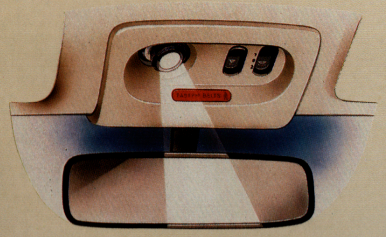
SAAB

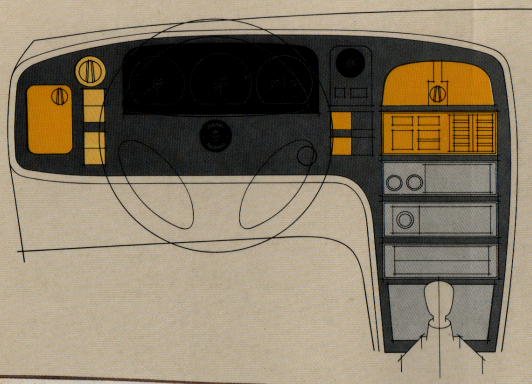
9000

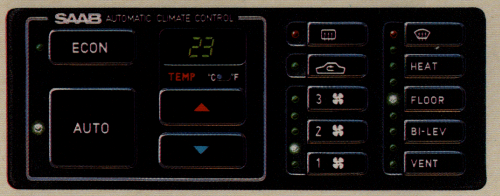
SERVICE MANUAL

3:1 Electrical system, instruments

M 1986–






SAAB AUTOMATIC CLIMATE CONTROL
ECON
AUTO
TEMP
HEAT
FLOOR
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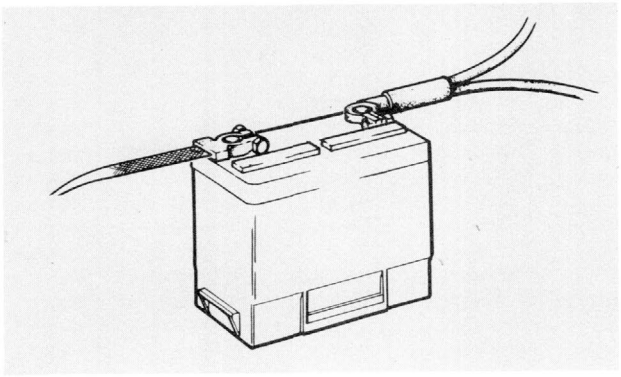
SAAB 9000

SERVICE MANUAL

3:1 Electrical system Instruments

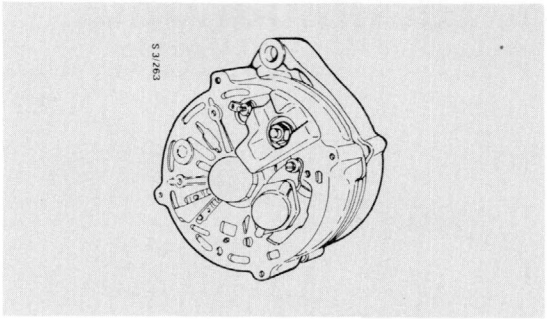
M 1986–

Technical data



Battery

Voltage	V	12
Capacity	Ah	62
Polarity		Negative (-) earth
Specific gravity of electrolyte:		
Recharging required		1.21
Battery fully charged		1.28



Alternator

Bosch N1-14V 80 A 19

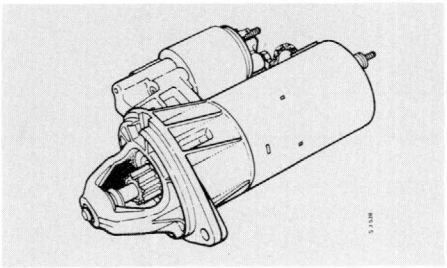
Rated voltage	V	14
Rated speed	r/min	1900
Stator connection		Star connection ⅄
Slip ring diameter, new	mm	27.8
minimum	mm	26.8
Maximum permissible slipring runout	mm	0.03
Maximum permissible rotor runout	mm	0.05
Minimum brush length	mm	5 (protruding from brush holder)
Gear ratio between crankshaft pulley and alternator		1:2.4

Test values

Resistance, rotor winding	Ohm	2.8 ± 10 %
between phases on stator	Ohm	0.10 ± 10 %
Output:		
At 1 500 r/min	A	36
At 2 000 r/min	A	54
At 6 000 r/min	A	80

Belt tension

New belt	N	800 ± 45
Minimum	N	265
After adjusting	N	535 ± 45



Starter motor

Type		Bosch DW 12V 0 001 108 012
No. of teeth on pinion		9
No. of teeth on ring gear		142
Gear ratio		15.8:1
Output	kW (hp)	1.4 (1.9)

Test values, mechanical

Backlash	mm	0.35 - 0.60
Clearance between pinion and ring gear	mm	2.5 - 3.0
Rotor end float	mm	0.05 - 0.40
Torque of freely rotating pinion	Nm (kgf cm)	0.12 - 0.18 (1.2 - 1.8)

Test values, electrical

Idling, 12 V and 70 A	r/min	3 000
Under load, 9 V and 315 A	r/min	1 700
Starter motor locked, 4 V and 650 - 750 A	r/min	0
Minimum voltage for solenoid engagement	V	7

Tightening torques

Solenoid securing bolts	Nm (kpm)	4.5 - 5.5 (0.45 - 0.55)
Commutator end bracket securing bolts (throughbolts)	Nm (kpm)	2.7 - 3.5 (0.27 - 0.35)

Ignition system

Type	Breakerless incorporating a Hall transducer
Firing order	1-3-4-2

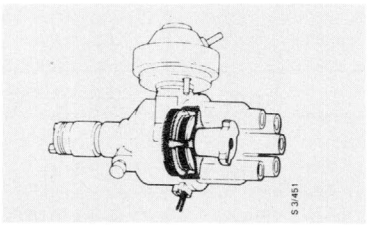
Ignition setting with vacuum control unit disconnected

Engine	Timing at r/min	Remarks
Turbo 16	16° BTDC/850	

Spark plugs

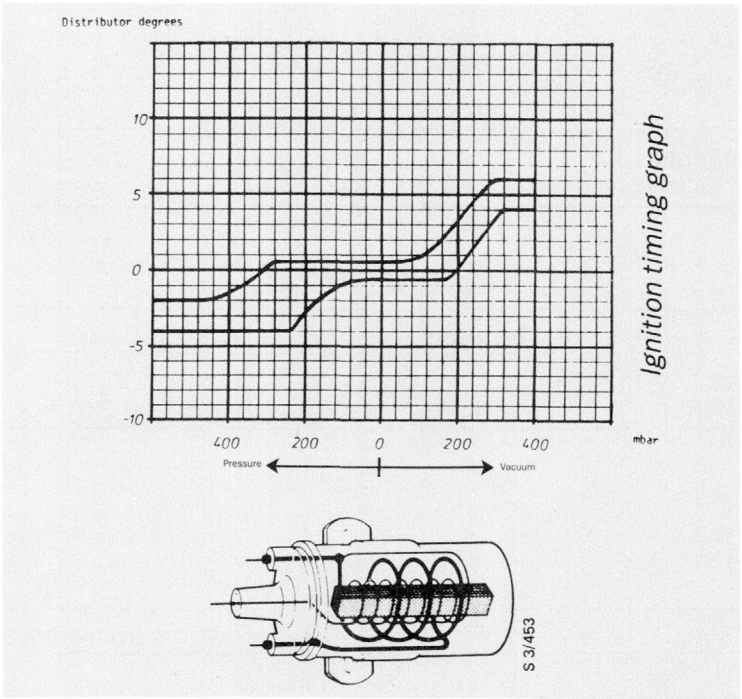
Engine	Type	Remarks
Turbo 16	Bosch F7DC	
	Champion C7GY	extremely hard driving
	Champion C9GY	
	Champion C9YC	
	NGK BCP 6ES	
	NGK BCP 6EV	
	NGK BCP 7EV	extremely hard driving

Electrode gap	mm	0.6
Tightening torque (non-lubricated plug)	Nm (kpm)	25 - 29 (2.5 - 2.9)



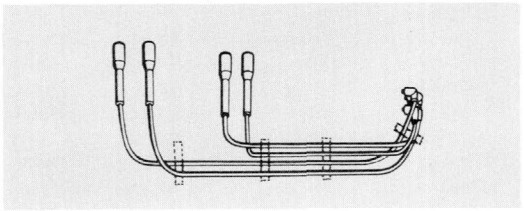
Distributor

Type		Bosch 0 237 507 007
Direction of rotation		Anticlockwise
Rotor arm resistance	kOhm	1



Ignition coil

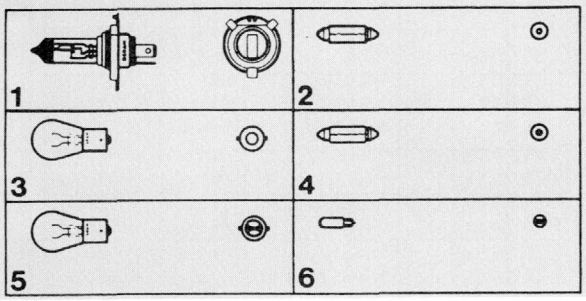
Resistance of primary winding measured between terminals 1 and 15	Ohm	0.52 - 0.76
Resistance in secondary winding measured between terminal 1 and the HT output terminal	kOhm	2.4 - 3.5

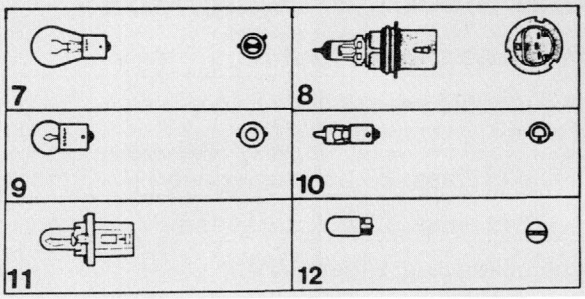


HT leads

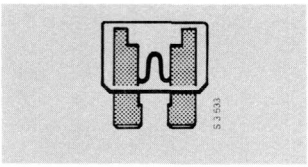
Resistance of lead (including connectors) between coil and distributor	kOhm	0.5 - 1.5
Resistance of lead (including connectors) between distributor and plug	kOhm	2 - 4

Light bulb table





			Socket	Pos
Headlamp (USA only)	W	75/50	Sylvania 9004 DOT	8
Headlamp	W	60/55	H4 holder P43 t-38	1
Rear direction indicators, stop lights, reversing lights	W	21	BA 15s	3
Front direction indicators, daylight driving lights/parking lights	W	21/5	BAY 15d	5
Fog lights/tail lights	W	21/4	BAZ 15d	7
Tail lights	W	5	BA 15s	9
Number plate illumination, door-mirror-switch illumination, glove compartment light, radio console light and door lights, seat-belt warning light	W	5	SV 8.5-8	2
Dome light and luggage compartment light	W	10	SV 8.5-8	4
Illumination for light switch and front ashtray	W	1.2	W2x4.6d	6
Warning/indicator lights for oil pressure, brakes, direction indicators (repeater), choke, rear-window heating main beam, hand brake, fuel level and pictogram, shift up	W	1.12	bulb with bulb holder	–
Fuel warning light	W	1.2	bulb with bulb holder	11
Charging warning light	W	2.0	bulb with bulb holder	11
Illumination for heating and ventilation controls and cigar lighter	W	2	W2 x 4.6d	6
Instrument illumination	W	3	bulb with bulb holder	–
Spotlight, front roof panel	W	5	halogen	10
Spotlight, rear seat	W	5	halogen	10
Side indicator repeater lights	W	5	W2.1 x 9.5 d	12
Rear-window stop lights	W	21	BA 15s	3



Fuses

Red	A	10
Blue	A	15
Yellow	A	20
Colourless	A	25
Green	A	30

Other electrical equipment

Windscreen wiper motor

Speed (double sweeps per minute) and power consumption:			
Wet glass, 13.5 V, half-speed	r/min	44 ± 4	≤3 A
Wet glass, 13.5 V, full speed	r/min	64 ± 6	≤4 A
Motor locked (e.g. wiper blades frozen to glass)	A	approx. 20	

Headlamp wiper motor (n/a USA)

Type		Bosch AHO 12V
Operating speed at output shaft when unladen, double sweeps/min		50 - 60
Power demand	A	0.75 - 1.5
Power demand when motor locked (e.g. wiper blades frozen to screen)	A	4.0 - 5.5

Heated front seats

Cut-in temperature of thermostat	°C (°F)	+12 (54) ± 2.8 (37)
Cut-out temperature of thermostat	°C (°F)	+28 (83) ± 2.8 (37)
Output of heating elements	W	approx. 86

Heated rear window

Output at 13 V	W	300 ± 30

Battery

The Saab 9000 is fitted with a sealed-for-life, 12 V battery, with a capacity of 62 Ah.

The battery is located on the left-hand side in the engine compartment and its negative terminal is connected to earth (negative-earth system).

The sealed-for-life battery works in the same way as a conventional battery and also contains an electrolyte con-sisting of diluted sulphuric acid. The battery must therefore always be kept upright.

The battery has a number of small vent holes, although much less gas is formed in this battery than in a conventional battery. Sealed-for-life batteries hold their charge longer than conventional batteries.

To remove

1 Disconnect the negative (-) battery lead first, followed by the positive (+) lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Undo the screw and remove the battery clamp.

3 Lift the battery out of the car.

To fit

Refit in the reverse order.

When refitting the battery, make sure that the external surfaces, terminal posts, pinch-bolts and clamps are clean. Lubricate the pinch-bolts and clamps with acid-free petroleum jelly.

Caution

Take care never to reverse the polarity of the electrical system by fitting the battery leads to the wrong terminals. If the leads are misconnected for just a moment, it is suf-ficient for the rectifier in the alternator to be damaged. Always connect the red positive (+) lead to the positive (+) terminal of the battery and the black negative (-) lead to the negative (-) terminal. If connecting an external bat-tery to the car battery, make sure that like poles are connected: positive to positive and negative to negative. **Never** connect or disconnect a battery when the engine is running. For rapid-charging of the battery, disconnect both battery leads.

Battery care

Since the level of charge in the battery is critical to starting of the engine, it is important that the battery is checked and looked after regularly. This is particularly important in winter, when the load on the battery is greater and its capacity is reduced by low ambient temperatures. A poorly charged battery can also freeze and be damaged in very cold weather.

Testing

The capacity and level of charge of the battery can be tested by connecting a load (equivalent to that on starting) to the battery for a duration of 15 seconds and measuring the voltage. This requires the use of a battery tester and a load resistor.

Test procedure: Apply a load of approximately 200 A to the battery for a period of 15 seconds, during which time the voltage should not drop below 9.6 V at a battery temperature of 27°C (80°F). The following table gives the corresponding volt-ages for lower temperatures.

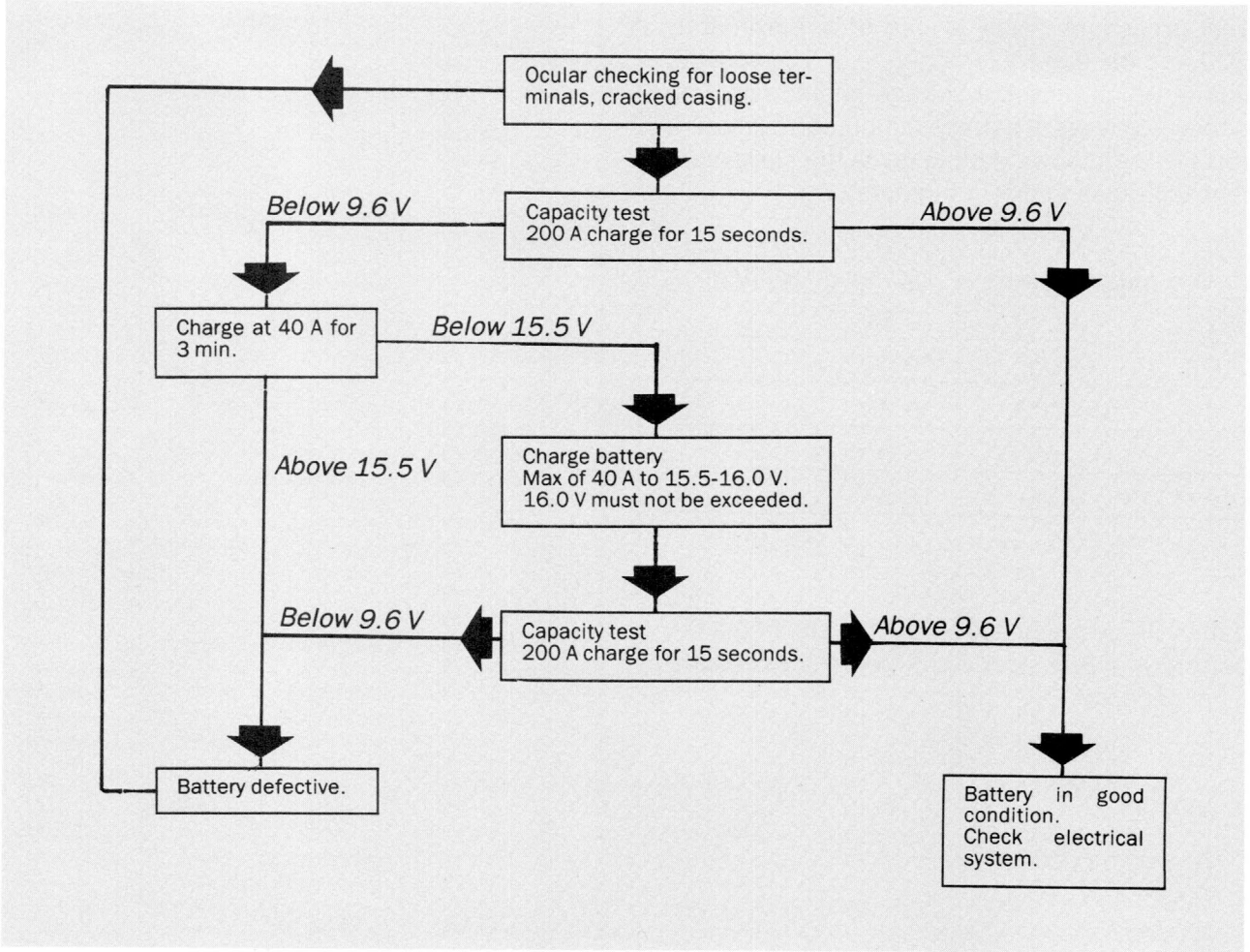
Battery temperature		*Minimum voltage*
27°C	(80°F)	9.6 V
16°C	(60°F)	9.5 V
4°C	(40°F)	9.3 V
-7°C	(20°F)	8.9 V
-18°C	(0°F)	8.5 V

If the voltage reading is below that specified, the battery is either poorly charged or has insufficient capacity.

Charging

The battery can normally be recharged by means of a conven-tional battery charger. For rapid charging, the charging current must not exceed 50 A. If the battery is almost fully discharged, for instance, if a power-consuming unit has been left on for a prolonged period, a low initial charge is required to start the chemical process in the battery. In such cases, charge the battery at 3 A (5 A max.) for 24 hours or until the charging current has fallen to its lowest stable value. The voltage on charging should not be allowed to exceed 16 V, as a rapid loss of water would be the result. If difficulty is encountered in keeping the voltage down, ideally a battery charger delivering a pulsating charging current should be used.

Use the fault-diagnosis chart to find out why the battery is not performing properly. If the chart shows the battery to be sound, poor operation may be attributable to abnormally heavy power consumption (e.g. if a power-consuming unit has been left on) or to a fault in the car's electrical system or charging system.

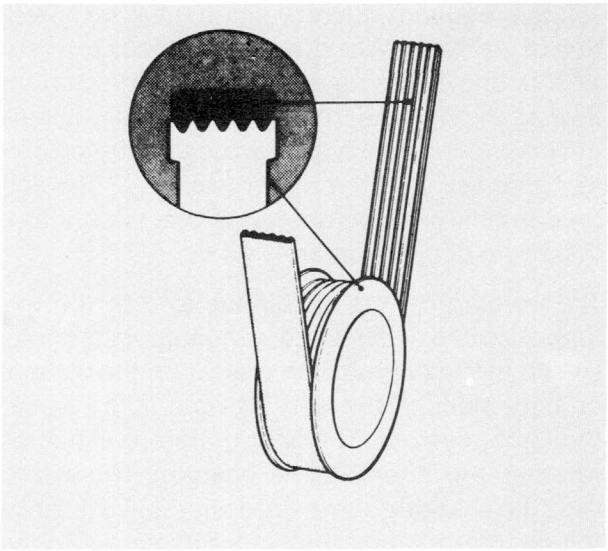


Fault-diagnosis chart

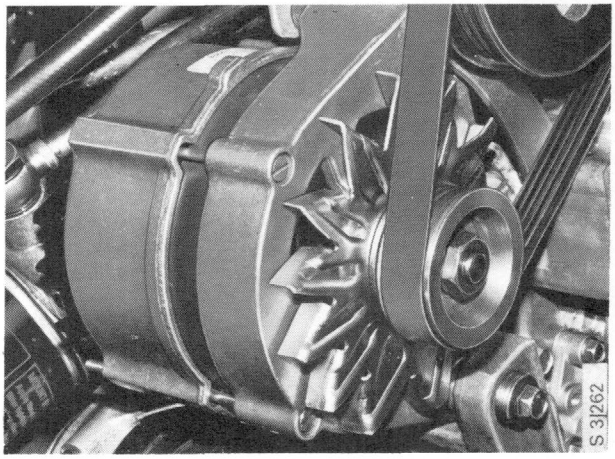
Alternator

The alternator fitted to the Saab 9000 is made by Bosch and is rated at 80 A.

The alternator has an external voltage regulator and is driven by means of a multi-groove belt from the crankshaft pulley. Access to the alternator for servicing or removal is gained by removing the front section of the wing liner.



The pulley is equipped with vanes to disperse the heat generated in the alternator. When the pulley is rotating, the vanes draw air through the alternator to provide the necessary cooling.



Principle of operation

When the ignition switch is on, the circuit is made and current flows from the ignition switch via the warning light to terminal D+ on the alternator. The current then flows through the rotor winding and to earth through the regulator.

Current flowing through the rotor creates a magnetic field around it. When the engine is started, and the rotor starts to rotate, the magnetic field also rotates, inducing an alternating current into the stator windings. As it passes through the rectifier diodes, the current is rectified and the unidirectional current flows to the battery via terminal B+. Current also flows from the stator windings via the exciter diodes to the voltage regulator, thereby controlling the operation of the latter. When the voltage rises to about 14 V or above, the regulator reduces the current flowing through the rotor winding. This weakens the magne- tic field and thus the alternating current induced into the stator windings. The voltage regulator therefore limits the voltage to a maximum of approximately 14 V.

The warning light is also influenced by the voltage supplied by the stator windings via terminal D+ on the regulator such that when the voltage on both sides of the warning light is the same, the light goes out. The light therefore indicates whether the alternator is charging. Relays to limit the charging current are not required, since the alternator limits the output itself. When the alternator is running at high speed, the frequency of the induced alternating current will also be high, and once the output current reaches a given value, the resulting resistance (impedance) will be of such magnitude that any further increase in output would be impossible.

Caution

Never earth the alternator or regulator energizing terminals or connecting leads.

Never disconnect the regulator or battery while the alternator is running.

Never remove the alternator with the battery connected.

Never run the alternator if the regulator is not connected.

Never test the alternator and regulator assemblies in the car or on a test bench unless the battery is connected.

Never reverse the polarity of the battery, as this can result in serious damage to the alternator.

Alternators should be overhauled only by specialist firms. It is vitally important that they are dismantled and tested correctly, as seemingly minor errors can result in serious damage.

Caution

To avoid damage to the diodes when electric welding is being carried out on the car, the negative (-) battery lead and all alternator leads must be disconnected first.

Internal circuitry

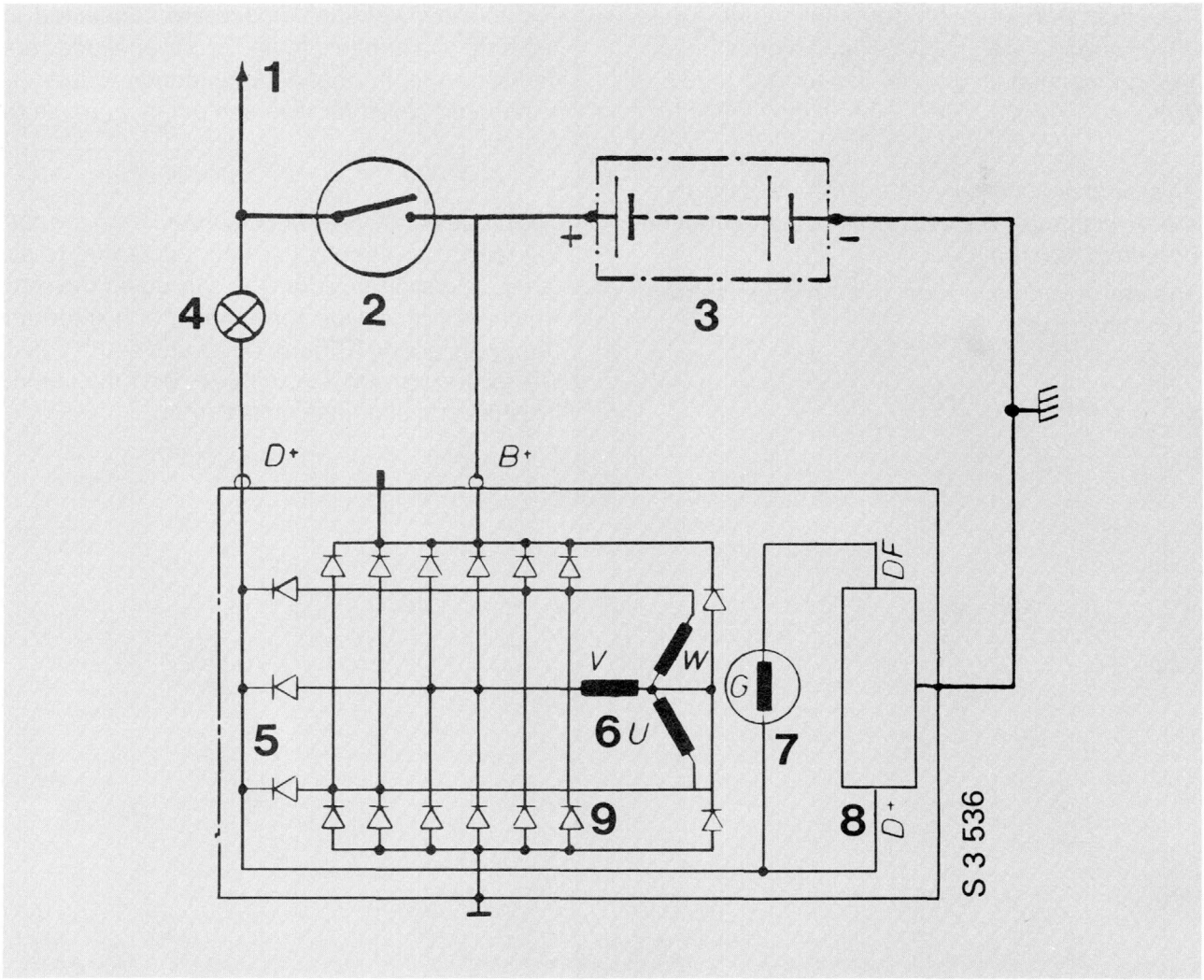
The alternator, which is internally ventilated, has a twelve-pole rotor, twelve silicon diodes for rectification and an additional two for the 'third circuit'.

An exciter diode is connected to each of the three stator windings. The exciter diodes are interconnected at terminal D+.

The stator windings form three phases and are star connected.

The fourteen rectifier diodes are connected in the form of a bridge circuit, i.e. seven diodes are connected for normal polarity (anode to the terminal) and seven for reversed polarity (anode to earth).

The diode holder is either insulated from the casing (earth) or directly earthed, according to polarity. The exciter winding is carried on the rotor which has claw-type ter-minals, with alternate terminals acting as north poles and south poles. The exciter current is supplied to the rotor coil via brushes and slip rings on the rotor.



Wiring diagram for the Bosch 80 A alternator

1 To power consumers
2 Ignition switch
3 Battery
4 Warning light
5 Exciter diodes
6 Stator windings
7 Rotor winding
8 Voltage regulator
9 Rectifier

Alternator care

The alternator has fully enclosed ball bearings which require lubrication only if removed in conjunction with other repairs.

It is driven by means of a multi-groove belt from the crankshaft pulley, and the tension of the belt must be correctly adjusted to avoid subjecting the bearings to unnecessarily high loads.

Adjusting the belt tension

See Service Manual, group 2, chapter "Crank mechanism" for working method and correct belt tension.

To remove

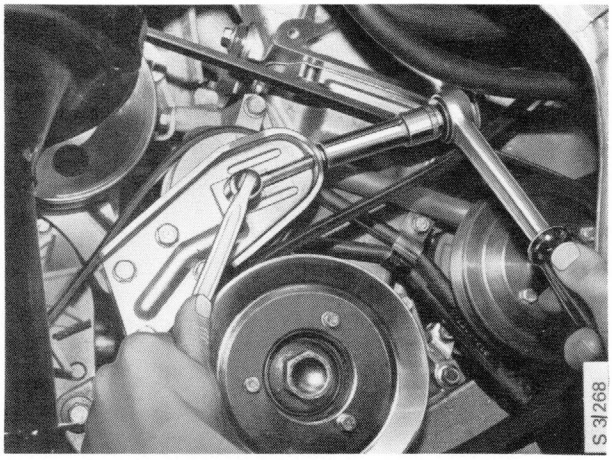
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

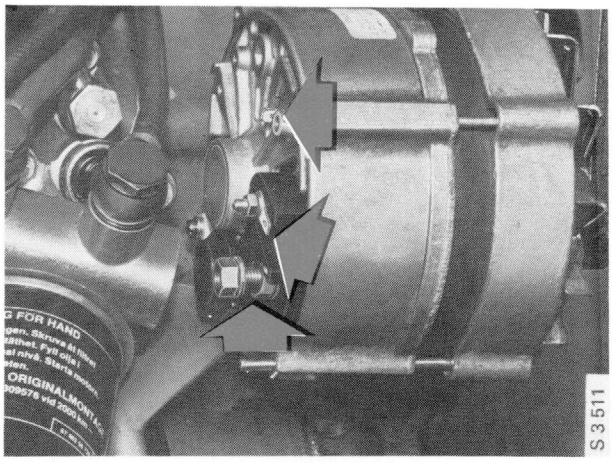
2 Jack up the front of the car, support it on axle stands and remove the right-hand road wheel.

3 Remove the front section of the right-hand wing liner.

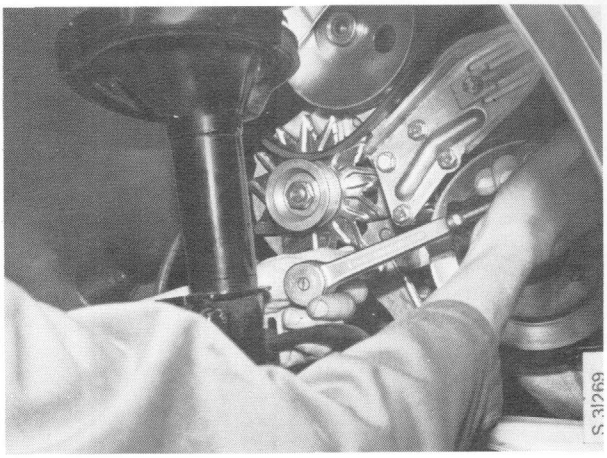
4 Slacken the alternator belt and lift it off the alternator pulley.

