

61 Electrical system

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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 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.

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 calendar). 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 does 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 preferably 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 interfering factor is the acid layer immediately after filling with distilled water. Battery wear with partially sulphated and/or strongly contaminated plates will also lead to incorrect acid density test results.

61 11 051 Replacing section of engine wiring harness (M73)

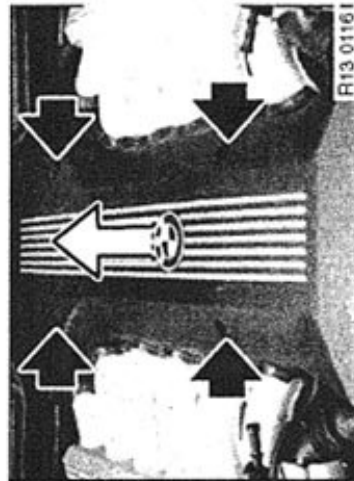
Observe instructions on disconnecting/connecting battery, refer to General Data MG 12.

Switch off ignition.

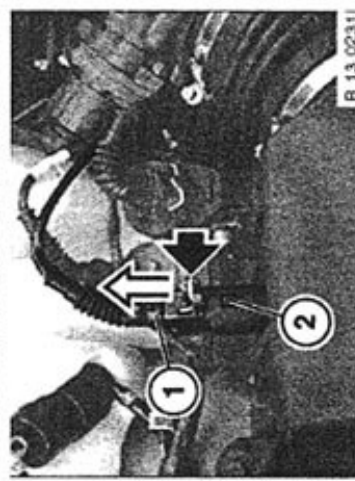
Remove battery ground wires.

Remove fan wheel, refer to 11 52 020.

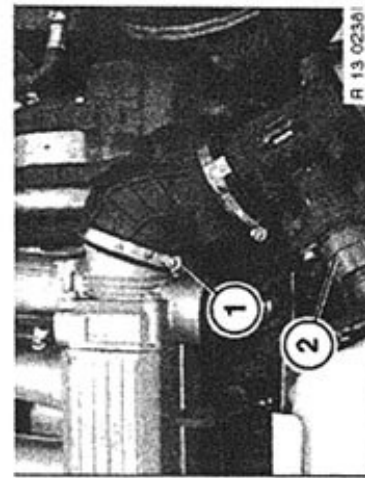
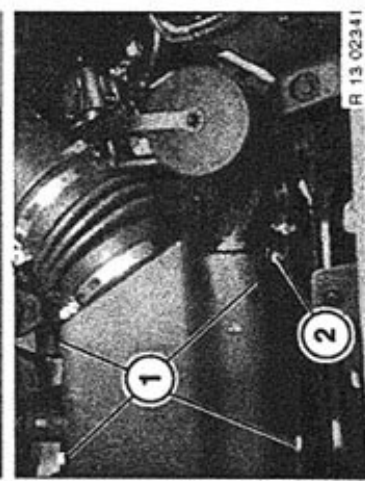
Rotate through screws 90°. Remove top of cylinder head cover.



Press down interlock (2) and remove plug connection (1).

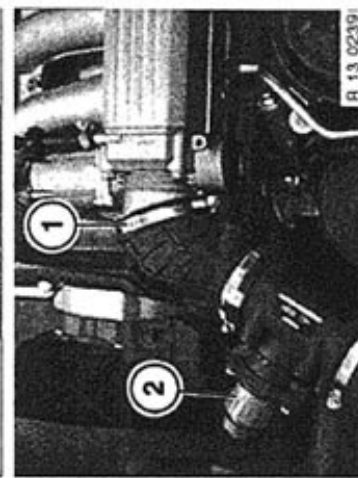


Unfasten clips (1). Unfasten hose clip (2) on inlet hose for air pump.

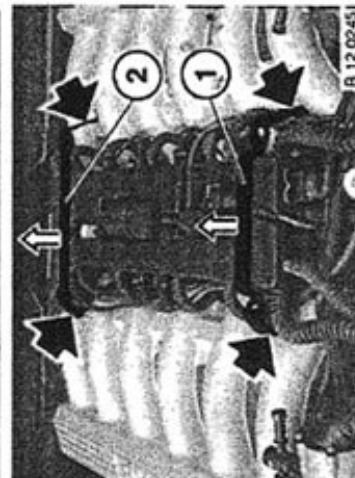


Unfasten hose clip (1). Disconnect plug connection (2).

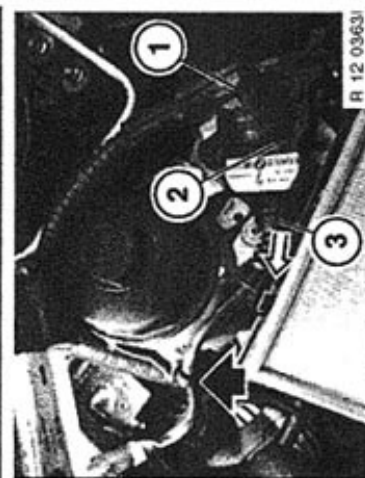
Remove right upper section of intake filter housing with mass air flow sensor.



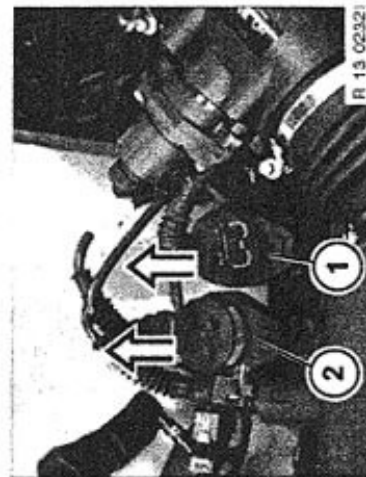
Unfasten hose clip (1). Disconnect plug connection (2). Remove upper section of intake filter housing with mass air flow sensor.



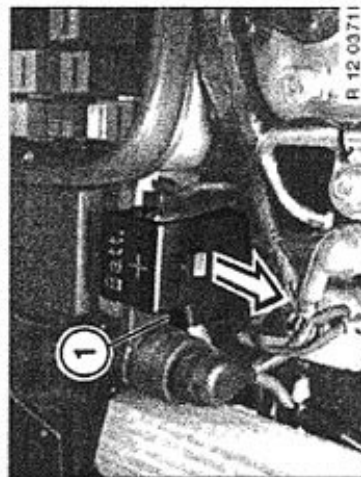
Unfasten retaining brackets (1 and 2) for top of cylinder head cover, unfasten screws and remove retaining bracket.



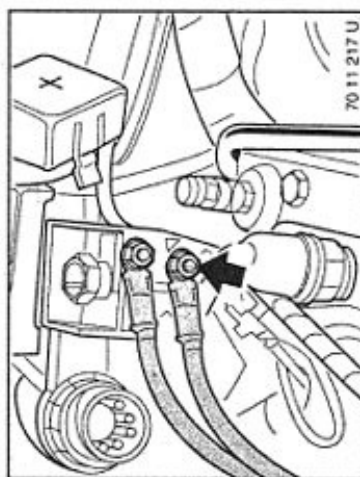
Remove connections (1), lift off cover (2) and disconnect plug connection (3).



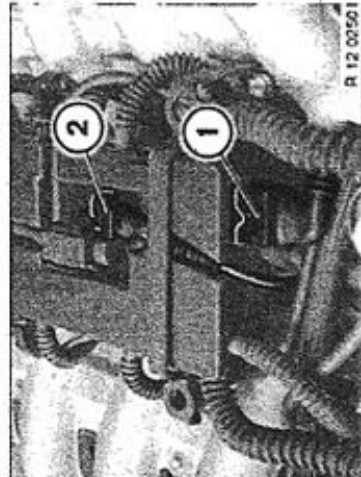
Designate plug connection of tank vent valves and disconnect plug connection.



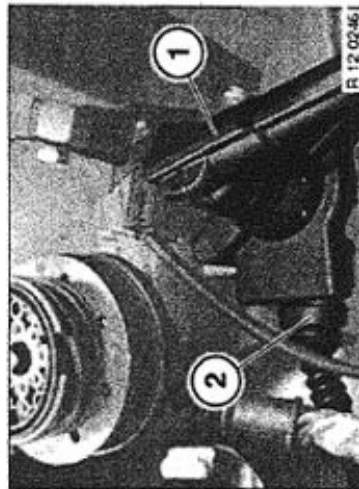
Unfasten clips (1) and remove cover.



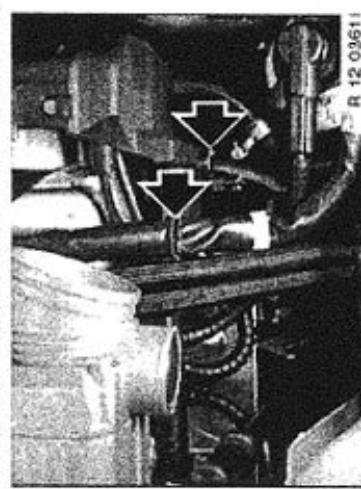
Unfasten screw connection on positive battery lead.



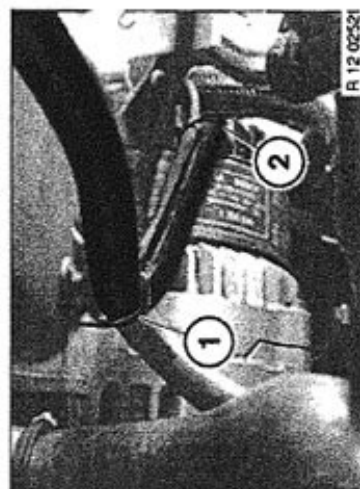
Disconnect plug connection (1) from camshaft sensor and plug connection (2) in vacuum control unit.



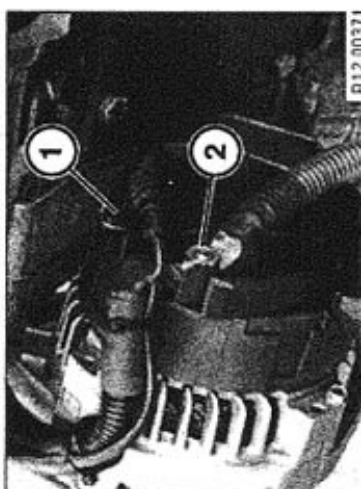
Disconnect connections (1 and 2) from right ignition coil.



Installation:
Note wiring harness routing on cover of distributor cap. Fit cable tie.

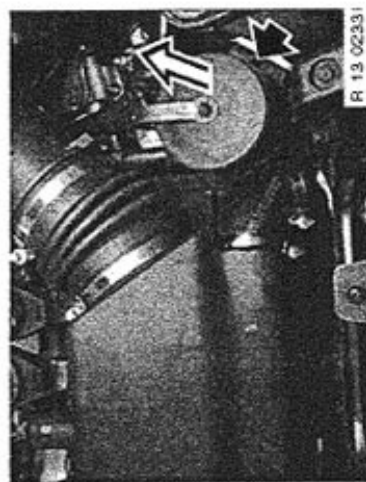


Disconnect connections on alternator, disconnecting cable ties (1 and 2).

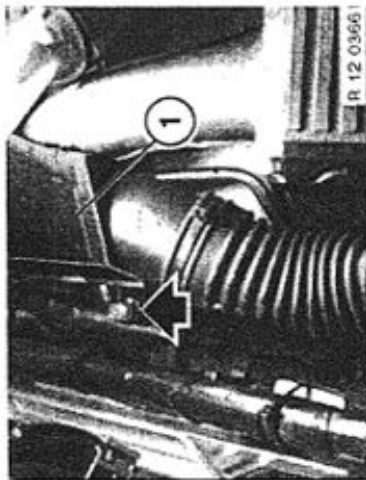


Connections illustrated here on removed alternator.
Disconnect plug connection (1).
Unfasten nut (2).

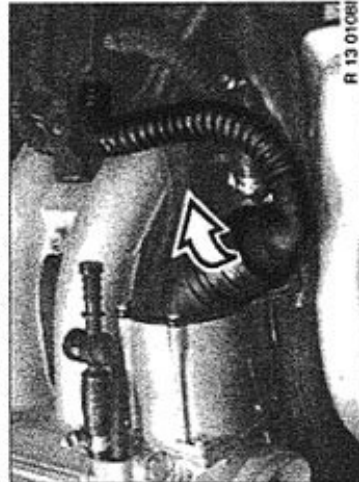
Installation:
Tightening torque, refer to Technical Data 12 31 1AZ.



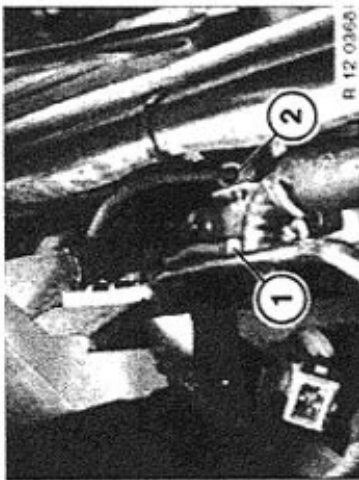
Unclip and remove diagnosis receptacle from bracket.



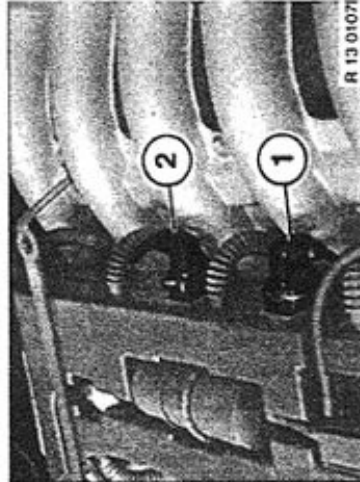
Unfasten nut at back of cable duct (1).



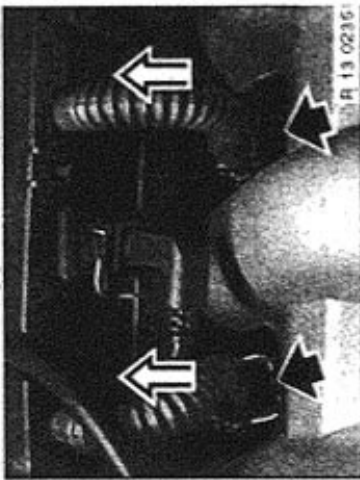
Unfasten plug connection on actuator motors for throttle valve actuation.



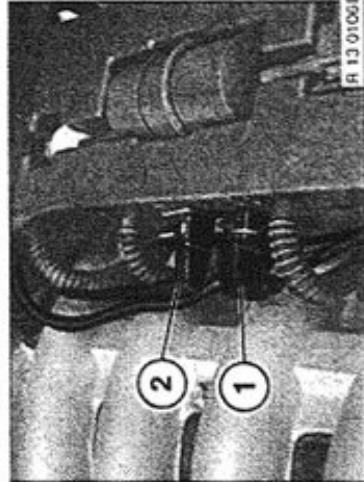
On rear cable duct:
Unfasten screw (1) and remove ground strap.
Unclip and remove cable clip (2) for impulse sensor line.



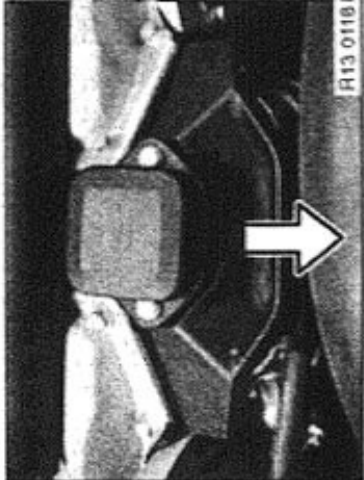
Unfasten plug connection on cable duct
1 Knock sensor for cylinders 1 to 3
2 Knock sensor for cylinders 4 to 6



Disconnect plug connection on the injection valves.



Unfasten plug connection on cable duct
1 Knock sensor for cylinders 7 to 9
2 Knock sensors for cylinders 10 to 12



Unclip and remove oil drip tray.

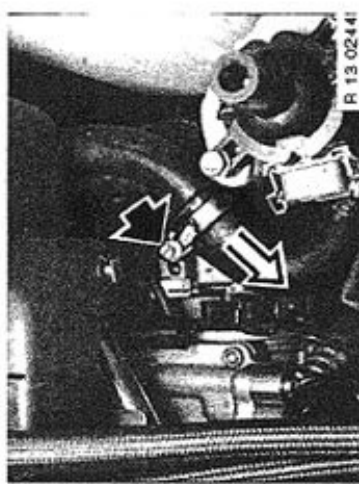
Unfasten pressure hose on pressure pipe on non-return valve for air induction to cylinder bank 7-12.
Unfasten hose clip. Unfasten hose on neck of non-return valve.



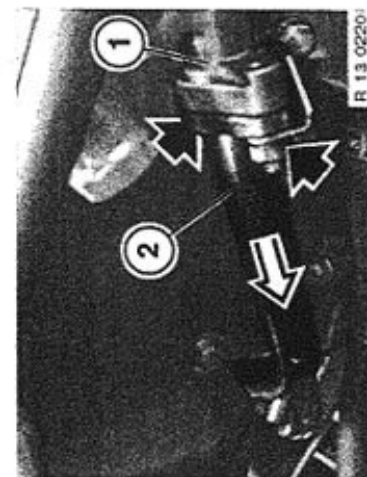
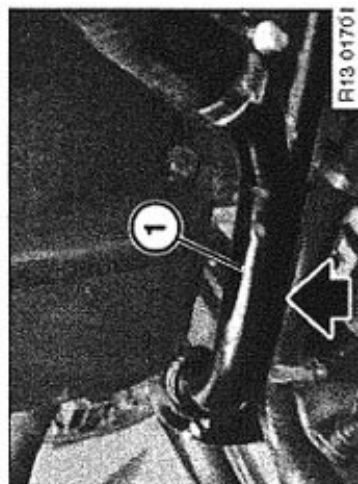
Pressure hose on pressure pipe of non-return valve for air induction of cylinder bank 1-6.
Unfasten hose clip. Unfasten hose on neck of non-return valve.



Pressure hose from air pump on pressure pipe. Unfasten hose clip and remove hose.



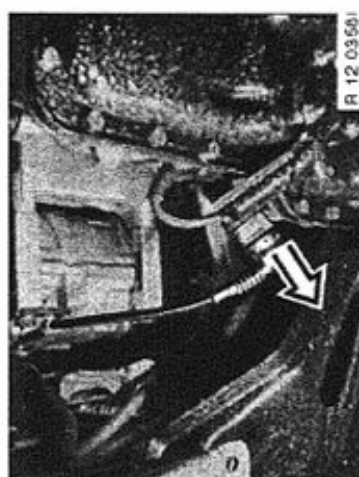
Unscrew pressure pipe (1) from brackets.



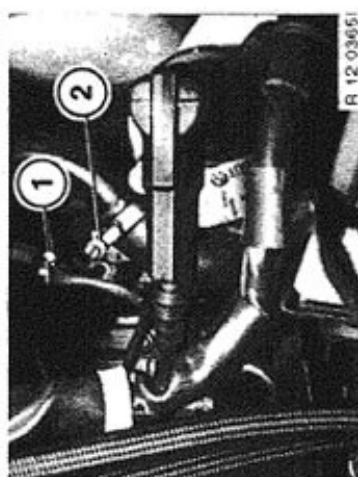
Unfasten nuts (1 and 2) from non-return valve on cylinder bank 1-6 and remove pressure pipe (2) from flange of non-return valve (1). After removal of non-return valve, plug connection can be disconnected from temperature sensor.



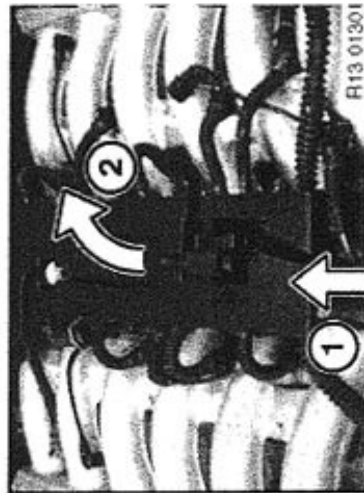
Installation location on water pump.
Unfasten plug connection of temperature sensor for coolant temperature.



Unfasten plug connection from oil level sensor.

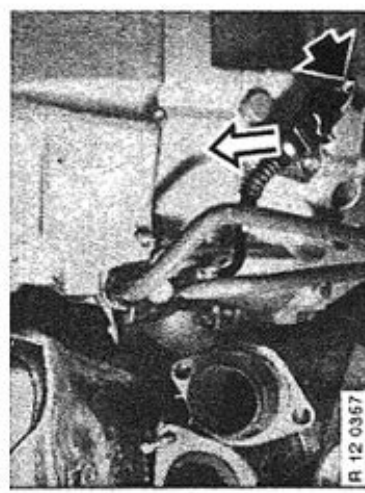


Installation:
Note wiring harness retainers (1 and 2) on cover of distributor cap and on body bracket.
Fit cable tie.



First slide cable duct backwards to remove from front interlock (1) then lift (2).

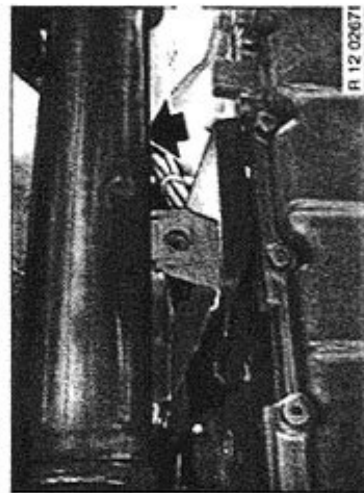
The wiring harness is now removed to a point where, for example, the intake air manifold can be removed.



Disconnect plug connection of impulse sensor on crankshaft (flywheel) for DME control unit on cylinder bank 1-6 (DME 1).



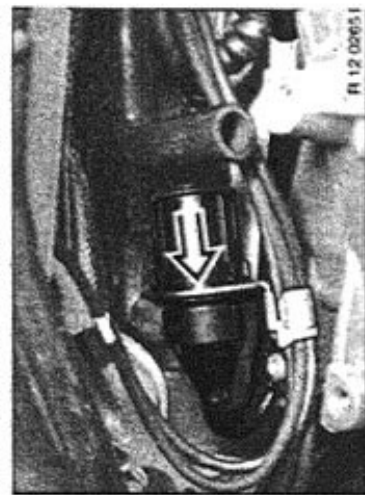
Disconnect plug connection from impulse sensor on crankshaft (flywheel) for DME control unit on cylinder bank 7-12 (DME 2).



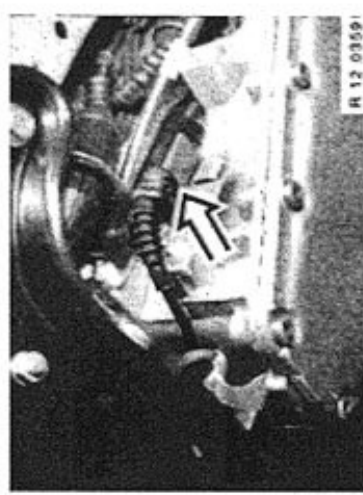
Unclip and remove lines from brackets on transmission.



Disconnect plug connection for position switch on automatic transmission.



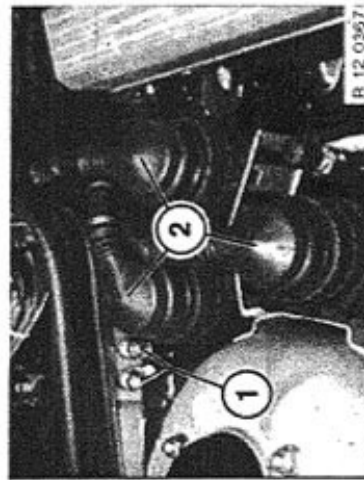
Disconnect plug connection for shift unit on automatic transmission.



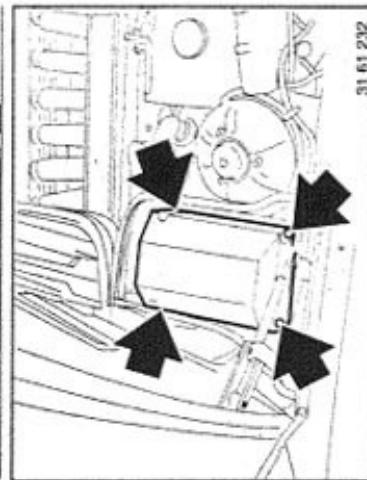
Disconnect plug connection on oxygen sensors.



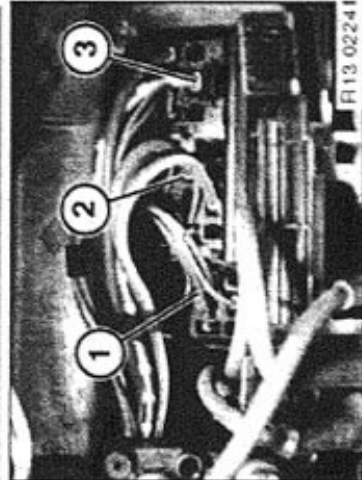
Disconnect plug connection from Lambda monitor sensors.



Unfasten nuts (1) on ground wires and disconnect plug connection (2).

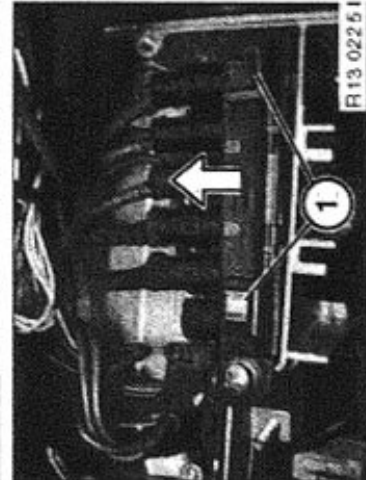


Unfasten screws.
Remove cover.

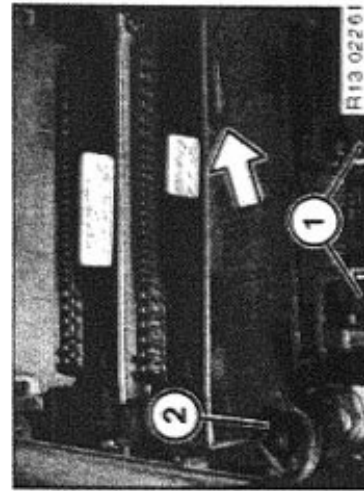


Remove relays (1 to 3) with brackets.

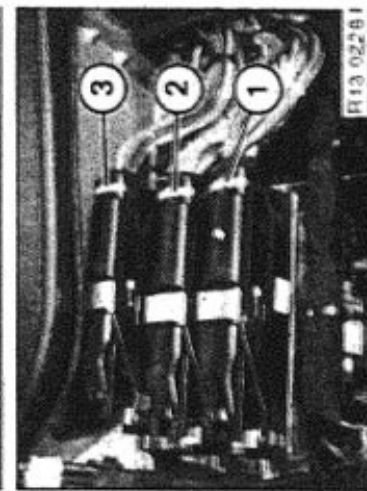
- 1 Relay for electrical fuel pump (EKP)
- 2 Relay for Digital Motor Electronics (DME 1)
- 3 Relay for Digital Motor Electronics (DME 2)



Unfasten clips (1) and remove distributor housing for CAN connections.

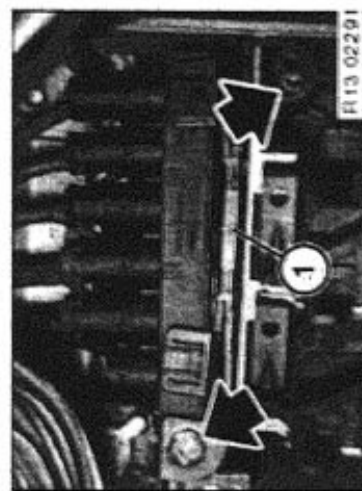


Unfasten clips (1) and disconnect plug connection (2).

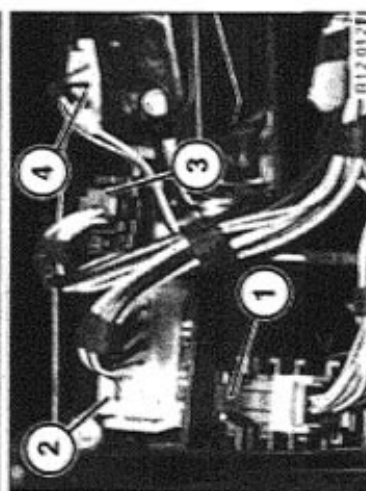


Disconnect plug connections (1 to 3).

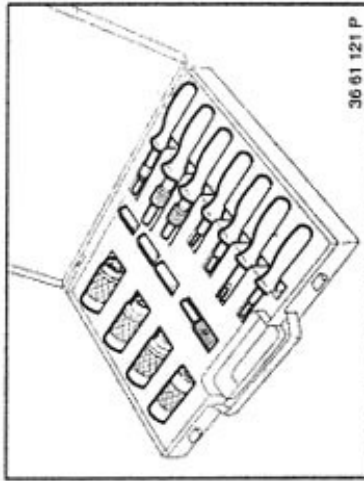
- 1 Control unit DME 1
- 2 Control unit DME 2
- 3 Control unit EML (Electronic Power Control)



Unfasten screws and remove bracket (1).



Disconnect plug connections (1 to 4).
Remove complete wiring harness.

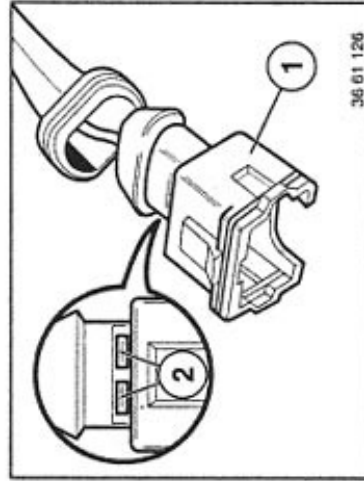


61 13 ... Removing and installing wire connectors in plug receptacles

Use special tool kit 61 1 150.

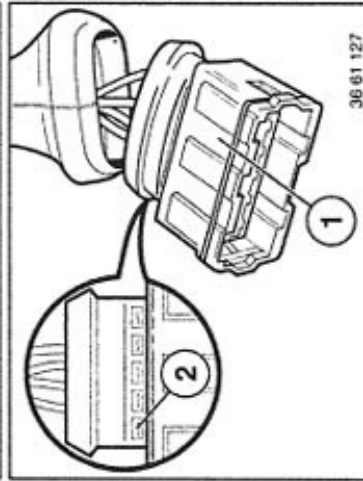
Application information

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 re-pairing plugs, it is always very important to make sure that the locks of plugs have engaged.

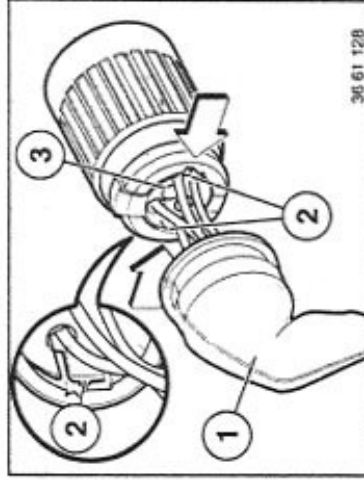


Ultrasonic bonded plugs

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.

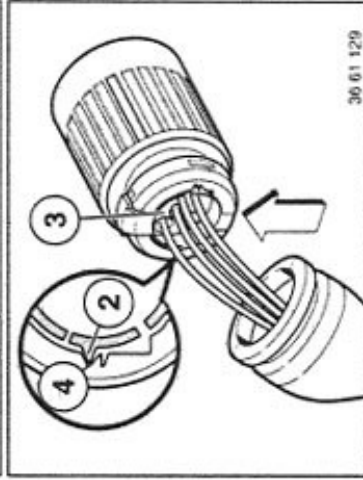


Pins of plugs (1) are bonded ultrasonically and cannot be replaced. They can be recognized by the bonds (2) on the long side of the plug.

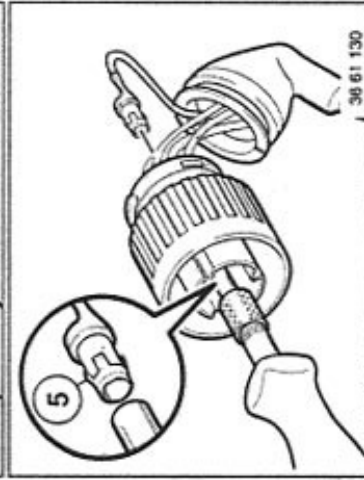


7 and 8 pin round male plugs

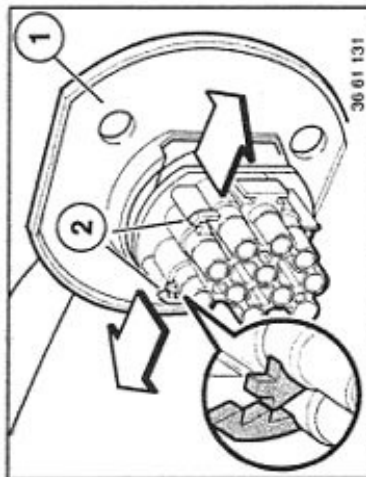
Pull rubber grommet (1) off carefully.
Push back retainers (2) of interior plugs (3) carefully.



Slide interior plug (3) in direction of arrow until retainers (2) lock in locking groove (4).

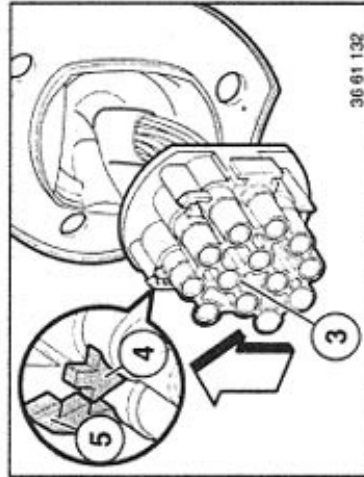


Push back steel spring locks (5) of the relevant pin using special tool no. 61 1 132 and pull out wires.

