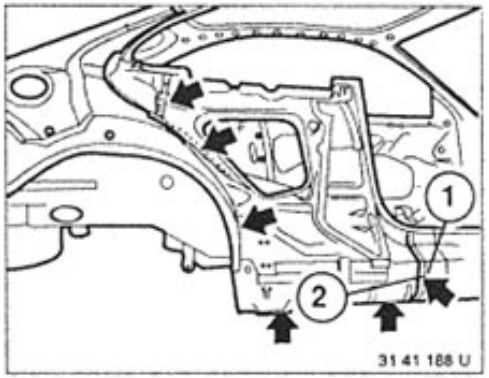
Remove side panel.



Roughly separate wheel arch extension.

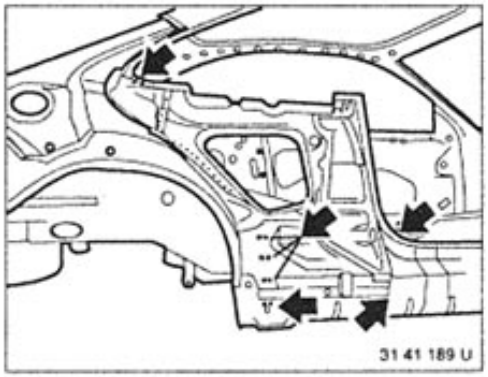


Roughly separate side carrier on rear window frame and roughly separate joint in center pillar.
Roughly separate side carrier on rear window frame.

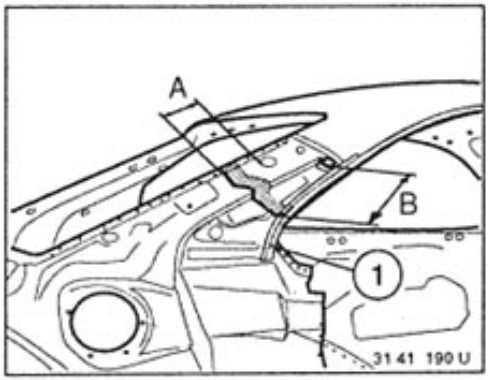


Cut out inside of side section.

1 = joint
2 = joint



Drill out welding spots or grind out.



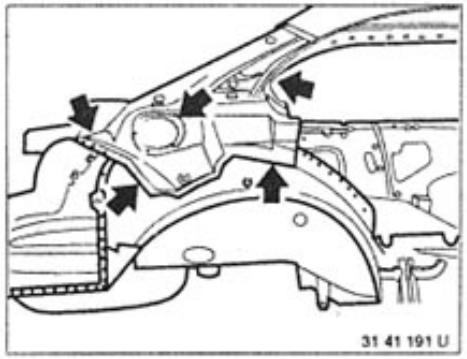
Support roof section.

Determine joint for partial replacement of rear window frame.

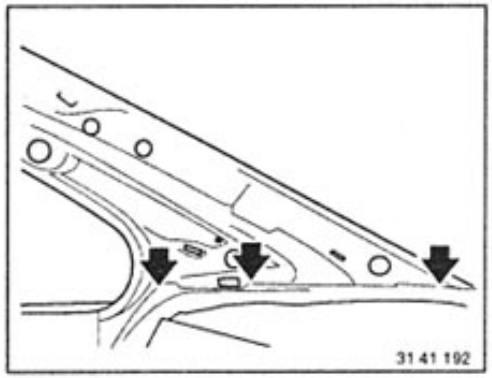
Dimension (A) = 70 mm
Dimension (B) = 160 mm

Cut through joint.

Caution!
Do not sever gasket bracket in roof frame (1)!

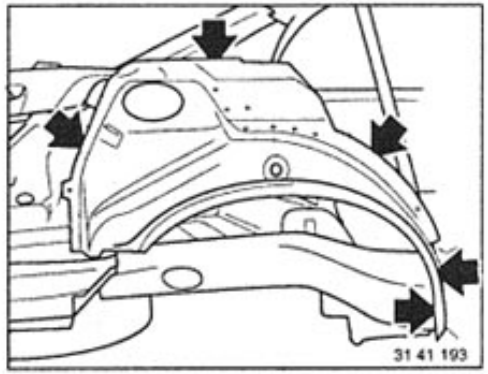


Disconnect rear window frame from outside of wheel arch and lower rear window frame.



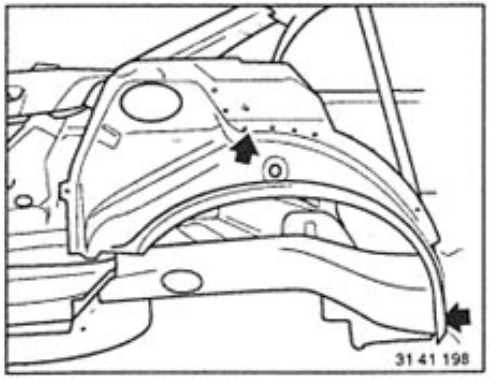
Disconnect outer wheel arch, lower rear panel and rear window frame from interior.

Remove rear window frame.

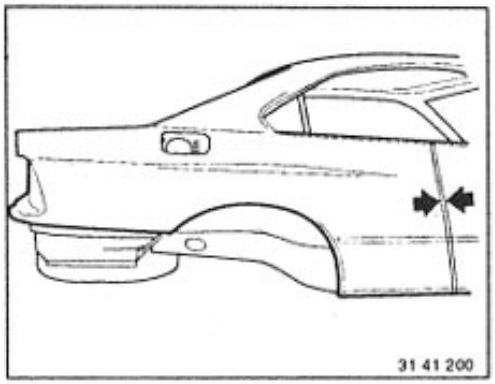


Disconnect outer wheel arch and remove.

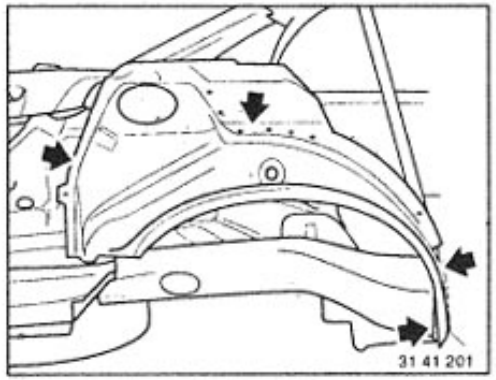
Remove scrap metal.
Align joints and grind down.



Adjust outer section of wheel arch. Mark out surface for plug welding and spot welding.
Clean welded surfaces on outside of new wheel arch.
Coat welding faces with zinc dust paint.

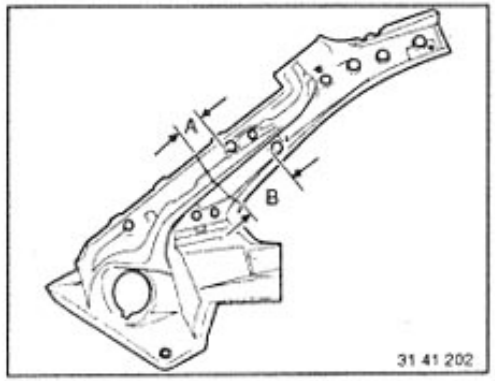


Adjust wheel arch to fit side panel.Ensure that joint is of uniform width!



Remove side panel.

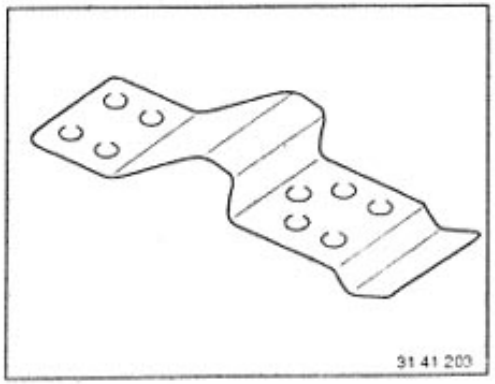
Weld up wheel arch.



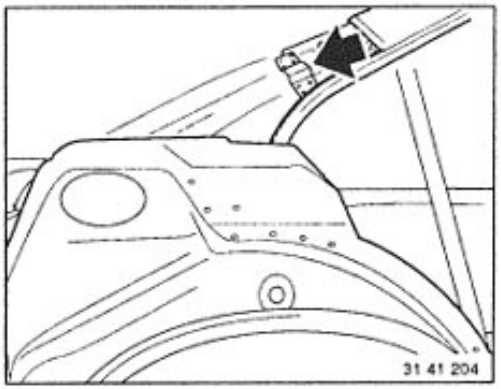
Determine joint for partial replacement of rear window frame and separate.

A = 70 mm
B = 160 mm

Adjust rear window frame.
Clean welding areas.



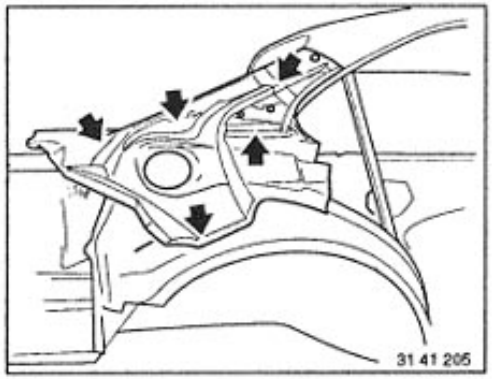
Produce new part from scrap sheet reinforcement metal (approx. 40 mm wide).
Drill holes for plug welding.
Clean welding surface.



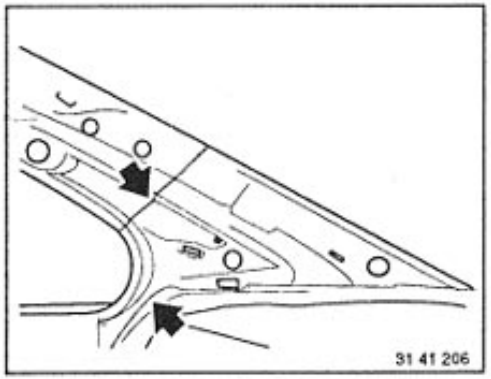
Clean welding surface for reinforcement plate on rear window frame.

Coat welding surface with zinc dust paint.

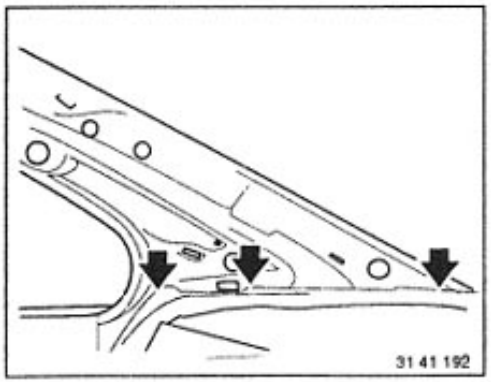
Secure reinforcement plate and weld up (approx. 20 mm overlap on each side).



Adjust rear window and weld up.
Plug weld the reinforcement sheet.

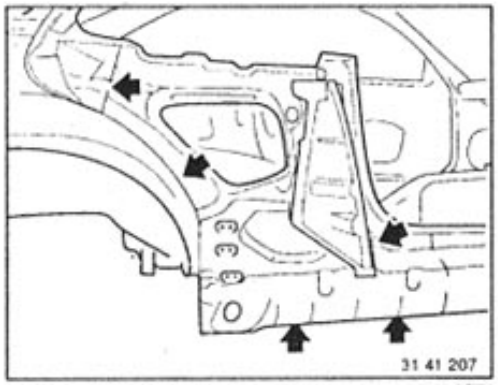


Weld rear window frame from inside vehicle body to wheel arch and and lower section of rear window frame.
Weld locating point for partial replacement.

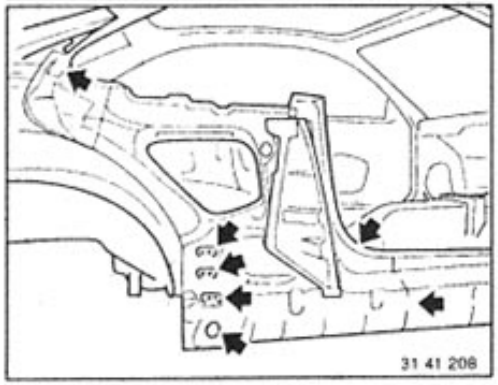


Weld connecting points for rear window frame / wheel arch from inside vehicle body.

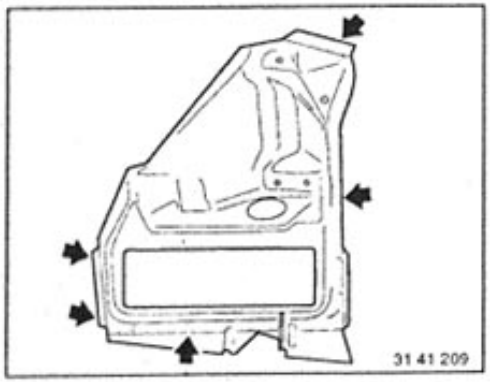
Adjust side panel to fit.
Clean connecting faces on side panel and coat with zinc dust paint.



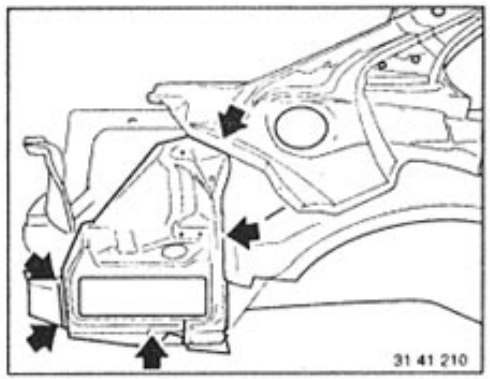
Adjust side panel to fit, secure and weld into place.



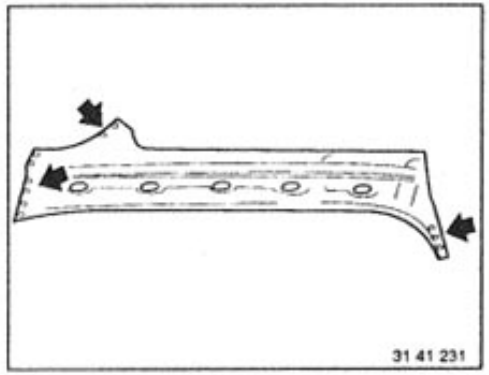
Weld up side panel.
Grind down welding surfaces.



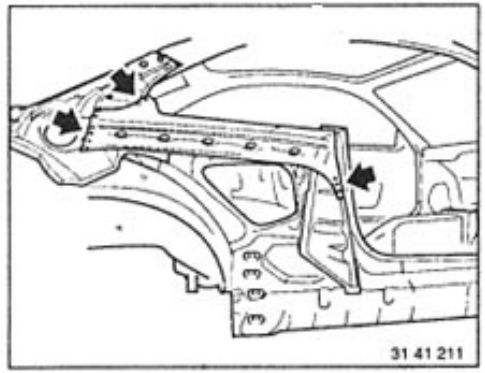
Adjust wheel arch extension to fit.
Clean wheel arch extension to welding surfaces.



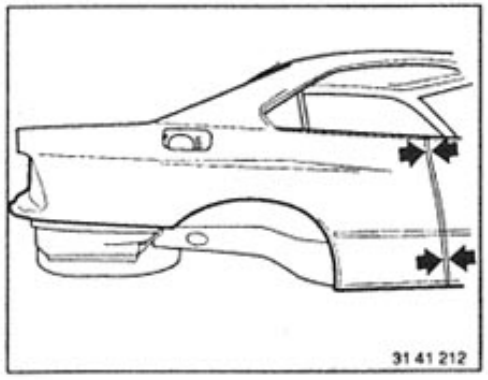
Adjust wheel arch extension and weld into place.
Grind down welding surfaces.



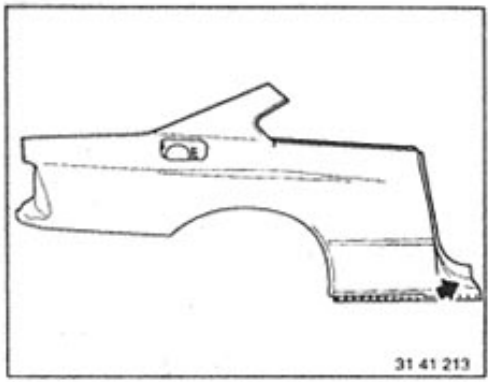
Adjust side carrier to fit and mark out holes for plug welding.
Drill out holes in side carrier for plug welding.
Clean welding surfaces.



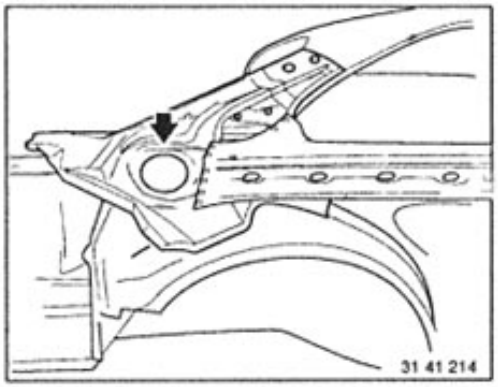
Adjust side carrier to fit side panel and secure.
Remove side panel again.
Weld up side carrier.
Grind down welded areas.



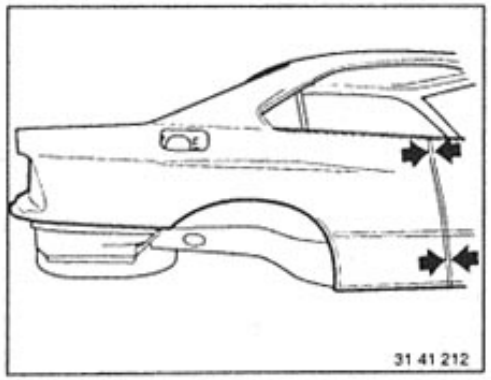
Adjust side panel to fit and ensure that joint is of uniform width!
Mark out holes for plug welding.
Remove side panel.



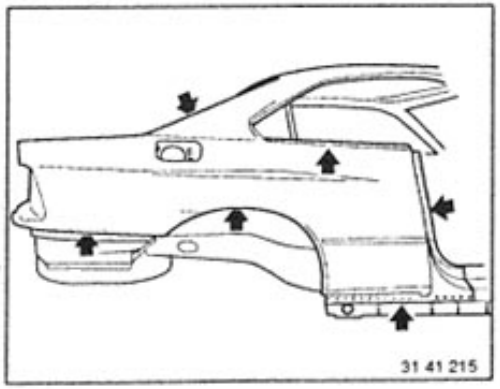
Drill holes for plug welding.
Clean welding surfaces.



Fit sealing material * to recess for tank filler neck.

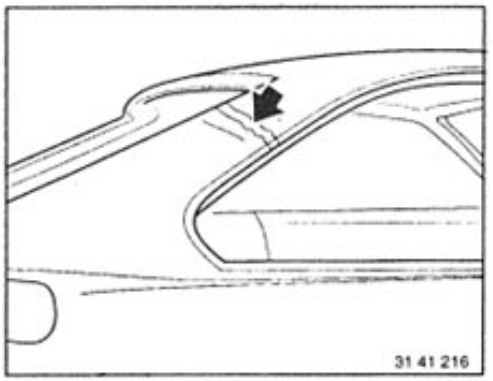


Adjust side panel to fit.
Ensure that joint is of uniform width!



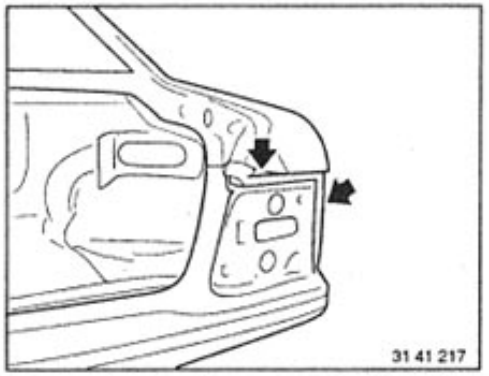
Weld up side panel.

* Refer to BMW Parts Service

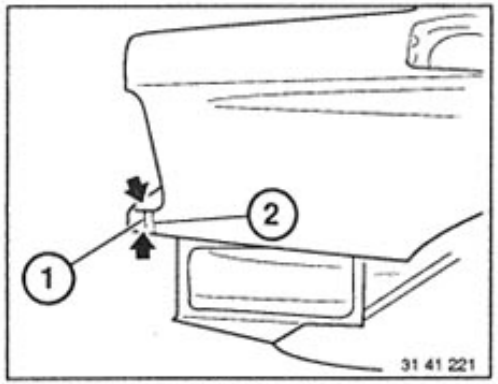


Weld connection for C pillar.
Arrange individual spots so close to one another that a continuous welded seam is created.

Caution!
Always allow each spot to cool down slightly before starting on next spot.
Risk of distortion!

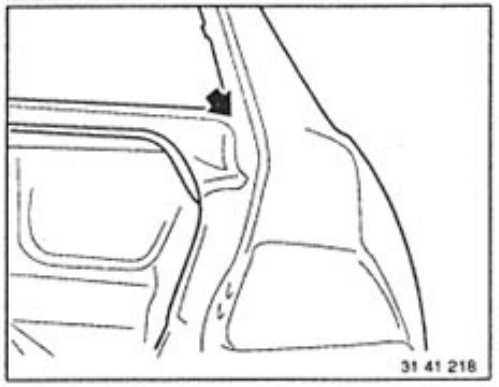


Install welding points in lamp support.
Braze water gutter and link to lamp support.

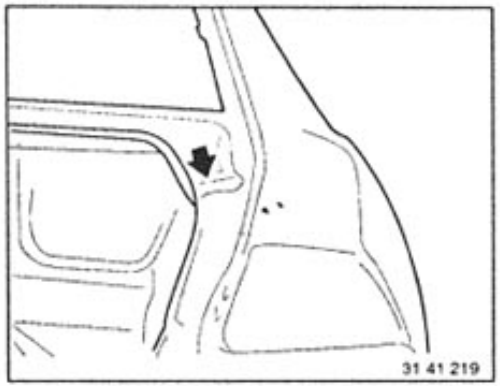


Braze joint between tail panel and rear side panel.

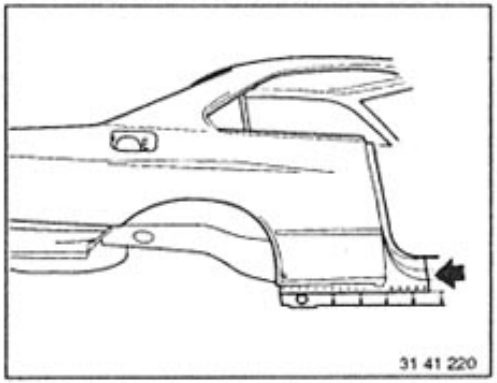
1 = Joint in tail panel (brazed point)
2 = Bead in side panel at rear



Weld up link between lower rear window frame and side panel.

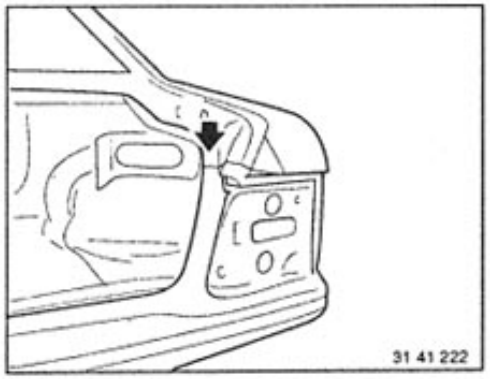


Braze link between lower rear window frame and side panel.

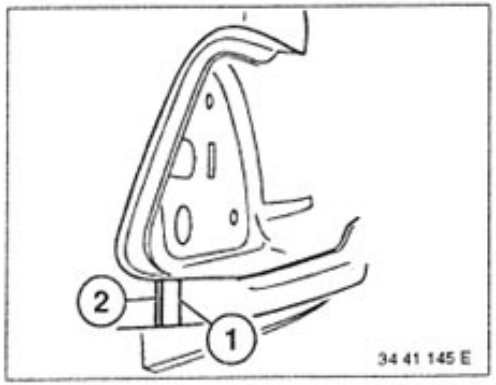


Braze cover for side member in door opening.

Grind down welding and brazing points.

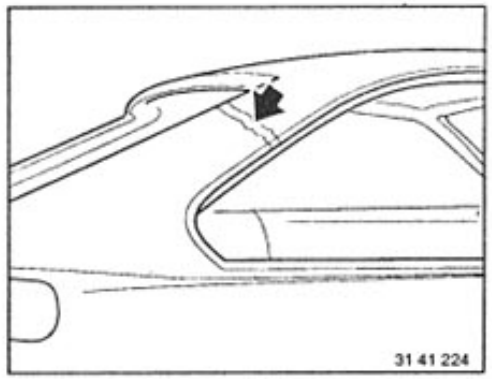


Tin out joint in water gutter and grind down.

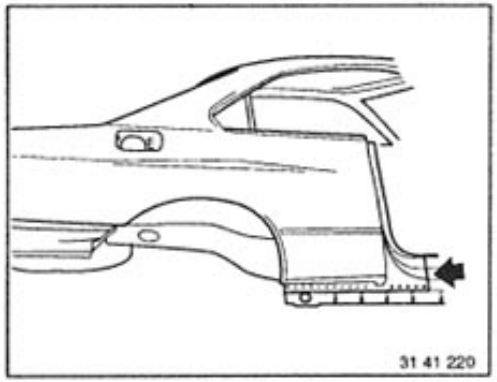


Tin out joint on side panel and grind down.

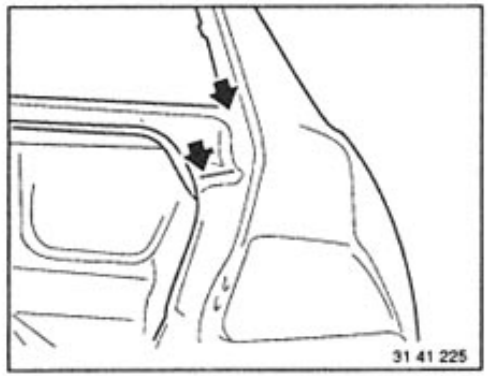
1 = Connecting point for tail apron (brazing point)
2 = Bead in side panel at rear



Tin out joint on C pillar and grind down.

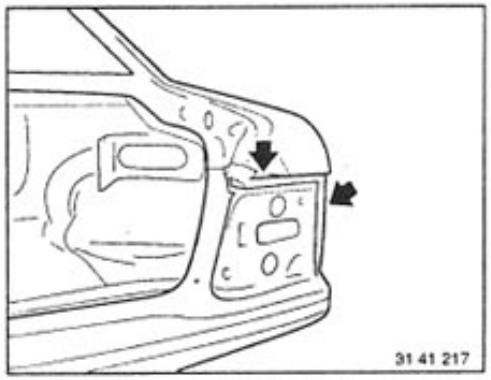


Tin out cover for side member in door opening and grind down.



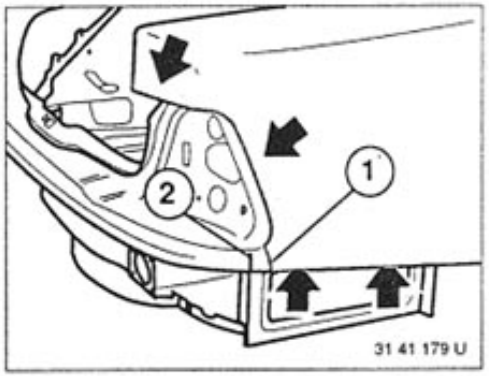
Tin out link between lower section of rear window frame and side panel and grind down.

41 14 180 REPLACING RIGHT REAR WHEEL HOUSE COMPLETE AND SIDE PANEL



Uncover lamp carrier connection.

Refer to information on body repairs!

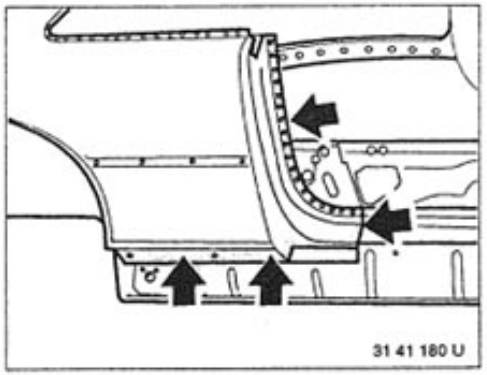


Cut off side panel roughly at the lamp carrier.

1 = Cutting line
2 = Bead in rear side panel

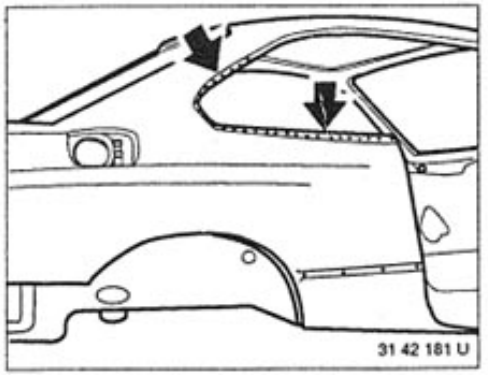
Cut off side panel roughly at the wheel house extension.

Set up car on a straightening bench.

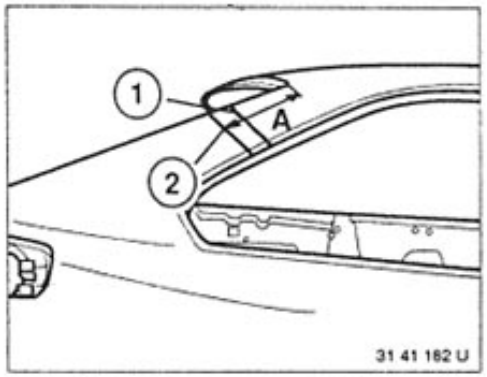


Drill off welding spots in door opening.
Uncover side section to side member connections.
Cut off side section roughly at the side member.

Remove or cover parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.



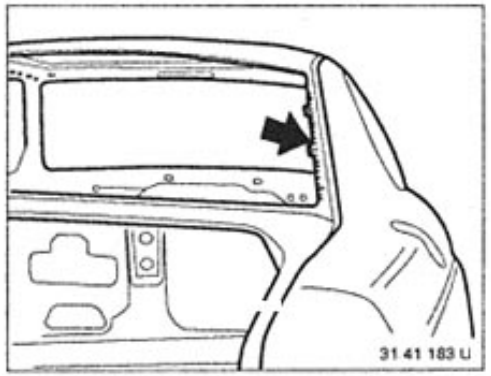
Drill off welding spots at side window and roof frame.



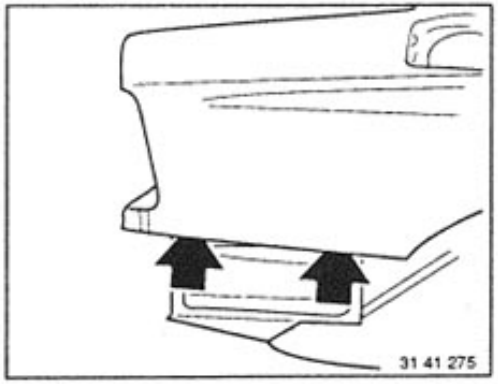
Uncover and cut shouldered surface at C-pillar (roof frame).

Distance A = 170 mm

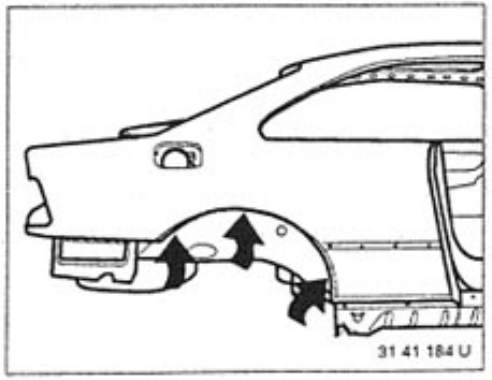
1 = Mating surface
2 = Cutting line for partial replacement



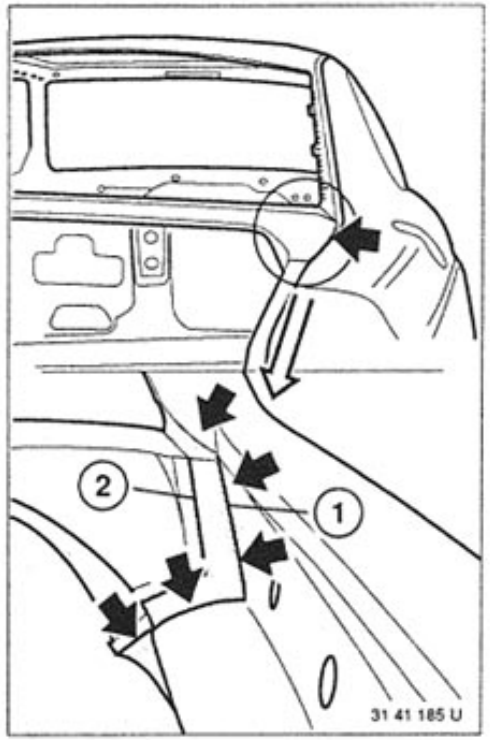
Drill off rear window welding spots.



Uncover and drill off wheel house extension welding spots.



Cut off side panel in wheel house.

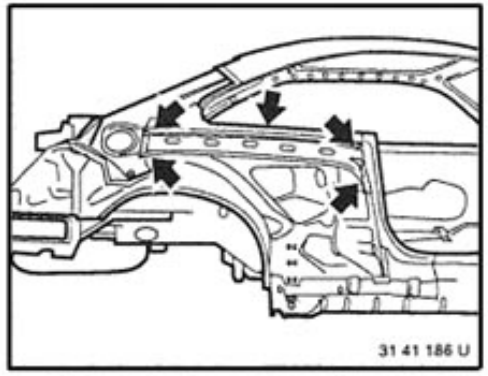


Cut off cowl panel connection.

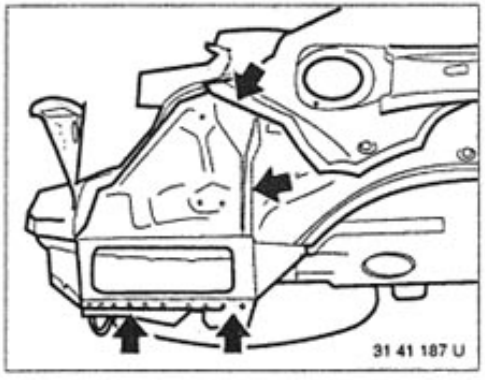
Important!
Cut off in front of the welding seam at edge as otherwise part would be too short.

1 = Cutting line
2 = Mating surface

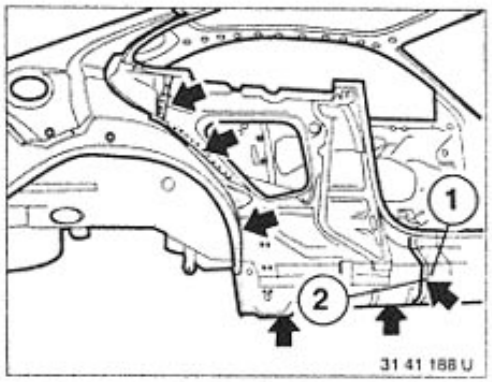
Remove side panel.



Cut through side member roughly at the rear window frame connection and at the center pillar connection.
Cut through side member roughly at the side window.

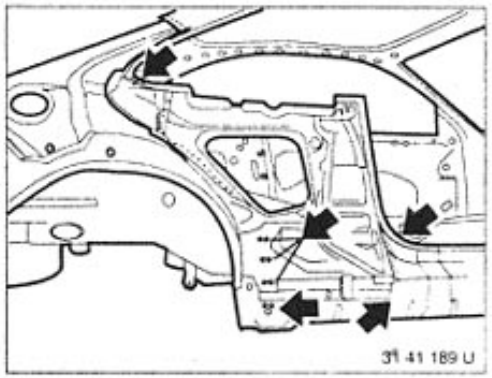


Cut off wheel house extension roughly.

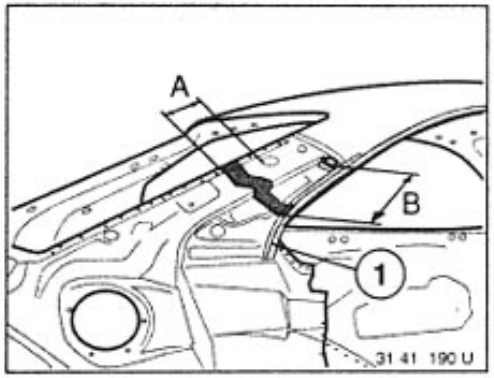


Cut out rear side section.

1 = Mating surface
2 = Cutting line



Drill or grind off welding spots.



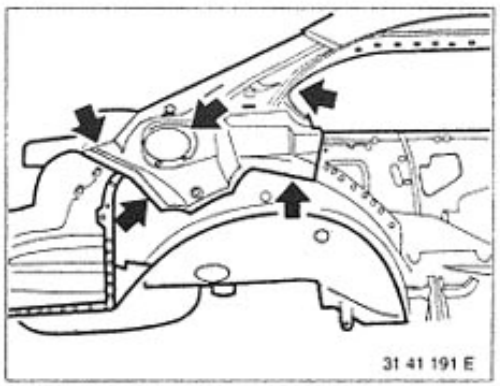
Support roof.

Determine cutting line for partial replacement of the rear window frame.

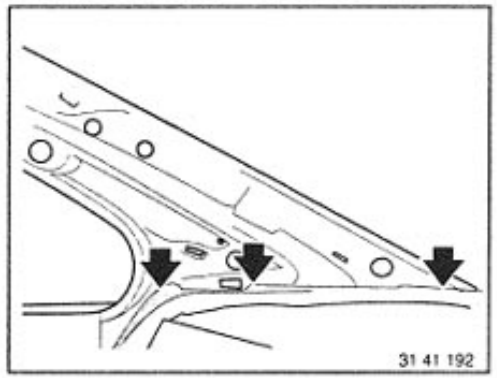
Distance A = 70 mm
Distance B = 160 mm

Cut off connection.

Important!
Don't cut through roof frame seal holder (1).

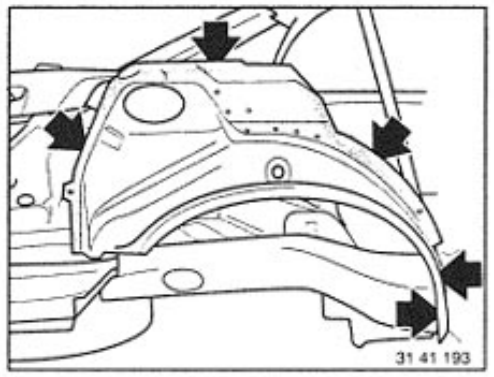


Cut off rear window frame from outside of wheel house and rear window frame at bottom.

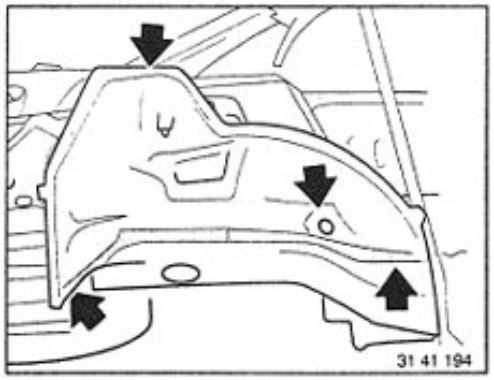


Cut off outer wheel house section, rear wall and rear window frame at bottom from inside of the car.

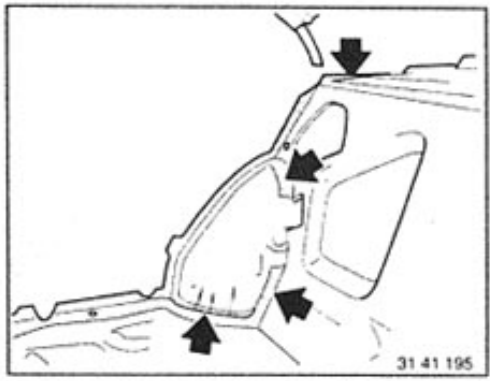
Remove rear window frame.



Cut off and remove outer wheel house section.

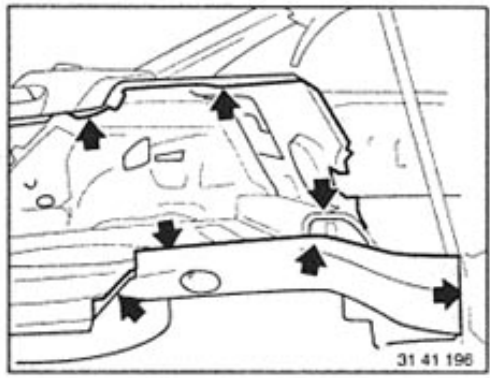


Clean mating surfaces inside of wheel house and drill off welding spots.



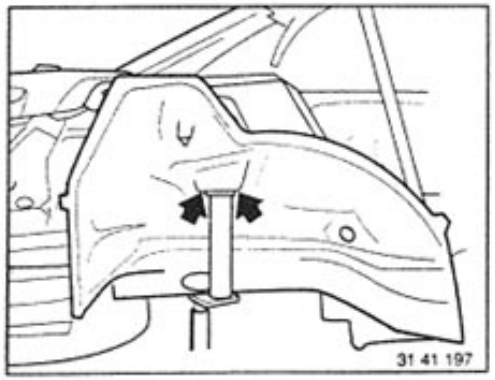
Clean mating surfaces on inner wheel house section from inside of car and drill off welding spots.

Remove inner wheel house section.



Clean mating surfaces.

Remove scrap metal from cowl panel and side member.
Clean welding surfaces.



Fit in new inner wheel house section using set of attachments.

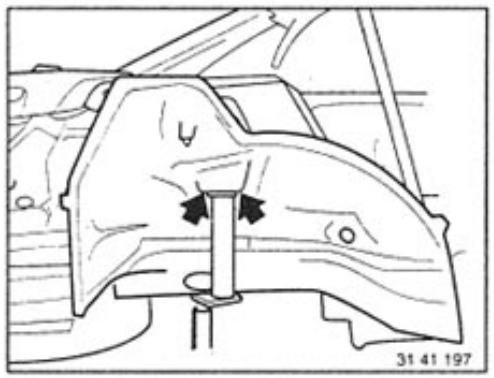
Important!
Ensure that attachment seats correctly.

Mark the mating surfaces.

Remove inner wheel house section.

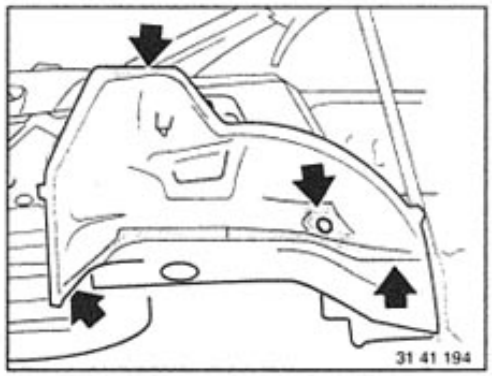
Drill holes for plug welding.

Clean mating surfaces on inner wheel house section and body.
Coat welding surfaces with zinc dust paint.

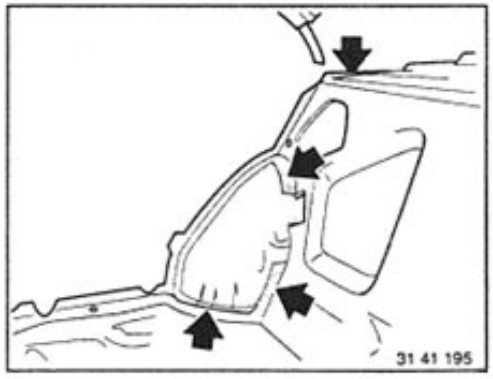


Install inner wheel house section.

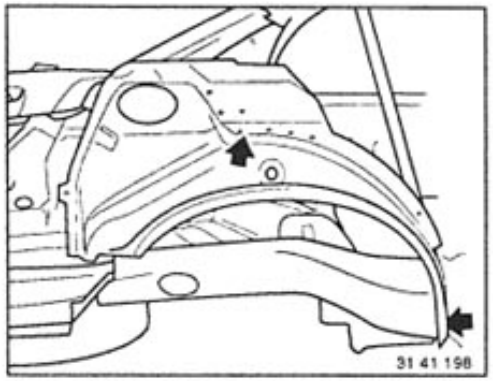
Important!
Ensure that attachment seats correctly.



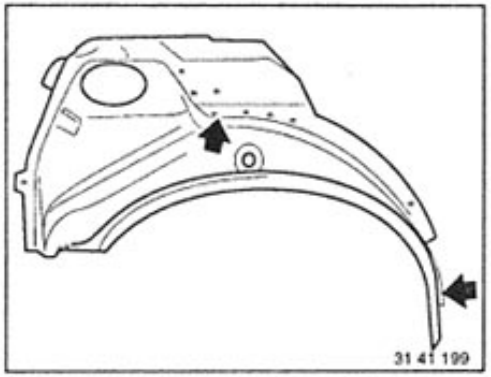
Weld inner wheel house section in wheel house.



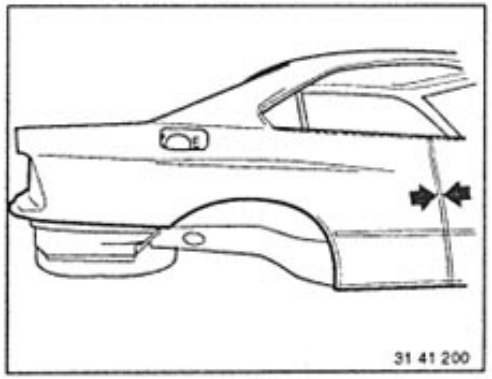
Weld inner wheel house section from inside of car.
Grind welding seams smooth.



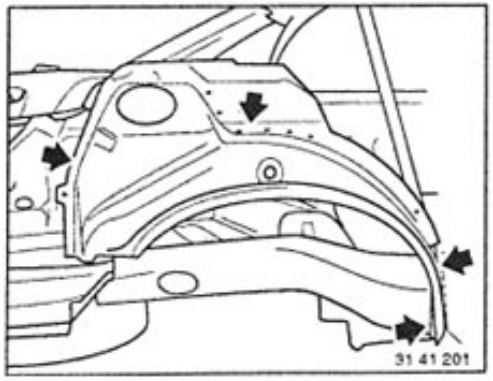
Fit in outer wheel house section.
Mark surfaces for plug welding and spot welding.



Drill holes for plug welding.
Clean spot welding surfaces.
Coat with zinc dust paint.

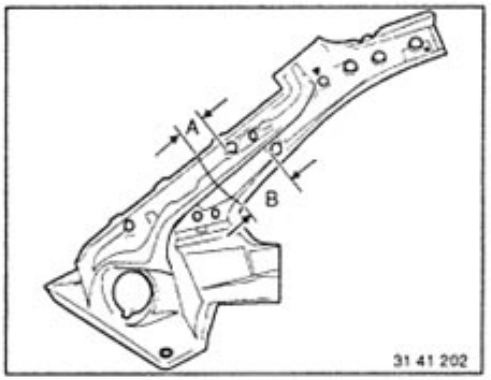


Fit in wheel house together with side panel.
Ensure uniform gap!



Remove side panel.

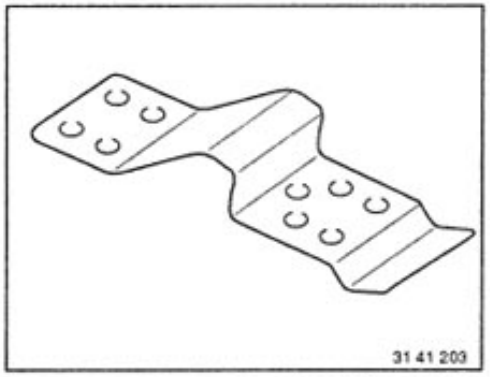
Weld wheel house.



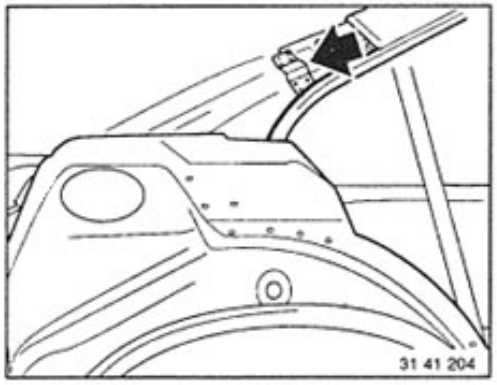
Partial Replacement Cutting Line
Determine line for rear window frame and cut.

A = 70 mm
B = 160 mm

Fit in rear window frame.
Clean welding surfaces.



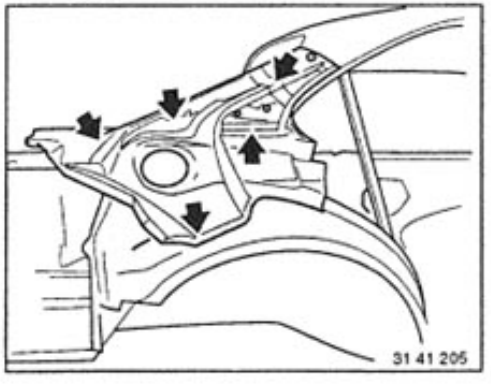
Produce reinforcement from remaining section of new part (approx. 40 mm wide).
Drill holes for plug welding.
Clean welding surfaces.



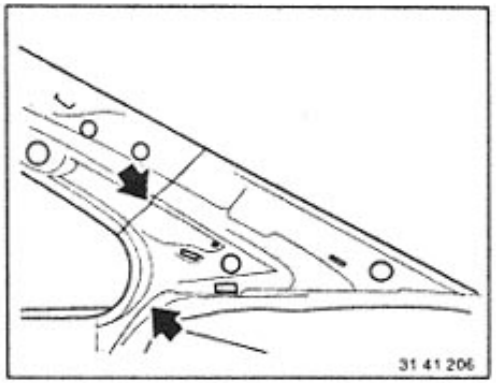
Clean welding surface for reinforcement on the rear window frame.

Coat welding surface with zinc dust paint.

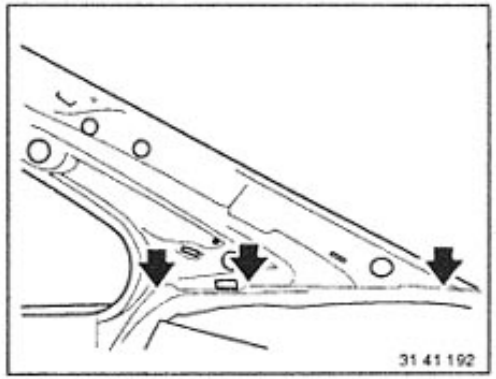
Position and weld reinforcement (approx. 20 mm overlap on each side).



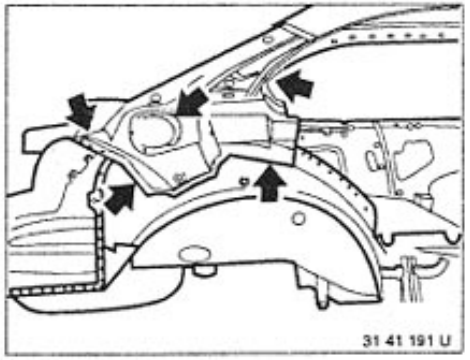
Fit in and weld rear window frame.
Plug weld reinforcement.



Weld rear window frame to wheel house from inside of car and rear window frame at bottom.
Weld partial replacement mating surfaces.

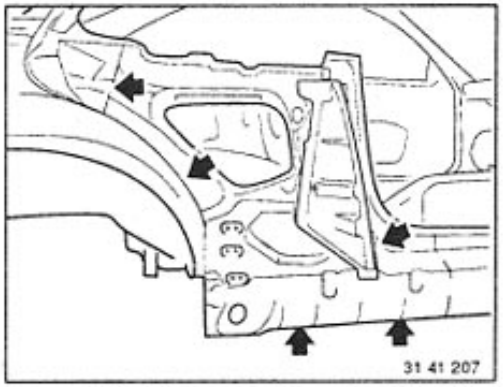


Weld rear window frame to wheel house mating surfaces from inside of car.

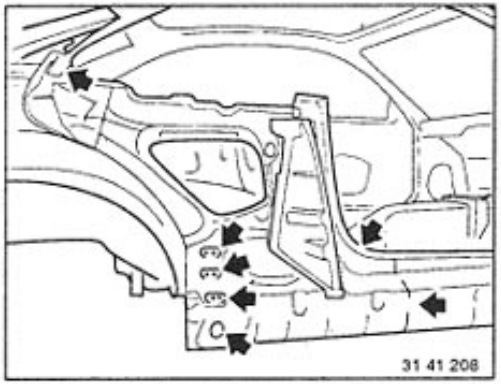


Weld rear window frame to wheel house mating surfaces from the wheel house.

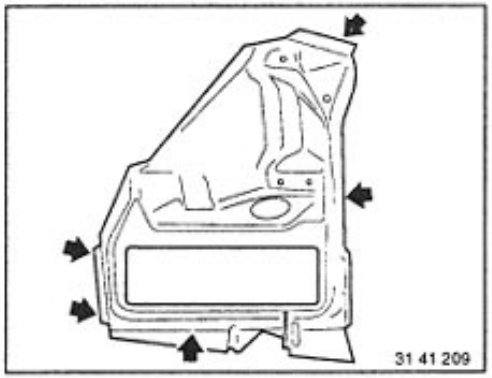
Fit in side section.
Clean mating surfaces on side section and coat with zinc dust paint.



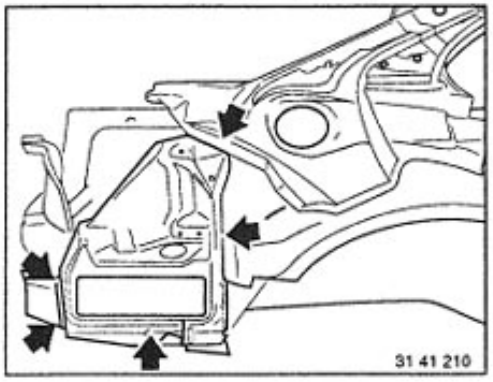
Fit in, clamp and weld side section.



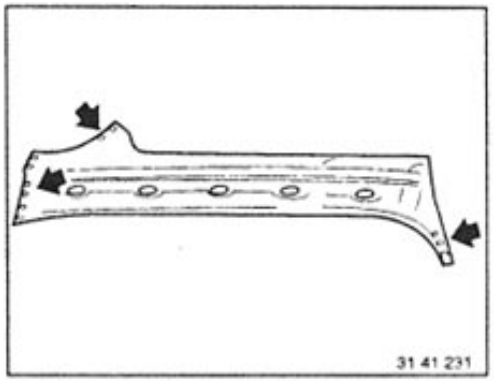
Weld side section.
Grind welded surfaces smooth.



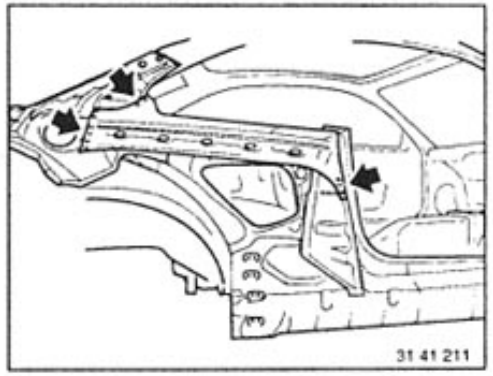
Fit in wheel house extension.
Clean welding surfaces on wheel house extension.



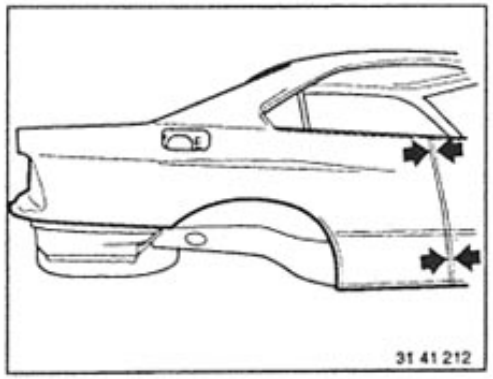
Fit in and weld wheel house extension.
Grind welding surfaces smooth.



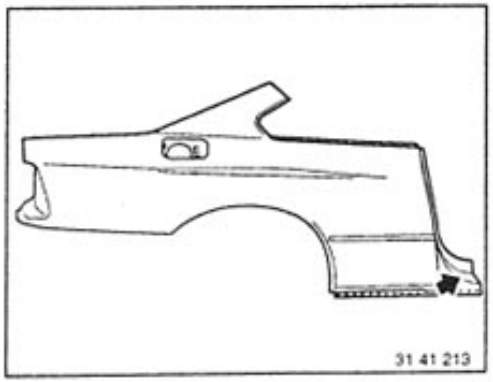
Fit in side member and mark location of holes for plug welding.
Drill holes for plug welding in the side member.
Clean welding surfaces.



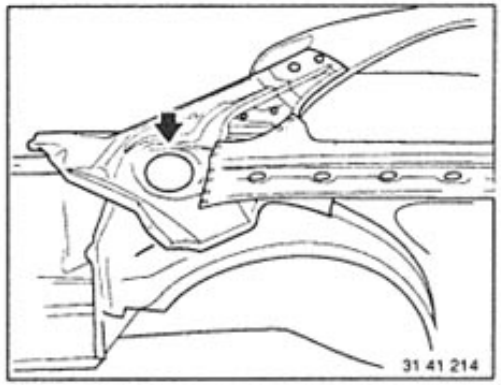
Fit in and clamp side member together with side panel.
Remove side panel.
Weld side member.
Grind welded surfaces smooth.



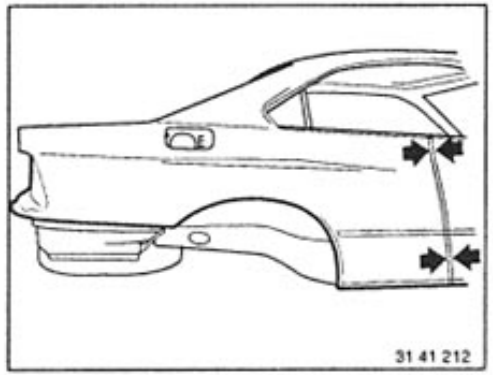
Fit in side panel and ensure uniform gap!
Mark location of holes for plug welding.
Remove side panel.



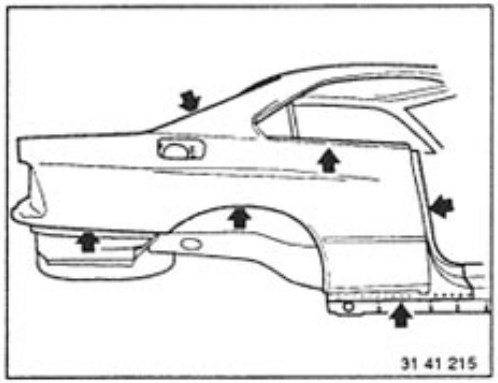
Drill holes for plug welding.
Clean welding surfaces.



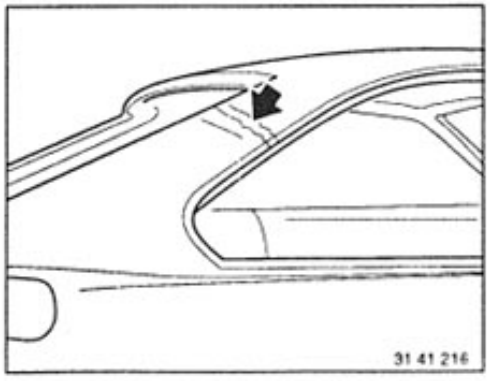
Apply sealing compound* in opening for tank filler neck.



Fit in side panel.
Ensure uniform gap!



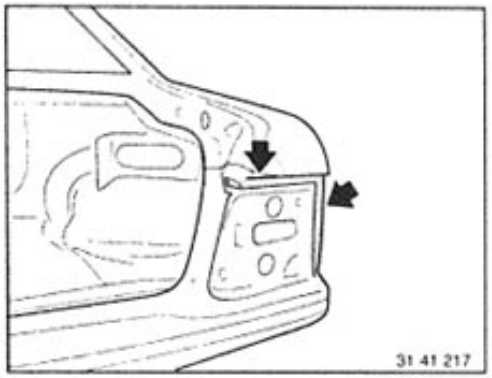
Weld side panel.



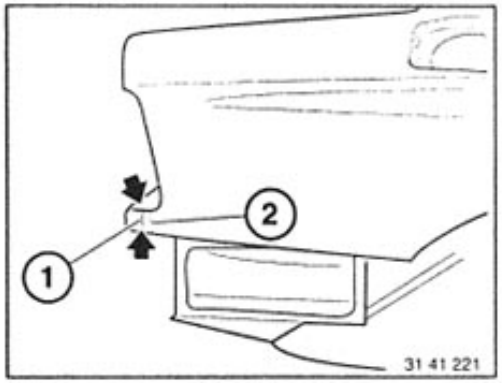
Weld C-pillar joint.
Spot weld so close together that a continuous seam is produced.

Important!
Always wait until one spot is cold before producing an adjacent spot.
Danger of distortion!

* Source of Supply: BMW Parts

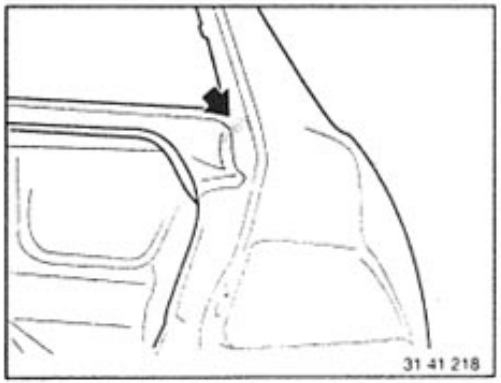


Spot weld in lamp carrier.
Braze water drain channel and lamp carrier transition.

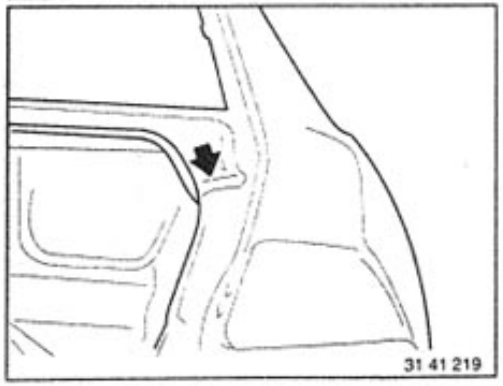


Braze tail panel and rear side panel joint.

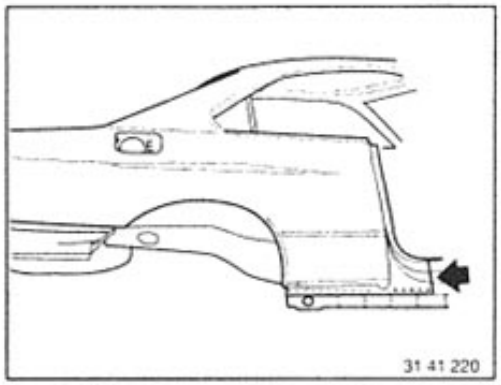
1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel



Weld transition between bottom of rear window frame and side panel.

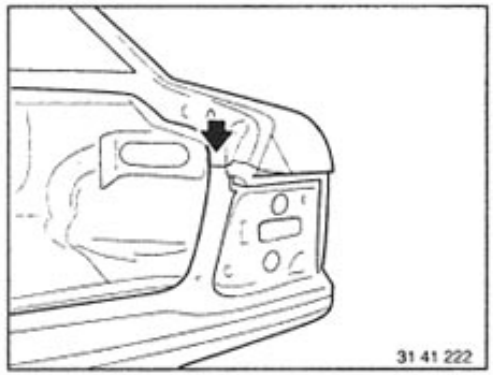


Braze transition between bottom of rear window frame and side panel.

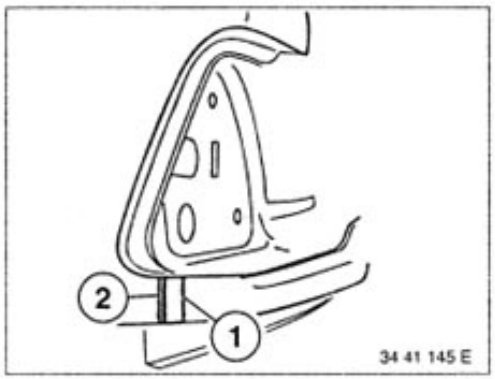


Braze side member cover in door opening.

Grind welded and brazed surfaces smooth.

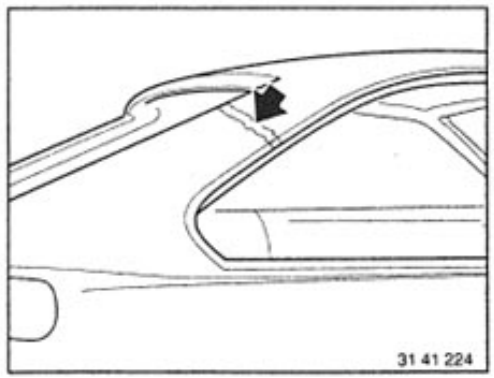


Tin mating surface in the water drain channel and grind smooth.

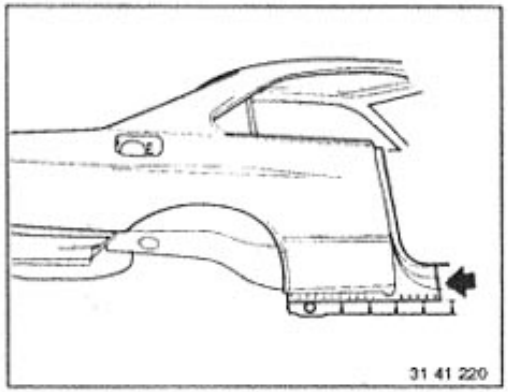


Tin mating surface on side panel and grind smooth.

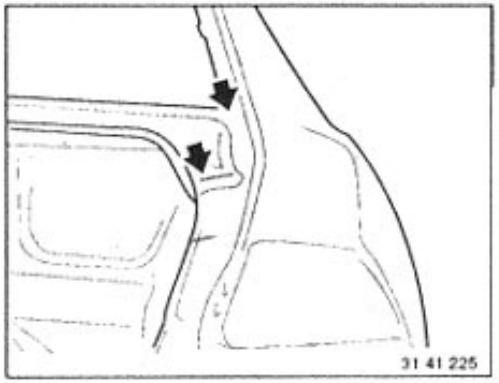
1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel



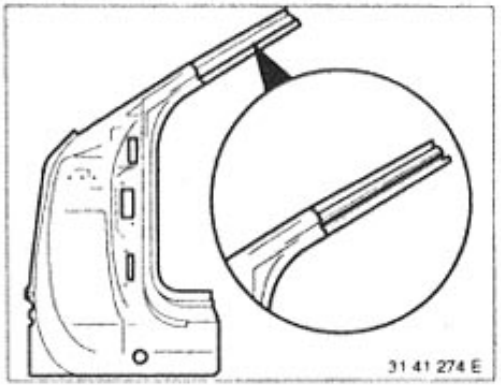
Tin C-pillar joint and grind smooth.



Tin cover for side member in the door opening and grind smooth.



Tin transition between bottom of rear window frame and side panel and grind smooth.

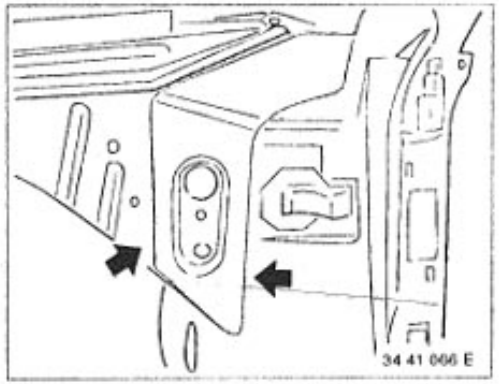


41 21 510 REPLACING LEFT FRONT DOOR PILLAR
(Outer Roof Frame Section or Roof Frame Partial Replacement Section Removed)

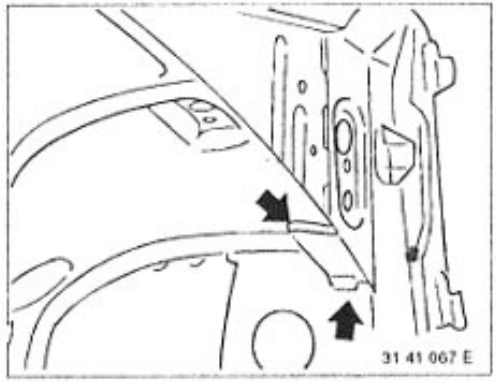
Refer 41-0/1 for information on body repairs.

Remove or disconnect the following parts:
Windshield
Dashboard trim panel
Roof liner
Engine hood
Front door
Side panel
Wire harness (roof liner and door pillar)

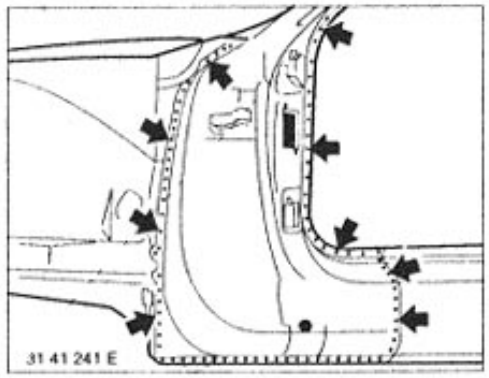
Remove or cover parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.



Uncover welding seams of end plate.
Grind off welding seams.



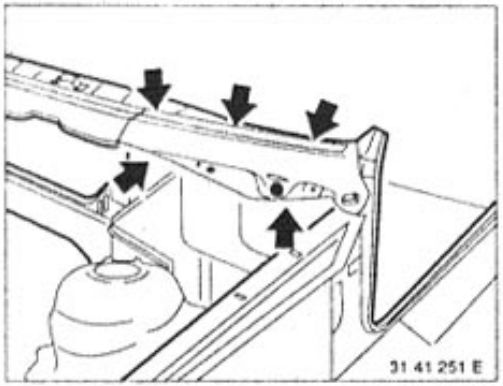
Drill off spot welding of end plate.
Remove end plate.



Uncover and drill off spot welding in door opening, on side member and firewall.

Determine cutting line for cowl panel partial replacement.

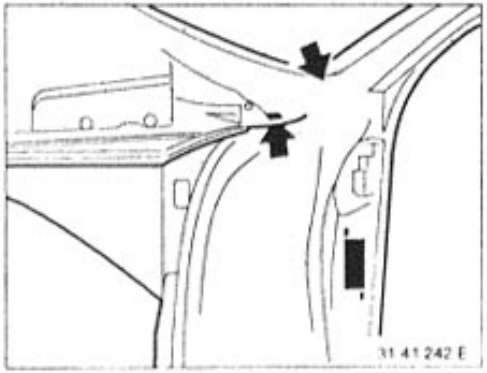
Important!
Whenever possible, mark the cowl panel partial replacement cutting line in such a manner that the chassis number does not have to be die-stamped again.



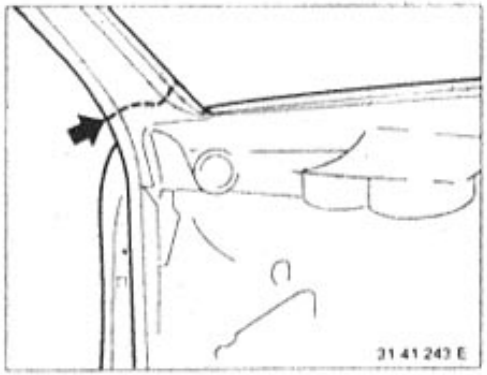
Cut along cutting line.
Uncover and drill off spot welding of cowl panel.

Remove cowl panel.

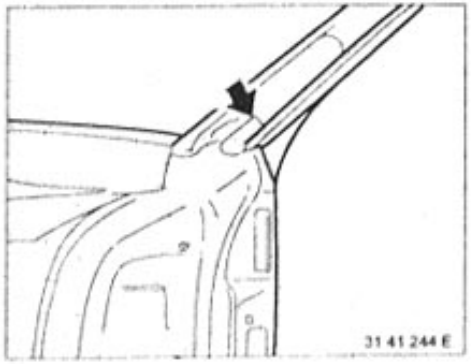
Remove scrap metal.



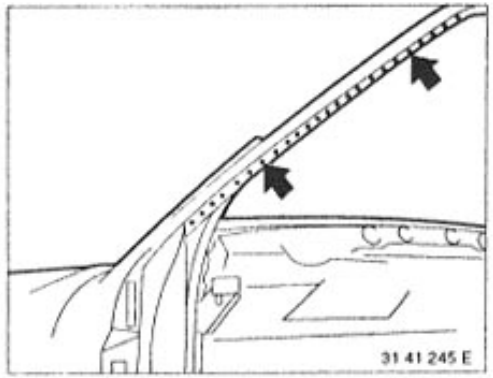
Break welding seam at top of wheel house and cowl panel.



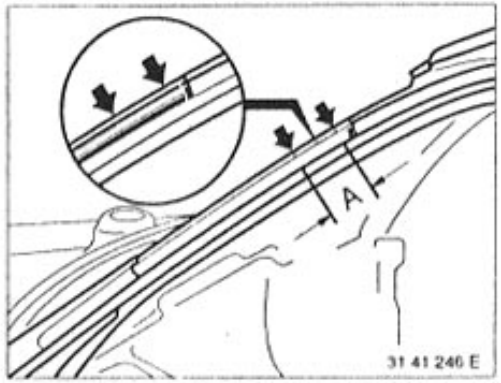
Break welding seam on inside of door pillar.



Uncover and break the brazed seam.

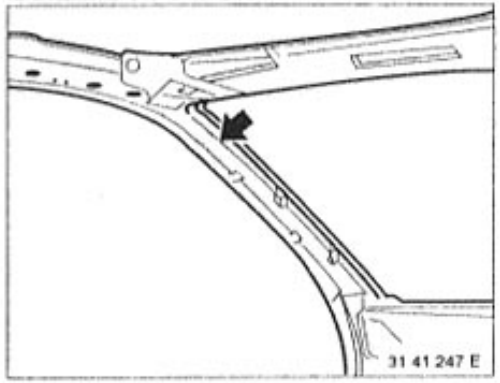


Drill off spot welding for the guide of the door window seal up to approx. 20 mm behind the reinforcement pipe.

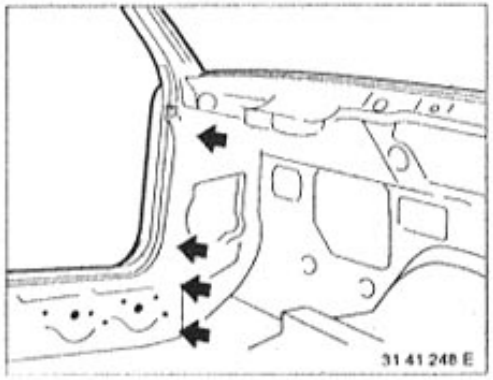


Cut through the inner plate of the A-pillar 100 mm before the end of the reinforcement pipe.

Distance A = 100 mm

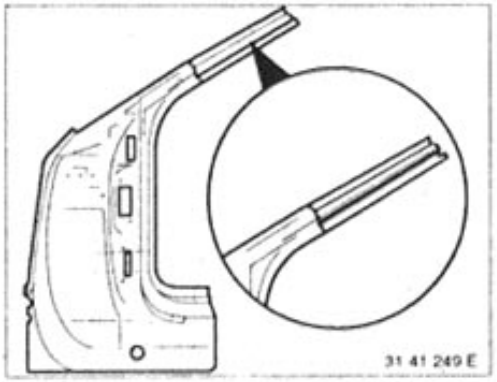


Break welding seam of the reinforcement pipe on the inner plate of the door pillar.



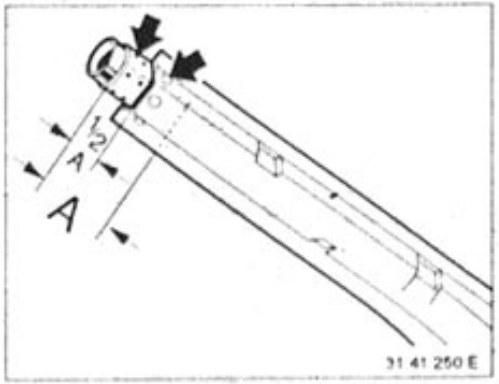
Drill off spot welding for the car jack take-up reinforcement.
Break welding seams of door hinges.

Remove door pillar.
Remove scrap metal.
Straighten and grind mating surfaces.



Fit in and cut door pillar to size.

Important!
Don't damage the reinforcement pipe!
Don't cut the reinforcement pipe!



Produce reinforcement for inner plate of the door pillar.
Width of reinforcement = 60 mm = distance A.

Drill holes in A-pillar for plug welding the reinforcement.

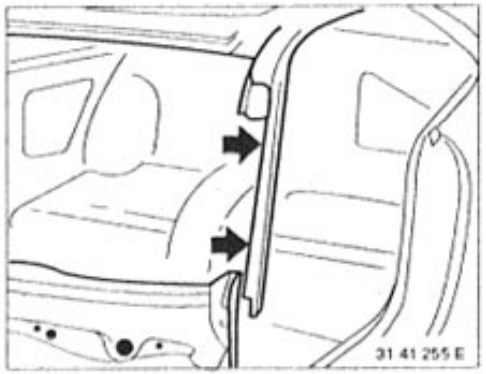
Important!
Don't damage the reinforcement pipe!

Install reinforcement in door pillar 30 mm deep = 1/2 of distance A.

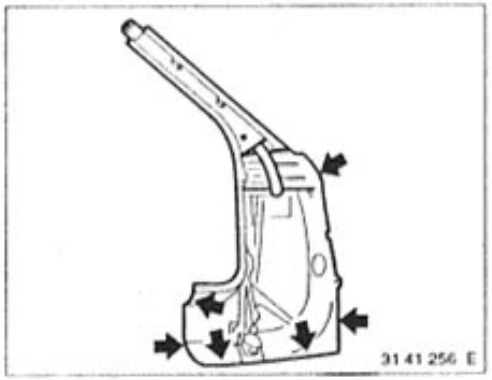
Important!
Reinforcement must not cover the hole required for welding the reinforcement pipe to the section of the A-pillar remaining on the car.

Coat reinforcement and mating surfaces on the door pillar with zinc dust paint.

Weld reinforcement to A-pillar.



Clean mating surface of guide for the door window seal.



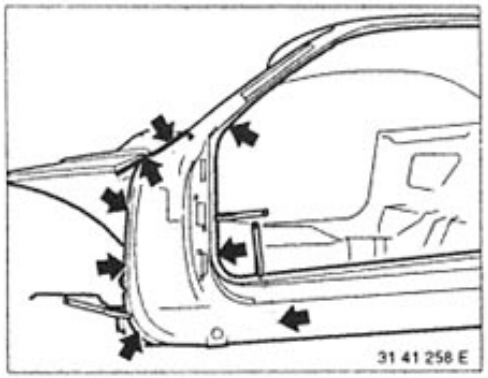
Drill holes in door pillar for plug welding.

Clean mating surfaces on side member and firewall/door pillar at inside.

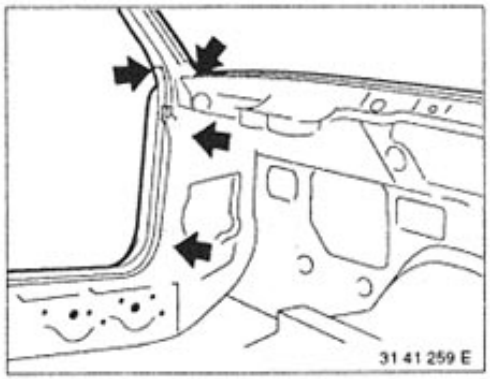


Clean mating surfaces in door opening and on reinforcement for the car jack take-up.

Coat mating surfaces with zinc dust paint.

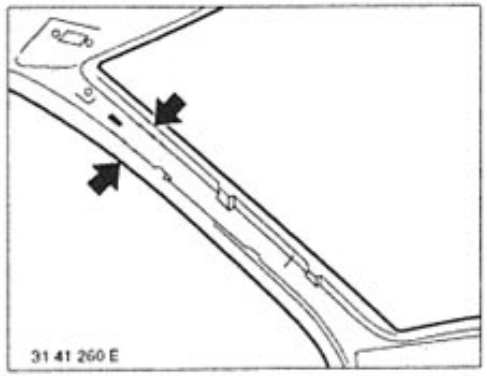


Fit in, clamp and weld door pillar.



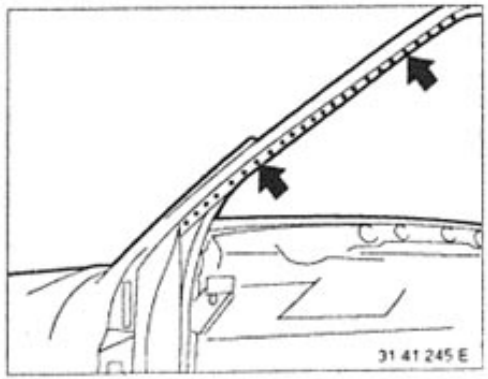
Weld door pillar from inside of car.

Weld reinforcement for car jack take-up.

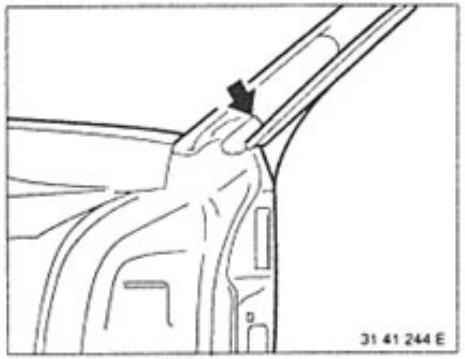


Weld reinforcement pipe in top hole.

Grind welded surfaces smooth.

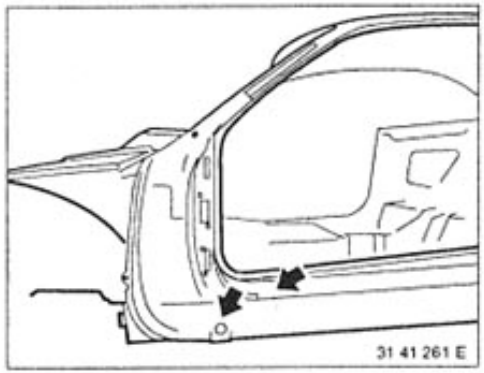


Fit in and weld guide for the door window seal.



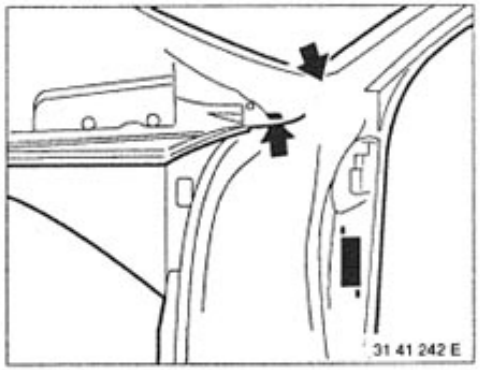
Braze guide for the door window seal.

Grind brazed and welded surfaces smooth.



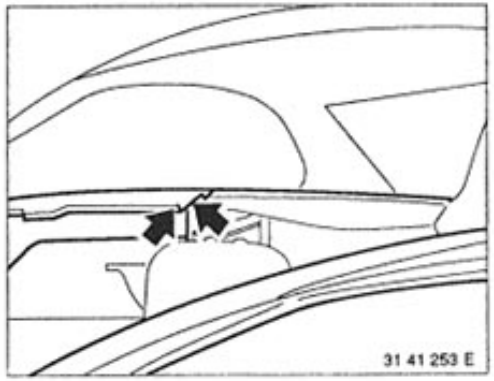
Weld and braze side member joint.
Weld car jack joint.

Grind brazed and welded surfaces smooth.

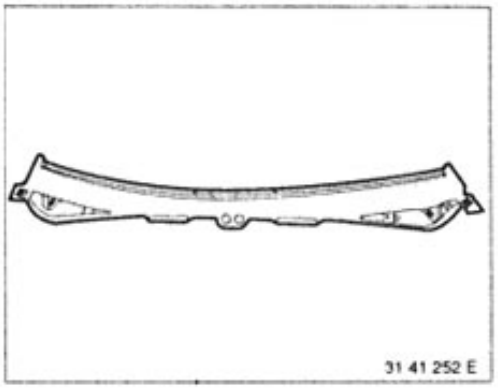


Weld door pillar at top of wheel house and cowl panel.

Grind welded surfaces smooth.



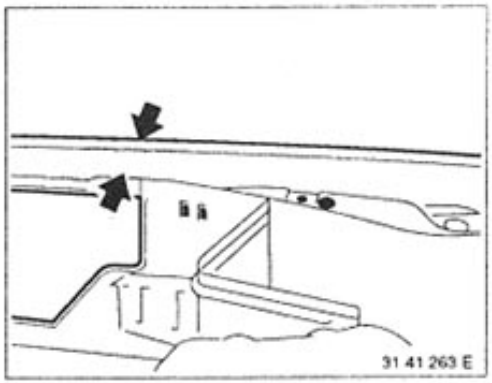
Shoulder cowl panel partial replacement section surface on car.



Fit in and cut cowl panel partial replacement section to size.

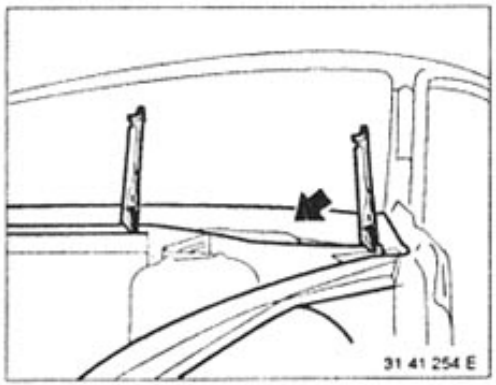
Important!
Size large enough for shouldering!

Clean and coat mating surfaces with zinc dust paint.

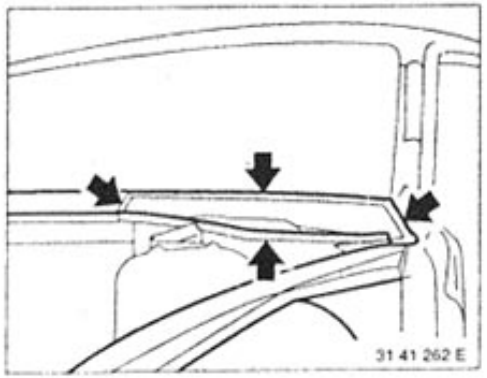


Grind welded surfaces smooth.

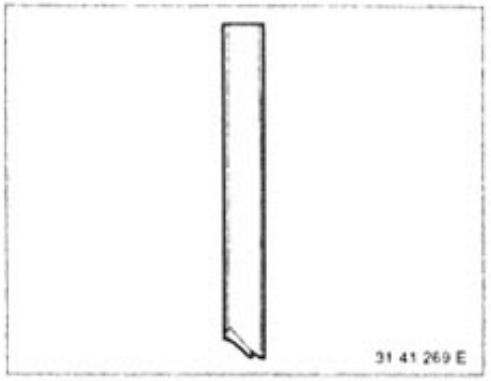
Tin mating surface of cowl panel replacement section and grind smooth.



Fit in and clamp cowl panel partial replacement section.



Weld cowl panel partial replacement section.



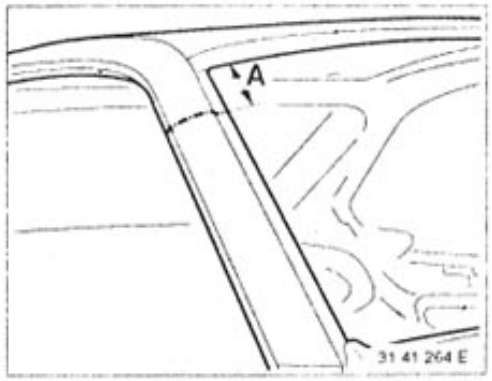
41 22 000 REPLACING LEFT OR RIGHT ROOF FRAME OUTER PARTIAL REPLACEMENT SECTION (COWL PANEL)

Note:
This step is shown on the right-hand side.

Refer 41-0/1 for information on body repairs.

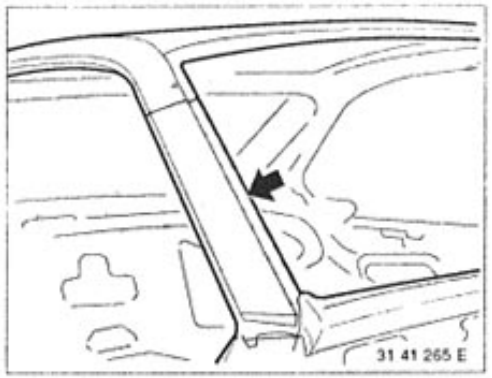
Remove or disconnect the following parts:
Windshield
Dashboard trim panel
Roof liner
Engine hood
Front door
Side panel
Wire harness (roof liner and A-pillar)

Remove or cover parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.

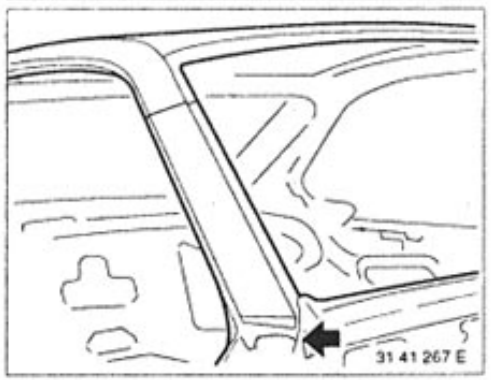


Mark location of cutting line and cut roof frame.

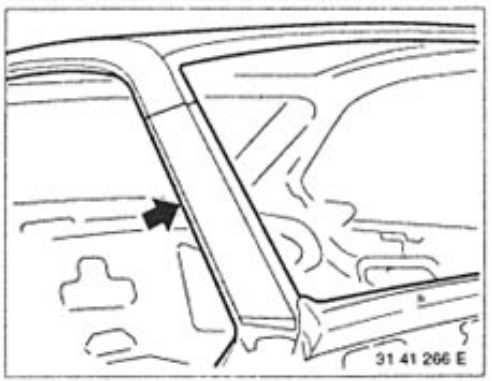
Distance A = 60 mm



Uncover and drill off spot welding.

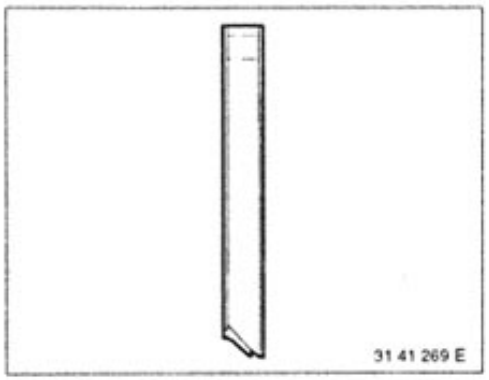


Uncover and break welded seam and brazed seam.

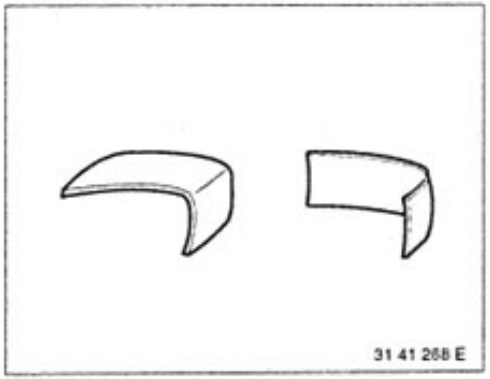


Uncover and break welded seam.
Remove roof frame.

Remove scrap metal.
Straighten and grind mating surfaces.

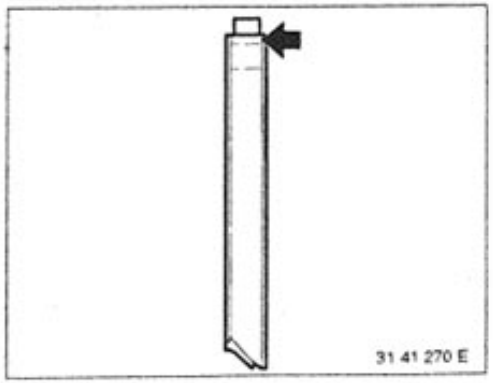


Cut roof frame partial replacement section to size and fit it in.

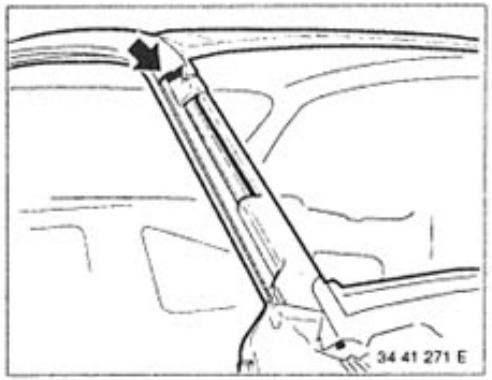


Produce and fit in reinforcement for the roof frame partial replacement section.

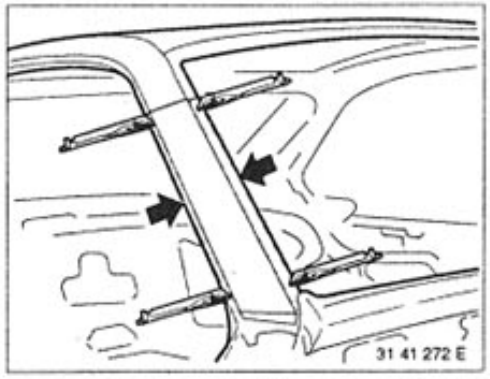
Width of reinforcement = 60 mm.



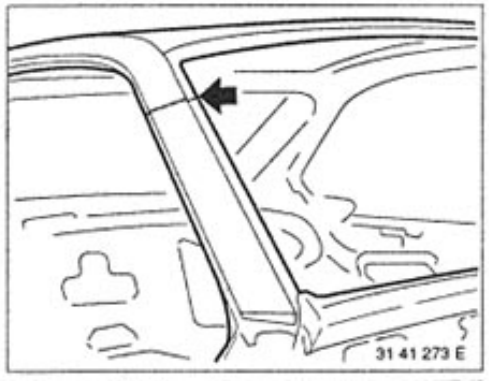
Drill holes in roof frame for plug welding the reinforcement.
Clean and coat mating surfaces with zinc dust paint.
Clean and coat reinforcement with zinc dust paint.
Weld reinforcement to roof frame.



Clean cowl panel mating surface.
Drill holes for plug welding the reinforcement.

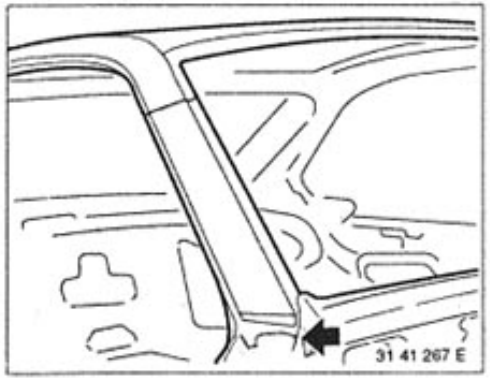


Clean and coat mating surfaces on the roof frame partial replacement section with zinc dust paint.
Fit in, clamp and weld roof frame partial replacement section.



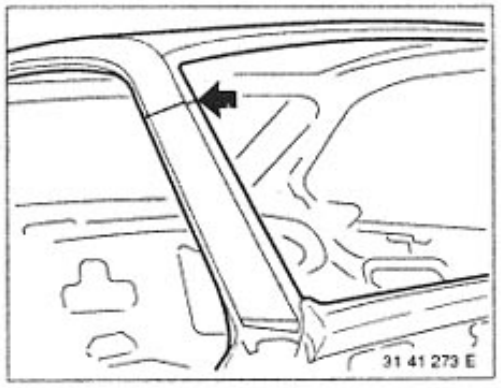
Produce welding spots at the cowl panel joint so close together to have a continuous seam.

Important!
Wait until the spot is cold before producing an adjacent spot.
Danger of distortion!

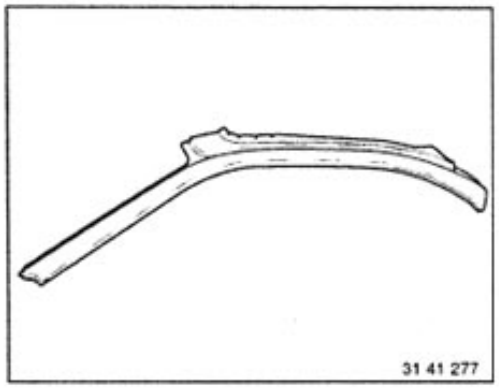


Braze the A-pillar joint.

Grind welded and brazed surfaces smooth.



Tin cowl panel mating surface and grind smooth.

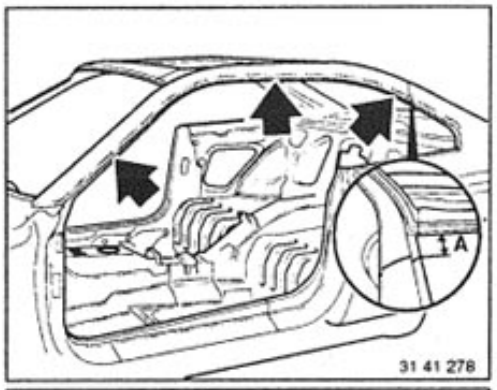


41 22 050 Replacing left or right outer roof frame (roof outer skin panel removed)

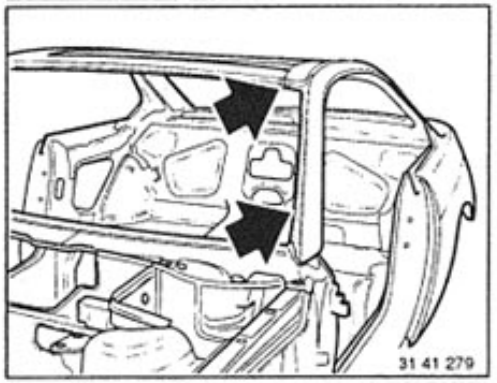
Body repair instructions, see 41-0/1.

Remove or detach the following parts:
Scope: refer to replacing roof outer skin panel

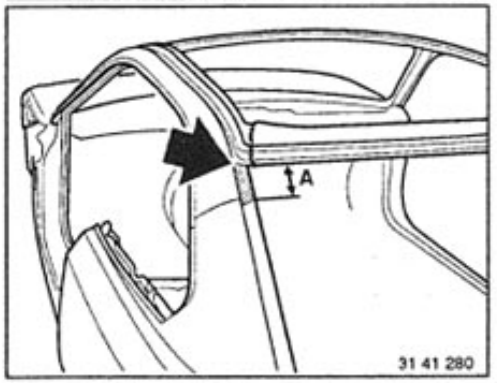
Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



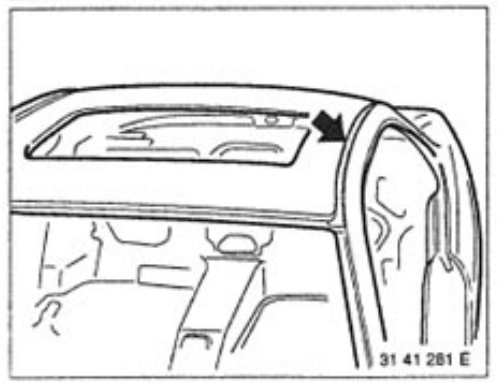
Expose and grind off welded seam.
Expose joint between roof frame / rear side panel.
Dimension "A" = 125 mm.



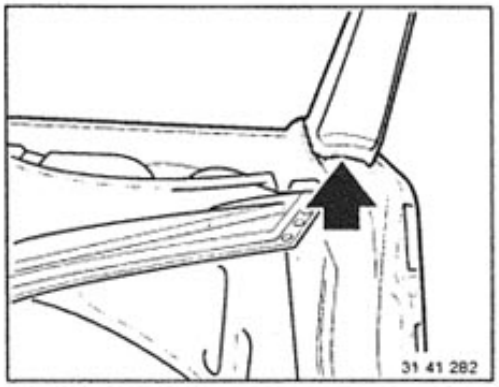
Expose and drill out welding spots on windshield frame.



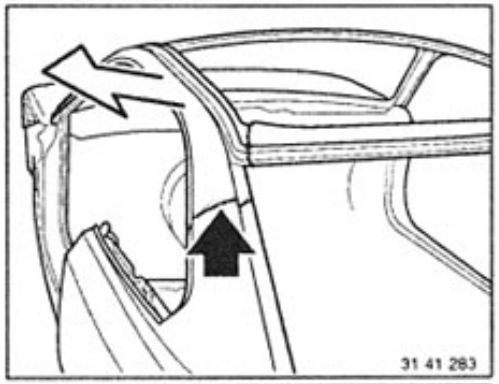
Expose and drill out welding spots on rear window frame and roof frame.
Dimension "A" = 125 mm.



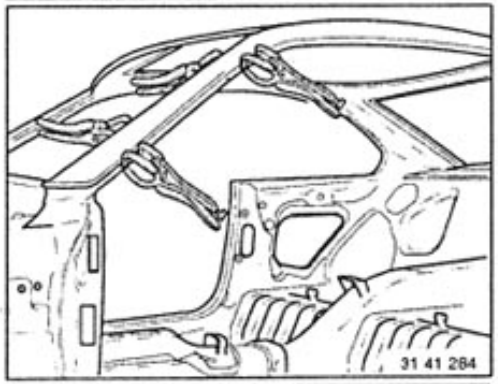
Drill out spots in roof frame / side frame.



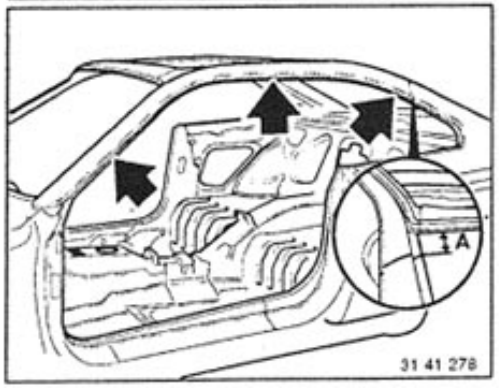
Expose welded seam and brazing point on A pillar / windshield frame and open up.



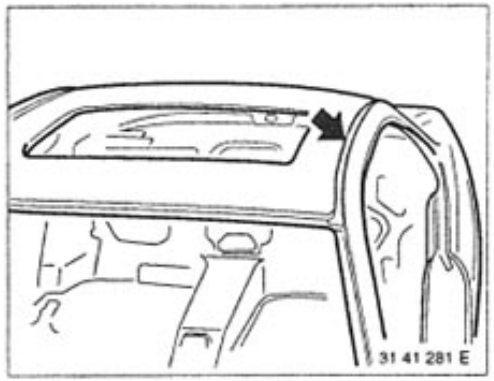
Open rear brazed joint between roof frame / side panel.
Remove roof frame.
Remove scrap sheet metal and grind down joints.



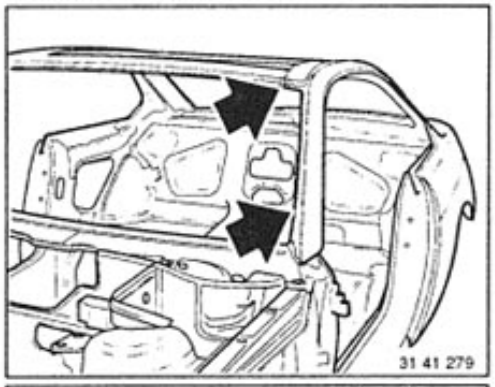
Adjust roof frame to fit.
Clean joints and coat with zinc dust paint.
Adjust roof frame to fit and secure in place.



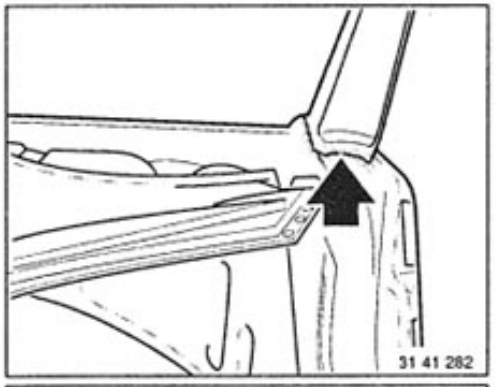
Mark out spots along roof frame beside previous welded seam.



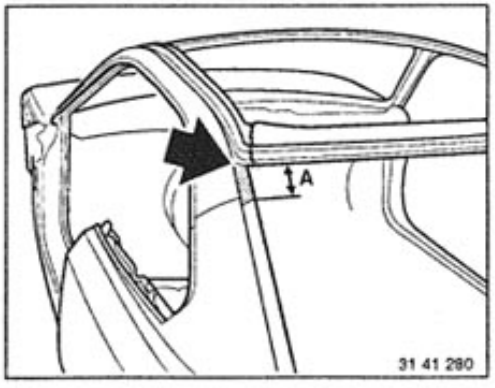
Apply spot welds to roof frame / side frame.



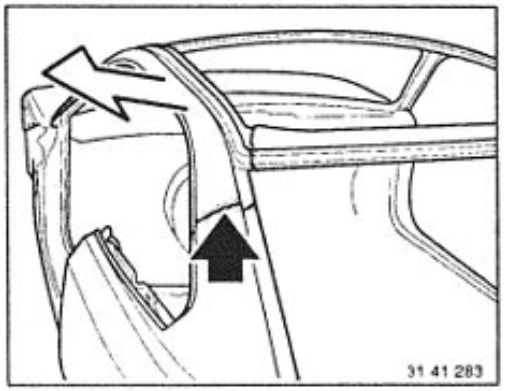
Apply welding spots to windshield frame.



Apply welded seam and brazing point to A pillar / windshield frame.



Apply spot welds to rear window frame and roof frame.



Apply brazed seam to joint between roof frame/ side panel.
Tin out joint and grind down.

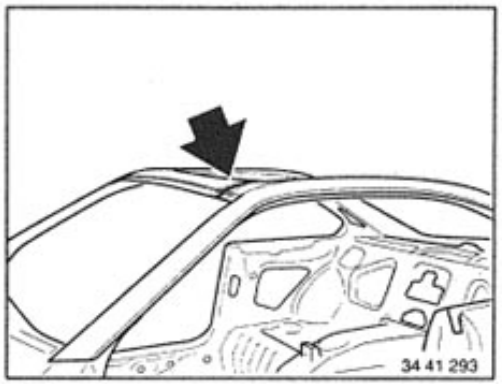
Grind down welding and brazing points.

41 22 541 Replacing front roof frame (roof outer skin panel removed)

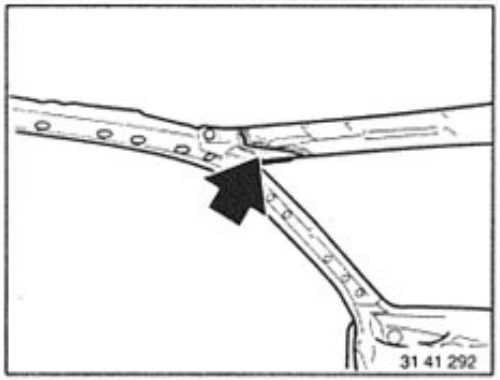
Body repair instructions: see 41-0/1.

Remove or unfasten the following parts:
Scope: refer to Replacing Roof Outer Skin Panel

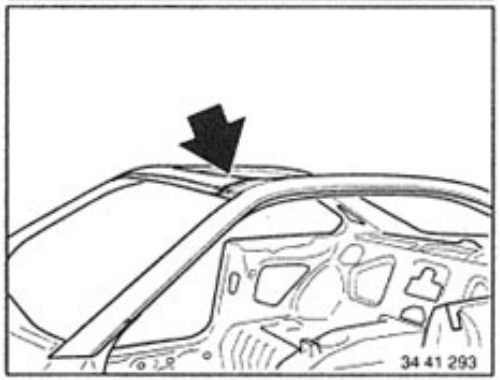
Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



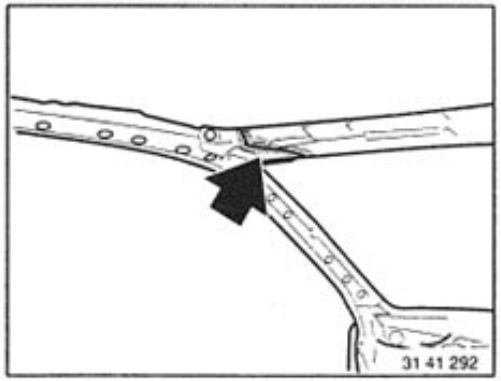
Expose welded seams.
Grind welded seams.



Drill out welding spots and remove roof frame.
Align connecting faces and grind out.



Clean connecting faces on new part.
Adjust new parts to fit and weld up.



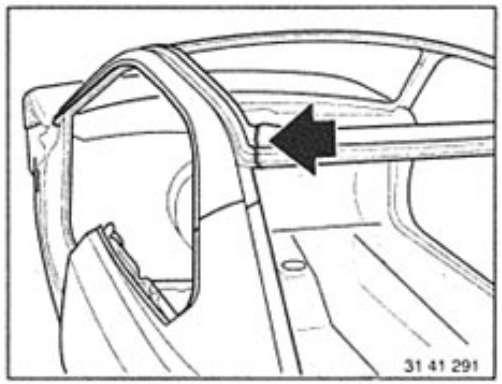
Weld up new parts.
Grind down all welded seams.

41 22 571 Replacing rear roof frame (roof outer skin panel removed)

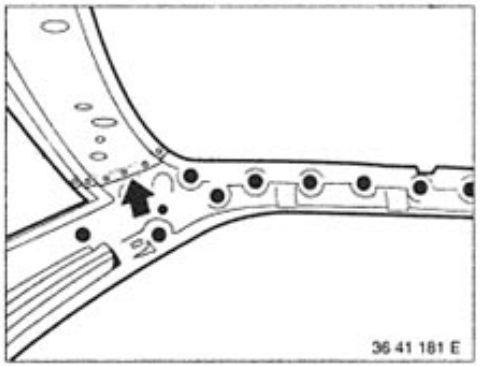
Body repair instructions: see 41-0/1.

Following parts must be removed or detached:
Scope: refer to Replacing Roof Outer Skin Panel

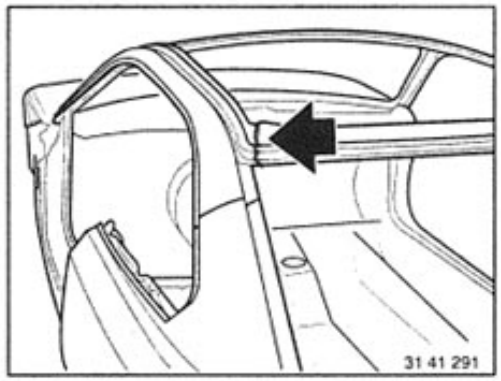
Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



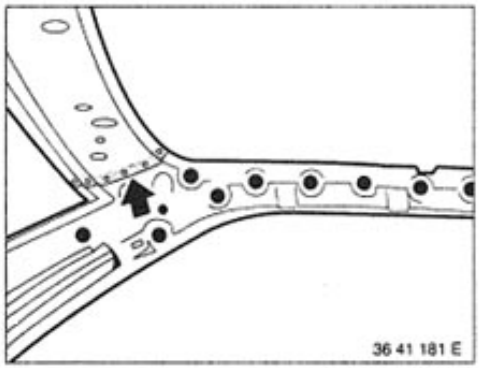
Expose welding surface.
Drill out welding spots.



Drill out welding spots.
Remove roof frame.
Align connecting faces and grind down.



Clean connecting faces on new part.
Adjust new part to fit and weld into place.



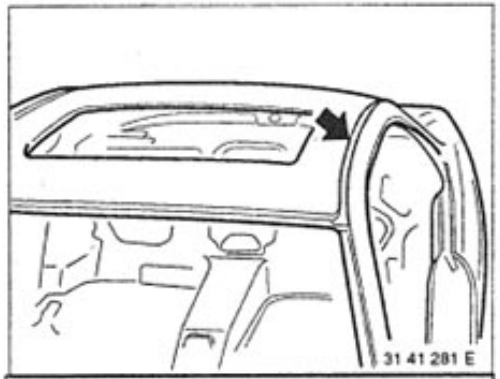
Weld new part into place.
Grind down all welding surfaces.

41 31 010 REPLACING ROOF PANEL (Version with Sun Roof)

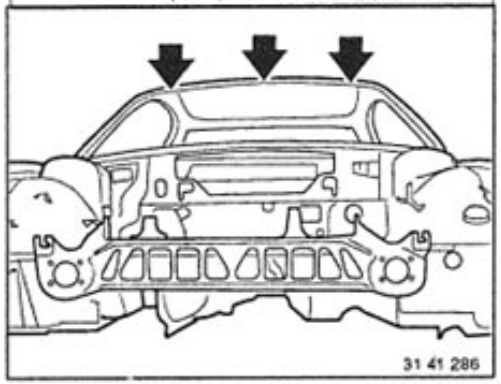
Refer 41-0/1 for information on body repairs.

Remove or disconnect the following parts:
Windshield
Rear window
Roof liner
Sun roof
Hatrack
Wire harness (partially)

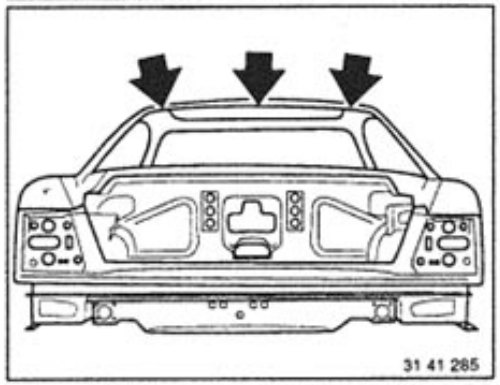
Remove or cover parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.



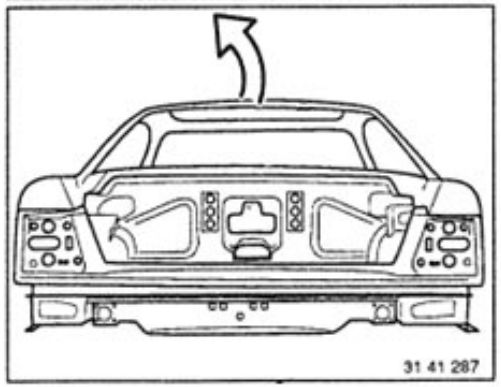
Uncover and drill off spot welding in channel.



Uncover and drill off windshield frame spot welding.



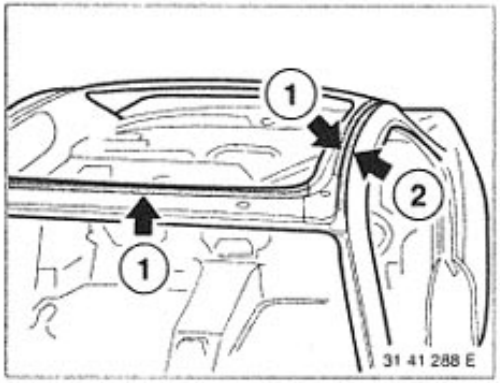
Uncover and drill off rear window frame spot welding.



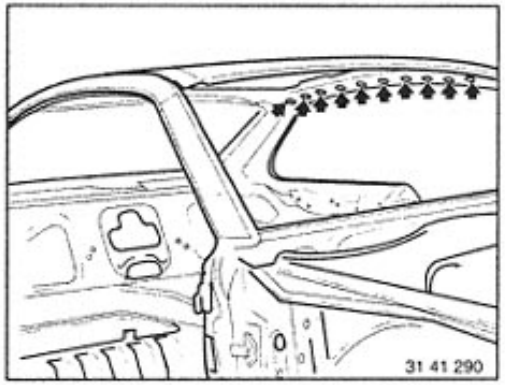
Remove roof panel.

Important!
The roof panel will be easier to remove by heating it at the surfaces coated with sealing compound and cement.
Extract the produced vapors!

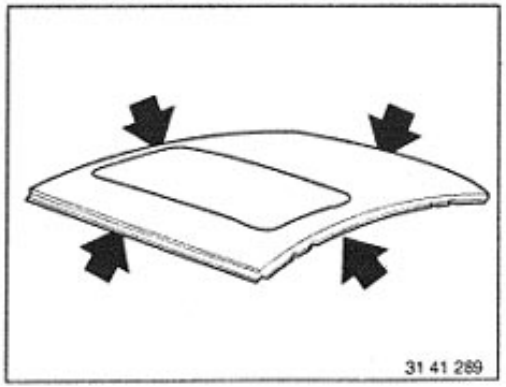
Align and grind down joints.



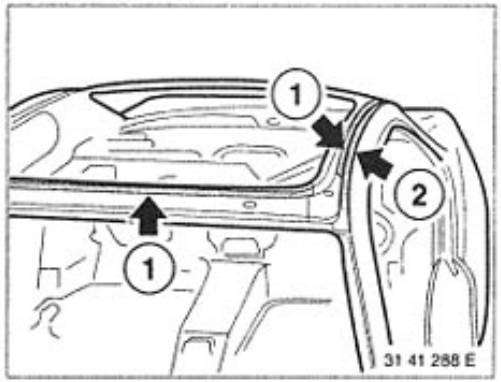
Remove sealing compound from roof frame (1).
Clean adhesive surface (2).



Clean contact points for spot welding electrodes through bores in roof frame.



Fit new roof outer skin panel.
Clean joints.
Coat joints which are not going to be coated with adhesive, with zinc dust paint.



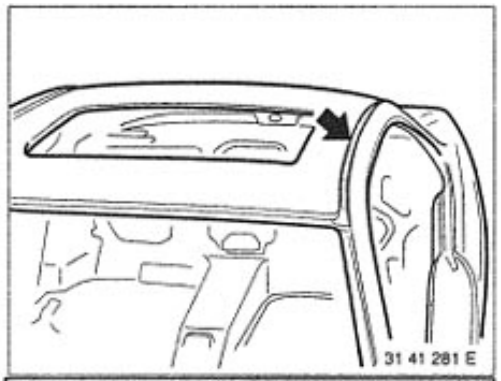
Coat adhesive surface (2) with adhesive 51 0 032.

Observe adhesive specifications for body parts, see 41-0/2.

Caution!
Do not coat retaining thread for roof carrier bracket with adhesive.

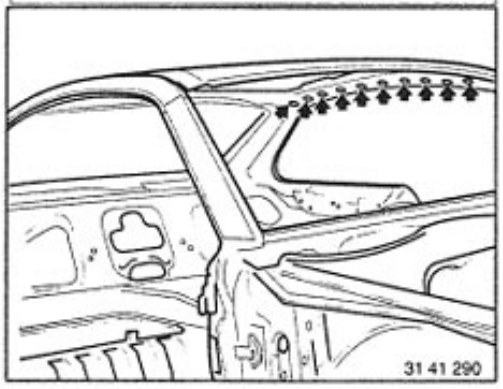
Coar roof frame (1) with sealinng compound *.

Fit roof outer skin panel and secure.



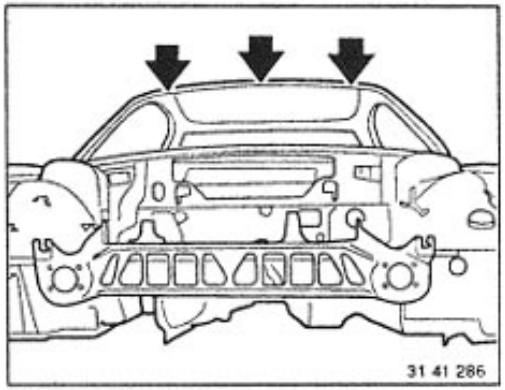
Spot-weld roof outer skin panel along roof gutter.

Note:
Position and number of welding points is determined by the bores in the roof frame provided for spot-welding electrodes.

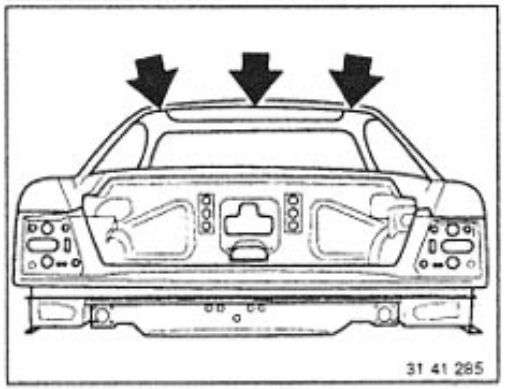


Bores in roof frame for spot-welding electrodes.

* Refer to BMW Parts service.



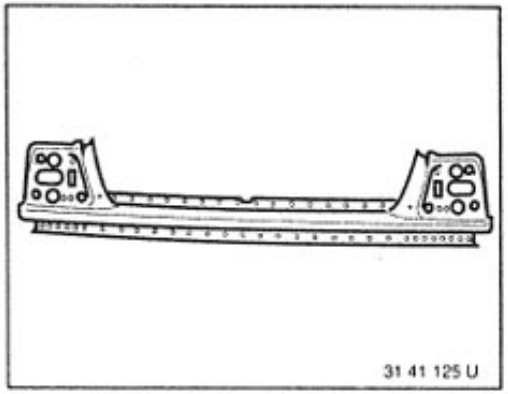
Spot weld windshield frame.



Spot weld rear window frame.

Grind mating surfaces smooth.

Remove excessive cement.

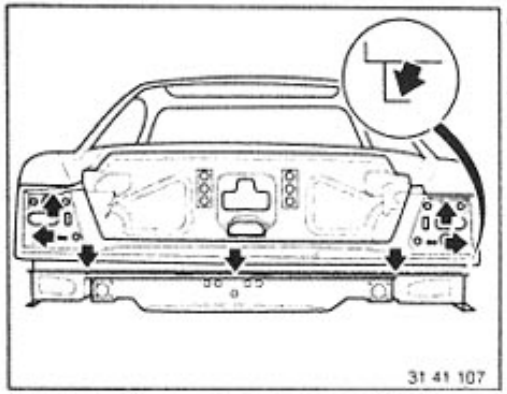


41 34 041 Replacing rear apron

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.

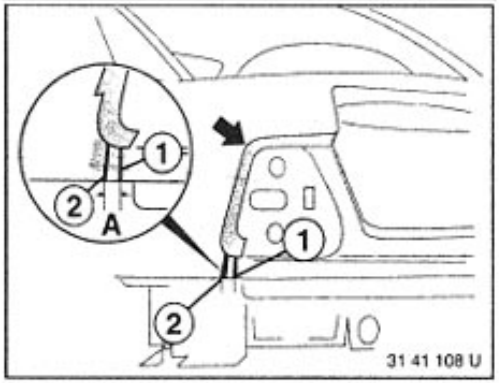
Note body repair instructions!

Remove or disconnect the following parts:
- bumper with impact absorber
- complete cover for trunk floor
- batteries
- car jack
- tail lights
- luggage compartment gasket
- part of wiring harness
- spare wheel
- forced ventilation
- trim on spare wheel box
- central ground connection
- lock in tail panel



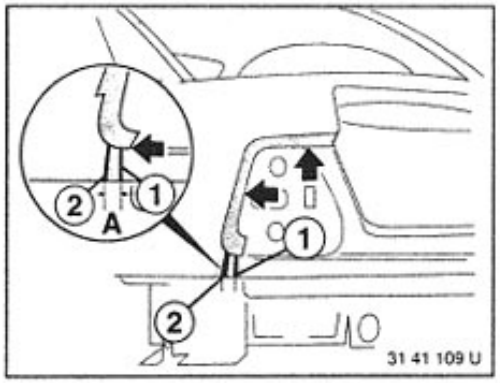
Clean joints.

Note:
To make illustration clearer, trunk lid has been removed.



Caution!
1 = connection point for tail panel (brazed section)
2 = Bead in side panel at rear

Dimension (A) = approx. 20 mm

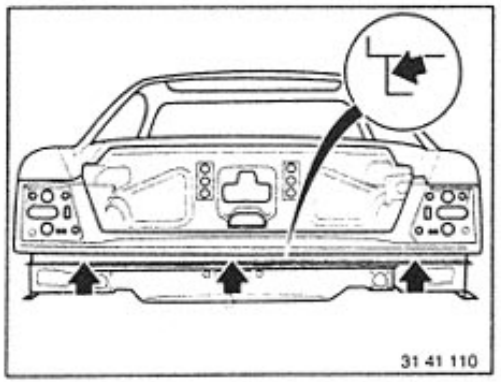


Roughly cut out reversing light section of tail panel with air cutter.

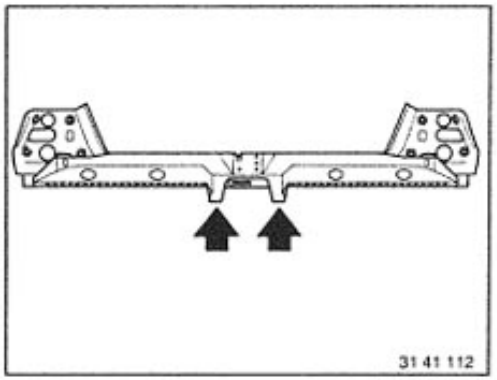
Caution!
Disconnect tail panel (1) in front of joint.

1 = Joint (brazing point)
2 = Bead in side panel at rear

Dimension (A) = approx. 20 mm

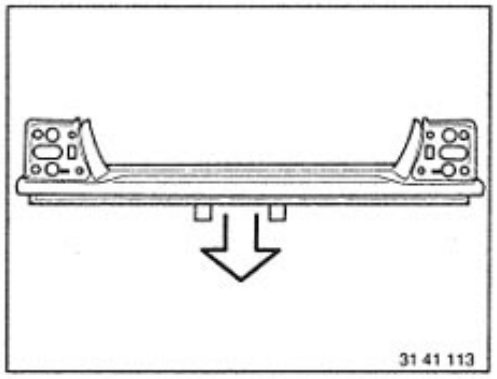


Roughly chisel off tail panel at outside joint with trunk floor.

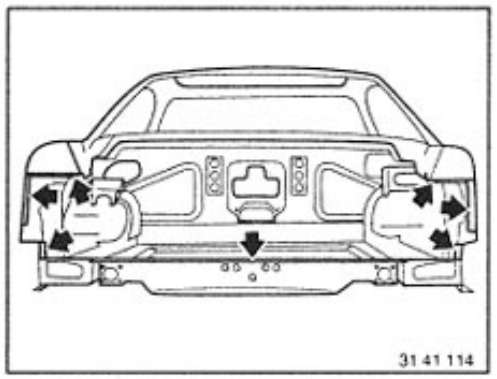


Disconnect joints between internal reinforcing members of tail panel and trunk floor.

Note:
To make the illustration clearer, shown with tail panel removed: viewed from luggage compartment.



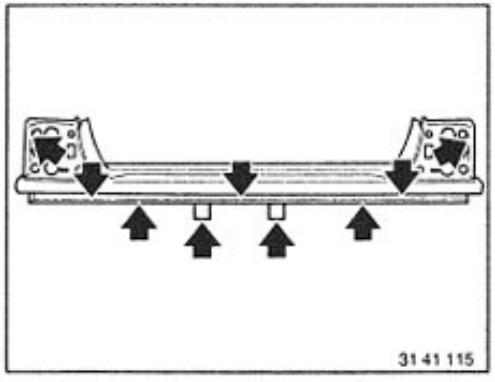
Remove tail panel.



Remove scrap metal.

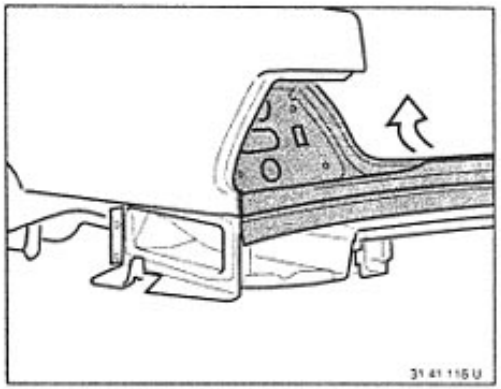
Note:
To make the illustration clearer, shown with tail panel removed:

clean welding surfaces and align.



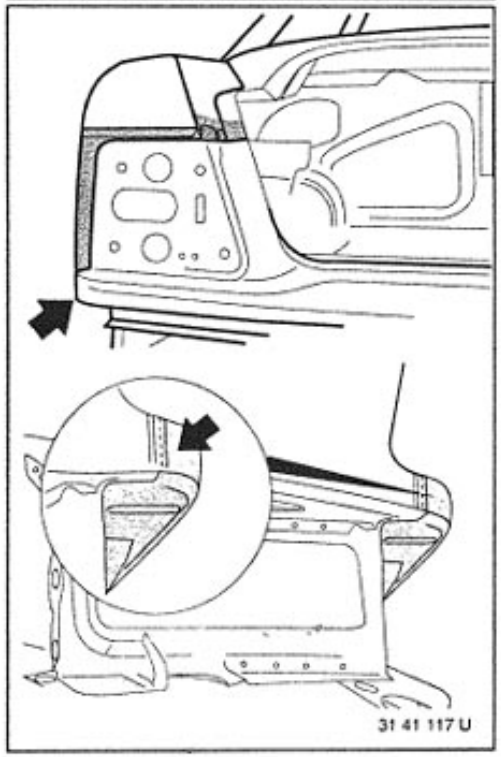
Clean welding surfaces (new part) and coat with zinc dust paint:

- joint in trunk floor
- wheel arch extension
- lighting cluster
- internal reinforcements on trunk floor

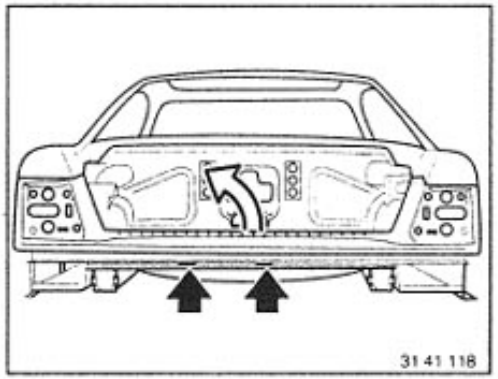


Adjust tail panel to fit

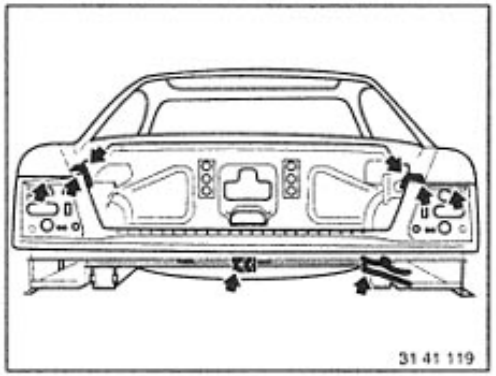
Installation:
Install tail panel obliquely from below



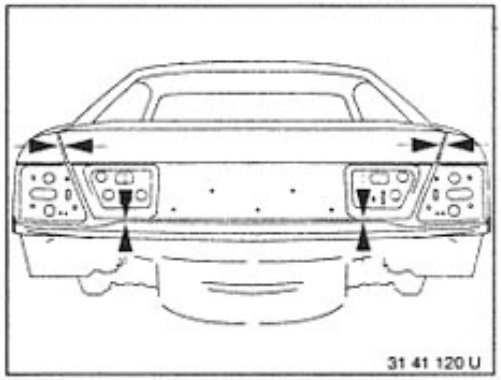
Ensure that tail panel is correctly seated on light cluster!



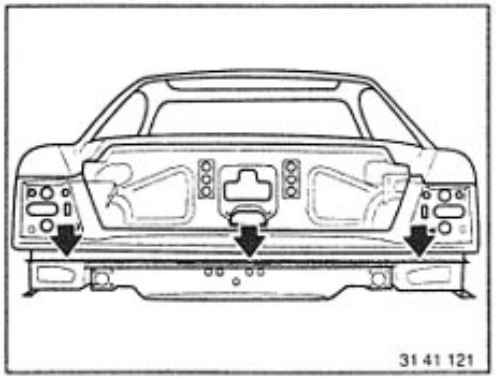
Insert internal reinforcements in trunk floor.
Turn tail panel into correct position.



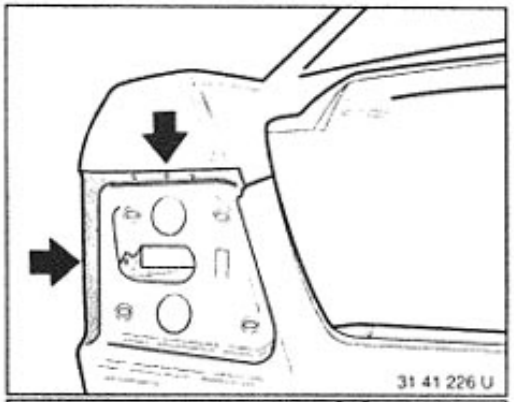
Align contact faces of light cluster.
Secure tail panel with tongs, spot brazing where necessary.



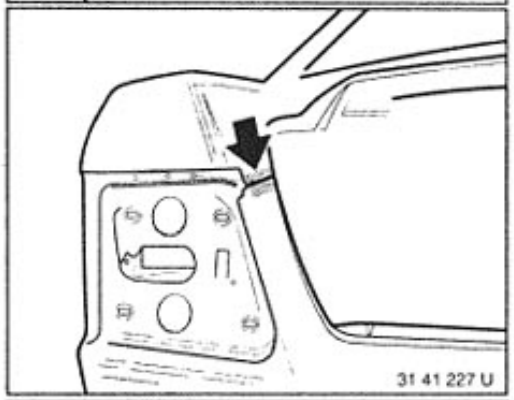
Adjust tail panel to fit trunk lid.
Ensure that joint is of uniform width.



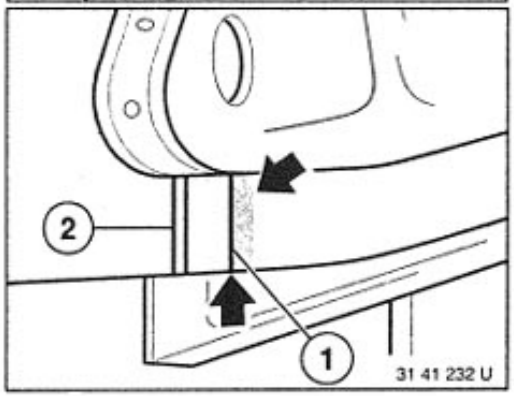
Spot weld tail panel to trunk floor.



Spot weld tail panel at tail light assembly.



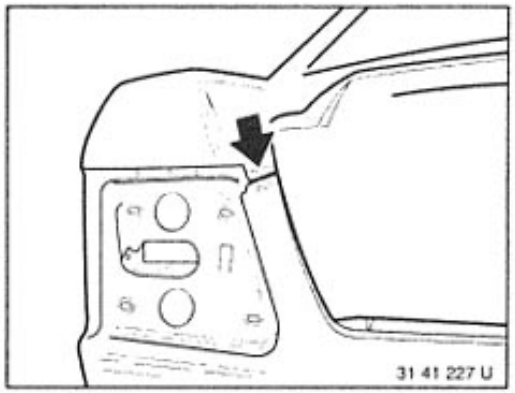
Braze water drain channel and tail light assembly transition.



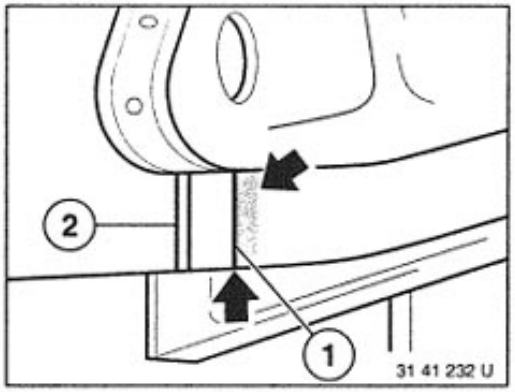
Braze tail panel and rear side panel joint.

1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel

Grind welded and brazed surfaces smooth.

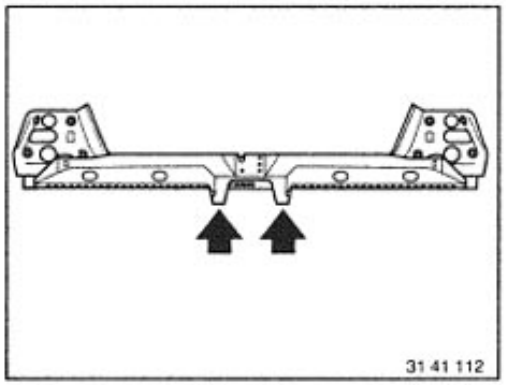


Tin mating surface in water drain channel and grind smooth.



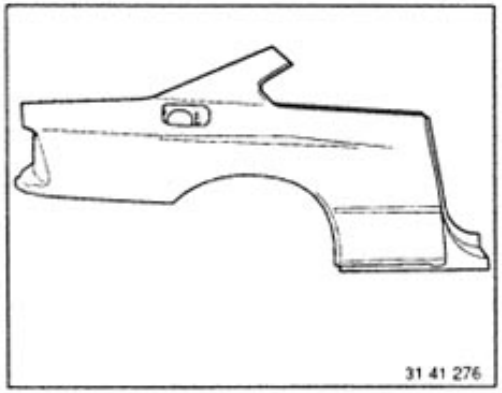
Tin mating surface on side panel and grind smooth.

1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel



Weld inner reinforcements of tail panel.

Note:
Tail panel was removed in picture for better illustration; view from trunk.

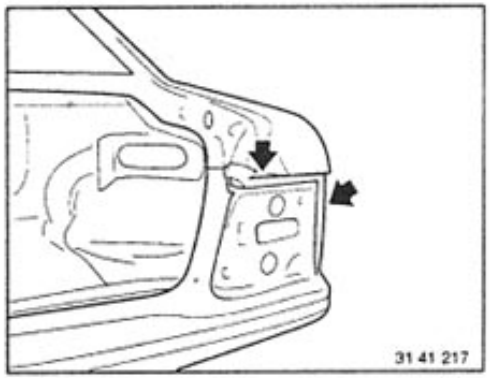


41 35 110 Replacing complete rear side panel (up to roof connection)

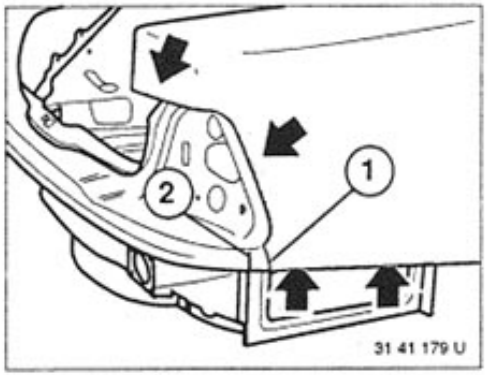
Body repair instructions: see 41-0/1.

Bumper with impact absorber
- Complete cover on trunk floor
- Battery
- Car jack
- Tail lights
- Luggage compartment gasket
- Section of wiring harness
- Spare wheel
- Fuel tank
- Forced ventilation
- Trim on spare wheel box
- Back wheel
- Front seat
- Rear window
- Trunk lid

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.



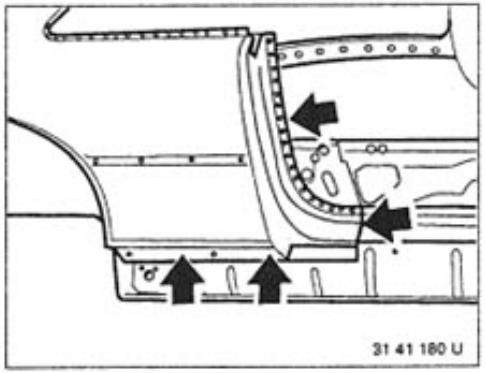
Expose connecting points for lamp support.



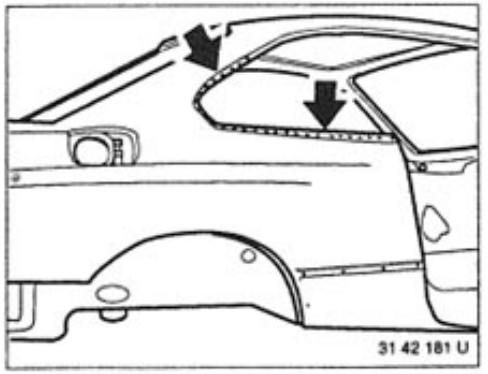
Roughly separate side panel beside lamp support.

1 = Joint for cut
2 = Bead in rear side panel

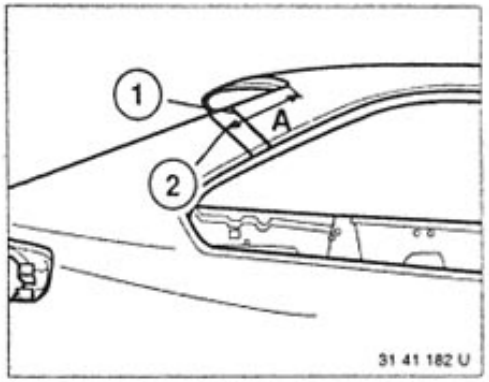
Roughly separate side panel on wheel housing extension.



Drill out welding points beside door opening. Expose joints between side panel and side member.
Roughly separate side panel from side member.

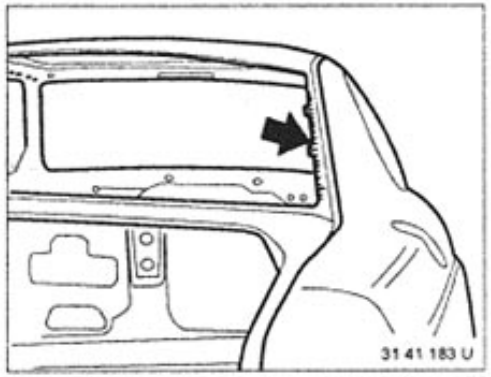


Drill out welding points on side window and roof frame.

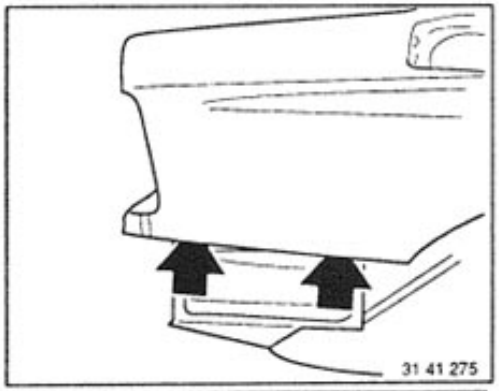


Expose joint between C pillar and roof frame.
Determine and separate joint.

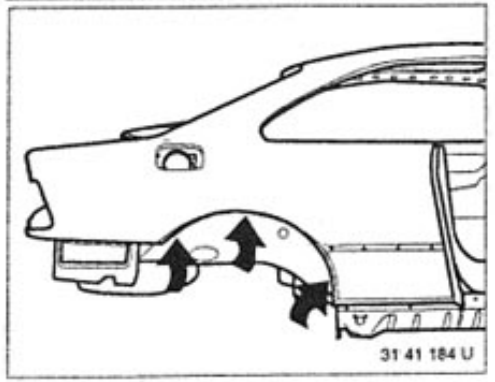
Dimension (A) = 170 mm.
1 = Connecting point
2 = Separating point



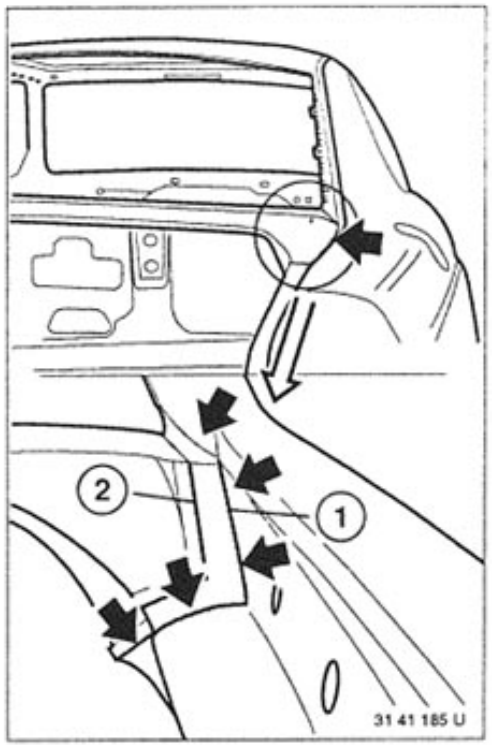
Drill out welding points on rear window.



Expose and drill out welding spots on wheel arch extension.



Expose and roughly separate connecting point on side panel in wheel housing.

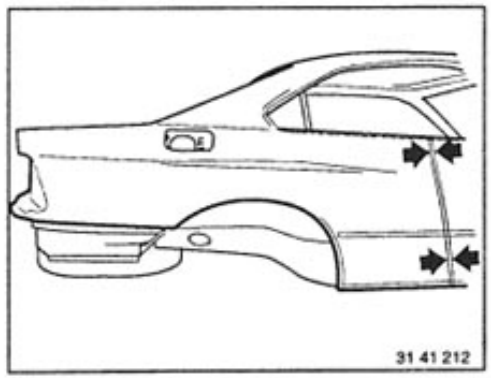


Expose and separate connecting point on windshield.

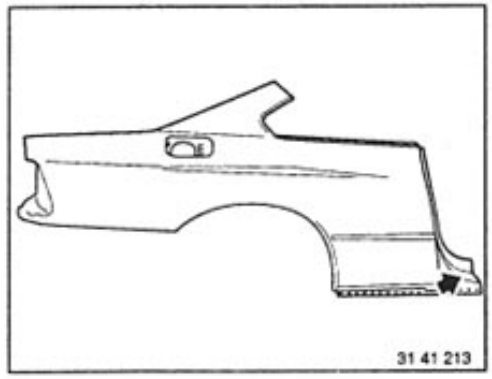
Caution!
Separate along edge in front of welded seam otherwise part will become too short.

Remove side panel.

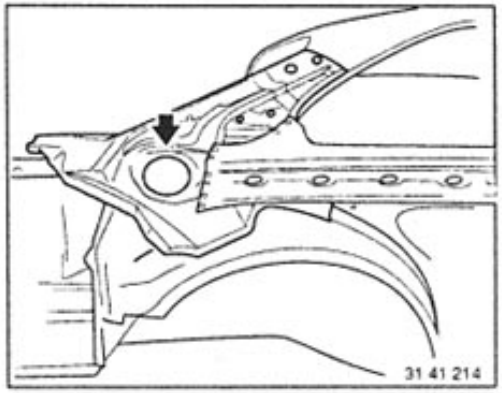
Remove scrap sheet metal.
Align connecting points and grind down.



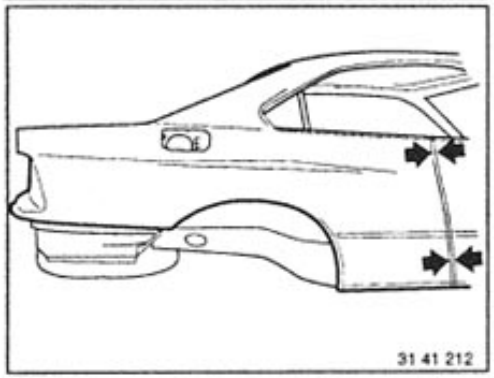
Adjust side panel to fit and ensure that joints are of uniform width!
Mark out holes for plug welding.
Remove side panel.



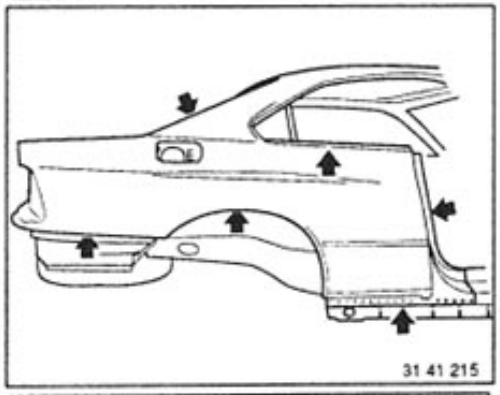
Drill out holes for plug welding.
Clean welding surfaces.



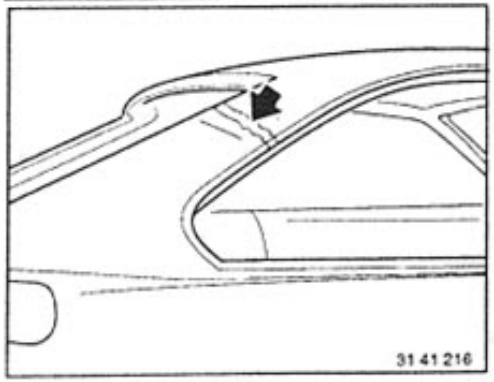
Apply sealant * to recess for tank filler neck.



Adjust side panel to fit.
Ensure that joints are of uniform width!



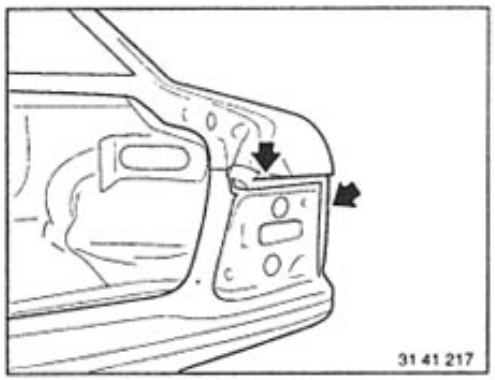
Weld up side panel.



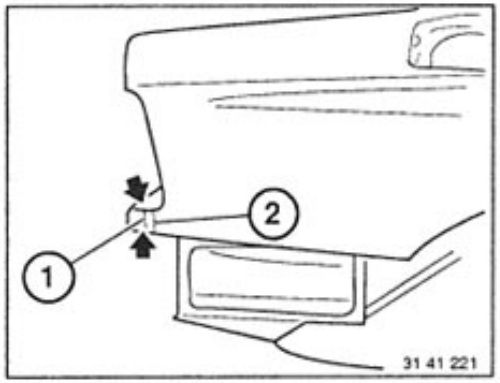
Weld up connection on C pillar.
Place welding spots so close to one another that a continuous seam is created.

Caution!
Always allow each spot to cool slightly before applying the next spot weld.
Risk of distortion!

* Refer to BMW Parts Service

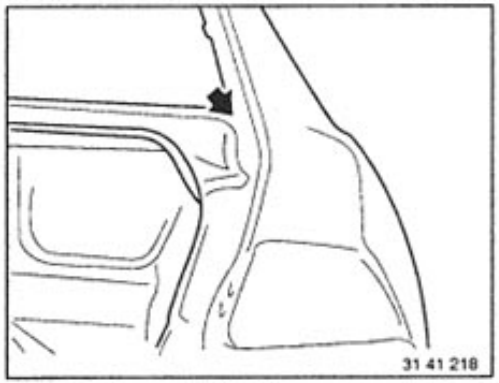


Apply spot welds to lamp support.
Braze water gutter and link to lamp support.

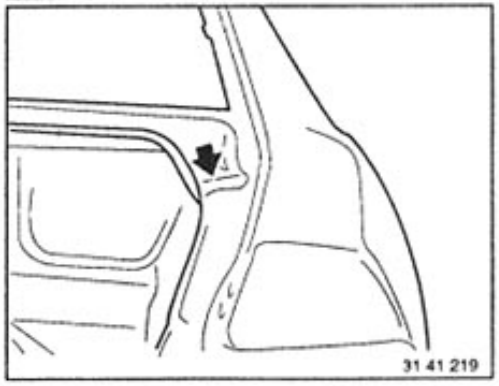


Braze connection between tail panel and rear side panel.

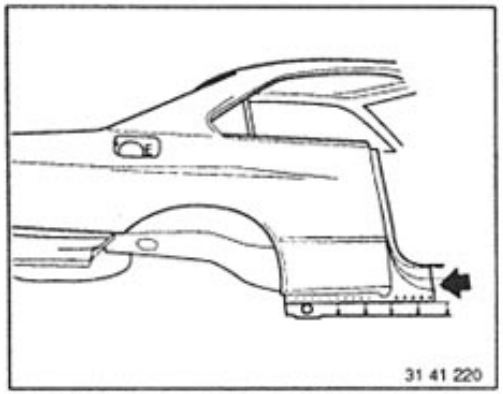
1 = Connecting point in tail panel (brazed point)
2 = Bead in rear side panel



Weld link between lower section of rear window frame and side panel.

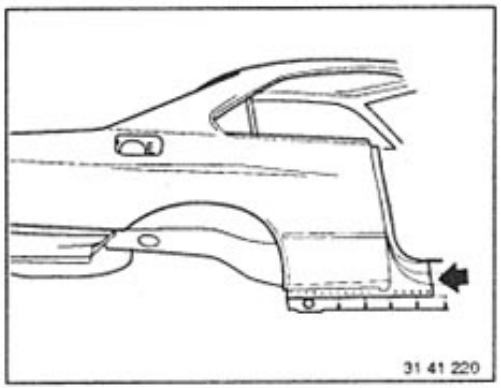


Braze link between lower section of rear window frame and side panel.

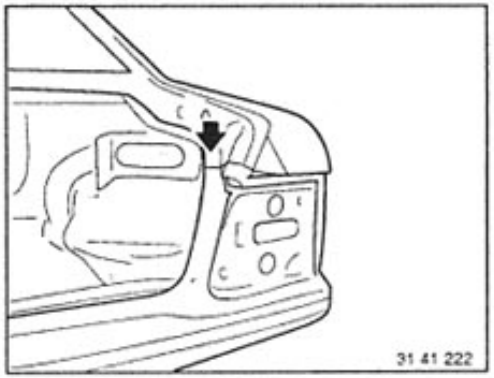


Braze cover on side member in door opening.