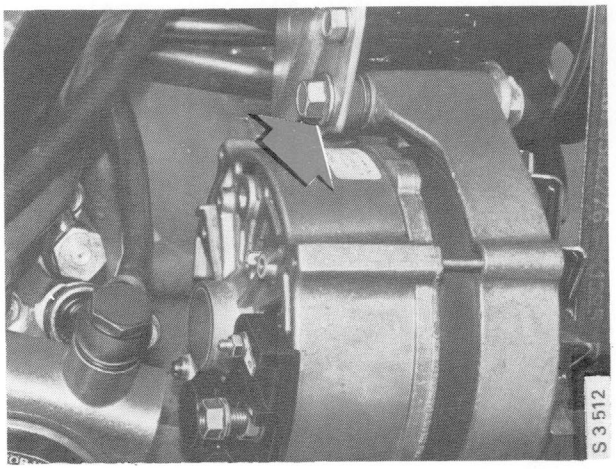


5 Pull off the electrical connectors on the back of the alternator.

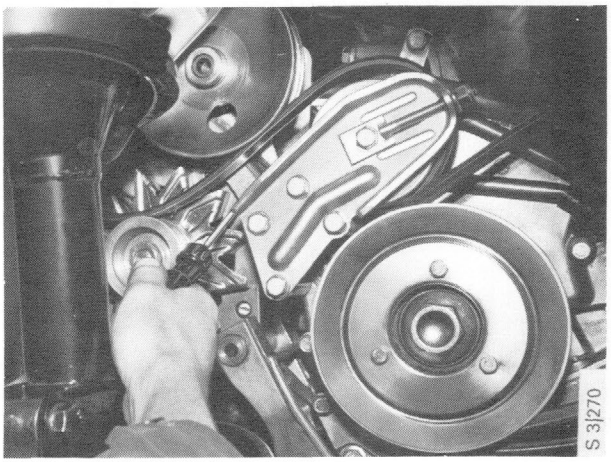


6 Slacken the two securing bolts for the alternator.

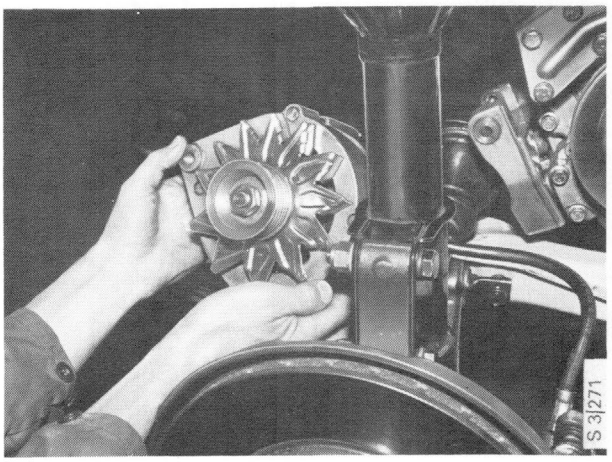




7 Use a screwdriver to lever the alternator to the left.



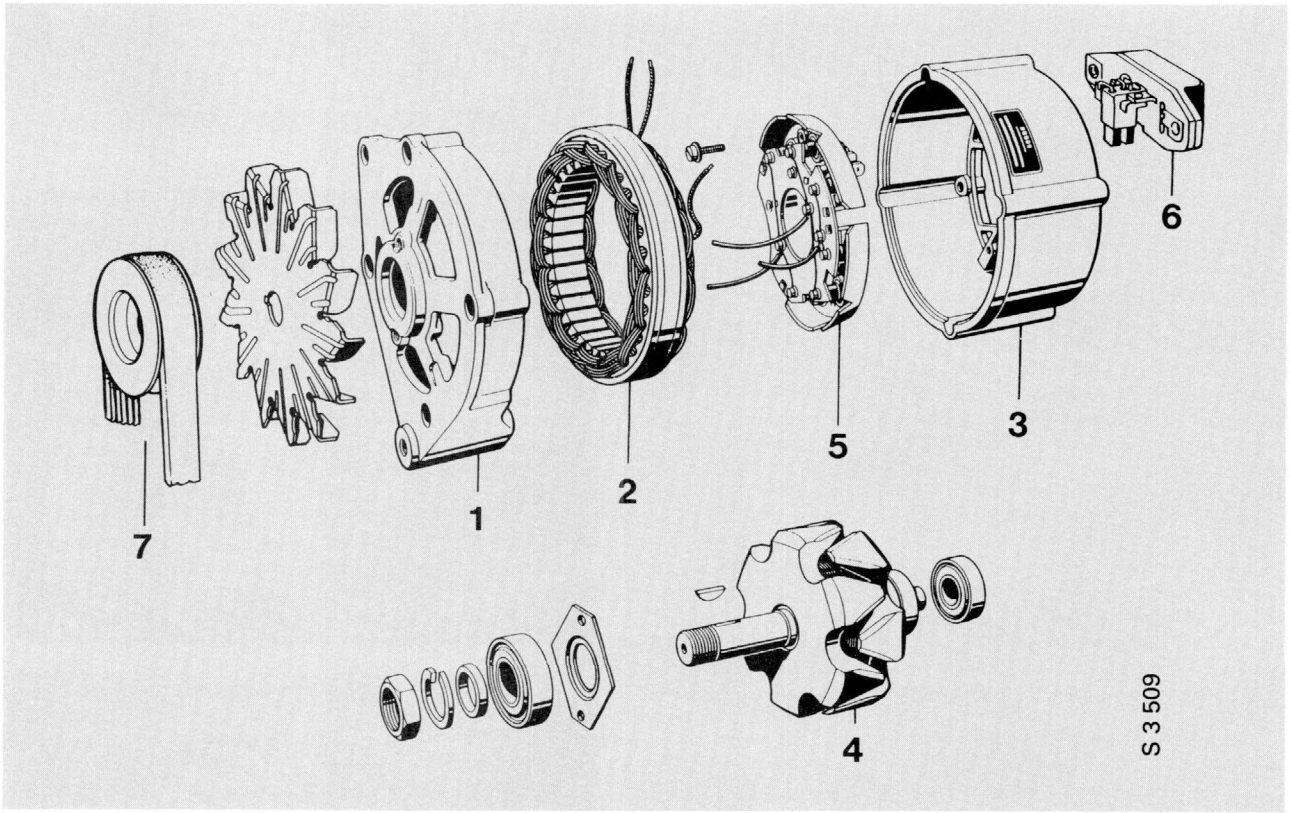
8 Pull the alternator forward.



To fit

Refit in the reverse order

After the alternator has been fitted, the belt tension must be adjusted.

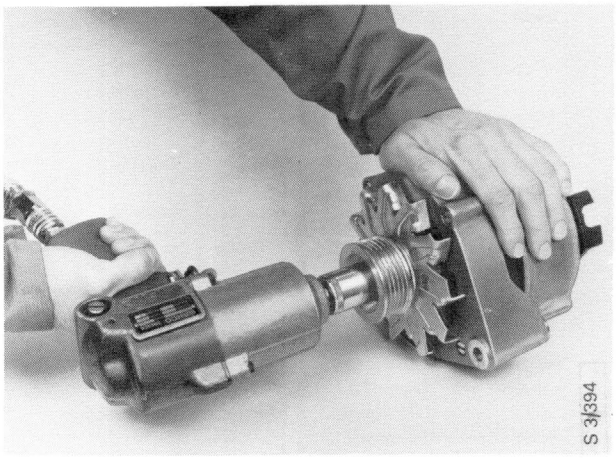


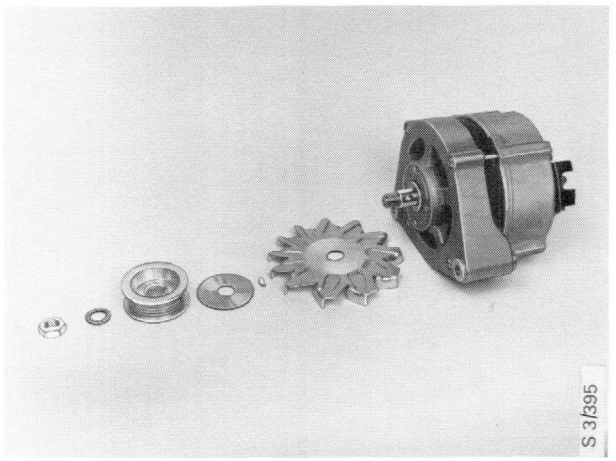
The Bosch 80 A alternator

1 Drive end bracket
2 Stator
3 Slip-ring end bracket
4 Rotor
5 Rectifier unit
6 Voltage regulator and brush holders
7 Pulley

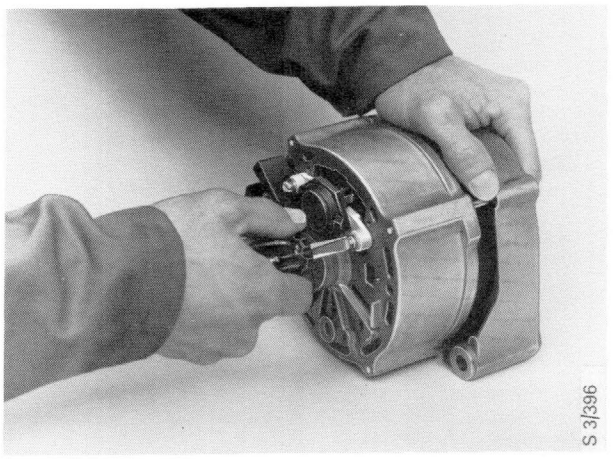
To dismantle (alternator removed from car)

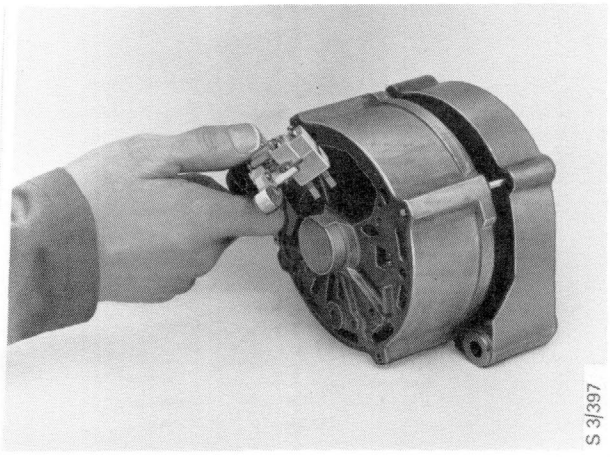
1 Undo the pulley centre-nut, using a pneumatic nut tightener with a 22-mm socket, and remove the pulley.



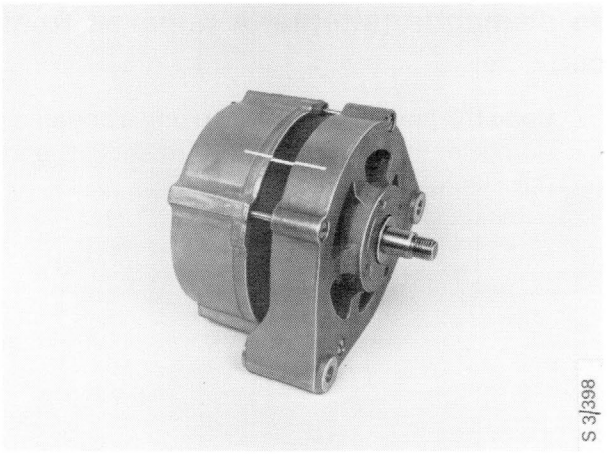


2 Remove the regulator unit.





3 Mark the position of the drive end bracket and the slip ring end bracket relative to the stator ring.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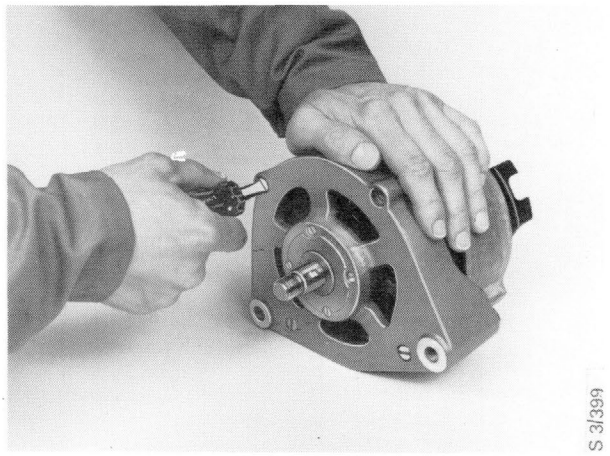
4 Separate the stator and slip ring end bracket from the drive end bracket and rotor.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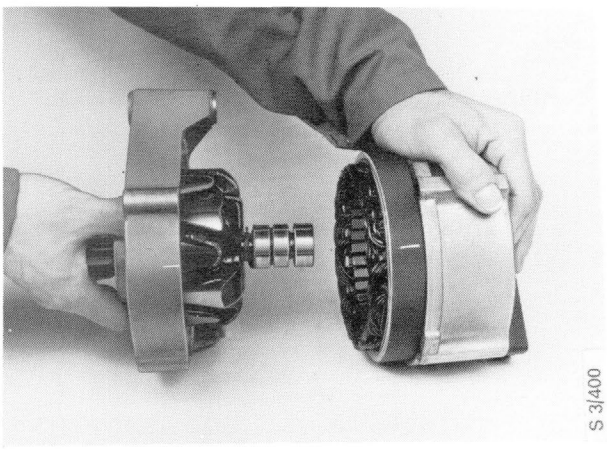
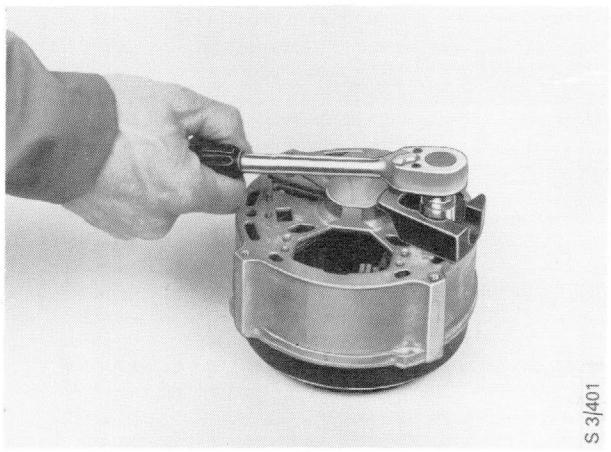
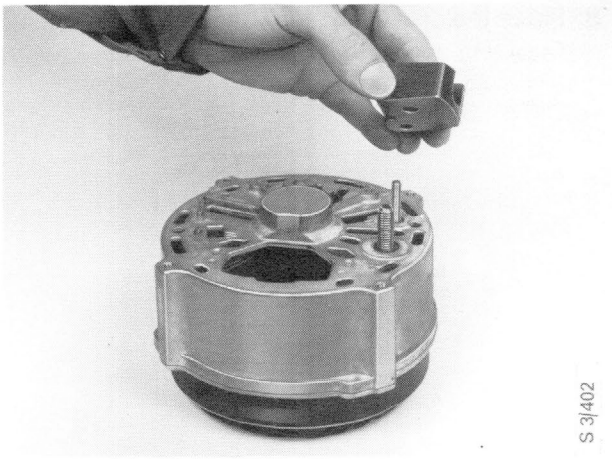
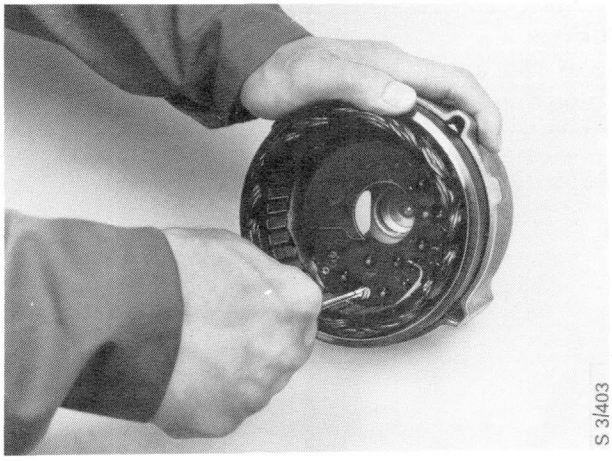

S 3/400

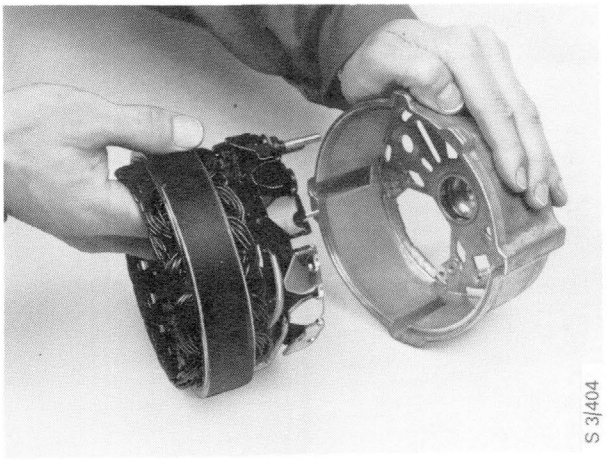
5 Remove the insulation block.


S 3/401


S 3|402

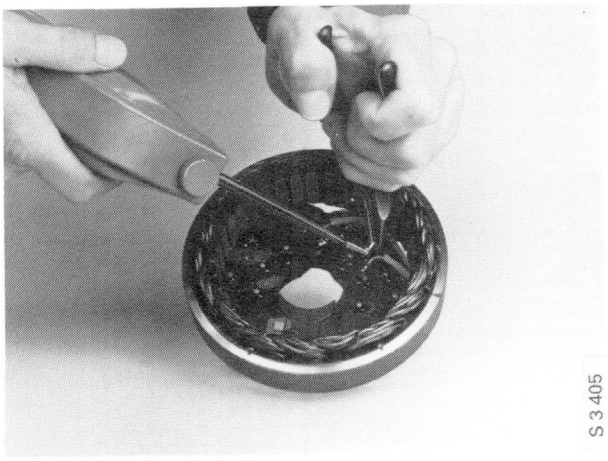
6 Undo the three rectifier-unit retaining screws and separate the unit from the slip ring end bracket.


S 3|403

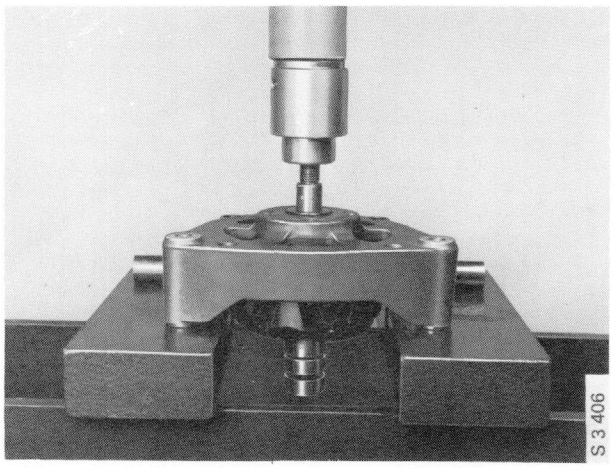

S 3|404

7 Carefully unsolder the stator leads from the rectifier unit.

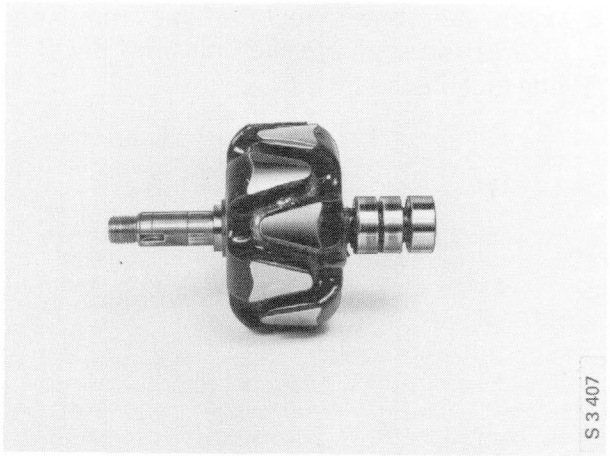
N.B.
Work quickly to avoid the diodes becoming unnecessarily hot.


S 3 405

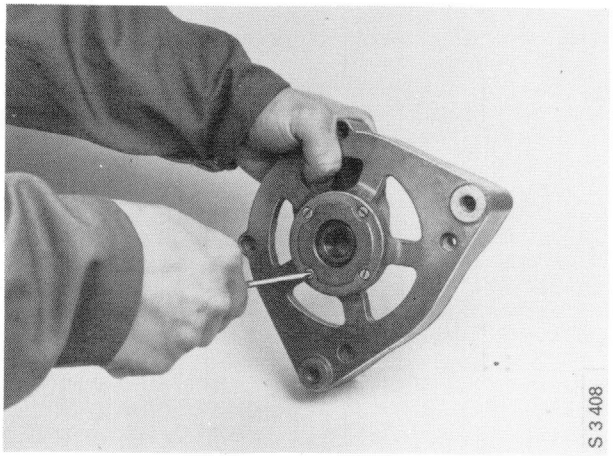
8 Place the drive end bracket on a suitable surface and press the rotor out carefully.



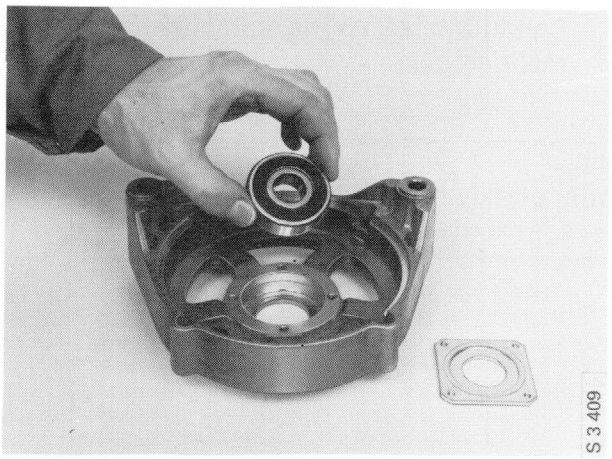
N.B.
Take care to prevent the rotor from falling and being damaged as it comes free of the bracket.



9 Remove the screws in the bearing retaining plate and remove the plate.



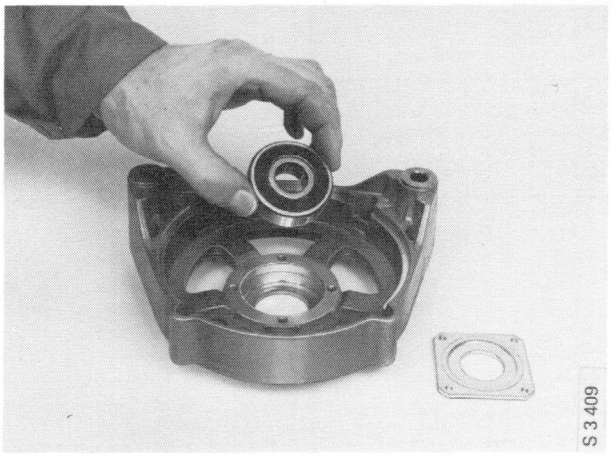
10 Remove the ball bearing at the slip ring end using a puller.

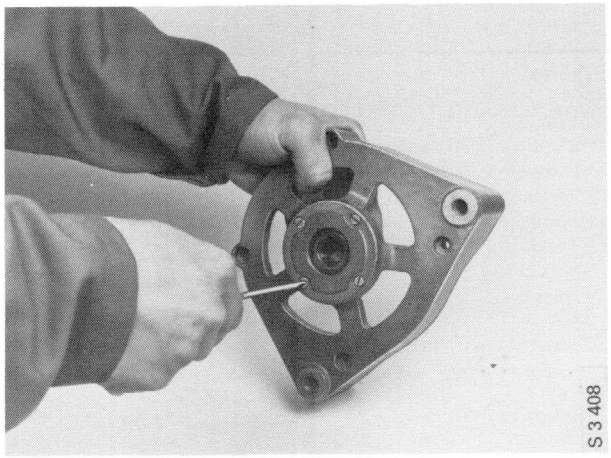


To assemble

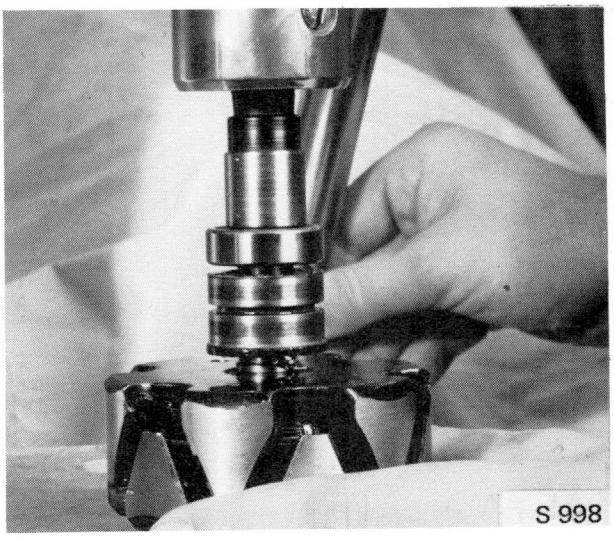
1 Pack the bearings with Bosch Ft 1 v 34 grease.

2 Fit the ball bearing and bearing retaining plate in the drive end bracket.



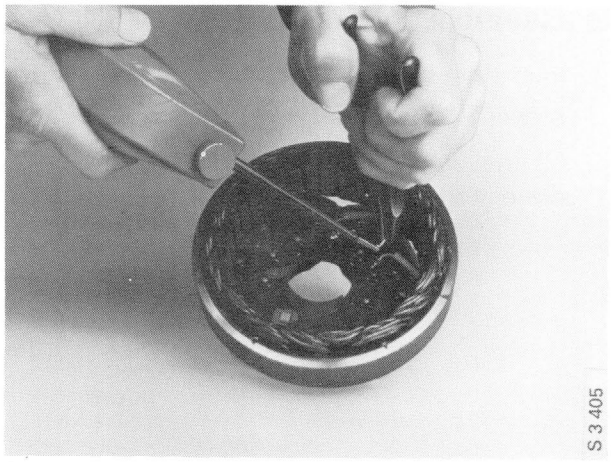


3 Press the ball bearing onto the slip ring end of the rotor. Make sure that the enclosed side is towards the slip rings.



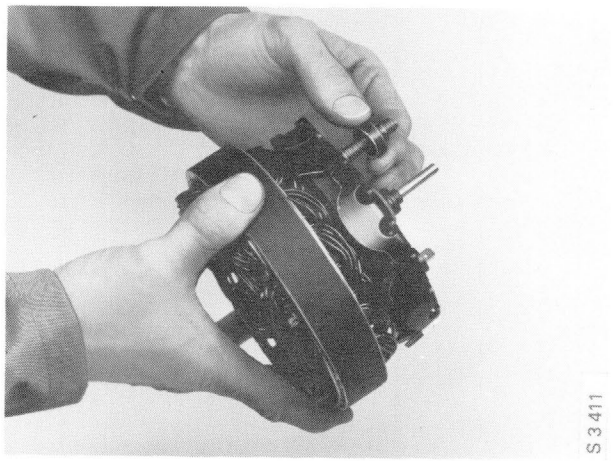
4 Press the drive end bracket onto the rotor.

5 Solder the stator leads to the rectifier unit.

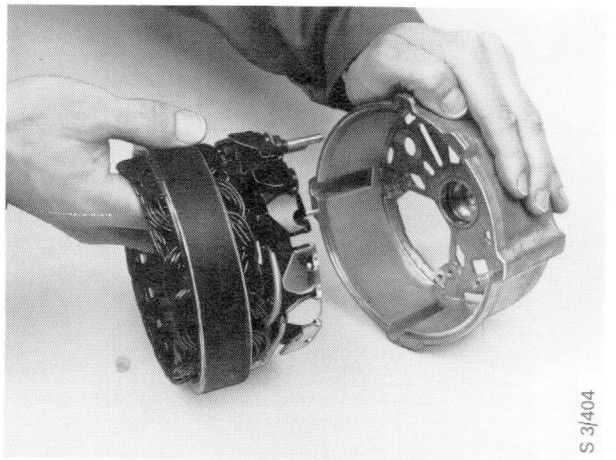


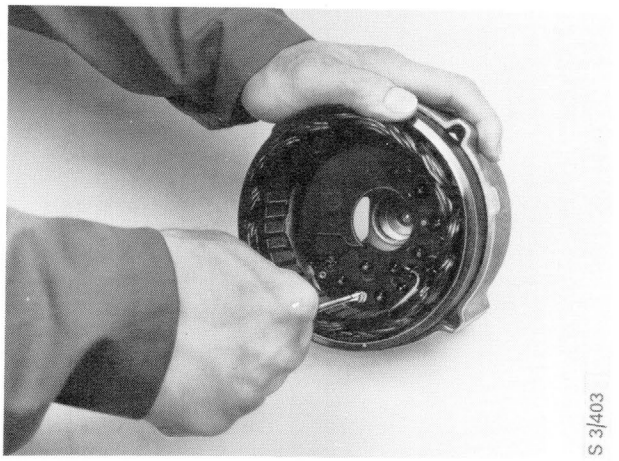
N.B.
Work quickly to avoid the diodes becoming unnecessarily hot.

6 Fit the rectifier unit inside the slip ring end bracket.

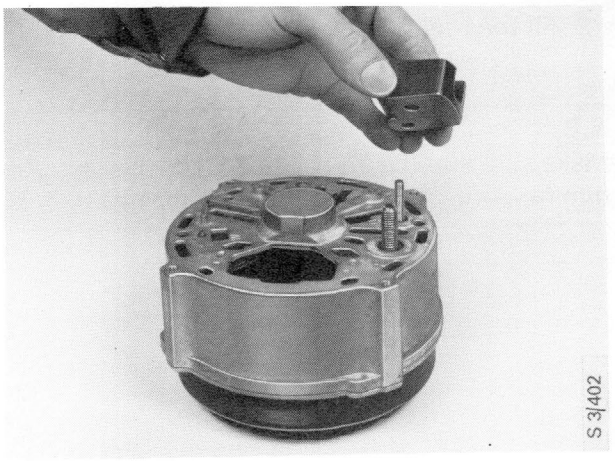


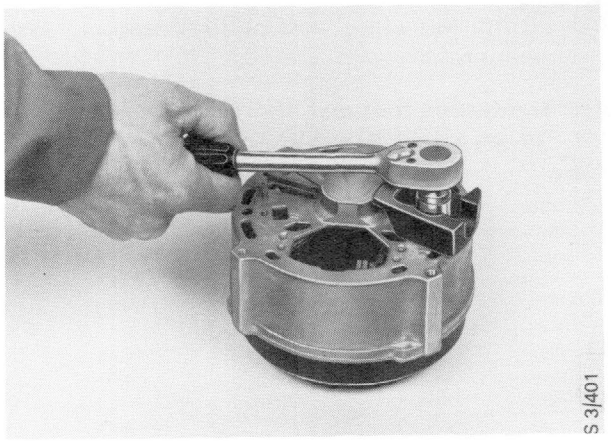
N.B.
Remember to fit the insulating washers to the electrical terminal screws.





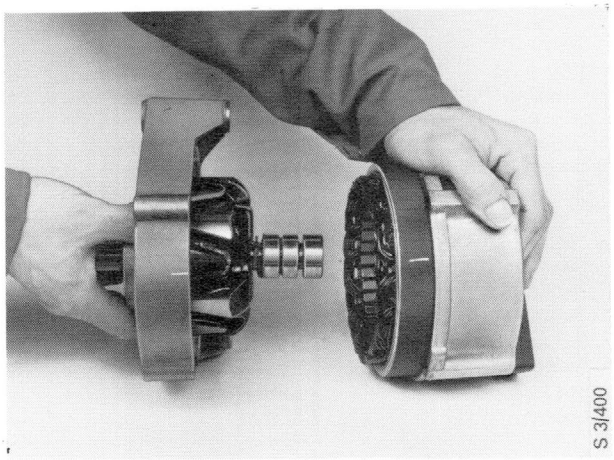
7 Fit the insulation block.

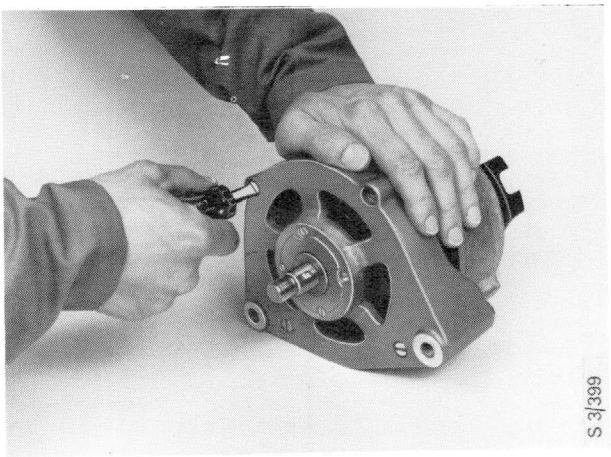




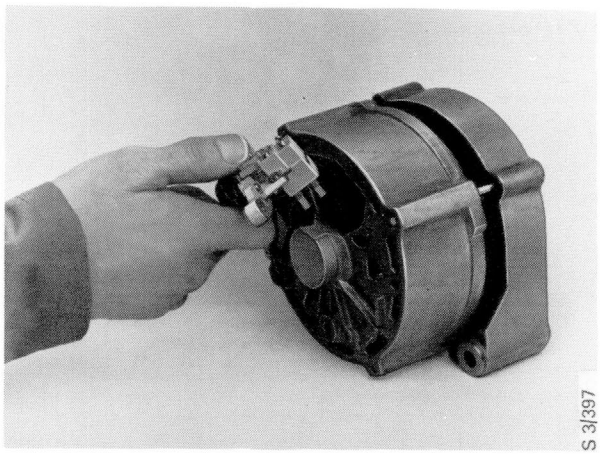
8 Fit the drive end bracket and rotor assembly to the slip ring end bracket and stator.

N.B.
Make sure that the marks made before dismantling line up.





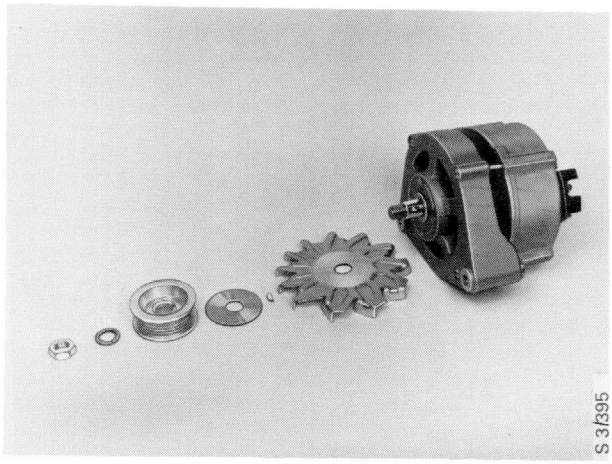
9 Fit the regulator unit.