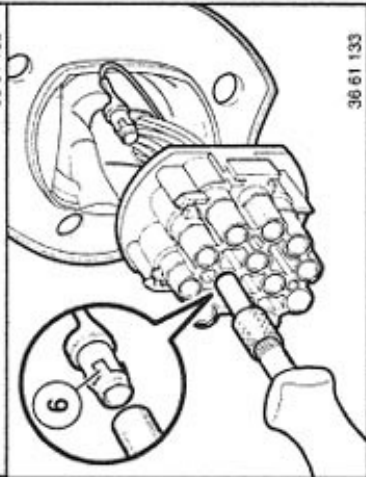


13-pin round male plug

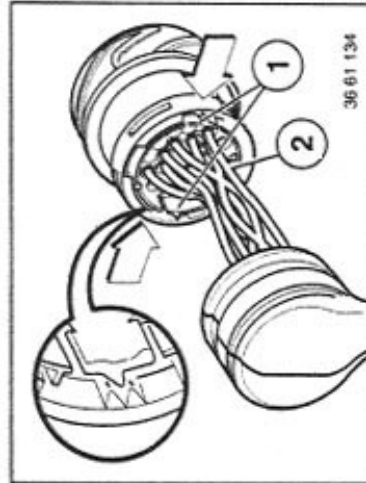
Pull off rubber grommet (1).
Pull lock (2) out carefully in direction of arrow.



Move lower plug section (3) in direction of arrow far enough that retainers (4) lock in locking groove (5).

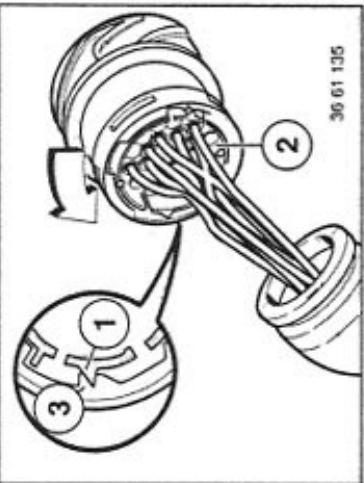


Push back steel spring locks (6) of relevant pin using pressing-out tool no. 61 1 132 and pull out wire.

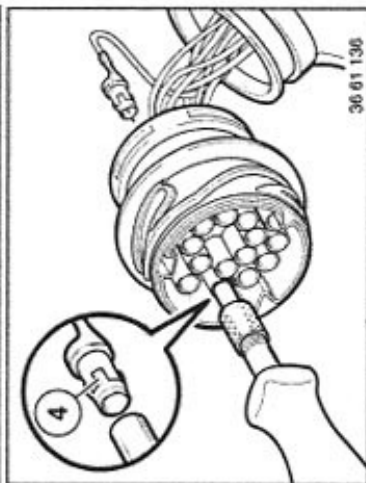


20-pin round male plug

Push back retainers (1) of interior plug (2) carefully.



Turn interior plug (2) far enough that retainers (1) lock in locking groove (3).

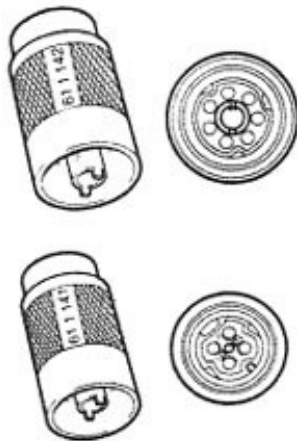


Push back steel spring locks (4) of relevant pin using pressing-out tool no. 61 1 132 and pull out wire.

Round male plugs with single core seal

Special tool 61 1 141 = unlocking tool for 4-pin plug housing.

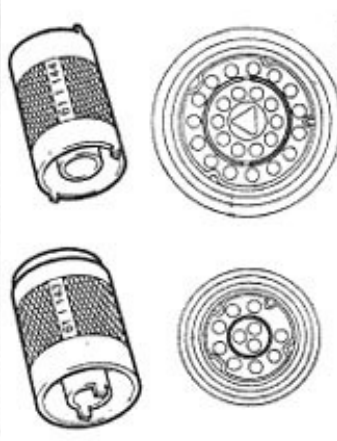
Special tool 61 1 142 = unlocking tool for 7-pin plug housing.



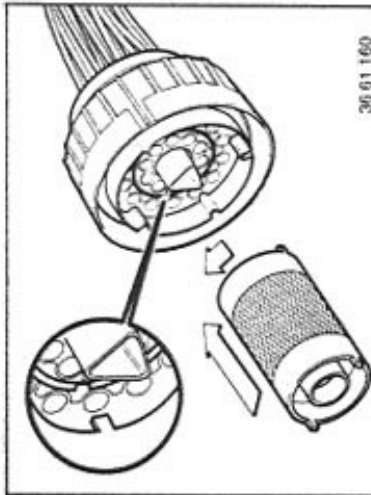
36 61 158

Special tool 61 1 143 = unlocking tool for 12-pin plug housing.

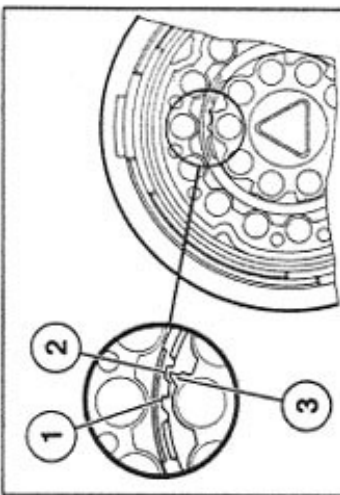
Special tool 61 1 144 = unlocking tool for 25-pin plug housing.



36 61 159



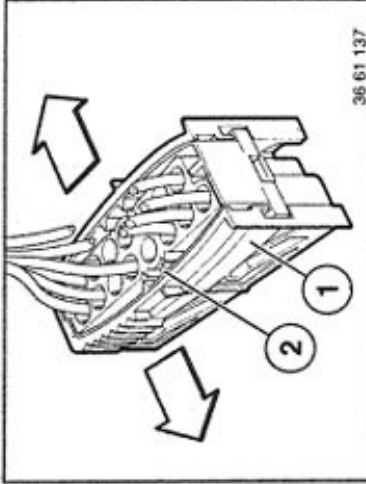
Unlock plug.
Insert suitable connection end of special tool into plug and turn counterclockwise approx. 3 degrees.



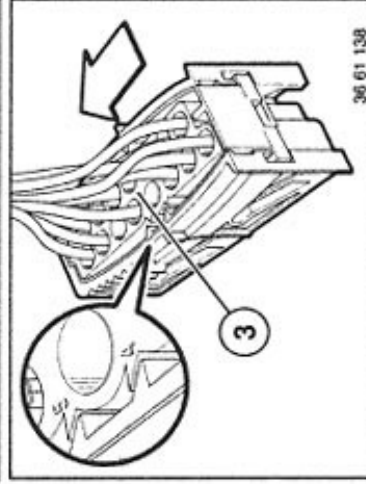
Plug locked.
Position of retainer (3) in locking groove (2).
Plug unlocked.
Retainer (3) in groove (1).



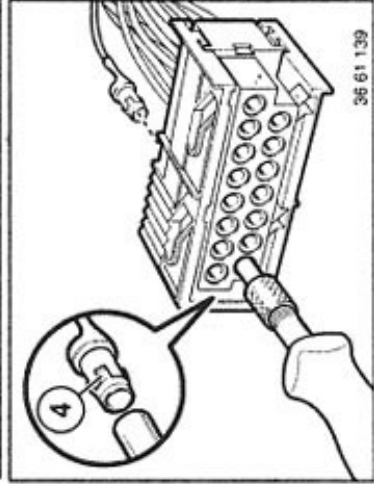
Push back steel spring locks (4) of relevant pin using special tool 61 1 132 and pull out wire.



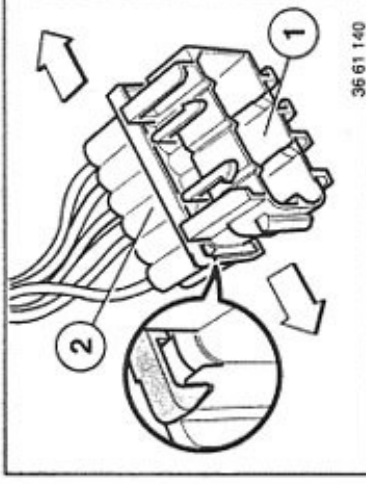
15-pin plug
Pull exterior plug (1) out slightly in area of retainers (2).



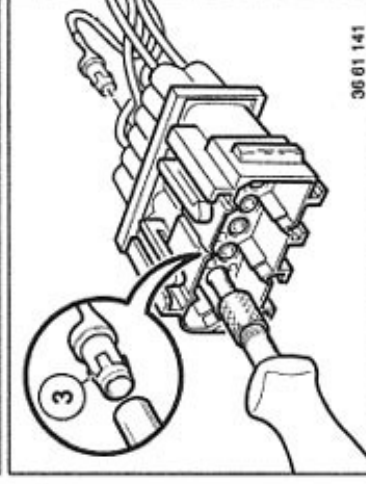
Pull interior plug (3) in direction of arrow as far as stop.



Use pressing-out tool no. 61 1 132 to push back steel spring locks (4) on relevant pin and pull out wire.



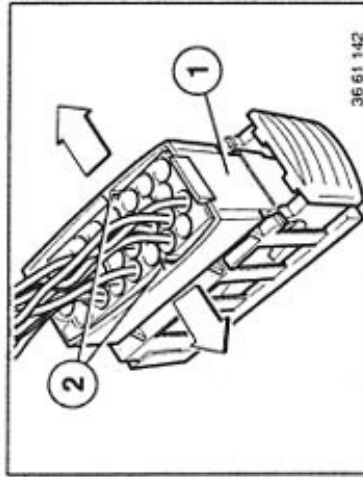
8- and 12-pin plugs
Move plug upper section (1) and plug lower section (2) against each other in direction of arrow.



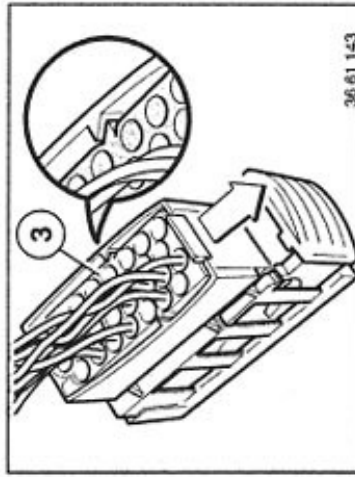
Use pressing-out tool no. 61 1 132 to push back steel spring locks (3) of relevant pin and pull out wire.

30-pin plug

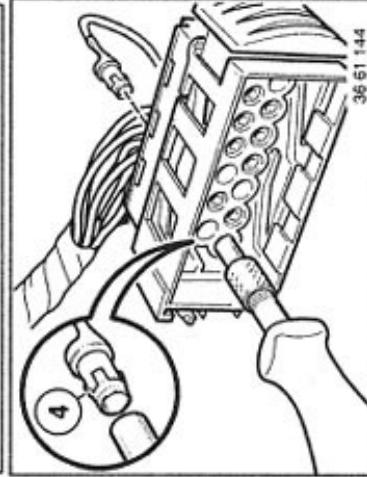
Pull exterior plug (1) out slightly in area of retainers (2).



Pull interior plug (3) in direction of arrow as far as stop.

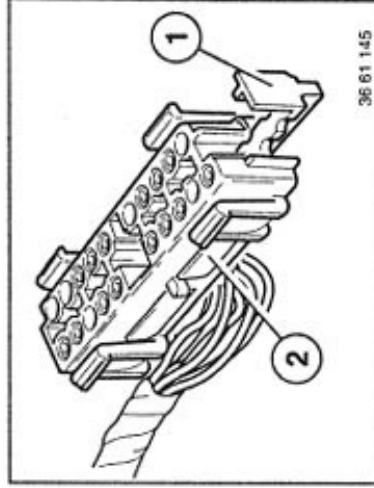


Push back steel locks (4) of relevant pin using special tool no. 61 1 132 and pull out wire.

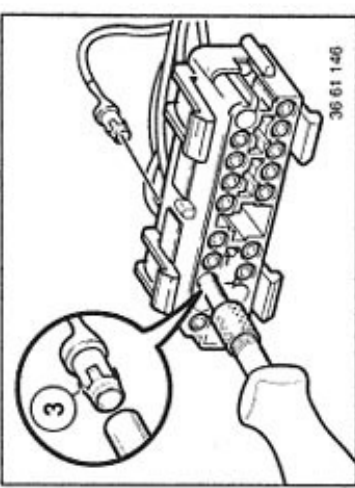


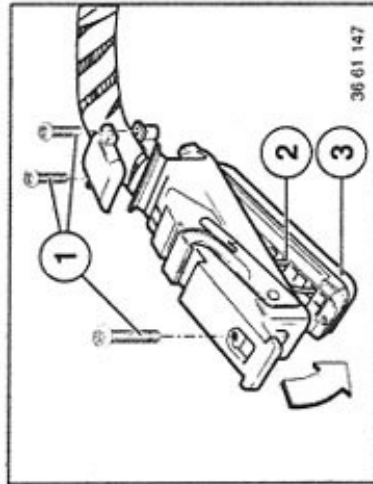
20-pin relay module plug

Pull locking slide (1) out of plug (2).

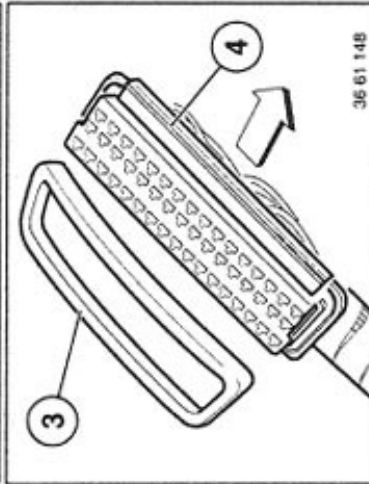


Push back steel spring locks (3) of relevant pin using special tool no. 61 1 132 and pull out wire.

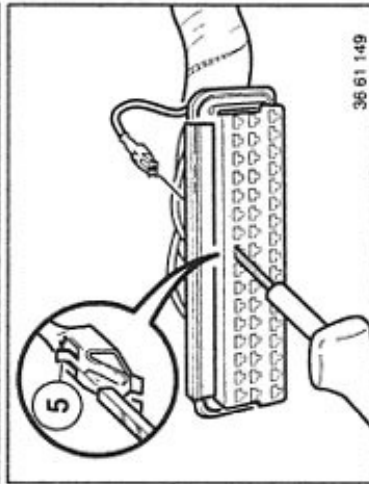




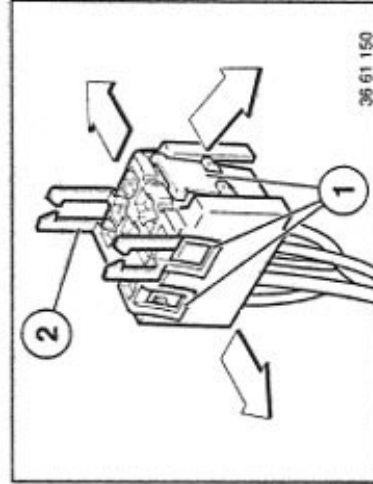
25-, 35- and 55-pin control unit plugs
Unscrew Phillips screws (1).
Pry out pin sender (2) with seal (3) in direction of arrow.



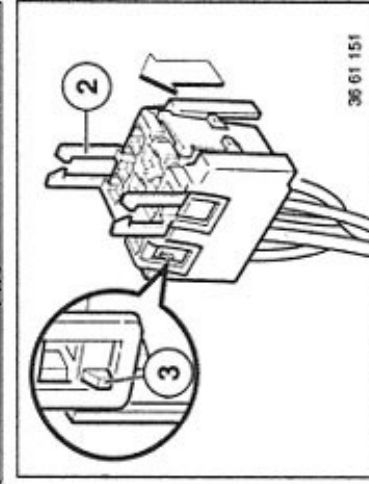
Pull off seal (3).
Pull off receptacle lock (4) in direction of arrow and unlock.



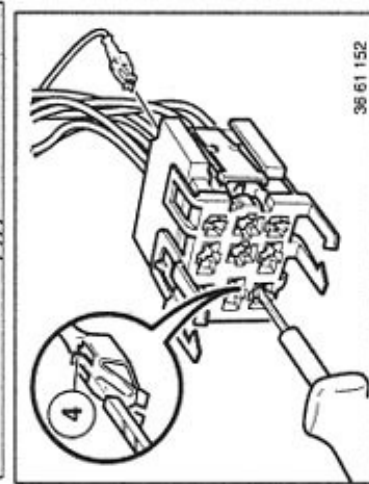
Push back steel spring lock (5) of relevant pin using special tool no. 61 1 134 and pull out wire.



Relay carrier
Carefully pull retainer (1) of relay holder (2) in direction of arrow.



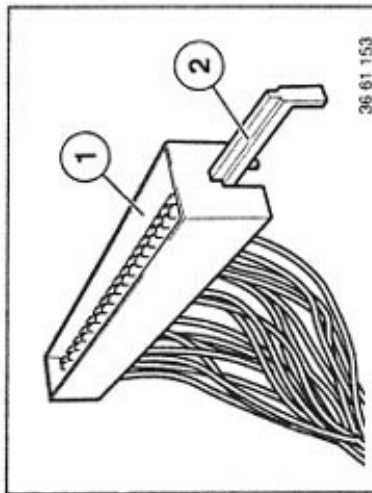
Pull relay holder (2) in direction of arrow into first catch (3).



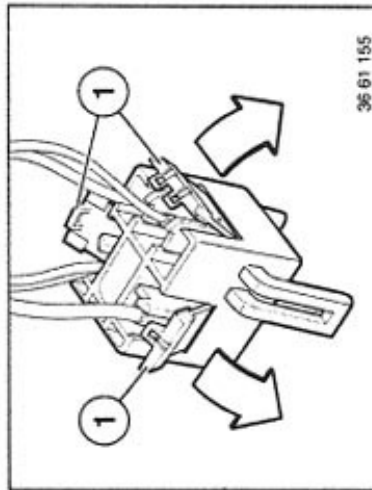
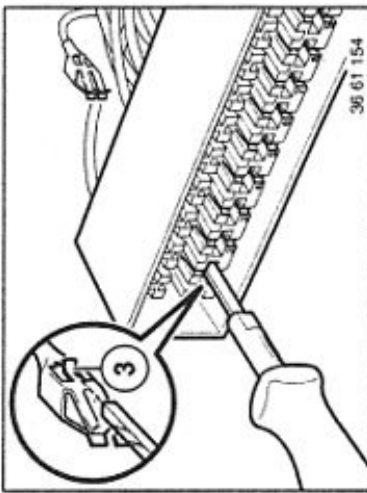
Push back steel spring lock (4) of relevant pin and pull out wire.
Press out size 6.8 double flat spring pins with special tool 61 1 136.
Press out size 2.8 double flat spring pins with special tool no. 61 1 137.

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.

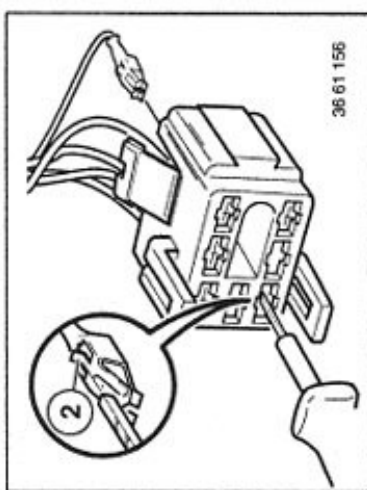


Push back steel spring locks (3) of relevant
pin using special tool no. 61 1 136 and pull out
wire.

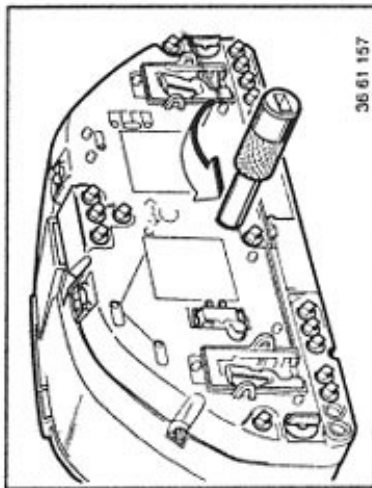


Main relay plug of DME

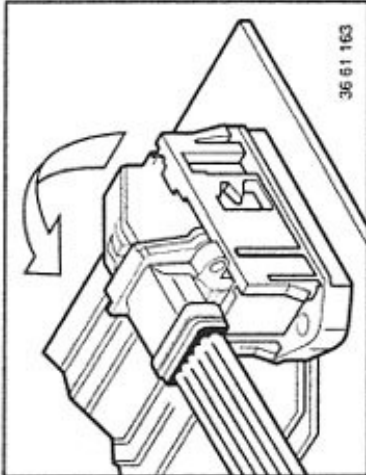
Unlock locking flap (1) of relevant wire.



Push back steel spring locks (2) of relevant
pin using special tool no. 61 1 137 and pull out
wire.

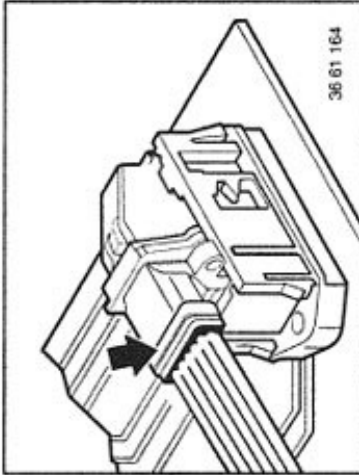
**Display lamp**

Apply socket wrench 61 1 138 to the appropriate display lamp, turn counterclockwise (in direction of arrow) 90° and take out display lamp.

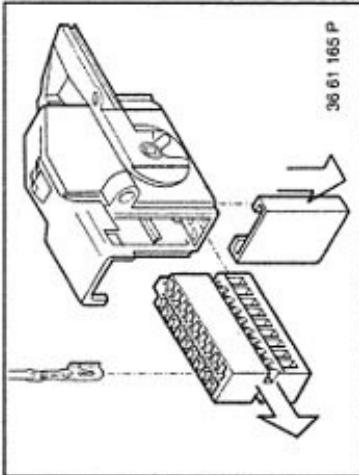


20-pin Elo plug (electronic connector from 9/91)

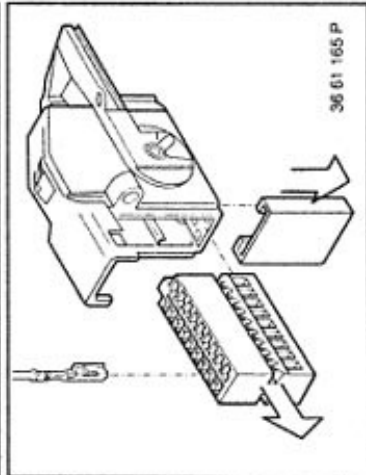
Unlock lock.



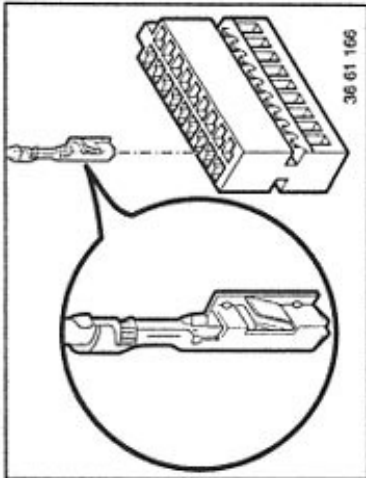
Loosen wire strap.



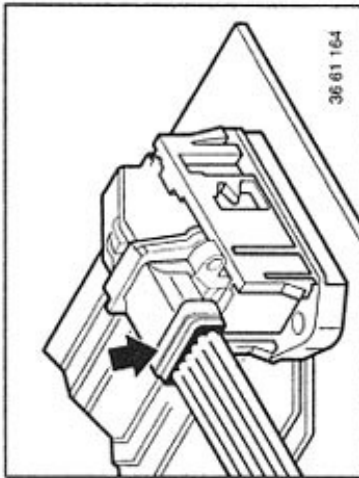
Pull off cover (slide).



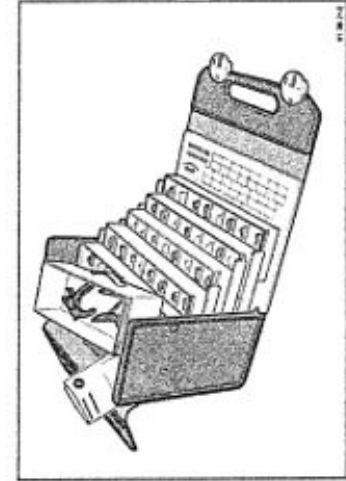
Pull out pin carrier.



Unlock pin.



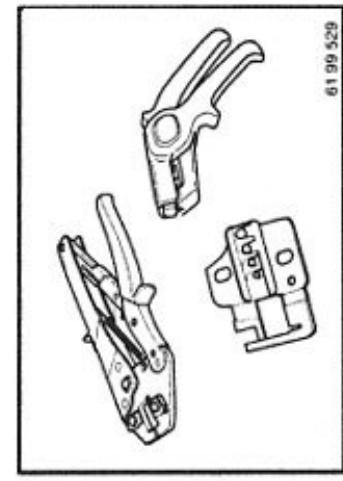
Caution!
Do not forget to install the wire strap.



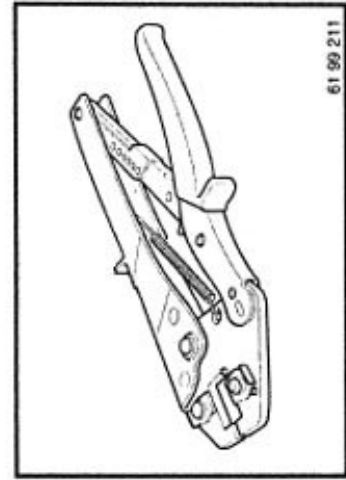
61 13 ... Wiring harness repair with the help of repair kit IV for vehicle electrics 61 9 020

Safety instructions:

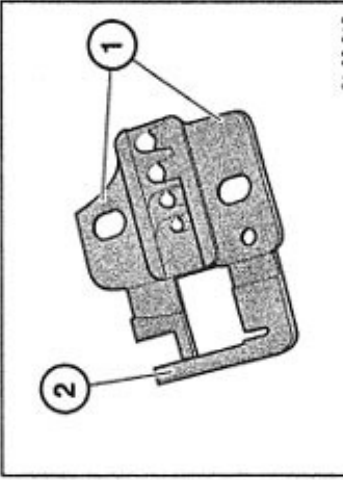
Check before repairing the wiring harness (e.g. sharp-edged body components, defective consumers, jamming mechanical parts, corrosion caused by water ingress etc.).
Interrogate fault memory.
Remedy cause of fault.
Disconnect battery ground.



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)

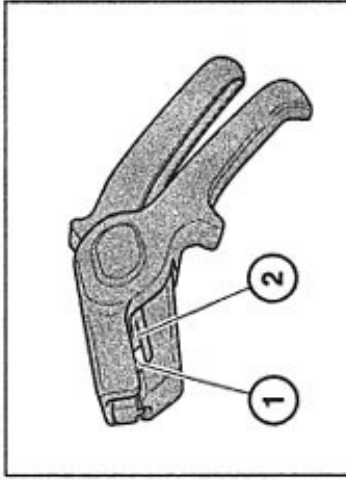


Mole grips without adjustable jaw 61 9 041.
(contained in repair kit 61 9 020)



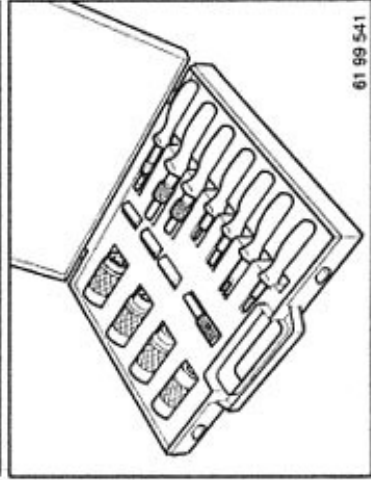
Adjustable jaw 61 9 042 for mole grips
61 9 041. (contained in repair kit 61 9 020)
Application:

- 1 Crimping contacts to wire cross sections of between 0.5 and 2.5 mm².
- 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 mm²
- 2 Cutting copper and aluminum conductors up to 2 mm² cross section.



Special tool kit 61 1 150.
Unlocking tool for connector system 2.5 mm, pressing-out tool for contacts.

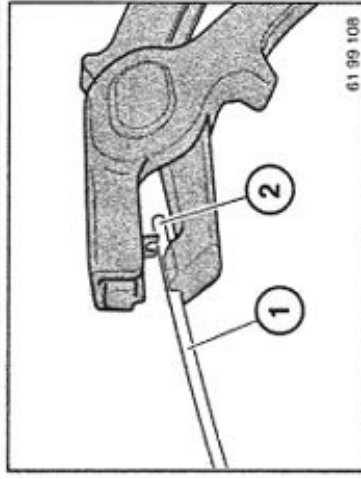
Operating instructions are enclosed with the repair kit 61 9 020. They contain the order details and sections of the parts list.



61 99 107

Strip insulation off cable.

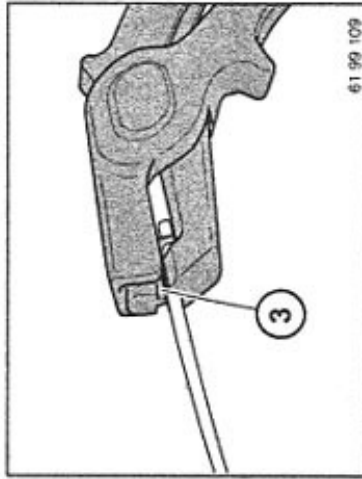
Use special tool 61 9 043.



61 99 108

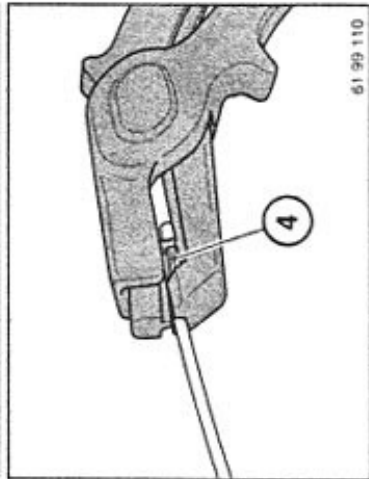
Guide wire (1) up to back of blade.
Length of wire to be stripped of insulation.

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



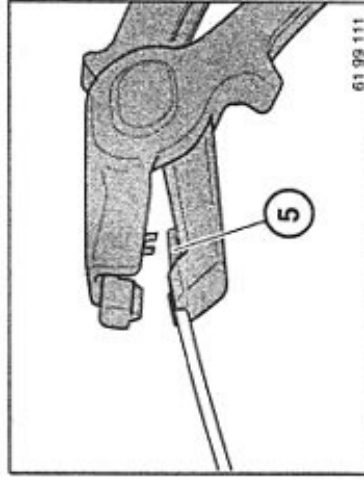
61 99 109

Press plier grips together until wire is gripped by jaws (3).



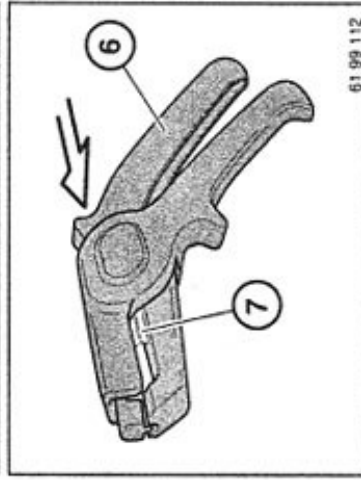
61 99 110

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).

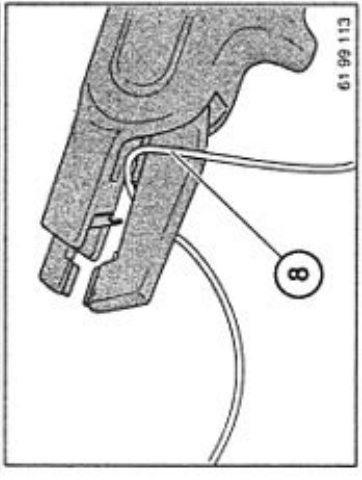


61 99 112

Cut off cable

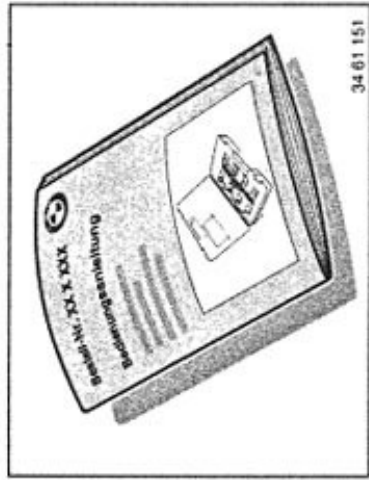
Use special tool 61 9 043.

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.



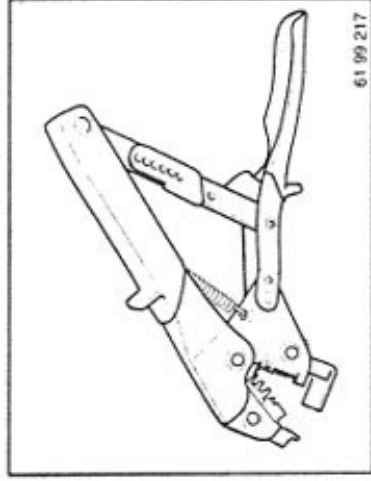
61 99 113

Grip wire (8) between cutters and press together handles until firm contact is made.