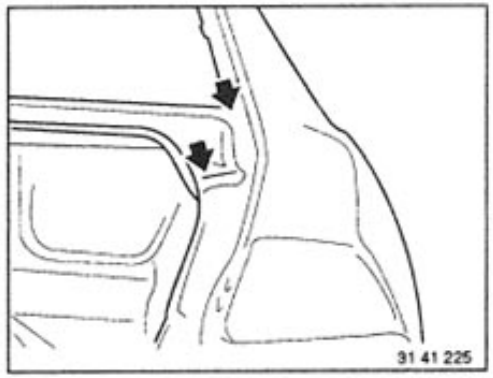
Grind down welding and brazing points.



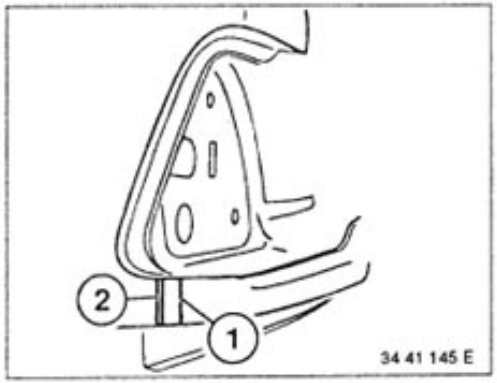
Tin out cover for side member in door opening and grind down.



Tin out connecting point in water gutter and grind down.

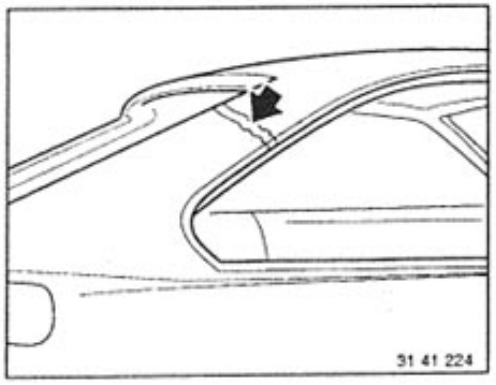


Tin out link between lower rear window frame and side panel and grind down.

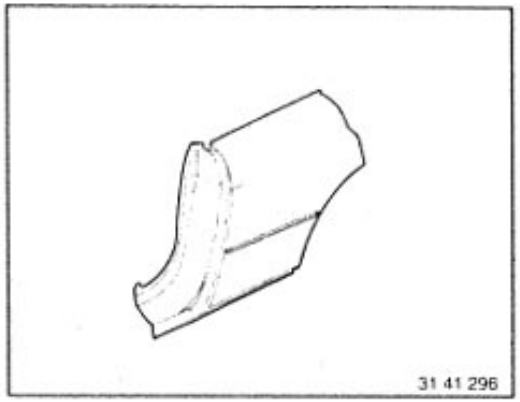


Tin out connecting point on side panel and grind down.

1 = Connecting point for tail panel (brazing point)
2 = Bead in rear side panel



Tin out connection on C pillar and grind down.



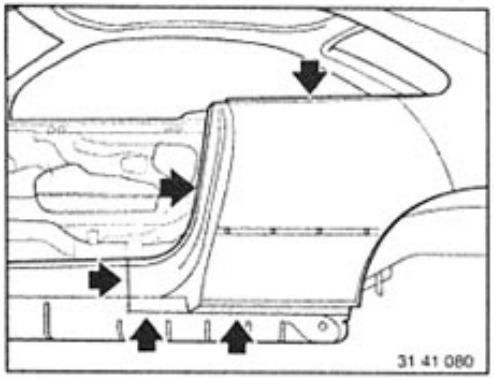
41 35 294 REPLACING LEFT OR RIGHT REAR SIDE PANEL

Remove or cover other parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.

Refer to information on body repairs!

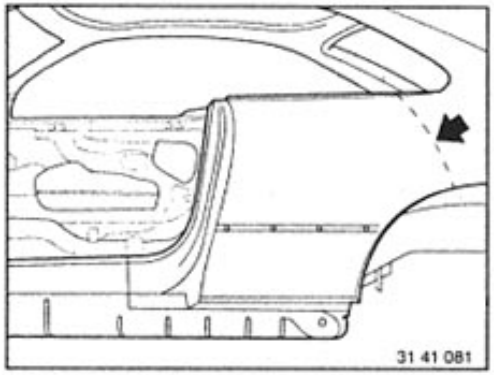
Remove or disconnect following parts.

- Bumper with impact absorbers
- Complete trunk floor cover
- Battery
- Car jack
- Tail light assembly
- Trunk seal
- Wire harness partially
- Spare wheel
- Lock in tail panel
- Extraction slot
- Spare wheel well trim panel
- Rear wheel
- Central ground connection
- Left bottom hinge
- Trunk lid

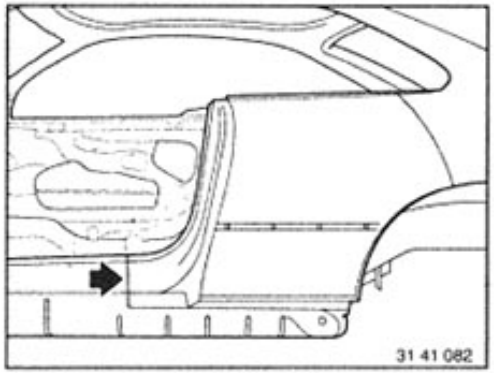


Clean mating surfaces.

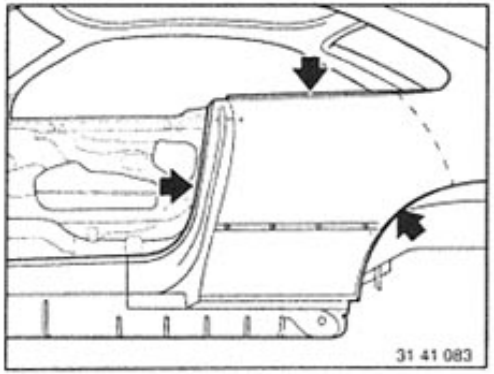
- Door opening
- Side member
- Window line
- Wheel house



Determine and mark cutting line.
Cut off along cutting line.

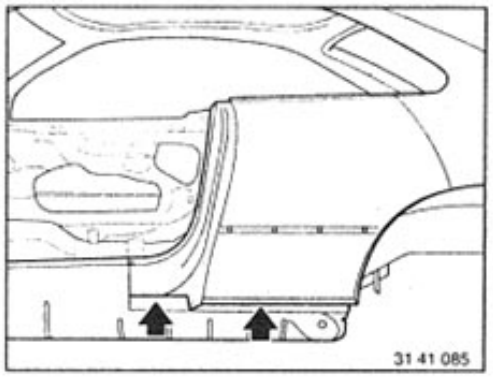


Remove brazing solder.



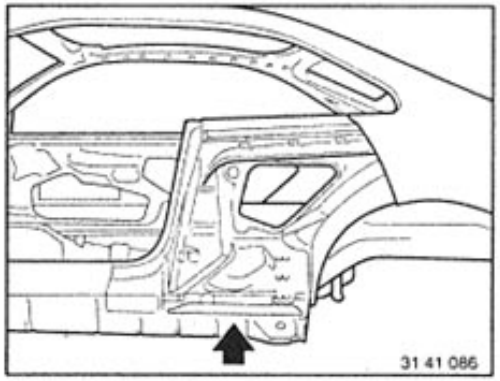
Drill off welding spots.

- Door opening
- Window line
- Wheel house

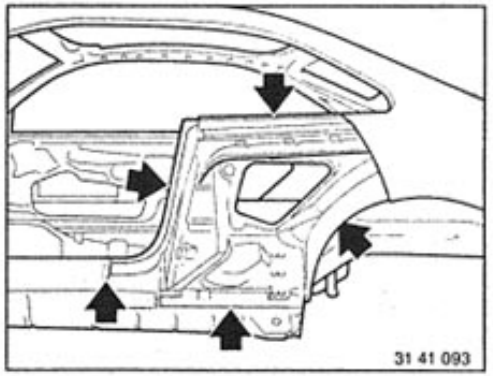


Cut off side member/side panel connection roughly with a sheet metal chisel.

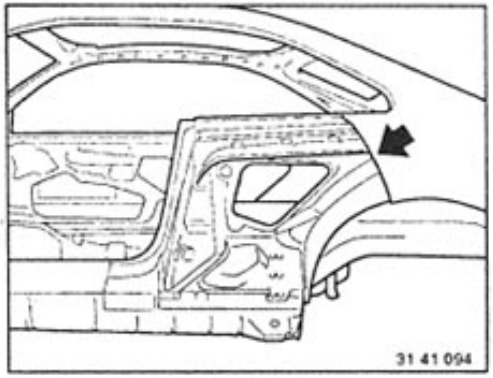
Take off side panel.



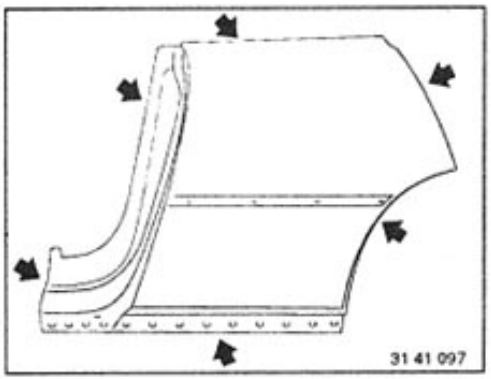
Remove scrap metal.



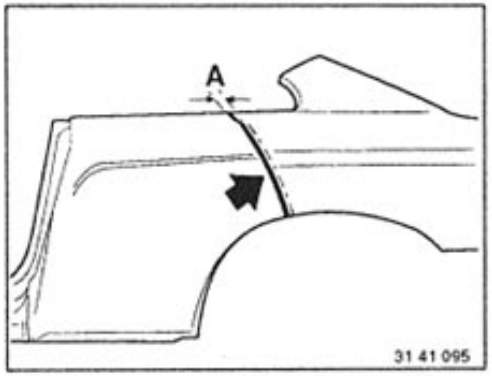
Grind (clean) mating surfaces.
Straighten mating surfaces (wheel house).
Remove undercoating on edge of wheel house.



Clean shouldered surfaces for partial replacement (side panel).



Clean welding surfaces on partial replacement section.
Drill holes for plug welding in partial replacement section.

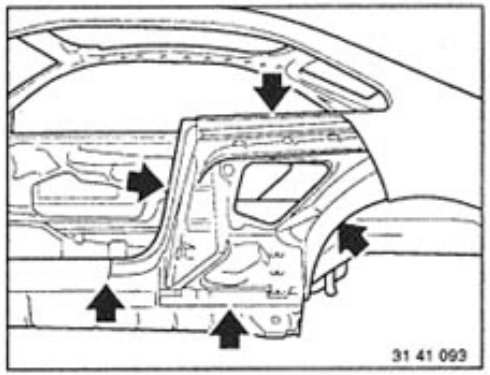


Mark cutting line on new side panel.

Note:
Consider width for reinforcement.
Reinforcement is produced from new side panel.

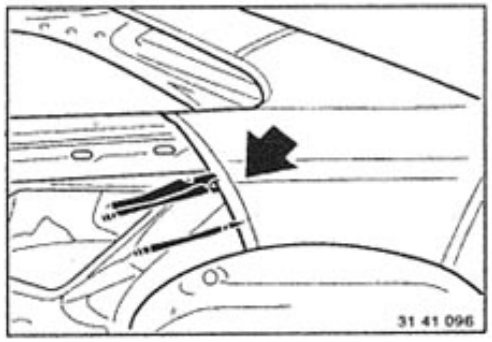
A = 40 mm (1.575") wide.

Cut out reinforcement and cut off section not required.



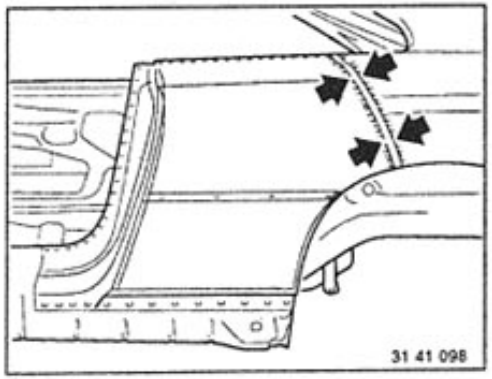
Coat welding surfaces with zinc dust paint.

- Door opening
- Window line
- Side member
- Entrance
- Wheel house

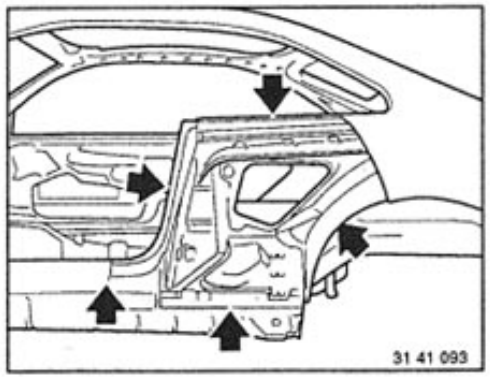


Fit in reinforcement on side panel and drill holes for plug welding.
Fit in and tack weld reinforcement.
Notch at beads.
Plug weld reinforcement.

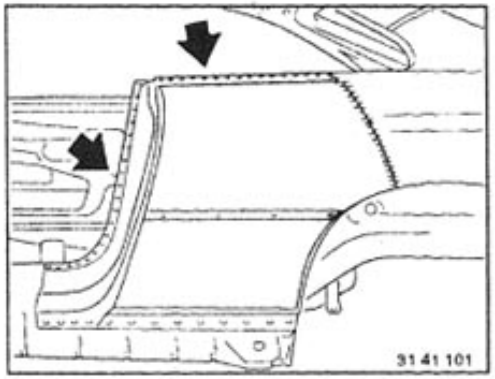
Fit in partial replacement section.



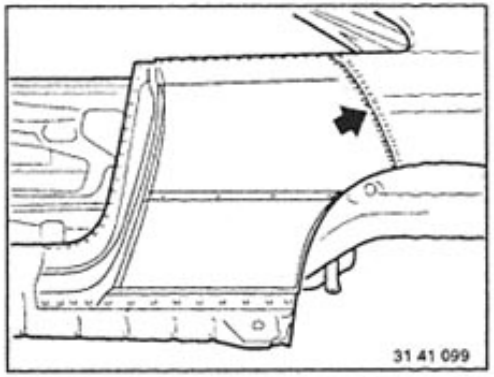
Fit in partial replacement section.
Check gaps.
Note door gap!



Plug weld reinforcement on partial replacement section at the side panel mating surface.

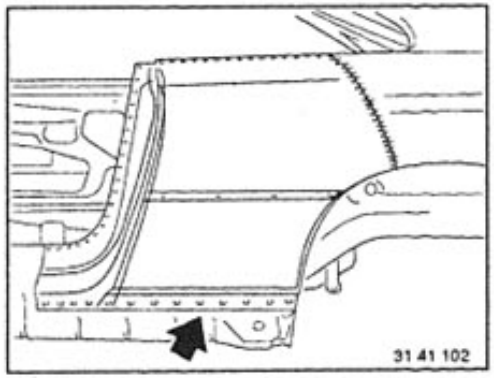


Spot weld partial replacement along window line
Only tack weld door opening (apply individual spots)
Align door opening
Spot weld door opening

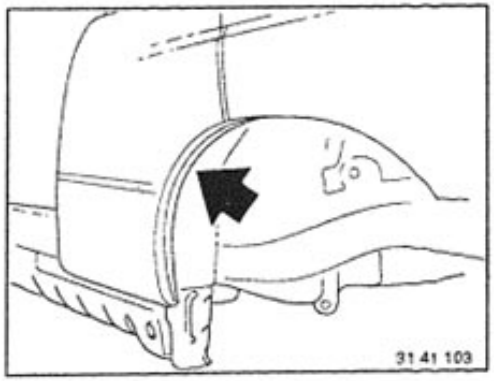


Apply spot welds along joint so close together that a continuous seam is created.

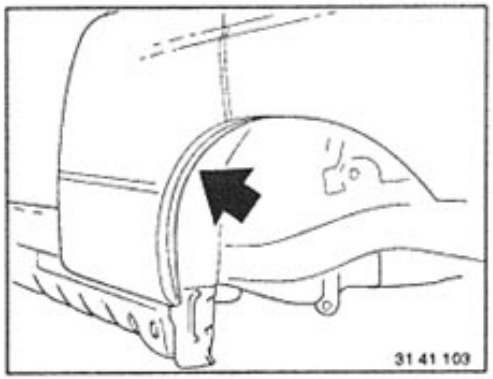
Caution!
Always allow each spot to cool slightly before applying the next spot.
Risk of distortion!



Plug weld connection between side member / side panel.

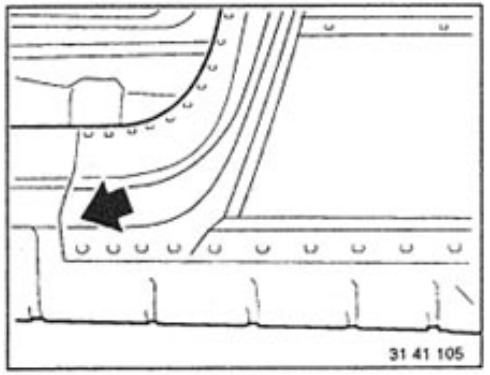


Align wheel housing (knurl along edge).
Inert gas weld joint in wheel arch.
Grind down joint.

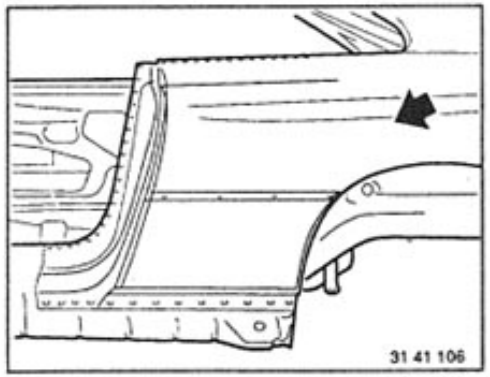


Spot weld wheel housing.

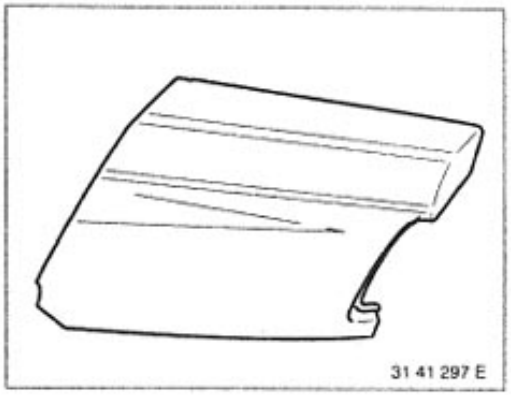
Grind down joints.



Clean brazing around door opening.
Tin out brazed area of door opening.



Tin out connection for partial replacement.
Smooth down tinned areas.



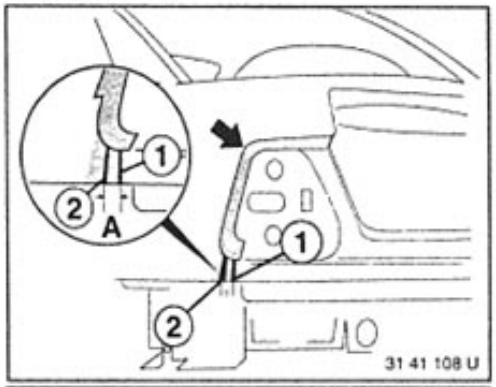
41 35 337 Replacing rear left side panel (partial replacement to wheel arch)

Remove or cover other vehicle parts in the repair zone which could be damaged by heat, sparks and dust.

Body repair instructions - see 41-0/1.

Remove or detach the following parts:

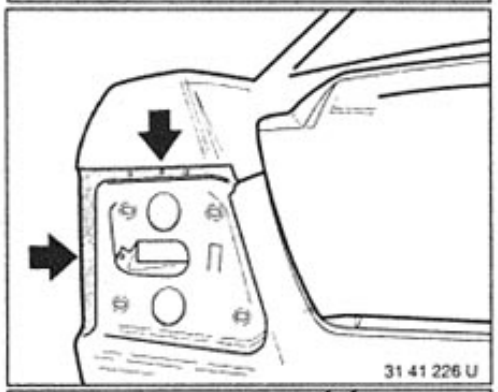
- Trunk lid
- Bumper
- Cover for trunk floor
- Battery
- Tail light, left
- Gasket for luggage compartment
- Section of wiring harness
- Lower hinge
- Back wheel



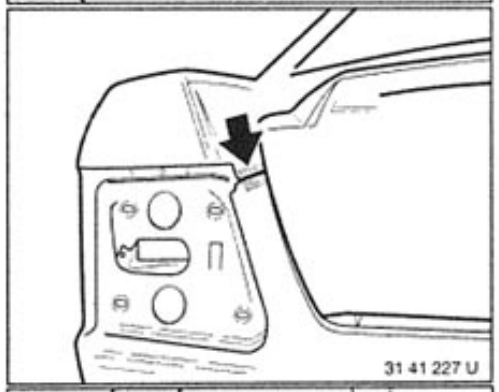
Clean mating surfaces.

Important!
1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel

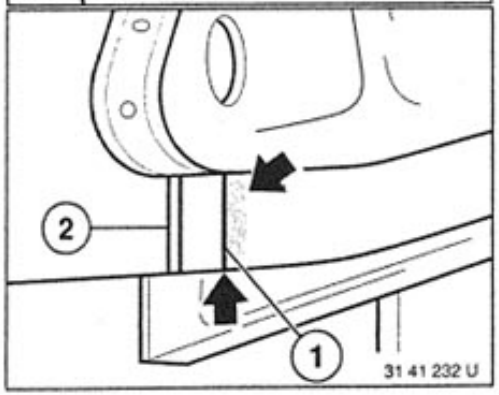
Distance (A) = approx. 20 mm (0.787").



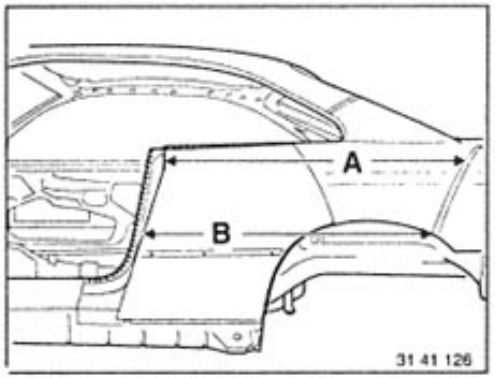
Drill off welding spots in lamp holder.



Grind off brazed surfaces in water drain and lamp holder transition.

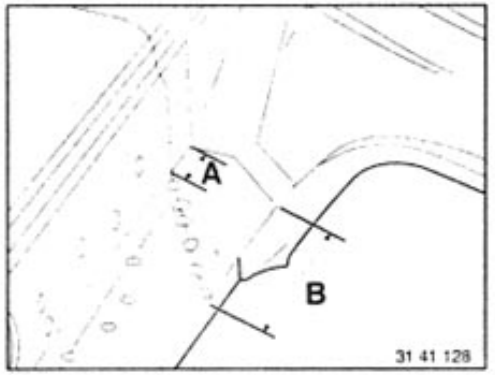


Grind off brazed surface on tail panel mating surface.



Determine and mark cutting line.

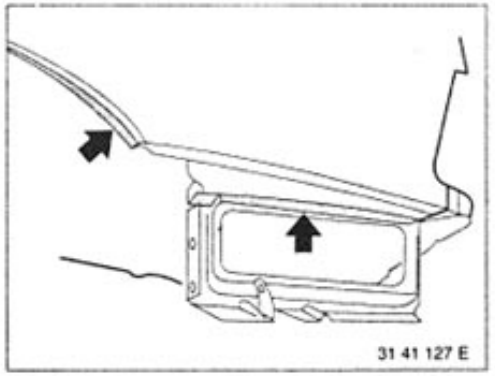
Distance A= approx. 1170 mm (46.063")
Distance B= approx. 1040 mm (40.905")



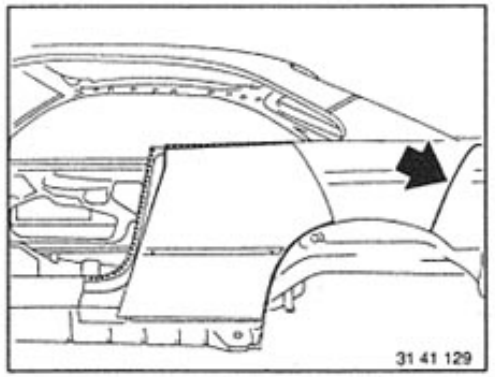
Determine and mark cutting line.

Important!
Make sure of sufficient distance to the window.

Distance A = approx. 30 mm (1.181")
Distance B = approx. 85 mm (3.346")

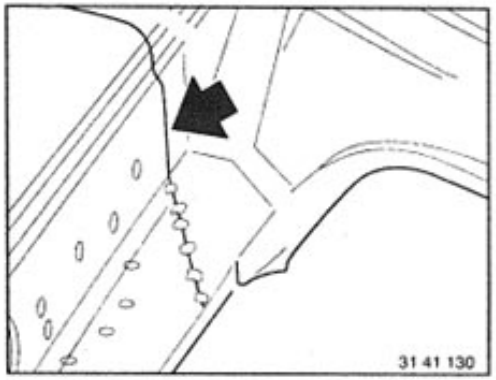


Remove undercoating on mating surfaces.
Cut off wheel house extension along cutting line roughly.
Drill off wheel house welding spots.



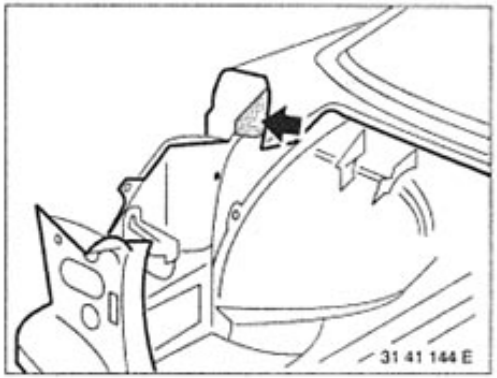
Cut off side panel along marked cutting line.

Important!
Don't cut through reinforcements.



Disconnect side panel at marked point on water gutter.

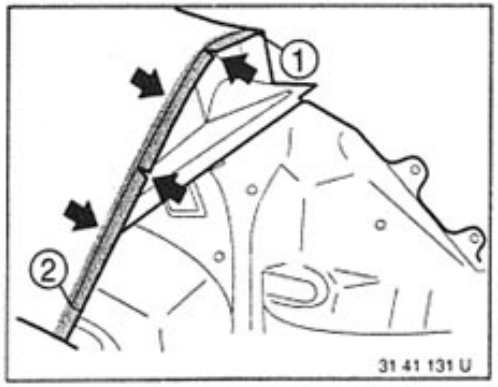
Caution!
Do not cut through sheet metal reinforcements.



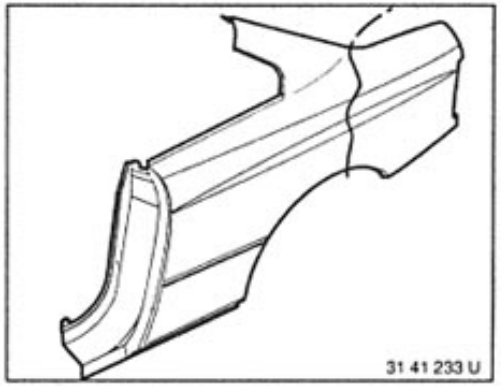
Position of sheet metal reinforcements on water gutter.

Caution!
Do not cut through sheet metal reinforcement.

Remove side panel.
Remove scrap metal, clean joints (wheel arch extension) and align.

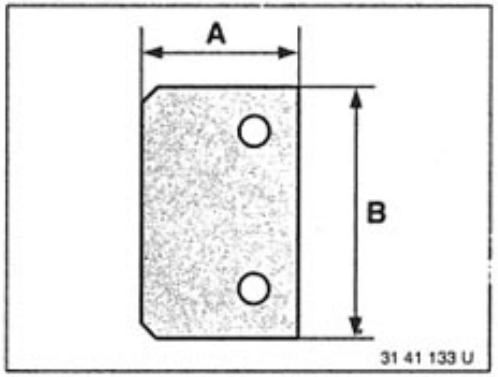


Offset remaining side panel from Point 1 to Point 2 and disconnect at edges.



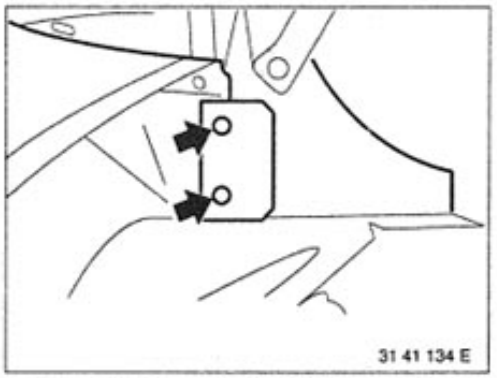
Mark out joint on new part for partial replacement of side panel and cut out roughly.

Caution!
Note offset dimension on remaining side panel!

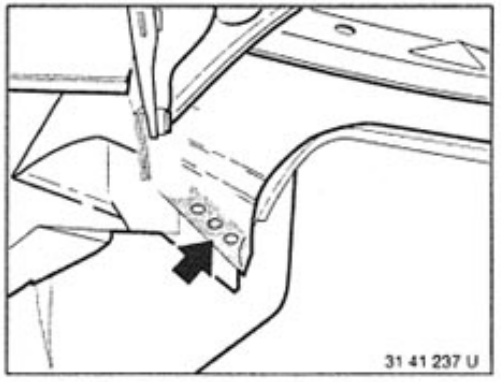


Produce reinforcement plate for side connection of water gutter and drill holes for plug welding.

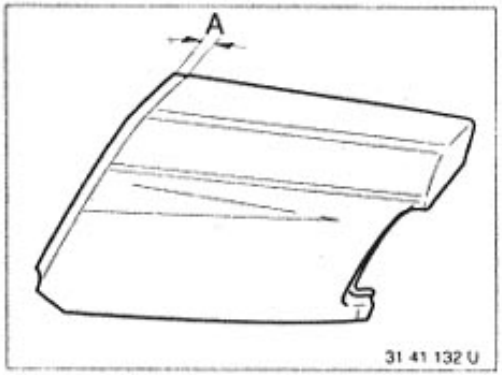
Dimension (A) = approx. 30 mm
Dimension (B) = approx. 50 mm



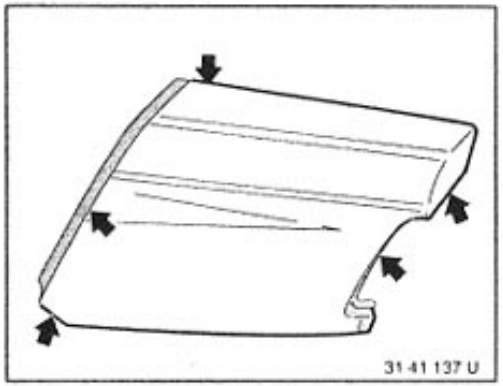
Adjust reinforcement plate to fit and plug weld.
Ensure adequate overlap
(min. 15 mm all round)!



Produce reinforcement plate for lower joint on water gutter and weld into place.

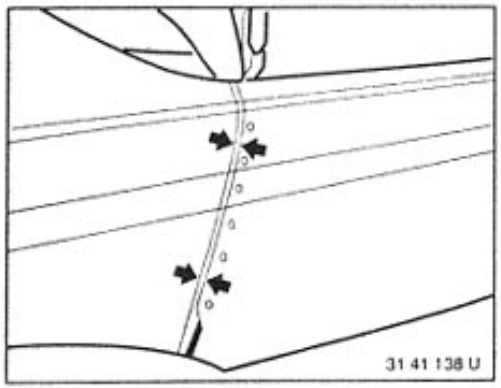


Fit in new part.

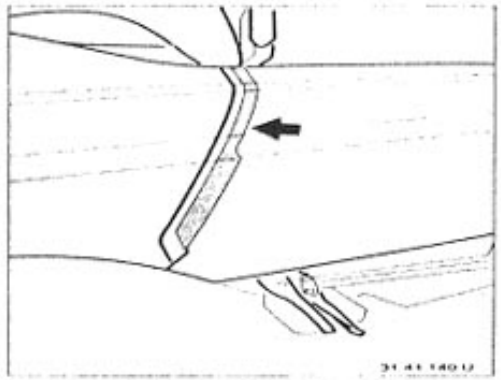


Clean welding surface on new part.
Coat welding surfaces with zinc dust paint.

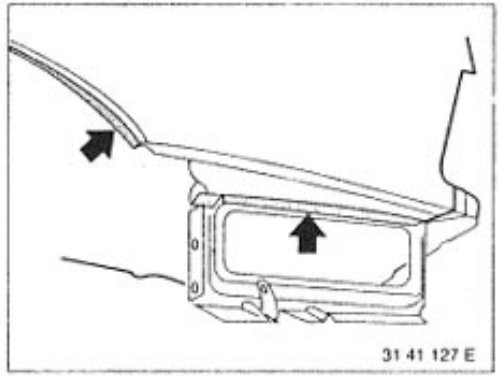
Drill holes for plug welding.



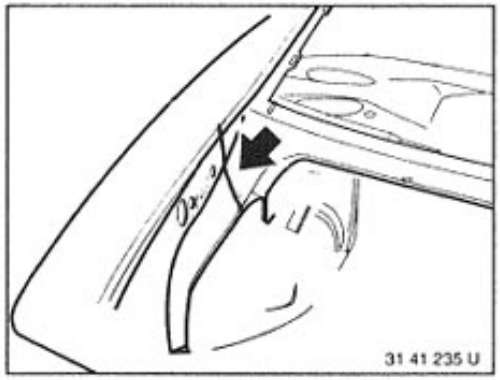
Fit in new part, checking for uniform joint width.



Plug weld shouldered edge of side panel partial replacement section.

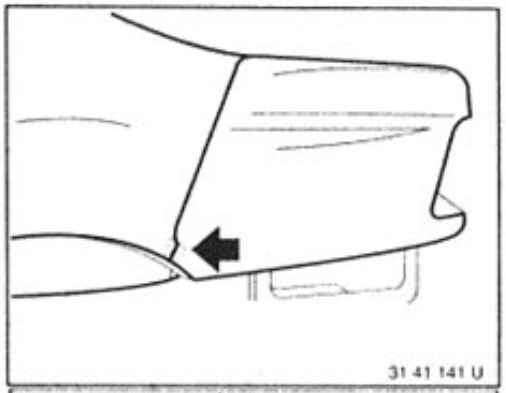


Spot weld on wheel house extension and in wheel house.

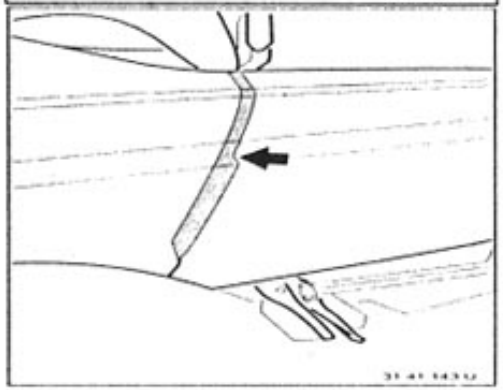


Spot weld side and bottom of water drain connection.
Place welding spots so close together that a welded seam is produced.

Important!
Protect rear window zone against excessive heat, as rear window could then leak.
Let one welded spot cool off before producing an adjacent spot.



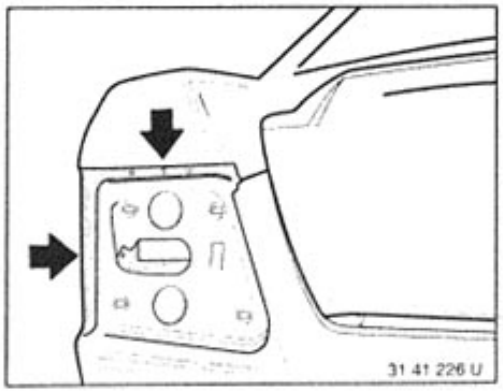
Butt weld along edge of wheel housing.



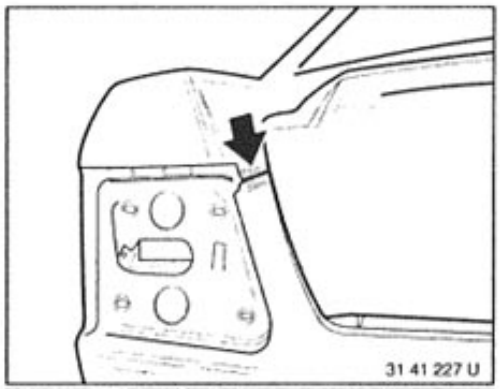
Apply individual spot welds along edge of partial replacement for side panel so close together that a continuous seam is created.

Caution!
Always allow each spot to cool slightly before applying the next spot.
Risk of distortion!

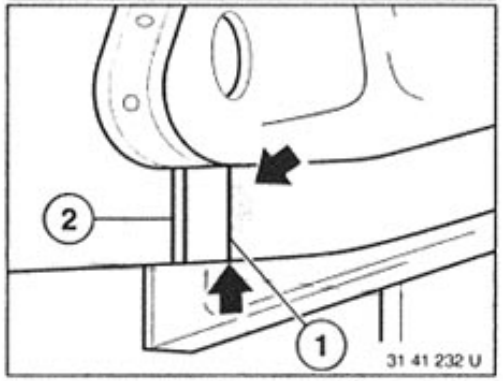
Align joints with one another.



Spot weld in the lamp support.

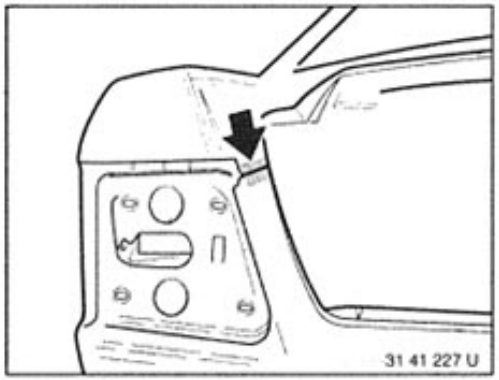


Braze water gutter and link to lamp support.

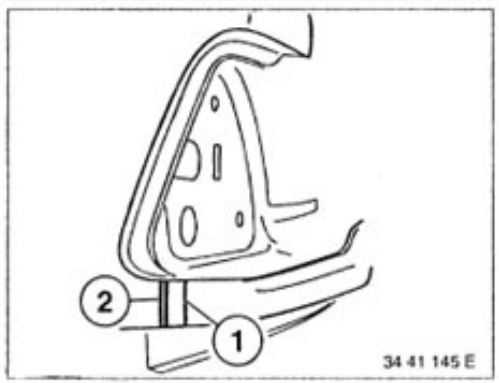


Braze link with tail panel and rear side panel.

1 = Joint on tail panel (brazed point)
2 = Bead in rear side panel



Tin out connection in water gutter and grind down.



Tin out joint on side panel and grind down.

1 = Connecting point on tail panel (brazing point)
2 = Bead in rear side panel

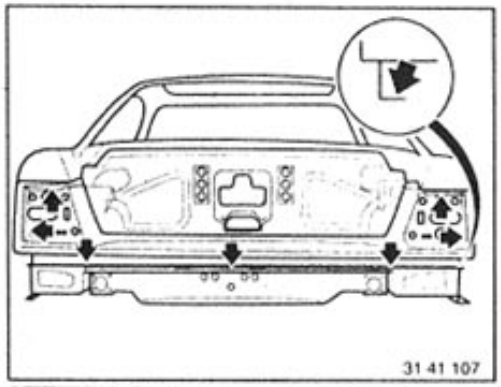
41 35 341 REPLACING LEFT REAR SIDE PANEL (Partial Replacement Up to Wheel House) AND TAIL PANEL

Remove or cover other parts of car which are located in the repair zone and could be subjected to heat, sparks or dust.

Refer to information on body repairs!

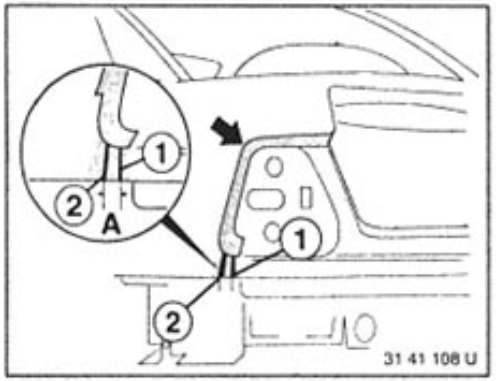
Remove or disconnect following parts.

- Bumper with impact absorbers
- Complete trunk cover
- Batteries
- Car jack
- Tail lights
- Trunk seal
- Wire harness partially
- Spare wheel
- Lock in tail panel
- Extraction slots
- Spare wheel well trim panel
- Rear wheel
- Central ground connection
- Bottom left hinge
- Trunk lid



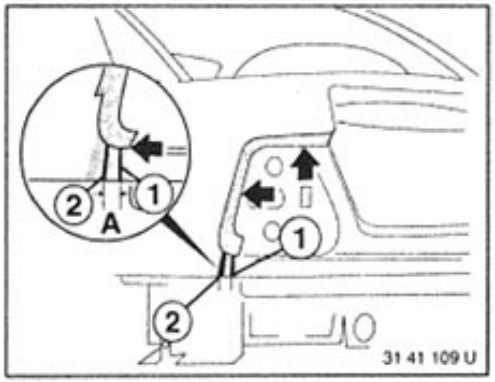
Clean mating surfaces.

Note:
Trunk lid was removed in picture for better illustration.



Important!
1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel

Distance A = approx. 20 mm (0.787")

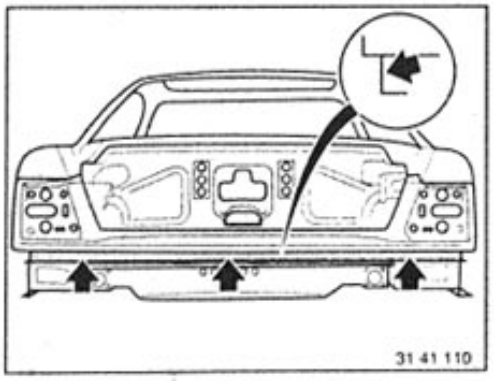


Cut out tail panel in the tail light area roughly with a pneumatic saw.

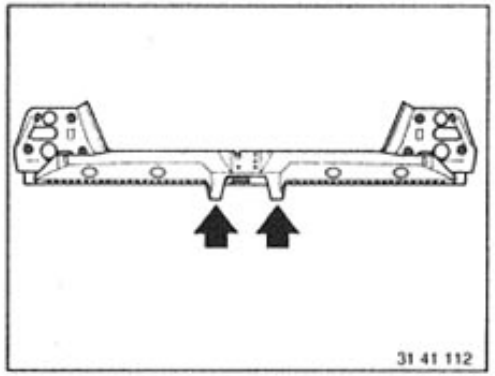
Important!
Cut in front of tail panel mating surface (1).

1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel

Distance A = approx. 20 mm (0.787")

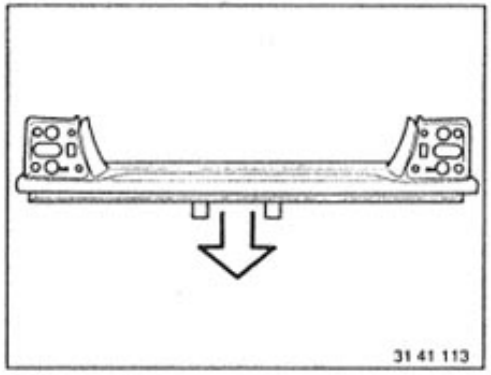


Chisel off tail panel roughly on the outside of the trunk floor plate connection.

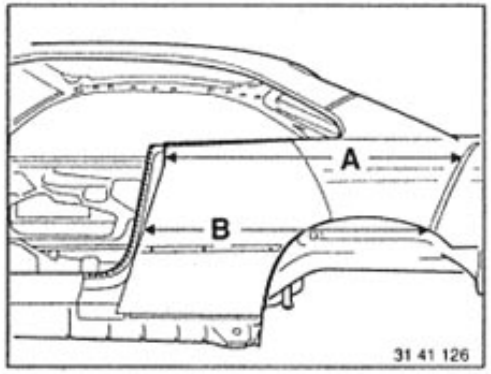


Cut off connecting plate of inside tail panel reinforcements on the trunk floor plate.

Note:
Tail panel was removed in picture for better illustration; view from trunk.

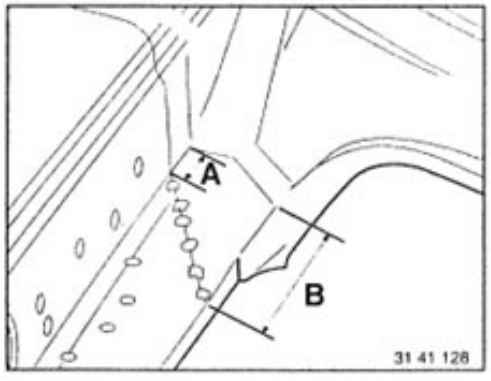


Take off tail panel.



Determine and mark cutting line.

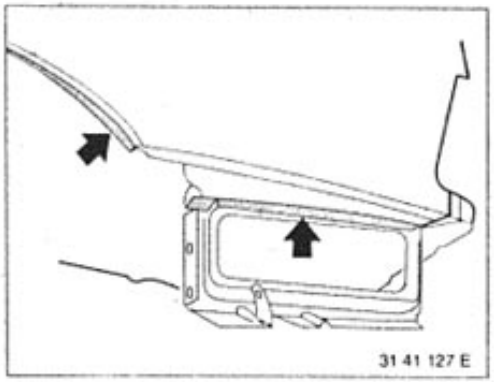
Distance A = approx. 1170 mm (46.063")
Distance B = approx. 1040 mm (40.945")



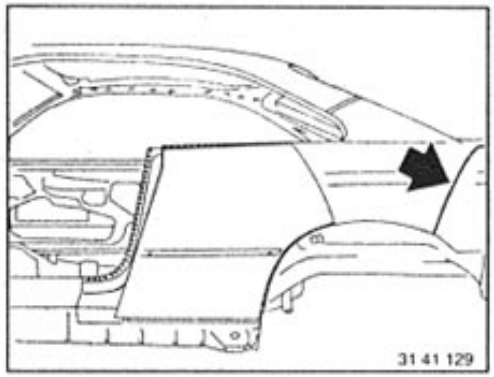
Determine and mark cutting line.

Important!
Make sure of sufficient distance to window!

Distance A = approx. 30 mm (1.181")
Distance B = approx. 85 mm (3.346")

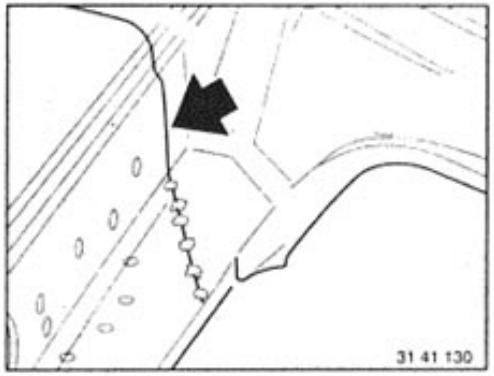


Remove underbody protection from connecting points.
Roughly separate wheel arch extension. Drill out spots in wheel housing.



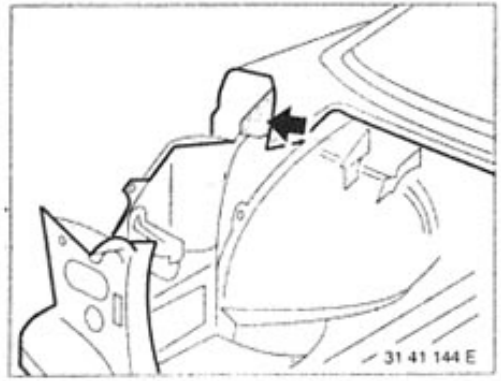
Separate side panel at marked location.

Caution!
Do not cut through reinforcement plate.



Cut through side panel at marked location in water gutter.

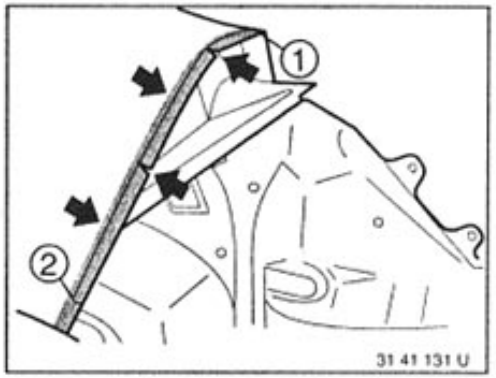
Caution!
Do not cut through sheet metal reinforcements.



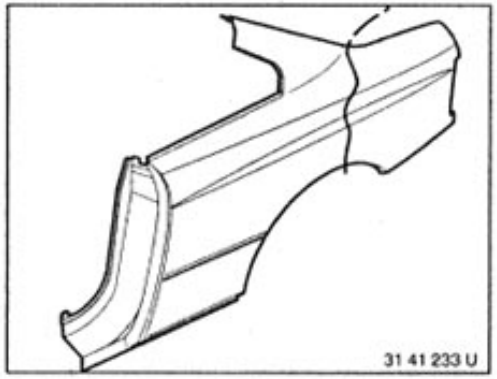
Location of reinforcement plates in water gutter.

Caution!
Do not cut through sheet metal reinforcements.

Remove side panel.
Remove scrap metal, clean joints and align to fit.

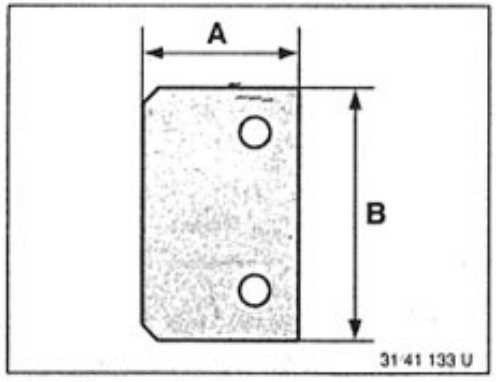


Offset remaining side panel from point 1 to point 2 and disconnect at edges.



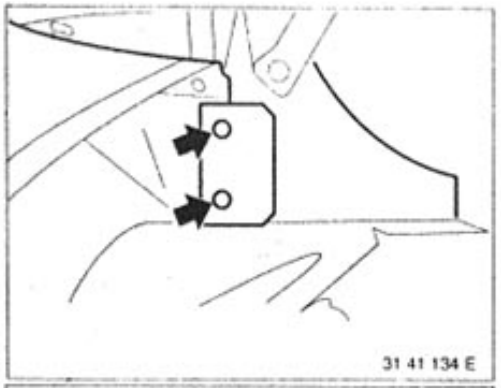
Mark out joint on new part for partial replacement of side panel and cut to shape roughly.

Caution!
Note offset dimension on remaining side panel!

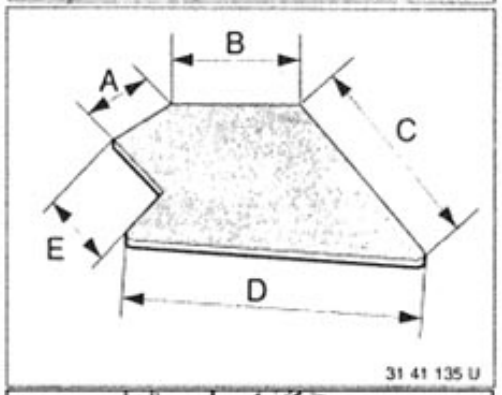


Produce a side reinforcement plate for connection to water gutter and drill out holes for plug welding.

Dimension (A) = approx. 30 mm
Dimension (B) = approx. 50 mm

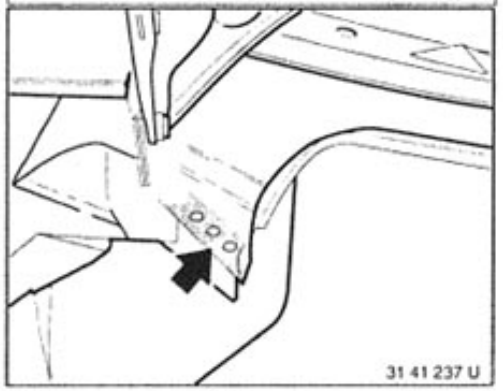


Fit in and plug weld reinforcement.
Make sure of sufficient overlapping – at least 15 mm (0.591") each.



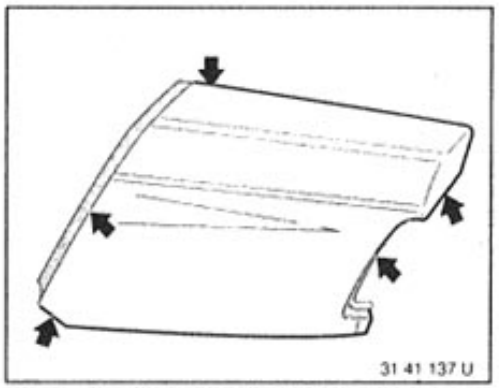
Produce reinforcement for bottom water drain connection.

Distance A = approx. 20 mm (0.787")
Distance B = approx. 35 mm (1.378")
Distance C = approx. 50 mm (1.969")
Distance D = approx. 75 mm (2.953")
Distance E = approx. 20 mm (0.787")

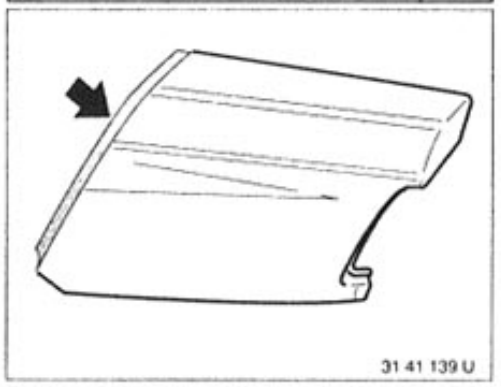


Fit in and spot weld reinforcement.
Make sure of sufficient overlapping!

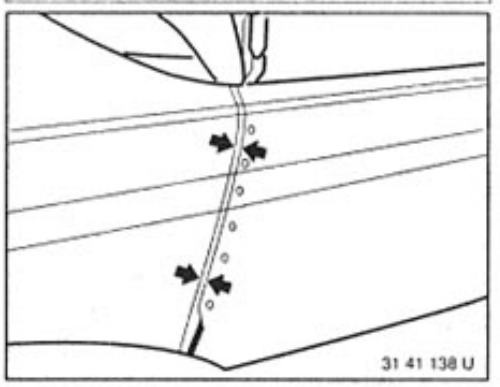
Fit in new part.



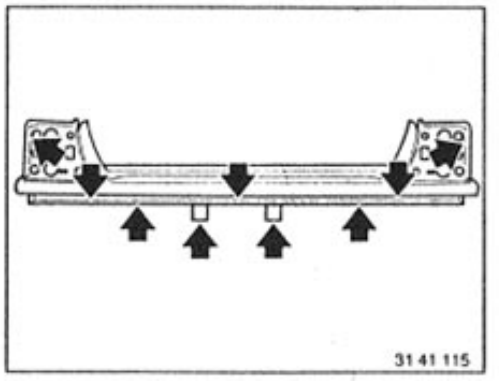
Clean welding surfaces on new part.
Coat welding surfaces with zinc dust paint.



Drill holes for plug welding.



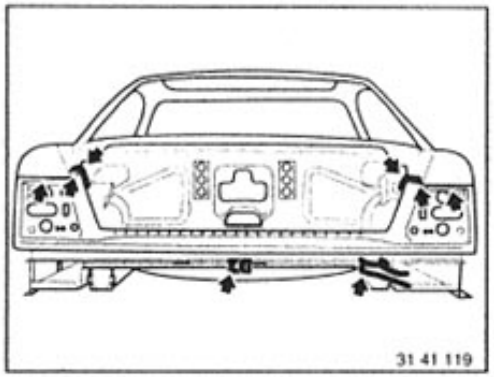
Fit in new part, checking for uniform joint width.



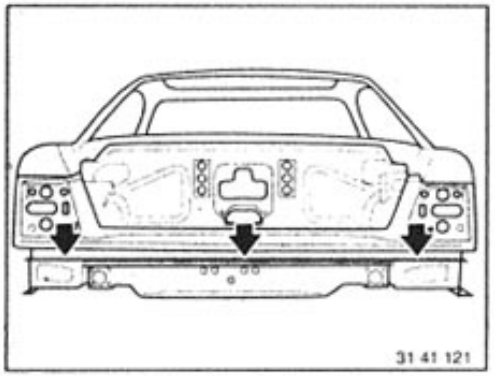
Clean welding surfaces on tail panel.

- Trunk floor plate
- Wheel house extension
- Tail light assemblies
- Inner reinforcements on trunk floor

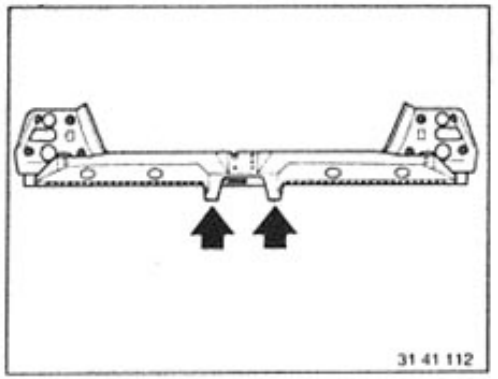
Fit in tail panel and rear side panel partial replacement section.



Straighten mating surfaces on tail light assemblies.
Hold tail panel in position with clamps, using brazing spots if necessary.



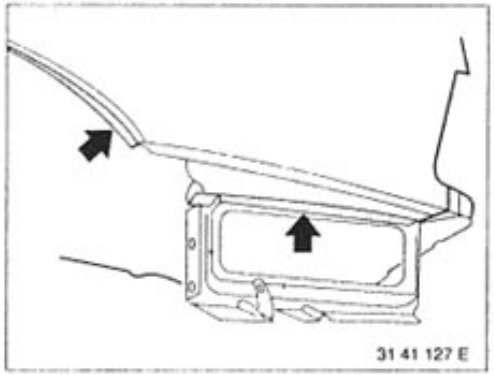
Spot weld tail panel on trunk floor plate.



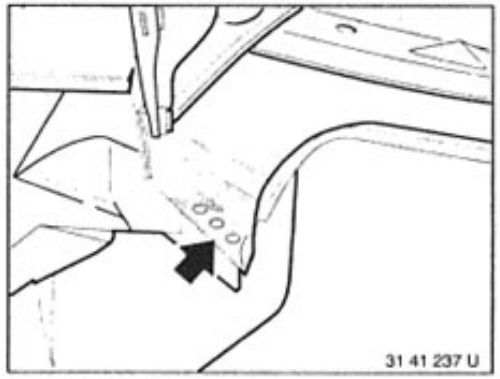
Weld inner reinforcements of tail panel.

Note:
Tail panel was removed in picture for better illustration; view from trunk.

Plug weld along shouldered edge of side panel partial replacement section.

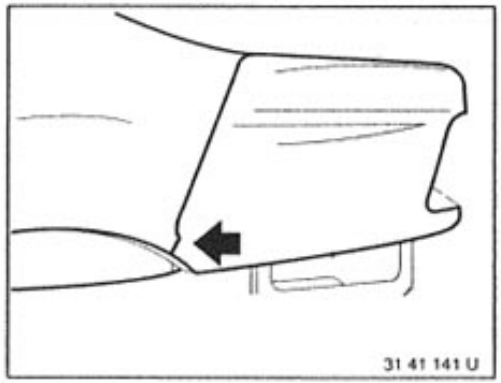


Spot weld on wheel house extension and in wheel house.

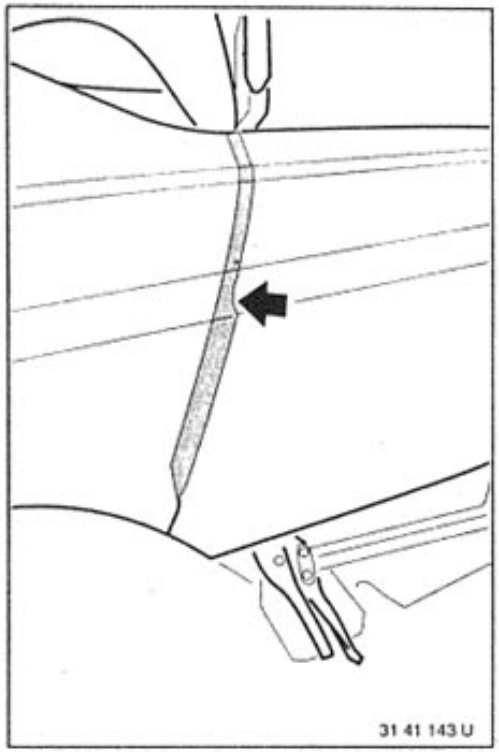


Spot weld side and bottom of water drain connection, placing spots so close together that a welded seam is produced.

Important!
Protect rear window zone against excessive heat, as otherwise the rear window could leak.
Let a welded spot cool off slightly before producing an adjacent spot.



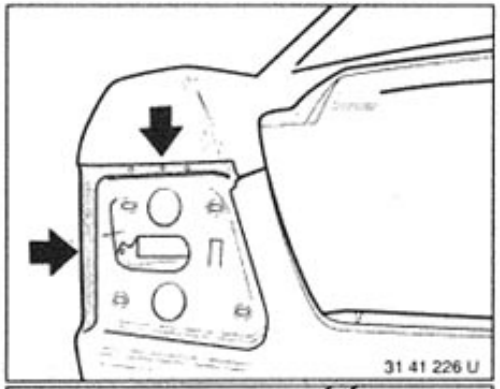
Butt weld along edge of wheel house.



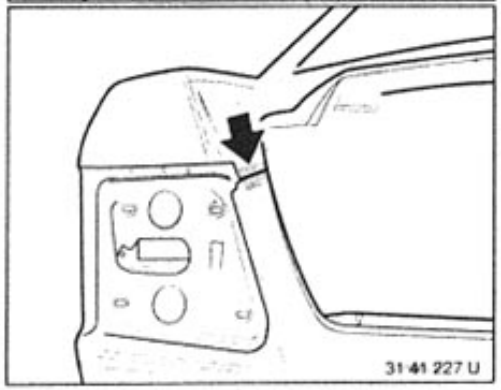
Spot weld along edge of side panel partial replacement section, placing the welded spots so close together that a welded seam is produced.

Important!
Always let a welded spot cool off slightly before producing an adjacent spot.
Danger of distortion!

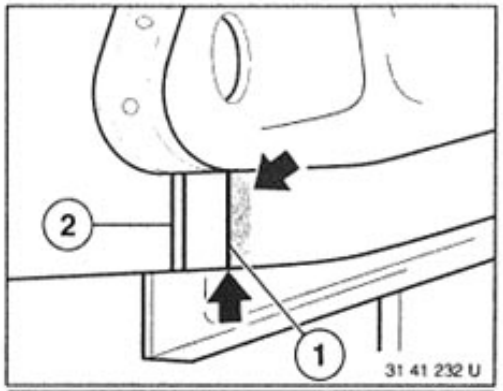
Straighten mating surfaces.



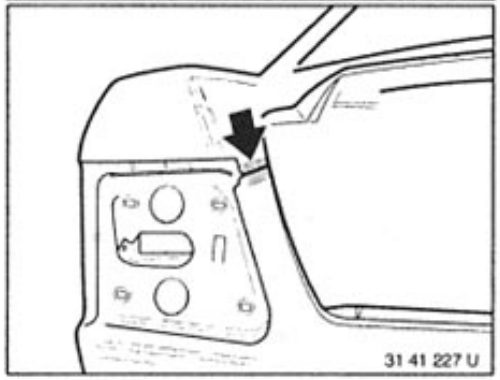
Spot weld in lamp holder.



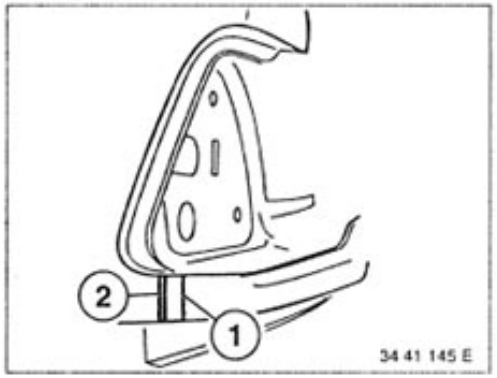
Braze water drain and lamp holder transition.



Braze tail panel and rear side panel connection.



Tin and grind down mating surface in the water drain.



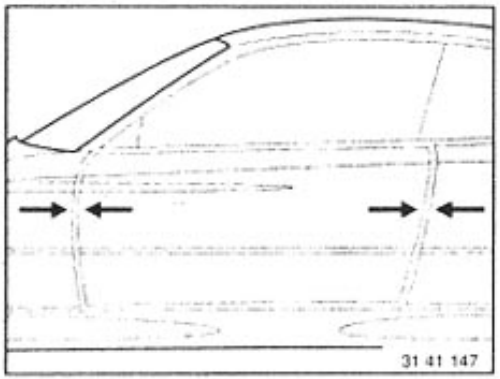
Tin and grind down mating surface on the side panel.

1 = Tail panel mating surface (brazed)
2 = Bead in rear side panel

41 51 004 Adjusting left or right front door

Vehicle must be standing on level ground.

Note:
Only perform adjustment operation on one completely mounted door.
The weight of the equipment means that it has a different mounting location than it would without equipment.
Once the door has been adjusted, check the adjustment of the side windows.



Door joints 5.5 mm $^{+0.5}_{-.1}$ mm

Permitted parallelity deviation 1 mm.
Level offset of relevant body section, closing to rear is max 1 mm towards inside.

41 51 101 Replacing left or right front door

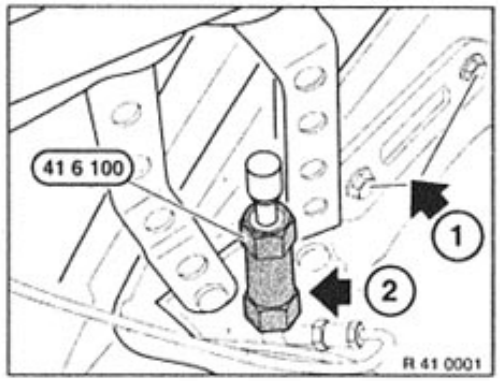
- Remove pin for arrester hook
- Remove and disconnect cable connector unit
- Remove door

Convert the following parts:
- Door trim and interior trim
- Control unit and wiring harness
- Window cavity cover strip, outside mirror, rear rubber cover, door cavity weather-strip and angle section for trim
- Side window, window regulator and window guides
- Door lock, door handle
- Body molding on outside of door
- Door stop
- Rubber seals

After conversion, fit door and align carefully, see 41 51 004.

41 61 014 Adjusting hood lid

Note:
The lids and doors are aligned in the body shell and bolted into place.
During subsequent movement, unpainted surfaces become exposed.
These must be touched up in the appropriate color of paint.

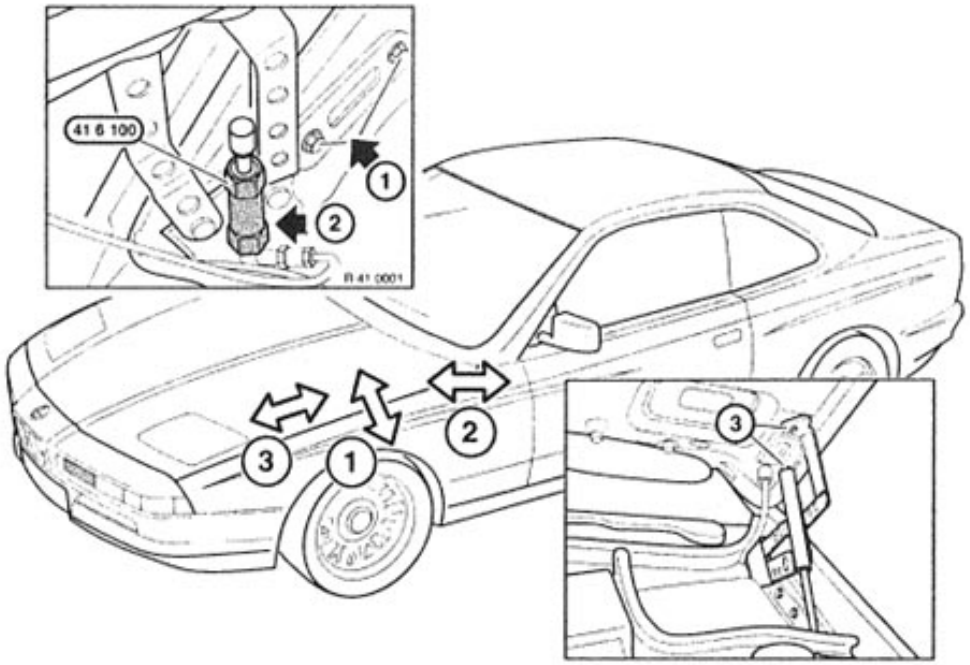


Open hood lid.

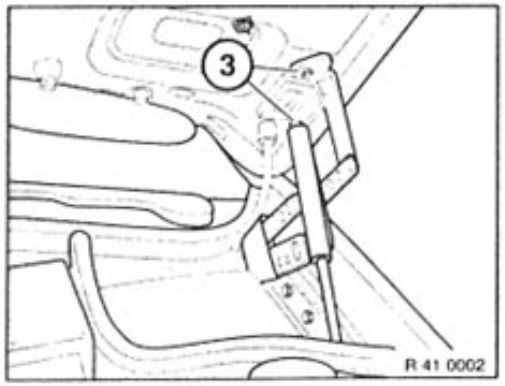
Unfasten left and right screws (1) in such a way that the hood lid can be moved.

Loosen screw (2) on left and right with special tool 41 6 100 to enable the hood lid to be moved and adjusted.

Note:
Screws (1) for height adjustment of hood lid.
Screw (2) for angle adjustment of hood lid.



Summary of hood lid adjustment:
Screw (1) = height adjustment
Screw (2) = angle adjustment
Screws (3) = longitudinal adjustment



Loosen screws (3) on left and right sides to enable these to be inserted in the hood lid.

Note:
Screw (3) for longitudinal adjustment of hood lid.

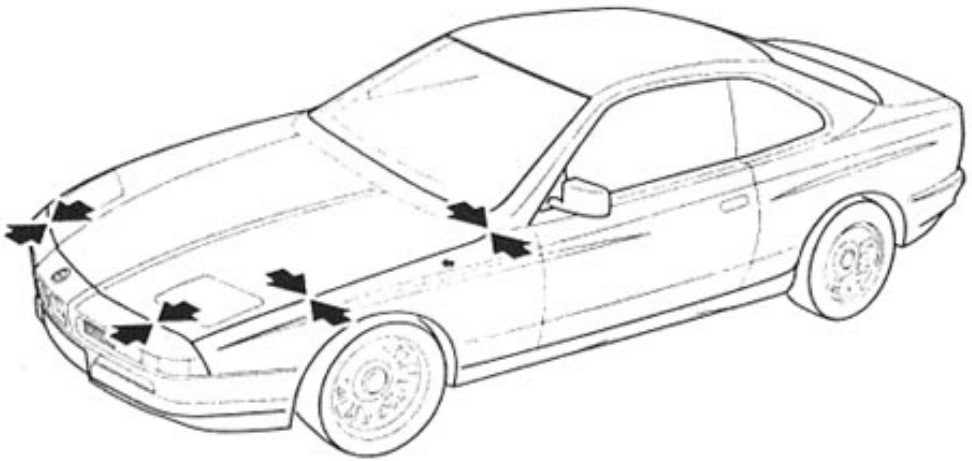
Carefully close hood lid.

Caution!
Hood lid must not make contact with side panels, front trim (bumper) and the headlight pod covers.

Height adjustment and centering of the hood lid locks

Requirement:
No parts may be worn or damaged!

Height of the hood lid:
The hood lid should be approx. 1 mm lower than the side panels.



R 41 0004

The distance between hood lid and side panels and to front trim (bumper) should feature a uniform width of gap all round.
The hood lid should be approx. 1 mm deeper than the side panels.

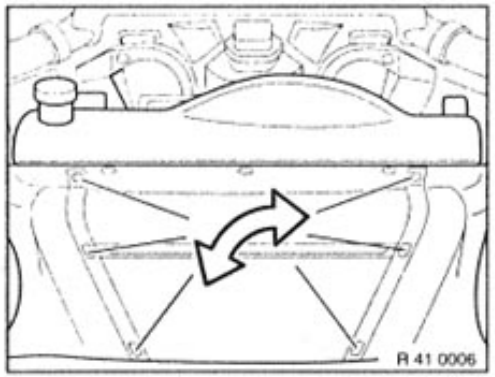
Adjustment dimensions: refer to gaps for doors / hood lid and trunk lid.

Align hood lid to side panels and to front trim (bumper).

Open hood lid and tighten loosened screws.

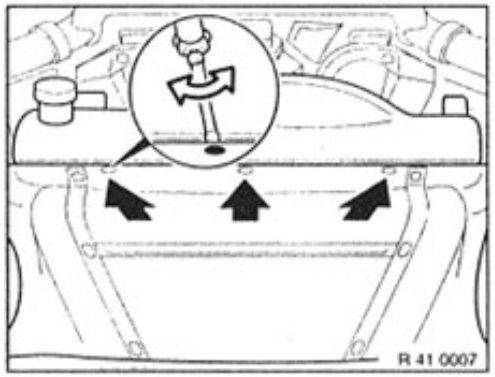
Check setting and repeat if necessary.

Check setting of hood lid locks and adjust if necessary.



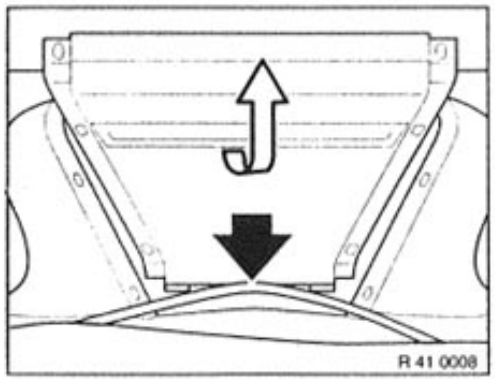
R 41 0006

1. Open hood lid.
2. Open clips on air guide cover for radiator by twisting.



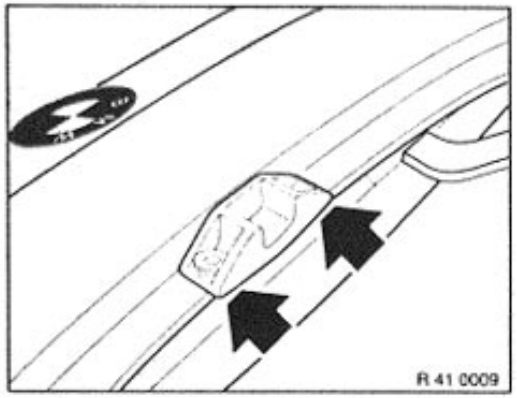
R 41 0007

3. Insert a screwdriver in the groove at the marked points.Twist screwdriver in order to release the lock.

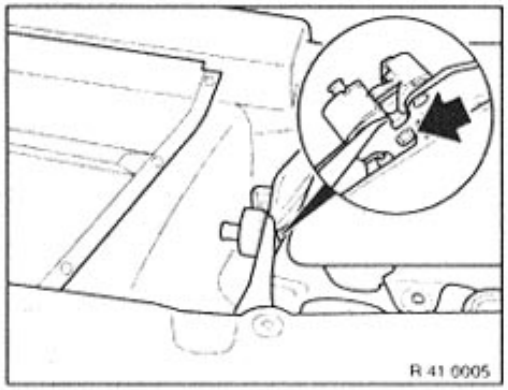


R 41 0008

4. Remove air guide for radiator and unclip Bowden cable for right hood lid lock.



5. Loosen nut on centering plate until it is possible to move the centering plate.



6. Unfasten screws on left and right sides of hood lid lock until it is possible to move the lock.

7. Block Bowden cable on hood lid locks to prevent the hood lid locks from being able to engage.

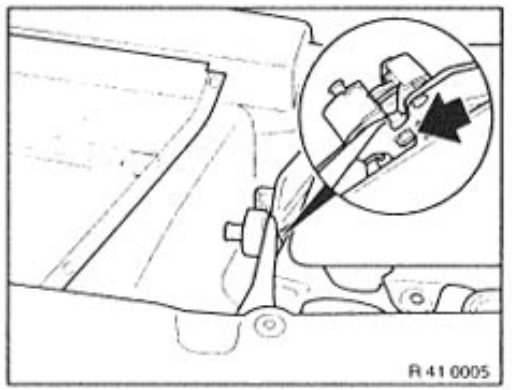
8. Slowly close hood lid

Caution!
Ensure that centering plate, centering pin and hood lid locks are in the correct position.

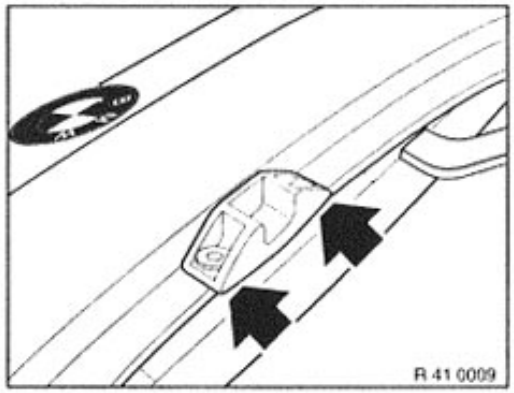
The hood lid must not make contact with the side panels and the headlight pod covers.

9. Press down hood lid until the specified height setting is obtained.

Note:
The hood lid locks are responsible for the height of the hood lid.



10. Open hood lid, tighten screws on left and right hood lid locks.

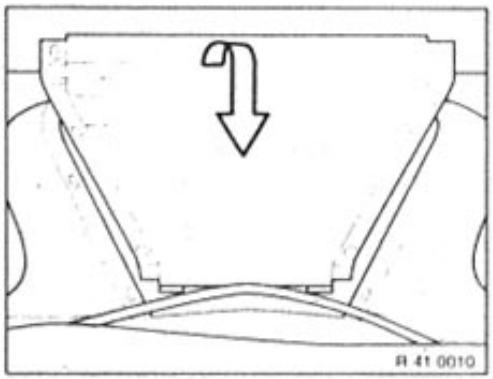


11. Tighten nut in centering plate.

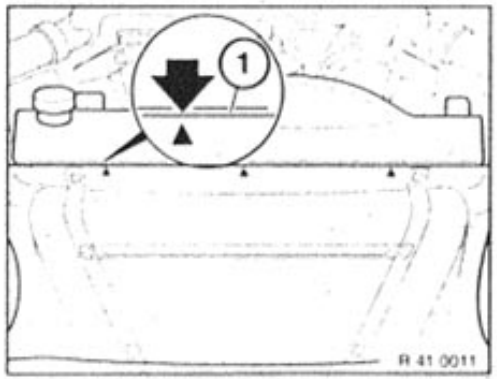
12. Lift interlock on Bowden cable for hood lid locks.

13. Slowly close hood lid.
Check setting of hood lid and repeat procedure if necessary.

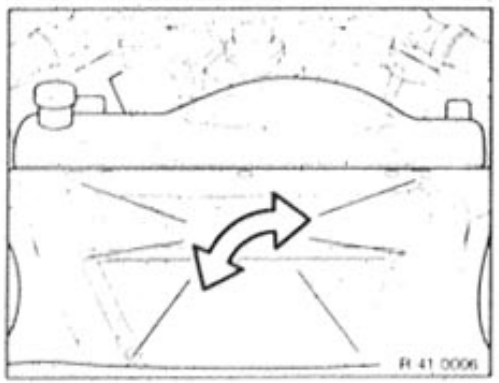
Caution!
Check that hood lid locks have engaged correctly on arrester hook and readjust if necessary.



14. Clip right Bowden cable for hood lid lock into place.
Install air guide for radiator.



Check that air guide is correctly seated in groove (1).



15. Install clips and twist to close.

16. Close hood lid.
Check that hood lid is in correct position and is secured correctly.

17. Check position of headlight pod covers relative to hood lid and adjust if necessary, see 63 12 450.

51 Body equipment

51 0 . . .	Instructions on the repair of plastic components	51- 0/1
51 11 000	Bumper, complete front section – remove and install	51- 11/1
005	Bumper, front – disassemble and assemble	51- 11/3
794	One shock absorber (impact absorber) for front bumper – replace (bumper removed)	51- 11/6
. . .	Shock absorber (impact absorber) for bumper – check	51- 11/6
51 12 000	Bumper, complete rear unit – remove and install	51- 12/1
005	Rear bumper – disassemble and assemble	51- 12/2
742	One shock absorber (impact absorber) for rear bumper – replace (bumper removed)	51- 12/3
. . .	Vibration damper (impact absorber) for bumper – check	51- 12/3
51 13 301	Roof strip, left or right – remove and install	51- 13/1
303	Cover strip in side window opening, left or right – remove and install	51- 13/1
51 16 000	Rear-view mirror on front door, left or right – remove and install	51- 16/1
026	Mirror glass for rear-view mirror – replace	51- 16/1
060	Rear-view mirror, inside – remove and install/replace	51- 16/2
200	Oddments tray – remove and install	51- 16/2
203	Oddments tray, rear – remove and install	51- 16/4
340	Lock for right glove box – remove and install/replace	51- 16/5
362	Glove box, right upper – remove and install/replace	51- 16/7
363	Glove box, lower – remove and install/replace	51- 16/8
51 21 090	Door lock on front door, left or right – remove and install	51- 21/1
140	Lock cylinder, complete unit, for front door, complete unit, left or right – replace	51- 21/2
170	Handle on front door, left or right – remove and install	51- 21/3
51 31 . . .	Window installing instructions	51- 31/1
. . .	Front window cementing survey	51- 31/2
000	Front windshield – remove and install	51- 31/3
. . .	Rear window cementing survey	51- 31/7
200	Rear window – remove and install	51- 31/8
. . .	Repairing flying stone damaged composite safety glass windshields (clear or tinted)	51- 31/12
51 32 120	Front (or rear) window guide rails in front door, left or right – remove and install	51- 32/1
154	Front door window – adjust	51- 32/1
170	Front door window, left or right – remove and install	51- 32/6
51 33 000	Power window regulator in front door – remove and install	51- 33/1
020	Reversing motor for power window regulator in front door – remove and install	51- 33/2
51 37 000	Rear power window regulator, left or right, complete – remove and install	51- 37/1
020	Flat motor for power window regulator, rear, left or right – remove and install	51- 37/1
154	Side window (with window regulator), rear, left or right – adjust	51- 37/2
171	Rear side window, left or right – replace	51- 37/4
51 41 000	Door trim, front left or right – remove and install	51- 41/1
51 43 000	Side trim, rear, left or right – remove and install/replace	51- 43/1
251	Trim for rear roof pillar, left or right – replace	51- 43/1
51 44 011	Headlining – replace	51- 44/1
51 45 030	Trim for instrument panel – remove and install	51- 45/1
51 46 000	Trim for shelf (rear shelf) – remove and install/replace	51- 46/1
002	Trim for shelf – replace (with sun roller blind)	51- 46/1
013	Rear window roller blind – remove and install/replace	51- 46/2
51 47 315	Carpet for front and rear passenger compartment – remove and install	51- 47/1

51 0 . . . INFORMATION FOR REPAIRING PLASTIC PARTS

The conditions mentioned below for plastic part repairs conform with legislation in Germany. Always conform with pertinent legislation in other countries.

These repairing instructions are provided for qualified workers and assume their skill, conscientiousness and sense of responsibility. The instructions are limited to factory approved repairing materials and methods as well as associated tips to make the work easier. Only general working procedures are described in these instructions. The scope of work and order of procedures will always have to be adapted to the pertinent damage condition. Repairs are an economical solution, so that optical deficiency cannot be excluded on a longterm basis due to the different physical properties of the concerned materials.

The following E 31 parts are made of plastic and can be repaired with Airo/CARPOX 383 or 3M 5900 plastic repairing material.

- Front spoiler
- Bumpers
- Side guards

Airo/CARPOX 383 repairing material must be used for repairs in visible zones (reflecting surfaces).

Important!
Only such damage, which does not have influence on the strength and rigidness of the bumper, may be repaired. The following types of damage may not be repaired in the interest of safety.

- Damage on body mounting points.
- Damage in immediate vicinity of body mounting points.
- Peel-offs.
- Ruptures.
- Cracks extending from corners and edges.
- Continuous cracks with a length of more than 100 mm.
- Holes of size 100 mm^2 or more.

Parts with these types of damage must be replaced!

Refer to the BMW Painting Manual for information on painting plastic parts.

Required Materials:

- Sanding discs, grain size P 120 and P 220
- Sandpaper, grain size P 400
- Wet sandpaper, grain size P 800
- 3M Cement Remover 9894
- 3M Aluminum Adhesive Tape Scotch 424
- 3M Glass Grind Fabric 9030
- Airo/CARPOX 383 or 3M 5900 plastic repairing material
- Mask
- Gloves
- Infrared lamp

Source of Supply: BMW Parts

Safety Precautions:

- Extract sanding abrasion.
- Wear mask and gloves while grinding.
- Work only in well ventilated rooms.
- Wash hands frequently.
- Store food separately.
- Don't eat, drink or smoke while working.
- Don't inhale vapors.

First Aid:

Take off dirty clothes immediately. If dust has gotten in eyes, rinse out with water thoroughly and go to a physician.
If a large amount of vapors is inhaled, go outdoors into the fresh air and, if necessary, visit a physician.

Information on Toxicology:

Irritates exes, skin and the respiratory track. No damaging effects are known as long as handling is correct.

Measures in Case of Fire:

Fire extinguishing agents: powders, foam, CO_2, halon, water mist.

Disposal:

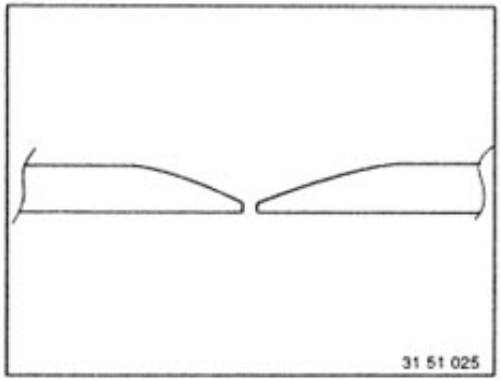
Never let it get into drink water systems.
Single components of the repair material must be disposed as special refuse.
After mixing the single components and hardening, it can be brought to the normal refuse station.

PROCEDURES:

Deep damage – points 1 ... 11.

Surface damage up to substrate – points 1 ... 4 and points 7 ... 11.

1. Clean repair surface with cement remover and wipe off with a clean dry cloth.

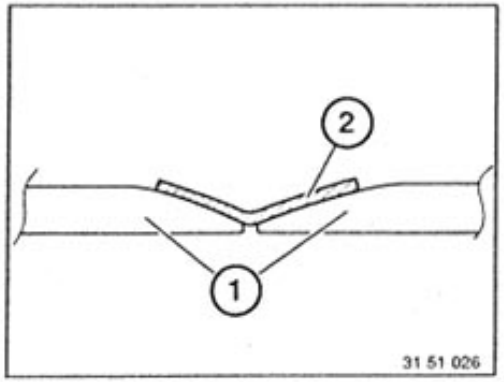


2. Sand down front of repair surface flat (grain size P 120).

   Roughen back of deep damaged repair surface (grain size P 120).

3. Clean repair surface with cement remover and wipe off with a clean dry cloth.

   Note:
   Let cleaned surface dry at room temperature about 10 minutes before continuing with the next step.



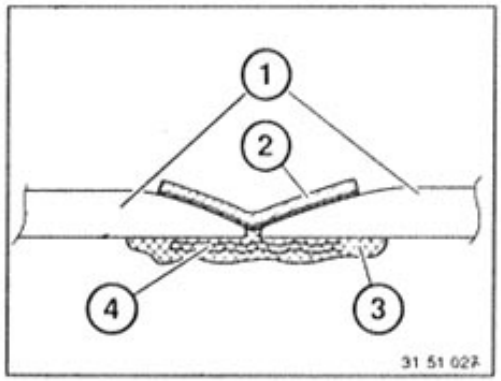
4. Paste aluminum adhesive tape over the damaged surface on the front.

   1 = Damaged plastic part

   2 = Aluminum adhesive tape

5. Cut glass grid fabric to size for the repair surface.

6. Mix repairing material to instructions from the supplier.



7. Apply coat of repairing material on back of the repair surface. Apply glass grid fabric, cover with repairing material and harden with infrared light.

   1 = Damaged plastic part

   2 = Aluminum adhesive tape

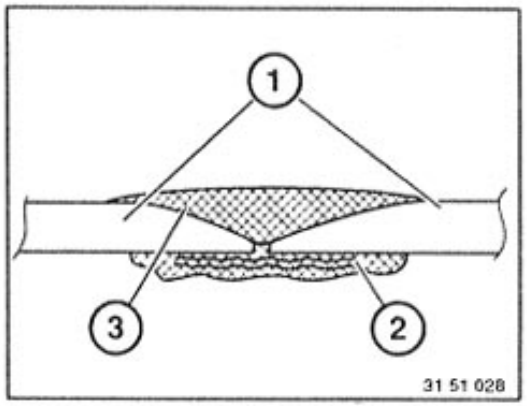
   3 = Plastic repairing material

   4 = Glass grid fabric

Hardening plastic repairing material with infrared light:

- Lamp to surface distance = 300 ... 400 mm.
- Lamp on time = 15 ... 30 minutes depending on thickness of coat.
- Max. surface temperature = 60 ... 70° C.

8. Pull off aluminum adhesive tape and sand down and clean the face of the repaired surface (grain size P 220).



9. Apply coat of repairing material on front and harden with infrared light.

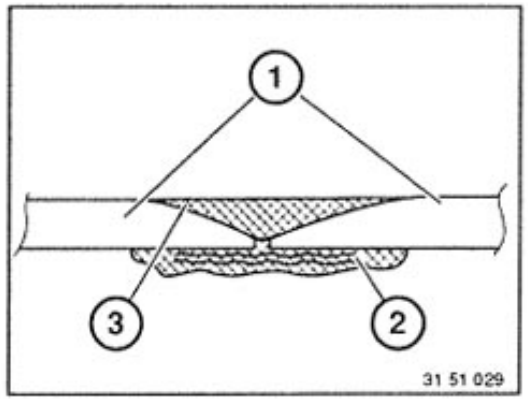
   1 = Damaged plastic part

   2 = Hardened plastic repairing material on back

   3 = Plastic repairing material coat on front

Hardening plastic repairing material with infrared light:

- Lamp to surface distance = 300 ... 400 mm.
- Lamp on time = 15 ... 30 minutes depending on thickness of coat.
- Max. surface temperature = 60 ... 70° C.



10. Smooth front of repaired surface (grain size P 220).

    1 = Damaged plastic part

    2 = Hardened plastic repairing material on back

    3 = Hardened and sanded plastic repairing material on front

11. If applicable, touch up blowholes and pores, and harden with infrared light.
    Smooth front of repaired surface (grain size P 400).
    Finish repaired surface with wet grinding sandpaper (grain size P 800).

Important!
It is absolutely necessary to use the specified grain size sanding materials to guarantee perfect results (thermal development).

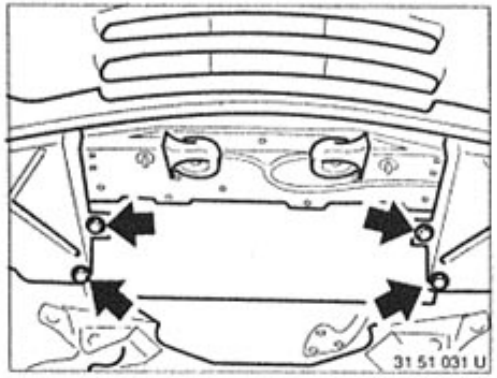
Procedures for Repairing Minor Bruises and Scratches:

1. Grind down damaged zone generously (down into the substrate) with dry sanding paper (grain size: 400 ... 500).
2. Clean ground zone with a plastic cleaner.
3. Apply coat of plastic adhesion solution.
   Apply several coats of BMW rapid filler + 20 % BMW softface additive on the cleaned surface until the shape of the part can be restored after grinding.
4. Grind down filled surface with wet sanding paper (grain size: 800 ... 1000).
   Continue as described in point 3, if ground through spots or damaged spots are still visible.
5. Grind down entire part if applicable (depending on extent of damage).
6. Apply final coat of paint with two-component BMW acrylic paint + 20 % BMW softface additive; for double-layer metallic paint finishes 20 % softface additive is mixed with the BMW acrylic clear lacquer.

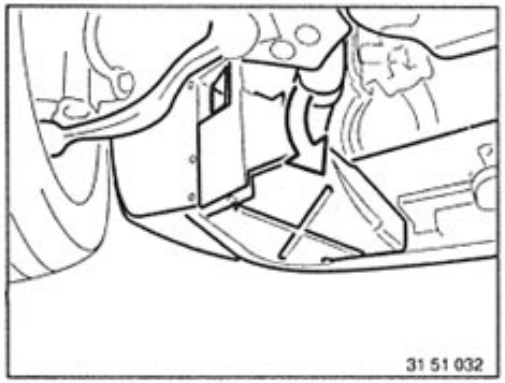
   Refer to the BMW Paint Spraying Manual for spraying instructions, materials and so on.

Caution!
Use mask and ensure sufficient ventilation.
Conform with accident prevention regulations for working with paints.
Conform with local and national legislation concerning safety at work and accident prevention as well as working material ordinances.
Refer to instructions supplied by the manufacturers!

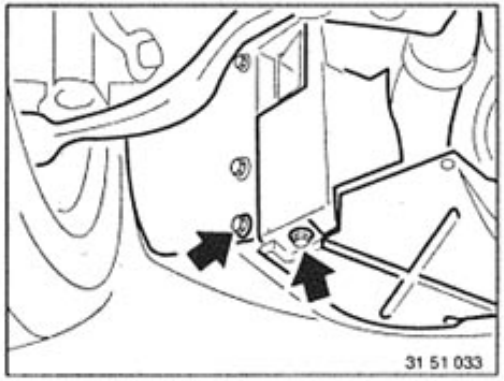
51 11 000 Removing and installing complete front bumper



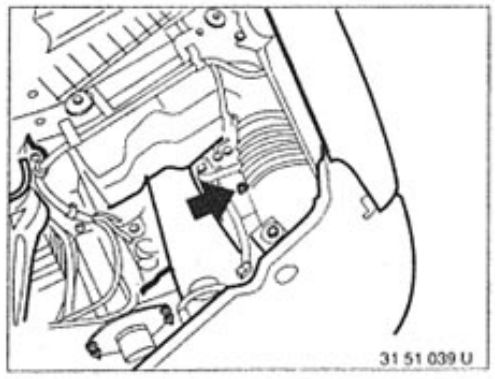
Completely removing pop-up headlights, refer to 63 12 090.
Unfasten screws and remove trim on underside.



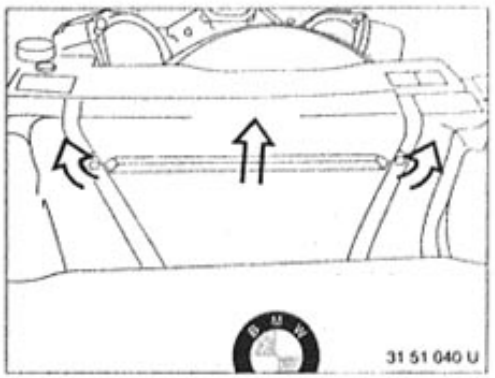
Remove hose for alternator cooling.



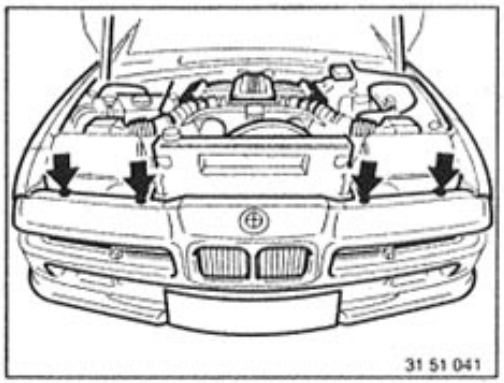
Unfasten screws on left and right sides.



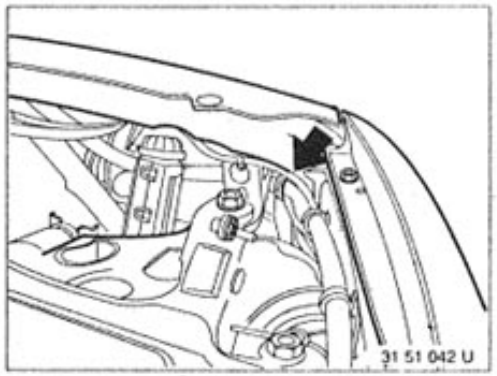
Unfasten hose clips on left and right sides of air manifold.



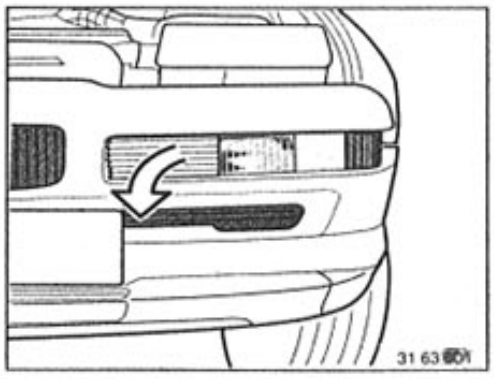
Unfasten locking fixture and unclip cover by pulling upwards.



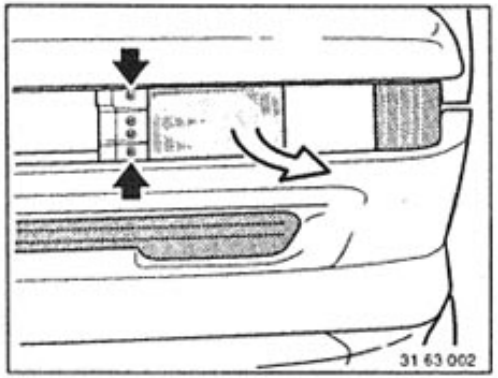
Unfasten screws.



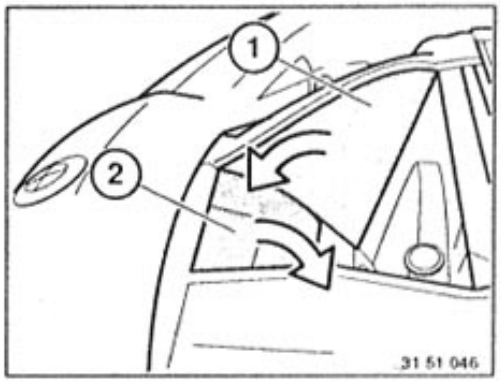
Unfasten hose clip and remove hose for headlight cleaning system.



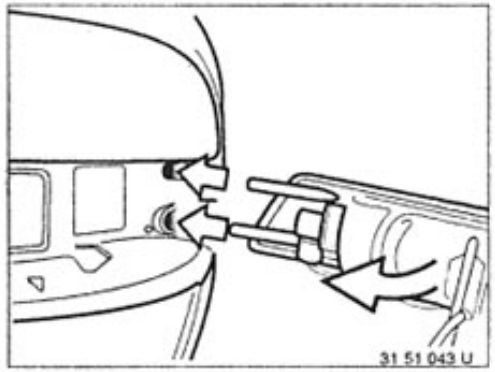
Pull left and right radiator grill panels forwards to unclip.



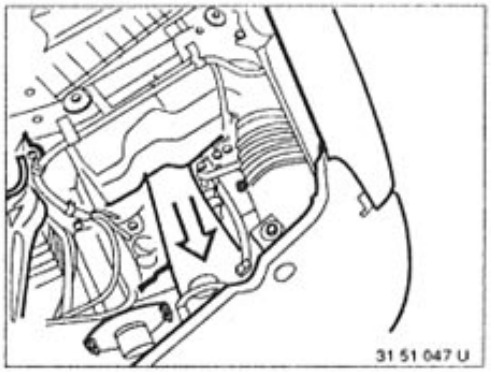
Unscrew screws.
Swing out left and right light assemblies forward and remove.
Disconnect plugs.



Installation:
Press air guide (1) toward outside.
Air guide (2) must seat inside.

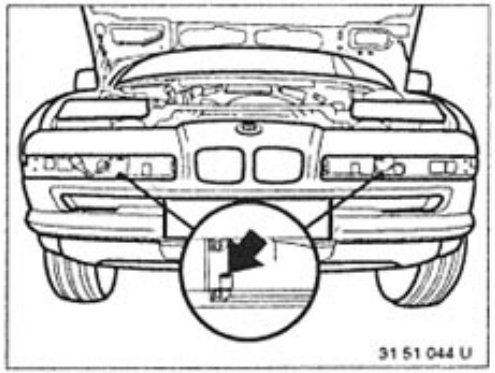


Installation:
Insert pins in retaining bores.



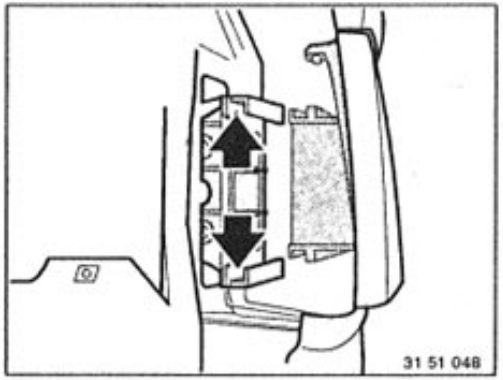
Installation:
Insert and engage brake cooling air guides in left and right air intakes.

– Headlight was removed for this picture. –

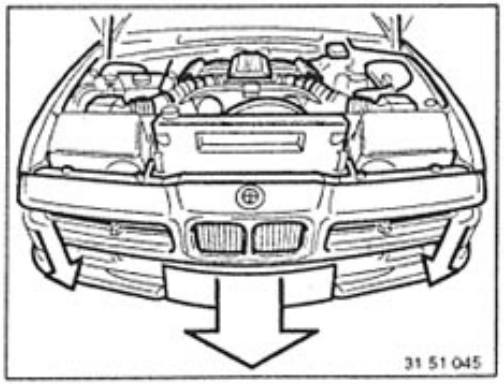


Unscrew screws.

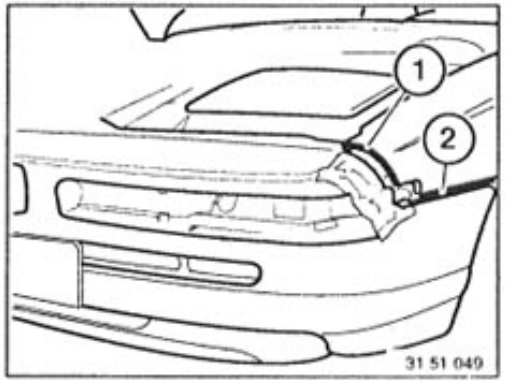
Installation:
Lock screws with Loctite No. 270.**
Tightening torque*.



Installation:
Guide sides of bumper into brackets.

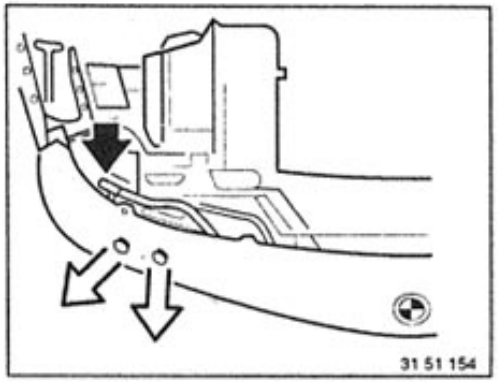


Pull left and right sides of bumper forward and remove bumper from front.



Installation:
Lubricate side seals (1 and 2) with a rubber lubricant.
Hold a piece of clear plastic sheet between the bumper and seal (2) while guiding in.

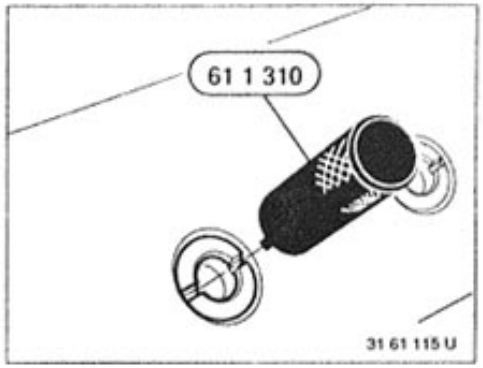
* **Refer to Specifications**
** **Source of Supply: BMW Parts**



51 11 005 DISASSEMBLING AND ASSEMBLING FRONT BUMPER

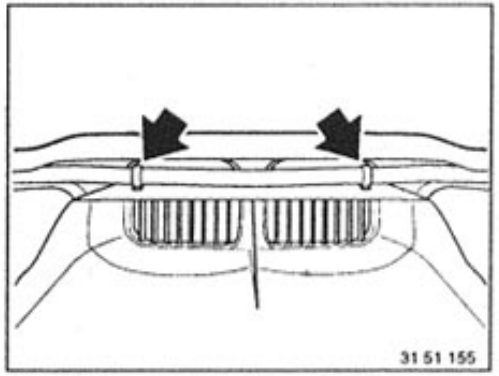
Important!
There will be residual water in the headlight cleaners which is ejected.

Apply pneumatic gun and run the nozzles out with air pressure (max. pressure = 5 bar).
Pull left and right covers off from above.

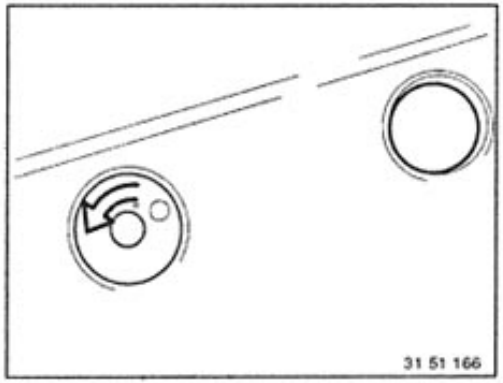


Unscrew ring using Special Tool 61 1 310.

Installation:
Install headlight cleaner nozzles that pins are inserted into slots of bumper.

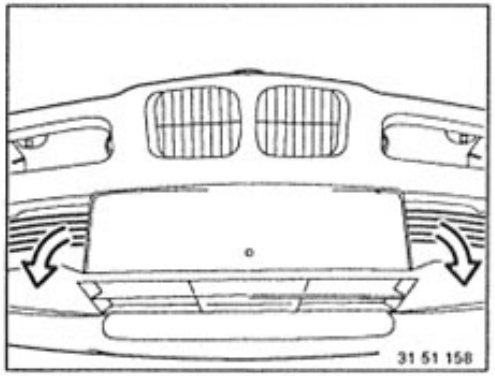


Loosen hose retainers and remove headlight cleaner nozzles together with hoses.

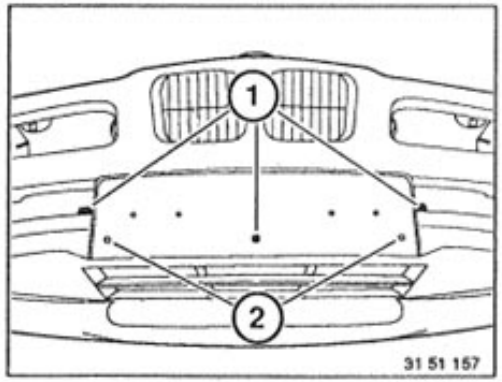


Unscrew cover carrier.

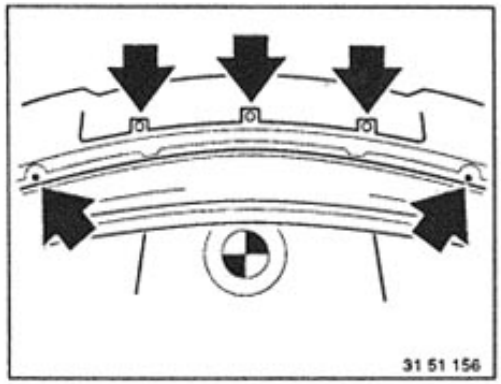
Installation:
Adjust cover height.
Screw cover carrier out or in until the cover is flush with the body when in installed state.



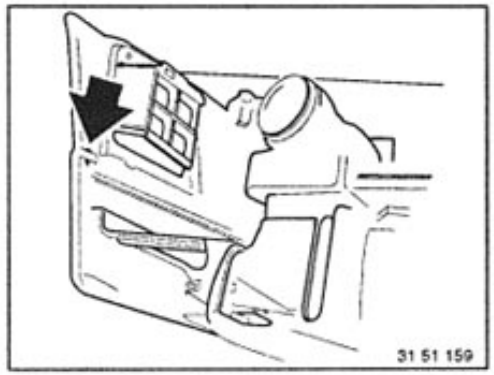
Unclip covers towards front.



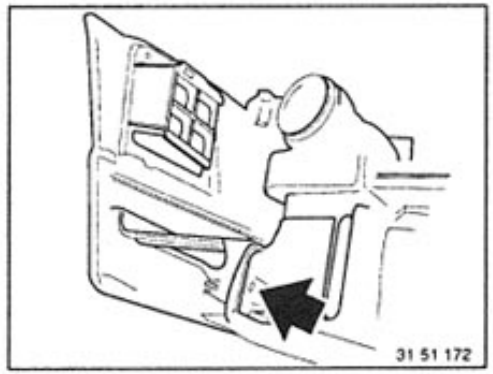
Unscrew screws (1).
Pull plugs (2) out.
Remove license plate holder.



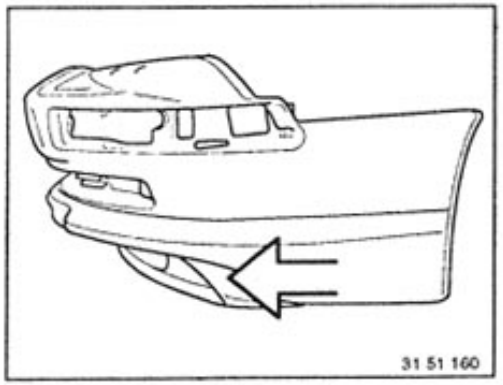
Unscrew screws from underside of bumper.



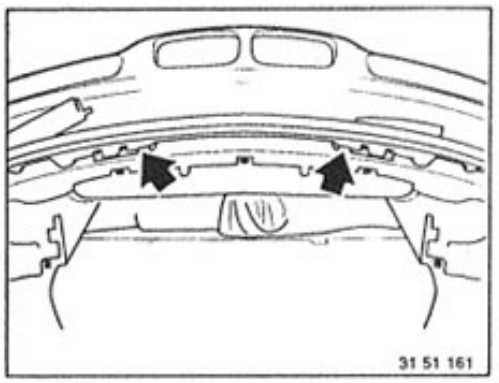
Unscrew left and right screws.



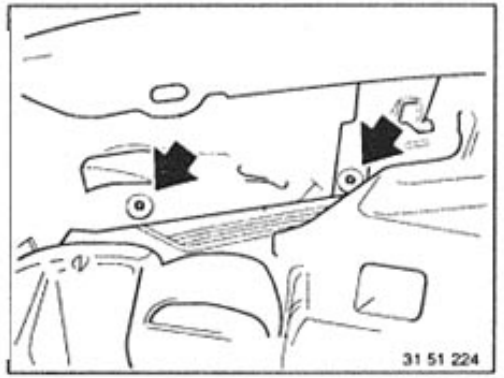
Loosen left and right clips.



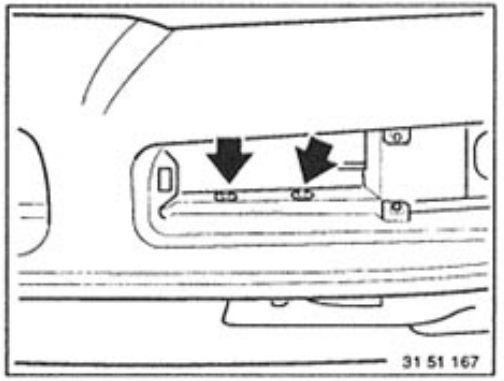
Pull lower bumper section forward firmly off of the upper bumper section (held by clips).



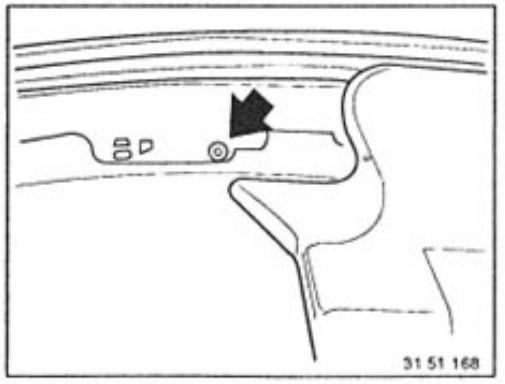
Loosen clips and lift air guide out towards the rear.



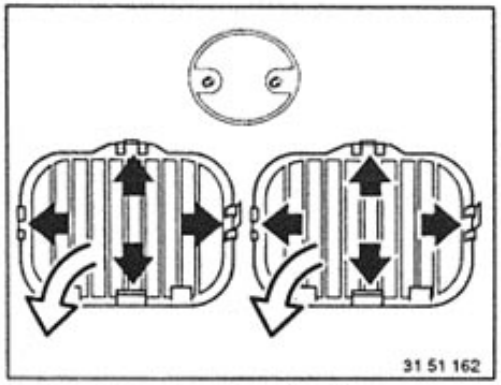
Loosen left and right clips.



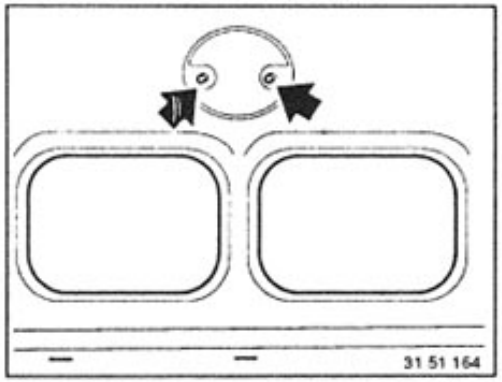
Loosen left and right clips.



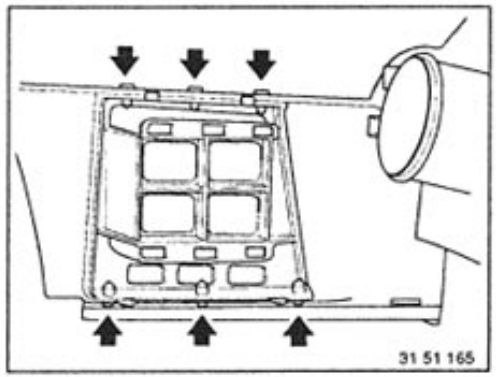
Turn bumper around and loosen clips on left and right sides.
Pry left and right air intakes and bumper carrier out towards the rear.



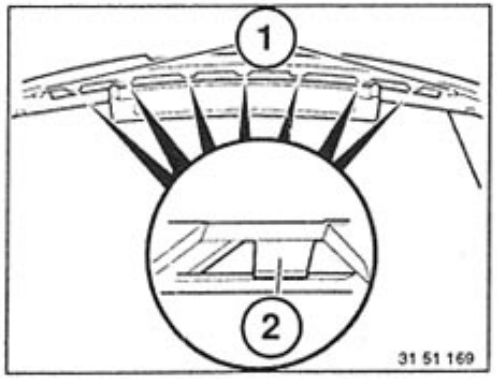
Press clips aside and lift grill out.



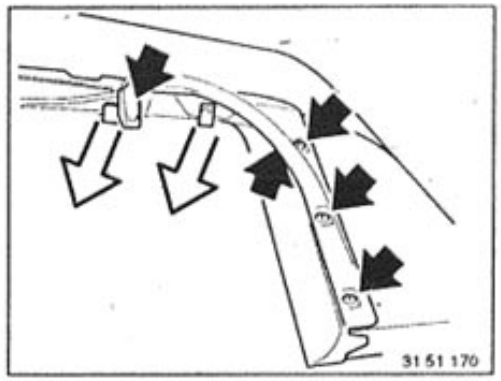
Press pins up and take BMW emblem off on the top side.



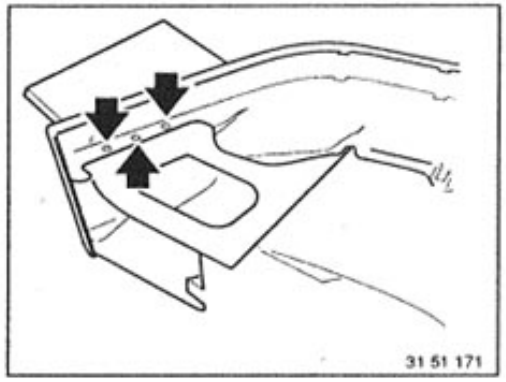
Loosen clips and take left and right holders off.
If applicable, remove remaining clips and stamped metal nuts from top of bumper.



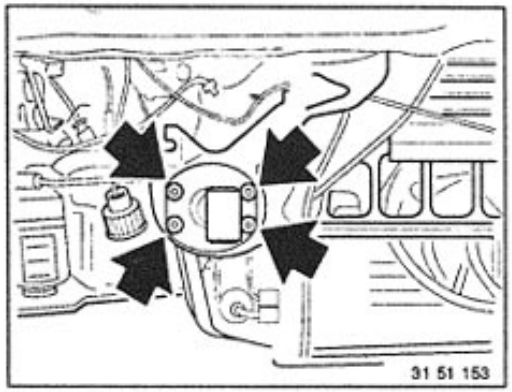
Lower Bumper Section:
Loosen left and right clips (1).
Press down on left and right locking hooks (2) and pull spoiler lip off towards the front.



Pull left and right clips off towards the rear.
Unscrew screws and nuts on left and right sides.
Remove spoiler.



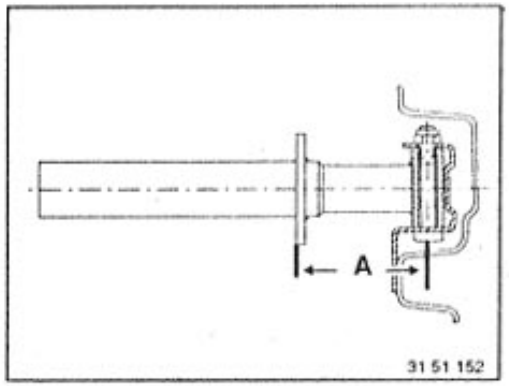
Loosen left and right clips and remove holders.
If applicable, remove remaining clips and stamped metal nuts.



51 11 794 REPLACING ONE IMPACT ABSORBER FOR FRONT BUMPER
– Bumper Removed –

Unscrew bolts and pull impact absorber out towards the front.

Installation:
Tightening torque*.



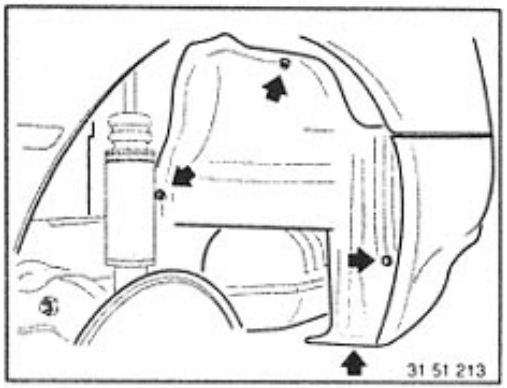
51 11 . . . CHECKING IMPACT ABSORBERS FOR BUMPER

Remove impact absorbers for bumper - refer to 51 11 794.

Check distance (A).
Distance (A) = 151 mm.

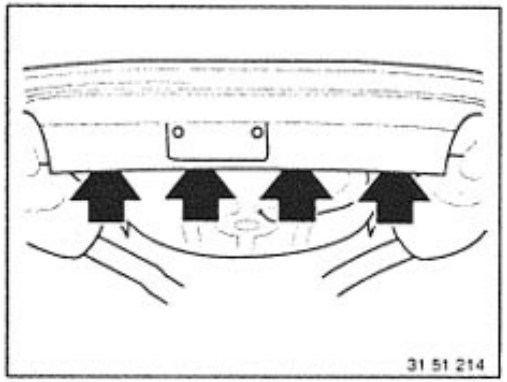
The impact absorber must be replaced if distance (A) is less than the specified value.

* Refer to Specifications

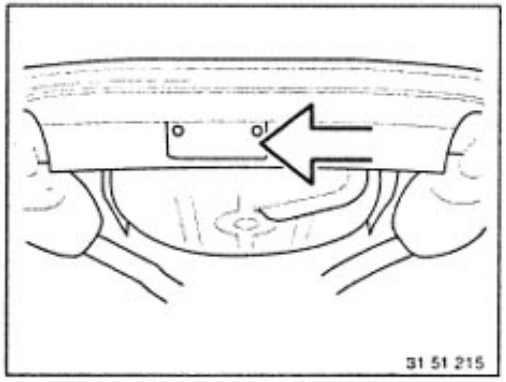


51 12 000 REMOVING AND INSTALLING REAR BUMPER ASSEMBLY

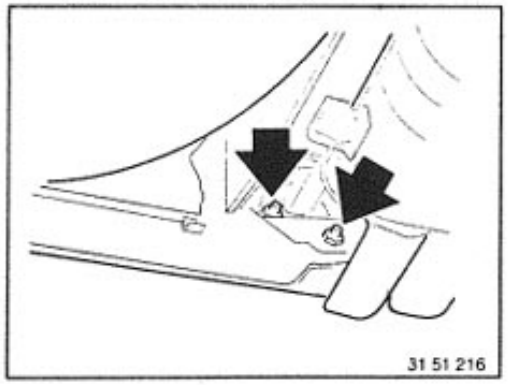
Unscrew screws in left and right wheel houses and take off panels.



Unhook rear panel at front.



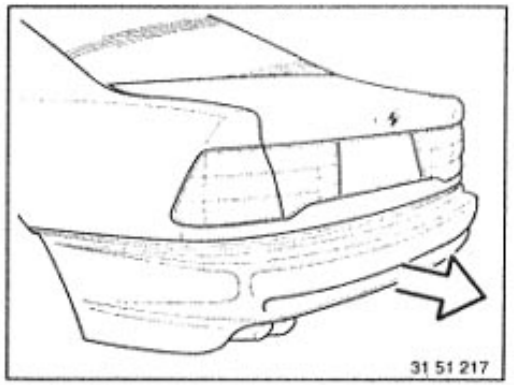
Push rear panel aside and take off.



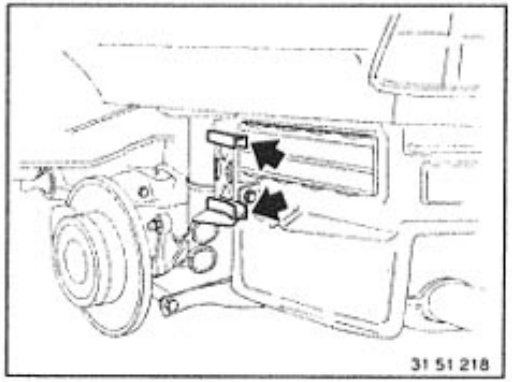
Unscrew left and right bolts.

Installation:
Tightening torque*.

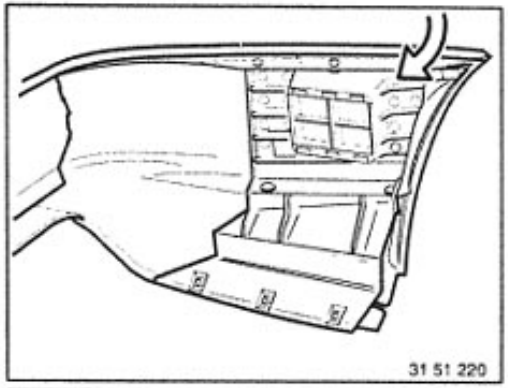
* See Specifications



Take off bumper toward rear.

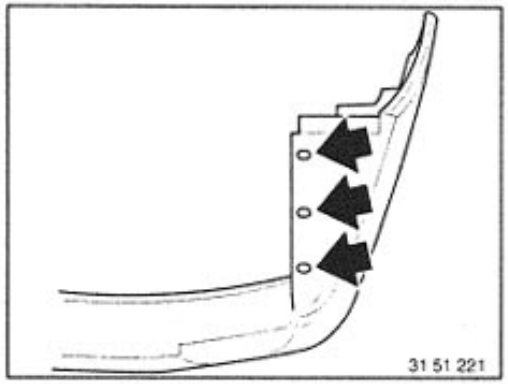


Installation:
Guide sides of bumper into brackets.

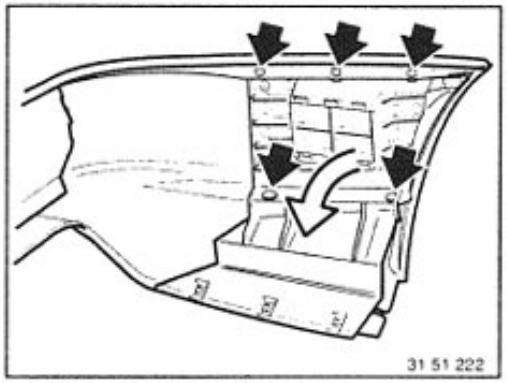


51 12 005 DISASSEMBLING AND ASSEMBLING REAR BUMPER

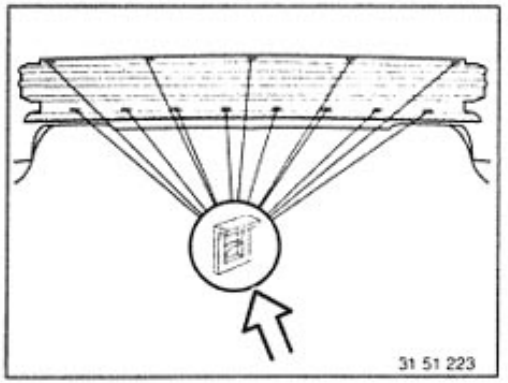
Remove rear bumper – see 51 12 000.
Pull off rubber guard.



Loosen clips at left and right bottom.



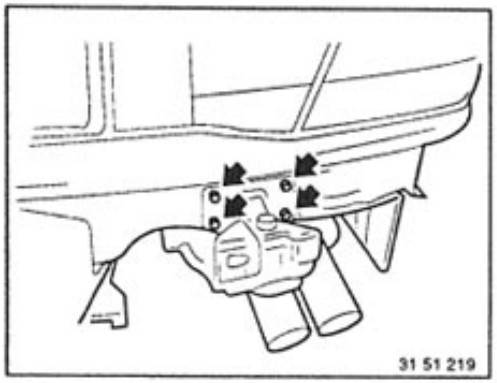
Loosen clips at left and right inside and take off holders.



Press locking hooks into wedges and remove wedges from above.
Remove bumper carrier.

Take off clips and stamped nuts.

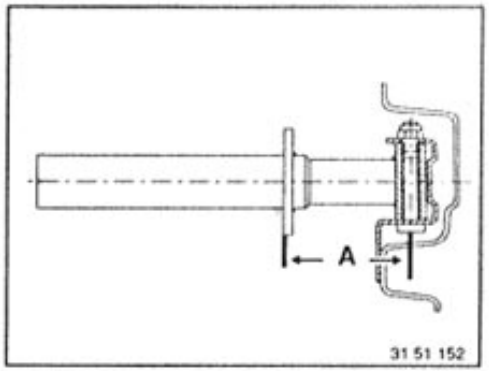
Note:
If the rear bumper is replaced after car was damaged in an accident, check the rear bumper impact absorbers if necessary – see 51 12 ...



51 12 742 REPLACING ONE IMPACT ABSORBER FOR REAR BUMPER
– Bumper Removed –

Unscrew bolts and pull out impact absorber toward rear.

Installation:
Tightening torque*.



51 12 ... CHECKING IMPACT ABSORBERS FOR REAR BUMPER

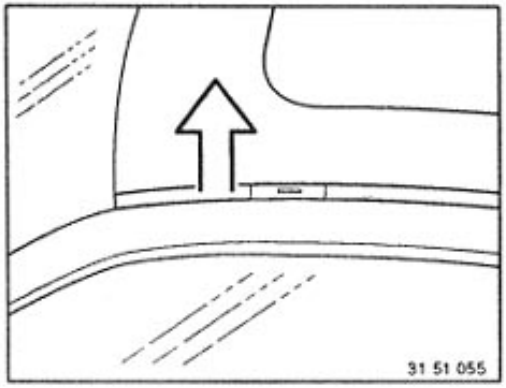
Remove rear bumper impact absorbers – see 51 12 742.

Check distance (A).
Distance A = 108 mm (4.252").

Impact absorber must be replaced, if distance (A) is less than that specified.

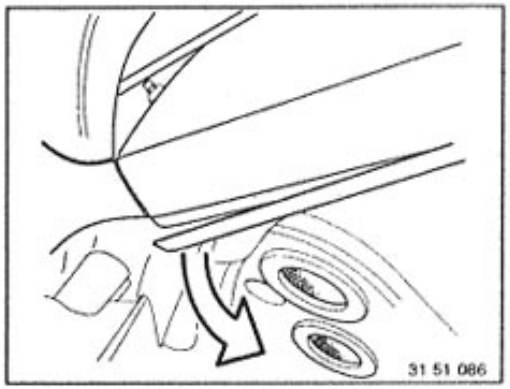
* See Specifications

* See Specifications



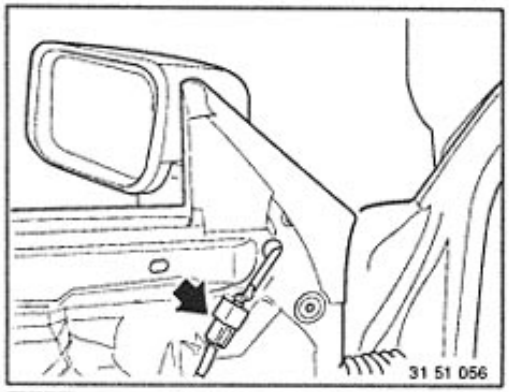
51 13 301 REMOVING AND INSTALLING LEFT OR RIGHT ROOF STRIP

Unclip roof strip from above.



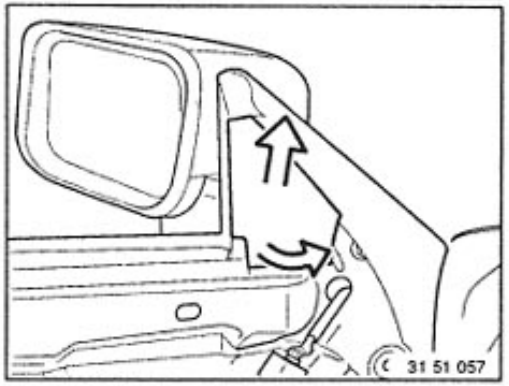
51 13 303 REMOVING AND INSTALLING COVER STRIP IN LEFT OR RIGHT SIDE WINDOW OPENING

Pull cover strip carefully from front to rear off of the sheet metal fold.

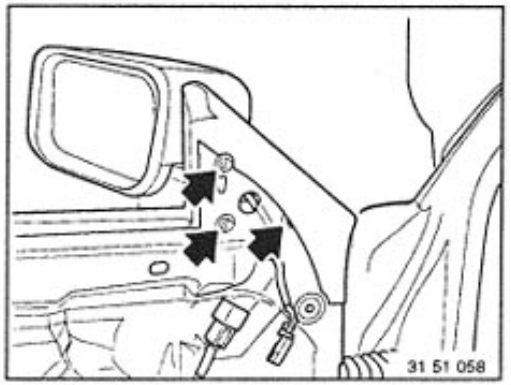


51 16 000 REMOVING AND INSTALLING MIRROR ON LEFT OR RIGHT FRONT DOOR

Remove front door trim panel – see 51 41 000.
Disconnect plug.

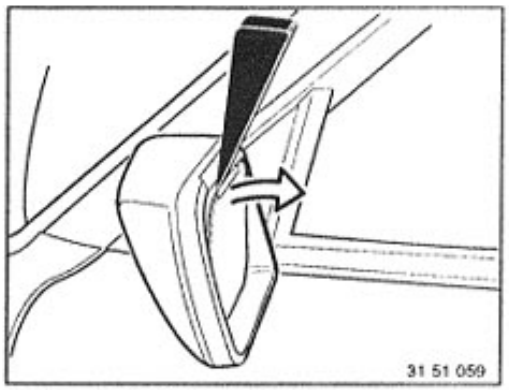


Unclip plate at bottom, push up and take off.



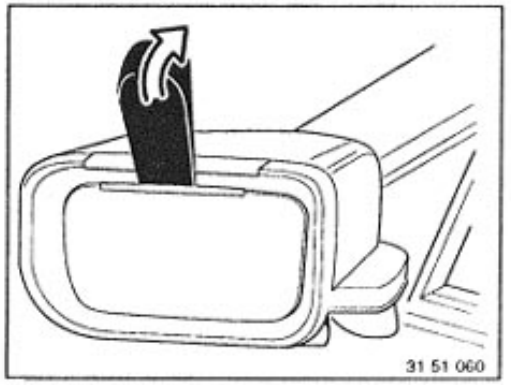
Unscrew screws.

Installation:
Tightening torque*.

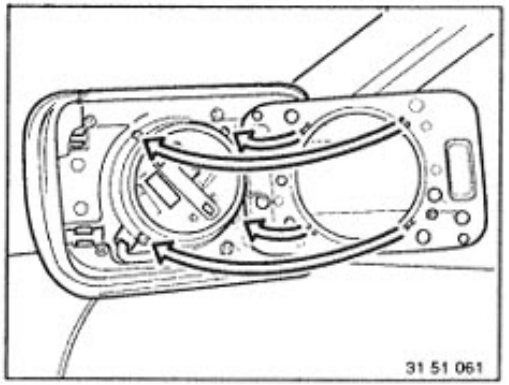


51 16 026 REPLACING GLASS FOR MIRROR

Tilt mirror glass.
Paste tape on mirror glass and edge of housing – prevents damage.

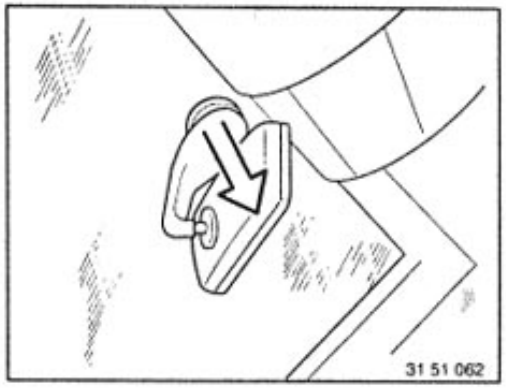


Unclip mirror glass with a wood wedge. Disconnect plug and take off mirror glass.



Installation:
Insert mirror glass with retaining clips on the tabs and clip in glass.

* See Specifications

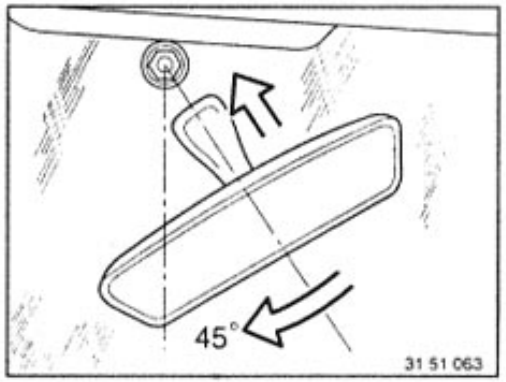


51 16 060 Removing and installing or replacing inside rear-view mirror

Pull mirror backwards off mirror mount.

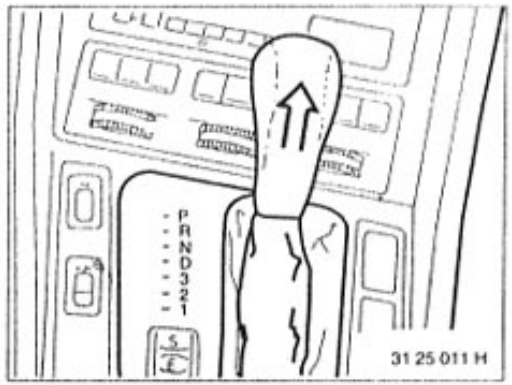
Rear-view mirror with automatic dimmer facility and or infrared receiver:

Open mirror trim and unfasten connector.



Installation:

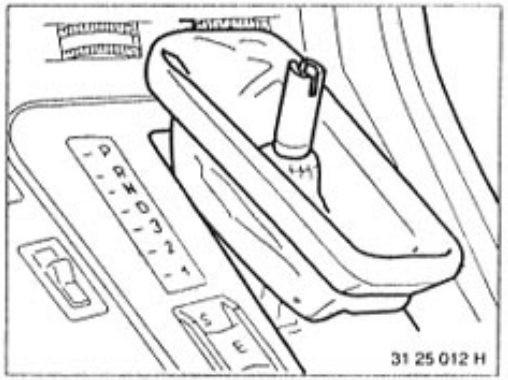
1. Fit mirror base to mirror mount, first turning through approx. 45°.
2. Rotate mirror base until it locates on the mirror mount.



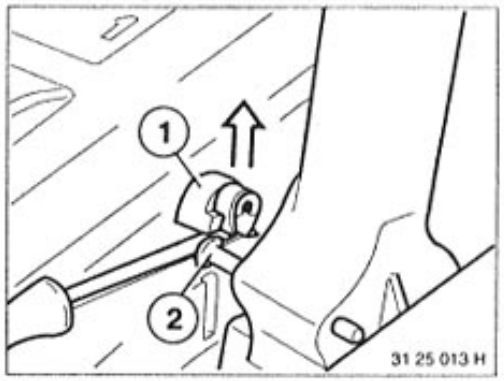
51 16 200 Removing and installing oddments tray

o Remove finisher from centre console: Remove radio, refer to 65 11 030.

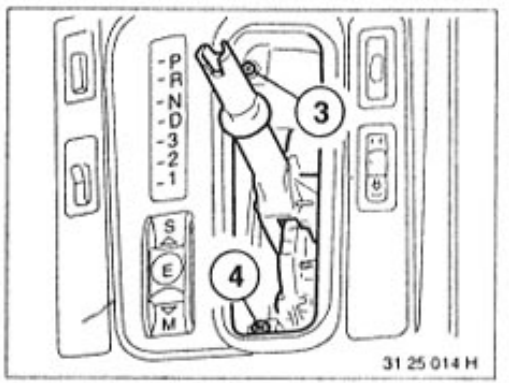
Pull selector lever handle upwards to remove Extraction force approx. 25 N.



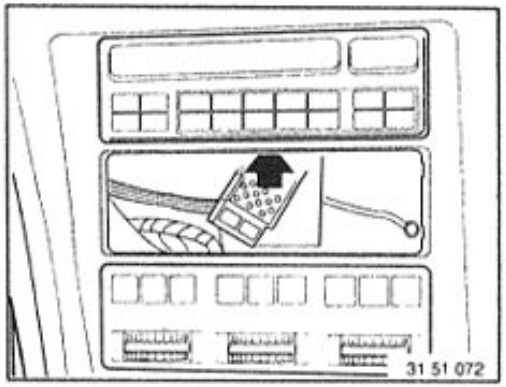
Unclip cover and pull upwards.



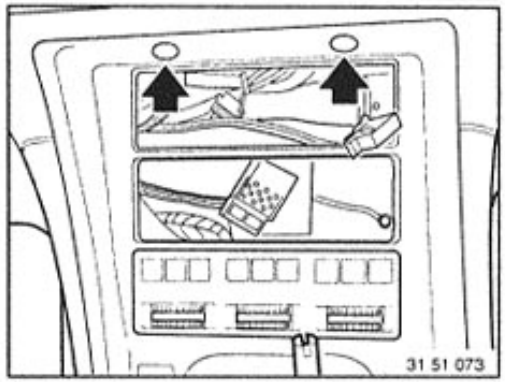
Push driver clip (1) upwards with a screwdriver and push pin (2) to one side. Pin (2) remains on shift lever.



Unfasten screws (3) and (4) and lift cover upwards to remove.
Unfasten connector.

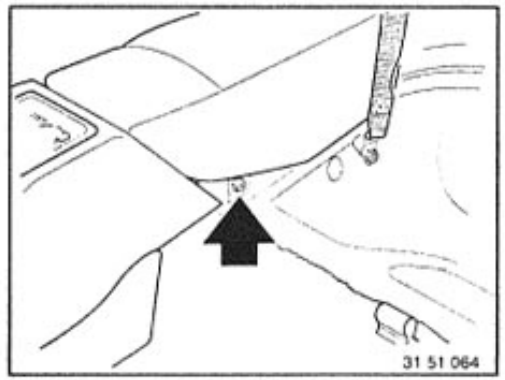


Press down clip in center and remove Multi Information Display (MID).
Unfasten connector.



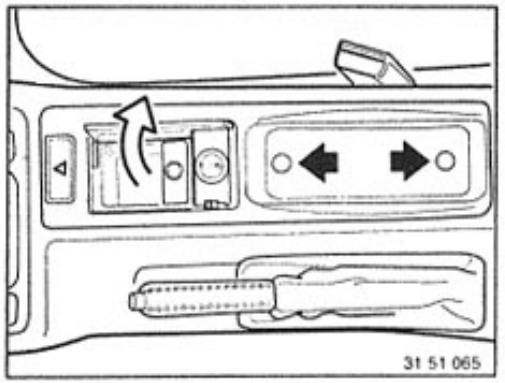
Remove finishers.
Unfasten screws and remove trim.
Unfasten connector (heater control).

Note:
The operation "Removing centre console" ends here.

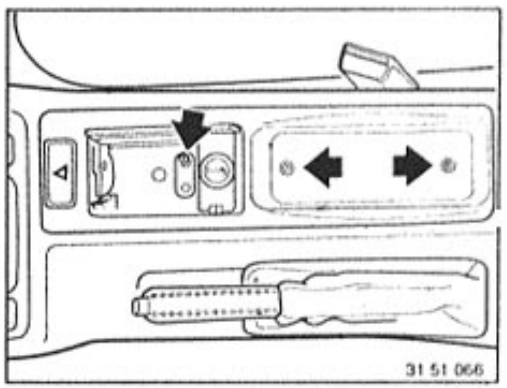


Remove both back seats, see 52 20 100.
Remove rear oddments tray, see 51 16 203.

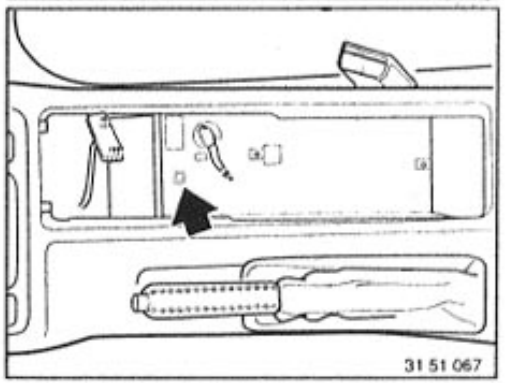
Unfasten screws on left and right sides and remove centre armrest.



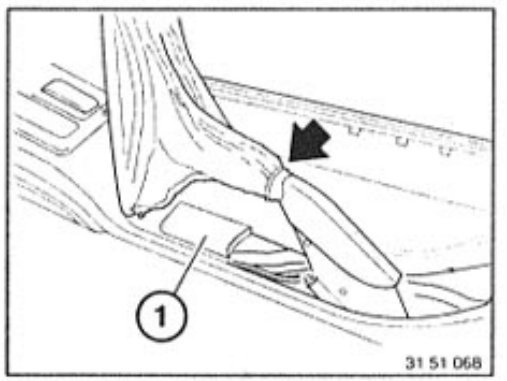
Remove ashtray.
Remove covers.



Unfasten screws and remove oddments tray.
Unfasten connector and remove ashtray light.

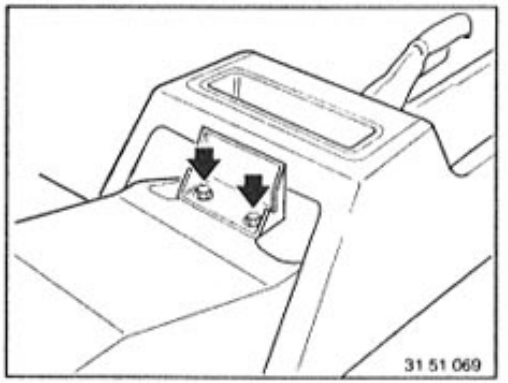


Unfasten screw.

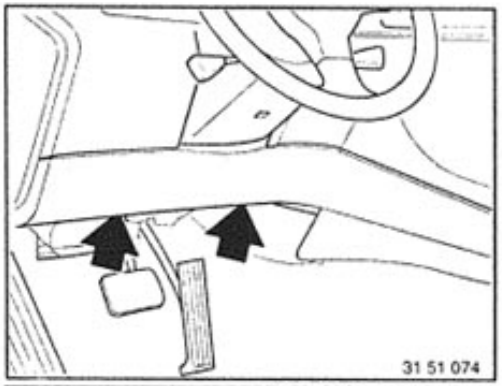


Unclip cover sleeve (handbrake) and fold down. Disconnect retaining strip and remove cover sleeve.
Remove finisher (1).

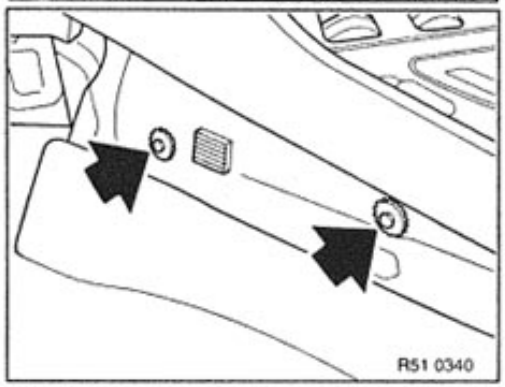
Installation:
Replace retaining strap.



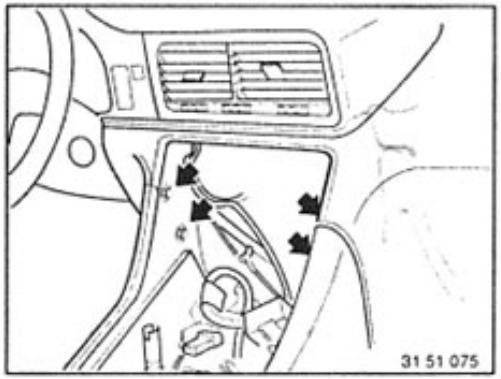
Unfasten screws.



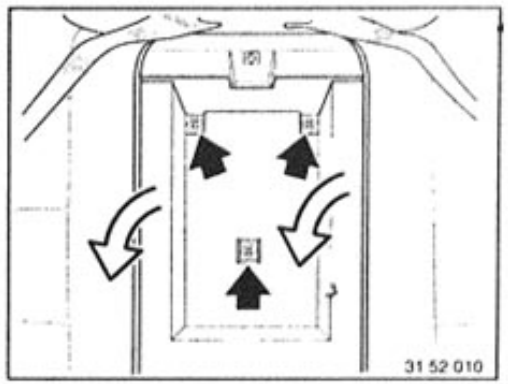
Twist clips, unfasten lower instrument panel trim and remove.



Unfasten screws on left/right sides.

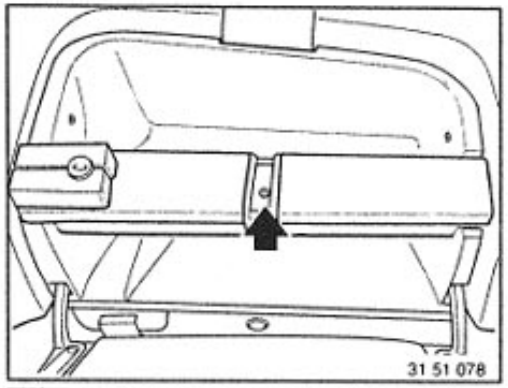


Unfasten screws on left and right sides and remove oddments tray (centre console).



51 16 203 Removing and installing rear oddments tray

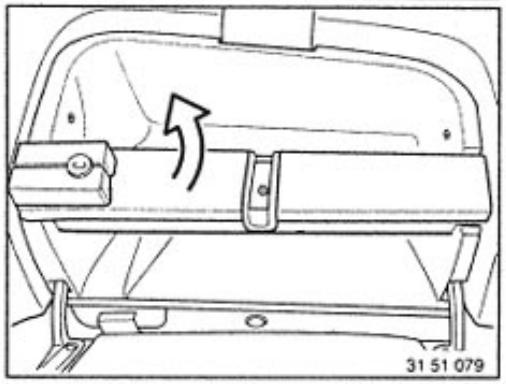
Remove first-aid kit.
Unfasten screws and carefully remove tray.



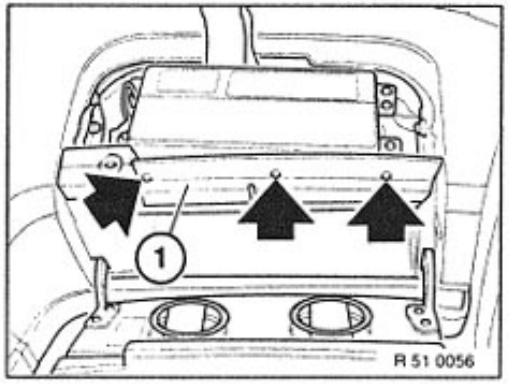
51 16 340 Removing and installing or replacing fastener for glovebox on right side

Open both glovebox lids and lift out finisher for passenger airbag.

Unfasten screw and remove finisher.

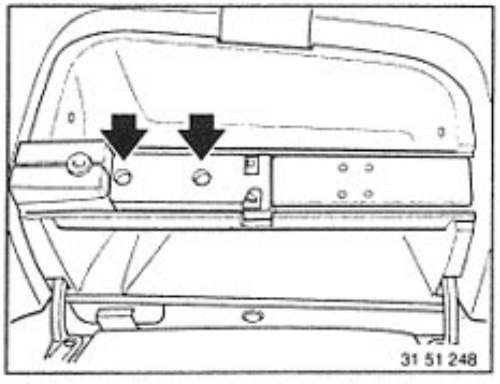


Remove finisher by lifting upwards.



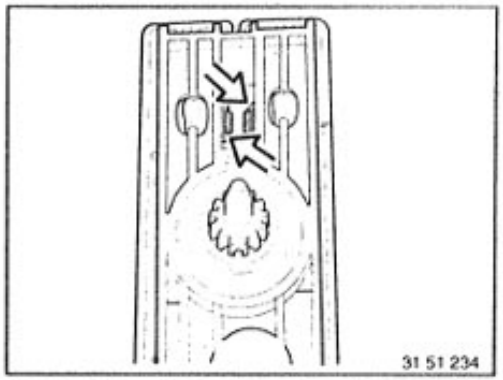
On passenger airbag:

Unfasten screws and remove finisher (1).

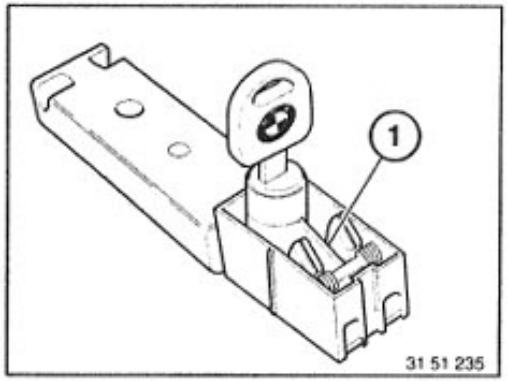


Unfasten screws and remove lock (with passenger airbag, now only one screw on right side).

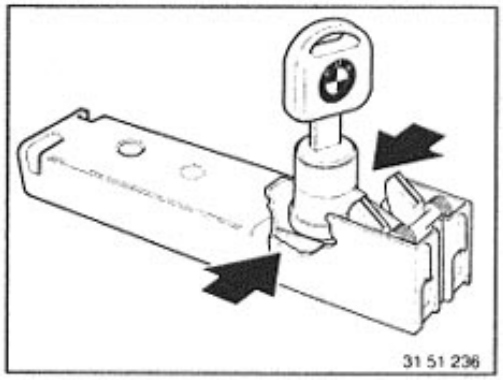
Note:
Installation and removal ends here: rest of section deals with replacement.



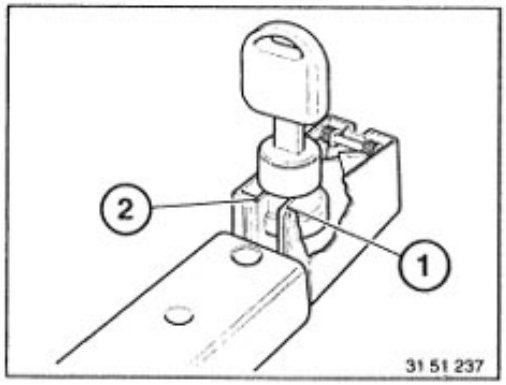
Press down clips on left and rights sides of old lock and remove pushbuttons.