N.B.
Make sure that the brushes protrude by at least 5 mm from the brush holder before fitting.

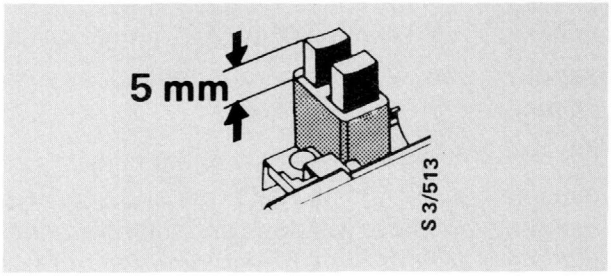
10 Fit the fan wheel and pulley complete with washers.

Tightening torque:
34-39 Nm (3.5-4.0 kpm)



Brushes

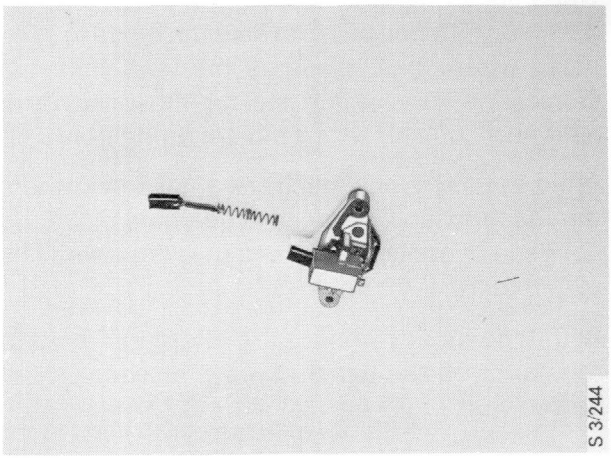
The alternator brush holder is part of the regulator unit. The brushes can be checked once the regulator unit has been removed from the alternator. The brushes should protrude from the brush holder by at least 5 mm. If not, new brushes must be fitted.



To change the brushes

1 Remove the voltage regulator unit.

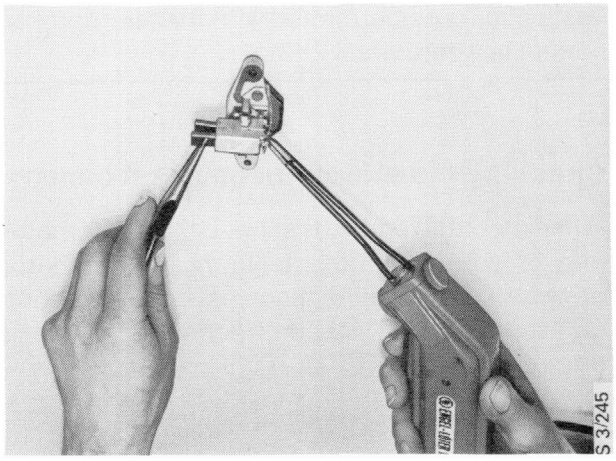
2 Carefully unsolder the brush lead from the brush-holder terminal, withdrawing the brush from the housing at the same time.



N.B.
Work quickly to avoid the regulator becoming unnecessarily hot.

3 Carefully remove any traces of solder from the brushholder terminal.

4 Fit the new brush in the brush holder, insert the brush lead in the brush-holder terminal and solder it.



Testing

Read through this subsection carefully before performing any tests on the alternator or its components.

For rectifier testing, use only direct current at a maximum of 40 V. For insulation and short-circuit tests on stator windings and the rotor winding use a 40 V/40 W a.c. test lamp (do not use 110 V or 220 V mains supply as this may damage the rectifiers). When measuring the charging current, never disconnect the battery leads with the engine running.

When soldering or unsoldering the diode terminals, use flatnose pliers to hold the diode lead as these will help to disperse the heat from the semiconductors, which are highly sensitive to heat (work quickly with a hot soldering iron).

Avoid imposing any mechanical stresses where the leads extend from the diode holder; i.e. do not bend or apply pressure to the wire where it is joined to the terminal.

Before doing any work to the alternator, be it in the car or on the bench, always disconnect the battery first.

N.B.
Tests should be performed with the alternator at normal temperature (60°C).

Checking the alternator on a test bench.

When mounted on the test bench, the alternator may only be driven by means of the alternator drive belt. Refer to the technical data in Section 023 for the speed ratio between the engine and alternator.

All leads must be connected by means of spade-terminal or plug-type connectors. This also applies to the battery - never use makeshift connections. A 12 V battery should be connected in parallel across the alternator for testing.

The battery will serve as a buffer and smooth the spikes in the current occurring when loads are switched on or off. This is important: if the spikes exceed the voltage limits, the rectification function of the diodes will be destroyed. The maximum voltage for silicon diodes is approximately 100 V.

The alternator can be tested using most types of alternator test bench. However, in some cases the use of suitable mountings and drive mechanisms will be necessary.

Caution

During testing, the alternator must be secured by means of its normal fixings and must not be held by clamps, or the like.

Excitation

Unlike a d.c. generator, an a.c. generator (alternator) will not remain in the excited state after it has been idle for some period. Consequently, a 12 V test lamp rated approx. 2 W must be connected between terminals D+ and B+ (see the wiring diagram). The initial exciting current for the rotor (field) winding flows across the test lamp, and through terminal D+ on the alternator, terminal D+ on the regulator, the closed regulator contacts and DF. It is therefore essential that the rating of the test lamp is at least as high as that specified. Excitation starts as soon as the alternator voltage opens the exciter diodes, which happens at 1 - 2 V. The voltage then rises rapidly and the drop across the test lamp steadily increases. The lamp will continue to glow until battery voltage is reached.

Checking the charging capacity

The charging voltage and charging current can be measured with the alternator in the car or mounted on a test bench.

The voltage is measured by means of a voltmeter connected between terminal B+ and earth on the alternator. The current is measured by means of an ampmeter connected in series with the load lead from terminal B+ on the alternator.

Test values

Connect the battery and charge the alternator. Set the alternator speed to the specified value, whereupon the alternator should provide a charging current at two-thirds of its rating:

54A at 1900 r/min

Insulation test on reassembled alternator

After the alternator has been dismantled and reassembled, check the insulation between terminal B+ and earth by means of an insulation tester.

Checking and testing dismantled components

Rotor

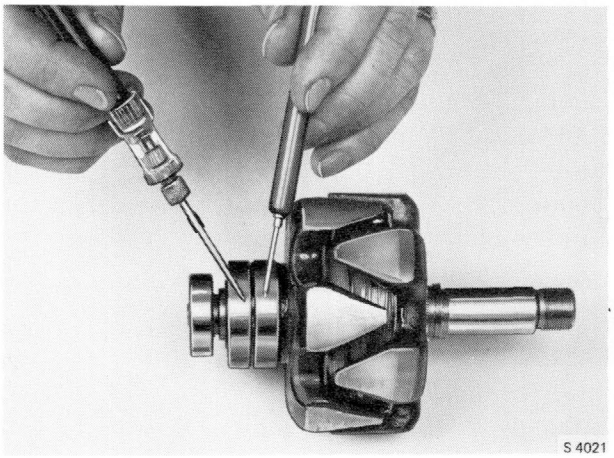
To measure the resistance.

Use an ohmmeter (graduated in ohms) to measure the resistance of the winding between the slip rings.

The reading should be within the following limits:

2.5-3.1 Ohm

A low resistance reading indicates a short-circuit in the rotor winding. A high resistance reading (∞) indicates that the rotor winding is broken.

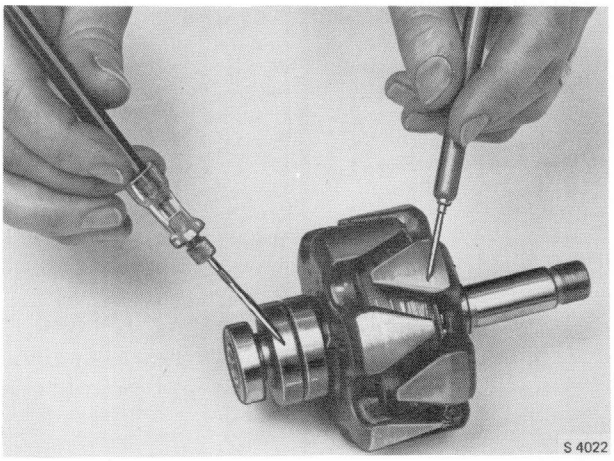

S 4021

Flashover test

By means of an ohmmeter (graduated in ohms x 1000), measure the resistance between one of the slip rings and the alternator casing.

The resistance should be high (∞).

A low resistance reading indicates flashover between the rotor winding and earth. A flashover test may also be performed by using a 40 V/40 W a.c. test lamp.


S 4022

Slip rings

Check the surface of the slip rings for grease, dirt and scoring. Clean them using trichloroethylene. Avoid polishing the surface of the slip rings as a highly polished surface will provide poorer contact with the brushes.

The dimension of the slip rings should be 27.8 (+ 0 mm/ -1 mm).

The maximum permissible slip-ring ovality is 0.03 mm.

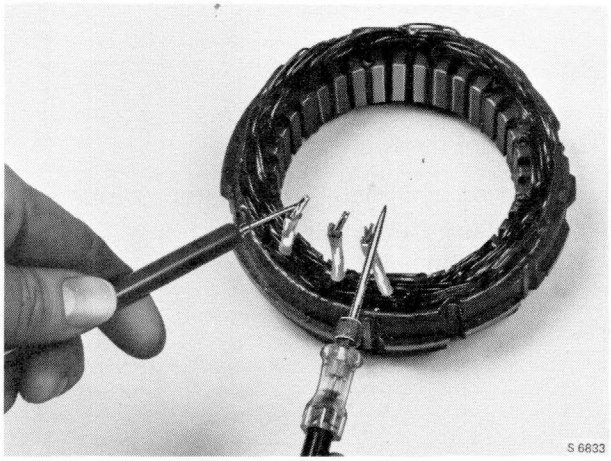
Stator

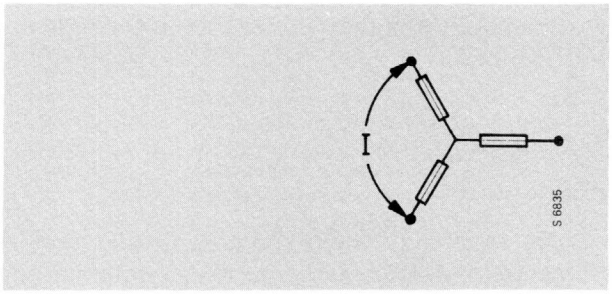
Measuring the resistance

Use an ohmmeter (graduated in ohms) to measure the resistance of the stator windings (three measurements).

The resistance readings should be as follows:

0.10 Ohm ± 10 %



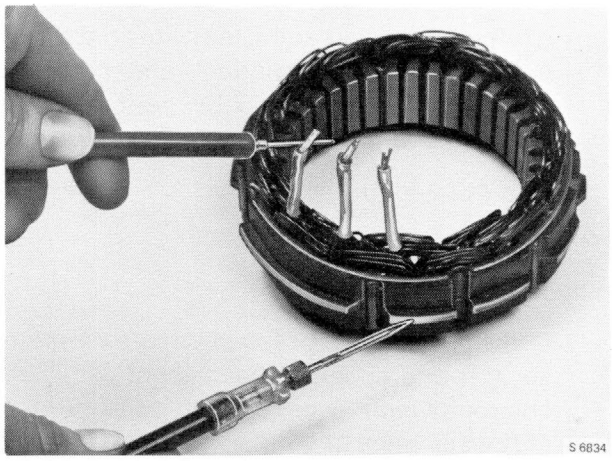


Flashover test

By means of an ohmmeter (graduated in ohms x 1000), measure the resistance between the stator casing and each of the stator windings.

The resistance should be high (∞).

A low resistance reading indicates flashover between the rotor winding and earth. A flashover test may also be performed by using a 40 V/40 W a.c. test lamp.



Diodes (rectifiers)

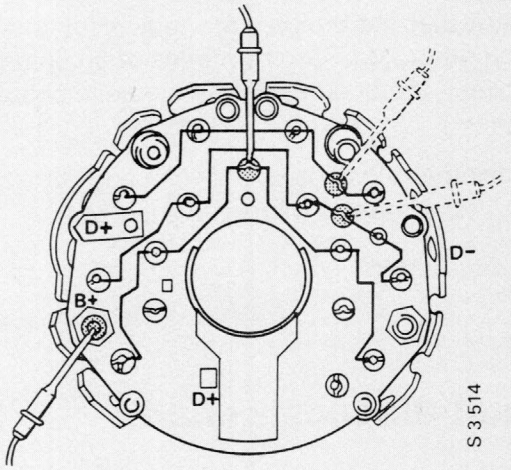
Test the diodes for breaks or short-circuits by means of a test lamp (maximum 40 V) or an ohmmeter.

Positive rectifier diodes

Measure between terminal B+ and the stator contacts.

The test lamp should glow or the ohmmeter give a low resistance reading when the positive terminal of the lamp (40 V max.) or the positive lead from the ohmmeter is connected to one of the stator contacts.

If the connections are reversed, the lamp should not glow or the ohmmeter should give a high resistance reading (a few thousand ohms).

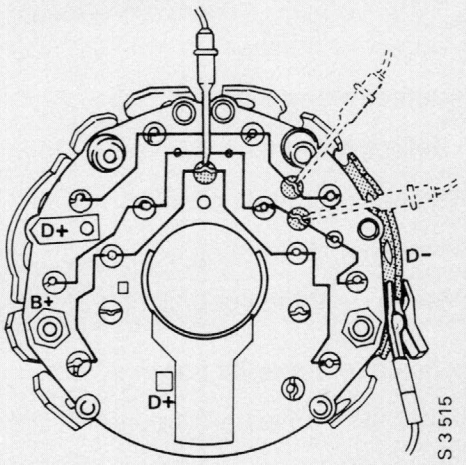


Negative rectifier diodes

Measure between terminal D- and the stator contacts.

The lamp should glow or the ohmmeter give a low resistance reading when the positive terminal on the lamp (40 V max.) or the positive lead on the ohmmeter is connected to the D- terminal.

When the connections are reversed, the lamp should not light up or the ohmmeter should give a high resistance reading (a few thousand ohms).

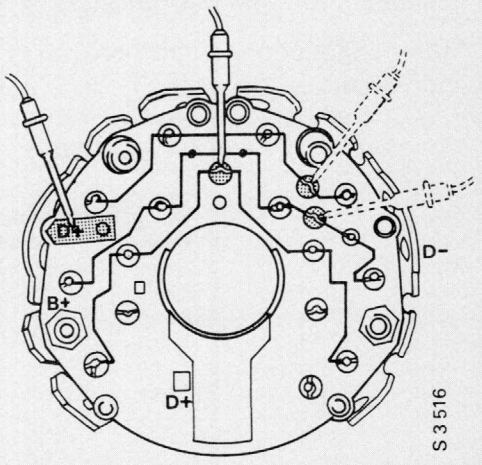


Exciter diodes

Measure between terminal D+ and the stator contacts.

The lamp should glow or the ohmmeter give a low resistance reading when the positive terminal on the lamp (40 V max.) or the positive lead on the ohmmeter is connected to one of the stator contacts.

If the connections are reversed, the lamp should not glow or the ohmmeter should give a high resistance reading (a few thousand ohms).



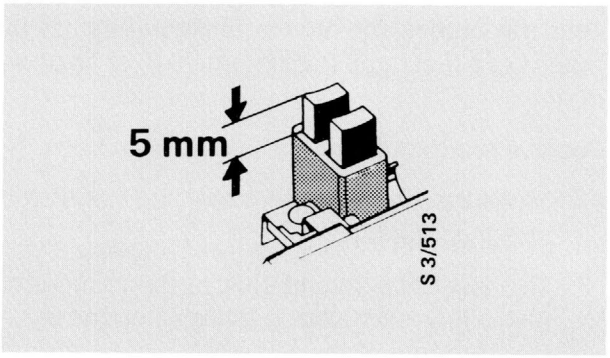
Brush holder

Check that the brushes move freely in the holder.

Check the wear on the brushes: at least 5 mm should protude from the holder.

Check that the brushes are fully insulated from each other. Measure by means of an ohmmeter between the brushes. The resistance should be high (∞).

Check that the contact between each brush and the '-'terminal and DF terminal is good.



Fault-diagnosis chart

Alternator not charging

- Alternator drive belt slipping
- Charging circuit and/or return circuit to earth broken.
- Defective brushes
- Defective regulator
- Defective diodes
- Broken excitation circuit
- Broken rotor winding
- Stator earthing out

Insufficient or irregular power supply

- Alternator drive belt slipping
- Defective brushes
- Defective regulator
- Defective diode rectifiers
- Leakage from rotor (partial short-circuit)
- Stator connection to earth broken or partial shortcircuit.

Current too high

- Defective regulator
- Poor contact between regulator and alternator.

Noisy alternator

- Excessive wear on alternator drive belt
- Pulley fitted incorrectly
- Loose alternator fixings
- Misalignment between alternator and crankshaft pulleys
- Worn or defective bearings
- Short-circuit in diode rectifier

Starter Motor

The Saab 9000 is fitted with a new type of starter motor equipped with an epicyclic gear set.

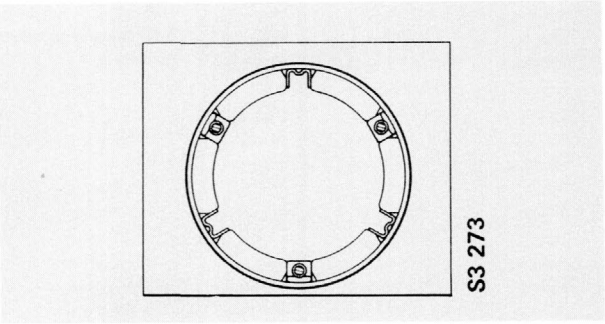
Compared with conventional models, the new starter motor is lighter, more compact and able to run at a higher speed.

Principle of operation

The starter motor turns the flywheel on the engine by means of a pinion which engages a ring gear on the flywheel. When the ignition switch is turned to the starting position, a solenoid moves the pinion, which is able to slide on the shaft, so that it engages the ring gear. The solenoid then closes the main contacts and current is supplied to the starter motor. When the engine fires, the flywheel speed increases, becoming greater than that of the starter motor. This causes the freewheel (unidirectional clutch) to disengage the starter pinion from the shaft, thereby preventing overspeeding of the starter motor. When the ignition key is released, the power supply to the solenoid is broken and a spring returns the starter pinion to its rest position.

Internal electrics

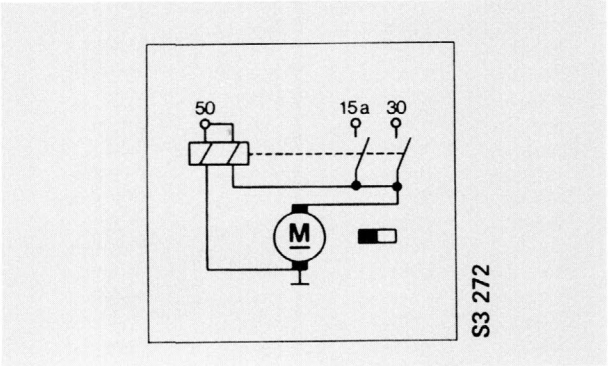
Instead of a conventional terminal housing with field win-dings, the Saab 9000 starter motor consists of a casing housing six permanent magnets. This design reduces the electrical resistance and thus the starting resistance.



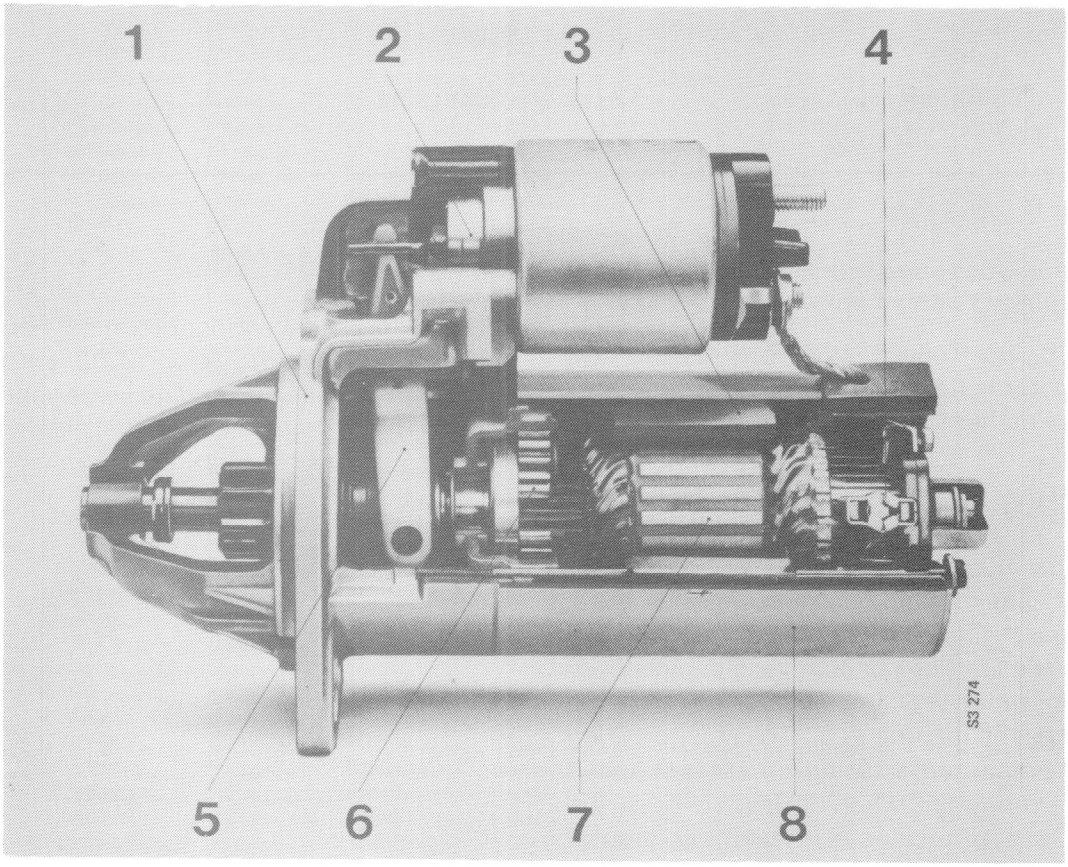
Casing housing six permanent magnets

When the ignition key is turned to the starting position, current flows to terminal 50 and the solenoid is energized. When the solenoid is energized, it closes the contacts at terminal 30 and the armature windings are connected direct to battery voltage via the brushes.

When the solenoid is energized, the starter pinion slides forward on its shaft and engages the ring gear on the flywheel. The rotation of the armature is then transferred to the pinion via a set of epicyclic gears inside the starter.

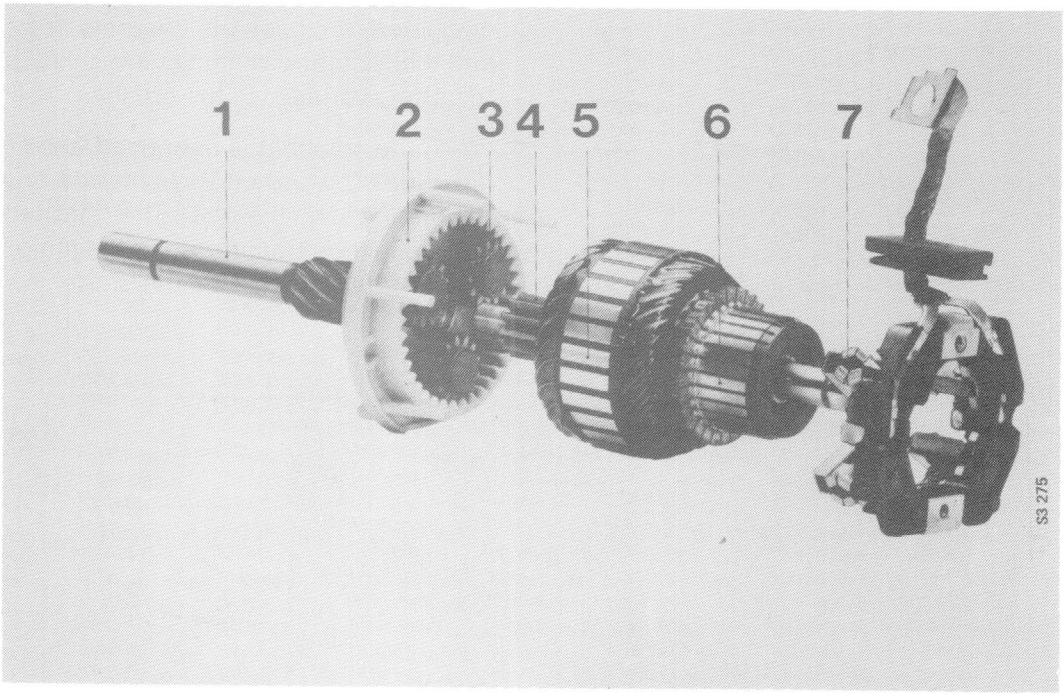


Wiring diagram



Cut-away view of starter motor

1 Pinion bracket assembly
2 Solenoid
3 Permanent magnets
4 Brush-holder assembly
5 Pinion-engaging lever
6 Epicyclic gear set
7 Armature
8 Casing



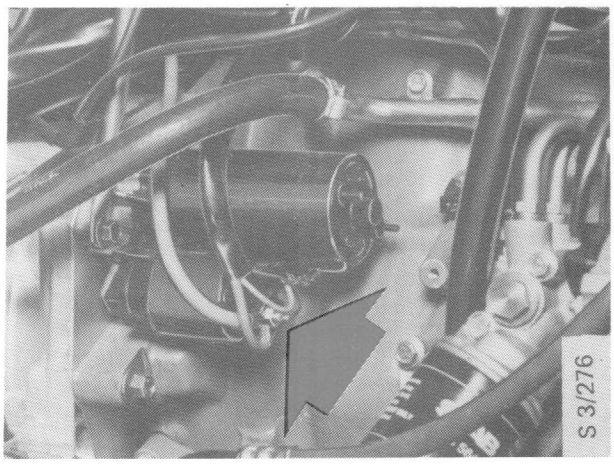
1 Pinion shaft
2 Annulus
3 Planet gear
4 Armature shaft carrying sun wheel
5 Armature
6 Commutator
7 Brush-holder assembly

To remove

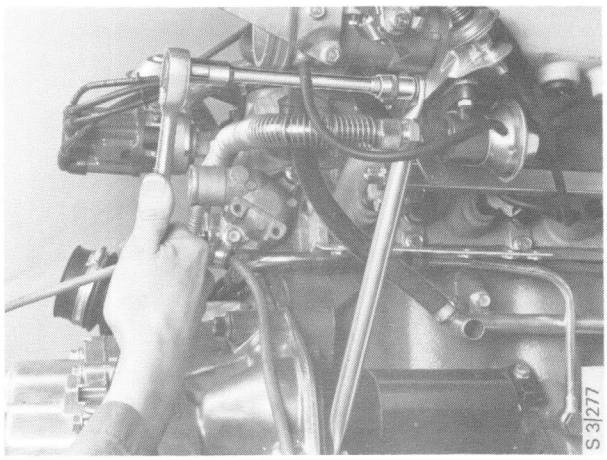
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

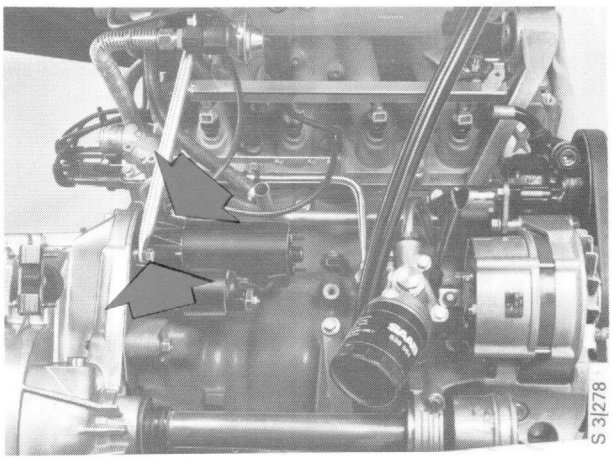
2 Disconnect the electrical leads from the starter motor.



3 Slacken off the top fixing for the steady bar. There is **no** need to remove it.



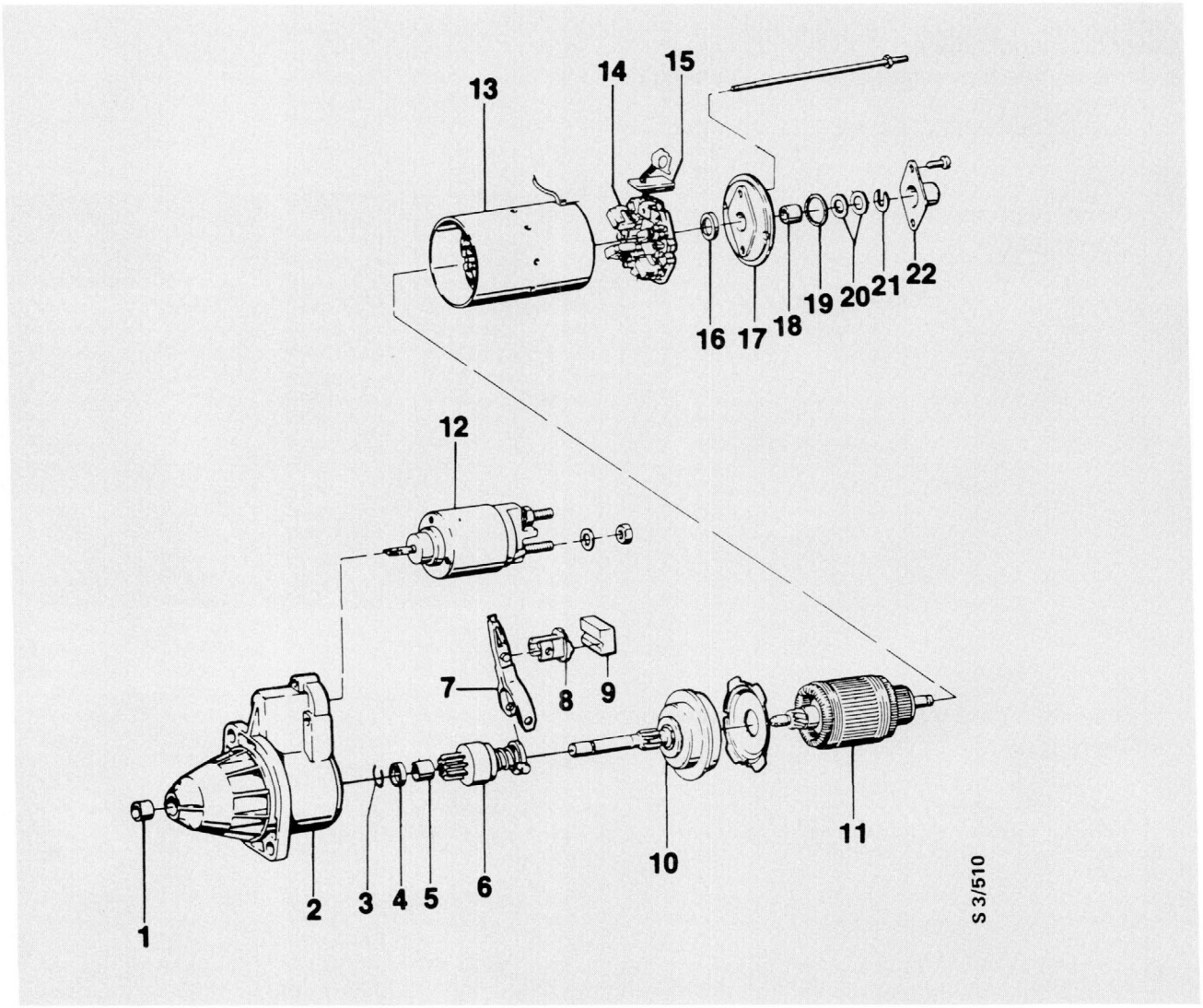
4 Undo the two starter securing bolts.