34 61 151

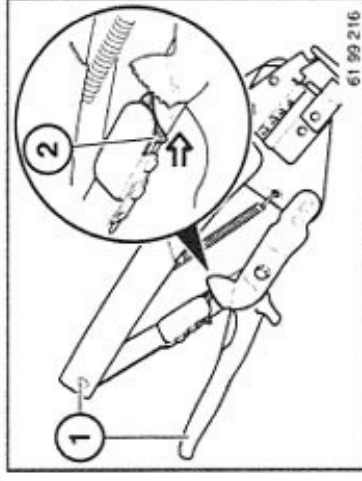
For additional operating manuals, refer to operating instructions:
Repair kit for vehicle electrics IV 61 9 020.



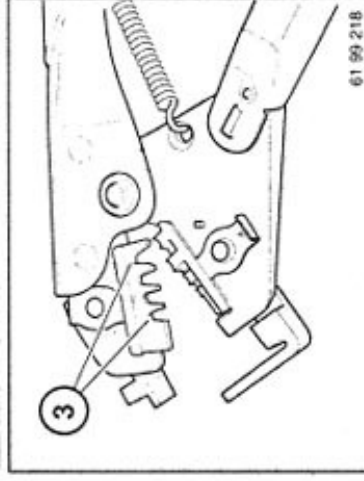
Crimping terminals

Use special tool 61 9 041 with adjustable jaws 619 042.

Strip insulation off cable.

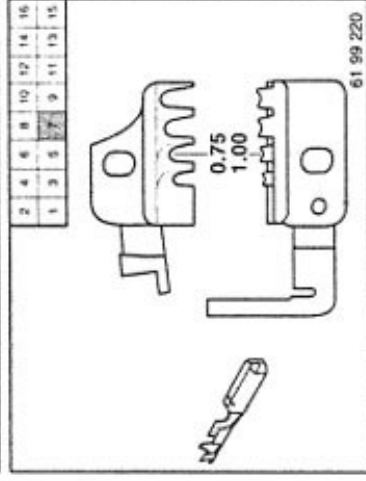


Unlock special tool:
Press handles (1) together gently and slide unlocking lever (2) in direction of arrow.
Or:
Press handles firmly together: pliers release automatically.



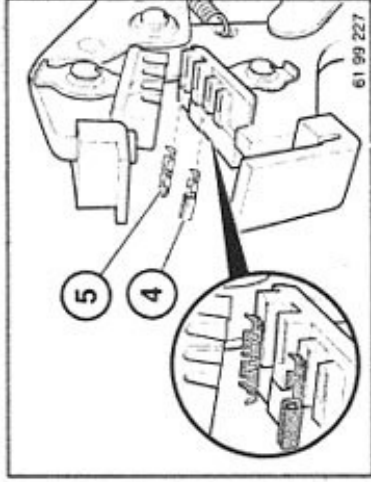
Designations on recesses (3) of adjusting jaw 61 9 042 indicate which pins should locate in which crimping nest.
The following wire cross sections and their corresponding terminals can be processed:

0.35 - 0.5	mm ²
0.75 - 1.0	mm ²
1.5	mm ²
2.5	mm ²

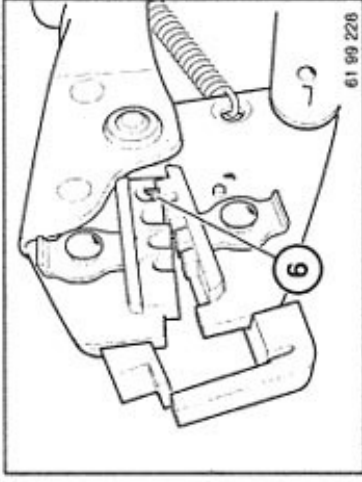


Here for example:
Contact sleeve 1.5 - 2.5 mm² for comb connector

Refer to operating manual for additional operating instructions:
repair kit for vehicle electrics IV 61 9 020.

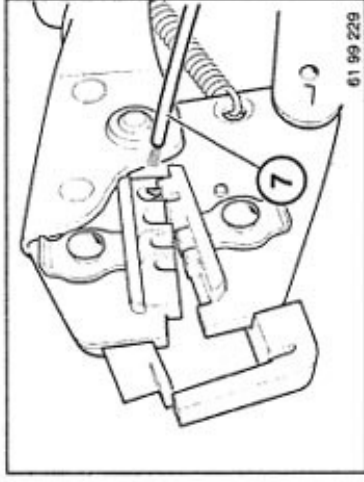


Install contact part (terminal) in predetermined nest.

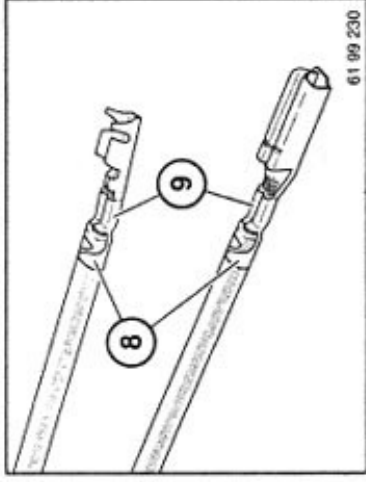


Preload contact part by pressing together in the adjusting jaws of the pliers.

Caution!
Only close pliers to point which prevents contact part from falling out of adjustable jaws of pliers.

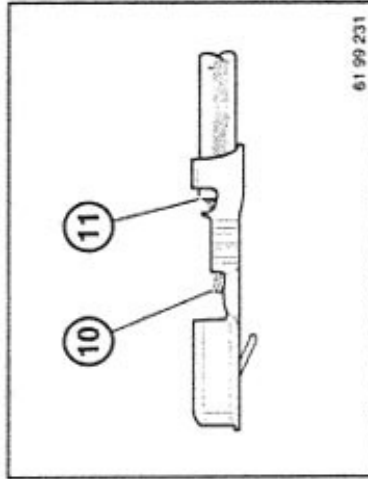


Install end of wire (7) with insulation stripped in the contact part. Ensure that the insulation and the stripped end of the wire are correctly located in the contact part.
Press pliers firmly together - pliers unlock automatically.

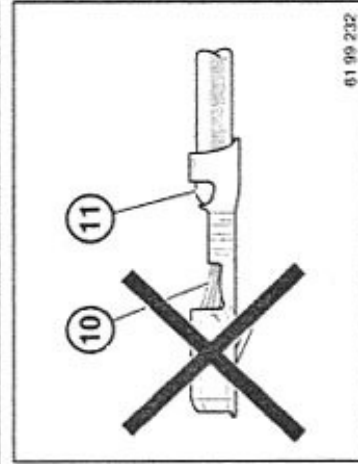


Remove contact from pliers.
Check that insulation crimp (8) and wire crimp (9) are in accordance with following illustrations.

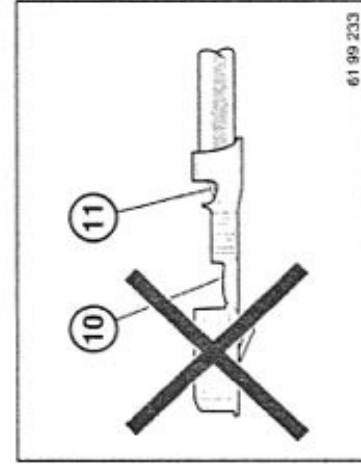
Correct crimping:
End of lead (10) visible.
End of insulation (11) visible.



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.

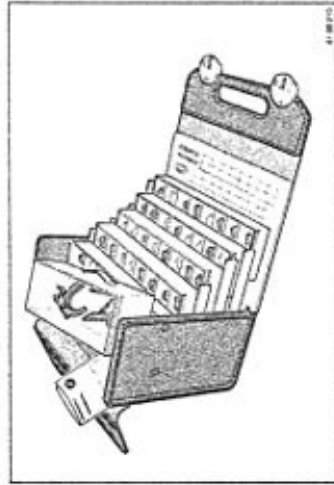


Repairing a plug connection on the wiring harness

Repair kit 61 9 020 contains ten different kits for wiring harness repairs.

Refer to operating manual for additional operating instructions:

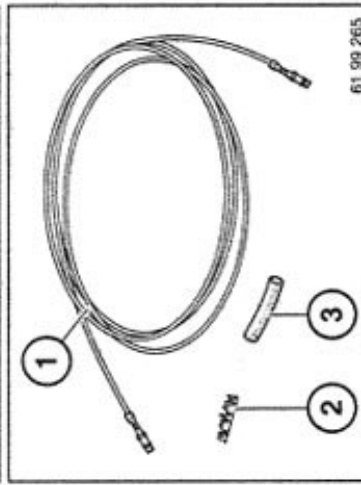
Repair kit for vehicle electrics IV 61 9 020.



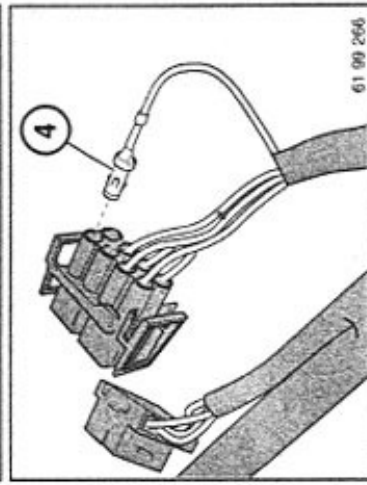
Here for example is repair kit A for contact sleeves for comb connectors.

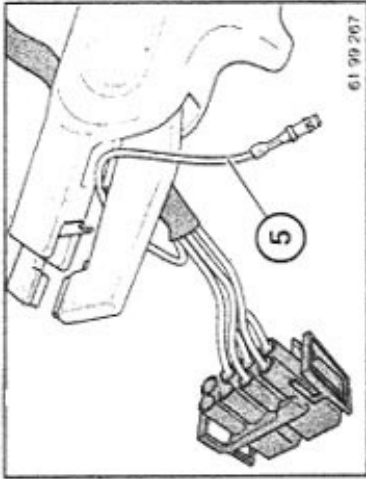


Select repair kit and remove the following parts:
Pressed cable end with requisite wire cross section (1), butt connector for selected cross section of wire (2), shrinkage tubing (3).

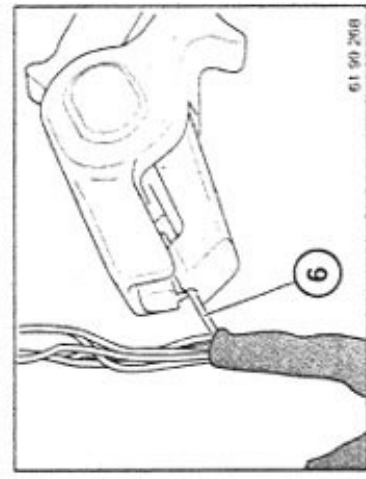


Unlock housing using special tool kit 61 1 150. Refer to operating manual 61 1 150 for additional operating instructions.
Mark defective contacts (4) with chamber number of housing and press out of housing using appropriate special tool (from special tool kit 61 1 150).

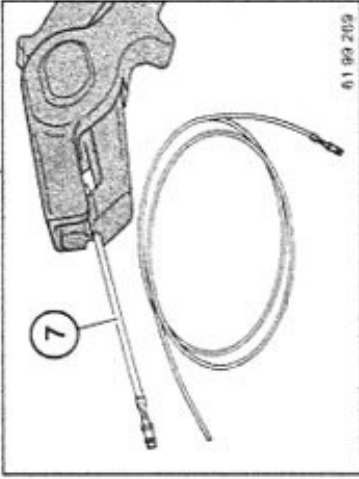




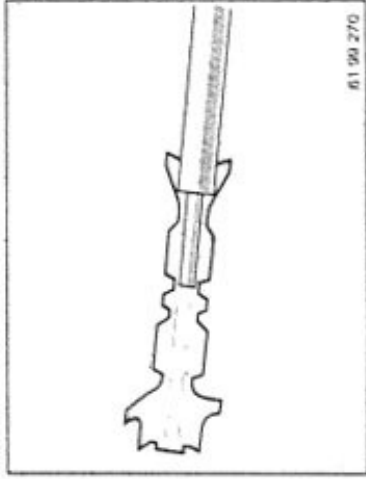
Cut off wire with defective contact (5) at accessible point.
Caution!
Note maximum length of repair cable! If more than one wire is to be repaired, arrange the cut cable ends in an offset manner to prevent the wiring harness from becoming too thick at the repaired point.



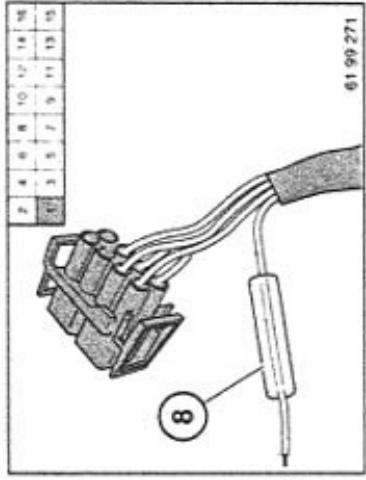
Strip insulation from wiring harness end of wire (6).



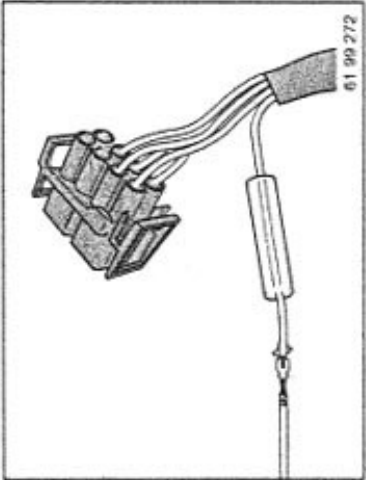
Cut prepressed end of wire (7) to required length and strip insulation off wire.



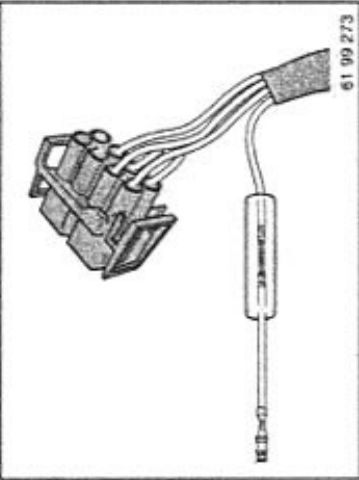
Crimp butt joint on end of wiring harness.



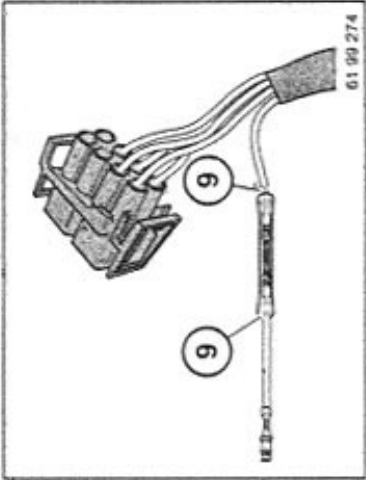
Slide shrinkage tubing (8) to exposed end of wire.



Crimp exposed end of wire with the impact connector.



Slide shrinkage tubing over impact connector.



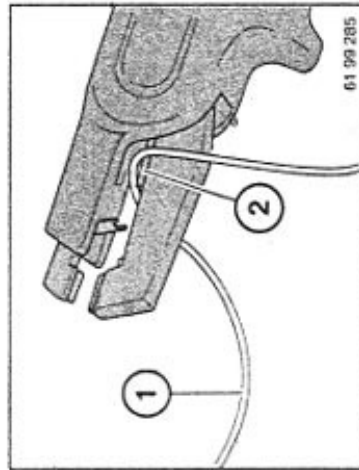
Use hot air blower to shrink shrinkage tubing until cement emerges evenly at both ends - (8) and (9) - of the shrinkage tubing.
Caution!
Do not set fire to shrinkage tubing!
Reinstall pin in housing.



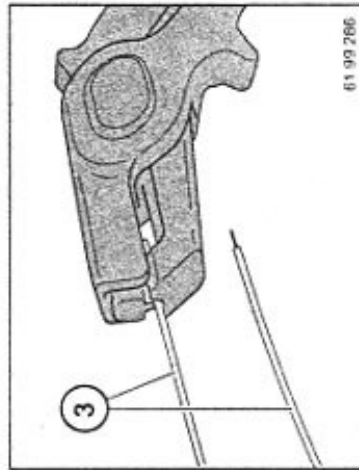
Install comb connector for retrofits

Comb connector and the required insulation parts and relevant tool are contained in the repair kit for vehicle electrics IV 61 9 020.

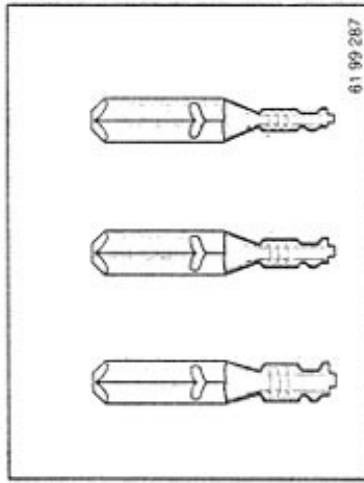
Refer to operating manual for operating instructions:
Repair kit for vehicle electrics IV 61 9 020.



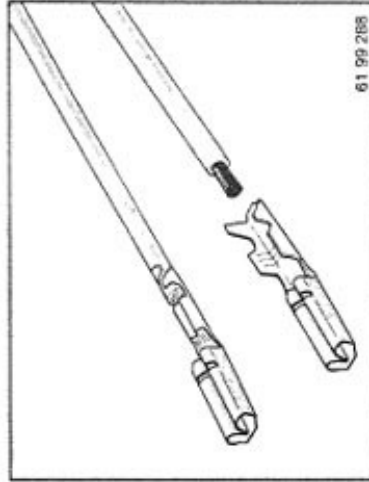
Cut wire loop in wiring harness with special tool 61 9 043.



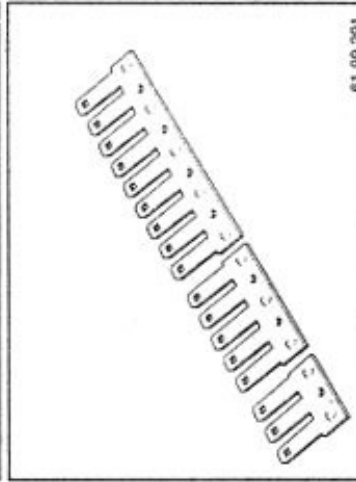
Strip insulation off both ends of the wire.



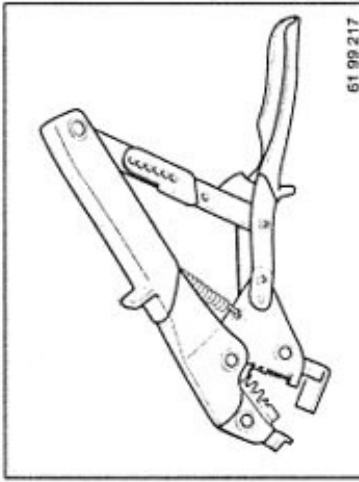
Select contacts in accordance with wire cross section.



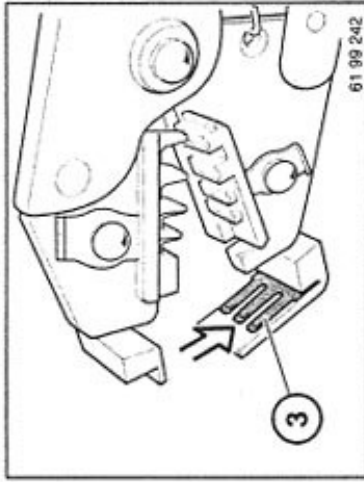
Crimp contacts with special tool 61 9 041 and adjusting jaws 61 9 042.



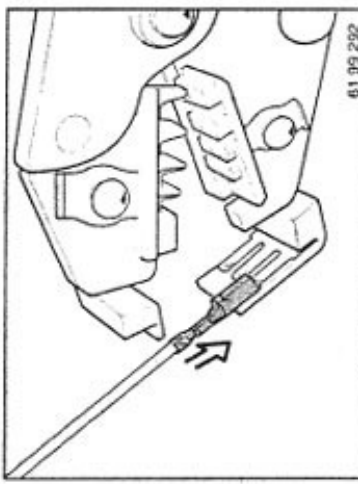
Remove comb connector from special tool kit 61 9 020 and cut down to the required number of terminals.



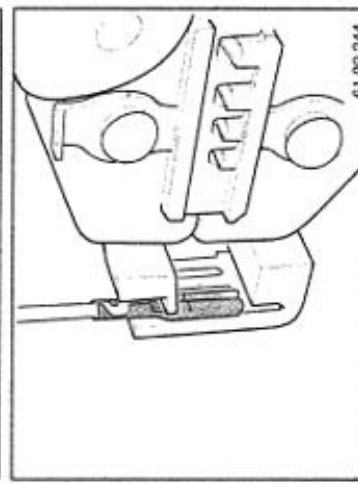
Use special tool 61 9 041 with adjusting jaws 61 9 042.



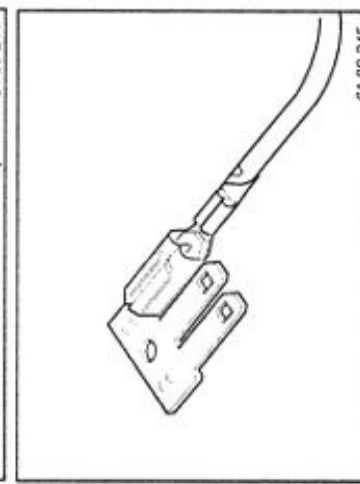
Install cut down comb connector in special tools 61 9 041 and 61 9 042.



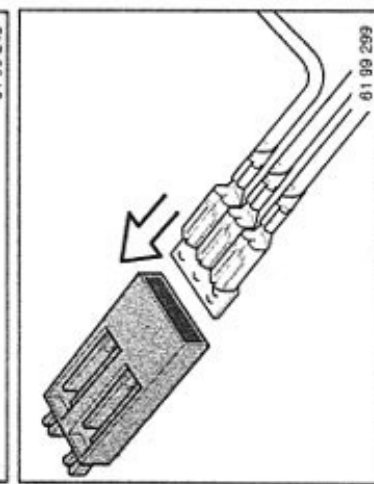
Fit wire and contact on comb connector.



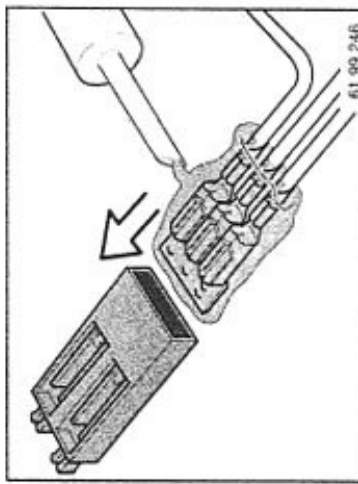
Press together special tool and slide contact firmly home.



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

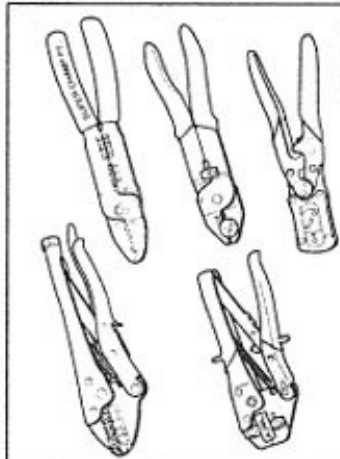
These repair kits are sold by the BMW Parts Service

Repair kit for vehicle electronics I
Order no.: 81 24 9 408 080

Repair kit for vehicle electronics II
Order no.: 81 24 9 408 300

Repair kit for vehicle electronics 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.



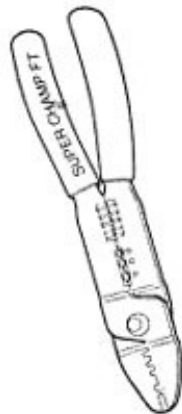
61 99 101

Summary of pliers used in vehicle electronics tool boxes I, II, III.



61 99 102

Crimpac II pliers from vehicle electronics tool kit I
Order no.: 81 24 9 408 125.



61 99 103

Super Champ FT pliers from vehicle electronics tool kit I.
Order no.: 81 24 9 408 126



61 99 104

Pliers for ignition cable contacts from vehicle electronics tool kit I.
Order no.: 81 24 9 408 127



61 99 105

Pliers for "Modu" (electronic contacts) from vehicle electronics tool kit II.
Order no.: 81 24 9 408 351



61 99 106

Pliers for 2.5 mm contacts from vehicle electronics 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 electricals repair kits I, II, III.

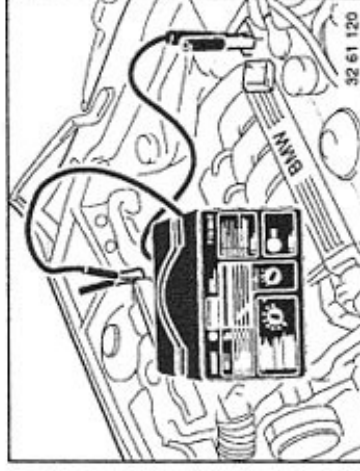
Among other points, the operating instructions contains:

- 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

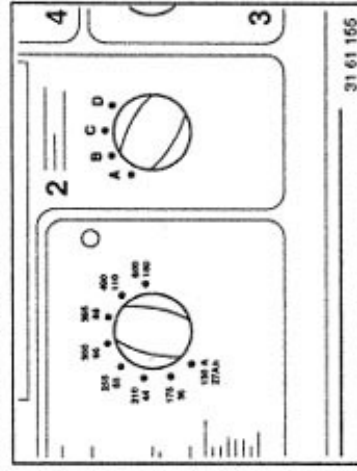
61 20 001 HIGH CURRENT TEST FOR CAR BATTERIES

Test with Bosch Tester 12 200E*.

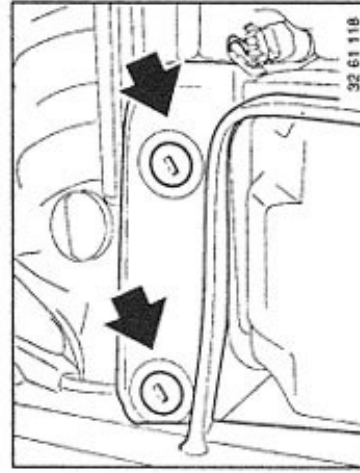


Connect the battery tester and set the cold testing current/rated capacity according to the battery specifications.

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 battery condition (such as cell shorts, sulphation).

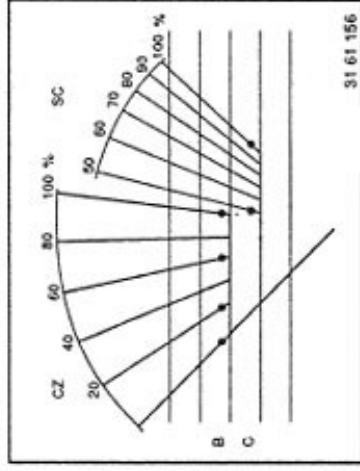


Start the test as described in the operating instructions.

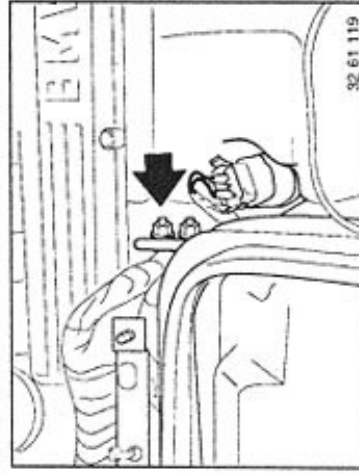


Test Procedures:

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 threshold 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 current, because then the burglar alarm horn would be active. This excessive current for the selected measuring range of the multimeter could destroy the instrument, 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)

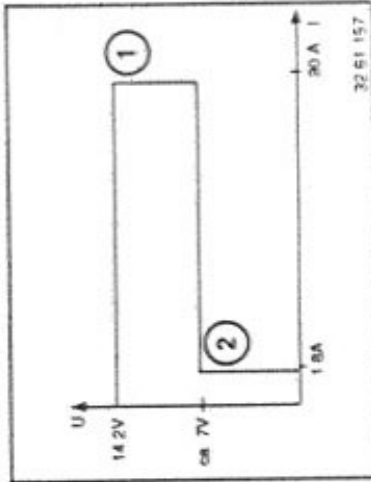
Disconnect batteries in car and charge separately.
Mutual charging must be avoided as batteries reach their gassing voltage at different times.

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.

Sample Chargers:
Siemens/Gossen VB 801
Gossen CG 32

Refer to "Voltage/Induction Charging Curve".

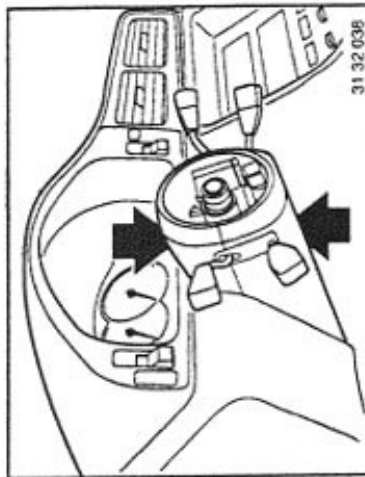


Voltage / Induction Charging Curve
Shows:

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.

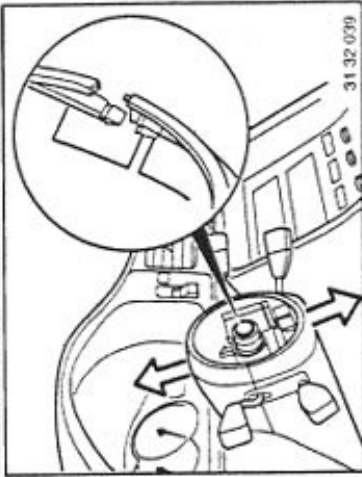
Battery chargers without these properties lead to damage in the car. The battery must be disconnected from the car power supply system when using any other chargers. Take battery out of the car when charging with non-regulated chargers (see Operating Instructions).

Refer to Service Information 61 08 88 (900) for additional information.



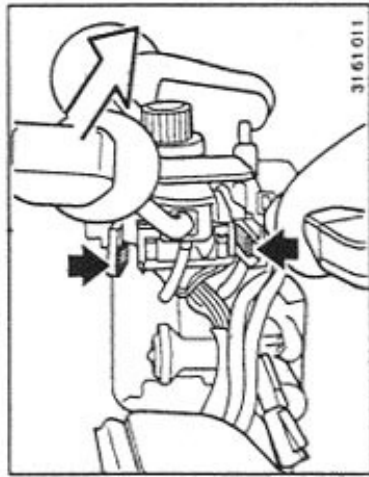
61 31 016 REPLACING TURN SIGNAL/HEADLIGHT DIMMER SWITCH

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.



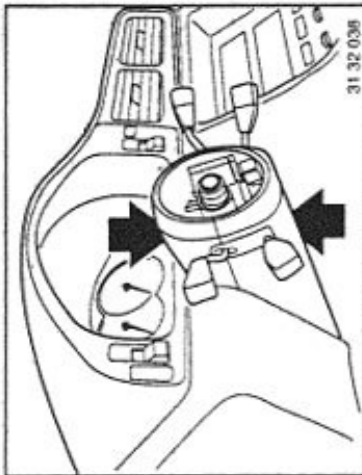
Unscrew screw and take off upper section of the steering column casing.

Disconnect plugs.



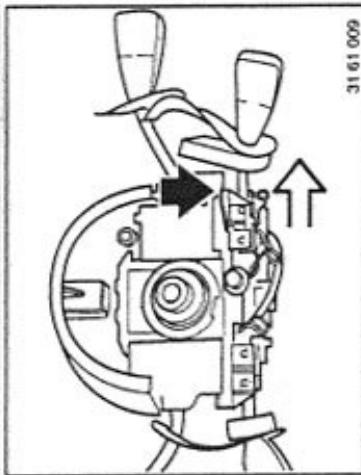
Push in retainers on both sides and pull out switch. Disconnect plugs.

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.

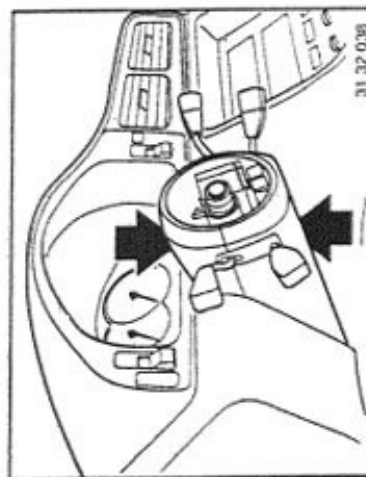


61 31 018 REPLACING SELECTOR SWITCH FOR CRUISE CONTROL

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.

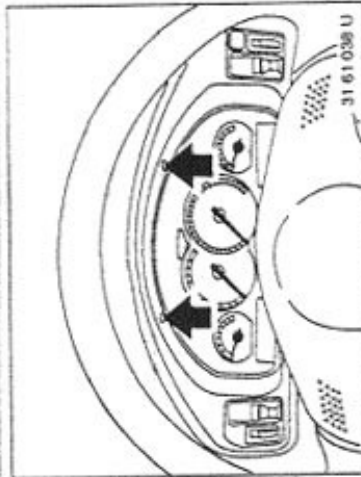


61 31 020 REPLACING IGNITION SWITCH

Remove dashboard trim panel at bottom left - see 51 45 180. Unscrew screw and take off lower section of the steering column casing.