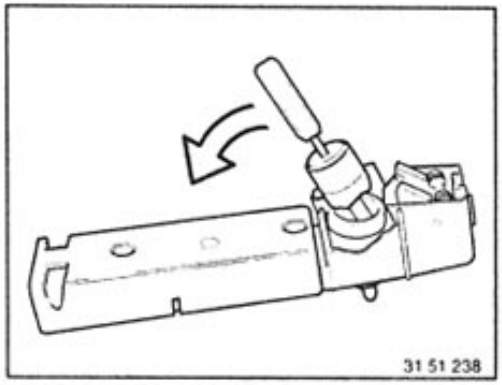
Insert main key in lock cylinder.
Cut web (1) with diagonal cutting pliers.



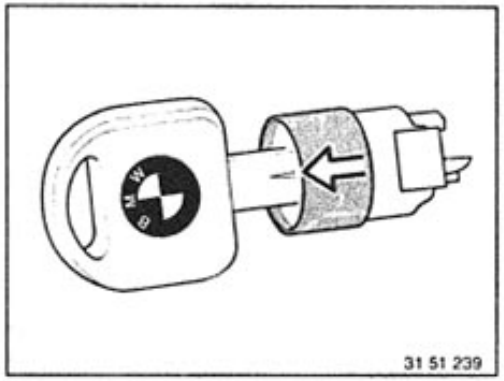
Break off left/right sides of housing.



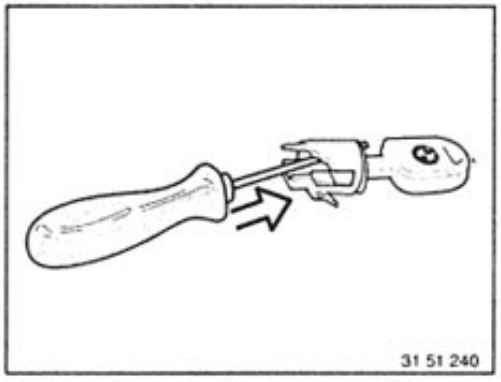
Break off webs (1) and (2).



Tilt lock cylinder to remove.

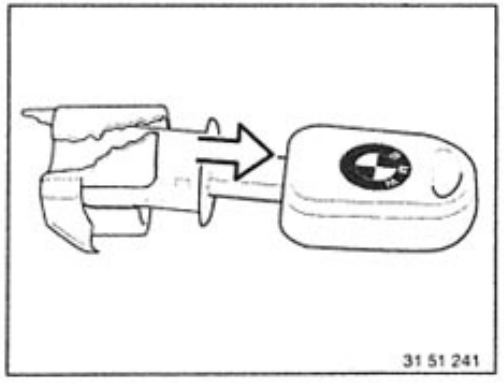


Remove metal ring. Carefully remove main key from locking cylinder. Remove metal ring and reinsert main key in the locking cylinder.

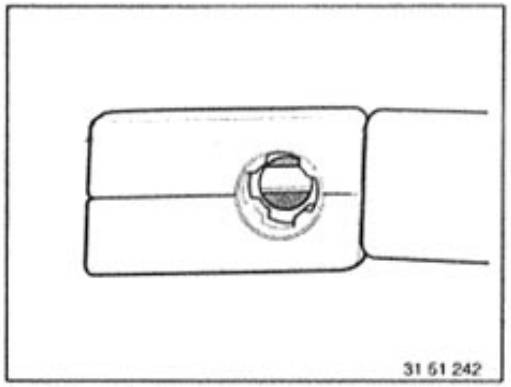


Caution!
Do not damage tumblers.

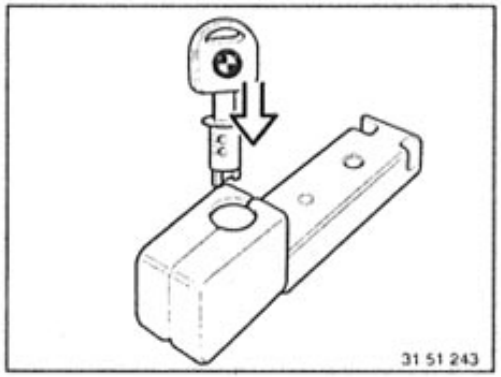
Insert screwdriver between lock cylinder and plastic sheath and break open plastic sheath.



Remove lock cylinder from plastic sheath.

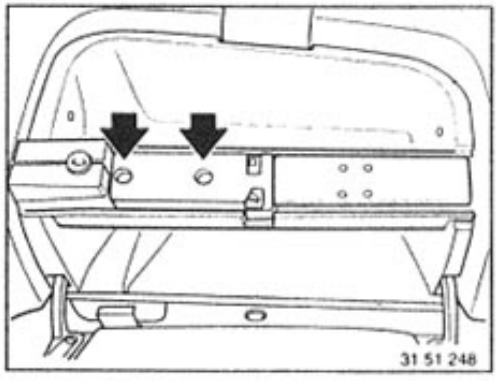


Turn new lock into "open" position.



Install lock cylinder and engage.

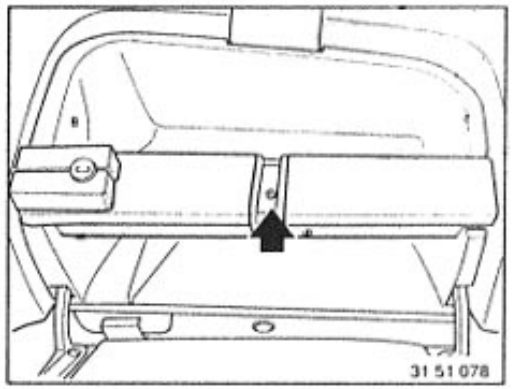
Installation:
Fit lock strip in opposite sequence to removal.
Tighten screws gently.



Fit lock to lock strip.

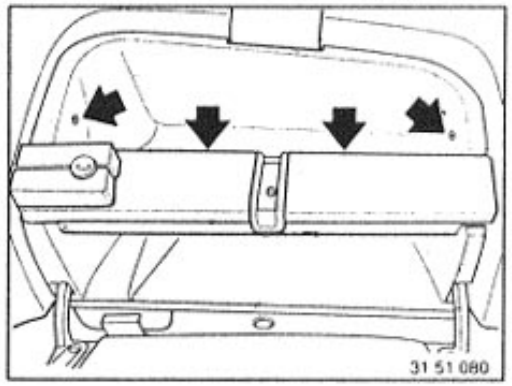
Installation:
Perform function check!

- Lock glovebox with main key; lid must be locked.
- Unlock glovebox; lid must be unlocked.

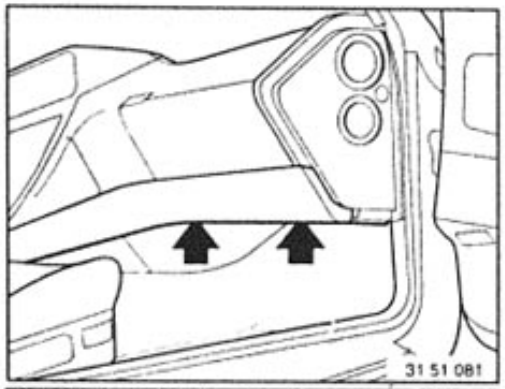


51 16 362 Removing and installing or replacing upper right glovebox

Open cover for upper and lower glovebox.
Unfasten screw and remove finisher.

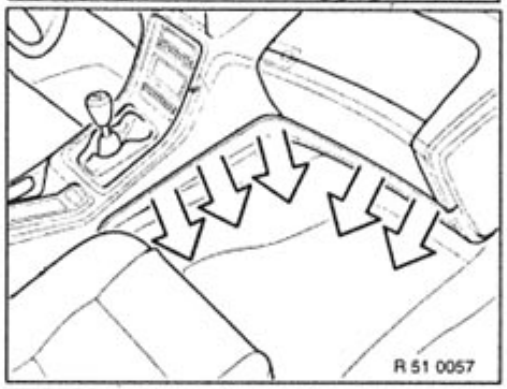


Unfasten screws and remove glovebox.

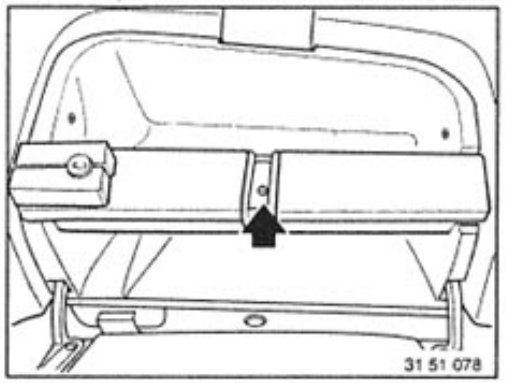


51 16 363 Removing and installing or replacing lower right glovebox

Twist clips and remove.

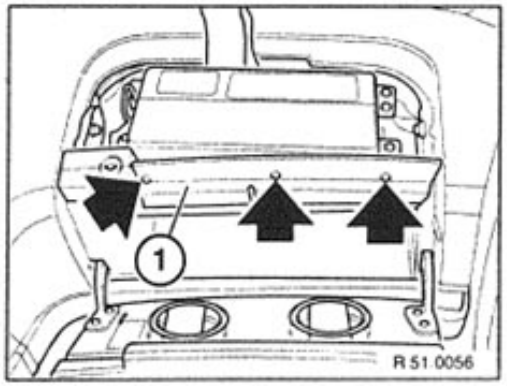


Lift out side instrument panel trim (beside transmission tunnel - burr fastener) and unclip by pulling backwards.



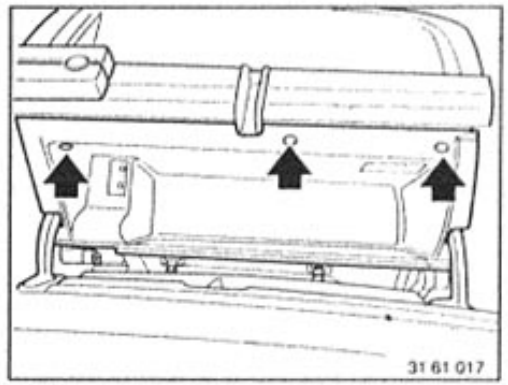
Open both covers on glovebox and remove finisher for passenger airbag.

Unfasten screw and remove finisher.

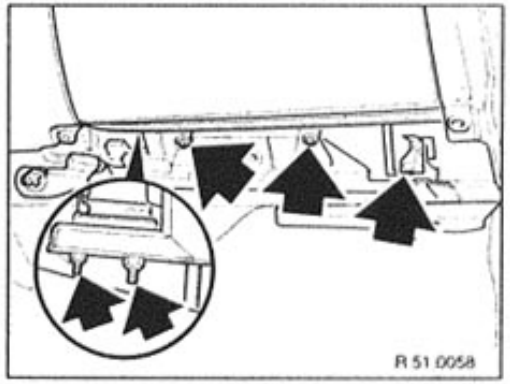


With passenger airbag:

Unfasten screws and remove finisher.



Unfasten screws.



Unfasten screws and nuts.
Lift out glovebox and unfasten connector.

51 21 090 REMOVING AND INSTALLING LOCK OF LEFT OR RIGHT FRONT DOOR

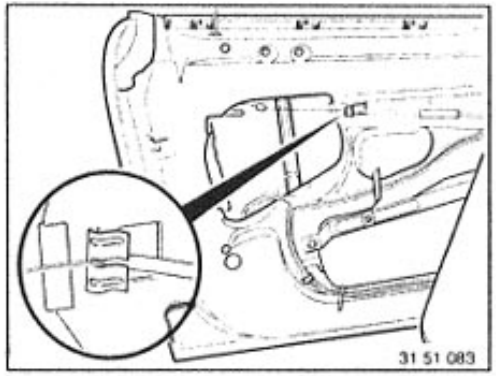
Raise side window.
Remove door trim panel – see 51 41 000.

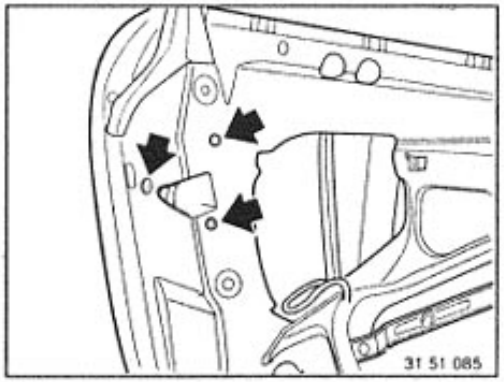
Important!
Disconnect power window plug in the interest of safety.

Remove outside door handle – see 51 21 170.

Unhook inside door lock operating cable.

Installation:
Check for correct seating of cable sleeve.





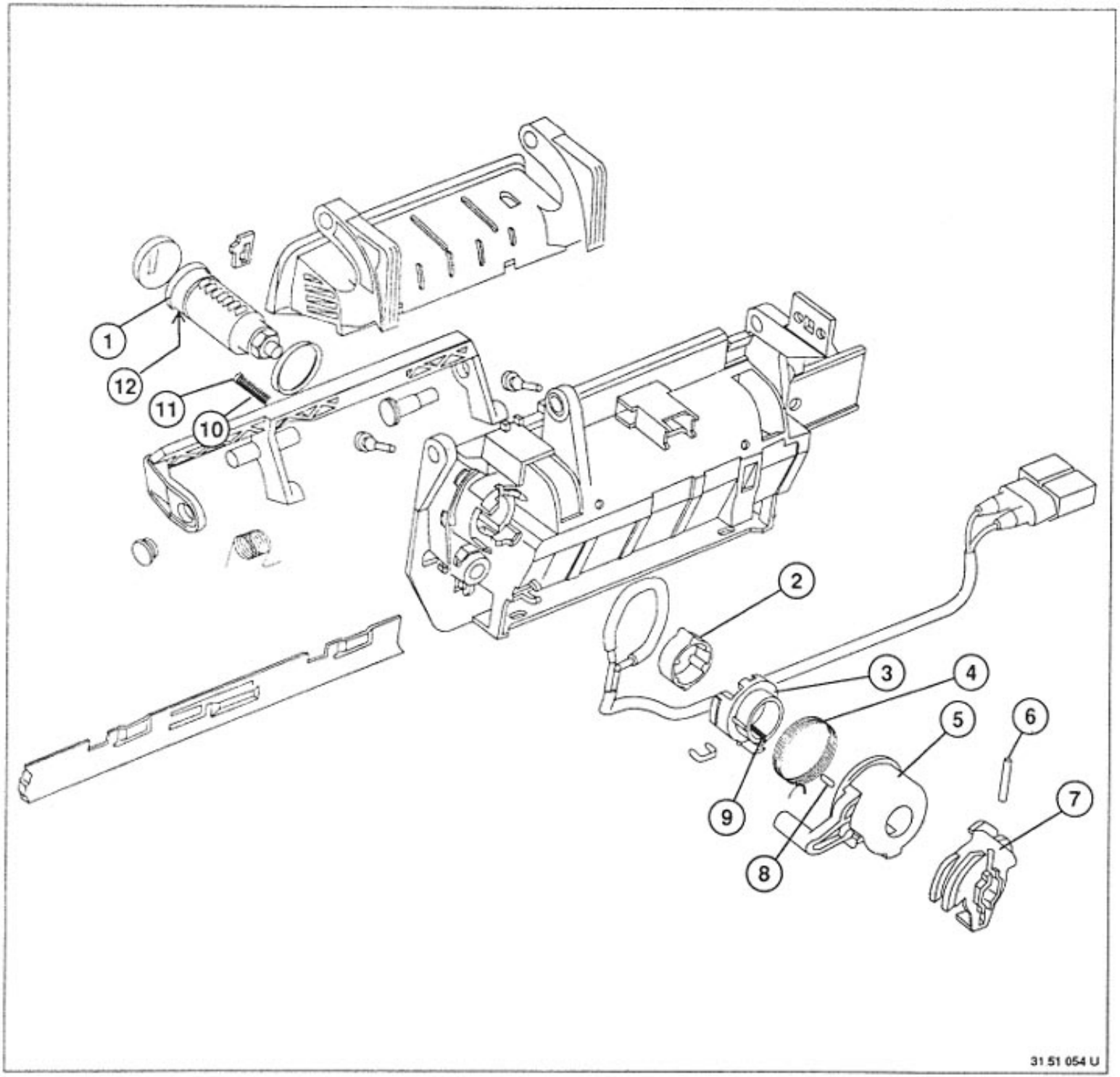
Unscrew screws and lift out lock.
Disconnect plug and unclip wires.

Installation:
Tightening torque*.

Disconnect plug.

Installation:
Check for correct seating of plug – a loud "click" must be heard for engagment.

* See Specifications



51 21 140 REPLACING COMPLETE LOCK CYLINDER OF LEFT OR RIGHT FRONT DOOR

Note:
Removal and installation of the lock cylinder are only possible with the main key.

Remove outside door handle - refer to 51 21 170.

Insert main key into lock cylinder.

Caution!
Clips have great tension – wear protective goggles.

Loosen and hold clips tight carefully. Remove cap and microswitch.

Press pin (6) out using a pointed pliers. – Don't knock it out! –

Remove eccentric (7) together with drive (5), spring (4) and guide ring (3) as a single unit and do not disassemble further if not absolutely necessary.

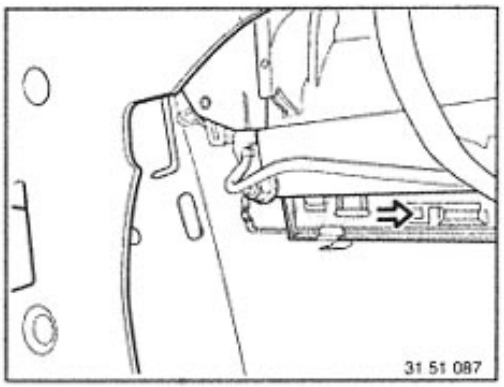
Installation:
Place cylindrical roller (8) in opening (9).

Remove insert ring (2).
Pull lock cylinder (1) out of the door handle.

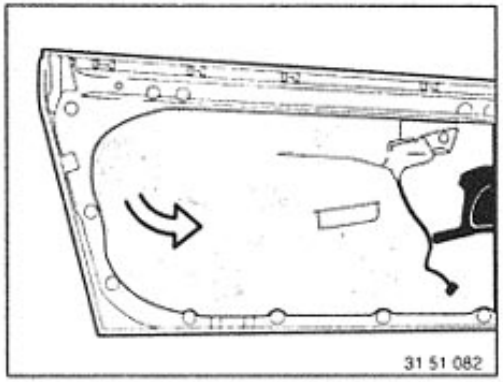
Installation:
Hold ball (11) on spring (10) with grease.
Push lock cylinder into door handle.
Press key lock (12) in using a pointed item, press lock cylinder firmly into door handle and hold tight.

51 21 170 Removing and installing outside handle on left or right front door

Close side window.
Remove door trim,
refer to 51 41 000



Slide strip forwards with special tool 51 3 190 and remove finisher from outside handle.

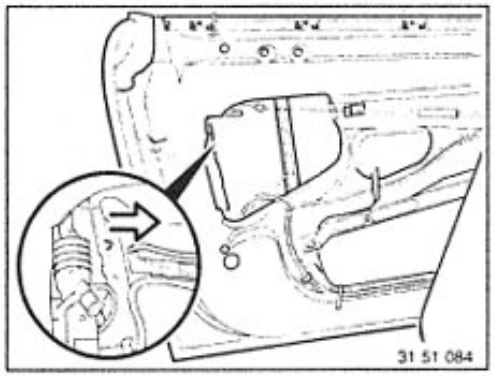


Pull cover partially forwards.

Caution!
For safety reasons, unfasten connector from electr. window regulator.

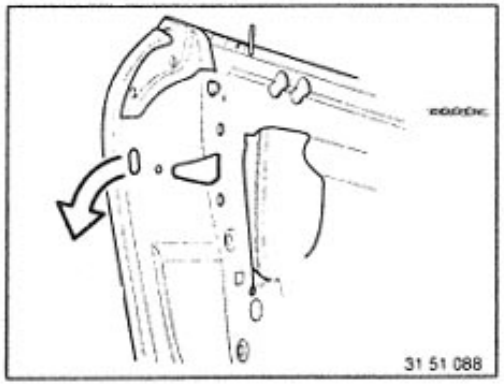
Unfasten inside screws and remove outside handle.
Unfasten connector and unclip lines.

Tightening torque refer to Technical Data
51 21 2AZ



Unclip linkages.

Installation:
Install outside handle with stud (1) in spline (2).



Remove plugs.

51-31 . . . Instructions on cementing windows

Front and rear windows are cemented to body (positive connection). This improves the torsional strength of the vehicle. Conformance with the following procedures is necessary to ensure windows are correctly cemented.

Note:
When using Sika Tack - Ultrafast (hot treatment), the cement must be heated in the cartridge oven* to 80°C.
Open rear end of aluminum membrane before placing cartridge in oven.

Removal:

Cement bead is cut through using an electric cutter* with oscillating blade*, as far as possible without damaging paint on the body aperture. When cutting out the window, wear protective goggles and gloves. Damaged paint finish in body openings must be touched up with BMW EP prime filler*. Large areas of damage must be ground down to base metal and coated with BMW EP prime filler (2K) (layer thickness 30 ... 40 µm). If a complete buildup of paint is required in the visible area, masking must be stripped off the primed cement flange before application of top coat.

Preparation for assembly:

Note:
When using Sika Tack - Ultrafast (hot treatment):
Before applying the cement, it must first be heated in a cartridge oven* to 80°C.
Sealed cement containers can be reheated several times and they remain stable for approx. 10 hours at 80°C.

The inside edge of the window is coated with a glass ceramic layer impermeable to UV light to protect the cement bead. A thin coat of primer is applied by brush to the glass ceramic surface (repair kit)*. Primer must be allowed to breathe for at least 10 minutes.

The body aperture is also coated with a thin layer of primer, requiring 10 minutes to air-dry. For cementing, only use the 1-component polyurethane cements (Sikaflex 255 FC for cold treatment or Sika Tack - Ultrafast for hot treatment)*. The cement is applied to the window with a cartridge press (compressed air or electrically operated)*.

If a cement other than one approved by BMW is used, radio reception is seriously impaired. The heating filaments also act as antennas.

Mounting:

Caution!
Assembly must be completed within 8 ... 10 minutes otherwise the cement bead forms a skin which no longer forms a perfect adhesive bond.
Always remove cement residue with cleaning agent (Sika-Entferner 208*) before cement hardens.
Do not press window back out at this point.
Hardened cement can now only be removed mechanically.

The car can be towed without a windshield or rear window.

To prevent a pressure buildup inside the car when the doors are closed, one side window should be open.

Cement hardens by reaction with humidity at room temperature.
The minimum hardening time is achieved at 22°C and 38% relative humidity, refer to table.
The vehicle must not be subjected to one-sided loads during the minimum hardening time (for example one wheel on kerb, lifting platform etc.). Maneuvering inside the workshop is still permitted.

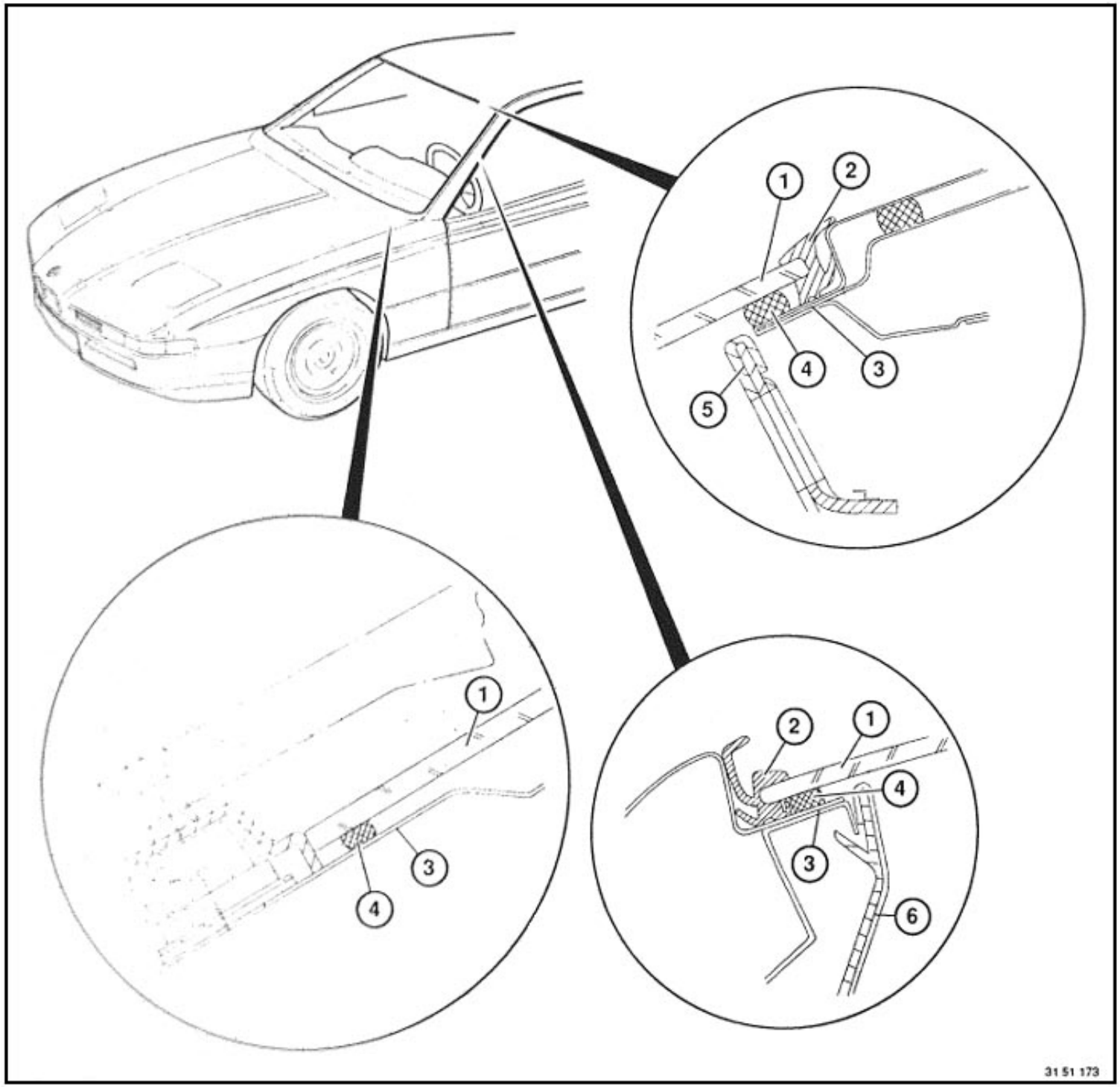
Caution!
Safety instruction after cementing (windshield with passenger airbag):
To ensure that the "passenger airbag" restraint system functions perfectly (support of airbag against windshield), all occupants must drive with seatbelts fastened until the minimum hardening time (refer to table) is reached after the windshield has been cemented.

Cements and minimum hardening time:

Cement	Minimum hardening time without passenger airbag (vehicle can be moved)	Minimum hardening time with passenger airbag (crash loading from airbag)
Sikaflex 255 FC (cold treatment)	4 hours	18 ... 24 hours
Sika Tack - Ultrafast (hot treatment)	2 hours	12 hours

Note:
For vehicles with passenger airbags, the vehicle can be presented to customers after the hardening time (vehicle movable, dependent upon type of cement) with the following warning notice:
All occupants must ride with seatbelts fastened for a specified time after the windshield has been cemented (refer to table, crash loadings from airbag).

*Source of Supply: BMWParts Service

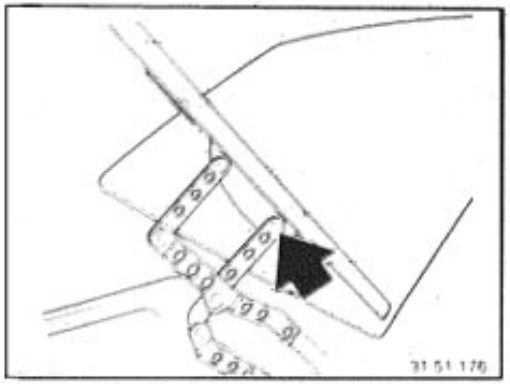


51 31 ... CEMENTED WINDSHIELD SURVEY

1 Windshield
2 Seal
3 Body flange
4 Cement bead
5 Roof liner
6 A-pillar trim panel

51 31 000 REMOVING AND INSTALLING WINDSHIELD

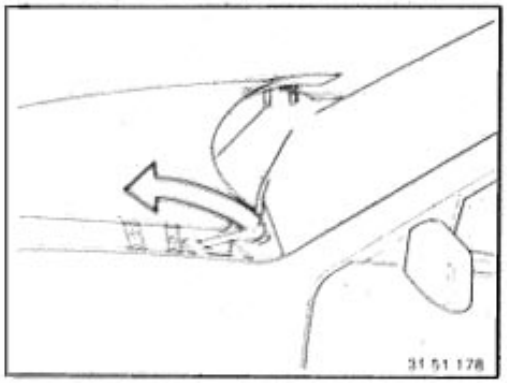
Cover bumper (top) and headlight lids with covers or side panel/fender guards to prevent damage to the paint finish.



Important!
Secure the engine hood to prevent it from falling into the windshield.

Unscrew left and right screws.

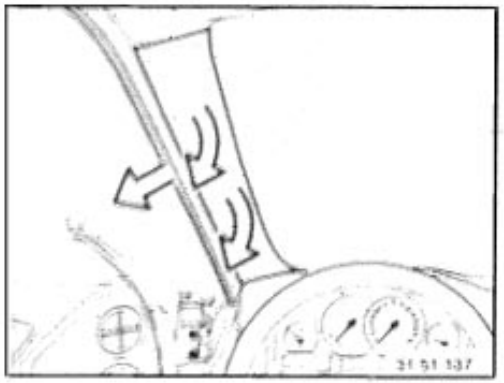
Installation:
Tightening torque*.



Lower the engine hood onto the side panel / fender guards or covers and pull forward.

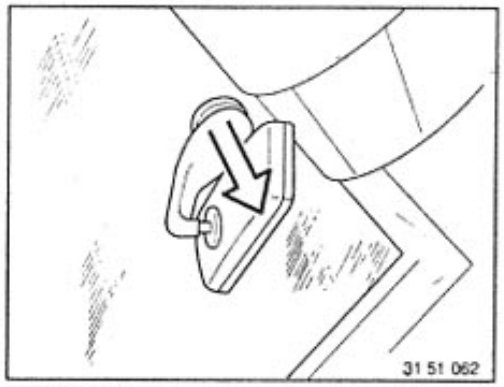
Remove wiper arms - refer to 61 61 071.

Unclip left and right plates upwards.
Raise the engine hood.



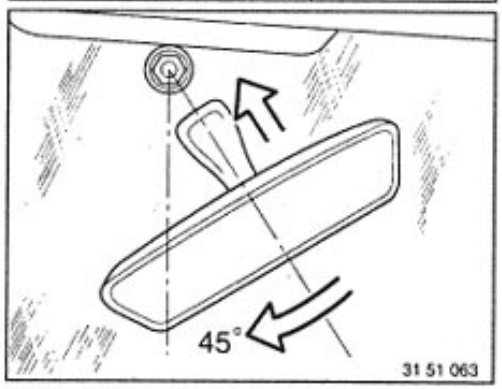
Unclip left and right plates.

* Refer to Specifications

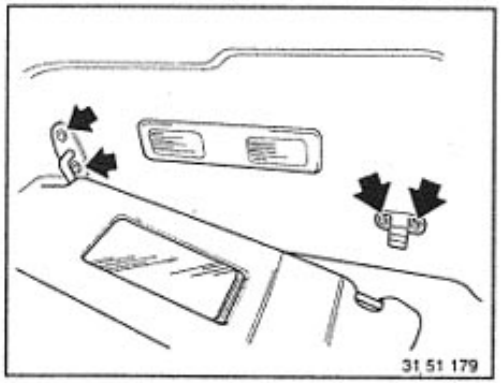


Pull mirror back off of the mirror base.

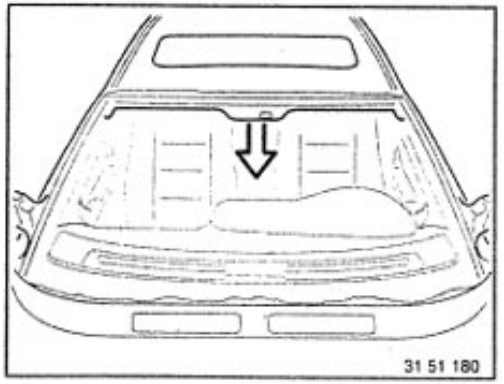
Cars with Automatic Inside Mirror Dimmer:
Open mirror trim panel and disconnect plug.



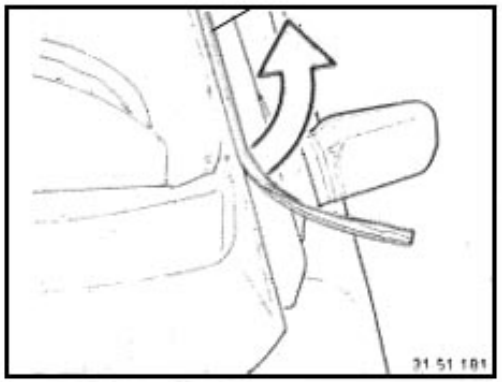
Installation:
1. Mount mirror foot turned about 45° on the mirror base.
2. Turn mirror foot until it engages on the mirror base.



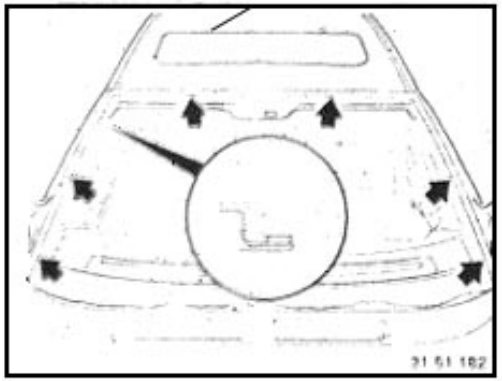
Unscrew screws.
Remove left and right sun vizors and holders.
Disconnect plug.



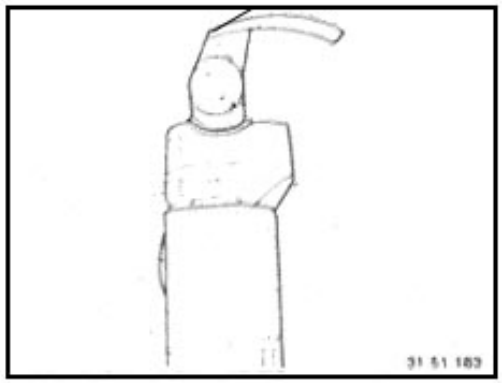
Lower front end of the roof liner slightly.



Pull seal out.

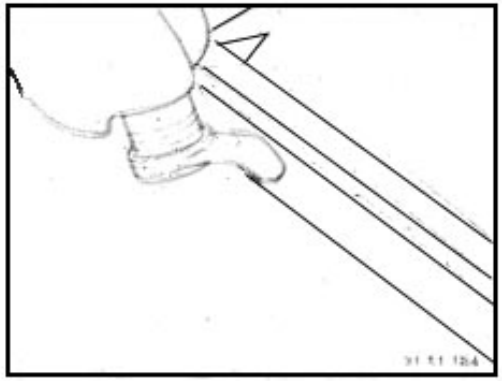


Paste two layers of cloth adhesive tape (e.g. Tesa) on the edges of the body opening.



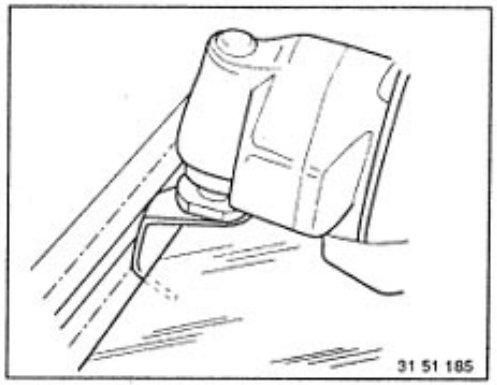
Mount long knife* (36 mm knife blade) on tool.

Note:
If necessary, resharpen knife with the machine running.

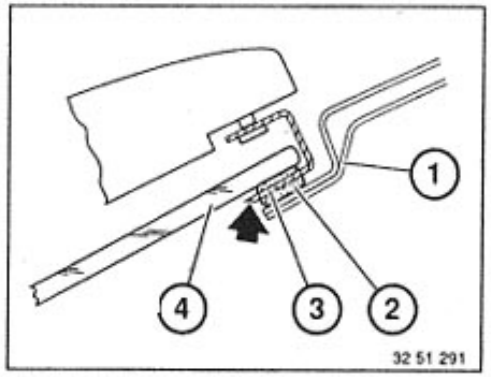


Insert knife* carefully between the body and windshield glass.

* Source of Supply: BMW Parts

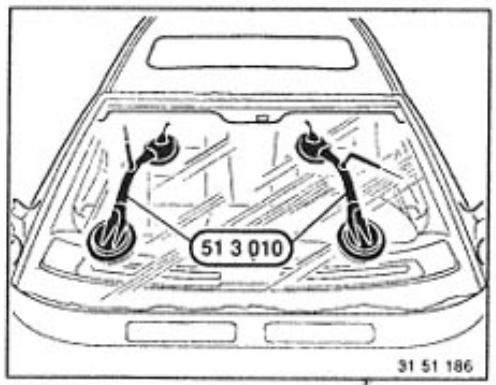


Guide web of knife* parallel to the windshield glass.

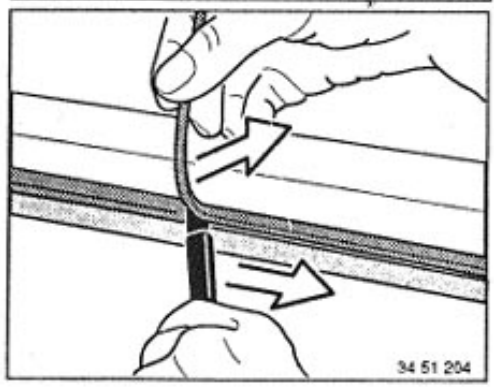


Cut through cement bead all around as close as possible to the windshield glass.

1 Body opening
2 Cement bead
3 Knife
4 Windshield



Lift windshield out using Special Tool 51 3 010.



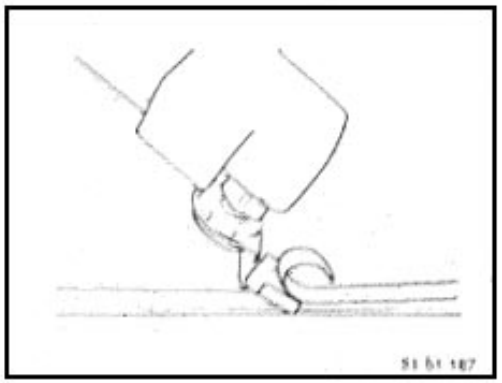
Reduce thickness of cement remaining on the edges of the body opening to about 0.5 mm.
Cut off surplus cement carefully using an universal knife (sharp as a razor blade) to avoid damaging the paint finish in the body opening.

* Source of Supply: BMW Parts

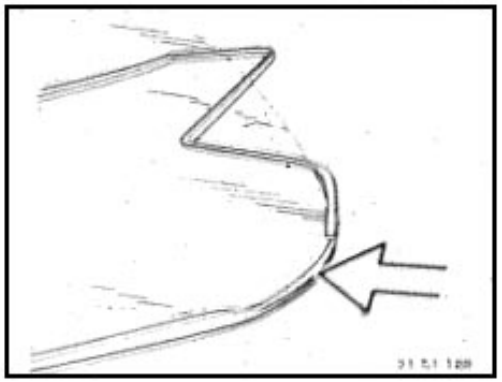
Important!
Always touch up damaged paint finish to guarantee longterm corrosion inhibition. Use BMW EP primer (2K)* for this purpose!

Remove remainders of cement, sand out scratches which are not in visible zones and touch up with BMW EP primer*.

Large-area damage must be ground off down to blank metal and then coated with BMW EP primer* (coat thickness = 30 ... 40 µm).
If complete paint build-up is necessary in a visible zone, cement must be removed from the cementing surface before applying a coat of paint.

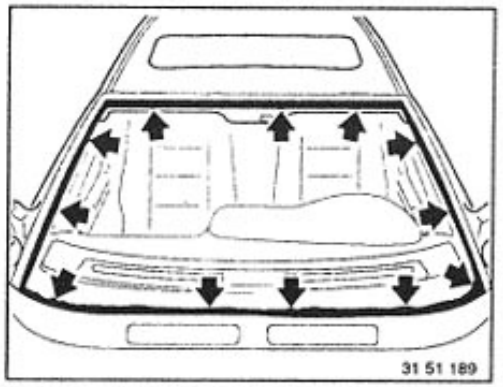


When reusing the windshield glass, reduce the thickness of the cement remaining on the glass to 0.5 mm using a knife*.



Install seal on windshield glass and press firmly.

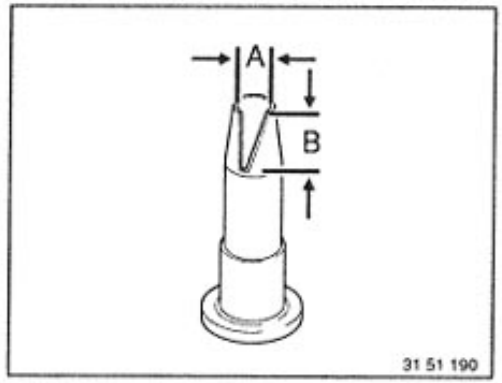
* Source of Supply: BMW Parts



Important!
BMW EP primer* must be hardened.

Coat windshield glass and body edges in area of the cemented surface with primer (repair kit*).

Note:
Air drying time: about 10 minutes.

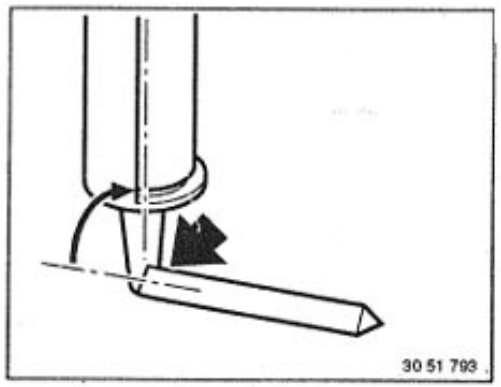


Cut nozzle to size.

Distance A = 7 ± 1 mm
Distance B = 13 ± 1 mm

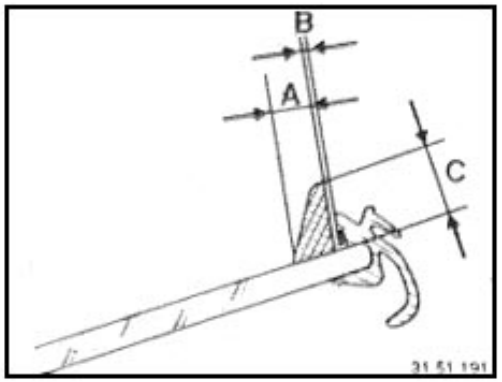
Note:
Use a cartridge gun* (pneumatic or electric) to produce uniform cement beads.

Note expiration date for application of cement!



If applicable, produce a trial bead first. Cartridge must be held perpendicular to the window glass.

* Source of Supply: BMW Parts

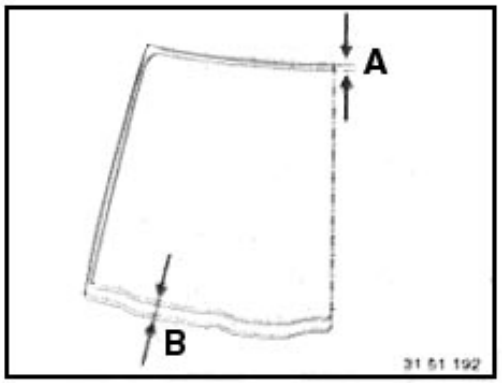


Shape of Cement Bead:

Distance A	=	7 ± 1 mm
Distance B	=	1 mm
Distance C	=	12 ± 2 mm

A-pillars:	9 mm
Roof joint:	11 mm
Cowl panel at bottom:	12 ± 1 mm

Note:
Various bead heights are reached by changing the pulling speed.

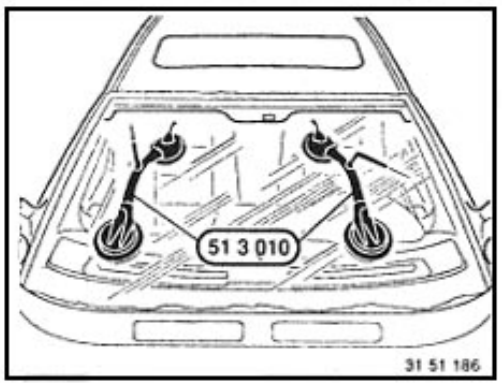


(A) is the distance of the cement bead to the seal.

Distance (A) = 1 mm

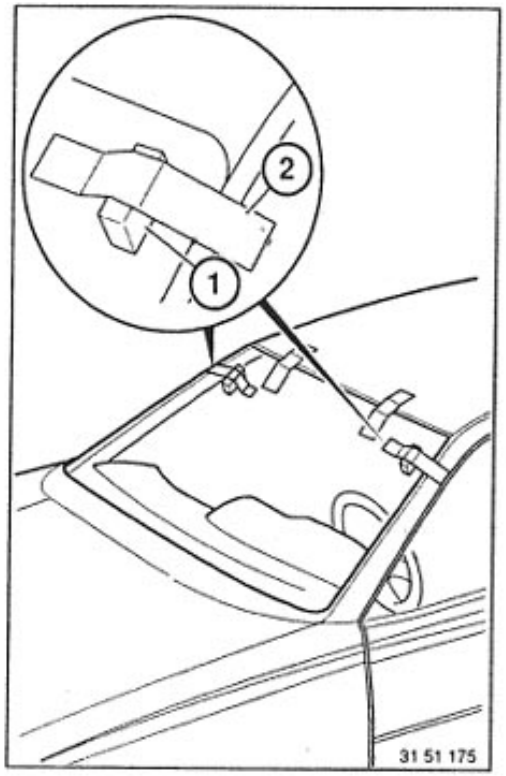
(B) is the distance of the cement bead to the edge of the windshield at the bottom of the cowl pane.

Distance (B) = 20 mm



Install windshield carefully using Special Tool 51 3 010 and press on.
Push windshield upwards and hold with cloth adhesive tape (e. g. Tesa).

Length:	300 mm
Width:	50 mm



Press top of windshield over small wood blocks (1) into the corners and hold in position with cloth adhesive tape (2) (e.g. Tesa).

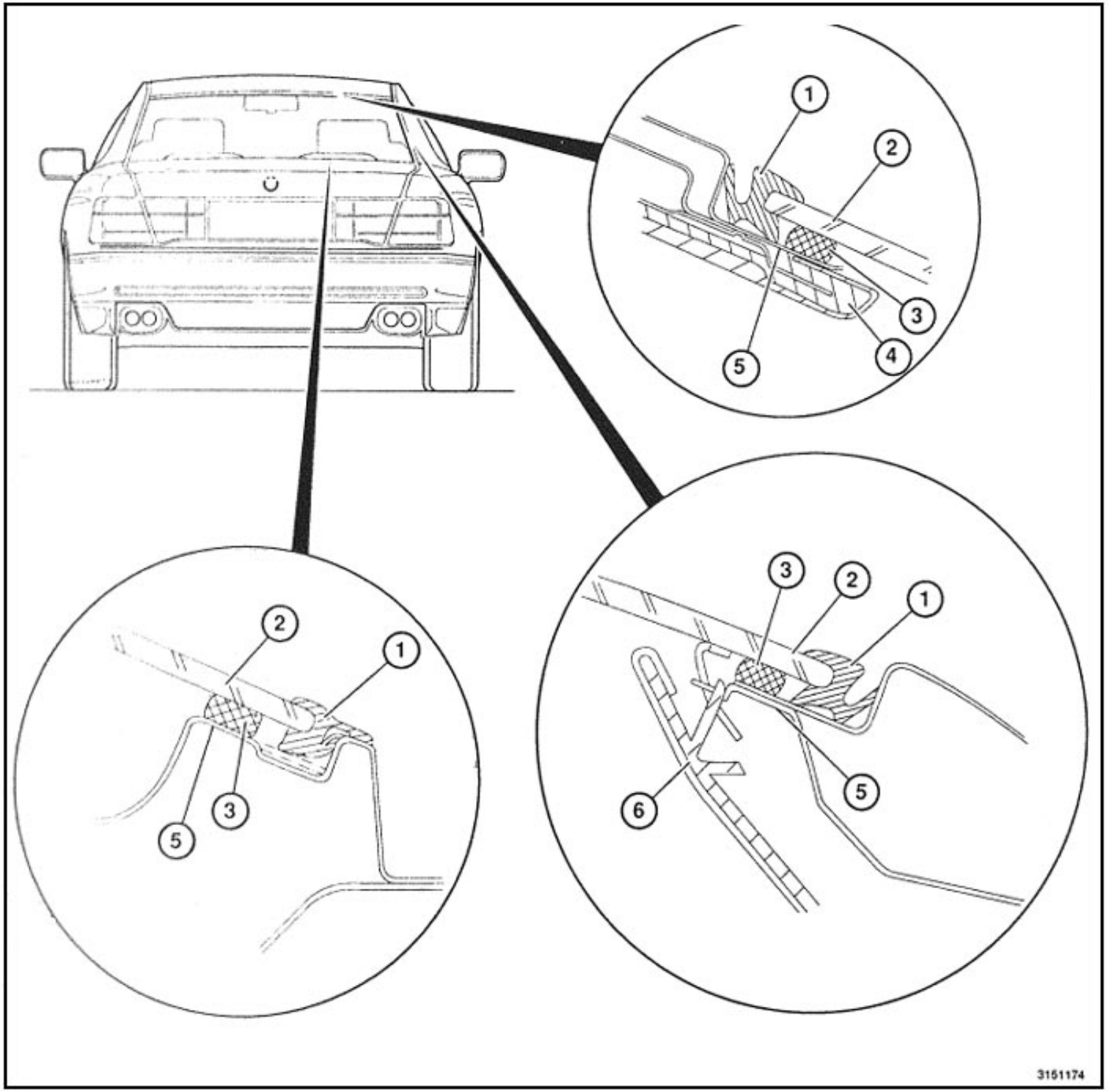
Size of wood blocks:
approx. 20 x 40 x 40 mm.

Important!
Remove dirt from residue cement with benzine before it has hardened. Do not press the windshield out again for this purpose.

Note:
Leaks can be detected by spraying water underneath the sealing lip or with an ultrasonic leak detector* and repaired with a corresponding nozzle.

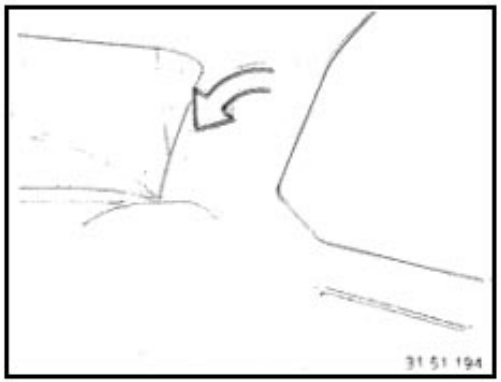
Assemble car.

* Source of Supply: BMW Parts



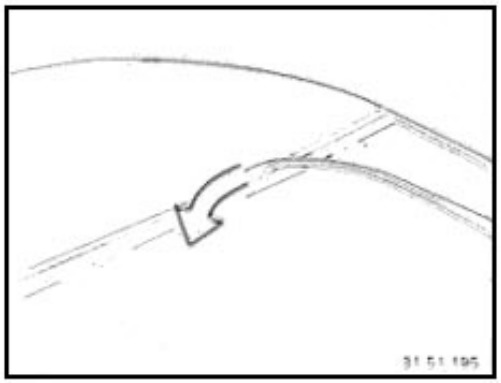
51 31 ... REAR WINDOW CEMENTING SURVEY

1 = Rubber frame seal
2 = Rear window
3 = Cement bead
4 = Roof liner
5 = Body flange
6 = C-pillar plate

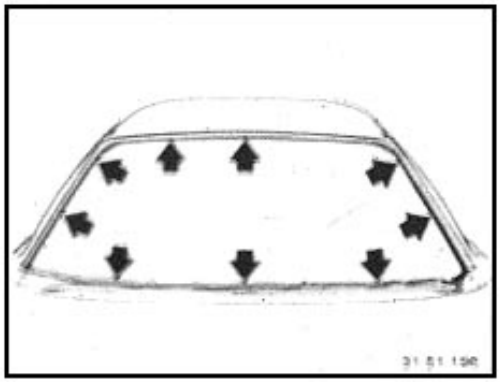


51 31 200 REMOVING AND INSTALLING REAR WINDOW

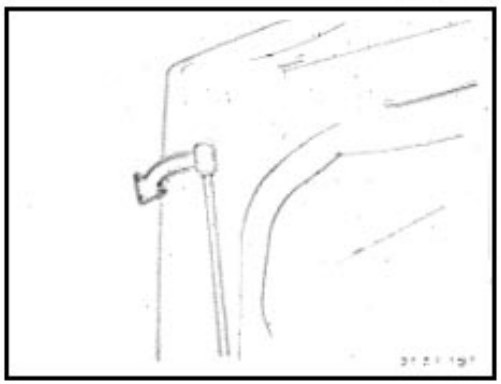
Unclip plate for C-pillar.
Disconnect plugs on rear window defogger and window antenna.



Pull seal out.

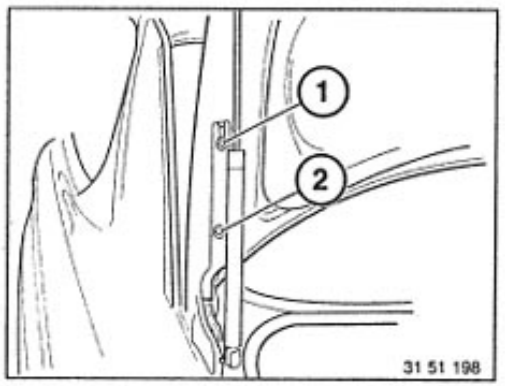


Paste a double layer of cloth adhesive tape (e.g. Tesa) on the edges of the body opening.

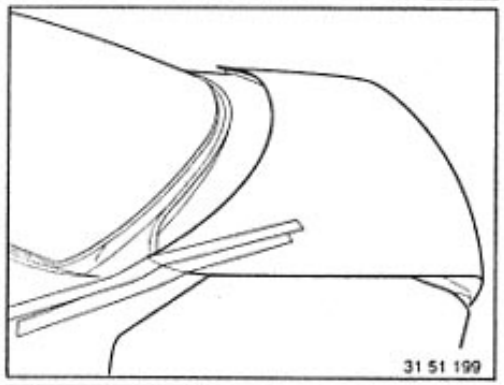


Loosen retainers and disconnect left and right gas pressure props.

Cover top of side panels with side panel/ fender guards, blankets or something similar.



Unscrew bolt (1).
Unscrew bolt (2).



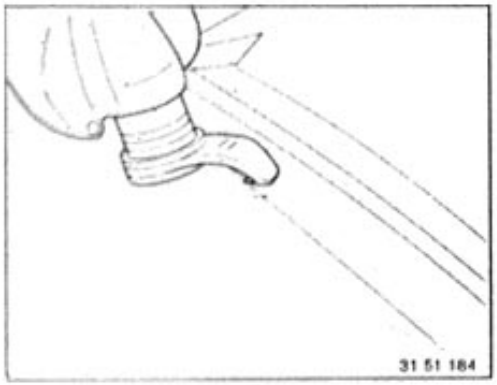
Pull trunk lid back, place on side panel/ fender guards and hold with cloth adhesive tape.



Mount a long knife* (36 mm long blade) on tool.

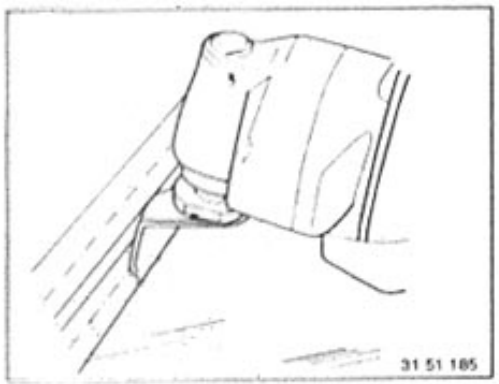
Note:
If necessary, resharpen knife with the machine running.

* Source of Supply: BMW Parts

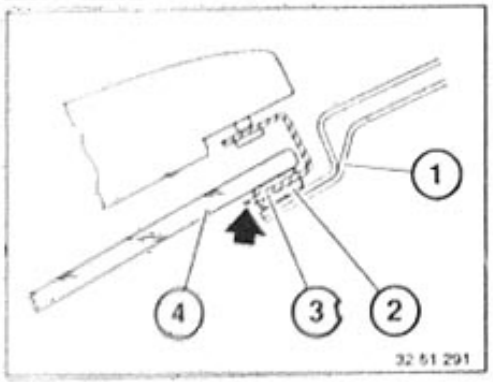


Insert knife* carefully between the body and rear window glass.

Note:
Ensure that roof liner or wires for the rear window defogger and window antenna are not damaged while cutting the rear window out.



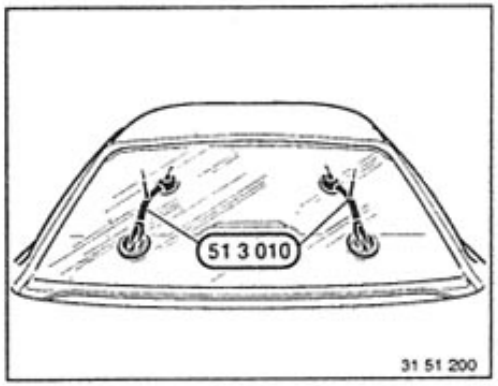
Guide web of knife* parallel to the rear window.



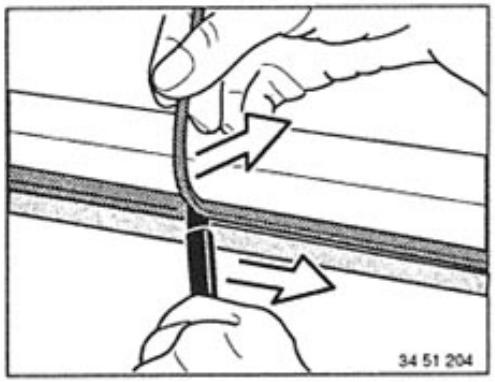
Cut thrlugh cement bead all around as close as possible to the window glass.

1 Body opening
2 Cement bead
3 Knife
4 Rear window glass

* Source of Supply: BMW Parts



Lift rear window out using Special Tool 51 3 010.



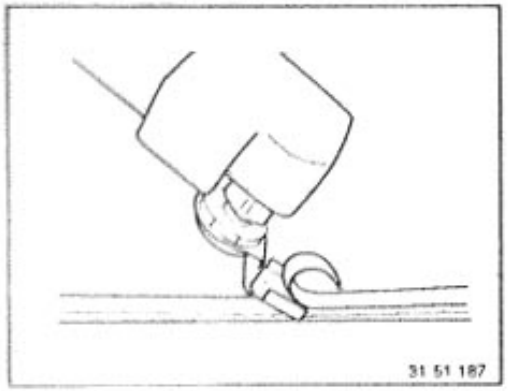
Reduce the thickness of cement remaining on edges of the body opening to approx. 0.5 mm.
Cut off surplus cement carefully using an universal knife (sharp as a razor blade) to avoid damaging the paint finish in the body opening.

Important!
Always touch up damaged paint finish to guarantee longterm corrosion inhibition. Use BMW EP primer (2K)* for this purpose!

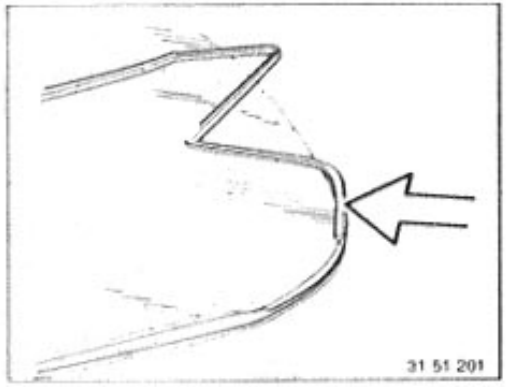
Remove remainders of cement, sand out scratches which are not in visible zones and touch up with BMW EP primer*.

Large-area damage must be ground off down to blank metal and then coated with BMW EP primer* (coat thickness = 30 ... 40 µm).
If complete paint build-up is necessary in a visible zone, cement must be removed from the cementing surface before applying a coat of paint.

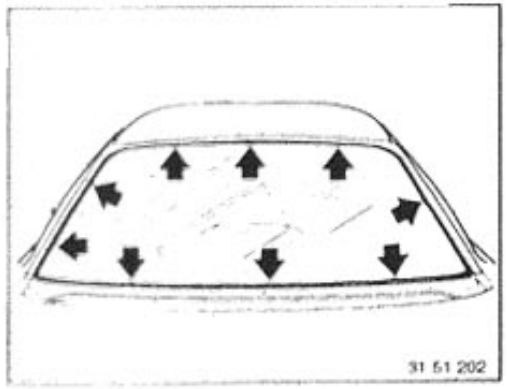
* Source of Supply: BMW Parts



When reusing the rear window glass, reduce the thickness of the cement remaining on the glass to 0.5 mm using a knife*.



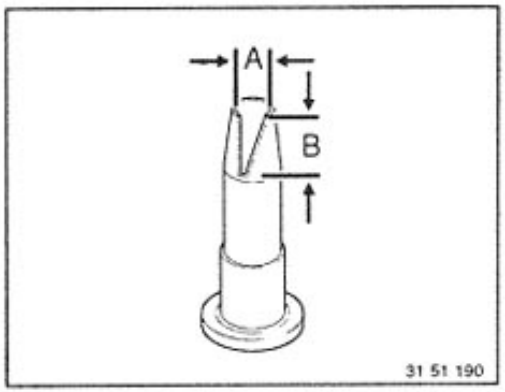
Install seal on rear window glass and press firmly.



Important!
BMW EP primer* must be hardened.

Coat rear window glass and body edges in area of the cemented surface with primer (repair kit*).

Note:
Air drying time: about 10 minutes.

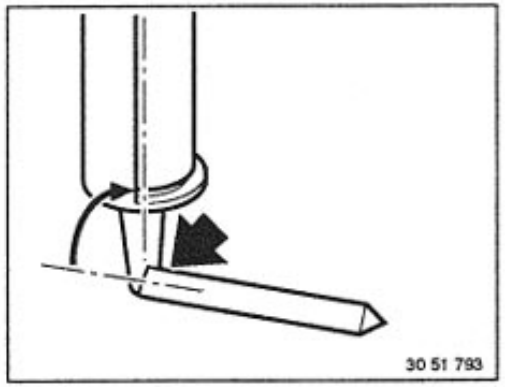


Cut nozzle to size.

Distance A = 7 ± 1 mm
Distance B = 13 ± 1 mm

Note:
Use a cartridge gun* (pneumatic or electric) to produce uniform cement beads.

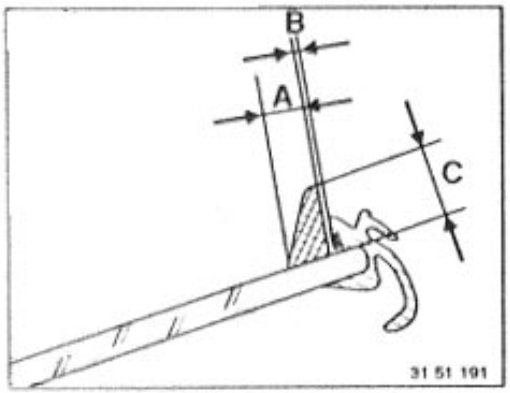
Note expiration date for application of cement!



If applicable, produce a trial bead first. Cartridge must be held perpendicular to the rear window glass.

* Source of Supply: BMW Parts

* Source of Supply: BMW Parts



Shape of Cement Bead:

Distance A = 7 ± 1 mm
Distance B = 1 mm (distance to seal)
Distance C = 12 ± 1 mm

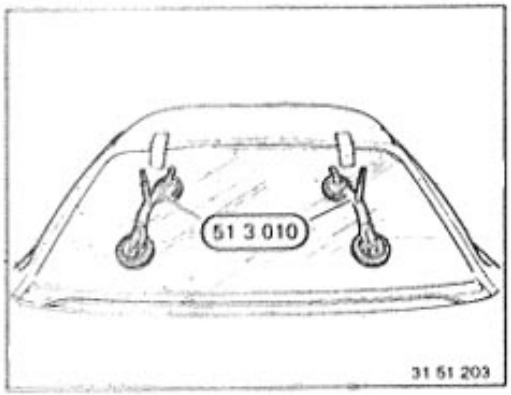
A-pillars: 14 mm
Roof joint: 11 mm
Cowl panel at bottom: 11 mm

Note:
Various bead heights are reached by changing the pulling speed.

Important!
Remove dirt from residue cement with benzine before it has hardened. Do not press the rear window out again for this purpose.

Note:
Leaks can be detected by spraying water underneath the sealing lip or with an ultrasonic leak detector* and repaired with a corresponding nozzle.

Assemble car.
Align trunk lid - refer to 41 62 014.



Install rear window carefully using Special Tool 51 3 010 and press on.
Push rear window upwards and hold with cloth adhesive tape (e.g. Tesa).

Length: 300 mm
Width: 50 mm

* Source of Supply: BMW Parts

51-31/12

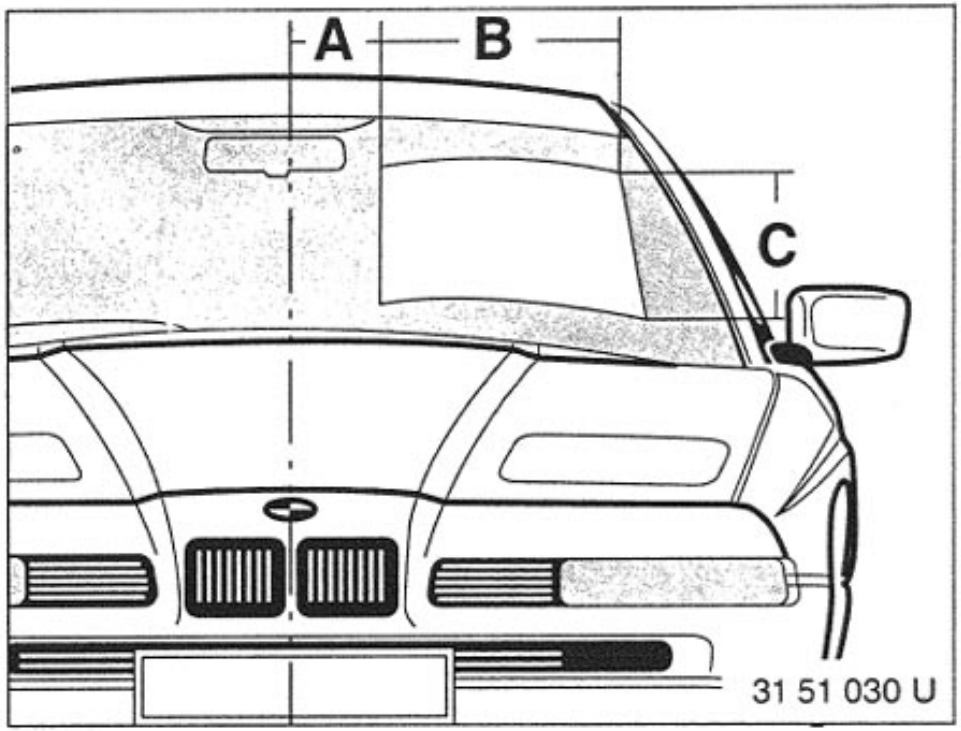
51 31 . . . REPAIRING LAMINATED SAFETY GLASS WINDSHIELDS (CLEAR OR TINTED GLASS) DAMAGED BY FLYING STONES

These instructions are meant for specialists and assume their skill, conscientiousness and sense of responsibility. The instructions are also limited to factory approved repairing materials*, repairing methods and tips to make the work easier. Only general procedures are described in the instructions. Scope of work must be adapted to the actual damage situation. Repairing procedures are an economical solution, so that optical deficiencies cannot be excluded. Consequently the repair should only be carried out when explicitly ordered by the customer.

The conditions listed below for repairing laminated safety glass windshields conform with legislation in Germany. Always conform with the pertinent legislation in other countries.

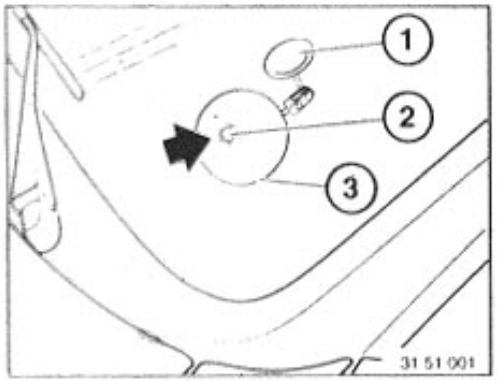
Important!

1. Only damage on the outside surface of the windshield may be repaired. Inside window window surface and the plastic sheet between inside and outside glass panes must not be damaged at all.
2. Repairing should take place as soon as possible after the window had been damaged. Moisture and/or dirt must not have been allowed to penetrate into the damaged spot.
3. The crater produced where the stone had hit the window must not exceed a diameter of 5 mm.
4. Cracks extending radially from the point where the stone had hit must not be longer than 50 mm. They must not end in the rubber seal or ornamental frame of the windshield.
5. Repairs may be carried out only outside of the driver's field of view (see sketch). View through the repaired zone must be clear, transparent and without distortion as well as possible.
6. Always conform with instructions supplied by the manufacturers.

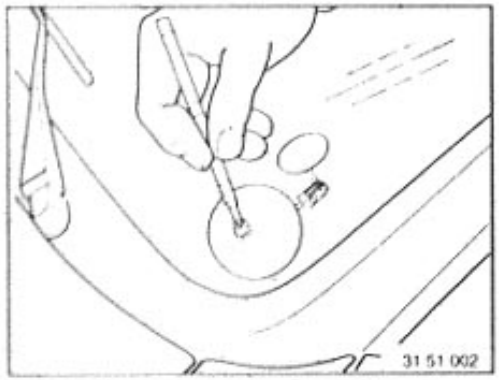


A = 240 mm (distance from field of view to center of car)
B = 290 mm (width of field of view)
C = Wiped field limit

Source of Supply: BMW Parts

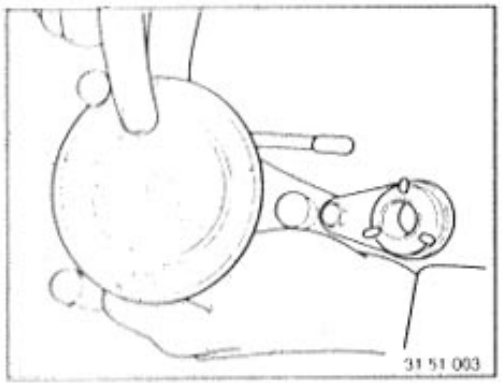


Apply a thin coat of gel on suction cup (1) of the concave mirror and position the suction cup on inside of the windshield in such a manner that the impact spot (2) can be seen from the outside in concave mirror (3).

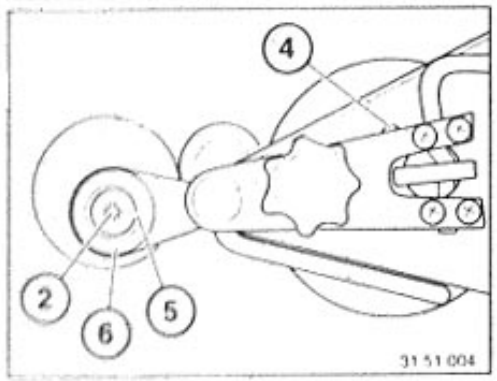


Remove all glass splitters from the impact spot from the outside using a scriber so that a rough surface is produced.

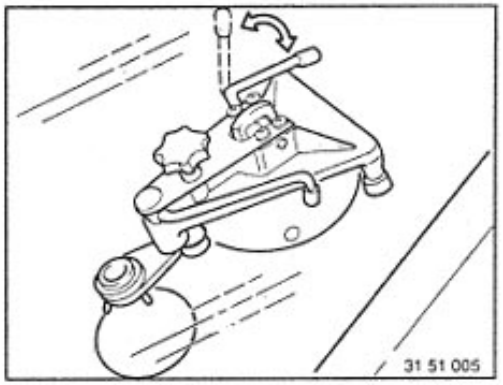
Important!
Don't increase the size of the impact spot hole.



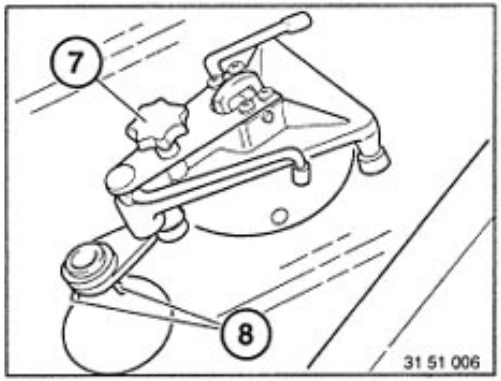
Apply a thin coat of gel on the suction cup of the tool holder.



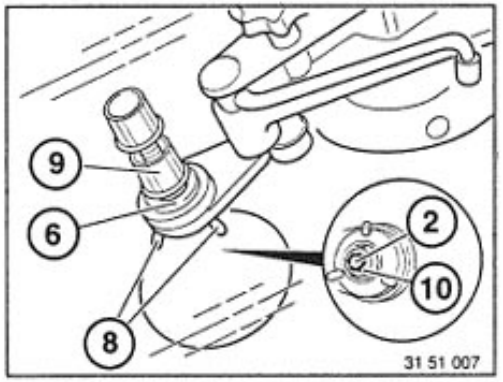
Position tool holder (4) on outside of the window in such a manner that opening (5) of head (6) is precisely over the impact spot (2).



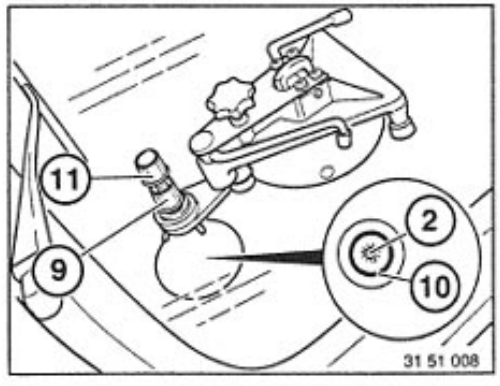
Move locking lever forward and back again.



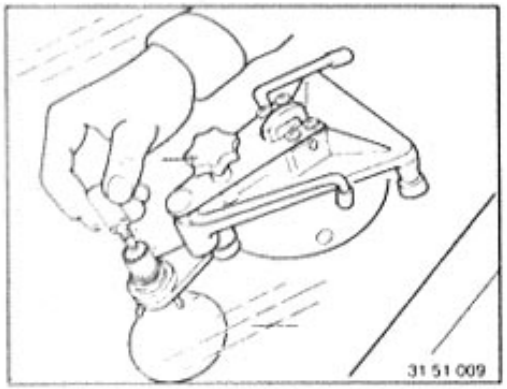
Screw knurled head screw (7) in far enough that base (8) bears firmly on the windshield.



Screw cylinder (9) into head (6) far enough that rubber seal (10) surrounds impact spot (2) on the window firmly and base (8) just barely lifts off again.

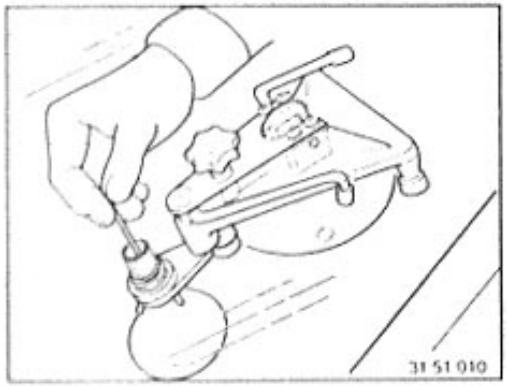


Screw injector (11) out of cylinder (9).
Look into cylinder (9) from above and check whether rubber seal (10) is positioned centrally over impact spot (2).
Reposition, if necessary.

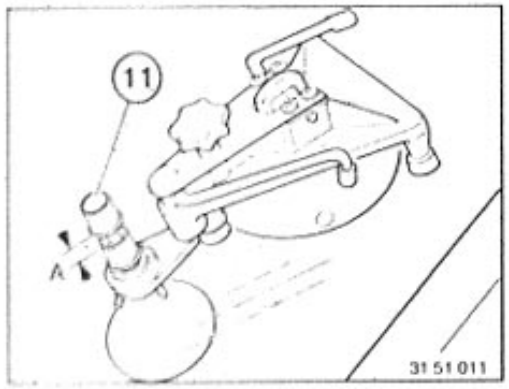


Open bottle of resin and pour about 1/3rd of its contents into the cylinder.

Important!
Always close the resin bottle immediately after use and protect it against ultraviolet light.



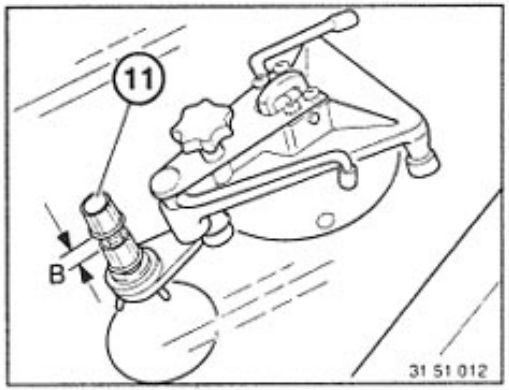
Stirr resin poured into the cylinder with a wooden rod to remove air bubbles.



Screw injector (11) into cylinder up to distance A (slight resistance noticed) and let everything rest as it is about 5 minutes.

Distance A = 5 mm.

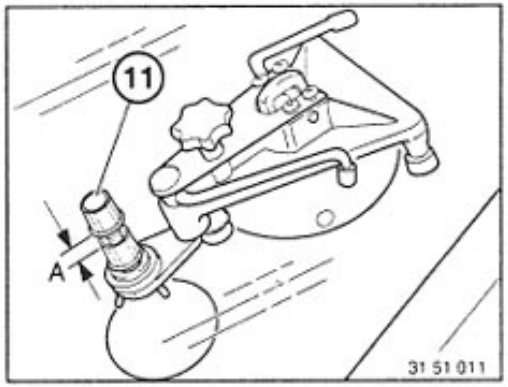
Note:
Pressure in this position will be about 16 bar. When observing the impact spot, it will be recognized that air in the impact spot disappears slowly (recognized as black shade).



Unscrew injector (11) quickly to distance B.

Distance B = 12 mm.

Note:
In this position there will now be vacuum which "pulls" the remaining air out of the impact spot.

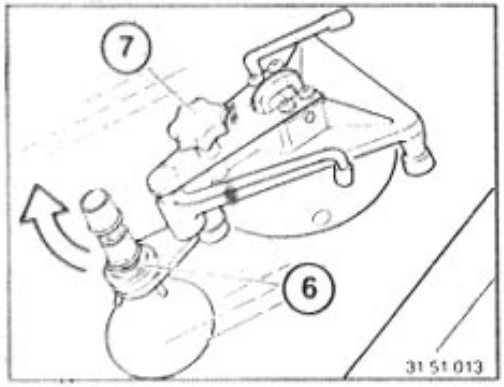


Screw injector (11) into cylinder back to distance A (slight resistance noticed) and again let everything rest as it is several minutes.

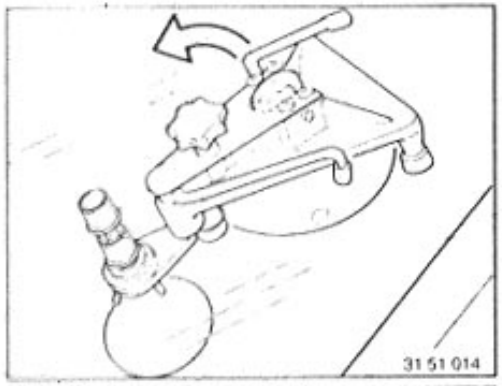
Distance A = 5 mm.

Repeat this step several times, alternating between pressure and vacuum, and then let injector (11) rest for a time in an intermediate position between distance A and distance B.

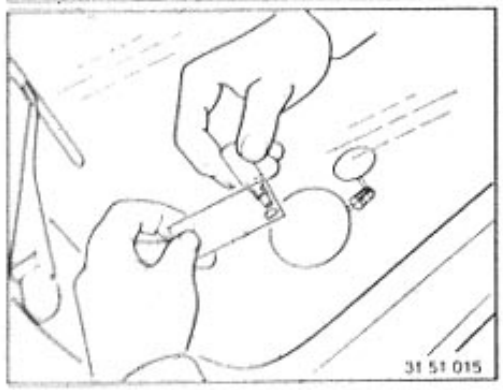
Note:
If this has not yet removed all of the air, heat the inside of the window with a lighter several seconds. The flame should be held as close as possible to the window, but not touch it.



Loosen knurled head screw (7), swing head (6) aside and observe the repaired spot from above and in the concave mirror from various angles.
Air inclusions should no longer be visible.
Should air inclusions still be seen, swing head (6) back over the impact spot and screw knurled head screw (7) in as far as before.
Repeat the steps as from the pressure / vacuum procedure.

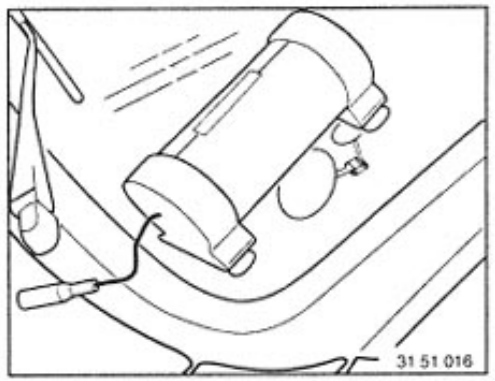


Swing locking lever forward and remove tool holder from the windshield.

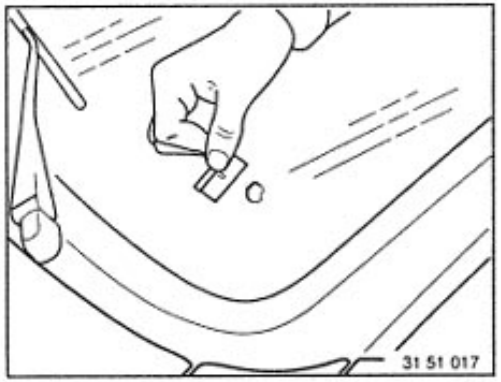


Let one drop of resin drip onto the impact spot and cover with clear plastic sheet.

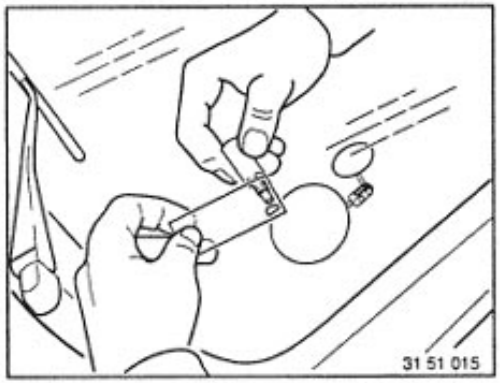
Note:
Only place clear plastic sheet over the impact spot – don't press it on.



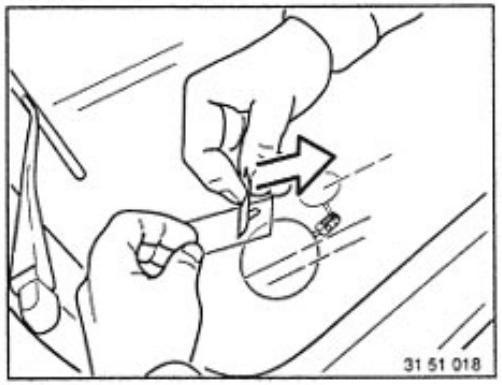
Apply ultraviolet lamp over the repaired spot and press firmly (suction cups). Connect ultraviolet lamp and let resin harden about 10 minutes.



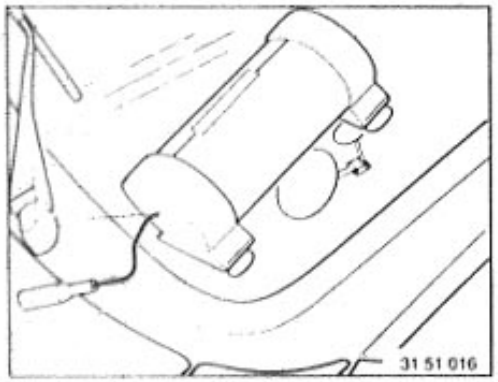
Remove ultraviolet lamp, pull off clear plastic sheet and scrape off excessive resin with a razor blade.



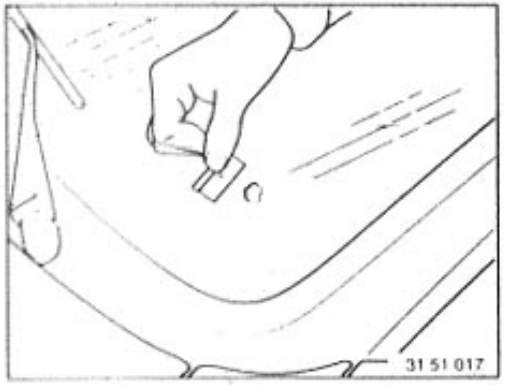
Let another drop of resin drip onto the impact spot and cover with a new piece of clear plastic sheet.



Move the razor blade over the clear plastic sheet carefully to have excessive resin run out on the sides.

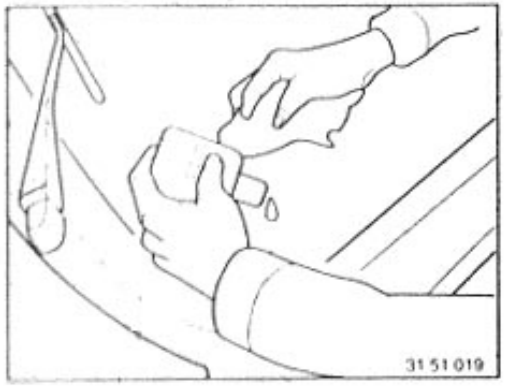


Set up ultraviolet lamp over the repaired spot again and press firmly (suction cups). Connect ultraviolet lamp and let resin harden about 10 minutes.



Remove ultraviolet lamp, pull off clear plastic sheet and scrape off excessive resin all around the impact spot with a razor blade.

Important!
Don't scrape over impact spot (2)!

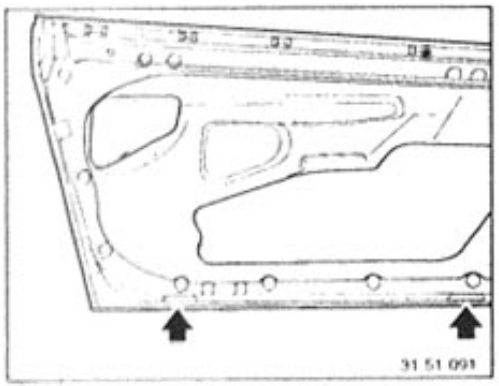


Polish the repaired spot with a cloth not losing lint and a polish until the surface is clean and smooth.

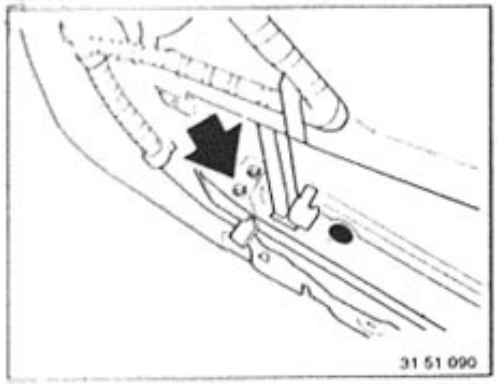
51 32 120 REMOVING AND INSTALLING FRONT OR REAR WINDOW GUIDE RAILS IN LEFT OR RIGHT FRONT DOOR

Remove door window – see 51 32 170.
Remove power window regulator – see 51 33 000.

Installation:
Install door window.
Adjust door window – see 51 32 154.



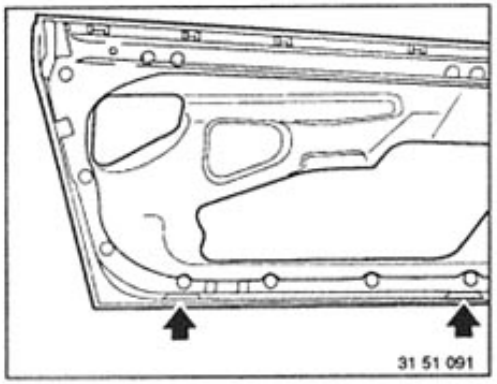
Unscrew screws and take off window guide rails.



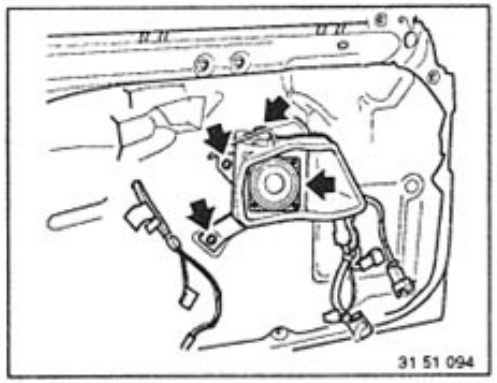
Installation:
Insert screw in inner threads of the rear window guide rail.

51 32 154 ADJUSTING FRONT DOOR WINDOW

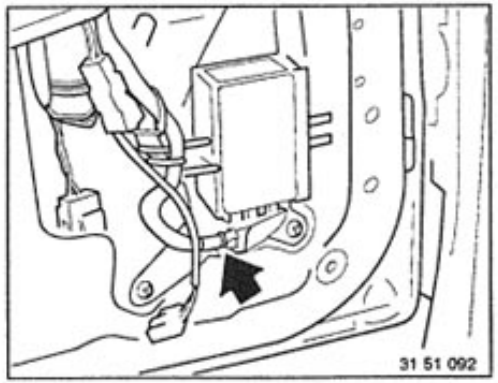
Requirements:
Door aligned correctly – see Group 41.
Seals in good condition and mounted correctly.



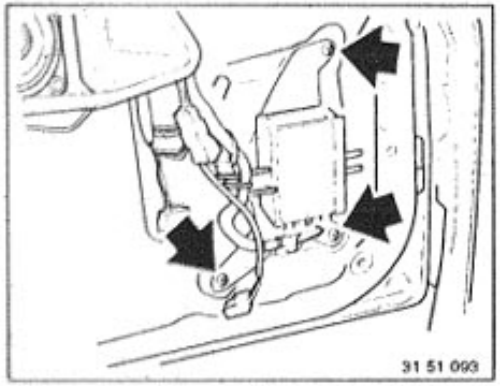
Note:
If only the submerged depth of the door window has to be corrected, it is not necessary to remove the door trim panel.
Lower door window, remove rubber plugs from underside of door and adjust the height stops through the open holes.



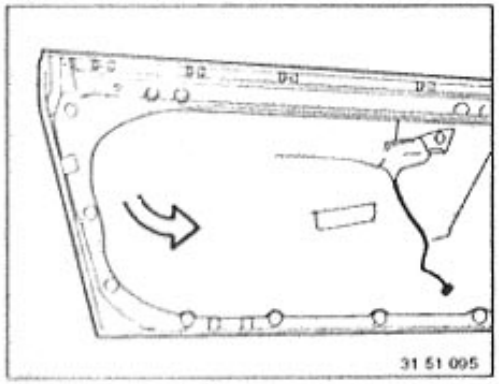
Remove door trim panel – see 51 41 000.
Unscrew screws, disconnect plug and take off loudspeaker.



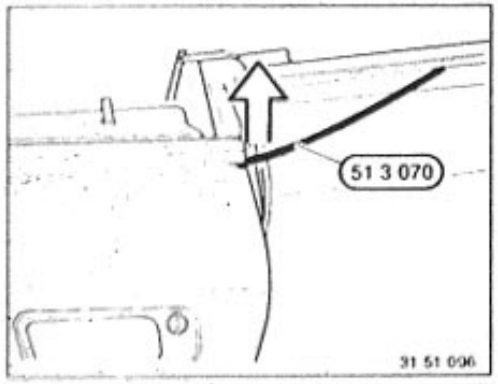
Disconnect ratchet strap and plug.



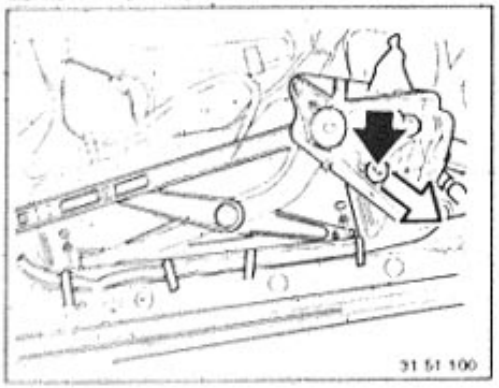
Unscrew screws and remove door module.



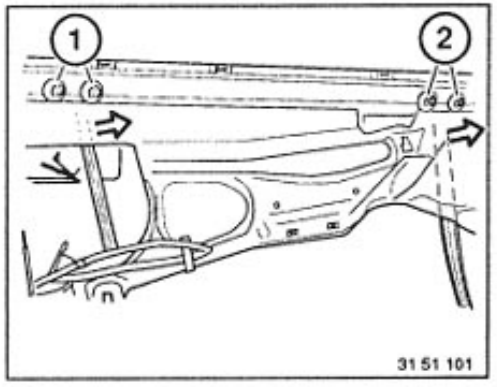
Pull cover off.



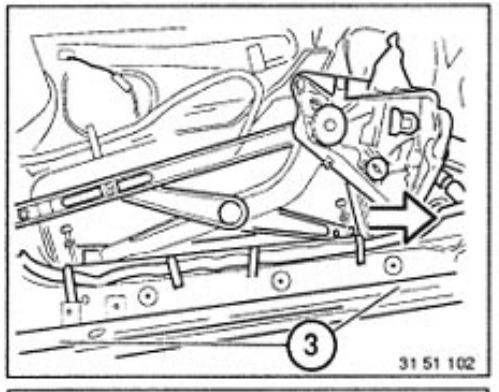
Lift window recess strip from above using Special Tool 51 3 070.



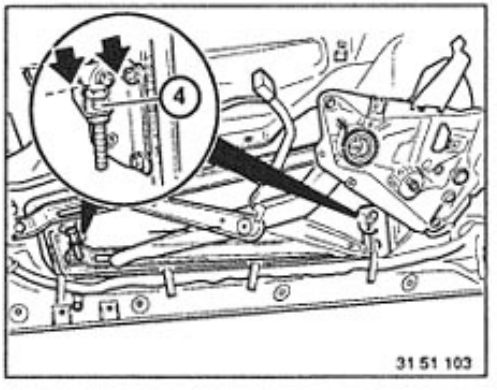
Connect power window switch and lower the door window.
Loosen screw and press down on main stop.



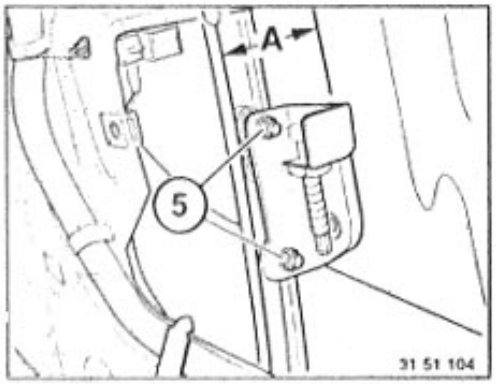
Raise the door window.
Loosen screws (1 and 2), press door window forward and place it on the door window seal.
Tighten screws (1 and 2).



Loosen screws (3) and press front and rear window guide rails in at the bottom the maximum amount towards the center of the car.
Tighten screws (3).

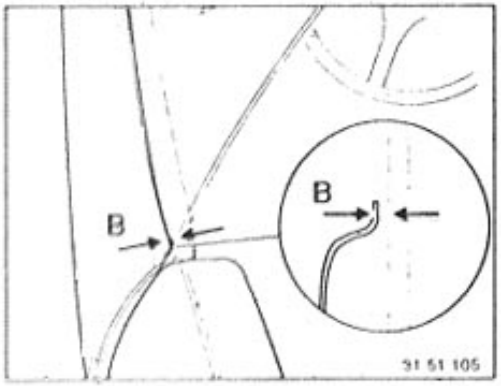


Lower the door window.
Screw height stops (4) in up to height of the edge.



Loosen screws (5) and adjust distance (A) between the door window glass and front / rear window guide rails.

Distance A = 30 mm.



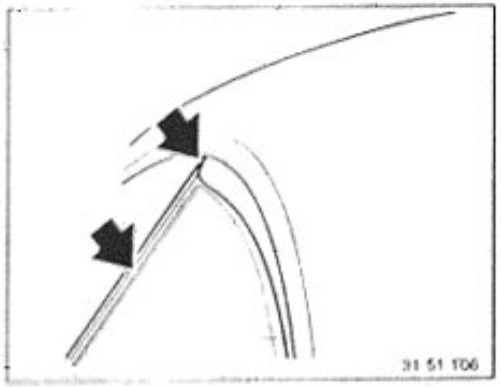
Raise the door window approx. 330 mm and adjust distance (B).

Distance B = 6 + 1 mm.

Note:
Distance (A) must not be changed.

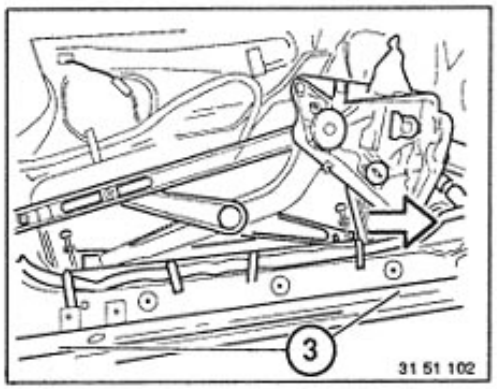
Tighten screws (5).

Installation:
Tightening torque*.



Mount window recess strip.
Lower rear side window completely.
Shut the door and raise the front door window so far that the glass pane is shortly before the seal.
Outside surfaces of the seal and door window glass must be flush.

* Refer to Specifications

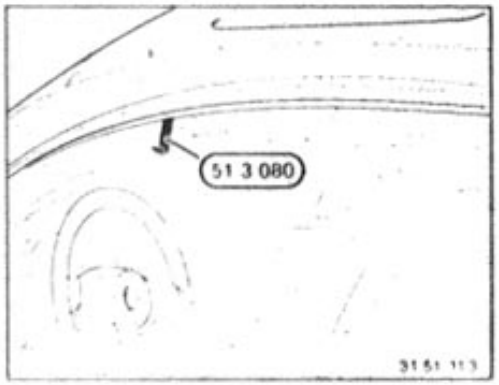


Correcting:
Loosen screws (3) at bottom of window guide rails and correct the angle of the door window glass.
Tighten screws (3).

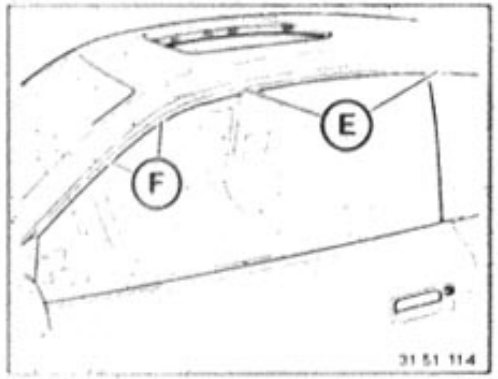
Connect the door module.
Shut the door.
Lower the door window, raise it completely and hold switch pressed about 3 seconds.

Initialization is correct, if

- the door window moves down several millimeters when lifting the door handle slightly or operating the inside door opener slightly and
- the door window moves up completely several seconds after releasing the door handle.



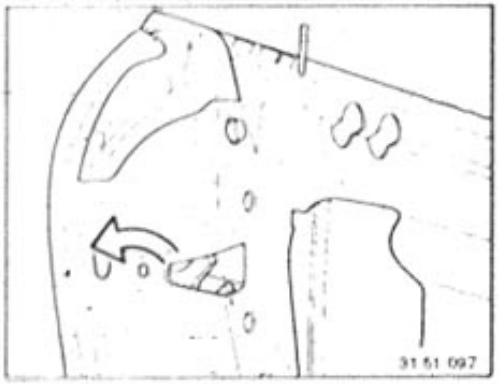
Shut the door.
Lower the door window about 25 mm and apply Special Tool 51 3 080 on the window (submersion depth).



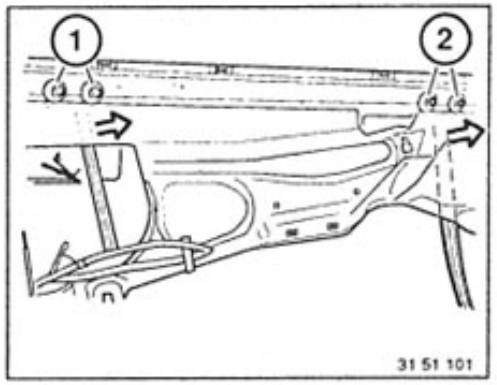
Raise the door window and check submerged depth (E and F).

Submerged depth E = 5 ± 1 mm
Submerged depth F = 2 ± 1 mm

Correct submerged depth (E) with help of height stops (4).

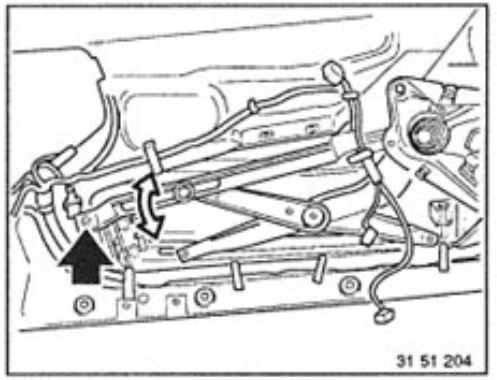


Note:
If the submerged depth does not have to be corrected, make a mark on the outside of the door window glass at the height of the window recess strip.
Open the door and turn striker in striker direction.
Run the door window to the marked position and unscrew height stops (4) to stop position plus one turn.
Remove the mark.
Operate door opener (striker opens).



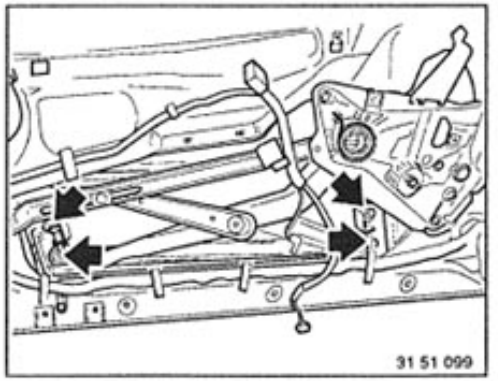
Correcting Submerged Depth (F):
Loosen screws (1 and 2) at top of the window guide rails.
Set the side window forward or back.
Tighten screws (2).
Lower and raise the window.
Tighten screws (1).

Note:
Always keep to the specified sequence to avoid operating noise later.



Correcting Submerged Depth Uniformly:

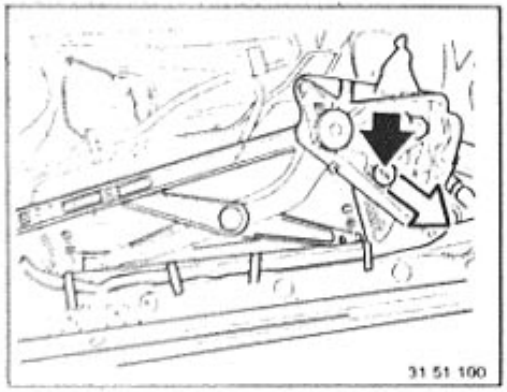
Rough Adjustment:
Loosen screw.
Swing the strut up or down.
Tighten screw.



Fine Adjustment:
Loosen screws and tilt the door window glass.
Tighten screws.

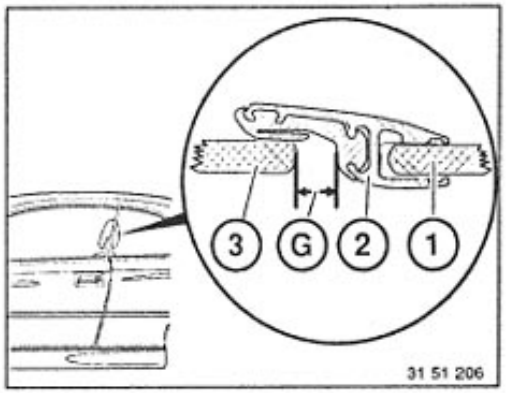
Installation:
Tightening torque*.

* Refer to Specifications



Shut the door and raise the door window.
Loosen screw and press main stop up to the stopping position.
Tighten screw.

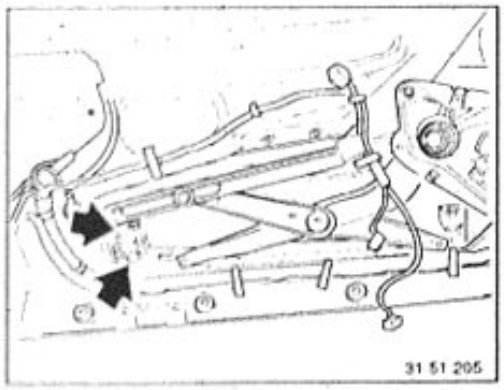
Installation:
Tightening torque*.



Raise the rear side window.
Check distance (G) and deviation in parallel between the rear side window and front door window.
If necessary, adjust the rear side window - refer to 51 34 154.

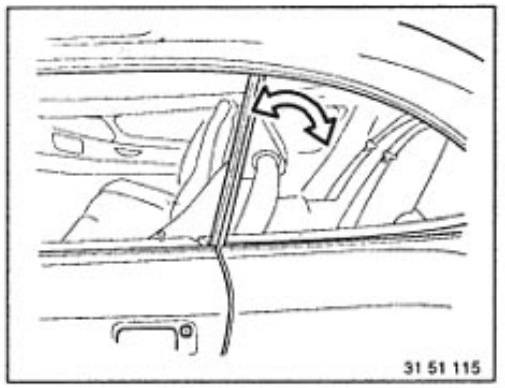
1 = Rear side window
2 = Rubber lip
3 = Front door window

Distance G = 5 mm.



Note:
If the door window glass falls forward or back while lowering or raising it, loosen the screws (raise the door window), press rear roller guide up against the stop into the guide rail and tighten screws.

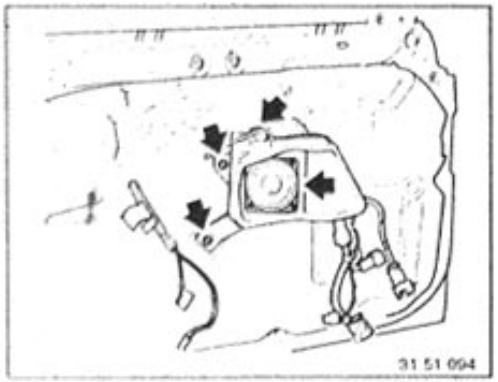
Installation:
Tightening torque*.



Lower the front door window about 25 mm.
Lower and raise the rear side window.
In so doing check overlapping between front door window and rear side window.
If necessary, preload the rear side window additionally - refer to 51 37 154.

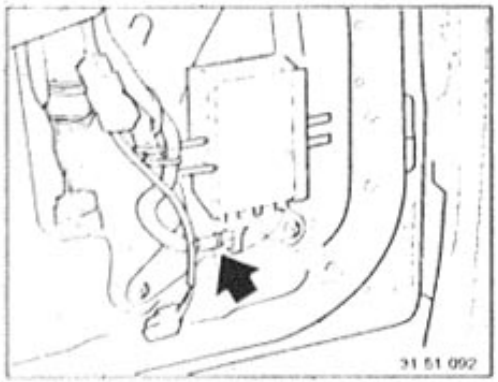
Reassemble door.

* Refer to Specifications



51 32 170 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR WINDOW

Remove door trim panel - refer to 51 41 000.
Unscrew screws.
Disconnect plug.
Remove loudspeaker.

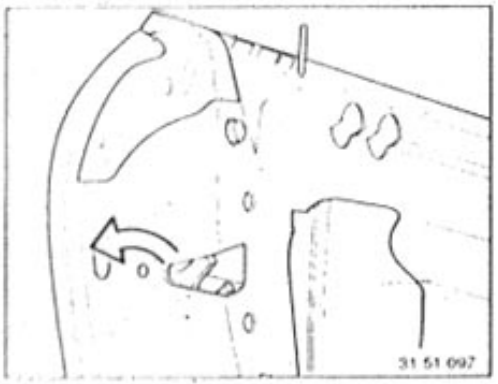


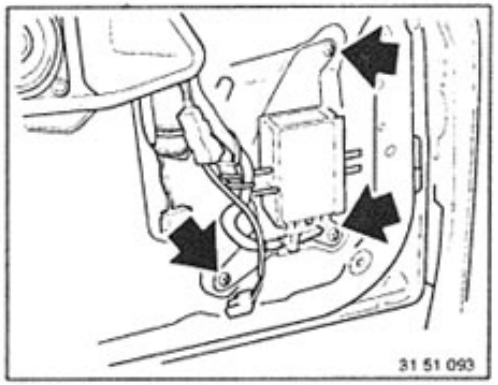
Loosen strap and disconnect plug.

Installation:
Connect door module and power window switch.
Turn striker to "door closed" position.
Raise the door window completely and hold switch pressed in about 3 seconds. Initialization of power window electronics is correct, if

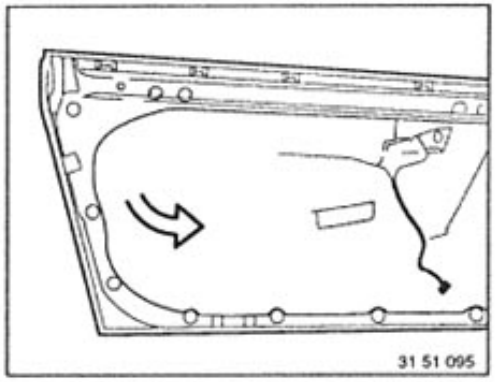
- the door window moves down several millimeters when lifting the door handle slightly or operating the inside door opener slightly and
- the door window moves up completely several seconds after releasing the door handle.

Unlock door.
Check and, if necessary, correct the door window adjustment - refer to 51 32 154.

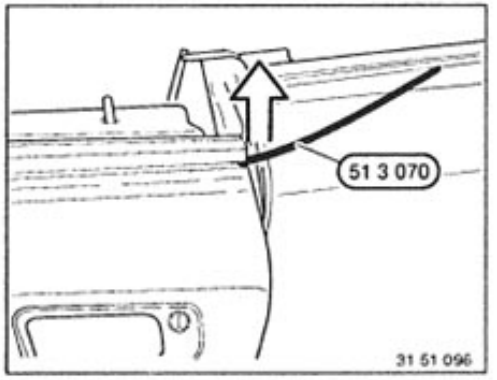




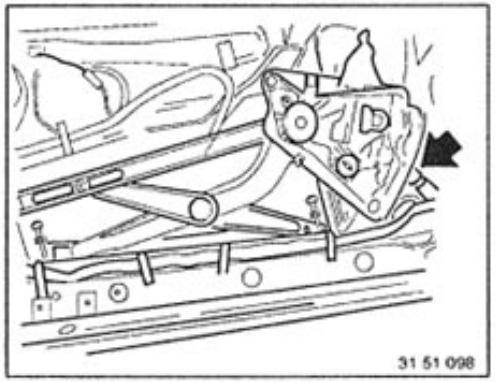
Unscrew screws and remove door module.



Pull cover off.

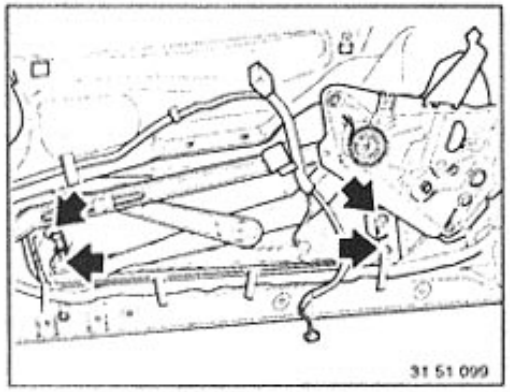


Lift window recess off from above using Special Tool 51 3 070.



Lower the door window.

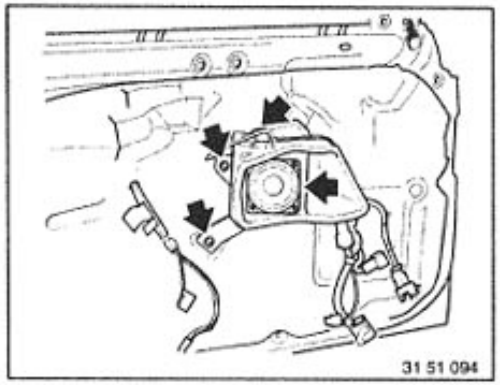
Caution!
Disconnect the plug on the power window motor in the interest of safety (danger of injury).



Hold tight on door window glass and unscrew screws.
Lift door window out from above.

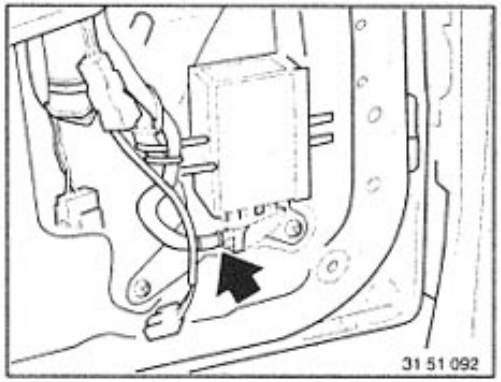
Installation:
Insert door window and install screws.
Press roller guides up into the guide rails as far as stops and tighten the screws.
Tightening torque*.

* Refer to Specifications



51 33 000 REMOVING AND INSTALLING POWER WINDOW REGULATOR IN FRONT DOOR

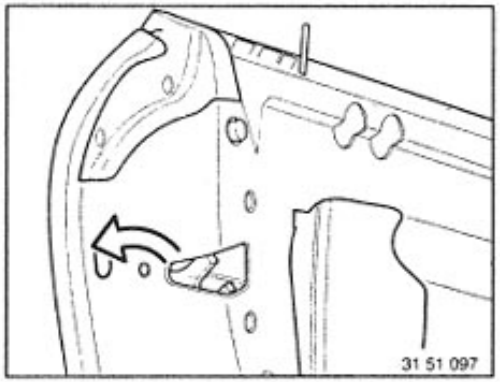
Remove door trim panel - refer to 51 41 000.
Unscrew screws.
Disconnect plug.
Remove loudspeaker.



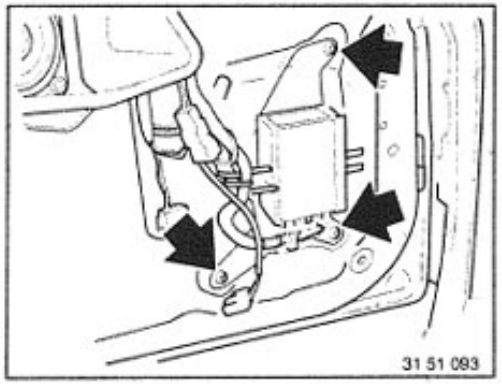
Loosen strap and disconnect plug.

Installation:
Connect door module and power window switch.
Turn striker to "door closed" position.
Raise the door window completely and hold switch pressed in about 3 seconds. Initialization of power window electronics is correct, if

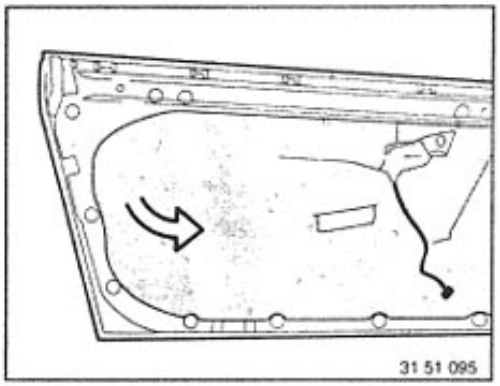
- the door window moves down several millimeters when lifting the door handle slightly or operating the inside door opener slightly and
- the door window moves up completely several seconds after releasing the door handle.



Unlock door.
Check and, if necessary, correct the door window adjustment - refer to 51 32 154.

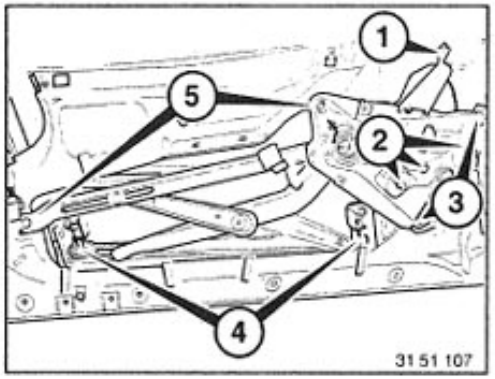


Unscrew screws and remove door module.



Pull cover off.

Caution!
Disconnect the plug on the power window motor in the interest of safety.



Unscrew screw (1) and remove cover.
Unscrew screws (3 ... 5).
Remove window regulator.

Installation:
Tightening torque*.

Note:
If the door window cannot be lowered, unscrew screws (2 and 3).
Pull window regulator forward slightly and move power window motor back off of the window regulator.
Press the window down by hand and unscrew screws (4).

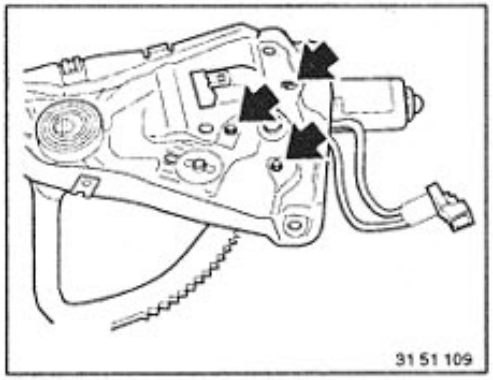
Caution!
Spring has great force – danger of clamping.

Note:
In case of a window regulator riveted to the door panel, rivets must be ground off and replaced by M 6 x 12 mm screws, washers and self-locking nuts.

* Refer to Specifications

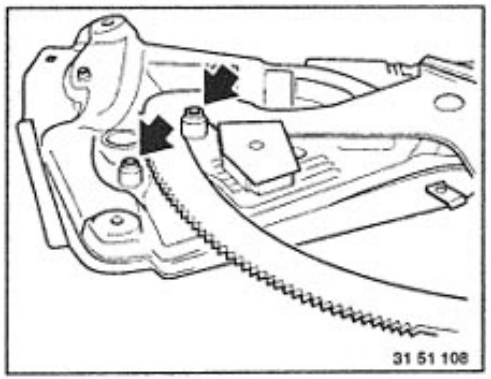
51 33 020 REMOVING AND INSTALLING MOTOR FOR POWER WINDOW REGULATOR IN FRONT DOOR

Remove power window regulator – see 51 33 000.



Unscrew screws and take off power window motor.

Installation:
Tightening torque*.



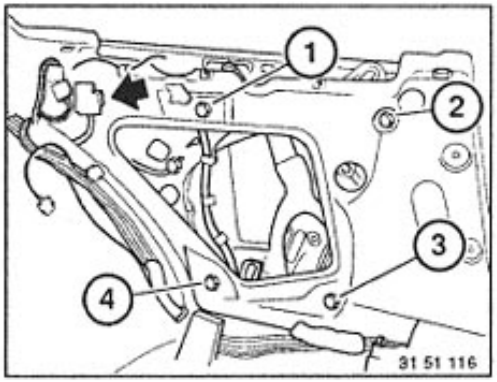
Installation:
Check installed direction of spacers.

* See Specifications

51 37 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR POWER WINDOW REGULATOR

Installation:
Adjust side window - refer to 51 37 154.

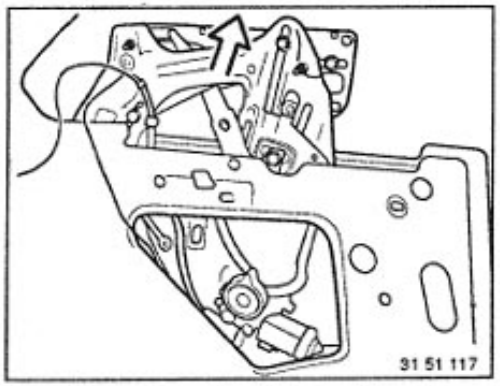
Remove rear side window - refer to 51 37 171.
Run window regulator up completely.



Disconnect plug.
Unscrew nuts (1 ... 3) and screw (4).
If necessary, loosen and tighten nuts and bolts with help of Special Tool 41 6 100.

Press window regulator towards outside and screw bolts (1 and 2) in completely.

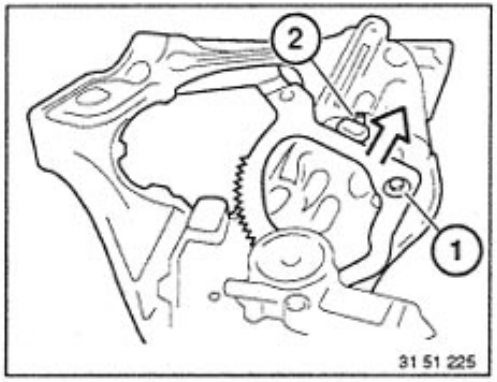
Installation:
Screw bolt (3) in as far as stop in the window regulator.



Lift window regulator out from above.

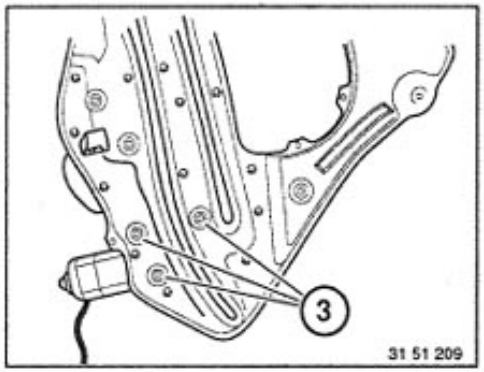
51 37 020 REMOVING AND INSTALLING MOTOR FOR LEFT OR RIGHT REAR POWER WINDOW REGULATOR

Remove rear power window regulator - refer to 51 37 000.



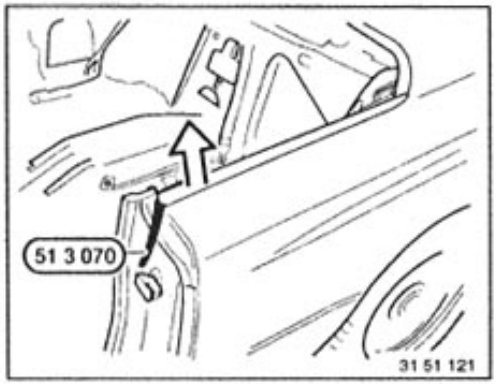
Unscrew screws (1 and 2).
Disengage toothed element upwards off of the power window motor.

Installation:
Tightening torque*.



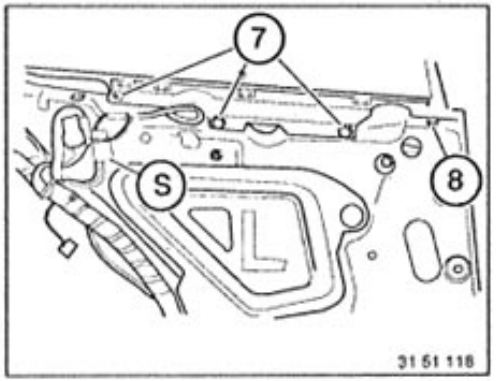
Turn power window regulator around, unscrew screws (3) and remove motor.

* Refer to Specifications



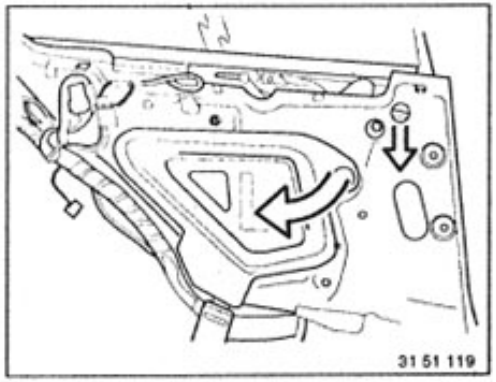
51 37 154 ADJUSTING LEFT OR RIGHT REAR SIDE WINDOW (WITH WINDOW REGULATOR)

Remove rear seat – see Group 52.
Remove rear side trim panel – see 51 43 000.
Lift off window recess strip from above with Special Tool 51 3 070.

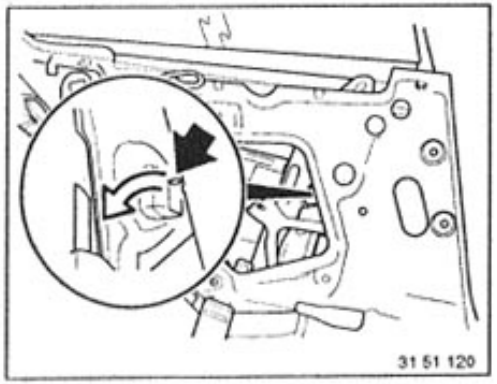


Unscrew screws (7).
Loosen stop screw (8), push back and lift off connecting bracket.

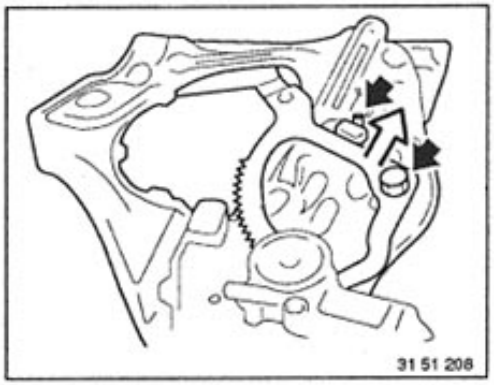
S = Plug for power window motor



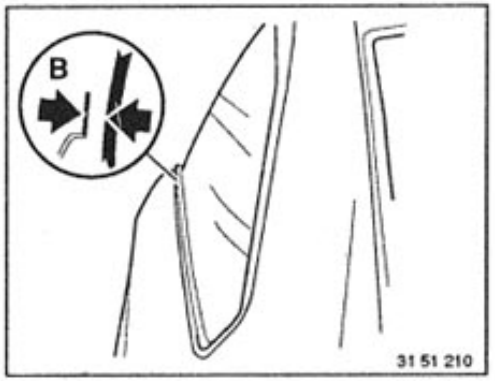
Pull off covers.



Loosen screw and push back main stop maximum distance.

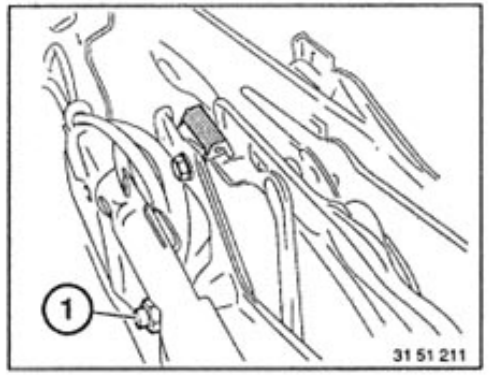


Loosen screw and push up hook completely.



Raise side window approx. 350 mm (13.780") and adjust distance (B) with adjusting screw (2).

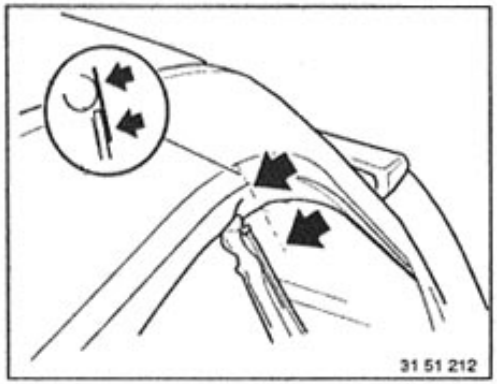
Distance B = 6 + 1 mm (0.236 + 0.039").



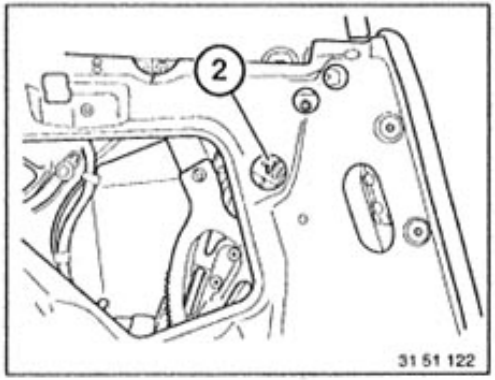
Loosen or tighten adjusting screw (1) until the hook overlaps (grabs).

Note:
Height of hook is adjusted later in a final step.

Mount outside recess seal and connecting bracket.
Adjust front stop to maximum travel.



Raise the side window enough until it is shortly before the seal.
Outside surfaces of seal and window glass must be flush in the front zone of the side window.

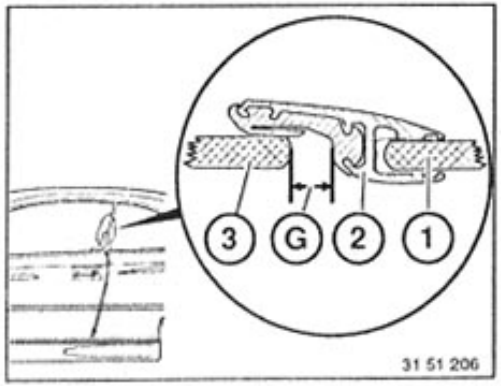


Correcting:

Caution!
Disconnect the power window motor plug in the interest of safety.

Loosen lower nut (2) on adjusting screw of the side window and correct the angle of the side window glass.
Tighten nut (2).

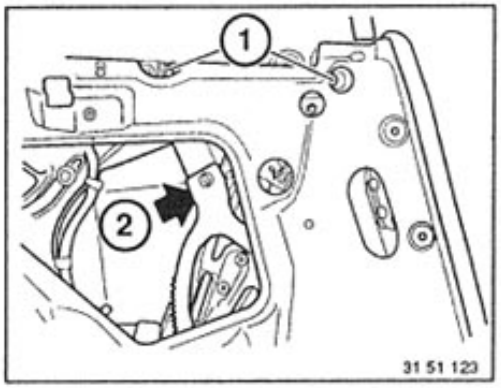
If applicable, connect plug on the power window motor and raise the side window completely.



Check distance (G) and deviation in parallel between the rear side window and front door window.

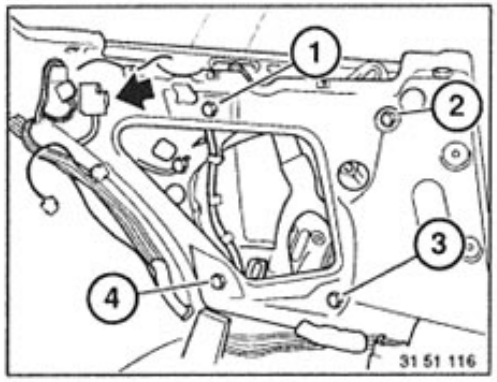
1 Rear side window
2 Rubber lip
3 Front door window

Distance G = 6 mm.



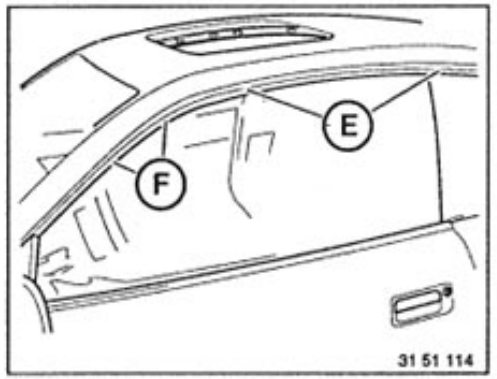
Correcting Parallel Deviation:
Loosen screws (1) and tilt the side window glass.
Tighten screws (1).

Installation:
Tighten torque*.



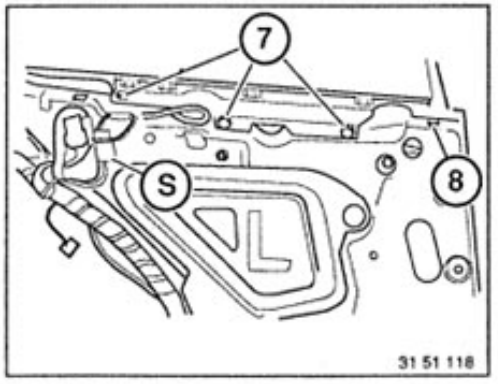
Correcting Distance (G):
Loosen nuts (1 ... 3) and screw (4).
Move the side window and window regulator towards front or rear.
Tighten nuts (1 ... 3) and screw (4).

Installation:
Tighten torque*.



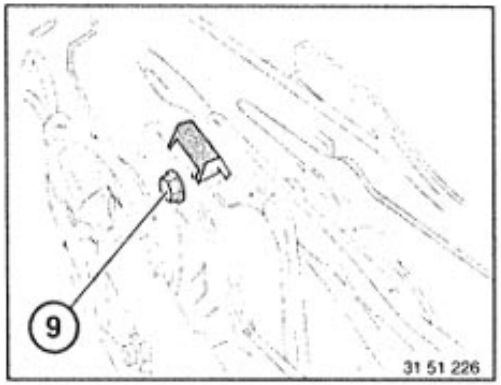
Lower the side window about 25 mm and apply Special Tool 51 3 080 on the window glass.
Raise the window and check submerged depth (E) in the front zone of the side window.

Submerged depth E = 5 ± 1 mm.

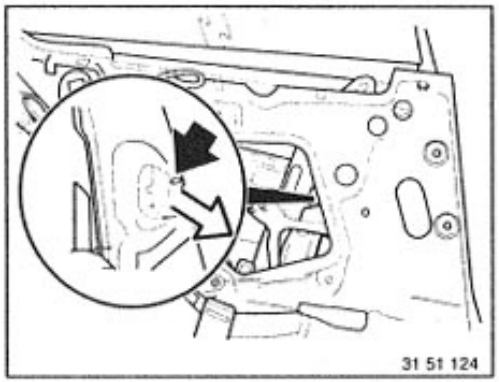


Correct on stop screw (8).

* Refer to Specifications

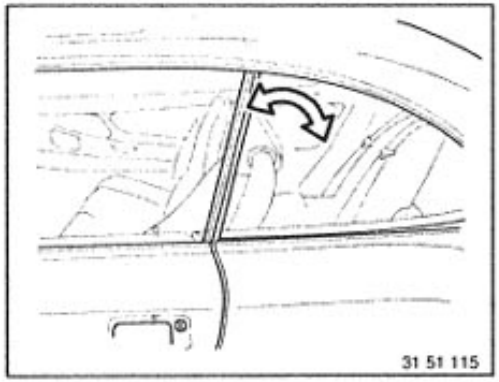


Loosen screw (9).
Press hook down onto the stop and tighten adjusting screw (9).



Loosen screw (2) and press main stop forward onto the stop.
Tighten screw (2).

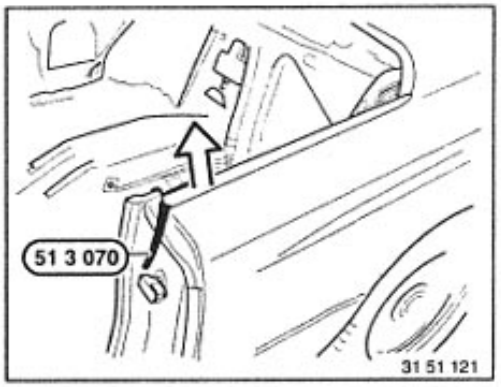
Installation:
Tightening torque*.



Lower the front door window about 25 mm.
Lower and raise the rear side window and check overlapping of the front door window and rear side window.
If applicable, preload the rear side window further.

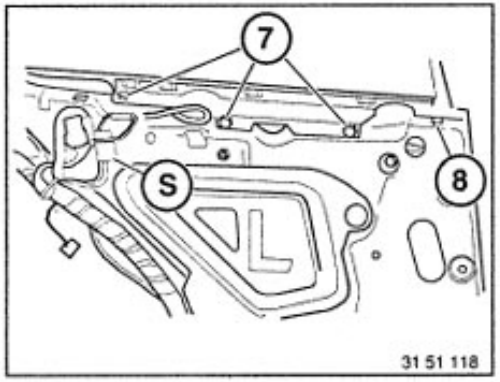
Note:
The rear side window must compensate all tolerances (glass cutting, body tolerances, etc.).
Consequently in some cases it might be necessary to deviate from the specified adjusting values.

* Refer to Specifications



51 37 171 REPLACING LEFT OR RIGHT REAR SIDE WINDOW

Remove rear seat - refer to 52 20 100.
Remove rear side trim panel - refer to 51 43 000.
Lift window recess strip off from above using Special Tool 51 3 070.

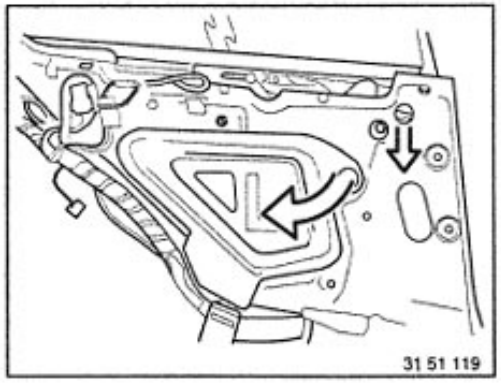


Unscrew screws (7).
Loosen screw (8).
Push back and lift off connecting bracket.

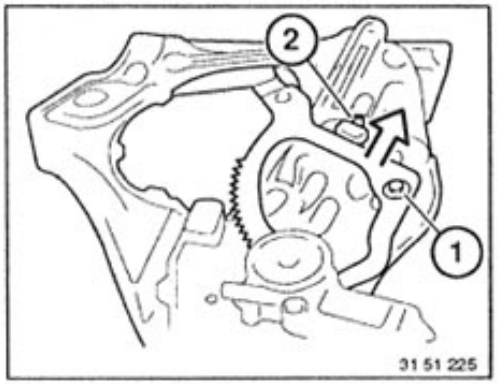
Installation:
Adjust rear side window - refer to 51 37 154.

Raise the side window and run it out of the seal by about 20 mm.

Caution!
Disconnect plug (5) on the power window motor in the interest of safety.

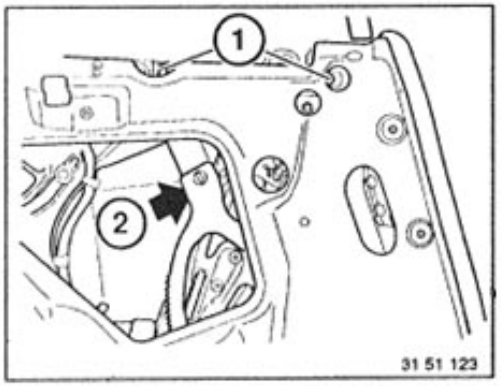


Pull covers off.

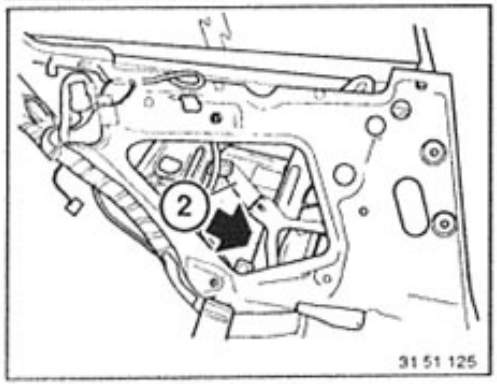


Note:
If the window cannot be operated electrically, unscrew screw (1) and disengage toothed element upwards off of the power window motor.
Main stop (2) must be unscrewed according to the position of the side window.

Installation:
Tightening torque*.



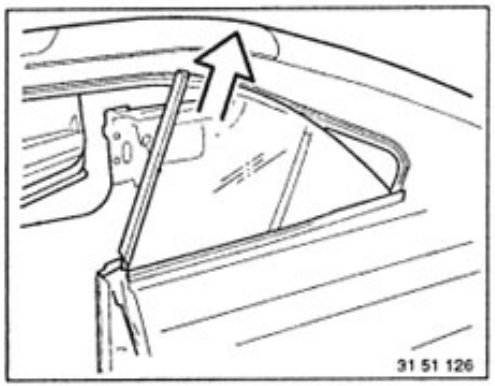
Unscrew screws (1) and nut on adjusting screw (2).
Screw adjusting screw in completely.

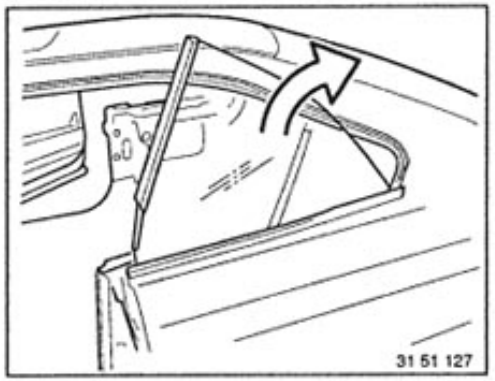


Hold tight on the side window, press in at top and swing adjusting screw (2) out of the window regulator at the bottom.
Lower the side window and tighten adjusting screw (2).

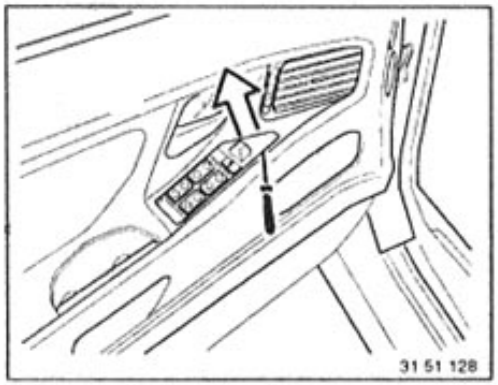
Installation:
Tightening torque*.

* **Refer to Specifications**





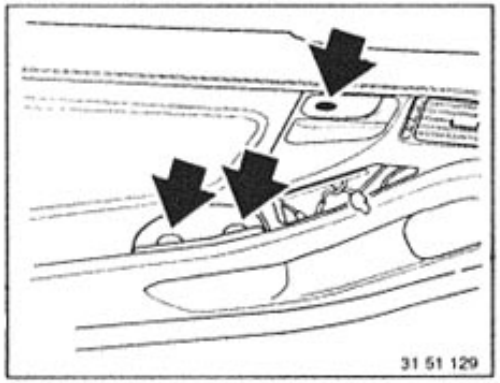
If necessary, remove the front stop.
Lift and twist the side window out from above.



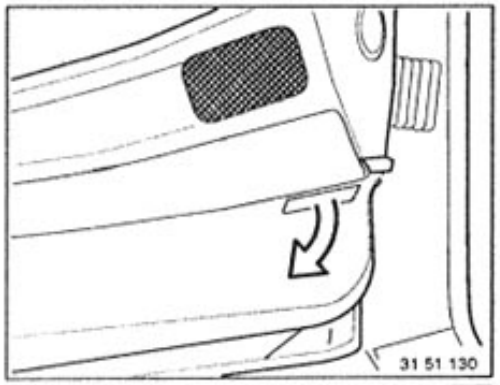
51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL

Lift out control and disconnect plug.

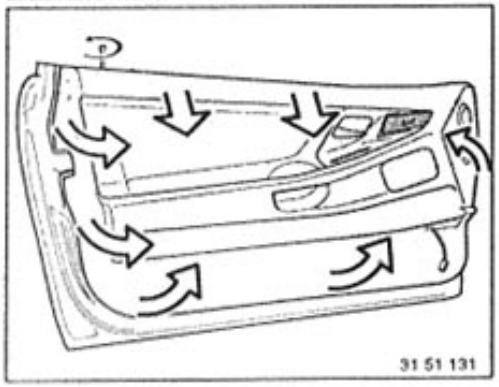
Installation:
Check for correct seating of hook!



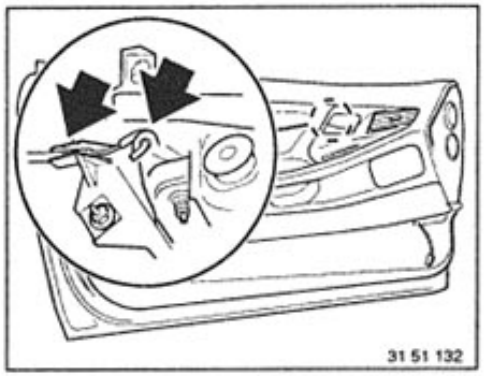
Lift out plates and unscrew screws.



Lift out light and disconnect plug.



Unscrew catch button.
Unclip door trim panel all around.

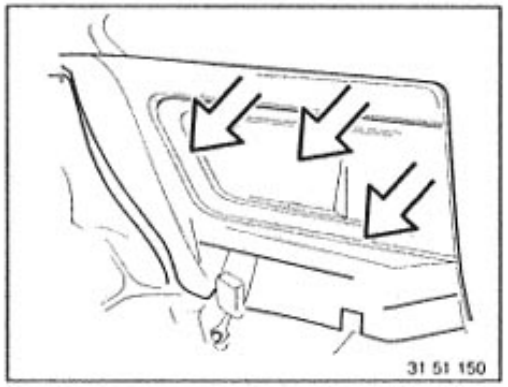


Lift off door trim panel.
Disconnect plug.
Disconnect door unlocking cable.

Installation:
Check for correct seating of cable!

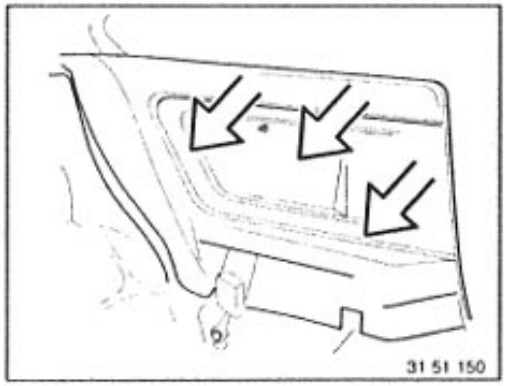
51 43 000 Removing and installing or replacing left or right side trim panel

Open door window and side window.
Slide front seat forwards.



One-piece back seat:

Unclip trim sections and lift out upwards.



Folding back seat backrests:

Remove back seat, see 52 20 100.

Unclip trim and lift out upwards.



51 43 251 Replacing rear left or right roof pillar trim

Unclip finisher on C-pillar.

Unfasten connector from rear window heating and rear window antenna.

51 44 011 REPLACING ROOF LINER

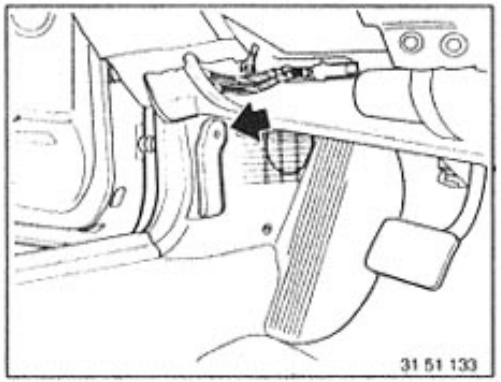
Lower all windows.
Pull off left and right edge guards partially.
Unclip A-pillar plates.
Unclip C-pillar plates.
Remove left and right sun visors with holders.

Unclip left and right inside lights.
Close sun roof completely and press in retainers for sun roof opening roof liner all around.
Unclip trim panel (sun roof switch).

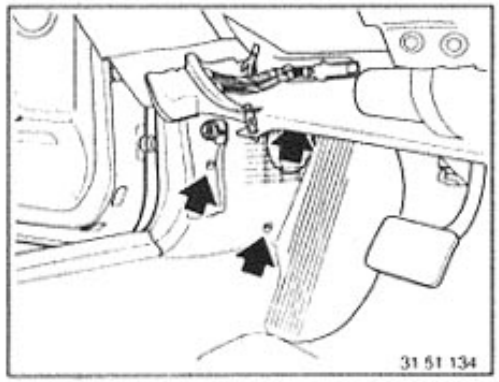
Lower front end of roof liner, push back and disconnect on metal fold.
Lift out roof liner from the side.

51 45 030 Removing and installing trim from instrument panel

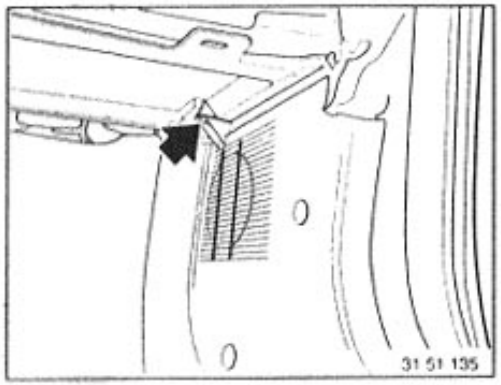
Remove steering wheel, see 32 33 000.
Remove switch for steering column adjustment and allow to hang down, see 61 31 035.
Remove instrument carrier, see 62 21 000.
Remove glovebox, see 51 16 200.
If necessary, remove passenger airbag, see 32 34 504.



Unfasten screw and remove lever for unlocking front lid.

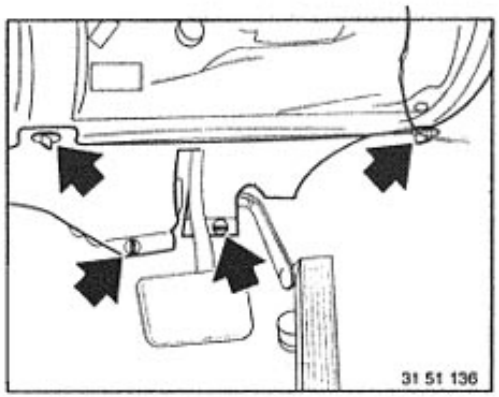


Twist clips and remove trim from left side.



In addition, on the right side:

Unfasten screws.

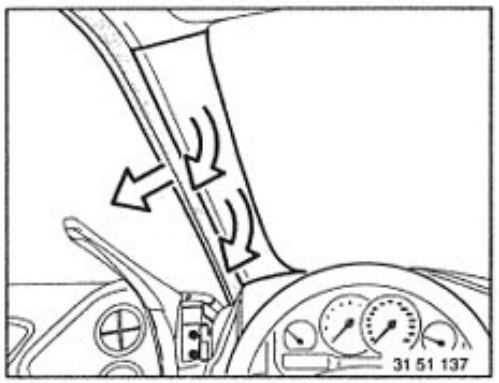


Twist clips and remove rear instrument door panel - lower section of trim.

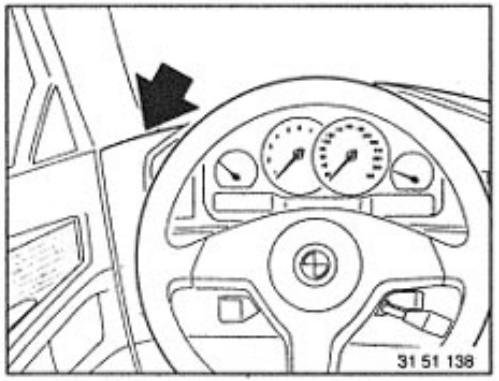
In addition, on the right side:

Unfasten connector.

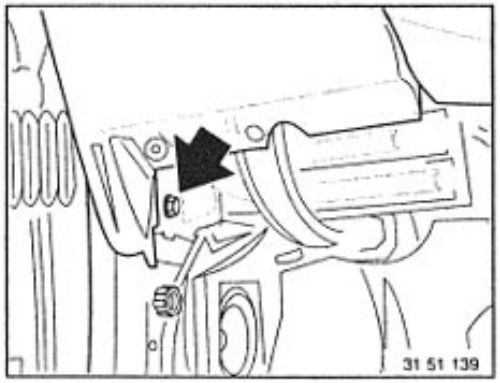
Installation:
Ensure that heating ducts are correctly seated.



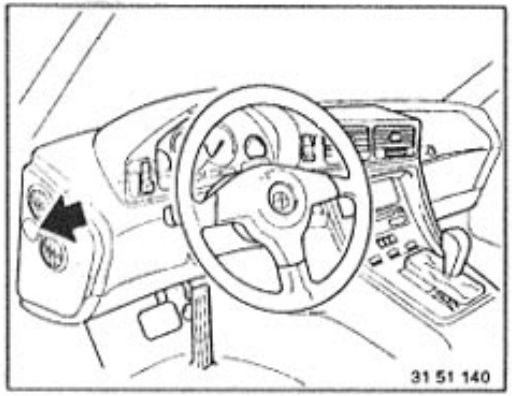
Unclip A-pillar finishers on left and right sides.



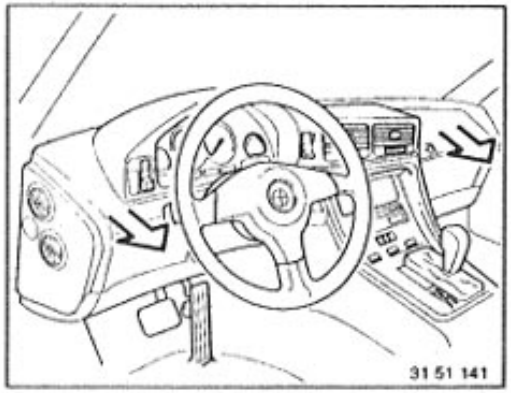
Unfasten screws on front left and right sides.