5 Remove the starter motor by dropping it down.

To fit

Refit in the reverse order



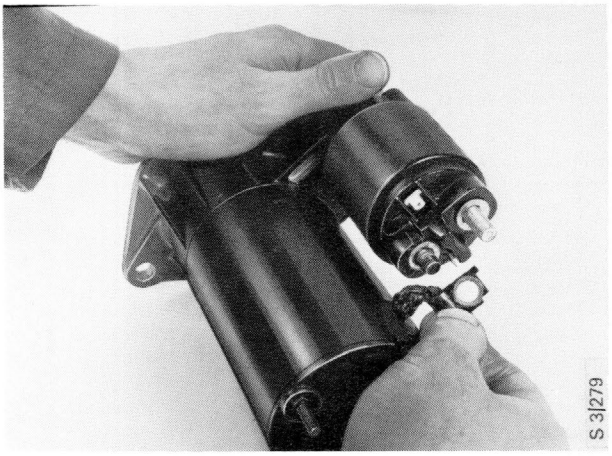
1 Drive end bush
2 Pinion bracket assembly
3 Circlip
4 Stop ring
5 Pinion-end bush
6 Starter pinion
7 Pinion-engaging lever
8 Bearing bracket
9 Seal
10 Epicyclic gear set

11 Armature
12 Solenoid
13 Casing
14 Brush-holder assembly
15 Seal
16 Seal
17 Bracket, commutator end
18 Bush, commutator end
19 Seal
20 Shim

21 Spring washer
22 End cover

To dismantle

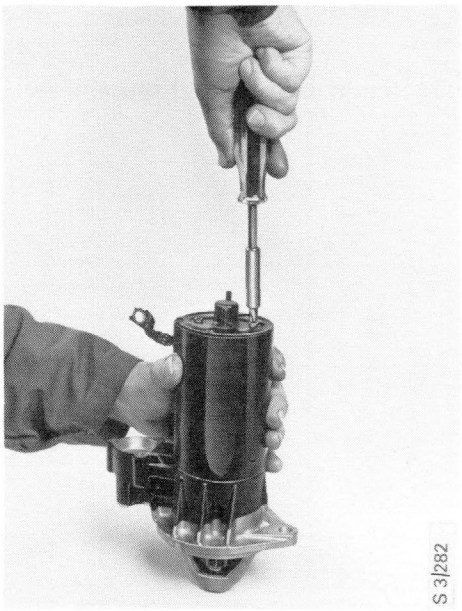
1 Disconnect the supply lead from the solenoid.



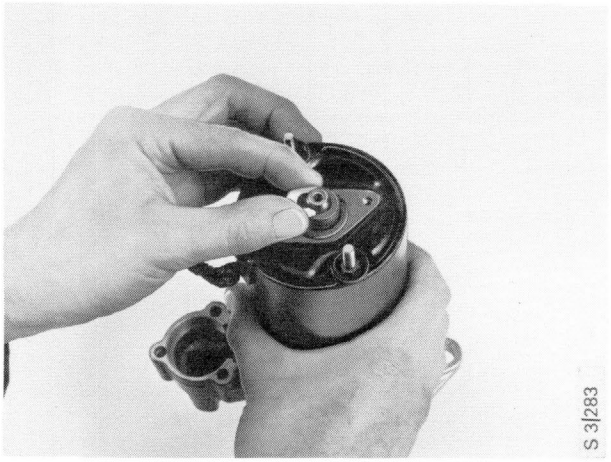
2 Undo the solenoid securing screws.

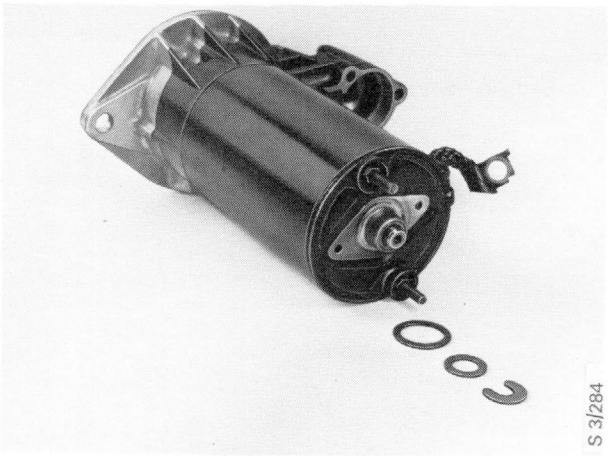
3 Unhook and remove the solenoid.

4 Remove the two end-cover retaining screws.

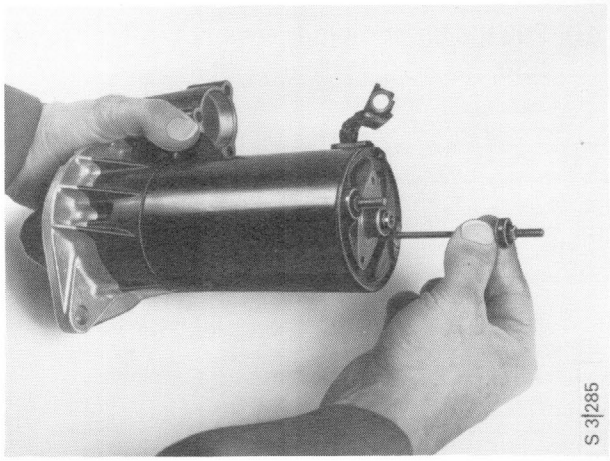


5 Remove the spring washer, shim and seal.

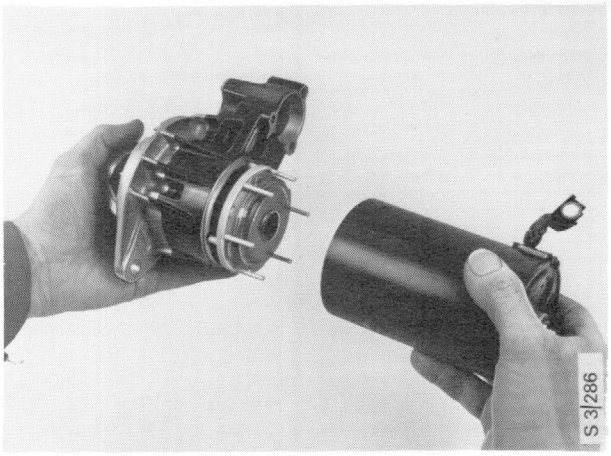




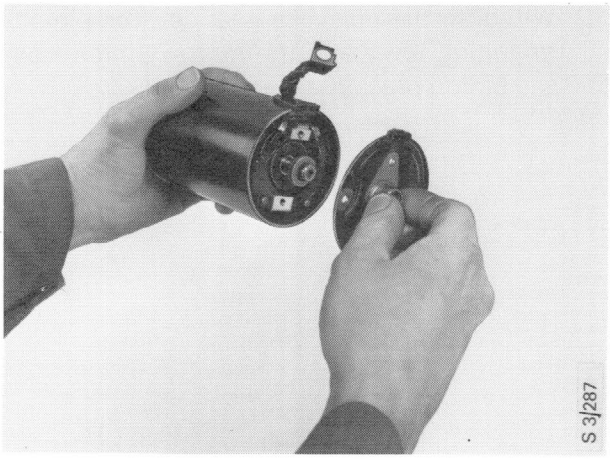
6 Remove the commutator end bracket screws.



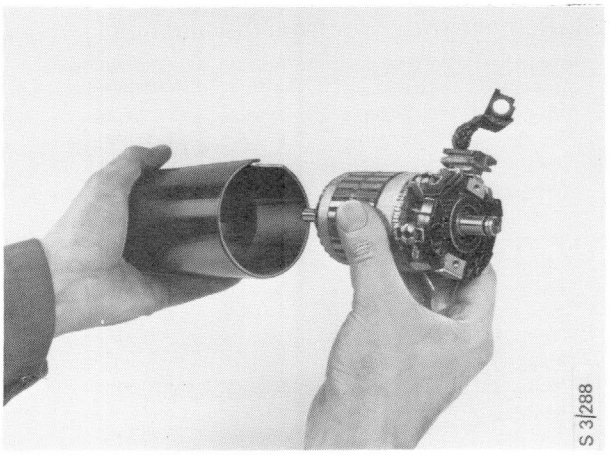
7 Separate the two halves of the starter motor by pulling the casing complete with armature and brush-holder assembly off the pinion bracket assembly with epicyclic gears.



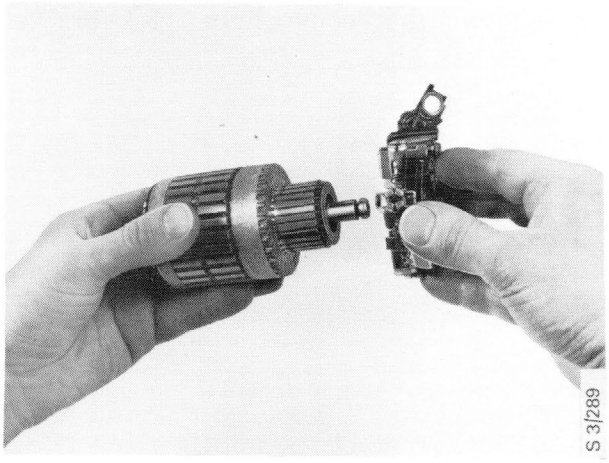
8 Remove the commutator end bracket and seal.



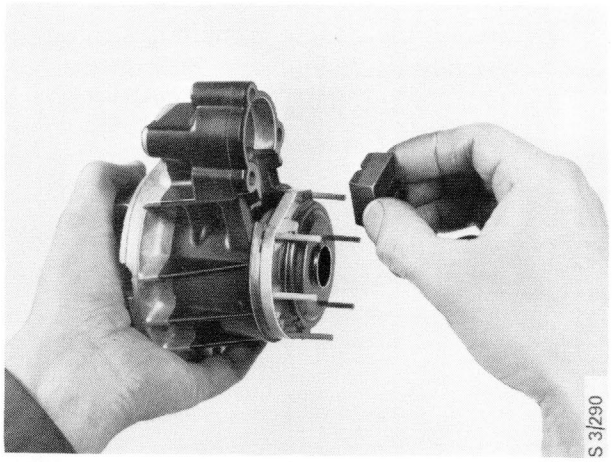
9 Withdraw the armature and brush-holder assembly through the rear of the starter casing.



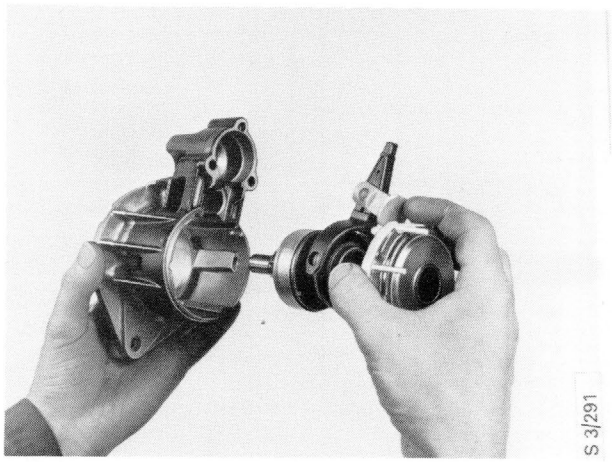
10 Pull the brush-holder assembly off the armature.



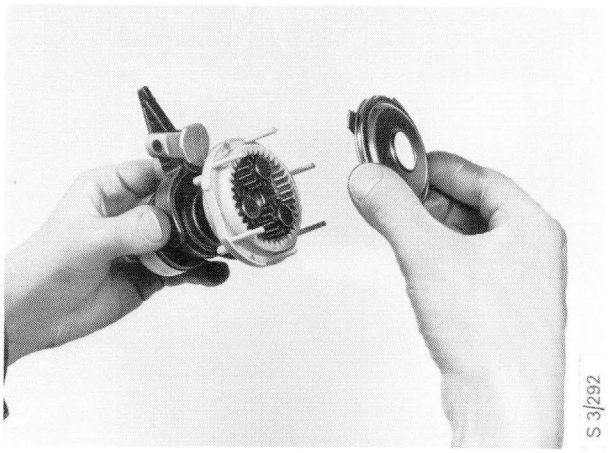
11 Remove the bearing bracket seal



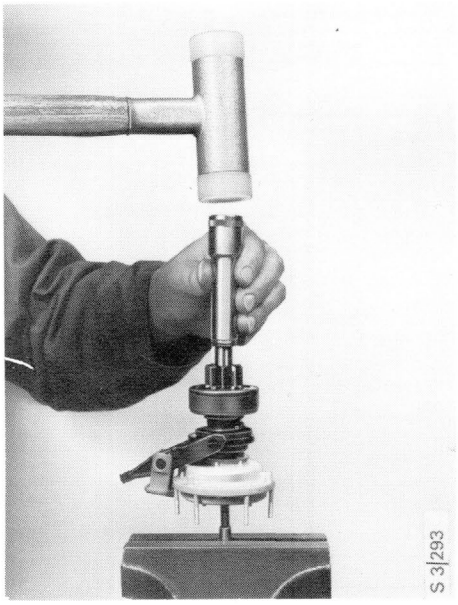
12 Withdraw the epicyclic gear set, the pinion-engaging lever and the starter pinion from the pinion bracket assembly



13 Remove the cover from the annulus

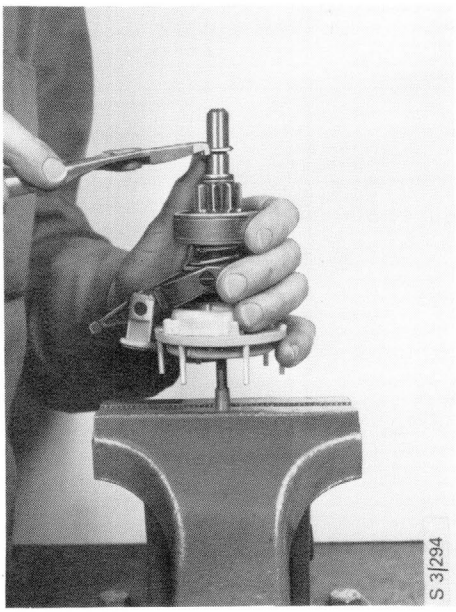


14 Use a short length of tubing to drive the stop ring down to the pinion

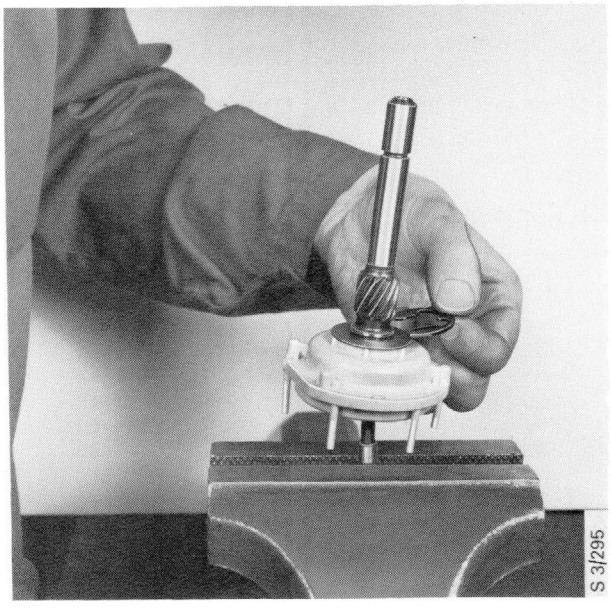


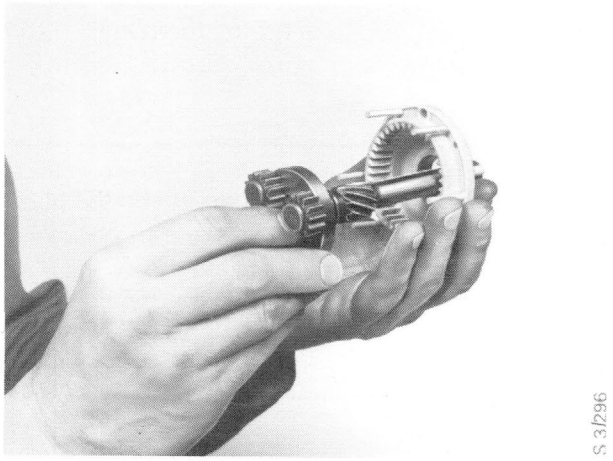
N.B
Take care to avoid putting any weight on the plastic legs of the annulus, as these can easily be broken

15 Use circlip pliers to remove the circlip and pull off the pinion



16 Remove the circlip and washer from the annulus and withdraw the planet gears

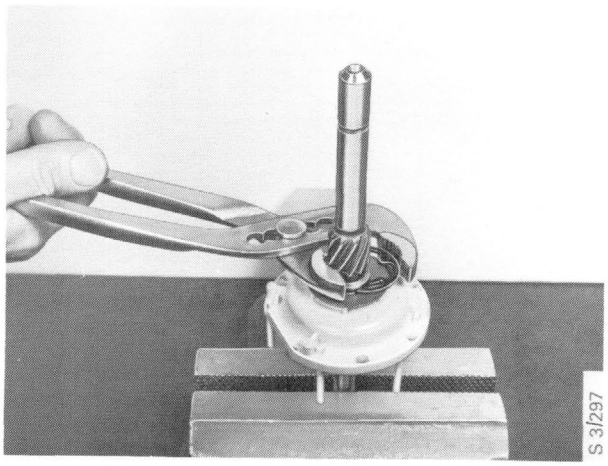




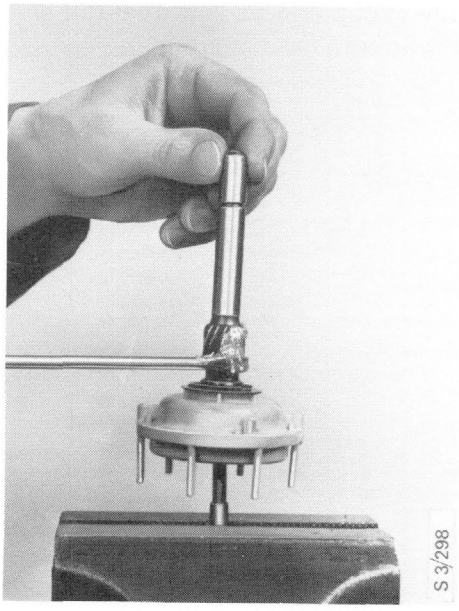
To assemble

N.B
Inspect all parts carefully and renew any that are damaged. Soak the bushes in warm oil prior to assembly

1 Insert the planet gears into the annulus and fit the washer and circlip



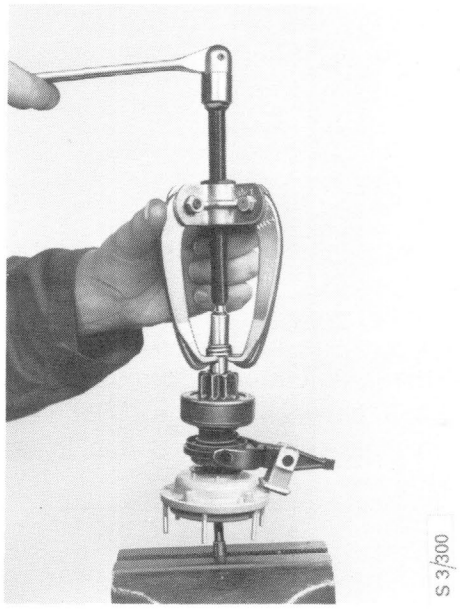
2 Lubricate the helical gear and the engaging ring for the starter pinion with silicon grease



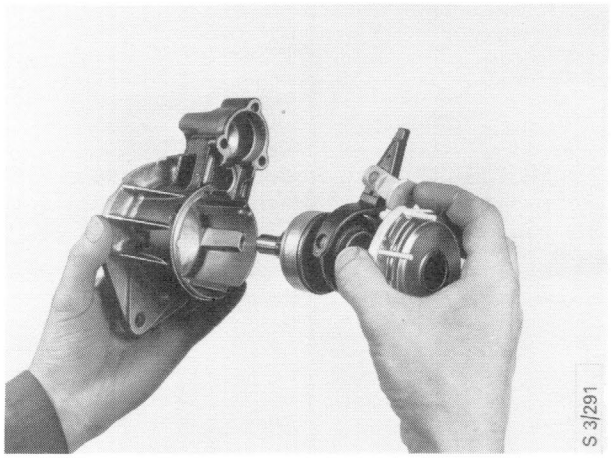
3 Slide the starter pinion and stop ring onto the shaft

4 Fit the circlip into its groove using circlip pliers

5 Slide the stop ring up against the circlip by means of a puller

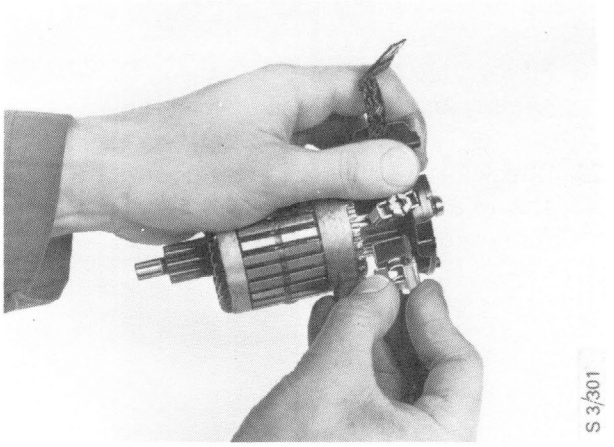


6 Insert the epicyclic gear set, the pinion-engaging lever and the starter pinion into the pinion bracket and fit the bearing bracket seal and the annulus cover

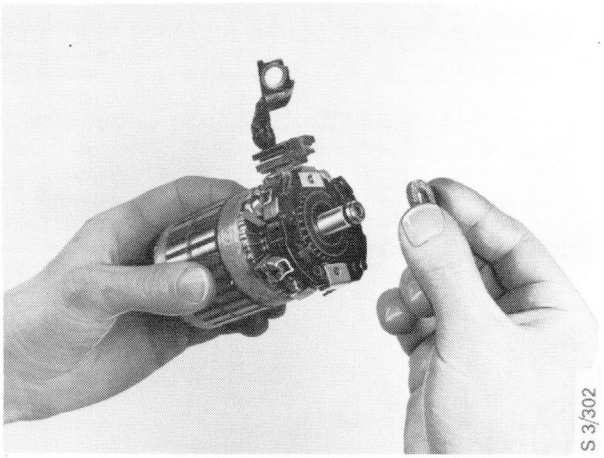


7 Fit the brush-holder assembly onto the armature shaft.

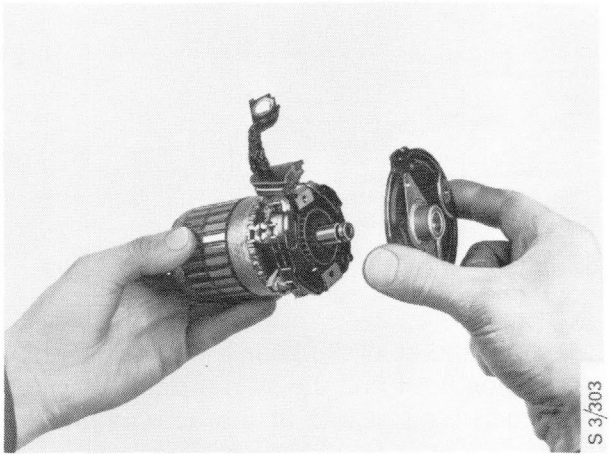
The easiest way is to slide the brush plate without the brush holder part-way onto the armature shaft. The brushes can then be properly centralized, after which the brush holders and springs can be fitted over the brushes and guided into their proper positions



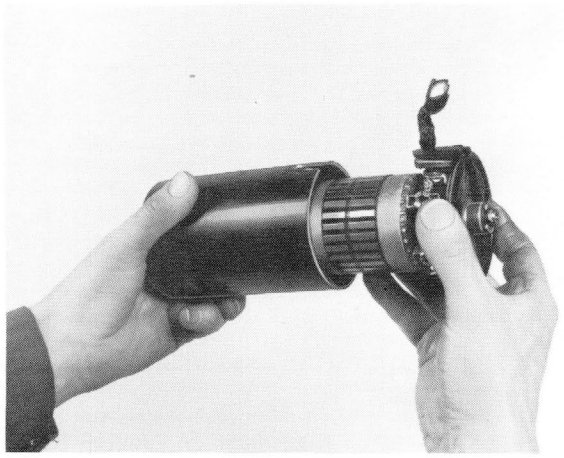
8 Fit the commutator end bracket, the shim and the spring washer onto the armature


S 3/302

N.B.
Before fitting the commutator end bracket, make sure that the seal between the bracket and the armature is in good condition and that it has been fitted correctly

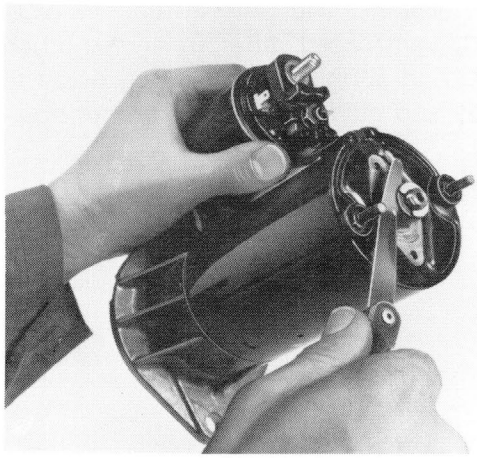

S 3/303

9 Fit the armature assembly, complete with brush holders, and the commutator end bracket into the starter casing


S 3/304

10 Fit together the starter casing and pinion assembly and fit the long through-bolts

11 Check the end float of the armature shaft. The end float must be between 0.05 and 0.40 mm

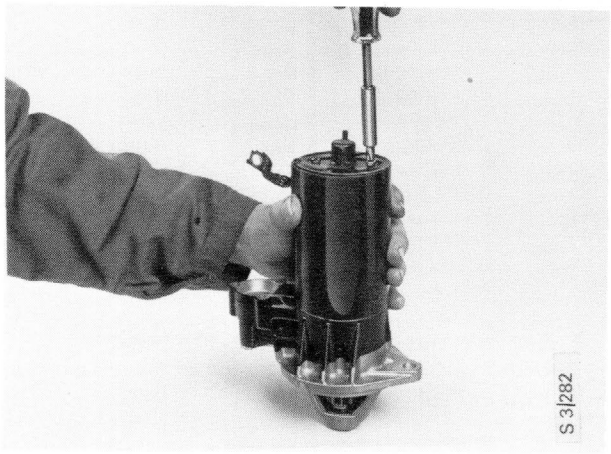

S 3/305

12 Fit the seal and end cover over the end of the armature shaft at the commutator end bracket

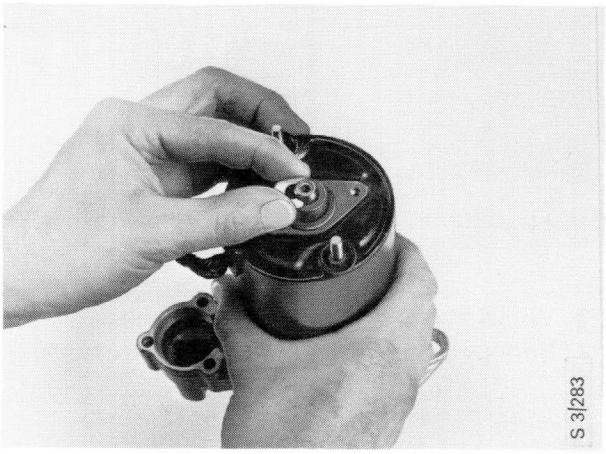
13 Fit the solenoid and secure the supply lead

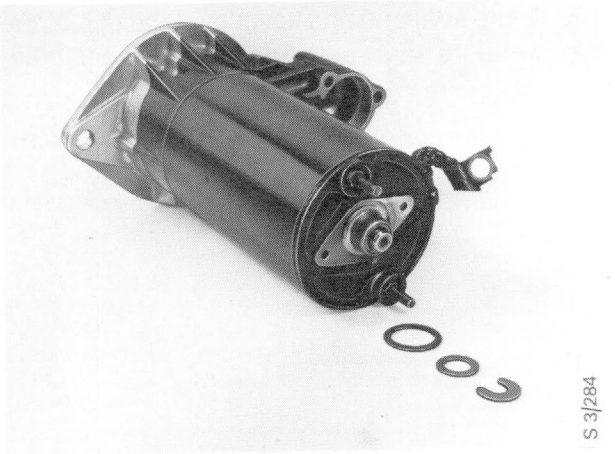
To remove the brush-holder assembly

1 Remove the two retaining screws for the end cover

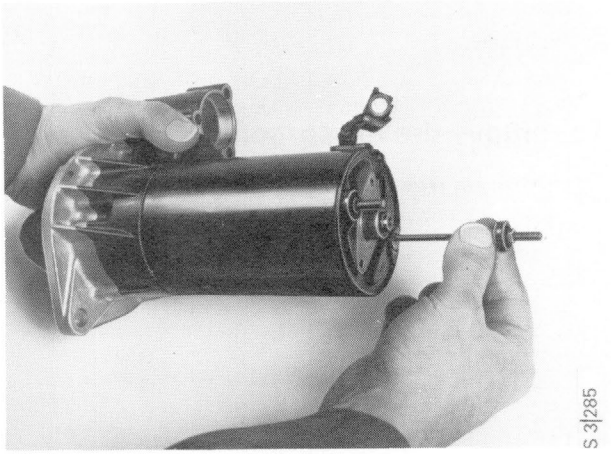


2 Remove the spring washer, shim and seal

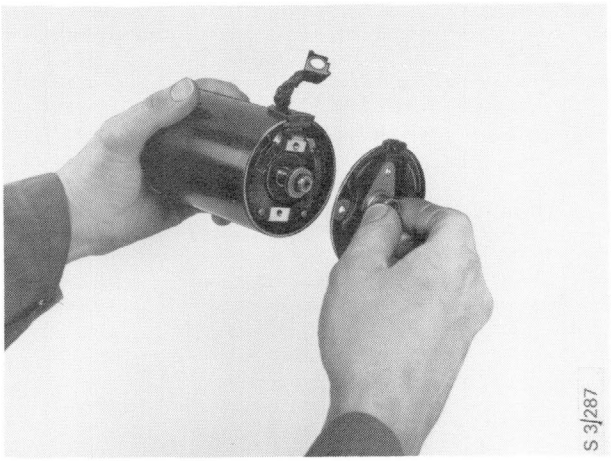




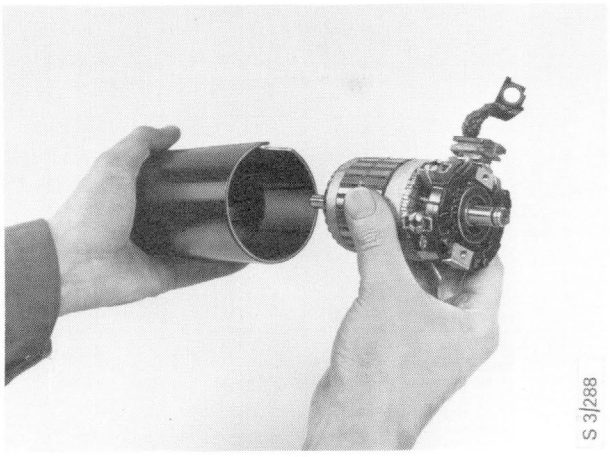
3 Remove the commutator end bracket screws



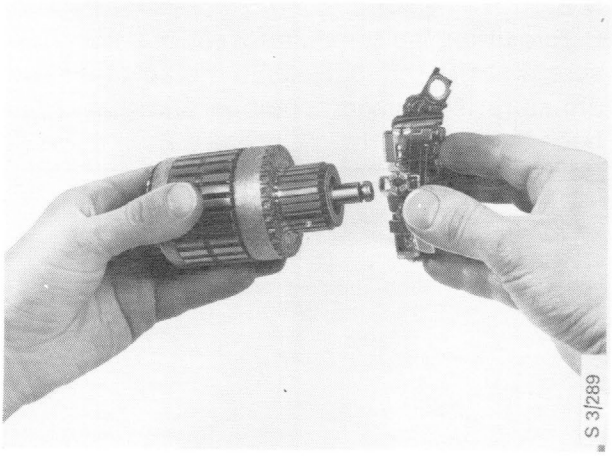
4 Remove the commutator end bracket



5 Withdraw the armature and brush-holder assembly through the rear of the starter casing



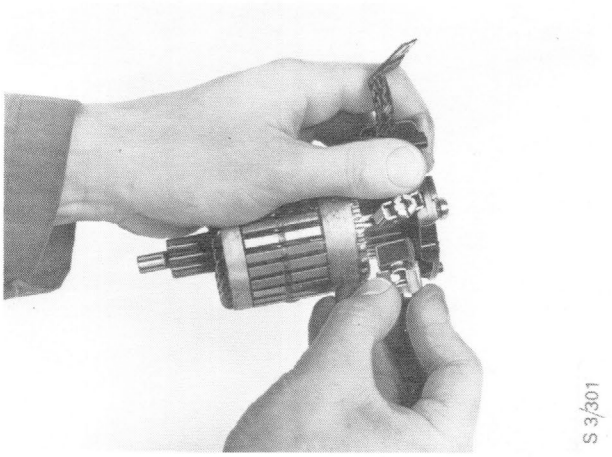
6 Remove the brush-holder assembly from the armature