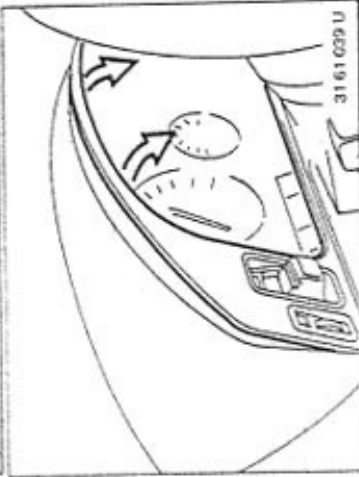


Unscrew setscrews on both sides. Pull out switch. Disconnect plug.

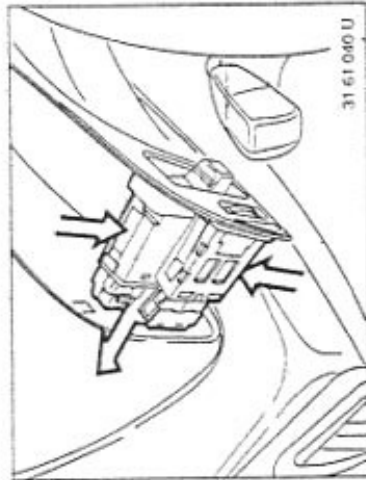


61 31 028 REPLACING LIGHT SWITCH

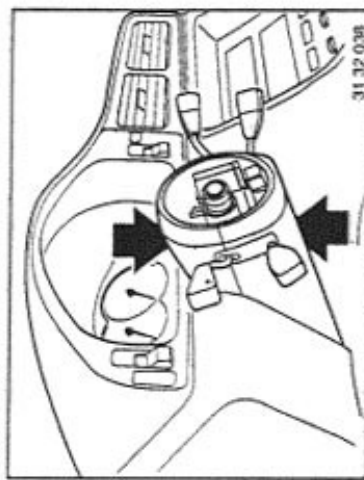
Unscrew screws.



Fold down ornamental frame at top. Remove ornamental frame.

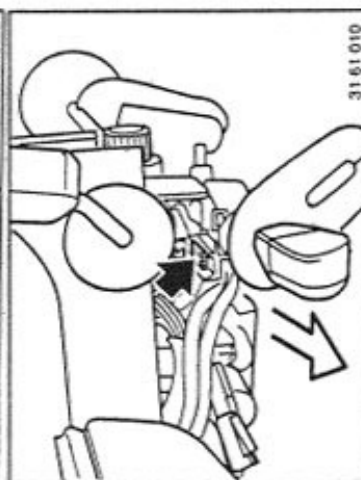


Disconnect plugs. Push in retaining hook and press switch out of the ornamental frame.

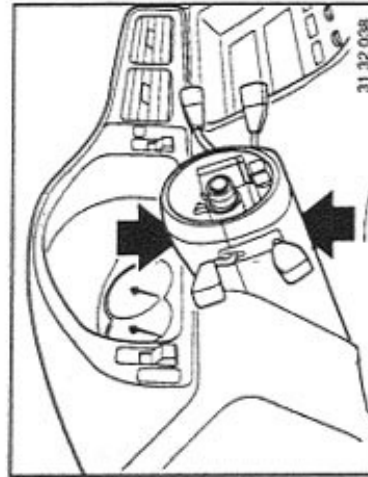


61 31 035 REPLACING STEERING COLUMN CONTROL SWITCH

Remove dashboard trim panel at bottom left - see 51 45 180. Unscrew screw and take off lower section of the steering column casing.

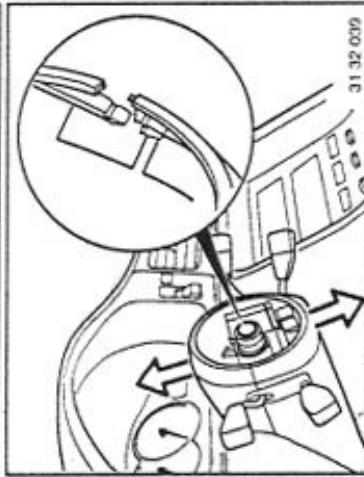


Press down on retaining hook and pull out switch. Disconnect plug.

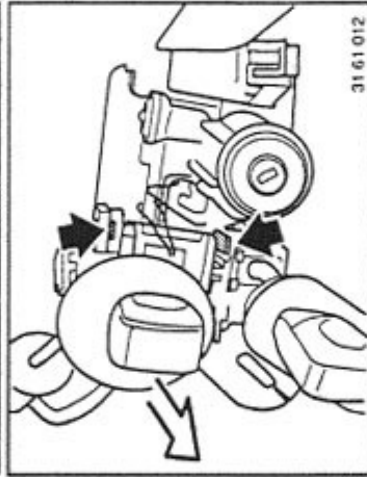


61 31 040 REPLACING WINDSHIELD
WIPER SWITCH

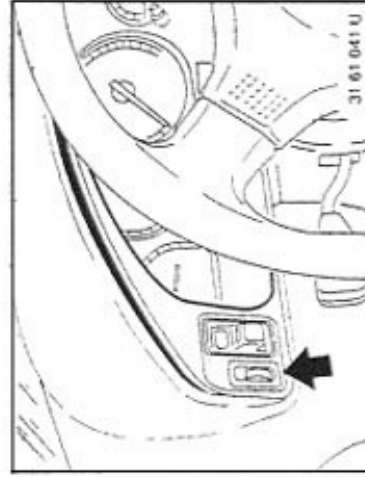
Remove dashboard trim panel at bottom left – see 51 45 180.
Unscrew screw and take off lower section of the steering column casing.



Unscrew screw and take off upper section of the steering column casing.

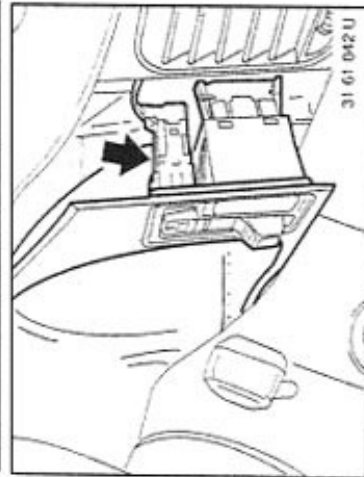


Press in retaining hooks on both sides.
Pull out switch.
Disconnect plug.



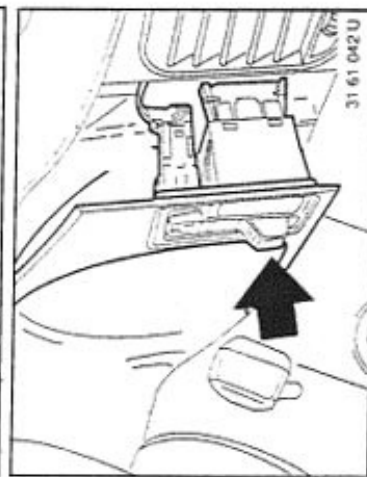
61 31 045 REPLACING INSTRUMENT
LIGHT DIMMER SWITCH

See "Replacing Light Switch" in
61 31 028.



61 31 060 REPLACING REAR WINDOW
DEFOGGER SWITCH

See "Replacing Light Switch" in
61 31 028.

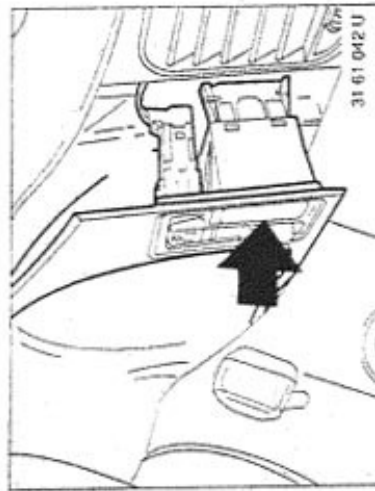


61 31 070 REPLACING FRONT FOG
LAMP SWITCH

See "Replacing Light Switch" in
61 31 028.

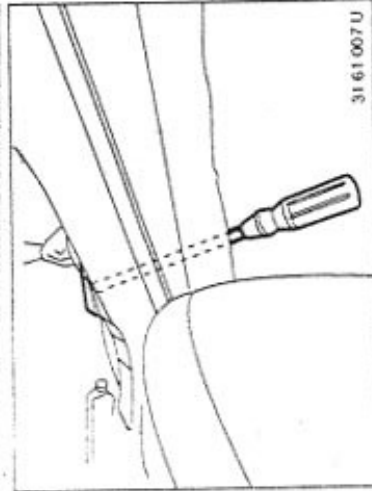
61 31 072 REPLACING VERTICAL HEADLIGHT AIM CONTROL SWITCH

See "Replacing Light Switch" in
61 31 028.

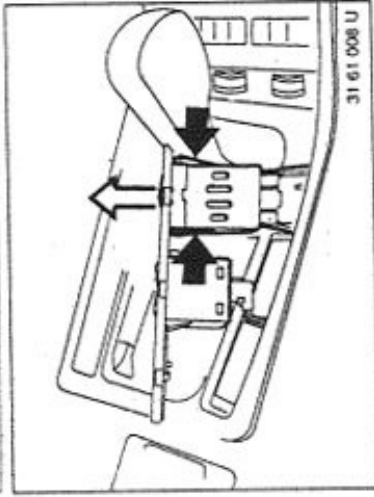


61 31 ... REPLACING SWITCH IN CENTER CONSOLE

Press out switch frame in center console carefully from underneath with a screwdriver.

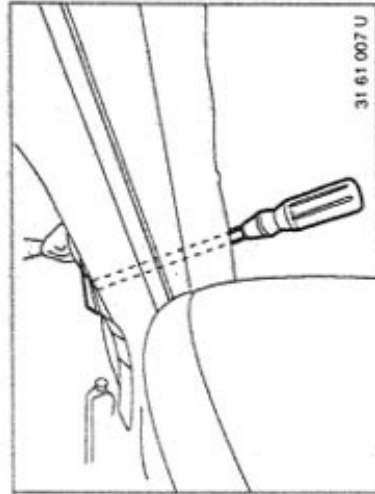


Pull off plug.
Press in retaining hook and press
switch forward out of the trim panel.

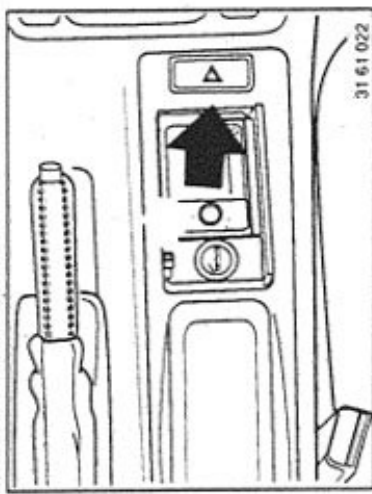


61 31 080 REPLACING HAZARD WARNING LIGHT SWITCH

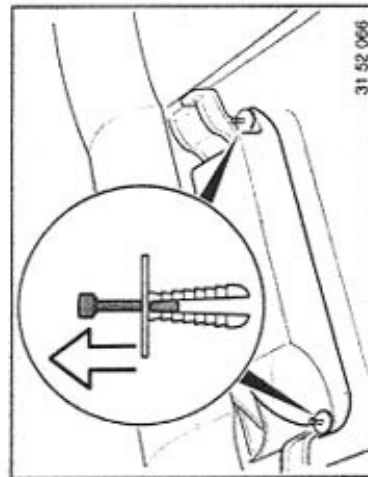
Press out switch frame in center console carefully from underneath with a screwdriver.



Press out hazard warning light switch
from underneath.



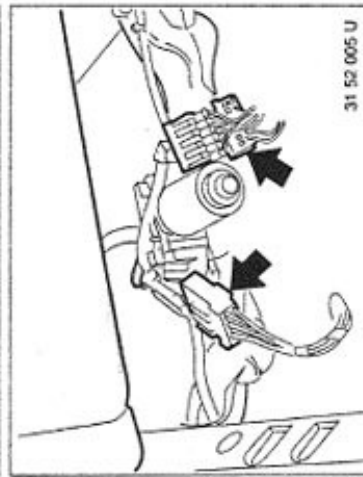
Disconnect plug.



31 52 066

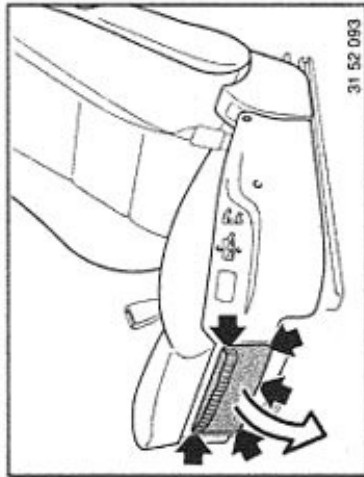
61 31 099 Removing and installing or replacing control unit for left or right seat adjustment

Move seat forwards and upwards.
Unfasten clips on cover finisher in footwell behind the seat frame.
Remove cover finisher.



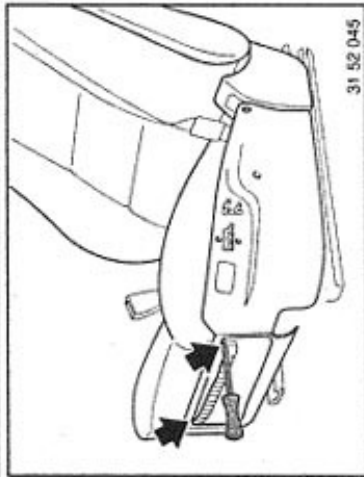
31 52 005 U

Disconnect plug connection between body wiring harness and seat wiring harness.

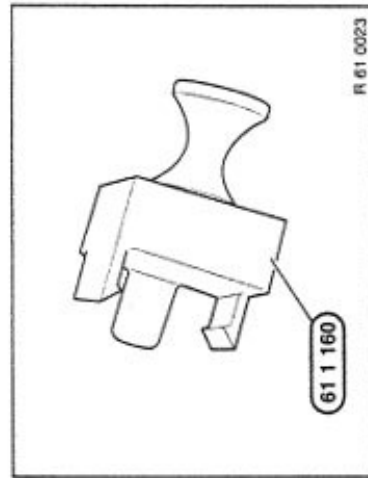


31 52 093

Unclip gathering pocket.

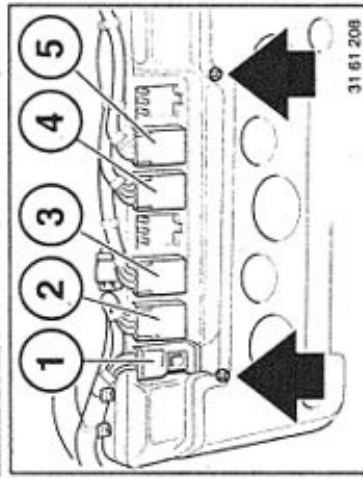


31 52 045



R 61 0023

Unfasten wiring harness cable connector.
Remove all connectors from seat control unit with special tool 61 1 160.



31 61 208

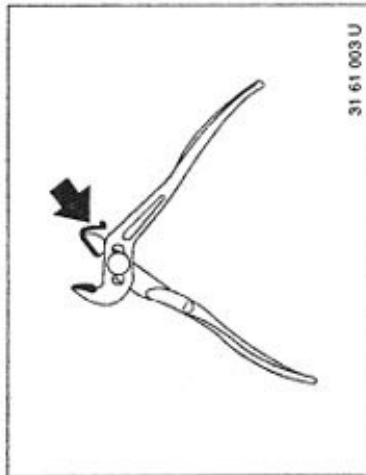
Unfasten screws and remove seat control unit.

Unfasten screws.
Remove trim.

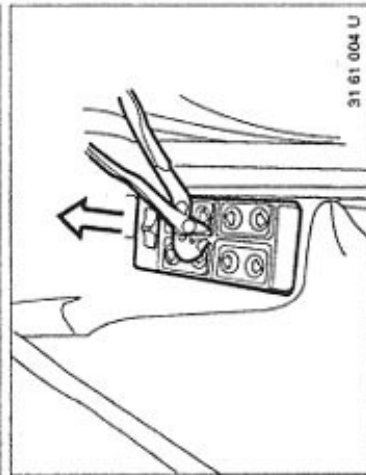
61 31 115 REPLACING SIDE WINDOW CONTROL SWITCH

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.



31 61 003 U

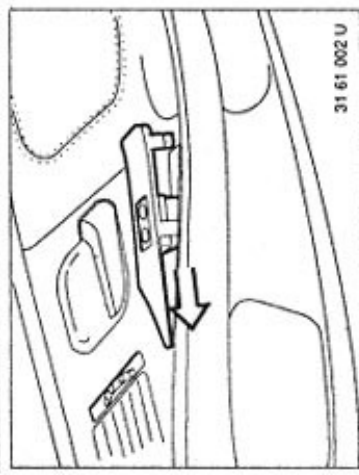


31 61 004 U

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.

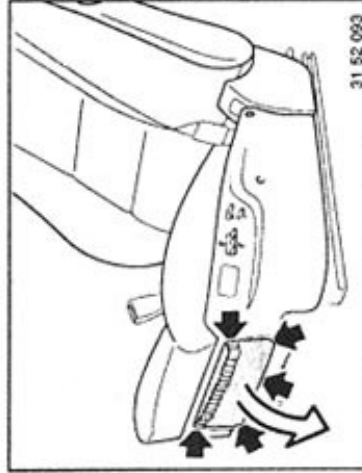


31 61 002 U

Disconnect plug.
Remove switch.

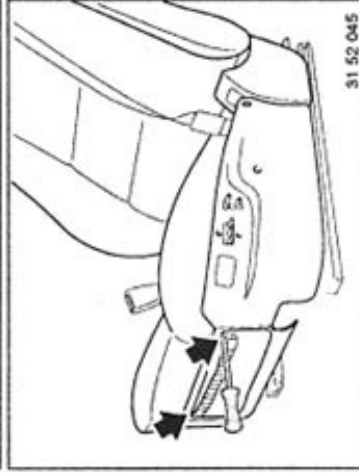
61 31 201 REMOVING AND INSTALLING
OR REPLACING REGULATOR
FOR FRONT SEAT HEIGHT
DRIVE

Unclip pocket.



31 52 003

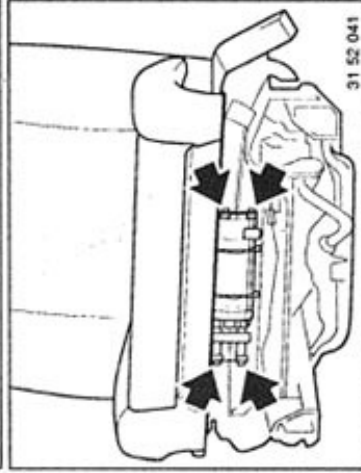
Unscrew screws and remove panel.



31 52 045

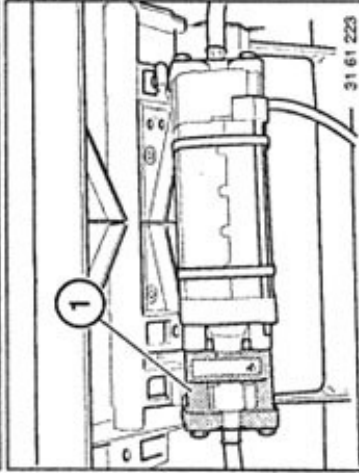
Loosen wire straps and unscrew screws.
Disconnect control unit plug.
Remove lockplates for height adjustment
shafts and motor.

Installation:
Insert spacers into rubber parts.
Check function.



31 52 041

Remove regulator (1).



31 61 223

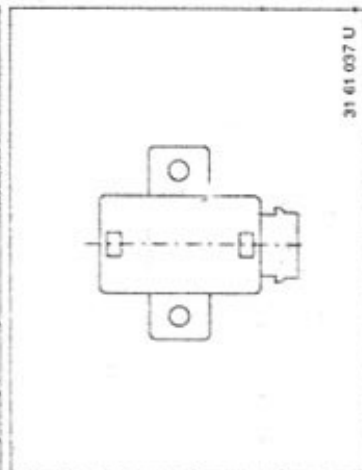
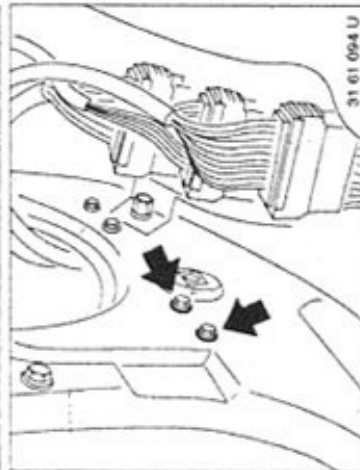
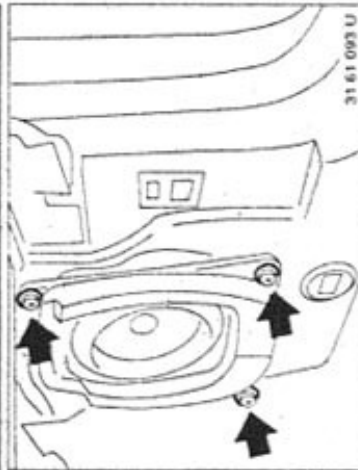
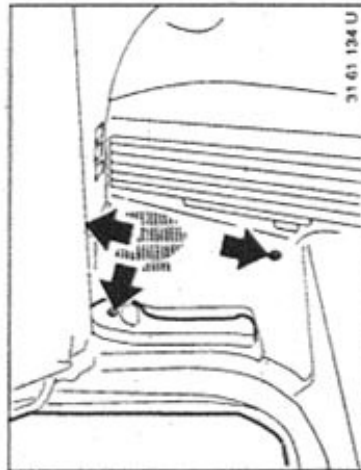
61 31 205 REPLACING IMPACT SWITCH FOR CENTRAL LOCKS

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.

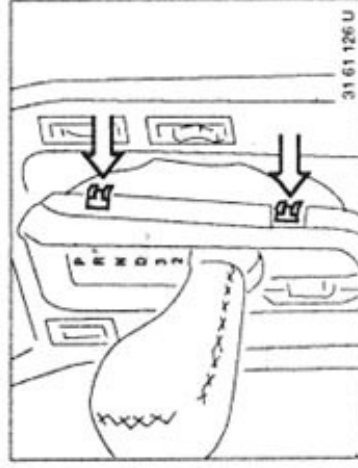
Unscrew screws.
Take impact switch out of the body cavity.

Installation:
Always check for correct installed position!

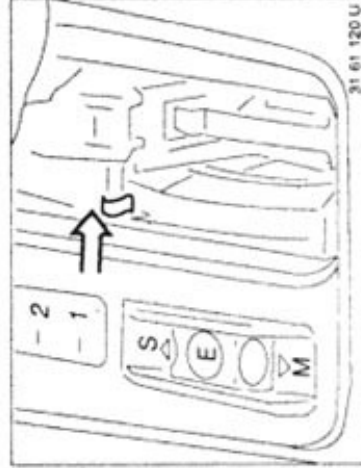


61 31 260 REPLACING TRANSMISSION SWITCH

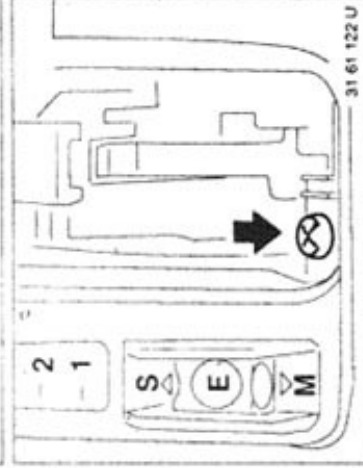
Push dust cover on selector lever up.



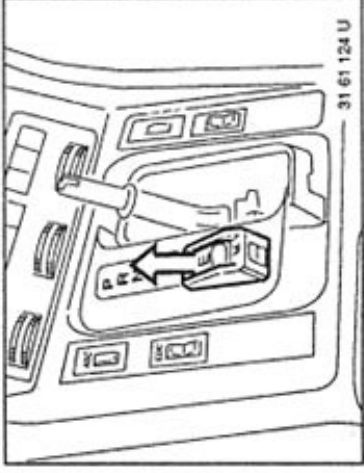
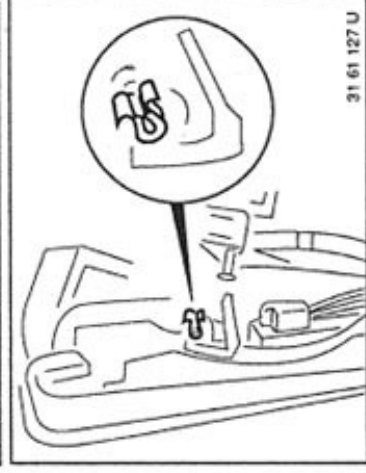
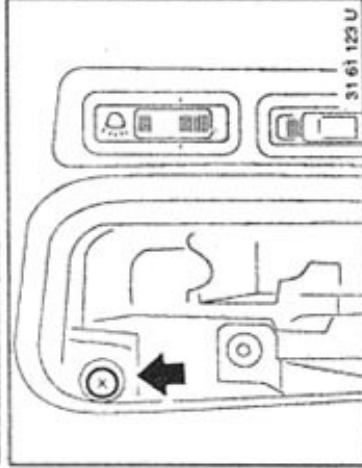
Pull selector lever handle off from above.



Move selector lever into "P".
Unscrew screw.



Move selector lever to range "1".
Unscrew screw.



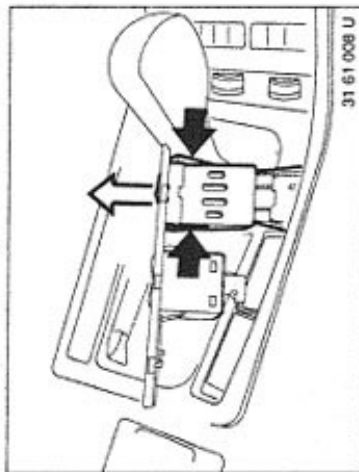
Move selector lever into "P".
Pry range indicator drive out carefully
using a screwdriver.

Press retainer aside and unclip the drive
carefully.

Picture shows retainer.

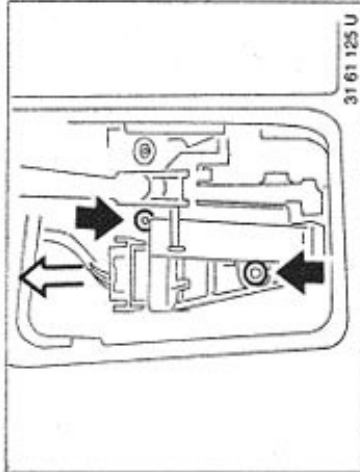
Remove console.

Disconnect plug.



31 61 008 U

Unscrew screws.



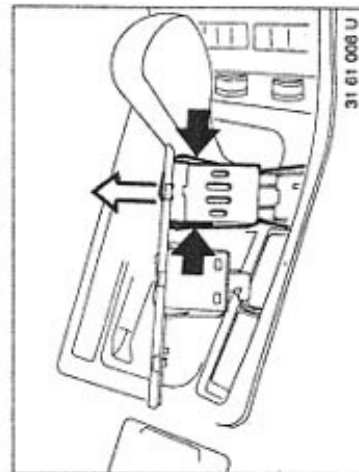
31 61 125 U

Position selector lever in such a manner that the switch can be taken out through the slot.

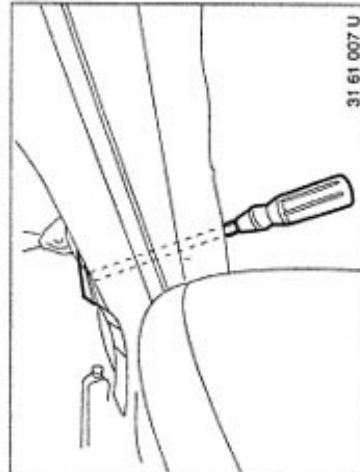


31 61 149 U

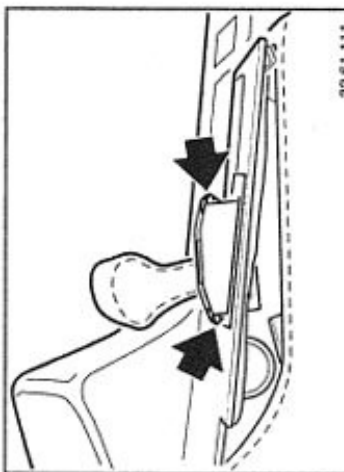
Installation:
Screws are microencapsulated and must be replaced.
Tightening torque*.
Install the range indicator's drive pin with the selector lever in "P", before installing the retainer.



31 61 008 U



31 61 007 U



32 61 111

61 31 265 REPLACING PROGRAM
SWITCH FOR "EH" TRANS-
MISSION CONTROL

Test - refer to BMW Test Plan in Group 24.

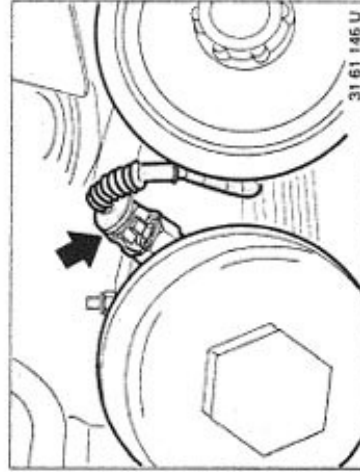
Checking:
Program switch must be in position "E"
after switching the ignition on.

Press trim panel out upwards carefully
using a screwdriver.

Push the retaining hooks back and press
the switch out of the trim panel from under-
neath.

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.

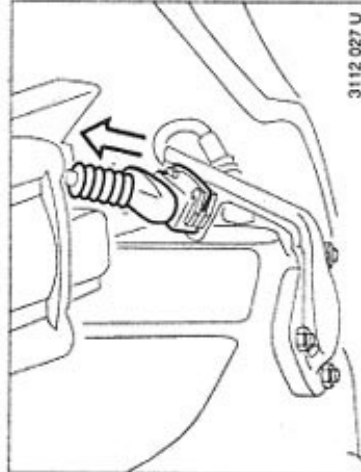


Unscrew switch.

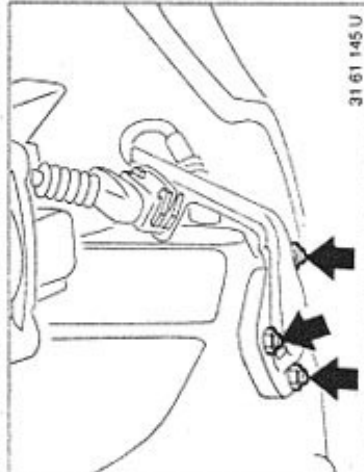
Installation:
Tighten oil filter cover.
Install switch.
Check oil level.

61 31 282 REPLACING ENGINE OIL LEVEL SWITCH

Drain engine oil.
Disconnect plug on engine carrier.

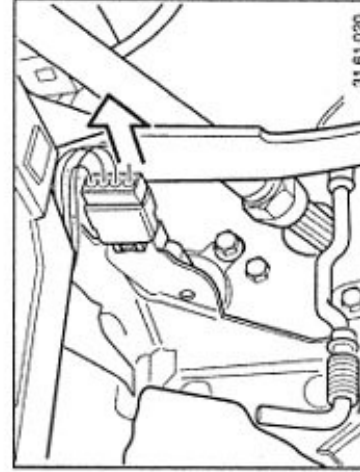


Unscrew screws.
Remove switch.
Pour engine oil in.



61 31 295 REPLACING CLUTCH SWITCH FOR CRUISE CONTROL

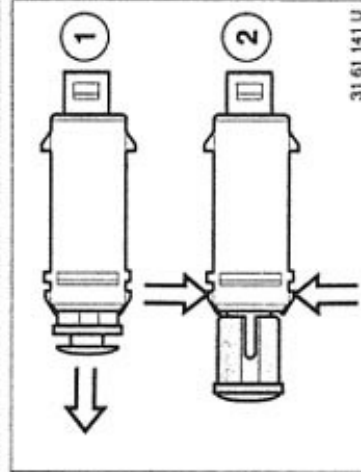
Remove plate at bottom of A-pillar.
Remove engine hood release lever.
Remove dashboard trim panel at bottom left.
Remove trim panel for pedal assembly.



Disconnect plug.

Floor the clutch pedal.

1: Pull plunger and sleeve forward as far as possible.
2: Squeeze retainers together and pull switch back.

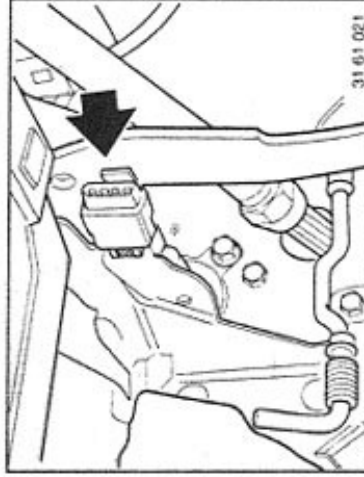


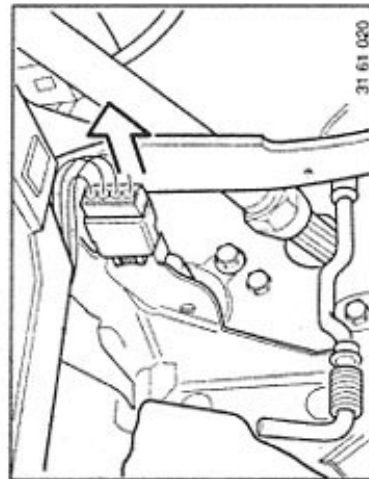
Important!

It is essential to check the safety path in cars with EML (electronic engine power control) - refer to 12 70 500.