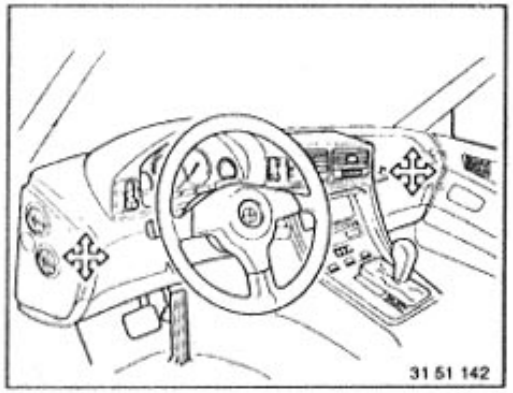
Loosen screws on left and right sides (footwell).



Lift left and right plates out and unscrew plates.



Lift dashboard out towards rear.
Disconnect plugs.



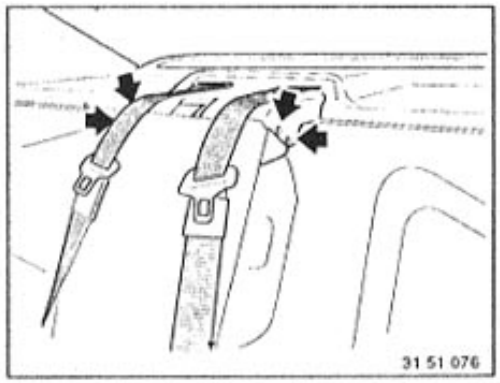
Installation:
Align dashboard and door trim panels with the doors shut.

51 46 000 Removing and installing or replacing trim for rear window shelf
51 46 002 Replace trim for rear window shelf (with rear sun roller blind)

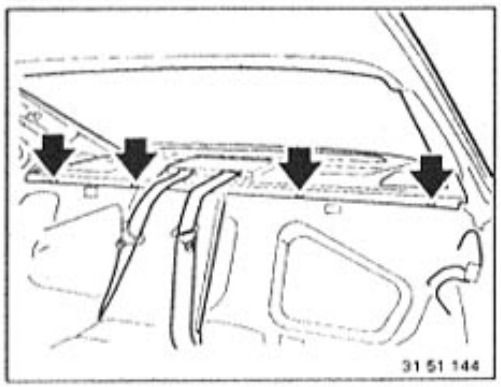
Remove both back seats, see 52 20 100.
Remove rear sections of side trim, see 51 43 000.

In addition, on vehicles fitted with a rear window roller blind:

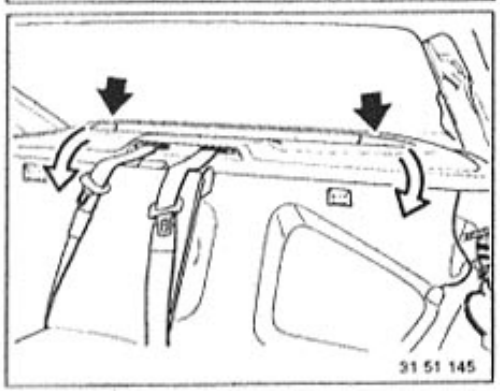
Remove trim sections on both C-pillars, see 51 43 251.

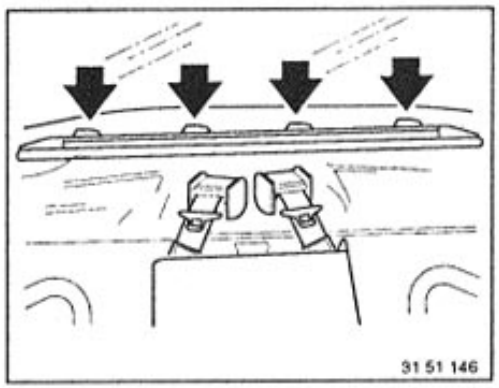


Lift clips up to remove.

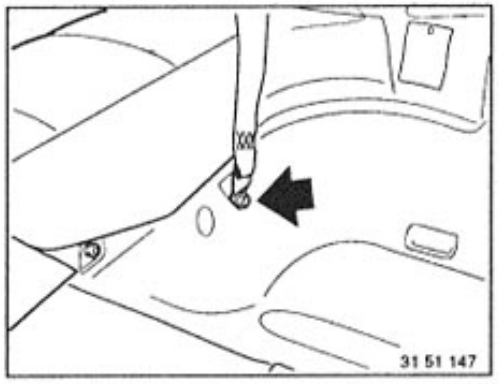


Carefully guide left, then right, sides of sun roller blind through rear window shelf.



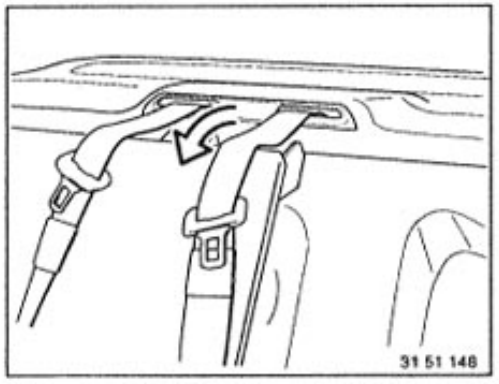


Installation:
Carefully guide sun roller blind through the rear window shelf (first the right corner, then the left), then slide the rear window shelf backwards, guiding the retaining clips over the recesses where they should engage. Press on burr fasteners.

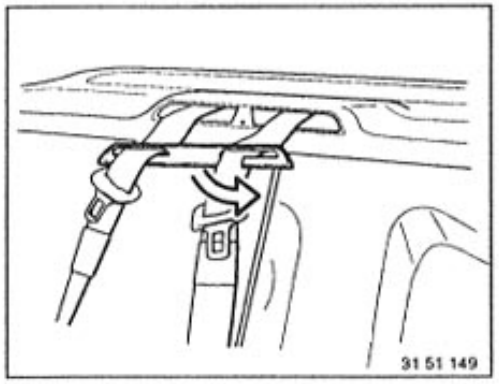


Unfasten seatbelt on left and right sides.

Installation:
Tightening torque 72 11 1AZ*



Unclip seatbelt guide from inside.



Remove seatbelt out of guide by lifting to side.
Remove rear seat shelf.

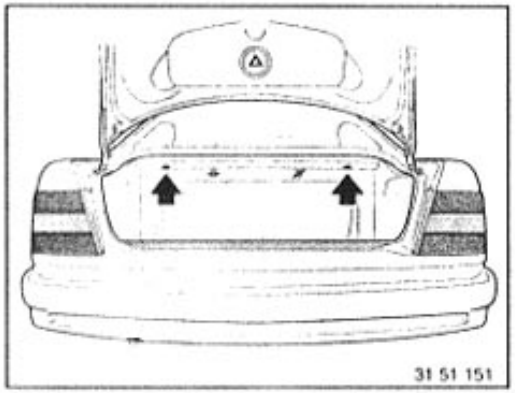
Only replacement:

Remove loudspeaker finishers.

* Refer to Technical Data

51 46 013 Removing and installing or replacing sun roller blind

Remove rear seat shelf, see 51 46 002.



Open trunk lid and unfasten screws.
Unfasten connector and remove sun roller blind.

Only replacement:

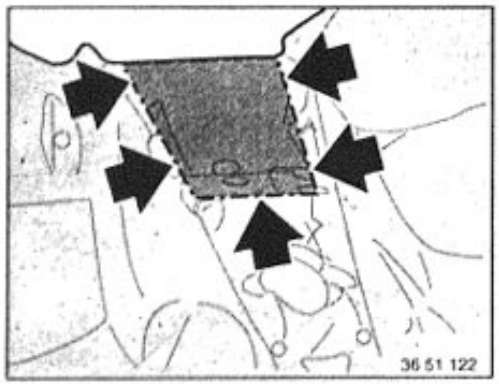
Remove control unit for sun roller blind on rear window.

51 47 315 REMOVING AND INSTALLING FRONT AND REAR CARPETS FOR PASSENGER COMPARTMENT

Disconnect battery - refer to Gr. 61.
Remove seats - refer to Gr. 52.
Remove center console, dashboard and front side trim panels (footwells) - refer to Gr. 51.
Remove accelerator pedal and full load stop - refer to Gr. 35.

Disconnect or unscrew left and right entrance strips, wire plugs and wire straps as well as plug plate in front of the shift gate.
Disconnect plug and loosen strap in front of the parking brake lever.
Remove the parking brake lever.

Unscrew plastic nuts securing carpets and wire straps on the cardan tunnel.



Installation:
The old or new carpet must then be cut out in the tunnel zone.

52 0 ... DIAGNOSING DAMAGE OF BELT SYSTEM INTEGRATED IN FRONT SEAT AFTER ACCIDENT

In the interest of occupants' safety no other repairs are permitted than those described below! Damaged components must be replaced!

Reference must be taken to the following criteria when diagnosing damage.

- Backrest play, measured at upper belt outlet point perpendicular to the backrest = max. 20 mm.

  Measuring maximum backrest play:
  Set seat to highest height position and backrest to most upright position.
  Press backrest against front stop with force of about 200 N.
  Measure distance perpendicular to backrest from upper belt outlet point to windshield and note value.
  Now press backrest against rear stop with force of about 200 N and again measure distance perpendicular to backrest from upper belt outlet point to windshield.
  The difference of both measured distances is the backrest play.

- Bending of belt anchors on seat frame (for both lower belt points) towards seat cushion, i.e. belt lock bears on seat cushion.

  Belt anchors may be bent back to their original position without effecting the vehicle's safety.

- All disturbances such as noise, seizure, hesitation, etc. as well as not reaching the final positions for all seat control functions.

- Front-end Collision

  Refer to the diagram for sequence of procedure. Indicators for the stress of the seat after a front-end collision are chiefly the belt anchors on the seat frame.
  It can be recognized on them, whether forces had been exerted to the belt system.
  This will be noticed on the bending of anchors towards the seat cushion and will always make it necessary to inspect the seat outside of the car.

- Rear-end Collision

  Refer to the diagram for sequence of procedure. The chief indicator for stress of the seat-integrated belt system after a rear-end collision is excessive backrest play.
  This point must be given special attention when checking.

- Side Collision, Oblique Collision and Rollover

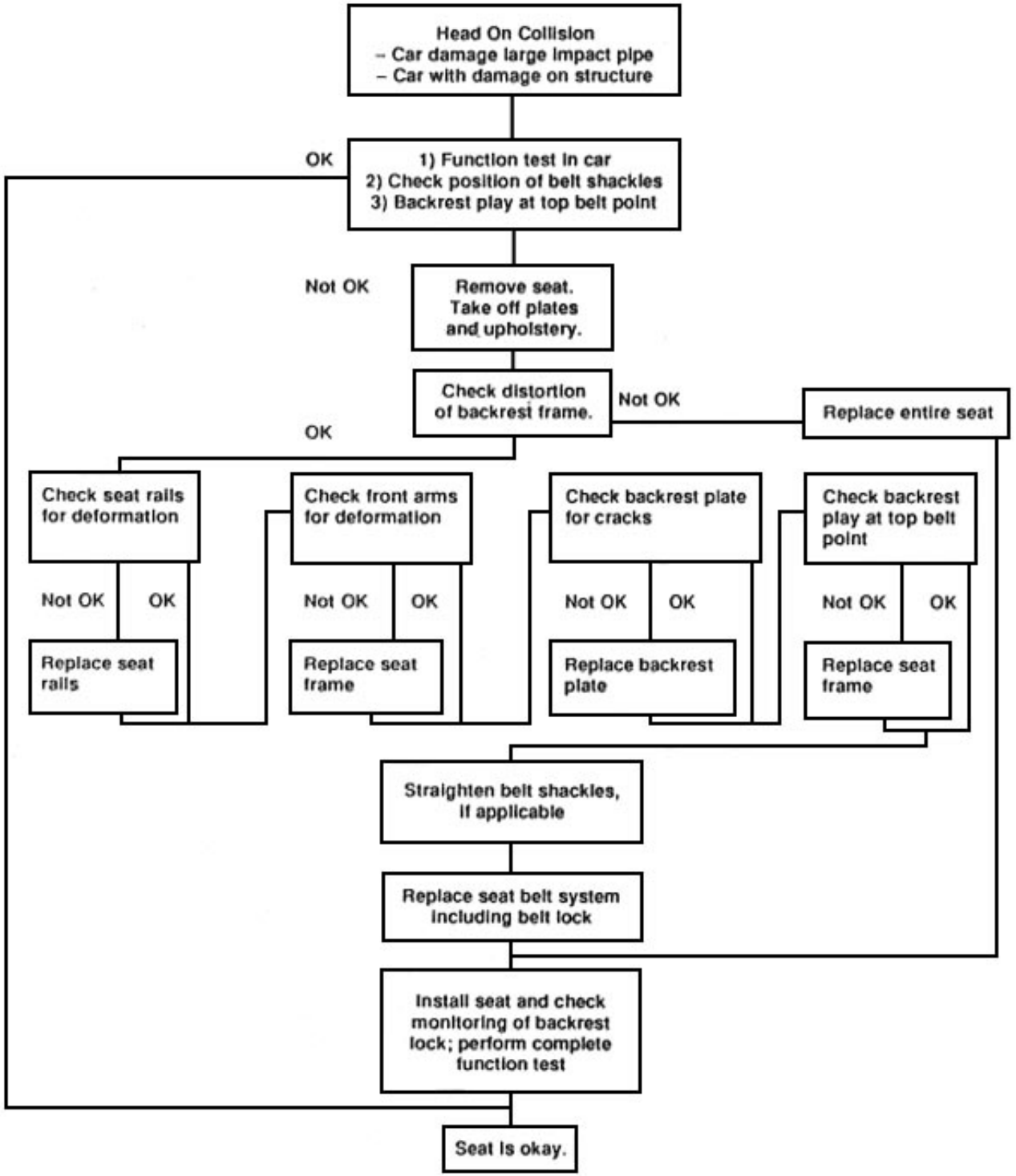
  Proceed as described for the front-end collision if belt anchors on the seat frame are bent (belt lock bears on seat cushion).

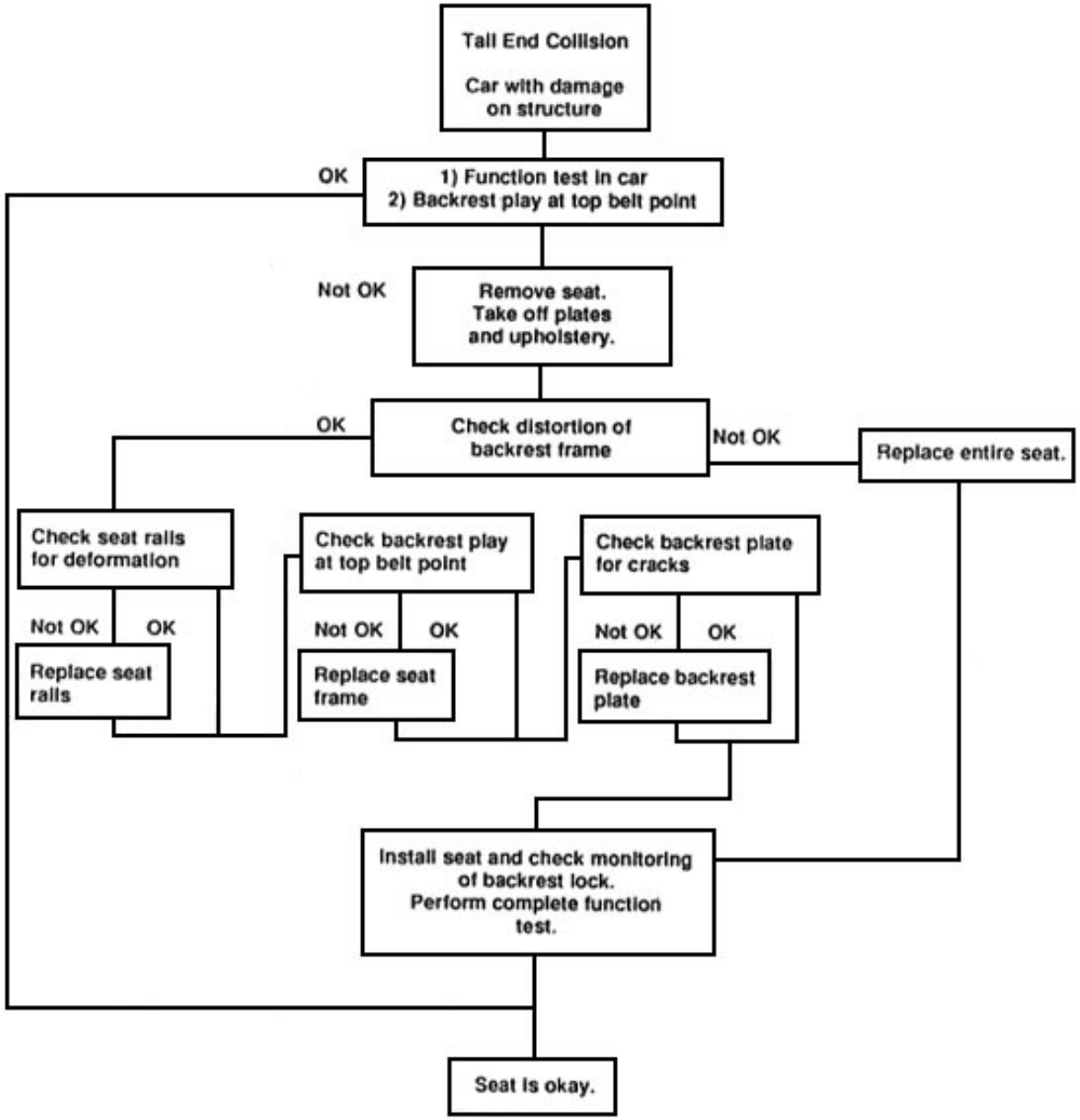
  Proceed as described for the rear-end collision if belt anchors are not bent, but considerable backrest play is noticed.
  If the seat is within the zone in which the car is deformed, replace the damaged parts or components.

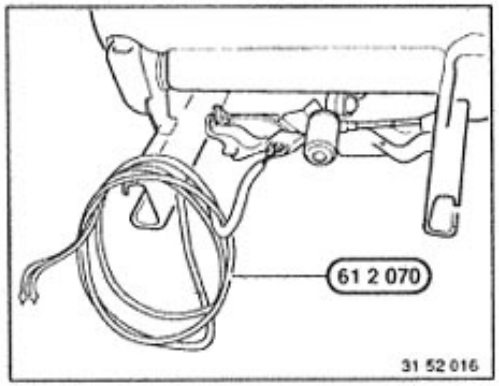
Notes:

Electrically Operated Seats:

Troubleshooting electronics:
refer to Car Electric/Electronic Test Plan.

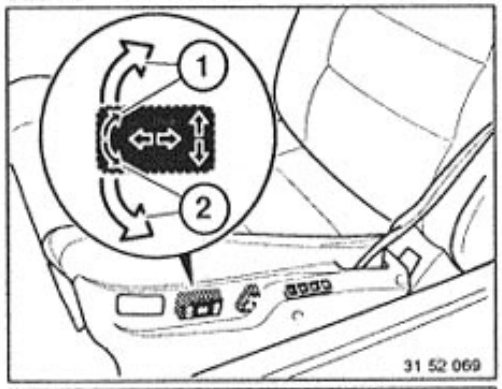

Head On Collision
– Car damage large impact pipe
– Car with damage on structure
OK
1) Function test in car
2) Check position of belt shackles
3) Backrest play at top belt point
Not OK
Remove seat.
Take off plates
and upholstery.
Check distortion
of backrest frame.
Not OK
Replace entire seat
OK
Check seat rails
for deformation
Check front arms
for deformation
Check backrest plate
for cracks
Check backrest
play at top belt
point
Not OK
OK
Not OK
OK
Not OK
OK
Not OK
OK
Replace seat
rails
Replace seat
frame
Replace backrest
plate
Replace seat
frame
Straighten belt shackles,
if applicable
Replace seat belt system
including belt lock
Install seat and check
monitoring of backrest
lock; perform complete
function test
Seat is okay.


Tail End Collision
Car with damage on structure
OK
1) Function test in car
2) Backrest play at top belt point
Not OK
Remove seat.
Take off plates and upholstery.
OK
Check distortion of backrest frame
Not OK
Replace entire seat.
Check seat rails for deformation
Not OK
OK
Replace seat rails
Check backrest play at top belt point
Not OK
OK
Replace seat frame
Check backrest plate for cracks
Not OK
OK
Replace backrest plate
Install seat and check monitoring of backrest lock.
Perform complete function test.
Seat is okay.



52 0 . . . CHECKING FUNCTION OF ELECTRIC FRONT SEAT ADJUSTMENT

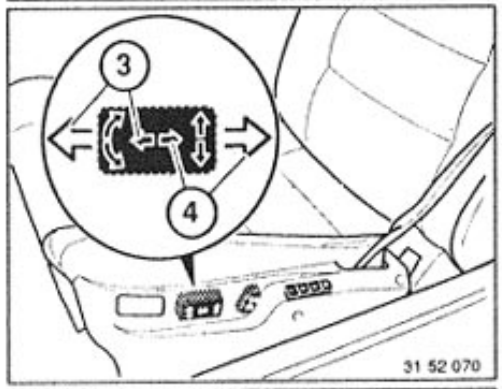
If applicable on removed seat, connect Special Tool 61 2 070 (adapter lead) to white plug (outer) and 12 V power supply source.
Carry out test.



Inclination Adjustment:

Front end of seat inclined upwards (1).
Front end of seat inclined downwards (2).

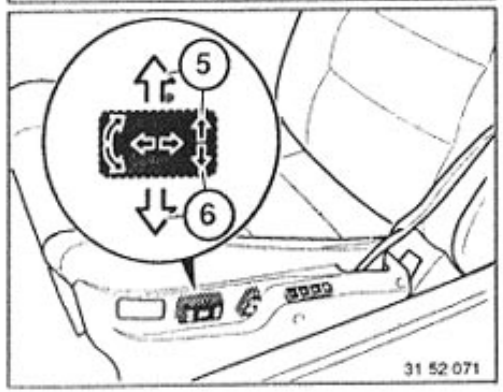
Maximum adjustment distance between (1) and (2), measured at front edge of seat = approx. 45 mm.



Axial Adjustment:

Seat moved forward (3).
Seat moved back (4).

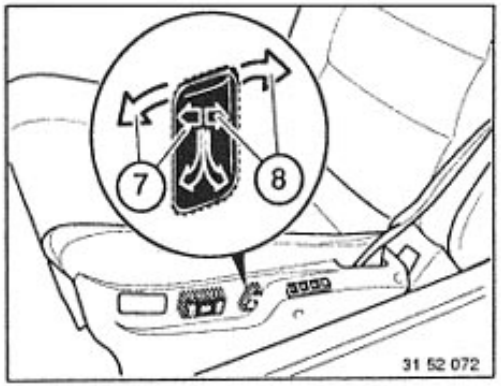
Maximum adjustment distance between (3) and (4) = approx. 170 mm.



Height Adjustment:

Seat moved up (5), headrest down.
Seat moved down (6), headrest up.

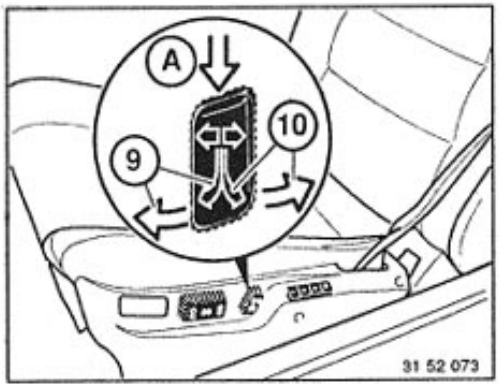
Maximum adjustment distance of seat between (5) and (6) = approx. 40 mm and of headrest = approx. 30 mm.



Backrest Inclination Adjustment:

Backrest moved forward (7), headrest down.
Backrest moved back (8), headrest up.

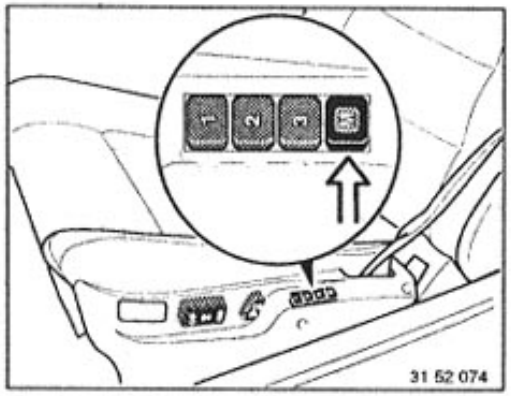
Maximum adjustment distance between (7) and (8) as measured at upper edge of backrest = approx. 185 mm, and of headrest = approx. 10 mm.



Lumbar Support:

Press switch downwards (A).
The lumbar support can only be operated in this position.
Inflating (9).
Deflating (10).

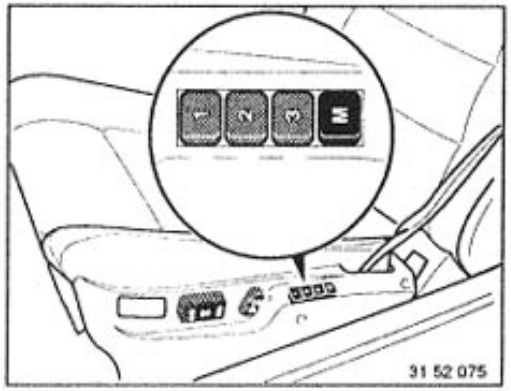
Note:
The position of the lumbar support cannot be stored in the memory.



52 0 . . . CHECKING FUNCTION OF MEMORY

Storing Positions in Memory:

Move the seat, outside mirrors and steering wheel to desired positions.
Press key (M=, which lights up.
Then press program key (1, 2 or 3).
Light in key (m) goes out and storing has been completed.



Calling Positions Stored in Memory:

Press program key (1, 2 or 3) so long until all motors have been switched off.

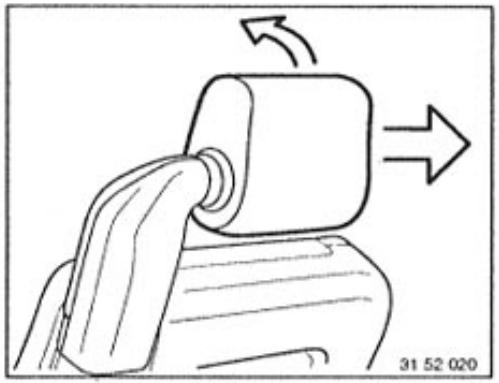
Note:
A maximum of two motors on the seat will be operated simultaneously.

Sequence:
1. **Axial adjustment, backrest inclination and steering wheel adjustment**
2. **Axial adjustment and height adjustment**
3. **Seat inclination adjustment**
4. **Both outside mirrors**

52 10 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SEAT

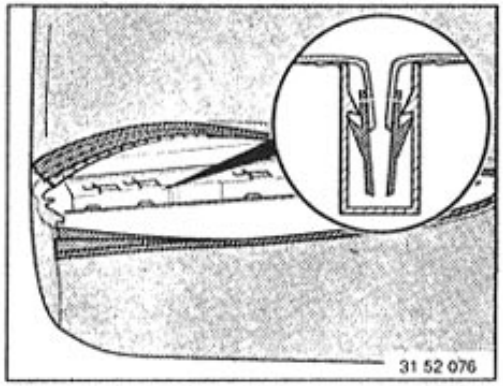
Note:
A second person is required to lift the front seat out of the car.

Lower front and rear side windows.

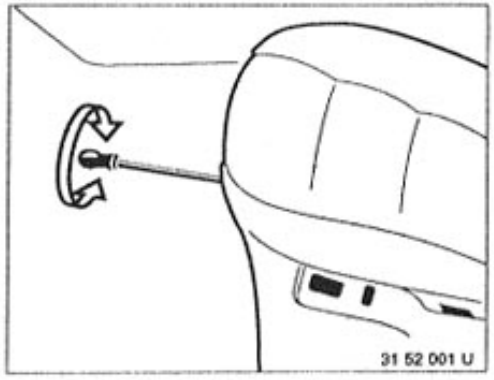


Set the backrest upright.
Run the seat height adjustment down.

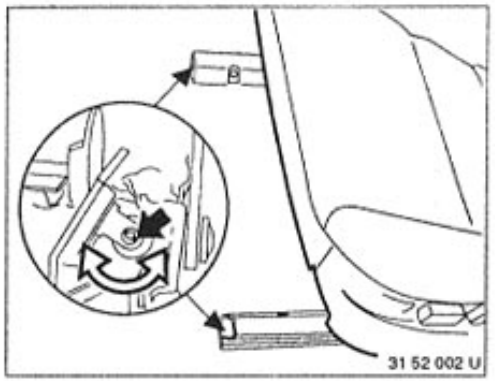
Pull headrest padding off by applying slight swinging movements.



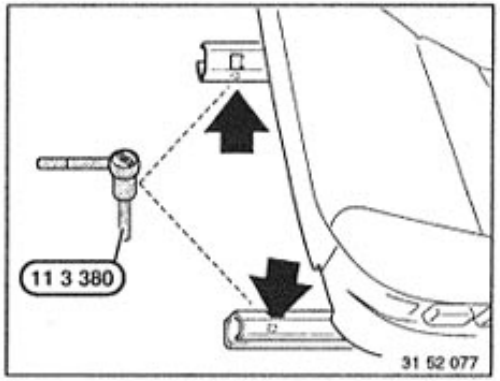
Installation:
If clips of the headrest cover have been opened, place the clip strips in the headrest padding and clip the strips.



If electric forward/back seat drive has failed, the seat can be moved manually with a screwdriver (8 mm blade width).

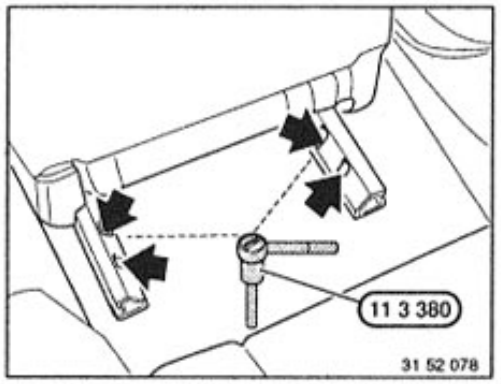


Insert screwdriver into slot and turn.
Turned clockwise = seat moved forward.
Turned counterclockwise = seat moved back.



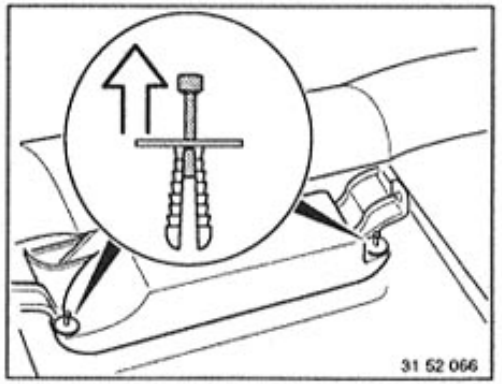
Run the seat back as far as possible.
Unscrew bolts using Special Tool 11 3 380 and remove them.

Installation:
Tightening torque*.



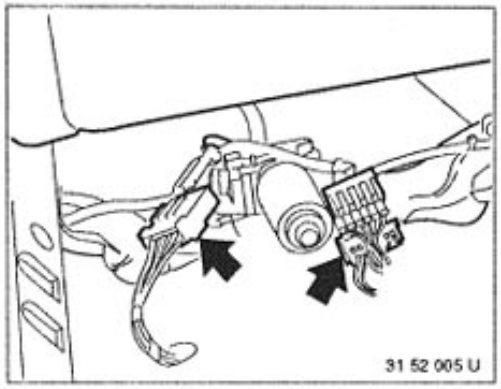
Run the seat forward and up as far as possible.
Unscrew bolts using Special Tool 11 3 380 and remove them.

Installation:
Tightening torque*.



Pull pins out and remove securing plugs.
Remove cover.

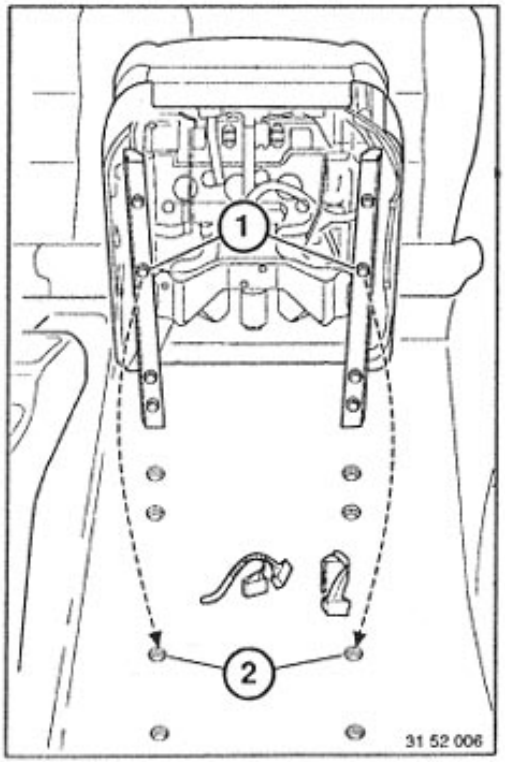
* Refer to Specifications



Note:
Cover side member panel to avoid damaging it while lifting out the seat.

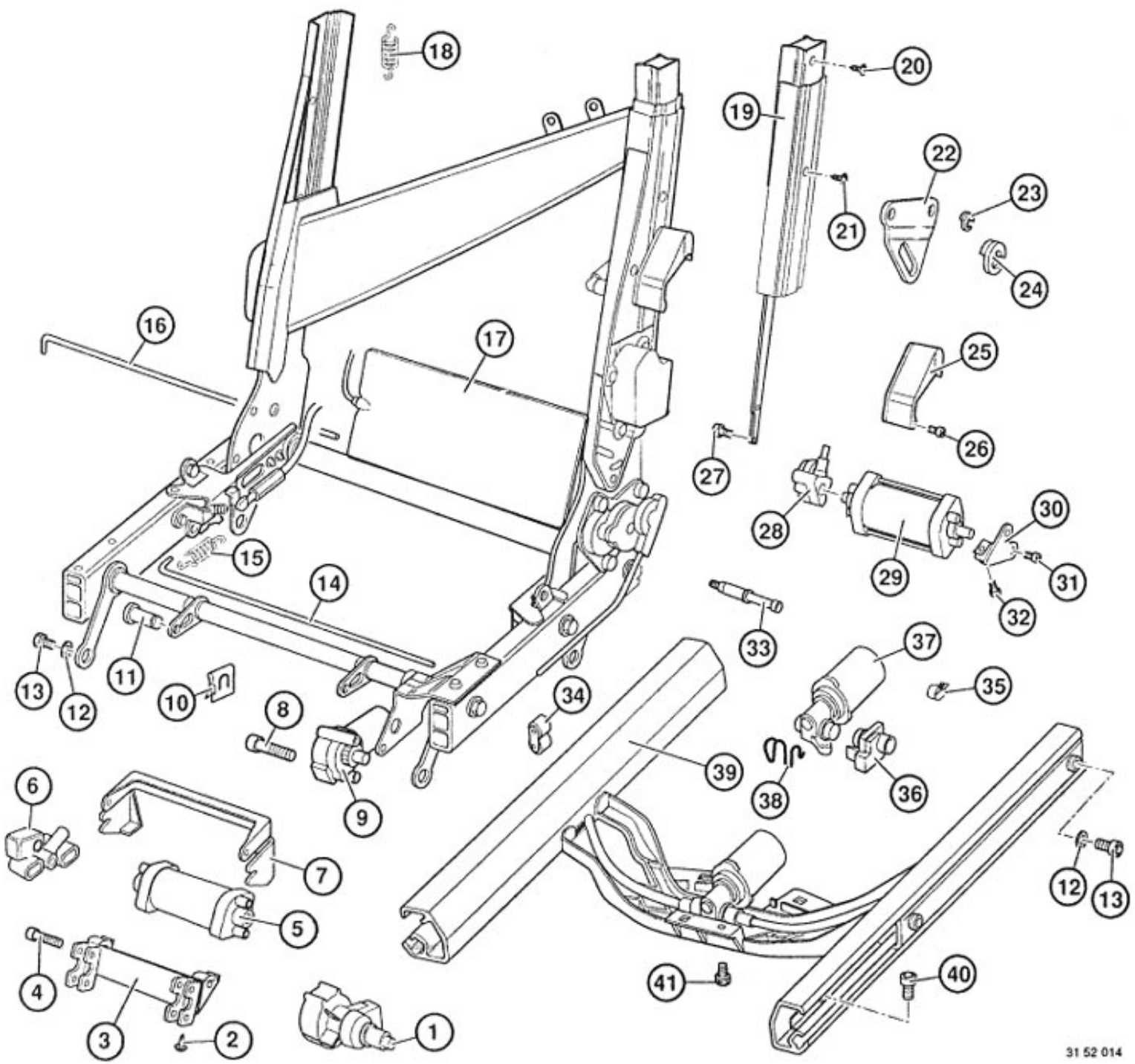
Lift seat at rear end and disconnect plugs.

Note:
Lift seat out of car (with help from second person) and place it on wooden blocks (transverse to the seat rails).



Installation:
Guide pins (1) on seat into bores (2) in car floor plate.

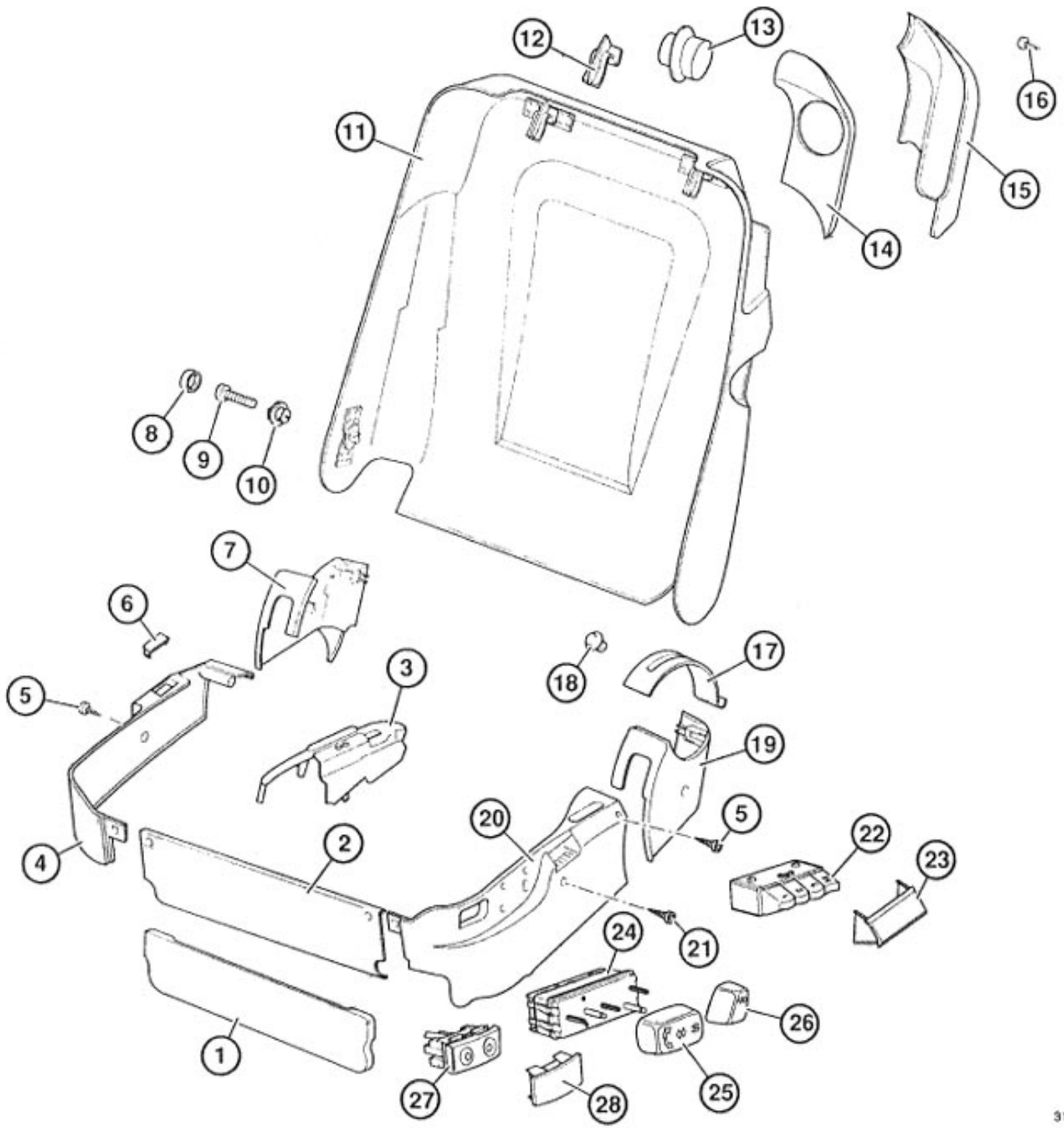
52 10 . . . FRONT SEAT SURVEY



1 Regulator (memory)
2 Oval head screw
3 Holder
4 Bolt
5 Up/down drive
6 Regulator (memory)
7 Rail
8 Bolt
9 Inclination drive
10 Lockplate
11 Shaft
12 Washer
13 Oval head screw
14 Torsion bar
15 Spring
16 Torsion bar L/R
17 Lumbar support
18 Spring
19 Front rail L/R
20 Screw
21 Screw
22 Lever L/R
23 Retainer
24 Lockwasher
25 Lever L/R
26 Screw
27 Shaft
28 Backrest regulator (memory)
29 Backrest drive
30 Holder
31 Screw
32 Oval head screw
33 Shaft bolt
34 Retainer
35 Clamp
36 Regulator (memory)
37 Forward/back drive
38 Spring
39 Seat rail
40 Fillister head bolt
41 Hexagon head bolt

Note:
Refer to Group 72 for all seat belt components.

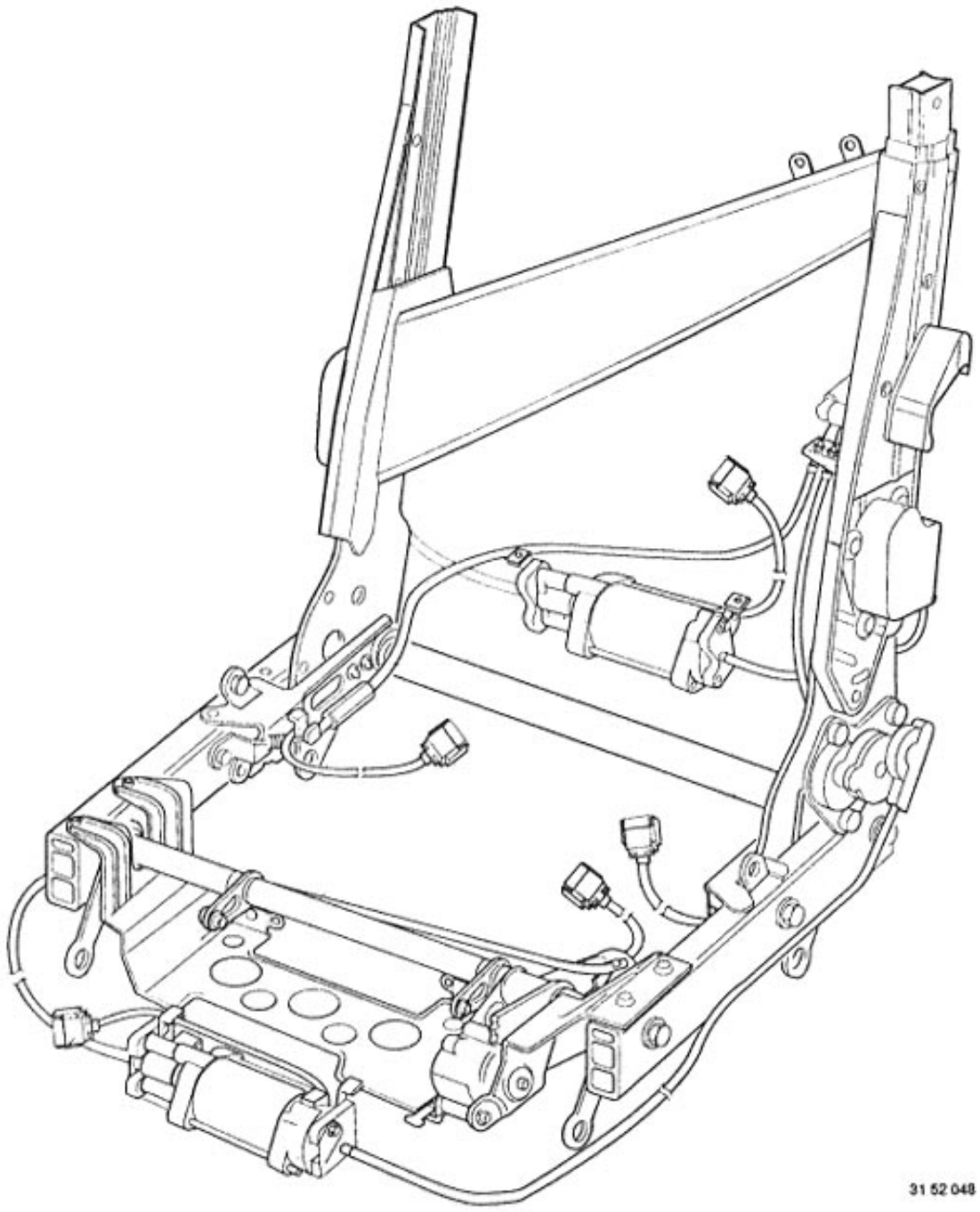
52 10 ... FRONT SEAT SURVEY



31 52 015

1 Pocket
2 Front panel
3 Cover L/R
4 Inside panel L/R
5 Ctsk. self-tapping screw
6 Cap
7 Inside panel L/R
8 Cap
9 Round head screw
10 Clamp
11 Rear panel L/R
12 Hook
13 Cover
14 Front panel L/R
15 Rear panel L/R
16 Oval head self-tapping screw
17 Cover L/R
18 Clamp
19 Outside panel L/R
20 Outside panel L/R
21 Oval head self-tapping screw
22 Memory switch
23 Cap
24 Front seat control switch L/R
25 Control knob L/R
26 Control knob L/R
27 Thigh support switch
28 Cap L/R

52 10 002 REPLACING LEFT OR RIGHT FRONT SEAT (CUSHION/ BACKREST FRAMES)



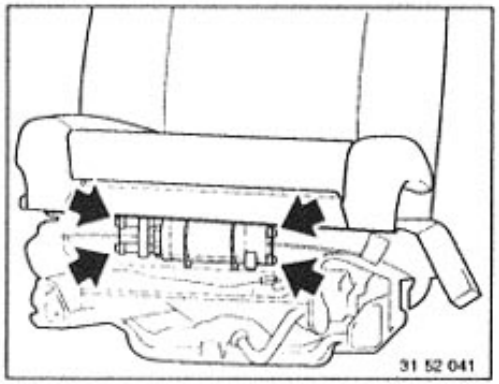
31 52 048

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove seat belt – refer to Gr. 72.
Remove backrest shell – refer to 52 10 082.
Remove cushion shell – refer to 52 10 080.
Remove seat rails – refer to 52 10 100.
Remove seat control unit – refer to Gr. 61.
Remove seat wiring harness – refer to electric wire routing in Gr. 61.
Check microswitch – refer to Gr. 61.
Adjust cable – refer to 52 10 575.

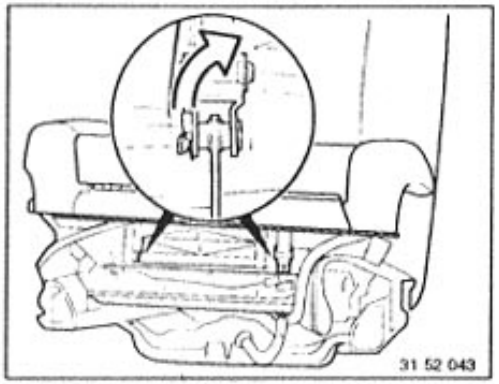
Assemble new seat cushion/backrest frames in reverse sequence.

52 10 080 REMOVING AND INSTALLING OR REPLACING CUSHION SHELL ON LEFT OR RIGHT FRONT SEAT

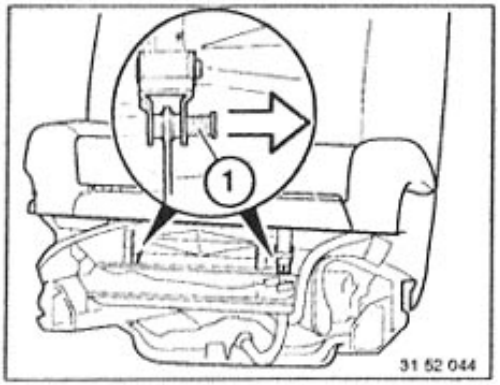
Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.



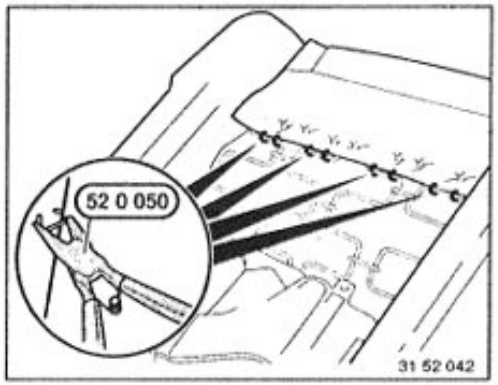
Unscrew screws on up/down drive motor.



Unbend lockplate.



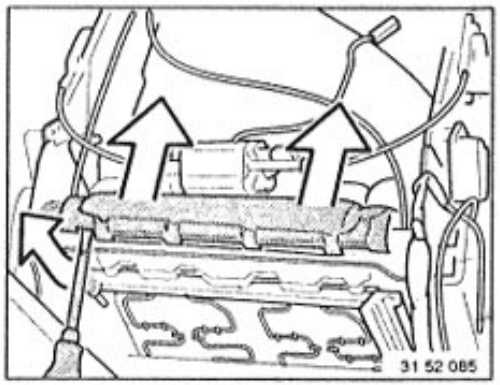
Remove shaft (1).



Detach clamps and fold cover back.

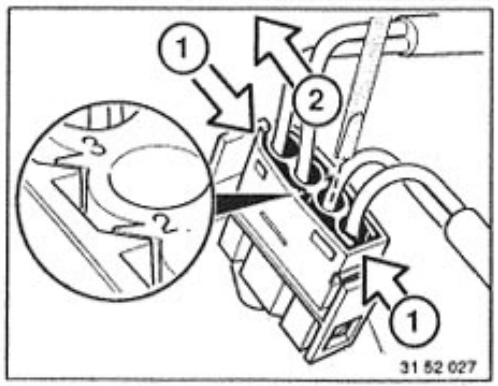
Installation:
Lock new clamps by bending with Special Tool 52 0 050.

Important!
Ensure that seat heating wires are not damaged while bending clamps.

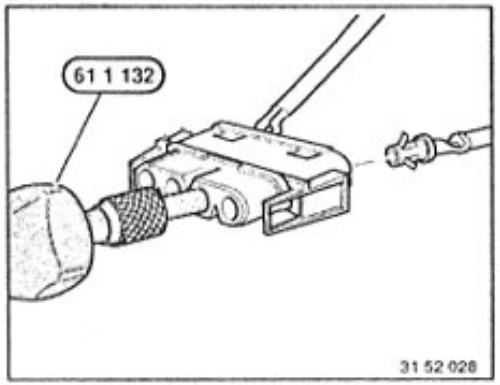


Disengage rear end of cushion shell using a large screwdriver and remove.

Installation:
Cushion shell must be heard engaging in the seat frame.

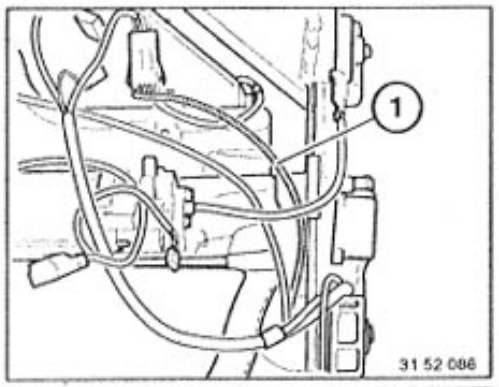


If applicable, disconnect seat heating wires at plug.
Unlock the secondary lock.
Squeeze plug together at (1) and unlock simultaneously with a screwdriver in direction (2).

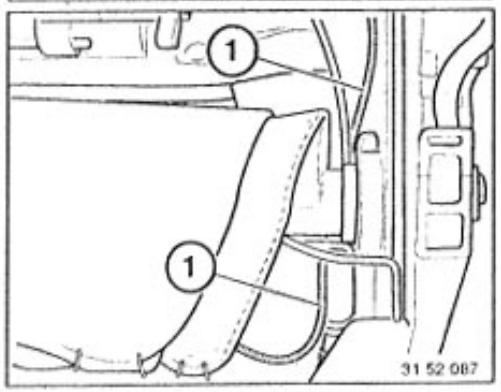


Disconnect two backrest heating wires using Special Tool 61 1 132.

Installation:
Lock the secondary lock again.
Check seat heating system for breaks with an ohmmeter.



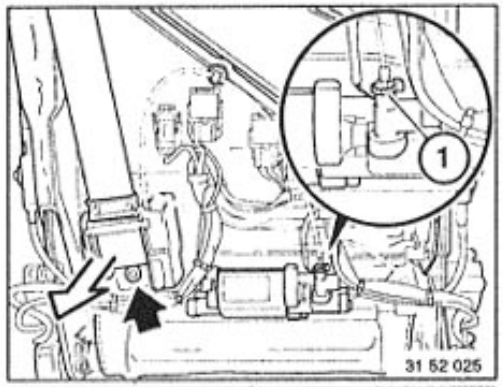
Installation:
Check routing of seat heating wires (1).



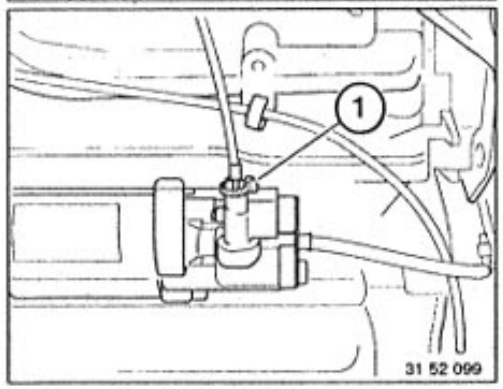
Installation:
Check routing of seat heating wires (1).

52 10 082 REMOVING AND INSTALLING OR REPLACING BACKREST SHELL ON LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.

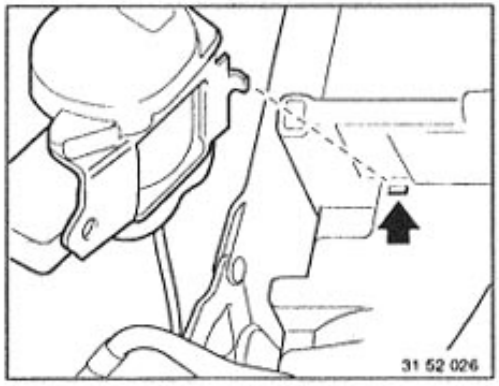


Disconnect cable (1) and pull shaft out of feed gearbox.
Unscrew bolt, remove automatic reel seat belt towards the rear and let it hang down.



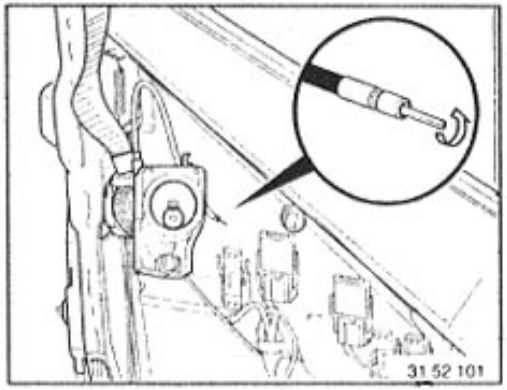
Installation:
The shaft must be routed without kinks and must not bear on the backrest shell panel.

The tip of wire clamp (1) must point to the side to avoid damaging the rear panel.

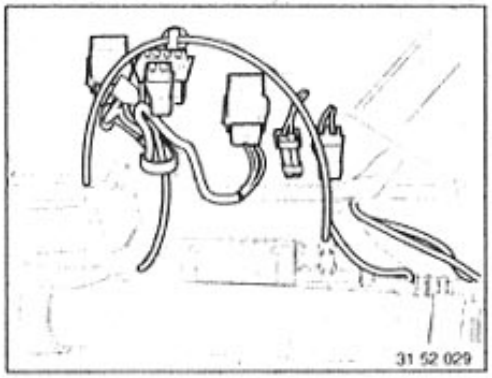


Installation:
Install automatic reel seat belt that the bent tab is inserted into the rear panel.
Replace screws.
Tightening torque*.

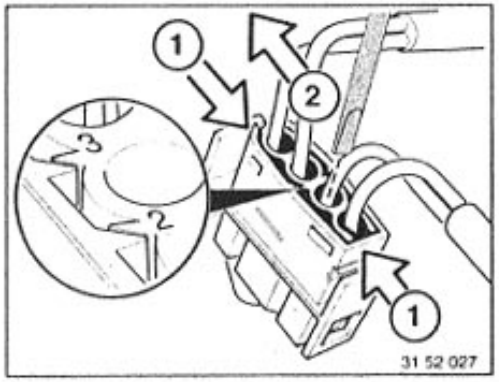
* Refer to Specifications



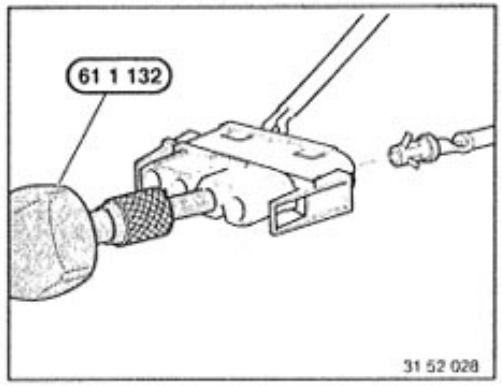
Installation:
Turn shaft for transmission counter-clockwise to its stop position.



Remove all relays, plug connectors and motors.

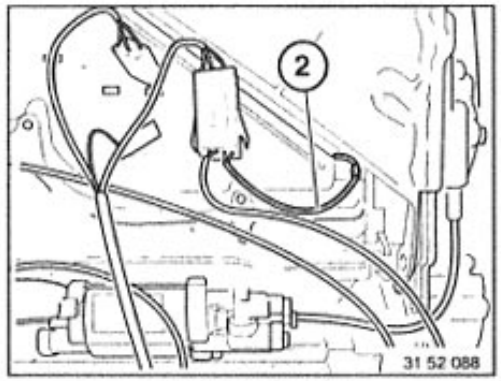


If necessary, unpin cable for seat heating from connector.
Unlock the secondary locking mechanism.
Squeeze together connector at (1) and, at the same time, unlock by turning screwdriver in direction (2).

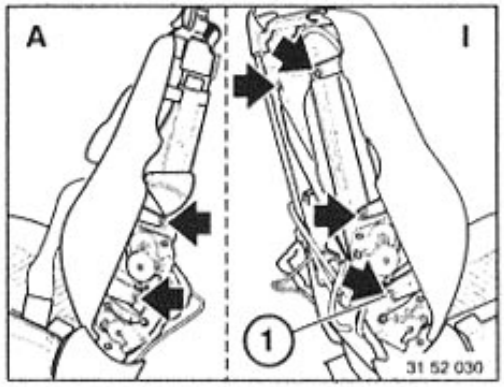


Use special tool 61 1 132
to unpin two cables on the seatback heating.

Installation:
Relock secondary locking mechanism.
Check seat heating for interrupts with ohmmeter.

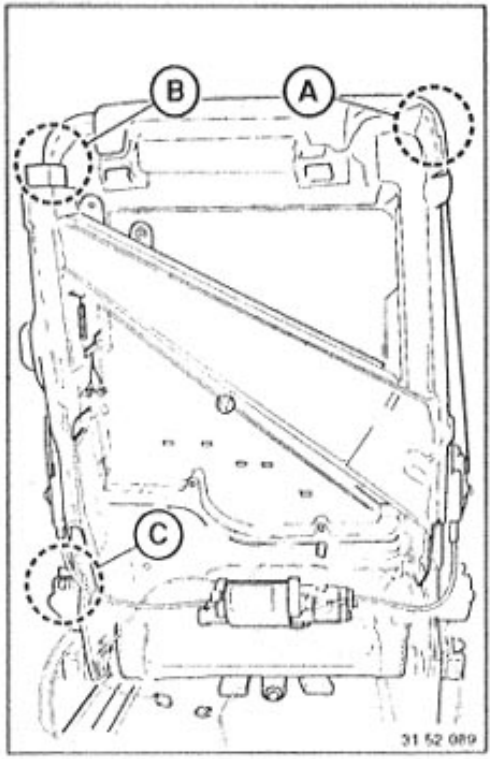


Installation:
Check wiring layout,
fault memory, fault memory.
Clear fault memory.

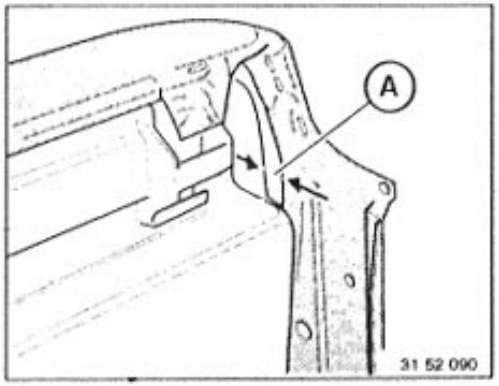


Unfasten screws and remove backrest shell.

Installation:
First tighten screw (1) on inside edge.

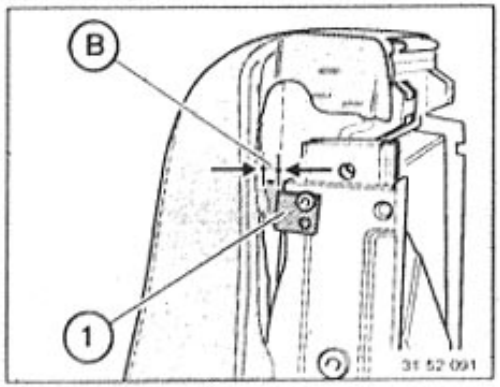


Installation:
Distances (A, B and C) must be maintained.



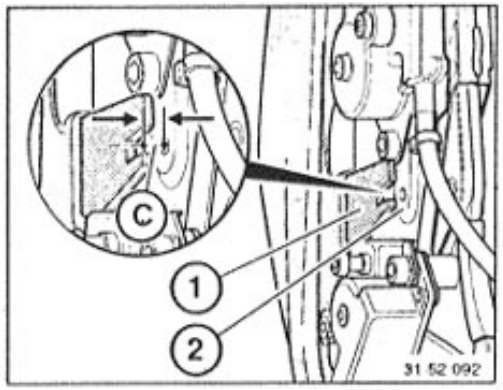
Distance (A):

Distance A = 12 mm.



Distance (B):

Distance B = 16 mm.



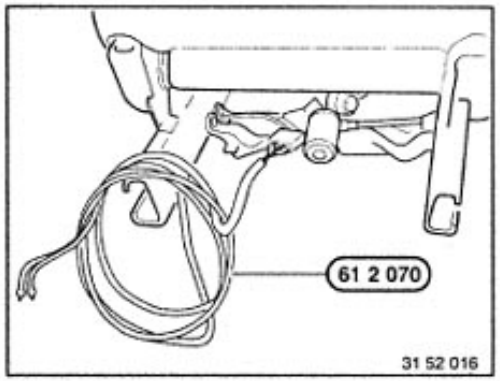
Distance (C):

Distance C = < 2 mm.

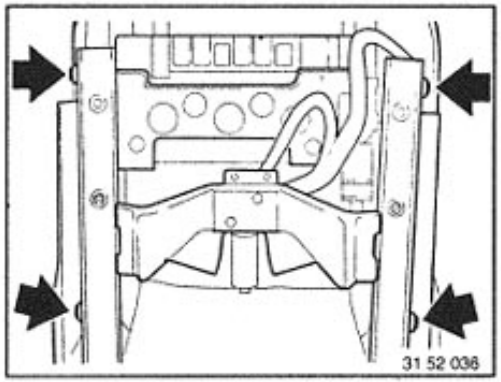
Installation:
If distance (C) is larger than 2 mm, the distance must be adjusted by installing washers between securing tab (1) and backrest frame (2).

52 10 100 Removing and installing or replacing seat rail on left or right front seat

Remove front seat, see 52 10 000.



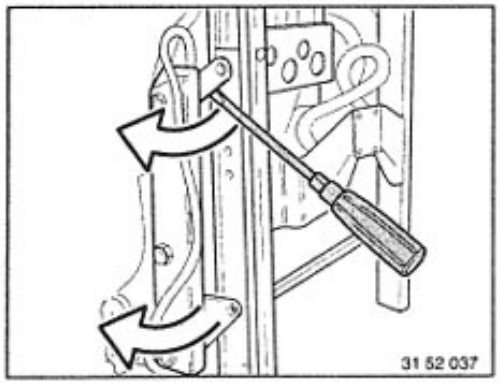
Connect adapter cable 61 2 070 to the white connector (outside) and to a 12 V power source.
Move seat into "upper" position.



Unfasten screws.

Installation:
Tightening torque*
Install screws with Loctite 270**.

Unfasten cable connector on wiring harness.
Remove connector from control unit.



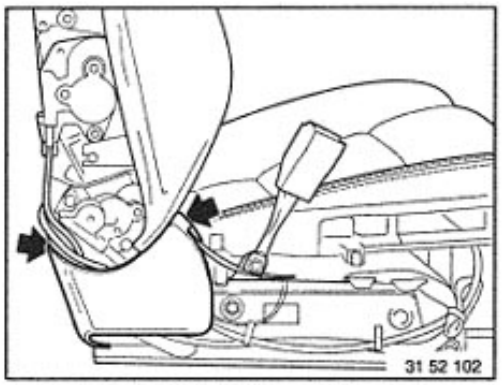
Lift out left and right seat rails with screwdriver.

Installation:
Perform function check.

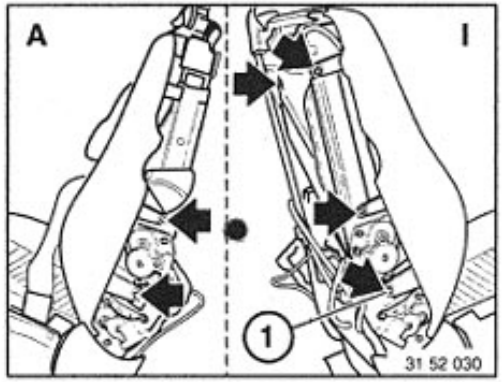
* Refer to Technical Data
** Source of supply: BMW Parts Service

52 10 105 Replacing rail (connecting rod)

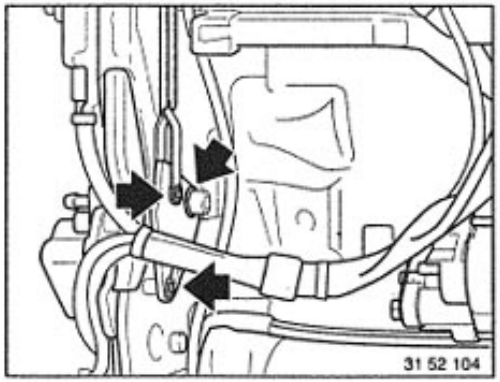
Remove front seat, see 52 10 000.
Remove rear wall, see 52 10 450.
Remove belt, see 72 11 030.



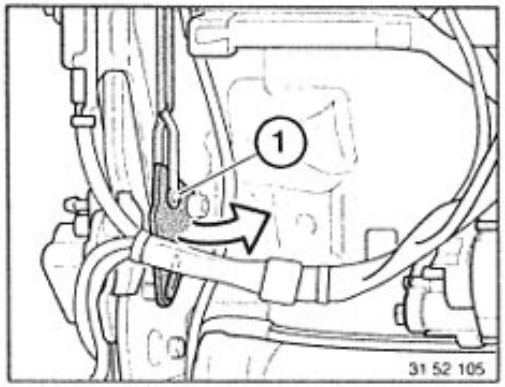
Unfasten screws and clips on inside finisher and allow finisher to hang down.



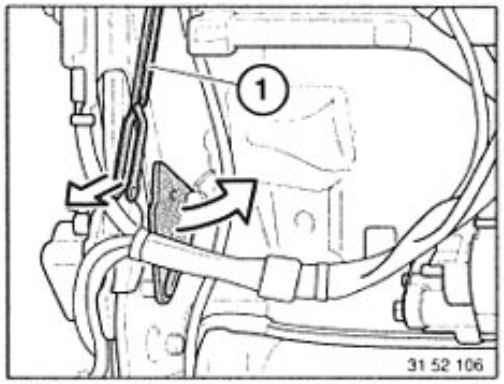
Loosen screws.
Push outside backrest cushion forwards.



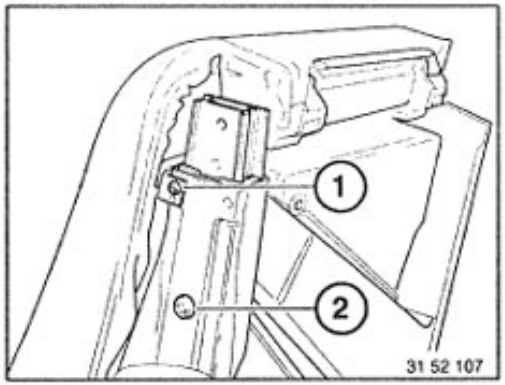
Unfasten retaining washers.



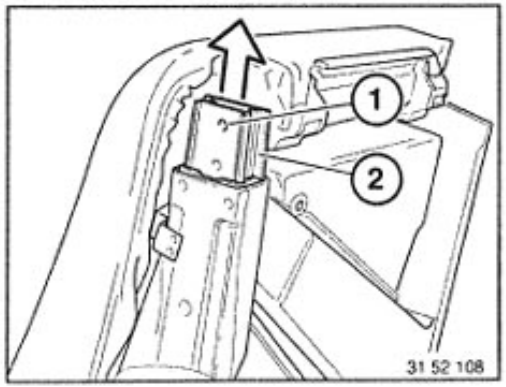
Press lower triangular plate to one side and remove pin (1).



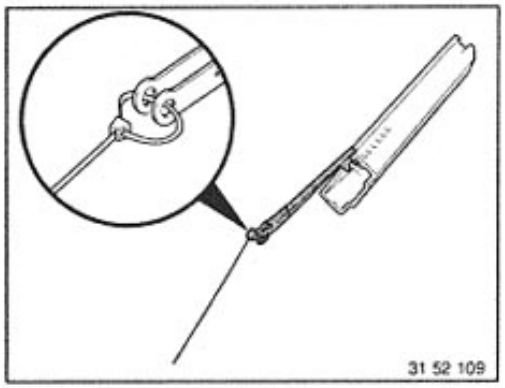
Pull coupling bar (1) backwards.
When doing so, press backrest cushion forwards and remove triangular plate by pulling to one side.



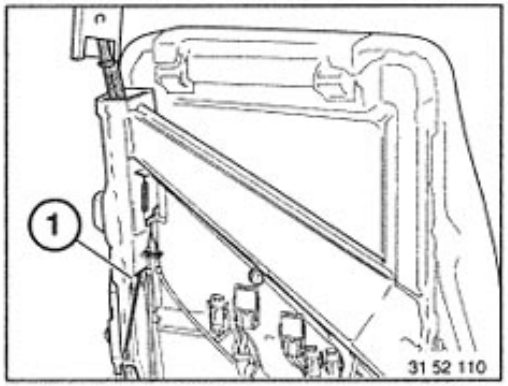
Unfasten screws (1).
Tightening torque refer to Technical Data 52 10 3AZ.
Unfasten screw (2).
Tightening torque refer to Technical Data 52 10 4AZ.



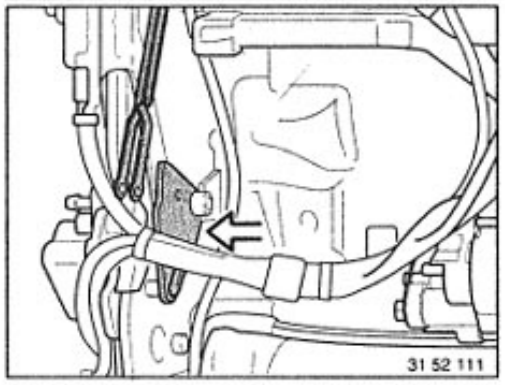
Fit hardwood wedge to bore (1) and drive out guide (2) upwards with gentle blows.



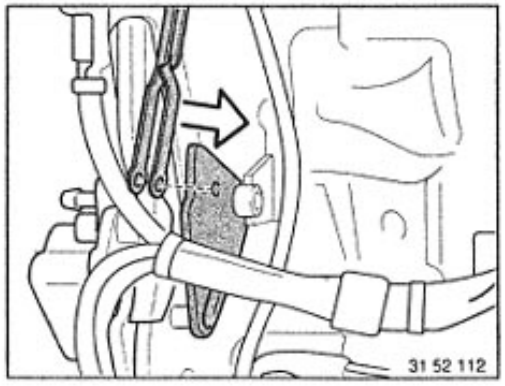
Installation:
As a directional aid, secure cable connector to the bores of the new coupling bar.



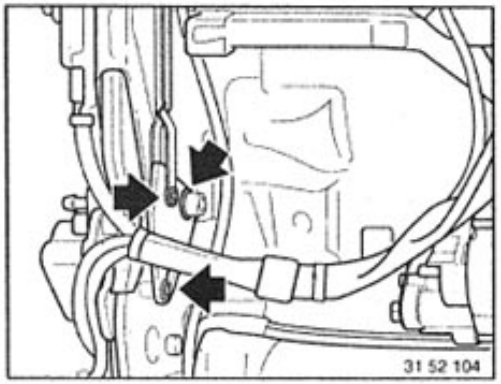
Guide coupling bar through bore (1) with cable connector.
Remove cable connector.



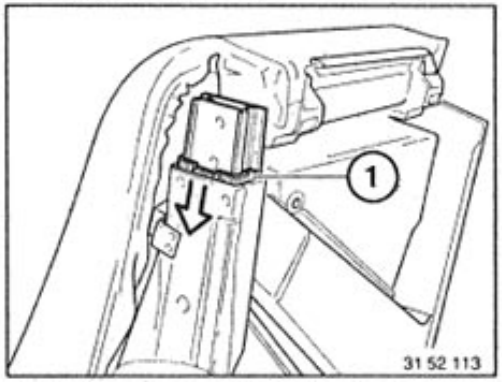
Press backrest cushion forwards and install new triangular plate.



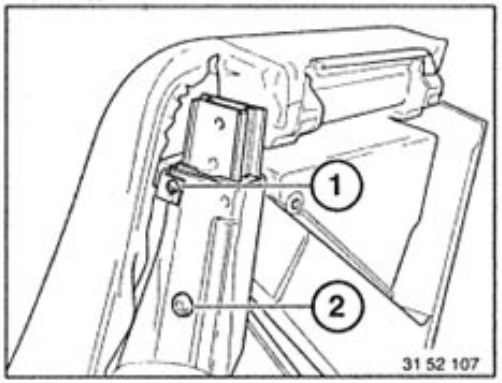
Slide coupling bar over the triangular plate, install pin with pliers and press into place with a screwdriver.



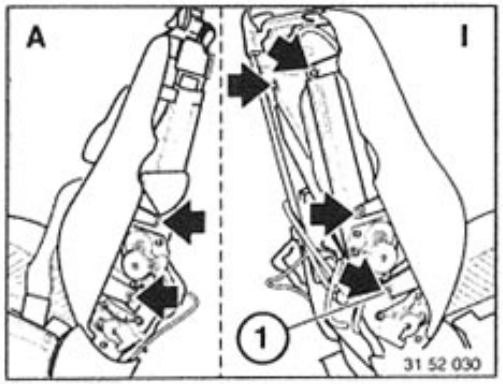
Fit retaining discs.



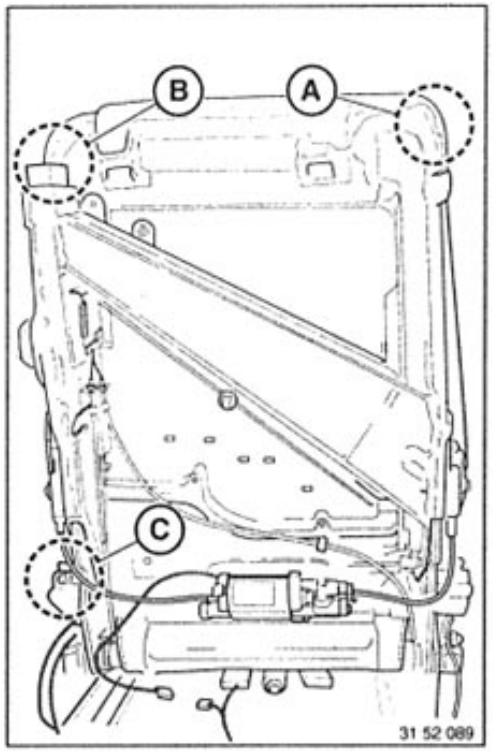
Drive in guide (1) with plastic hammer until it is flush with backrest frame.



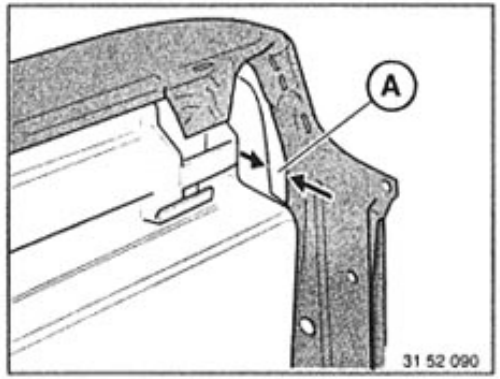
Tighten spacer bracket into top bore with screw (1).
Tightening torque refer to Technical Data 52 10 3AZ.
Tighten screw (2).
Tightening torque refer to Technical Data 52 10 4AZ.



Installation:
Tighten inside screw (1).

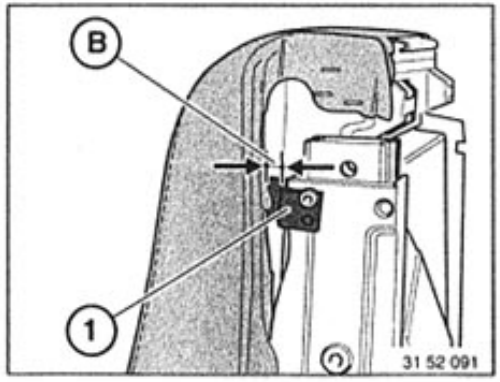


Installation:
Maintain gaps (A), (B) and (C).



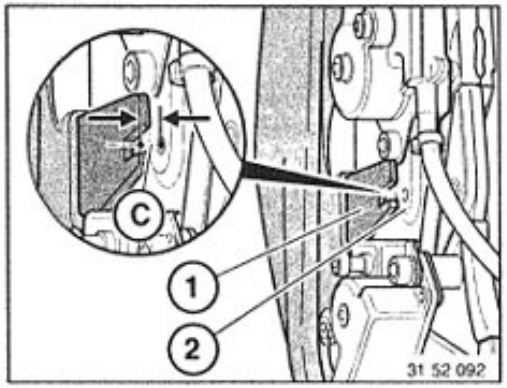
Gap (A):

dimension (A) = 12 mm



Gap (B):

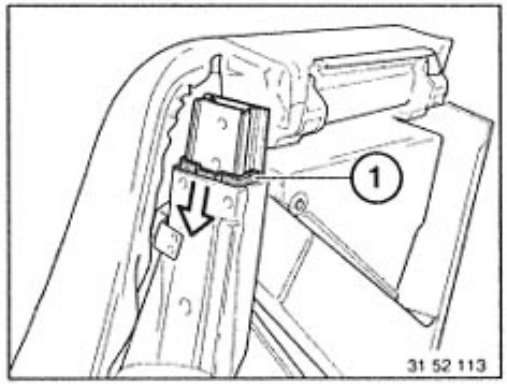
dimension (B) = 16 mm



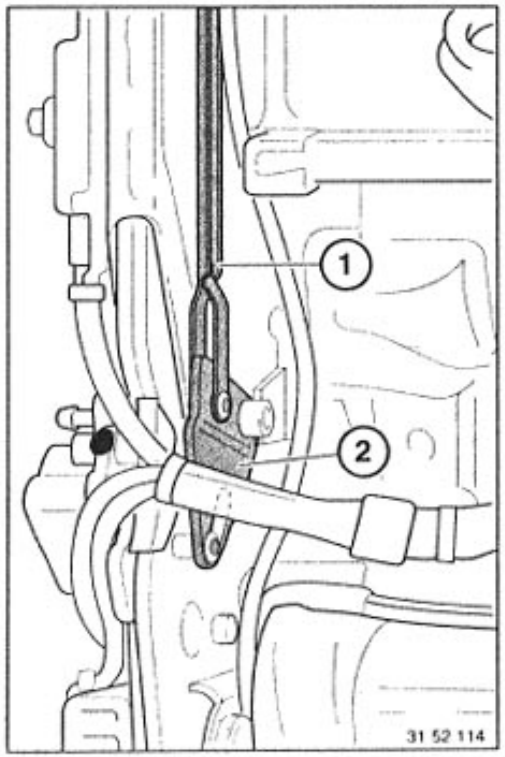
Distance (C):

Distance C = < 2 mm.

Installation:
If distance (C) is larger than 2 mm, the distance must be adjusted by installing washers between securing tab (1) and backrest frame (2).



Run the seat height drive to both final positions.
In so doing guide (1) must be run out and in free of noise or hesitation.



Set the seat backrest upright.

Check connecting rod and triangular plate (visual check).

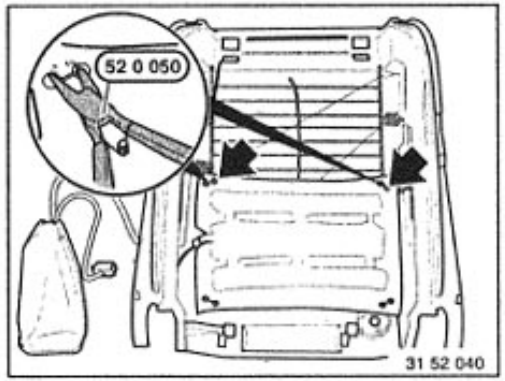
Connecting rod (1) and slot in triangular plate (2) absolutely straight = OK.

Connecting rod (1) / slot in triangular plate (2) bent or lightly distorted = replace connecting rod and triangular plate.

Important!
Straightening is not permitted in the interest of occupant safety (danger to life).

52 10 400 REMOVING AND INSTALLING OR REPLACING LUMBAR SUPPORT ON LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.
Remove backrest cover - refer to 52 11 031.
Remove padding – refer to 52 11 141.



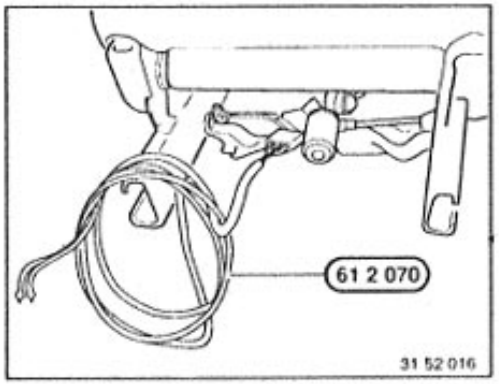
Unbend clamps and remove lumbar support.

Note:
Be careful not to damage the lumbar support.

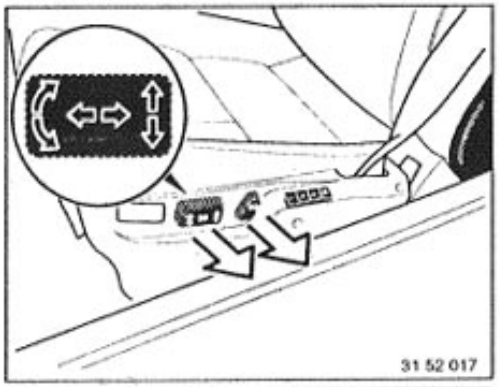
Installation:
Lock clamps by bending with Special Tool 52 0 050.
Check function of lumbar support.

52 10 450 REMOVING AND INSTALLING OR REPLACING REAR PANEL FOR LEFT OR RIGHT FRONT SEAT BACKREST

Remove front seat – refer to 52 10 000.

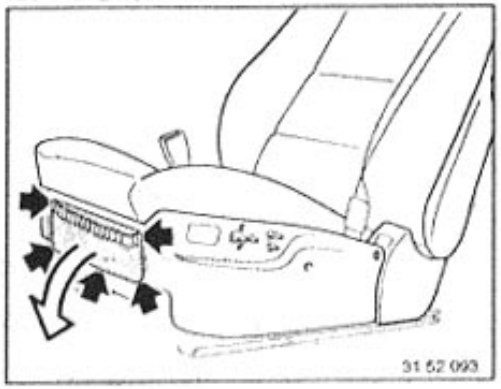


Connect Special Tool 61 2 070 (adapter lead) to white plug (outer) and 12 V power supply source.
Move seat to "bottom" position and backrest to "upright" position.

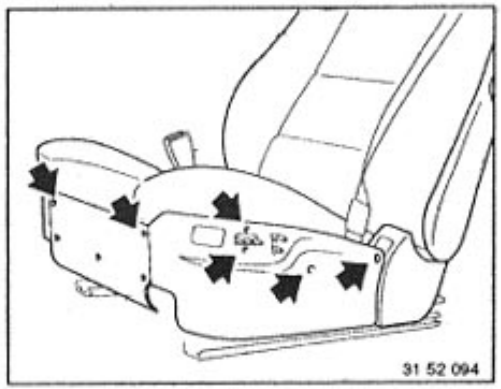


Pull off control knobs.

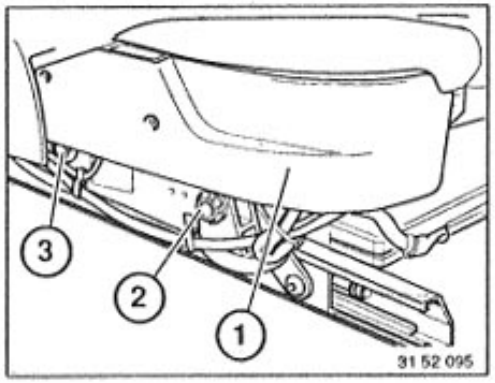
Installation:
The curved arrows for seat inclination must be at front end.



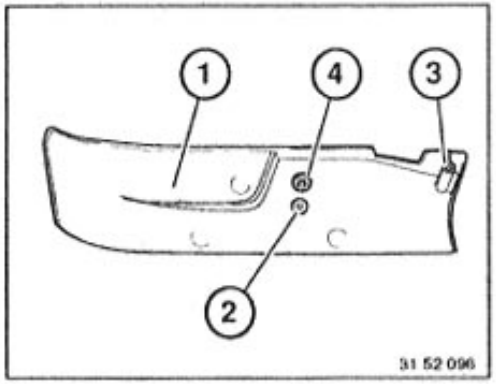
Unclip pocket.



Unscrew screws and remove trim panels.



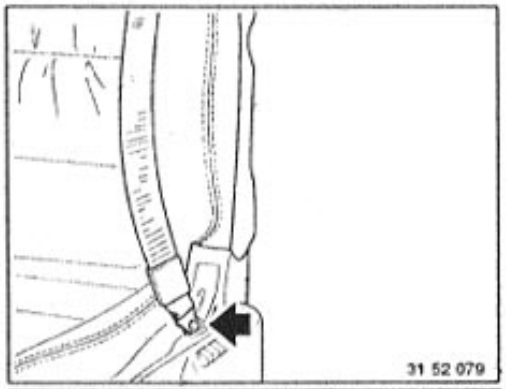
Installation:
Ensure correct clipping and parallelism of front and side trim panels.
Ensure sufficient clearance of trim panel (1) at points (2 and 3) as otherwise there would be a scraping noise when running the seat up or down.



Remedy:
Use, for example, washers (4) at screwed points (2 and 3).

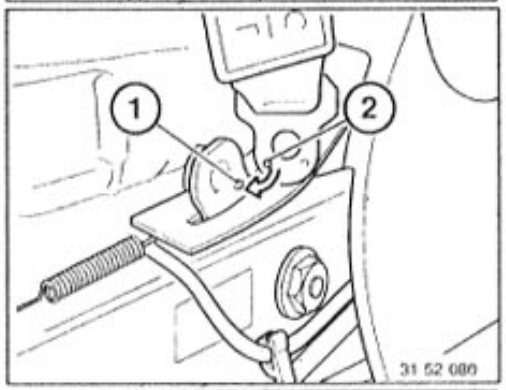
52 Seats

52 0 . . .	Damage assessment of front seat – belt system integrated in seat after an accident	52- 0/1
52 0 . . .	Function check of power adjustment of front seat	52- 0/4
52 0 . . .	Function check of memory	52- 0/5
52 10 000	Front seat, left or right – remove and install	52- 10/1
. . .	Front seat survey	52- 10/3
002	Front seat (seat backrest frame), left or right – replace	52- 10/5
080	Seat shell on front seat, left or right – remove and install or replace	52- 10/6
082	Backrest bucket on front seat, left or right – remove and install or replace	52- 10/7
100	Seat rail on front seat, left or right, – remove and install or replace	52- 10/10
105	Rail (coupling bar) – replace	52- 10/10
400	Lumbar support on front seat, left or right – remove and install or replace	52- 10/13
450	Rear wall for front seat backrest, left or right – remove and install or replace	52- 10/14
495	Actuator drive for seat height on front seat – remove and install or replace	52- 10/17
575	One Bowden cable on front seat, left or right – adjust	52- 10/17
900	Actuator drive for seat adjustment (longitudinal adjustment) on front seat - remove and install or replace	52- 10/18
913	Actuator drive for tilt adjustment on front seat – remove and install or replace	52- 10/18
920	Actuator drive for backrest adjustment on front seat – remove and install or replace	52- 10/19
52 11 003	Seat cover on front seat, left or right – replace	52- 11/1
031	Backrest cover for front seat, left or right – replace	52- 11/2
101	Support (foam rubber section) from front seat, left or right – replace	52- 11/3
141	Support (foam rubber section) for front seat backrest, left or right – replace	52- 11/4
592	Heating element for front seat (seat surface), left or right – replace	52- 11/5
593	Heating element for front seat (backrest), left or right – replace	52- 11/6
52 20 070	Backrest for rear seat, left or right – remove and install/replace	52- 20/1
100	Rear seat, left or right – remove and install/replace	52- 20/1
	• Rear seat – one piece	52- 20/1
	• Rear seat backrest , folding	52- 20/2
245	Lock for rear seat backrest, left or right – replace	52- 20/2
51 20 400	Back wall for rear seat backrest, left or right – remove and install/ completely replace	52- 20/3
52 21 055	Cover for rear seat backrest, left or right – remove and install/replace	52- 21/1

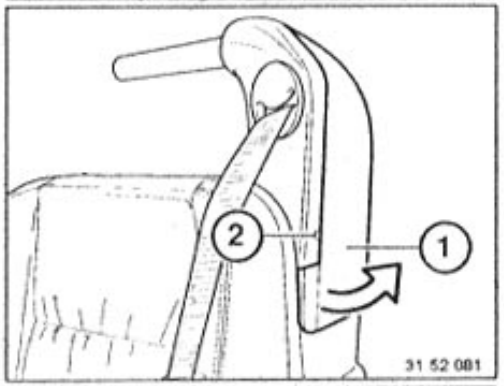


Pull plate out from the side and unscrew screw**.

Installation:
Replace screw**.
Tightening torque*.

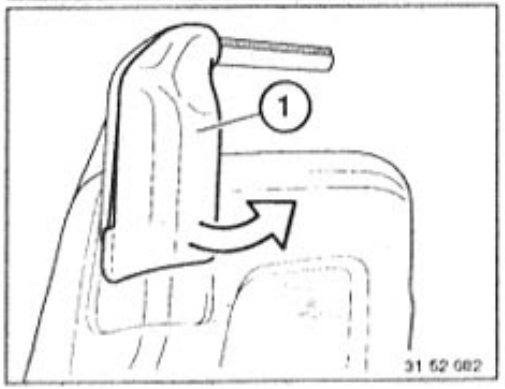


Installation:
Pin (1) must engage in bore (2).



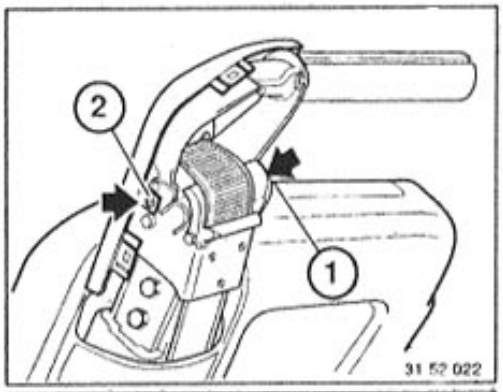
Grab hold underneath plate (1) from the side, press to point (2), counterhold and unclip plate (1) from the side.

Installation:
Plate must be heard to engage.



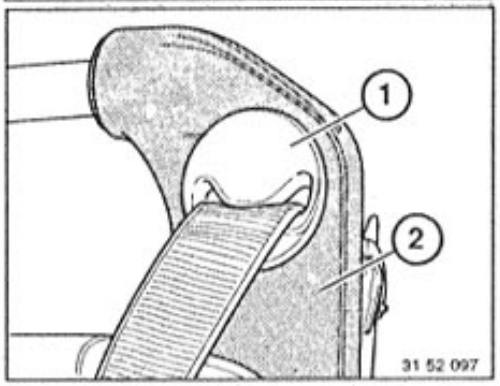
Grab hold underneath plate (1) from behind and unclip plate (1) towards rear and upwards.

* Refer to Specifications
** Source of Supply: BMW Parts

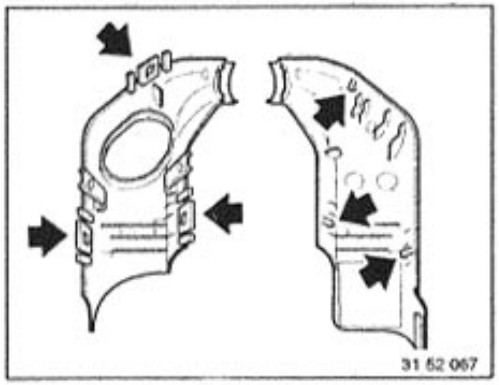


Unscrew screws (1 and 2) and remove plate.

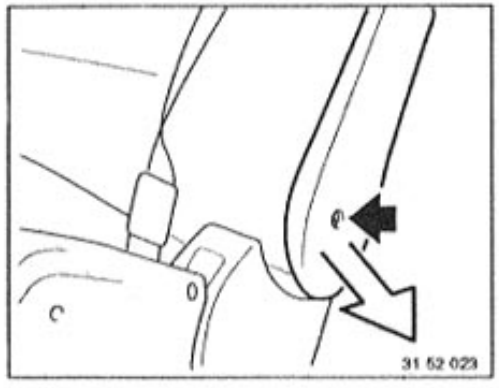
Installation:
First tighten screw (1) to center the plate.



Installation:
Escutcheon (1) must turn freely in plate (2).

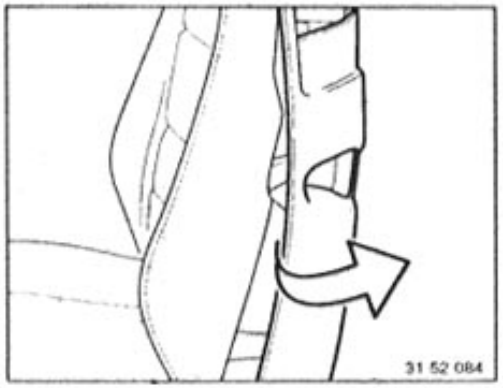


Clips and fasteners of plate must not be damaged.
Damaged parts must be replaced.



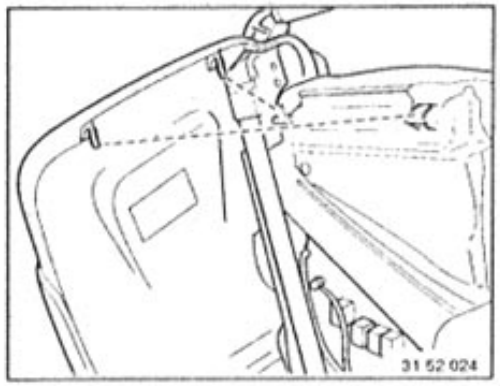
Remove caps.
Unscrew left and right screws.
Unclip backrest trim panel towards outside from the side.

Installation:
Install caps on screws.

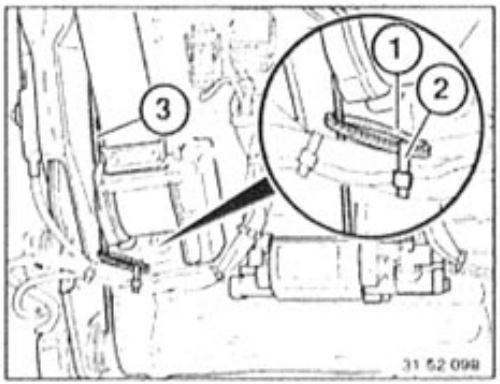


Lift trim panel upwards over the unlocking lever from the side.

Important!
Don't damage the backrest trim panel.



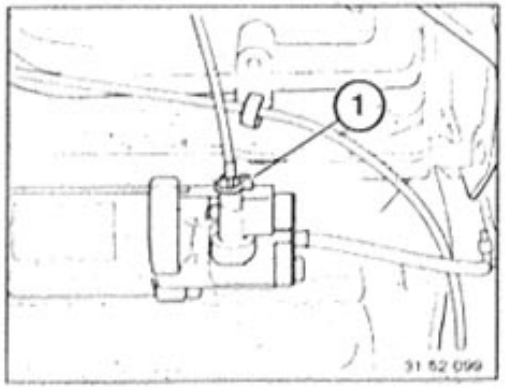
Installation:
Engage backrest trim panel at top.
Make sure of uniform spacing between the upholstery and trim panel.
Make sure that upholstery edge is parallel to the backrest shell edge.



Installation:
Install wire straps (1 and 2).

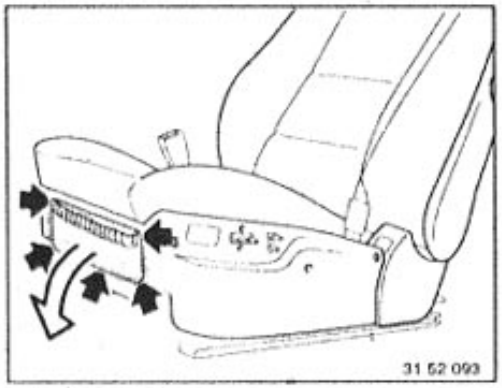
Size the length of wire strap (1) that cable (3) cannot be crushed between the connecting rod and backrest frame while adjusting backrest inclination.

Installation:
If it is not possible to mount the backrest trim panel parallel, the backrest shell must be adjusted again - refer to 52 10 082.



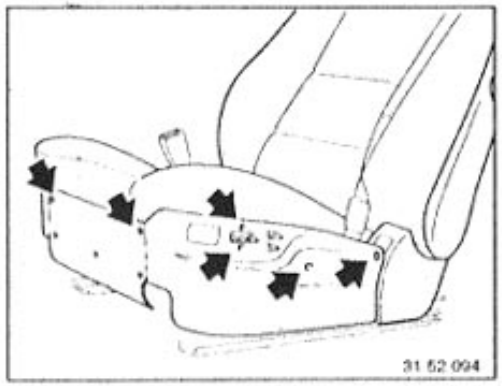
Installation:
The shaft must be routed without bends and must not touch the rear wall trim panel.

The tip of wire strap (1) must point to the side to avoid damaging the rear wall.

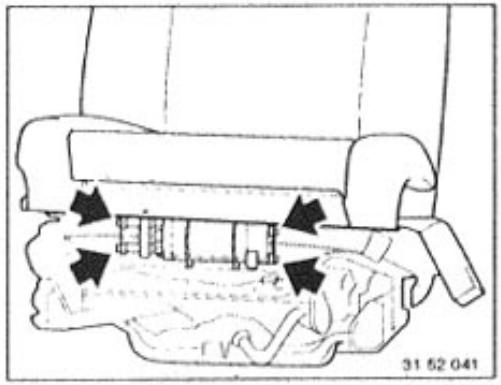


52 10 495 REMOVING AND INSTALLING OR REPLACING FRONT CUSHION HEIGHT DRIVE ON FRONT SEAT

Unclip pocket.



Unscrew screws and remove trim panels.

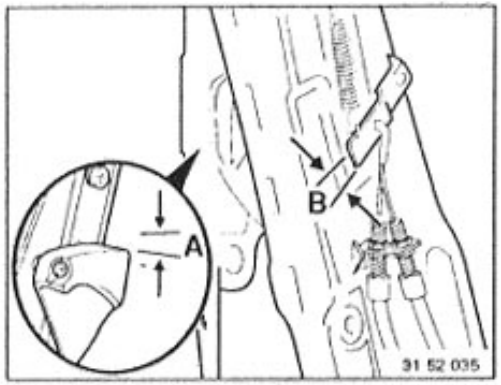


Loosen wire straps and unscrew screws.
Disconnect plug on control unit.
Remove lockplates of shafts and motor for height adjustment.

Installation:
Reinsert spacers into rubber parts.
Check function.

52 10 575 ADJUSTING ONE CABLE ON LEFT OR RIGHT FRONT SEAT

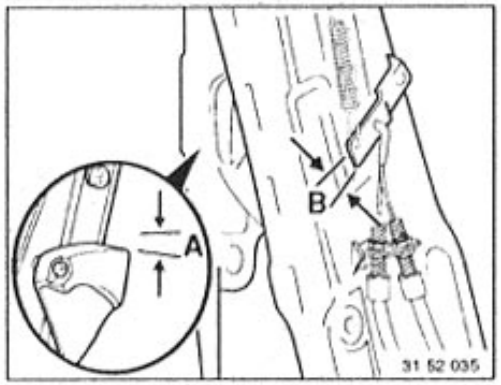
Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.



Push handle up until clicking of the microswitches is heard.

Distance (A) = 4 to 5 mm
Clearance (B) = approx. 2 mm

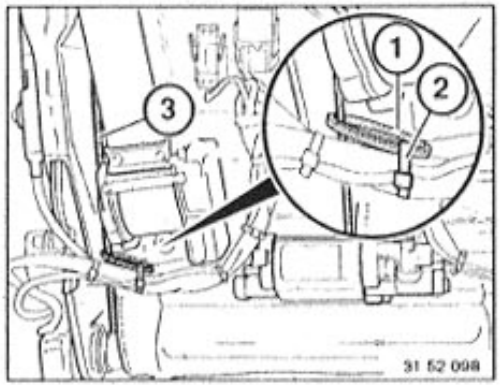
Note:
Microswitches must operate prior to unlocking the backrest.



Unscrew nuts and adjust cables.

Note:
Both microswitches must operate simultaneously.

Installation:
Check microswitches – refer to 61 31 . . ..

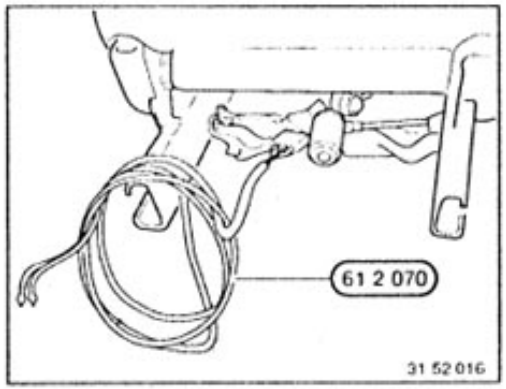


Installation:
Install wire straps (1 and 2).

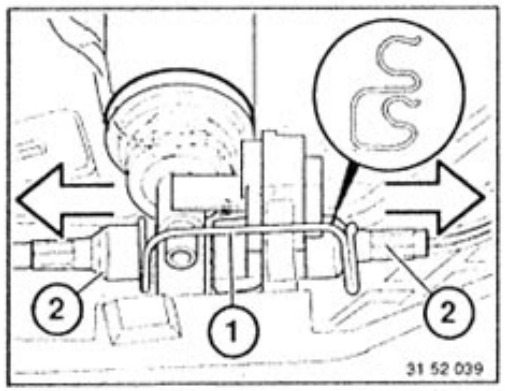
Size the length of wire strap (1) that cable (3) cannot be crushed between the connecting rod and backrest frame while adjusting backrest inclination.

52 10 900 REMOVING AND INSTALLING OR REPLACING FORWARD / BACK DRIVE ON FRONT SEAT

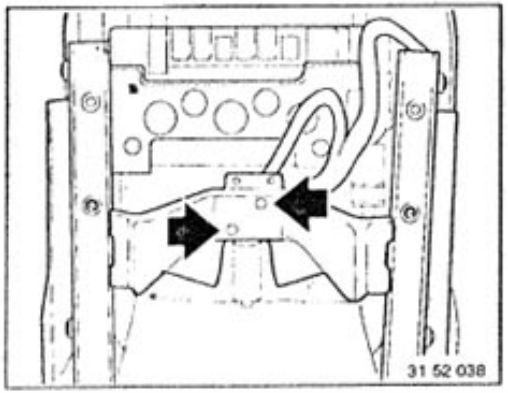
Remove front seat – refer to 52 10 000.



Connect Special Tool 61 2 070 (adapter lead) to white plug (outer) and 12 V power supply source.
Move seat to "top" position.
Move front seat inclination to "top" position.



Remove plug from seat control unit.
Loosen clamp (1) and pull drive shafts (2) off.

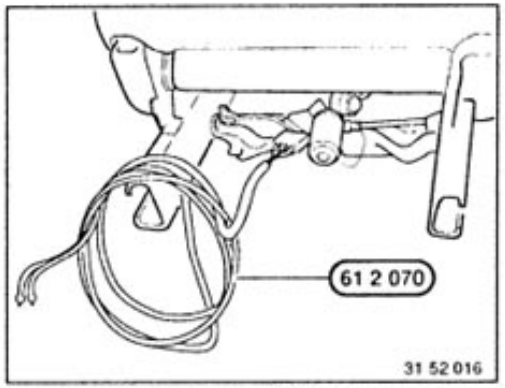


Unscrew screws and remove drive.

Installation:
Check function.

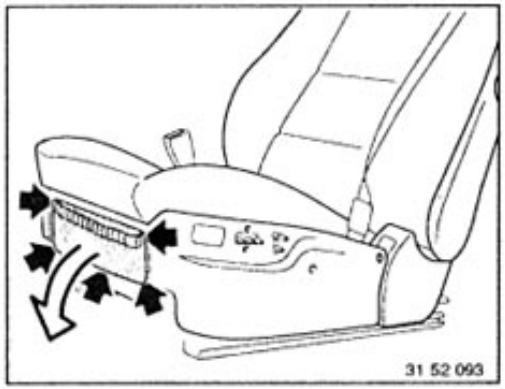
52 10 913 REMOVING AND INSTALLING OR REPLACING INCLINATION DRIVE ON FRONT SEAT

Remove front seat – refer to 52 10 000.

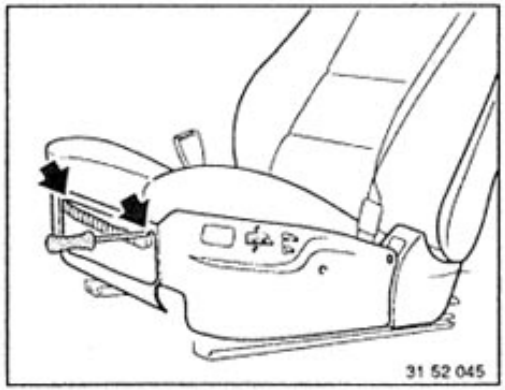


Connect Special Tool 61 2 070 (adapter lead) to white plug (outer) and 12 V power supply source.
Move seat to "top" position.

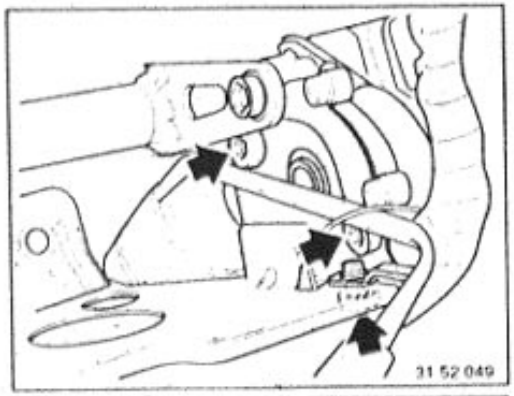
Remove seat control unit – refer to 61 31 099.



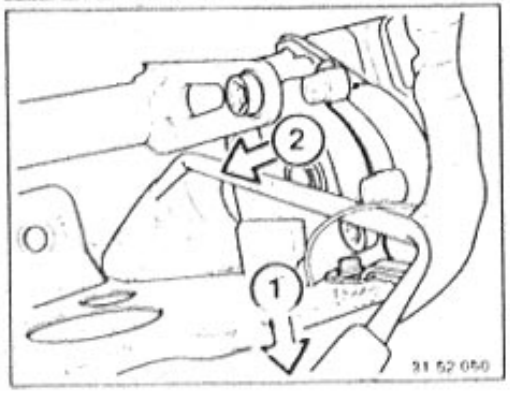
Unclip pocket.



Unscrew screws and remove trim panel.



Uncover wires and disconnect plugs.
Unscrew screws.
Press front end of cushion shell up slightly – refer to 52 10 080.

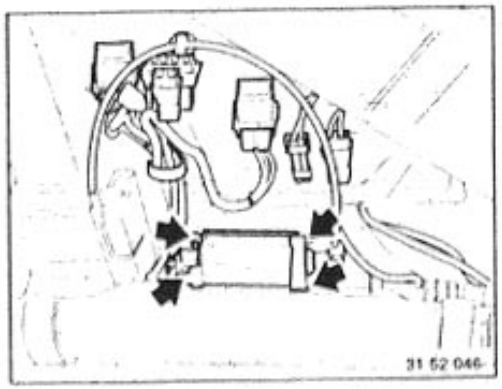


Press plate (1) of seat control unit downwards.
Push holder (2) aside and remove motor.

Installation:
Check function.

52 10 920 REMOVING AND INSTALLING OR REPLACING BACKREST DRIVE ON FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.



Unscrew screws.
Remove lockplates of shafts and motor for backrest adjustment.

Installation:
Check function.

52 11 003 REPLACING CUSHION COVER FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450

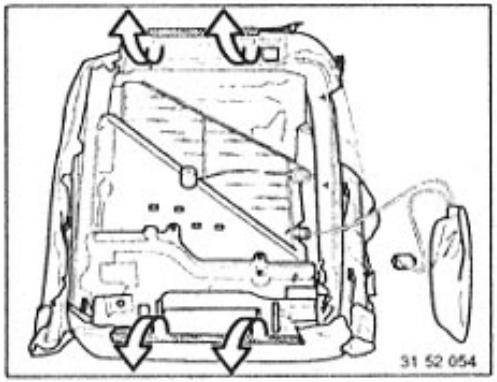


Unbend clamps.

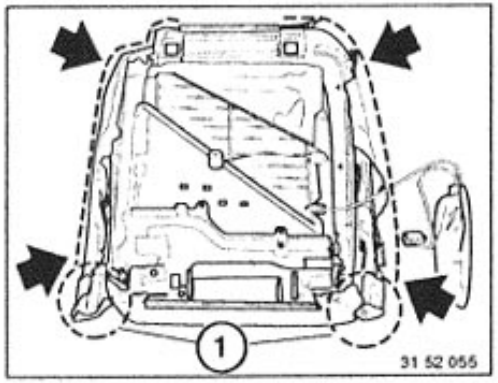
Installation:
Lock new clamps* by bending with Special Tool 52 0 050.

52 11 031 REPLACING BACKREST COVER FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.

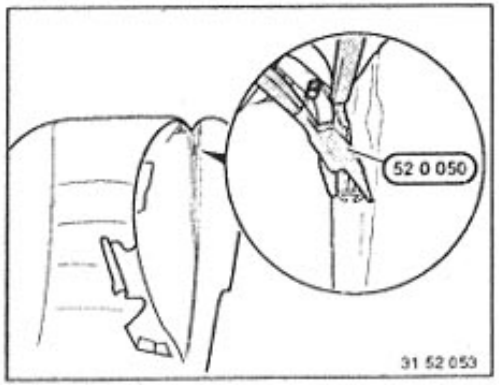


Pull off clamping bars at top and bottom of cover.



Unbend all clamps.

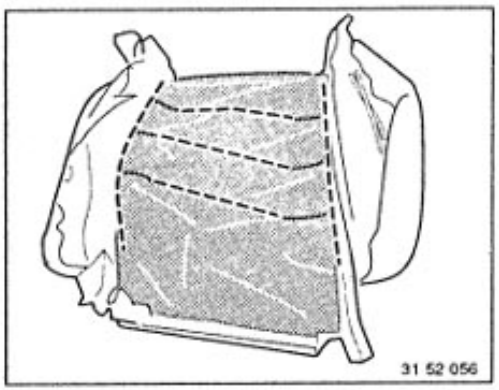
Installation:
Secure new (6 mm) clamps* with a pneumatic tacker*.
Cement cover in zone (1) with 3 M Cement Spray*.



Unbend clamps.

Installation:
Lock new clamps* by bending with Special Tool 52 0 050.

* Source of Supply: BMW Parts



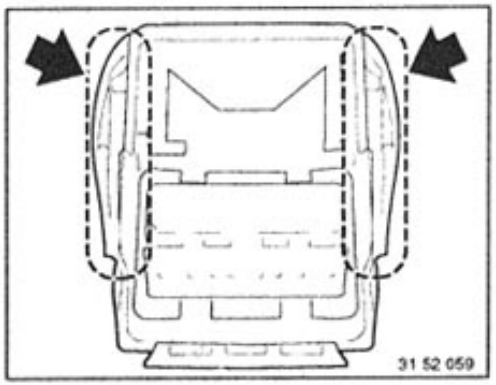
Remove cover.
Pull securing rods out.

Note:
Remove all clamps.

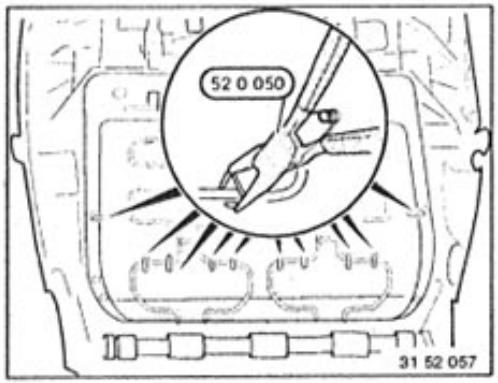
Installation:
Pull old securing rods into new cover; cutting the new cover accordingly for this purpose.

52 11 101 REPLACING CUSHION PADDING (FOAM RUBBER) FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.
Remove cushion shell – refer to 52 10 080.
Remove cushion cover – refer to 52 11 003.

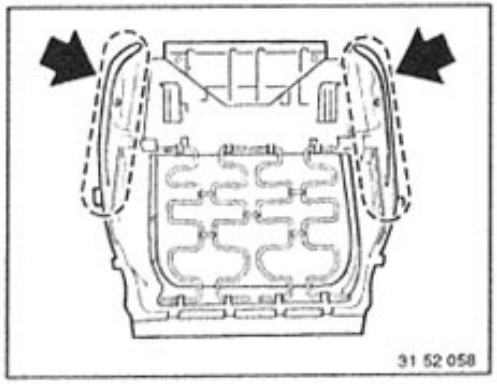


Installation:
Spray corresponding surfaces on padding. Press both parts together.



Unbend clamps and remove padding.

Installation:
Lock new clamps by bending with Special Tool 52 0 050.

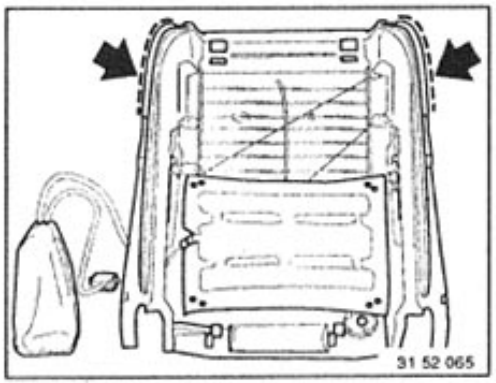


Installation:
Apply 3 M Cement Spray* on left and right cementing surfaces.

* **Source of Supply: BMW Parts**

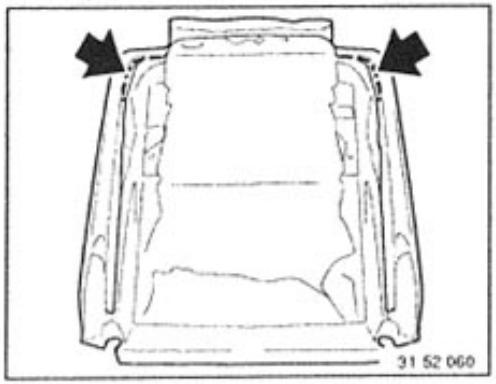
52 11 141 REPLACING BACKREST PADDING (FOAM RUBBER) FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.
Remove backrest cover - refer to 52 11 031.



Remove padding.

Installation:
Apply 3 M Cement Spray* on left and right cementing surfaces.

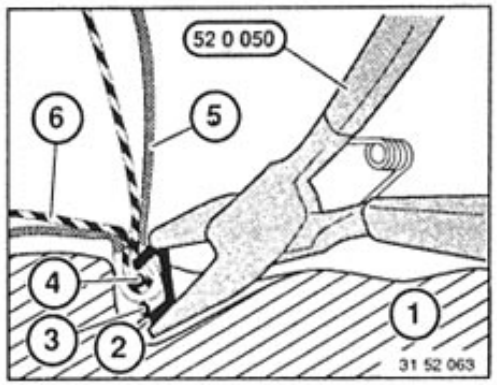


Installation:
Spray corresponding surfaces on padding.
Press both parts together.

* Source of Supply: BMW Parts

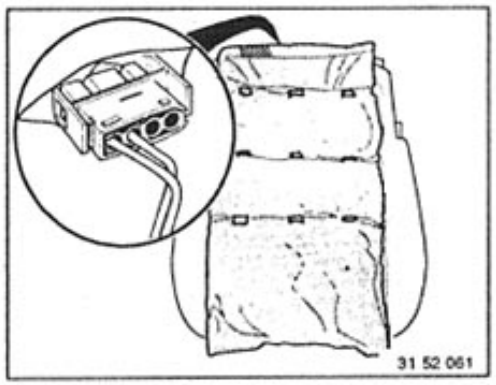
52 11 592 REPLACING CUSHION HEATING ELEMENT FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.
Remove cushion shell – refer to 52 10 080.
Remove cushion cover – refer to 52 11 003.

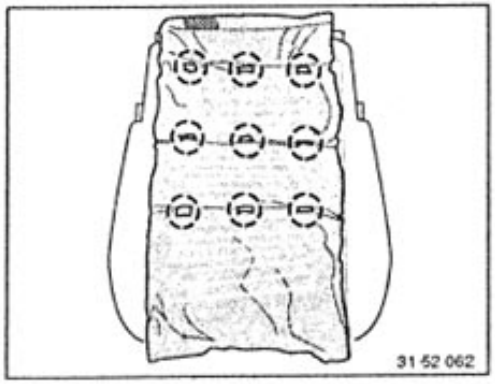


Installation:
Lock new clamps by bending with Special Tool 52 0 050.

1 Foam rubber padding
2 Clamp
3 Securing rod in padding
4 Securing rod in cover
5 Heating element
6 Cover

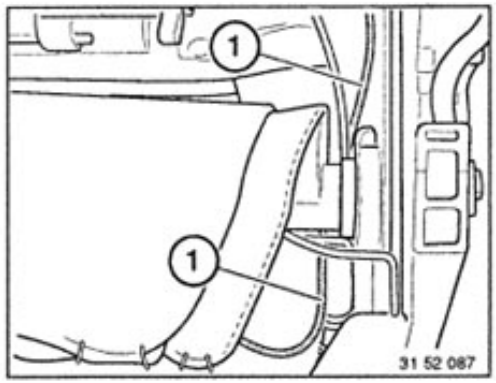


Pull wires through padding and remove heating element.



Installation:
The heating element must be secured together with the cover to the padding at the shown positions.

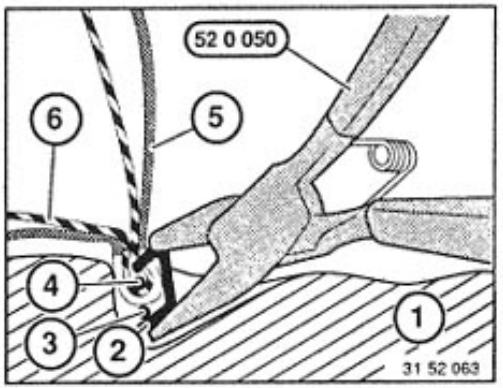
Caution!
Don't damage the heating conductor of the heating element.



Installation:
Check routing of wires (1).

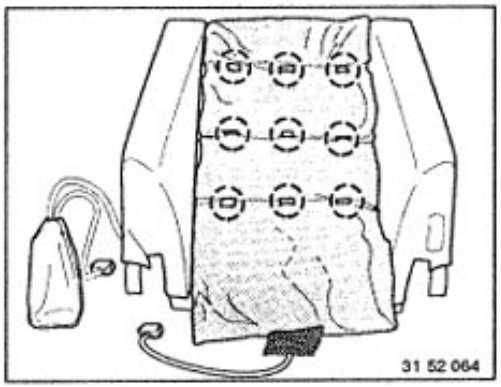
52 11 593 REPLACING BACKREST HEATING ELEMENT FOR LEFT OR RIGHT FRONT SEAT

Remove front seat – refer to 52 10 000.
Remove rear panel for front seat backrest – refer to 52 10 450.
Remove backrest shell – refer to 52 10 082.
Remove backrest cover - refer to 52 11 080.



Installation:
Lock new clamps by bending with Special Tool 52 0 050.

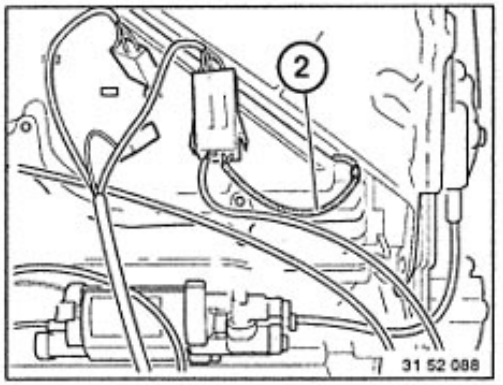
1 Foam rubber padding
2 Clamp
3 Securing rod in padding
4 Securing rod in cover
5 Heating element
6 Cover



Remove heating element.

Installation:
The heating element must be secured together with the cover to the padding at the shown positions.

Caution!
Don't damage the heating conductor of the heating element.

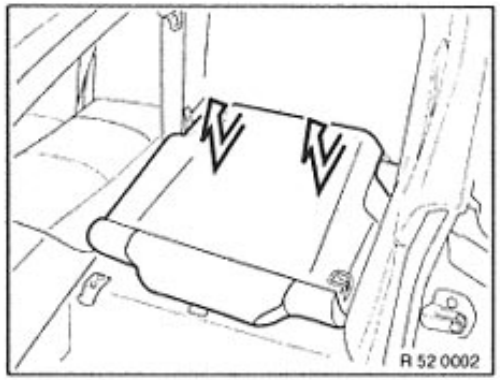


Installation:
Check routing of wires (2).

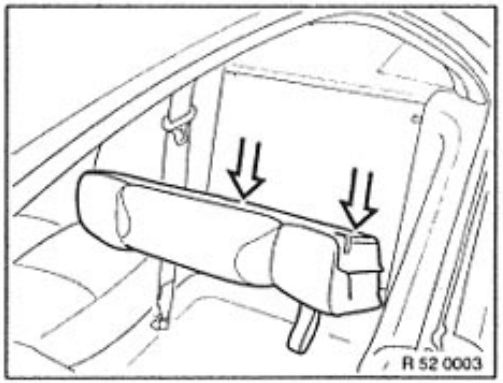
52 20 070 Removing and installing or replacing backrest on left or right back seat

Remove back seat, see 52 20 100.

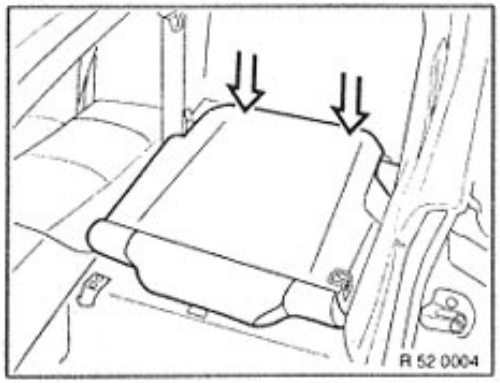
Unlock backrest with the loop and fold forwards.



Lift out rear backrest forwards / upwards.



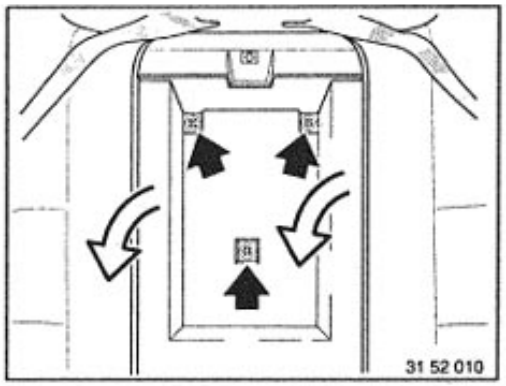
Installation:
Install backrest in spring at 45°.



Fold backrest downwards and press down firmly to engage.

52 20 100 Removing and installing or replacing left or right back seat

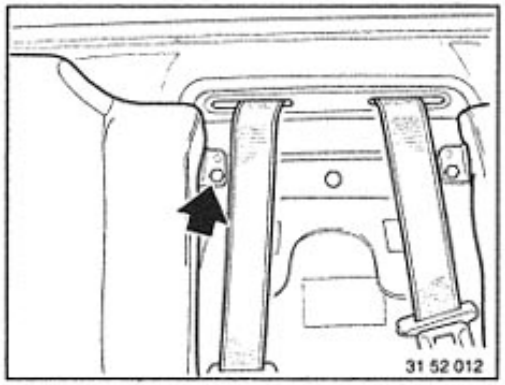
Open door window and side window.



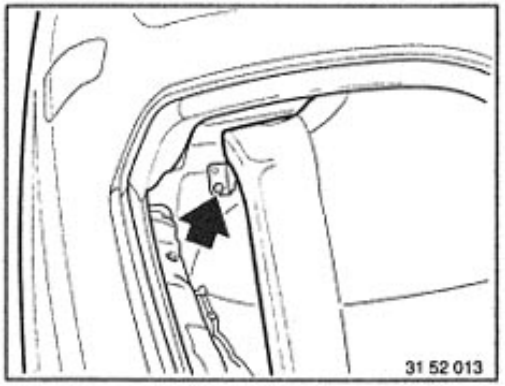
o One-piece back seat:

Remove side trim, see 51 43 000.

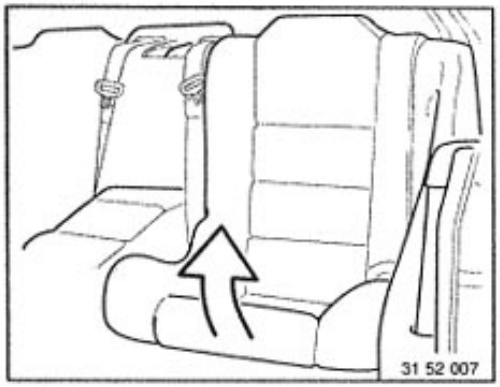
Remove first aid box.
Unfasten screws and carefully remove tray.



Unfasten inside screws.
Tightening torque, refer to Technical Data 52 24 1AZ



Unfasten outside screws.
Tightening torque, refer to Technical Data 52 24 1AZ



Lift front of seat and lift upwards to disengage.



o Folding back seat:

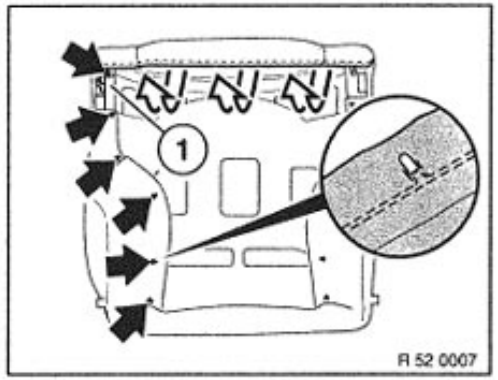
Note:
Side trim does not have to be dismantled.

Lift back seat forwards and upwards to remove.

52 20 245 Replacing lock on back seat backrest on left or right

Unscrew back section of rear seat, refer to 52 20 400.

If necessary, remove finisher from hinge.

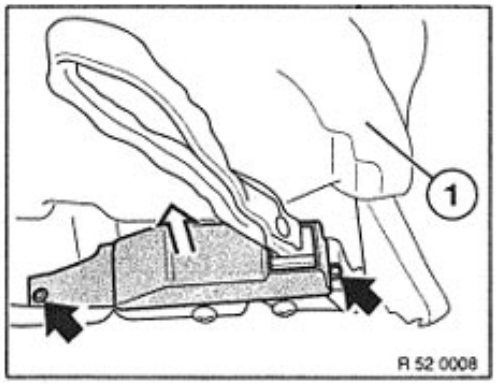


Remove strip from top.
Unfasten cover from outside face (1) of lock.

Remove cover and foam from outside face.

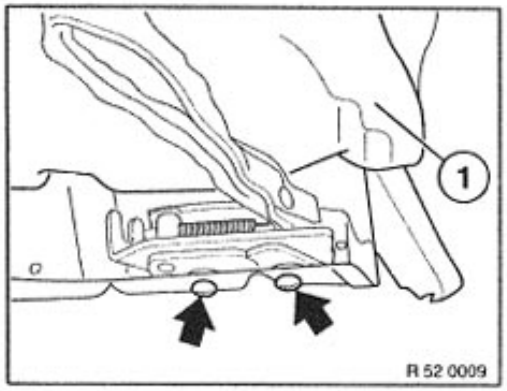
Note:
Remove the foam rubber cemented to the top fold (risk of damage).

Installation:
Secure foam with standard spray adhesive (for foam rubber).

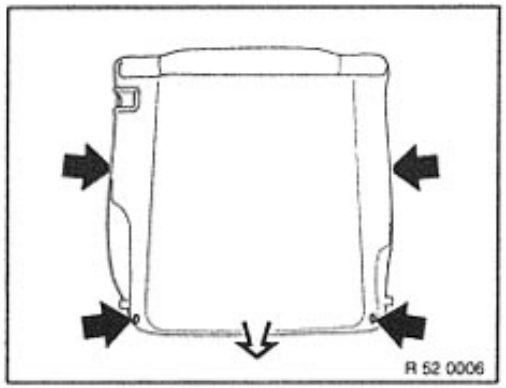


Drill out rivets from cover.

Installation:
Rivet diameter 4 mm.



Unfasten screws and remove lock.



51 20 400 Removing and installing or completely replacing back wall from back seat backrest

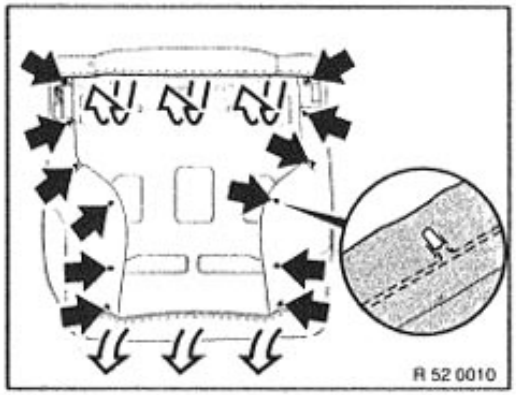
Remove backrest, see 52 20 070.

Unfasten screws.
Lift up lower cover and remove.

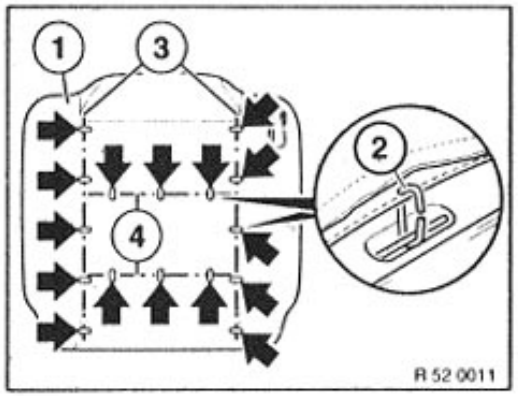
52 21 055 Removing and installing or replacing cover for back seat backrest on left or right

Remove back wall from back seat backrest, see 52 20 400.

Remove finisher from left / right mount.



Lift up strip to remove.
Disconnect backrest cover from clamping strip tips and remove by pulling downwards.

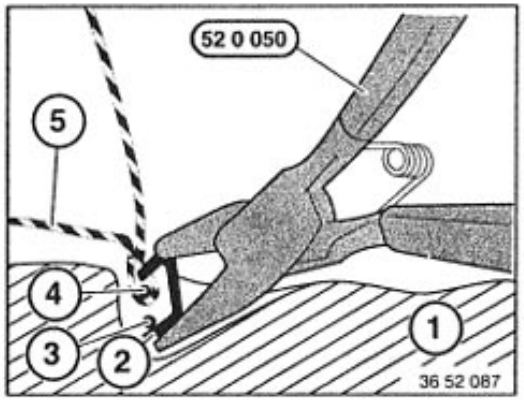


Fold backrest cover (1) to one side.Unfasten clips (2) in the cushion (foam padding) from the cover rods (3).
Remove cover rods (3) by pulling upwards.
Unfasten remaining clips (2) from cover rods (4) and remove backrest cover (1).

Note:
Remove clips completely.

Only replacement:

Installation:
Remove retaining rods from cover.
Cut new cover and slide in retaining rods.



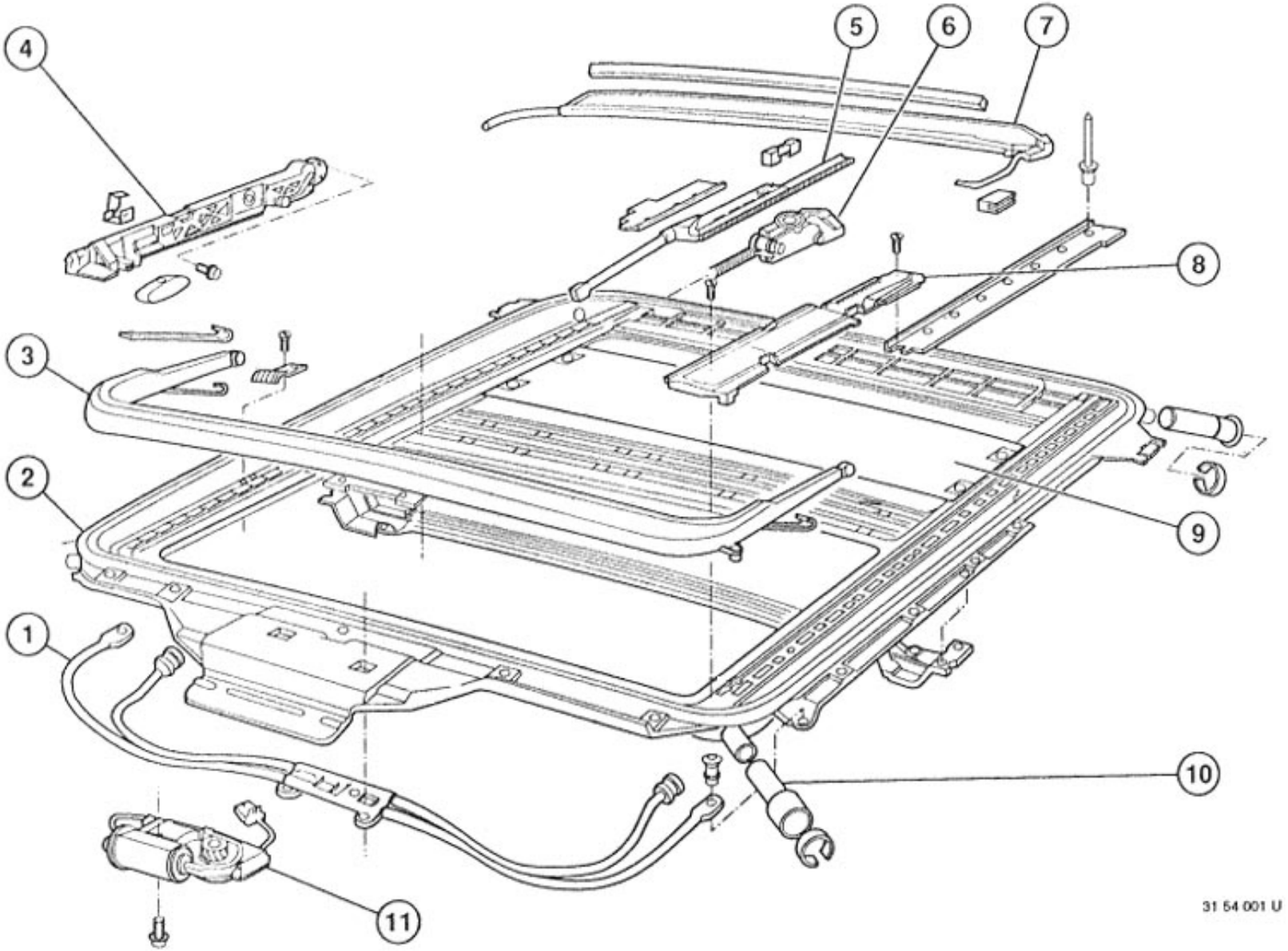
Installation:
Bend new clips with special tool 52 0 050.

1 Support
2 Clip
3 Retaining rod in the support
4 Retaining rod in the cover
5 Cover

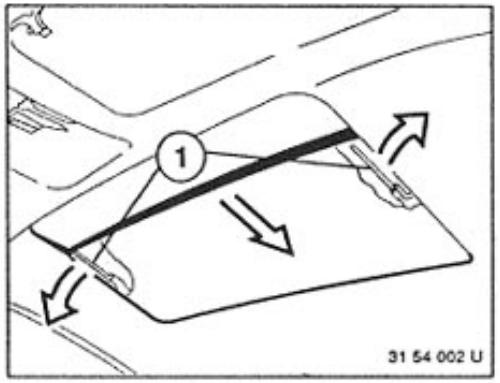
54 Hood, sunroof

54 12 . . .		Layout of slide/tilt sunroof	54-12/1
	004	Slide/tilt sunroof – adjust	54-12/2
	100	Slide/tilt sunroof lid – remove and install	54-12/3
	130	Headliner for slide/tilt sunroof lid – remove and install	54-12/4
	135	Water gutter – remove and install	54-12/5
	210	Slide/tilt sunroof, complete unit – remove and install	54-12/5
	241	Both drive cables for slide/tilt sunroof – remove and install	54-12/6
54 13 010		Motor and gearbox unit for slide/tilt sunroof – remove and install or replace	54-13/1
	015	Module for slide/tilt sunroof – remove and install or replace	54-13/2

54 12 ... SUN ROOF LAYOUT DRAWING

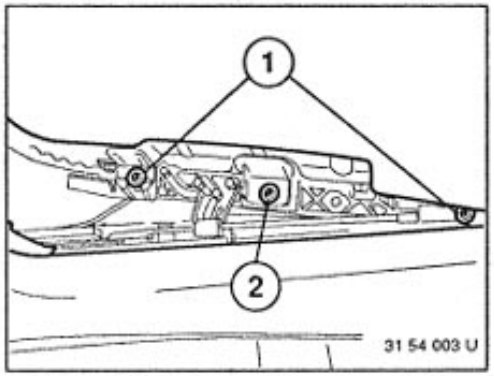


1 Guide pipe
2 Frame
3 Wind deflector
4 Gate
5 Rack
6 Drive cable
7 Water drain channel
8 Sliding rail
9 Floating roof liner
10 Water drain hose
11 Motor gearbox unit / module

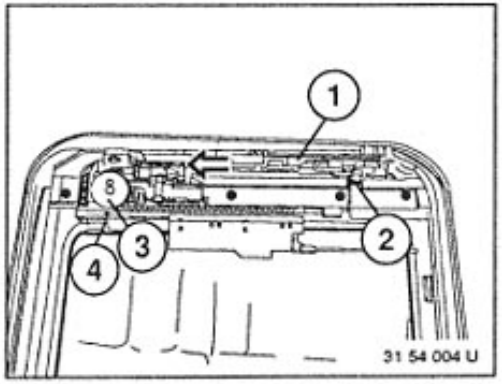


54 12 004 ADJUSTING SUN ROOF

Open the sun roof to lifted position.
Press locking lever (1) out and push the floating roof liner back.

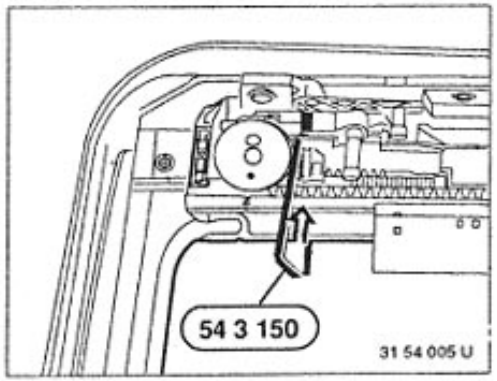


Loosen screws (1 and 2) on left and right sides.
Close the sun roof.



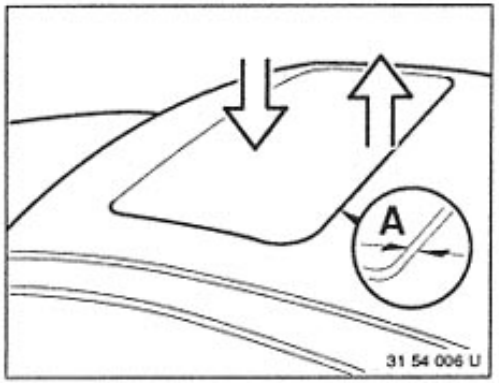
Press gate (1) back against stop (2) on left and right sides.
Bore (3) and notch (4) must be opposite each other on left and right sides.

Note:
The sun roof lid was removed for this picture.



Insert Special Tool 54 3 150 on left and right sides and lock the gate with it.

Note:
The sun roof lid was removed for this picture.



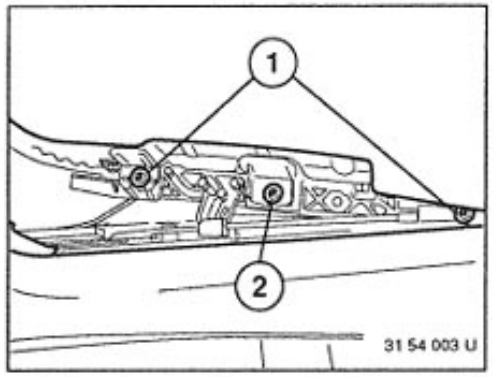
Ideal Adjustment:

Uniform distance (A) of lid to roof at front* and rear.

Height:

Front: flush to 1 mm deeper
Rear: flush to 1 mm higher

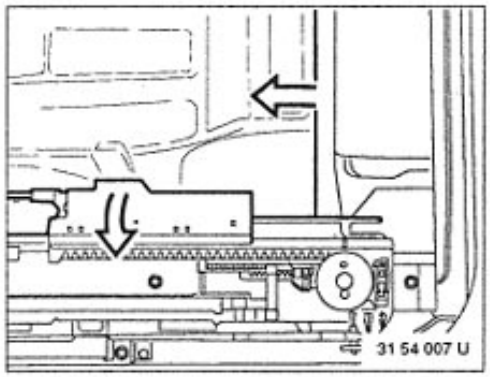
Installation:
Replace screws.



Tighten screws (1) on left and right sides.

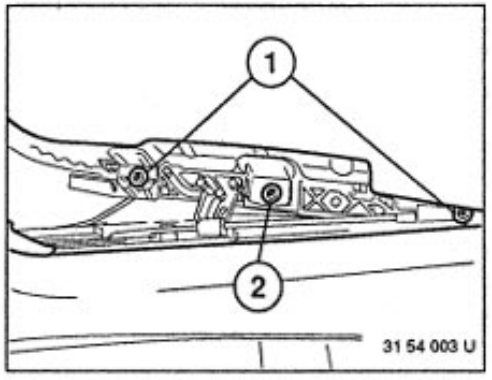
Installation:
Tightening torque*.

Remove Special Tool 54 3 150.



Important!
Lift left and right racks and pull floating roof liner forward half the distance (if not retainers on the racks would break off when operating the sun roof).

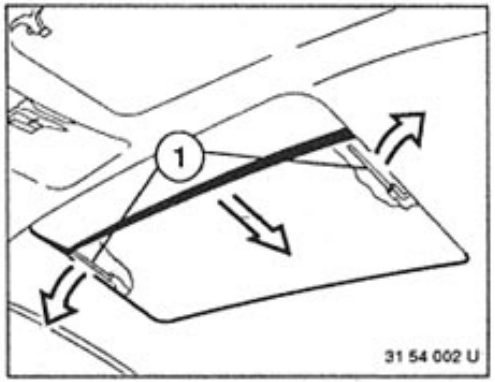
Note:
The sun roof lid was removed for this picture.



Open the sun roof to lifted position.
Tighten screws (2) on left and right sides.

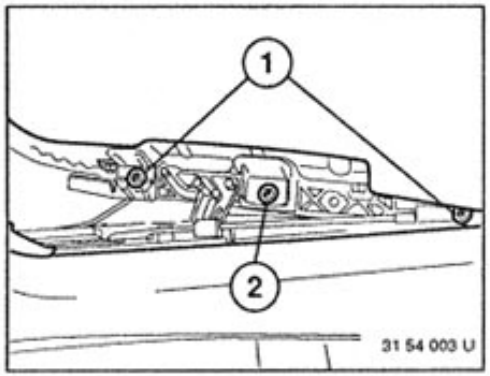
Installation:
Replace screws.
Tightening torque*.

* Refer to Specifications



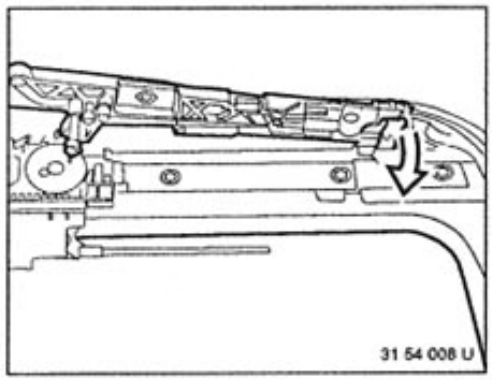
54 12 100 REMOVING AND INSTALLING SUN ROOF LID

Removing:
Opn the sun roof to lifted position.
Press locking lever out and push the floating roof liner back.



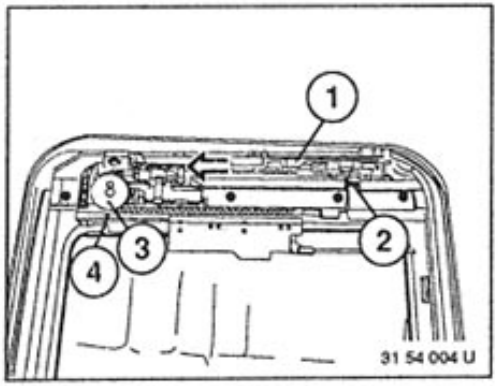
Loosen screws (1) on left and right sides.
Unscrew screws (2) on left and right sides.

Installation:
Replace screws.

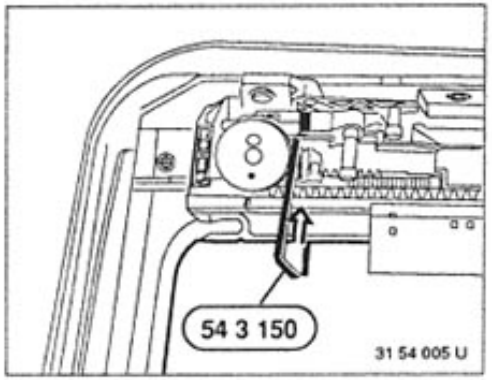


Press retainers in on left and right sides using a screwdriver and remove sun roof lid from above.

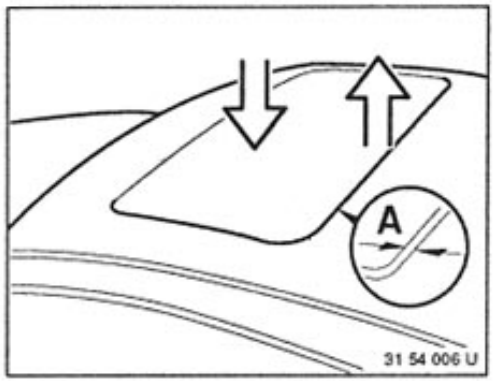
Note:
The sun roof lid was removed for this picture.



Installing:
Move sun roof lid or gates to "closed" position.
Press gate (1) back against stop (2).
Bore (3) and notch (4) must be opposite each other.



Insert Special Tool 54 3 150 on left and right sides and lock the gate with it.



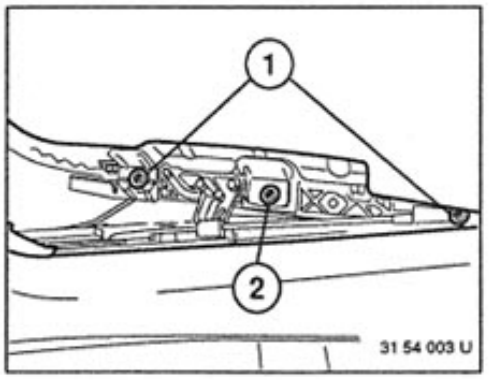
Mount and adjust lid.

Ideal Adjustment:

Uniform distance (A) of lid to roof at front and rear.

Height:

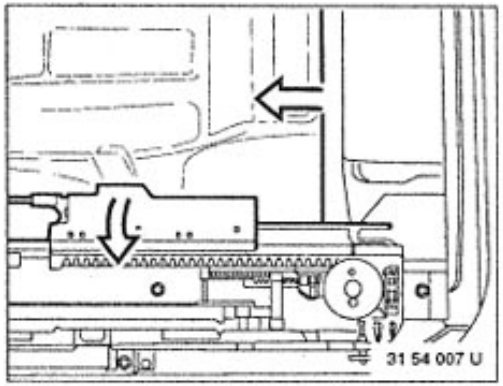
Front:	flush to 1 mm deeper
Rear:	flush to 1 mm higher



Tighten screws (1).
Tightening torque*.

Remove Special Tool 54 3 150.

* Refer to Specifications



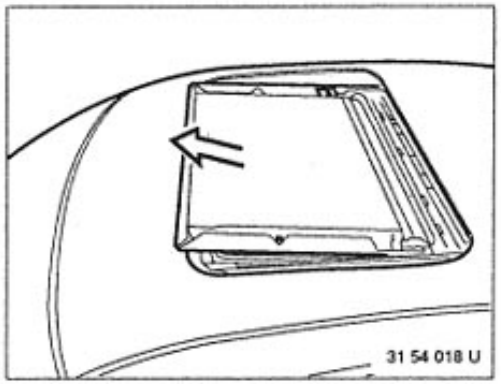
Important!
Lift left and right racks and pull floating roof liner forward half the distance (if not retainers on the racks would break off when operating the sun roof).

Note:
The sun roof lid was removed for this picture.

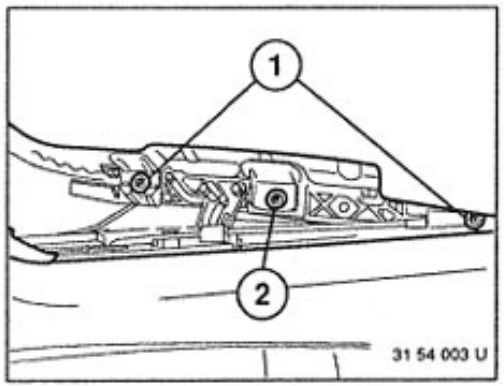
Installation:
Replace screws.

54 12 130 REMOVING AND INSTALLING ROOF LINER FRAME FOR SUN ROOF LID

Remove both drive cables for sun roof - refer to 54 12 241.



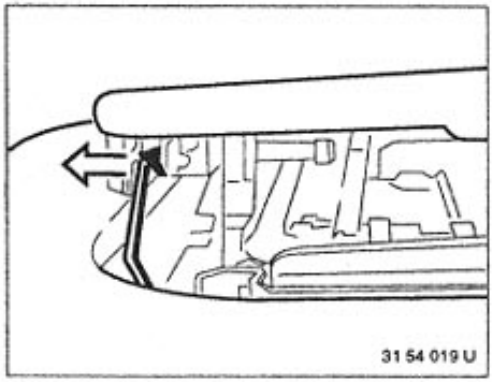
Pull floating roof liner forward as far as possible and lift it out.