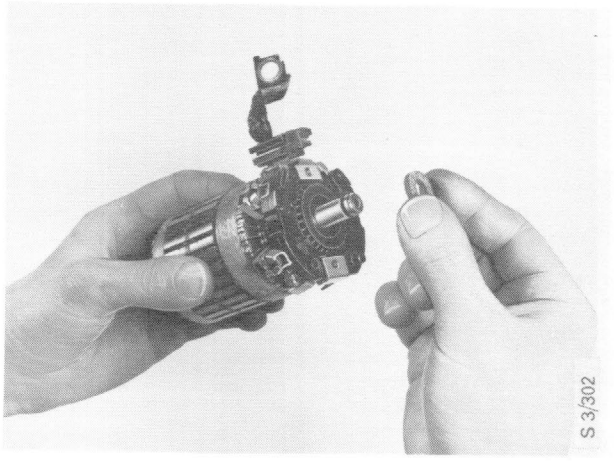
To fit the brush-holder assembly

1 Fit the brush-holder assembly onto the armature shaft.

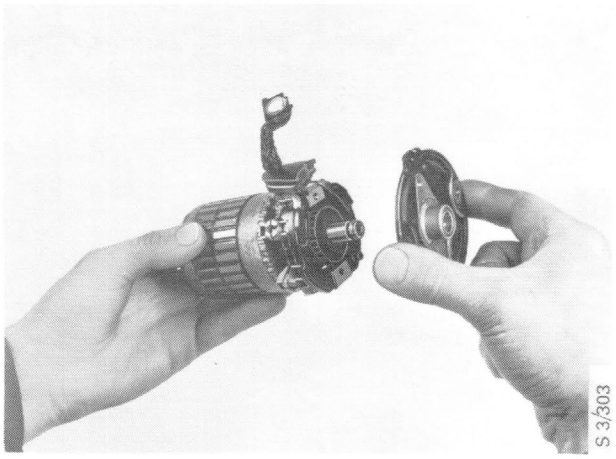
The easiest way is to slide the brush plate without the brush holder part-way onto the armature shaft. The brushes can then be properly centralized, after which the brush holders and springs can be fitted over the brushes and guided into their proper positions



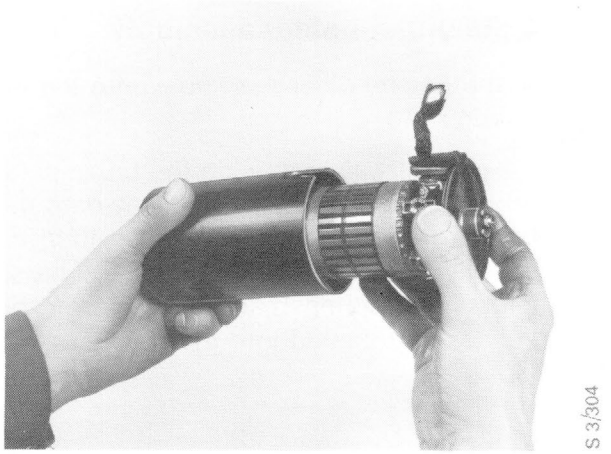
2 Fit the commutator end bracket, the shim and the spring washer onto the armature



N.B.
Before fitting the commutator end bracket, make sure that the seal between the bracket and the armature is in good condition and that it has been fitted correctly



3 Fit the armature, brush-holder assembly and commutator end bracket into the starter casing



4 Fit the seal and end cover

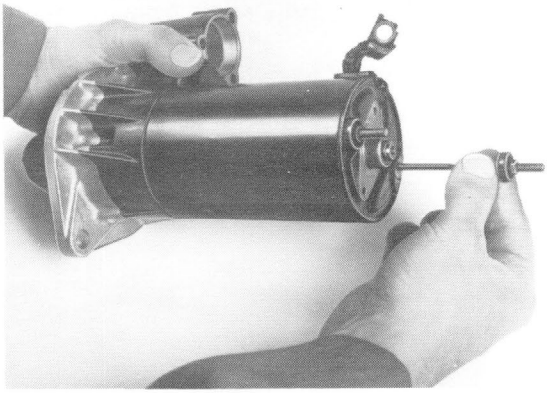
To remove the starter pinion

1 Disconnect the supply lead from the solenoid

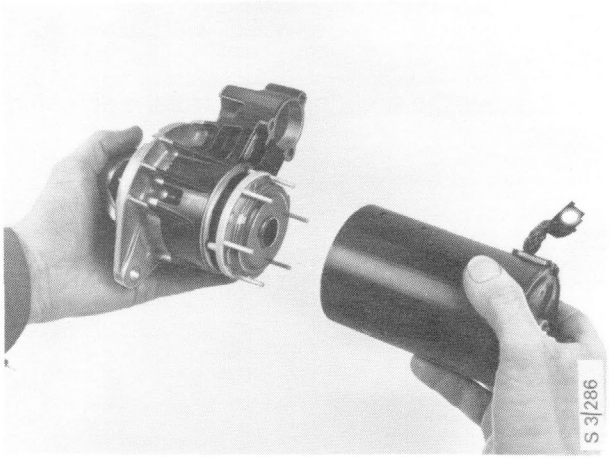
2 Remove the securing screws for the solenoid

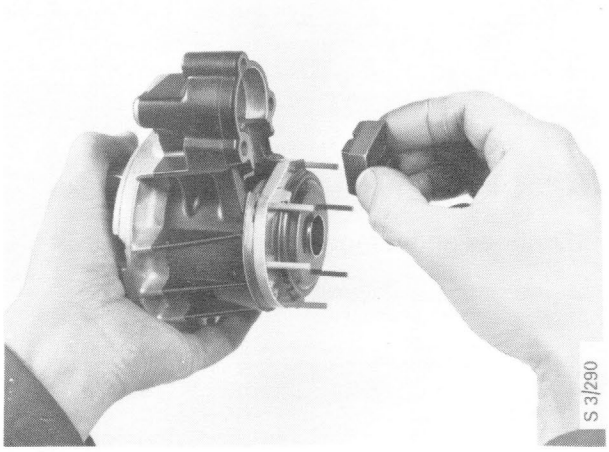
3 Unhook and remove the solenoid

4 Remove the commutator end bracket securing screws

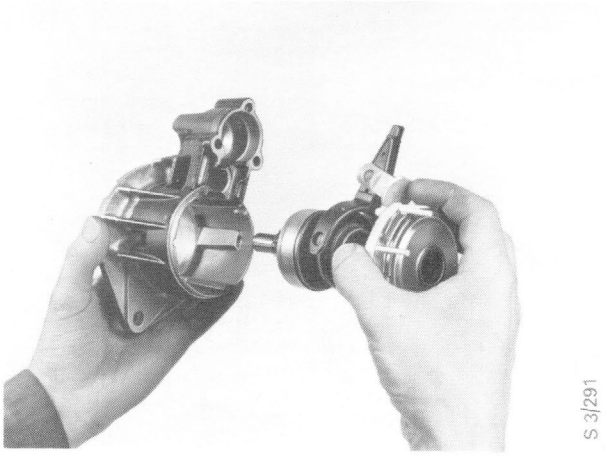


5 Pull off the pinion assembly and remove the bearing bracket seal

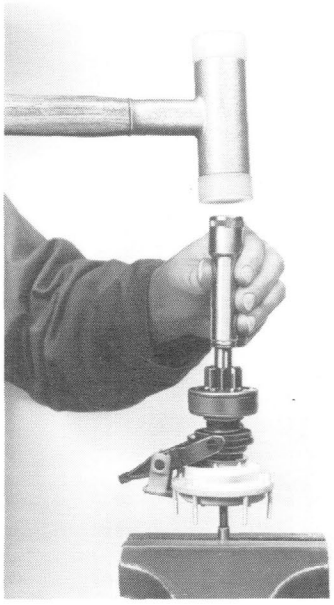




6 Withdraw the epicyclic gear set, the pinion-engaging lever and the starter pinion from the pinion bracket

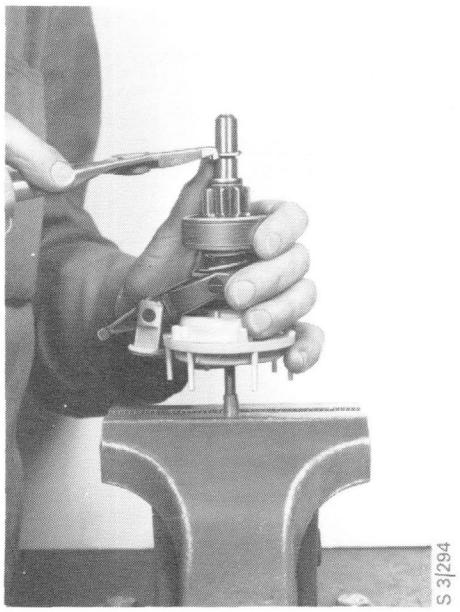


7 Press the stop ring up against the pinion using a piece of tubing


S 3|293

N.B.
Take care to avoid putting any weight on the plastic legs of the annulus, as these can easily be broken

8 Use circlip pliers to remove the circlip and withdraw the pinion

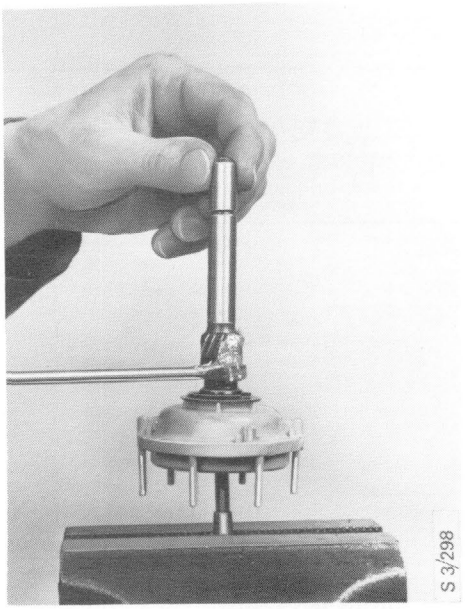

S 3|294

9 Remove the stop ring and starter pinion

10 Check for and remove by filing any burrs on the helical gear for the pinion on the armature shaft. File off any burrs

To fit the starter pinion

1 Lubricate the helical gear on the armature shaft and the engaging ring with silicon grease

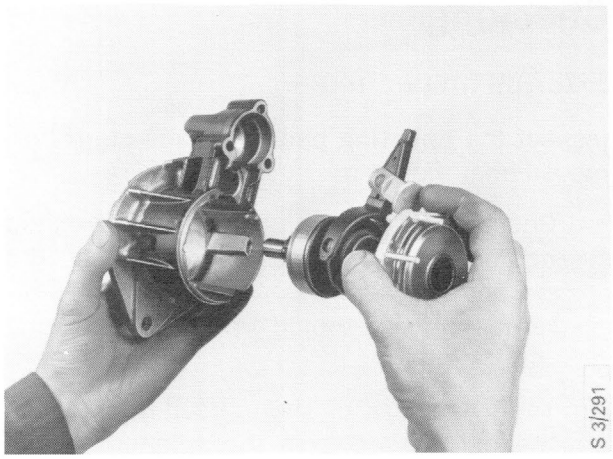


2 Slide the starter pinion and stop ring onto the armature shaft

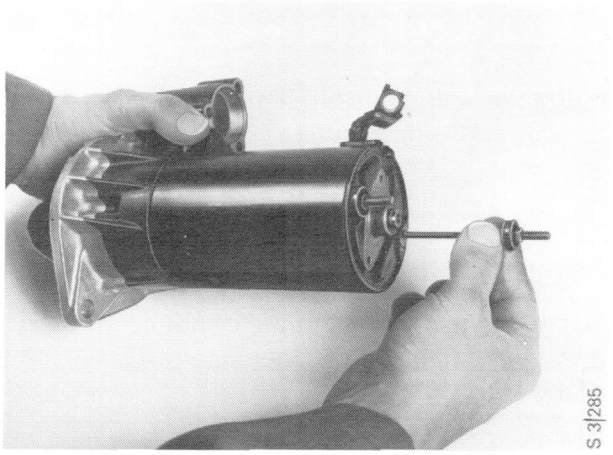
3 Using circlip pliers, fit the circlip into its groove

4 Slide the stop ring up against the circlip by means of a puller

5 Insert the epicyclic gear set, the pinion-engaging lever and the starter pinion into the pinion bracket and fit the bearing bracket seal and annulus cover



6 Fit and tighten the commutator end bracket through-bolts



7 Hook the solenoid onto the pinion-engaging lever and tighten the screws

8 Connect the supply lead

Checking

External inspection

Inspect the following items with the starter removed from the car but not dismantled

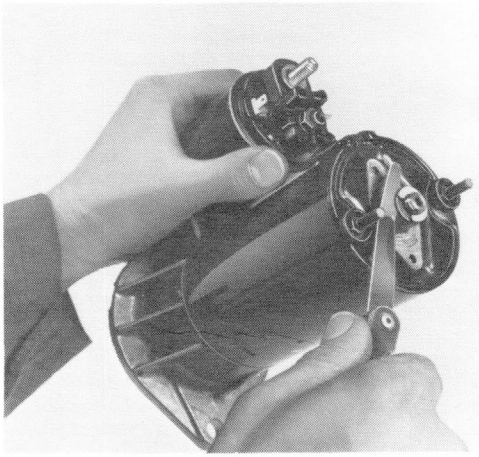
- Check that the stop ring for the starter pinion has been fitted correctly and securely. The distance between the stop ring and the starter-motor fixing should be between 31.3 and 32.6 mm
- There is a risk of short-circuiting between the earth braid from the solenoid to the brush-holder assembly and earth. Make sure that the cable is well clear of the starter casing and remove any accumulations of dirt
- Make sure that all seals have been fitted correctly and securely

Armature end float

To check the end float of the armature shaft, remove the end cover and measure the movement of the shaft.

The end float should be between 0.05 and 0.40 mm.

To adjust the end float, fit a new shim under the rear end cover.



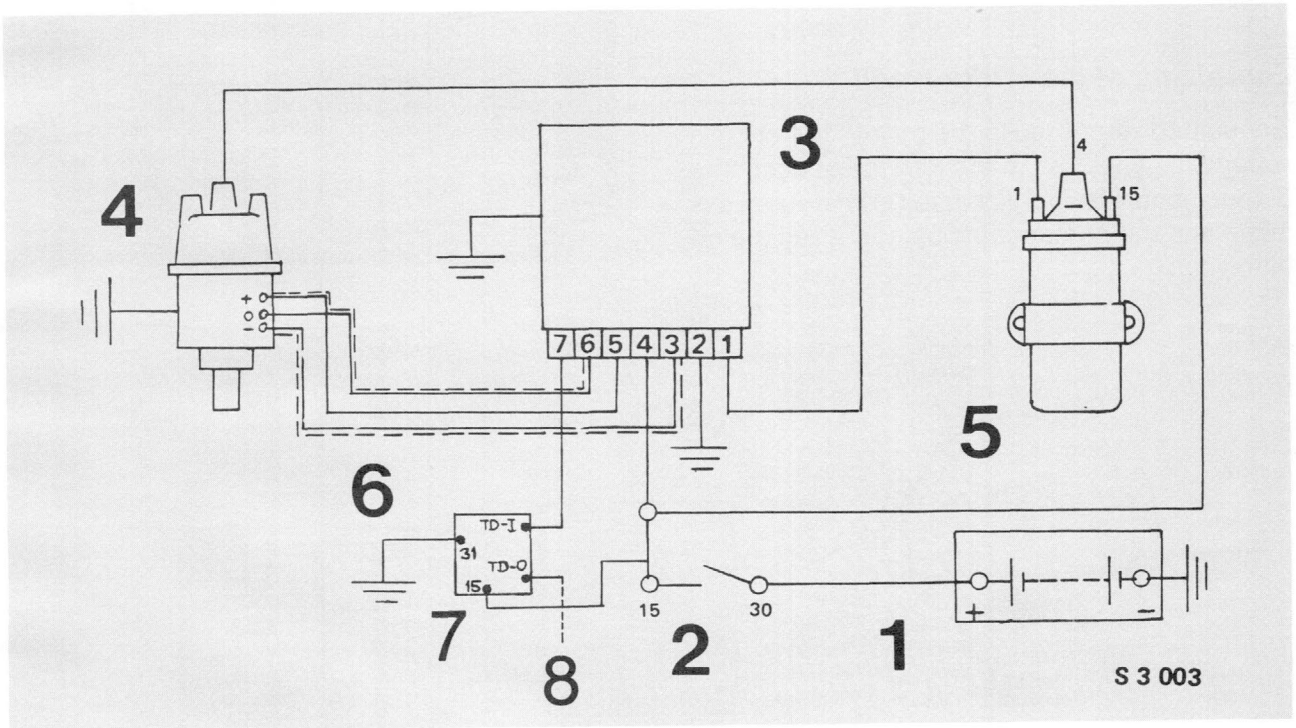
S 3305

Ignition system

The Saab 9000 is fitted with a breakerless ignition system incorporating a Hall transducer.

Principle of operation

Instead of mechanical contact-breaker points, the distributor incorporates a semiconductor transducer (Hall transducer) which is connected to an output module. The output module amplifies and transforms the signal from the transducer. This signal is then used to control the energizing and discharging of the ignition coil, i.e. the making and breaking of the primary circuit.

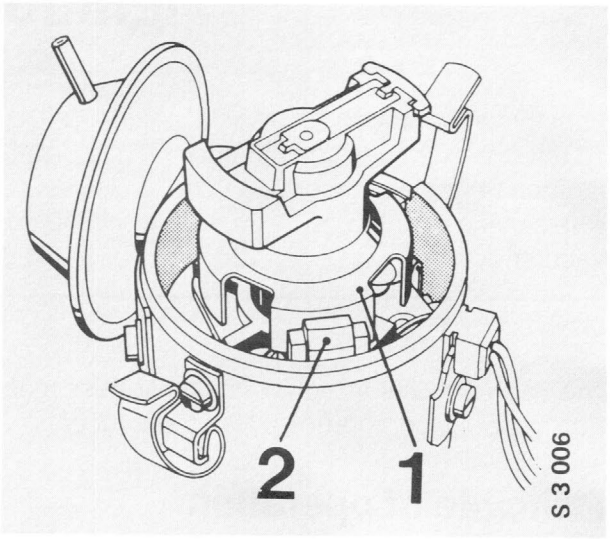


1 Battery
2 Ignition switch
3 Output module
4 Distributor
5 Ignition coil
6 Screened cable
7 Ignition pulse amplifier
8 Ignition pulse socket

Distributor

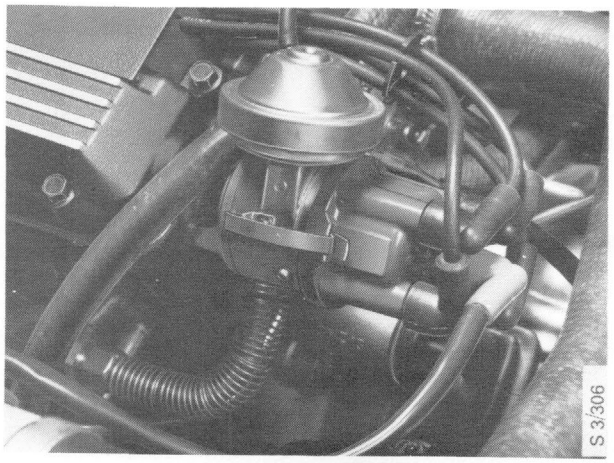
The distributor incorporates a slotted rotor, which rotates with the distributor shaft, and a Hall transducer fitted to a plate inside the distributor. The transducer consists of a semiconductor element and a magnet which acts on the semi- conductor. The slotted rotor alternately interrupts and releases the magnetic field, thereby determining the ignition timing.

N.B.
The Hall transducer and the rotor cannot be removed separately; consequently, if the transducer unit is thought to be defective, the entire distributor must be replaced.



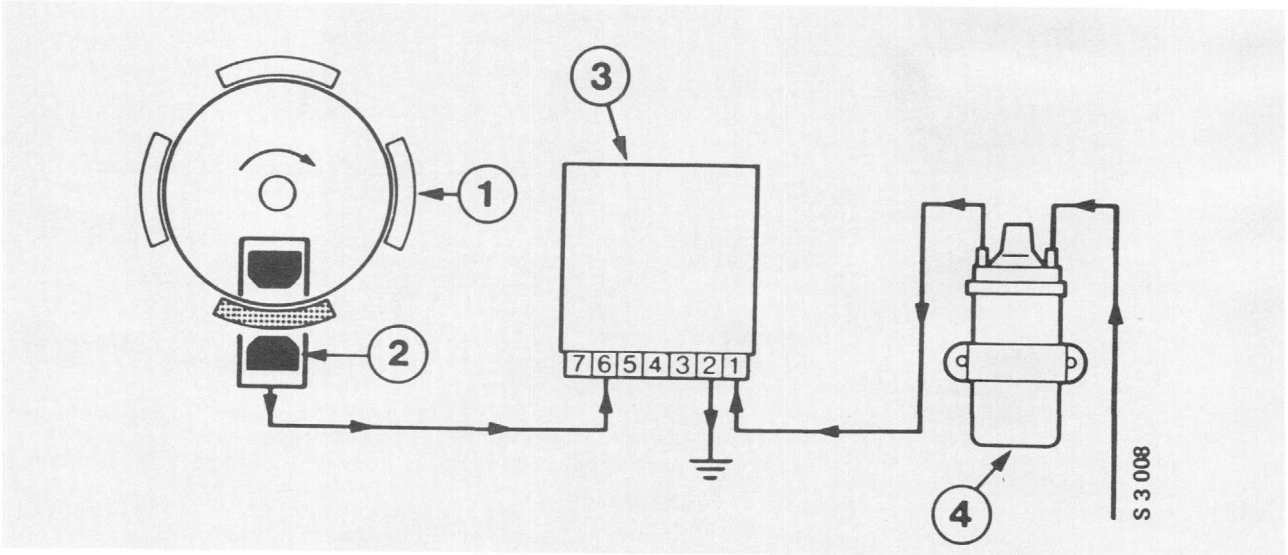
1 Slotted rotor
2 Hall transducer

The distributor has a double-acting vacuum timing control device which alters the timing to match the load on the engine. Thus, in addition to conventional vacuum control, the distributor includes a pressure-regulating function which retards the timing under certain conditions. The system is therefore able to prevent pinking tendencies when the turbocharger is operating.



Energizing of the ignition coil

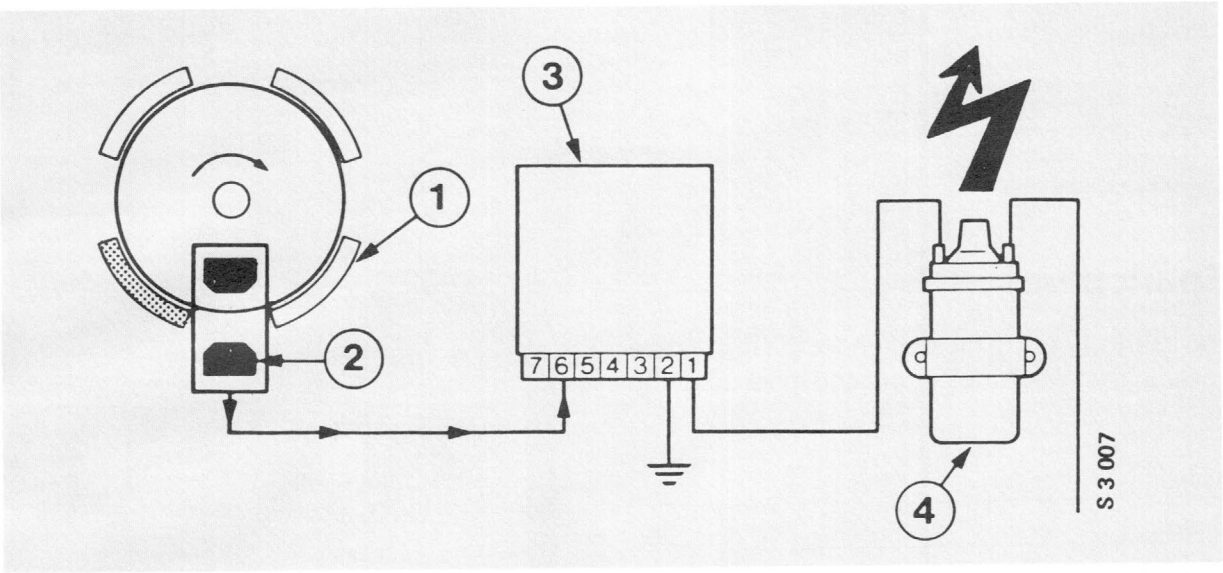
The slotted rotor breaks the magnetic field. No voltage is generated in the Hall transducer. The output module is energized, the primary circuit is made and the primary winding energizes the ignition coil.



1 Slotted rotor
2 Hall transducer
3 Ouput module
4 Ignition coil

Spark point

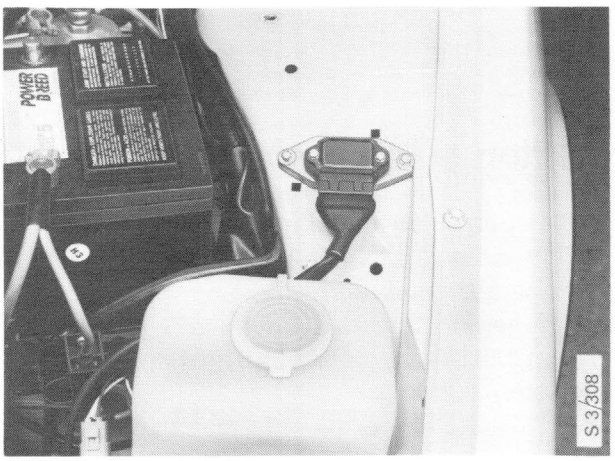
The slot in the rotor is in line with the Hall transducer. The transducer generates a voltage, which is sensed by the output module, which breaks the primary circuit. Ignition voltage is now induced in the secondary winding of the coil.



1 Slotted rotor
2 Hall transducer
3 Ouput module
4 Ignition coil

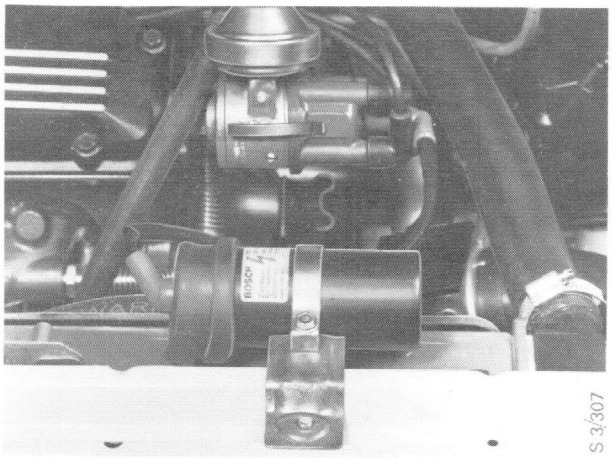
Output module

The output module is mounted on a cooling fin on the left-hand wheel arch. The output module amplifies and transforms the pulse from the distributor. The amplified and trans-formed pulse is then used to control the energizing and discharge of the ignition coil. The output module also monitors and regulates the dwell angle. The use of hybrid technology in the design of the module has made it possible to produce an extremely compact output module.



Ignition coil

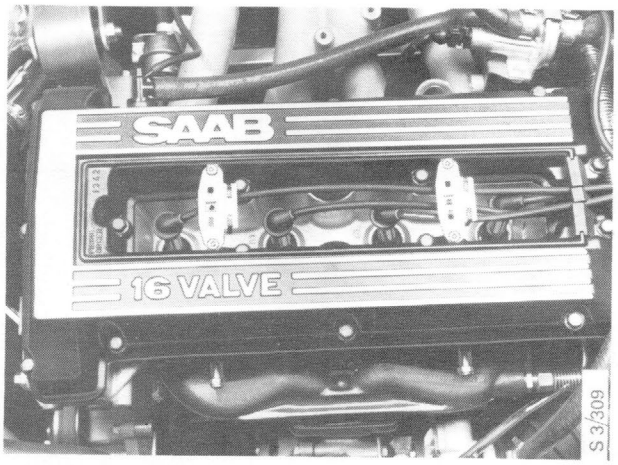
The ignition coil, which is specially designed for the igni-tion system in the Saab 9000, is mounted on top of the radiator.



Spark plugs

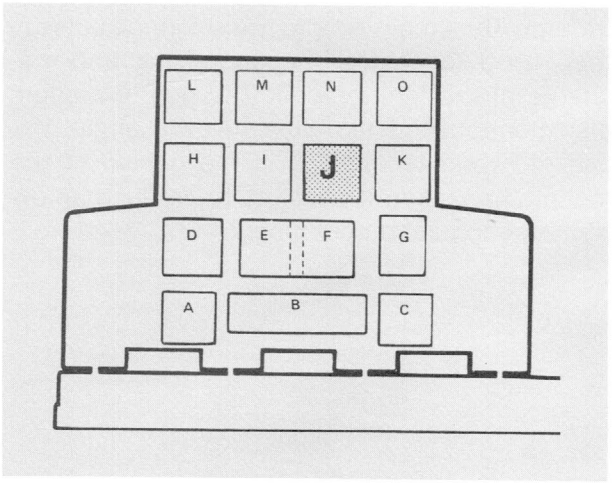
The spark plugs are located under the inspection cover in the top of the engine and must be of the following type:

Make	*Type*
Bosch	F7DC
Champion	C7GY
Champion	C9GY
Champion	C9YC
NGK	BCP 6ES
NGK	BCP 6EV
NGK	BCP 7EV



Ignition pulse amplifier

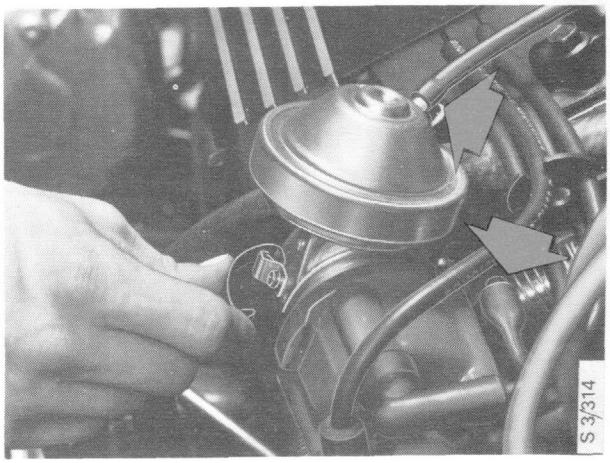
The ignition pulse amplifier, located on the pow-er distribution panel behind the glove compart-ment, is designed to provide more-precise con-trol of ignition-sensitive functions (e.g. the APC system and LH system) as well as reducing radio interference.



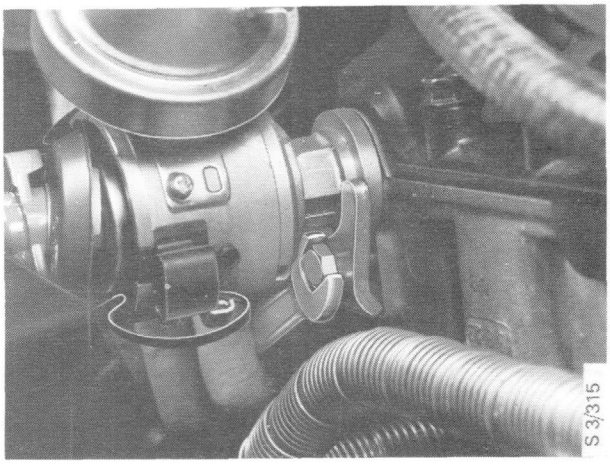
To remove/exchange components

Distributor

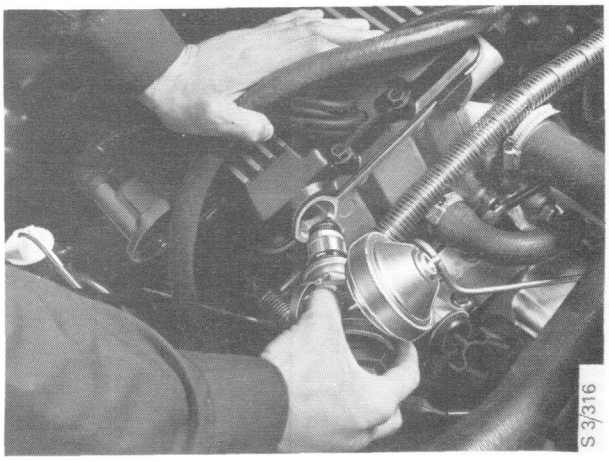
1 Remove the distributor cap and disconnect the Hall transducer and vacuum hose.



2 Release the clip on the distributor.



3 Pull off the distributor.



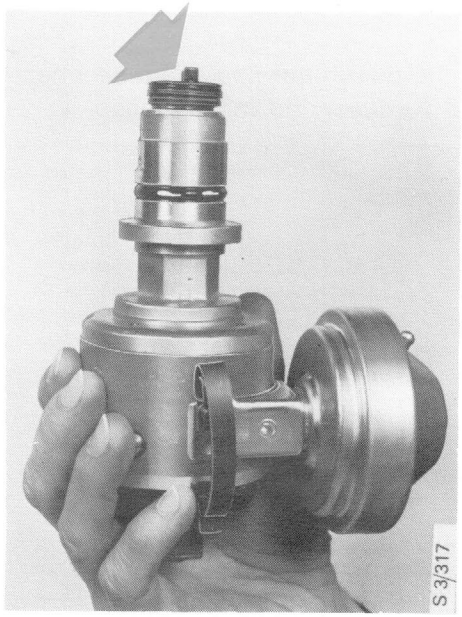
N.B.
The Hall transducer and slotted rotor cannot be removed. In the event of a fault in this unit, a new distributor must be fitted.

To fit

Refit in the reverse order.

N.B.
When refitting the distributor, rotate the distributor shaft until the drive dog engages the slot in the camshaft (the slot is offset).

Always check the timing after refitting the distributor.