61 31 300 Replacing brake light test switch

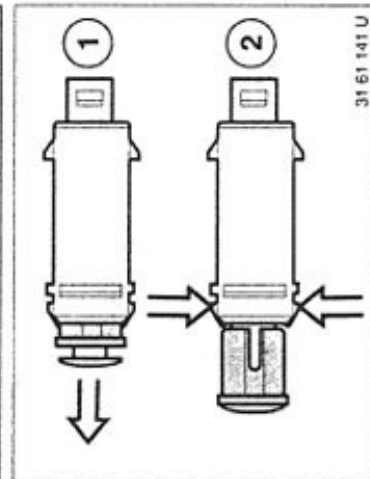
Brake light test switch is installed in same housing as the brake light switch.
Refer to "Removing brake light switch" for removal and adjustment. Can be recognized on the 4-pin plug.





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.

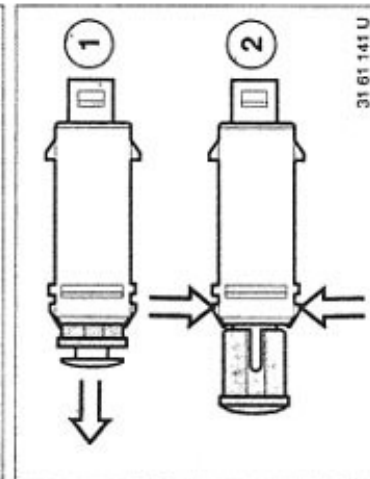


Depress brake pedal.

- 1: Pull plunger and sleeve forward completely.
- 2: Compress retainers and pull switch to rear.

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.

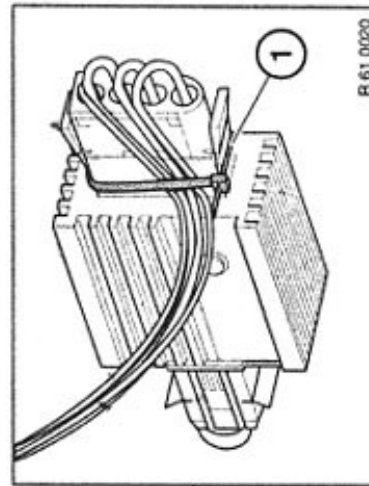


Caution!

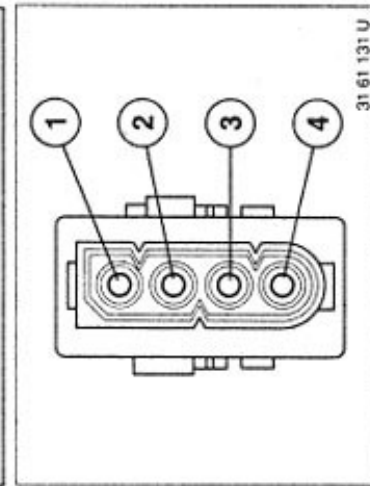
On vehicles with EML (Electronic Power Control) always check the safety path! Refer to 12 70 500.

Caution!

The switch setting could be affected if the brake pedal is released suddenly.
Perform function check.



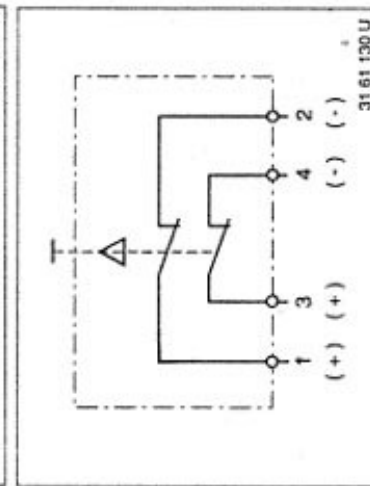
Caution!
On vehicles with an electronic brake light switch (identifiable by cooling ribs), the lines must be secured with a cable connector (1), as shown in the figure.



Plug connections for brake light switch and brake light test switch.

- 1 and 2 brake light switch
- 3 and 4 brake light test switch

Circuit diagram for brake light test switch and brake light switch

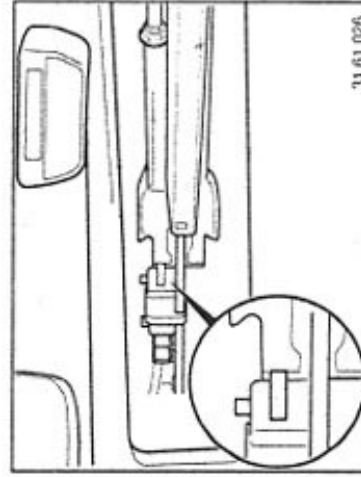


Caution!

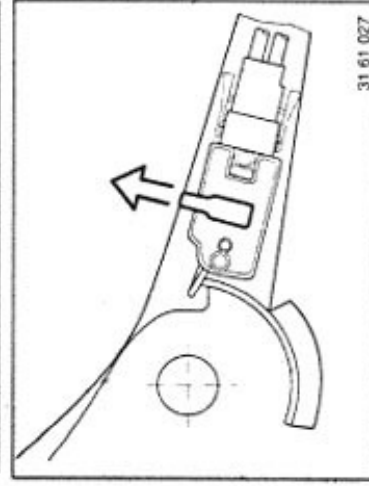
After replacing the brake light test switch or brake light switch, always perform the following test:
Check safety path of the Electronic Power Control. Procedure described in Repair Instructions 12 70 500.

61 31 320 Replacing switch for hand-brake warning light

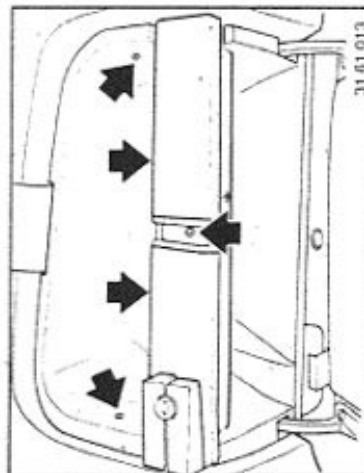
Unclip trim panel.



Lever out bracket.
Disconnect plug connection.
Remove switch.

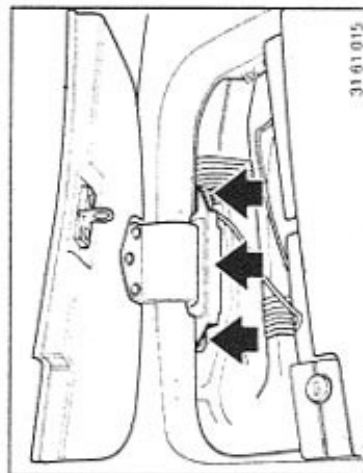


Setting:
Switch must engage between first and second detent stages.

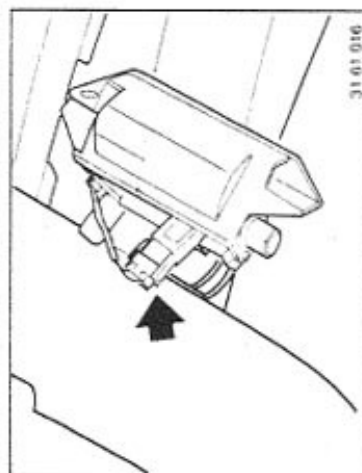


61 31 331 Replacing switch for glove box lighting at top

Unfasten screws.
Remove trim panel.



Unfasten screws.
Remove hinge by lifting out past air duct at an angle.

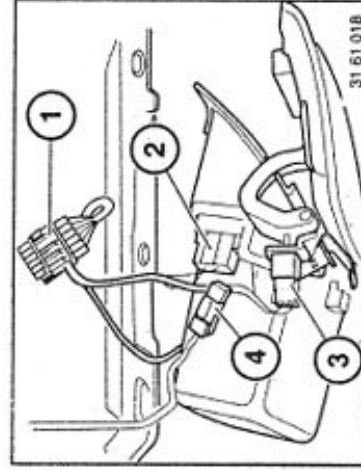


Installation:

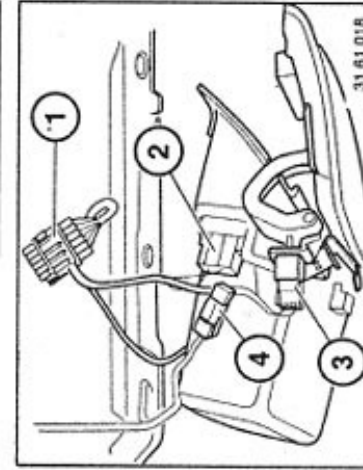
During installation, ensure that the switch does not slide out of the bracket. Slowly close flap and check through crack whether light goes out.

61 31 332 Replacing lower glove box light switch

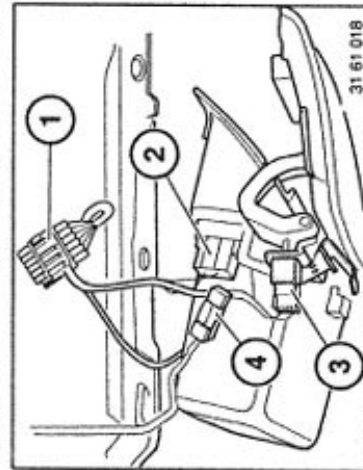
Remove lower right glove box,
refer to 51 16 363
Remove trim panel.



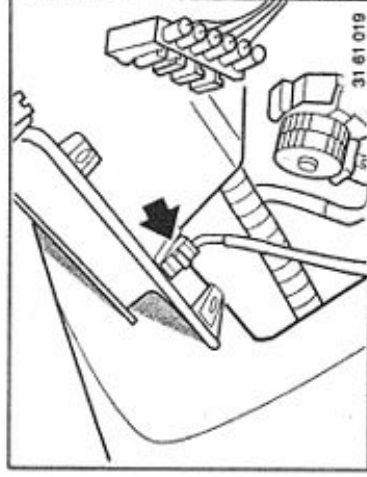
Remove switch (3).
Disconnect plug connection.



1 = Plug connection for glove box lighting



4 = Plug connection for microswitch - lock cylinder in glove box.
2 = Charge connector for pocket torch.



Plug connection for microswitch on lock cylinder of glove box.

61 31 440 Removing and installing or replacing thermostat for heated windshield washer jets

Function description:

The thermostat is switched sequentially with the heated washer spray jets.

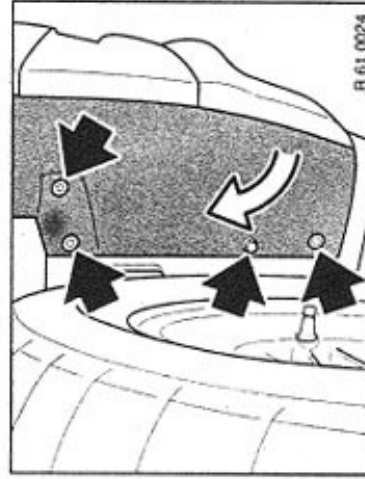
Cut-in temperature: 2 - 10 °C

Cut-out temperature: 8 - 16 °C

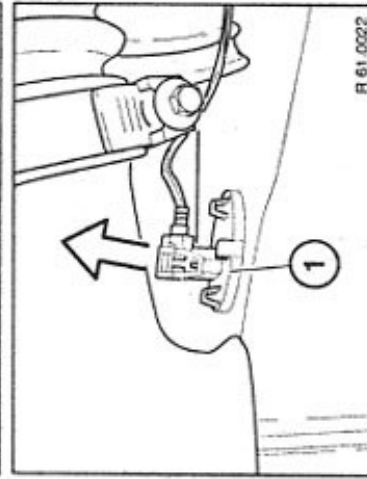
Note when troubleshooting:

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.

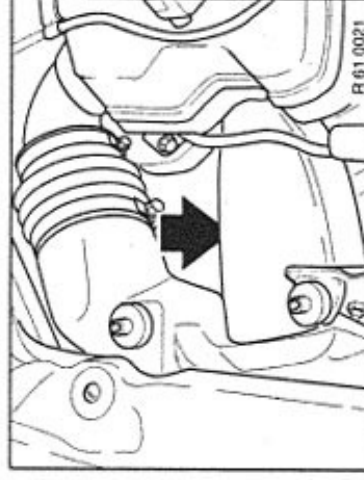


850 CSI:
Wheel arch inner trim at front right: unfasten screws.

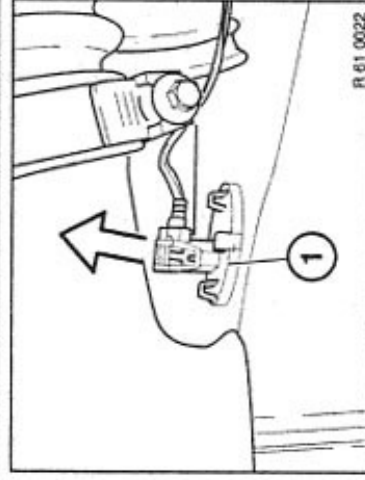


Installation location:
In front brake air duct.
Disconnect plug connection.
Unclip temperature sensor (1).

850 CI, 840 CI:
Remove complete right headlight with carrier plate, refer to 63 12 460.



Installation location:
In front brake air duct.

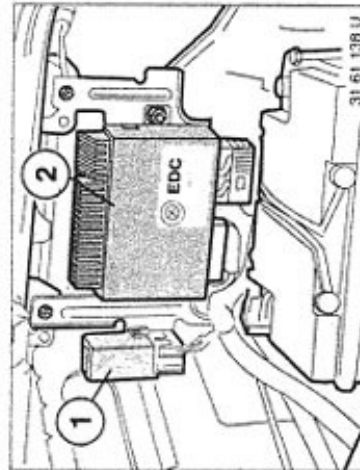


Disconnect plug connection.
Unclip temperature sensor (1).

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.

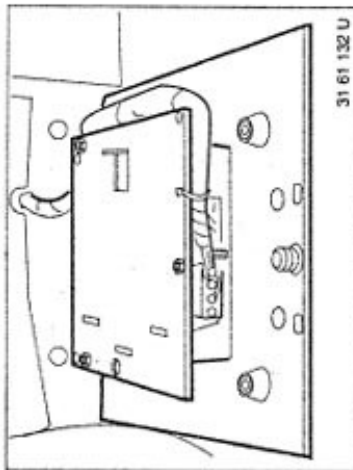


Right Side of Car:

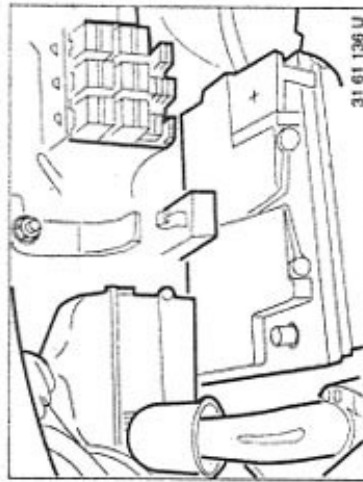
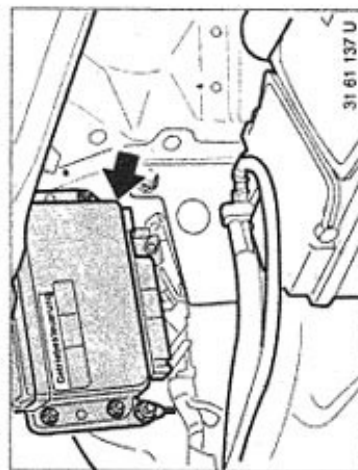
EDC control unit - refer to Group 37 for additional information.

- 1 Power saving relay
- 2 Control unit for EDC (electronic absorber control)

Audio-amplifier



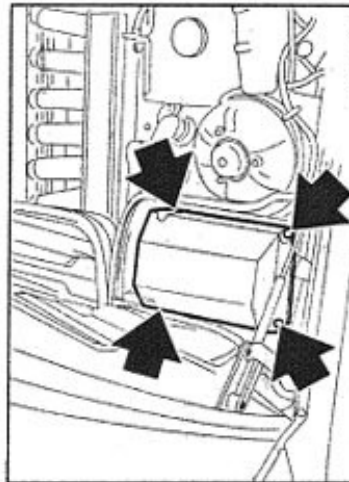
Control unit for electronic transmission control (automatic transmission)



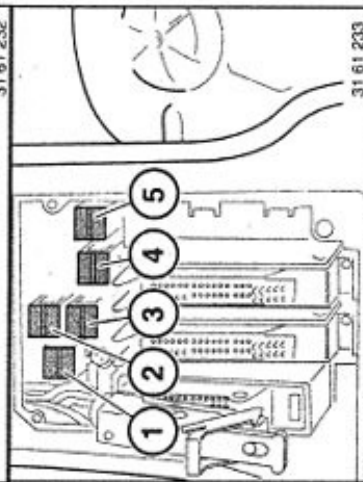
Left Side of Car: Trailer hitch.

61 31 487 Replacing main relay (for lambda control)

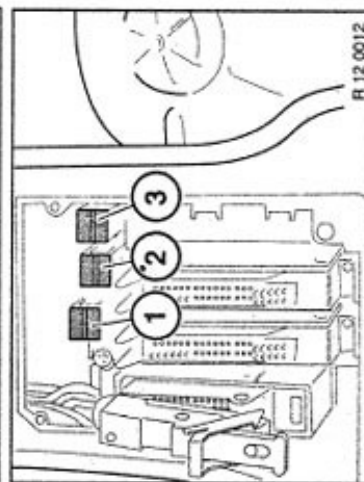
Unfasten screws in cover.
Remove cover.



31 61 232



31 61 233



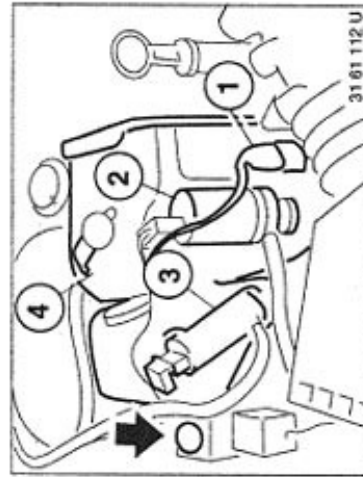
R 12 0012

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.



31 61 112 U

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

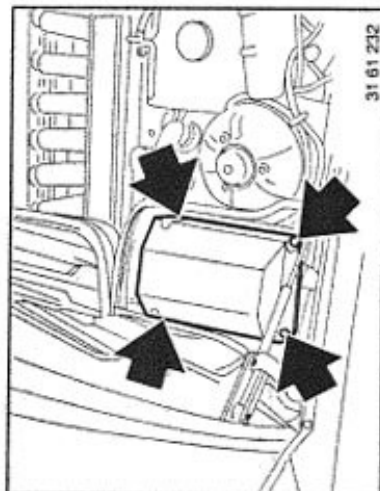
Caution!

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 31 521 Replacing main relay (for digital motor electronics)

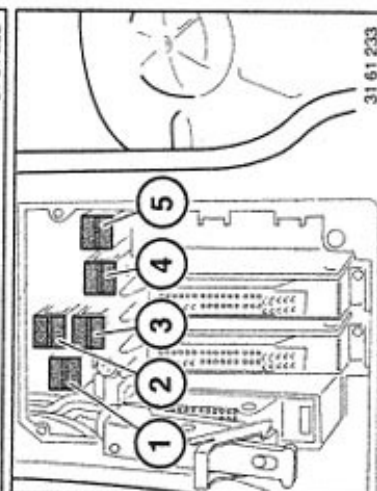
Unfasten screws in cover.
Remove cover.



31 61 232

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.



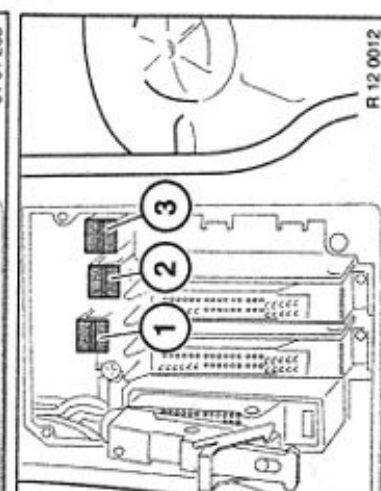
31 61 233

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.



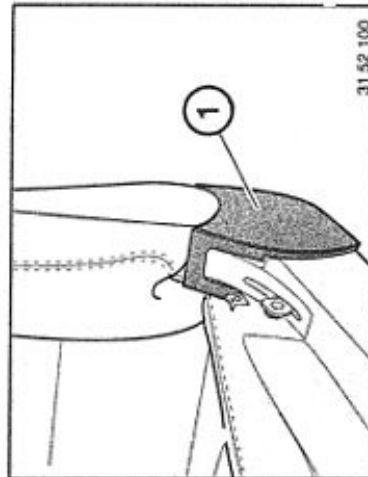
R 12 0012

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.

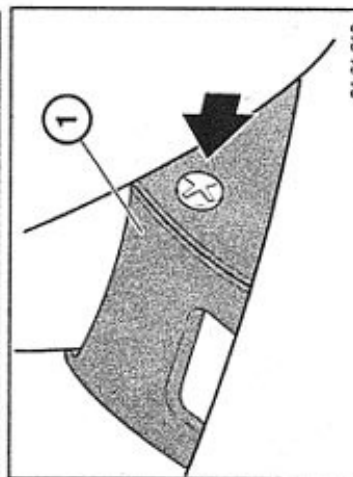
Remove front seat - refer to Group 52.
Remove panel on back of front seat backrest - refer to Group 52.
Remove panel (1).



31 52 100



31 61 209



31 61 210



31 61 211

Unscrew screw.

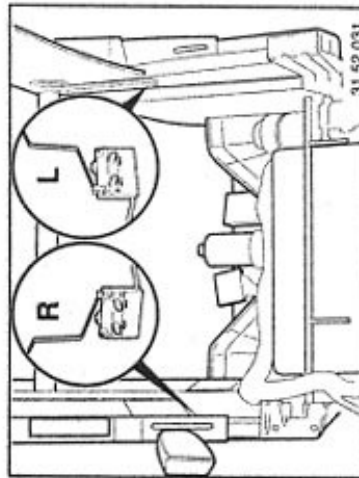
Unscrew screw.

Detach spring and remove reclining mechanism.

Important!
The spring must be attached correctly, as otherwise the microswitch wiring would be damaged.

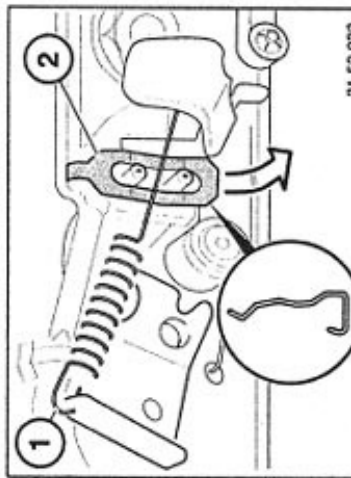
Two microswitches are installed on each seat.

Important!
Microswitches are marked and must not be mixed up.
"R" = right side looking forward in car
"L" = left side looking forward in car



31 52 031

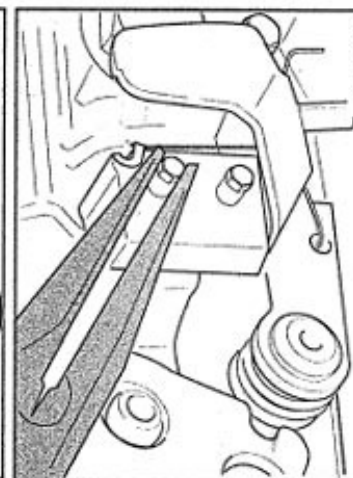
Right Side Microswitch:
Detach return spring (1) and re-retain (2).



31 52 032

Remove microswitch.

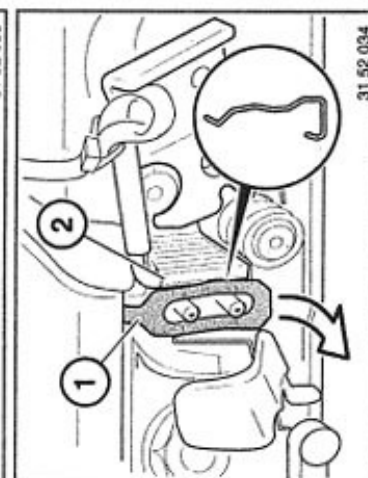
Installation:
Check the installed position of the microswitch operating lug.



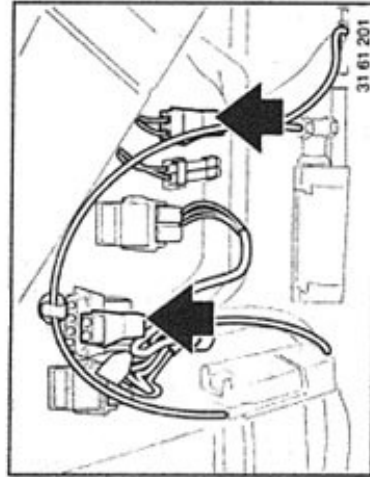
31 52 033

Left Side Microswitch:
Remove spring retainer (1) and microswitch (2).

Installation:
Check the installed position of the microswitch operating lug.



31 52 034

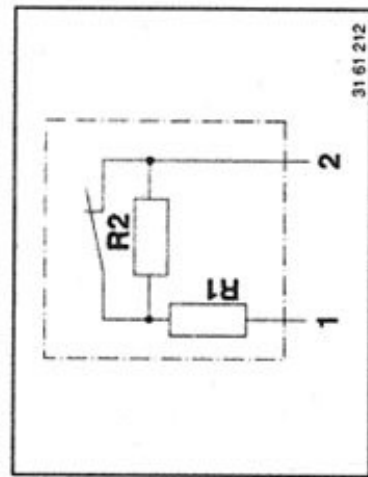


61 31 ... CHECKING FUNCTION OF MICROSWITCHES

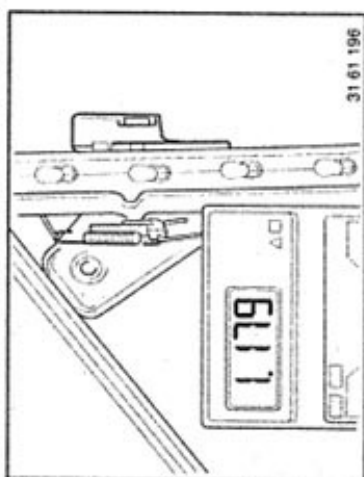
Remove front seat - refer to Group 52.
Remove backrest shell panel - refer to Group 52.

Disconnect plugs of microswitches.

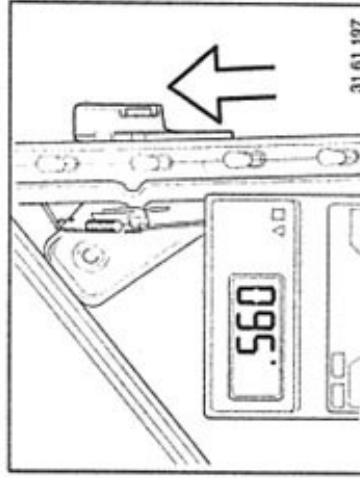
Connect Special Tool 61 1 465 (adapter lead) to microswitch.



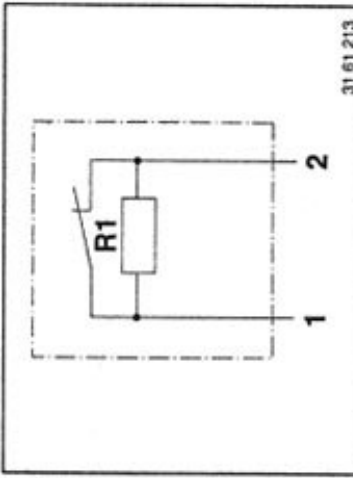
Left Side Microswitch:
Wiring diagram of left side microswitch (seen looking forward in car) drawn with the backrest locked.



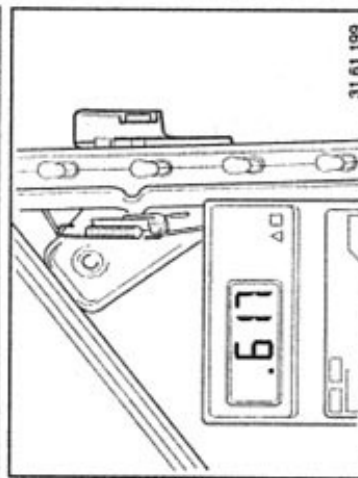
Unlocking lever is not operated.
Specification: $1180 \pm 10 \Omega$.



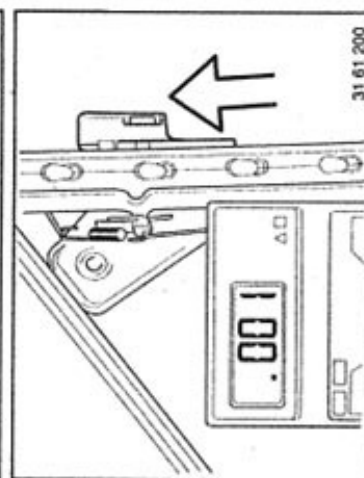
Pull the unlocking lever about 4 to 5 mm.
The microswitch should then work.
Specification: $560 \pm 10 \Omega$.



Right Side Microswitch:
Wiring diagram of right side microswitch (seen looking forward in car) drawn with the backrest locked.



Unlocking lever is not operated.
Specification: $620 \pm 10 \Omega$.

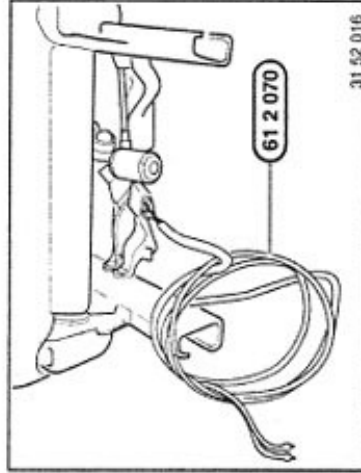


Pull the unlocking lever about 4 to 5 mm.
The microswitch should then work.
Specification: 0Ω .

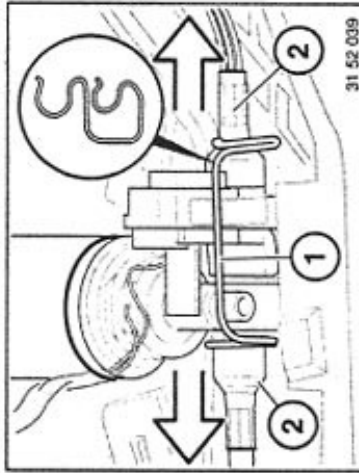
- Install seat.
- Erase fault memories with tester.
- Check function.
- Interrogate fault memories again.
- Investigate any stored faults.

61 31 643 REMOVING AND INSTALLING
OR REPLACING REGULATOR
FOR POWER SEAT DRIVE
(AXIAL ADJUSTMENT)

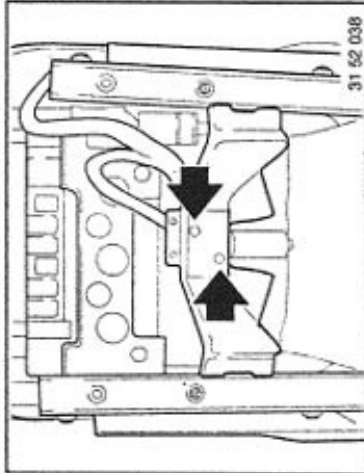
Remove front seat - refer to Group 52.



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.



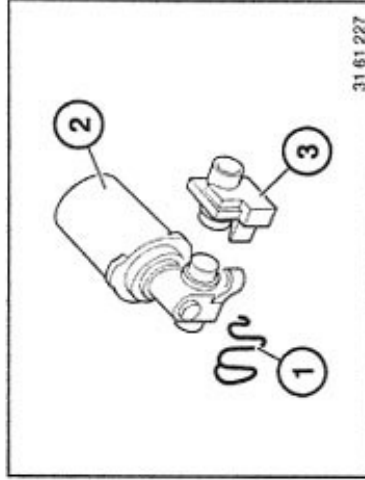
Disconnect seat control unit plug.
Disconnect retainer (1) and pull drive shafts (2) off.



Unscrew screws and remove drive.
Remove regulator.

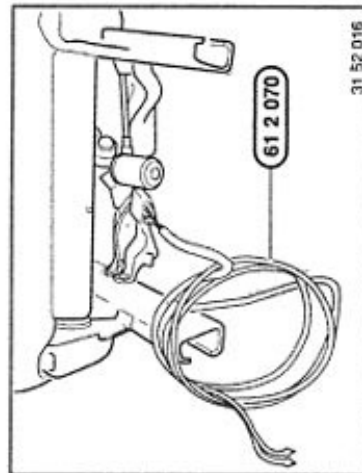
Installation:
Check function.

- 1 Retainer
- 2 Drive
- 3 Regulator

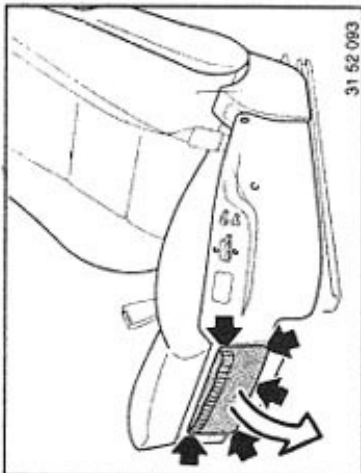


**61 31 644 REMOVING AND INSTALLING
OR REPLACING REGULATOR
FOR POWER SEAT DRIVE
(INCLINATION ADJUSTMENT)**

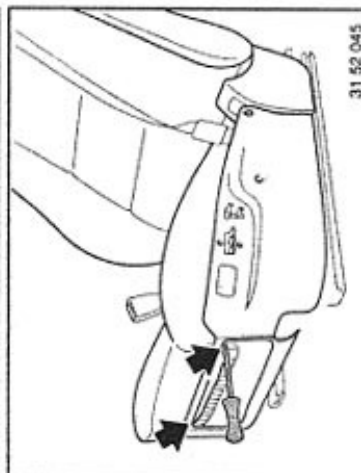
Remove front seat - refer to Group 52.