Open the sun roof to lifted position.
Install and tighten screw (2).
Tightening torque*.

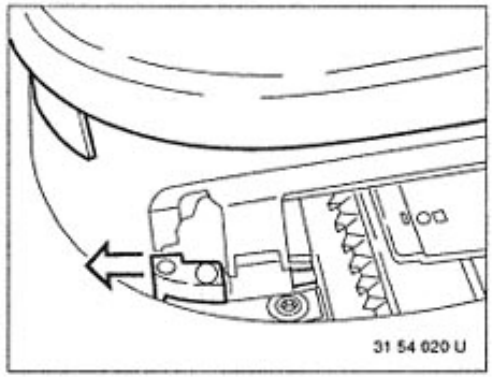
Pull floating roof liner forward as far as possible and engage.

* **Refer to Specifications**

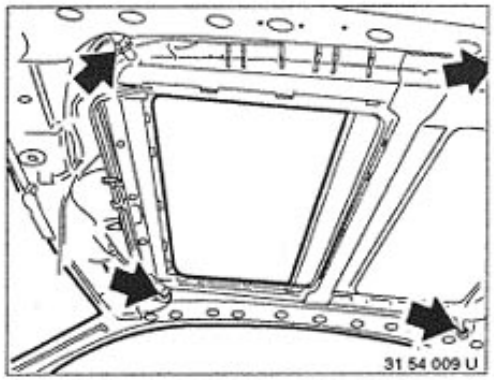


54 12 135 REMOVING AND INSTALLING WATER DRAIN

Open sun roof to lifted position.
Unclip linkage from behind on left and right sides.



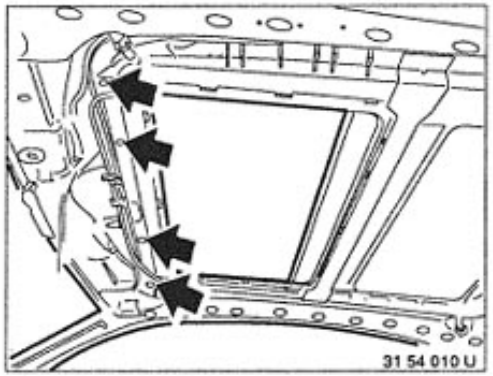
Unclip left or right side.
Push rain molding strip aside and lift out water drain.



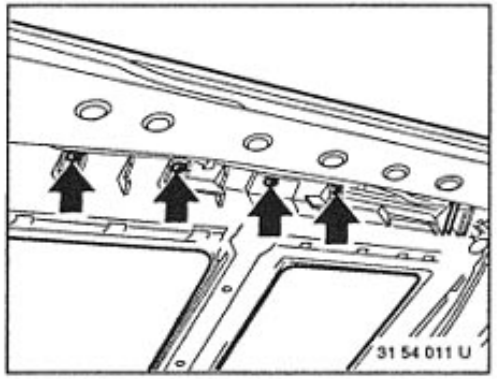
54 12 210 REMOVING AND INSTALLING SUN ROOF ASSEMBLY

Open sun roof and lower side windows.
Remove roof liner – see Group 51.
Remove motor and gearbox unit for sun roof – see 54 13 010.
Loosen clamps at front and rear on left and right sides.
Pull off water drain hoses.

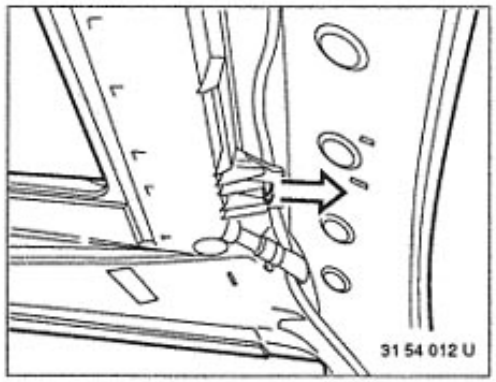
Installation:
Replace clamps.



Unscrew screws on left and right sides.



Unscrew screws on left and right sides.



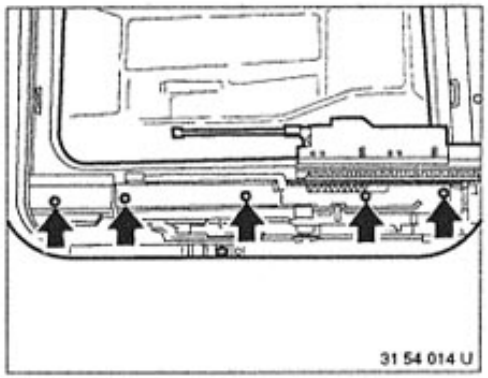
Press out retainers on left and right sides.
Lower rear end of sun roof cassette slightly and then pull back.

Installation:
Hook in sun roof cassette.

* See Specifications

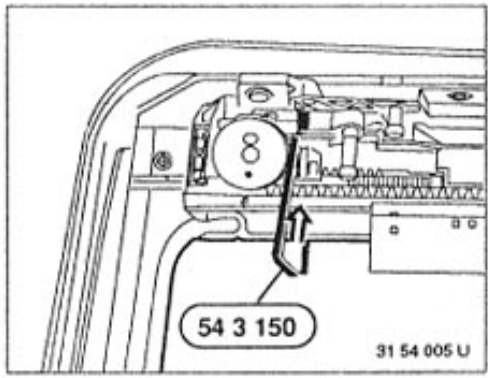
54 12 241 REMOVING AND INSTALLING BOTH DRIVE CABLES FOR SUN ROOF

Remove sun roof lid – see 54 12 100.
Remove motor/gearbox unit – see 54 13 010.

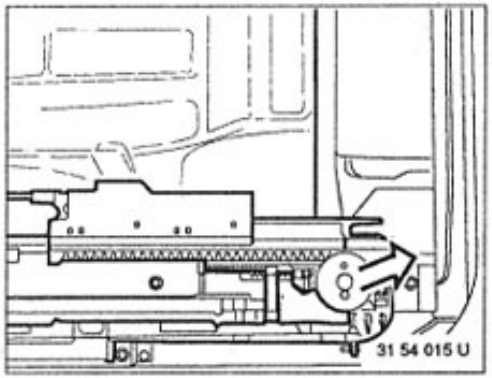


Unscrew screws and take off sliding rails.

Installation:
Replace screws.
Tightening torque*.

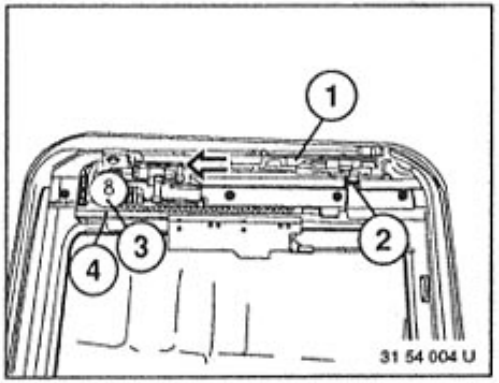


Installation:
Insert Special Tool 54 3 150 on left and right sides to lock the gates.

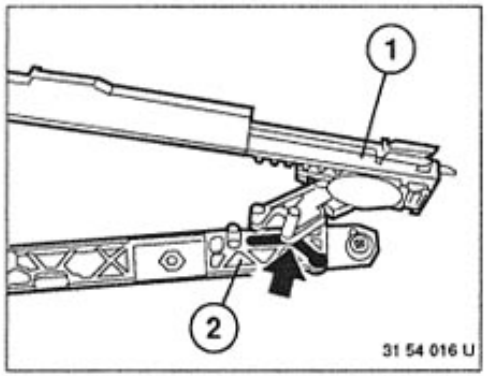


Push drive cable with gate forward completely on left and right sides.
Lift gate and unclip linkage on left and right sides.
Lift and pull out drive cable with gate toward rear.

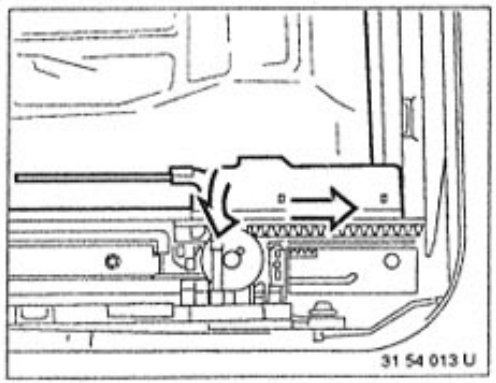
Installation:
Don't lubricate drive cables.



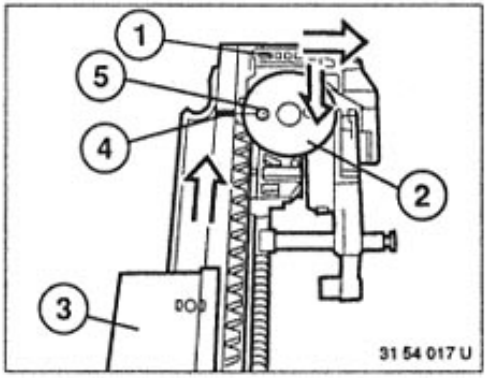
Installation:
Push drive cable with gate forward uniformly to "closed sun roof position" on left and right sides.
Then press back gate (1) against stop (2) on left and right sides.
Bore (3) and notch (4) must be opposite each other on left and right sides.



Press drive cable (1) off of gate (2) in middle position.
Drive cable (1) is marked
L for left
or
R for right.



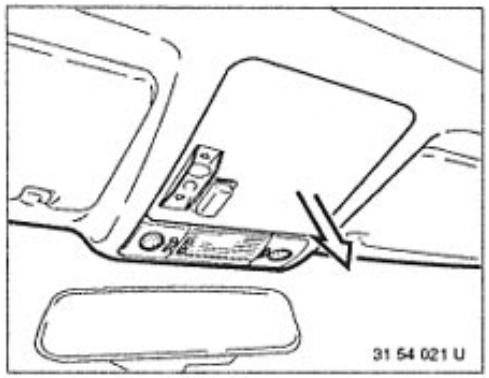
Push back drive cable with gate uniformly on left and right sides, while lifting the rack (if not, clips would break off).



Push lock (1) aside, press on gear (2) firmly and push rack (3) forward.

Installation:
Notch (4) and bore (5) must be aligned with the lock engaged.
Correct the position if necessary.

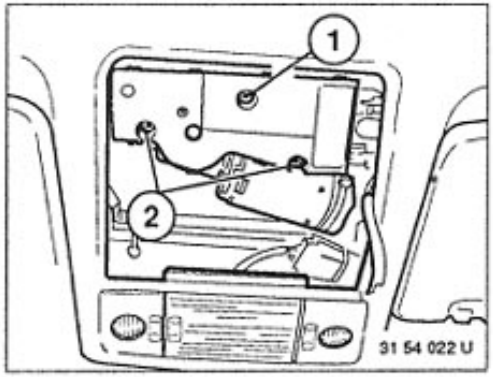
* See Specifications



54 13 010 REMOVING AND INSTALLING OR REPLACING MOTOR AND GEARBOX UNIT FOR SUN ROOF

Lift cover out.

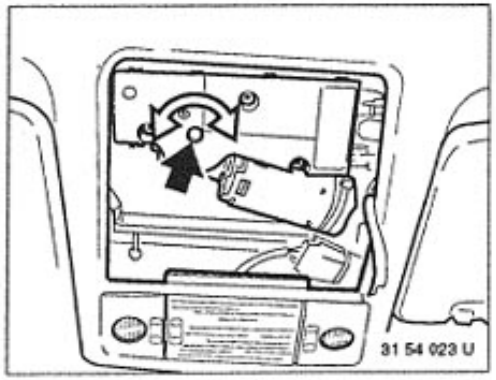
Installation:
Check function.
If applicable, initialize the sun roof module by operating and holding the switch approx. 15 seconds (plug connection on sun roof module must have been disconnected once).



Unscrew screws /1 and 2).
Remove motor/gearbox unit and sun roof module.
Disconnect plug.

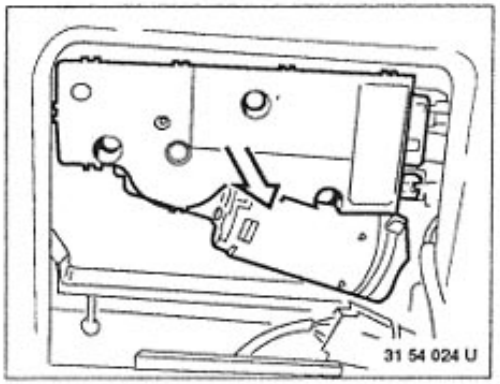
Installation:
Tightening torque*.

Screw 1 = long
Screw 2 = short

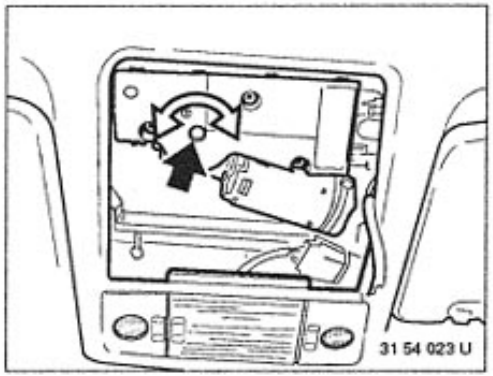


Installation:
Turn the motor shaft using a hexagon socket wrench until the gearbox gear engages in the drive cables.

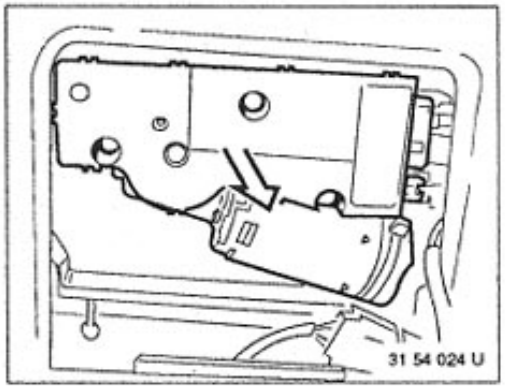
* **Refer to Specifications**



Lift the sun roof module off of the motor / gearbox unit.



Installation:
Turn the motor and gearbox shaft using a hexagon socket wrench until the sun roof module can be installed.



54 13 015 REMOVING AND INSTALLING OR REPLACING MODULE FOR SUN ROOF

Procedures are identical with those for "Removing and Installing Motor and Gearbox Unit for Sun Roof".

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GENERAL INFORMATION

Important When Disconnecting Battery!

Location: In trunk one battery each on left and right sides behind the wheel house.
Disconnecting the battery erases the fault memories of control units so that fault memories should be read first and any faults printed.
Always disconnect both ground leads — otherwise danger of short circuits!

Important After Reconnection of Battery!

Faults could be stored in the fault memories due to the different switching-off and switching-on conditions of control units. If in doubt, interrogate the fault memories, eliminate faults and erase fault memories.

Re-initializing front power windows: Shut the doors, raise the windows by operating the switch and hold the switch pressed in for at least 3 seconds.

Re-initializing power sun roof: Lift the sun roof lid by operating the switched and hold the switch pressed in to lift position for at least 15 seconds.

Checking initialization: The automatic tip operation must function in the closing direction. If not, repeat the procedures.

Important With Connected Battery!

Working on components, wire connections and so on could cause faults in fault memories of the concerned control units.
If disconnection of the battery is specified in the Repair Manual for the carrying out of repairs, there must always be conformance with this in the interest of safety.

Outside Starting Aid and Car Telephone!

Siemens C 2:
When starting the engine with help of the battery in a different vehicle en- sure that the Siemens C 2 telephone is not damaged through overvoltage. Disconnect the sender and receiver from the electrical system prior to starting the engine with outside help.

Siemens C 3 and Motorola C 451:
Senders and receivers of Siemens C 3 and Motorola C 451 car telephones have overvoltage protection, but calls may not be made while starting the engine with outside help.

Always refer to the pertinent operating instructions of other type and other make car telephones. If in doubt, disconnect the sender/receiver from the electrical system.

Windshield Wipers (Wiper Operating Motor)

Intermittent wiping and wiper speed 1 are switched off by a protector in case of failure. The protector remains active even after eliminating the fault. It can be cancelled by turning the ignition off (terminals 15 and R) for 3 minutes.

Instructions for Removing and Installing Electronic Control Units

If disconnection of the battery is specified in the Repair Manual for the carrying out of repairs, there must always be conformance with this in the interest of safety.

Caution!
Disconnecting the car's battery will cancel the fault memories of control units.
Consequently prior to disconnection of the car's battery fault memories should be interrogated and faults printed by the printer of a BMW Service Tester. Investigate stored faults.
Ignition must always be switched off before disconnecting or connecting control unit plugs.
Removal and installation of components, relays, fuses, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis. Consequently fault memories must always be interrogated after working on the electrical system. Stored faults must be investigated and erased.

BATTERY CARE AND MAINTENANCE

The electrolyte level of present low-maintenance batteries should be checked at least annually and corrected to the max. mark specified by the battery supplier with distilled water when necessary.
Discharging by the power consumption of control units even in standby mode is added to the natural self-discharging of a battery due to the increasing number of control units used in cars today. The batteries of cars in storage should be recharged at the latest every six weeks to maintain the service life and avoid excessive discharging (refer to battery recharging calender). The time for self-discharging depends on the car model and equipment.

Charging Battery:

If a standard or fast charger (e.g. Bosch SL 24 90*) is used to charge a battery, the battery must be disconnected from the car's electrical system and removed in order to avoid damage to paint finishes and upholstery by the escaping gas.
Excessively discharged batteries could be damaged or destroyed by the very high initial current (high temperature).
The battery can remain connected when using an electronic charger (e.g. Siemens VB 80).
The electronics deos not permit critical peak voltage.
An electronic charger also charges an excessively discharged battery with reduced current until a certain basic voltage is reached.
Refer to Service Information 61 08 88 if there is doubt as to whether or not the battery charger in the workshop is suitable.

Important!
Always first measure the open circuit voltage before charging a battery installed in the car. If this voltage is 10 V or less, it cannot be excluded that one or more cells are faulty or that the battery as a whole is already pre-damaged.
In this case it is always necessary to remove the battery as escaping gas while charging could damage interior equipment.
Attempt to regenerate the faulty cells with low charging current.
Remove plugs from the separate cells in the interest of safety.
Also refer to page 61-21/1.

Testing Battery:

An objective statement on the charged condition of a battery is only possible by way of a load test with cold testing current.
This test can be carried out with a battery tester, for example

Bosch T 12 220* or preferrably with
Bosch T 12 200*.

Additional information on load tests is contained in the pertinent operating instructions (also refer to page 61-20/1).

The acid density of a battery can also be used to determine the charged condition.
This test, however, is not as positive due to the design-orientated dispersion range of acid density (e.g. charged standard battery version = acid density 1.28 kg/ltr. — tropic version = acid density 1.23 kg/ltr.).
Another interferring factor is the acid layer immediately after filling with distilled water.
Battery wear with partially sulphated and/or strongly contaminated paltes will also lead to incorrect acid density test results.

* Source of Supply: BMW Parts

* Source of Supply: BMW Parts

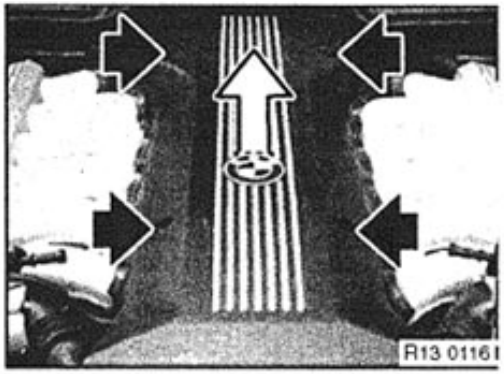
61 11 051 Replacing section of engine wiring harness (M73)

Observe instructions on disconnecting/connecting battery, refer to General Data MG 12.

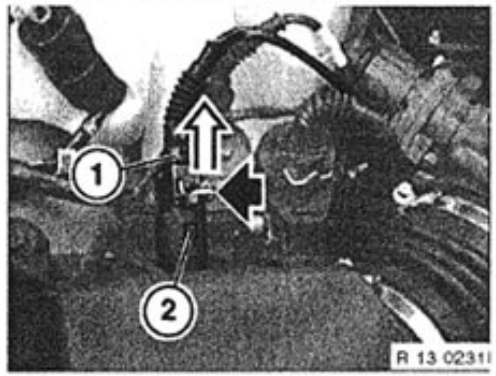
Switch off ignition.

Remove battery ground wires.

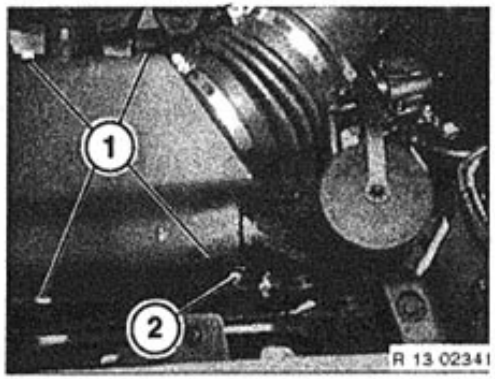
Remove fan wheel, refer to 11 52 020.



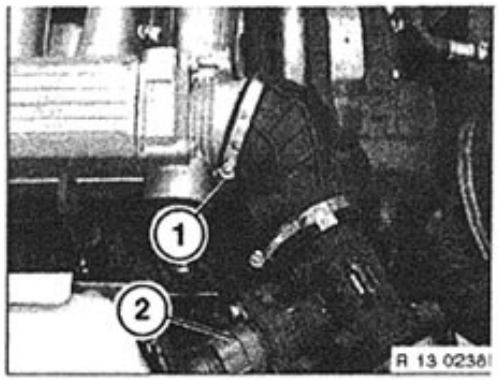
Rotate through screws 90°. Remove top of cylinder head cover.



Press down interlock (2) and remove plug connection (1).

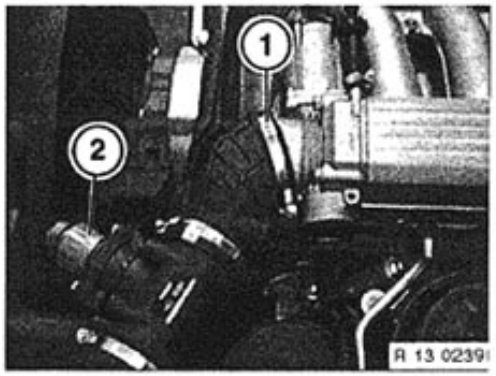


Unfasten clips (1).
Unfasten hose clip (2) on inlet hose for air pump.

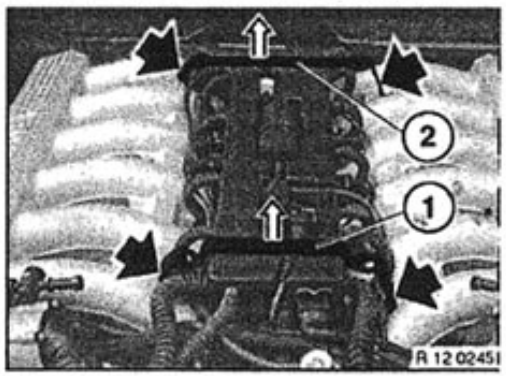


Unfasten hose clip (1).
Disconnect plug connection (2).

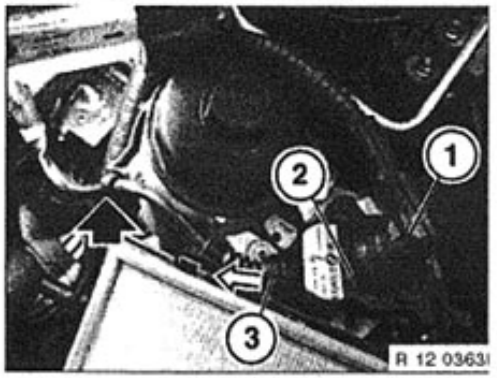
Remove right upper section of intake filter housing with mass air flow sensor.



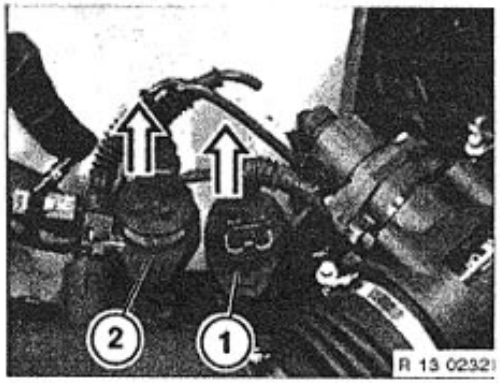
Unfasten hose clip (1).
Disconnect plug connection (2).
Remove upper section of intake filter housing with mass air flow sensor.



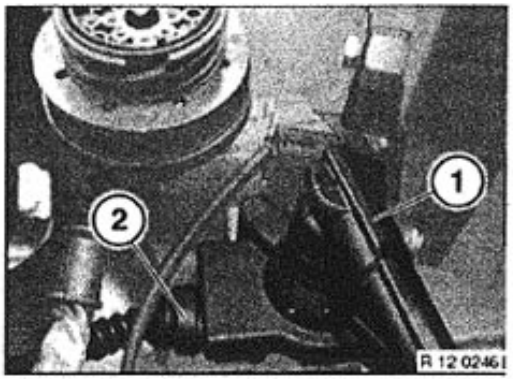
Unfasten retaining brackets (1 and 2) for top of cylinder head cover, unfasten screws and remove retaining bracket.



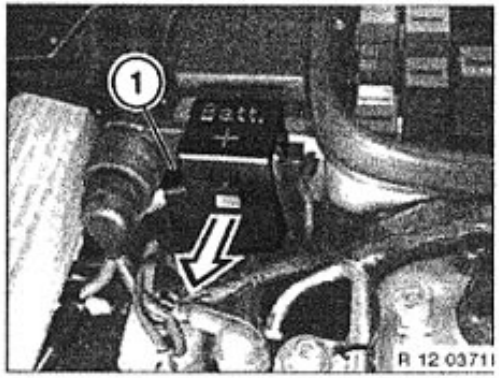
Remove connections (1), lift off cover (2) and disconnect plug connection (3).



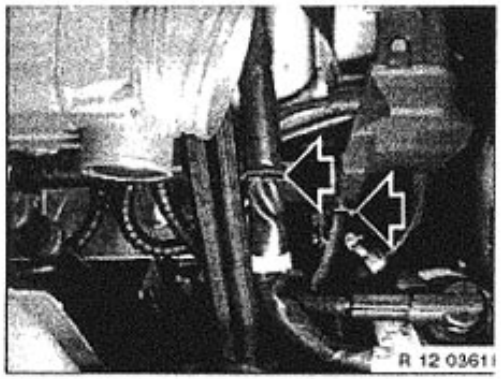
Designate plug connection of tank vent valves and disconnect plug connection.



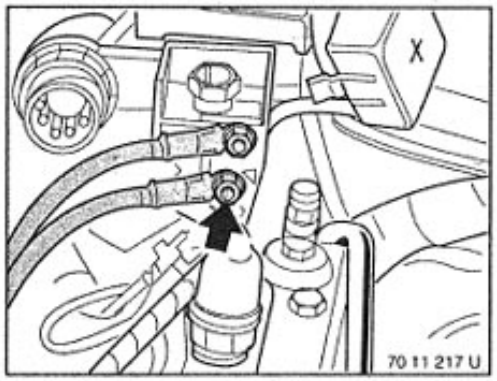
Disconnect connections (1 and 2) from right ignition coil.



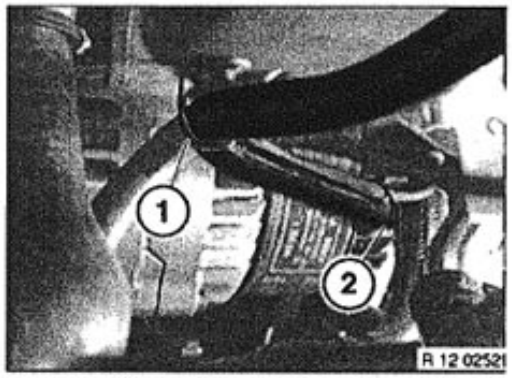
Unfasten clips (1) and remove cover.



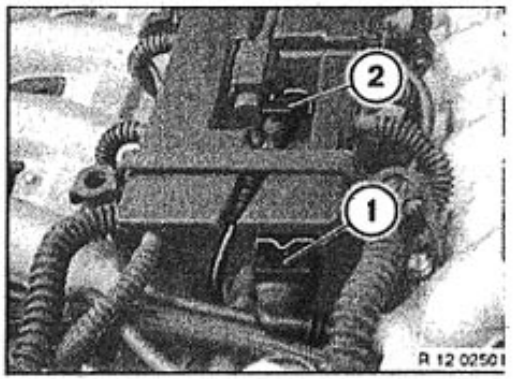
Installation:
Note wiring harness routing on cover of distributor cap. Fit cable tie.



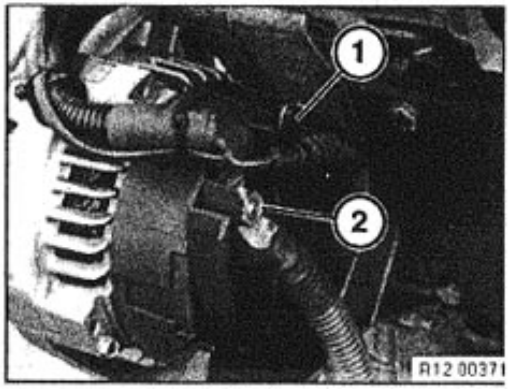
Unfasten screw connection on positive battery lead.



Disconnect connections on alternator, disconnecting cable ties (1 and 2).

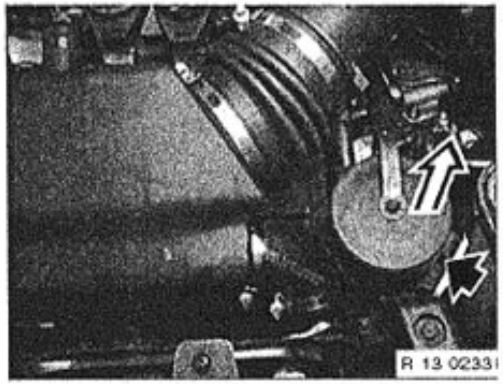


Disconnect plug connection (1) from camshaft sensor and plug connection (2) in vacuum control unit.

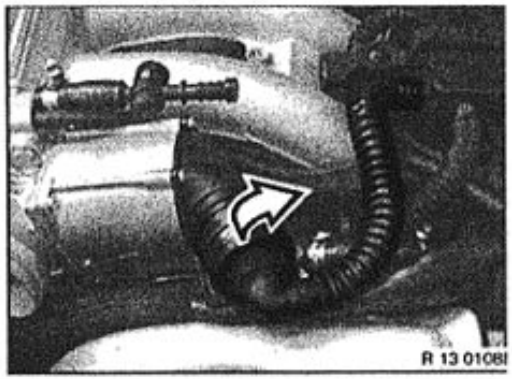


Connections illustrated here on removed alternator.
Disconnect plug connection (1).
Unfasten nut (2).

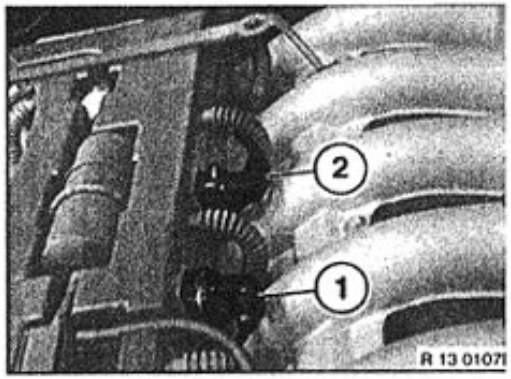
Installation:
Tightening torque,
refer to Technical Data 12 31 1AZ.



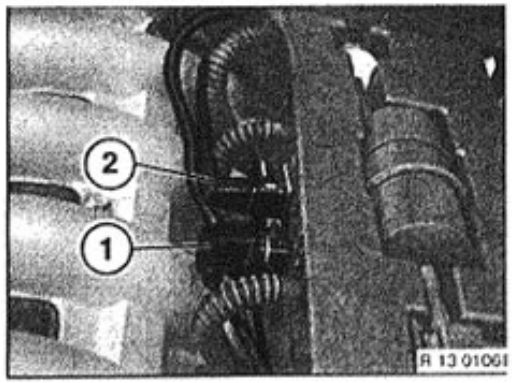
Unclip and remove diagnosis receptacle from bracket.



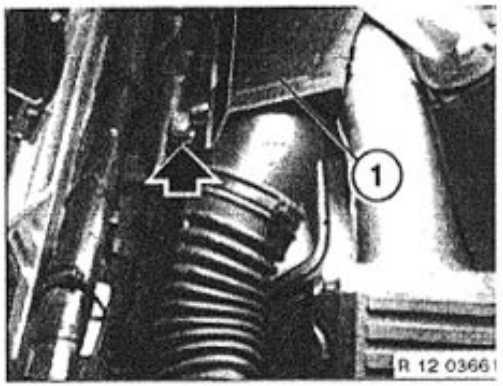
Unfasten plug connection on actuator motors for throttle valve actuation.



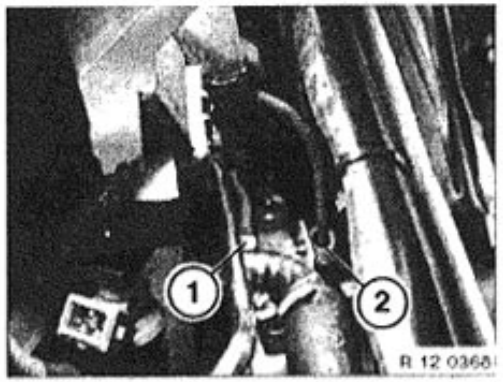
Unfasten plug connection on cable duct
1 Knock sensor for cylinders 1 to 3
2 Knock sensor for cylinders 4 to 6



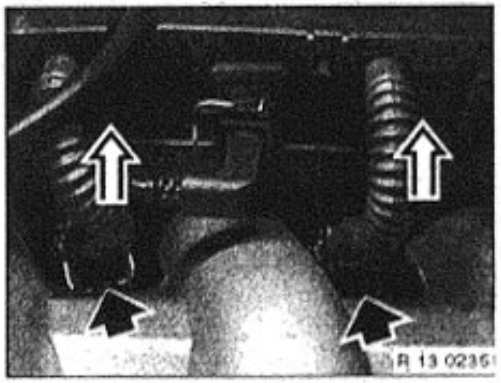
Unfasten plug connection on cable duct
1 Knock sensor for cylinders 7 to 9
2 Knock sensors for cylinders 10 to 12



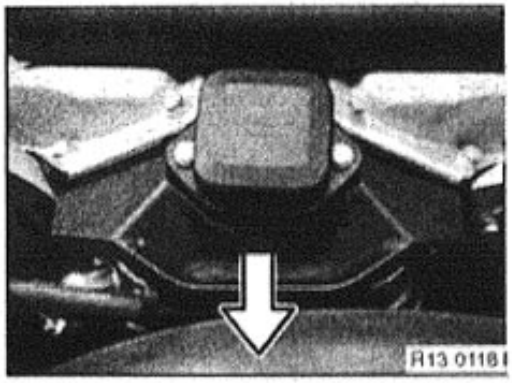
Unfasten nut at back of cable duct (1).



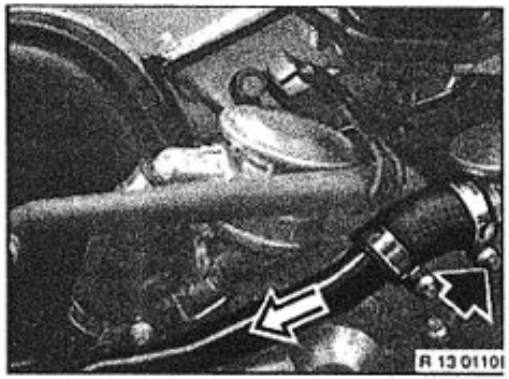
On rear cable duct:
Unfasten screw (1) and remove ground strap.
Unclip and remove cable clip (2) for impulse sensor line.



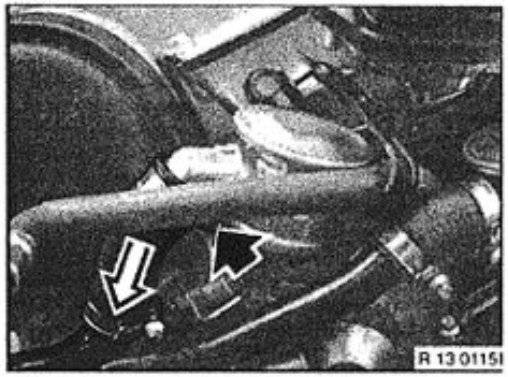
Disconnect plug connection on the injection valves.



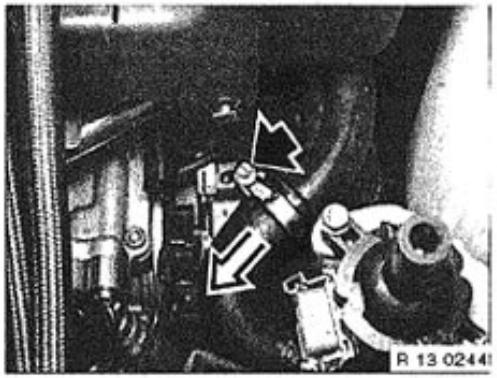
Unclip and remove oil drip tray.



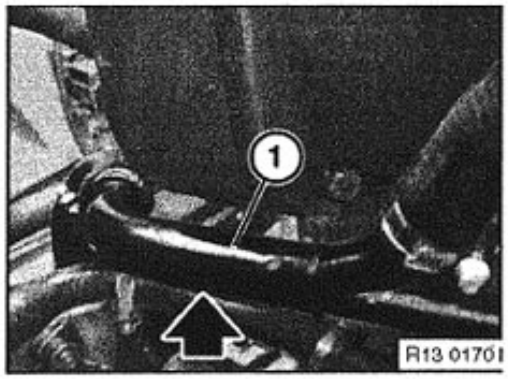
Unfasten pressure hose on pressure pipe on non-return valve for air induction to cylinder bank 7-12.
Unfasten hose clip. Unfasten hose on neck of non-return valve.



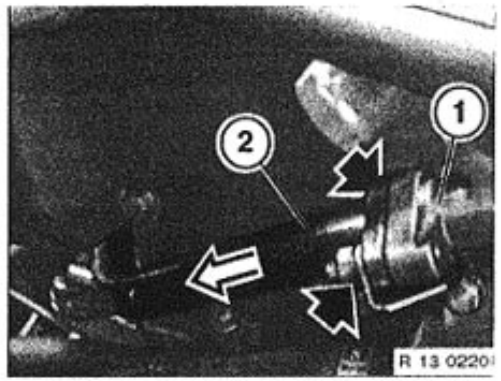
Pressure hose on pressure pipe of non-return valve for air induction of cylinder bank 1-6.
Unfasten hose clip. Unfasten hose on neck of non-return valve.



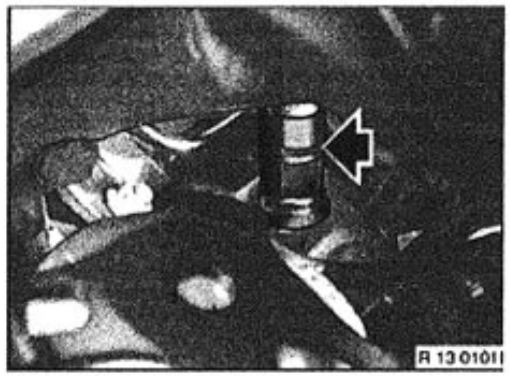
Pressure hose from air pump on pressure pipe. Unfasten hose clip and remove hose.



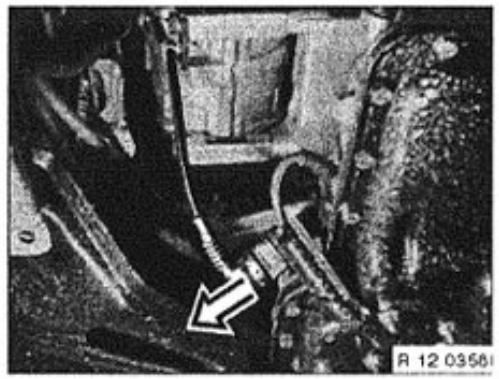
Unscrew pressure pipe (1) from brackets.



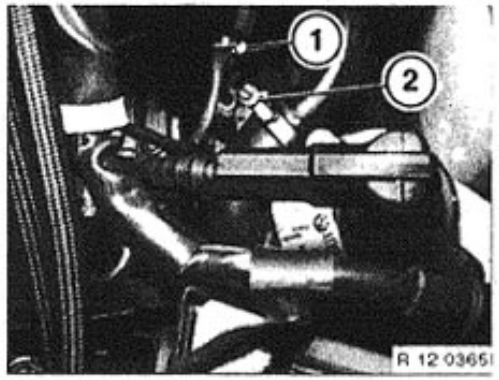
Unfasten nuts (1 and 2) from non-return valve on cylinder bank 1-6 and remove pressure pipe (2) from flange of non-return valve (1).
After removal of non-return valve, plug connection can be disconnected from temperature sensor.



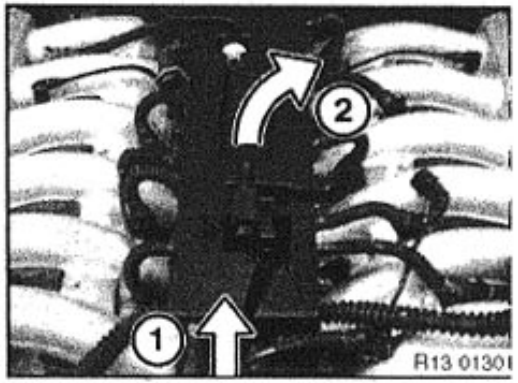
Installation location on water pump.
Unfasten plug connection of temperature sensor for coolant temperature.



Unfasten plug connection from oil level sensor.

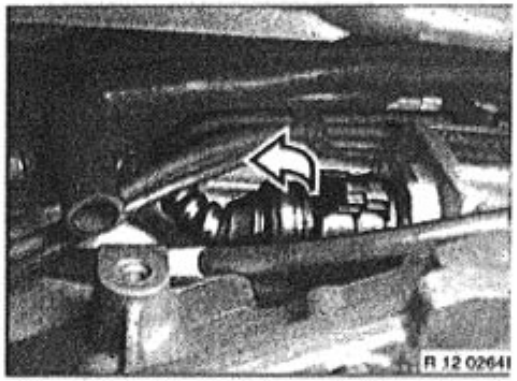


Installation:
Note wiring harness retainers (1 and 2) on cover of distributor cap and on body bracket.
Fit cable tie.

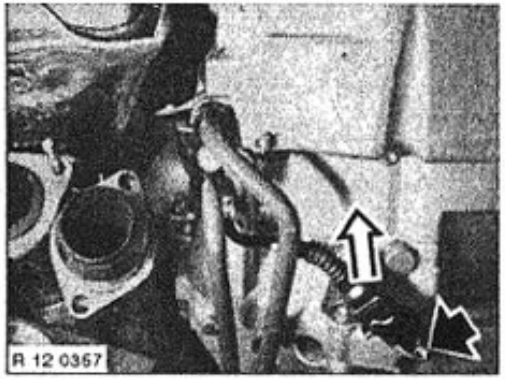


First slide cable duct backwards to remove from front interlock (1) then lift (2).

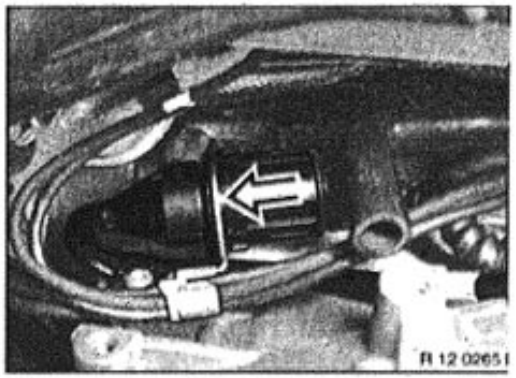
The wiring harness is now removed to a point where, for example, the intake air manifold can be removed.



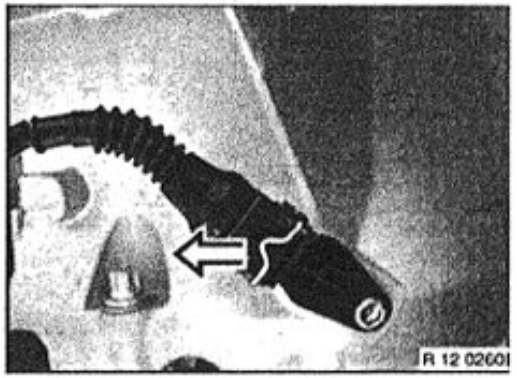
Disconnect plug connection for position switch on automatic transmission.



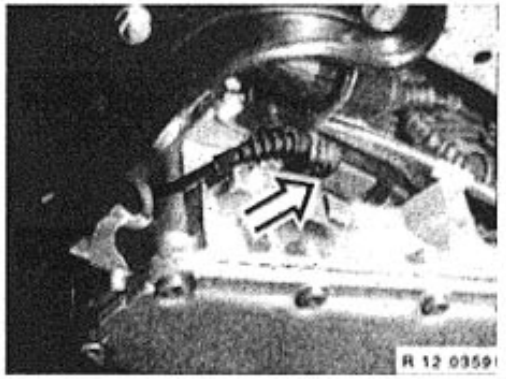
Disconnect plug connection of impulse sensor on crankshaft (flywheel) for DME control unit on cylinder bank 1–6 (DME 1).



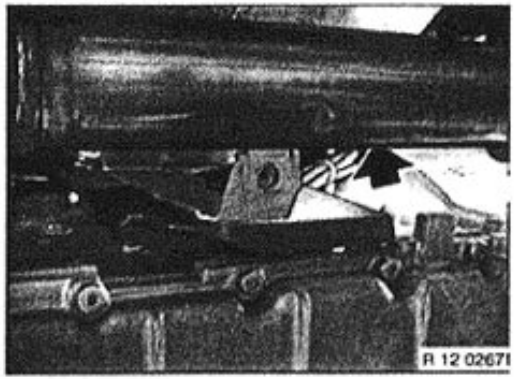
Disconnect plug connection for shift unit on automatic transmission.



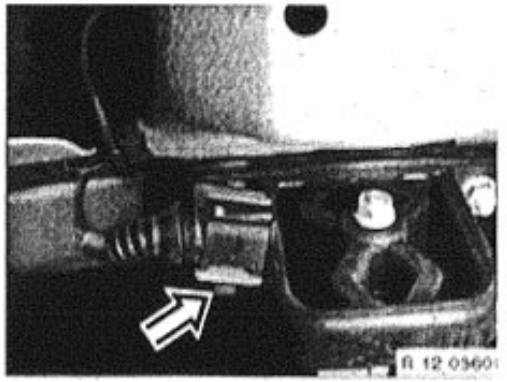
Disconnect plug connection from impulse sensor on crankshaft (flywheel) for DME control unit on cylinder bank 7–12 (DME 2).



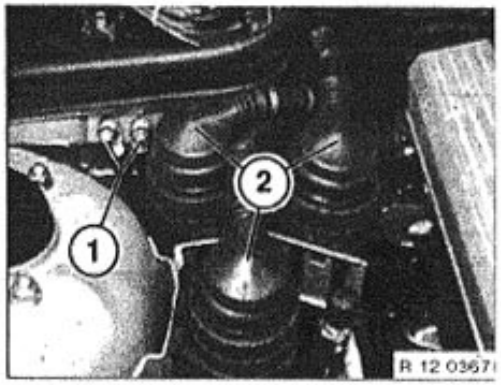
Disconnect plug connection on oxygen sensors.



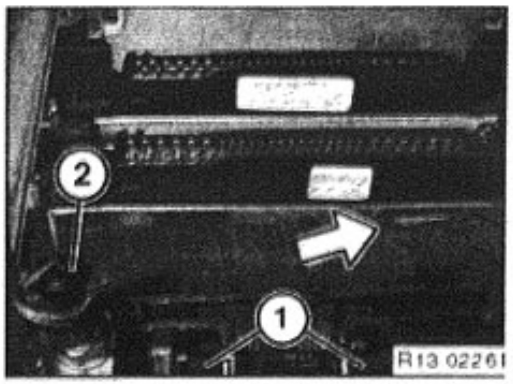
Unclip and remove lines from brackets on transmission.



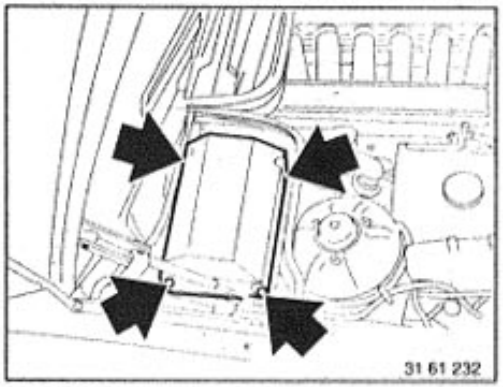
Disconnect plug connection from Lambda monitor sensors.



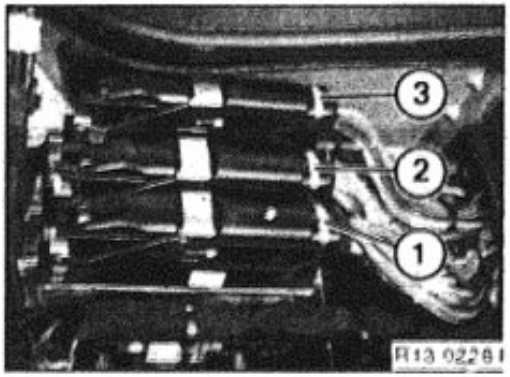
Unfasten nuts (1) on ground wires and disconnect plug connection (2).



Unfasten clips (1) and disconnect plug connection (2).

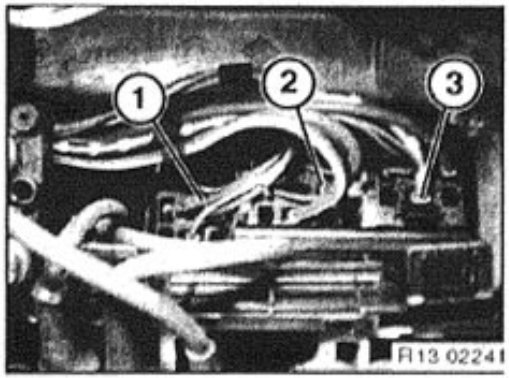


Unfasten screws.
Remove cover.



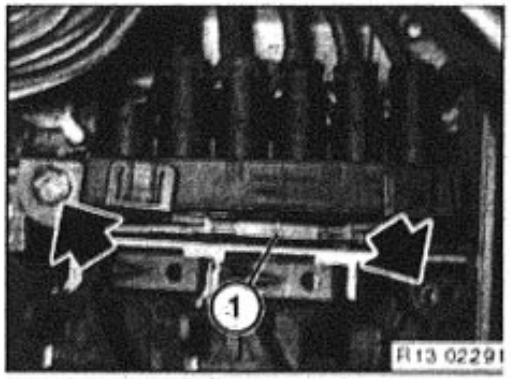
Disconnect plug connections (1 to 3).

1 Control unit DME 1
2 Control unit DME 2
3 Control unit EML (Electronic Power Control)

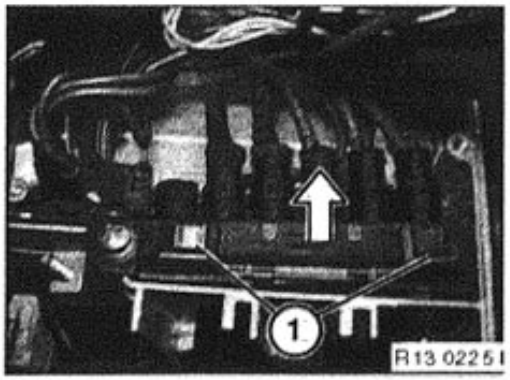


Remove relays (1 to 3) with brackets.

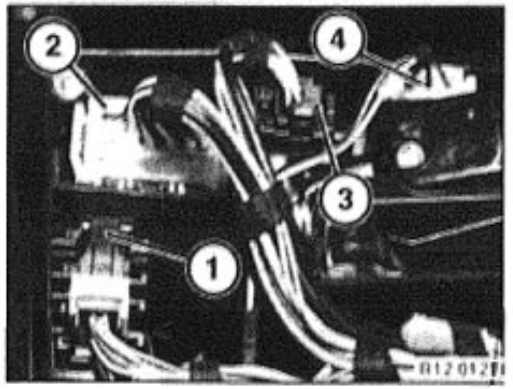
1 Relay for electrical fuel pump (EKP)
2 Relay for Digital Motor Electronics (DME 1)
3 Relay for Digital Motor Electronics (DME 2)



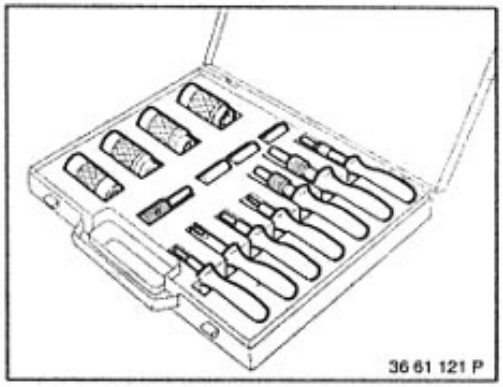
Unfasten screws and remove bracket (1).



Unfasten clips (1) and remove distributor housing for CAN connections.



Disconnect plug connections (1 to 4).
Remove complete wiring harness.

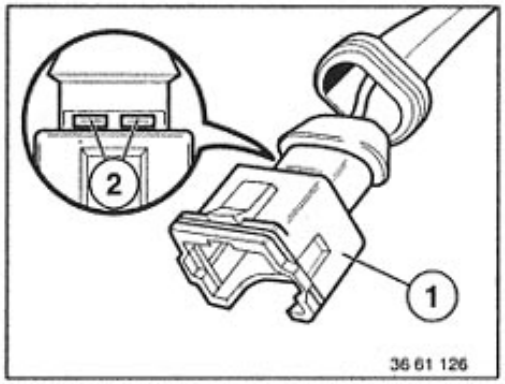


61 13 . . . Removing and installing wire connectors in plug receptacles

Use special tool kit 61 1 150.

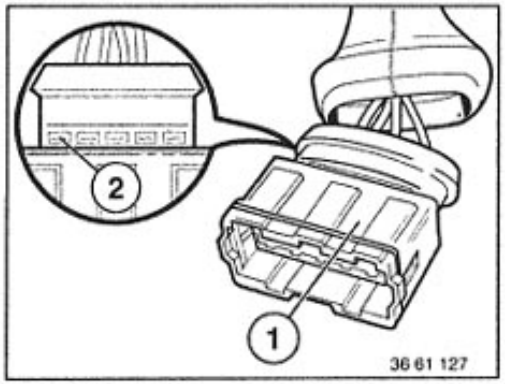
Application information

These instructions only describe plugs with additional receptacle lock.The pins of plugs not described in this section can be pressed out with a suitable pressing out tool. After repairing plugs, it is always very important to make sure that the locks of plugs have engaged.

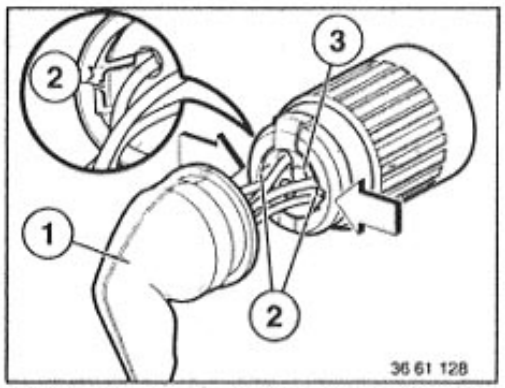


Ultrasonic bonded plugs

Pins of plugs (1) are bonded ultrasonically and cannot be replaced.
They can be recognized by the bonds (2) on the long side of the plug.

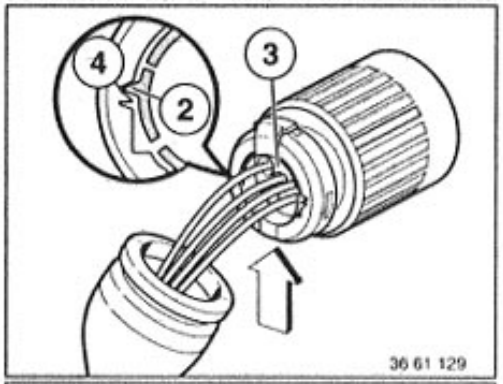


Pins of plugs (1) are bonded ultrasonically and cannot be replaced.
They can be recognized by the bonds (2) on the long side of the plug.

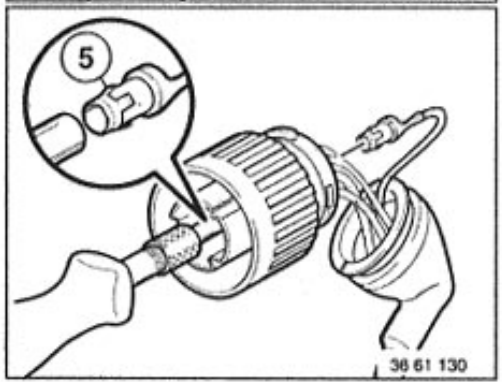


7 and 8 pin round male plugs

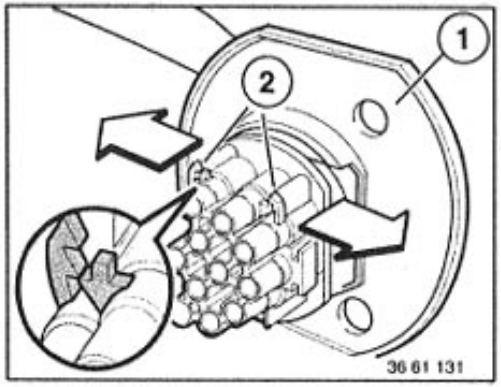
Pull rubber grommet (1) off carefully.
Push back retainers (2) of interior plugs (3) carefully.



Slide interior plug (3) in direction of arrow until retainers (2) lock in locking groove (4).

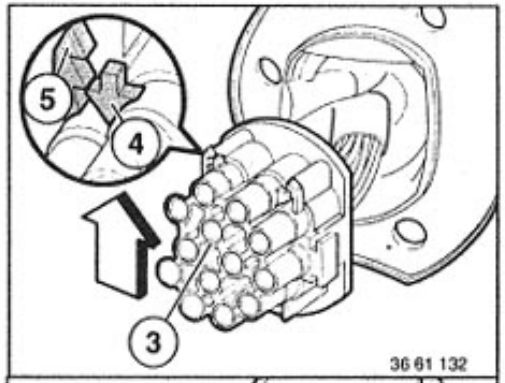


Push back steel spring locks (5) of the relevant pin using special tool no. 61 1 132 and pull out wires.

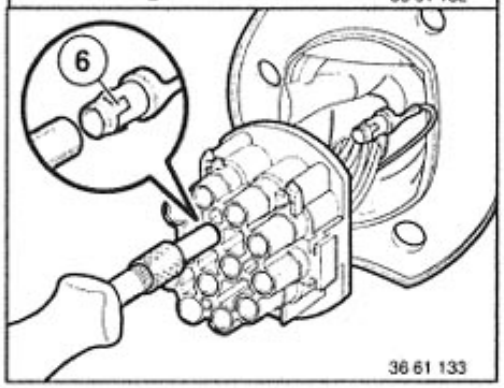


13-pin round male plug

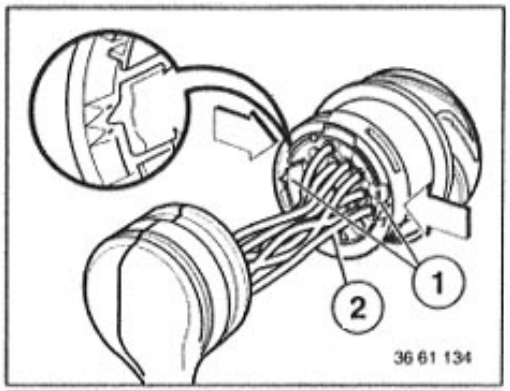
Pull off rubber grommet (1).
Pull lock (2) out carefully in direction of arrow.



Move lower plug section (3) in direction of arrow far enough that retainers (4) lock in locking groove (5).

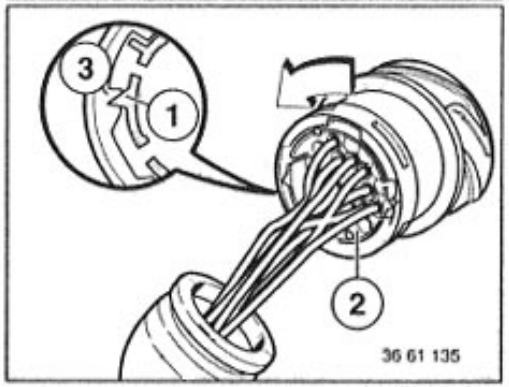


Push back steel spring locks (6) of relevant pin using pressing-out tool no. 61 1 132 and pull out wire.

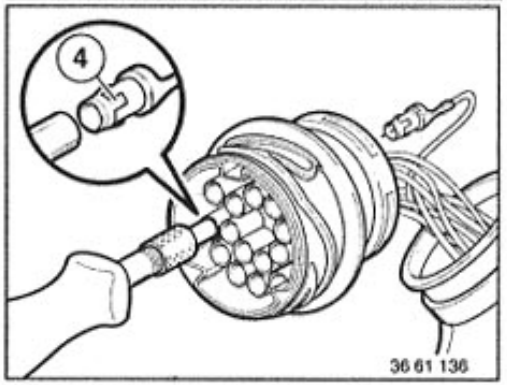


20-pin round male plug

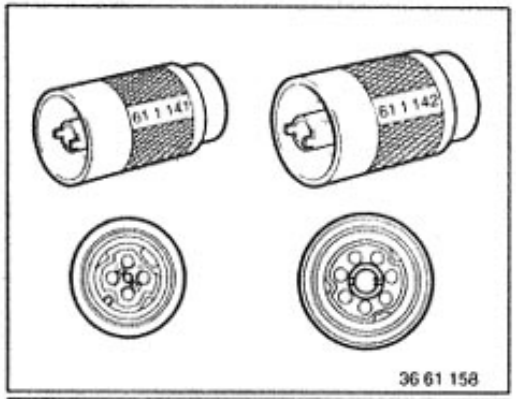
Push back retainers (1) of interior plug (2) carefully.



Turn interior plug (2) far enough that retainers (1) lock in locking groove (3).



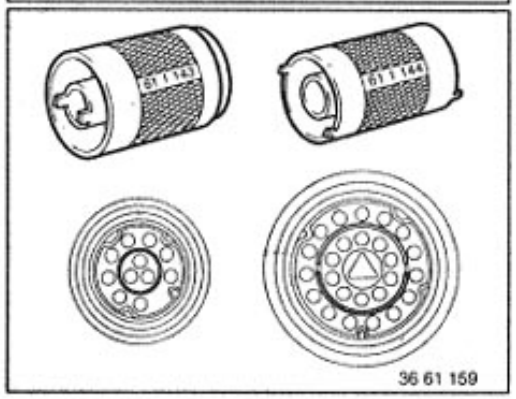
Push back steel spring locks (4) of relevant pin using pressing-out tool no. 61 1 132 and pull out wire.



Round male plugs with single core seal

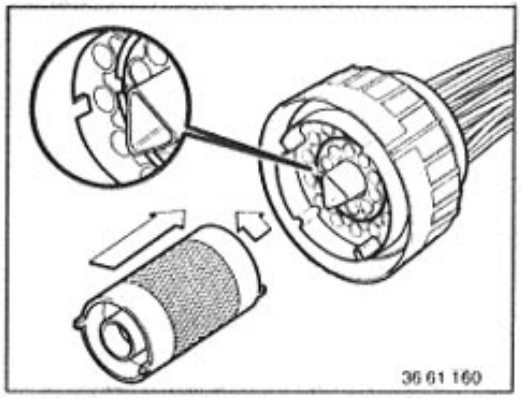
Special tool 61 1 141 = unlocking tool for 4-pin plug housing.

Special tool 61 1 142 = unlocking tool for 7-pin plug housing.

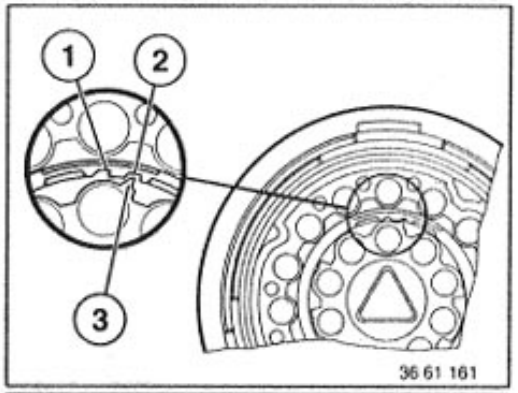


Special tool 61 1 143 = unlocking tool for 12-pin plug housing.

Special tool 61 1 144 = unlocking tool for 25-pin plug housing.

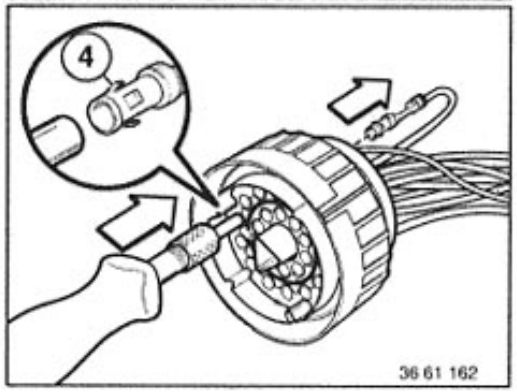


Unlock plug.
Insert suitable connection end of special tool into plug and turn counterclockwise approx. 3 degrees.

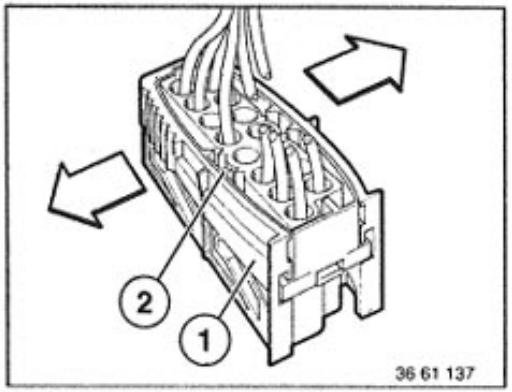


Plug locked.
Position of retainer (3) in locking groove (2).

Plug unlocked.
Retainer (3) in groove (1).

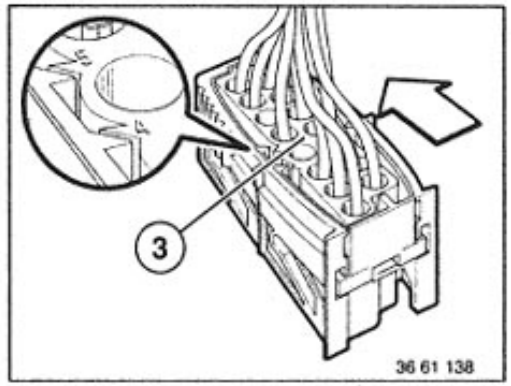


Push back steel spring locks (4) of relevant pin using special tool 61 1 132 and pull out wire.

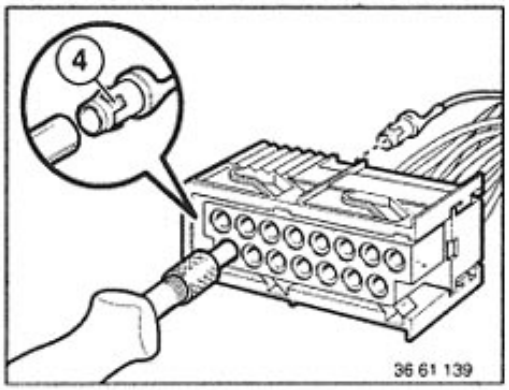


15-pin plug

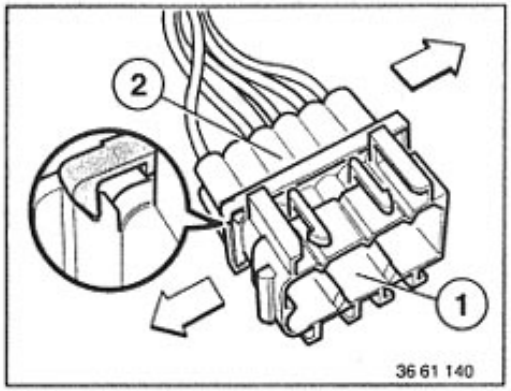
Pull exterior plug (1) out slightly in area of retainers (2).



Pull interior plug (3) in direction of arrow as far as stop.

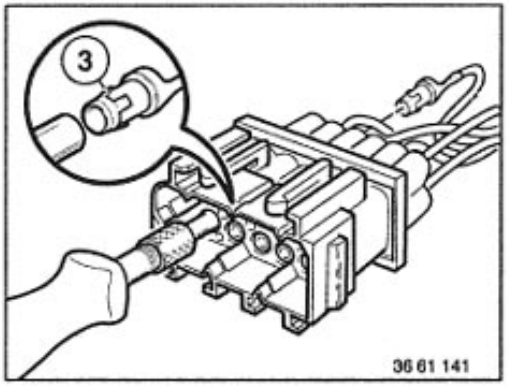


Use pressing-out tool no. 61 1 132 to push back steel spring locks (4) on relevant pin and pull out wire.

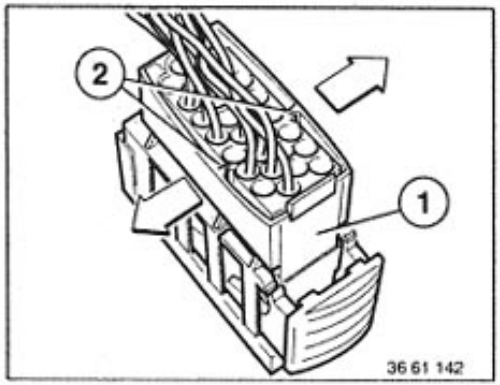


8- and 12-pin plugs

Move plug upper section (1) and plug lower section (2) against each other in direction of arrow.

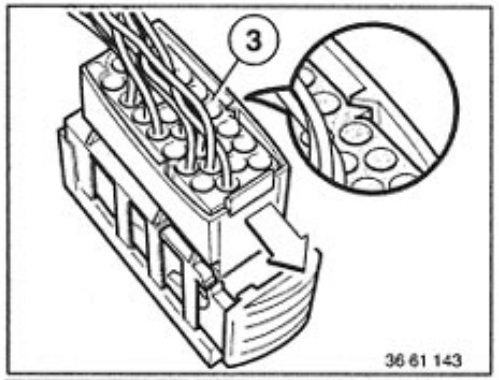


Use pressing-out tool no. 61 1 132 to push back steel spring locks (3) of relevant pin and pull out wire.

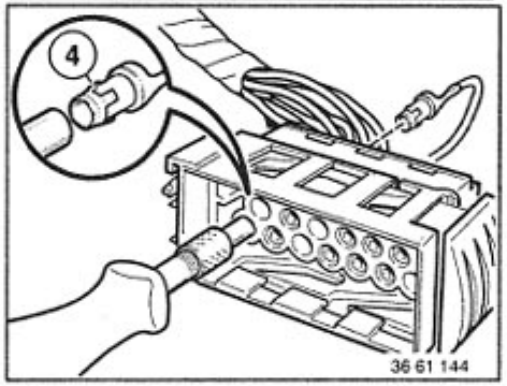


30-pin plug

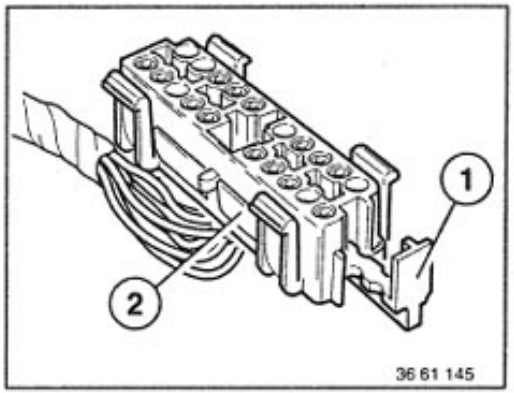
Pull exterior plug (1) out slightly in area of retainers (2).



Pull interior plug (3) in direction of arrow as far as stop.

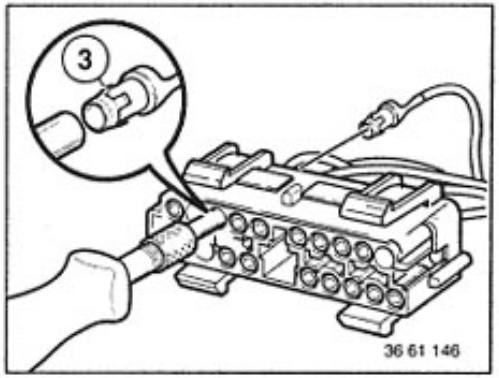


Push back steel locks (4) of relevant pin using special tool no. 61 1 132 and pull out wire.

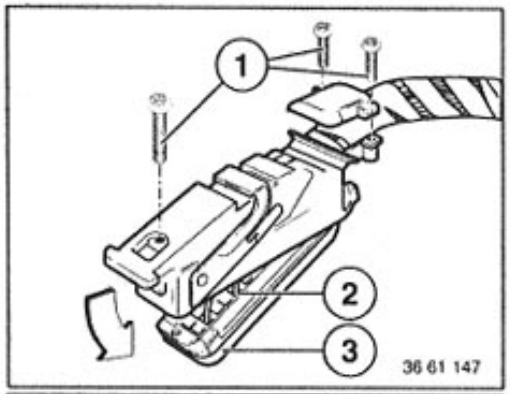


20-pin relay module plug

Pull locking slide (1) out of plug (2).

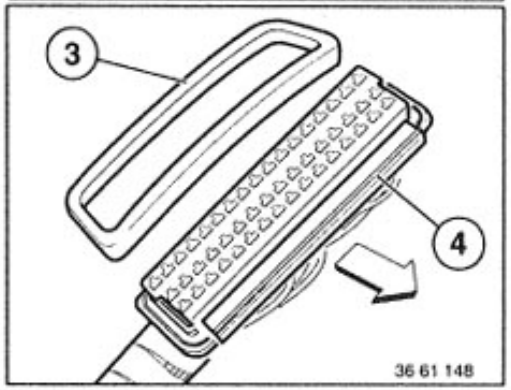


Push back steel spring locks (3) of relevant pin using special tool no. 61 1 132 and pull out wire.

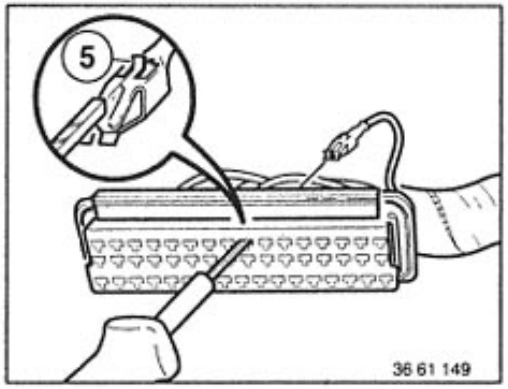


25-, 35- and 55-pin control unit plugs

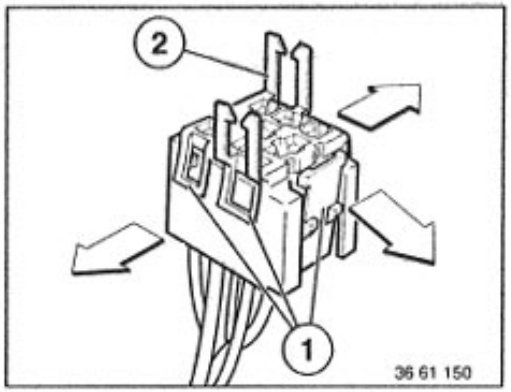
Unscrew Phillips screws (1).
Pry out pin sender (2) with seal (3) in direction of arrow.



Pull off seal (3).
Pull off receptacle lock (4) in direction of arrow and unlock.

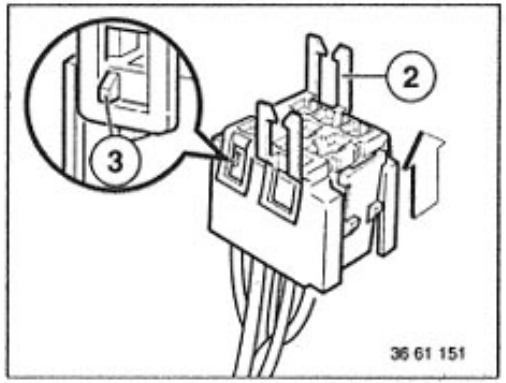


Push back steel spring lock (5) of relevant pin using special tool no. 61 1 134 and pull out wire.

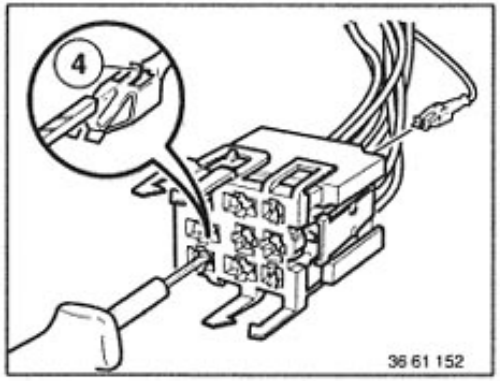


Relay carrier

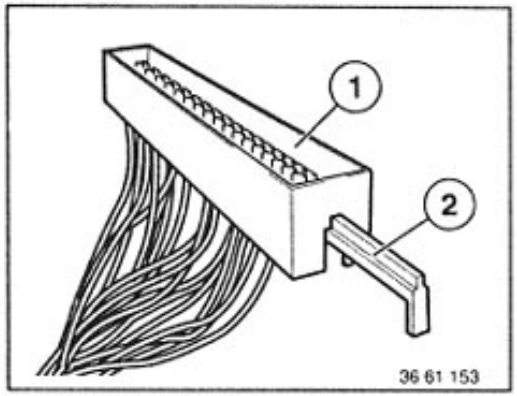
Carefully pull retainer (1) of relay holder (2) in direction of arrow.



Pull relay holder (2) in direction of arrow into first catch (3).

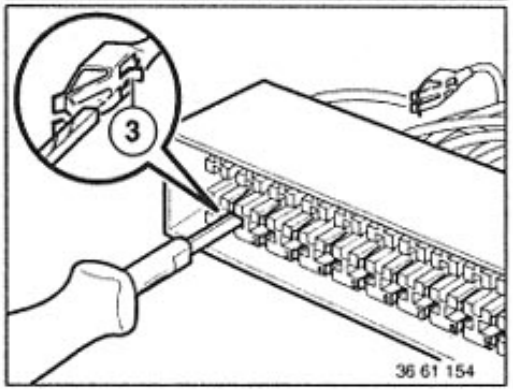


Push back steel spring lock (4) of relevant pin and pull out wire.
Press out size 6.8 double flat spring pins with special tool 61 1 136.
Press out size 2.8 double flat spring pins with special tool no. 61 1 137.

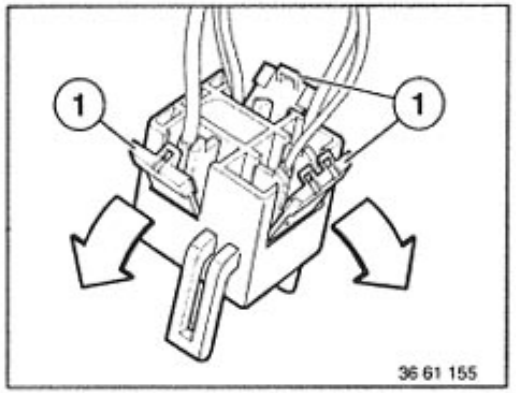


Fuse plate

Pull relevant fuse out of fuse plate (1). (mark positions when removing all fuses). Pull locking slide (2) out of fuse plate (1) as far as stop.

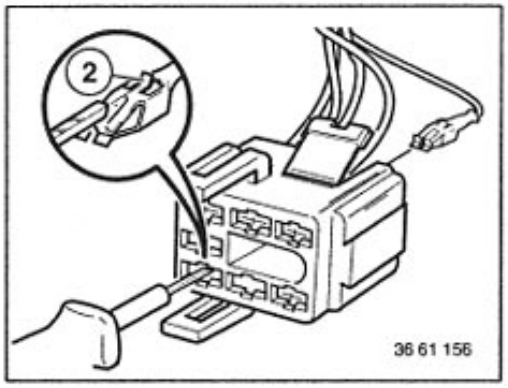


Push back steel spring locks (3) of relevant pin using special tool no. 61 1 136 and pull out wire.

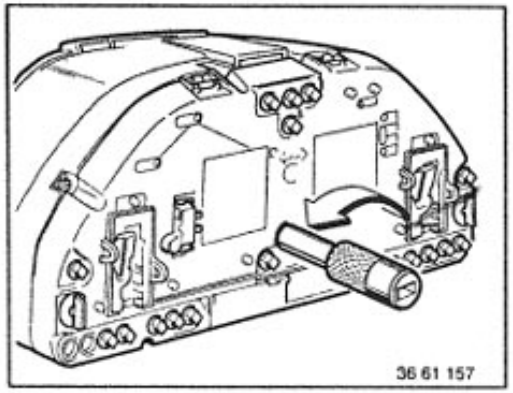


Main relay plug of DME

Unlock locking flap (1) of relevant wire.

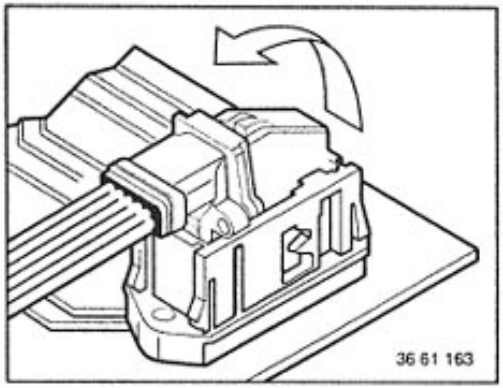


Push back steel spring locks (2) of relevant pin using special tool no. 61 1 137 and pull out wire.



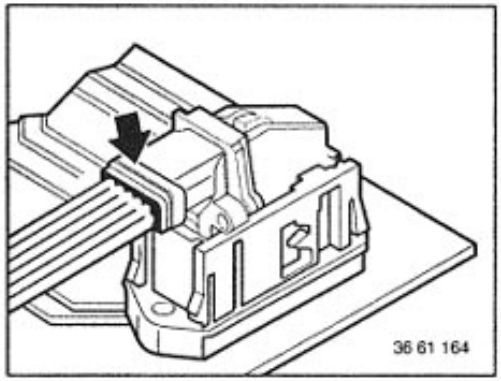
Display lamp

Apply socket wrench 61 1 138 to the appropriate display lamp, turn counterclockwise (in direction of arrow) 90° and take out display lamp.

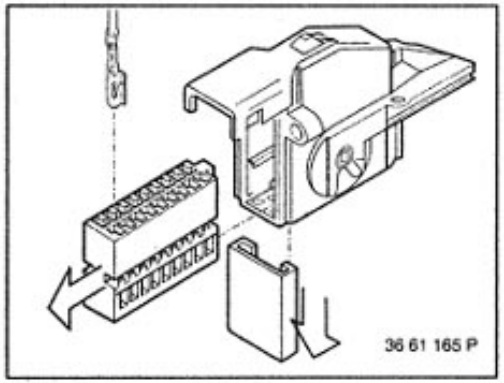


20-pin Elo plug (electronic connector from 9/91)

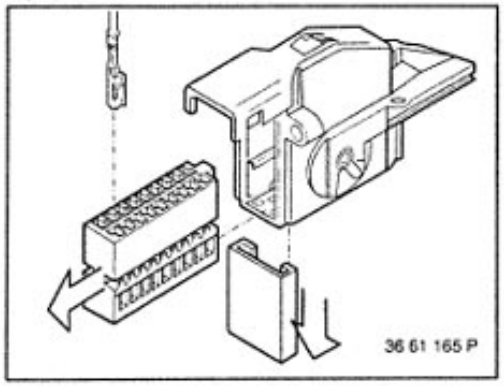
Unlock lock.



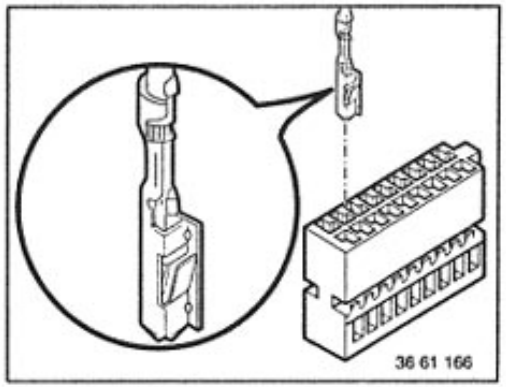
Loosen wire strap.



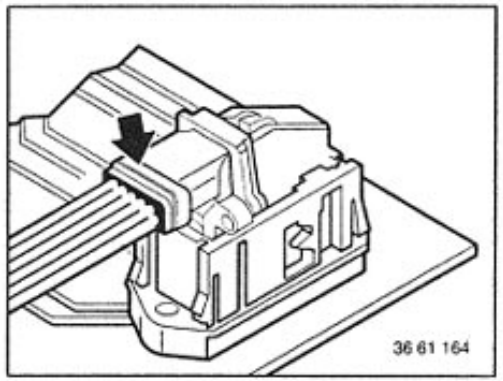
Pull off cover (slide).



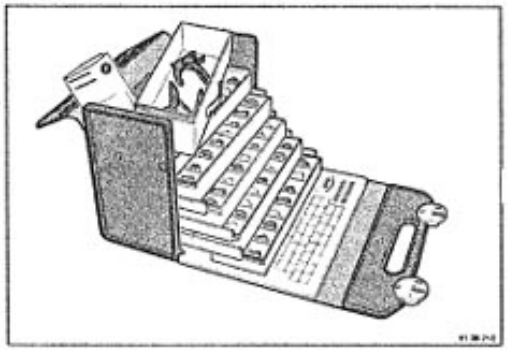
Pull out pin carrier.



Unlock pin.



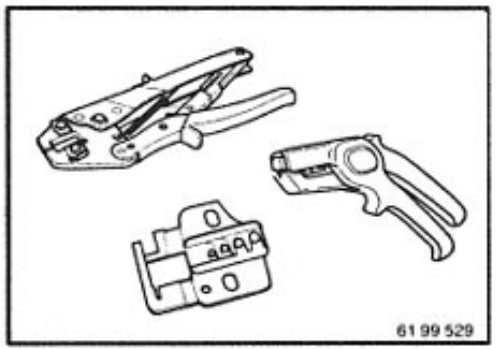
Caution!
Do not forget to install the wire strap.



61 13 . . . Wiring harness repair with the help of repair kit IV for vehicle electrics 61 9 020

Safety instructions:

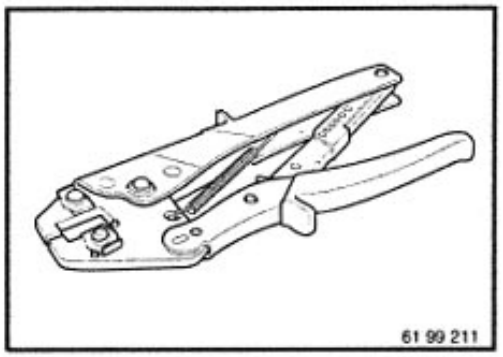
Check before repairing the wiring harness (e.g. sharp-edged body components, defective consumers, jamming mechanical parts, corrosion caused by water ingress etc.).
Interrogate fault memory.
Remedy cause of fault.
Disconnect battery ground.



Caution!
Only perform repairs to wiring harness if no safety-related systems on the circuit diagram (e.g. antilock braking system, active rear axle kinematics, airbag etc.) are affected. If this is not the case, replace defective wiring harness or use repair cable (e.g. Service Information for Construction Group 34 and Parts Service)

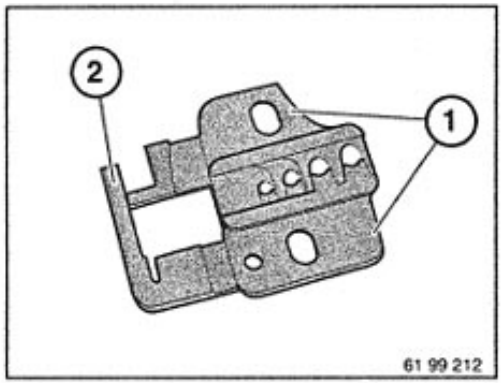
After a wiring harness repair operation, perform a function check and interrogate the fault memory once again. If necessary, remedy any other faults then cancel the fault memory.

Operating instructions are enclosed with the repair kit 61 9 020. They contain the order details and sections of the parts list.



Special tools for wiring harness repairs

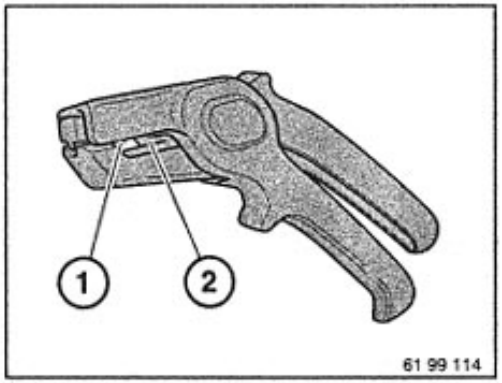
Mole grips without adjustable jaw 61 9 041. (contained in repair kit 61 9 020)



Adjustable jaw 61 9 042 for mole grips 61 9 041. (contained in repair kit 61 9 020)
Application:

1 Crimping contacts to wire cross sections of between 0.5 and 2.5 mm.^{2}

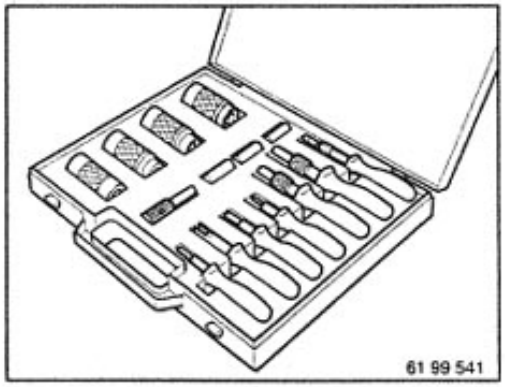
2 Slide contact sleeves onto comb connector



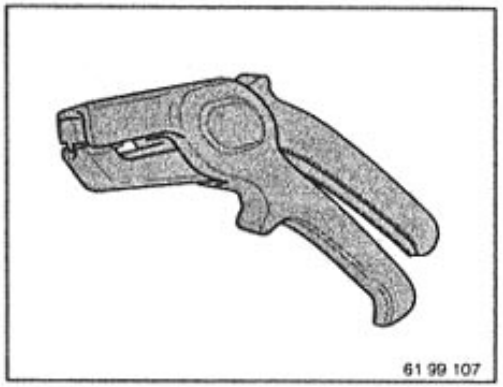
Insulation stripping pliers with wire cutter 61 9 043 (contained in repair kit 61 9 020).

1 Strip PVC insulation off wires with cross sections of between 0.5 and 4.0 mm^2

2 Cutting copper and aluminum conductors up to 2 mm^2 cross section.

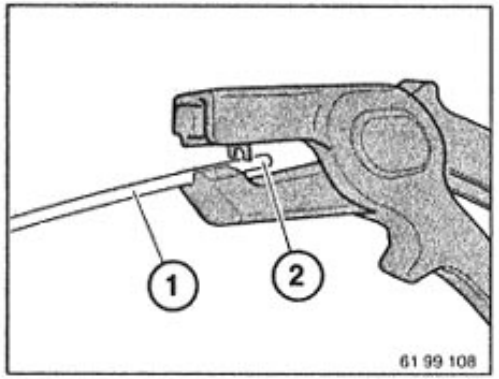


Special tool kit 61 1 150.
Unlocking tool for connector system 2.5 mm, pressing-out tool for contacts.


61 99 107

Strip insulation off cable.

Use special tool 61 9 043.

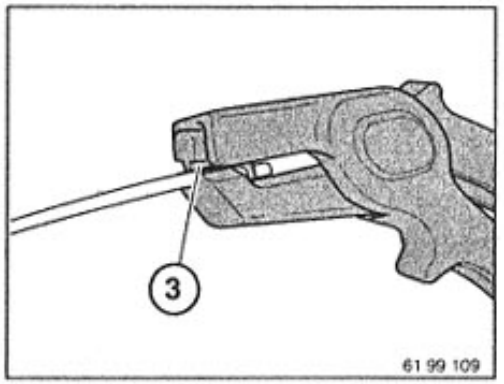


61 99 108

Guide wire (1) up to back of blade.
Length of wire behind blade is stripped of insulation.

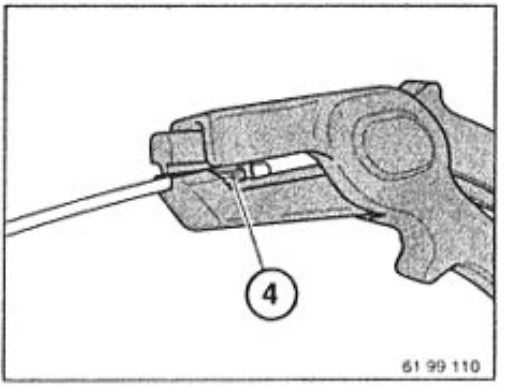
Insulation-stripping length.

Wire cross section mm^2	Insulation-stripping length mm
0.35 - 0.50	4.0
0.75 - 1.00	4.5
1.00 - 2.50	5.0



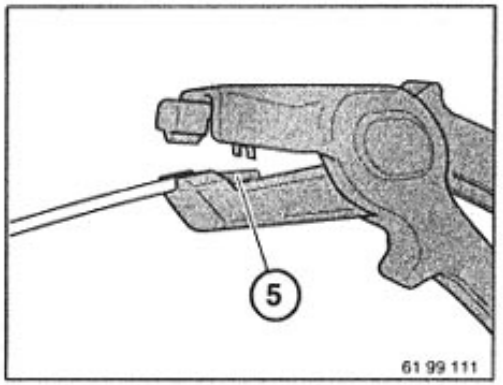
61 99 109

Press plier grips together until wire is gripped by jaws (3).



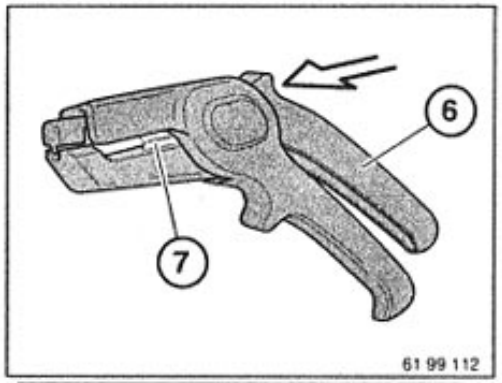
61 99 110

Continue pressing together jaws of pliers until firmly closed. This strips insulation off wire (4).



61 99 111

Open wire-stripping pliers and remove stripped wire (5).

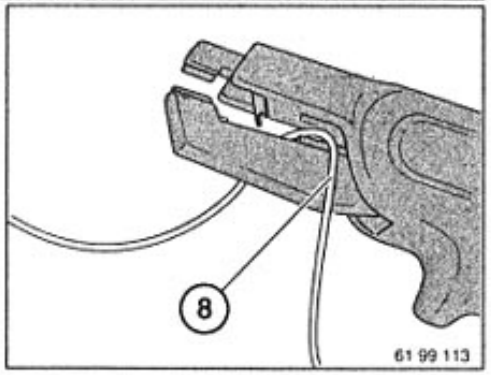


61 99 112

Cut off cable

Use special tool 61 9 043.

Slide upper handle of wire-stripping pliers (6) in direction of arrow until cutting point is exposed. Open pliers in limit position and hold firmly.



61 99 113

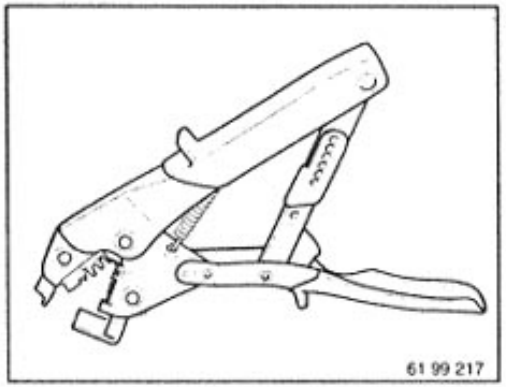
Grip wire (8) between cutters and press together handles until firm contact is made.



34 61 151

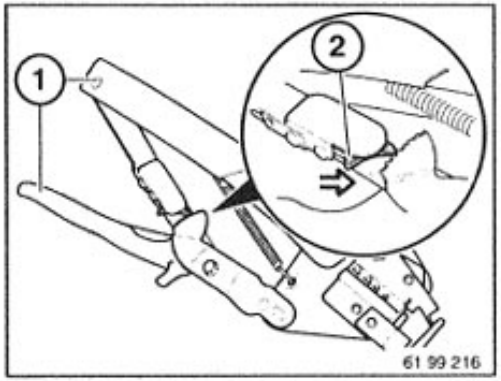
For additional operating manuals, refer to operating instructions:
Repair kit for vehicle electrics IV 61 9 020.

Crimping terminals

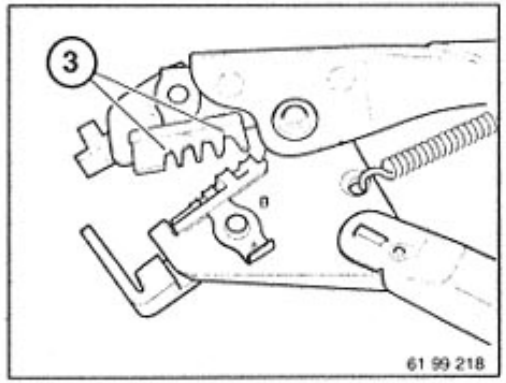


Use special tool 61 9 041 with adjustable jaws 619 042.

Strip insulation off cable.

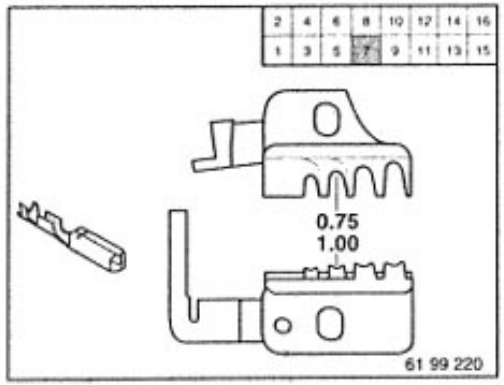


Unlock special tool:
Press handles (1) together gently and slide unlocking lever (2) in direction of arrow.
Or:
Press handles firmly together: pliers release automatically.



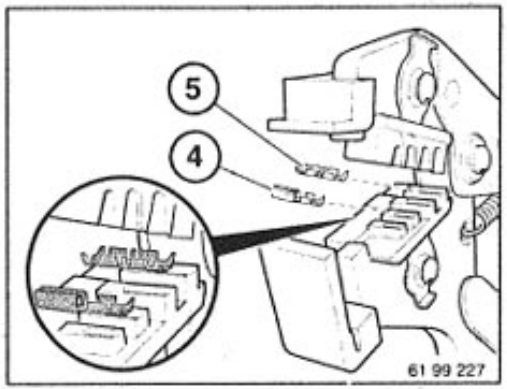
Designations on recesses (3) of adjusting jaw 61 9 042 indicate which pins should locate in which crimping nest.
The following wire cross sections and their corresponding terminals can be processed:

0.35 - 0.5	mm^2
0.75 - 1.0	mm^2
1.5	mm^2
2.5	mm^2

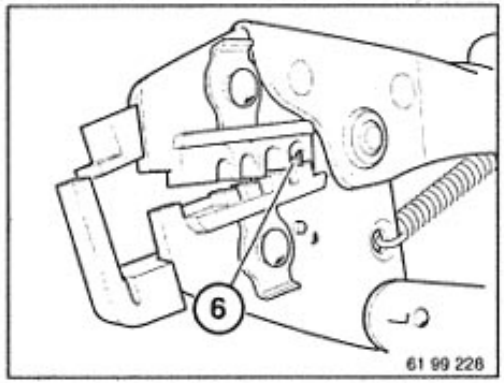


Here for example:
Contact sleeve 1.5 - 2.5 mm^2 for comb connector

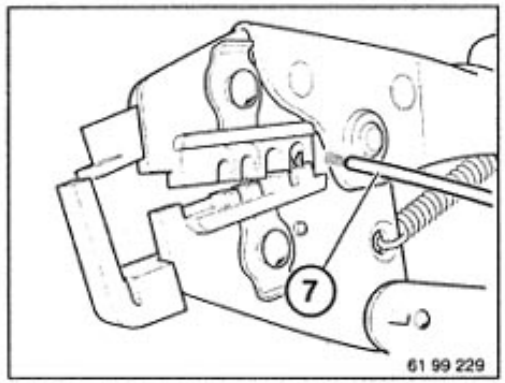
Refer to operating manual for additional operating instructions:
repair kit for vehicle electrics IV 61 9 020.



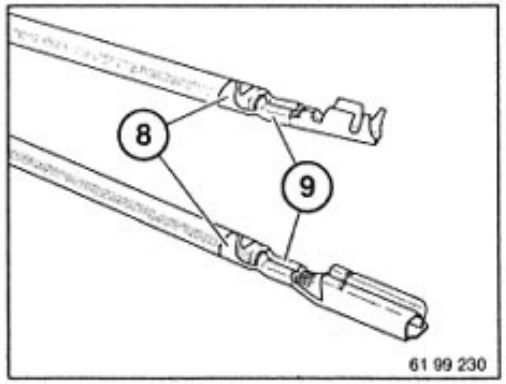
Install contact part (terminal) in predetermined nest.



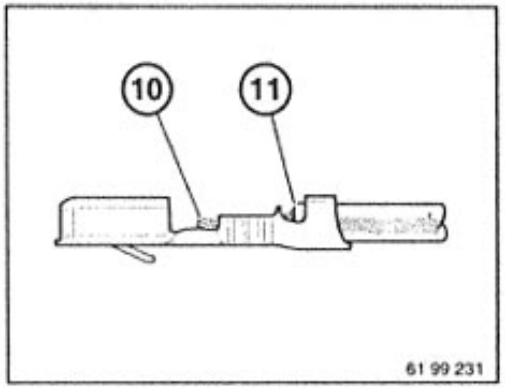
Preload contact part by pressing together in the adjusting jaws of the pliers.
Caution!
Only close pliers to point which prevents contact part from falling out of adjustable jaws of pliers.



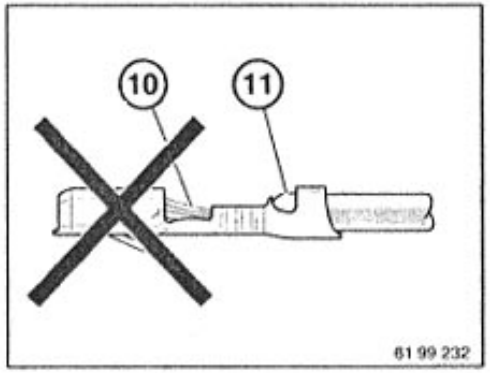
Install end of wire (7) with insulation stripped in the contact part. Ensure that the insulation and the stripped end of the wire are correctly located in the contact part.
Press pliers firmly together - pliers unlock automatically.



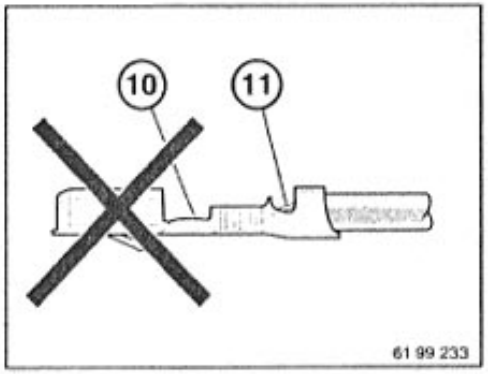
Remove contact from pliers.
Check that insulation crimp (8) and wire crimp (9) are in accordance with following illustrations.



Correct crimping:
End of lead (10) visible.
End of insulation (11) visible.



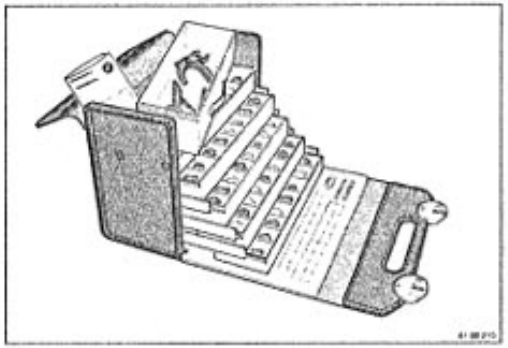
Incorrect crimping:
End of lead (10) installed too deep.
End of insulation (11) in the wire crimp.
If necessary, repeat operation with new contact.



End of lead (10) no longer visible.
End of insulation (11) not visible.
If necessary, repeat operation with new contact.

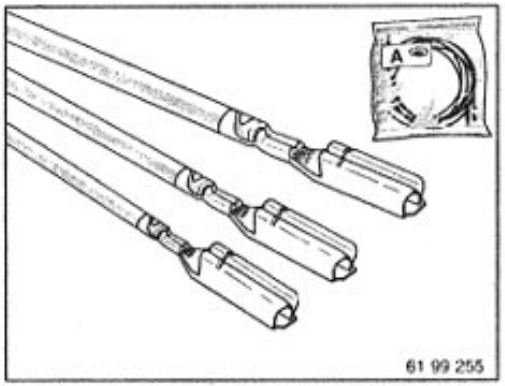
Refer to operating manual for additional operating instructions:
Repair kit for vehicle electrics IV 61 9 020.

Repairing a plug connection on the wiring harness

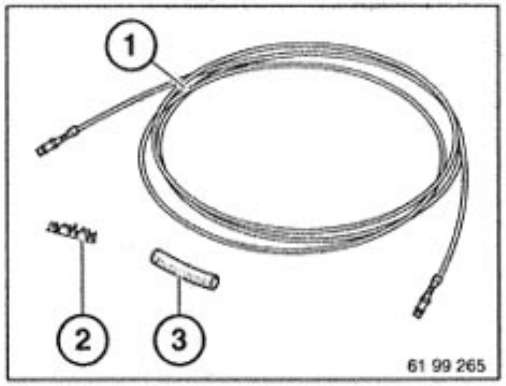


Repair kit 61 9 020 contains ten different kits for wiring harness repairs.

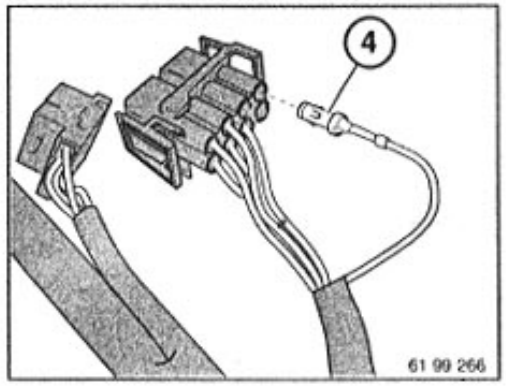
Refer to operating manual for additional operating instructions:
Repair kit for vehicle electrics IV 61 9 020.



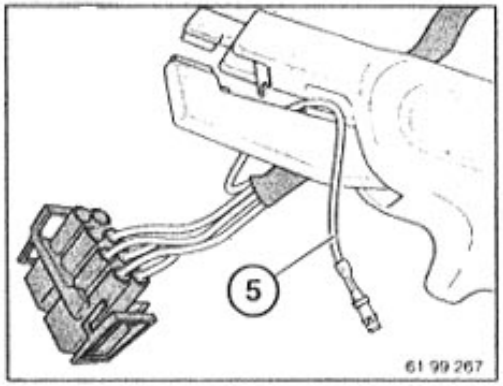
Here for example is repair kit A for contact sleeves for comb connectors.



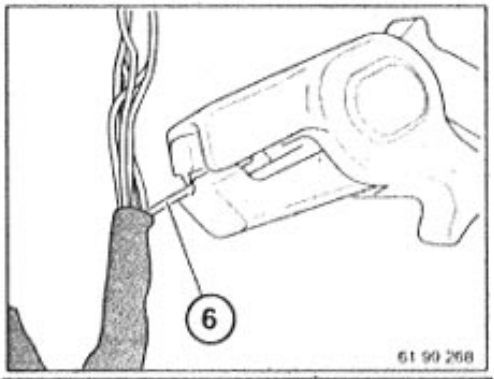
Select repair kit and remove the following parts:
Predressed cable end with requisite wire cross section (1), butt connector for selected cross section of wire (2), shrinkage tubing (3).



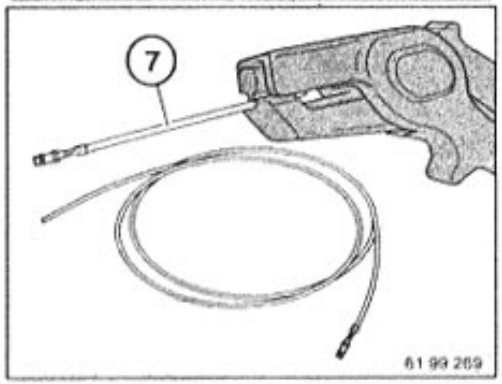
Unlock housing using special tool kit 61 1 150.
Refer to operating manual 61 1 150 for additional operating instructions.
Mark defective contacts (4) with chamber number of housing and press out of housing using appropriate special tool (from special tool kit 61 1 150).



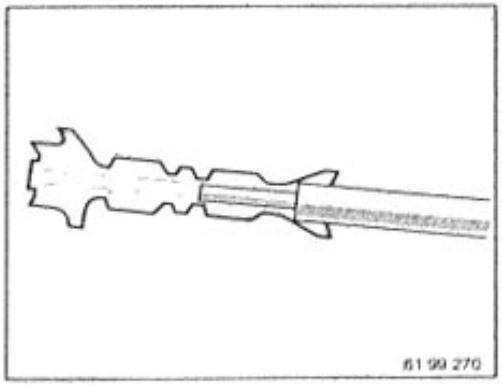
Cut off wire with defective contact (5) at accessible point.
Caution!
Note maximum length of repair cable!
If more than one wire is to be repaired, arrange the cut cable ends in an offset manner to prevent the wiring harness from becoming too thick at the repaired point.



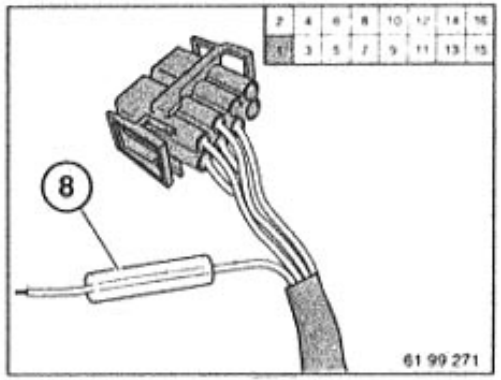
Strip insulation from wiring harness end of wire (6).



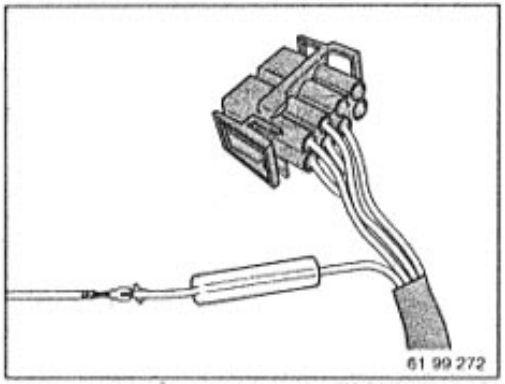
Cut predressed end of wire (7) to required length and strip insulation off wire.



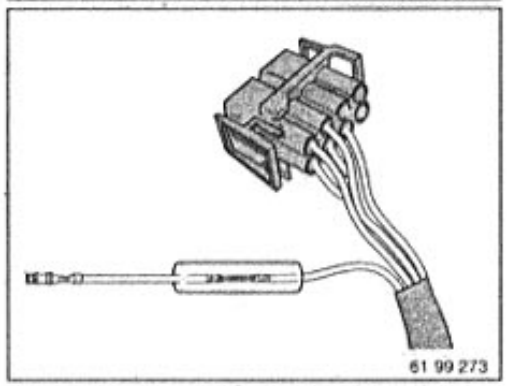
Crimp butt joint on end of wiring harness.



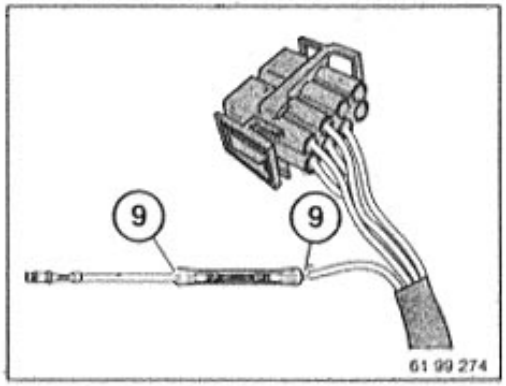
Slide shrinkage tubing (8) to exposed end of wire.



Crimp exposed end of wire with the impact connector.

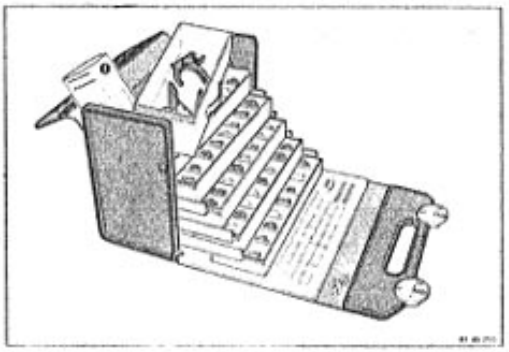


Slide shrinkage tubing over impact connector.



Use hot air blower to shrink shrinkage tubing until cement emerges evenly at both ends - (8) and (9) - of the shrinkage tubing.
Caution!
Do not set fire to shrinkage tubing!

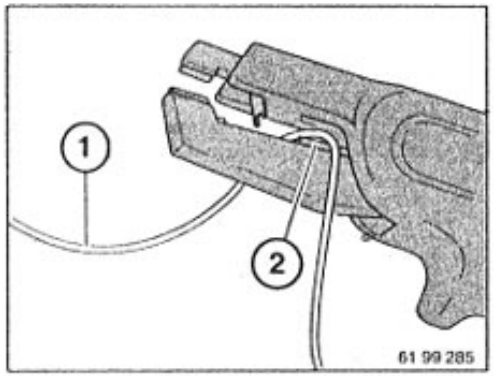
Reinstall pin in housing.



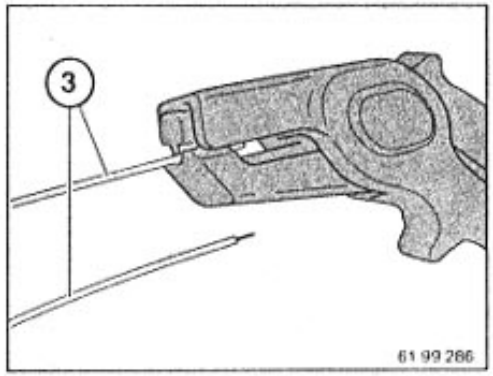
Install comb connector for retrofits

Comb connector and the required insulation parts and relevant tool are contained in the repair kit for vehicle electrics IV 61 9 020.

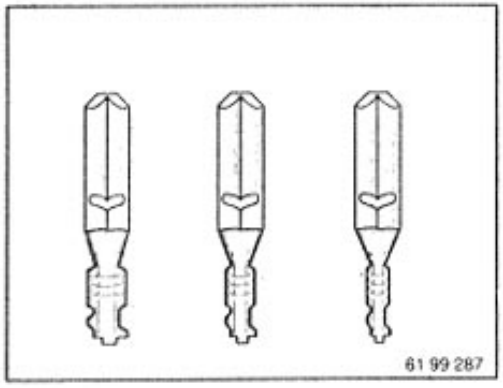
Refer to operating manual for operating instructions:
Repair kit for vehicle electrics IV 61 9 020.



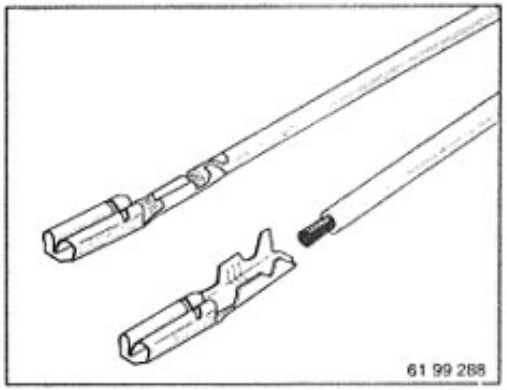
Cut wire loop in wiring harness with special tool 61 9 043.



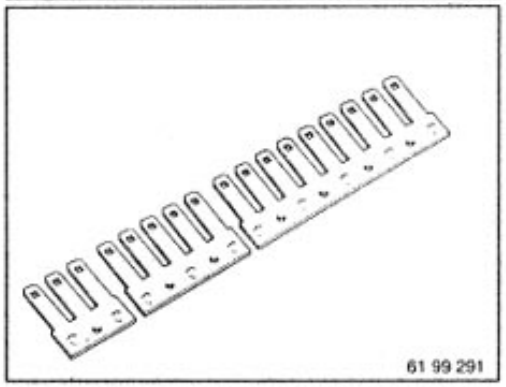
Strip insulation off both ends of the wire.



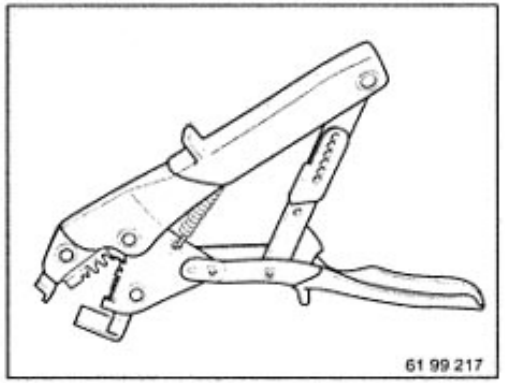
Select contacts in accordance with wire cross section.



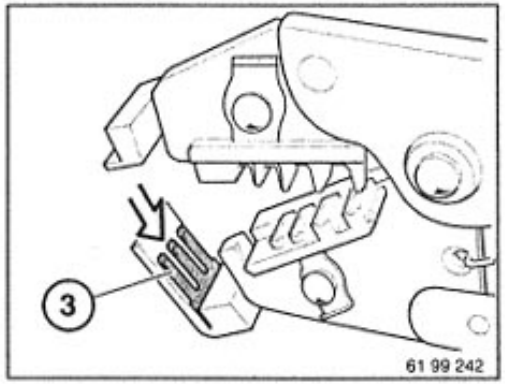
Crimp contacts with special tool 61 9 041 and adjusting jaws 61 9 042.



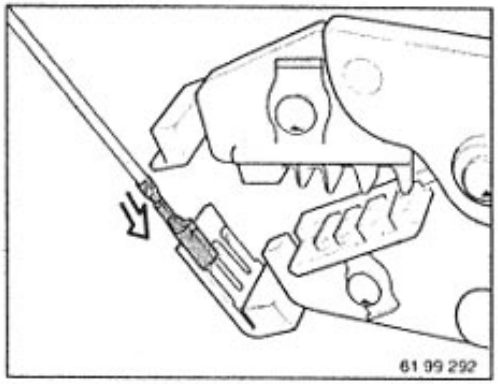
Remove comb connector from special tool kit 61 9 020 and cut down to the required number of terminals.



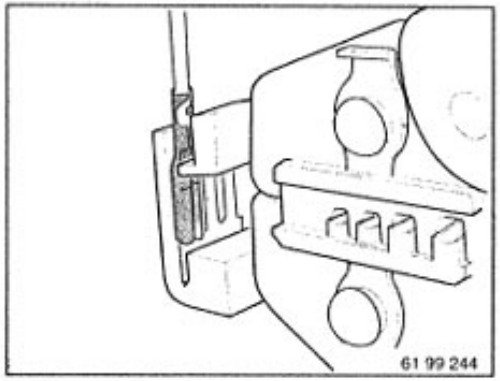
Use special tool 61 9 041 with adjusting jaws 61 9 042.



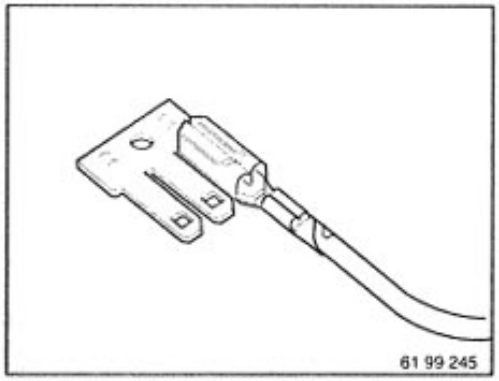
Install cut down comb connector in special tools 61 9 041 and 61 9 042.



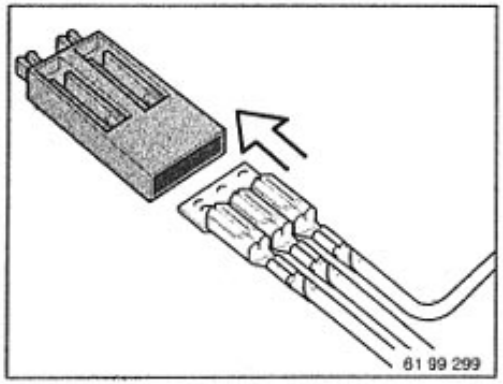
Fit wire and contact on comb connector.



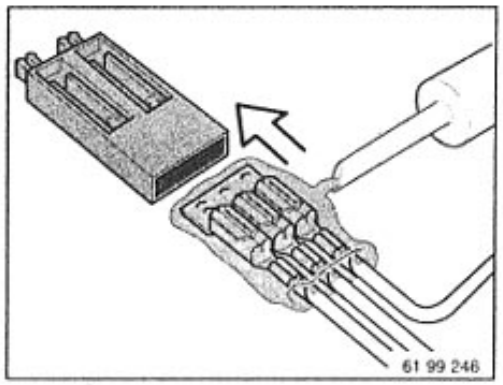
Press together special tool and slide contact firmly home.



Fitted comb connector.

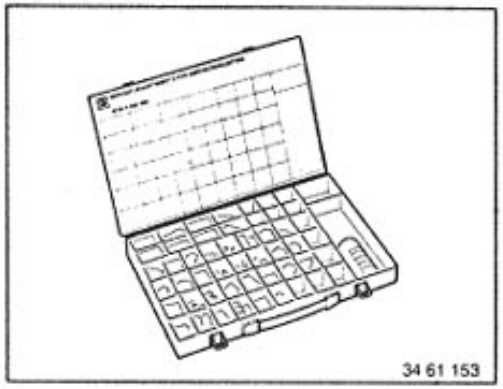


Slide assembled comb connector into insulation housing and lock in position. Secure insulation housing to body.



For applications outside the vehicle interior, the insulation housing must be fully sealed. Seal the housing with silicone and secure housing to body.

Refer to operating manual for additional operating instructions:
Repair kit for vehicle electrics IV 61 9 020.


34 61 153

Tools for repairing wiring harness in repair kits I,II and III

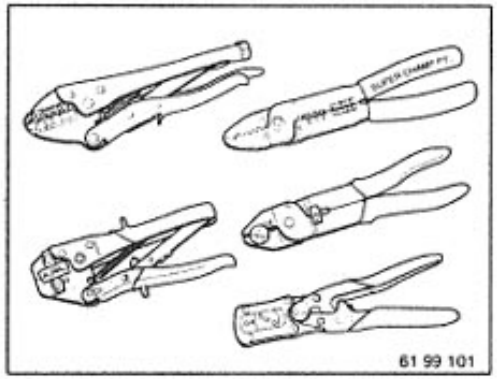
These repair kits are sold by the BMW Parts Service

Repair kit for vehicle electrics I
Order no.: 81 24 9 408 080

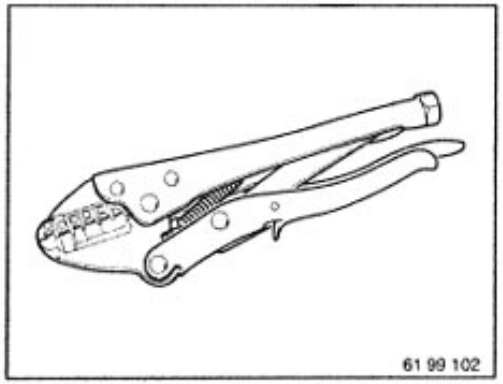
Repair kit for vehicle electrics II
Order no.: 81 24 9 408 300

Repair kit for vehicle electrics III
Order no.: 81 24 9 408 400

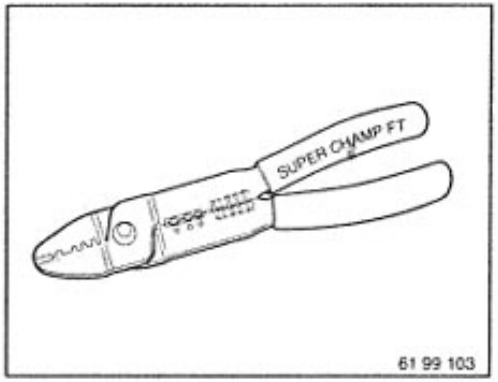
These are used primarily for repairing Series E 12, E 21, E 23, E 24, E 28, E 30.


61 99 101

Summary of pliers used in vehicle electrics tool boxes I, II, III.

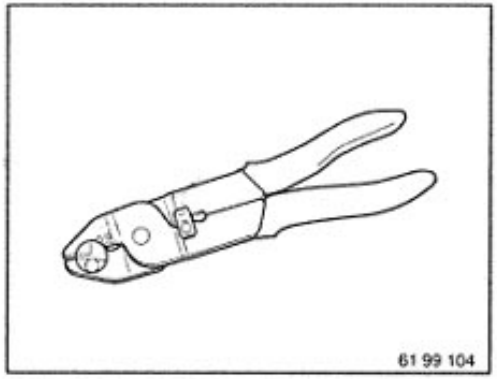

61 99 102

Crimpac II pliers from vehicle electrics tool kit I
Order no.: 81 24 9 408 125.

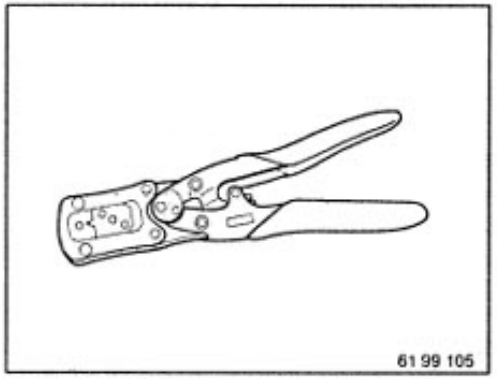


61 99 103

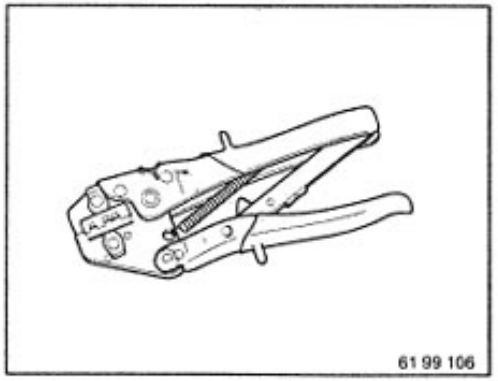
Super Champ FT pliers from vehicle electrics tool kit I.
Order no.: 81 24 9 408 126


61 99 104

Pliers for ignition cable contacts from vehicle electrics tool kit I.
Order no.: 81 24 9 408 127


61 99 105

Pliers for "Modu" (electronic contacts) from vehicle electrics tool kit II.
Order no.: 81 24 9 408 351


61 99 106

Pliers for 2.5 mm contacts from vehicle electrics tool kit III.
Order no.: 81 24 9 408 449



For additional processing and operating instructions, refer to:
Operating instructions: Order no.: 61 8 084
Tool for cable repair from vehicle electrics repair kits I, II, III.

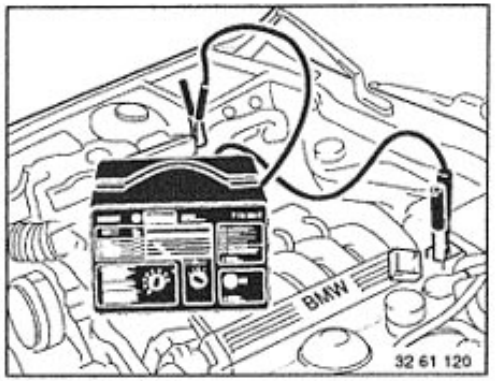
Among other points, the operating instructions contains:

1 Handling of tools
2 Reduced frequency of repairs
3 Higher process safety during repair work

Orders for the operating instructions:
Cartool GmbH
Alfred Brehm Str. 5
8070 Ingolstadt

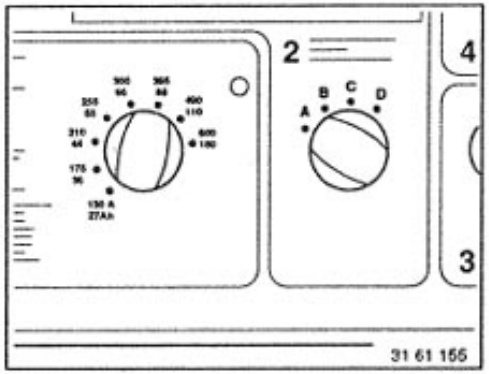
61 20 001 HIGH CURRENT TEST FOR CAR BATTERIES

Test with Bosch Tester 12 200E*.

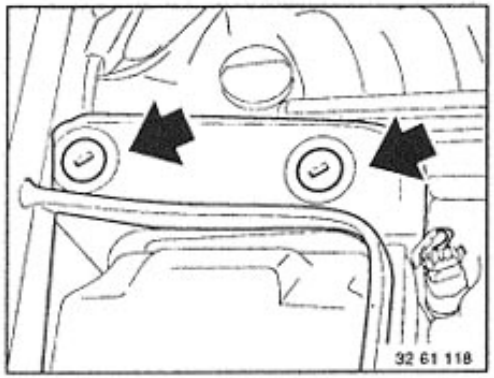


Connect the battery tester and set the cold testing current/rated capacity according to the battery specifications.

There is high current load of approx. 200 A, with electronic evaluation of the voltage curve during and after load.
This test is presently the most dependable method of evaluating the charged condition and physical battey condition (such as cell shorts, sulphatation).

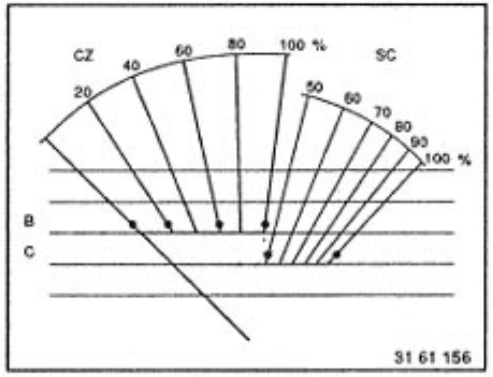


Start the test as described in the operating instructions.

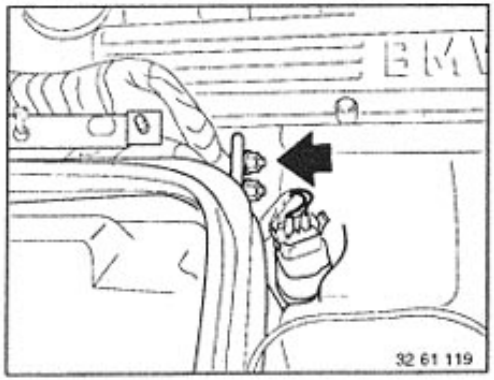


Test Procedures:

Disconnect batteries from car's electrical system.
Test batteries separately.
Connect the battery tester.



Only scales B and C are required for the evaluation of batteries.



* Source of Supply: BMW Parts

Battery evaluation threshhold values for all batteries (excluding telephone batteries)

Charge condition[1]	Starting power[1]	OK	Test results Charge	Faulty
Test step 1 - Before charging battery				
Not testable			X	
less than 50 % [2]			X	
more than 50 %	less than 75 %		X	
more than 50 %	more than 75 % 3)		X	
more than 80 %	more than 75 %	X		
Test step 2 - After charging battery				
Not testable				X
less than 50 % [2]	less than 75 %			X
more than 50 %	more than 75 % [3]		X	

1) Charge condition and starting power must always be evaluated together

2) Test charging — more than 5 hours with charger Gossen CG 32 or Siemens/Gossen VB 801

3) Full charging — more than 80 %

Note:
If the battery was checked from the positive connection point in the engine compartment, and the test results were negative, the test must be carried out direct on the battery to be on the safe side.

61 20 ... CHECKING BATTERY IN OPEN CIRCUIT CURRENT TEST

If the battery is okay after the high current test, battery discharging could be caused by excessive open circuit current consumption.

Before Open Circuit Current Test:

Switch all consumers off which can be switched off (ignition, inside lights, reading lamps, seat heating, additional heater, additional ventilator, telephone, etc.).
Shut the glovebox, trunk lid and engine hood.
Vehicle must have been unused at least 3 hours.

Keep to the following procedures so that possibly seizing relays do not fail.

Connecting Ammeter:

Connect the positive lead of the ammeter to the disconnected ground connection.
Connect the ground lead of the ammeter to body ground.

Remove the shrink-fit hose on the body end of the battery ground lead on the batteries. Clip on a cable with an alligator clip at this point (Hirschmann AK 2 S clip together with test leads, red = Order No. 61 1 472 and black = Order No. 61 1 474).
Clip a second cable on body ground. Close, lock and arrest (double-lock) the driver's door and front passenger's.
The trunk lid remains open.
Disconnect the battery ground lead with connected alligator clip on the ground connection point carefully 5 minutes after the locking step and bend it away.
Static current now flows only via the multimeter.

Simulation of the closed car by pressing the trunk light switch on the striker.
Read static current value on the multimeter.

If the static current is more than

50 mA,

it can be assumed that a hidden consumer is loading the battery.
The hidden consumer can be pinpointed by pulling off fuses, possibly relays and control units one after the other.

When testing and possibly troubleshooting have been concluded, the multimeter must be removed in reverse order of installation so that the memories of the radio, on-board computer and various control units are not cancelled.

Static Current Test in Cars with Burglar Alarm:

In order to be able to measure the actual static current, the trunk contact must be pressed 5 minutes after the locking step.

The trunk contact must not be released immediately after reading the static cur- rent, because then the burglar alarm horn would be active. This excessive cur- rent for the selected measuring range of the multimeter could destroy the in- strument, but at least the installed fuse.

The ground lead must always be reconnected in reverse order of disconnection, in order to be able to deactivate and unlock the car correctly.

61 21 011 REPLACING BATTERY

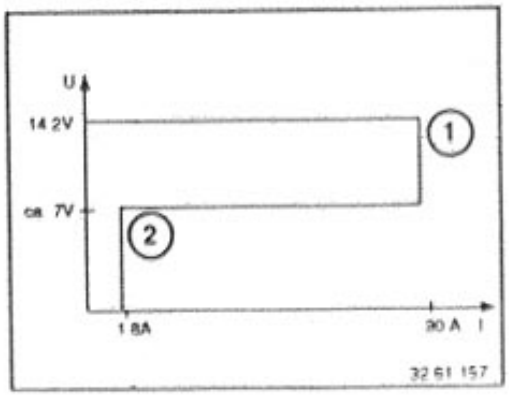
Always conform with the following points when car is fitted with two batteries.
Check the condition of both batteries in a high current test.
Disconnect the batteries from the car's electrical system and check the batteries separately in high current test.
Replace both batteries, if after charging the high current tests show a charged condition of less than 70 % and starting power of less than 75 %.

When replacing a defective battery, the second battery must also be replaced.
When replacing batteries, ensure that both batteries are of the same make.

Important!
If both batteries are not replaced at the same time, the older battery could damage the other battery due to the different degree of sulphatation.
In other words the batteries would discharge on their own to a certain degree.

61 21 030 CHARGING BATTERY (BATTERIES)

Disconnect batteries in car and charge separately.
Mutual charging must be avoided as batteries reach their gassing voltage at different times.



Voltage / Induction Charging Curve Shows:

1. **Charging with minimum current up to gassing limit voltage of 14.2 V, whereby charging in range of about 13.2 to 14.2 V could last relatively long, because in this limit range charging is with very low current.**

2. **Charging of strongly discharged batteries with an initial current of approx. 2 A up to a terminal voltage of approx. 7 V, at which maximum charging current cuts in.**

Only chargers with the following properties are suitable for charging a battery in the car with connected power supply.

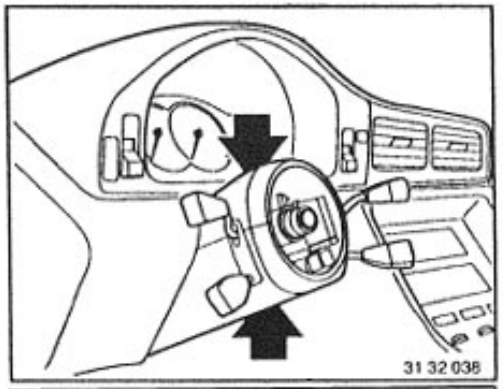
- **Current limitation for strongly discharged batteries (regeneration of slightly predamaged batteries).**
- **Switchover or shutoff after reaching 14.4 V gassing voltage.**
- **Direct current voltage with harmonic wave less than 1 V.**

Battery chargers without these properties lead to damage in the car.
The battery must be disconnected from the car power supply system when using any other chargers.
Take battery out of the car when charging with non-regulated chargers (see Operating Instructions).

Sample Chargers:
Siemens/Gossen VB 801
Gossen CG 32

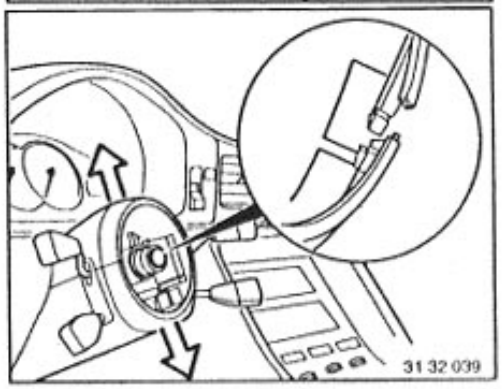
Refer to "Voltage/Induction Charging Curve".

Refer to Service Information 61 08 88 (900) for additional information.



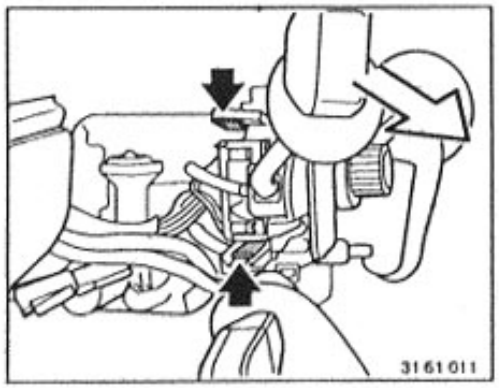
61 31 016 REPLACING TURN SIGNAL/ HEADLIGHT DIMMER SWITCH

Turn steering wheel to straight ahead.
Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.



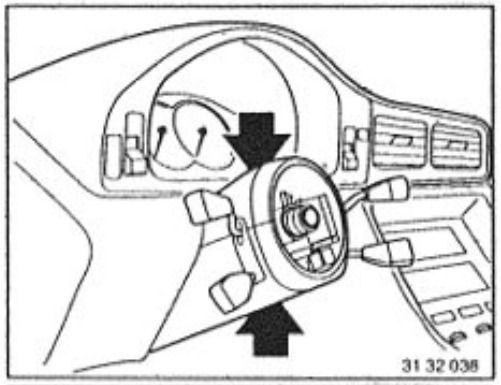
Unscrew screw and take off upper section of the steering column casing.

Disconnect plugs.



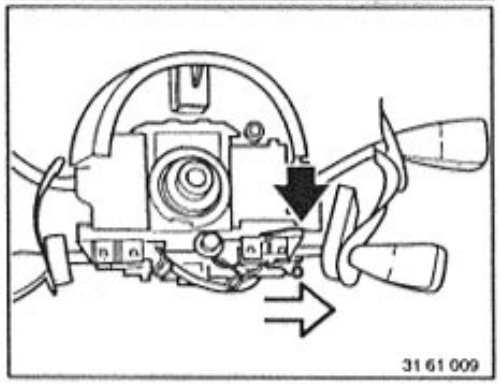
Push in retainers on both sides and pull out switch.
Disconnect plugs.

Installation:
Be careful not to damage the self-cancelling cam of the turn signal switch.
Mount turn signal switch after first setting it to middle position.

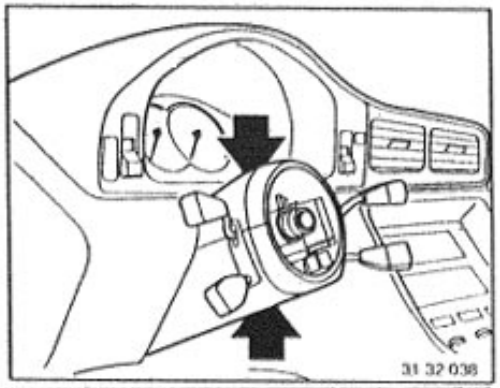


61 31 018 REPLACING SELECTOR SWITCH FOR CRUISE CONTROL

Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.

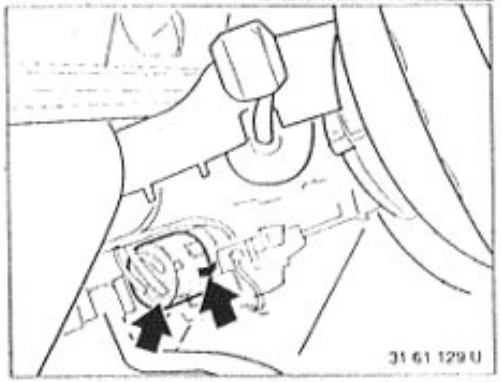


Press down on retaining hook and pull out switch.
Disconnect plug.

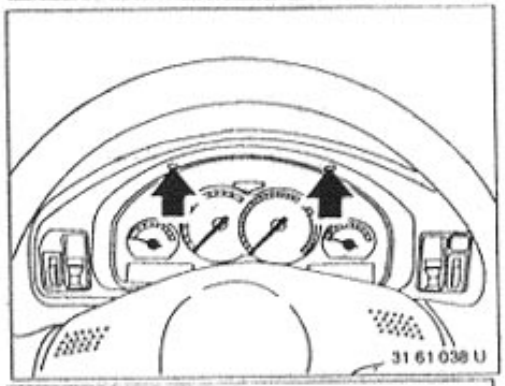


61 31 020 REPLACING IGNITION SWITCH

Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.

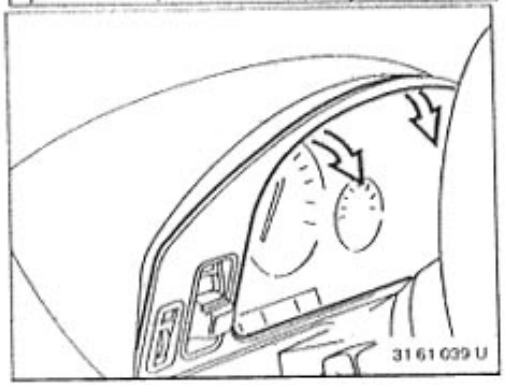


Unscrew setscrews on both sides.
Pull out switch.
Disconnect plug.

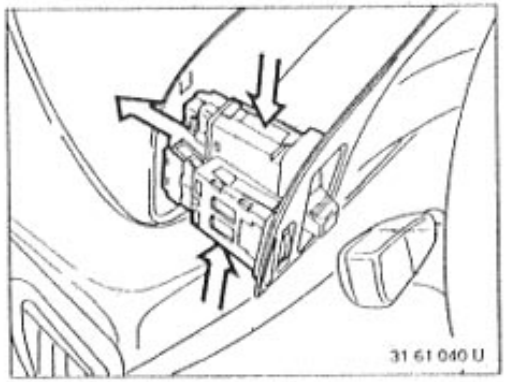


61 31 028 REPLACING LIGHT SWITCH

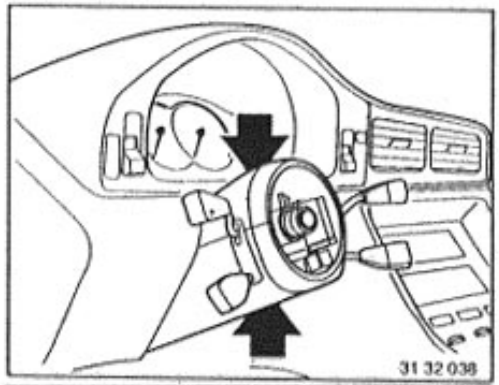
Unscrew screws.



Fold down ornamental frame at top.
Remove ornamental frame.

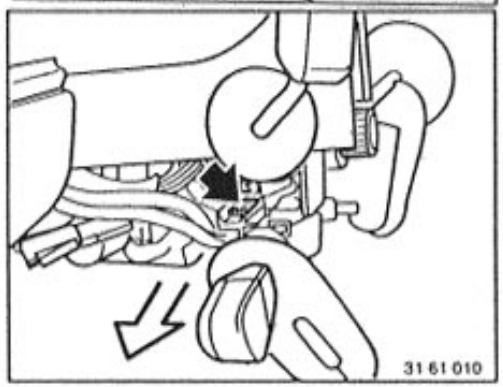


Disconnect plugs.
Push in retaining hook and press switch out of the ornamental frame.

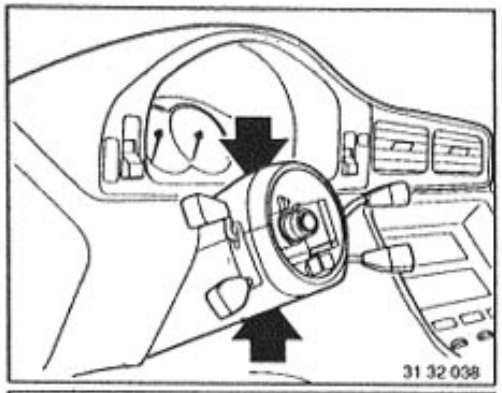


61 31 035 REPLACING STEERING COLUMN CONTROL SWITCH

Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.

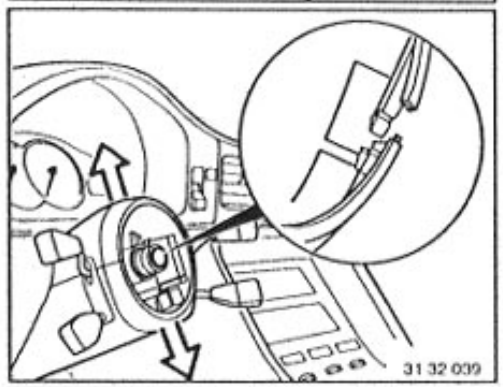


Press down on retaining hook and pull out switch.
Disconnect plug.

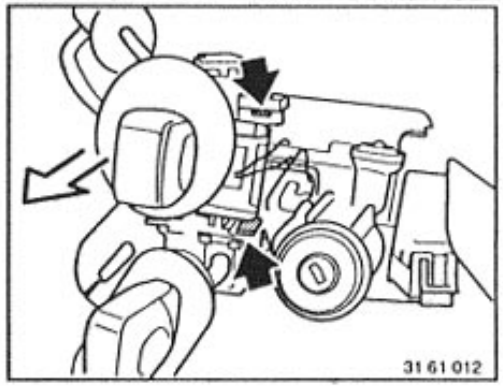


61 31 040 REPLACING WINDSHIELD WIPER SWITCH

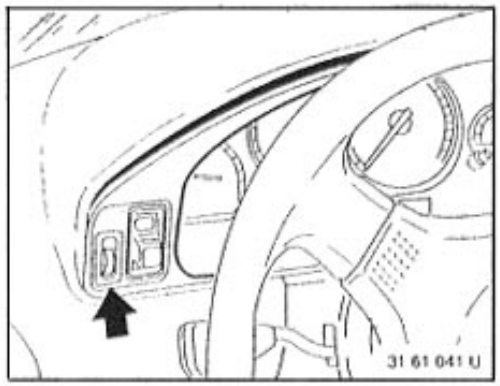
Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.



Unscrew screw and take off upper section of the steering column casing.

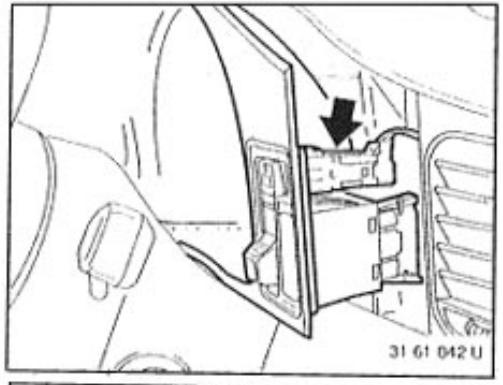


Press in retaining hooks on both sides.
Pull out switch.
Disconnect plug.



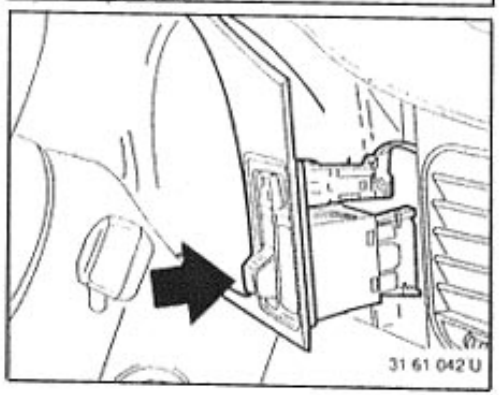
61 31 045 REPLACING INSTRUMENT LIGHT DIMMER SWITCH

See "Replacing Light Switch" in 61 31 028.



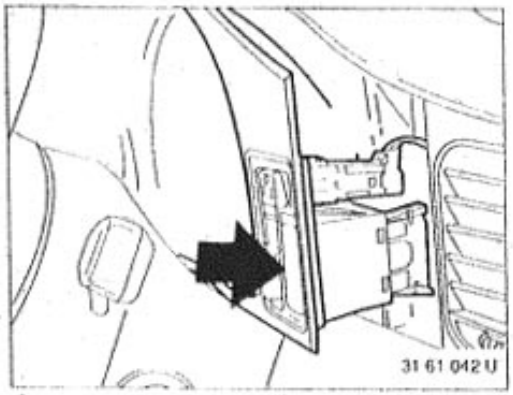
61 31 060 REPLACING REAR WINDOW DEFOGGER SWITCH

See "Replacing Light Switch" in 61 31 028.



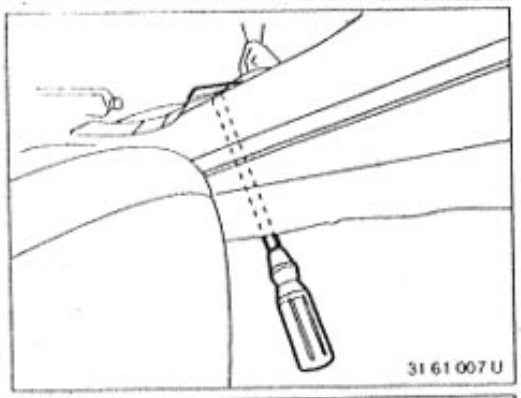
61 31 070 REPLACING FRONT FOG LAMP SWITCH

See "Replacing Light Switch" in 61 31 028.



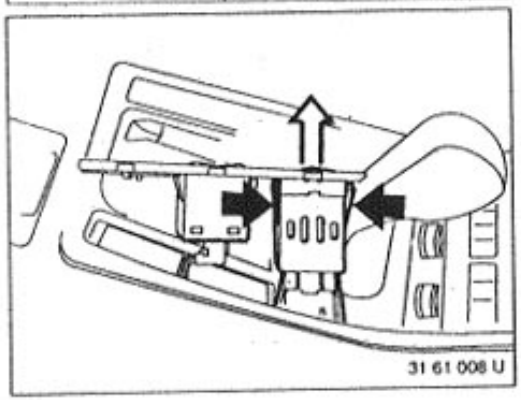
61 31 072 REPLACING VERTICAL HEADLIGHT AIM CONTROL SWITCH

See "Replacing Light Switch" in 61 31 028.

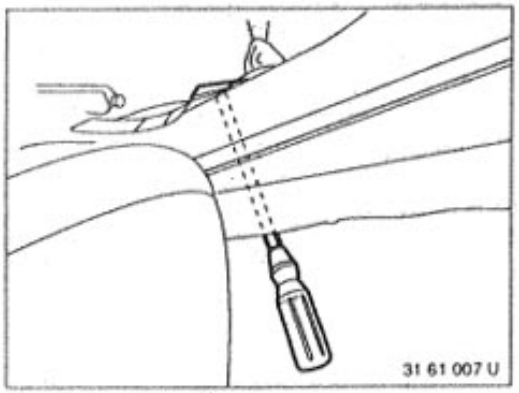


61 31 ... REPLACING SWITCH IN CENTER CONSOLE

Press out switch frame in center console carefully from underneath with a screwdriver.