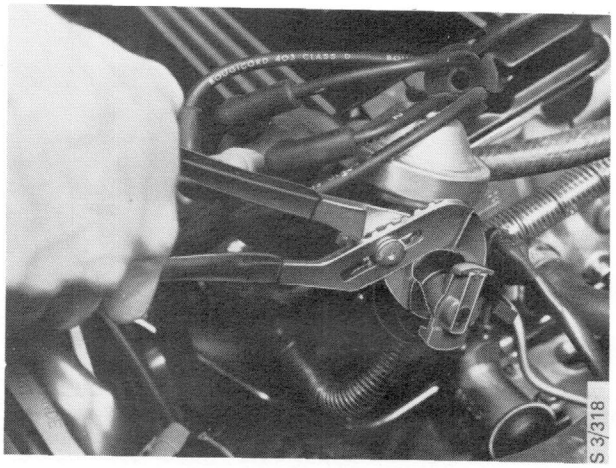


Rotor

1 Remove the distributor cap.

2 To remove the rotor, break it up by crushing it with water pump pliers or the like.

N.B.
Make sure that no fragments of the crushed rotor get into the distributor.



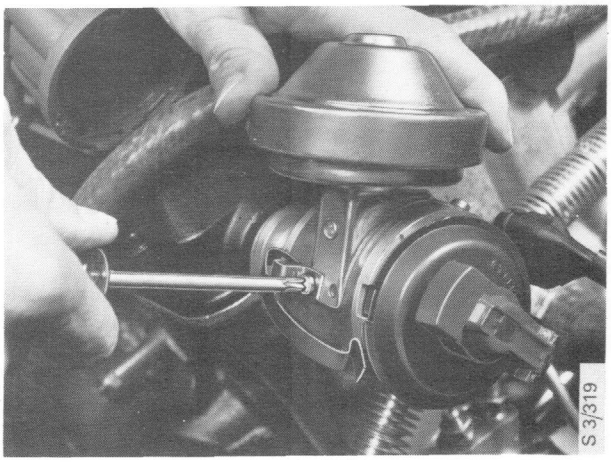
N.B.
When a new rotor is fitted, it must be locked to the distri-butor shaft by means of Loctite or the equivalent.

Vacuum control unit

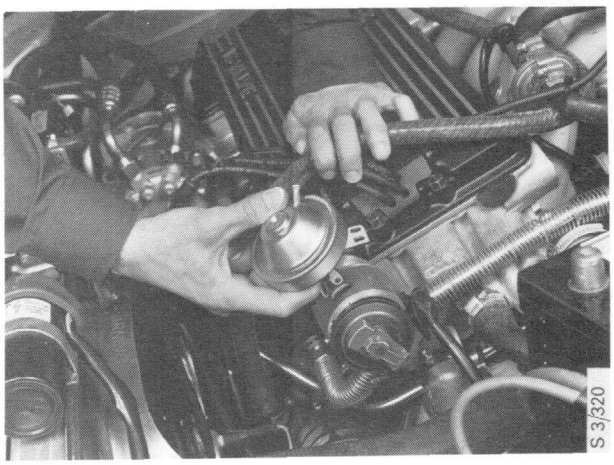
1 Remove the distributor cap.

2 Disconnect the vacuum hose.

3 Remove the securing screws for the unit.



4 Remove the vacuum control unit.



To fit

Refit in the reverse order.

To facilitate fitting of the unit, rotate the Hall trans-ducer clockwise until it butts against its stop and then rock it backwards and forwards while hooking the actuating lever from the vacuum control unit onto the pin in the distributor.

N.B.
Never bring any metal tools into contact with the Hall transducer. To move it, use either a finger or a suitable plastic tool and always exercise great care.

Output module

1 Unplug the connector from the output module.

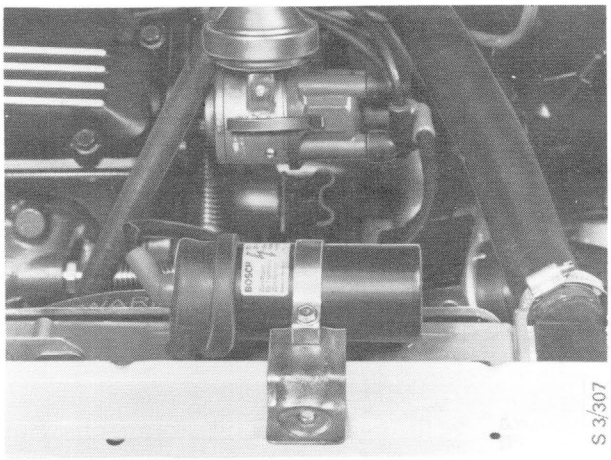
2 Unscrew the output module from the cooling fin.

To fit

Refit in the reverse order

Ignition coil

1 Roll back the rubber dust cover on the ignition coil.



2 Disconnect the leads from the coil.

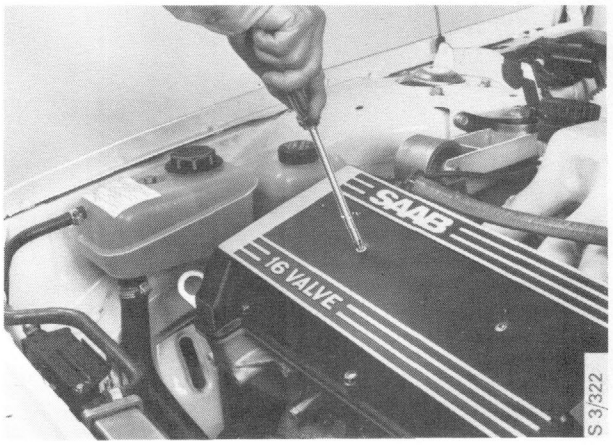
3 Unscrew and remove the coil.

To fit

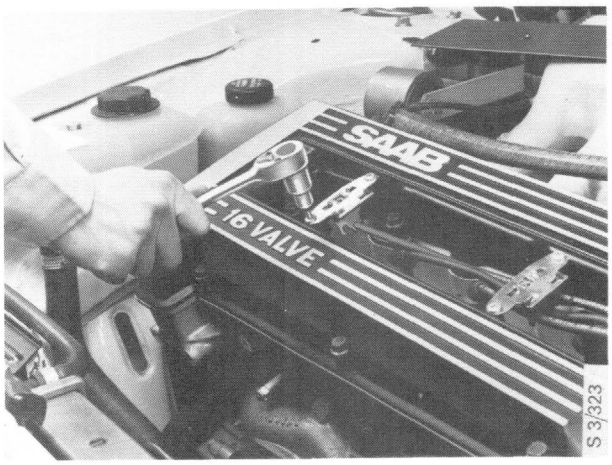
Refit in the reverse order.

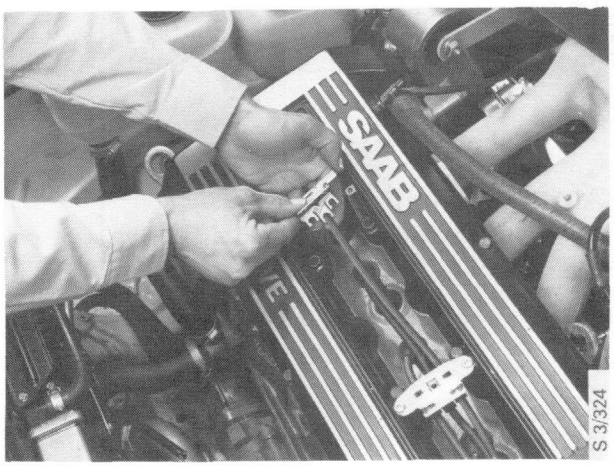
Spark plugs

1 Remove the inspection cover over the plugs.

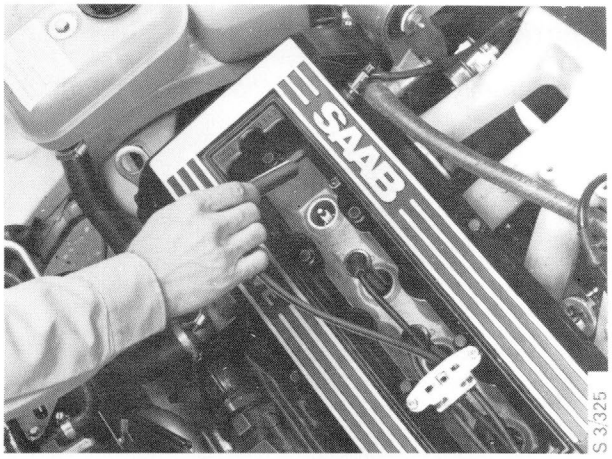


2 Remove the clips securing the HT leads.



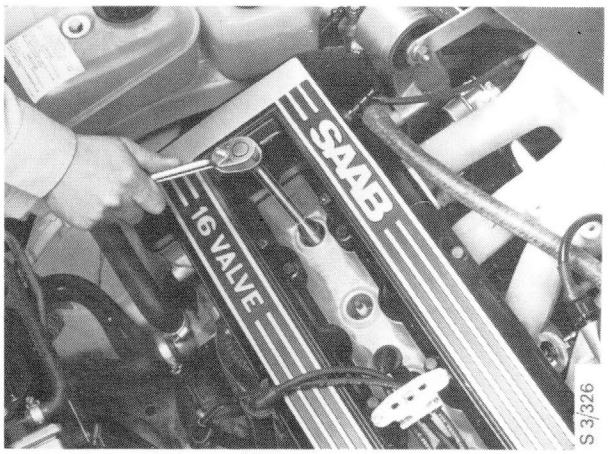


3 Pull off the plug caps - do not pull on the leads.



4 Blow compressed air around the plugs to remove any dirt.

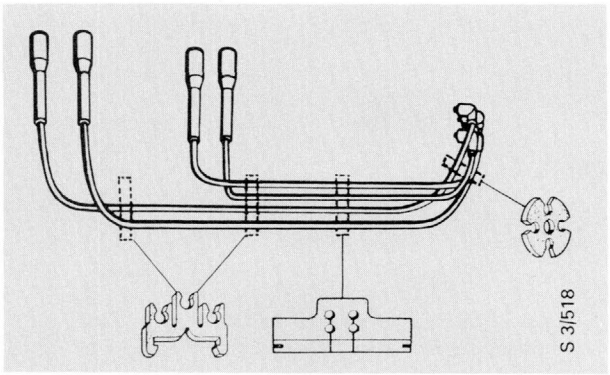
5 Unscrew the plugs using spark plug socket 83 93 902.



To fit

Refit in the reverse order.

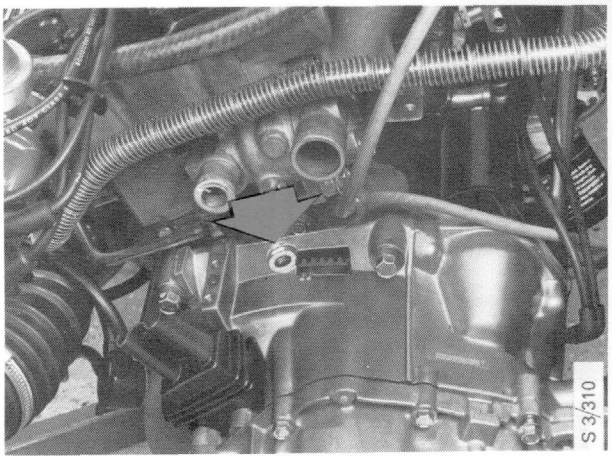
N.B.
When refitting the clips, make sure that the leads are secured in the clips.



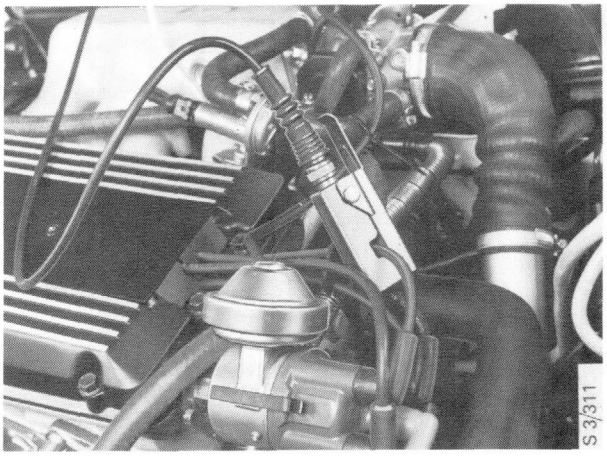
Ignition lead runs

Ignition timing equipment

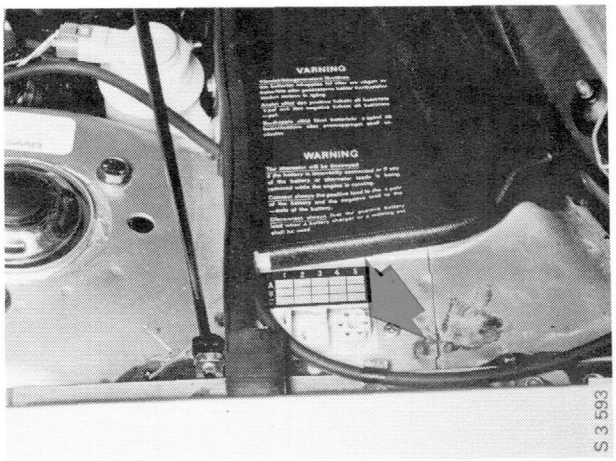
The engine includes provision for use of an ignition-timing meter. A special pin is provided on the flywheel and a test socket is incorporated in the flywheel cover. (Marks are also provided on the flywheel for checking the timing with a conventional stroboscopic lamp.)



The ignition-timing meter has a special plug which fits the socket in the flywheel cover and a terminal clip which fits the HT lead for no. 1 cylinder.

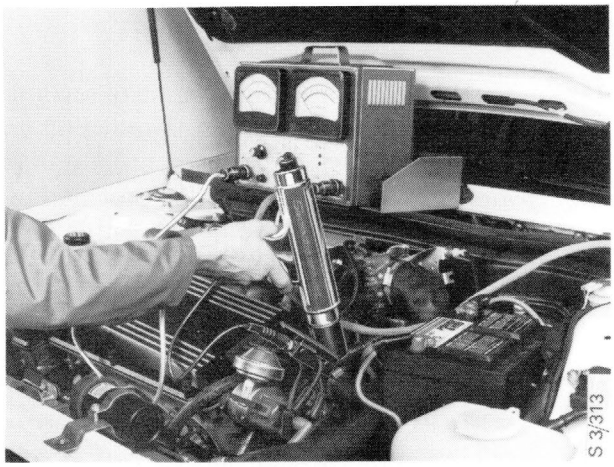


The ignition service (TSI) instrument connects to the ignition service socket on the car. The instrument includes a tachometer, a dwell- angle meter, a stroboscopic lamp, a switch for the starter motor and, in the latest ver-sion, an ignition-timing meter with a graduated dial.



Caution

Remember to check that the car is in neutral before switching on the starter motor.



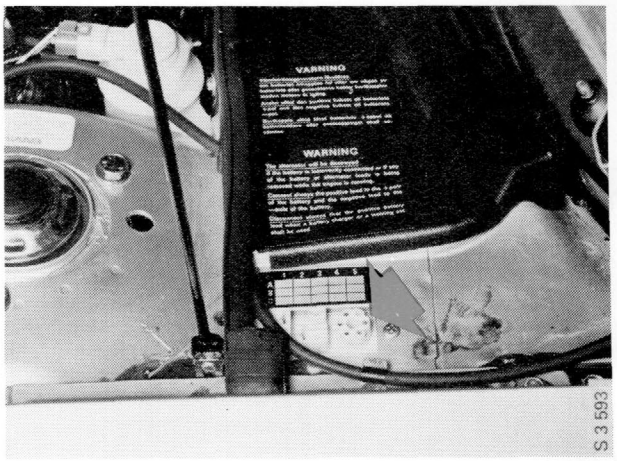
When the engine is being run by means of the TSI instrument, the ignition switch is bypassed, which means that the radiator fan will not run. Consequently, if the engine is run for a prolonged period (more than about ten minutes), the ignition system should be energized by means of the ignition switch to enable the fan to operate.

N.B.

Bear in mind that when the ignition is switched on all other electrical components connected across the ignition switch will also be on.

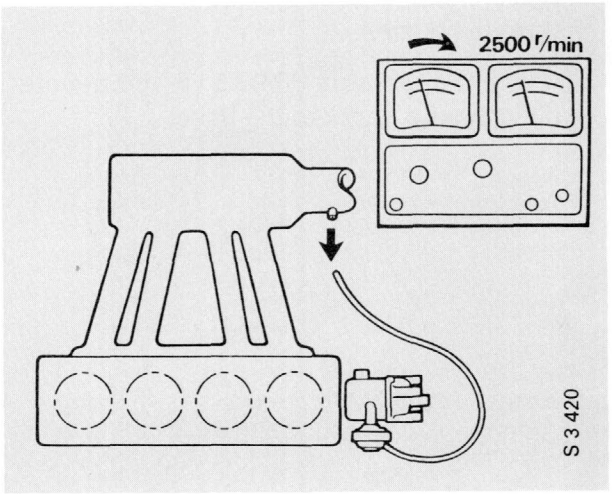
Vacuum control

1 Connect the ignition service (TSI) instrument to the socket in the car.



2 Disconnect the vacuum hose from the throttle housing.

3 Start the engine and run it at approximately 2500 r/min.



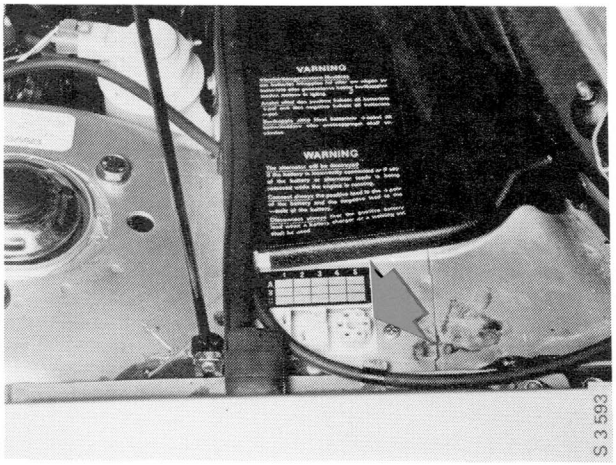
4 Check the timing.

5 Connect the vacuum hose to the throttle housing.

6 Check that the timing has now advanced appreciably.

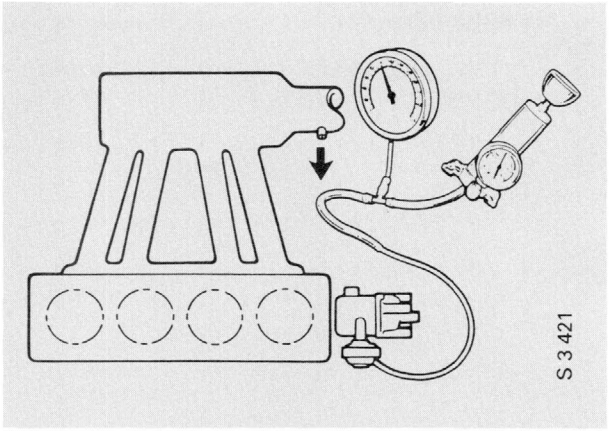
Pressure control

1 Connect the ignition service (TSI) instrument to the socket in the car.



2 Disconnect the vacuum hose from the throttle housing.

3 Connect apparatus 83 93 514 and a suitable pressure tester to the hose.



4 Start the engine and let it idle.

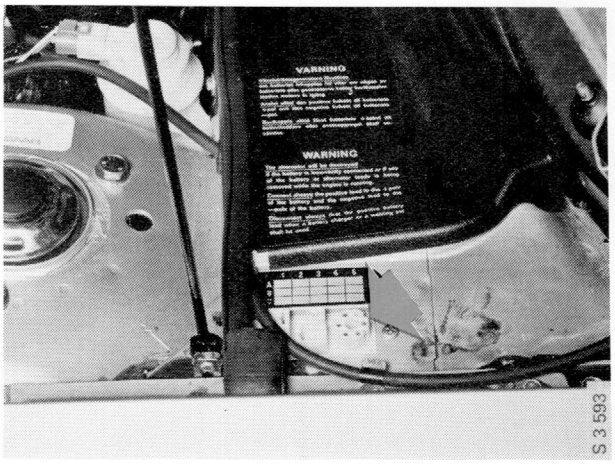
5 Check the timing.

6 Raise the pressure to 0.5 bar.

7 Check that the timing has now retarded by 3-7°.

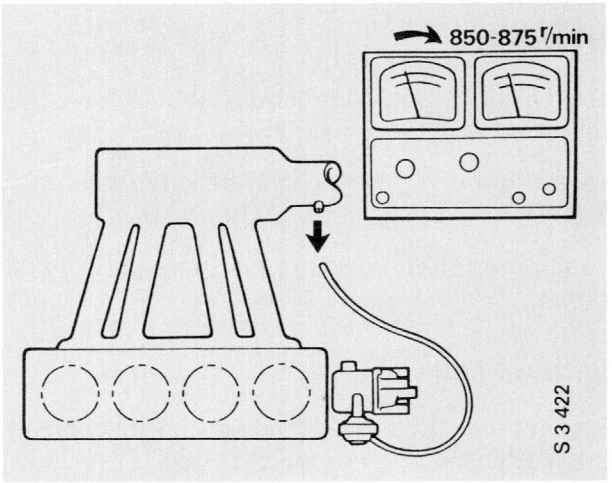
Checking and adjusting the timing

1 Connect the ignition service (TSI) instrument to the socket in the car.



2 Disconnect the vacuum hose from the throttle housing.

3 Start the engine and run it at 850 - 875 r/min.



4 Check the timing and adjust as necessary.

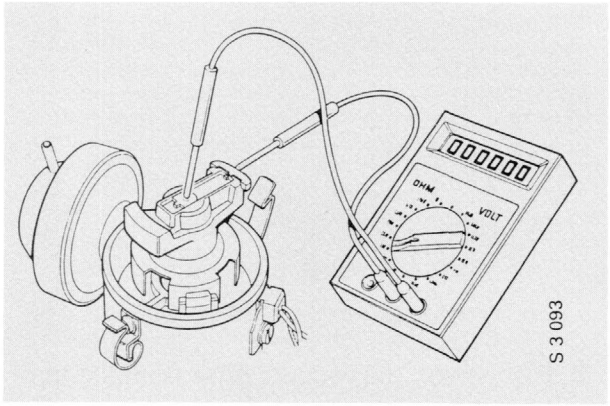
Testing and inspecting components

Distributor

The Hall transducer and slotted rotor cannot be removed; in the event of a fault in the transducer unit, the distributor must be replaced.

Rotor

The rotor should have a resistance of 1 kOhm.



HT leads

The HT leads and connections should have the following resistance values:

Lead between ignition coil and distributor: 0.5 - 1.5 kOhm

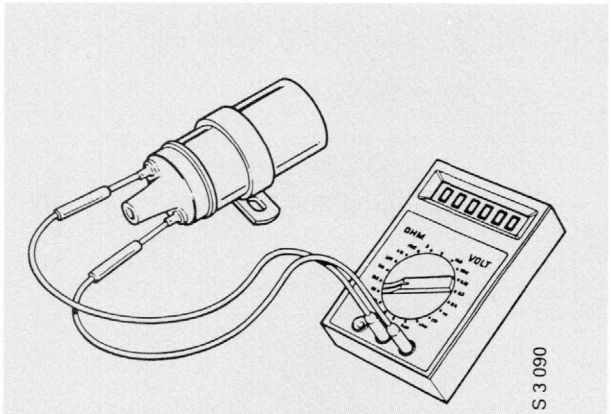
Lead between distributor and spark plug: 2 - 4 kOhm.

Ignition coil

Remove the rubber dust cover and disconnect the leads.

Measure the resistance in the primary winding across terminal 1 (-) and terminal 15 (+).

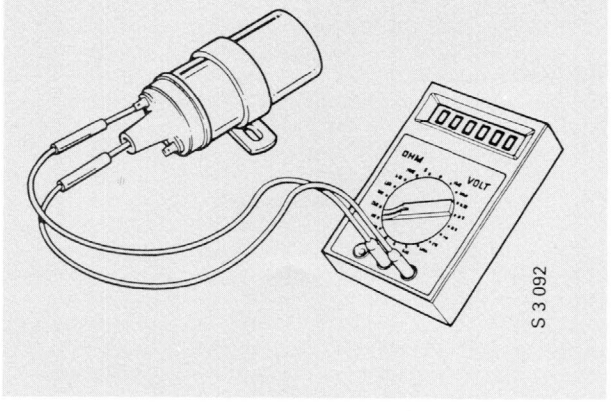
The resistance should be: 0.52 - 0.76 Ohm.



Measure the resistance in the secondary winding across terminal 1 (-) and the high- voltage terminal.

The resistance should be: 2.4-3.5 kOhm.

Measure the performance of the coil either in volts or by the length of the spark.



N.B.
Faults often occur only when the ignition coil is warm. When in doubt, mount the coil on a test bench and leave it switched on under load for about half an hour. The coil should still operate perfectly after this time.

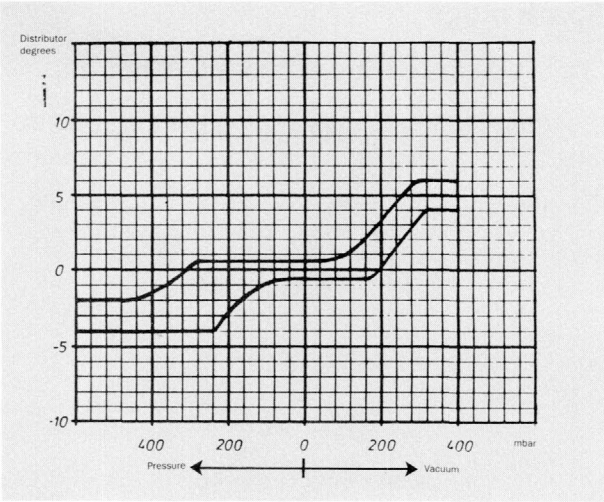
Spark plugs

Check that the electrode gap is 0.6 mm.

If necessary, adjust by bending the side electrode.

Testing the distributor on a test bench

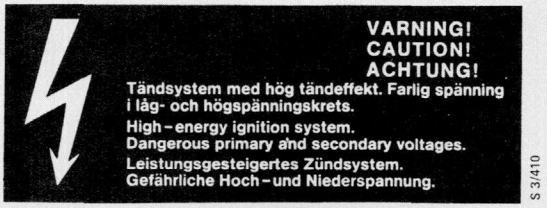
Test in accordance with the instructions for using the testing equipment. The test values should coincide with those shown on the adjacent timing curve.



N.B.
The distributor rotates at half the speed of the engine.

Danger

The electronic ignition system has an ignition voltage of over 30,000 V and is within the power range that constitutes a danger to sensitive persons, such as those fitted with a pacemaker. In some cases, shocks may be fatal.



Caution

Because of the damage that can result from flashover or shorting-out in the ignition coil, HT leads, distributor and electronic control unit, the following must be observed:

- Never disconnect an HT lead when the engine is running.
- Never attempt to start the engine if any HT lead has been disconnected or if the distributor cap has been removed.
- Before performing any compression tests or the like, always disconnect the output module first.

To check the spark, proceed as follows:

a Unscrew the spark plug or use a separate plug.
b Connect the plug lead.
c Hold theplug against the engine so that it is well earthed.
d Check the spark.

Caution

Because of the high ignition energy, dangerously high voltages may also be present in the primary circuit (terminal 1) of the ignition coil and in the associated leads (including the tachometer socket, the TSI socket and the electronic control unit switch) when the engine is running.

When the ignition is switched on, maximum current will be present in the primary winding of the ignition coil at all times. Before working with the ignition switched on, disconnect terminal 1 (-) on the ignition coil first.

Fault diagnosis

The fault-diagnosis procedure should be followed step by step, and the necessary checks and action taken. If a com-ponent is found to be faulty, it should be exchanged before the next step is started. If, for instance, a fault tends to occur at certain temperatures, always try to trace the fault within this temperature range. Thus, if starting problems are experienced when the engine is cold, attempts to trace the fault should also be made when the engine is cold. It is quite usual for a defective electronic com-ponent to function properly at normal temperatures before it breaks down completely. Poor contact is also affected by temperature.

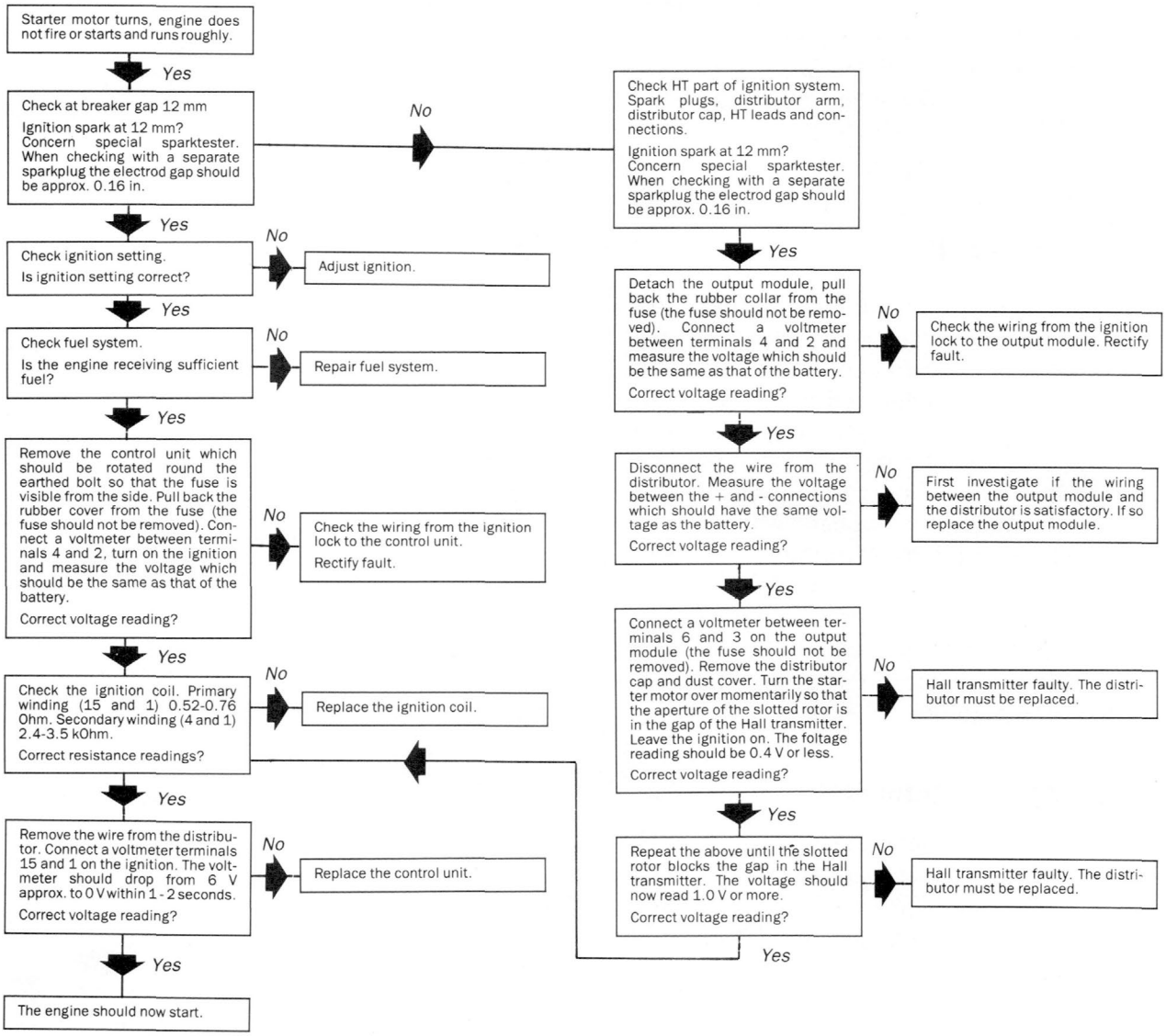
Fault-diagnosis equipment

Ignition timing instrument (preferably with a 90 dwell-angle scale), a volt-ohmmeter with scales for 15 V d.c., 5 V a.c. and a minimum sensitivity of 10,000 ohm/V, and scales for 0-5 Ohm and 0-5 kOhm.

Fault diagnosis chart

Conditions for testing

Fully-charged battery, fuel in tank, engine and ambient temperature 32–104°F (0–40°C). Temperature has a considerably effect on values recorded.