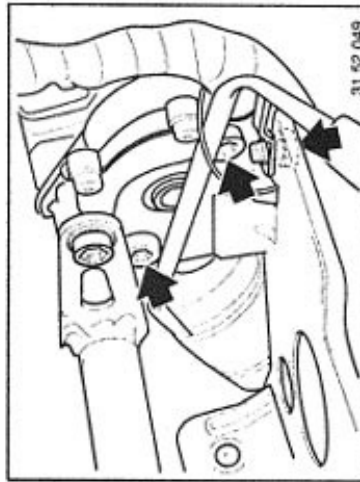
Connect Special Tool 61 2 070 (adapter lead) to left white plug of seat and 12 V power supply source.
Run seat to "top" position.
Remove seat control unit - refer to 61 31 099.



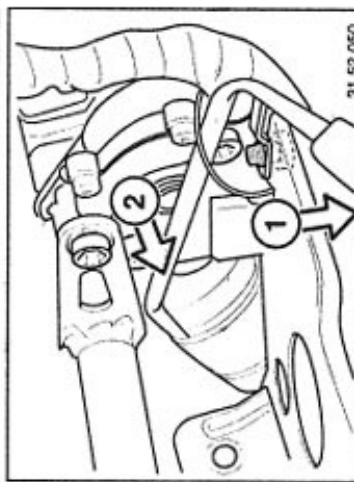
Unclip pocket.



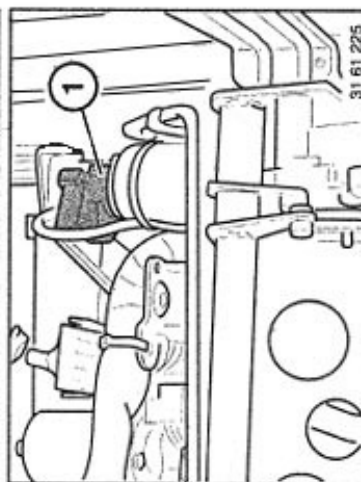
Unscrew screws and remove panel.



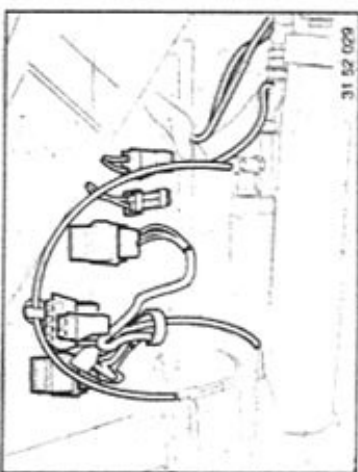
Unclothe wiring and disconnect plug.
Unscrew screws.
Disconnect front end of cushion shell - refer to Removing Cushion Shell in Group 52.



Press holder (1) on seat control unit downwards.
Push holder (2) aside and remove drive.

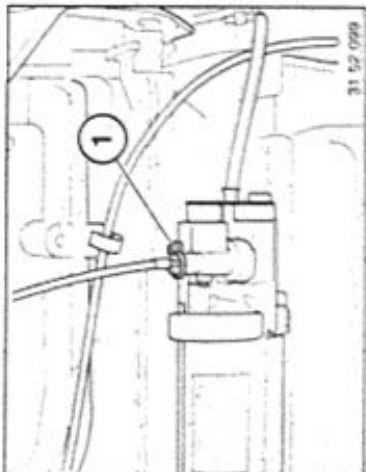


Remove regulator (1).
Installation:
Check function.

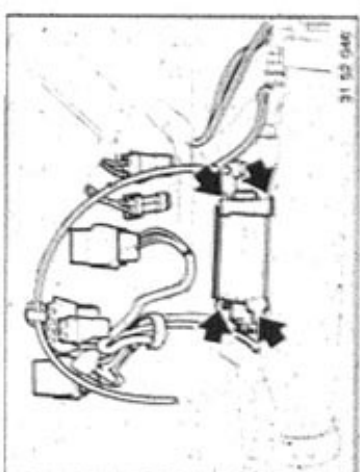


61 31 645 REMOVING AND INSTALLING
OR REPLACING REGULATOR
FOR POWER SEAT DRIVE
(BACKREST ADJUSTMENT)

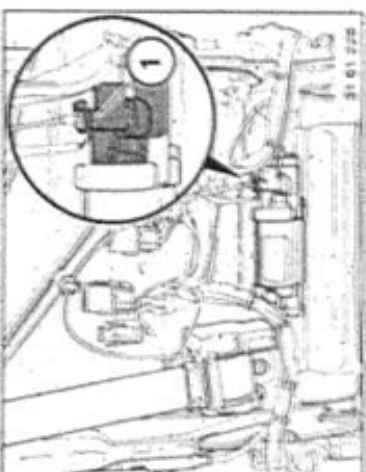
Remove front seat - refer to Group 52.
Remove rear panel on back of front seat
backrest - refer to Group 52.



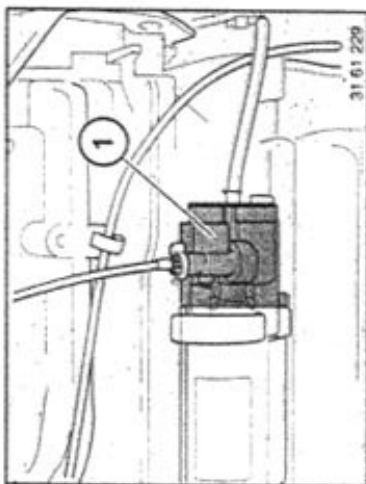
Loosen wire strap of belt adjustment and
remove drive shaft.



Unscrew screws.
Remove lockplate for backrest adjustment
shafts and motor.



Remove regulator (1).

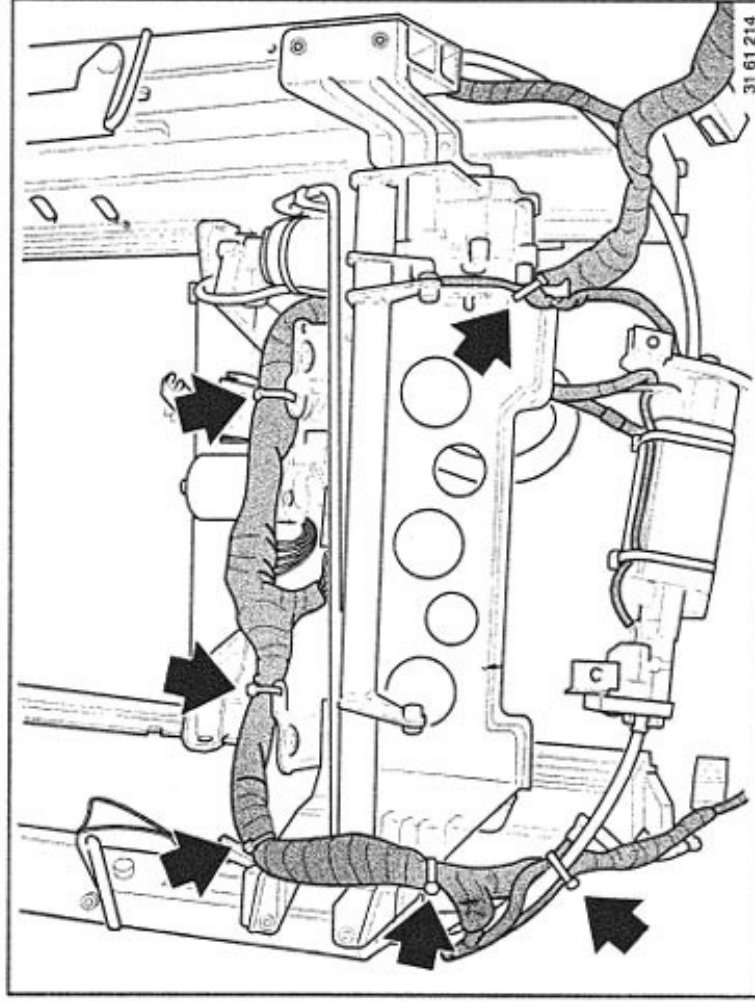


Remove regulator (1).

61 31 ... ROUTING OF WIRES ON FRONT SEAT

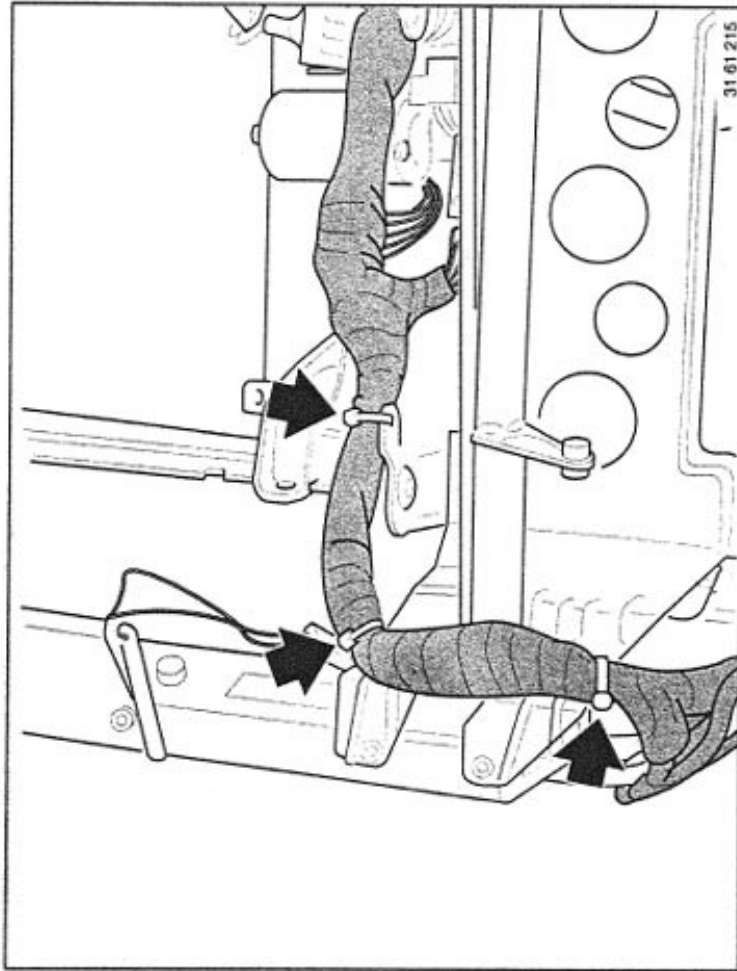
White marks on the wire harness show the points, at which the wire harness must be secured to the seat with wire straps. If these marks are neglected while installing the wire harness, the distance of seat adjustment could be too small or the wire harness might be damaged.

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.

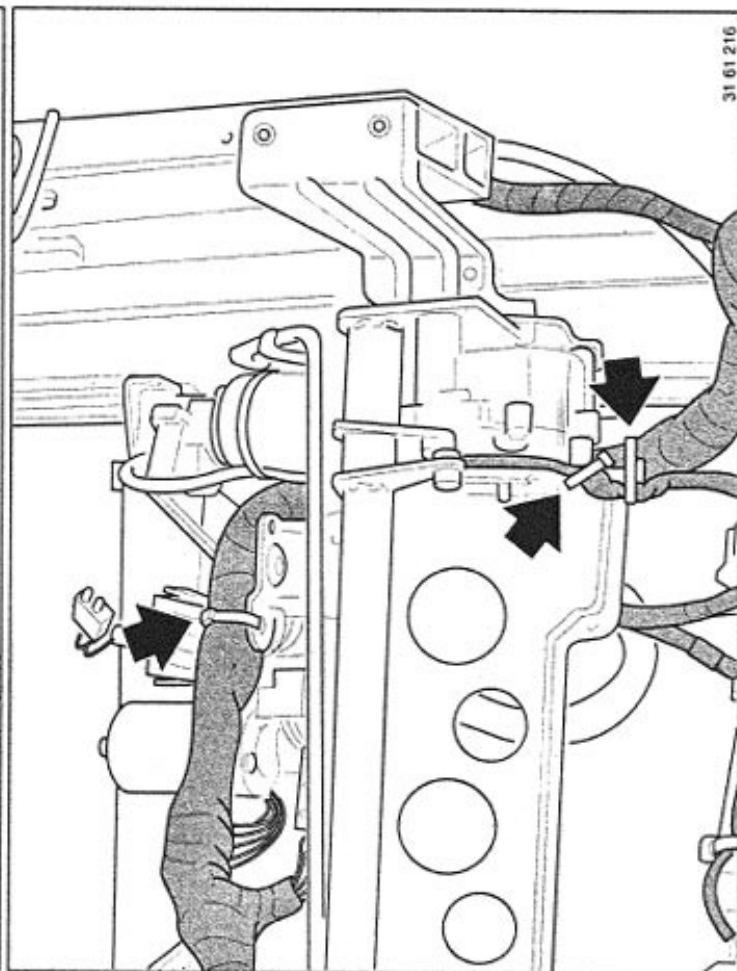


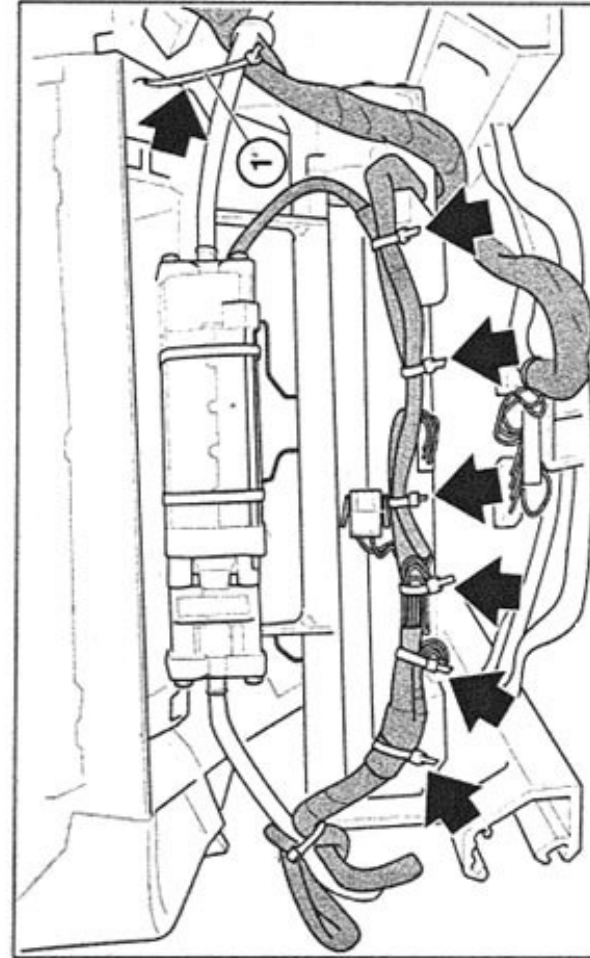
Top front view of seat without cushion shell.

Top front view of seat without cushion shell.
Routing at left-hand side.

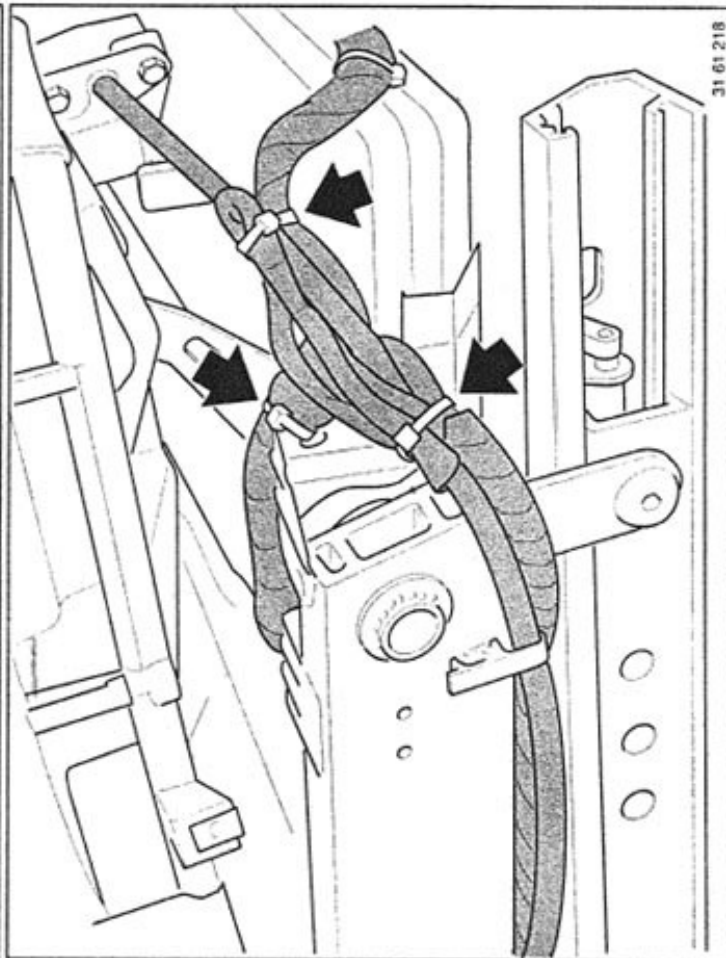


Top front view of seat without cushion shell.
Routing at right-hand side.

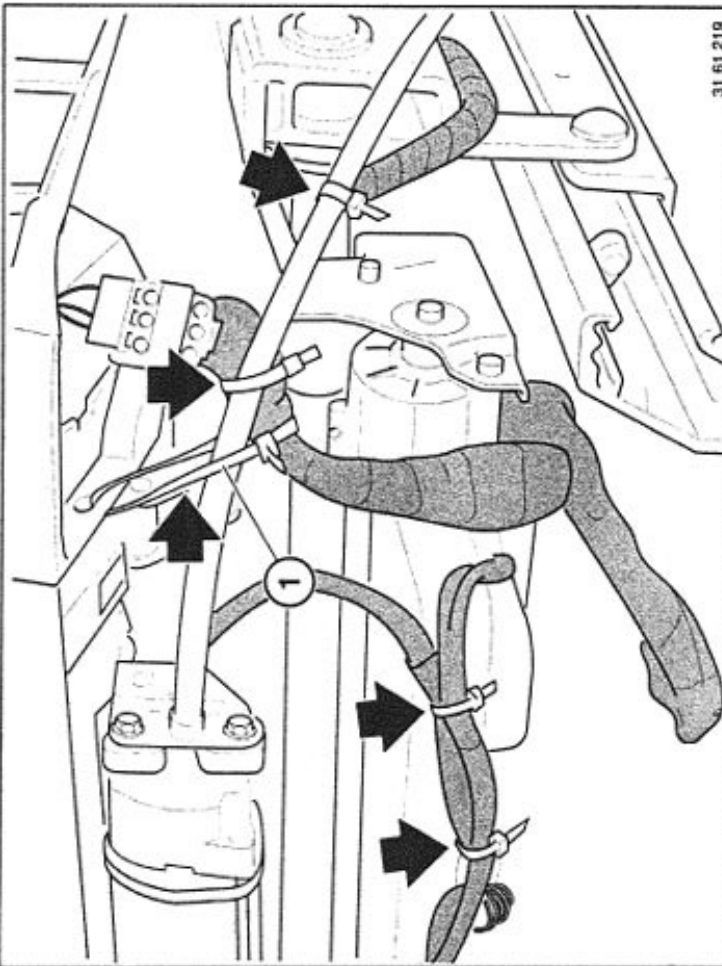




Front view.
Wiring secured to seat rail.
Control unit installed.



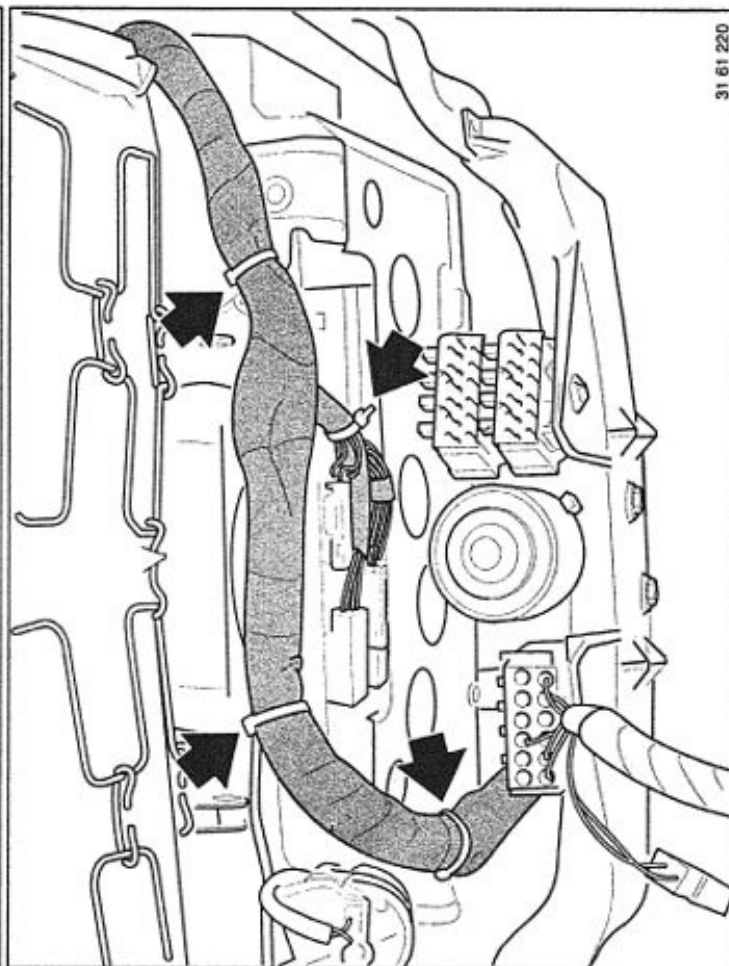
Front view.
Control unit installed.
Left-hand side.



Front view.
Wiring secured to seat rail.
Control unit installed.
Right-hand side.

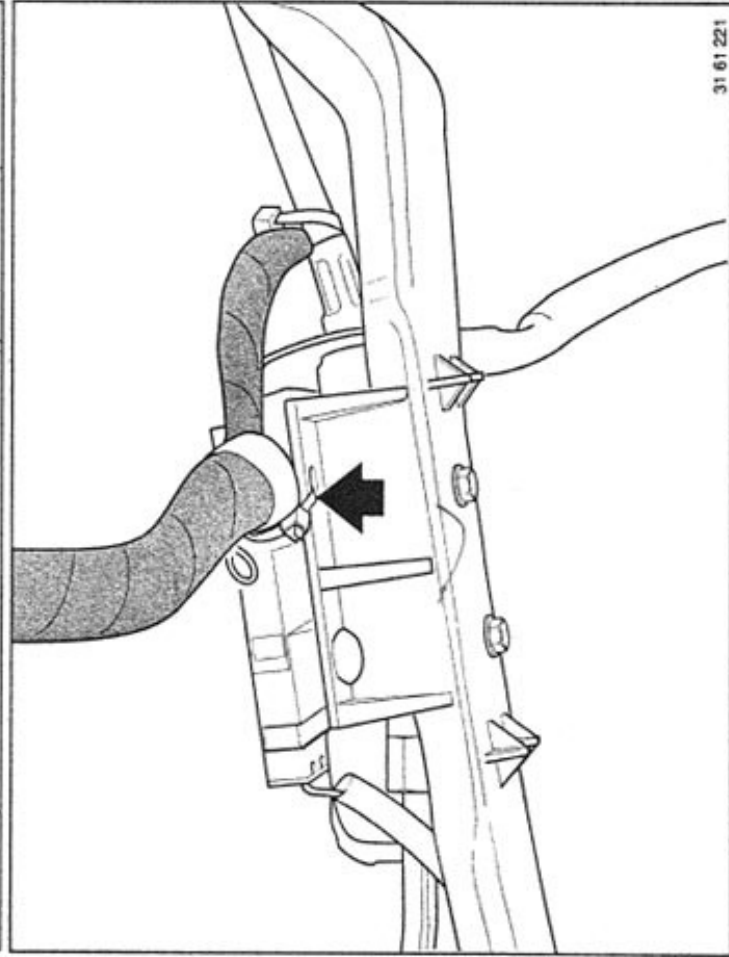
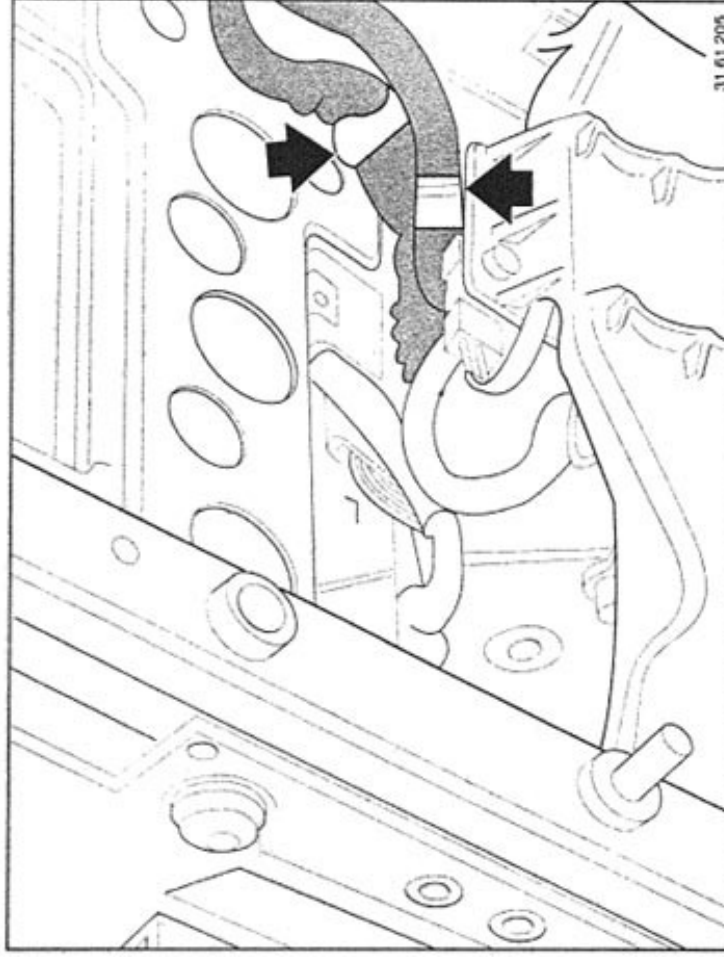
Important!

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 disconnect-
ed, 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!

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

Sample Central Label:

Chassis number

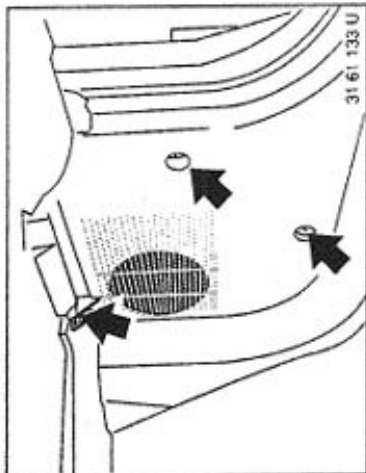
GM = Basic code (9 digits)
SA = Special equipment (17 digits)
VN = Version (11 digits)
AM = Drive management (11 digits)

Note:

Check whether the chassis number is
correct.

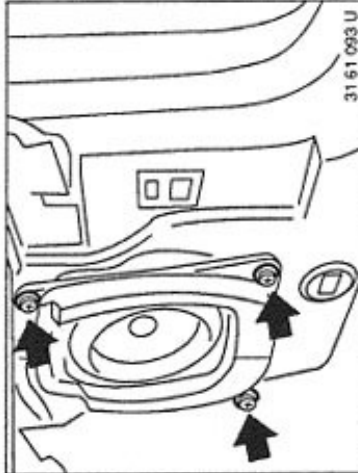
WBA EGM2308M CB72001 3
GM 01210000 9
SA 0000000000000000 2
VN 0000000000 3
AM FFFFFFFF G

31 61 177

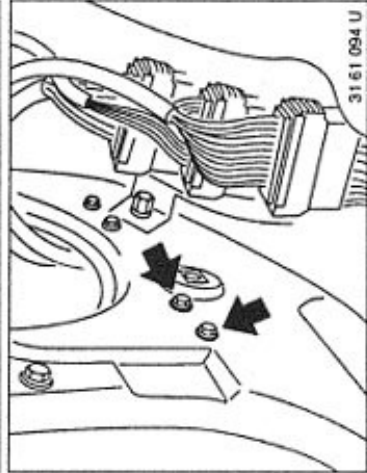


61 35 ... REMOVING AND INSTALLING
CONTROL UNITS IN
A-PILLAR

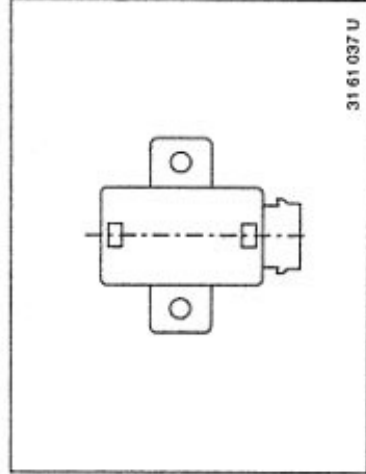
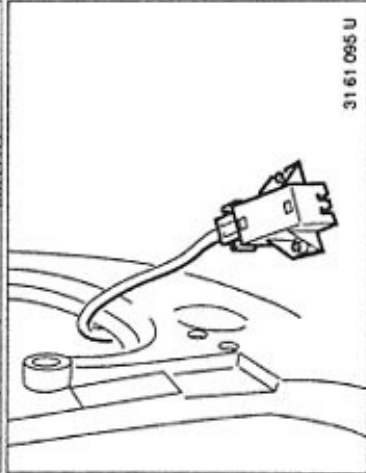
Turn screws 90° and remove trim panel.



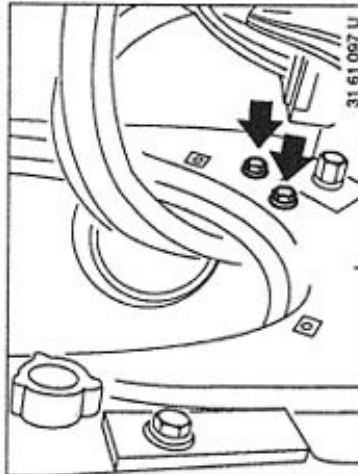
Remove loudspeaker.



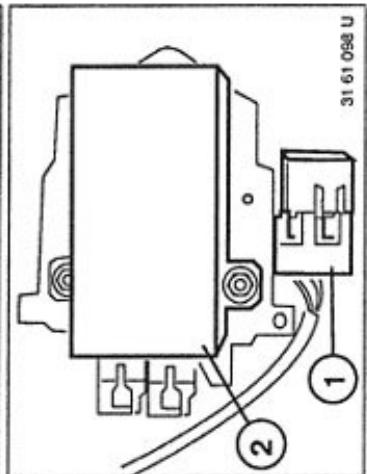
Remove impact switch.



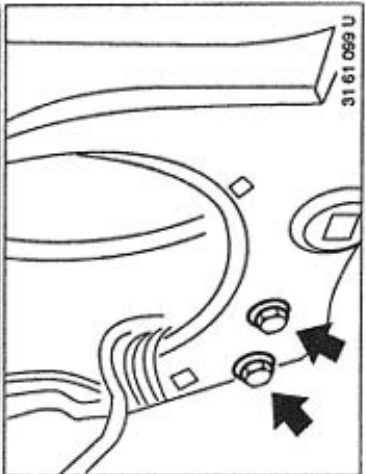
Installation:
Always check whether the installed
position is correct – plug faces down!



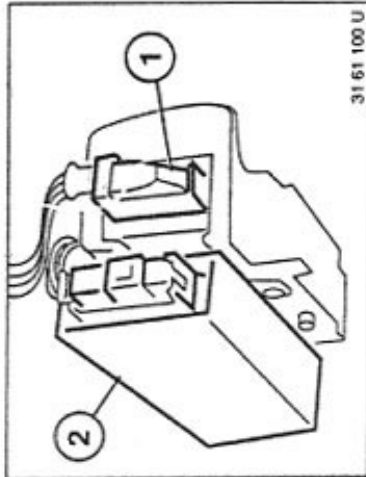
Unscrew screws.



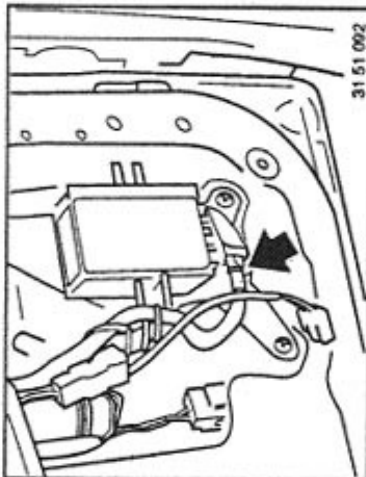
1 = Inside light relay
2 = Control unit for A/C lock sensor



Control Units on Passenger's Side:
Unscrew screws.

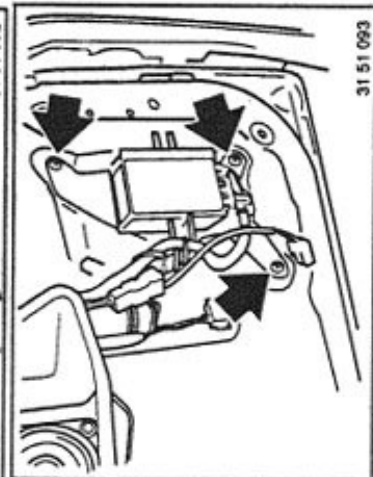


- 1 =Control unit for infrared remote control
- 2 =Control unit for automatic recirculating air control (AUC)



61 35 ... REPLACING LEFT OR RIGHT DOOR MODULE

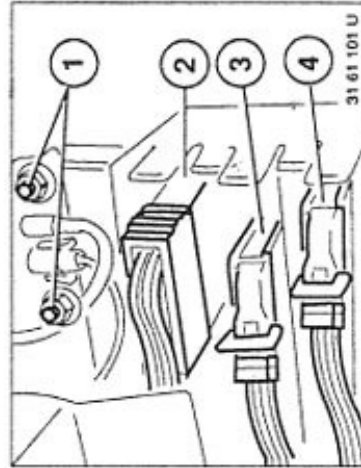
Remove door trim panel – see Gr. 51.