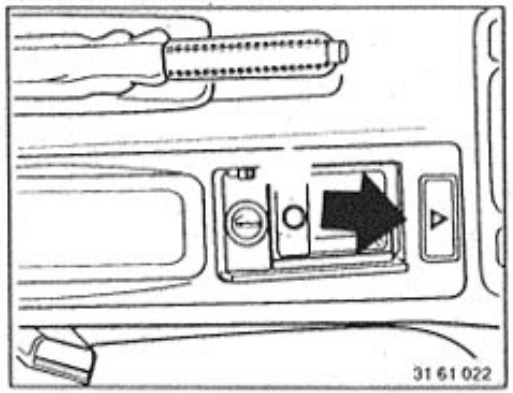


Pull off plug.
Press in retaining hook and press switch forward out of the trim panel.



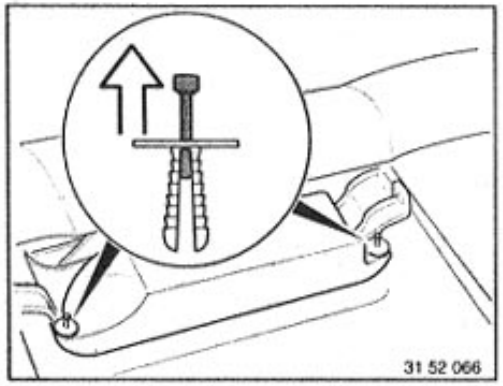
61 31 080 REPLACING HAZARD WARNING LIGHT SWITCH

Press out switch frame in center console carefully from underneath with a screwdriver.



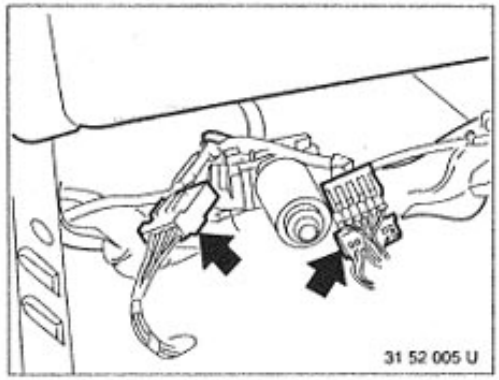
Press out hazard warning light switch from underneath.

Disconnect plug.

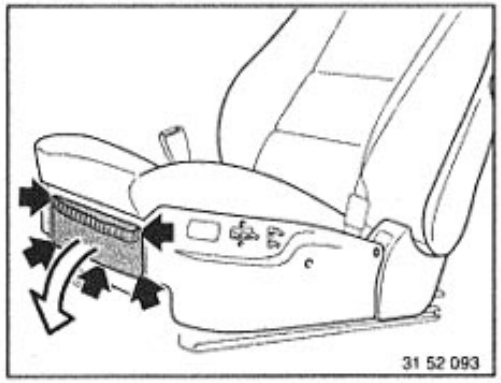


61 31 099 Removing and installing or replacing control unit for left or right seat adjustment

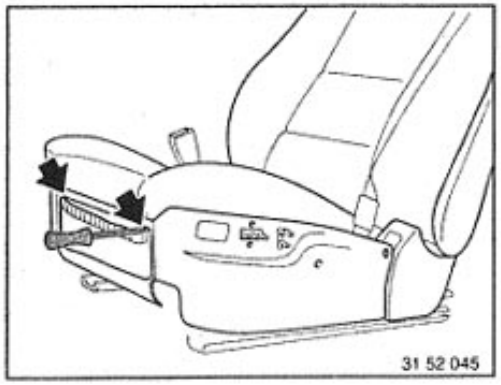
Move seat forwards and upwards.
Unfasten clips on cover finisher in footwell behind the seat frame.
Remove cover finisher.



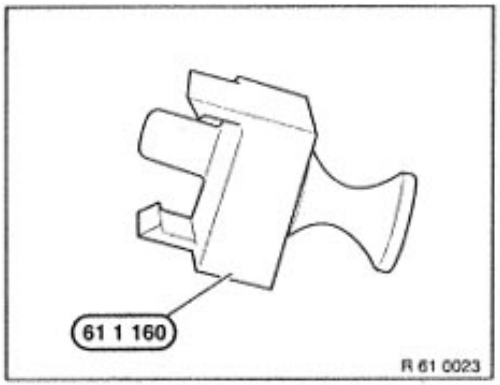
Disconnect plug connection between body wiring harness and seat wiring harness.



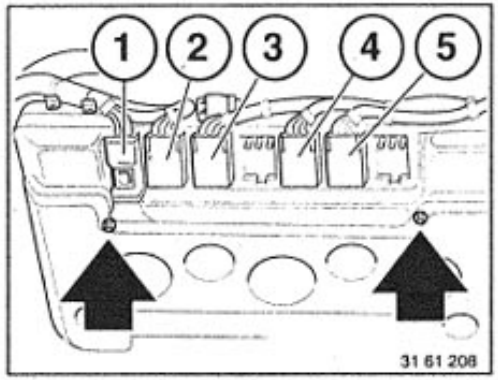
Unclip gathering pocket.



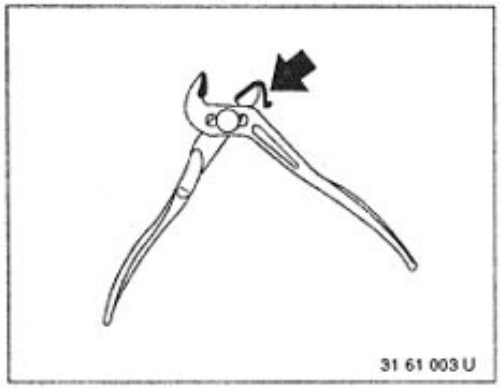
Unfasten screws.
Remove trim.



Unfasten wiring harness cable connector.
Remove all connectors from seat control unit with special tool 61 1 160.

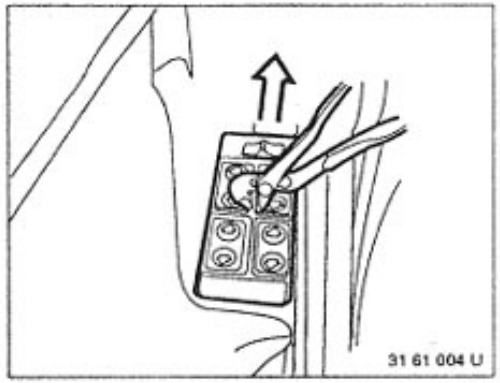


Unfasten screws and remove seat control unit.

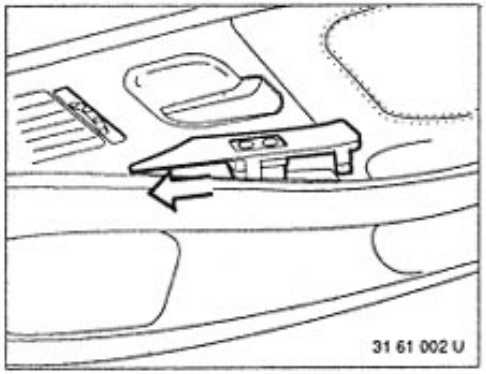


61 31 115 REPLACING SIDE WINDOW CONTROL SWITCH

Driver's Side:
Wrap adhesive tape around pliers.
Apply pliers on center web at left and right sides and pull switch out by pulling up on left and right sides separately.

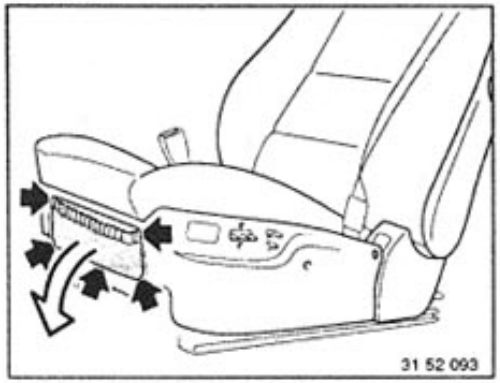


Pull the ornamental frame back carefully to avoid breaking the front holding tab off.



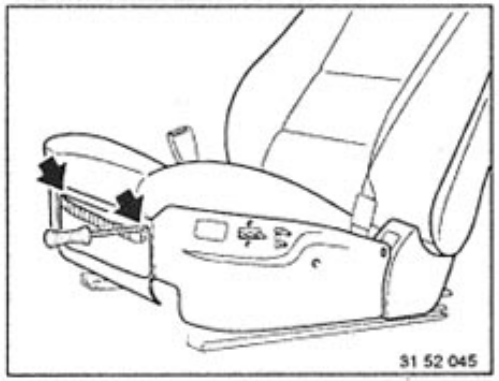
Passenger's Side:
Slide the switch frame forward.
Insert an approx. 1 mm thick feeler gage blade behind and pry the frame off from behind carefully.
Pull frame out towards the rear.

Disconnect plug.
Remove switch.

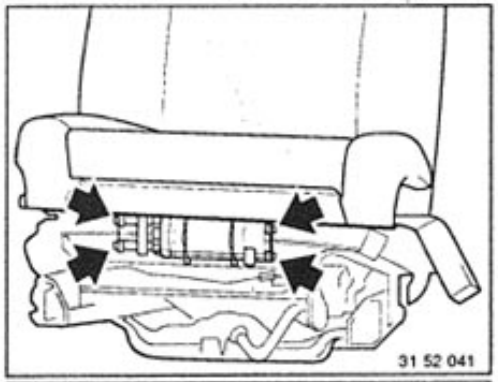


61 31 201 REMOVING AND INSTALLING OR REPLACING REGULATOR FOR FRONT SEAT HEIGHT DRIVE

Unclip pocket.

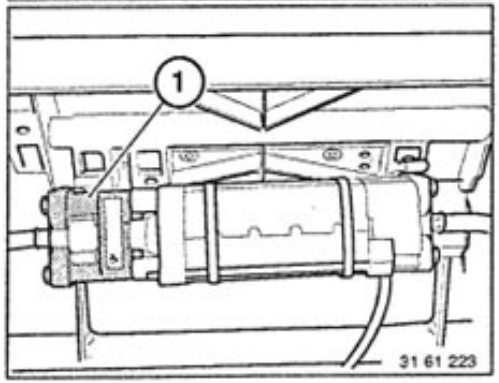


Unscrew screws and remove panel.

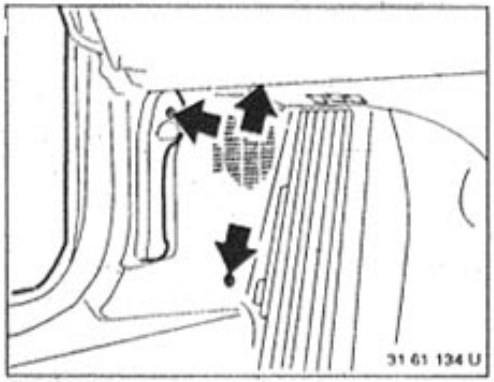


Loosen wire straps and unscrew screws.
Disconnect control unit plug.
Remove lockplates for height adjustment shafts and motor.

Installation:
Insert spacers into rubber parts.
Check function.

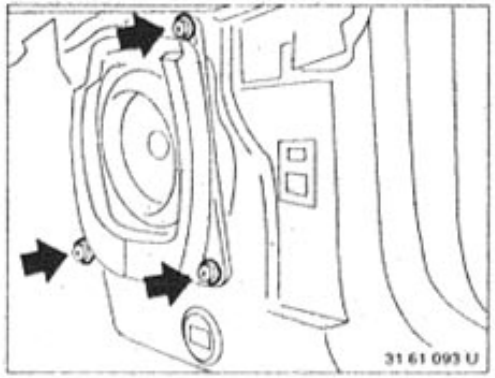


Remove regulator (1).

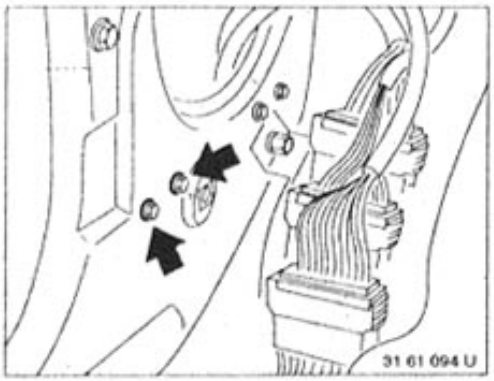


61 31 205 REPLACING IMPACT SWITCH FOR CENTRAL LOCKS

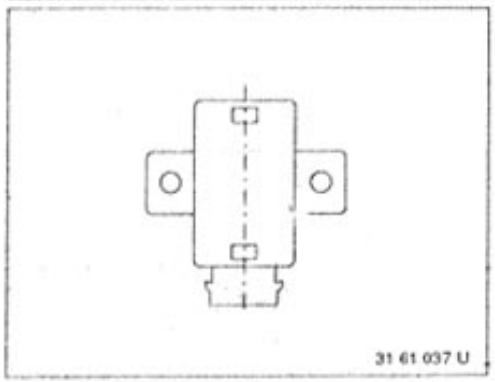
Remove A-pillar trim panel at bottom right.
Remove dashboard trim panel at bottom right.
Remove trim panel for pedal assembly.



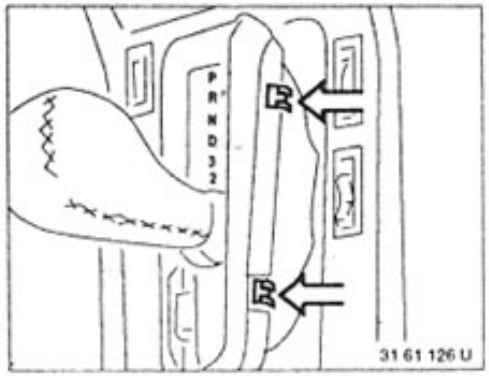
Remove loudspeaker box.
Disconnect plug.



Unscrew screws.
Take impact switch out of the body cavity.

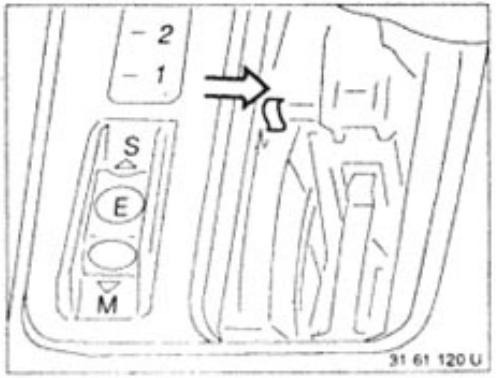


Installation:
Always check for correct installed position!

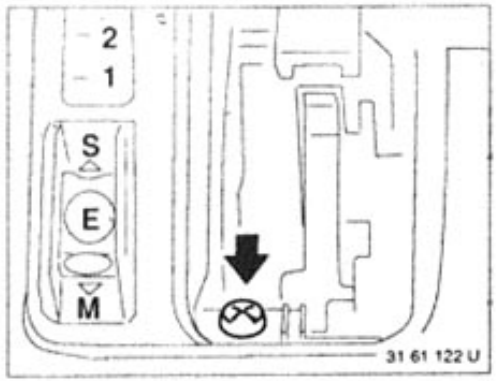


61 31 260 REPLACING TRANSMISSION SWITCH

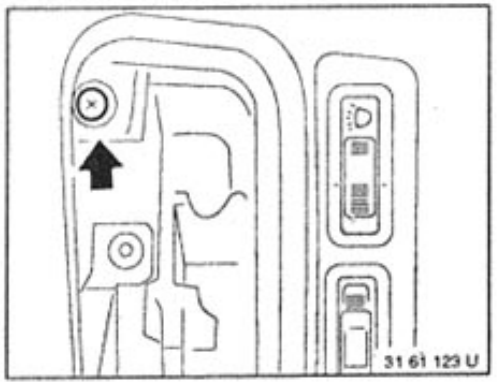
Push dust cover on selector lever up.



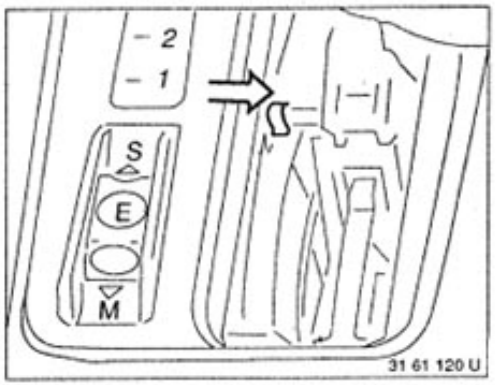
Pull selector lever handle off from above.



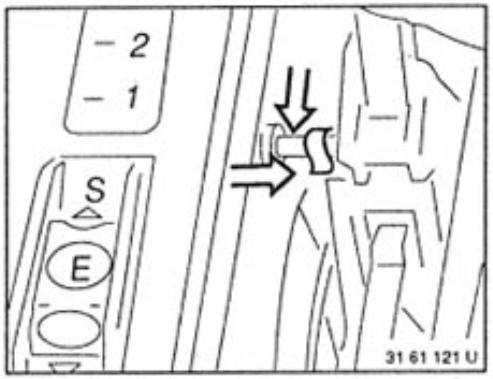
Move selector lever into "P".
Unscrew screw.



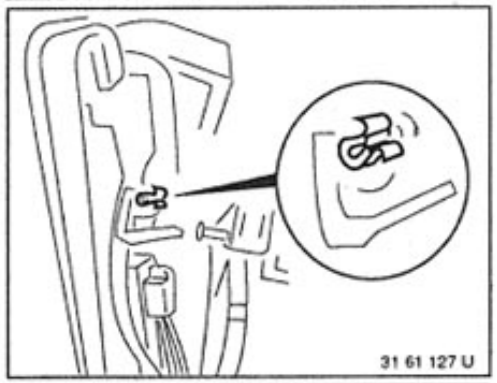
Move selector lever to range "1".
Unscrew screw.



Move selector lever into "P".
Pry range indicator drive out carefully using a screwdriver.



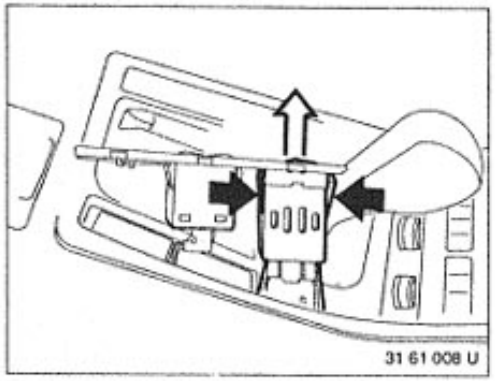
Press retainer aside and unclip the drive carefully.



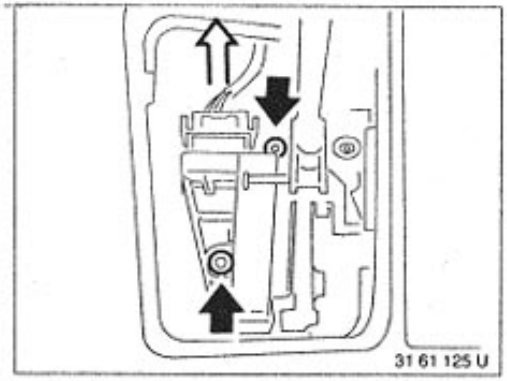
Picture shows retainer.



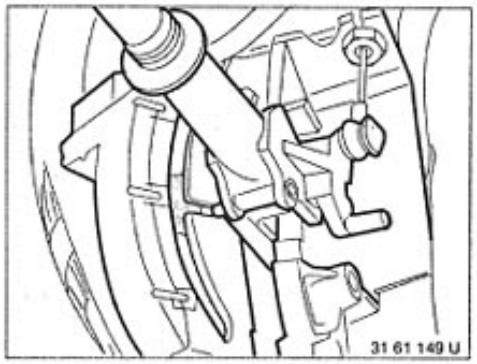
Remove console.



Disconnect plug.



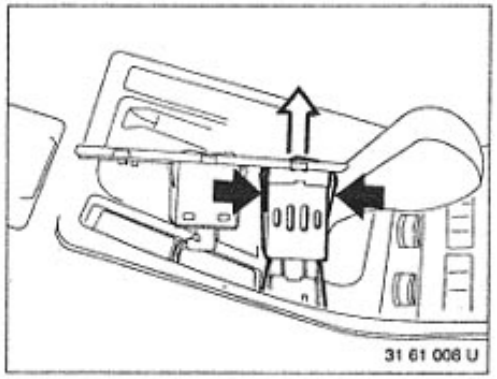
Unscrew screws.



Position selector lever in such a manner that the switch can be taken out through the slot.

Installation:
Screws are microencapsulated and must be replaced.
Tightening torque*.
Install the range indicator's drive pin with the selector lever in "P", before installing the retainer.

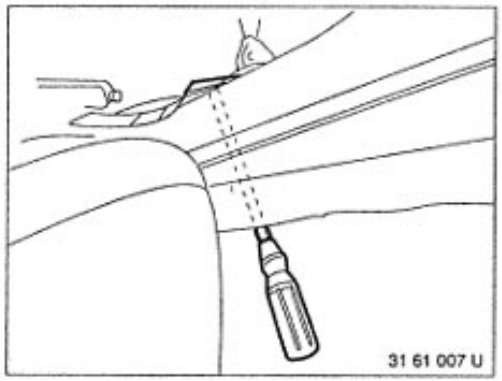
* Refer to Specifications



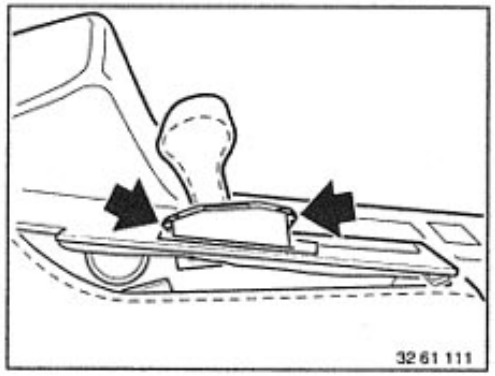
61 31 265 REPLACING PROGRAM SWITCH FOR "EH" TRANSMISSION CONTROL

Test - refer to BMW Test Plan in Group 24.

Checking:
Program switch must be in position "E" after switching the ignition on.



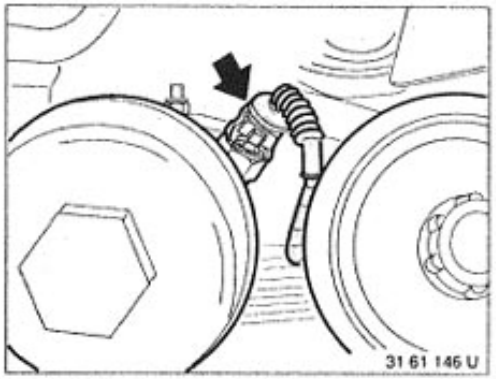
Press trim panel out upwrads carefully using a screwdriver.



Push the retaining hooks back and press the switch out of the trim panel from underneath.

61 31 280 REPLACING OIL PRESSURE SWITCH

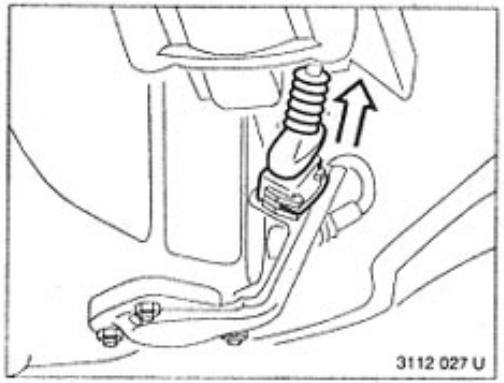
Oil pressure switch is located on the base of the oil filter.
Unscrew oil filter cover to have oil in the oil filter run back into the oil pan.
Disconnect plug.



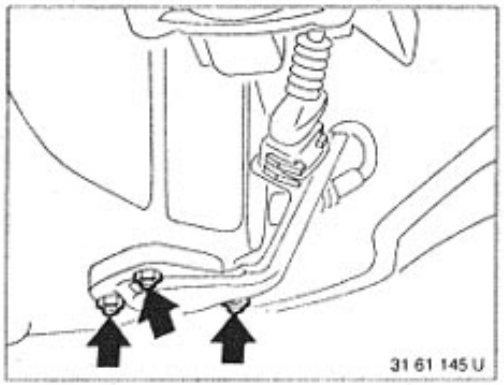
Unscrew switch.

Installation:
Tighten oil filter cover.
Install switch.
Check oil level.

61 31 282 REPLACING ENGINE OIL LEVEL SWITCH



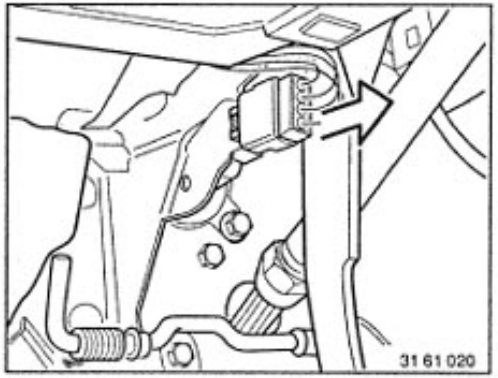
Drain engine oil.
Disconnect plug on engine carrier.



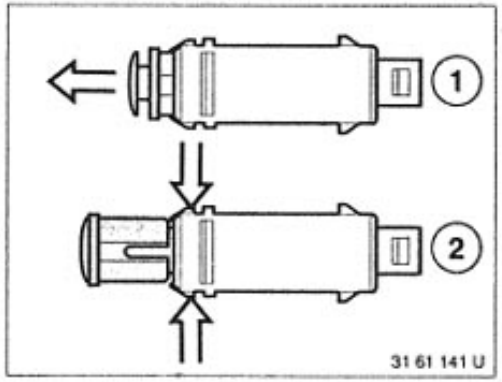
Unscrew screws.
Remove switch.
Pour engine oil in.

61 31 295 REPLACING CLUTCH SWITCH FOR CRUISE CONTROL

Remove plate at bottom of A-pillar.
Remove engine hood release lever.
Remove dashboard trim panel at bottom left.
Remove trim panel for pedal assembly.

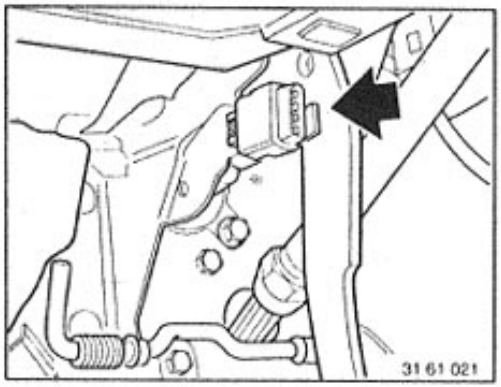


Disconnect plug.



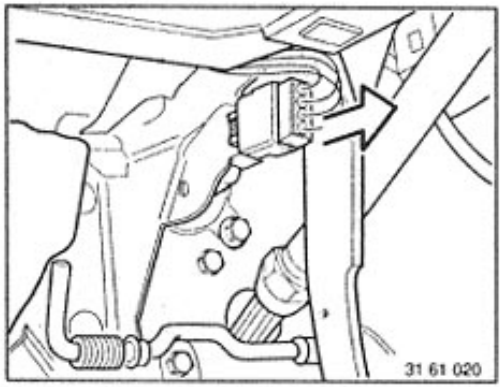
Floor the clutch pedal.
1: Pull plunger and sleeve forward as far as possible.
2: Squeeze retainers together and pull switch back.

Important!
It is essential to check the safety path in casr with EML (electronic engine power control) - refer to 12 70 500.



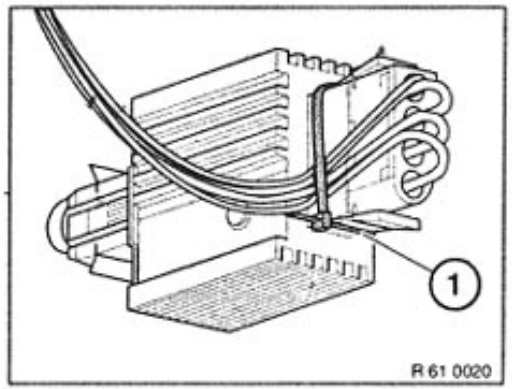
61 31 300 Replacing brake light test switch

Brake light test switch is installed in same housing as the brake light switch.
Refer to "Removing brake light switch" for removal and adjustment. Can be recognized on the 4-pin plug.

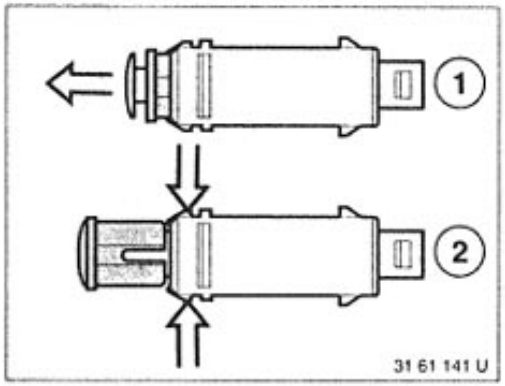


61 31 310 Replacing brake light switch

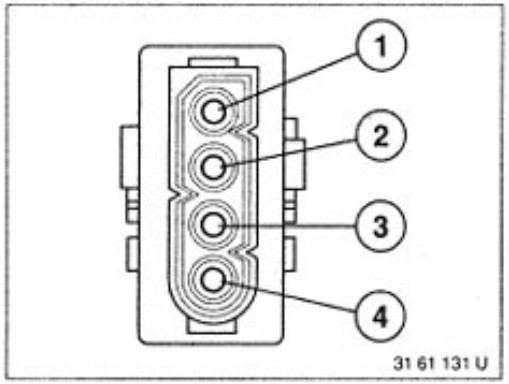
Remove lower A-pillar trim panel.
Remove unlocking lever for front panel.
Remove dashboard trim panel at bottom left.
Remove trim panel from pedals.
Disconnect plug connection.



Caution!
On vehicles with an electronic brake light switch (identifiable by cooling ribs), the lines must be secured with a cable connector (1), as shown in the figure.

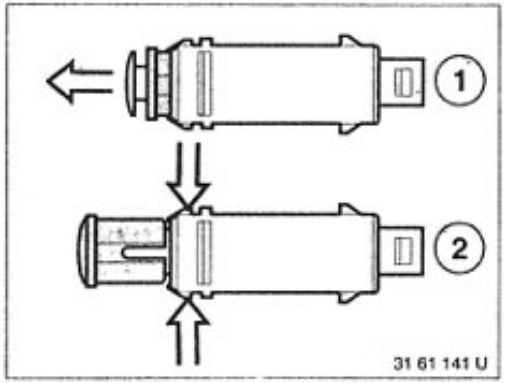


Depress brake pedal.
1: Pull plunger and sleeve forward completely.
2: Compress retainers and pull switch toward rear.



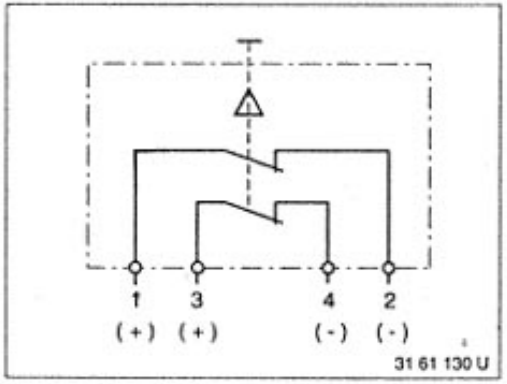
Plug connections for brake light switch and brake light test switch.

1 and 2 brake light switch
3 and 4 brake light test switch



Installation:
Depress brake pedal.
Pull plunger and sleeve completely forward, as described in 1.
Insert switch as shown in 2 and slowly release pedal to neutral position.
Adjustment is automatic.

Caution!
On vehicles with EML (Electronic Power Control) always check the safety path! Refer to 12 70 500.



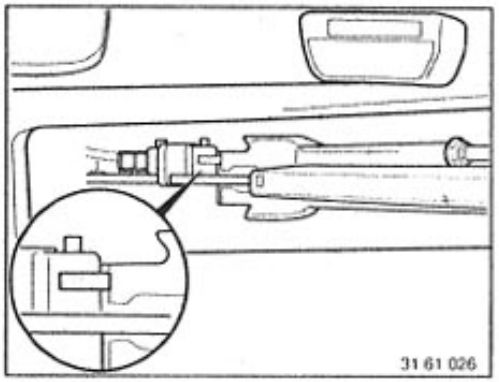
Circuit diagram for brake light test switch and brake light switch

Caution!
The switch setting could be affected if the brake pedal is released suddenly.
Perform function check.

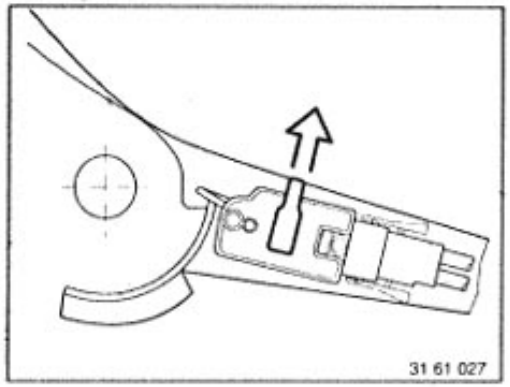
Caution!
After replacing the brake light test switch or brake light switch, always perform the following test:
Check safety path of the Electronic Power Control. Procedure described in Repair Instructions 12 70 500.

61 31 320 Replacing switch for hand-brake warning light

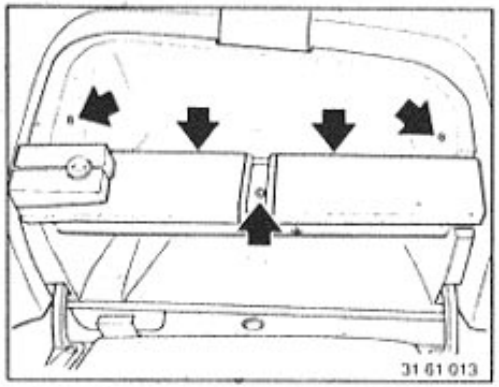
Unclip trim panel.



Lever out bracket.
Disconnect plug connection.
Remove switch.

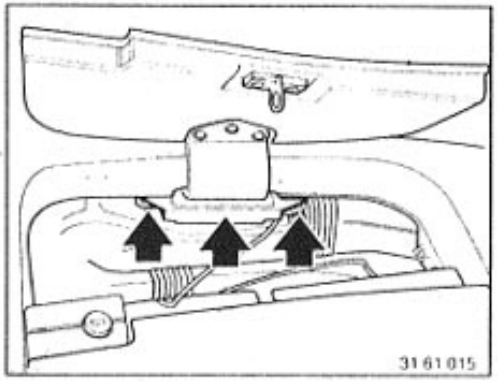


Setting:
Switch must engage between first and second detent stages.

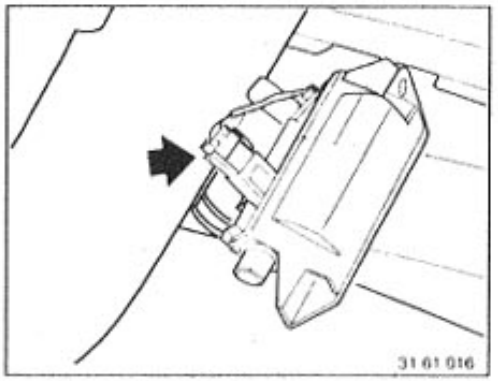


61 31 331 Replacing switch for glove box lighting at top

Unfasten screws.
Remove trim panel.



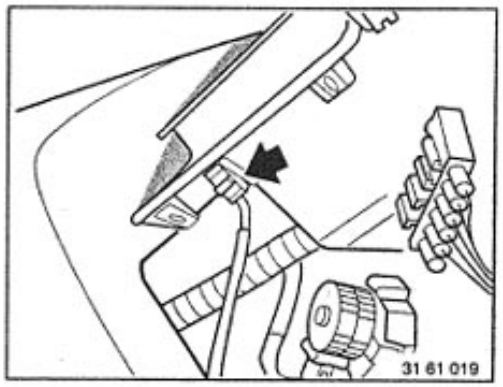
Unfasten screws.
Remove hinge by lifting out past air duct at an angle.



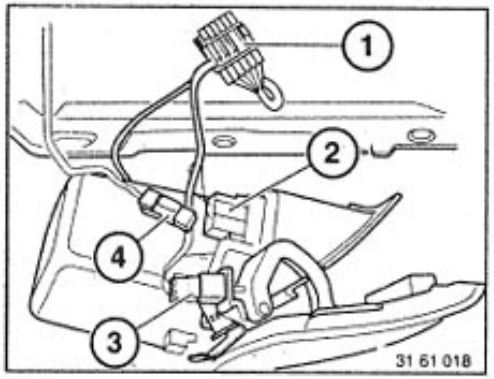
Installation:
During installation, ensure that the switch does not slide out of the bracket. Slowly close flap and check through crack whether light goes out.

61 31 332 Replacing lower glove box light switch

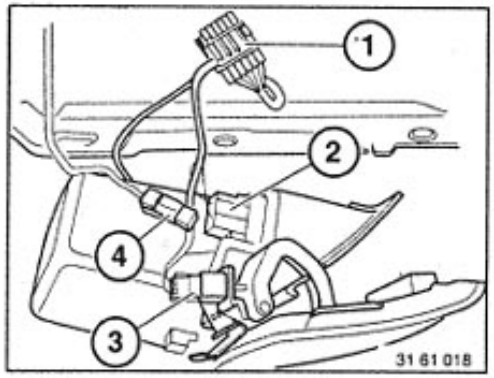
Remove lower right glove box,
refer to 51 16 363
Remove trim panel.



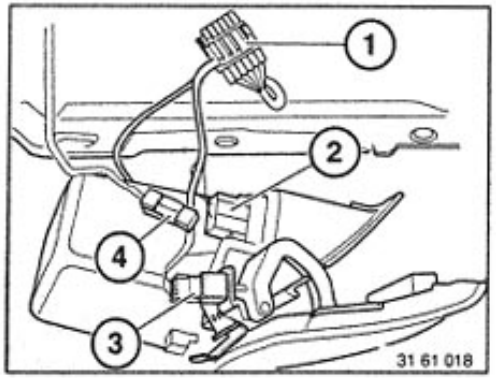
Plug connection for microswitch on lock cylinder of glove box.



Remove switch (3).
Disconnect plug connection.



1 = Plug connection for glove box lighting

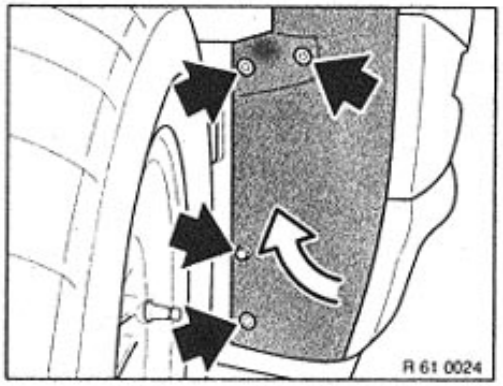


4 = Plug connection for microswitch - lock cylinder in glove box.
2 = Charge connector for pocket torch.

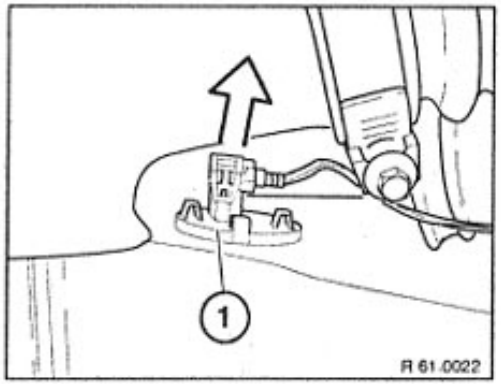
61 31 440 Removing and installing or replacing thermoswitch for heated windshield washer jets

Function description:
The thermoswitch is switched sequentially with the heated washer spray jets.
Cut-in temperature: 2 - 10 °C
Cut-out temperature: 8 - 16 °C

Note when troubleshooting:
Switch is usually open because ambient temperature is usually greater than 16°C.
Spraying with refrigerant spray seldom causes heating to cut in because a response lag time of a few minutes is permitted.

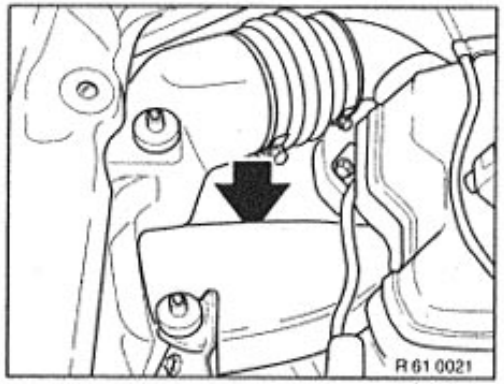


850 CSI:
Wheel arch inner trim at front right: unfasten screws.

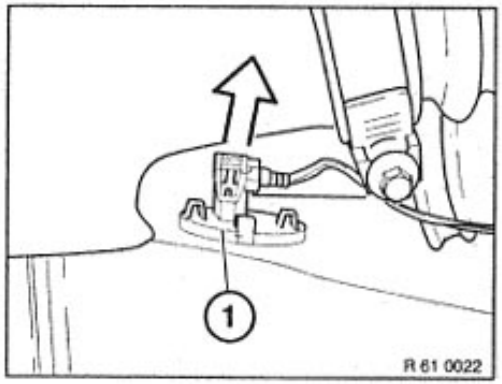


Installation location:
In front brake air duct.
Disconnect plug connection.
Unclip temperature sensor (1).

850 CI, 840 CI:
Remove complete right headlight with carrier plate, refer to 63 12 460.



Installation location:
in front brake air duct.

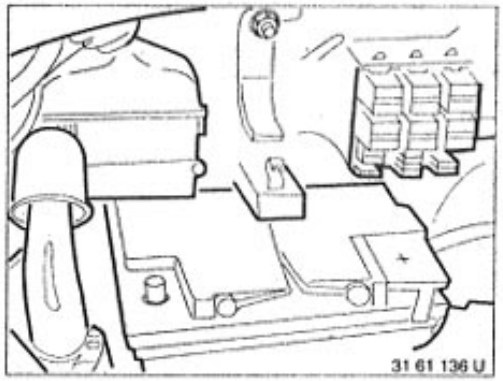


Disconnect plug connection.
Unclip temperature sensor (1).

61 31 470 REMOVING AND INSTALLING OR REPLACING RELAY / MODULE (IN TRUNK)

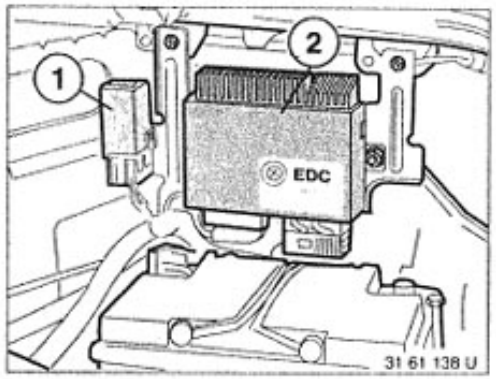
Refer to general information in 61 00!

Switch ignition off.
Disconnect battery.
Remove left and right trim panels in trunk.



Left Side of Car:

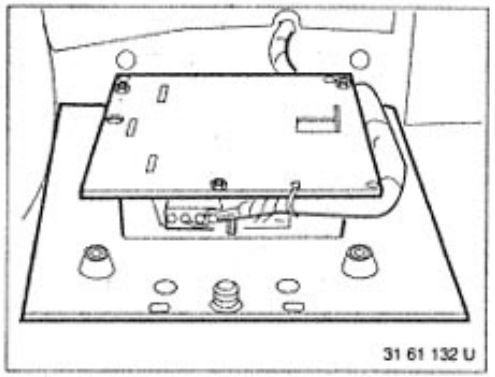
Trailer hitch.



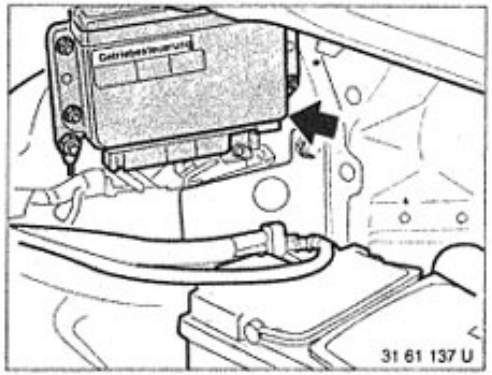
Right Side of Car:

EDC control unit - refer to Group 37 for additional information.

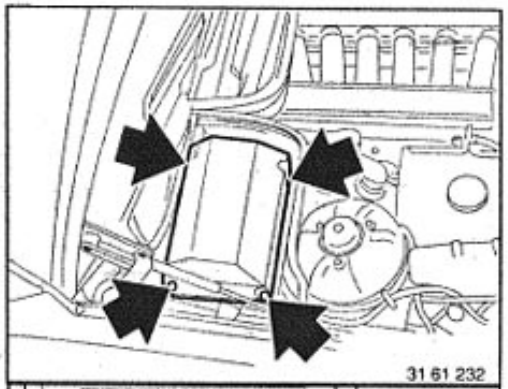
1 Power saving relay
2 Control unit for EDC (electronic absorber control)



Audio-amplifier

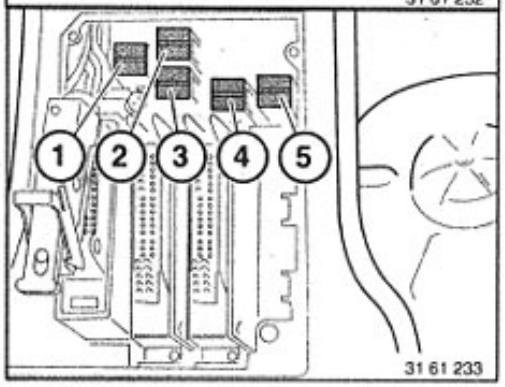


Control unit for electronic transmission control (automatic transmission)

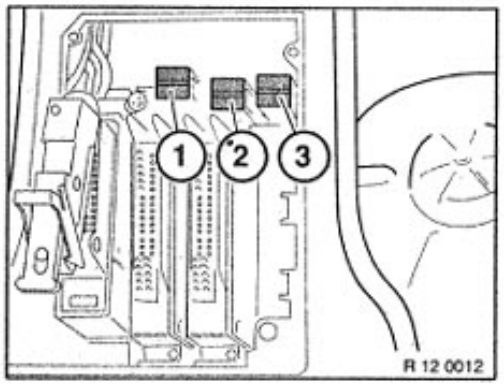


61 31 487 Replacing main relay (for lambda control)

Unfasten screws in cover.
Remove cover.



Remove relay (1) for Lambda oxygen sensor heating.The relay supplies both Lambda sensors 1 and 2 with electrical power.



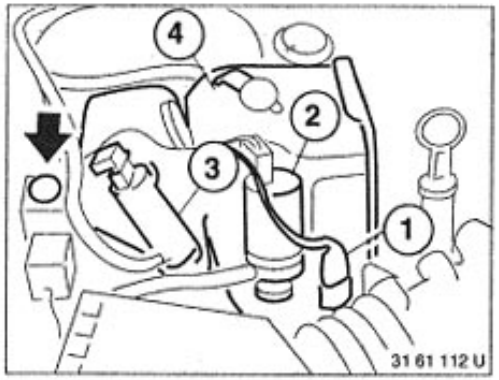
3 Relay for Lambda oxygen sensor heating

Caution!
Depending on condition of vehicle, the location of the relays can differ. If in doubt, pull the desired relay to test whether the correct function is interrupted.

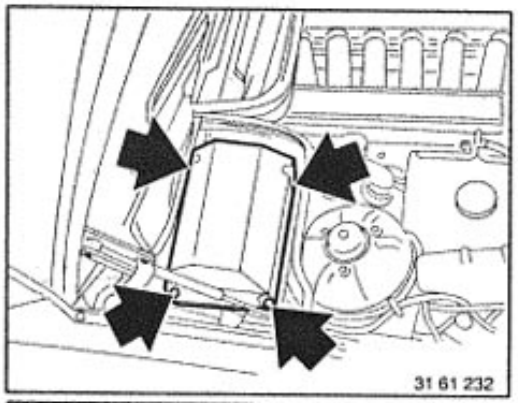
For additional information on troubleshooting, refer to schematics in Electrical Troubleshooting Manual - 8 Series.

61 31 492 Replacing level switch

Empty container. Remove cable from level switch. Lift out switch.

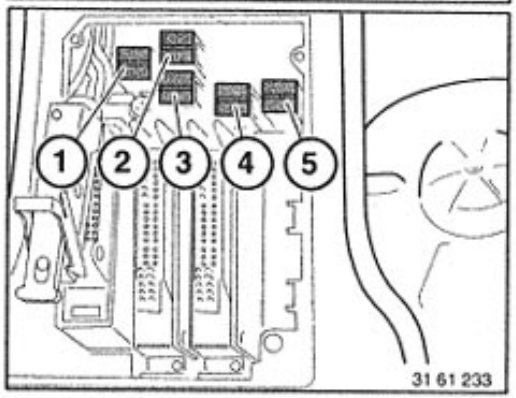


Installation:
Check that switch is in correct position.
Top up wash water.
Check system for leaks.



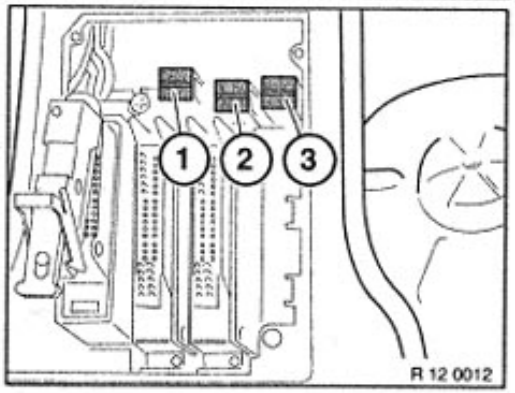
61 31 521 Replacing main relay (for digital motor electronics)

Unfasten screws in cover.
Remove cover.



M 70, S 70:

2 Main relay 2 for Digital Motor Electronics, cylinder bank 2 - cylinders 7-12.
3 Main relay 1 for Digital Motor Electronics, cylinder bank 2 - cylinders 1-6.

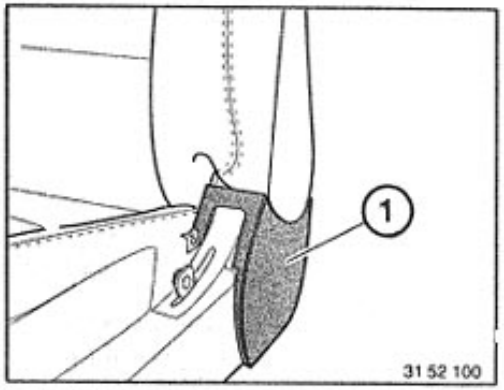


M 60:

1 Main relay for Digital Motor Electronics

Caution!
Depending on construction status of vehicle, location of relays can differ. If in doubt, pull the desired relay to check that the relevant function is interrupted.

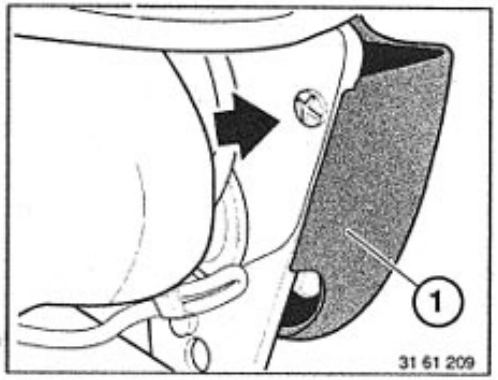
Additional instructions on troubleshooting - see schematics in Electrical Troubleshooting Manual - 8 Series.



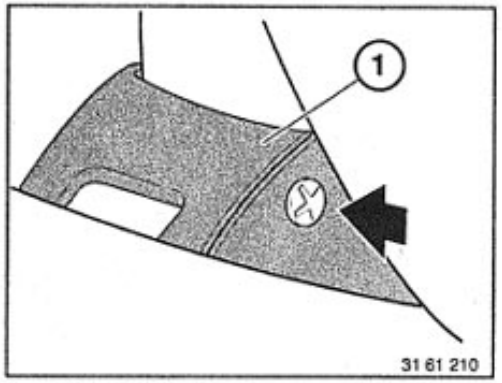
61 31 642 REPLACING BOTH MICRO-SWITCHES FOR BACKREST LOCKING ON LEFT OR RIGHT FRONT SEAT

Interrogate fault memories.

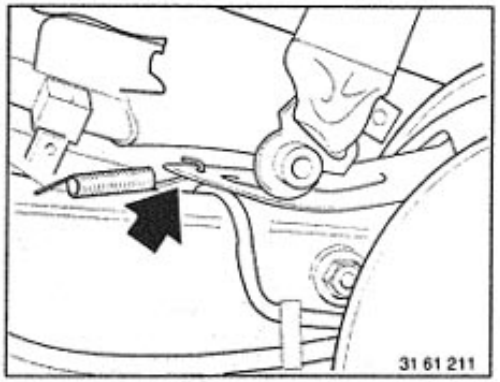
Remove front seat - refer to Group 52.
Remove panel on back of front seat backrest - refer to Group 52.
Remove panel (1).



Unscrew screw.

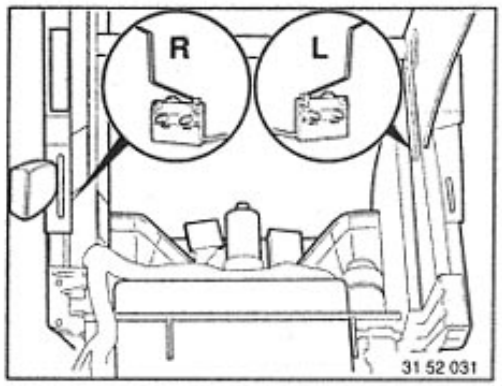


Unscrew screw.



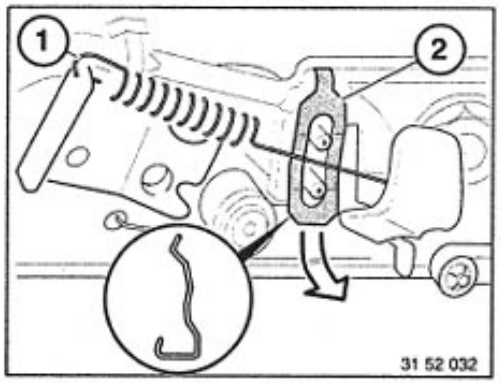
Detach spring and remove reclining mechanism.

Important!
The spring must be attached correctly, as otherwise the microswitch wiring would be damaged.

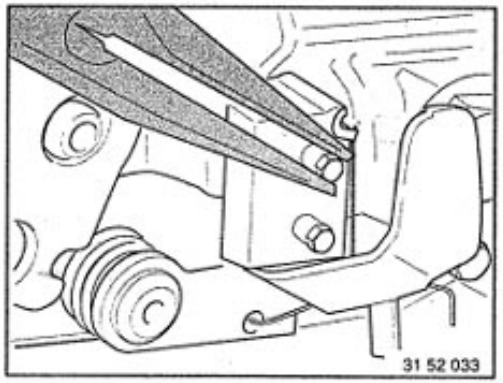


Two microswitches are installed on each seat.

Important!
Microswitches are marked and must not be mixed up.
"R" = right side looking forward in car
"L" = left side looking forward in car

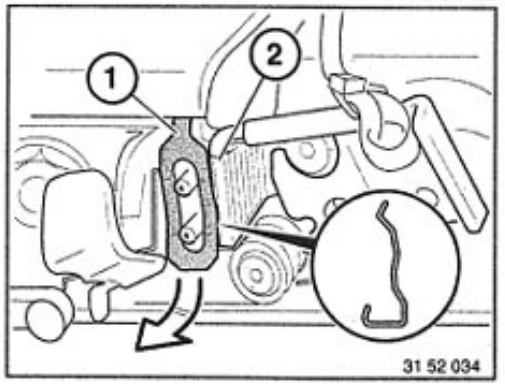


Right Side Microswitch:
Detach return spring (1) and re retainer (2).



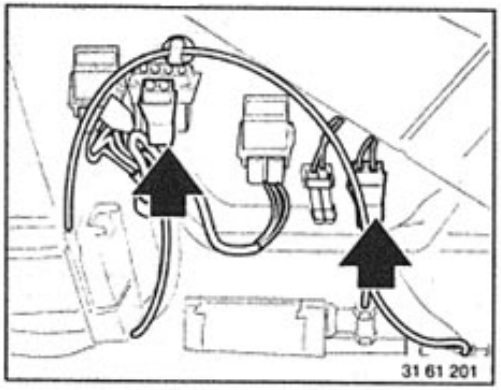
Remove microswitch.

Installation:
Check the installed position of the microswitch operating lug.



Left Side Microswitch:
Remove spring retainer (1) and microswitch (2).

Installation:
Check the installed position of the microswitch operating lug.

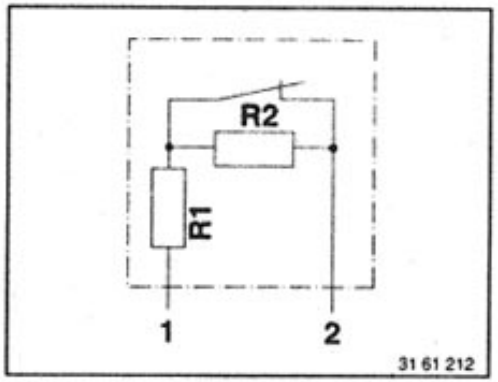


61 31 ... CHECKING FUNCTION OF MICROSWITCHES

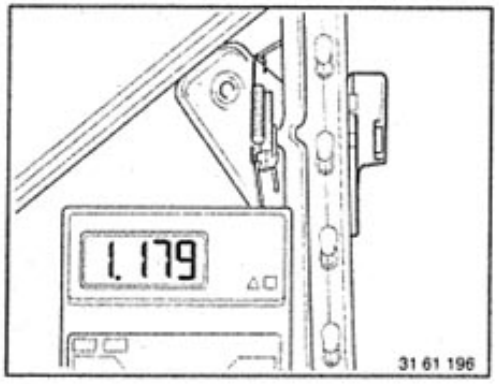
Remove front seat - refer to Group 52.
Remove backrest shell panel - refer to Group 52.

Disconnect plugs of microswitches.

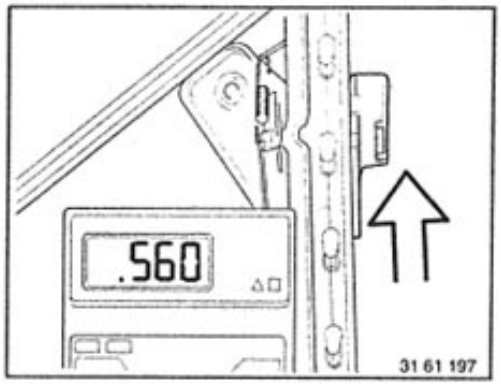
Connect Special Tool 61 1 465 (adapter lead) to microswitch.



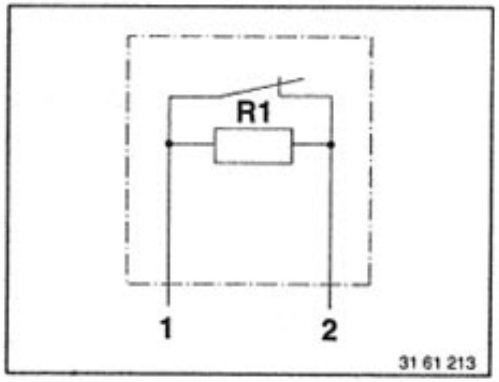
<u>Left Side Microswitch:</u>
Wiring diagram of left side microswitch (seen looking forward in car) drawn with the backrest locked.



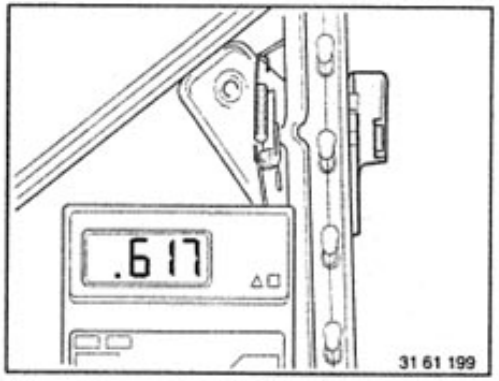
Unlocking lever is not operated.
Specification: 1180 ± 10 Ω.



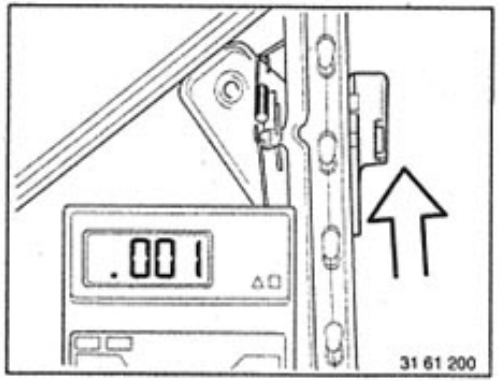
Pull the unlocking lever about 4 to 5 mm.
The microswitch should then work.
Specification: 560 ± 10 Ω.



<u>Right Side Microswitch:</u>
Wiring diagram of right side microswitch (seen looking forward in car) drawn with the backrest locked.



Unlocking lever is not operated.
Specification: 620 ± 10 Ω.

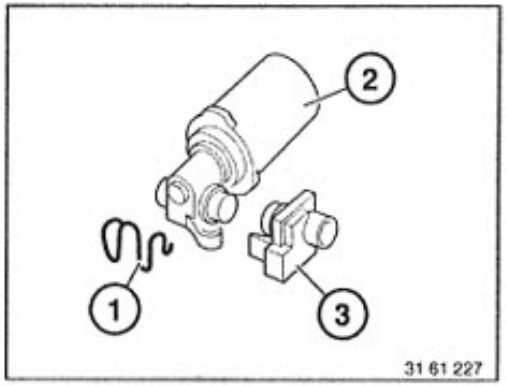


Pull the unlocking lever about 4 to 5 mm.
The microswitch should then work.
Specification: 0 Ω

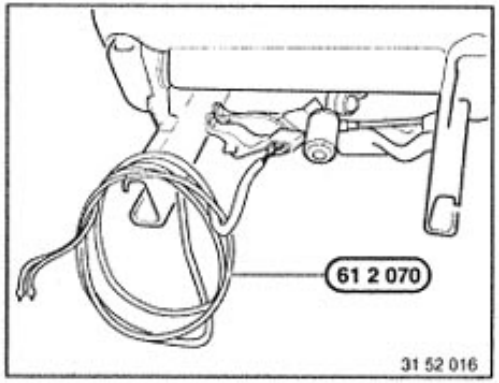
- Install seat.
- Erase fault memories with tester.
- Check function.
- Interrogate fault memories again.
- Investigate any stored faults.

61 31 643 REMOVING AND INSTALLING OR REPLACING REGULATOR FOR POWER SEAT DRIVE (AXIAL ADJUSTMENT)

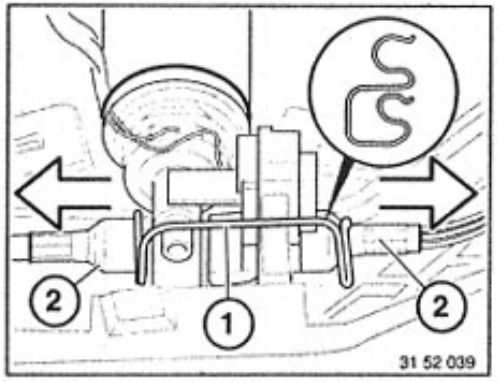
Remove front seat - refer to Group 52.



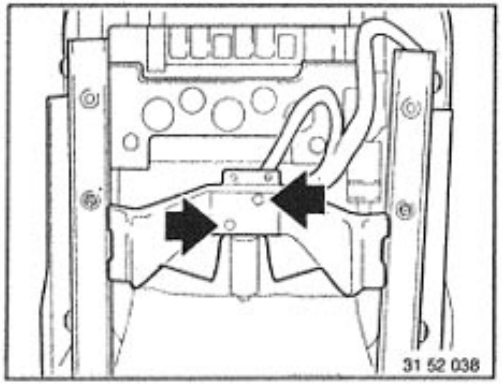
1 Retainer
2 Drive
3 Regulator



Connect Special Tool 61 2 070 (adapter lead) to left white plug of seat and 12 V power supply source.
Run seat to "top" position.
Run front seat inclination to "top" position.



Disconnect seat control unit plug.
Disconnect retainer (1) and pull drive shafts (2) off.

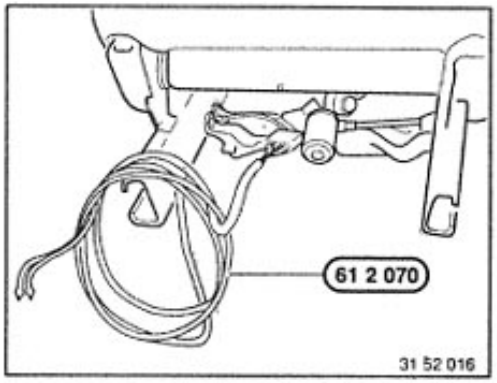


Unscrew screws and remove drive.
Remove regulator.

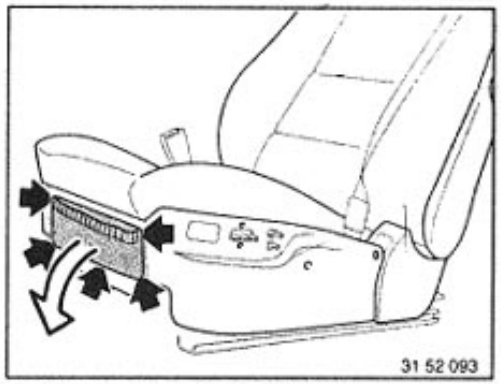
Installation:
Check function.

61 31 644 REMOVING AND INSTALLING OR REPLACING REGULATOR FOR POWER SEAT DRIVE (INCLINATION ADJUSTMENT)

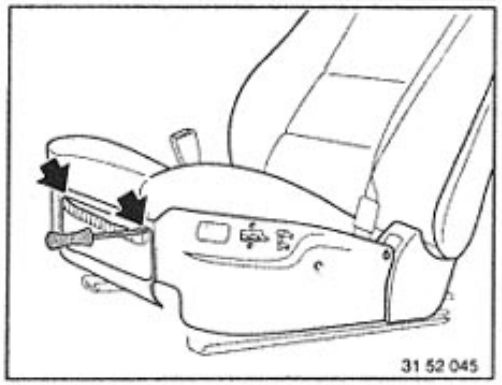
Remove front seat - refer to Group 52.



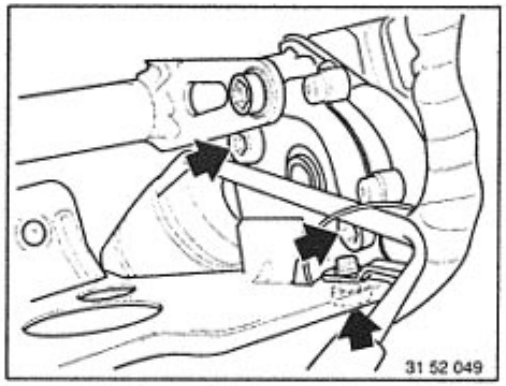
Connect Special Tool 61 2 070 (adapter lead) to left white plug of seat and 12 V power supply source.
Run seat to "top" position.
Remove seat control unit - refer to 61 31 099.



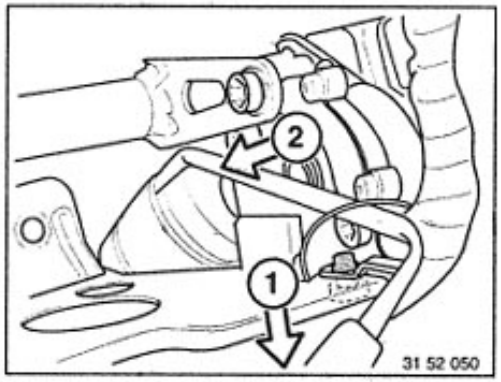
Unclip pocket.



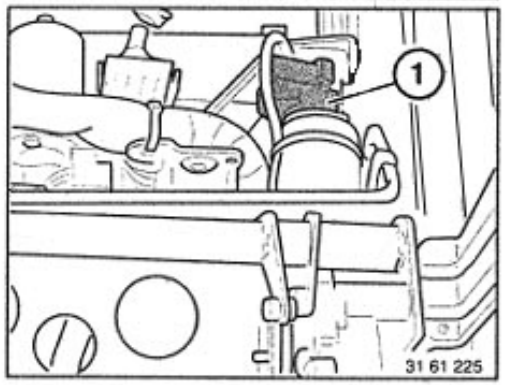
Unscrew screws and remove panel.



Unclover wiring and disconnect plug.
Unscrew screws.
Disconnect front end of cushion shell - refer to Removing Cushion Shell in Group 52.

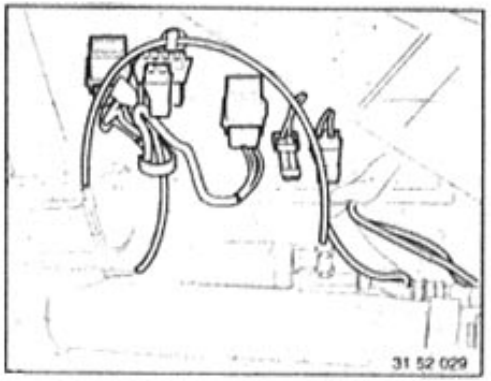


Press holder (1) on seat control unit downwards.
Push holder (2) aside and remove drive.



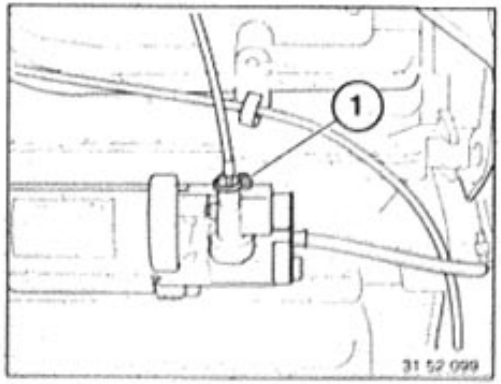
Remove regulator (1).

Installation:
Check function.

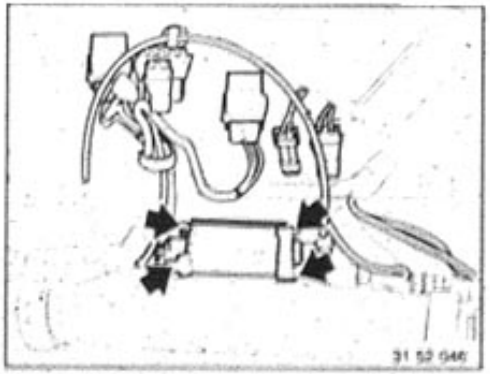


61 31 645 REMOVING AND INSTALLING OR REPLACING REGULATOR FOR POWER SEAT DRIVE (BACKREST ADJUSTMENT)

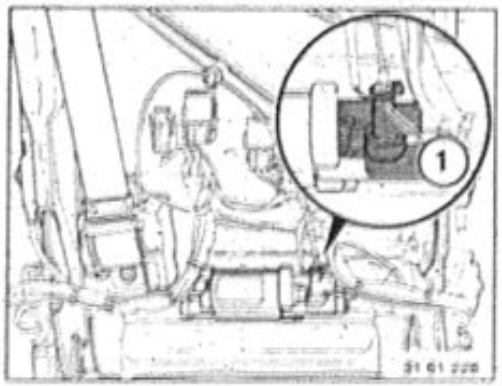
Remove front seat - refer to Group 52.
Remove rear panel on back of front seat backrest - refer to Group 52.



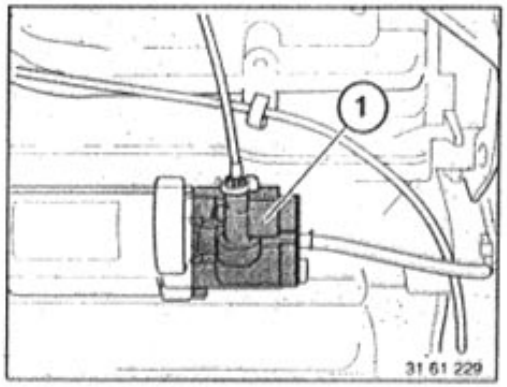
Loosen wire strap of belt adjustment and remove drive shaft.



Unscrew screws.
Remove lockplate for backrest adjustment shafts and motor.



Remove regulator (1)

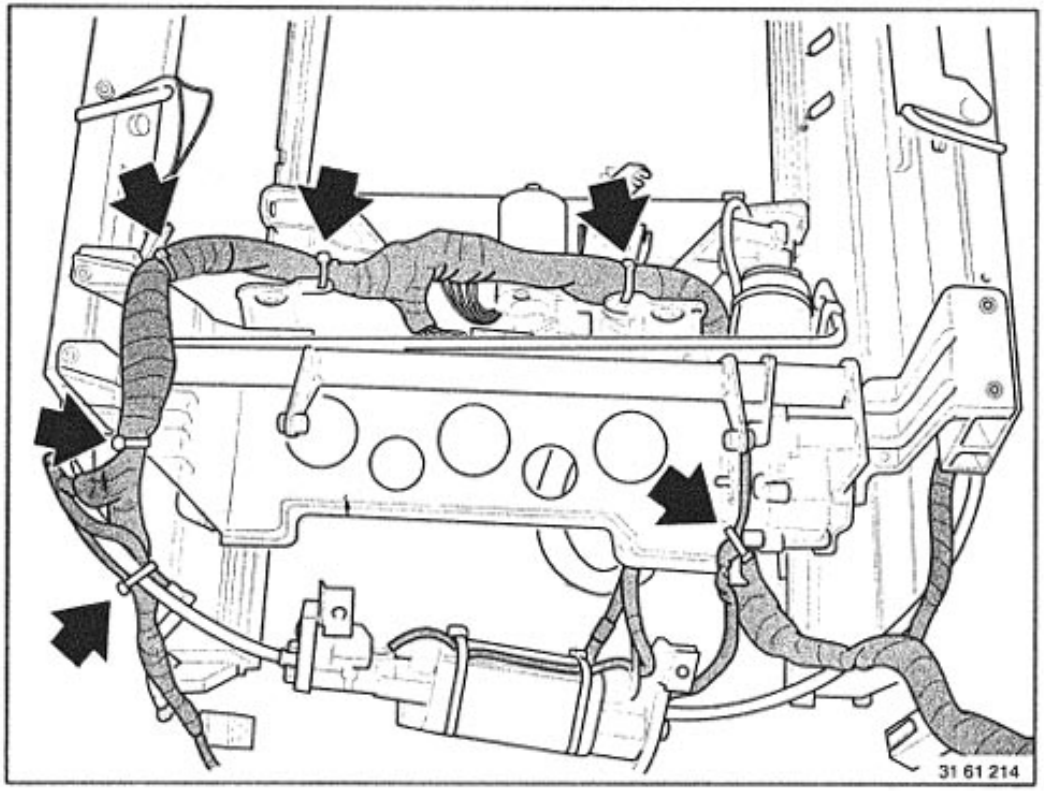


Remove regulator (1).

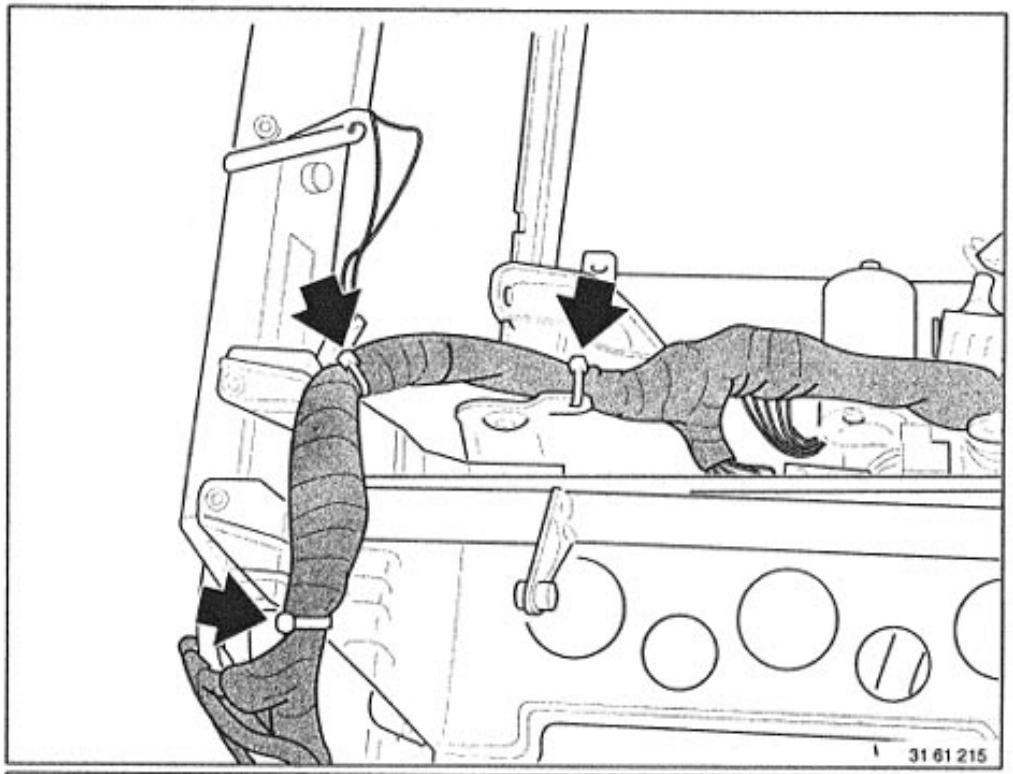
61 31 ... ROUTING OF WIRES ON FRONT SEAT

White marks on the wire harness show the points, at which the wire harness must be secured to the seat with wire straps.
If these marks are neglected while installing the wire harness, the distance of seat adjustment could be too small or the wire harness might be damaged.

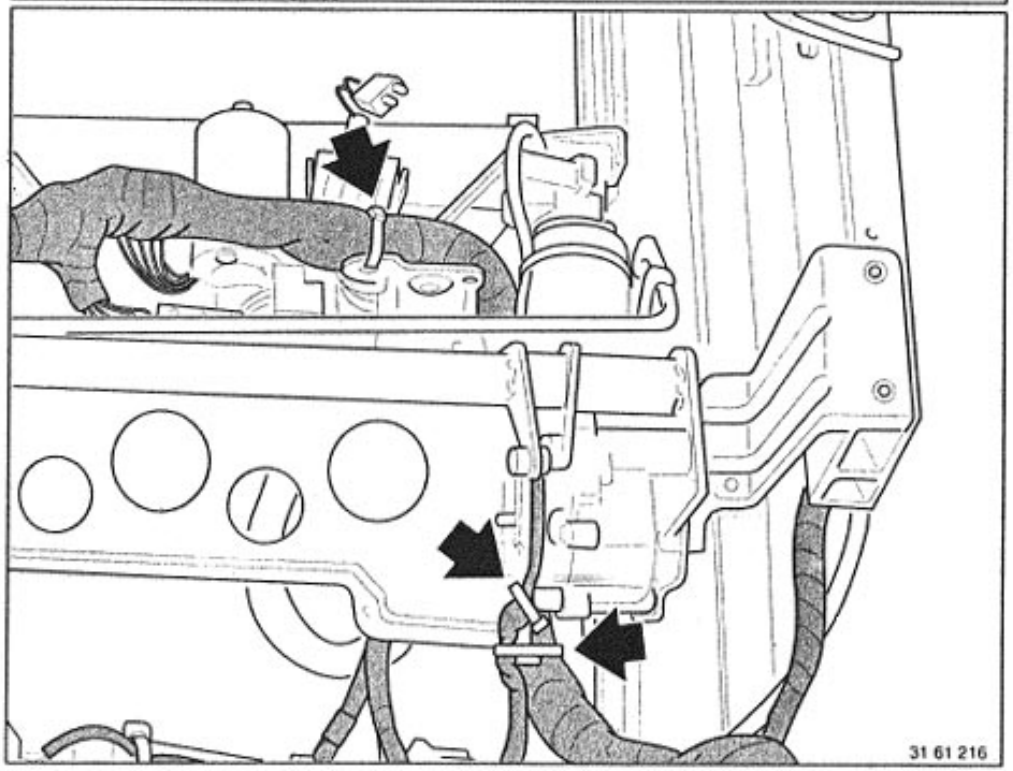
The following description is based on the driver's seat with seat memory and seat heater. The wiring for the passenger's seat or seats with other equipment must be routed similarly.



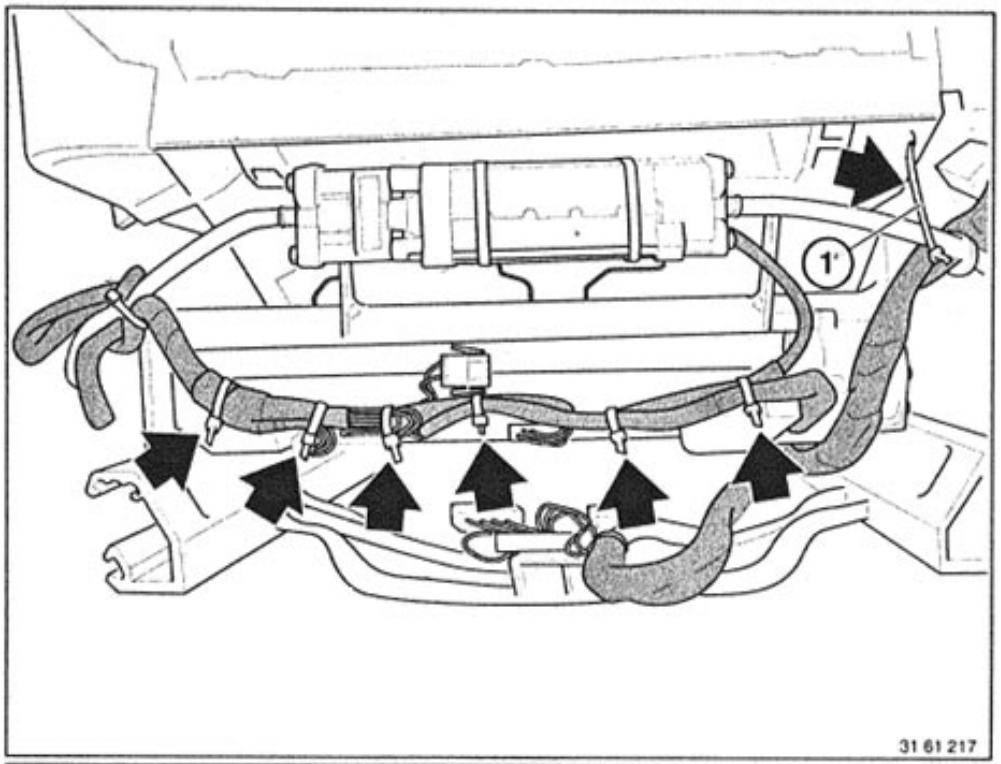
Top front view of seat without cushion shell.



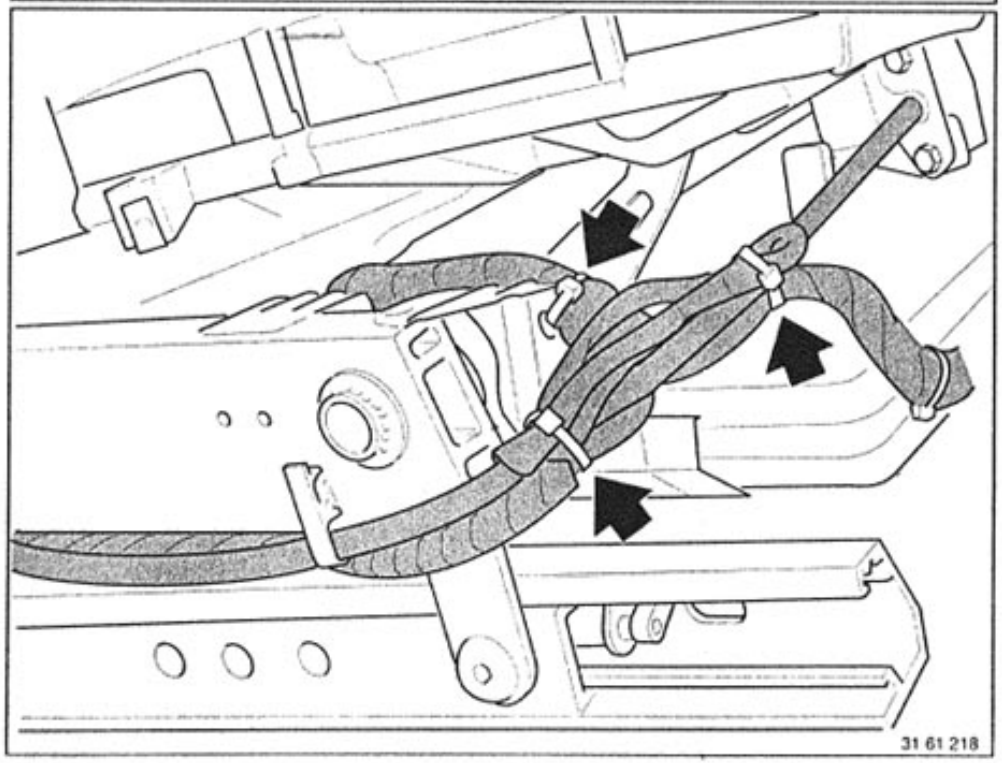
Top front view of seat without cushion shell.
Routing at left-hand side.



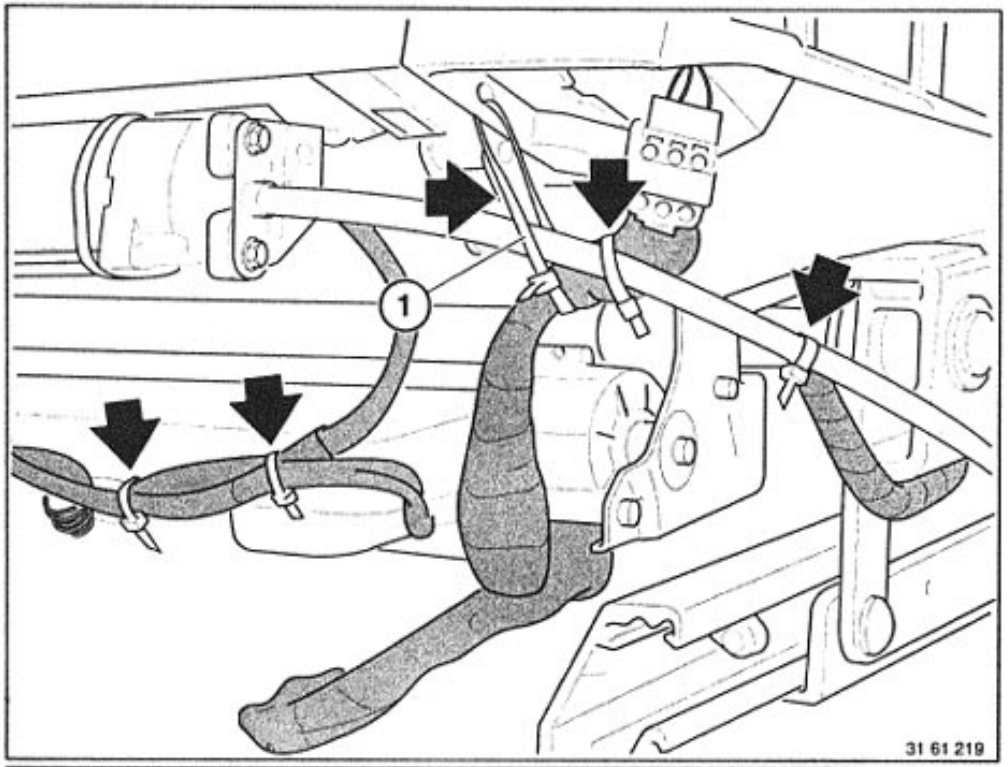
Top front view of seat without cushion shell.
Routing at right-hand side.



Front view.
Wiring secured to seat rail.
Control unit installed.

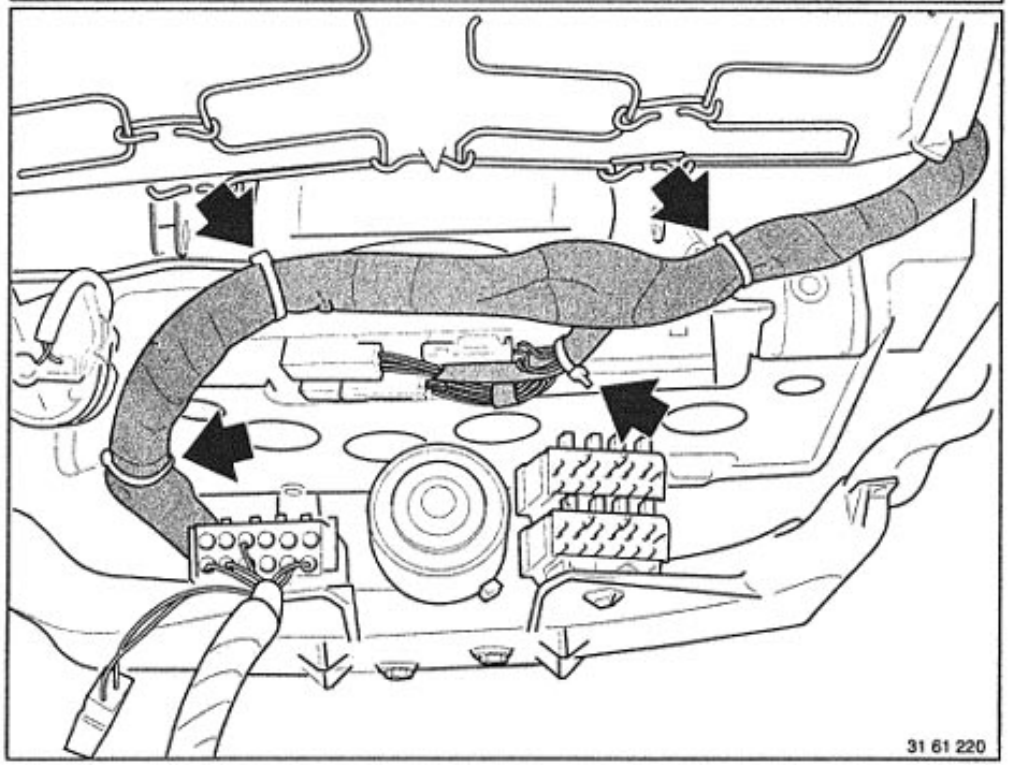


Front view.
Control unit installed.
Left-hand side.

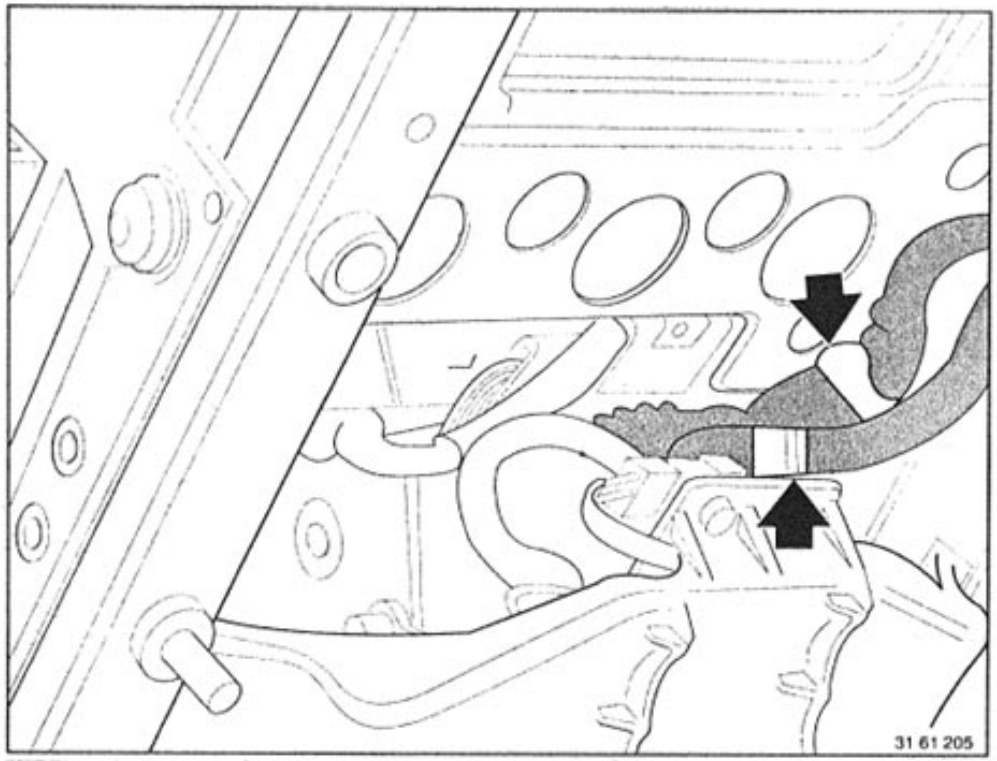


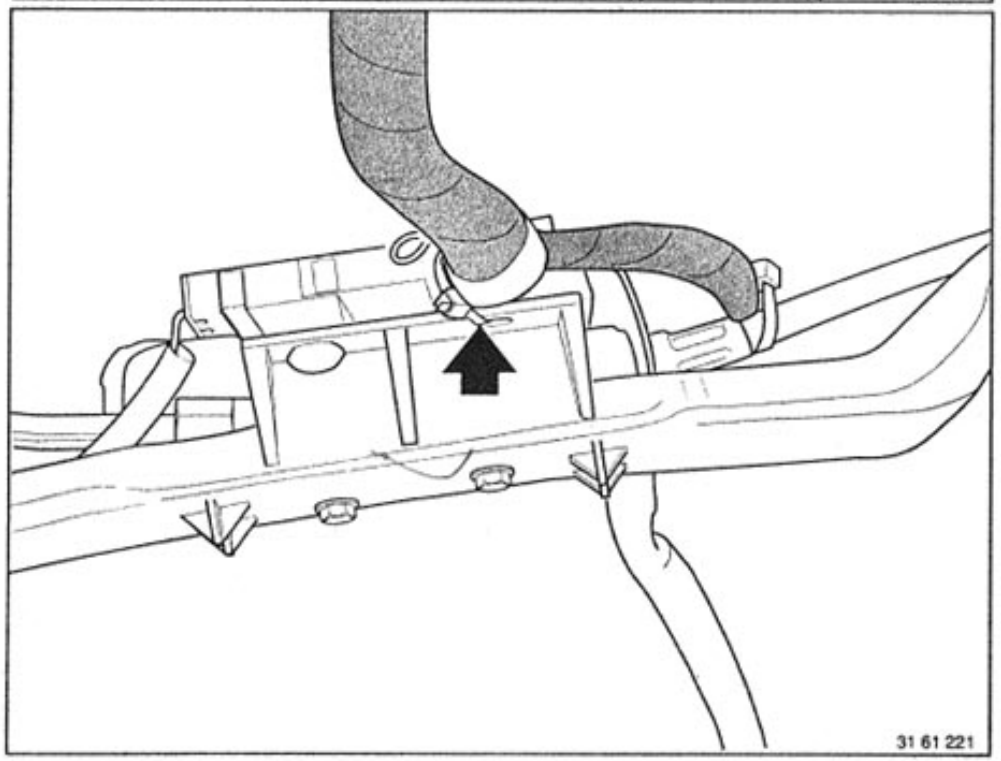
Front view.
Wiring secured to seat rail.
Control unit installed.
Right-hand side.

Important!
Wires to the power seat switches must be tied back with wire strap (1) to avoid damaging them when the seat is adjusted.



Rear bottom view.
Wiring secured to seat rail.
Control unit installed.

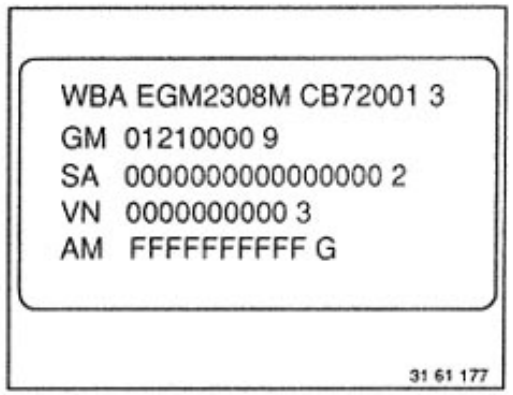




Rear bottom view.
Wiring secured to seat rail.
Control unit installed.

61 35 ... EXCHANGING AND CODING CONTROL UNITS

Refer to general information on 61-0.
Disconnect battery ground leads before exchanging control units.
If battery ground leads are not disconnected, incorrect special equipment versions could be recognized due to the different switching-on and switching-off conditions of control units.
This would result in malfunctions!



Sample Central Label:

Chassis number
GM = Basic code (9 digits)
SA = Special equipment (17 digits)
VN = Version (11 digits)
AM = Drive management (11 digits)

Note:
Check whether the chassis number is correct.

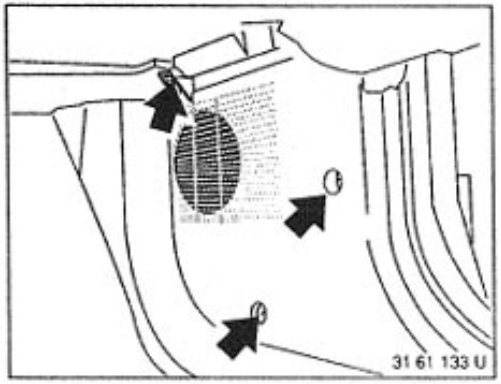
Conform with specified procedures when exchanging the following modules.

1. **Body module**
2. **Basic module**
3. **Lamp control module**
4. **EDC control unit**

Before the introduction of programming modules via MoDIC, the code must be read from the central label which is located on the electronic box lid.
This information is required to order a replacement module.
Coding is carried out in Dingolfing for a specific model according to information from the central code.

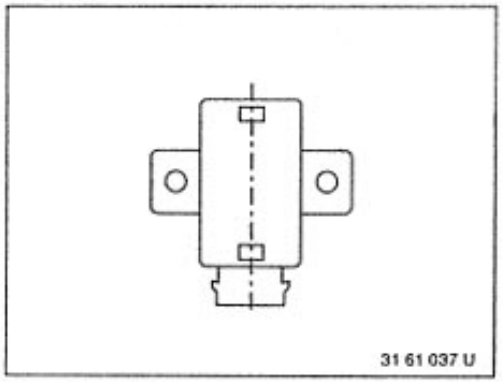
Required information:

1. **Part number of required module**
2. **Last seven digits of chassis number**
3. **Fourtyeight digits of code**

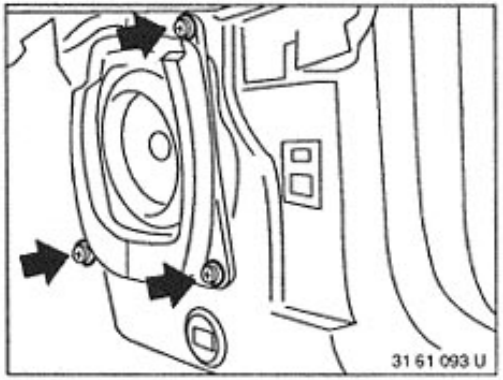


61 35 ... REMOVING AND INSTALLING CONTROL UNITS IN A-PILLAR

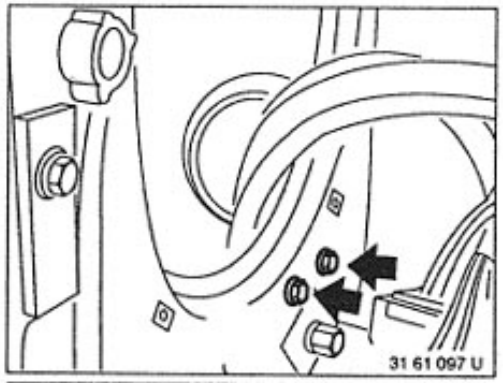
Turn screws 90˚ and remove trim panel.



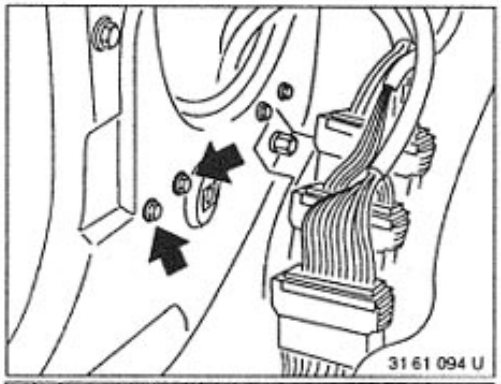
Installation:
Always check whether the installed position is correct – plug faces down!



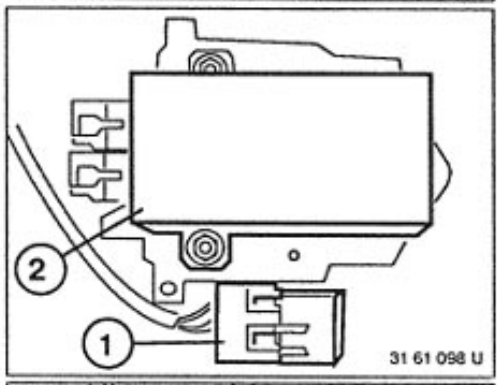
Remove loudspeaker.



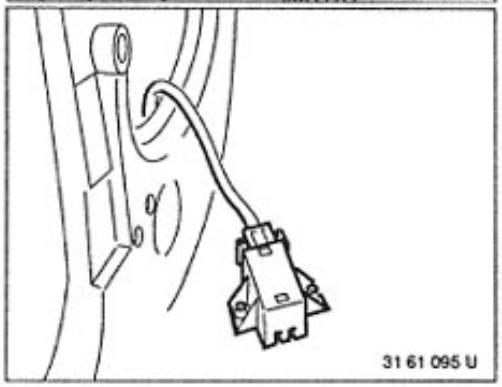
Unscrew screws.



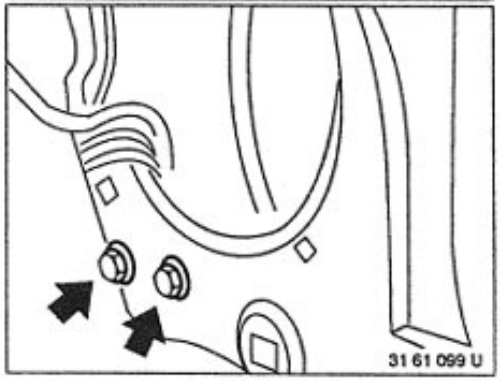
Control Units on Driver's Side:



1 = Inside light relay
2 = Control unit for A/C lock sensor

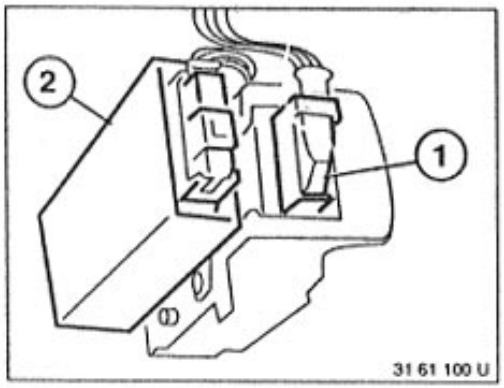


Remove impact switch.



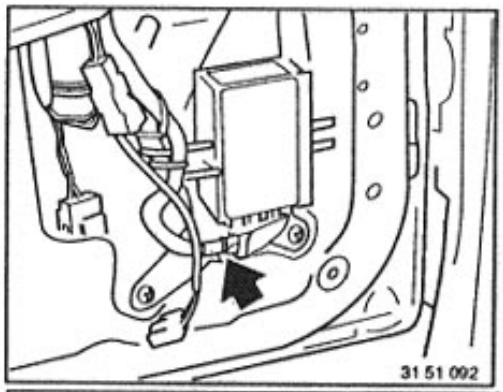
Control Units on Passenger's Side:

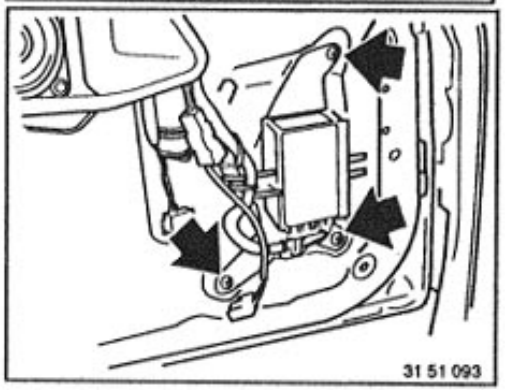
Unscrew screws.



1 = Control unit for infrared remote control

2 = Control unit for automatic recirculating air control (AUC)





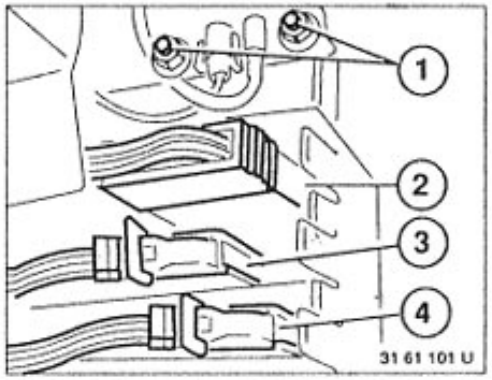
61 35 ... REPLACING LEFT OR RIGHT DOOR MODULE

Remove door trim panel – see Gr. 51.

Disconnect plug.
Unscrew screws.

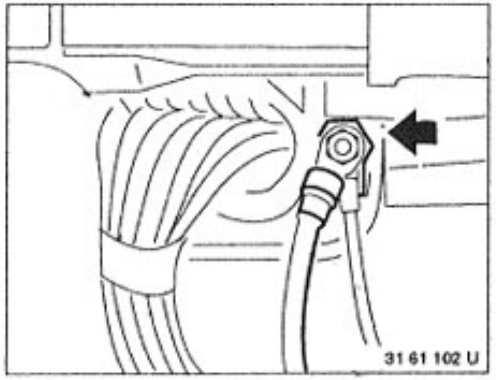
61 35 ... REPLACING CONTROL UNITS BELOW DASHBOARD TO THE LEFT

Remove dashboard trim panel at bottom left.
Turn screws 90°.

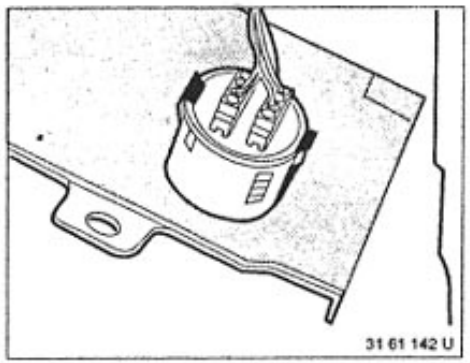


1 Windshield antenna connection
2 Lamp control module
3 Basic module
4 Electronic body module

Important!
Note central code - refer to page 61-35/1.

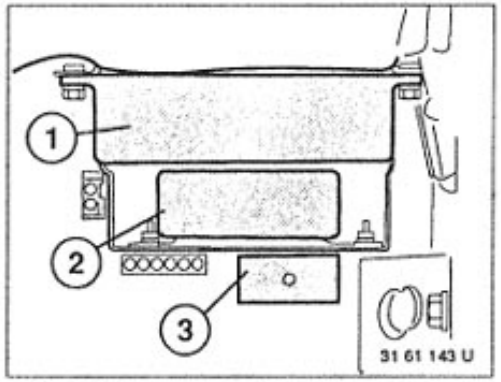


Positive connection point at firewall opening.

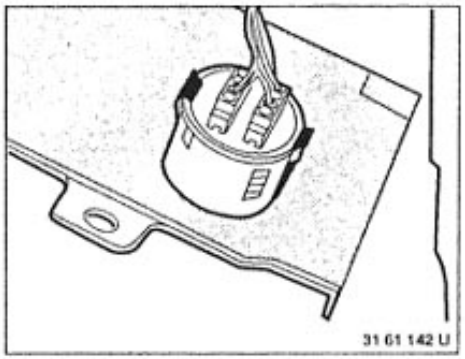


61 35 ... REPLACING CONTROL UNITS BELOW DASHBOARD TO THE RIGHT

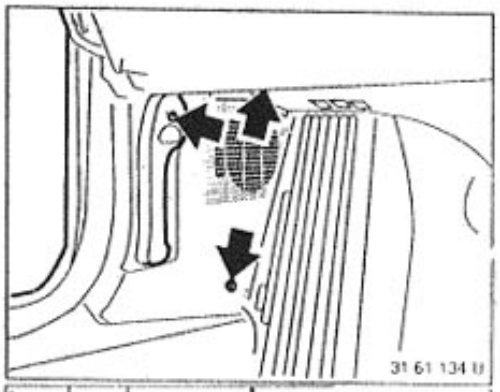
Remove dashboard trim panel at bottom left.
Turn screws 90°.



1 Control unit for airbag
2 Control unit for additional heater
3 Relay box for heater

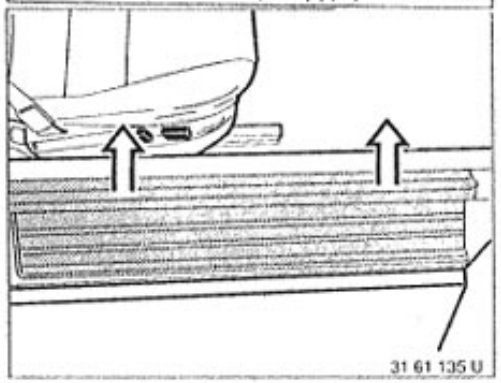


Take gong out of trim panel.
Disconnect plug.

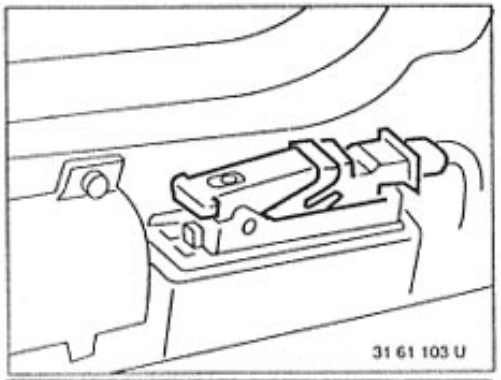


61 35 ... REMOVING AND INSTALLING CONTROL UNITS IN DOOR MEMBERS ON DRIVER'S SIDE

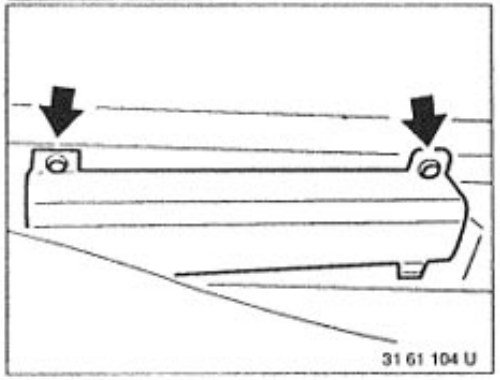
Unscrew hood release lever.
Take off loudspeaker cover.



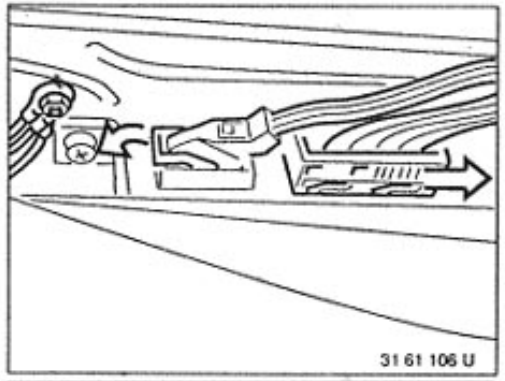
Unclip side member strip.
Fold back carpet.



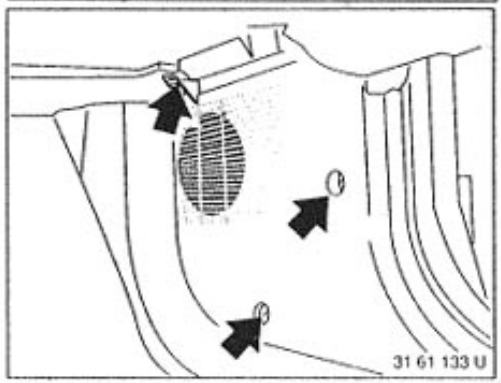
ABS control unit – see Group 34 for procedures when replacing.



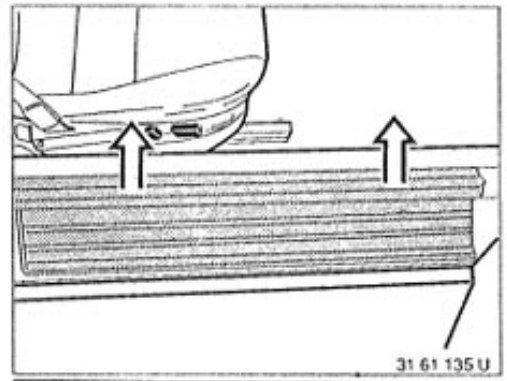
Loosen clips.
Remove trim panel.



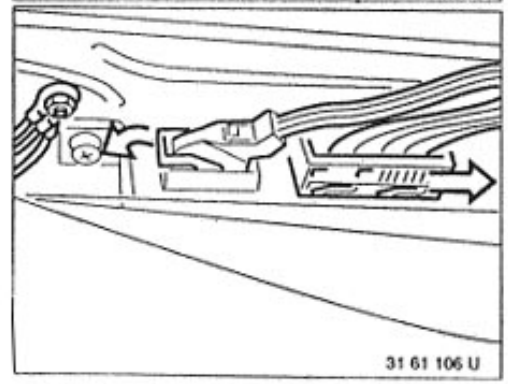
Relay Module:
Disconnect plugs.



Control Units on Passenger's Side:
Take off loudspeaker cover on A-pillar.



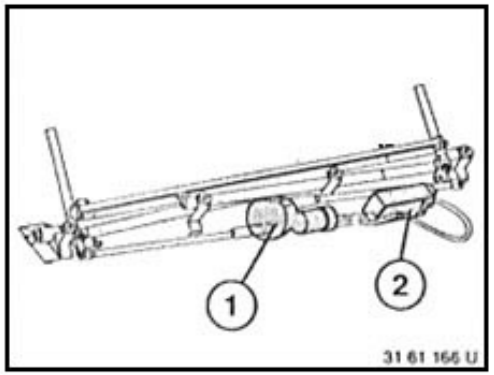
Unclip side member strip.
Fold back carpet.



DWA Control Unit
(burglar alarm)

61 35 ... REPLACING CONTROL UNIT FOR ELECTRIC SUN SHADE

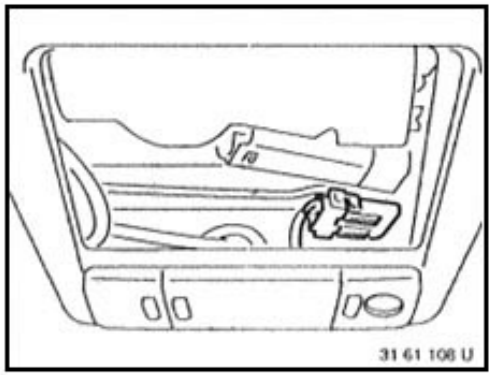
Remove hatrack – see Group 51.



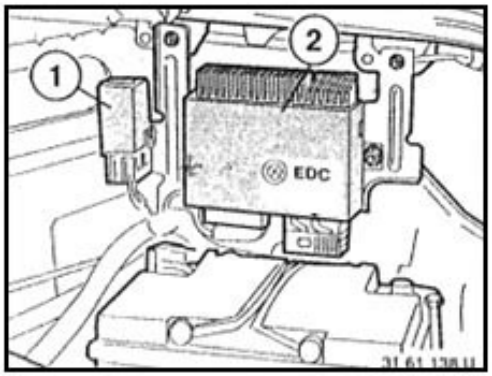
Control unit is underneath the hatrack.
Troubleshoot – see Electric/Electronic Test Plan.

61 35 ... REPLACING CONTROL UNIT FOR POWER SUN ROOF

Unclip trim panel.
Remove sun roof motor – see Gr. 54.



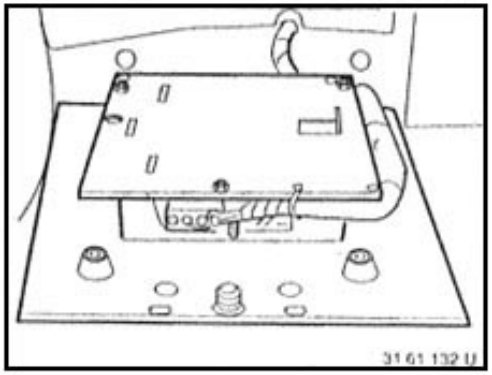
61 35 ... REMOVING AND INSTALLING CONTROL UNITS IN TRUNK



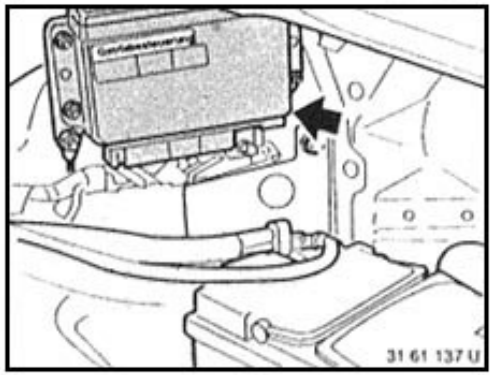
EDC control unit – see Group 37 for other instructions.

1 =Power saving relay
2 =EDC control unit

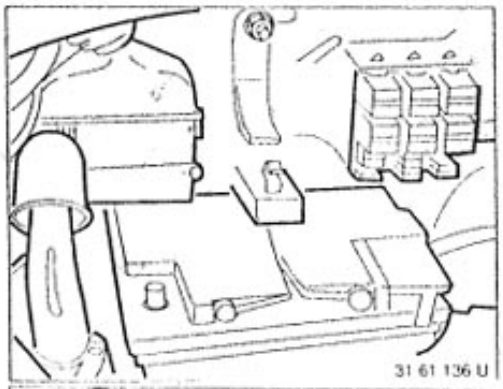
EDC = electronic absorber control



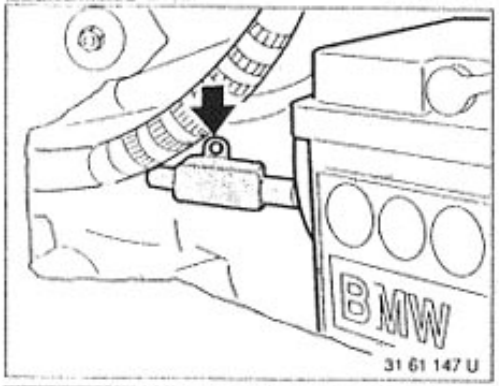
Audio amplifier



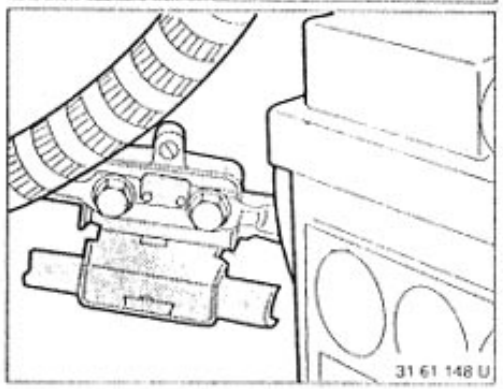
Control unit for electronic transmission control



Traller module



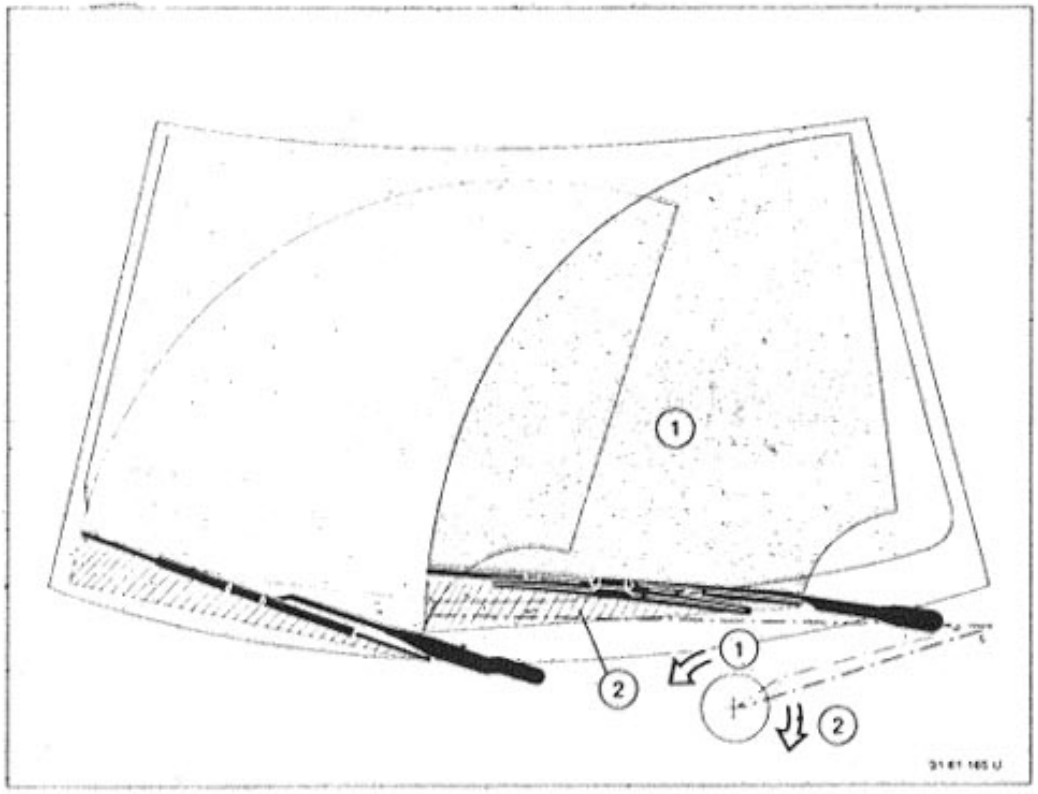
Safety fuse 80 A



CONTROL UNIT LOCATION SURVEY

Description	Location	Other information
ABS control unit	In front section of door member on driver's side	Group 34
AEGS control unit (independent electronic transmission control)	In trunk on wheel house at passenger's side	Group 24
Trailer module	In trunk behind wheel house on driver's side	Group 72
Airbag control unit	Underneath dashboard on passenger's side	Group 32 (conform with safety precautions!)
AUC sensor	On radiator	Group 64
AUC control unit (autom. circulating air control)	In A-pillar behind loudspeaker on passenger's side	Group 64
Audi amplifier	In trunk behind trunk compartment wall	Group 65
Batteries	In trunk behind wheel housings	Group 61
DME control units	In electronic box in engine compartment	Group 12
DWA control unit (burglar alarm)	In fron section of door member on passenger's side	Electric/Electronic Test Plan
EDC control unit (electronic absorber control)	In trunk behind wheel house on passenger's side	Group 37
EKM module (electronic body module)	Underneath dashboard on driver's side	Electric/Electronic Test Plan
EML control unit (electronic engine power control)	In electronic box in engine compartment	Group 12
General module	Underneath dashboard on driver's side	Electric/Electronic Test Plan
Control unit for infrared remote control	In A-pillar of passenger's side behind loudspeaker	Electric/Electronic Test Plan
Inside light relay	In A-pillar of driver's side behind loudspeaker	Electric/Electronic Test Plan
Steering column memory	On heater behind middle outlet nozzle of ventilating system	Group 32
Lamp control module (LKM)	Underneath dashboard on driver's side	Electric/Electronic Test Plan
Lock sensor control unit	In A-pillar of driver's side behind loudspeaker	Group 64

Description	Location	Other information
Relay module	In front section of door member on driver's side	Electric/Electronic Test Plan
Relays	In relay/fuse box in engine compartment In trunk	Electric/Electronic Test Plan
Relay box for extra heater	Underneath dashboard on passenger's side	Electric/Electronic Test Plan
Sun roof control unit	In roof, bolted on drive	Electric/Electronic Test Plan
Fuses	In fuse/relay box in engine compartment In trunk	Electric/Electronic Test Plan
Sun shade control unit	Underneath hatrack	Electric/Electronic Test Plan
Seat/mirror memory control unit	Underneath driver's seat	Electric/Electronic Test Plan
Seat heating control unit	Underneath passenger's seat	Electric/Electronic Test Plan
Parked car heating control unit	Underneath dashboard on passenger's side	Electric/Electronic Test Plan
Parked car ventilating control unit	Underneath dashboard on passenger's side	Electric/Electronic Test Plan
Door module	In concerned door	Electric/Electronic Test Plan
Central lock crash sensor	In A-pillar on driver's side behind loudspeaker	Electric/Electronic Test Plan

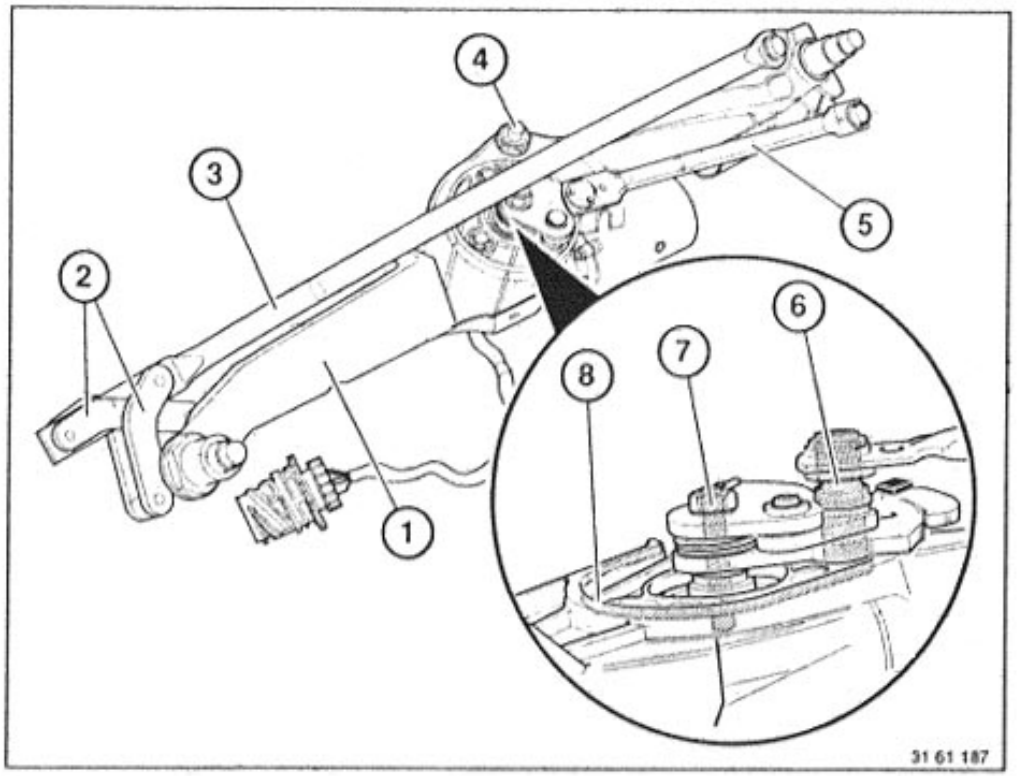


1 Wiping Operation
Windshield wiper operating motor runs in clockwise direction.
Produces normal wiped zone.

2 Parked
Windshield wiper operating motor runs in counterclockwise direction.
Wiped zone increased to include zone 2.
Drive arm is extended via the shifting gate.
Wipers run to parked position.

61 61 ... REPAIRING WIPER CONSOLE, WIPER MOTOR AND STOP FOR PARKED POSITION

A modified wiper system had been installed in LHD models produced before June, 1990. As the separate components of both wiper systems (refer to parts microfiche, date of introduction: 06/90) cannot be interchanged, the entire wiper system of cars produced before June, 1990 must be replaced.
If the entire wiper system has already been replaced, which can be recognized on the features shown below, separate parts may also be replaced.
Also refer to Service Information 61 05 91 (355).



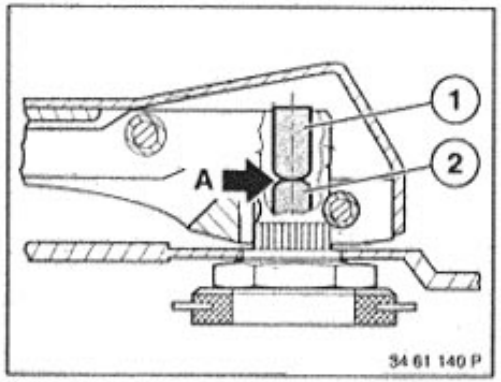
New wiper systems can be recognized on the following features:

1 Cast console with modified reinforcement ribs
2 Doube cross-arm on passenger's wiper shaft instead of single cross-arm
3 Connecting rod in pipe version instead of U-profile
4 Spring-load pin stop with damper ring to prevent "snapping"
5 Drive rod in U-profile version instead of flat sheet metal
6 Longer stop for parked position
7 Longer wiper operating motor shaft
8 Inlet on cast console for parked position stop

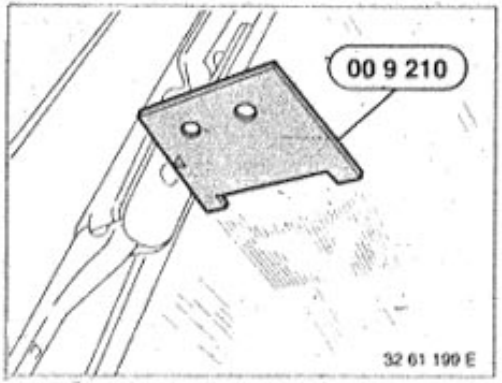
Note:
Inlet (8) on the cast console guides the longer stop (6) of the motor crank for the parked position.

61 61 . . . Adjust or inspect windshield wiper arm approach angle on windshield

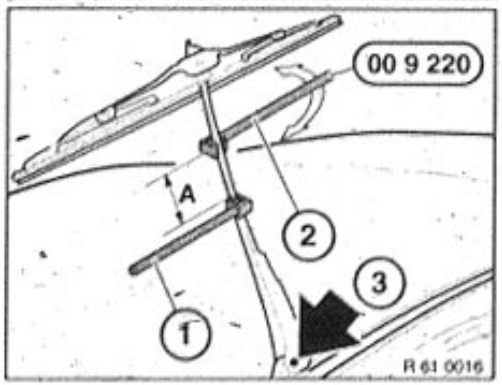
The approach angle of the wiper arm on the windshield determines to a large extent the wipe quality during intermittent operation and the wipe quality at low roadspeeds.



On vehicles with an approach angle adjustment facility, the ignition switched off and the wiper blade installed, check the clearance between the adjusting screw (1) and the push rod (2) - this should be A = 0 - 0.2 mm.

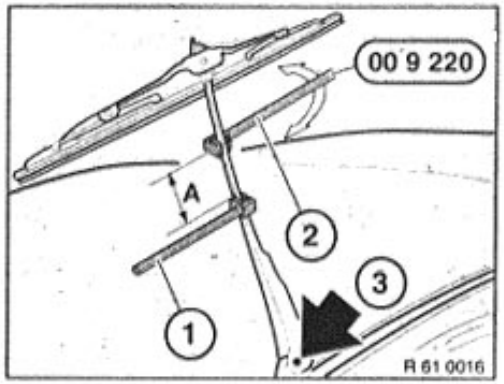


Fit special tool 00 9 210 (latest version is gray in color and is equipped with two holes) to balance point of wiper blade on windshield. Support for disc and vehicle designation are indicated on the special tool.



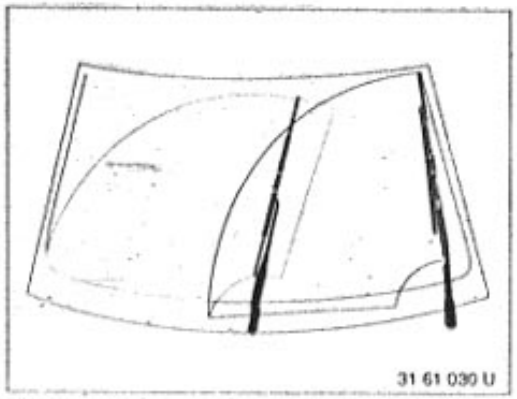
If the approach angle is defective, the wiper arm must be turned into the correct position using special tool 00 9 220.

Caution!
Actuate wiper unit and move wiper arms into fold-away position



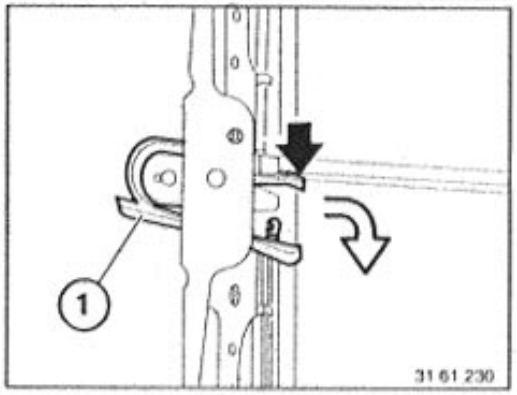
Procedure:
Select largest possible gap "A" between special tool 1 and special tool 2.
Grip special tool 1 to avoid stress being applied to joint 3 when bending.
Twist special tool 2.

Perform function check.

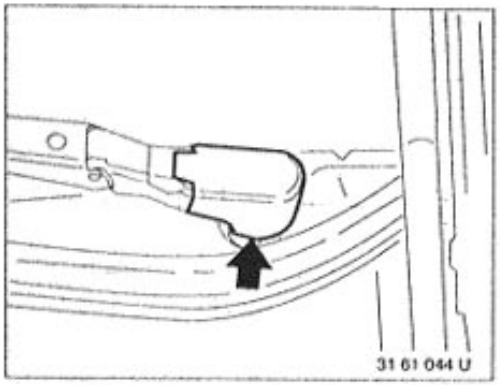


61 61 041 REPLACING BOTH WINDSHIELD WIPER BLADES

Move windshield wipers to folding position by switching the ignition on, operating the wiper switch in intermittent mode and switching the ignition off when wipers are in bottom reversing position.
Wiper runs to folding position at A-pillar and remains there.

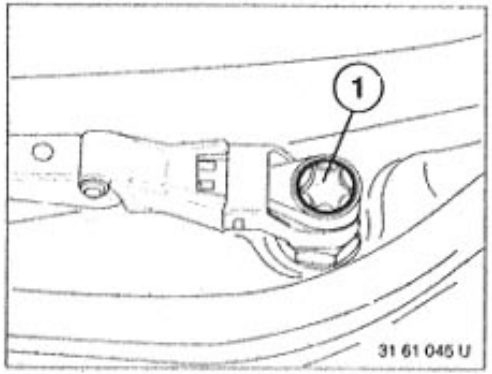


Unlock adapter (1) on the driver's side.
Squeeze retainers together.
Push the wiper blades forward.

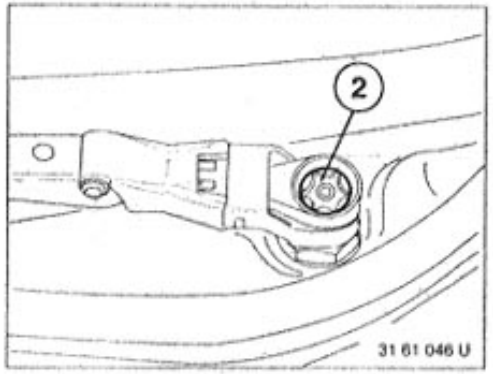


61 61 100 REPLACING BOTH WINDSHIELD WIPER ARMS

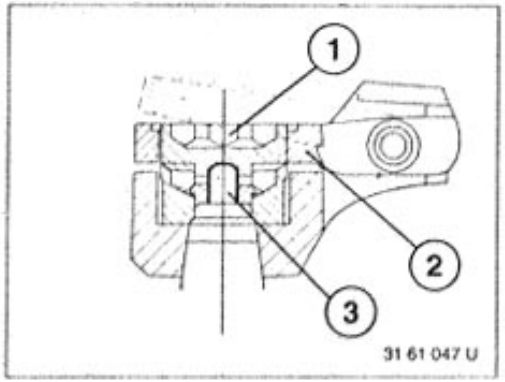
Remove cover.



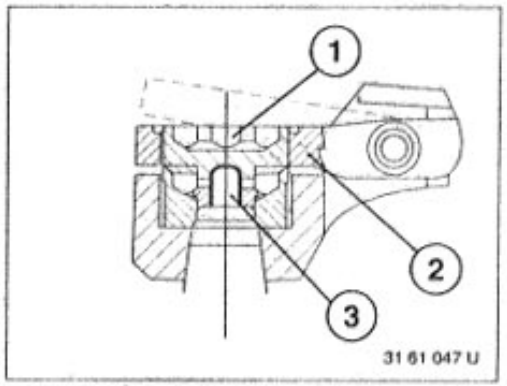
Driver's Side:
Unscrew screw (1) using Special Tool 61 6 010.



Unscrew nut (2) using Special Tool 61 6 010.

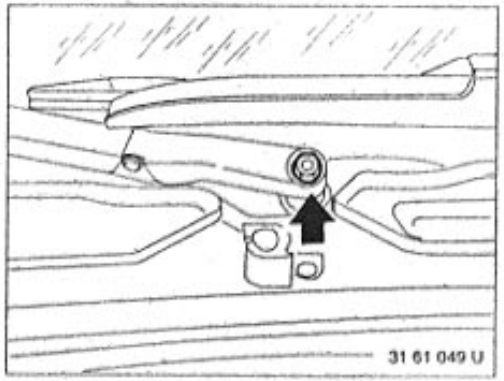


Installation:
Clean threads to remove Loctite.
Screw (1) must be replaced.



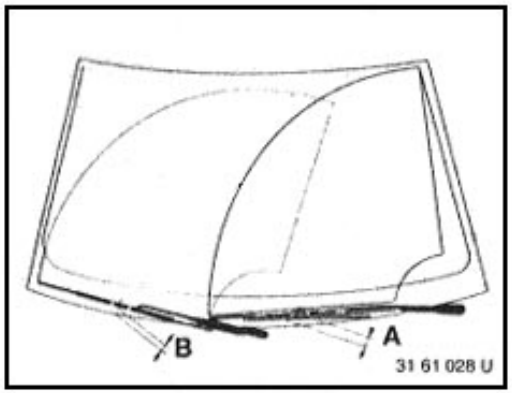
Screw screw (1) in far enough that there is no play between wiper contact force control lever screw (2) and plunger (3).

Installation:
Press wiper arm against windshield lightly so that it will be easier to install the nut.

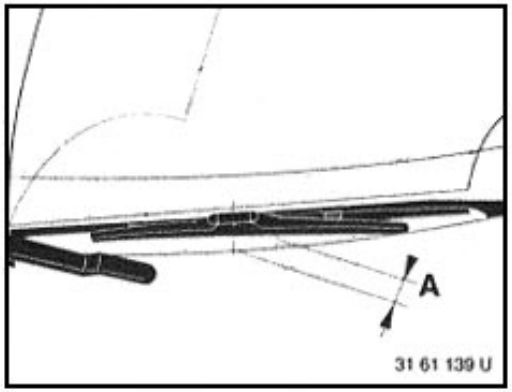


Passenger's Side:
Remove cover.
Unscrew nut.
Tightening torque*.

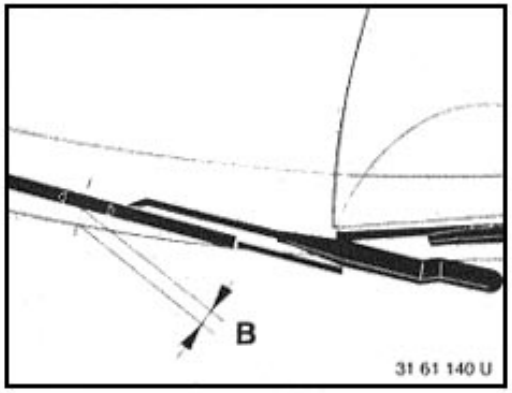
* Refer to Specifications



Adjusting dimensions in park position:
A = 35 + 3 mm
B = 23 + 3 mm



Adjusting dimension A = 35 + 3 mm

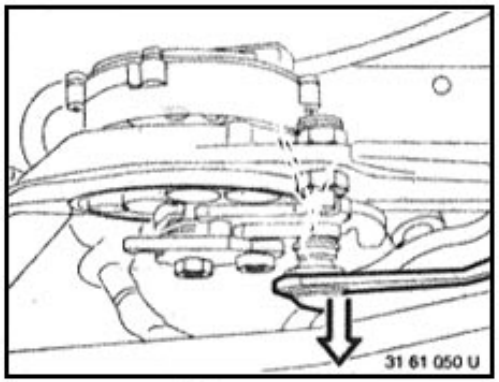


Adjusting dimension B = 23 +3 mm

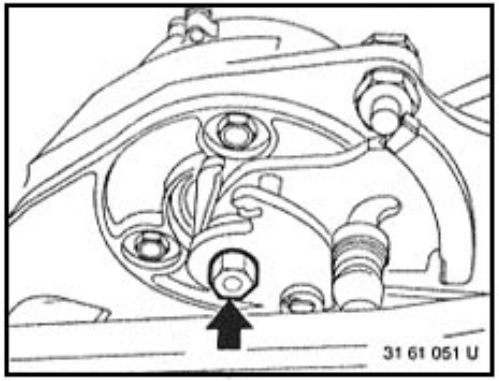
61 61 250 REPLACING WINDSHIELD WIPER MOTOR

Remove complete wiper console - refer to 61 61 271.
Run the wiper motor to parked position (if possible) prior to removal.

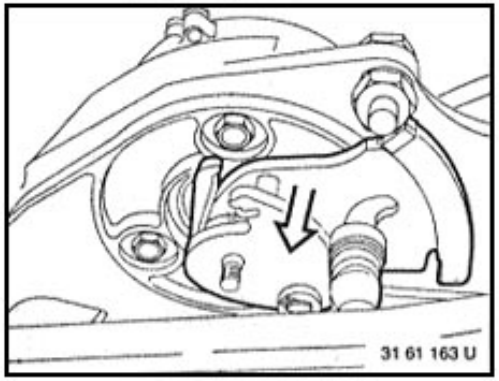
Important!
Refer to information on 61-61/1.



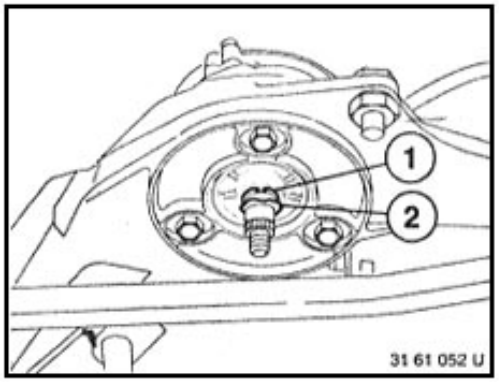
Pry drive rod out.



Unscrew screw.

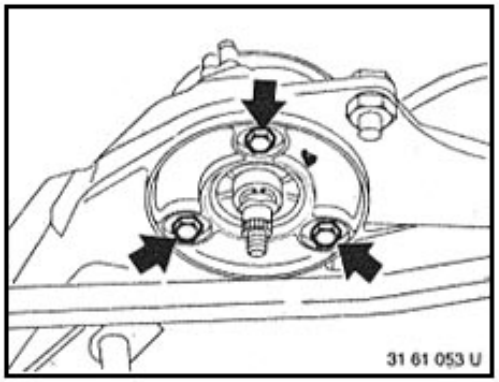


Pry motor crank off.



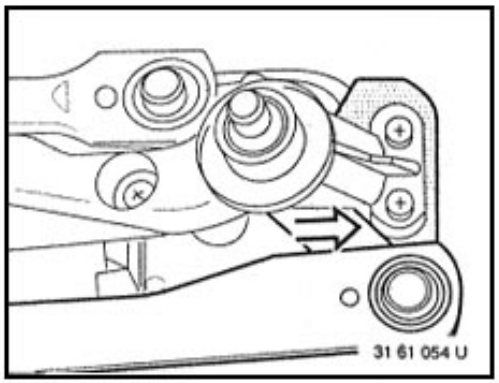
View of Wiper Motor Output Shaft

1 Circlip
2 Corrugated washer



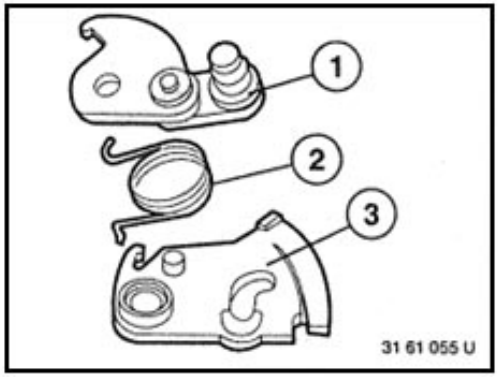
Unscrew screws.

Assembling Wiper Motor:

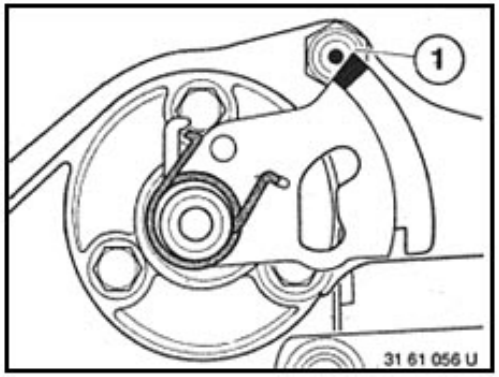


Run the wiper linkage to parked position (bearing on stop).

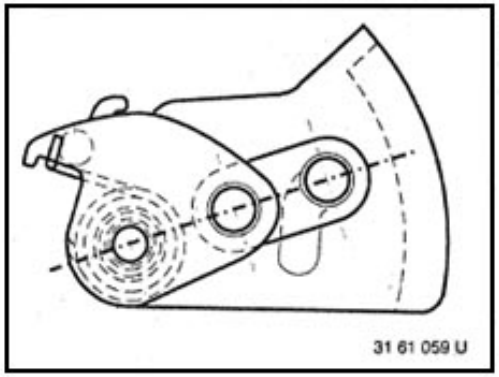
Connect plug on motor and run the motor to parked position.
Screw motor on console.
Tightening torque*.



1 Motor crank
2 Spring
3 Sliding gate for parked position

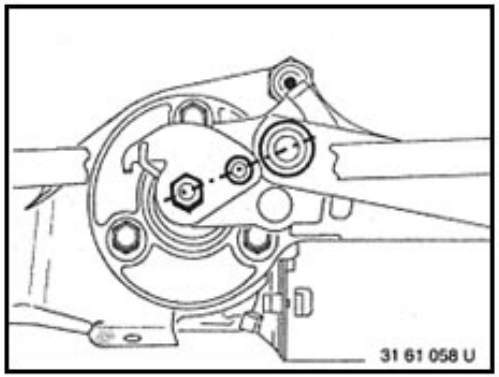


Move sliding gate of drive crank against stop (1).
Attach spring.

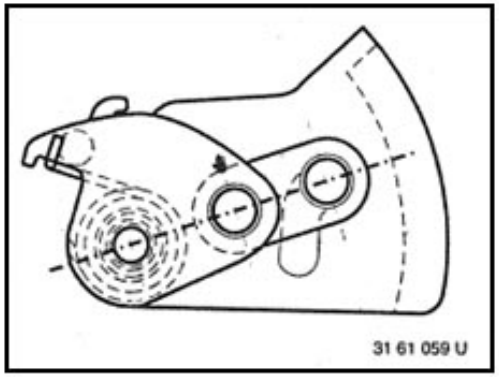


Install motor crank in gate.

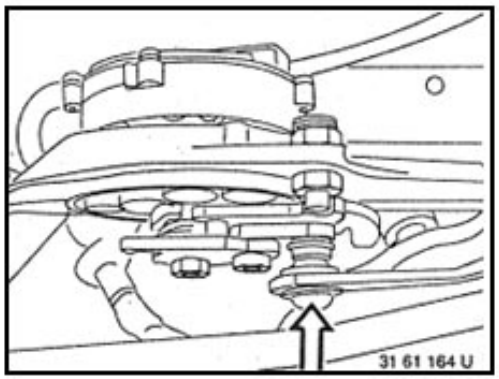
* Refer to Specifications



Ensure that center lines of fulcrums for motor crank, drive pin in gate and output pins for the drive rod are in one line.

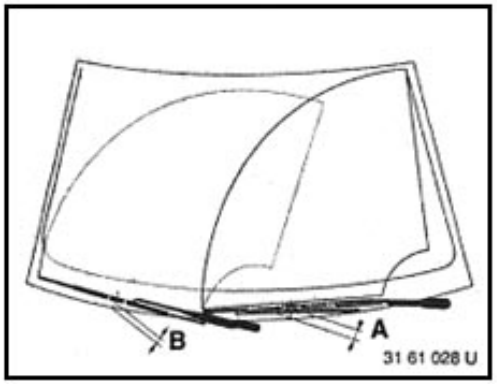


Tighten motor crank.
Tightening torque*.
Connect motor plug and run the motor to parked position.
Check whether axles are lined up.



Install drive rod.

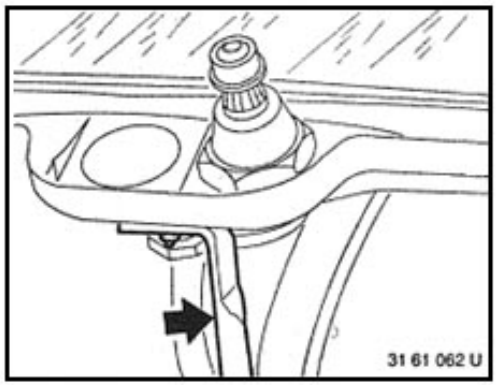
* Refer to Specifications



61 61 271 REMOVING AND INSTALLING COMPLETE WIPER CONSOLE

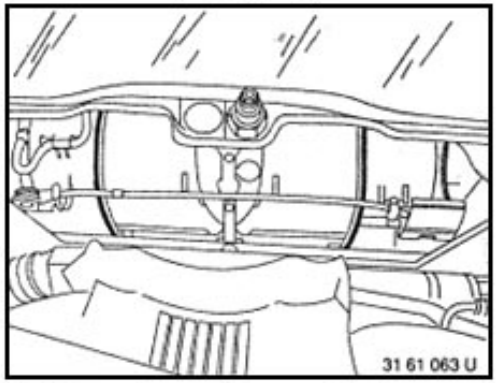
Run the wipers to parked position.
Remove windshield wiper arms - refer to 61 61 100.

Important!
Refer to information on 61-61/1.

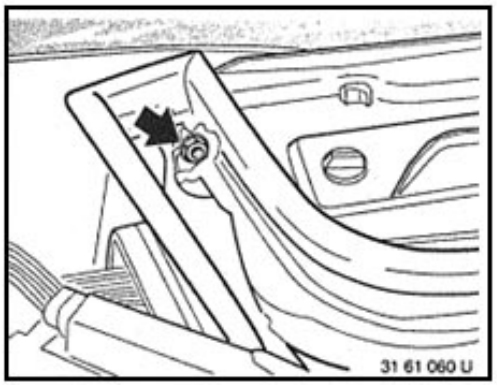


Remove prop.

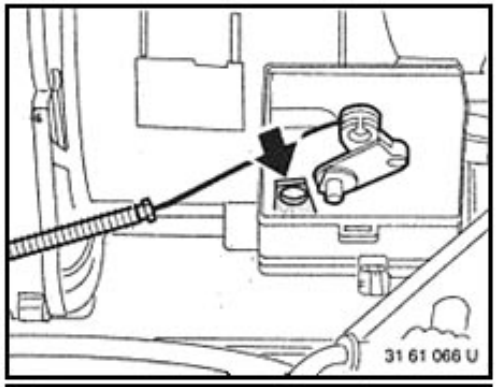
Important!
Set the air volume control wheel to zero and switch the ignition on before disconnecting the cable, so that the drive motor closes the air flaps.
Disconnect battery ground leads.
Refer to information on page 61-00.



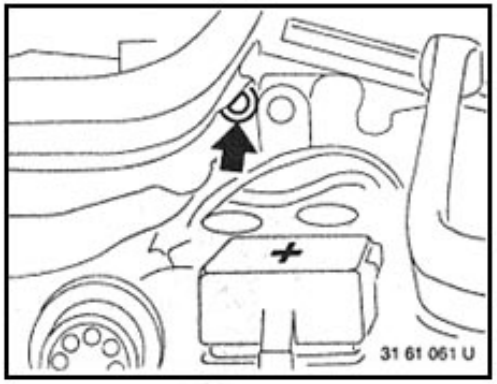
Disconnect cables completely.



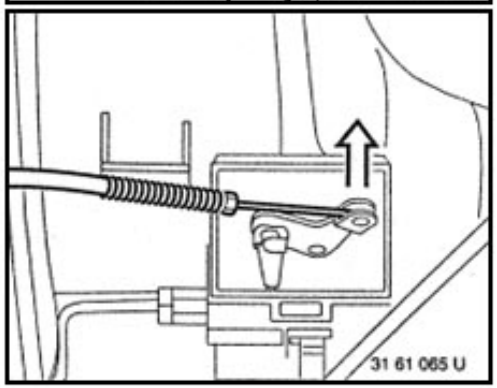
Unscrew screw.
Remove air collection box cover.