Lighting

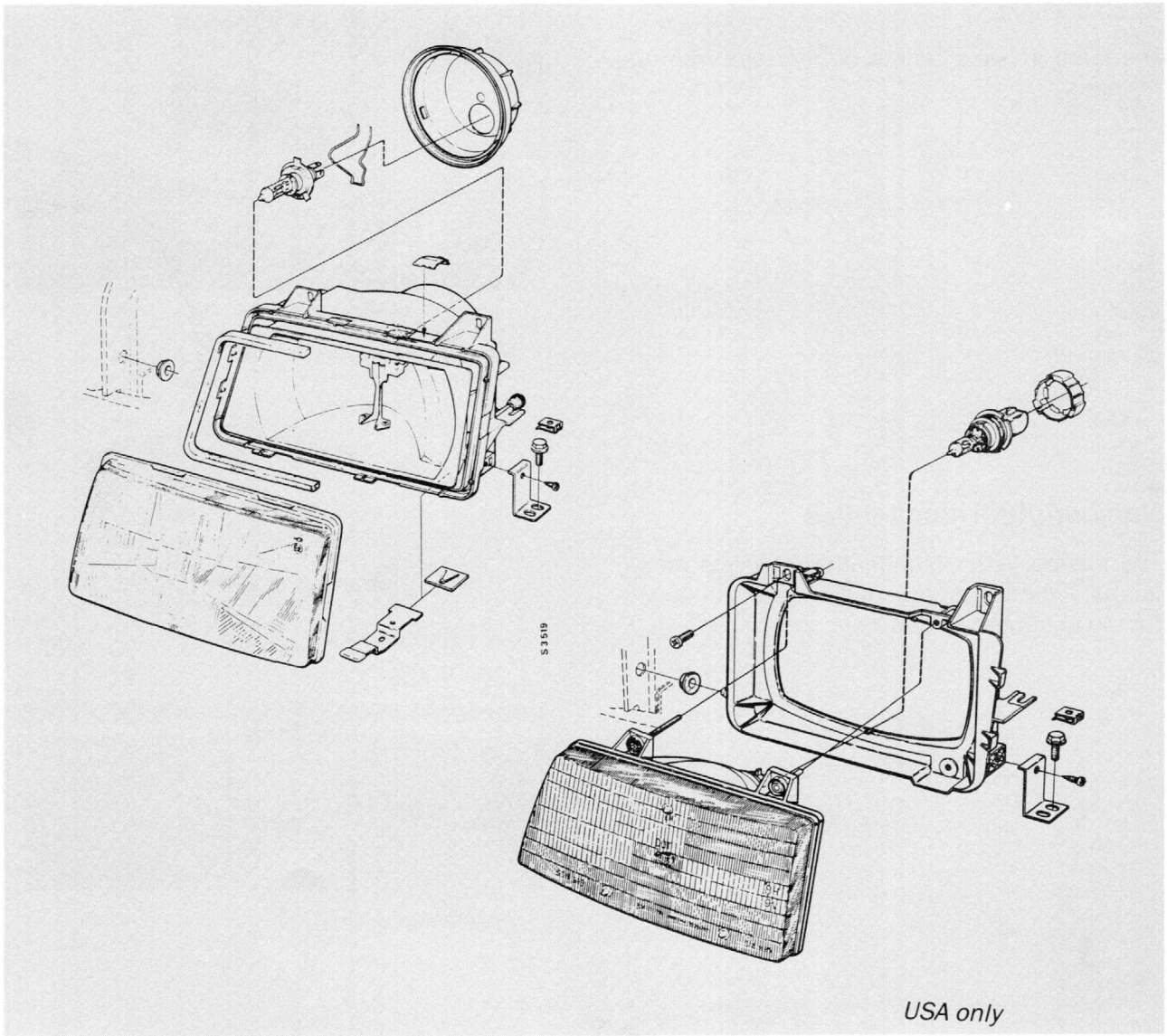
The lighting system on the Saab 9000 includes headlights, front end rear clusters, side indicator repeater lights, rear-window stop lights, number plate illumination, interior lighting, instrument and control illumination, door lights and luggage compartment lighting.

A pictogram incorporated in the main instrument display panel lets the driver know if a headlight bulb or a bulb in the rear light clusters has blown. The relay for the pictogram (a hot-wire instrument) is located on the fuse panel inside the glove compartment.

The headlamps are integrated in the front panel of the car and for some markets are fitted with replaceable glass (n/a USA).

Each headlamp bulb has two filaments, one being for the main beam and the other for the dipped beam. The switch for main/dipped beam is incorporated in the direction-indicator stalk to the left of the steering column. A blue warning light on the instrument panel glows when the main beam is on.

According to the market specification of the car, the headlamps have either a left-hand or a right-hand asymmetric dipped beam.



USA only

Headlamps

Front light clusters

The front light clusters incorporate lamps for direction indicators, side marker lights, parking lights and cornering lights.

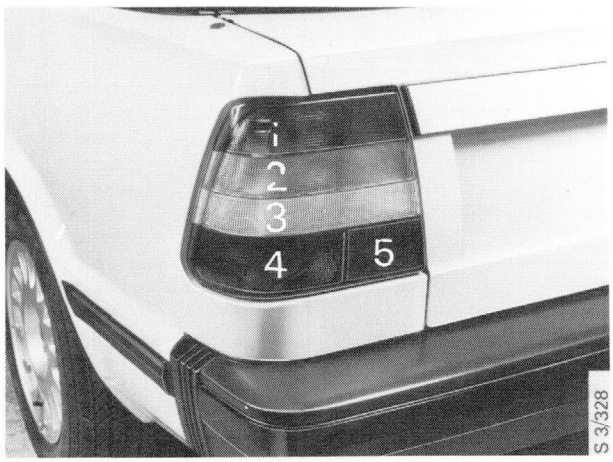
The glasses cannot be removed from the fittings.

1 Direction indicator/side marker light
2 Parking light/cornering light

Rear light clusters

The rear light clusters incorporate lamps for direction indicators, tail lights, stop lights, and reversing light.

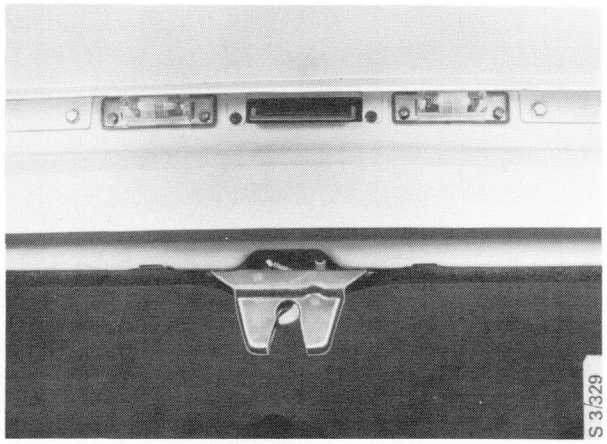
The lamp glasses cannot be removed from the fittings.



1 Stop light
2 Direction indicator
3 Reversing light
4 Tail light/stop light
5 Tail light

Number-plate illumination

The number-plate illumination consists of two lamps, located one on either side of the handle for the luggage compartment door.

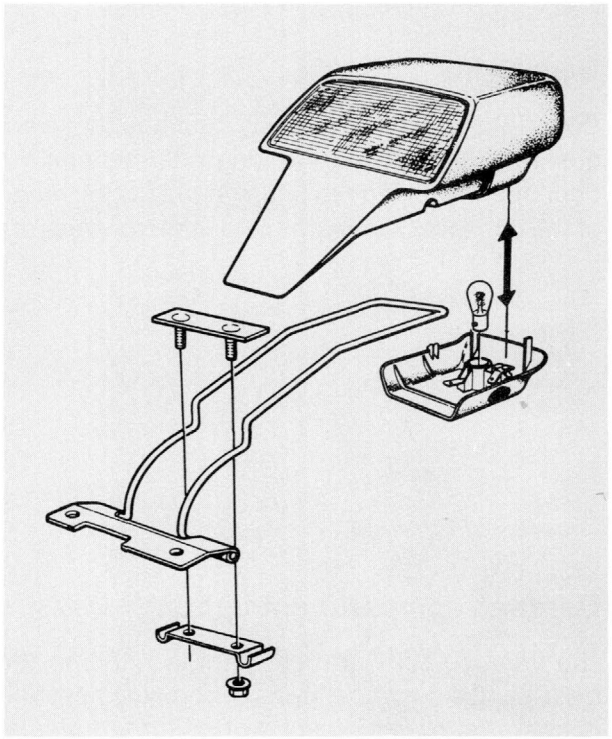


Side indicator repeater lights

Side indicator repeater lights are fitted to the rear sections of the front wings.

Rear-window stop lights

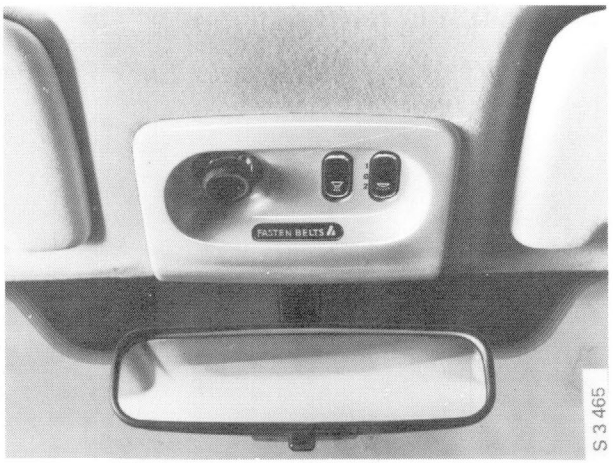
The rear-window stop lights are fitted at the bottom and in the middle of the rear window.



Interior lighting

The interior lighting consists of a dome light in the centre of the ceiling, a light on the rear-view mirror, a swivelling spotlight on the overhead panel and a fixed reading light on each of the rear pillars.

The interior lighting is wired through a time-delay relay and the lighting therefore remains on about fifteen seconds after the doors have been closed or until the ignition has been switched on.



S 3 465

Instrument and control illumination

Lamps are provided for illumination of instruments, the heater control panel, the ashtray, the glove compartment and certain controls.

Door lights

Door lights are fitted to every door and these are designed so that a white beam illuminates the door opening and a red beam in the trailing edge of the door acts as a warning to other road users.


S 3 330

Luggage compartment lighting

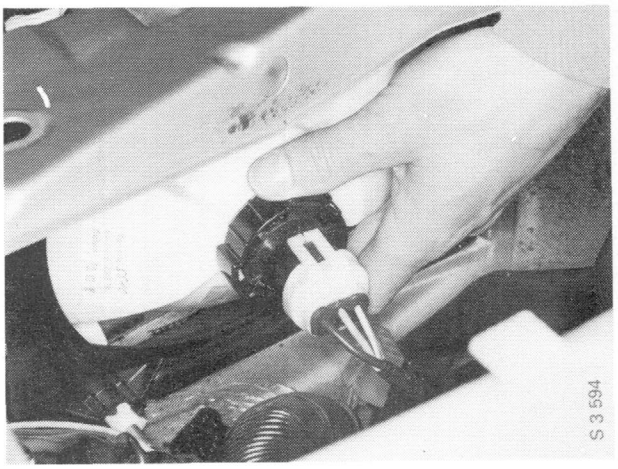
The luggage compartment light is fitted on the right-hand side on the luggage compartment and is operated by a mercury switch in the luggage compartment door.


S 3 331

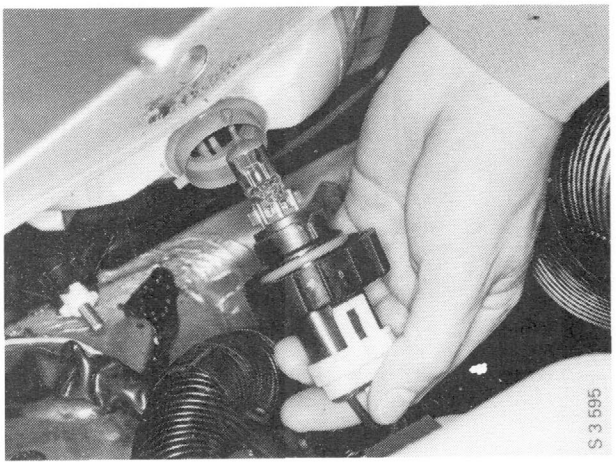
Changing bulbs

Headlamps (USA only)

1 Open the bonnet and detach the fitting.



2 Change the bulb.



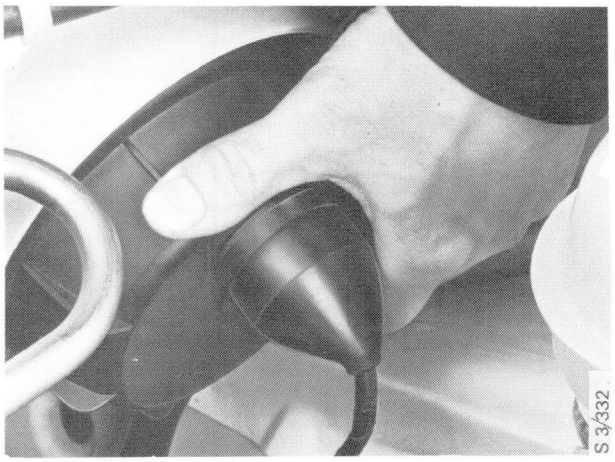
3 Fit a new bulb taking care not to touch the glass of the bulb with your fingers. Make sure that the three locating lugs are correctly located.

4 Fit the spring clip making sure that it is correctly located.

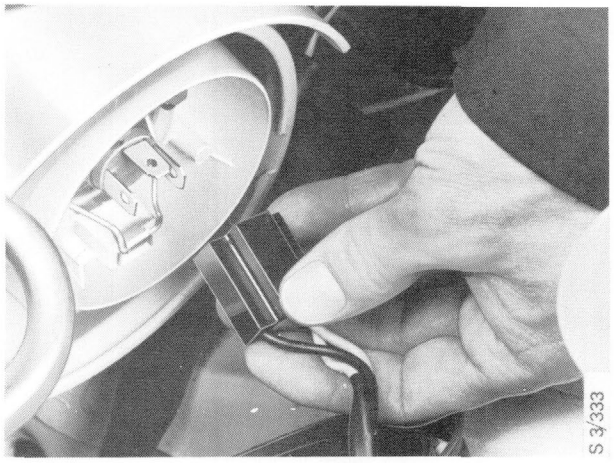
5 Plug on the connector and fit the cover.

Headlamps (n/a USA)

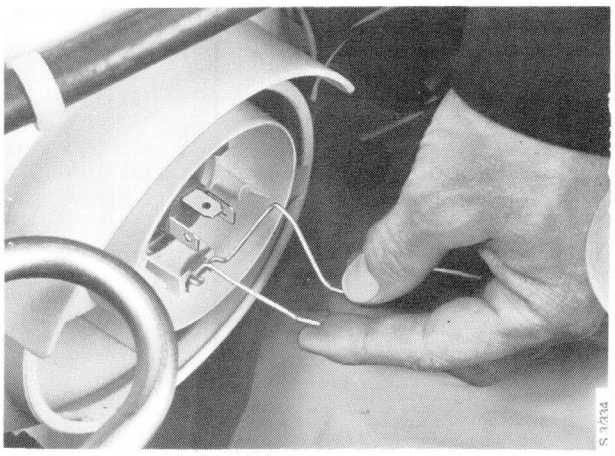
1 Open the bonnet and detach the cover from the rear of the headlamp fitting.



2 Unplug the connector from the lamp fitting.



3 Pull back the spring clip.



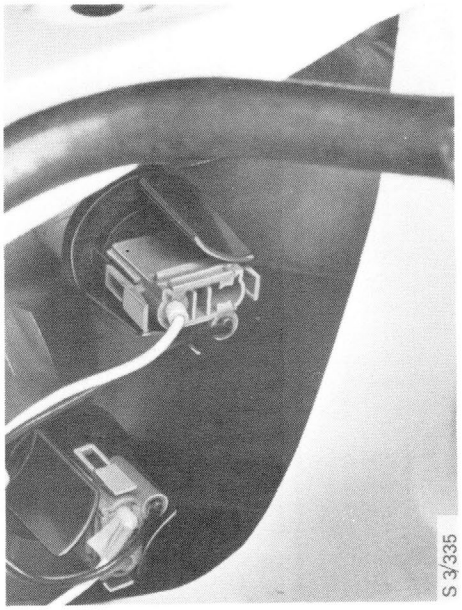
4 Fit a new bulb taking care not to touch the glass of the bulb with your fingers. Make sure that the three locating lugs are correctly located.

5 Fit the spring clip making sure that it is correctly located.

6 Plug on the connector and fit the cover.

Front light clusters

1 Twist and remove the bulb holder.

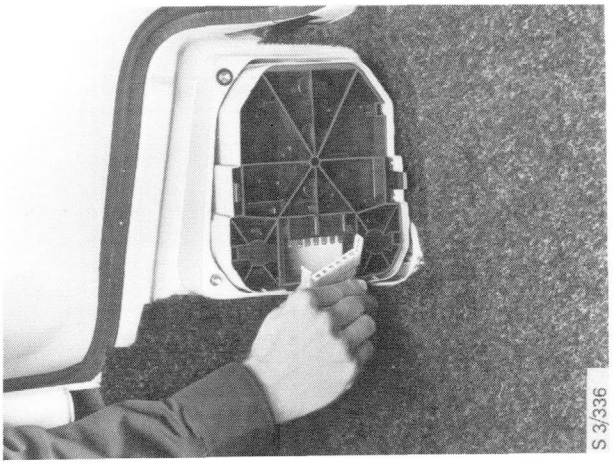


2 Fit the new bulb taking care not to touch the bulb glass with your fingers.

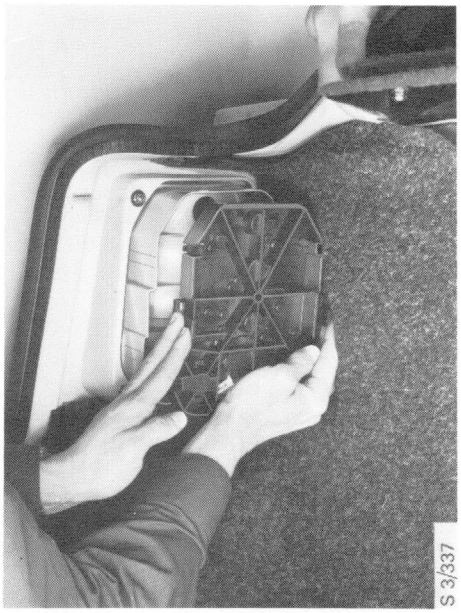
3 Refit the bulb holder, twisting it to secure it.

Rear light clusters

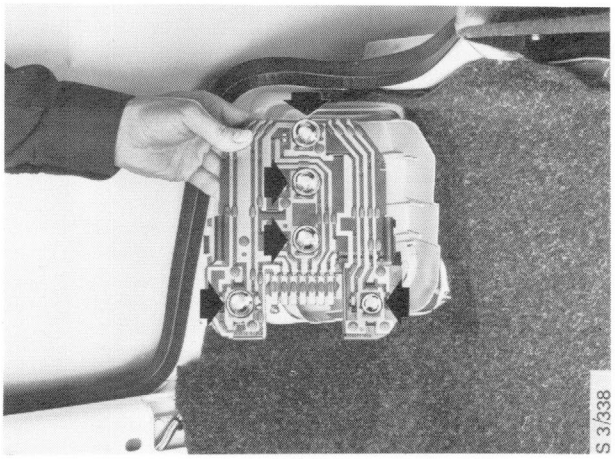
1 Unplug the electrical connector.



2 Depress the catches and withdraw the bulb holder.



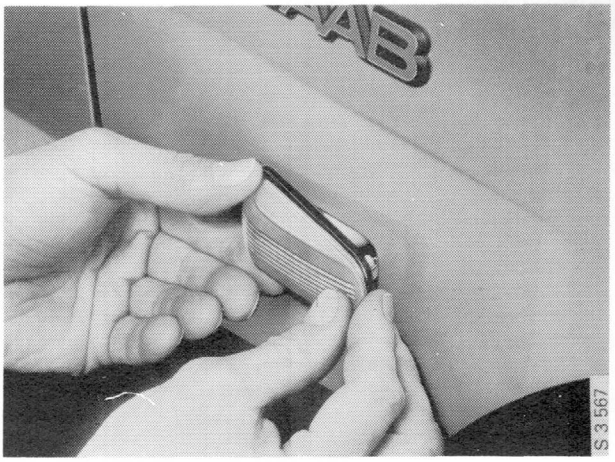
3 Fit the new bulb taking care not to touch the bulb glass with your fingers.



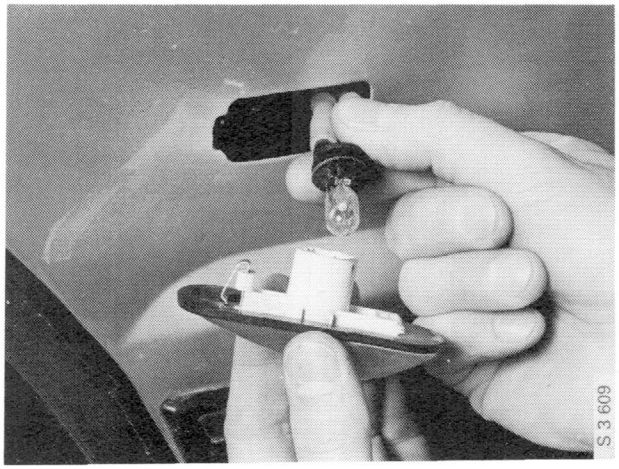
4 Insert the bulb holder and plug on the connector.

Side indicator repeater lights

1 Slide the fitting back and withdraw it.



2 Remove the bulb holder and change the bulb.



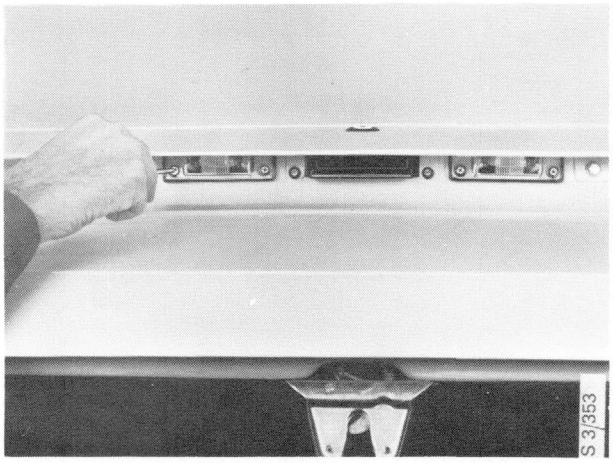
Rear-window stop lights

1 Remove the cover panel in which the bulb holder is mounted by pulling it down.

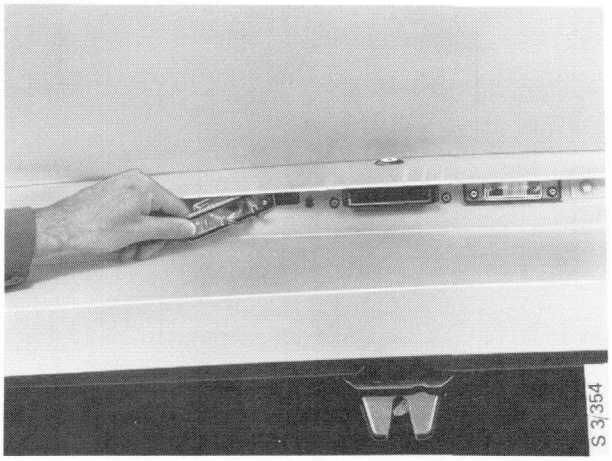
2 Change the bulb.

Number plate light

1 Remove the securing screws.

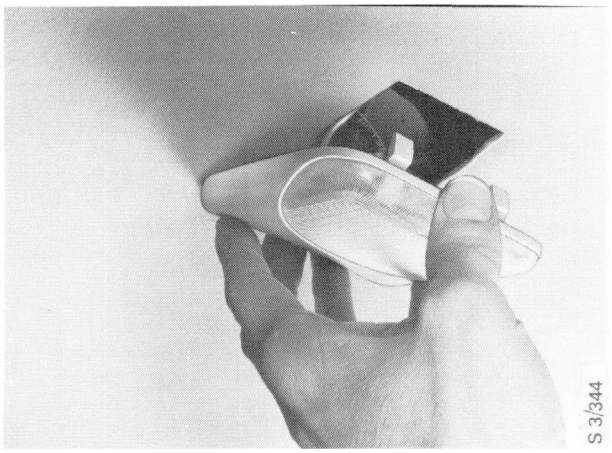


2 Pull the lamp fitting forward and change the bulb.

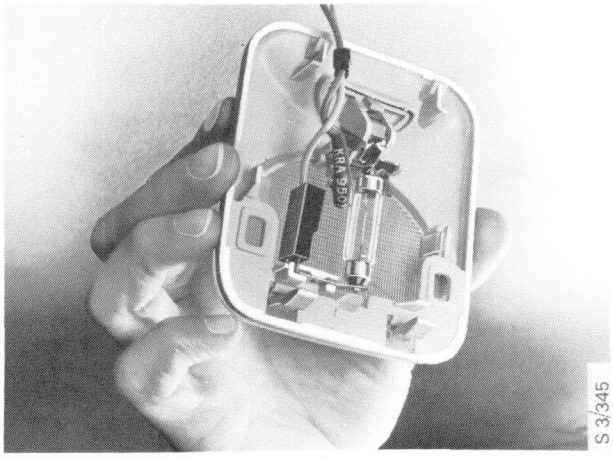


Dome light

1 Pull down the forward end of the fitting.

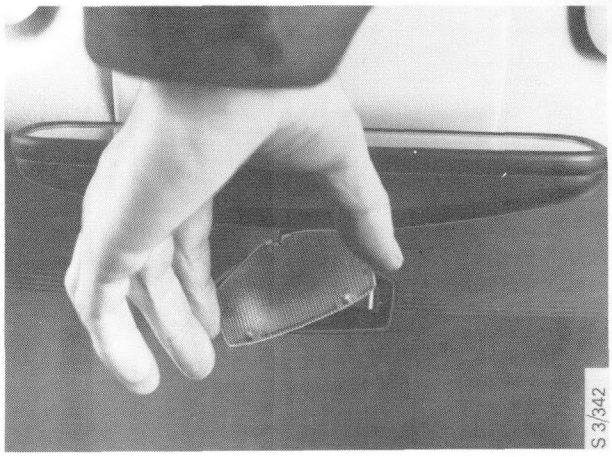


2 Lift off the fitting and change the bulb.

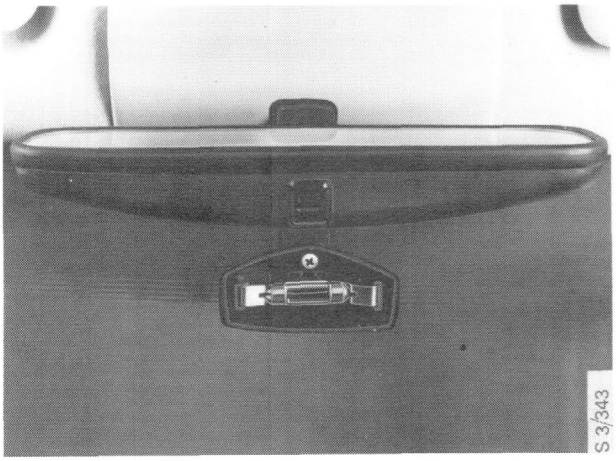


Rear-view-mirror light

1 Remove the glass.

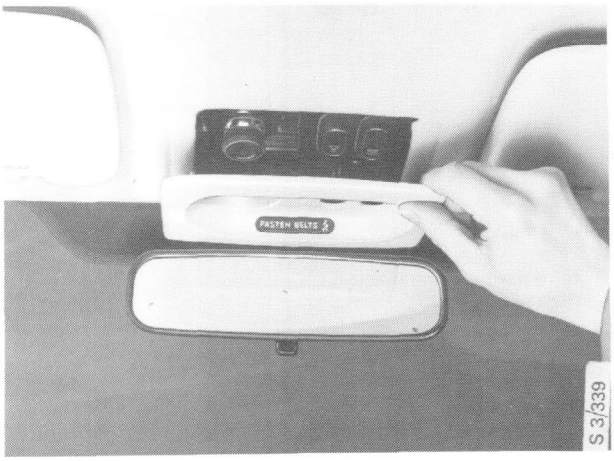


2 Change the bulb.

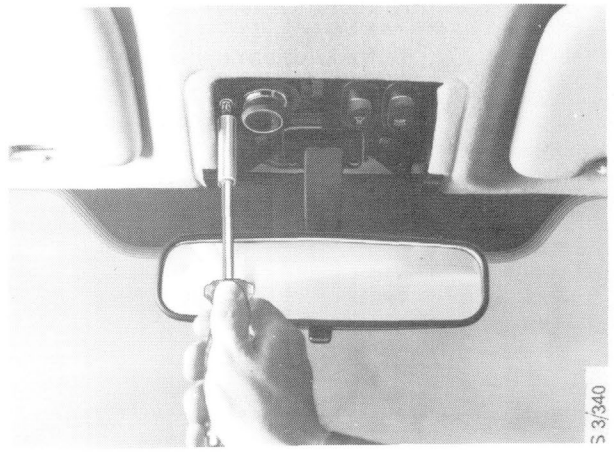


Overhead panel spotlight

1 Remove the cover.



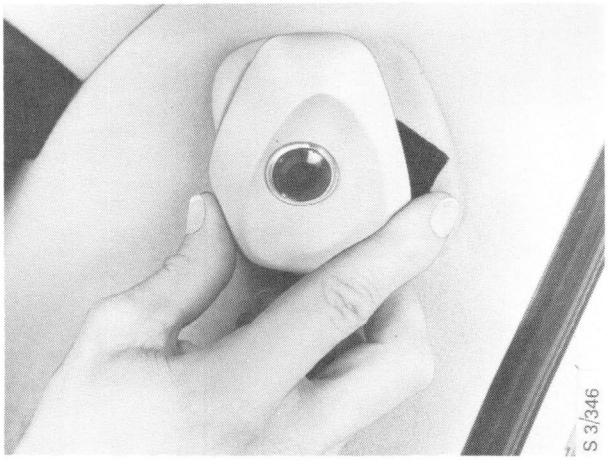
2 Undo the three securing screws.



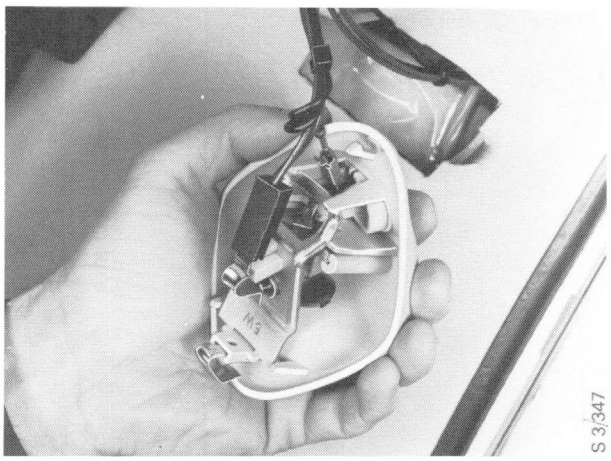
3 Change the bulb.

Rear-pillar reading light

1 Lift the forward edge of the fitting.

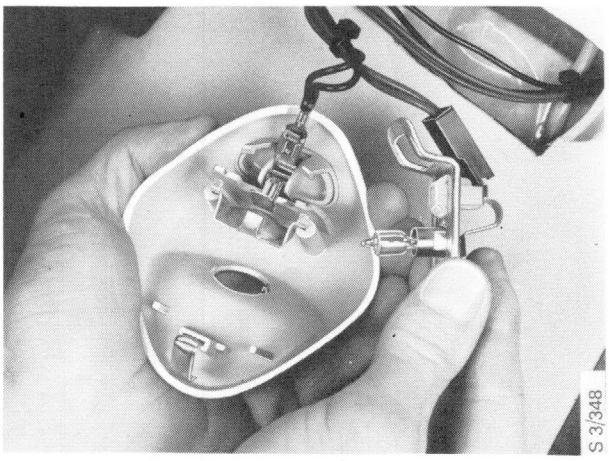


2 Pull off the fitting.



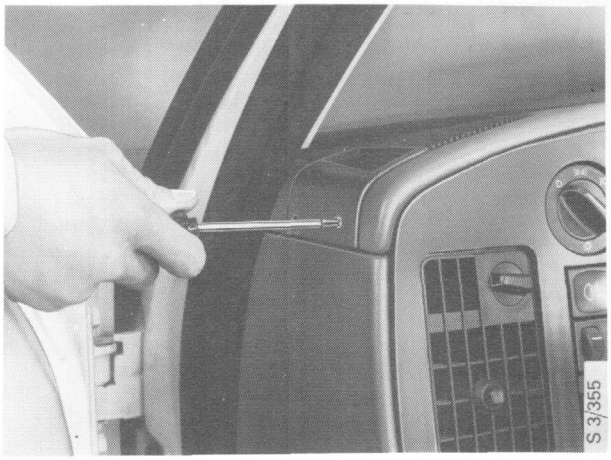
3 Press back the catches.

4 Lift out the bulb holder and change the bulb.

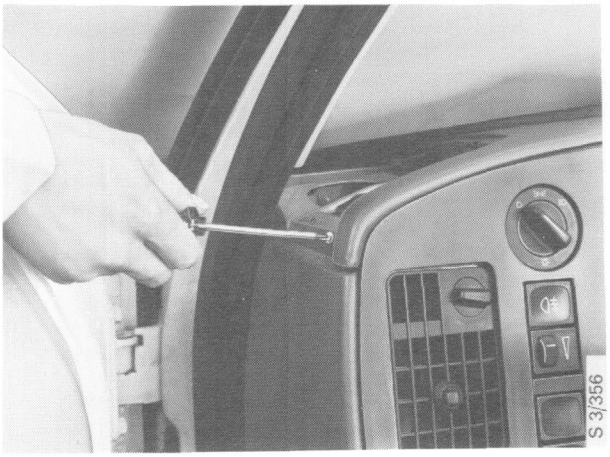


Main instrument display panel and clock

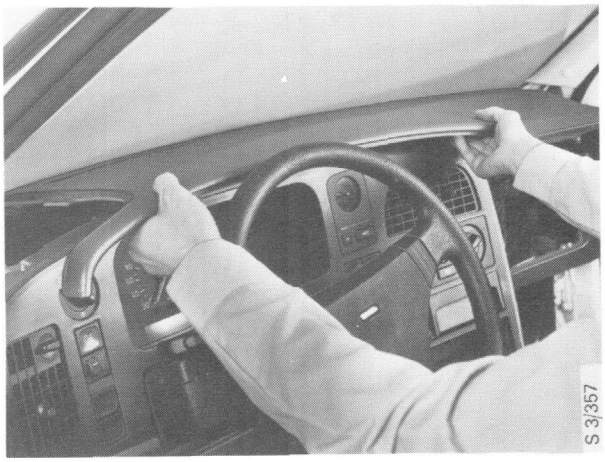
1 Remove the speaker grilles on either side of the panel.