Disconnect plug.
Unscrew screws.

61 35 ... REPLACING CONTROL UNITS BELOW DASHBOARD TO THE LEFT

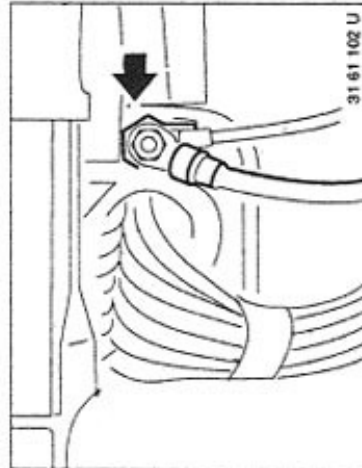
Remove dashboard trim panel at bottom
left.
Turn screws 90°.



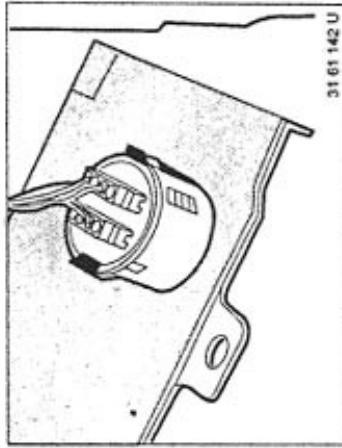
- 1 Windshield antenna connection
- 2 Lamp control module
- 3 Basic module
- 4 Electronic body module

Important!

Note central code - refer to page 61-35/1.

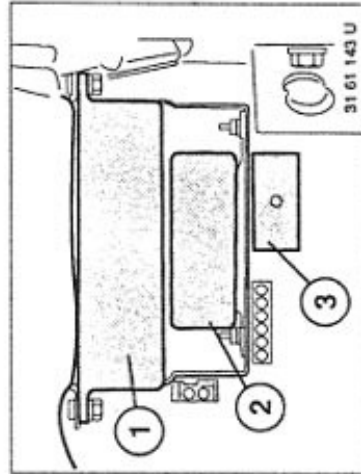


Positive connection point at firewall
opening.

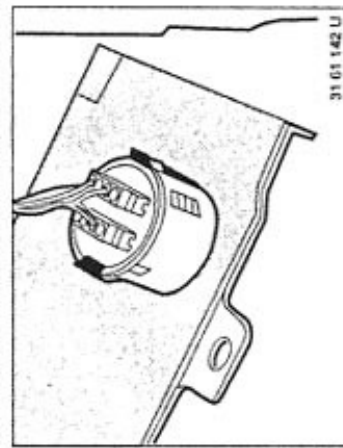


61 35 ... REPLACING CONTROL UNITS BELOW DASHBOARD TO THE RIGHT

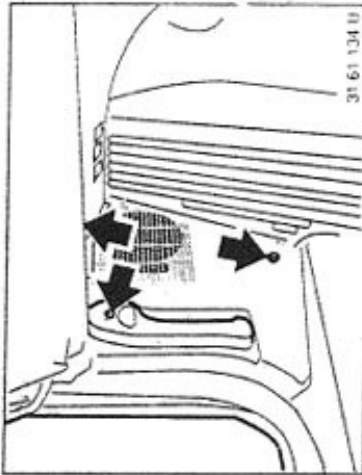
Remove dashboard trim panel at bottom
left.
Turn screws 90°.



- 1 Control unit for airbag
- 2 Control unit for additional heater
- 3 Relay box for heater

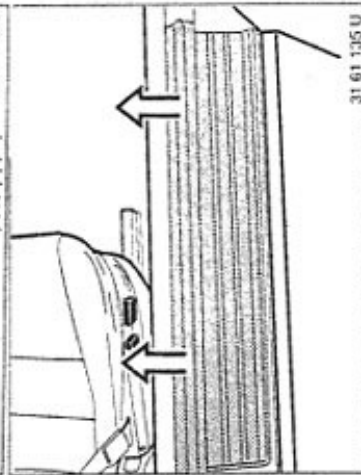


Take gong out of trim panel.
Disconnect plug.

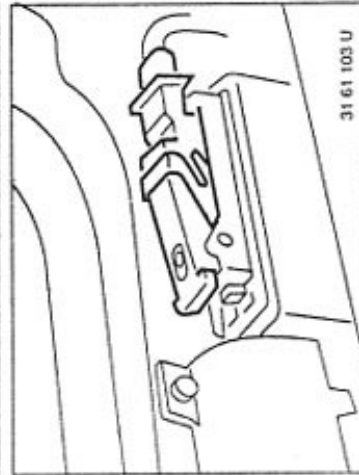


61 35 ... REMOVING AND INSTALLING
CONTROL UNITS IN DOOR
MEMBERS ON DRIVER'S
SIDE

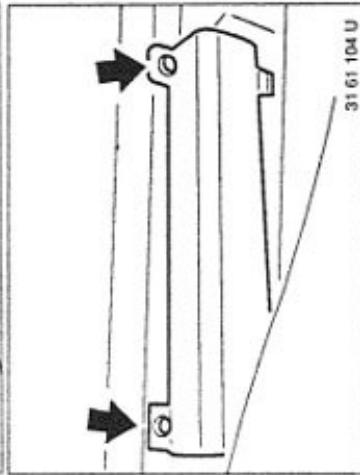
Unscrew hood release lever.
Take off loudspeaker cover.



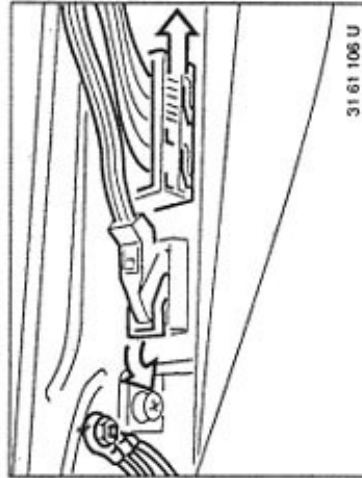
Unclip side member strip.
Fold back carpet.



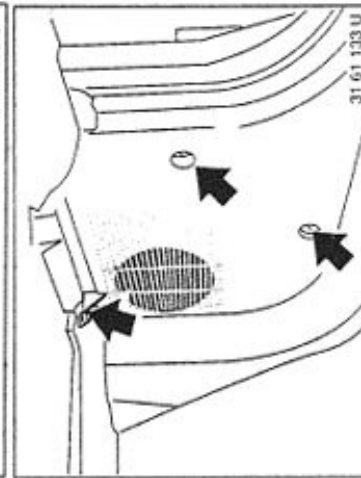
ABS control unit - see Group 34 for
procedures when replacing.



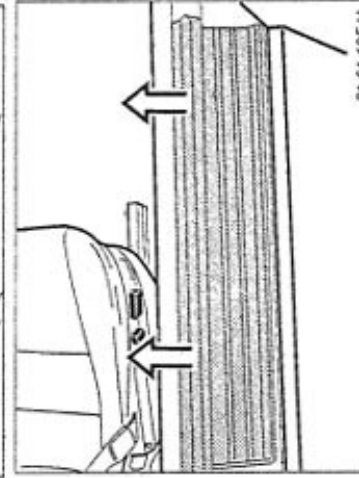
Loosen clips.
Remove trim panel.



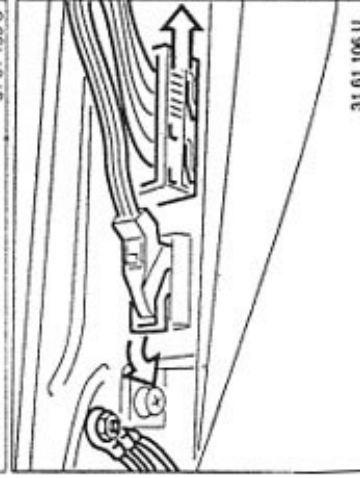
Relay Module:
Disconnect plugs.



Control Units on Passenger's Side:
Take off loudspeaker cover on A-pillar.



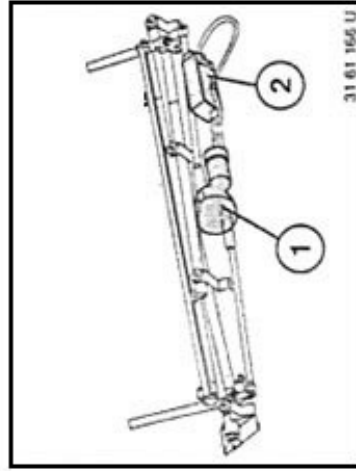
Unclip side member strip.
Fold back carpet.



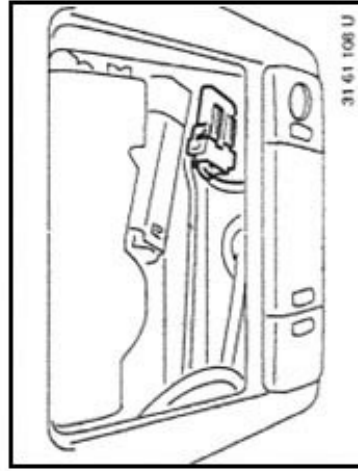
DWA Control Unit
(burglar alarm)

61 35 ... REPLACING CONTROL UNIT FOR ELECTRIC SUN SHADE

Remove hatrack – see Group 51.



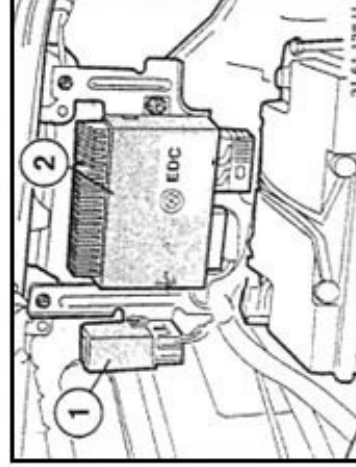
Control unit is underneath the hatrack.
Troubleshoot – see Electric/Electronic
Test Plan.



61 35 ... REPLACING CONTROL UNIT FOR POWER SUN ROOF

Unclip trim panel.
Remove sun roof motor – see Gr. 54.

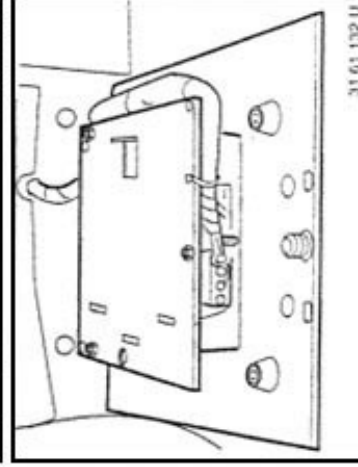
61 35 ... REMOVING AND INSTALLING CONTROL UNITS IN TRUNK



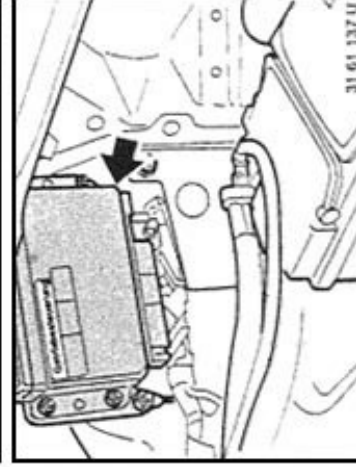
EDC control unit – see Group 37 for
other instructions.

1 = Power saving relay
2 = EDC control unit

EDC = electronic absorber control

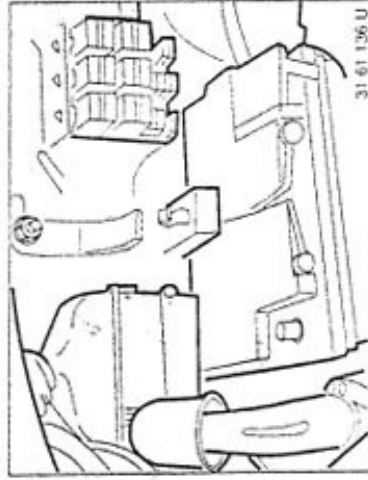


Audio amplifier

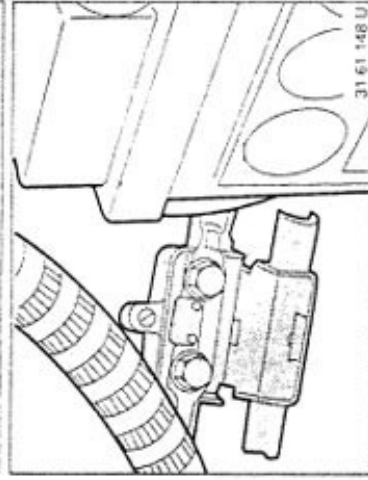
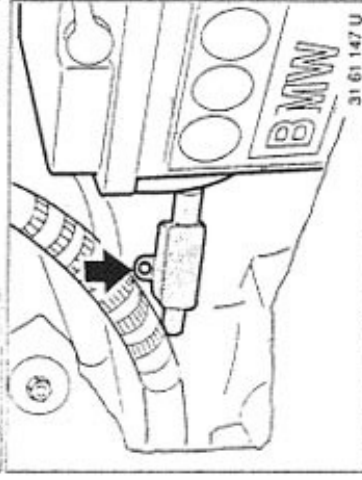


Control unit for electronic transmission
control

Trailer module



Safety fuse 80 A

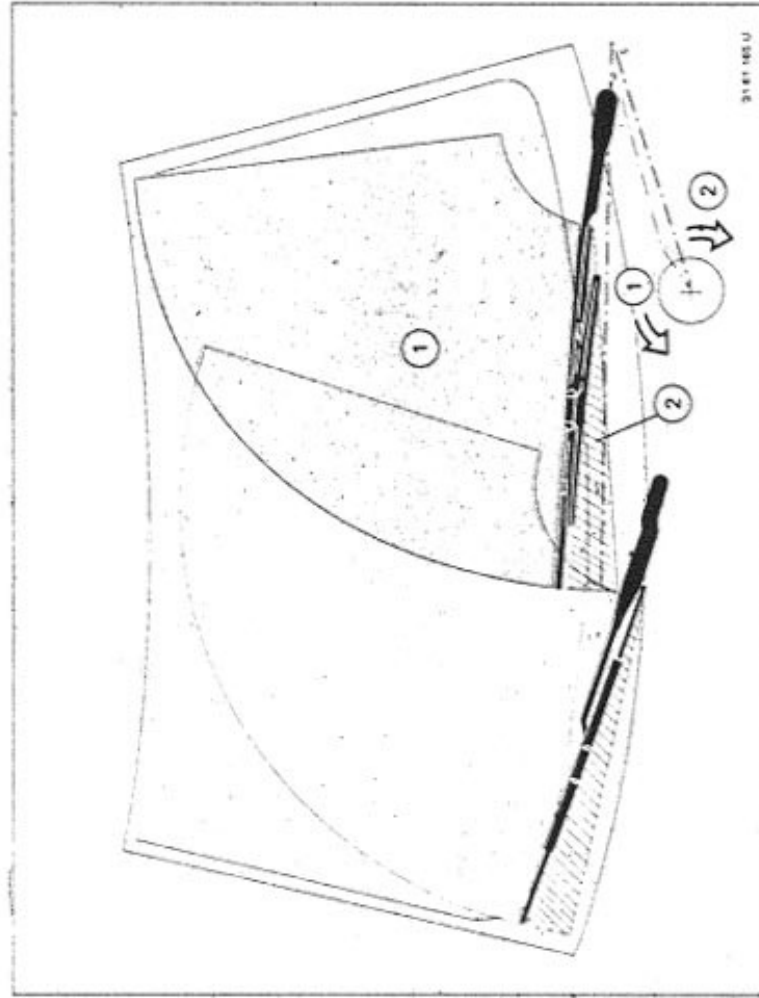


CONTROL UNIT LOCATION SURVEY

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 front 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

61 61 . . . OPERATION OF WINDSHIELD WIPERS



31.87 185 U

- 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.

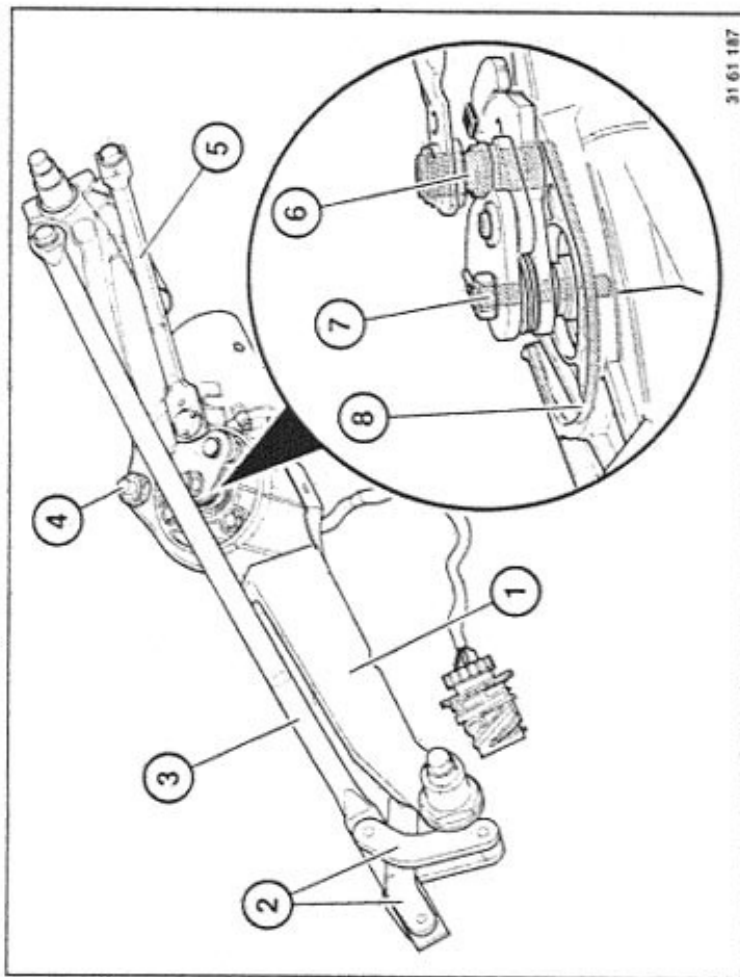
Also refer to Service Information 61 05 91 (355).

New wiper systems can be recognized on the following features:

- 1 Cast console with modified reinforcement ribs
- 2 Double 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

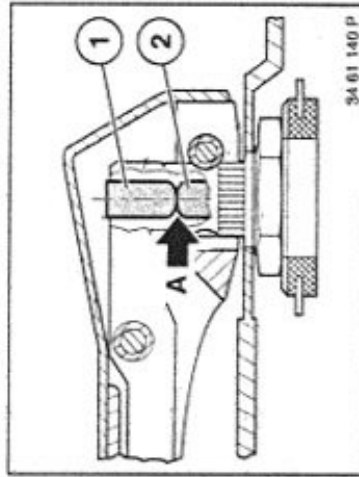
Note:

Inlet (8) on the cast console guides the longer stop (6) of the motor crank for the parked position.

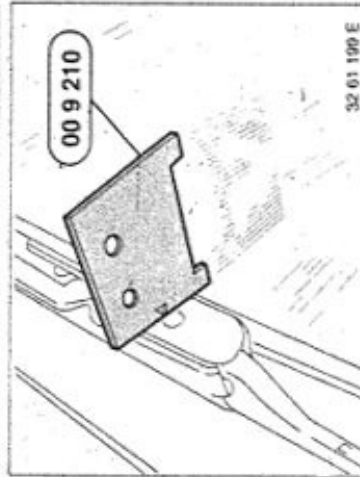


61 61 ... Adjust or inspect windshield wiper arm approach angle on windshield

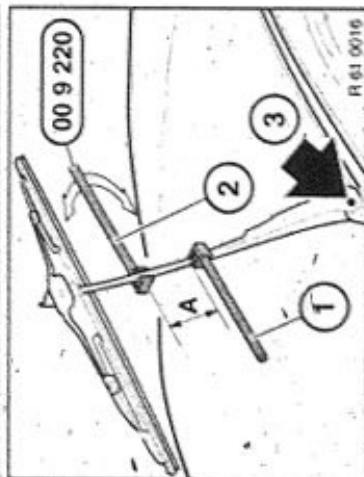
The approach angle of the wiper arm on the windshield determines to a large extent the wipe quality during intermittent operation and the wipe quality at low roadspeeds.



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.

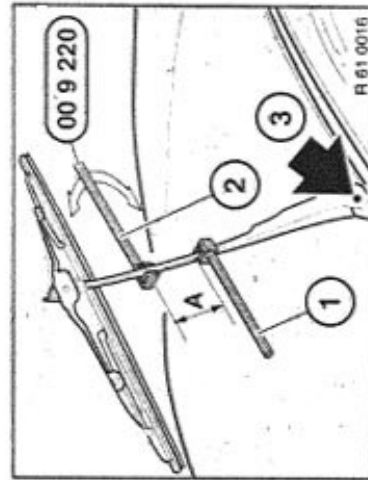


Fit special tool 00 9 210 (latest version is gray in color and is equipped with two holes) to balance point of wiper blade on windshield. Support for disc and vehicle designation are indicated on the special tool.



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

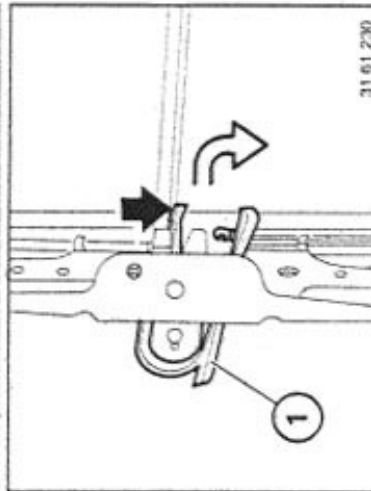
Move windshield wipers to folding position by switching the ignition on, operating the wiper switch in intermittent mode and switching the ignition off when wipers are in bottom reversing position. Wiper runs to folding position at A-pillar and remains there.

31 61 030 U



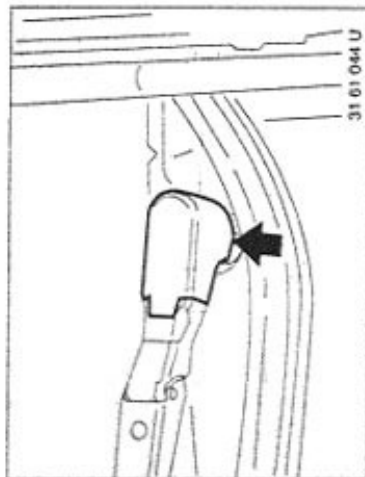
Unlock adapter (1) on the driver's side. Squeeze retainers together. Push the wiper blades forward.

31 61 230

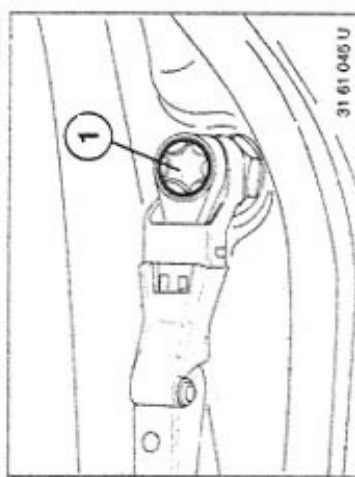


**61 61 100 REPLACING BOTH WIND-
SHIELD WIPER ARMS**

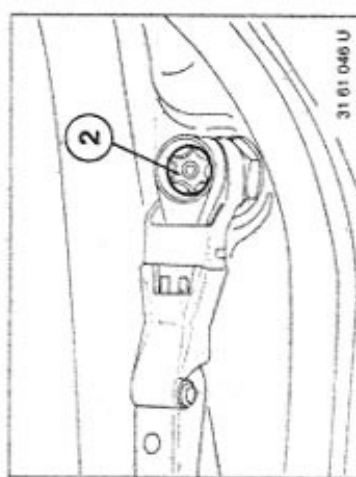
Remove cover.



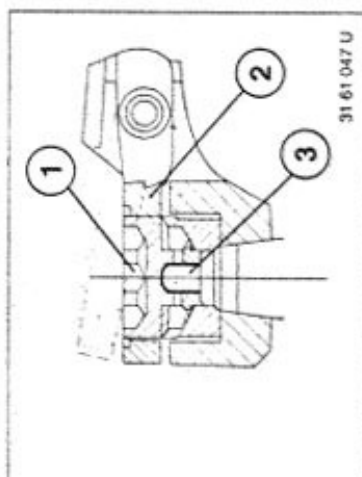
Driver's Side:
Unscrew screw (1) using Special Tool
61 6 010.



Unscrew nut (2) using Special Tool
61 6 010.



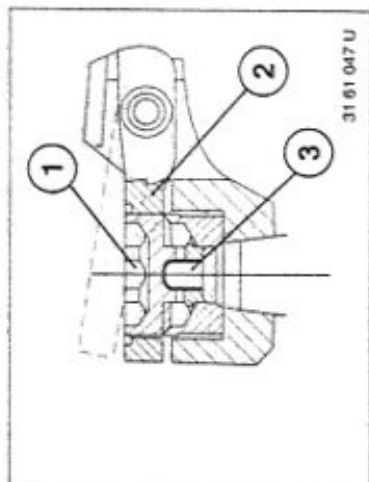
Installation:
Clean threads to remove Loctite.
Screw (1) must be replaced.



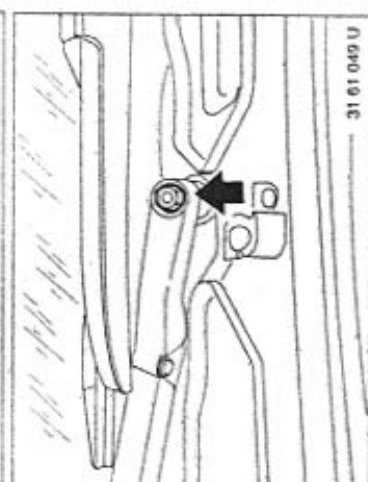
Screw screw (1) in far enough that there is
no play between wiper contact force
control lever screw (2) and plunger (3).

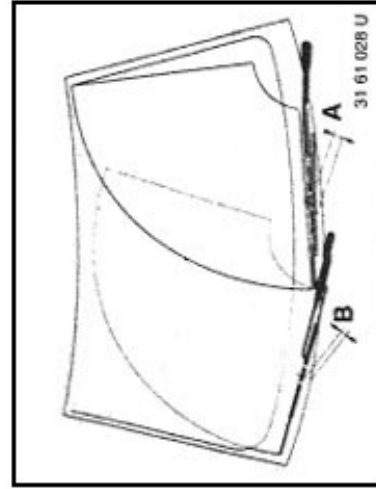
Installation:

Press wiper arm against windshield lightly
so that it will be easier to install the nut.

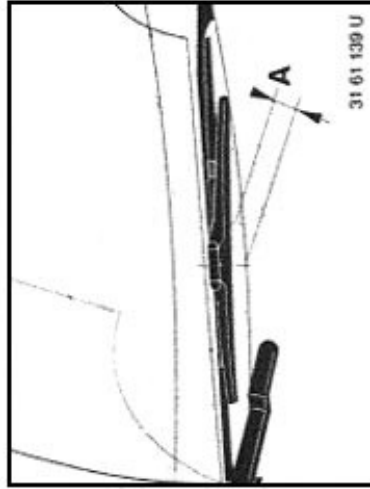


Passenger's Side:
Remove cover.
Unscrew nut.
Tightening torque*.

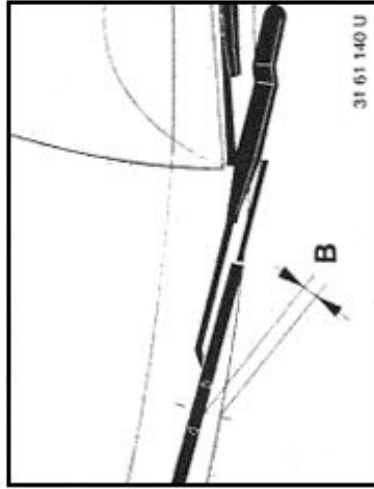




Adjusting dimensions in park position:
 $A = 35 \pm 3 \text{ mm}$
 $B = 23 \pm 3 \text{ mm}$



Adjusting dimension $A = 35 \pm 3 \text{ mm}$

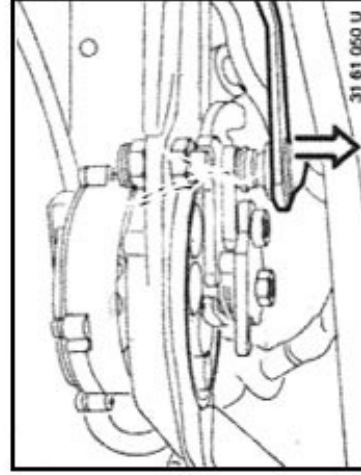


Adjusting dimension $B = 23 \pm 3 \text{ mm}$

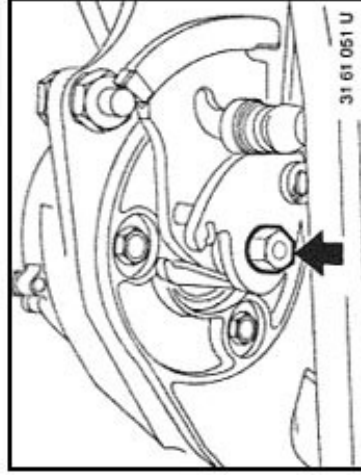
61 61 250 REPLACING WINDSHIELD WIPER MOTOR

Remove complete wiper console - refer to 61 61 271.
Run the wiper motor to parked position (if possible) prior to removal.

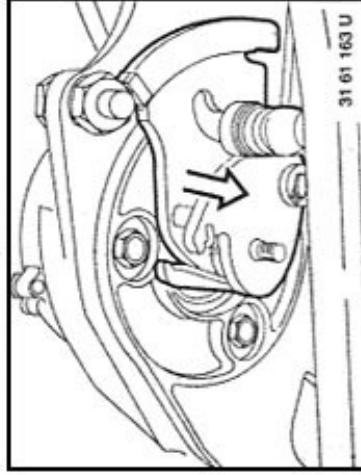
Important!!
Refer to Information on 61-61/1.



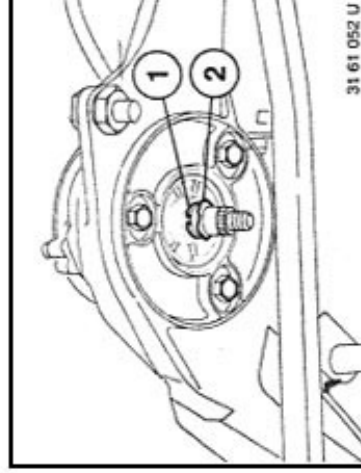
Pry drive rod out.



Unscrew screw.

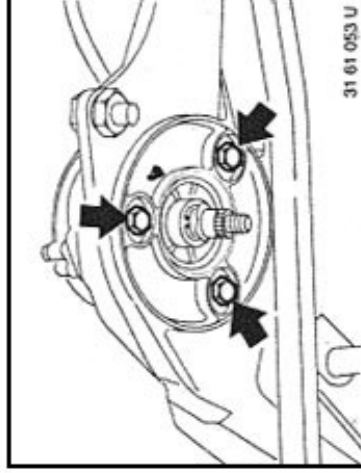


Pry motor crank off.



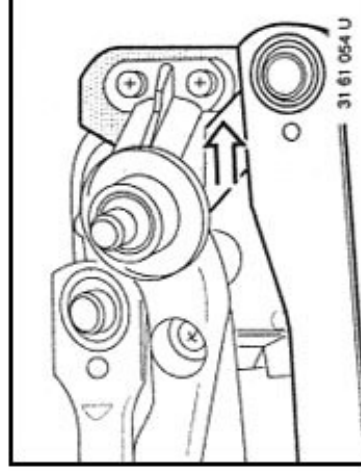
View of Wiper Motor Output Shaft

- 1 Circlip
- 2 Corrugated washer



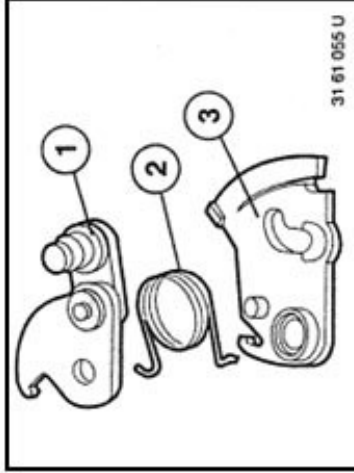
Unscrew screws.

Assembling Wiper Motor:

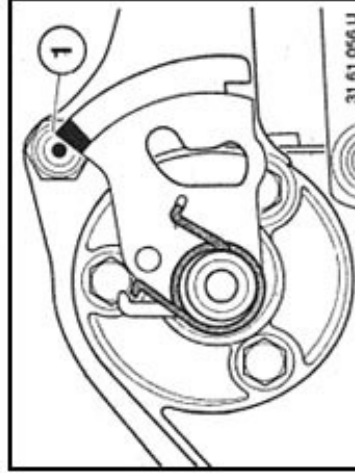


Run the wiper linkage to parked position (bearing on stop).

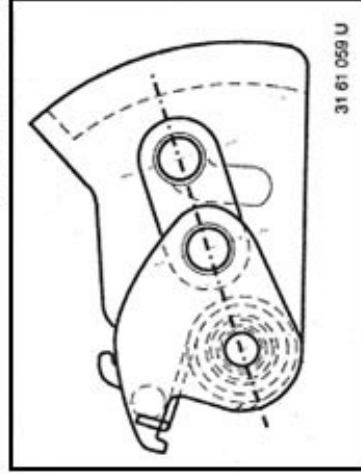
Connect plug on motor and run the motor to parked position.
Screw motor on console.
Tightening torque*.