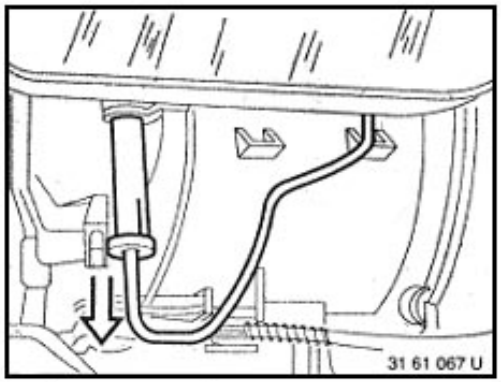
Disconnect linkage.



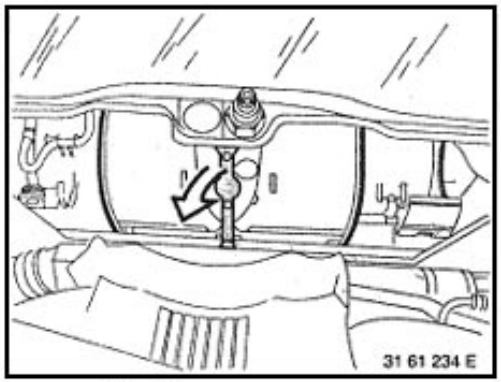
Unscrew screw.
Pull air collection box out upwards.



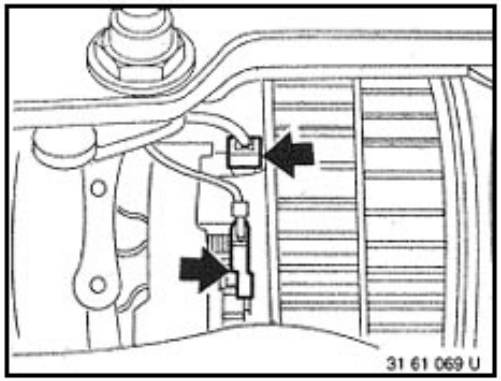
Disconnect cable.



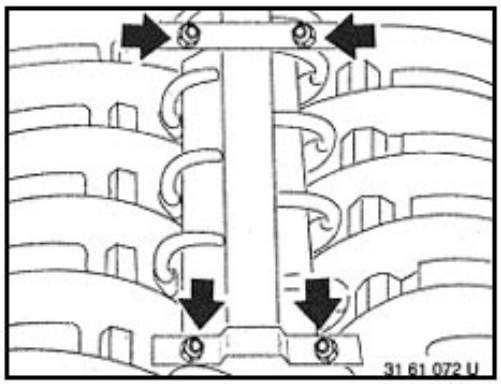
Pull temperature sensor out of eyelet.



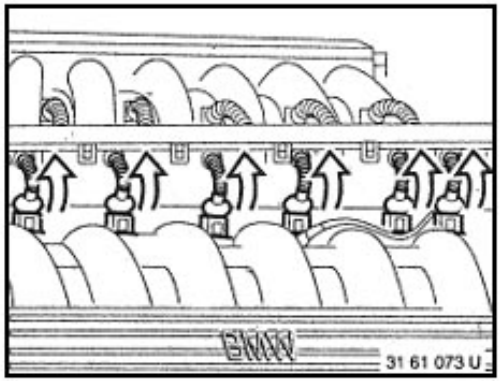
Remove retaining strap.



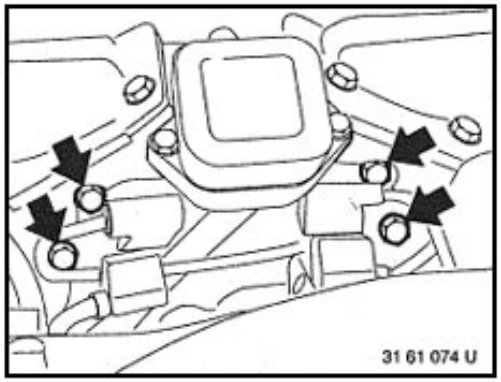
Remove cover.
Pull plug off of blower.
Remove cover on fuel injectors.



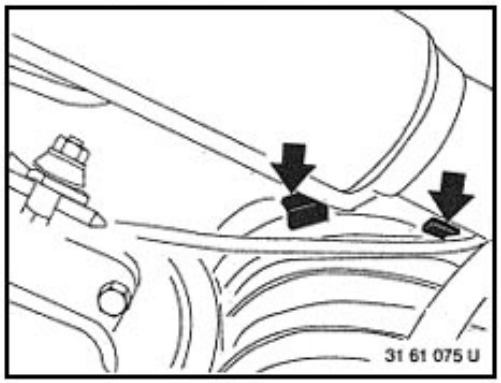
Unscrew electric lead tray of fuel injectors.
Unscrew screws.



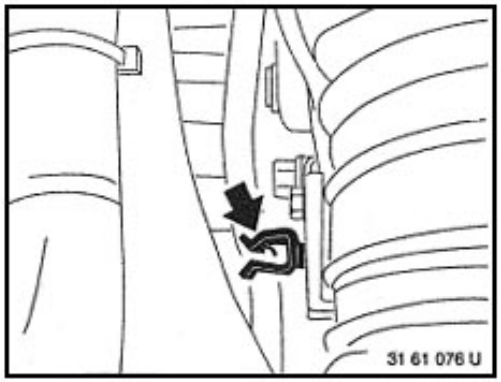
Disconnect leads of injection plate on right side.



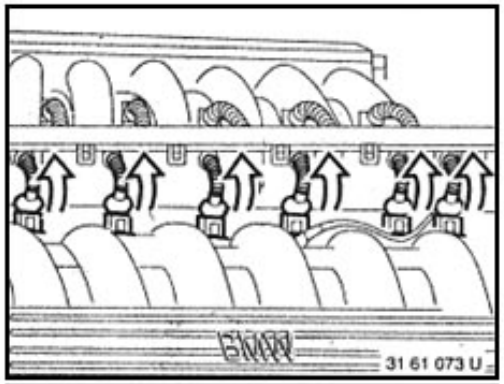
Unplug pulse and TDC senders.
Unscrew bracket.



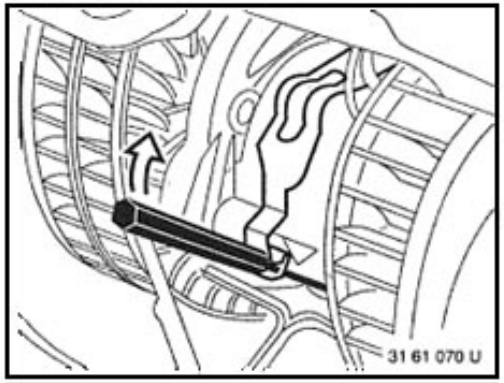
Unclip leads for oxygen sensors in holders underneath the transmission bell housing.



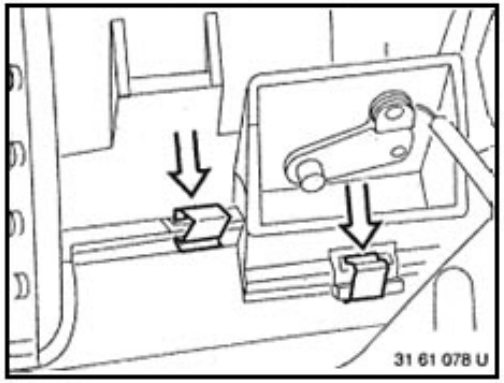
Unclip leads on firewall.
Clips are located underneath the electronic box electric lead duct to the fuel injectors.



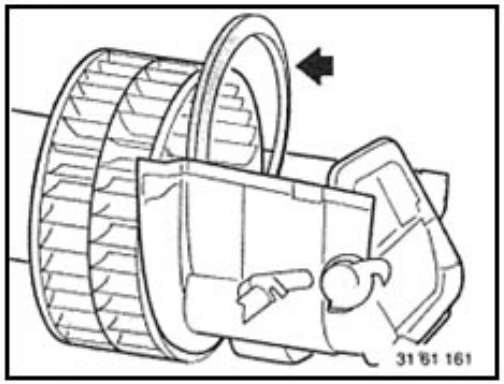
Tie electric lead duct for fuel injectors aside.



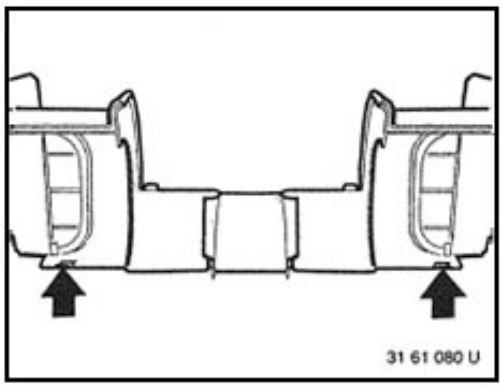
Remove blower.
Insert an approx. 2 mm thick mandrel into the retaining strap of the blower motor and pry the retaining strap out.



Lift retainers off.

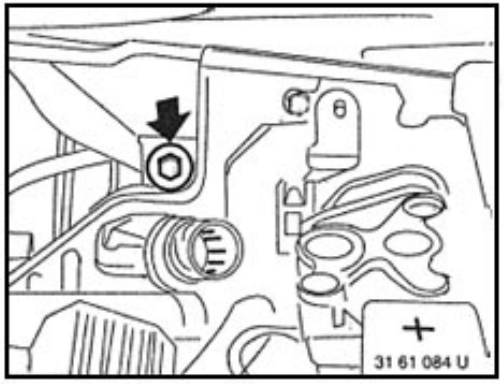


Remove inlet cowl.

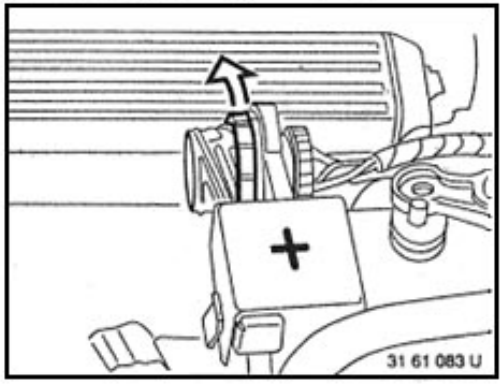


Remove retainers on inside.
Not shown in this picture.

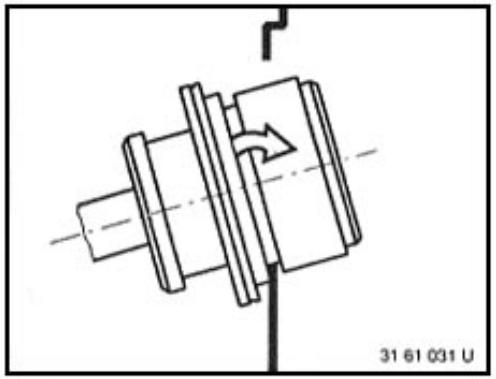
Remove cover.



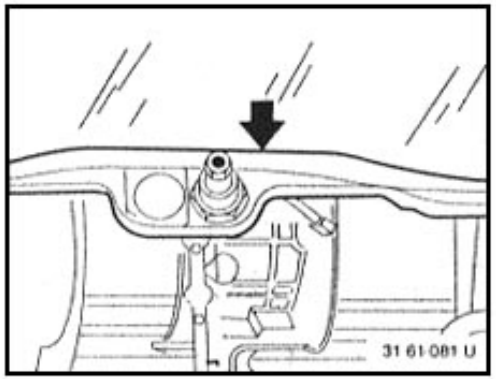
Remove rubber grommet from electric lead opening in the firewall.
Remove holder.



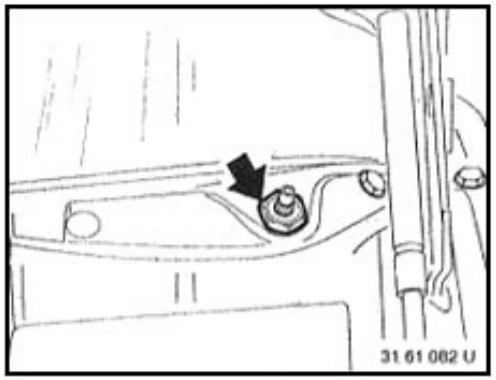
Take plug out of holder.
Loosen wire strap.



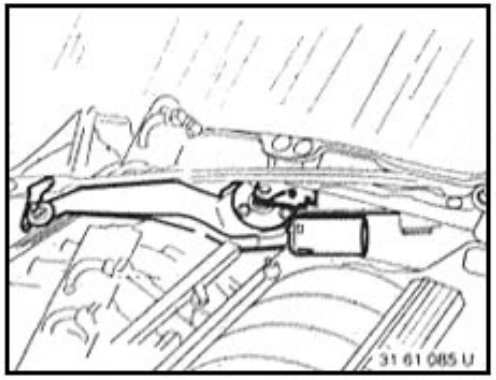
Remove plug through opening in firewall.



Unscrew nut on cowl panel.



Unscrew nut on cowl panel.



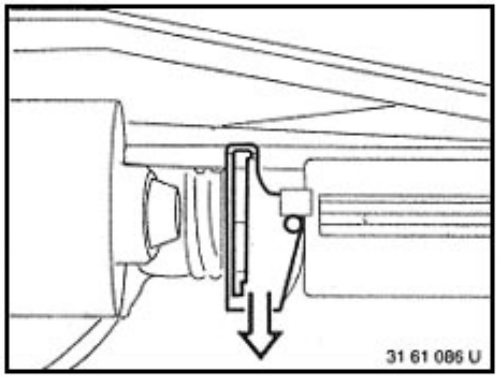
Take wiper console out of the firewall.

Installation:
First tighten the wiper shaft nuts on the cowl panel to specified tightening torque.
Then tighten screws of the prop to specified tightening torque.
Tightening torque*.

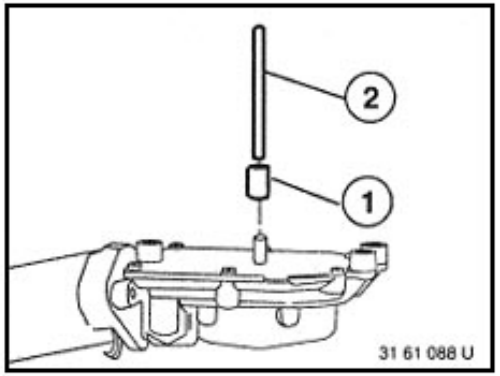
* Refer to Specifications

61 61 285 REPLACING WIPER CONTACT FORCE CONTROL MOTOR

Remove complete wiper console - refer to 61 61 271.

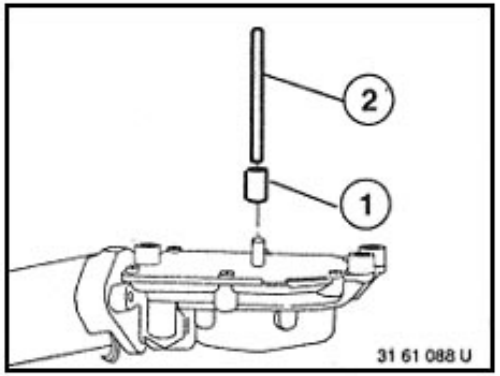


Disconnect plug.



Unscrew screws.

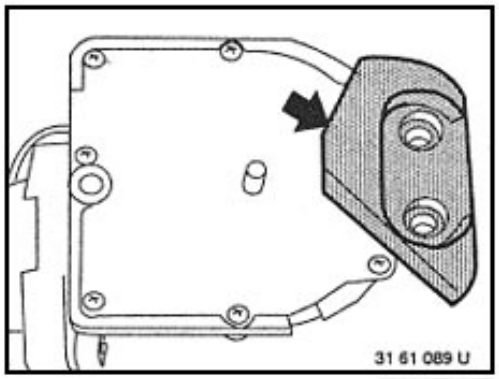
Installation:
Tightening torque*.



Prevent sleeve (1) and plunger (2) from falling out.

Installation:
Lubricate sleeve and plunger with grease prior to installation.

* **Refer to Specifications**



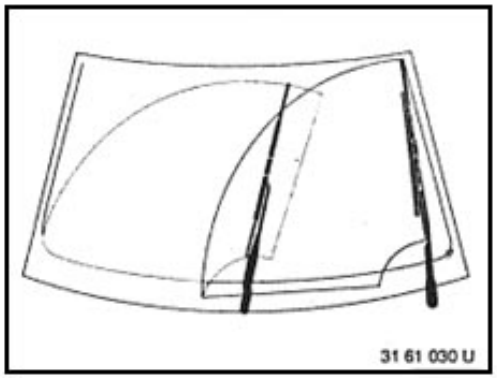
Installation:
Mount stop for the wiper linkage.

61 61 ... REPLACING STOP FOR PARKED POSITION

A faulty stop will be noticed when wipers do not return to parked position from neutral position after wiping.
Wiper motor turns inversed so that wipers can get to parked position from the neutral position.

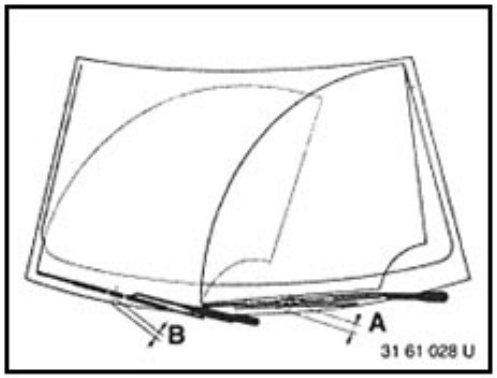
Important!
Refer to information on 61-61/1.

While running backwards the cam remains stuck on the stop and the wipers move below the engine hood at a certain angle.

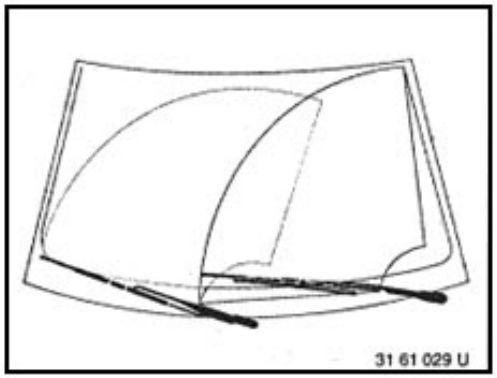


Fold-away position

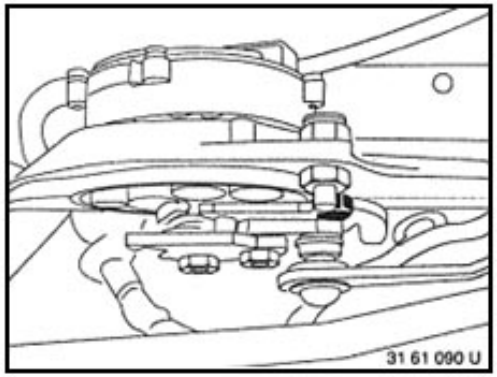
Remove complete wipre console - refer to 61 61 271.



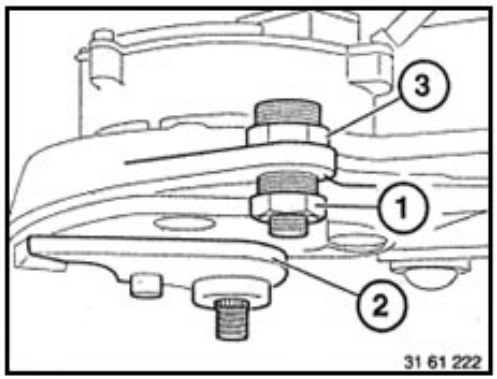
Parked position



Neutral position

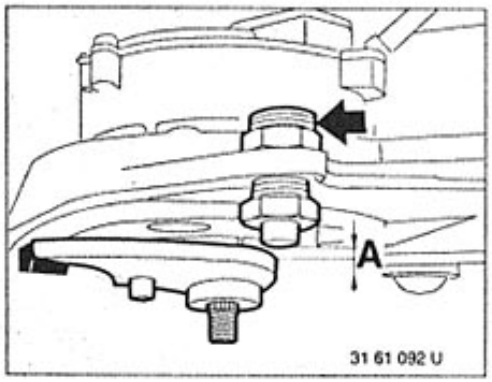


Stop in parked position



1 Stop
2 Cam
3 Lock nut – tightening torque*

* Refer to Specifications

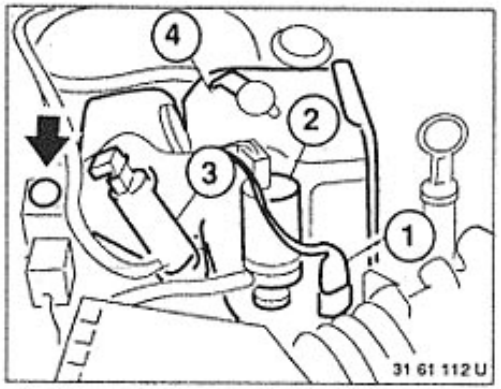


Unscrew lock nut.

Installation:
Tightening torque*.

Unscrew stop.
Adjust height of stop to distance A = 1.5 to 2.0 mm.

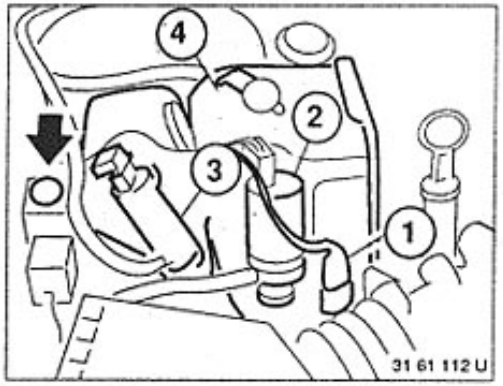
* **Refer to Specifications**



61 67 010 REPLACING WASHING FLUID PUMP FOR HEADLIGHT CLEANERS

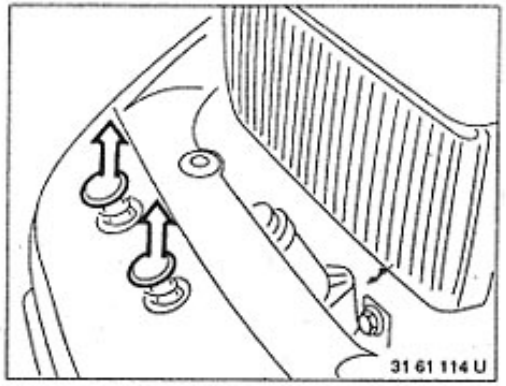
Empty the washing fluid tank.
Unscrew screw.
Remove pump (3).
Loosen hose clamp and disconnect hose.

Important!
Hoses must not be kinked after installation.

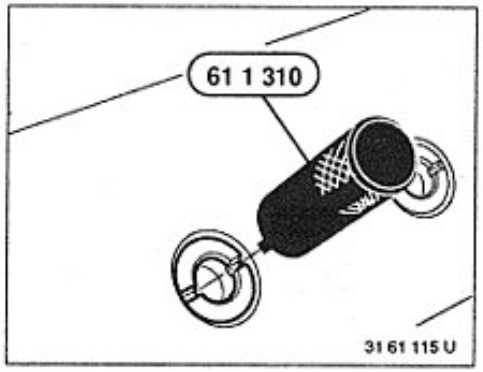


61 67 060 REPLACING SPRAY NOZZLES FOR HEADLIGHT CLEANERS

Disconnect hose on headlight cleaner washing fluid pump (4).



Important!
Pressure of maximum 5 bar may be applied on spray nozzles, as they would be damaged from excessively high pressure.



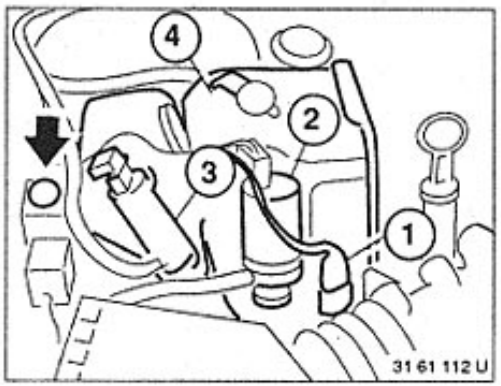
Run the spray nozzles out by applying maximum 5 bar pressure into the disconnected hose.
Unclip caps.

Remove bumper - refer to Group 51.
Unscrew nuts using Special Tool 61 1 310.

Installation:
Spray nozzles are set and do not have to be adjusted.

61 67 065 REPLACING WASHING FLUID AND INTENSIVE CLEANING FLUID TANKS

Empty the tanks.
Lift pumps out together with hoses.



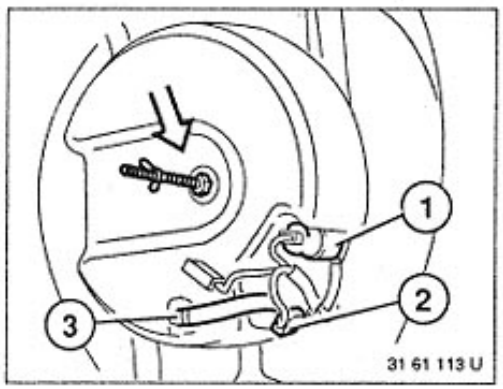
1 Level switch
2 Pump for windshield washing fluid
3 Pump for windshield intensive cleaning fluid
4 Pump for headlight washing fluid

Unscrew screw and lift tank.
Pull wires off of level switch and lift tanks out.

Installation:
Fill tanks with washing fluid and intensive cleaning fluid.
Check system for leaks.

61 67 ... REPLACING SUPPLY TANK IN SPARE WHEEL WELL

Remove spare wheel.
Empty the tank.



1 Delivery pump for filling front tank; switched on and off by level switch in front tank
2 Level switch
3 Filling pipe

61 71 004 AIMING SPRAY NOZZLES FOR WINDSHIELD WASHER

The ejected water should hit the glass in the middle of a zone.
Dimensions are applicable for LHD models, but are inversed for RHD models.

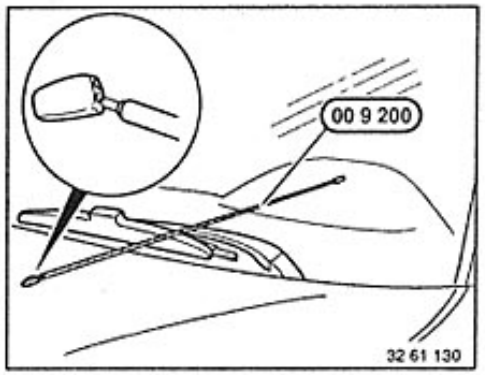
Dimensions in mm:

A1 = 215
A2 = 540

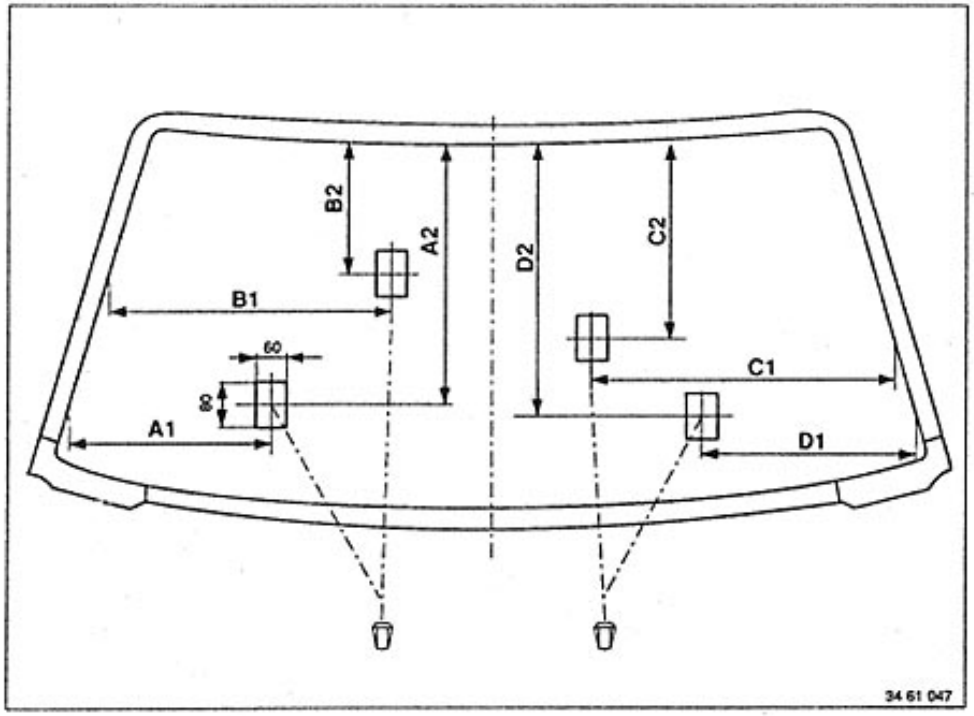
B1 = 442
B2 = 245

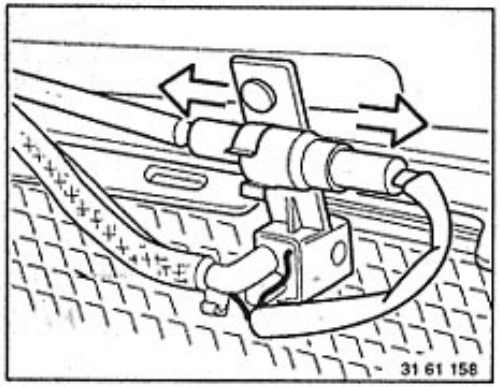
C1 = 465
C2 = 286

D1 = 220
D2 = 550

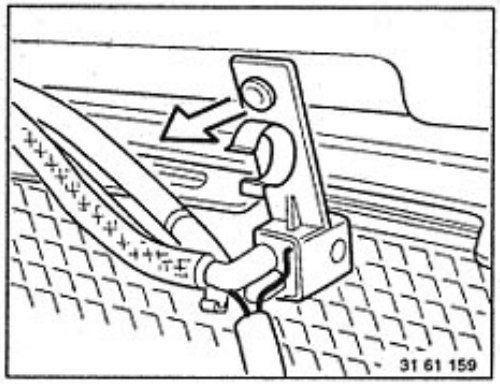


Mark points of contact with pieces of tape. Adjust the spray nozzles using Special Tool 00 9 200.

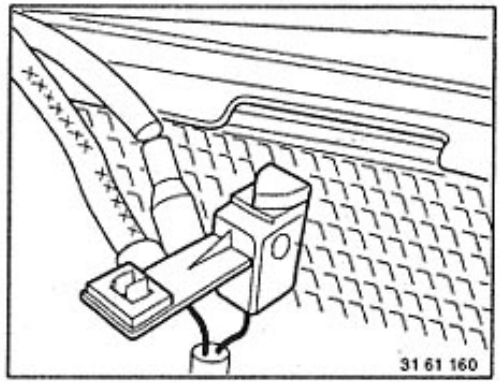


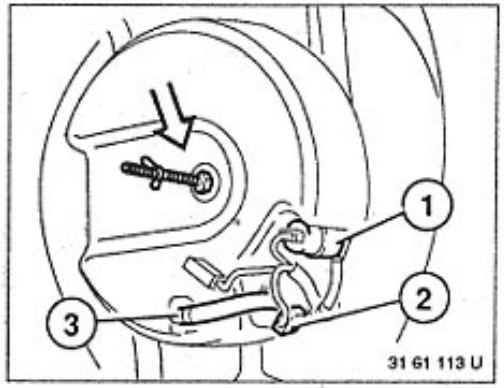


61 71 010 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT WINDSHIELD SPRAY NOZZLE



Pull lockpin out of clip.
Loosen hose clamps.
Pull hoses off.
Pull plug off.





61 71 061 REPLACING WINDSHIELD WASHING FLUID TANK (REFILLING TANK IN TRUNK)

1 Delivery pump for filling front tank; switched on and off by level switch in front tank
2 Level switch
3 Water feed from tail panel

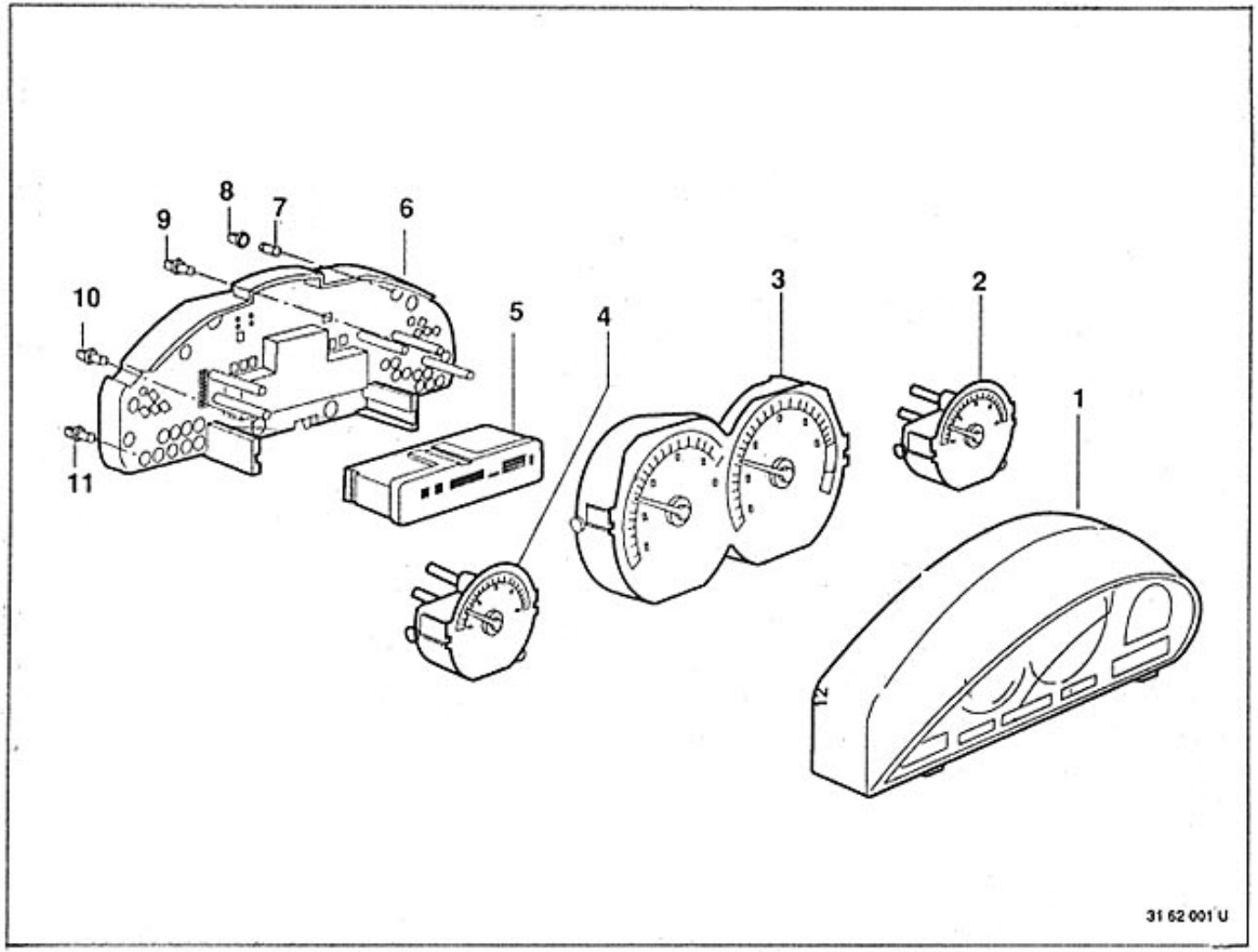
Empty the tank.
Remove pump, level switch and water feed.

Installation:
Fill tank with washing fluid.
Check system for leaks.

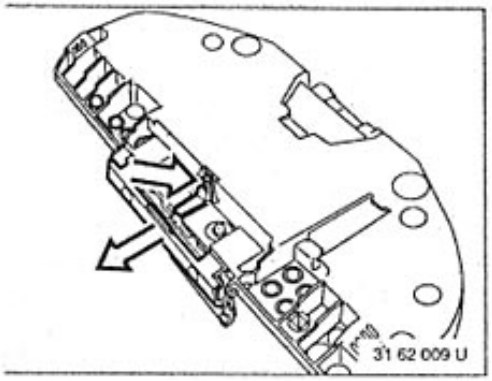
62 Instruments

	Layout of instrument cluster	62-11/1
62 11 080	LCD module – remove and install or replace	62-11/2
62 16 050	Sensor for remote thermometer – remove and install or replace	62-16/1
071	Sensor for speedometer display – remove and install or replace	62-16/1
62 21 000	Instrument carrier, complete unit – remove and install	62-21/1
. . .	Instrument carrier – dismantle	62-21/2
62 99 . . .	Lights in instrument cluster – replace	62-99/1

INSTRUMENT CLUSTER SURVEY

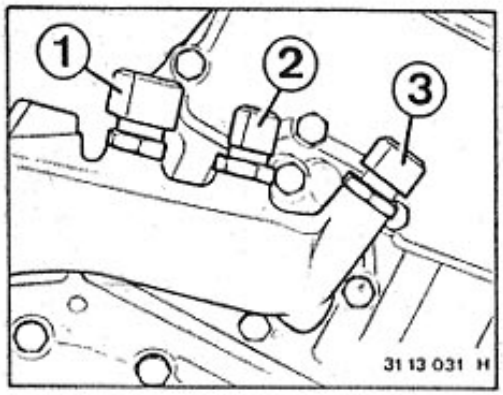


1 Instrument carrier
2 Temperature gage
3 Speedometer/tachometer
4 Fuel gage
5 LCD module
6 Base plate
7 Light bulb 12 V 3 W
8 Bulb holder
9 Light bulb for instrument light
10 Light bulb for LCD 12 V 1.5 W
11 Light bulbs for control lamps



62 11 080 REMOVING AND INSTALLING OR REPLACING LCD MODULE

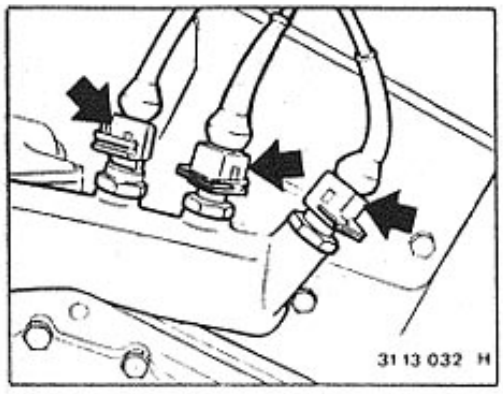
Push back retainer and pull out LCD module.



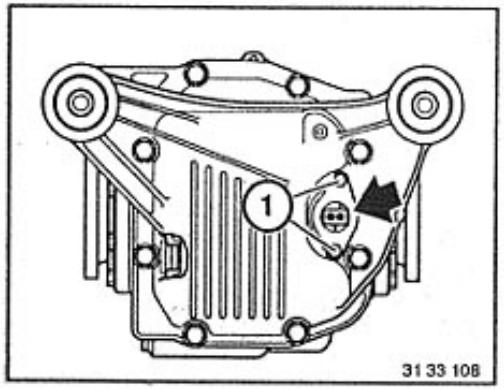
62 16 050 REMOVING AND INSTALLING OR REPLACING SENDER FOR TEMPERATURE GAGE

The temperature gage sender is located with two other temperature sensors behind the engine between the firewall and engine in a water pipe.

Note:
Temperature sensors are shown on a removed engine in the picture for better illustration.
Arrangement:
1 Temperature sensor - DME
2 Temperature sensor - EML
3 Temperature sensor - temp. gage

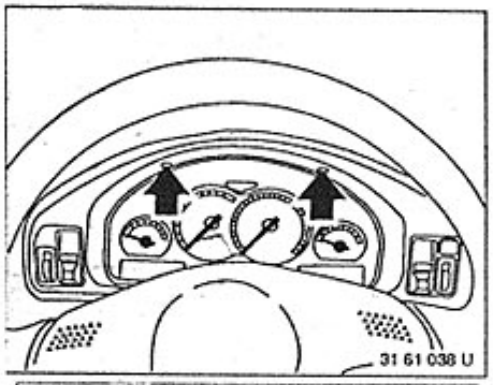


Pull off plug on temperature gage and unscrew sender.



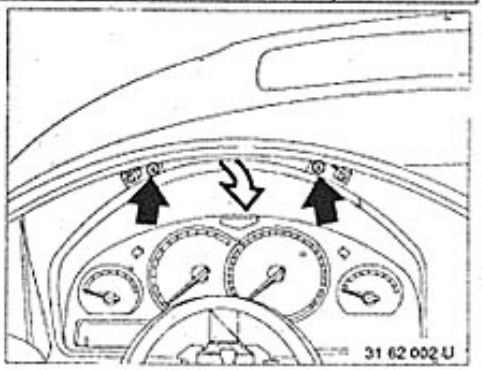
62 16 071 REMOVING AND INSTALLING OR REPLACING SENDER FOR SPEEDOMETER

Pull off plug.
Unscrew screws (1).
Pull out sender.



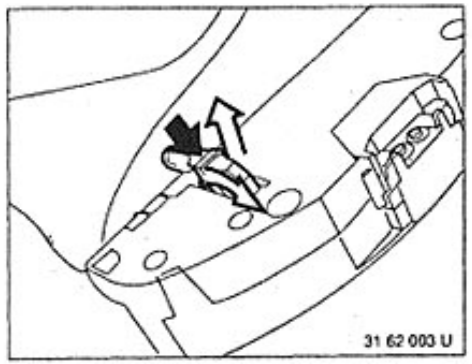
62 21 000 REMOVING AND INSTALLING INSTRUMENT CARRIER

Remove steering wheel – see 32 33 000.
Unscrew screws and remove switch frame – see Group 61.



Unscrew screws.
Pry out instrument cluster upward slightly and pull forward up to the steering column, then tilt forward completely and remove.

Note:
Cover steering column with felt sheet or foam rubber to avoid scratching the glass of the instrument cluster.

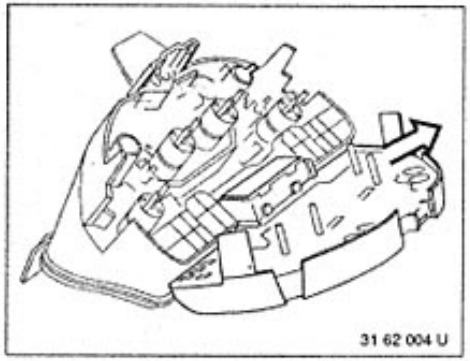


Push lever on plug forward and then pull off plug.

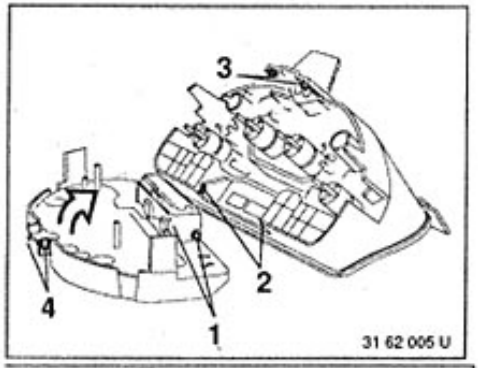
Installation:
Lever must be positioned forward when inserting the plug.

62 21 ... DISASSEMBLING INSTRUMENT CARRIER

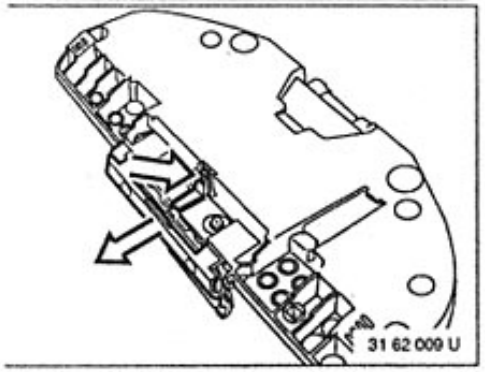
Remove instrument carrier – see 62 21 000.
Tilt up lock the full distance and pull back rear housing section.



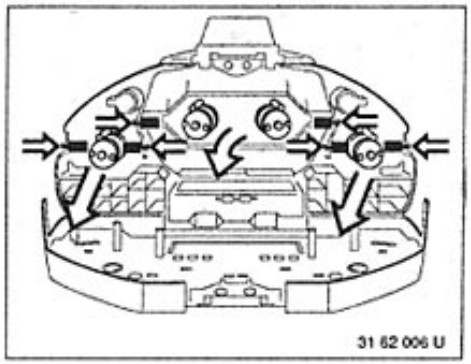
Tilt rear housing section the full distance and pull out.



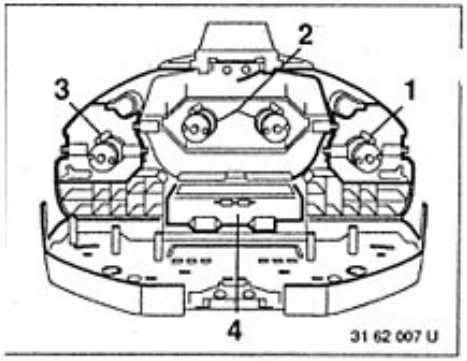
Installation:
Guide pins (1) into grooves (2) and tilt the rear housing section in closed direction far enough that pins (3) engage in grooves (4). Then press lock.



Press lock in direction of arrow and pull out display.



Press in locks on left and right sides to replace an instrument and pull out the concerned instrument from above.



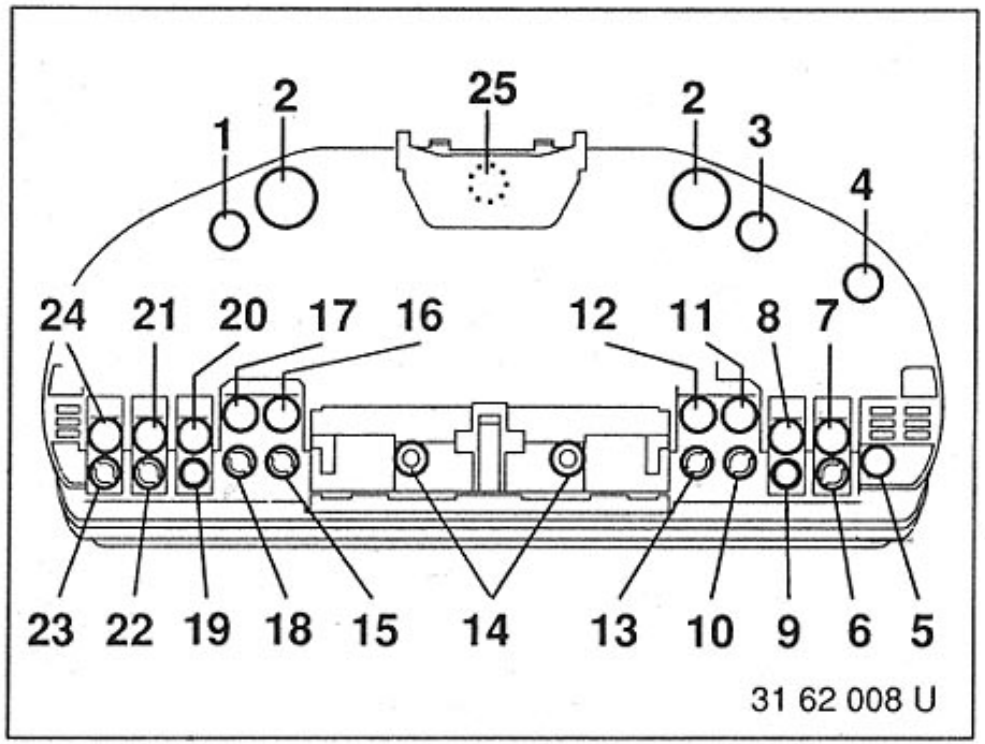
1 Fuel gage
2 Speedometer
3 Tachometer with economy control
4 Temperature gage
5 LCD module

63 Lights

63 10 004	Headlights (pop-up headlights) – adjust	63- 10/1
508	Basic position of headlight inserts (pop-up headlights), left or right – adjust	63- 10/2
63 11 100	Front light cluster, left or right – remove and install	63- 11/1
63 12 033	Lens (for pop-up headlights), left or right – remove and install or replace	63- 12/1
090	Pop-up headlights, complete unit, left or right – remove and install or replace	63- 12/2
200	Actuator drive for pop-up headlights, left or right – replace	63- 12/3
400	Insert for headlights, left or right – remove and install/replace	63- 12/5
460	Pop-up headlights with carrier plate, complete unit, left or right – remove and install	63- 12/6
600	Full beam headlight insert, left or right – remove and install/replace	63- 12/7
610	Low-beam headlight insert (pop-up headlights), left or right – remove and install/replace	63- 12/8
620	Fog light insert (pop-up headlight), left or right – remove and install/replace	63- 12/9
747	Both pop-up headlights – fit and align headlights	63- 12/10
63 21 180	Tail light, complete unit, left or right – remove and install or replace (on side wall / trunk lid)	63- 21/1
63 25 000	Auxiliary brake light – remove and install or replace	63- 25/1
63 26 000	License plate light, left or right – remove and install or replace	63- 26/1
63 99 250	Bulbs for front light cluster – replace	63- 99/1
315	Bulb for tail light (on side panel or trunk lid), left or right – replace	63- 99/2
375	Bulb for auxiliary brake light – replace	63- 99/3
401	Bulb for license plate light, left or right – replace	63- 99/4

62 99 ... REPLACING LAMPS IN INSTRUMENT CLUSTER

Remove instrument cluster – see 62 21 000.
Turn faulty light bulb about 45° and pull out.



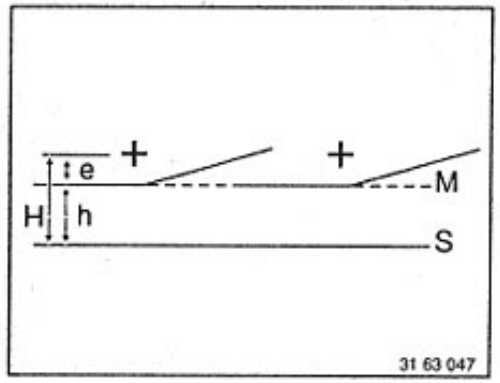
1 Turn signals - right
2 Instrument light
3 Turn signals - left
4 Fuel reserve
5 Front fog lamps
6 Rear fog lights
7 Seat belts
8 Oil pressure
9 Not used
10 Not used
11 Battery charge
12 High beams
13 Engine control
14 LCD module light
15 Not used
16 General warning lamp
17 Brake warning
18 Not used
19 Not used
20 Parking brake
21 ABS control
22 Trailer turn signals
23 Not used
24 AIRBAG
25 Antislip control

63 10 004 Adjusting headlights (pop-up headlights)

Note:
This adjustment dimension (e) is valid in the FRG (Germany).
Note relevant national specifications!

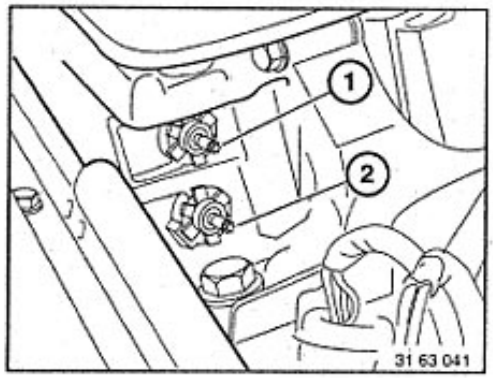
Test requirements:

- **Check tire pressure and correct if necessary**
- **Apply load equivalent to one person to driver's seat (approx. 75 kg)**
- **Vehicle fuel tank full or equivalent extra weight in trunk**
- **Vertical aim control in setting 0**
- **Vehicle on level ground**
- **Correct adjustment of headlights relative to hood lid**
- **Align adjusting unit down longitudinal axis of vehicle and parallel to base position then adjust marking line (M) on adjustment unit to dimension (e)**
- **Dimension (e) for low beam and full beam = 12 cm / 10 m**
- **Dimension (e) for foglights = 20 cm / 10 m**



e = H-h = 12 cm
H = Height of headlight center over the base position
h = Height of marking line over the base position
+ = Central mark = center point of headlights
M = Marking line for the adjusting unit
S = Base position of vehicle and adjusting unit

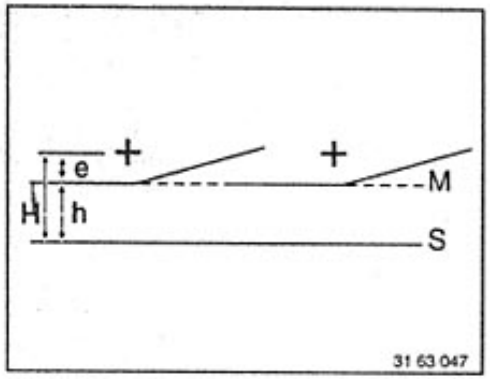
Adjustment procedure:
When adjusting the height setting, the light/dark limit of the low beam headlight must match the horizontal marking line (M) on the unit. For lateral adjustment, the light/dark limit on the bend line must start on the horizontal marking line.



Adjust headlights using adjusting screws (Torx).
It is not possible to achieve clear allocation of adjusting screws.

1. **Adjusting screw used primarily for lateral setting**
2. **Adjusting screw used primarily for height setting**

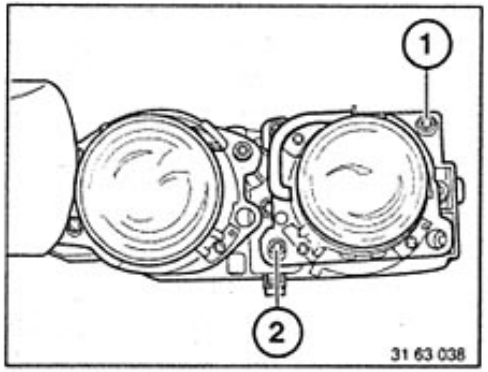
Note:
Always perform adjustment using either of adjusting screws (optional). Only the low beam headlight is adjusted in this way. Check adjustment for high beam and foglights, resetting basic position if necessary - see 63 10 508.



63 10 508 Adjusting basic position of headlight inserts (pop-up headlights) on left and right sides

For adjusting the headlight inserts relative to one another, remove the lens
see 63 12 033

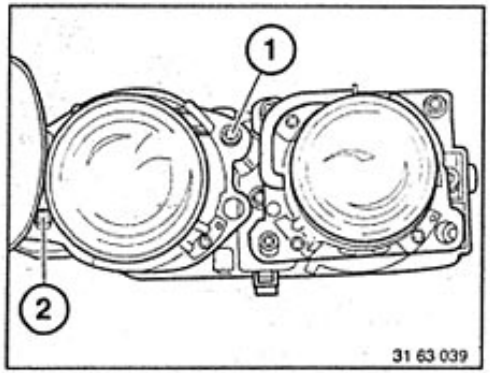
Adjustment procedure:
For height adjustment, the light/dark limit of the low beam headlight must match the horizontal marking line on the unit. For lateral adjustment, the bend line must start below the center mark (+) on the horizontal marking line (M). The center point for the low beam headlight is set to match the center mark (+).
Test requirements see 63 10 004



Adjusting screws for low beam headlight

1 Lateral adjustment
2 Height adjustment

Note:
To make illustration clearer, shown with carrier frame removed.

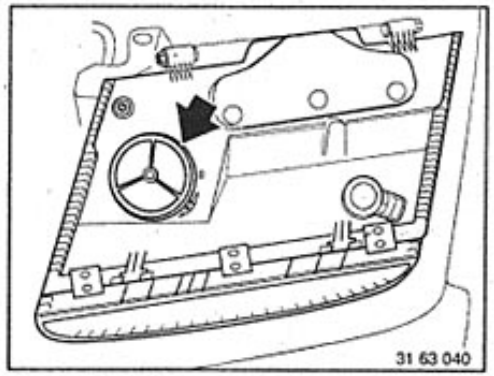


Adjusting screws for foglights

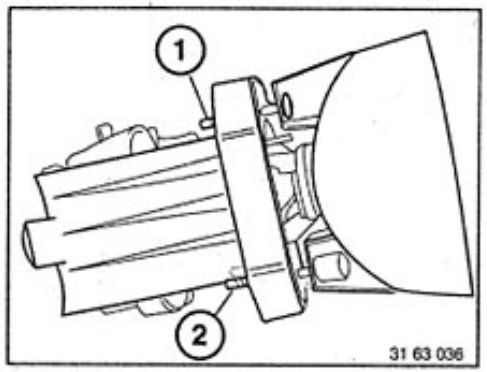
Caution!
Note different adjusting dimension (e).

1 Lateral adjustment
2 Height adjustment

Note
To make the illustration clearer, shown with carrier frame removed.



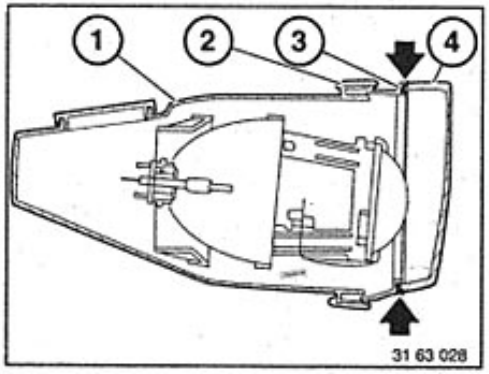
For basic setting of low beam headlight, open sealing cover.



Adjust setting screw (1) for high beam headlight with Torx nut from above and setting screw (2) from front.

1 Height adjustment (upper screw)
2 Lateral adjustment (lower screw)

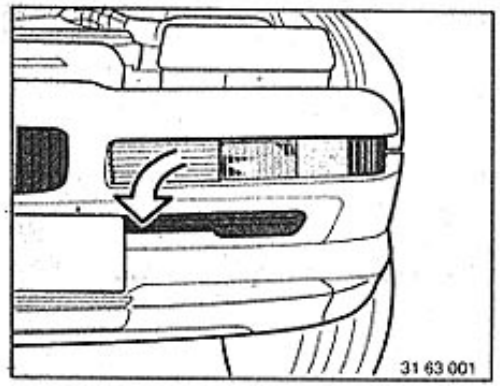
Note:
To make the illustration clearer, shown with carrier frame removed.
Close sealing cover once again.



Fit lens.

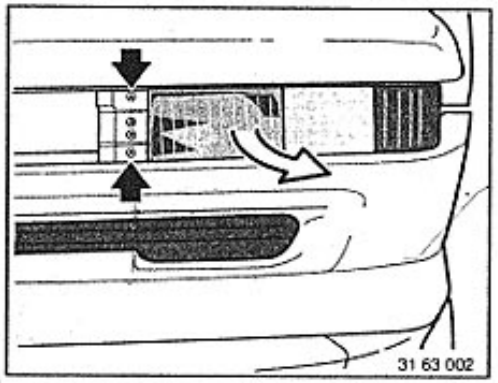
Installation:
Ensure lens is correctly installed.
If necessary, fit new gasket!

1 Headlight housing
2 Clip
3 Gasket
4 Lens



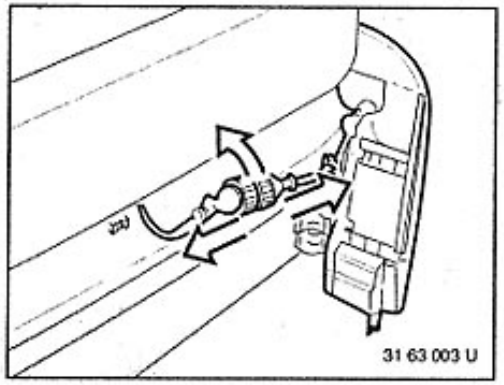
63 11 100 Removing and installing left or right front light cluster

Unclip and remove grill

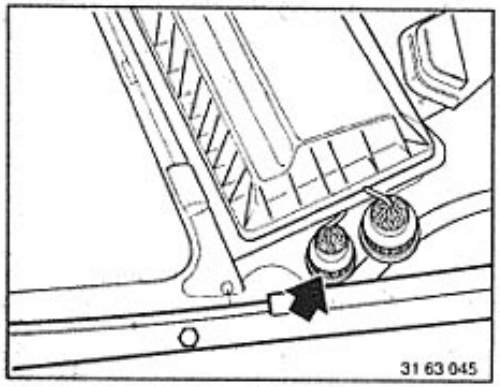


Unfasten the outer screws and lift out headlights.

Installation:
The two inner screws are used to adjust the headlights

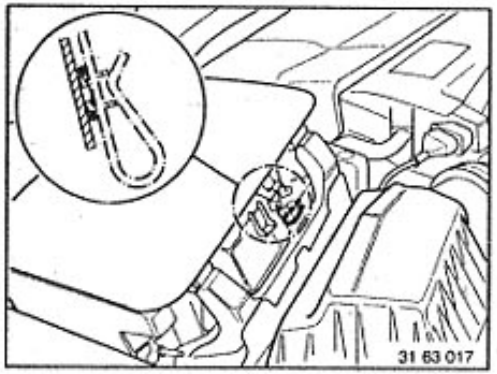


Disconnect plug connection

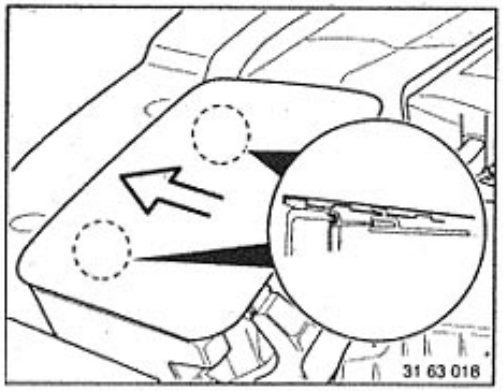


63 12 033 Removing and installing or replacing left or right lens (for pop-up headlights)

Raise pop-up headlights.
Disconnect 4-pin connector for actuator drive to prevent a risk of accident!

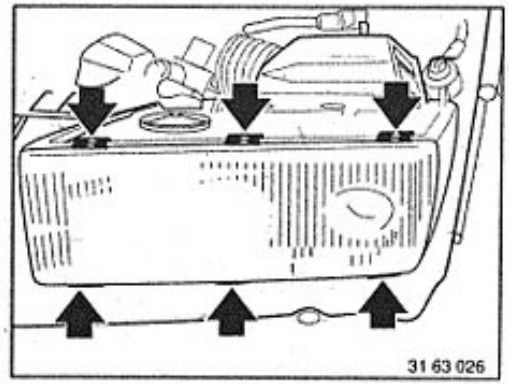


Remove retaining pin.
Open lock.

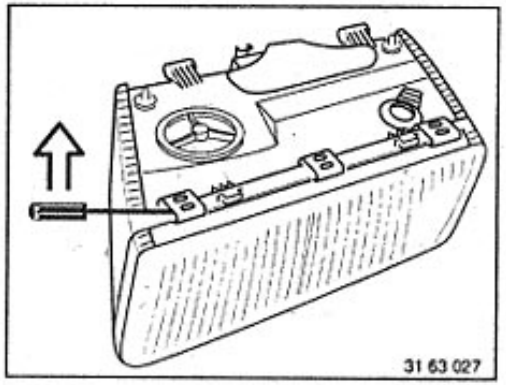


Slide cover forwards and remove.

Installation:
Ensure that cover is correctly seated.

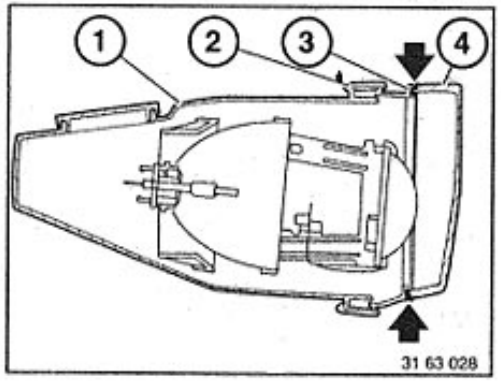


Remove clips from top and bottom.



Insert screwdriver between headlight housing and clips and lift up clips.

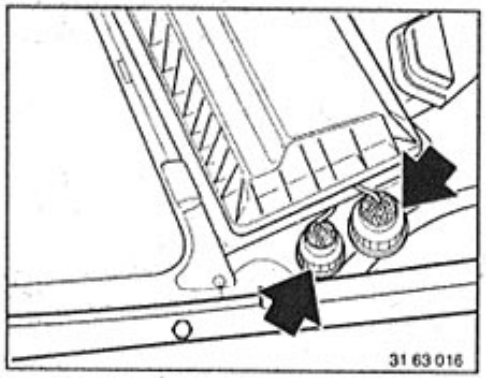
Note:
To make illustration clearer, shown with headlights removed.



Remove lens.

Installation:
Ensure that lens is correctly seated.
If necessary, remove gasket!

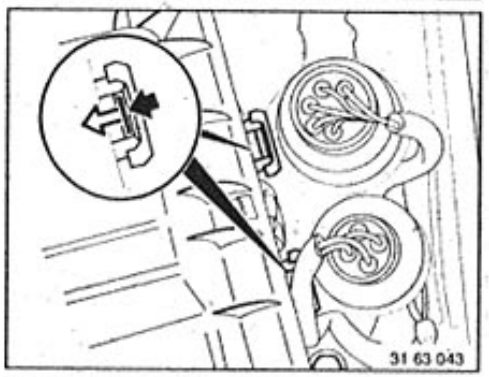
1 = Headlight housing
2 = Clips
3 = Gasket
4 = Lens



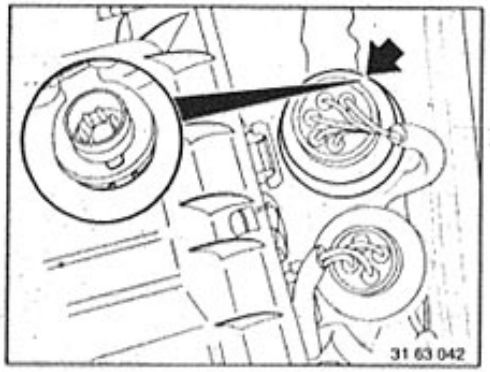
63 12 090 Removing and installing or replacing complete left and right pop-up headlights

Raise pop-up headlights.
Unfasten connector.

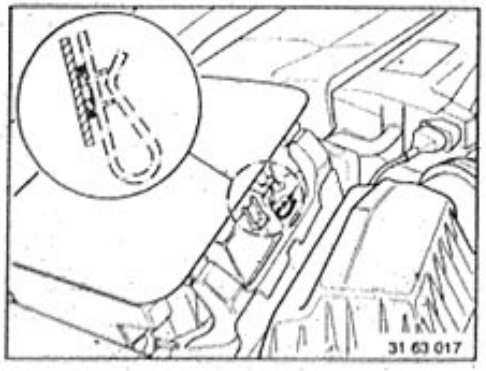
Installation:
Interrogate fault memory, remody any faults and clear memory.



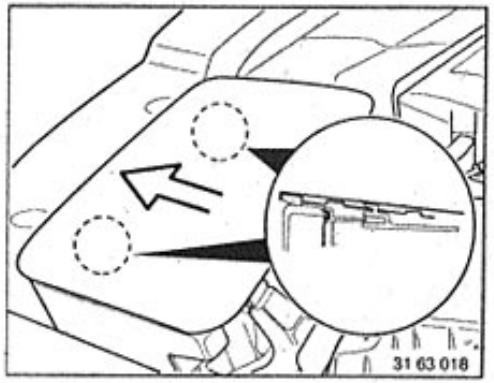
Unclip bracket.
Remove bracket.



Unscrew retaining nut.



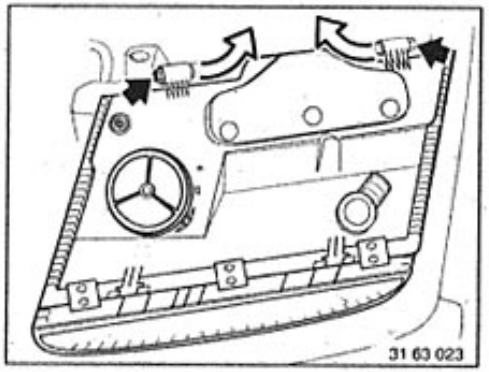
Remove retaining pin.
Open lock.



Slide cover forwards and remove.

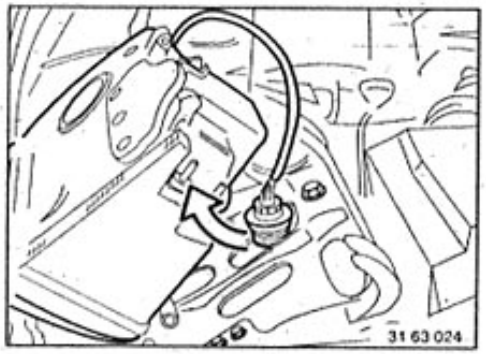
Installation:
Check that cover is correctly seated!

1 Cover
2 Lug on headlight housing



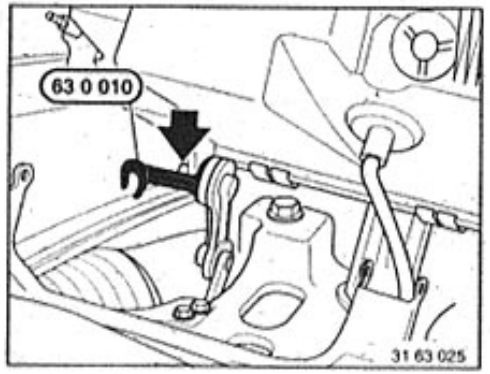
Unfasten nuts and remove dowel pin.

Installation:
Ensure that dowel pin is correctly located!



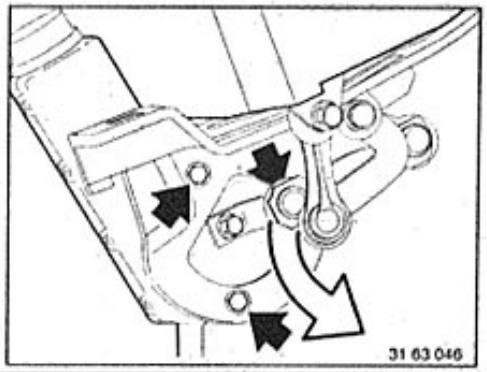
Fold headlights forward.

Note:
Protect headlight and body from damage.
Pull cable and connector through carrier plate.



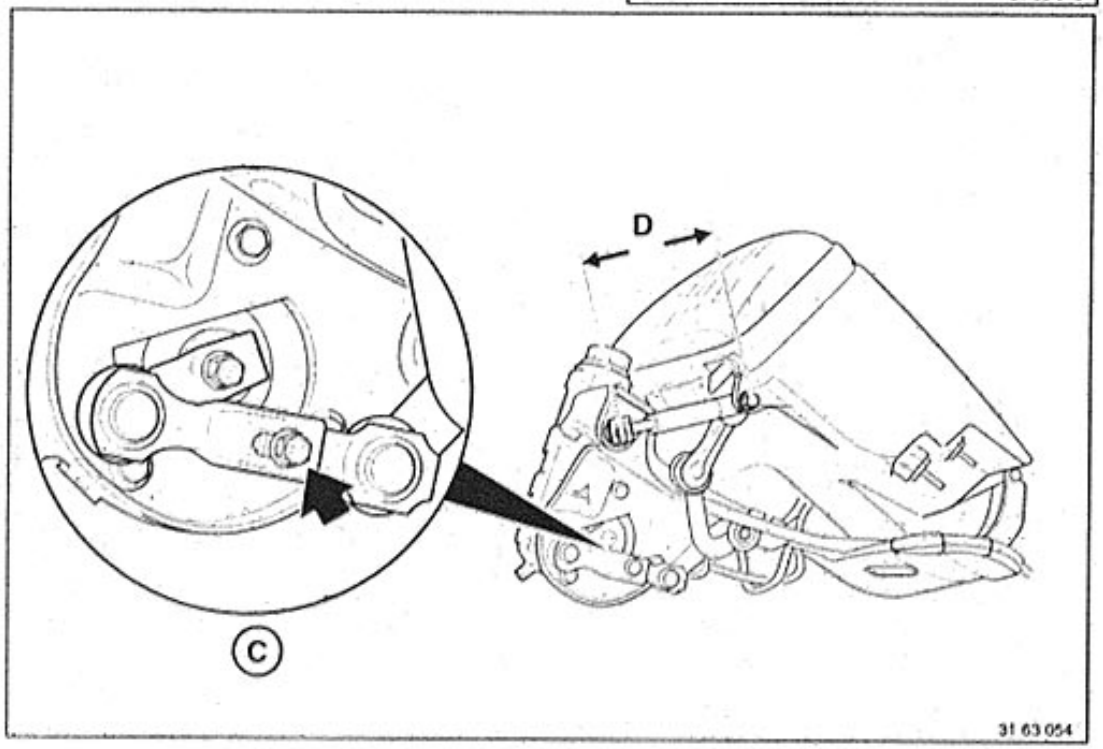
Use special tool 63 0 110 to trip lock nut and unfasten nut.

Note:
If necessary, slide back rubber grommets and ensure that they are correctly seated after installation.

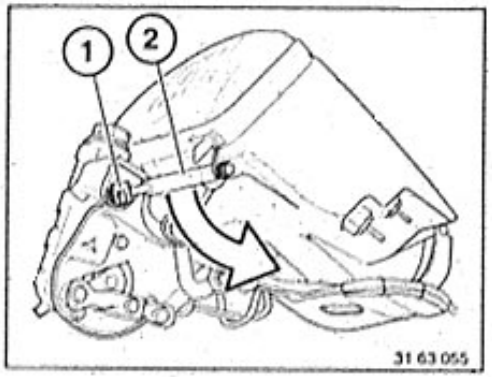


63 12 200 Replacing actuator drive for left or right pop-up headlights

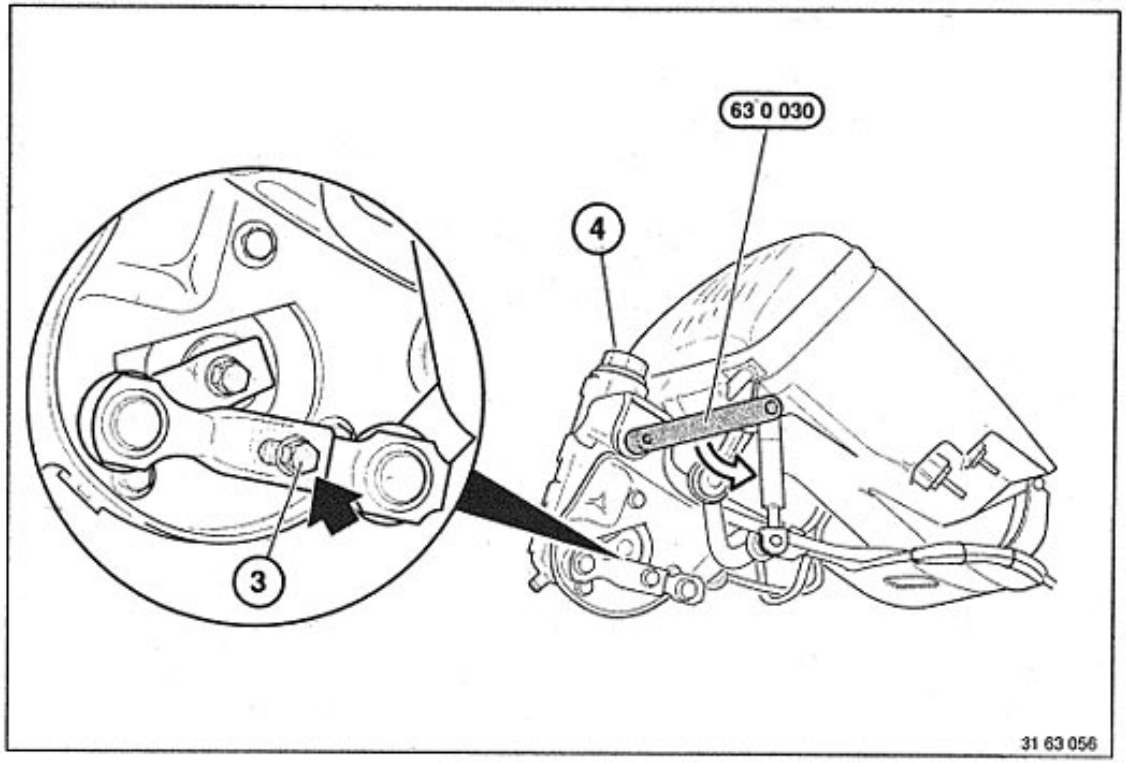
Remove pop-up headlight with carrier plate, see 63 12 460.
Lever linkage off ball pin.
Unfasten screws and remove actuator drive.



Check setting of adjustment lever (C).
The adjustment dimension (D = 102 mm ± 1) for the gas strut must be set using the adjustment lever (C). Once the adjustment dimension (D) is correct, install and adjust the headlight, see 63 12 747



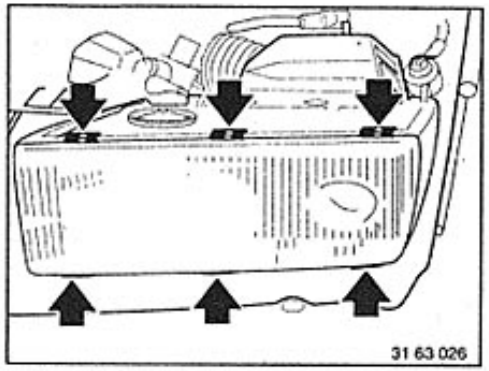
If the adjustment dimension (D) is not correct, unfasten the retaining clip (1), lift out the gas strut (2) and fold down.



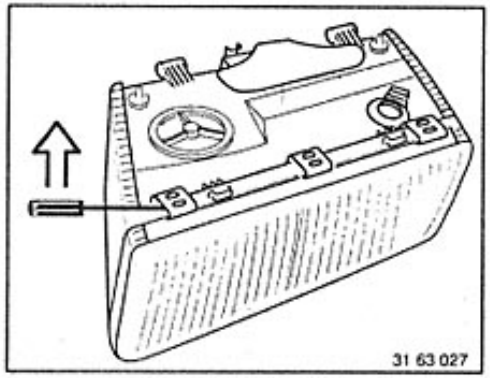
Fully raise the pop-up headlights (4) using the handwheel (4).
Slid special tool 63 0 030 on to the two retaining points of the gas struts (small bore on the lower pin, large bore on the retaining nut).
If the special tool does not fit, loosen screw (3) and slide adjustment lever until the tool fits on the two retaining points. Tighten screw (3), reinstall the gas strut, then install and adjust the headlight unit
see 63 12 747

63 12 400 Removing and installing or replacing insert for left or right headlight

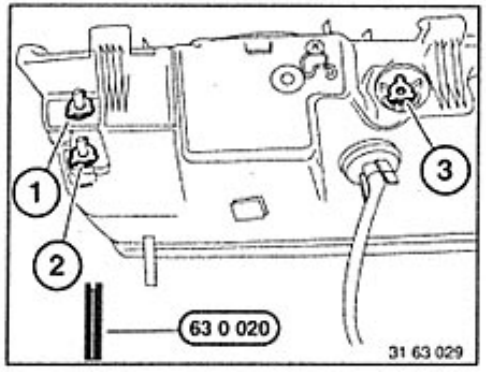
Removing and installing complete left or right pop-up headlight - see 63 12 090.



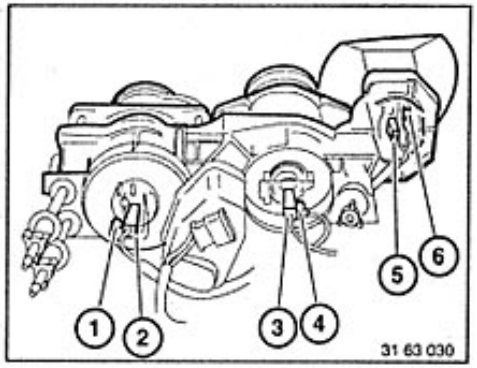
Remove lens.
Remove top and bottom clips.



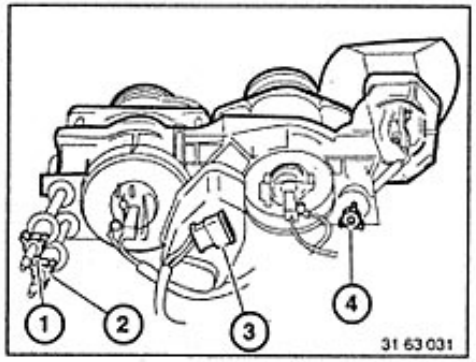
Insert screws between headlight housing and lift out clips.



Twist retaining nuts on adjusting screws (1 and 2) and the retaining screw (3) using special tool 63 0 020 until the carrier frame can be lifted out.
Withdraw carrier frame until it is possible to remove the cables.



Caution!
Note colors of lines.
Remove plugs 1 to 6.

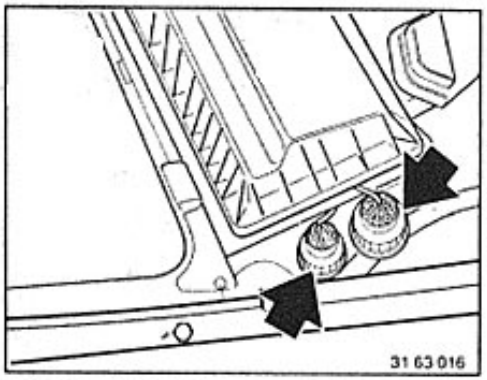


Remove connector 3 for motor for vertical aim control and remove complete carrier frame.

1 Adjusting and retaining screw for carrier frame
2 Adjusting and retaining screw for carrier frame
3 Connector for motor for vertical aim control
4 Retaining screw for vertical aim control

Replace high beam headlight insert
See 63 12 600
Replace high beam headlight insert
see 63 12 610
Replace foglights
see 63 12 620

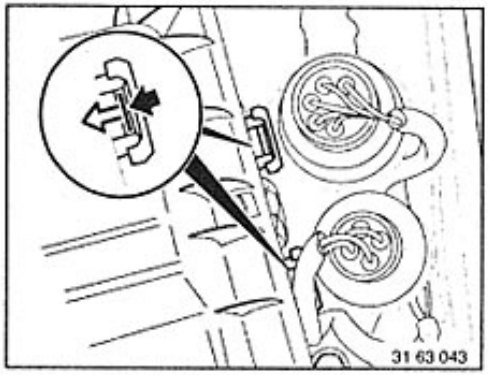
Installation:
Adjusting headlights, see 63 10 004



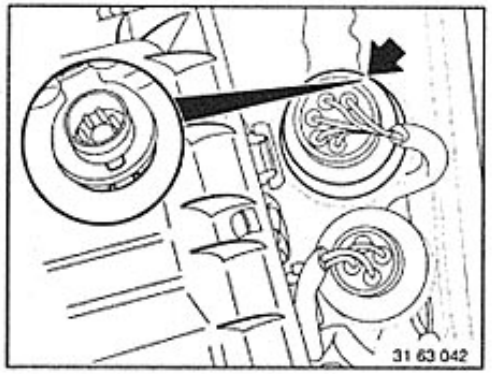
63 12 460 Removing and installing or replacing complete left or right pop-up headlight with carrier plate

Remove connector.

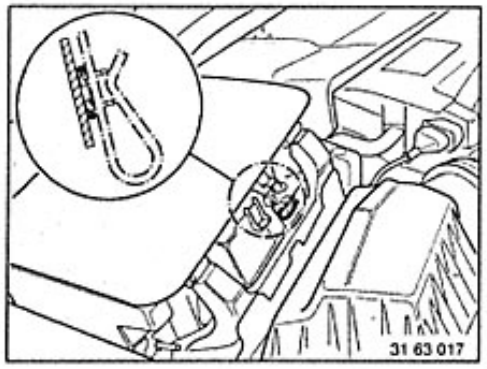
Installation:
Interrogate fault memory, remedy any faults and clear the memory.



Unfasten clips.
Remove bracket.

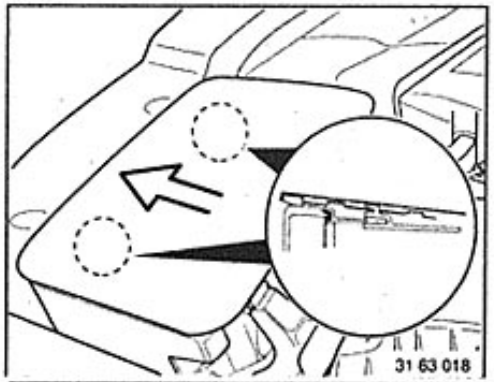


Unscrew and remove retaining nut.



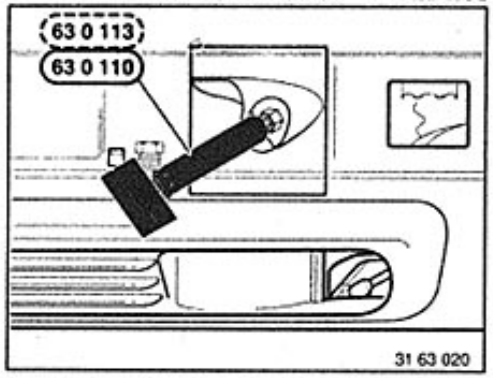
Remove retaining pin.
Open lock.

Caution!
Ensure that installation position is correct!



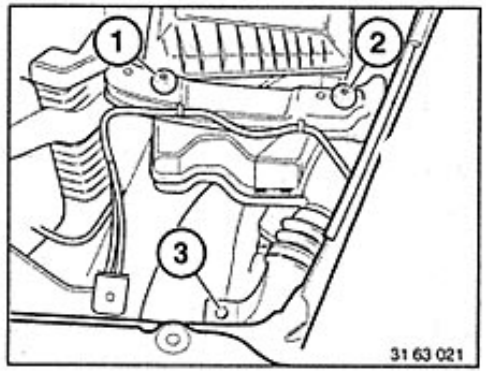
Slide cover forwards and remove.

Installation:
Ensure that cover is correctly seated!



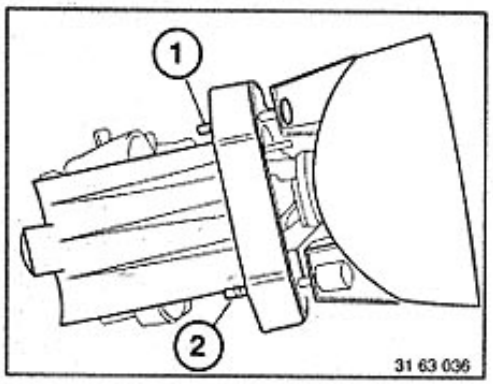
Unfasten nut with special tool 63 0 110 or, with width across flats of 17 mm, unfasten using special tool 63 0 113.

Note:
Always brace to avoid altering the height of the headlight.



Unfasten nuts (1 to 3) and remove headlight by lifting upwards.

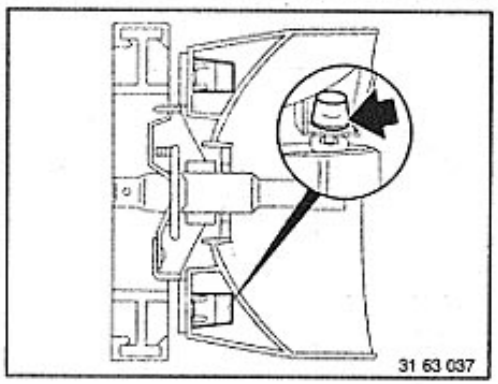
Installation:
Adjust pop-up headlights and install
see 63 12 747



63 12 600 Removing and installing or replacing left or right high beam headlight insert

Remove headlight insert see 63 12 400

Caution!
Do not turn adjusting screws (1 and 2).



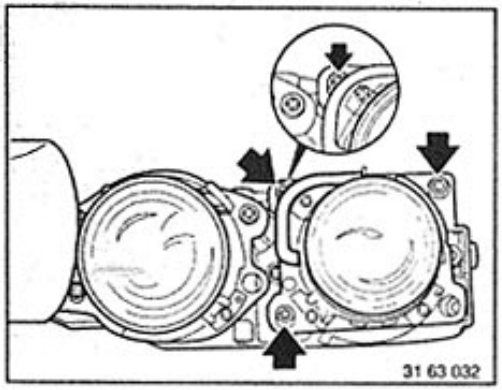
Heat retaining clips with hot air blower.

Caution!
Do not damage carrier frame and reflector when heating the retaining clips.

Installation:
Replace retaining clips!

Remove reflector from retaining clips.

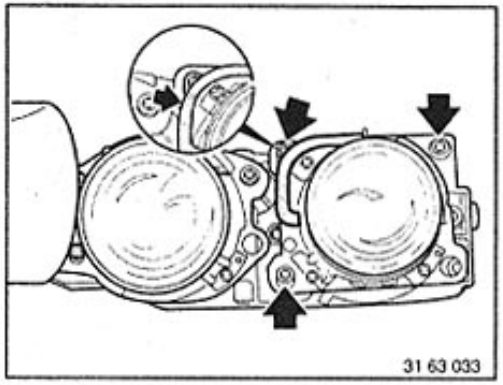
Caution!
Do not reach into reflector.
Adjust basic setting of headlight inserts see 63 10 508.



63 12 610 Removing and installing or replacing left or right low beam headlight insert (pop-up headlights)

Removing headlight insert -see 63 12 400

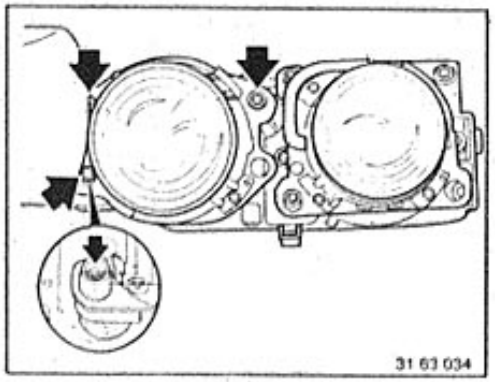
Caution!
Do not twist adjusting screws in the retaining clips.



Move reflector unit into RHD setting. Heat retaining clips with hot air blower and press out of bracket.

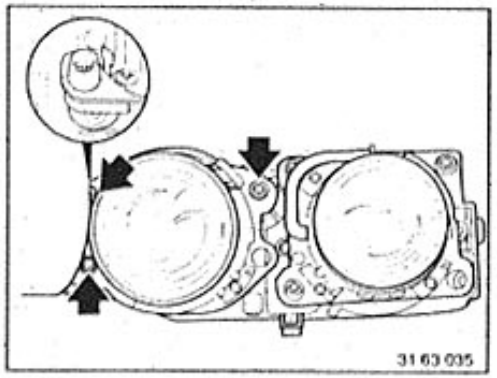
Caution!
Do not damage the carrier frame when heating the retaining clips.

Installation:
Replace retaining clips!
Do not reach into reflector unit!
Adjust basic setting of headlight inserts see 63 10 508.



63 12 620 Removing and installing or replacing left or right fog-light insert (pop-up head-lights)

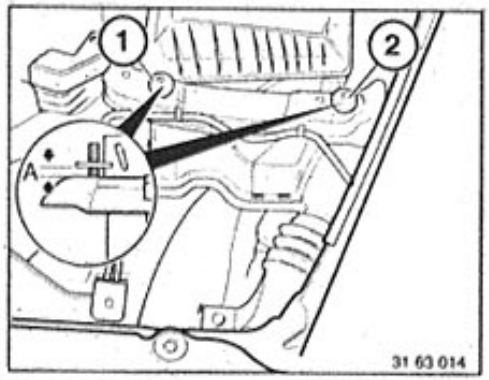
Remove headlight insert see 63 12 400
Caution!
Do not twist adjusting screws in the retaining brackets.



Heat retaining clips with hot air blower and press out of bracket.

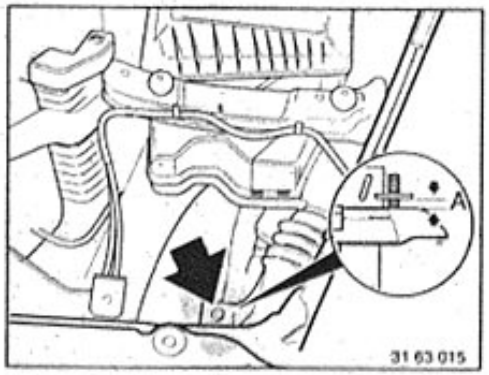
Caution!
Do not damage carrier frame and reflector when heating the retaining clips.

Installation:
Replace retaining clips!
Adjust basic position of headlight inserts see 63 10 508.

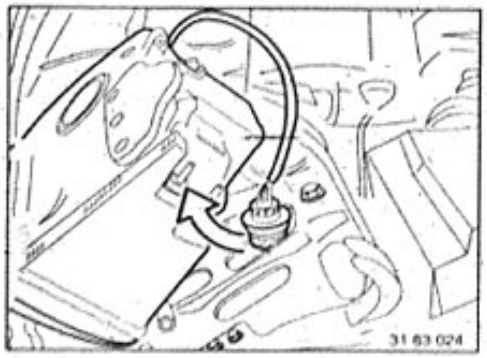


63 12 747 Installing both pop-up headlights and adjusting the headlights

Set rear adjusting screws (1 and 2) with special tool 63 0 110 or 63 0113 to preassembly dimension A = 9.5 mm.

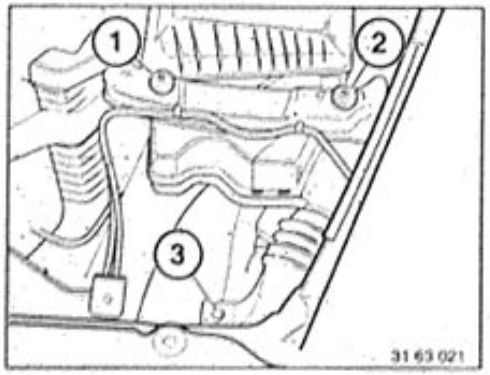


Set adjusting screw to preassembly dimension A = 5.0 mm with special tool 63 0 110 or 63 0 113.



Install headlights with cables.

Caution!
Ensure that cables are correctly located.

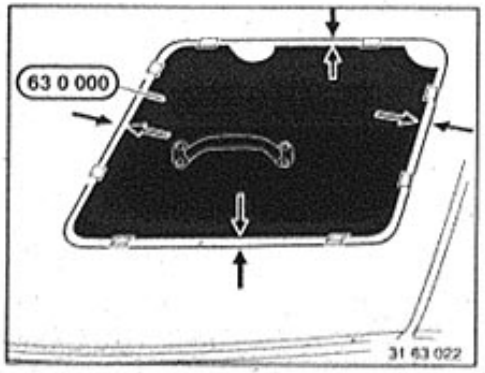


Tighten all nuts gently.

Note:
It must be possible to slide headlights sideways.

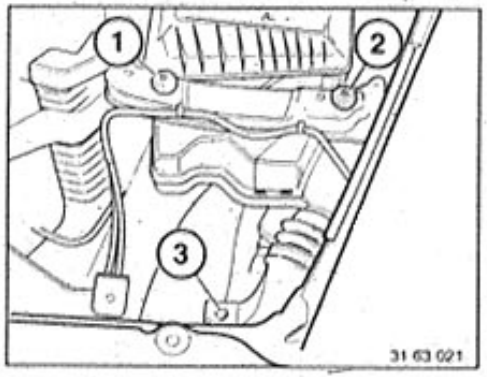
Perform function check on the pop-up headlights

Caution!
Only perform check if both headlights are connected, otherwise a fault will be recorded in the fault memory.



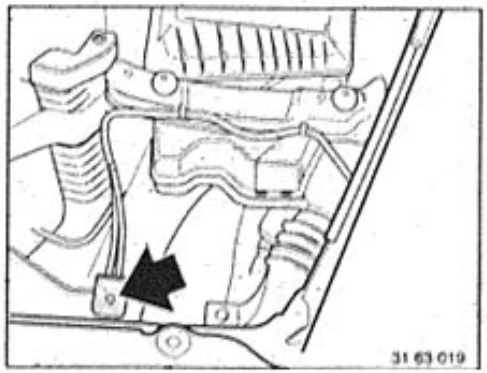
Fit shaped lid (special tool) 63 0 000.
Carefully close hood lid to avoid damage to paint on hood lid being caused by the spacer blocks

Caution!
Shaped lids for left and right sides are different.



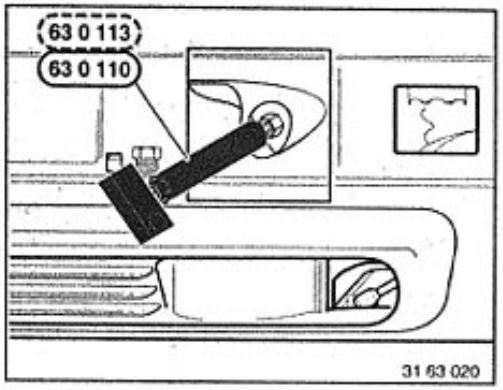
Perform height adjustment on adjusting screws (1 ... 3).
Use special tool 63 0 110.

Note:
To make illustration clearer, shown with pop-up headlights removed.

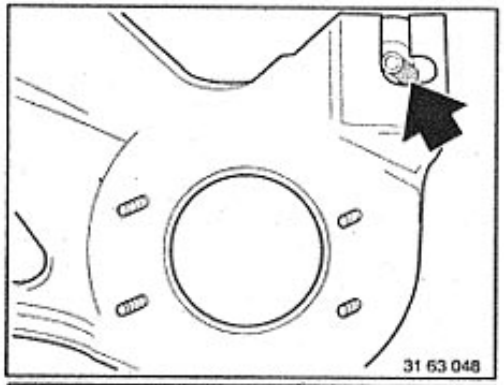


From 5/91 the height adjustment of the inner screw can be performed from the top. The front light cluster is not removed any more.
Set adjusting screw to preassembly dimension A = 5.0 mm using special tool 63 0 110 or 63 0 113.

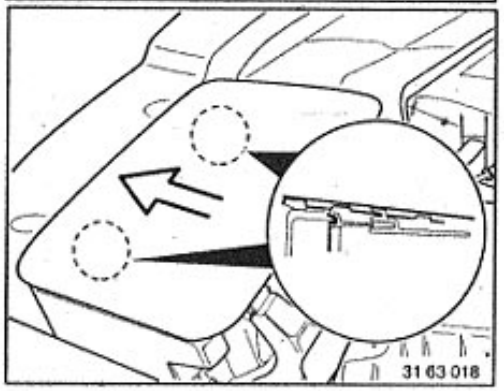
Note:
To make illustration clearer, shown with pop-up headlights removed.



Until 5/91, height of retaining bracket is adjusted from the front. To do this, first remove the front light cluster, see 63 11 100.



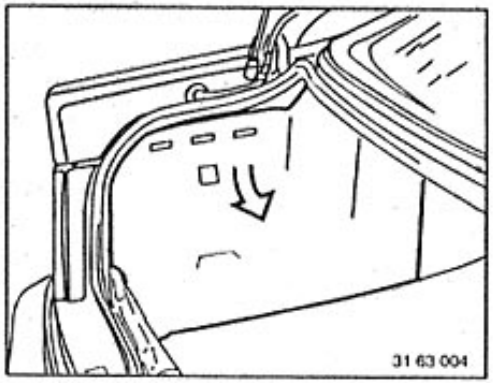
up to 5/91
Installation:
If height cannot be adjusted sufficiently, ensure that the adjusting screw is correctly installed.



Tighten retaining nuts.
Remove shaped cover and fit sealing cover.

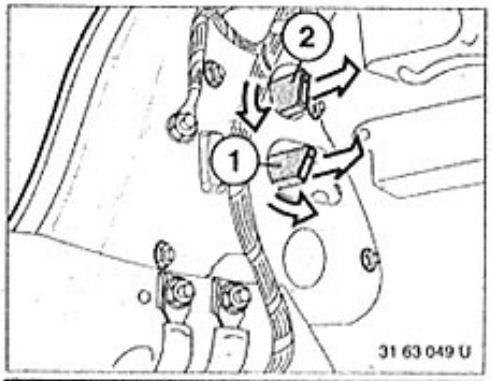
Installation:
Ensure that the lid is correctly seated.

Close the hood lid.
Check that gap between hood lid and headlight cover is the same all round. Check height adjustment once again and, if necessary, repeat the height adjustment process.
Adjust headlights see 63 10 004.

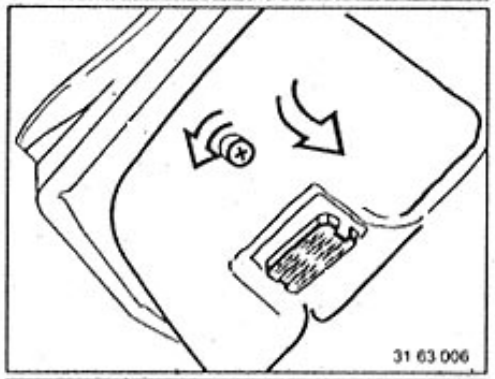


63 21 180 Removing and installing or replacing complete left or right tail light (on side panel / trunk lid)

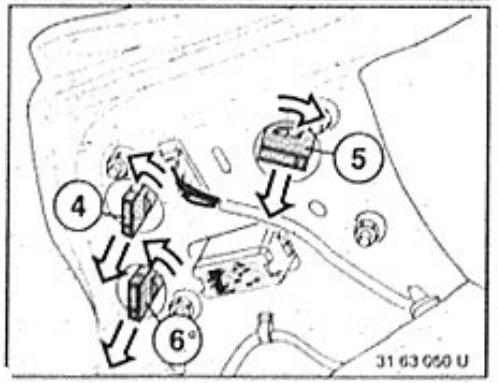
Unclip side trim panel.



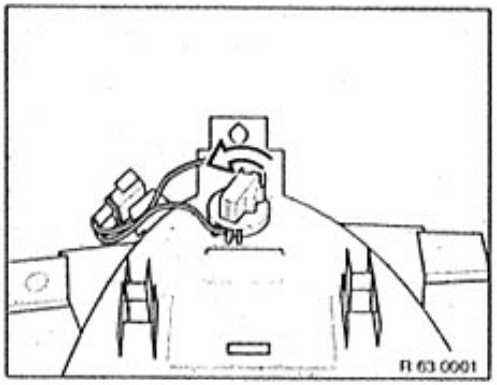
Remove connector, unfasten nuts and lift out tail light.



Turn clips 90° and fold down trunk lid trim panel.

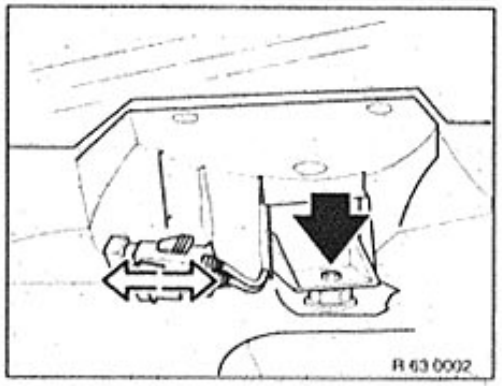


Remove connector, unfasten nuts and lift out tail light.

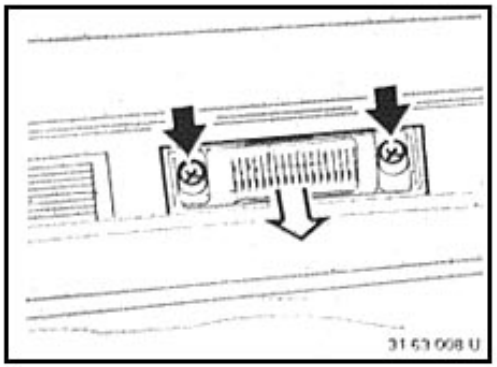


63 25 000 Removing and installing or replacing additional brake light

Twist lamp bracket (from trunk) and remove.

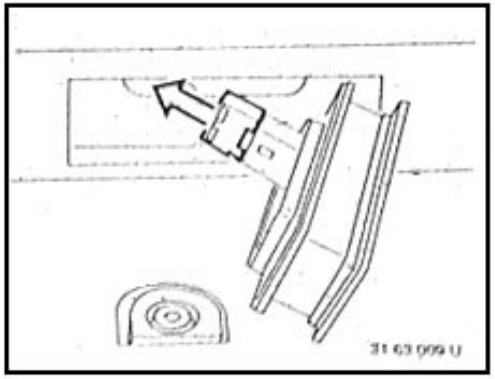


Remove rear shelf, see 51 46 000
Unfasten screw connection.
Unfasten screws and remove brake light.



63 26 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT LICENSE PLATE LIGHT

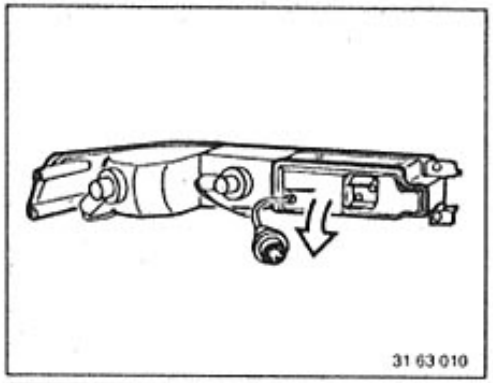
Unscrew screws and take out light.



Pull off plug.

Note.
Light bulb type*.

* See Specifications

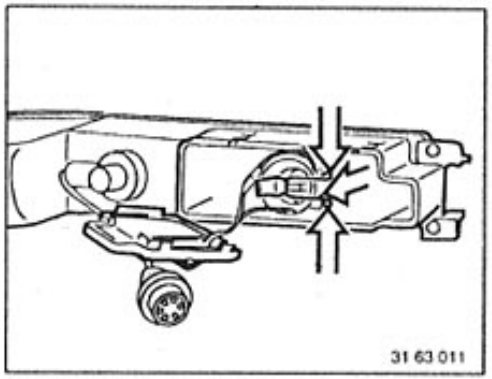


63 99 250 Replacing bulbs for front light combination

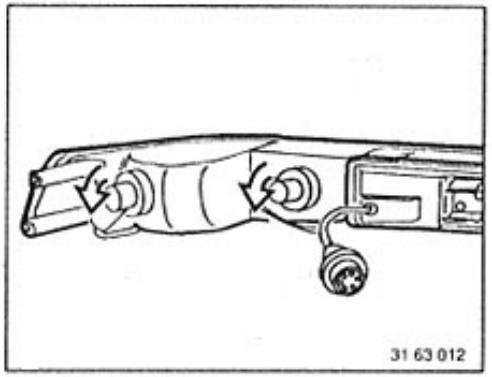
Remove front light combination
see 63 11 100

Replace bulb in high-beam headlights

Unclip cover

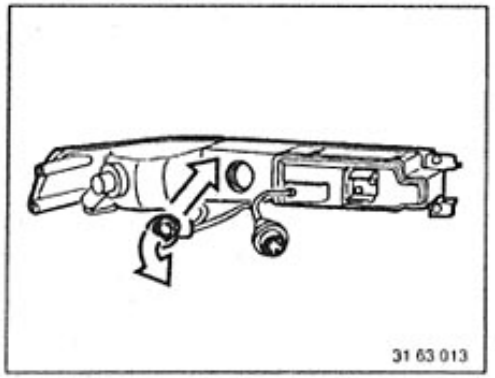


Unfasten connector 1, press together clips and open, lift out bulb



Replace bulb for parking light

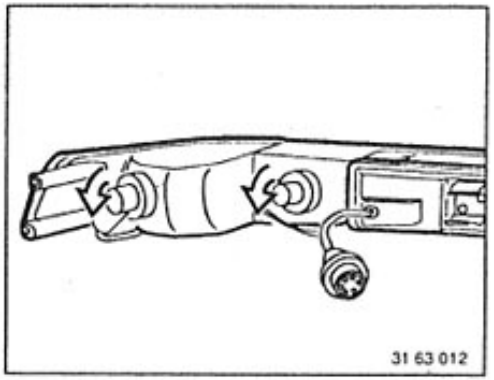
Twist lamp bracket and lift out



Twist bulb and lift out.

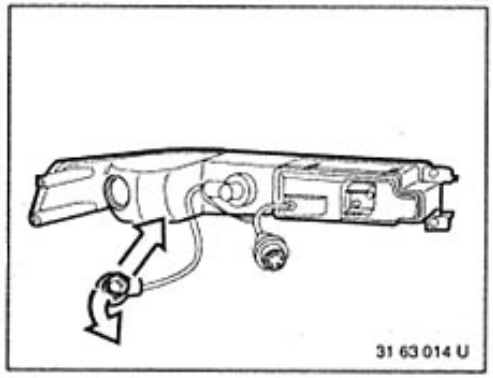
Caution:
Only use 2 thread lamp *.

* Refer to Technical Data

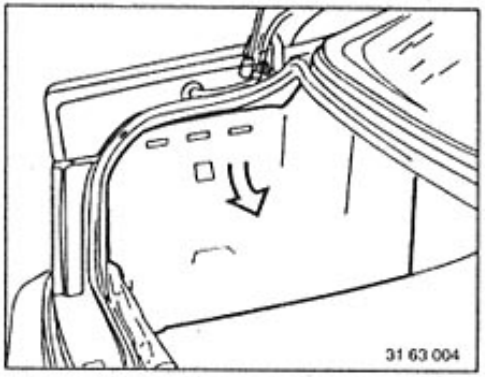


Replace bulb for indicators

Twist lamp bracket and lift out

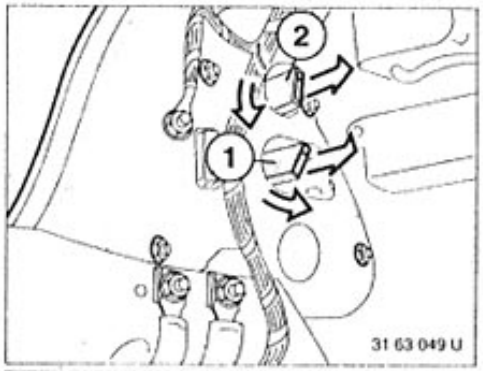


Twist and lift out bulb



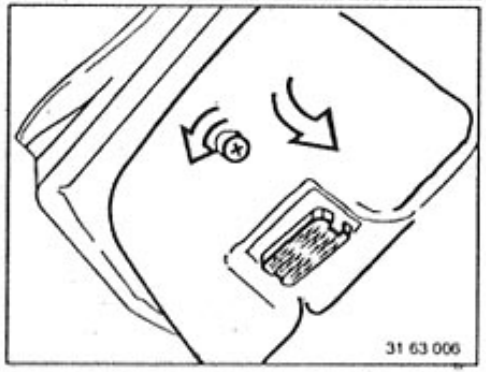
63 99 315 Replacing bulb for left or right tail light (on side panel or trunk lid)

(for bulbs in side panel)
Unclip side trim panel

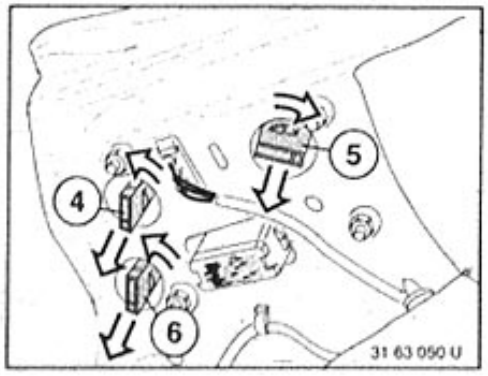


Twist relevant lamp bracket and remove. Twist bulb and remove.

Caution!
Use correct type of lamp.*
Arrangement:
1 Brake light
2 Display light for direction of travel



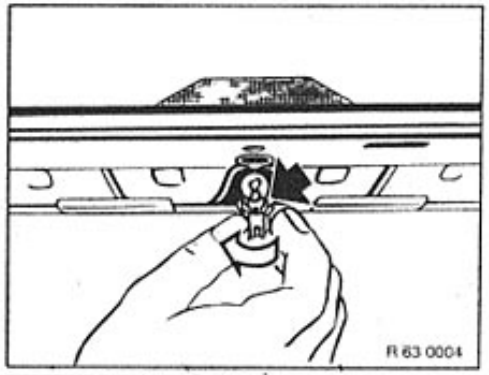
(for bulbs in trunk lid)
Twist clips 90° and fold down trunk lid trim panel.



Twist appropriate lamp bracket and remove.Twist bulb and remove.

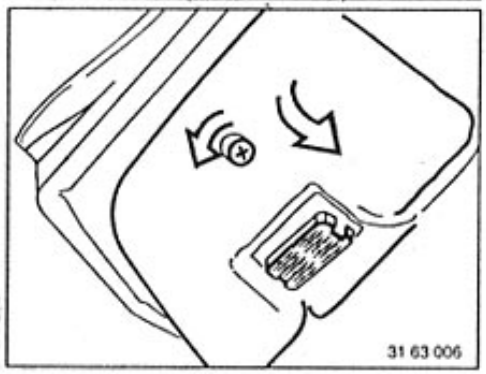
Caution!
Use correct type of lamp.*
Arrangement :
4 Tail light
5 Rear foglight
6 Reversing light

* Refer to Technical Data



63 99 375 Replacing bulb for additional brake light

Open trunk lid.
Twist lamp bracket and remove.
Twist bulb and remove.



63 99 401 Replacing bulb for left or right license plate light

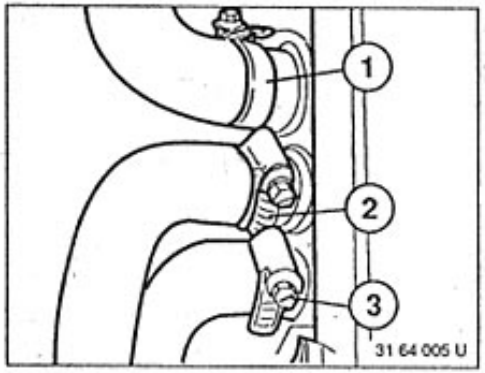
Unfasten screws and remove lamp.
Remove bulb from contacts.

64 Heating and air conditioning

64 11 205	Heater (IHKA) – remove and install	64- 11/1
207	Heater core – replace	64- 11/3
210	Heater blower motor – remove and install	64- 11/4
260	Additional water pump – replace	64- 11/7
271	Water valve – remove and install (refer to 64 11 260)	64- 11/7
355	Blower for inside sensor – remove and install	64- 11/8
590	Blower final stage – replace	64- 11/9
750	Heater controls – remove and install and disassemble	64- 11/10
755	Face panel – replace	64- 11/11
63 99 . . .	Light bulb for heater controls – replace	64- 11/11
64 11 765	Heating control unit – replace	64- 11/12
64 31 010	Microfilter – replace	64- 31/1
	Refrigerant circuit	64- 50/1
	Service station (R 12)	64- 50/2
64 50 009	Air conditioner – discharge and charge	64- 50/3
	Air conditioner – suck out refrigerant	64- 50/4
	Discharging air conditioner	64- 50/5
	Charging air conditioner	64- 50/6
	Detecting leaks	64- 50/6
	Cleaning refrigerant	64- 50/7
	Troubleshooting with help of pressure test	64- 50/8
	Air conditioner power test	64- 50/9
	Function of refrigerant circuit	64- 50/10
	Service device (SECU 134)	64- 50/11
64 50 009	Air conditioner – evacuate and charge	64- 50/12
	Air conditioner – draw off fluid	64- 50/13
	Air conditioner – evacuate	64- 50/14
	Charging the system	64- 50/15
	Perform leak check	64- 50/16
	Cleaning refrigerant	64- 50/17
	Troubleshooting using pressure measurement	64- 50/18
	Air conditioner power check	64- 50/19
64 51 000	Evaporator – clean	64- 51/1
510	Evaporator – remove and install	64- 51/2
64 52 020	Compressor for air conditioner – replace	64- 52/1
061	Compressor coupling – replace	64- 52/2
64 53 510	Drier flask for air conditioner – remove and install/replace	64- 53/1
550	Condenser for air conditioner – remove and install/replace	64- 53/2
	Function of leakage sensor	64- 90/1

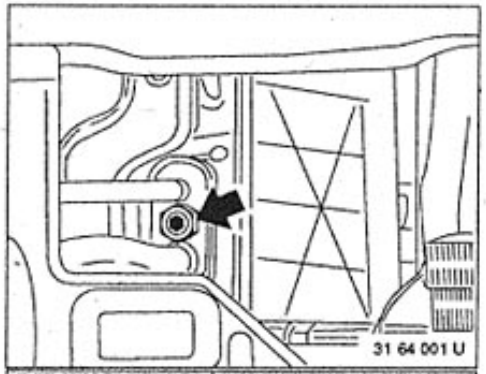
64 11 205 REMOVING AND INSTALLING HEATER (IHKA)

Draw refrigerant out of air conditioner (see operating instructions of pertinent equipment).
Remove complete dashboard – see Group 51.
Remove complete wiper console – see Group 61.



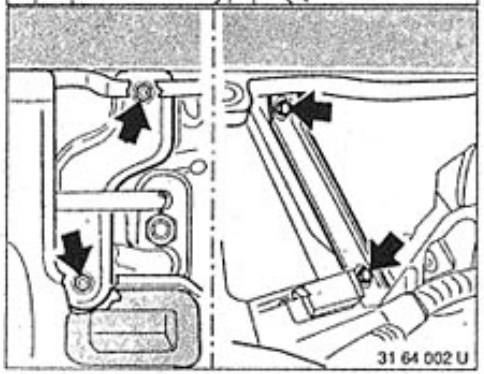
Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

Note:
Clean heater pipes with compressed air carefully to prevent coolant in the passenger compartment while removing the heater.



Unscrew nut.

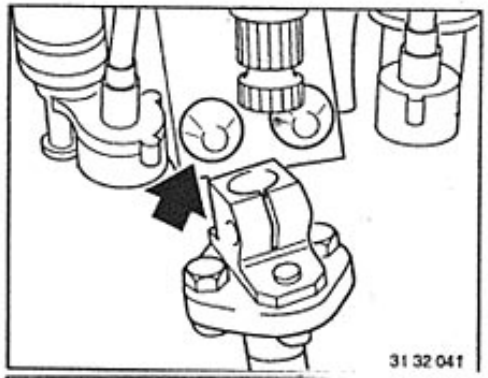
Installation:
Tightening torque*.
Replace O-rings.



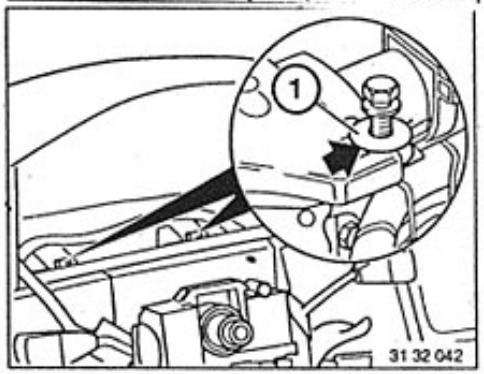
Unscrew left and right bolts.

Note:
Only the right bolts are shown in the picture.

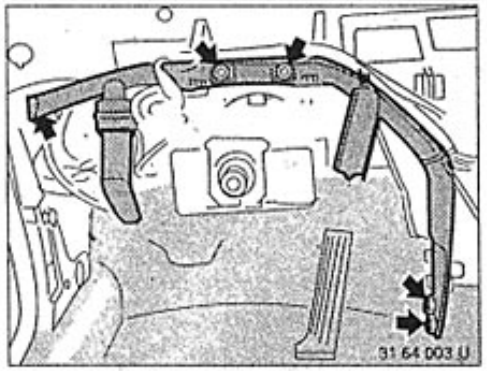
* See Specifications



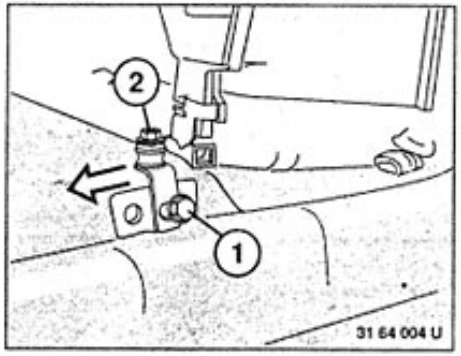
Remove shear-off screw from steering column.



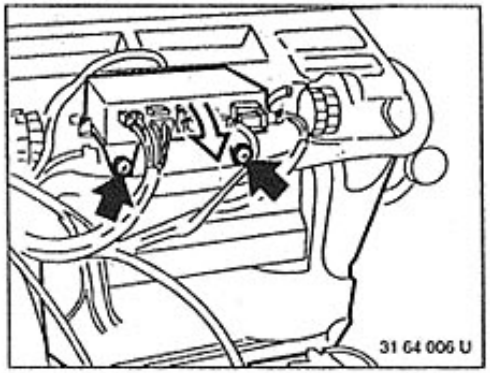
Unscrew screws and lower steering column.



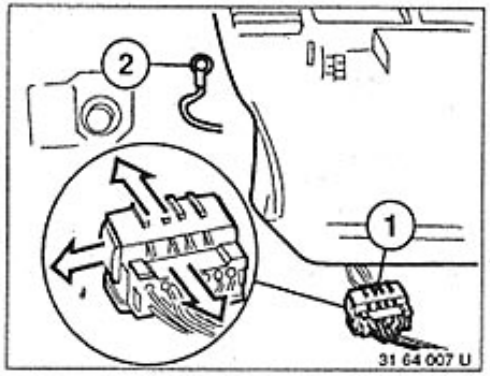
Unscrew screws and pull clamp forward slightly.



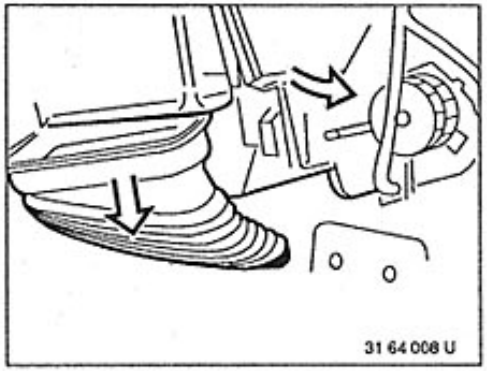
Unscrew screw (1) and nut (2) on left and right sides and pull out brackets.



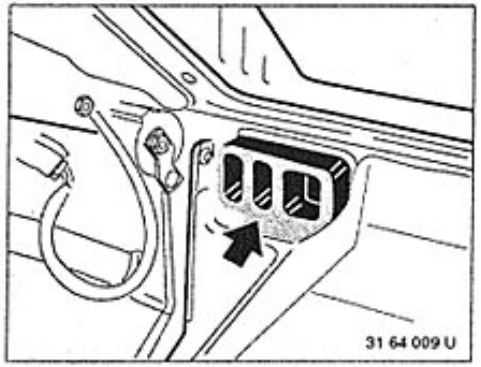
Unscrew screws and place control unit for electric steering column control aside.



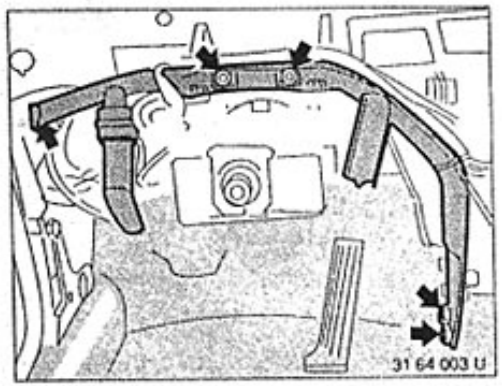
Disconnect plug (1).
Unscrew ground lead (2).



Lift out left and right air ducts.
Remove heater.

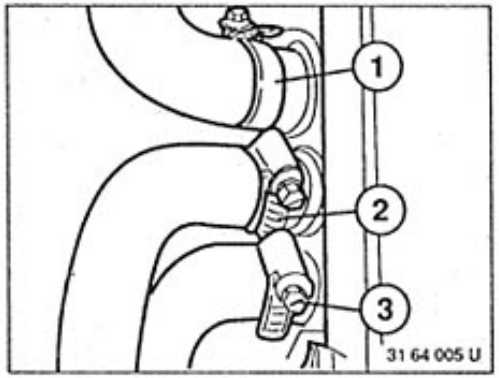


Installation:
Brush out pipe opening with tire mounting paste.



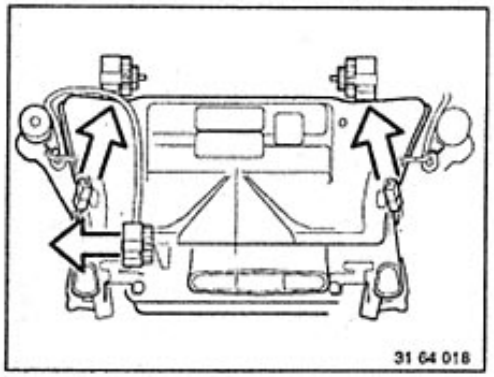
64 11 207 REPLACING HEATER CORE

Remove complete dashboard – see Group 51.

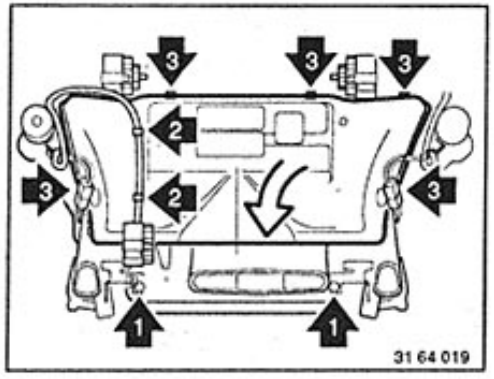


Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

Note:
Blow through heater pipes with compressed air carefully to keep coolant out of the passenger compartment when removing the heater core.

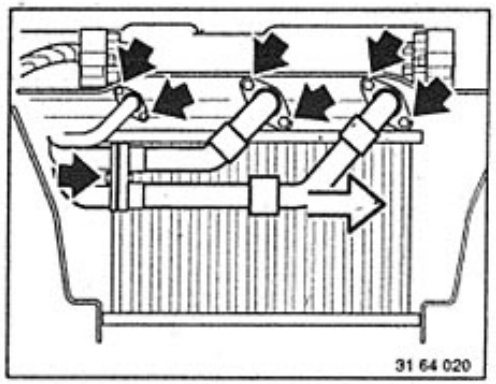


Pull off plugs on both inside temperature sensors.



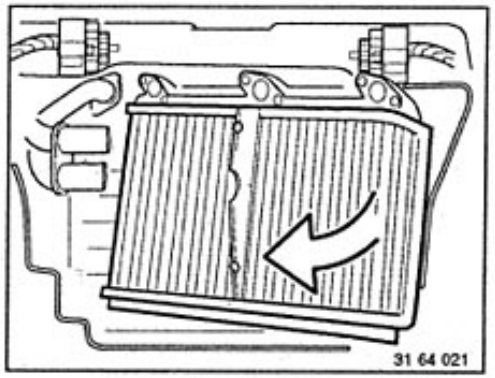
Unscrew screws (1).
Loosen cable strap (2) and retainers (3).
Take off cover.

Installation:
Check for correct seating of cover to prevent uncontrolled wind noise.

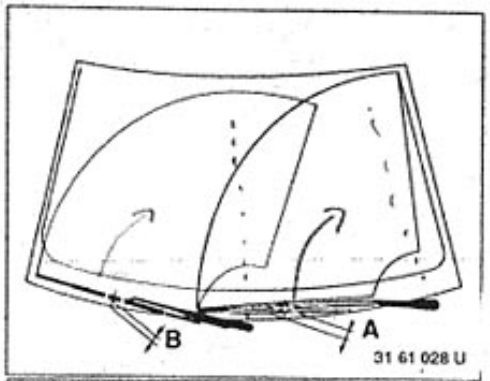


Loosen screws and take off heater pipes.

Installation:
Replace O-rings.

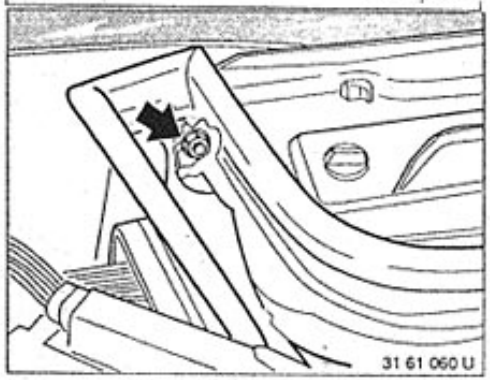


Lift out heater core from the right side.

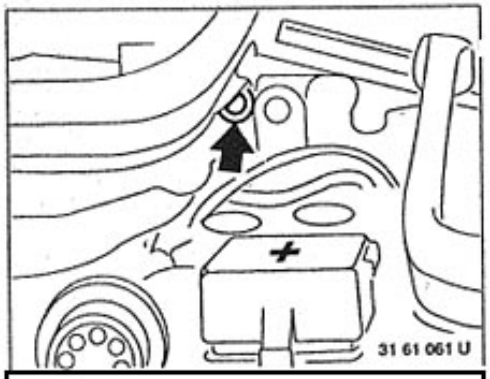


64 11 210 REMOVING AND INSTALLING MOTOR FOR HEATER (BLOWER)

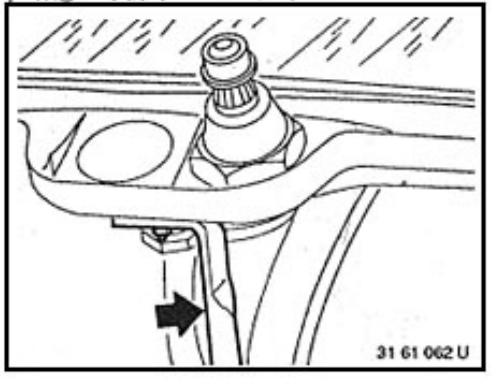
Run wipers to parked position.
Switch off from wiper speed 1.
Remove windshield wiper arms – see 61 61 100.



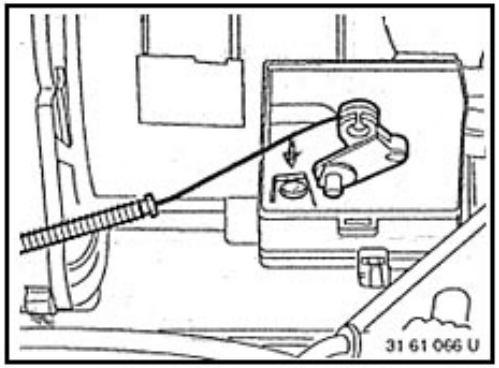
Important!
Set air volume control wheel to zero and switch ignition on and off before disconnecting the cable, in order to have the drive motor close the air flaps.
Disconnect battery ground leads.



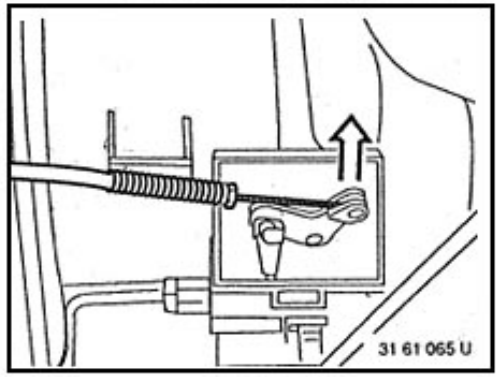
Unscrew screw.
Take of air box cover.



Unscrew screw.
Pull out air box from above.



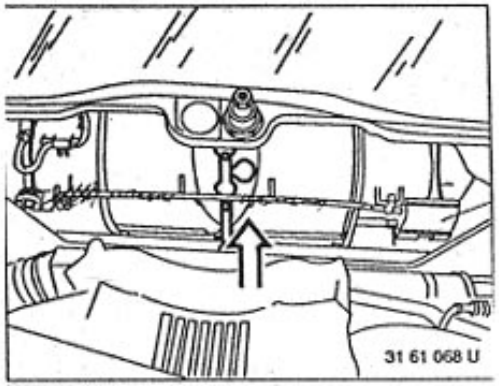
Remove prop.



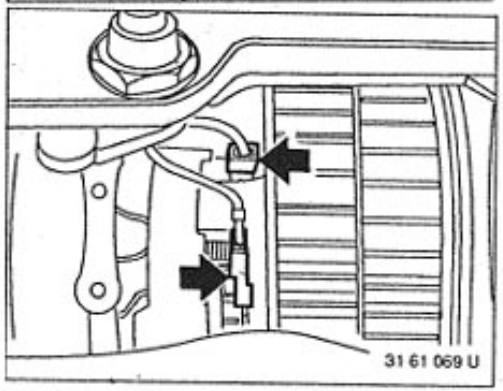
Disconnect cables fully.

Disconnect linkage.

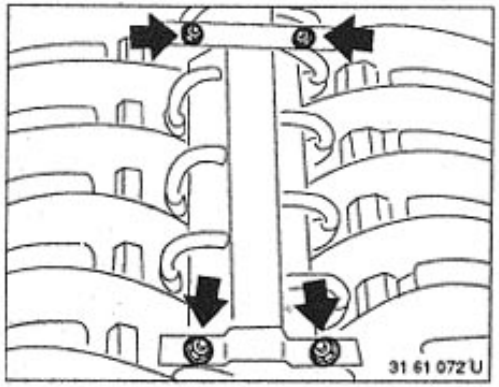
Disconnect cable.



Pull temperature sensor out of eyelet.

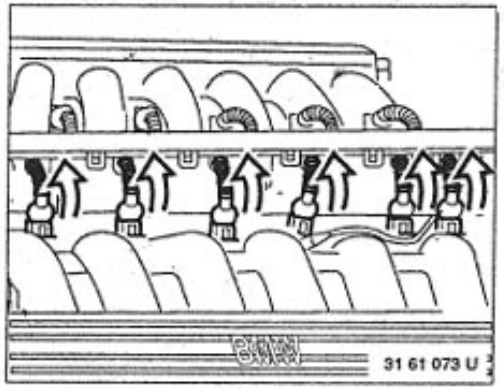


Take off retaining strap.

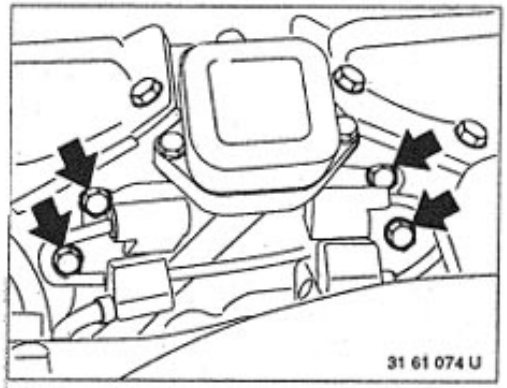


Remove cover.
Pull plug off of blower.
Remove cover on fuel injectors.

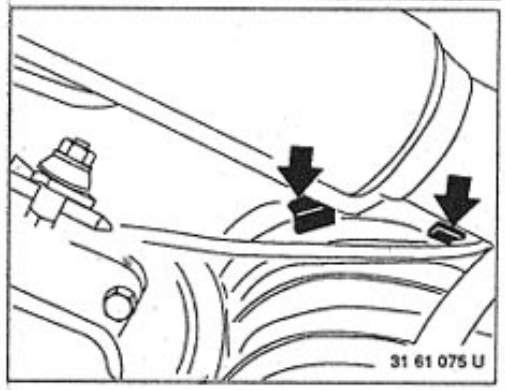
Unscrew electric lead duct of fuel injectors.
Unscrew screws.



Disconnect leads of fuel injection plate on right side.

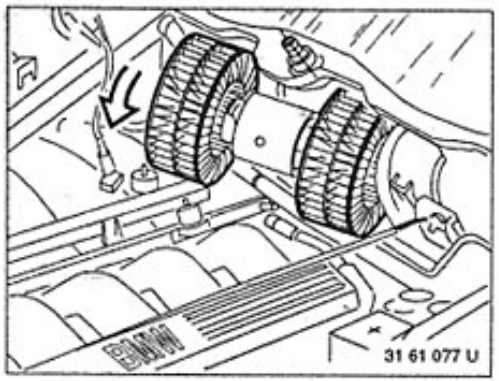


Unplug pulse and TDC senders.
Unscrew bracket.

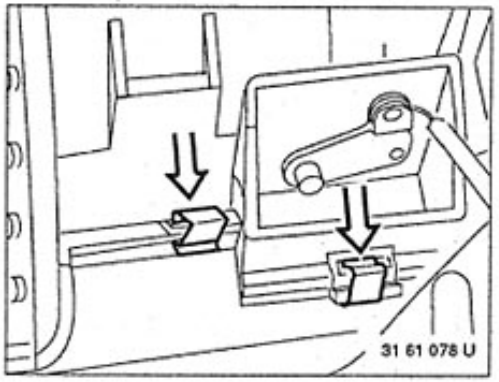


Unclip leads to the oxygen sensors in holders on bottom of the transmission bell housing.

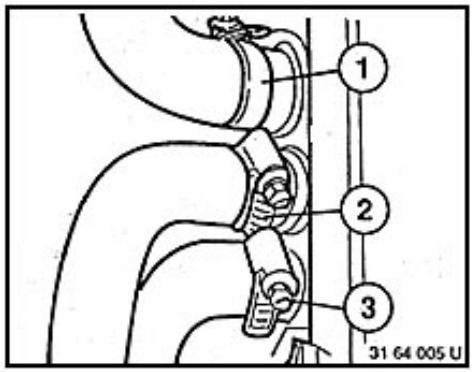
Unclip leads on firewall.
Clips are located underneath electric lead duct of electronic box for fuel injectors.



Tie electric lead duct of fuel injectors aside.



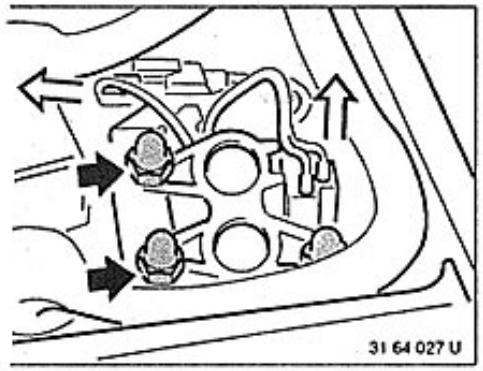
Remove blower.
Insert an approx. 2 mm (0.079") thick mandrel in retaining strap of the blower motor and pry out retaining strap.



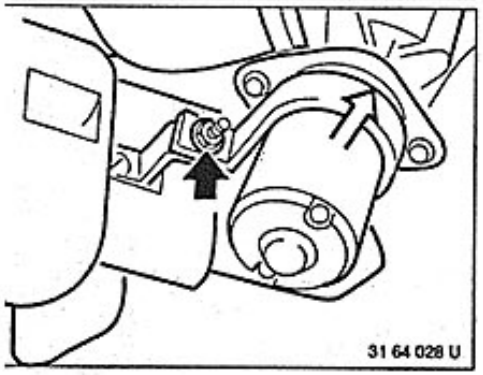
64 11 260 REPLACING ADDITIONAL WATER PUMP

Remove air box – see 64 11 210.
Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

Disconnect feed hose on additional water pump.



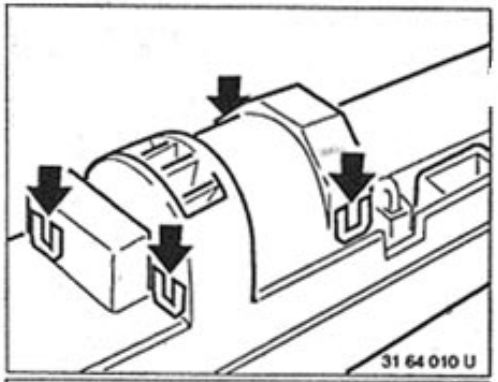
Pull off plug.
Unscrew screws and lift out water valve complete with pump.



Loosen clamp and unscrew screw.
Remove pump.

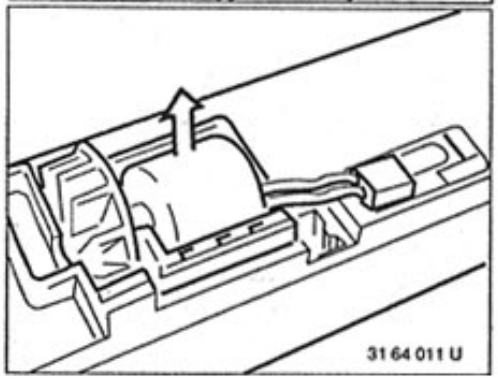
64 11 271 REMOVING AND INSTALLING WATER VALVE

See 64 11 260.



64 11 355 REMOVING AND INSTALLING INSIDE SENSOR BLOWER

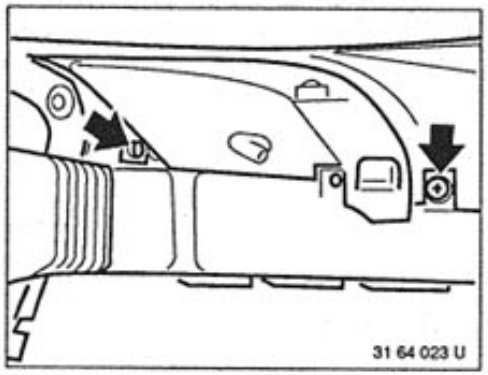
Remove heater controls – see 64 11 750.
For removal of the sensor blower lift retainers on cover slightly and take off the cover.



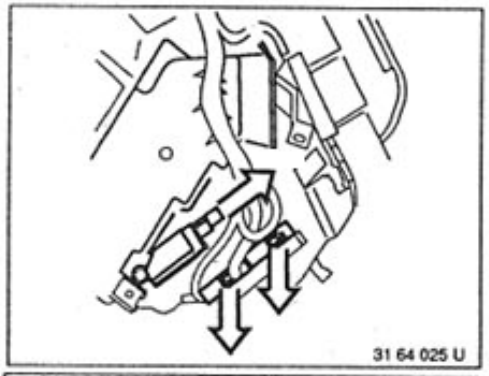
Pull off plug and take out sensor blower.

64 11 590 REPLACING FINAL STAGE FOR BLOWER

Remove glove box - refer to Group 51.
Check the final stage prior to replacing it - refer to Car Electric/Electronic Test Plan.

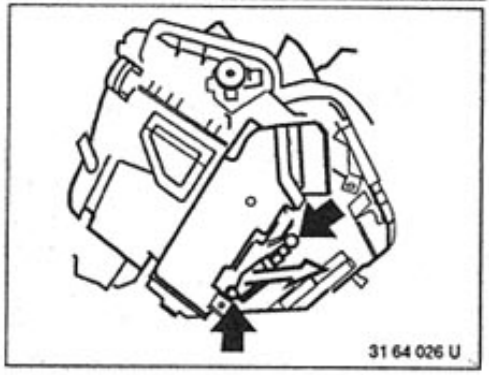


Unscrew screws and lift air duct out.

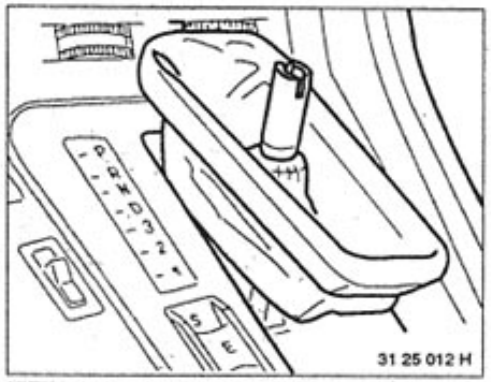


Pull wires off of control unit and final stage.

Note:
Heater remains installed and was removed for this picture only for better understanding.



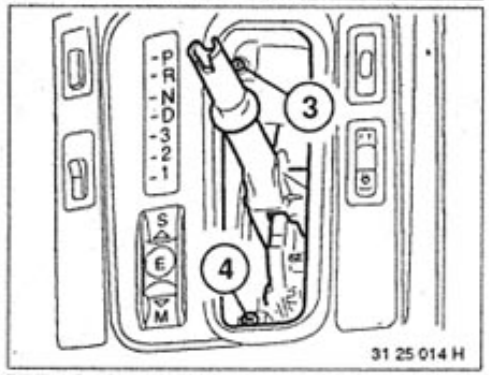
Unscrew screws and pull final stage out.



64 11 750 DISASSEMBLING AND ASSEMBLING HEATER CONTROLS

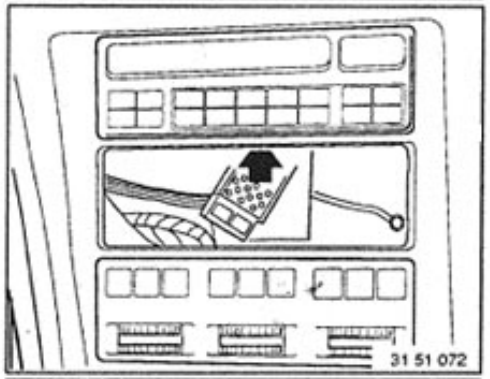
Unclip and pull cover upwards.

Note:
Selector lever handle remains installed.

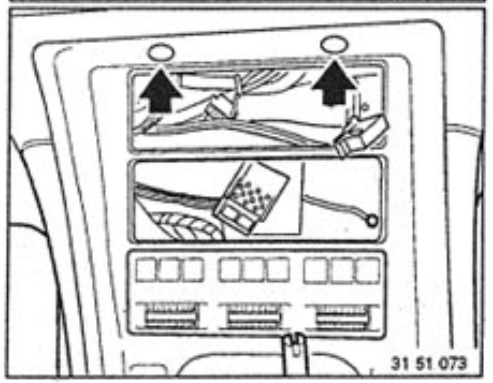


Unscrew screws (3 and 4) and lift cover out upwards.
Disconnect plug.

Note:
Only screw (4) is installed in cars with manual transmission.

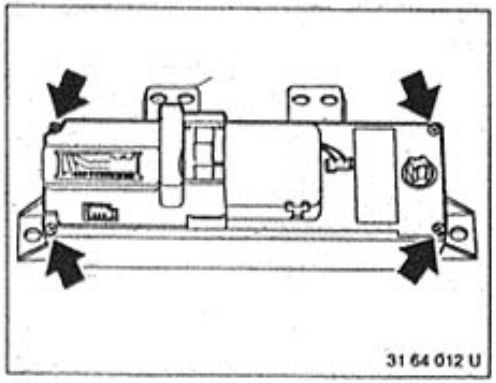


Remove mask for radio opening or radio - refer to Group 65.
Press clip in at middle and pull the multi-function display out.
Disconnect plug.



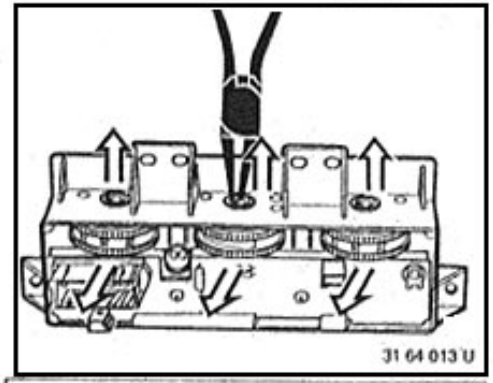
Lift caps out.
Unscrew screws and lift trim panel.
Disconnect plugs from heater controls.

Unscrew control unit at trim panel.



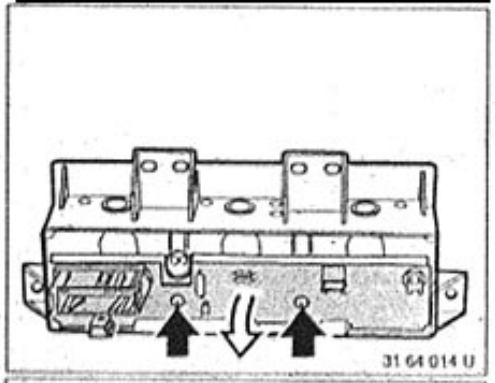
64 11 755 REPLACING FRONT PANEL

Remove heater controls – see 64 11 750.
Unscrew screws and take off cover.

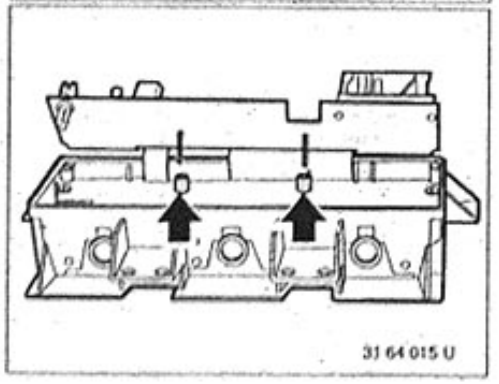


Push back retainers on pins and pull out pins and control wheels.
Pull off push button from front.

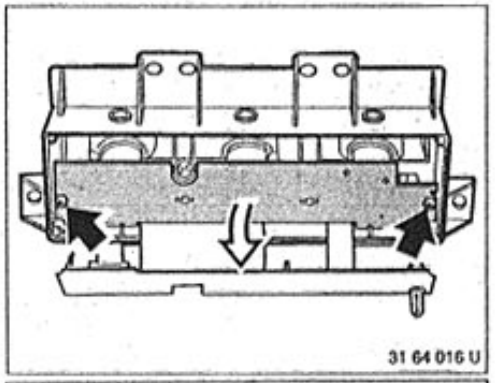
Installation:
Check for correct positioning of control wheels to potentiometers.



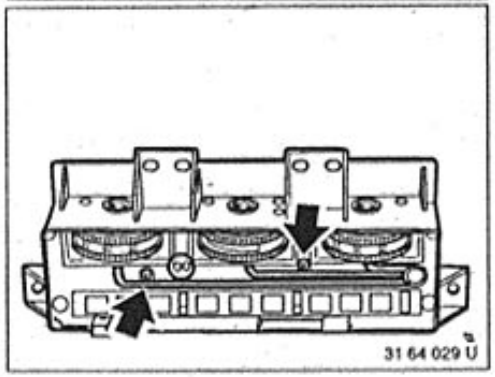
Unscrew screws and fold up upper printed circuit board section.



Don't forget the spacers when installing.



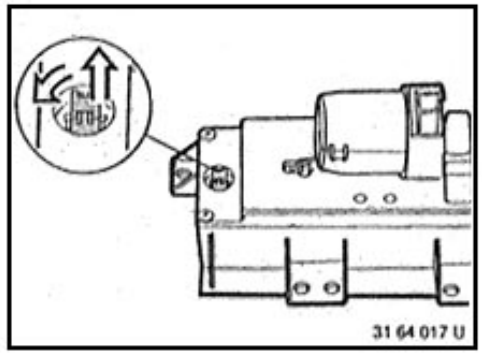
Unscrew screws and remove both printed circuit boards.



63 99 ... REPLACING LIGHT BULB FOR CONTROL PANEL

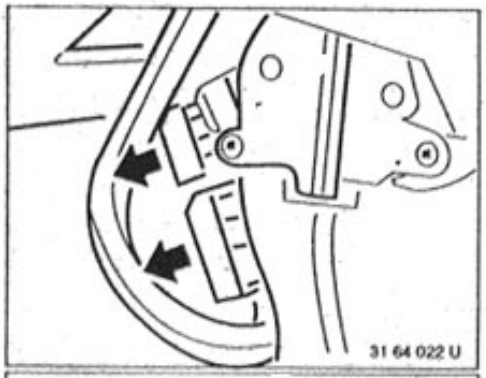
Remove plate for center console – see Group 51.

Twist and remove bulb holder.

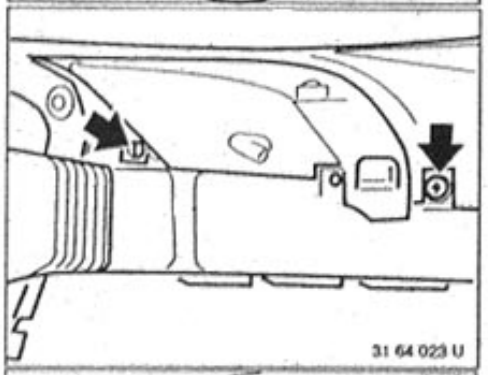


64 11 765 REPLACING CONTROL UNIT FOR HEATER

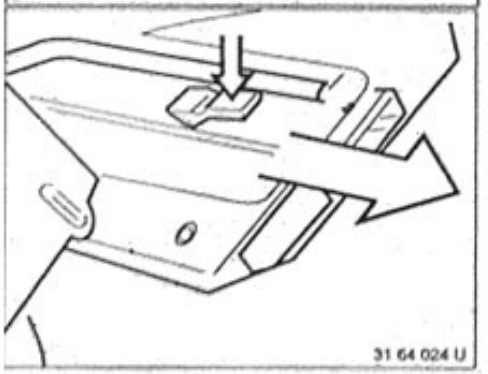
First check the control unit prior to removal – see 64 10 010.



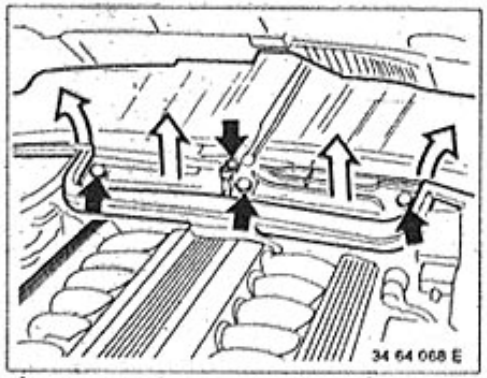
Pull off left and right plugs on control unit.



Unscrew screws and lift out air duct.

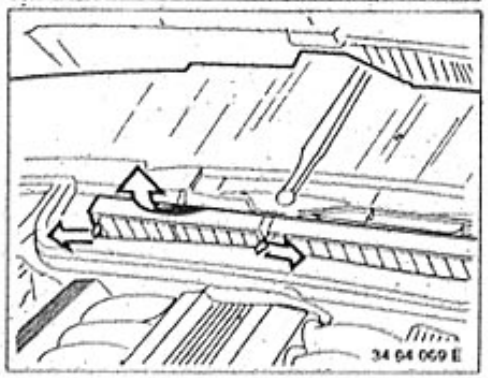


Press down on retainer and pull out control unit.



64 31 010 REPLACING MICROFILTER

Run wiper arm to upright position.
Unscrew screws.
Lift rubber seal slightly at side and lift cover out upwards.

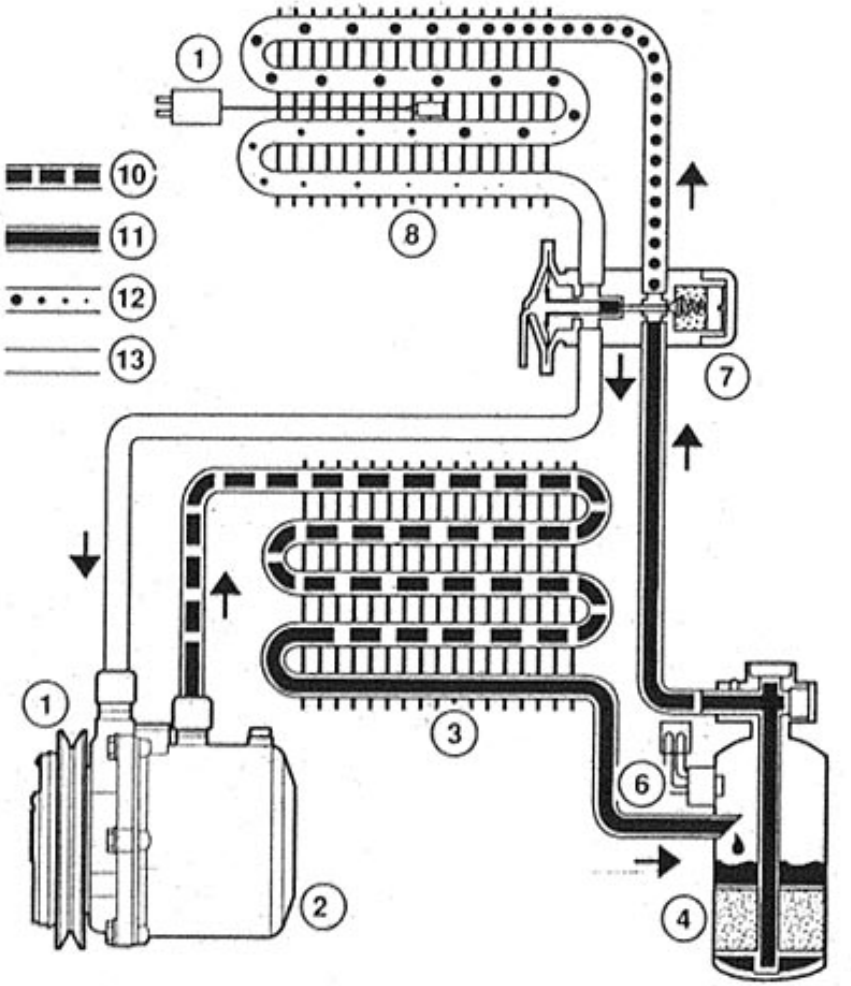


Spread clips apart on left and right sides.
Tilt microfilter forward and pull it out upwards.

DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION

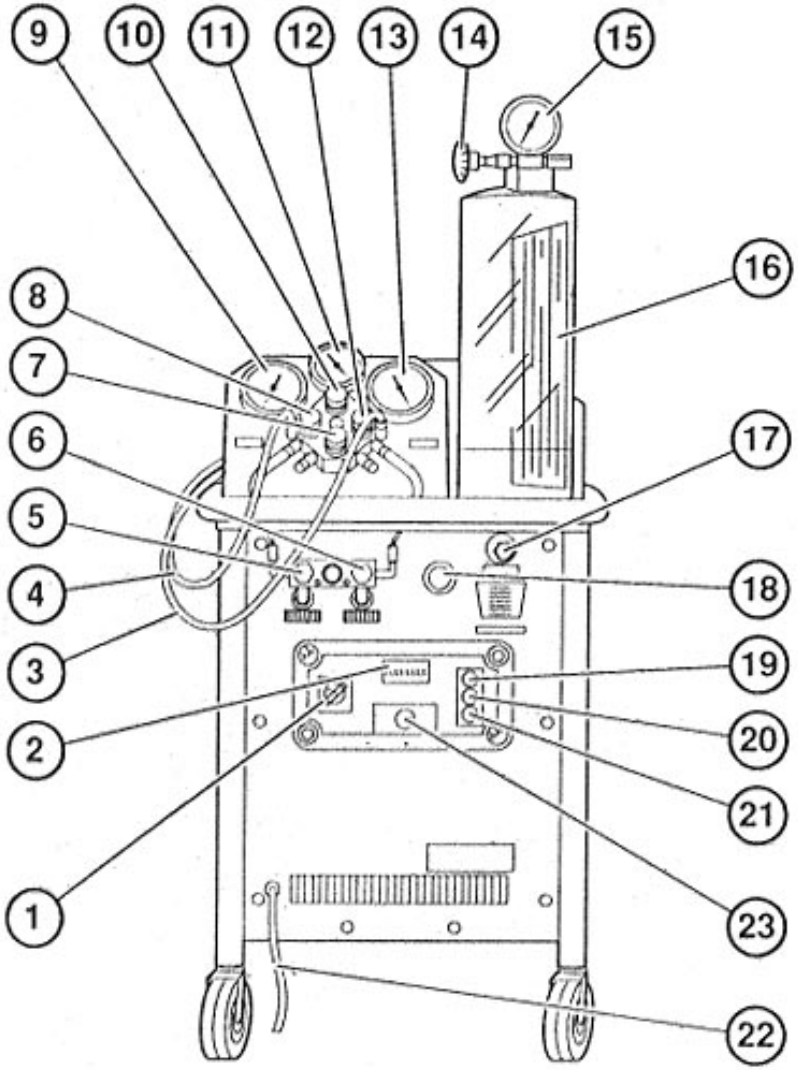
After switching on the air conditioner the refrigerant circuit is activated in that the solenoid clutch receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 6 to 10 grams for R 12 or 10 to 16 grams for R 134 a systems.
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air – respectively circulated air – flowing past the cold evaporator, with blower support, is cooled accordingly and delivered into the passenger compartment via nozzles.
The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.
Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and could cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.
It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that is switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure pressostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure pressostat switches the second stage of an addition fan on at a pressure of about 18 bar.
In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



36 64 002 U

1 Solenoid clutch
2 Compressor
3 Condenser
4 Drier
6 Safety switches (high/low pressure pressostats)
7 Expansion valve
8 Evaporator
9 Temperature switch
10 High pressure gas
11 High pressure liquid
12 Low pressure liquid
13 Low pressure gas



36 64 003

SERVICE STATION (R 12)

1 Main switch
2 Operation hour counter
3 High pressure hose
4 Low pressure hose
5 Refrigerant inlet valve
6 Refrigerant outlet valve
7 Vacuum pump valve
8 Low pressure valve
9 Low pressure gage
10 Vacuum meter valve
11 Vacuum meter
12 High pressure valve
13 High pressure gage
14 Charging cylinder valve
15 Charging cylinder high pressure gage
16 Charging cylinder with scale
17 Refrigerant drain valve
18 Moisture indicator
19 Control lamp - yellow
20 Control lamp - red
21 Control lamp - green
22 Power supply cord
23 Charging cylinder push button switch

64 50 009 DISCHARGING AND CHARGING AIR CONDITIONER

Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant Frigen R 12 or Frigen R 134a gradually as from the beginning of 1991.

Important!
R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

Frigen R 12 is very dangerous for the environment because of fluorchlorhydrocarbons (FCH) and must be drawn out, cleaned and refilled in a system with a service station. Frigen R 134 A does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperature, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. Frigen is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation – especially in working pits – which would not be readily noticed since the gas has no color or odor.
Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant circuit) are required for perfect air conditioner operation.

Frigen R 12 and even more so R 134 A take on moisture very quickly. Plug opened pipes, condenser, evaporator, compressor or drier with plugs immediately.

Important!
Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

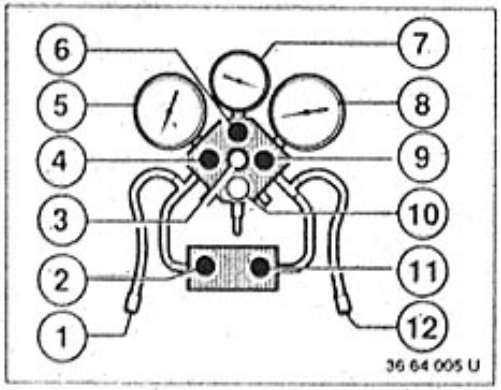
There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated.
In addition, refrigerants decompose at high temperature or when exposed to open flame. Decomposed products are injurious to health.
Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

Important!
After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

The following procedures describe sucking, discharging and charging air conditioners with help of a SECU service station from the company "Behr".
Refer to pertinent operating instructions for changes in the service station design.

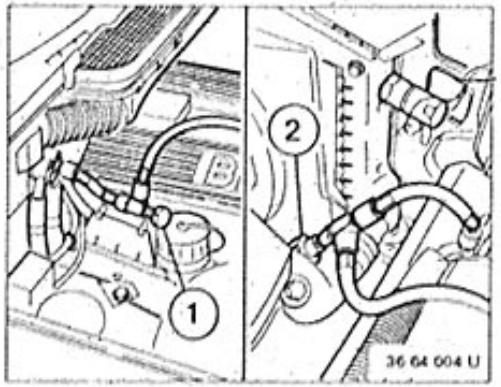
Prior to starting any operation, the service station must be brought into basic setting.
Basic setting means: All shut-off valves of the service station and both hose valves must be closed.

Important!
When using a different service station, refer to the pertinent operating instructions.

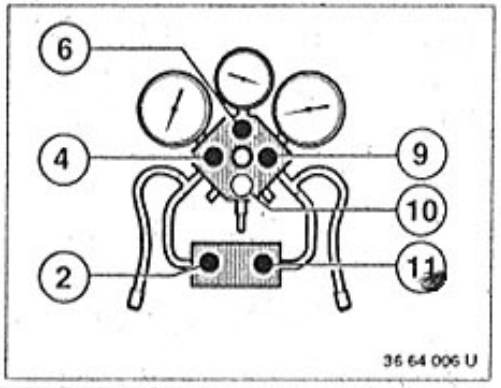


SUCKING REFRIGERANT OUT OF AIR CONDITIONER:

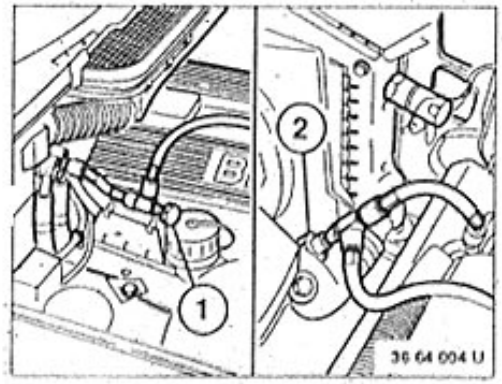
Description of pressure gage assembly
1 Low pressure hose (blue)
2 Refrigerant inlet valve
3 Sight glass
4 Low pressure valve
5 Low pressure gage
6 Vacuum meter valve
7 Vacuum meter
8 High pressure gage
9 High pressure valve
10 Vacuum pump valve
11 Refrigerant outlet valve
12 High pressure hose (red)



Bring service station into basic setting (refer to page 64-50/3).
Connect service station to vehicle.
Connect blue hose to low pressure side (thick pipe).
Connect red hose to high pressure side (thin pipe).



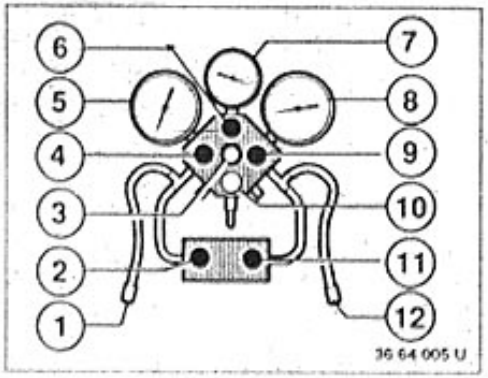
First suck out the service station to ensure that there is no residual refrigerant in the service station.
Open valves (2, 4 and 9) and start the sucking operation.
After the service station has been switched off, write or note the volume of refrigerant in the charging cylinder (information is required for fault finding to evaluate the system).



Open valves (1 and 2) on vehicle.
Operate start button again and suck refrigerant out of the entire system.
The air conditioner system of the vehicle is empty when the service station is again switched off.

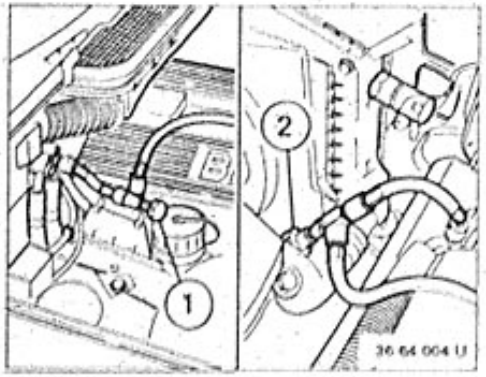
Bring service station into basic setting (refer to page 64-50/3).
Read present volume on the charging cylinder.
Open valve (14) slowly and let about 200 to 300 grams of refrigerant run into the system.
Open valve (17) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.
If there is no more oil in the catch tank, it will close automatically.
Measure amount of drained refrigerant oil.
Suck out system again afterwards and bring into basic setting.

Important!
Never reuse drained refrigerant oil and dispose it as special refuse.

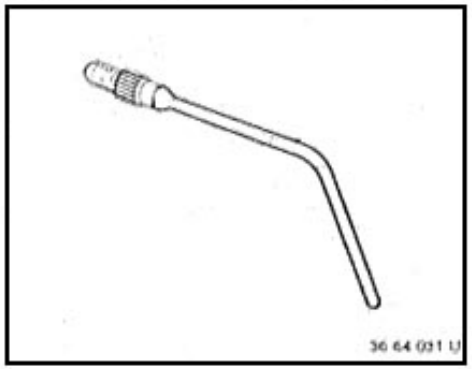


DISCHARGING AIR CONDITIONER:

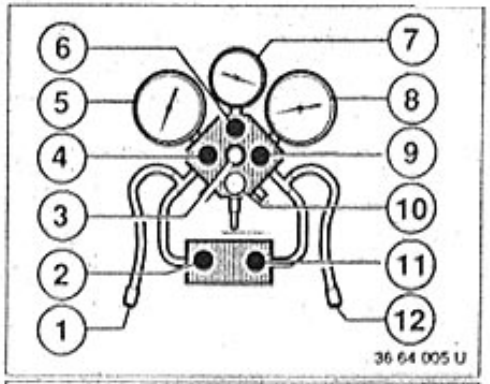
Bring service station into basic setting (refer to page 64-50/3).
Open valves (4, 6, 9 and 10).
Switch on vacuum pump. This only discharges the service station.
Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (7) must then be above or below the zero. This strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The service station has a leak if the zero point is not approximately reached or vacuum is not built up.
Close valve (10) and switch off vacuum pump after reaching maximum vacuum. The service station does not leak if the pressure does not rise after about 1 to 2 minutes.
Afterwards set needle of vacuum meter (7) to zero (with adjusting screw on top of the vacuum meter) and close valve (6).



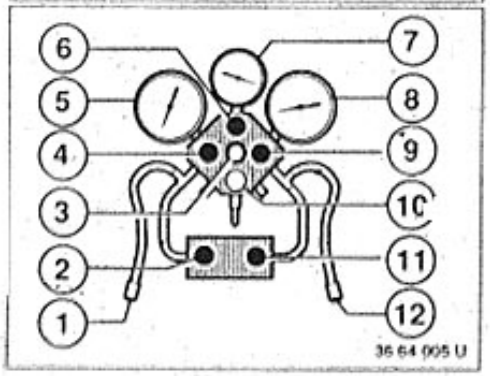
Open valves (1 and 2) slowly.
Then discharge the entire system briefly



Close valve (9) and switch vacuum pump off.
Unscrew high pressure hose from pressure gage assembly and connect to the supplied suction pipe.



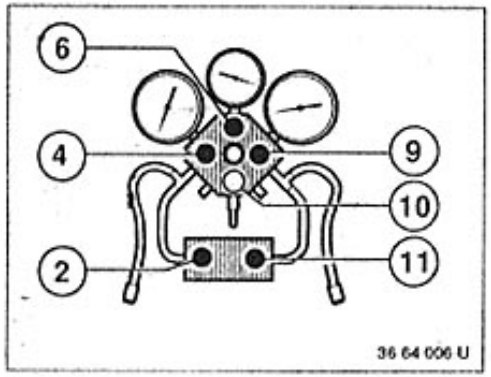
Switch on vacuum pump and using the suction pipe suck the previously measured amount of new refrigerant oil out of the measuring cup into the system. Switch off vacuum pump as soon as the total amount of oil is in the system, in order to avoid sucking in "moist" air. Reconnect high pressure hose to connection (12) and open valve (9). Switch on vacuum pump again and discharge system at least 30 minutes.



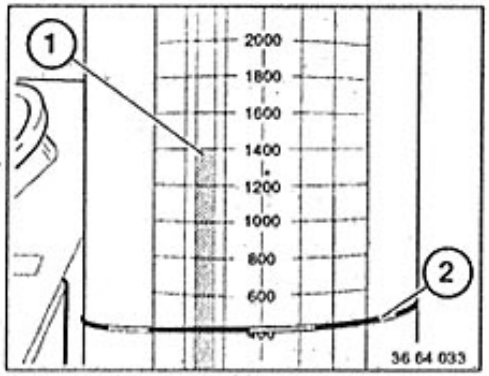
After discharging, close valve (10) and switch off vacuum pump.
There is no longer moisture in the system if the needle of vacuum meter (7) remains at 0 over a period of at least 3 to 5 minutes. However, if the needle rises in small jumps this is indication of water drops which are evaporating and causing the pressure to rise. In such a case discharging must be continued.

CHARGING SYSTEM:

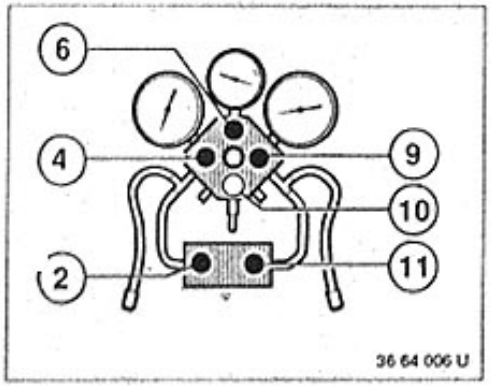
Requirements for correct charging are a sufficient amount of refrigerant and pressure in the charging cylinder of at least 9 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater or cleaning the refrigerant.



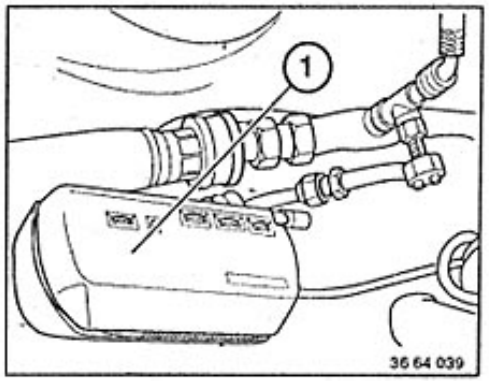
Bring service station into basic setting.
Open valves (4 and 9).
Open valve (11) briefly and close again, so that refrigerant can flow up to the charging hoses.



Read charging cylinder level (1), subtract specified charging volume* from this value and mark new volume level with a rubber band (2).



Open valves (1 and 2) on the charging hoses. Then open valve (11) again and observe the level in the charging cylinder. If there is approximately correct charging volume* in the system, close and open valve (11) in steps until the correct volume is in the system.



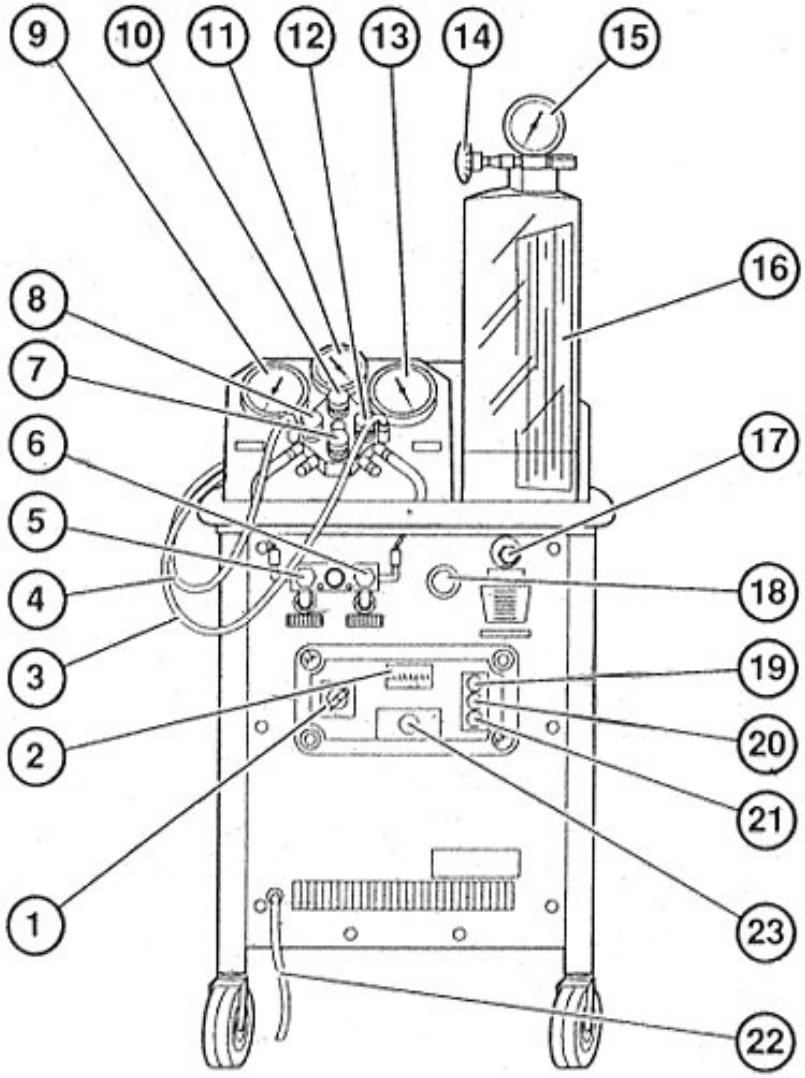
DETECTING LEAKS:

Calibrate leak detector (1)** according to the operating instructions.
Check air conditioner for leaks with leak detector (1).
Tighten loose pipes and eliminate leaks.

Note:
Always check below an assumed point of leakage as refrigerant is heavier than air.
Suck refrigerant oil out of system again after finishing the leak test and eliminating leaks.

* Refer to Specifications

** Refer to Workshop Equipment



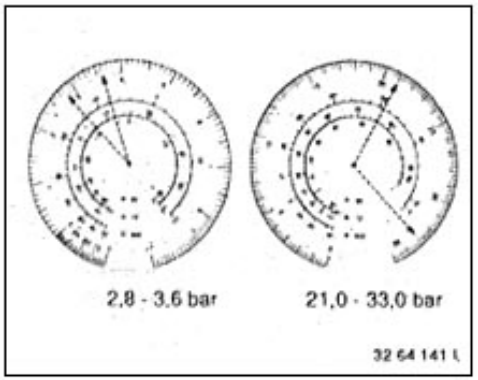
36 64 003

CLEANING REFRIGERANT:

Bring service station into basic setting (refer to page 64-50/3).
Open valve (14) on charging cylinder slightly (1 to 1 and 1/2 turns).
Switch on suction and let cleaning run at least ten minutes.
Close valve (14) and wait until the compressor is automatically switched off.
In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (18) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows.

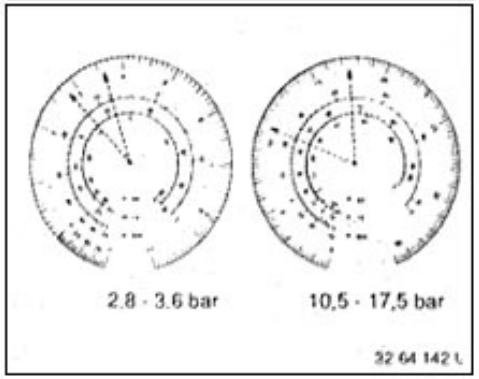
1. Insufficient/excessive pressure in intake of the compressor. This is applicable, if the charging cylinder valve is opened too little or too much.
2. Excessive pressure (> 17 bar) in charging cylinder. This means non-condensable gas in the circuit. In this case close valve (14) and discharge the non-condensable gas via the Schrader valve on the charging cylinder or wait until refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on suction until there is no longer refrigerant in the service station and the compressor is switched off automatically.



TROUBLESHOOTING BY MEASURING PRESSURE:

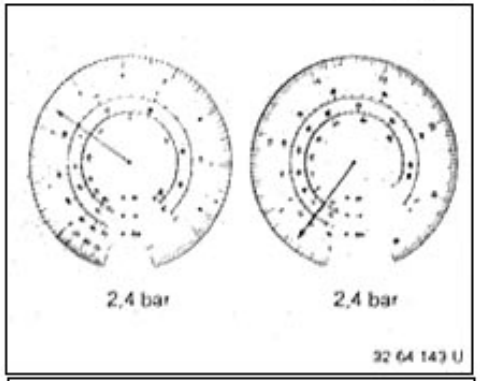
High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

Remedy:
Suck out refrigerant, discharge and recharge system, clean condenser and check additional fan, replacing if necessary.



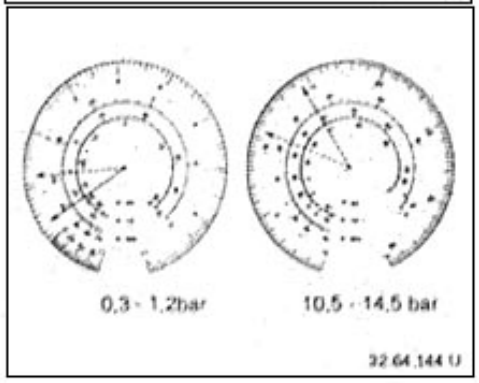
High inlet pressure and normal outlet pressure indicate a defective compressor.

Remedy:
Replace compressor.



Compressor does not run with equal inlet and outlet pressures.

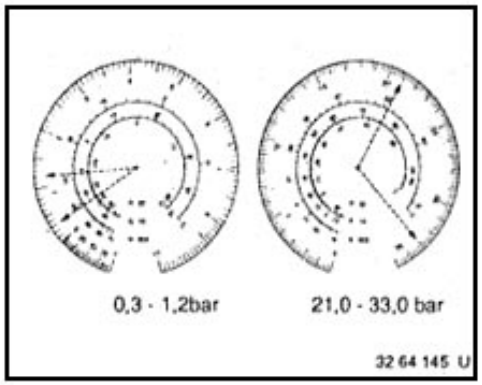
Remedy:
If icing-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64).
Otherwise check magnetic coupling mechanically (slips).



Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

Remedy:
1. Check whether evaporator has ice; then check evaporator sensor.
2. Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume*, check flow of expansion valve; then discharge and recharge system.

Refer to Specifications



Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

Remedy:
Check condenser, drier and expansion valve.

AIR CONDITIONING EFFICIENCY TEST

Several conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature approx. 50° C

Ref. Point 1:

Connect Modic or BMW Service Tester to vehicle and have the evaporator temperature displayed.

Ref. Point 2:

Install a thermometer approx. 5 cm below the vehicle's roof liner at B-pillar height and place the display unit facing out.

Ref. Point 3:

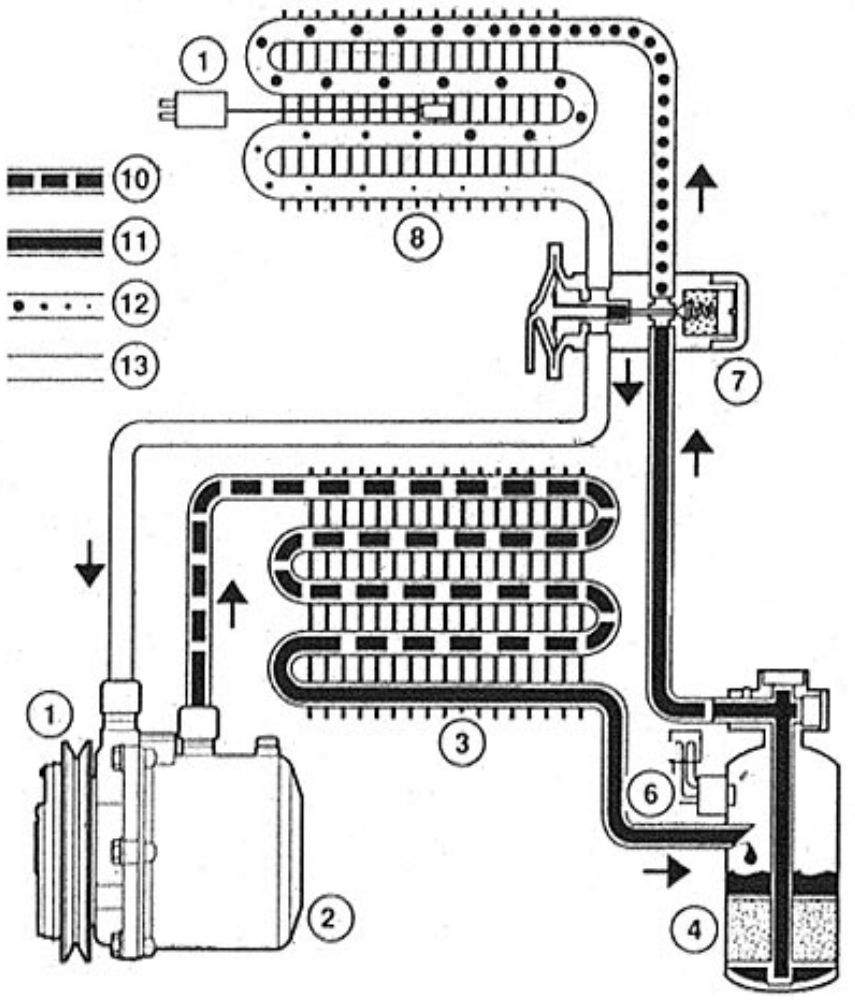
Set the heater to maximum heating. Switch the air conditioner on and set it to recirculated air mode. Set vehicle blower to stage 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2000 rpm.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Evaporator and passenger compartment temperature will now be measured and subtracted from each other. There should be a difference of approximately 40° C.
If this difference in temperature is not reached, the Service Station must be connected and the intake pressure measured. If the intake pressure is less than 1.5 bar, proceed as described for measuring pressure with excessively low intake pressure.

DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION

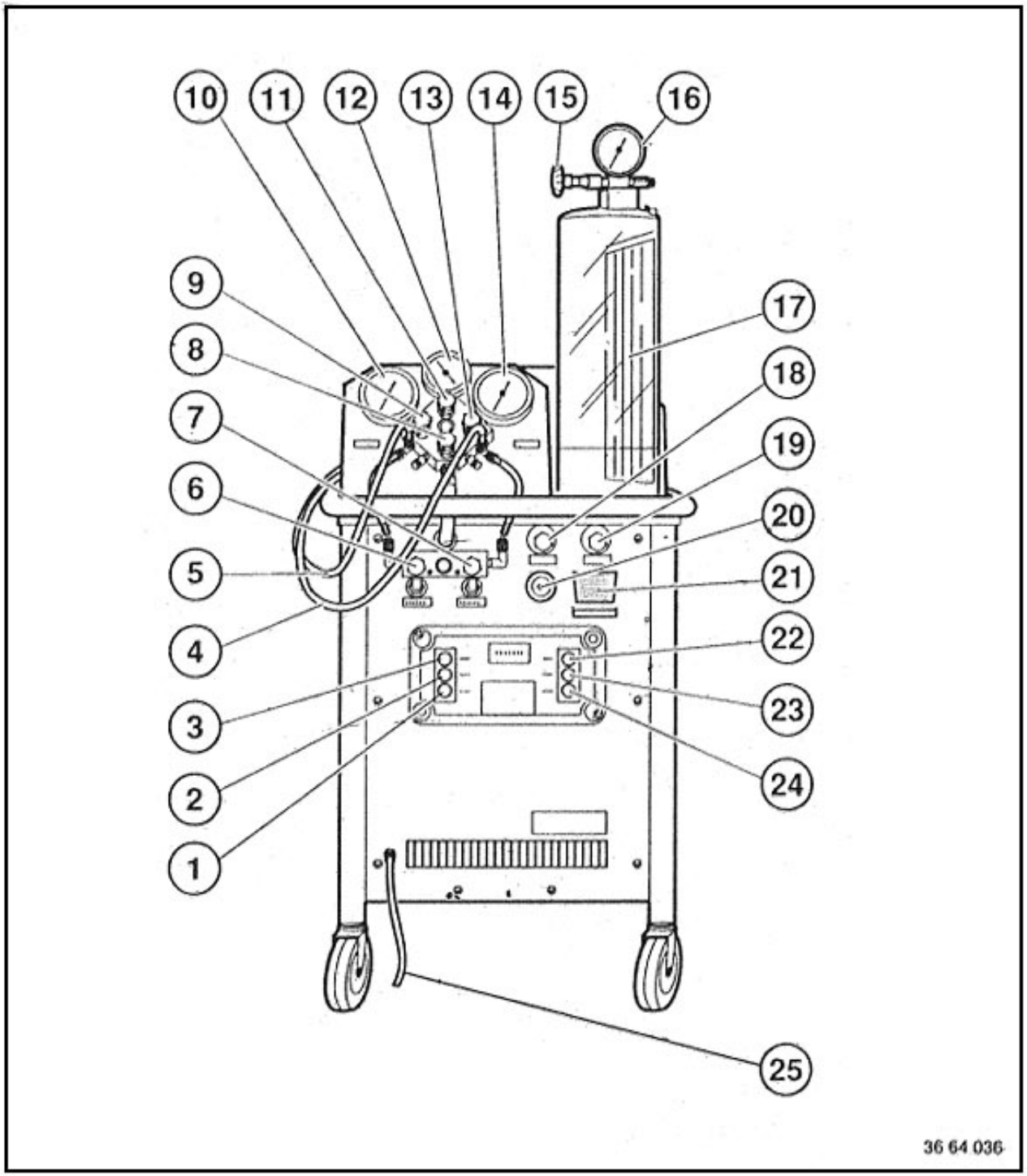
After switching on the air conditioner the refrigerant circuit is activated in that the magnetic coupling receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 6 to 10 grams in R 12 systems or 10 to 15 grams in R 134a systems.
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air – respectively circulated air – flowing past the cold evaporator, with blower support, is cooled accordingly and delivered into the passenger compartment via nozzles.
The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.
Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and could cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.
It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that it switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure pressostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure pressostat switches the second stage of an additional fan on at a pressure of about 18 bar.
In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



36 64 002 U

1 Magnetic coupling
2 Compressor
3 Condenser
4 Drier
6 Safety switches (high and low pressure pressostats)
7 Expansion valve
8 Evaporator
9 Temperature switch
10 High pressure gas
11 High pressure liquid
12 Low pressure liquid
13 Low pressure gas



SERVICE STATION (SECU 134)

1 Main switch
2 SUCKING/CLEANING switch
3 SUCKING end control lamp
4 High pressure hose
5 Low pressure hose
6 Refrigerant inlet valve
7 Refrigerant outlet valve
8 Vacuum pump valve
9 Low pressure valve
10 Low pressure gage
11 Vacuum meter valve
12 Vacuum meter
13 High pressure valve
14 High pressure gage
15 Charging cylinder valve
16 Charging cylinder high pressure gage
17 Charging cylinder with scale
18 Refrigerant oil filler valve
19 Refrigerant oil drain valve
20 Moisture indicator
21 Measuring cup
22 VACUUM PUMP switch
23 Red control lamp
24 HEATER switch
25 Power cord

64 50 009 DISCHARGING AND CHARGING AIR CONDITIONER

Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant Frigen R 12 or Frigen R 134a gradually as from the beginning of 1991.

Important!
R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

Frigen R 12 is very dangerous for the environment because of fluorchlorhydrocarbons (FCH) and must be drawn out, cleaned and refilled in a system with a service station. Frigen R 134 A does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperature, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. Frigen is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation – especially in working pits – which would not be readily noticed since the gas has no color or odor.
Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant circuit) are required for perfect air conditioner operation.

Frigen R 12 and even more so R 134 A take on moisture very quickly. Plug opened pipes, condenser, evaporator, compressor or drier with plugs immediately.

Important!
Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

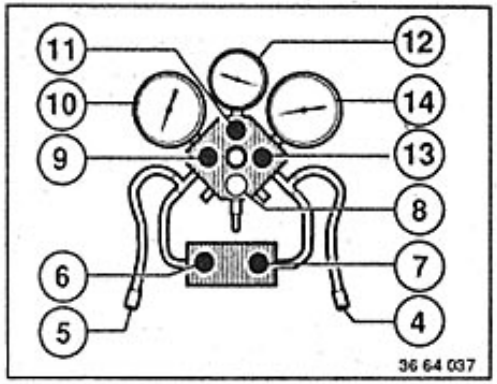
There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated.
In addition, refrigerants decompose at high temperature or when exposed to open flame. Decomposed products are injurious to health.
Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

Important!
After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

The following procedures describe sucking, discharging and charging air conditioners with help of a SECU 134 service station from the company "Behr".
Refer to pertinent operating instructions for changes in the service station design.

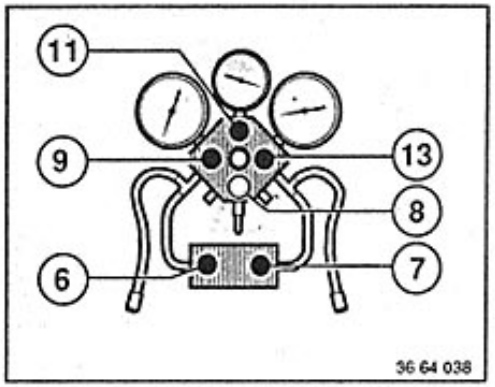
Prior to starting any operation, the service station must be brought into basic setting.
Basic setting means: All shut-off valves of the service station and both hose valves must be closed.

Important!
When using a different service station, refer to the pertinent operating instructions.

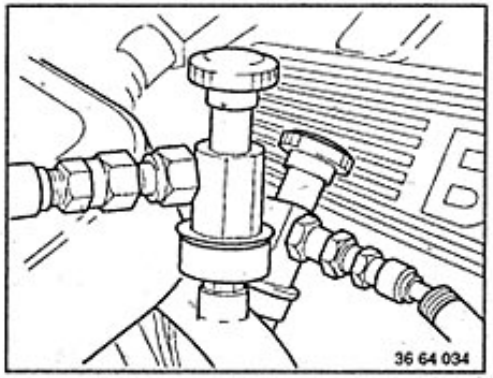


SUCKING REFRIGERANT OUT OF AIR CONDITIONER:

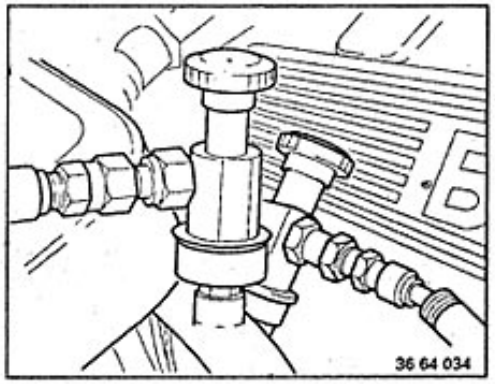
Description of pressure gage assembly
4 High pressure hose (red)
5 Low pressure hose (blue)
6 Refrigerant inlet valve
7 Refrigerant outlet valve
8 Vacuum pump valve
9 Low pressure valve
10 Low pressure gage
11 Vacuum meter valve
12 Vacuum meter
13 High pressure valve
14 High pressure gage



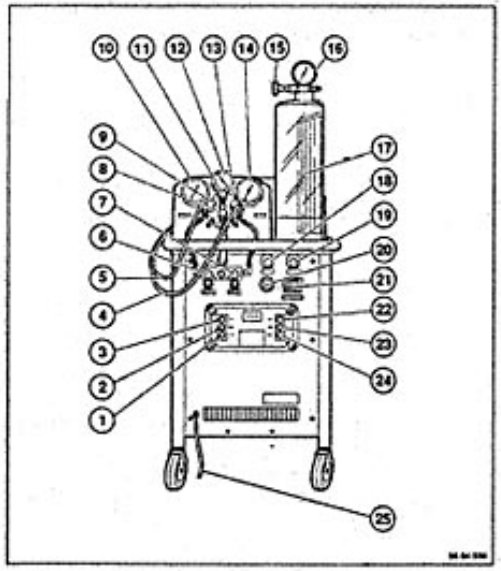
First suck out the service station to ensure that there is no residual refrigerant in the service station.
Open valves (6, 9 and 13) and start the sucking operation.
After the service station has been switched off, write or note the volume of refrigerant in the charging cylinder (information is required for fault finding to evaluate the system).



Open valves at the quick-action couplings.
Operate start button again and suck refrigerant out of the entire system.
The air conditioner system of the vehicle is empty when the service station is again switched off.

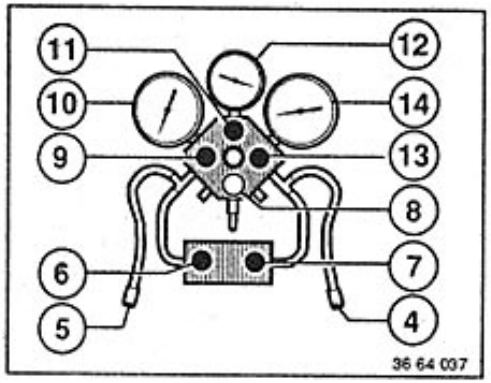


Bring service station into basic setting (refer to page 64-50/12).
Connect service station to vehicle.
Connect blue hose to low pressure side (thick pipe).
Connect red hose to high pressure side (thin pipe).
The quick-action coupling are different in diameter to avoid mixing them up.



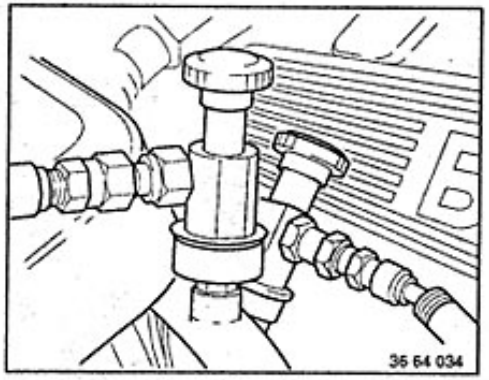
Bring service station into basic setting (refer to page 64-50/12).
Read present volume on the charging cylinder.
Open valve (15) slowly and let about 200 to 300 grams of refrigerant run into the system.
Open valve (19) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.
If there is no more oil in the catch tank, it will close automatically.
Measure amount of drained refrigerant oil.
Suck out system again afterwards and bring into basic setting.

Important!
Never reuse drained refrigerant oil and dispose it as special refuse.
After discharging the system must again be filled with the same amount of new refrigerant oil plus 10 cm^3.

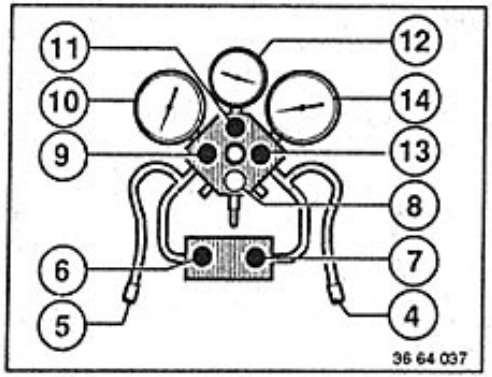


DISCHARGING AIR CONDITIONER:

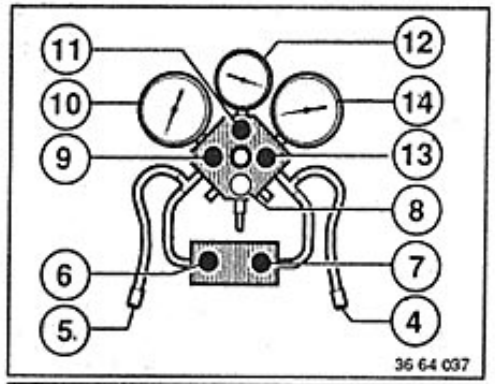
Bring service station into basic setting (refer to page 64-50/12).
Open valves (8, 9, 11 and 13).
Switch on vacuum pump. This only discharges the service station.
Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (12) must then be above or below the zero. This strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The service station has a leak if the zero point is not approximately reached or vacuum is not built up.
Close valve (8) and switch off vacuum pump after reaching maximum vacuum. The service station does not leak if the pressure does not rise after about 1 to 2 minutes.
Afterwards set needle of vacuum meter (12) to zero (with adjusting screw on top of the vacuum meter) and close valve (11).



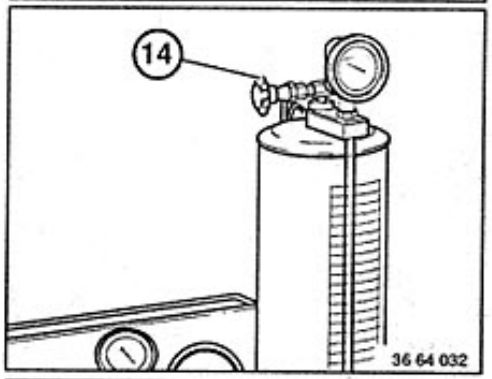
Open the valves slowly.
Then discharge the entire system briefly.



Open valve (11) if low pressure gage (12) is at 0 bar.

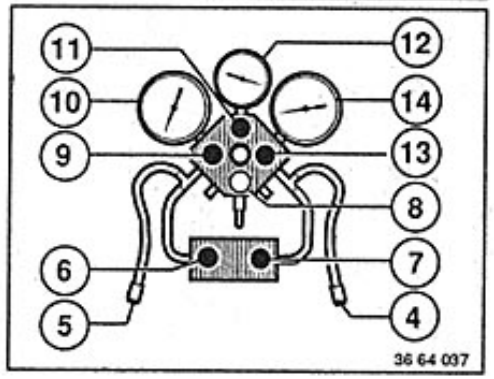


Switch on vacuum pump and using the suction pipe suck the previously measured amount of new refrigerant oil out of the measuring cup into the system. Switch off vacuum pump as soon as the total amount of oil is in the system, in order to avoid sucking in "moist" air. Reconnect high pressure hose to connection (4) and open valve (13). Switch on vacuum pump again and discharge system at least 30 minutes.



The previously sucked out refrigerant can be cleaned simultaneously to the discharging process.
This requires opening valve (14) slightly (1 to 1 1/2 turns) and switching on suction.

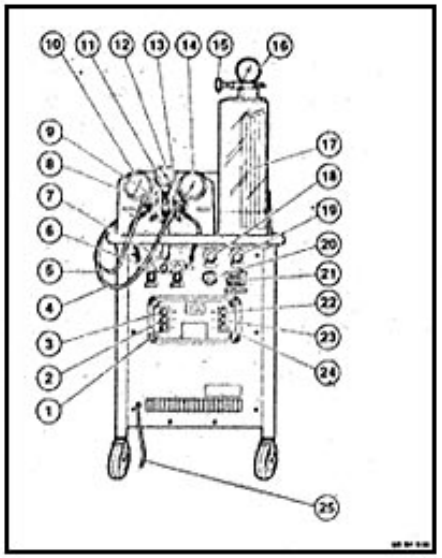
Important!
Stop the cleaning process after about 10 to 15 minutes. Discharging still runs.



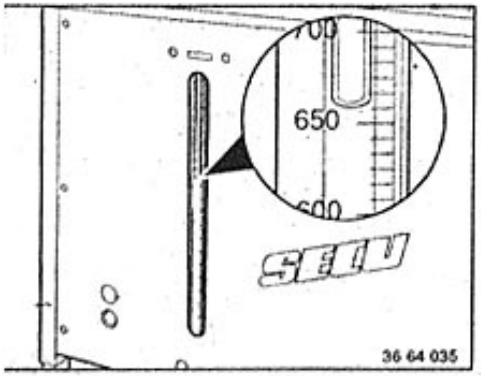
After discharging, close valve (8) and switch off vacuum pump.
There is no longer moisture in the system if the needle of vacuum meter (12) remains at 0 over a period of at least 3 to 5 minutes. However, if the needle rises in small jumps this is indication of water drops which are evaporating and causing the pressure to rise. In such a case discharging must be continued.

CHARGING SYSTEM:

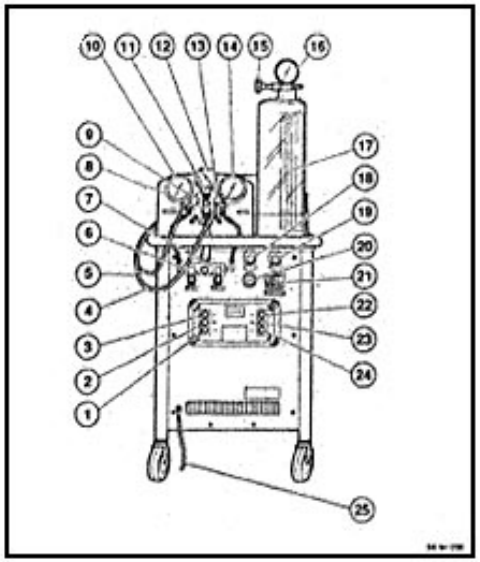
Requirements for correct charging are a sufficient amount of refrigerant and pressure in the charging cylinder of at least 9 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater or cleaning the refrigerant.



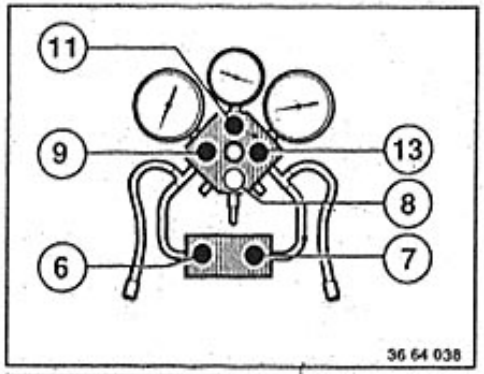
Before charging the system it will be necessary to replace the amount of oil taken out by sucking the refrigerant out.
Bring service station into basic setting for this purpose (refer to page 64-50/12).
Open valve (15) on the charging cylinder slowly until the white control lamp (3) goes out.



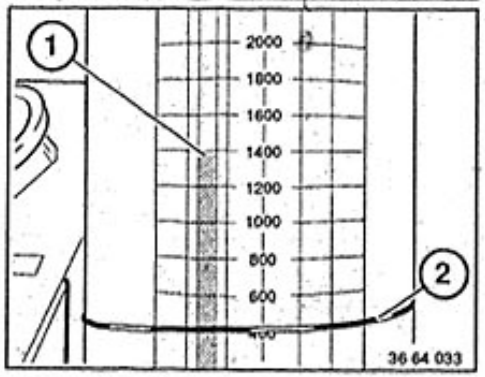
Open the valves on the charging hoses.
Read the amount of oil from the scale of the oil reservoir.



Open and close valve (18) carefully several times until there is the same amount of oil in the system plus 10 cm3.
Observe the scale while charging.

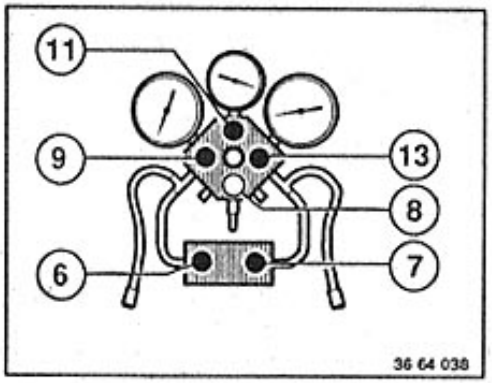


Bring service station into basic setting (refer to page 64-50/12).
Open valves (9 and 13).
Open valve (7) briefly and close again, so that refrigerant can flow up to the charging hoses.

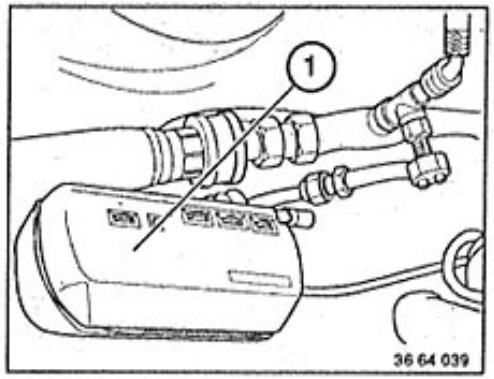


Read charging cylinder level (1), subtract specified charging volume* from this value and mark new volume level with a rubber band (2).

* Refer to Specifications



Open the valves on the charging hoses.
Then open valve (7) again and observe the level in the charging cylinder.
If there is approximately correct charging volume* in the system, close and open valve (7) in steps until the correct volume is in the system.



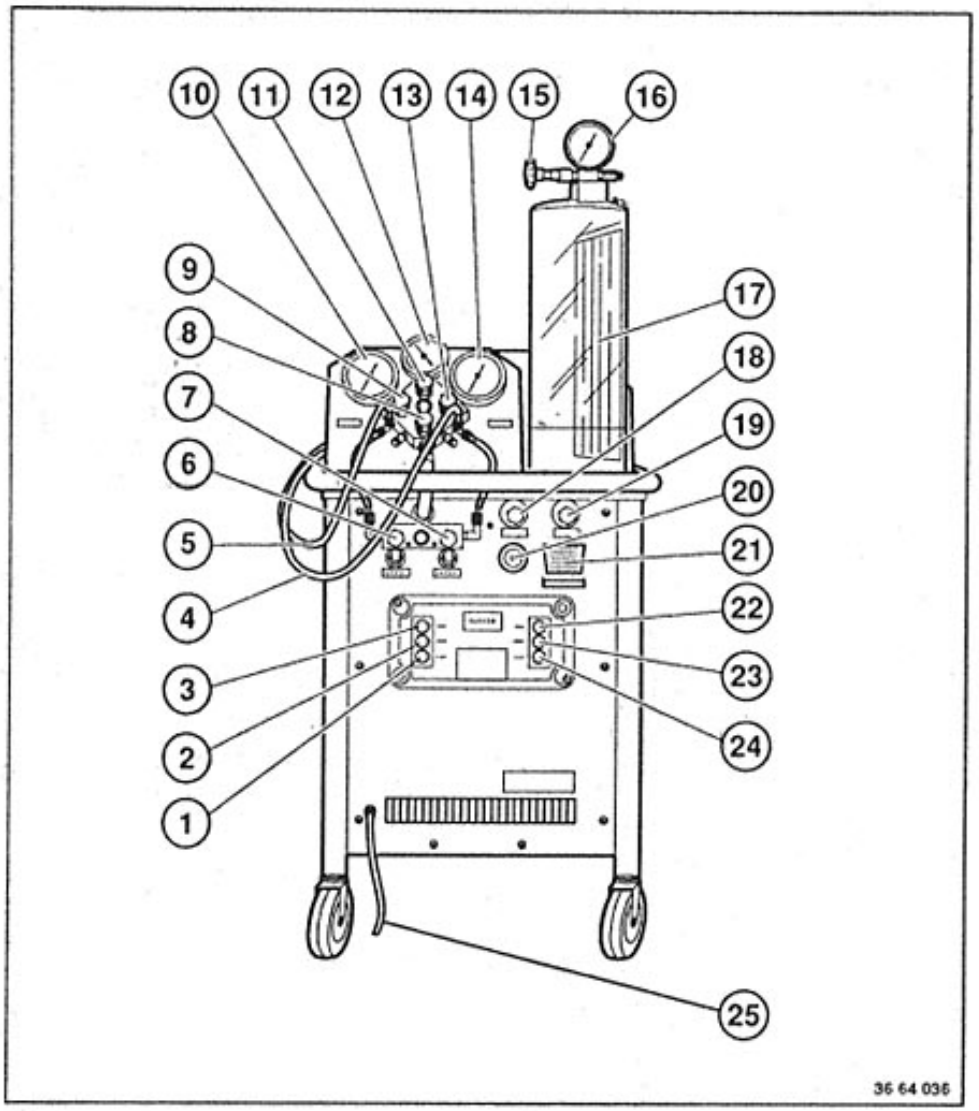
DETECTING LEAKS:

Calibrate leak detector (1)** according to the operating instructions.
Check air conditioner for leaks with leak detector (1).
Tighten loose pipes and eliminate leaks.

Note:
Always check below an assumed point of leakage as refrigerant is heavier than air.
Suck refrigerant oil out of system again after finishing the leak test and eliminating leaks.

* Refer to Specifications

** Refer to Workshop Equipment

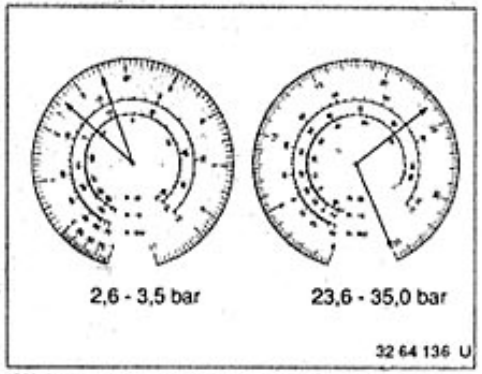


CLEANING REFRIGERANT:

Bring service station into basic setting (refer to page 64-50/12).
Open valve (15) on charging cylinder slightly (1 to 1 and 1/2 turns).
Switch on suction (2) and let cleaning run at least ten minutes.
Close valve (15) and wait until control lamp (3) lights up the compressor is automatically switched off.
In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (20) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows.

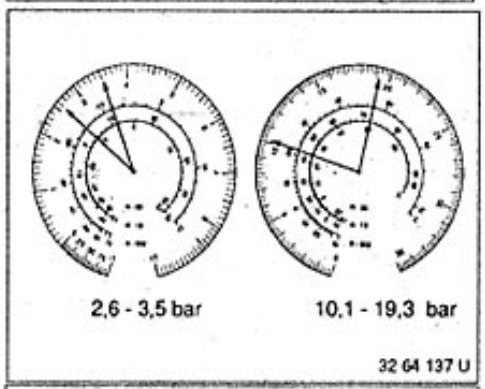
1. Insufficient/excessive pressure in intake of the compressor. This is applicable, if the charging cylinder valve is opened too little or too much.
2. Excessive pressure (> 17 bar) in charging cylinder. This means non-condensable gas in the circuit. In this case close valve (15) and discharge the non-condensable gas via the Schrader valve on the charging cylinder or wait until refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on suction until there is no longer refrigerant in the service station and the compressor is switched off automatically.



TROUBLESHOOTING BY MEASURING PRESSURE:

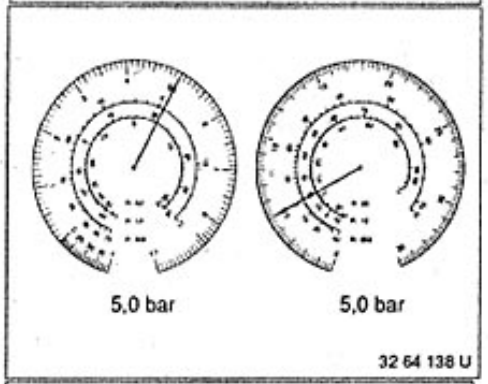
High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

Remedy:
Suck out refrigerant, discharge and recharge system, clean condenser and check additional fan, replacing if necessary.



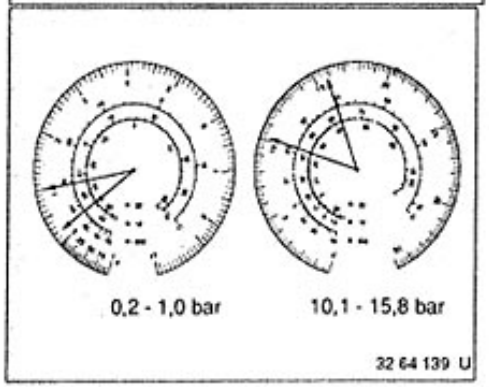
High inlet pressure and normal outlet pressure indicate a defective compressor.

Remedy:
Replace compressor.



Compressor does not run with equal inlet and outlet pressures.

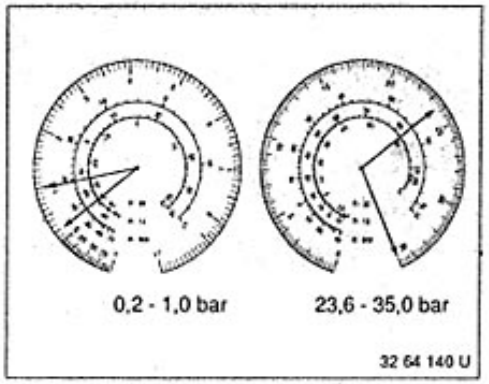
Remedy:
If icing-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64).
Otherwise check magnetic coupling mechanically (slips).



Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

Remedy:
1. **Check whether evaporator has ice; then check evaporator sensor.**
2. **Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume*, check flow of expansion valve; then discharge and recharge system.**

* **Refer to Specifications**



Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

Remedy:
Check condenser, drier and expansion valve.

AIR CONDITIONING EFFICIENCY TEST

Several conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature approx. 50° C

Ref. Point 1:

Connect Modic or BMW Service Tester to vehicle and have the evaporator temperature displayed.

Ref. Point 2:

Install a thermometer approx. 5 cm below the vehicle's roof liner at B-pillar height and place the display unit facing out.

Ref. Point 3:

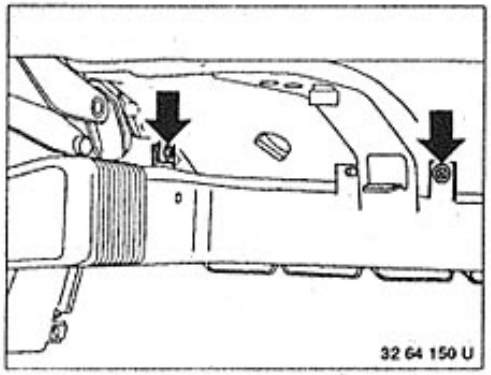
Set the heater to maximum heating. Switch the air conditioner on and set it to recirculated air mode. Set vehicle blower to stage 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2000 rpm.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Evaporator and passenger compartment temperature will now be measured and subtracted from each other. There should be a difference of approximately 40° C.
If this difference in temperature is not reached, the Service Station must be connected and the intake pressure measured. If the intake pressure is less than 1.5 bar, proceed as described for measuring pressure with excessively low intake pressure.

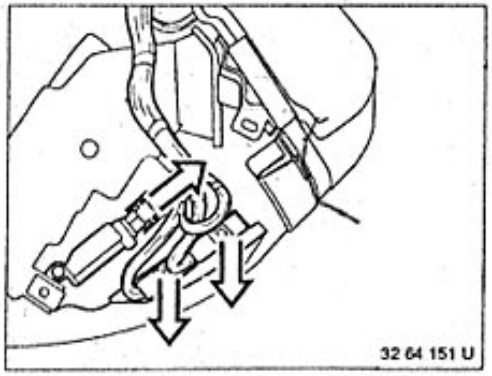
64 51 000 CLEANING EVAPORATOR

It could happen that bacteria settle on the fins of the evaporator. This is caused by the condensation water which collects on the fins after switching the compressor off. There could temporarily be an unpleasant odor in the car when the compressor is switched on again. Consequently the evaporator should be cleaned at regular intervals.

Note:
It is recoomended to drive the car to a washbay and do the cleaning there, as the water will run out through the drain holes in the transmission tunnel.

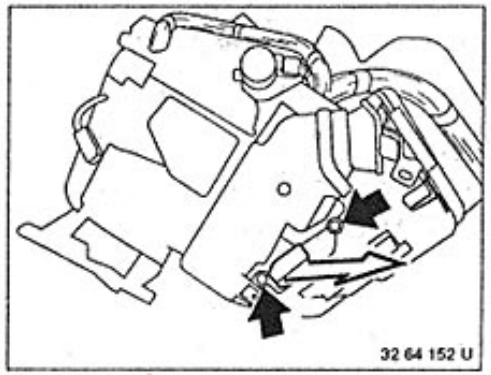


Remove the glovebox - refer to Group 51.
Unscrew screws and fold the air duct down.



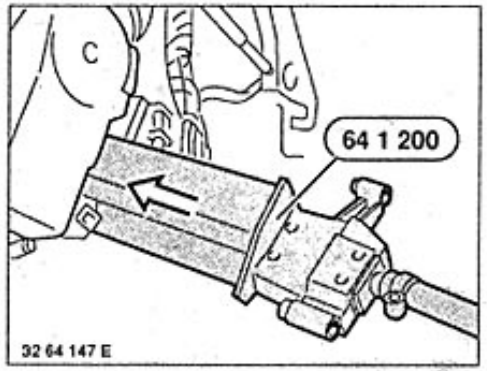
Disconnect wires from the control unit and final stage.

Norte:
The heater remains installed and was only removed in this picture for better understanding.

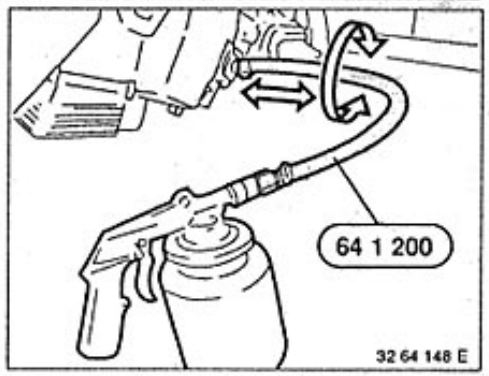


Unscrew screws and pull the final stage out.

Important!
Cars with Microfilter:
Unscrew cover, pull the microfilter out and reinstall the cover.



Slide Special Tool 64 1 200 into the final stage opening and secure.

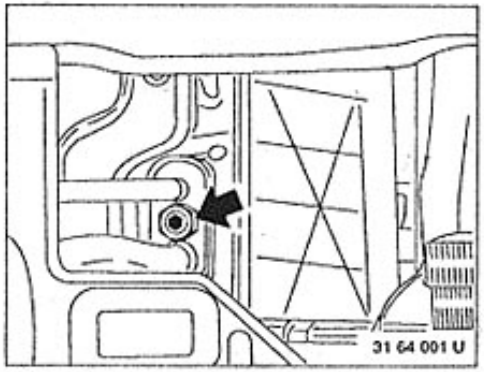


Apply about 1 liter of 5 per cent cleaning solution* onto the evaporator by moving the spray nozzle pipe back and forth uniformly.
Leave the cleaning solution on the evaporator for about 10 to 15 minutes.
Afterwards rinse off the evaporator with a large amount of water (at least 6 liters of water).

* Refer to Service Information

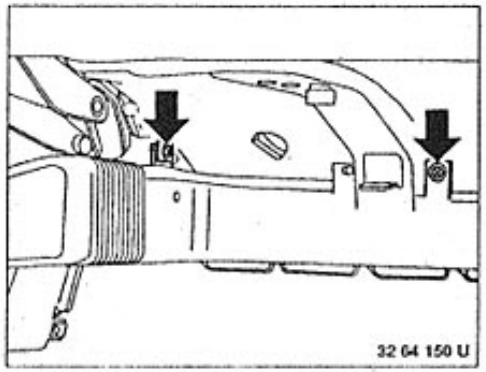
64 51 510 REMOVING AND INSTALLING EVAPORATOR

Suck the refrigerant out of the air conditioner with help of a service station (refer to 64 50 009 or the operating instructions supplied with pertinent service station).
Remove wiper console - refer to Group 61.

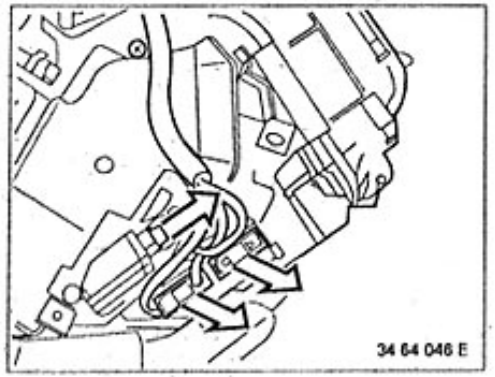


Unscrew nut.

Installation:
Replace O-rings.
Tightening torque*.

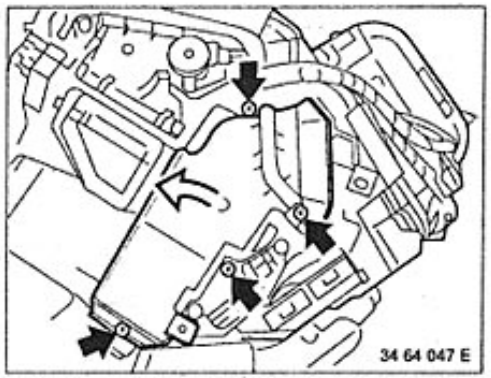


Remove the glovebox - refer to Group 51.
Unscrew screws and remove the air duct.

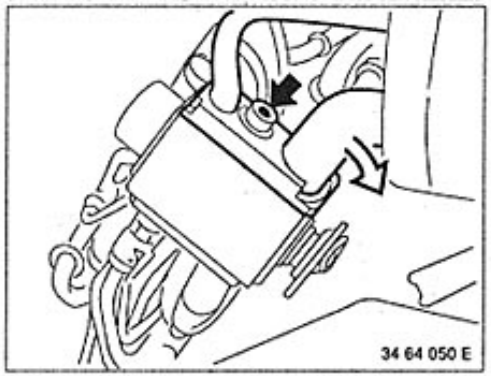


Pull all plugs off of the control unit and final stage and lay the wire harness on top.

* Refer to Specifications

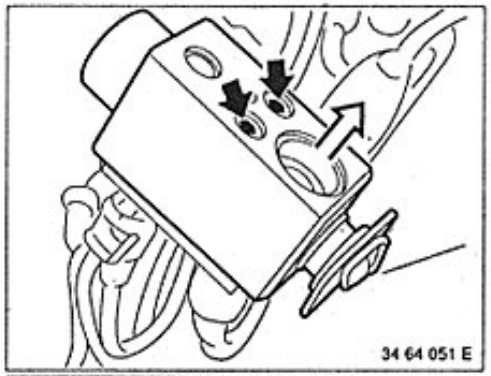


Unscrew screws and lift cover out.



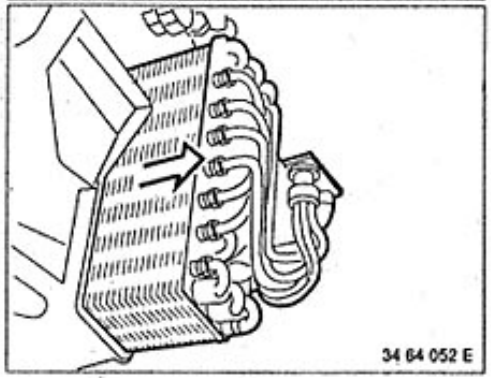
Unscrew screw and remove the double-pipe.

Installation:
Replace the O-rings.

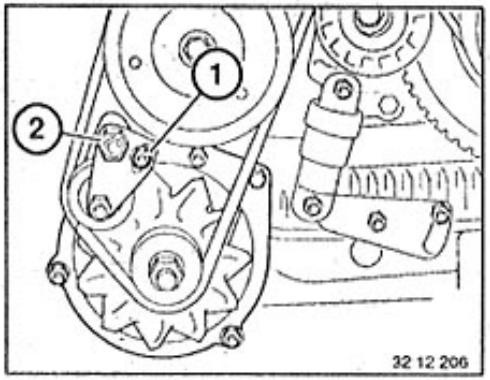


Unscrew screws and remove the expansion valve.

Installation:
Replace the O-rings.

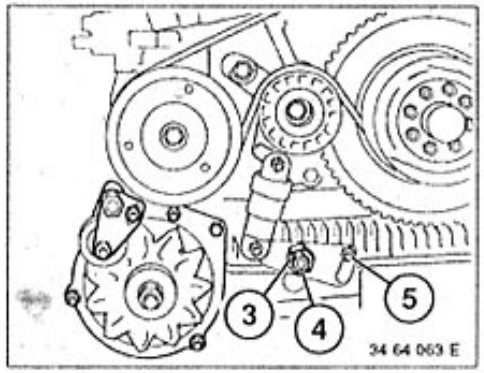


Pull the evaporator out.

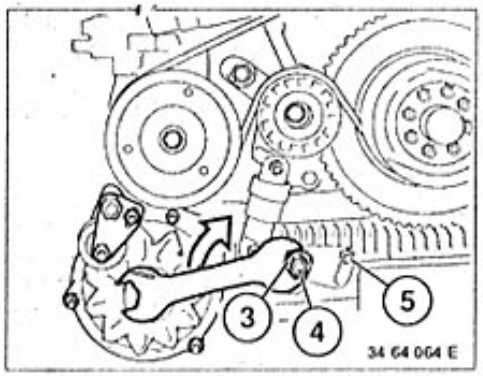


64 52 020 REPLACING AC COMPRESSOR

Remove engine splash guard.
If applicable, loosen nut (1) and bolt (2) and take the ribbed drive belt off of the additional alternator.

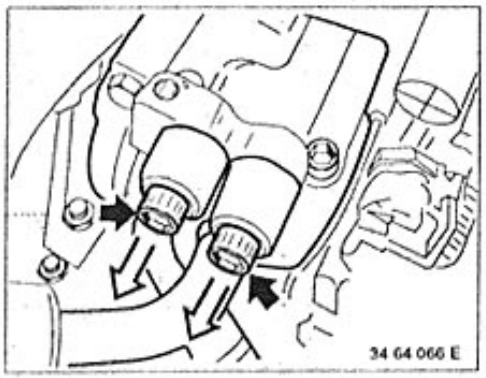


Loosen nuts (4 and 5) on the tensioning roller and take the ribbed drive belt off of the compressor.



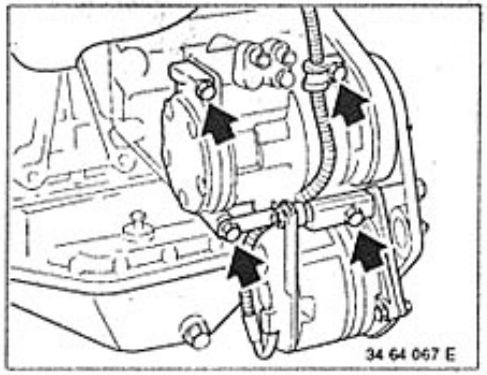
Installation:
Turn the tensioning roller on hexagon (3) as far as stop, then tighten nut (5) first and finally nut (4).

Tightening torque = 24 Nm.

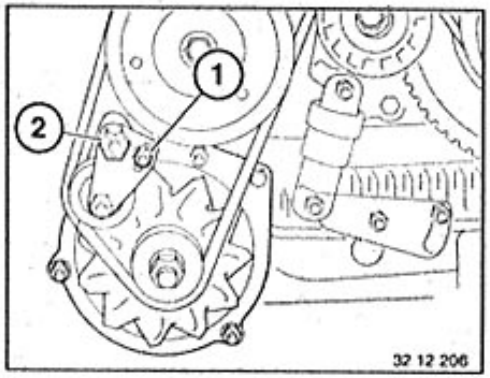


Unscrew couplings and remove intake and pressure pipes.

Installation:
Replace O-rings.

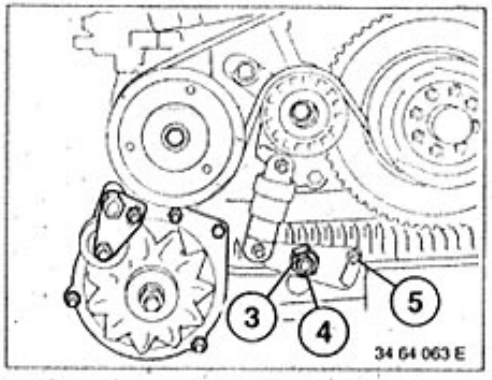


Unscrew bolts.
Disconnect plug.
Lift compressor out downwards.

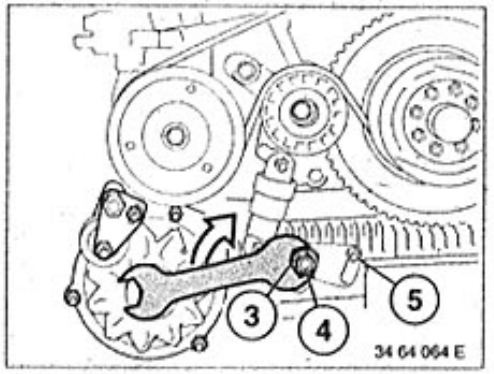


64 52 061 Replacing compressor coupling

Remove underbody protection from engine.
If necessary, unfasten nut (1) and screw (2) and remove Vee belt from auxiliary alternator.

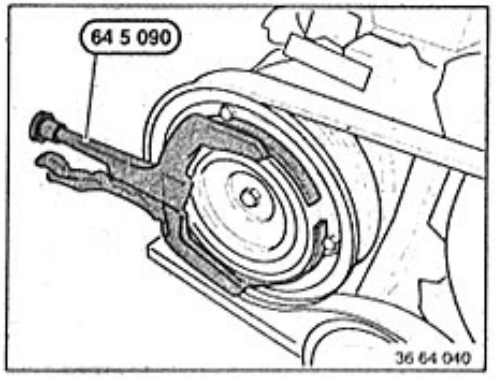


Loosen nuts (4 and 5) on tensioning roller and remove Vee belt from compressor.

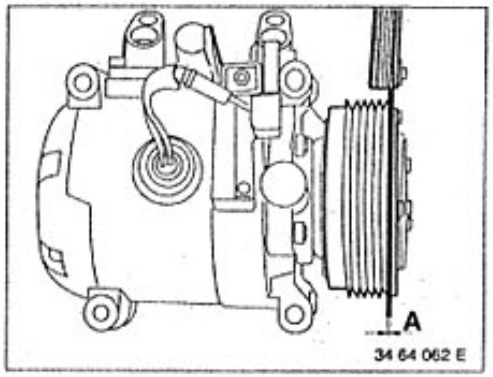


Installation:
Rotate tensioning roller on hex head (3) to limit position, then tighten nut (5) followed by nut (4).

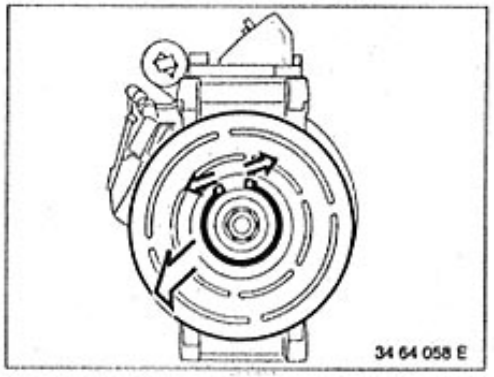
Tightening torque = 24 Nm



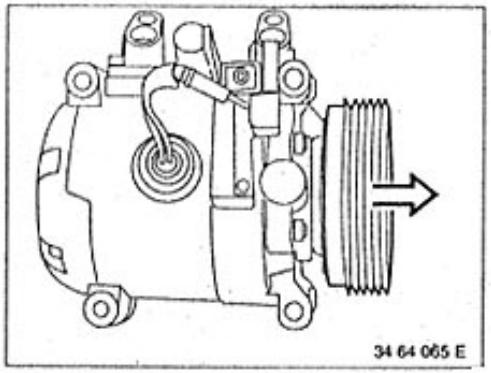
Grip drive plate with special tool 64 5 090, unfasten screw (1) and remove drive plate.



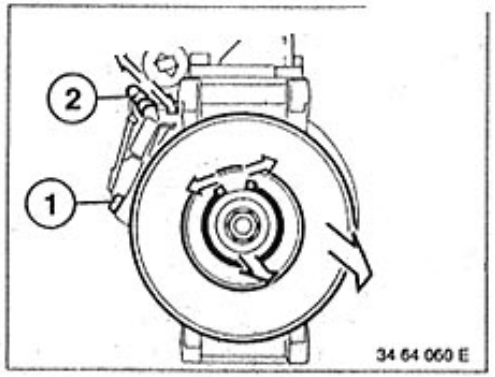
Installation:
Check that clearance between drive plate and pulley is correct: A (0.5 . . . 0.8 mm). If necessary, adjust using shims.



Prise open retaining ring and remove



Remove pulley.

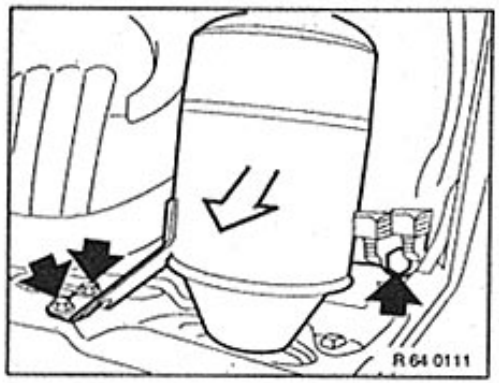


Prise open retaining ring and remove.
Unfasten screw (1), disconnect plug connection (2) and remove magnetic coil.

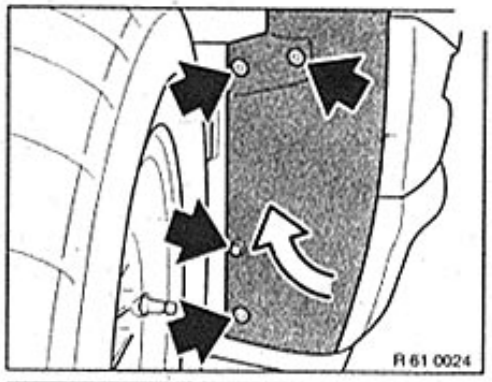
64 53 510 Removing and installing / replacing drier flask for air conditioner

Note:
Provided that the air conditioner is operational and does not leak, there is no need to replace the drier flask at regular service intervals.
The drier flask must always be replaced without fail if

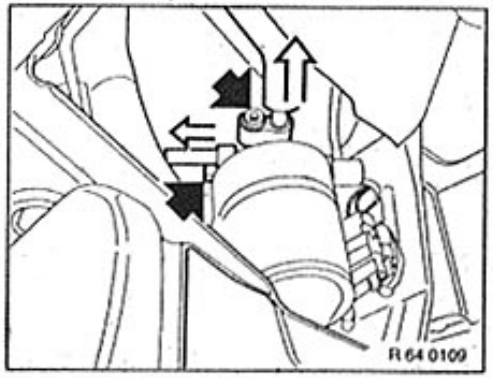
- there is any dirt in the refrigerant circuit (e.g. compressor seized),
- if system leaks and there is no refrigerant left in the circuit,
- the refrigerant circuit was open for longer than 24 hours during a repair job.



Unfasten screws and remove drier flask.

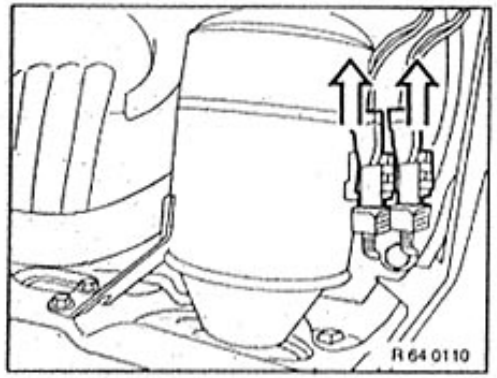


Air conditioner drained,
refer to 64 50 009
Remove right front wheel. Unfasten screws on front right wheel arch trim and remove trim panel.



Unfasten screws and remove lines.

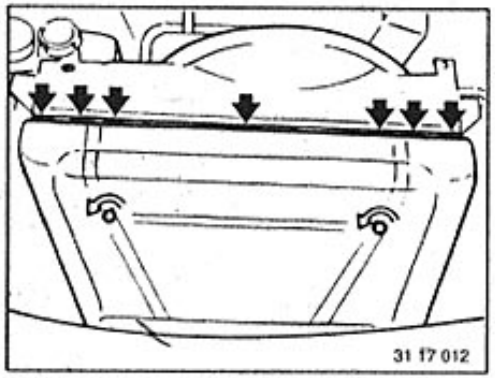
Installation:
Replace O-rings.



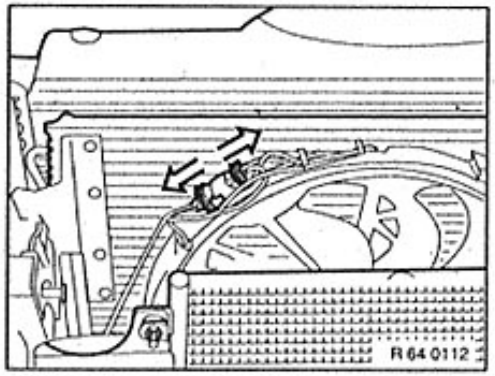
Remove connector.

64 53 550 Removing and installing / replacing air conditioner condenser

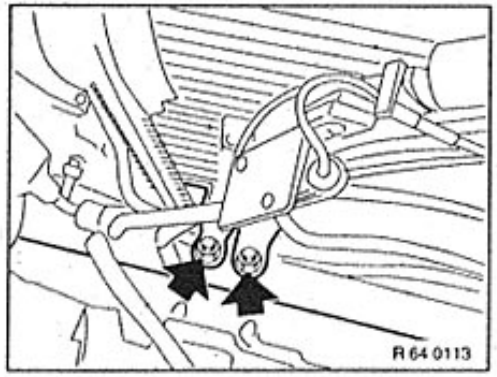
Air conditioner drained,
refer to 64 50 009
Completely remove both pop-up headlights,
refer to 63 12 090



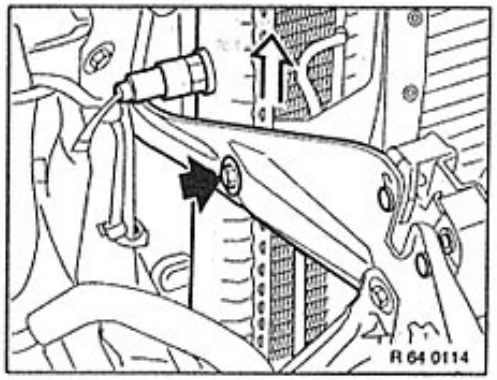
Remove complete air guide.



Disconnect plug connection.



Unfasten screws and remove lines.
Installation:
Replace O-rings.



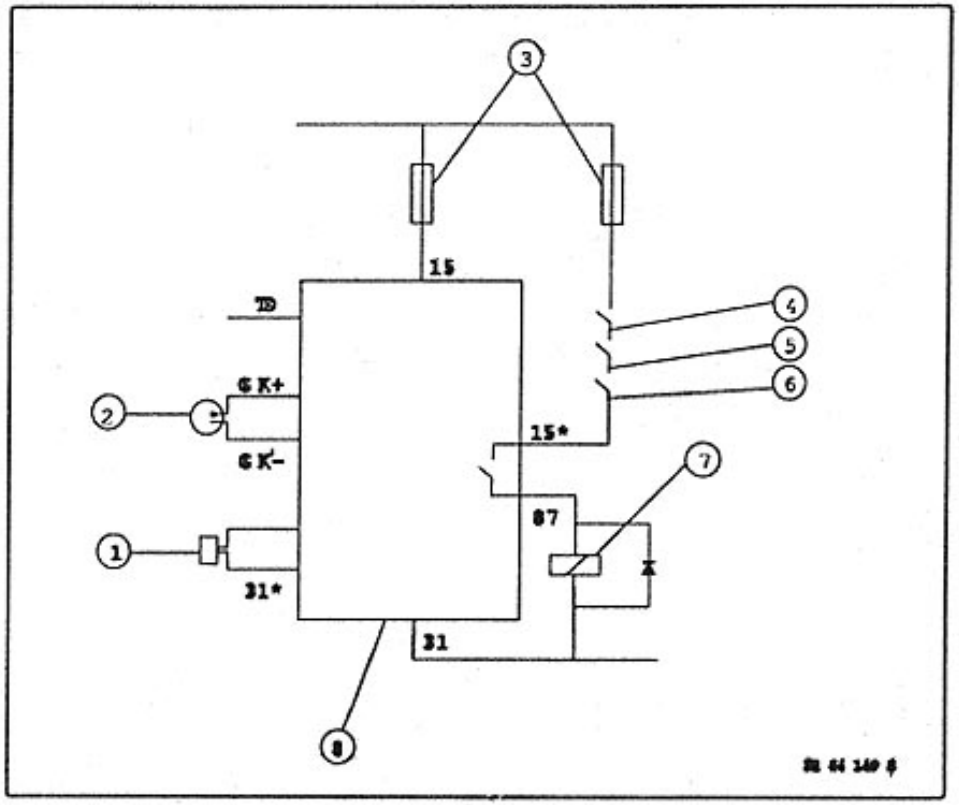
Unfasten screws left and right on condenser and pull out upwards condenser.

OPERATION OF LOCK SENSOR

The lock sensor consists of a control unit and speed sensor (lock sensor) on the AC compressor.
This lock sensor is installed only in models with the M 70 engine (750, 850) because the AC compressor and water pump are driven by the same ribbed drive belt.
If the ribbed drive belt tears or jumps off of the pulley when the compressor locks, the engine cooling system would also fail. This is prevented by the electronics of the lock sensor control unit. It continuously monitors engine speed and compressor speed and immediately switches the magnetic clutch of the compressor off when there is more than 30 % slip. This control unit also monitors coolant temperature and at first times the compressor in case of overheating and switches it off later if the temperature rises further.
After starting the engine and exceeding an engine speed of 600 rpm for the first time the control unit is activated, the compressor is switched on, engine speed is continuously compared with compressor speed and coolant temperature is measured. If during a measuring period of 200 milliseconds slip is recognized once at high speed or slip is recognized three times at low speed, the compressor will be switched off.

Important!
The compressor can only be switched on again if the engine is started again. In case of fault and when a mechanical defect of the compressor cannot be found, check whether brief slip has occurred while driving through a puddle (wet ribbed drive belt).

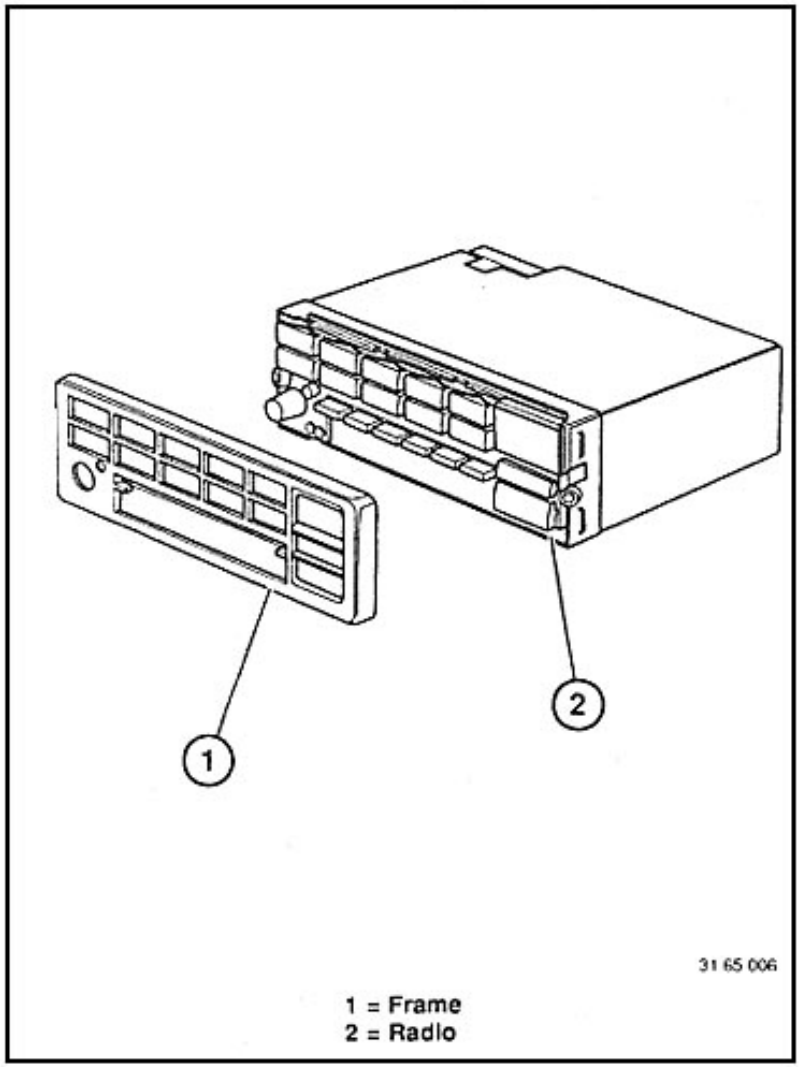
Monitoring of the coolant temperature takes place parallel to monitoring of slip. If the coolant temperature exceeds the 117° C mark with rising tendency, the compressor will be timed, i.e. the magnetic clutch of the compressor will be switched off for 20 seconds every 40 seconds. If this measure causes the coolant temperature to drop below 114° C, the compressor will again be switched on continuously. However, if it rises again to 120° C, the compressor will be switched off until it is below the 114° C mark.



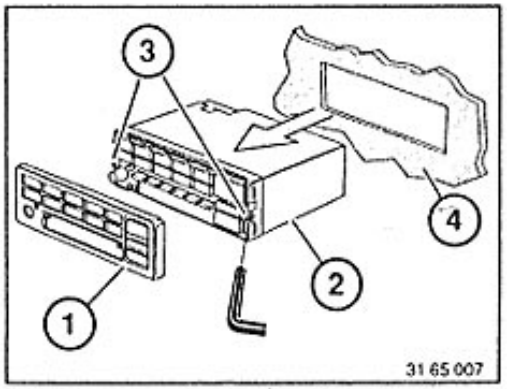
65 Radio and special equipment

65 11 030	Radio (business) – remove and install or replace	65- 11/1
030	Radio (Bavaria C II or C Reverse II)	65- 11/2
65 12 000	Loudspeaker, front, left or right – remove and install or replace	65- 12/1
020	Loudspeaker, rear, left or right – remove and install or replace	65- 12/1
65 13 050	Loudspeaker in front door, left or right – remove and install or replace	65- 13/1
	Bavaria C Professional radio – troubleshoot	65- 99/1
	Connecting wires – check	65- 99/1
	Plug pin connections	65- 99/2
	Fault survey	65- 99/3
	Fault 01	65- 99/4
	Fault 02	65- 99/5
	Fault 03	65- 99/6
	Fault 04	65- 99/7
	Fault 06	65- 99/8
	Fault 07	65- 99/8
	Fault 08	65- 99/9
	Fault 09	65- 99/10
	Fault 10	65- 99/11

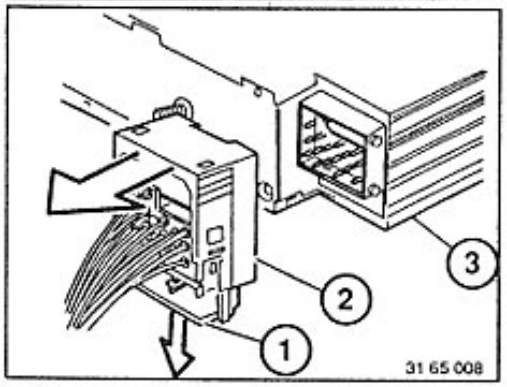
65 11 030 REMOVING AND INSTALLING OR REPLACING RADIO (BUSINESS)



1 = Frame
2 = Radio

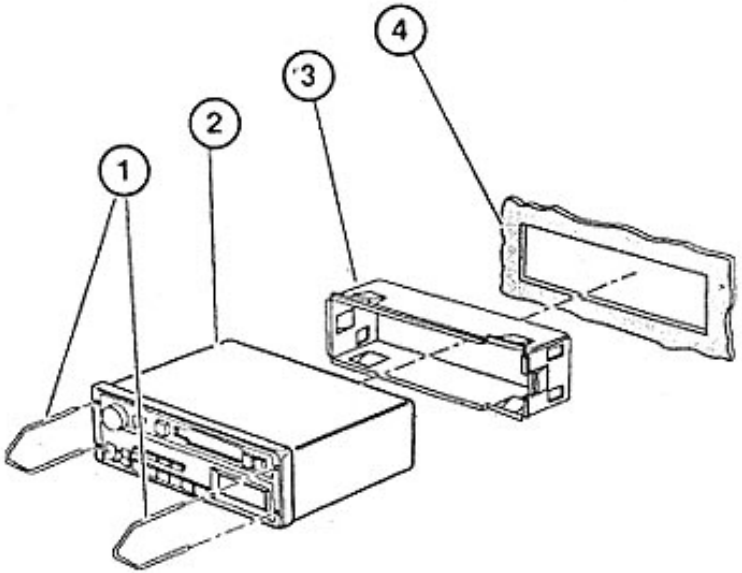


Pull off frame (1).
Unscrew screws (3) on left and right sides.
Pull radio (2) out of radio opening.



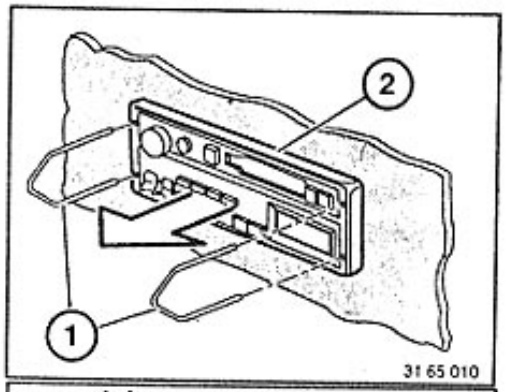
Pull out retainer (1) and disconnect plug (2) on radio (3).

65 11 030 RADIO (BAVARIA C II OR C REVERSE II)



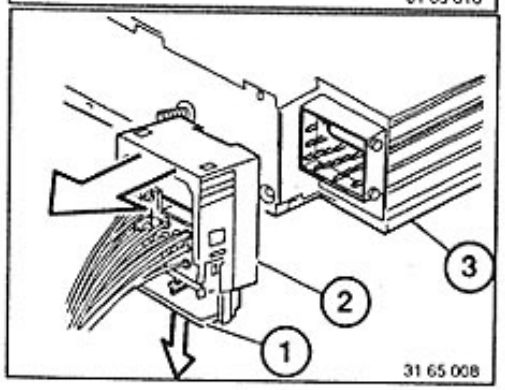
1 = Unlocking hook
2 = Radio
3 = Radio carrier
4 = Radio opening

31 65 009



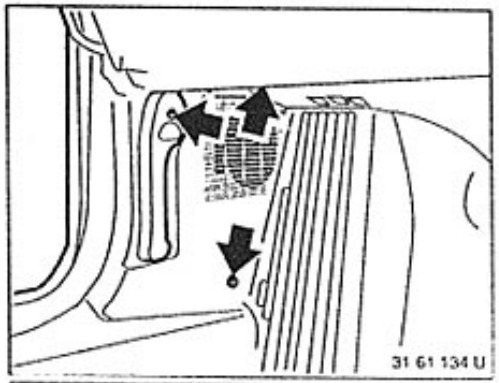
31 65 010

Press unlocking hook (1) into radio on left and right sides.
Pull out radio carefully with the hooks.



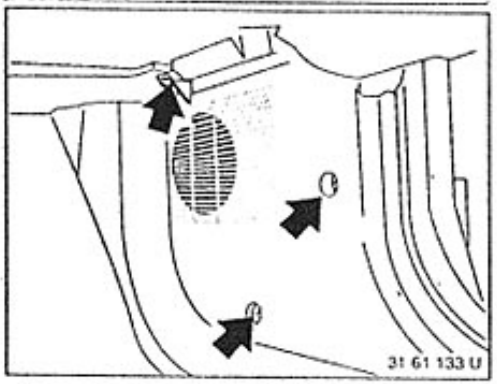
31 65 008

Pull out retainer (1) and disconnect plug (2) on radio (3).

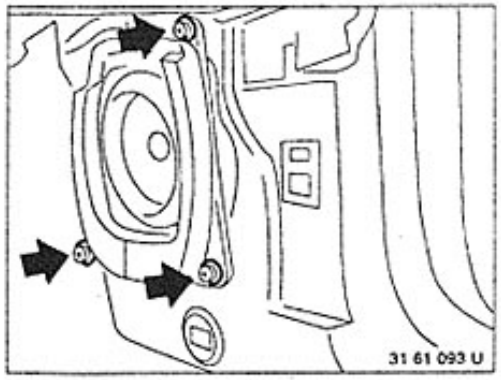


65 12 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT FRONT RADIO LOUDSPEAKER

(Left)
Unscrew engine hood release lever.
Unscrew screws and lift off A-pillar plate.



(Right)
Unscrew screws and lift off A-pillar plate.



Unscrew screws, pull off electric wires and take out loudspeaker.

65 12 020 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT REAR RADIO LOUDSPEAKER

Unclip loudspeaker frame on hatrack and unscrew screw.
Remove wheel house trim panel in trunk and resonance box with wires.
Unscrew screws and take out loudspeaker.

65 13 050 REMOVING AND INSTALLING OR REPLACING RADIO LOUDSPEAKER IN LEFT OR RIGHT FRONT DOOR

Remove door trim panel – see Gr. 51.
Unscrew screws, pull off electric wires and take out loudspeaker.

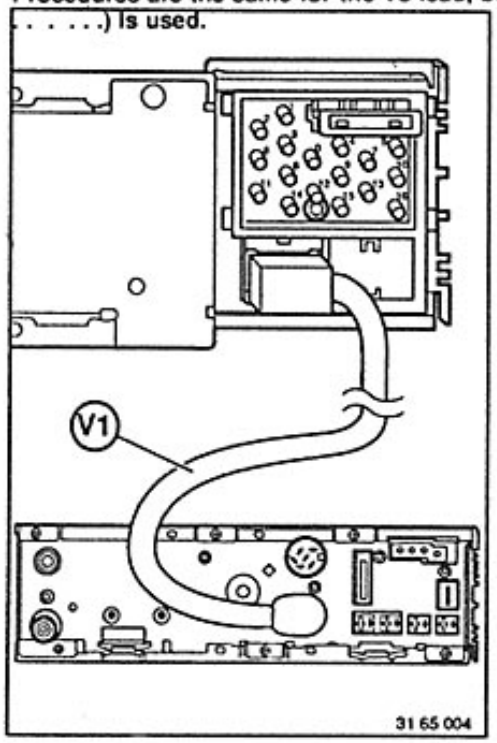
TROUBLESHOOTING BAVARIA C PROFESSIONAL RADIOS

Bavaria C4 is available in two versions, either with or without a CD player. Control panel and radio of both versions are separated from each other. The control panel is installed in the dashboard as always, while the radio itself and as applicable a CD player are located in the trunk. This makes it necessary to have a connecting lead between the control panel and radio or CD player, which in the course of troubleshooting is referred to as V1 (without CD player) or V2 (with CD player).
Leads V1 and V2 differ only in length, because connecting lead V2 leads from the control panel to the CD player first and from there with V3 to the radio.

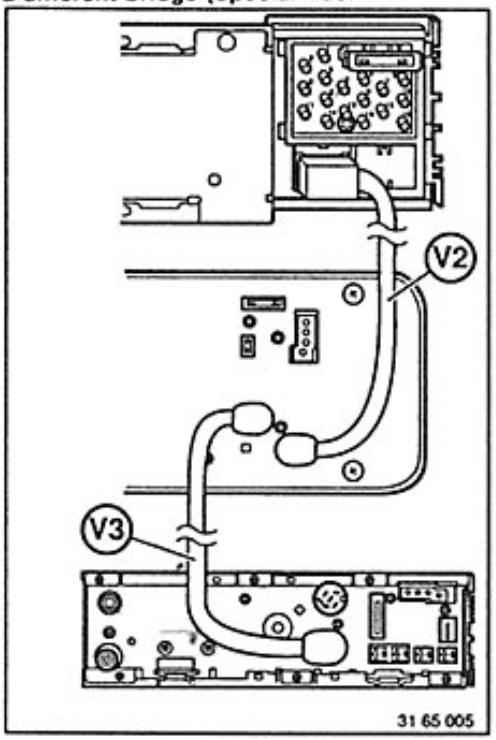
Checking Connecting Leads

Connecting leads are tested for breaks and short circuits.
Procedures:
Unplug connecting lead on both ends.
Install a bridge (Special Tool . . . . . .) on the 12-pin Elo plug for the control panel in the case of the V1 or V2 lead. Measure continuity between the different pins on the other end with a multimeter and test points. Remove bridge. Now there should not be continuity between the pins.

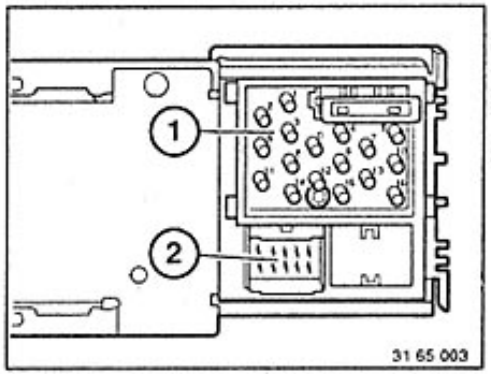
Procedures are the same for the V3 lead, but a different bridge (Special Tool . . . . . .) is used.



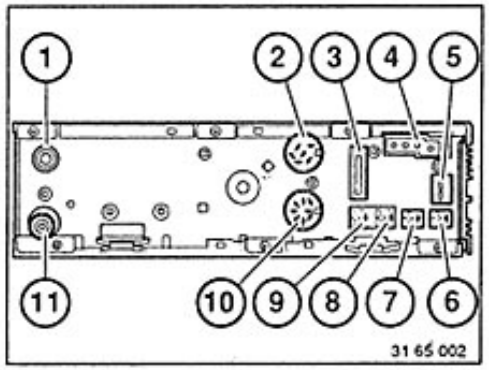
Wire Routing Without CD Player



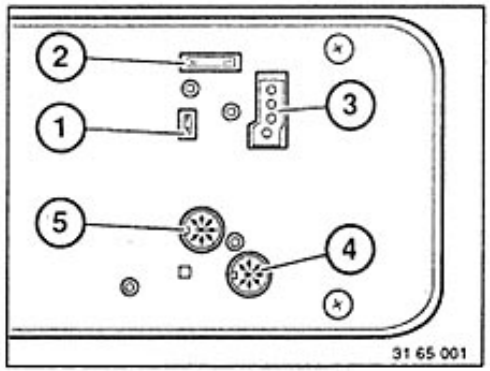
Wire Routing With CD Player



Control Panel Connections:
1 17-pin plug (power supply)
2 10-pin plug (to radio with V1 lead or to CD player with V2 lead)
3 Fuse - 3 amps



Radio Connections:
1 Ant. div.
2 Remote control
3 Fuse - 5 amps
4 4-pin plug (power supply)
5 1-pin plug (electric antenna)
6 Loudspeaker front left
7 Loudspeaker front right
8 Loudspeaker rear left
9 Loudspeaker rear right
10 12-pin plug (from control panel with lead V1 or from CD player with lead V3)
11 Rear window antenna



CD Player Connections:
1 1-pin plug (12 V control output)
2 Fuse - 3 amps
3 Plug (power supply)
4 Plug (to radio with lead V3)
5 Plug X3 (from control panel with lead V2)

Pin Connections

Pin No.	17 Pin Plug (Control Panel)	
1 ... 4		not used
5	term. 75	(switched positive)
6 ... 8		not used
9	term. 30	(permanent positive)
10 ... 12		not used
13	term. 58	(light)
14		not used
15	term. 31	(ground)
16		not used
17		not used

Pin No.	4 Pin Plug (Radio)	
1	term. 31	(ground)
2	term. 75	(switched positive)
3		not used
4	term. 30	(permanent positive)

Pin No.	4 Pin Plug (CD Player)	
1	term. 31	(ground)
2		not used
3		not used
4	term. 30	(permanent positive)

FAULT SURVEY

The objective of troubleshooting is the systematic detection of sources of fault. Possible faults are listed in this fault survey. Certain procedures are specified for each fault, which answered with yes/no lead to the source of fault.

All plugs of the various components should be checked for correct connection prior to beginning with troubleshooting.

Does not switch on, i.e. radio shows no reaction	⇒	Fault 01
Does not switch on, i.e. clicking is heard in control panel but there is no sound or display	⇒	Fault 02
Does not switch off	⇒	Replace control panel
No sound from one or more loudspeakers while playing radio, cassette or CD (displays shown)	⇒	Fault 03
No sound from one or both channels only while playing cassette	⇒	Fault 04
Sound pattern is dead while playing cassette	⇒	Fault 05
Faulty cassette drive operation, e.g. ejection, fast forward or reverse	⇒	Fault 06
Faulty radio reception	⇒	Fault 07
CD ejection button for ejection of CD magazine does not react	⇒	Fault 08
CD operation fails	⇒	Fault 09
Faulty reaction to loudness or sound adjustments	⇒	Fault 010
Faulty displays (undefined signs displayed)	⇒	Replace control panel

FAULT 01

Radio does not switch on – no reaction

Is there battery voltage between pins 9 and 15 of 17-pin plug on control panel? —— no → **Repair break in positive or ground wire.**

↓ yes

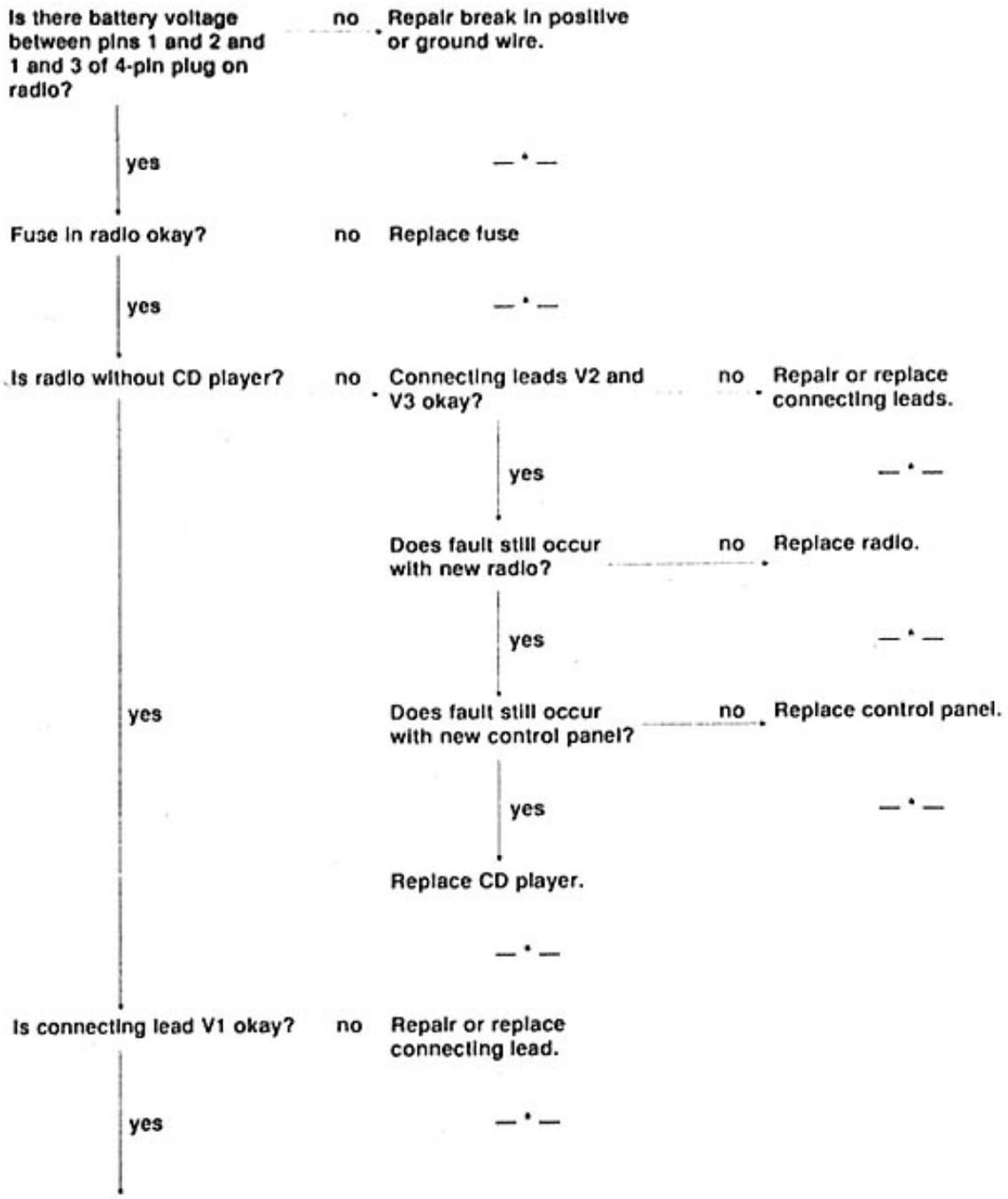
Is fuse in control panel okay? ---- no → **Replace fuse.**

↓ yes

Replace control panel.

FAULT 02

Radio does not switch on. Clicking is heard in control panel, but no sound or display.



Does fault still occur with a new radio? — no → Replace radio.

yes

Replace control panel.

FAULT 03

No sound from one or more loudspeakers with radio, cassette or CD playing (displays visible)

Sound tuned to middle position? — no → Adjust sound tuning to middle position (see operating instructions).

yes

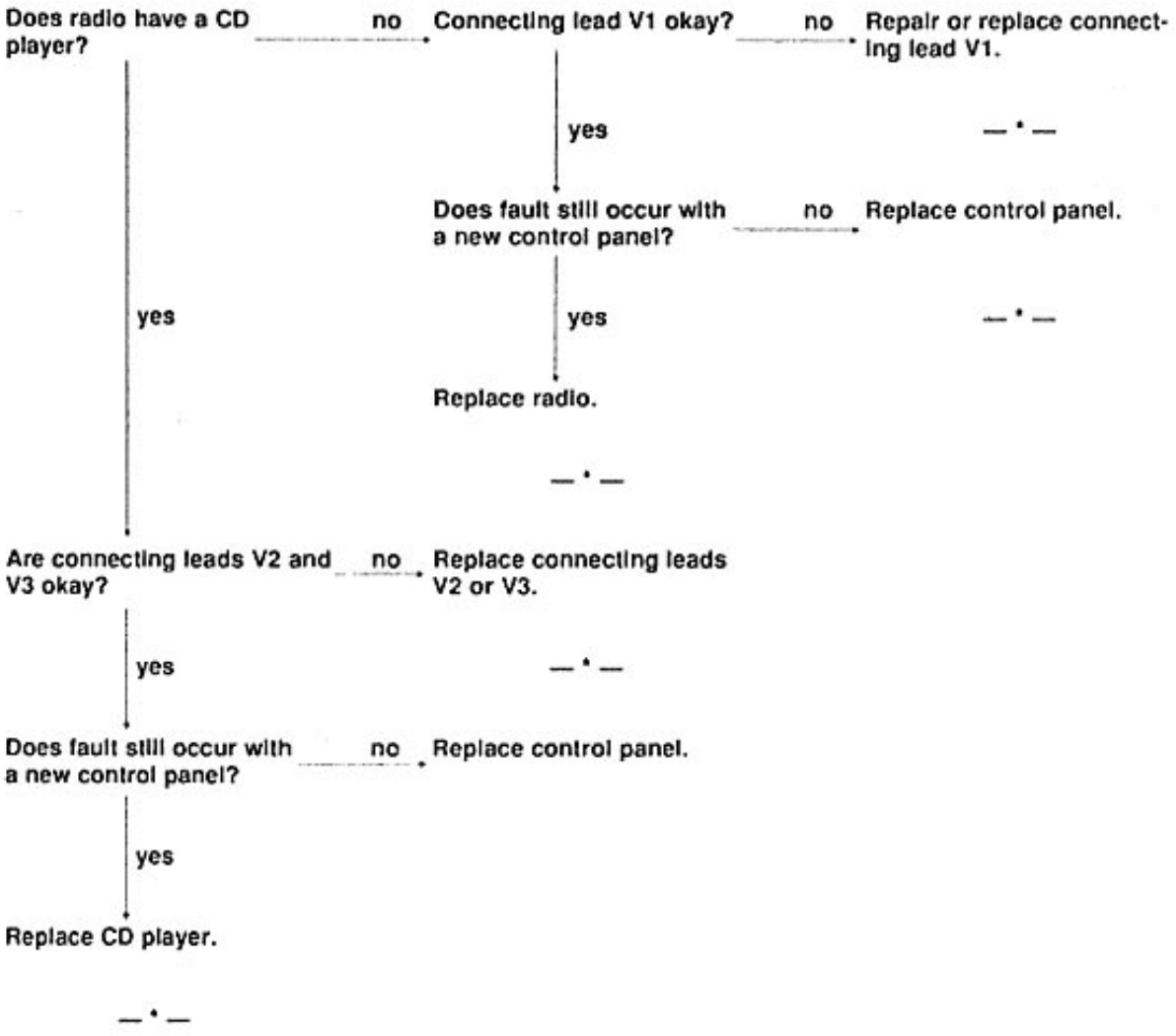
Are loudspeaker outlets on radio okay (check with test loudspeaker)? — no → Replace radio

yes

Repair loudspeakers or loudspeaker connections.

FAULT 04

No sound from one or both channels while playing cassette



FAULT 05

Sound pattern dead while playing cassette

Is sound control in middle position? — no → Adjust sound control (see operating instructions).

↓ yes

Does fault still occur with a different cassette of known sound quality? — no → Cassette used first is faulty or of poor quality.

↓ yes

Does fault still occur after cleaning the control panel? — no → Control panel is okay.

↓ yes

Replace control panel.

— • —

FAULT 06

Faulty cassette drive operation, e.g. ejection, fast forward or reverse

Does fault still occur with a different cassette? — no → Cassette has a mechanical fault.

↓ yes

Replace control panel.
(Note: leave seized cassette in control panel. Don't remove with force.)

— • —

FAULT 07

Faulty radio reception

Does fault still occur with a new radio? — no → Replace radio.

yes → —•—

Check antenna or antenna system and replace faulty part.

—•—

FAULT 08

CD ejection button for ejection of CD magazine does not react

Is there battery voltage between pins 7 and 4 of 4-pin plug on CD player? — no → Check power supply in car.

yes → —•—

Is fuse in CD player okay? — no → Replace fuse.

yes → —•—

Replace CD player.

—•—

FAULT 09

CD operation failure

Installed position of CD player adjusted correctly? (Instructions for adjusting on left and right sides of housing.)

no → **Adjust installed position correctly.**

yes ↓

Replace CD player.

FAULT 10

Fault reaction to loudness or sound adjustments

Does fault still occur with a new radio?

no — **Replace radio.**

yes

Replace control panel.

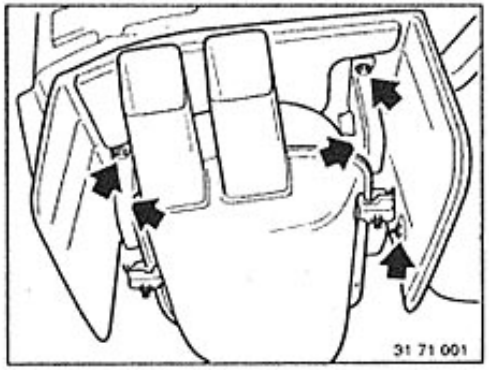
71 Equipment and accessories for engine and chassis

71 60 . . . Trailer hitch – remove and install 71-60/1
Function test after installation 71-60/2
13-pin plug connections 71-60/2

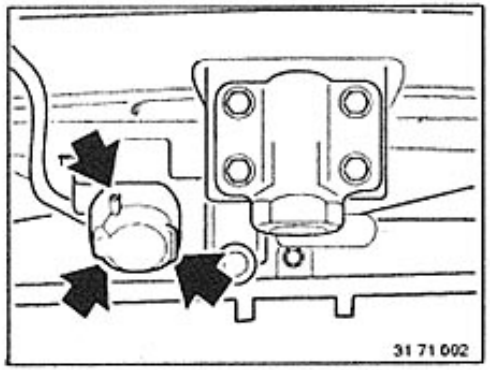
71 60 ... REMOVING AND INSTALLING TRAILER HITCH

Important!
Check function after installation.

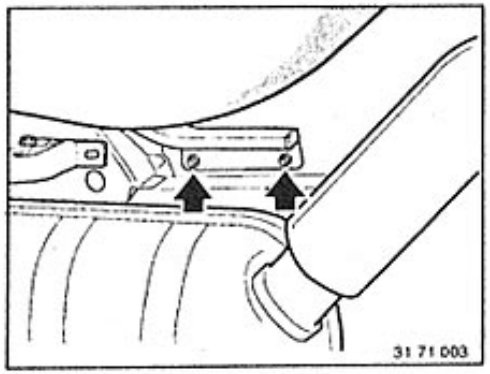
Remove rear bumper – see Group 51.



Support exhaust assembly.
Unscrew bolts on left and right sides and nut.
Lower exhaust assembly and take off heat shield.



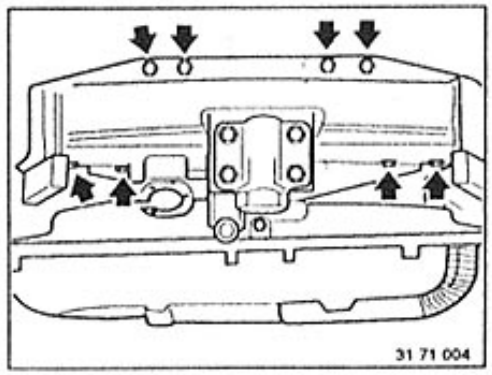
Remove socket.



Unscrew nuts.

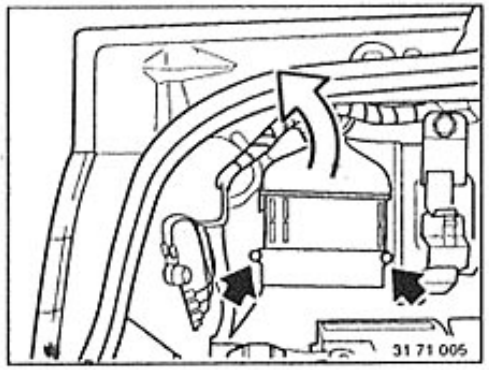
Installation:
Tightening torque*.

* See Specifications



Unscrew bolts and take off hitch.

Installation:
Tightening torque*.



Remove trailer module.

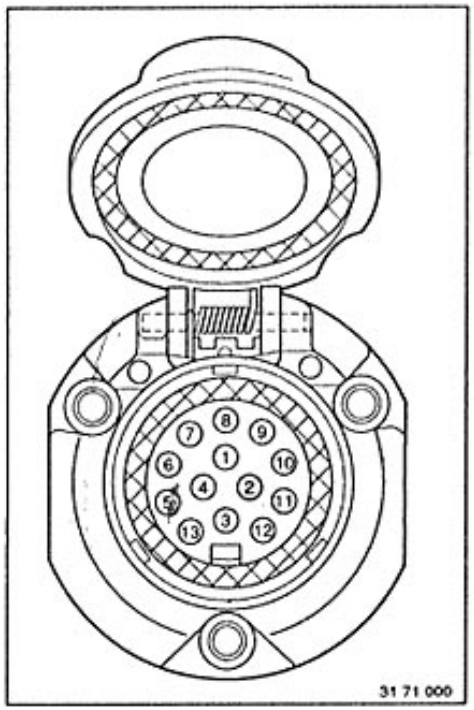
* See Specifications

FUNCTION TEST AFTER INSTALLATION

Pull off cap.
Insert ball rod in take-up pipe.
Check for easy movement while locking, tight fit of ball rod and features for correct locking.
- Green mark on handwheel is opposite green zone on ball rod.
- Handwheel bears on ball rod.
- Key can be pulled out after locking.

Take off ball rod, which must disconnect on its own after turning the handwheel.
Check locking of handwheel in tensioned position of the system.
Mount cap and check that it fits tight.
Insert ball rod in holder.
Check for correct seating and perfect function of clamp.

Check electric function with a trailer socket tester*.



CONNECTIONS OF 13 PIN PLUG

Pin 1	Turn signal indicator, left
Pin 2	Tail fog lights
Pin 3*	Ground (for circuit contacts 1 through 8)
Pin 4	Turn signal indicator, right
Pin 5	Right tail light, contour light, marker light and license plate light
Pin 6	Stop lights
Pin 7	Left tail light, contour light, marker light and license plate light
Pin 8	Backup light and/or backup device for overrun brake
Pin 9	Power supply (permanent positive)
Pin 10	Positive charging wire for battery in trailer
Pin 11	Not used
Pin 12	Not used
Pin 13*	Ground (for circuit contacts 9 through 12)

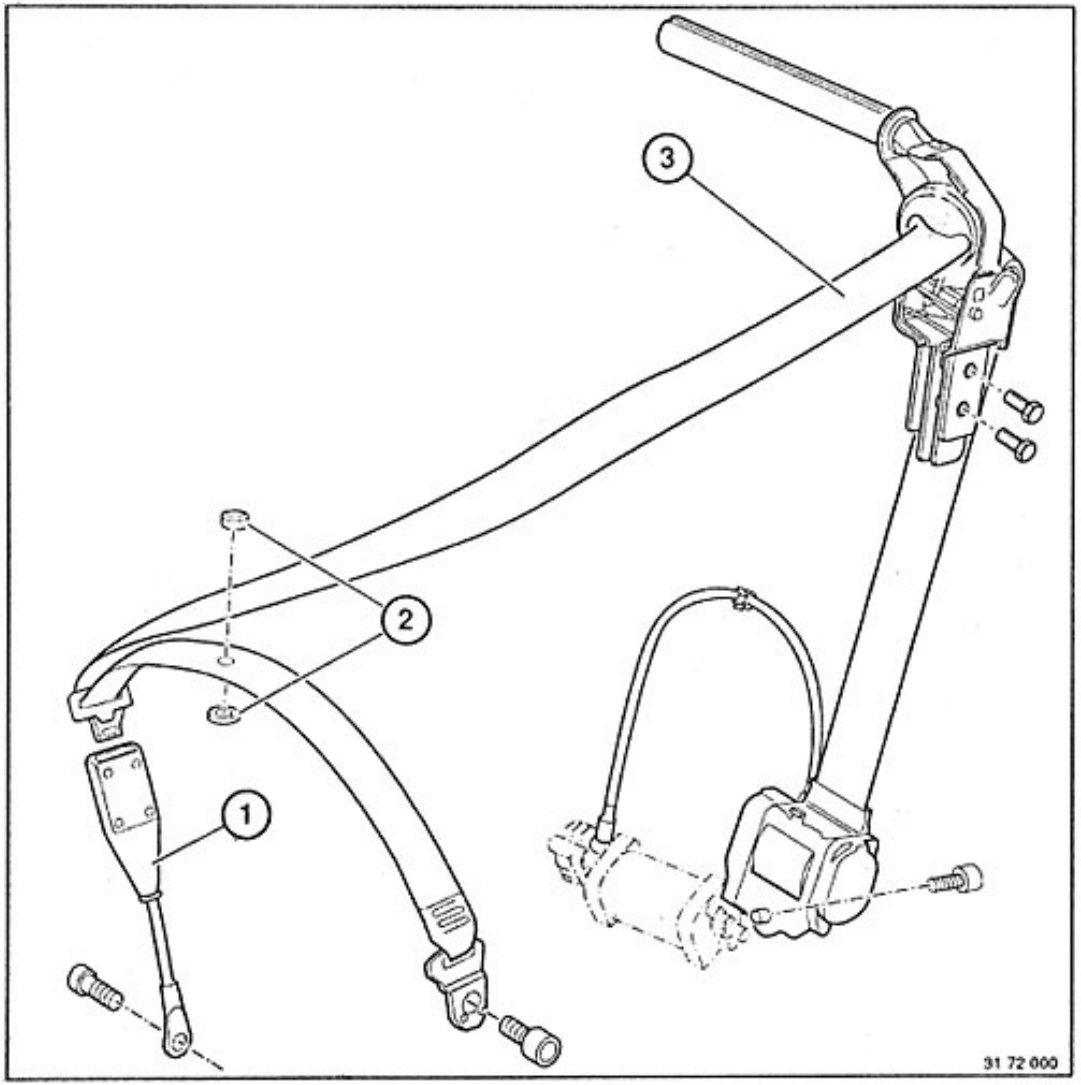
* Source of Supply: HWB

* Ground wires on the trailer end must not be connected electrically conductive!

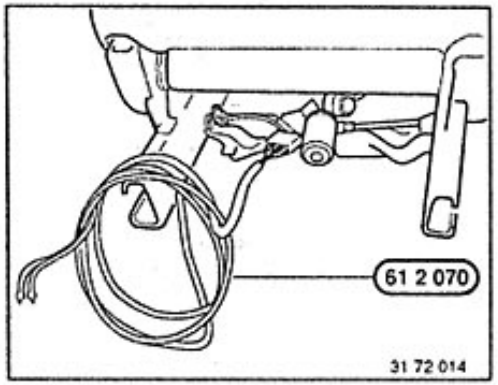
72 Equipment and accessories for body

	Front seat belt layout drawing	72-11/1
72 11 030	Front seat belt – remove and install or replace	72-11/2
102	Rear seat belts – remove and install or replace	72-11/2
. . .	Automatic reel seat belts – check	72-11/7
	Automatic reel seat belt checklist	72-90/1

FRONT SEAT BELT ARRANGEMENT



1 Lower strap belt lock
2 Retaining snap
3 Upper strap

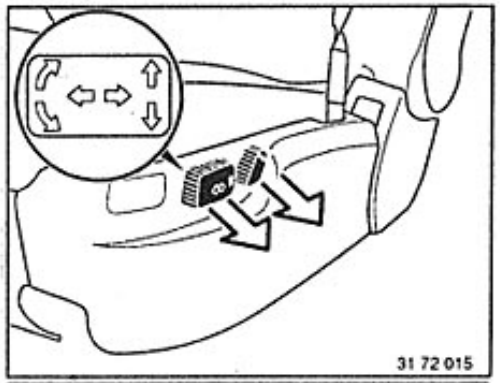


72 11 030 REMOVING AND INSTALLING OR REPLACING FRONT SEAT BELT

Remove seat – refer to Group 52.

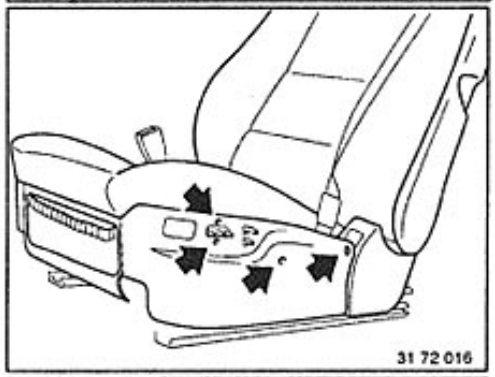
Important!
Check function of seat belt before reinstalling seat.

1. Operate backrest to both final positions, which puts the locking system in neutral.
2. Operate seat to "top" position and backrest to "front" position.
2.1 Unlock backrest.
2.2 Pull out seat belt strap as far as stop and measure length of belt strap.
Specification = 300 to 450 mm.
3. Lock backrest and pull out seat belt completely.
3.1 Seat belt must wind up on reel completely and without noise.
4. Pull out seat belt suddenly – belt should lock.
4.1 It should not be possible to pull a locked belt out of belt clamp on the headrest by more than max. 10 mm by pulling firmly. Otherwise the belt must be replaced – *danger of injury in an accident!*



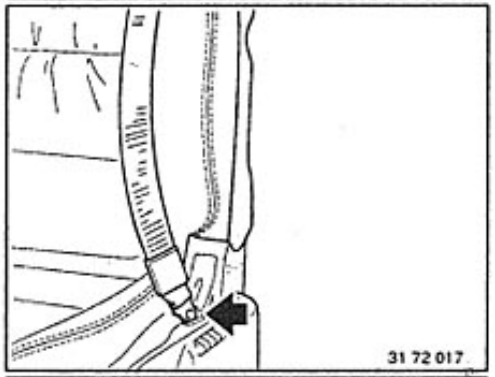
Pull off control knobs.

Installation:
Arrows (curved) for seat inclination must be at front end.



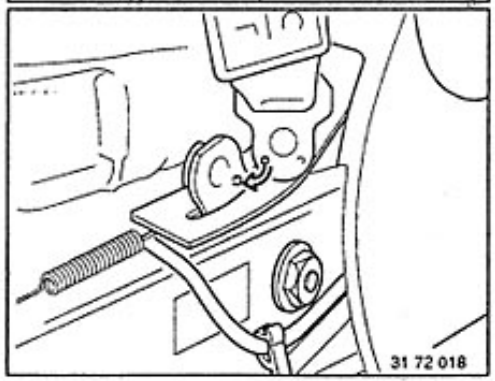
Remove pocket.
Unscrew screws on both sides and take off trim panels.
If applicable, pull off memory and seat heating switches.

Installation:
Make sure that front/side trim panels are clipped correctly.



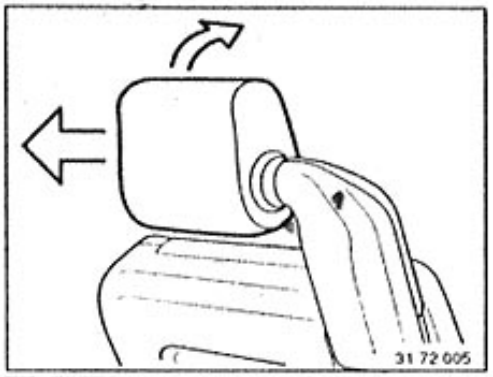
Unscrew belt lock and upper belt strap anchorage bolts.

Installation:
Replace bolts.
Tightening torque*.

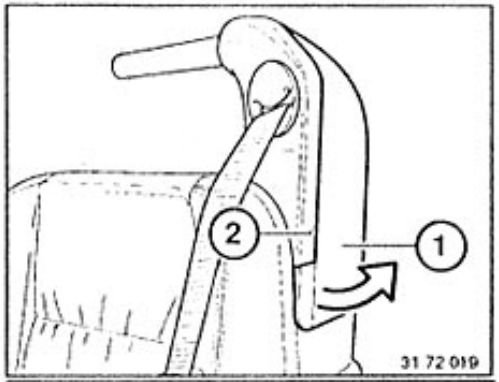


Installation:
Check turning lock.
The high spot on the belt tongue must engage in the low spot of the anchor.

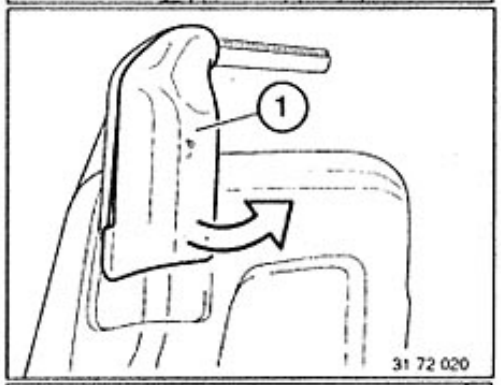
* See Specifications



Swing the padding section forward and pull it off applying slight twisting movement.

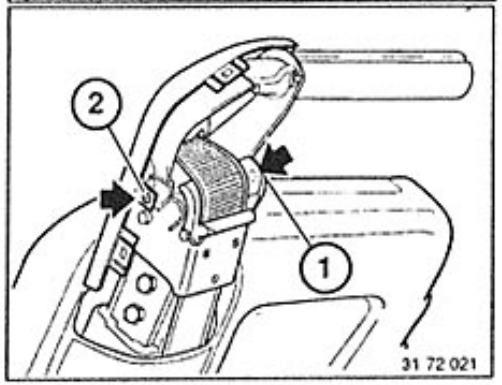


Grab hold underneath plate (1) from the side, press on point (2), counterhold and unclip plate (1) from the side.



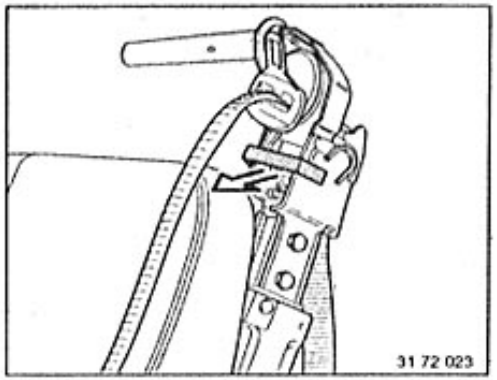
Grab hold underneath plate (1) from behind and unclip plate (1) towards rear/upwards.

Installation:
Clips must be heard to engage.

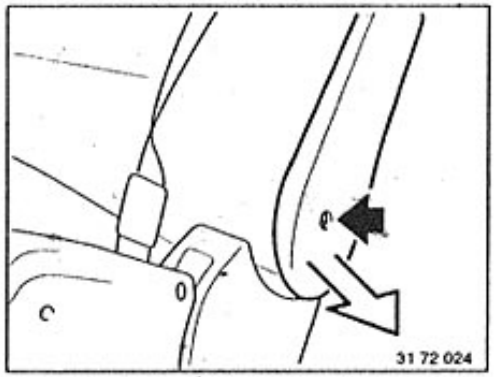


Unscrew screws (1 and 2) and remove plate.

Installation:
Check clips and catches for damage, replacing the plate if necessary.
First tighten screw (1) – the belt escutcheon must move easily.

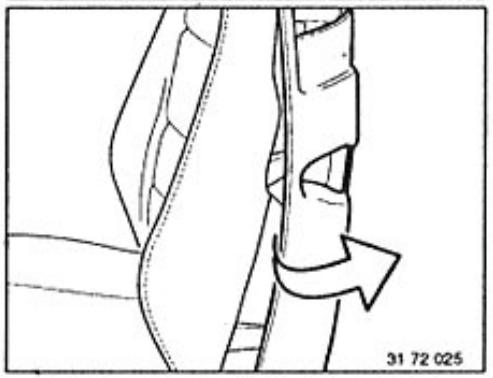


Installation:
Remove the transportation lock.
The shaft must fit in the housing on both ends.

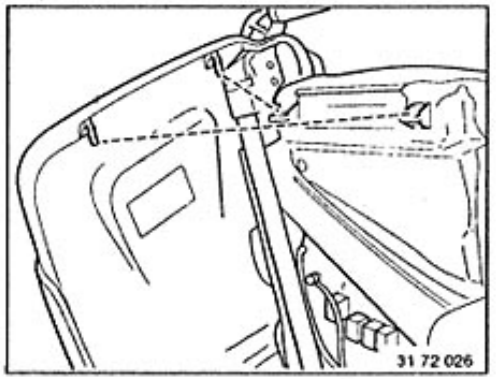


Remove caps and unscrew left and right screws.
Unclip the backrest trim panel towards outside from the side.

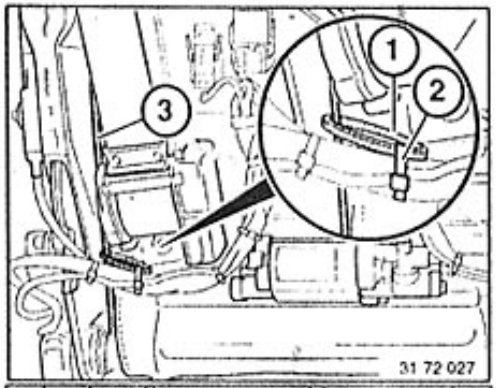
Installation:
Press caps onto the screws.



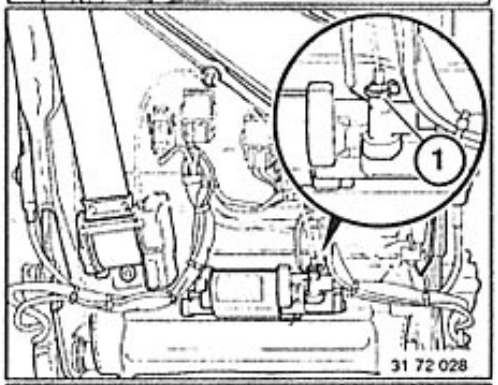
Pull the backrest trim panel upwards over the unlocking lever and remove.



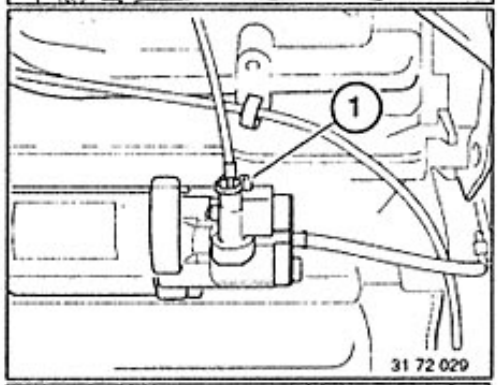
Installation:
Attach the backrest trim panel at top.
Ensure uniform gap between the padding and trim panel.



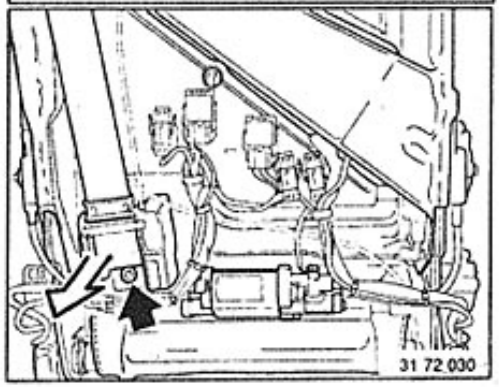
Installation:
Install wire straps (1 and 2).
Size the length of wire strap (1) in such a manner that cable (3) cannot be clamped between the connecting rod and backrest frame while adjusting backrest inclination.



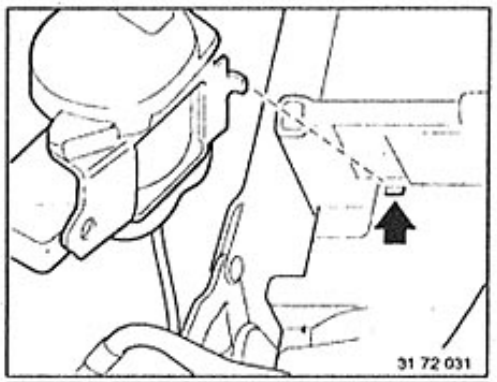
Disconnect cable strap (1) and pull shaft out of the feed gearbox.



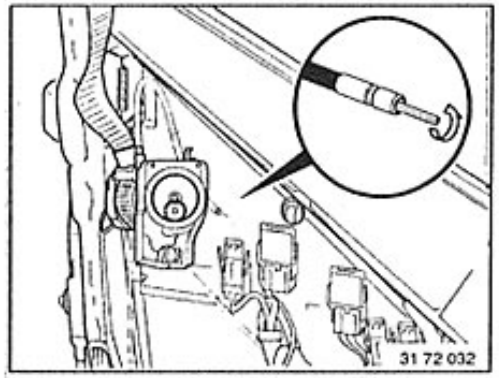
Installation:
The shaft must be routed without kinks and may not touch the backrest trim panel. The tip of cable strap (1) must point to the side, as otherwise it would damage the backrest.



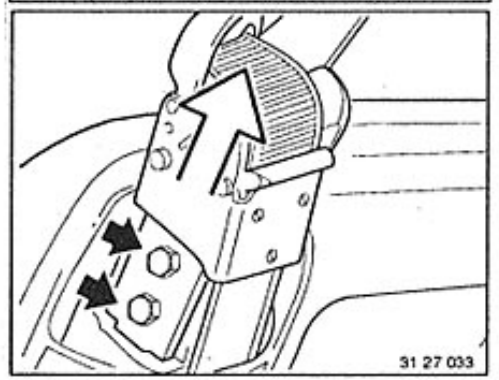
Unscrew bolt and remove bolt.



Installation:
Angled tab must engage in the slot.
Tightening torque*.



Installation:
Turn the shaft for the feed gearbox counterclockwise as far as the stop.

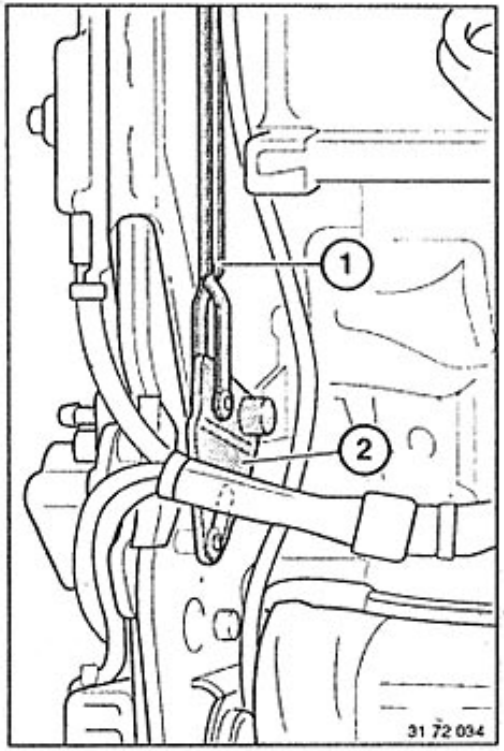


Position the backrest towards the rear, unscrew bolts and pull the headrest out.

Installation:
Replace bolts.
Tightening torque*.

Important!
The connecting rod must be checked prior to installation of the headrest.

* Refer to Specifications



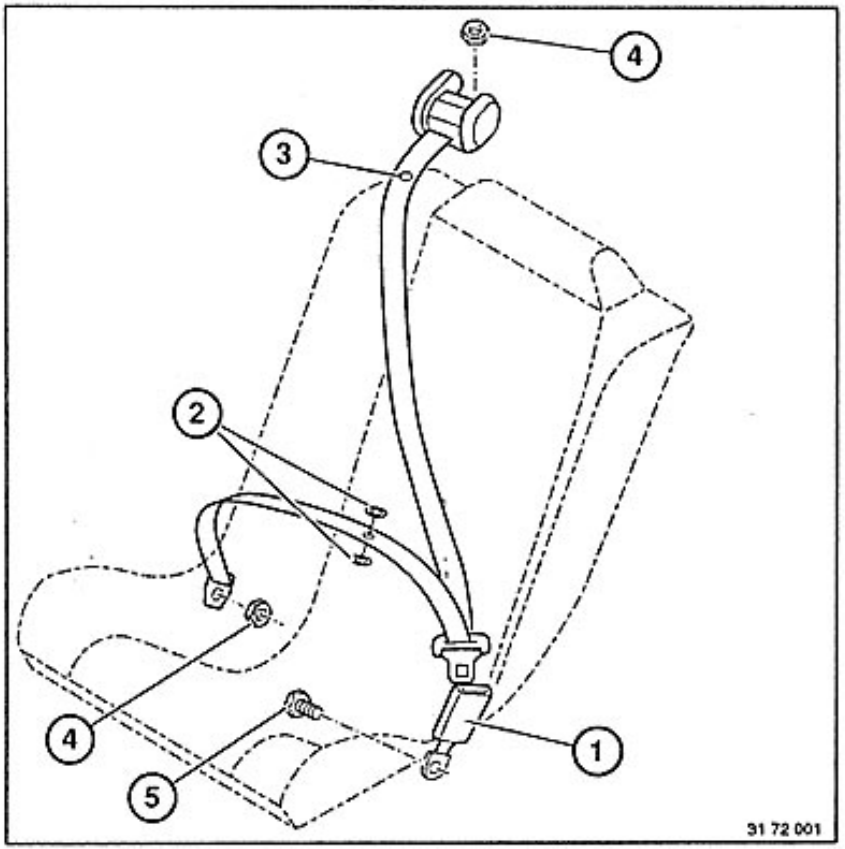
Visual inspection of connecting rod (1) and triangular plate (2):

Set the backrest upright.

Both parts must be absolutely straight.

If damage is found, both parts must be replaced - refer to Group 52.

Important!
Straightening is not permitted — safety of occupants — danger to life.



72 11 102 REMOVING AND INSTALLING OR REPLACING ALL REAR SEAT BELTS (COMPLETE)

Remove rear seat - refer to Group 52.
Remove hatrack - refer to Group 51.

1 Lower belt strap lock
2 Holding snap
3 Upper belt strap
4 Nut
5 Bolt

Unscrew bolt (5) and nuts (4).

Installation:
Tightening torque*.

* Refer to Specifications

72 11 . . . INSPECTING AUTOMATIC REEL SEAT BELTS

The automatic reel has two independent activating systems for the locking of seat belts.

The first activating system should lock the automatic reel when driving fast in curves, driving in tight curves, when car rolls over, during sharp braking or by impact.
This activation is accomplished with a ball.
To check, seat backrest must be set upright and both hands held in supporting position close to the steering wheel. Afterwards the brakes must be applied fully while driving on a dry surface and at a road speed equal to twice walking speed.
The seat belt should lock.

The second activating system is for additional safety and controlled by inertia mass.
This system is also okay, if the reel locks when pulling out the belt suddenly.

The automatic reel does not require servicing and must not be opened.

The belt should retract on its own as far as possible when released in parked position.
If the last section is not wound, the return spring could be weak or broken and there could be excessive friction in belt guides.

An unusable seat belt or a seat belt worn in a serious accident should be destroyed immediately after removal to guarantee that it cannot be used again.

To fasten a seat belt the tongue should insert easily and with a loud click in the lock.
When pressing the "PRESS" button the belt tongue should be ejected from the lock by spring force.
When replacing a seat belt, the lower strap must also be replaced.
The tongue of the lower strap could be deformed by the impact of an accident.
Refer to evaluating seat damage in Group 52.

Belt straps should only be cleaned with a luke-warm soap solution or a commercial fine laundry detergent.

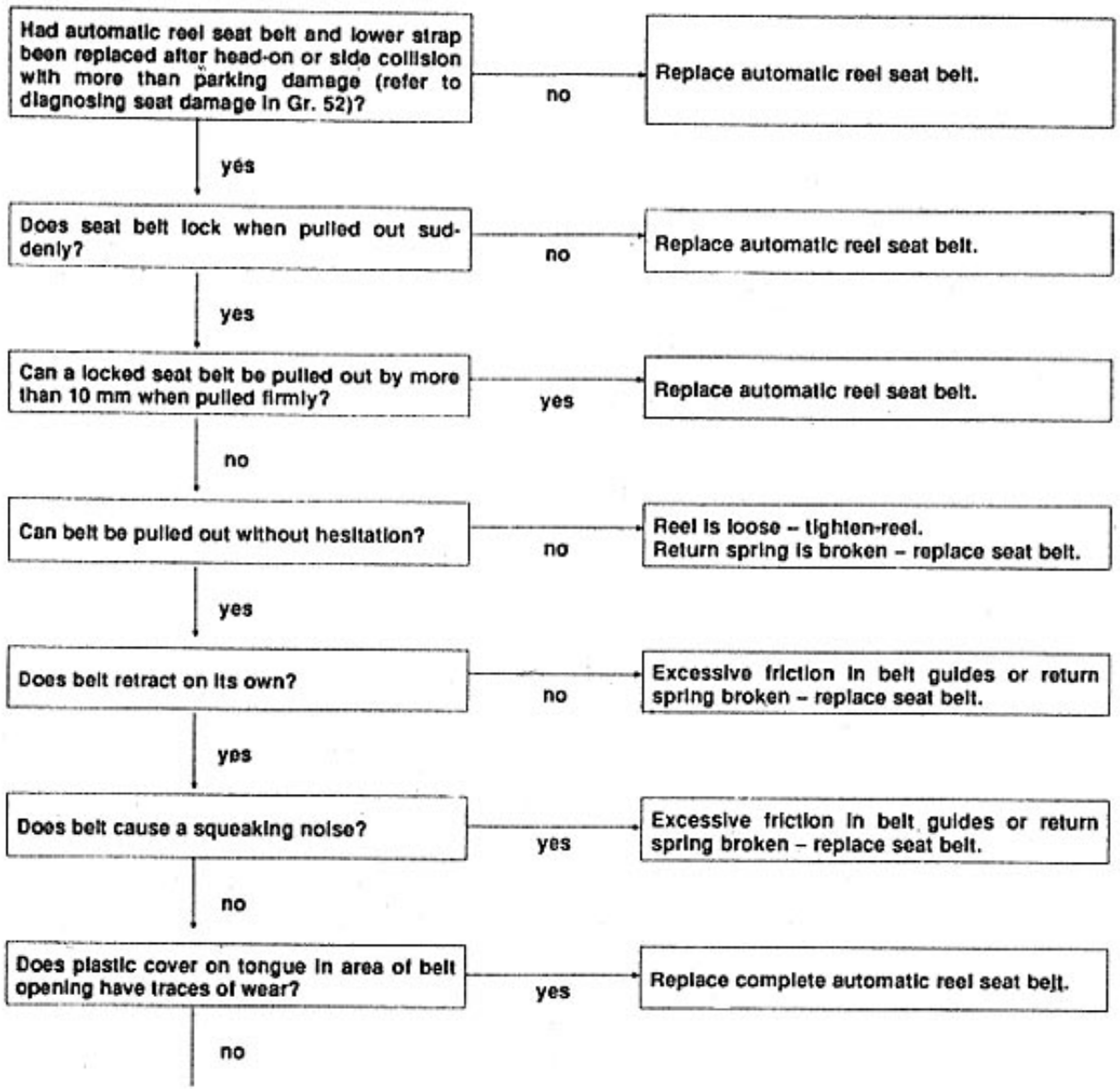
Belt straps must never be cleaned chemically or dyed.

Automatic reel seat belts must be replaced in case of

- creases,
- unravelling,
- pinches,
- tears and cuts,
- traces of melting,
- traces of abrasion in plastic cover on belt opening for tongue or
- damaged seams on end of belt strap.

Also refer to Check List for Automatic Reel Seat Belts.

CHECK LIST FOR AUTOMATIC REEL SEAT BELTS



CHECK LIST FOR AUTOMATIC REEL SEAT BELTS