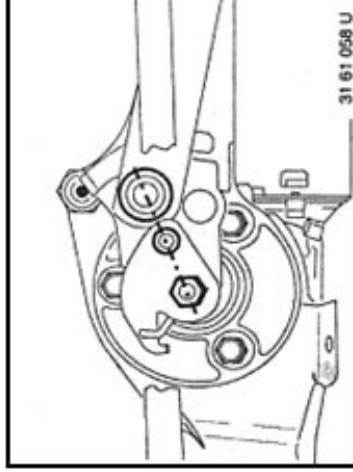
- 1 Motor crank
- 2 Spring
- 3 Sliding gate for parked position



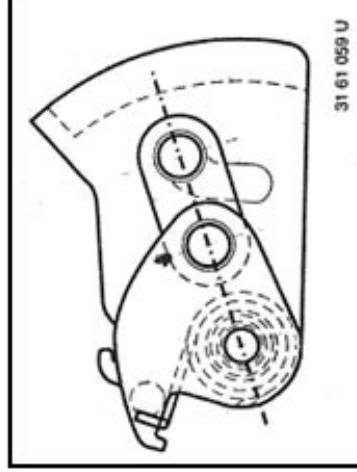
Move sliding gate of drive crank against stop (1).
Attach spring.



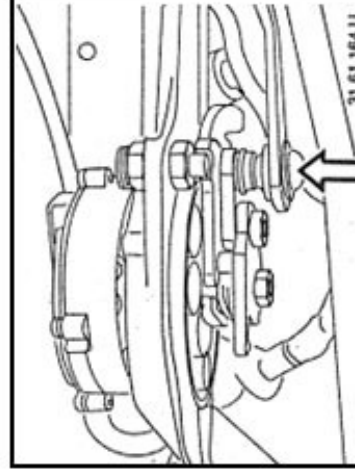
Install motor crank in gate.



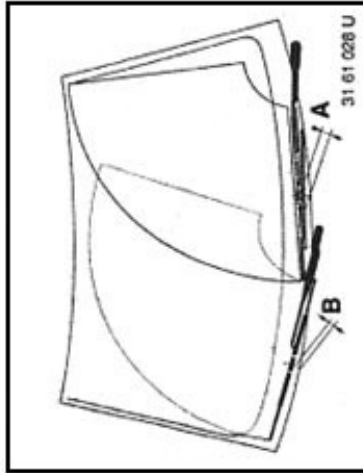
Ensure that center lines of fulcrums for motor crank, drive pin in gate and output pins for the drive rod are in one line.



Tighten motor crank.
Tightening torque*.
Connect motor plug and run the motor to parked position.
Check whether axles are lined up.



Install drive rod.

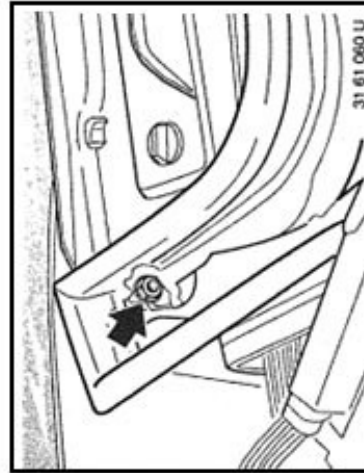


61 61 271 REMOVING AND INSTALLING
COMPLETE WIPER CONSOLE

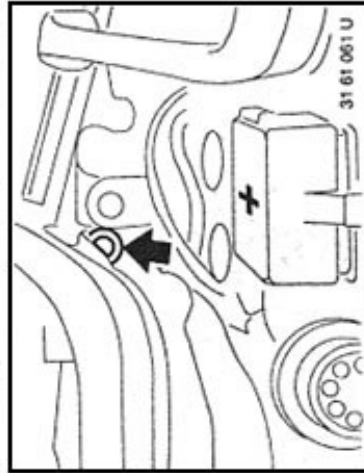
Run the wipers to parked position.
Remove windshield wiper arms - refer to
61 61 100.

Important!
Refer to information on 61-61/1.

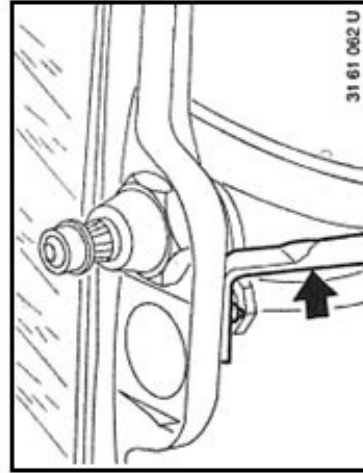
Important!
Set the air volume control wheel to zero
and switch the ignition on before discon-
necting the cable, so that the drive motor
closes the air flaps.
Disconnect battery ground leads.
Refer to information on page 61-00.



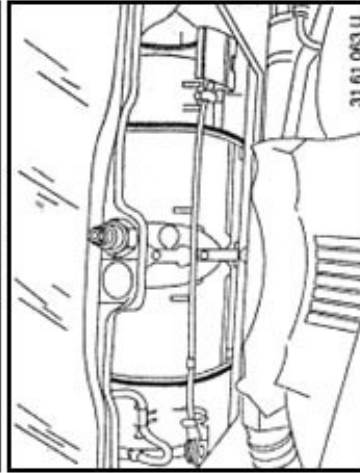
Unscrew screw.
Remove air collection box cover.



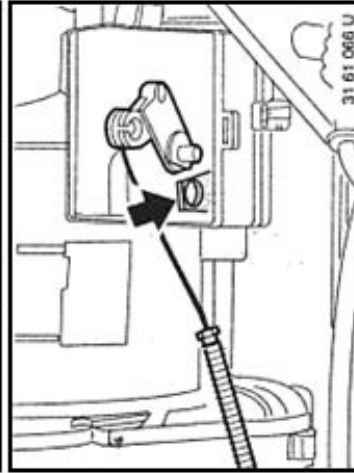
Unscrew screw.
Pull air collection box out upwards.



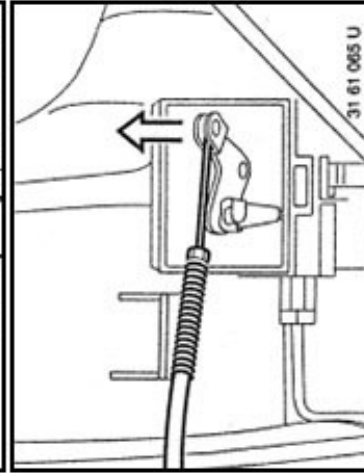
Remove prop.



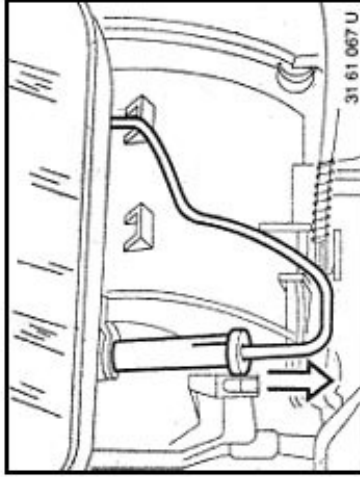
Disconnect cables completely.



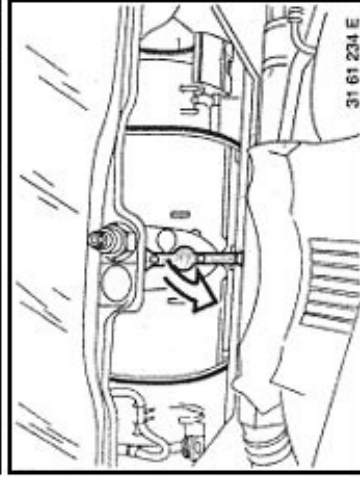
Disconnect linkage.



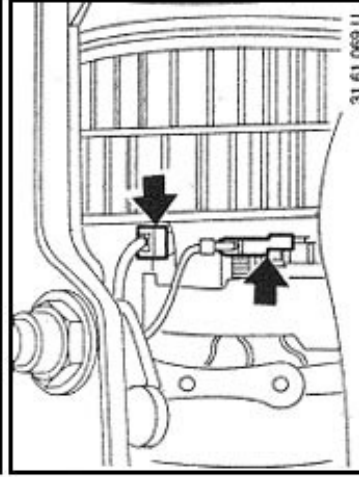
Disconnect cable.



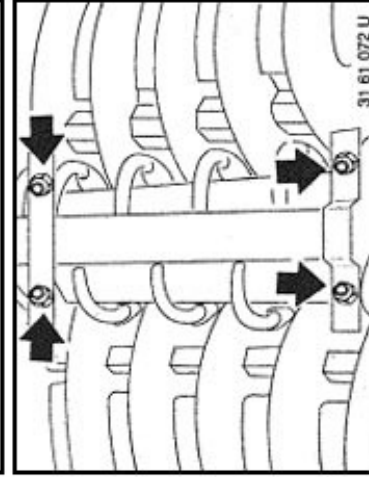
Pull temperature sensor out of eyelet.



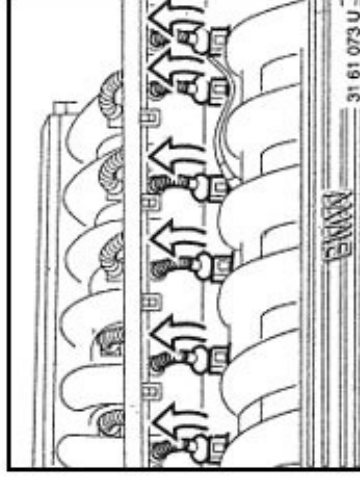
Remove retaining strap.



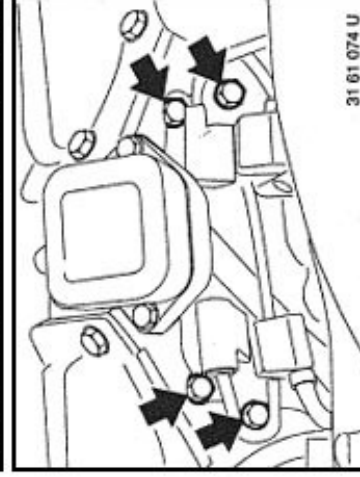
Remove cover.
Pull plug off of blower.
Remove cover on fuel injectors.



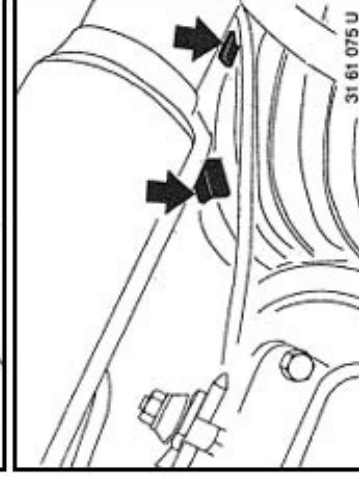
Unscrew electric lead tray of fuel injectors.
Unscrew screws.



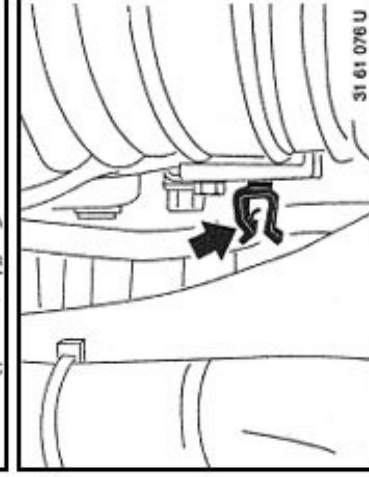
Disconnect leads of injection plate on right side.



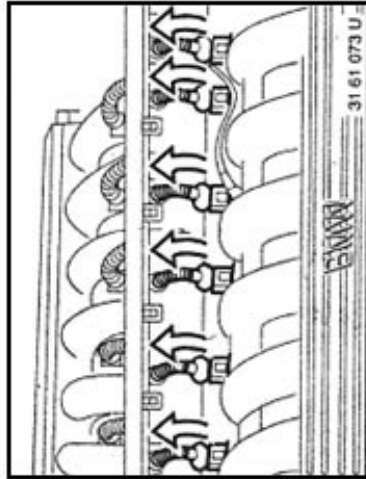
Unplug pulse and TDC senders.
Unscrew bracket.



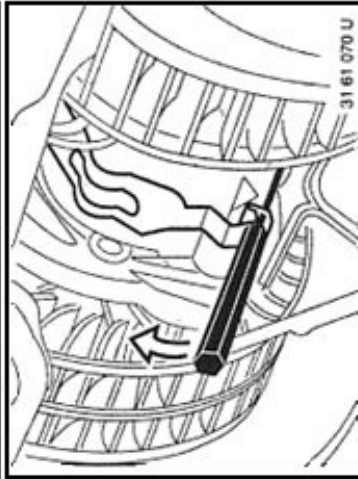
Unclip leads for oxygen sensors in holders underneath the transmission bell housing.



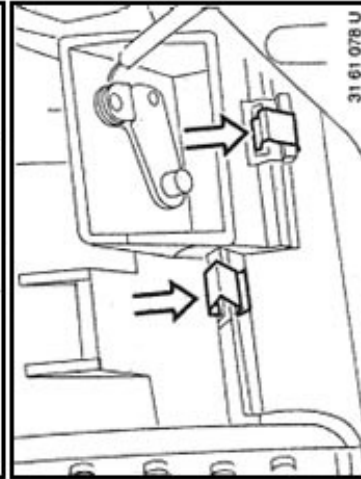
Unclip leads on firewall.
Clips are located underneath the electronic box electric lead duct to the fuel injectors.



Tie electric lead duct for fuel injectors aside.



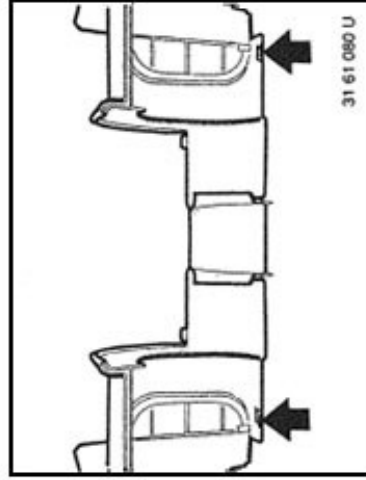
Remove blower.
Insert an approx. 2 mm thick mandrel into the retaining strap of the blower motor and pry the retaining strap out.



Lift retainers off.

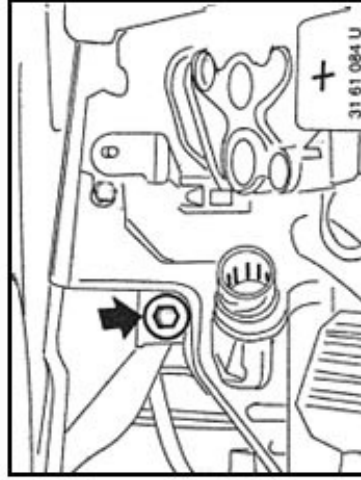


Remove inlet cowl.

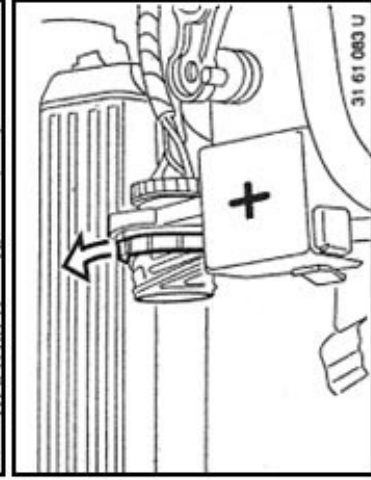


Remove retainers on inside.
Not shown in this picture.

Remove cover.

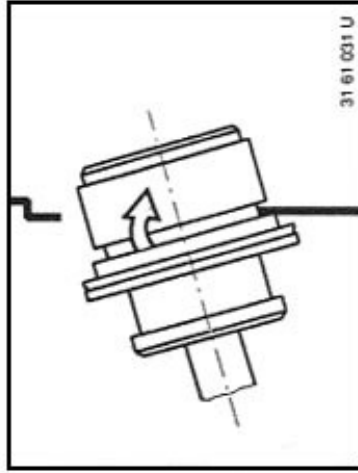


Remove rubber grommet from electric lead opening in the firewall.
Remove holder.

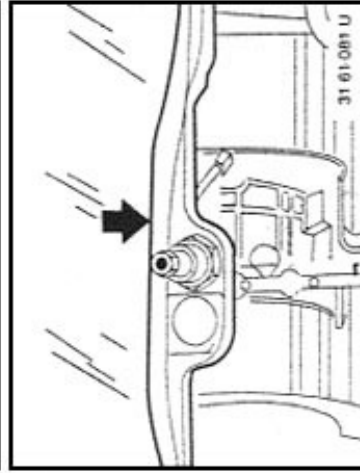


Take plug out of holder.
Loosen wire strap.

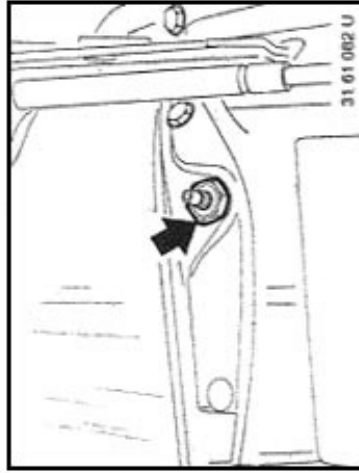
Remove plug through opening in firewall.



Unscrew nut on cowl panel.



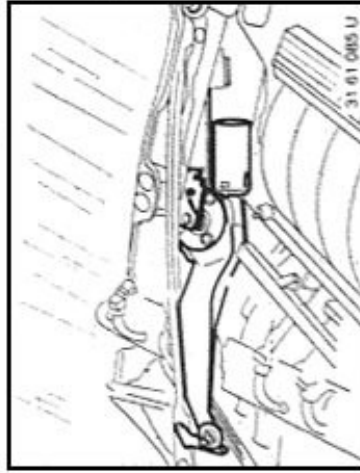
Unscrew nut on cowl panel.



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.

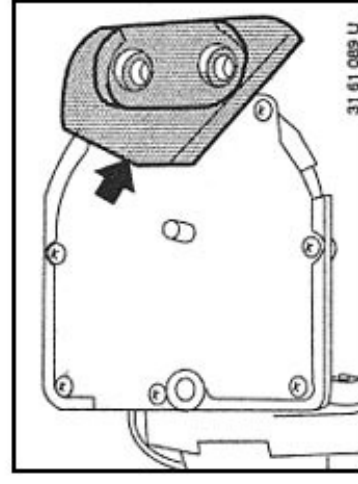


• Refer to Specifications

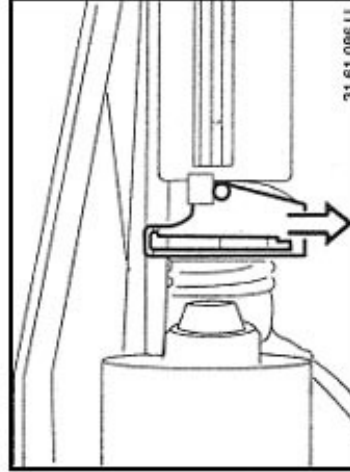
61 61 285 REPLACING WIPER CONTACT FORCE CONTROL MOTOR

Remove complete wiper console - refer to
61 61 271.

Installation:
Mount stop for the wiper linkage.

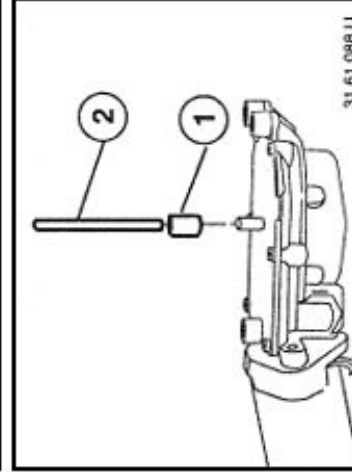


Disconnect plug.



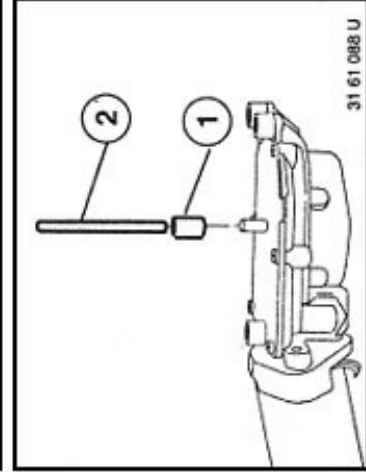
Unscrew screws.

Installation:
Tightening torque*.



Prevent sleeve (1) and plunger (2) from
falling out.

Installation:
Lubricate sleeve and plunger with grease
prior to installation.



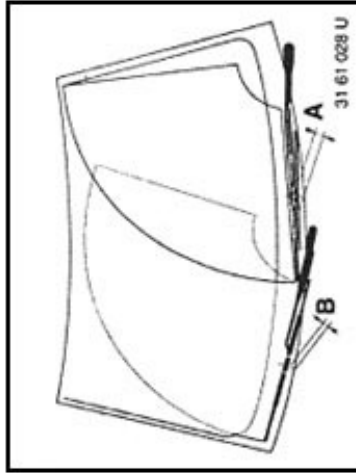
* Refer to Specifications

61 61 ... REPLACING STOP FOR PARK- ED POSITION

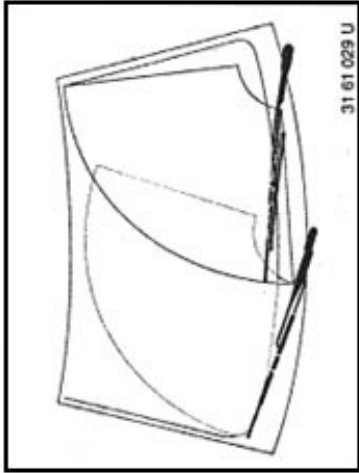
A faulty stop will be noticed when wipers do not return to parked position from neutral position after wiping. Wiper motor turns inverted so that wipers can get to parked position from the neutral position.

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.

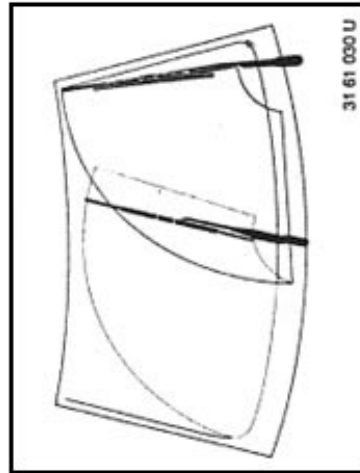


Parked position



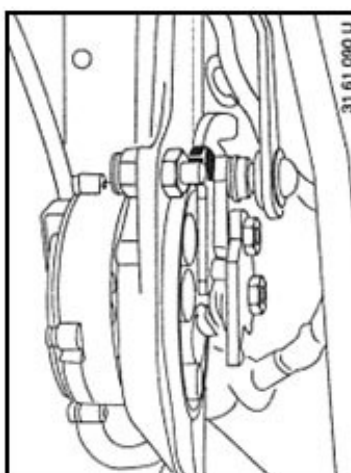
Neutral position

Fold-away position

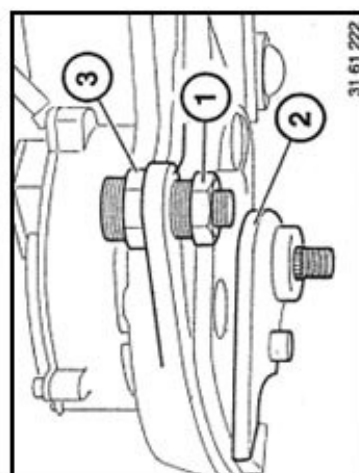


Remove complete wiper console - refer to 61 61 271.

Stop in parked position

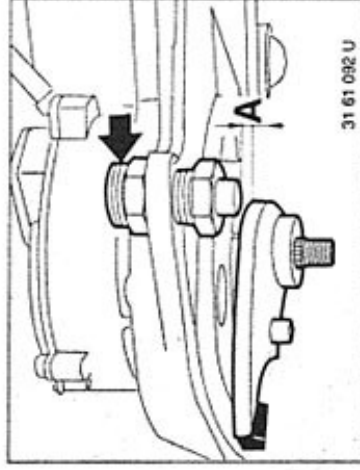


- 1 Stop
- 2 Cam
- 3 Lock nut - tightening torque*



* Refer to Specifications

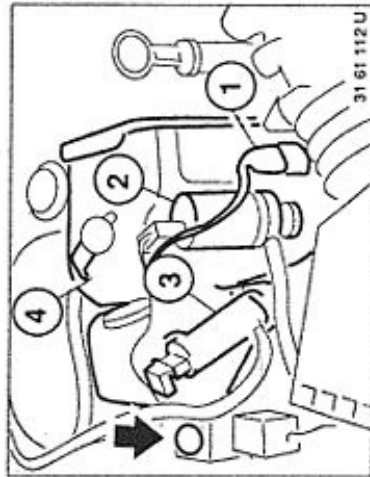
61-61/15



Unscrew lock nut.

Installation:
Tightening torque*.

Unscrew stop.
Adjust height of stop to distance A =
1.5 to 2.0 mm.

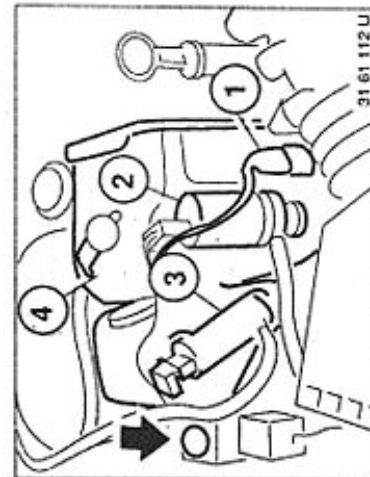


61 67 010 REPLACING WASHING FLUID PUMP FOR HEADLIGHT CLEANERS

Empty the washing fluid tank.
Unscrew screw.
Remove pump (3).
Loosen hose clamp and disconnect hose.

Important!

Hoses must not be kinked after installation.

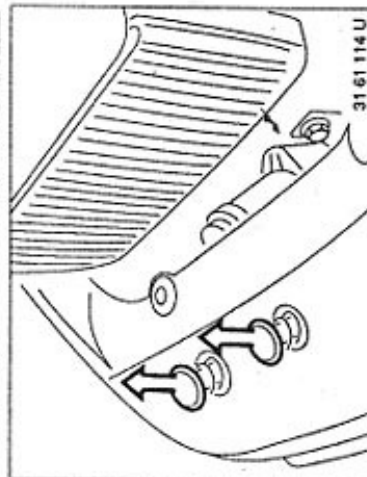


61 67 060 REPLACING SPRAY NOZZLES FOR HEADLIGHT CLEANERS

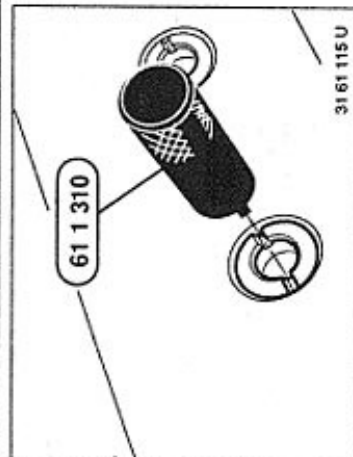
Disconnect hose on headlight cleaner washing fluid pump (4).

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.
Uncap caps.



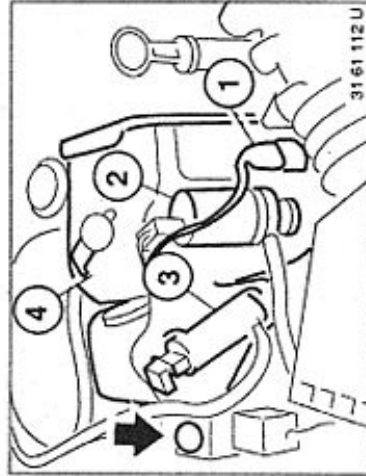
Remove bumper - refer to Group 51.
Unscrew nuts using Special Tool 61 1 310.

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.



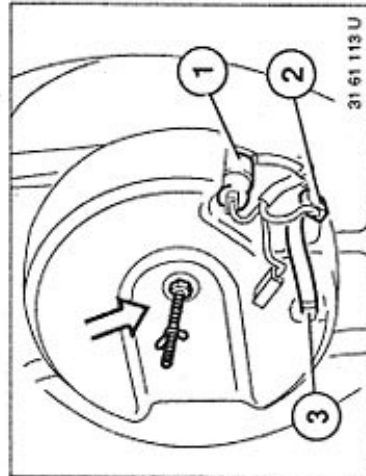
- 1 Level switch
- 2 Pump for windshield washing fluid
- 3 Pump for windshield intensive cleaning fluid
- 4 Pump for headlight washing fluid

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 inverted for RHD models.

Dimensions in mm:

A1 = 215

A2 = 540

B1 = 442

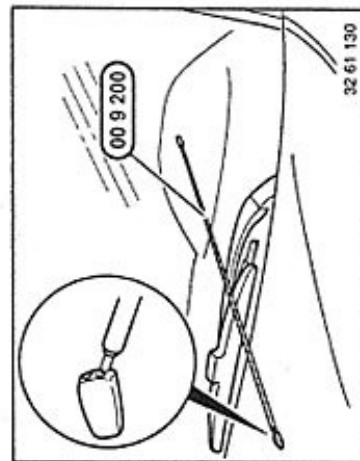
B2 = 245

C1 = 465

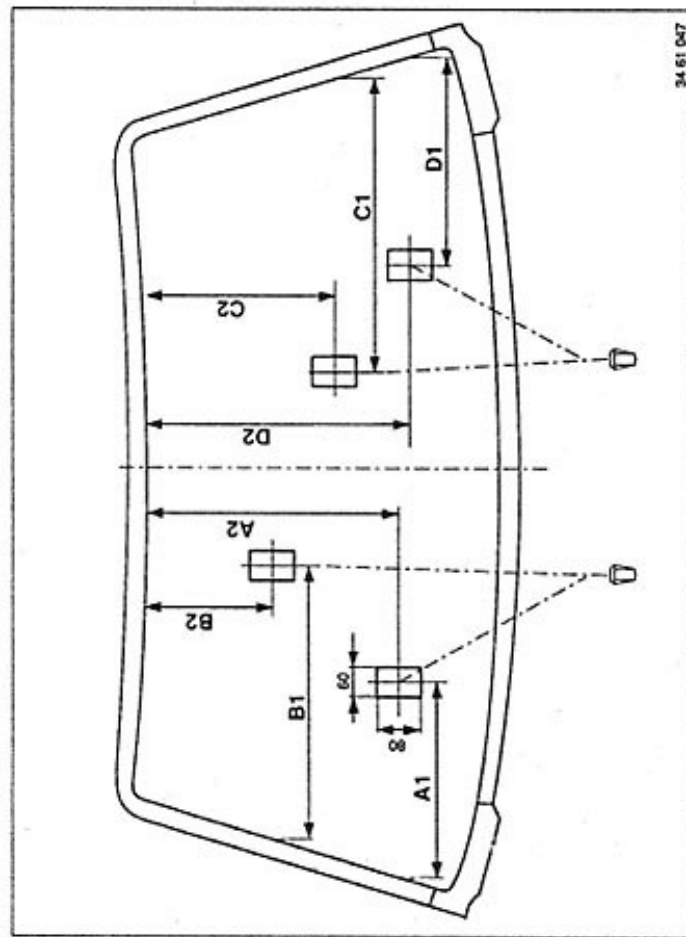
C2 = 286

D1 = 220

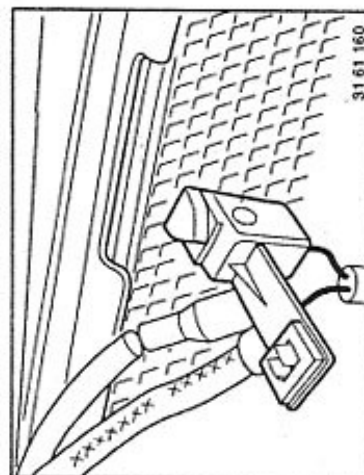
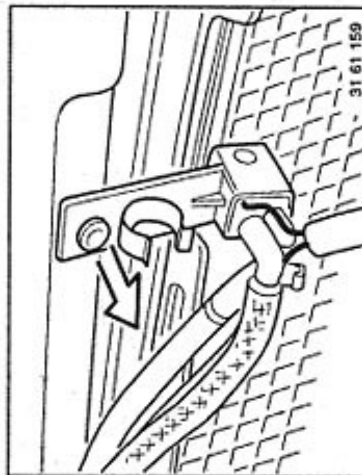
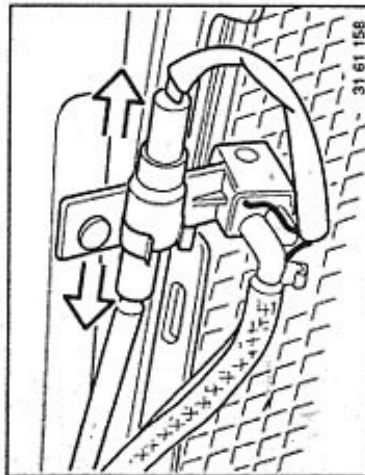
D2 = 550



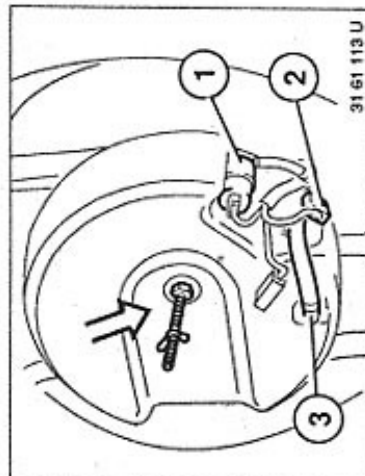
Mark points of contact with pieces of tape.
Adjust the spray nozzles using Special Tool 00 9 200.



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.