2 Unscrew the top section of the instrument panel (seven screws including one in the glove compartment).

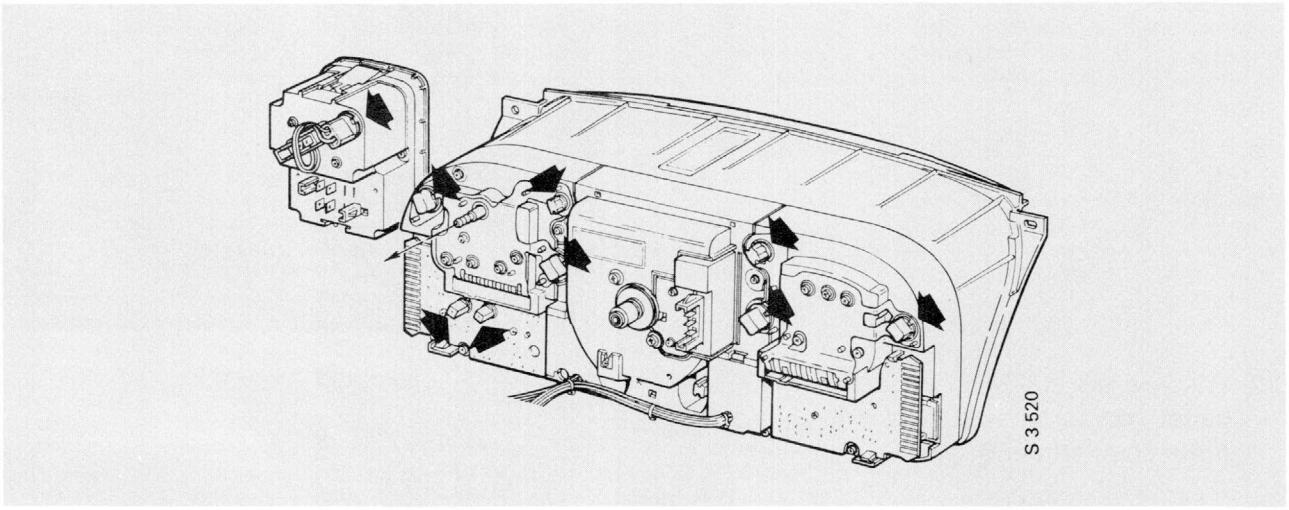


3 Lift off the top section.



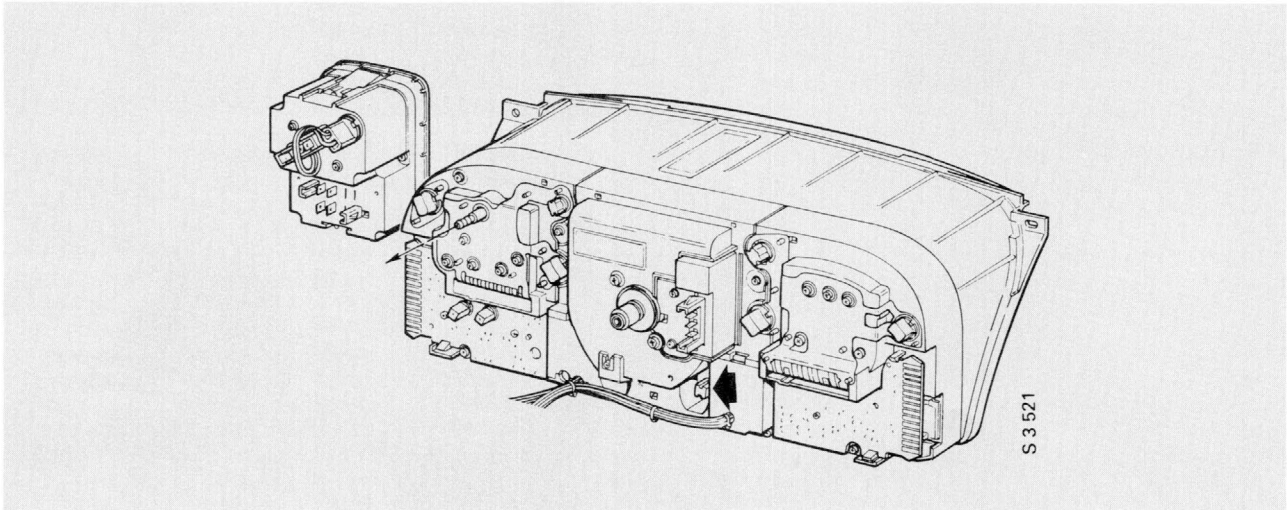
4 Remove the duct.

5 The bulbs for the main instrument display panel and clock and also for the fuel, charging and direction- indicator warning lights are now accessible.

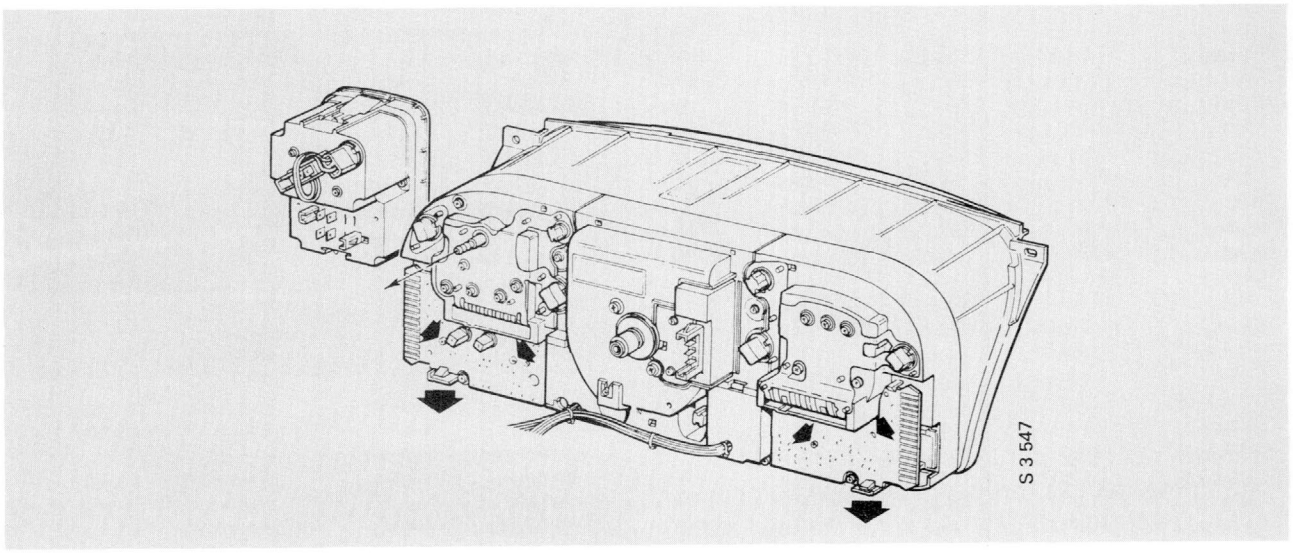


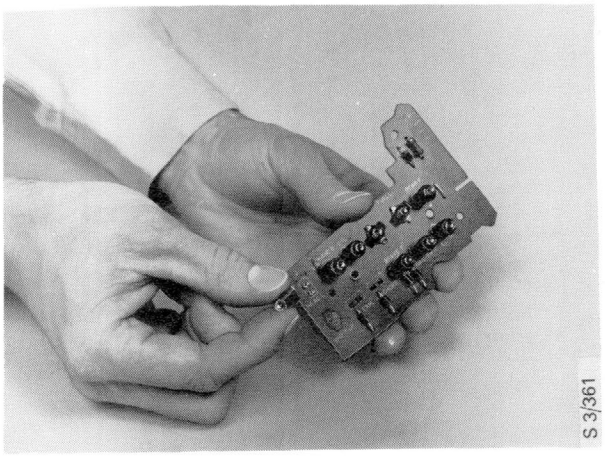
6 Remove the main instrument display panel (two screws).

7 The bulb for the electronic LCD display is now accessible for changing. To change the bulb, use a pair of pliers to twist and remove it.



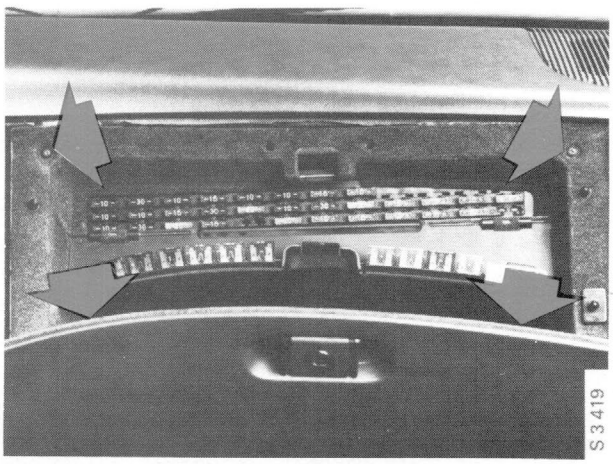
8 To change the bulbs in the pictogram or warning unit, remove the circuit boards by first removing the screws and then bending back the plastic lugs.





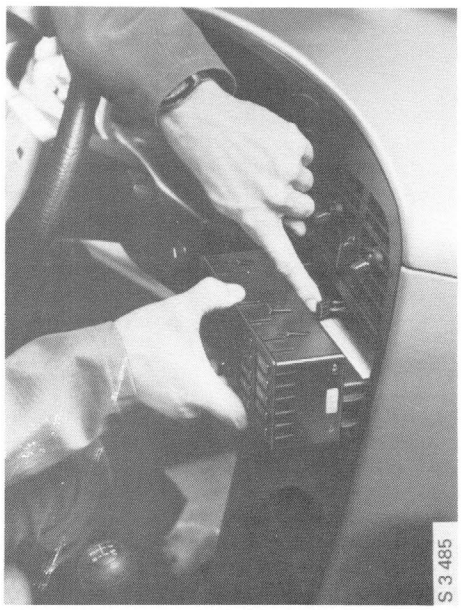
Heater control panel

1 Remove the glove compartment.

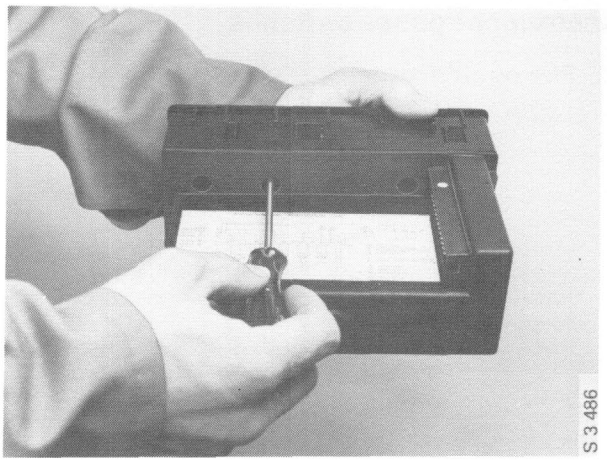


2 Push out the control panel from behind, gaining access through the glove compartment aperture.

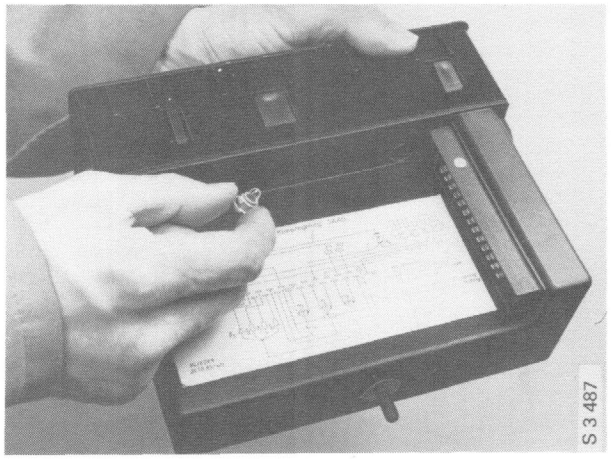
3 Detach the connector at the rear of the unit by pressing out the leading edge and unhooking the rear edge.



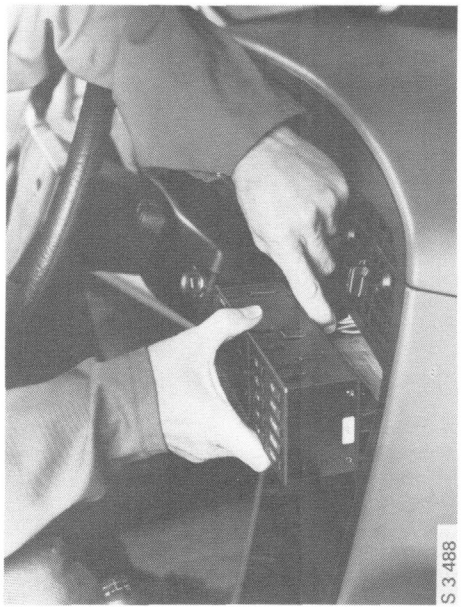
4 Use a screwdriver to ease out the bulb holder.



5 Fit a new bulb and secure by twisting.



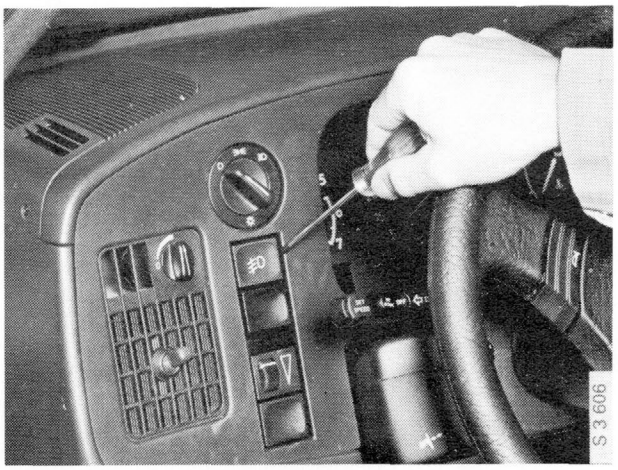
6 Insert the trailing edge of the connector in the recess and press home the leading edge.



7 Push back the control panel and fit the glove compartment.

Instrument panel switches

1 Pull out the switch.

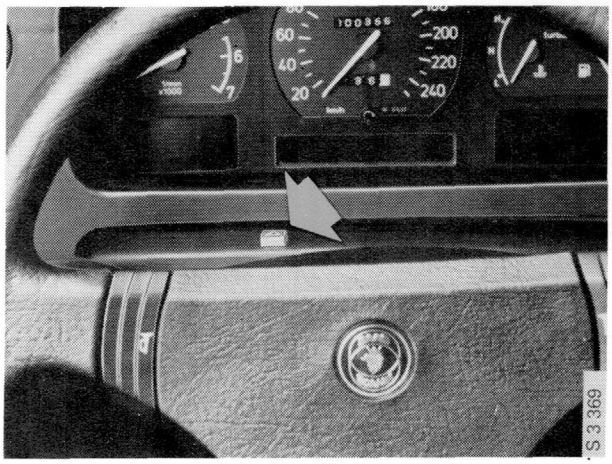


2 Unplug the connector.

3 Change the switch (the bulb is not replaceable).

Hazard warning light switch

1 Lift the glass off the switch.



2 Withdraw the bulb.

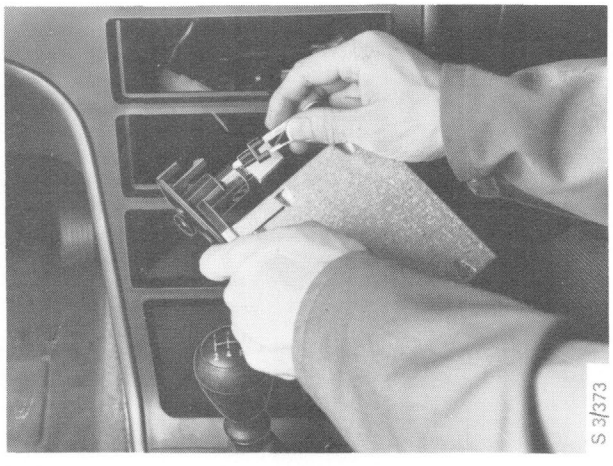
Ashtray and cigar lighter

1 Remove the ashtray.

2 Remove the compartment below the ashtray.

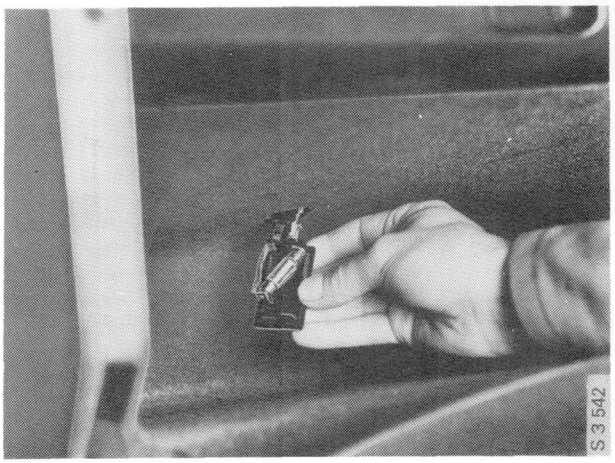
3 Remove the ashtray frame by pushing up the two lugs underneath and withdrawing the frame.

4 Change the bulb.



Glove compartment

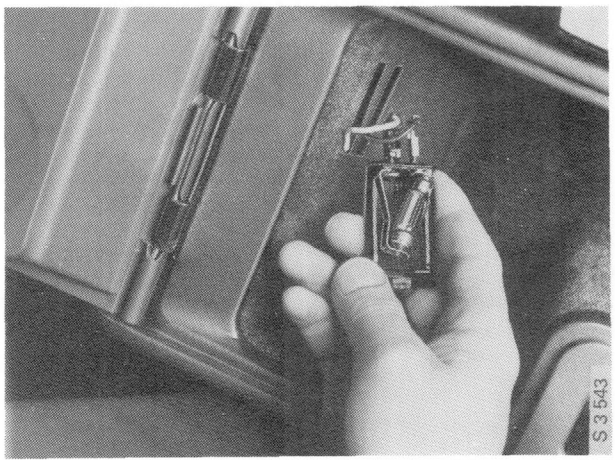
1 Remove the glass.



2 Change the bulb.

Center compartment between the front seats

1 Remove the glass.

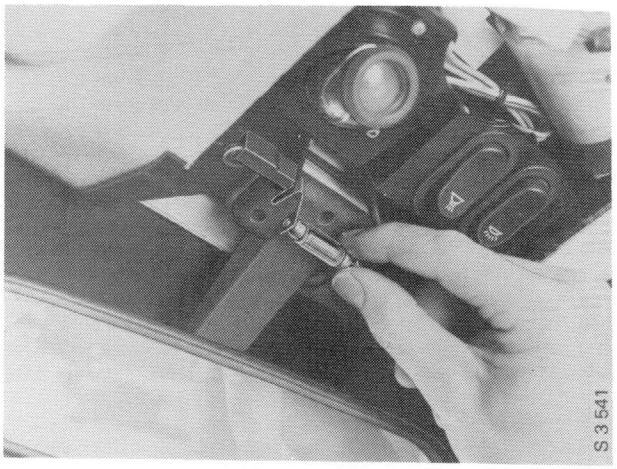


2 Change the bulb.

Seat belt warning light

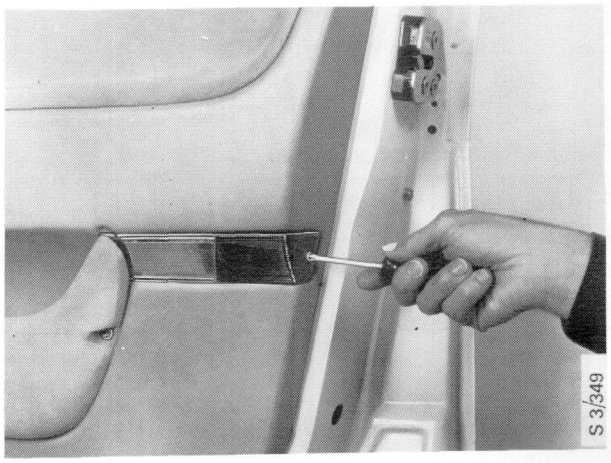
1 Remove the lock over the overhead panel.

2 Change the bulb.



Door lights

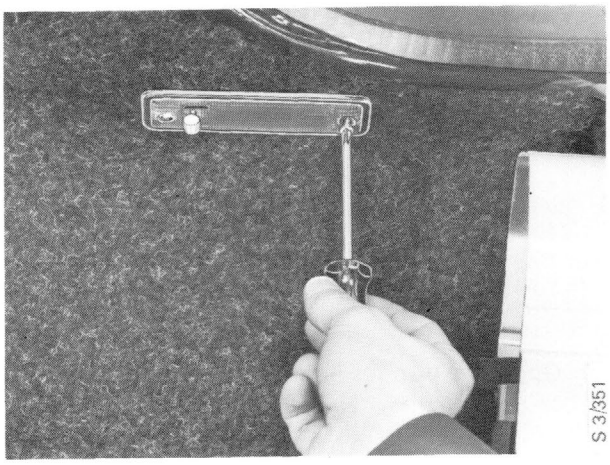
1 Remove the screw.



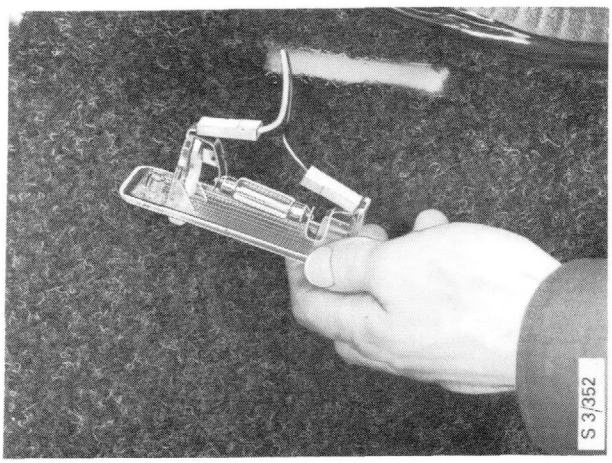
2 Lift off the fitting and change the bulb.

Luggage compartment light

1 Remove the screws.



2 Lift off the fitting and change the bulb.



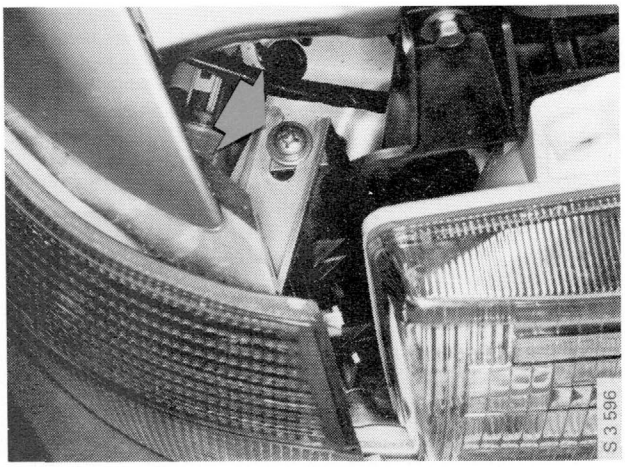
Headlamps

To remove (USA only)

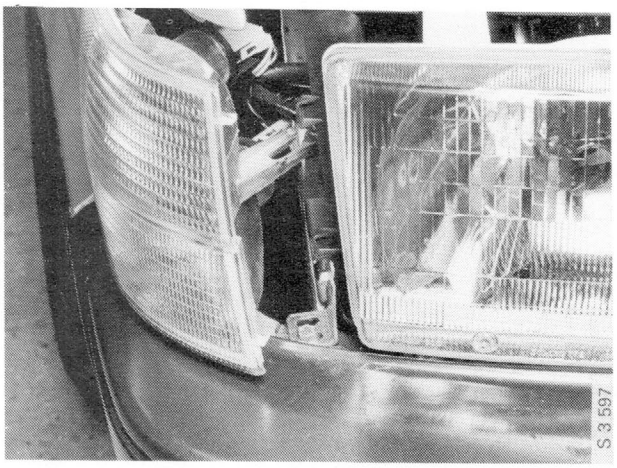
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

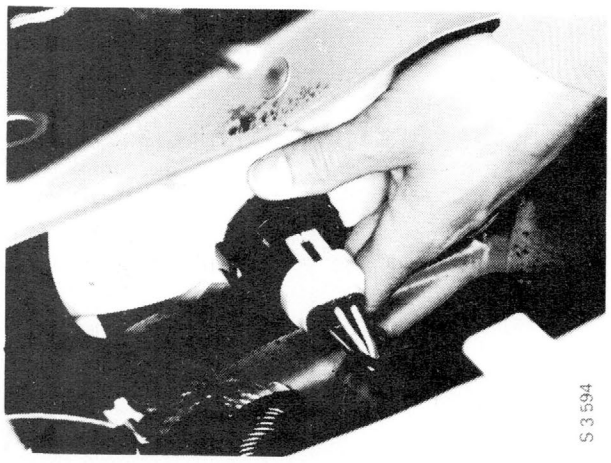
2 Undo the securing screws for the light cluster.



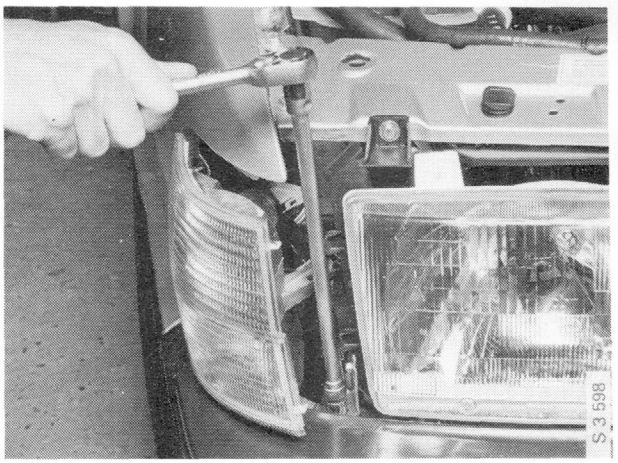
3 Ease out the fitting slightly.



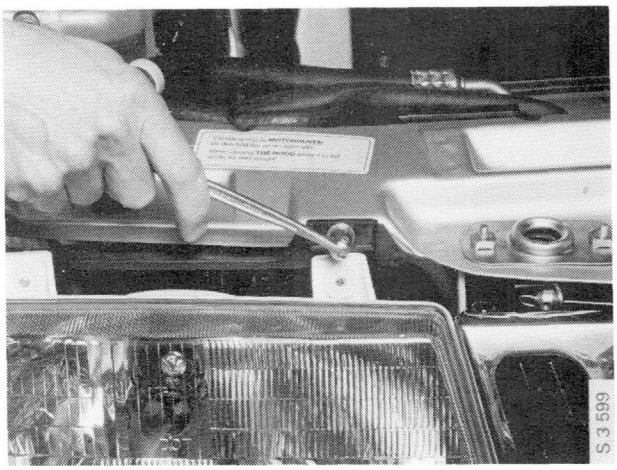
4 Open the bonnet and detach the fitting.



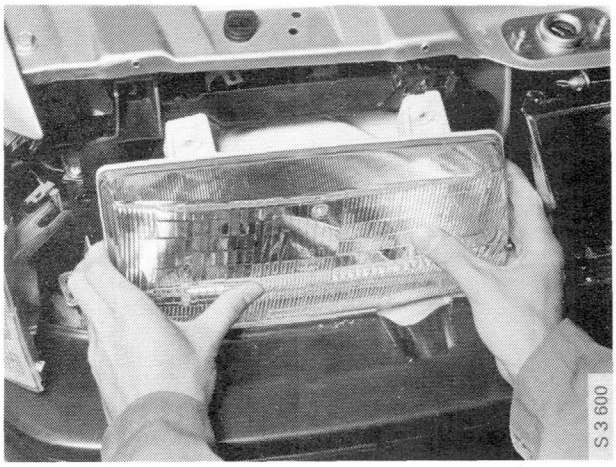
5 Remove the bottom retaining screw for the headlamp.



6 Remove the two top retaining screws.



7 Ease the headlamp slightly sideways, towards the wing, to release it from its inner clip. Remove the headlamp by lifting it.

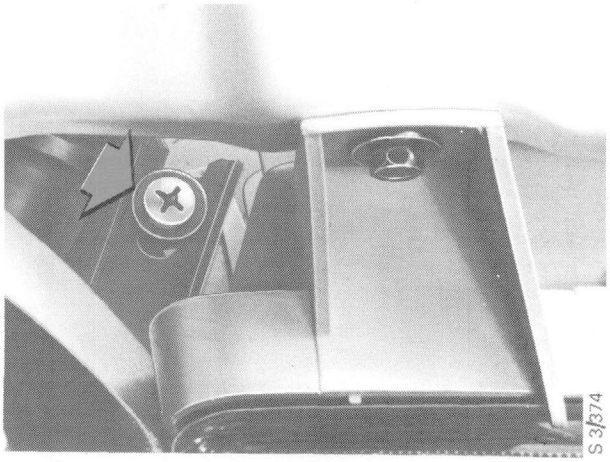


To remove (n/a USA)

1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

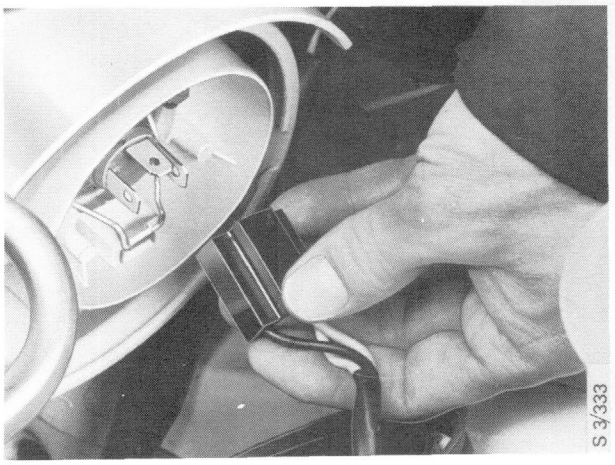
2 Undo the securing screws for the light cluster.



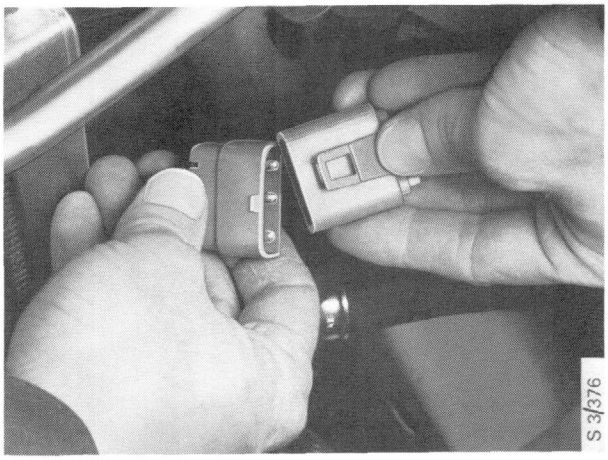
3 Ease out the fitting slightly.

4 Detach the cover from the back of the headlamp.

and unplug the connectors to the bulb

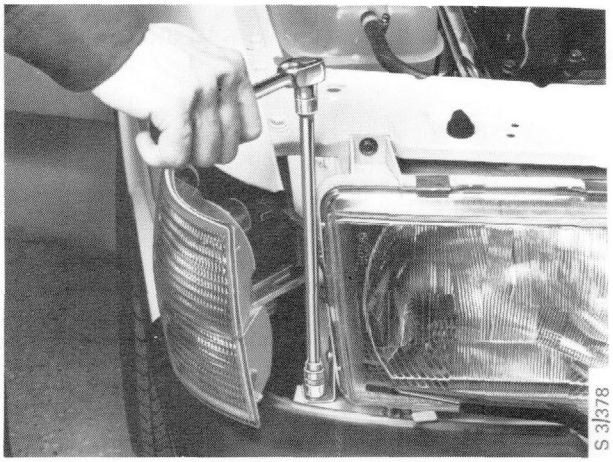


and the wiper motor.



5 Disconnect the rubber washer hose at the wiper blade.

6 Remove the bottom retaining screw for the headlamp.



7 Remove the two top retaining screws.

8 Ease the headlamp slightly sideways, towards the wing, to release it from its inner clip. Remove the headlamp by lifting it

To fit

Refit in the reverse order.

The headlamp alignment must be checked after the headlamp has been refitted.

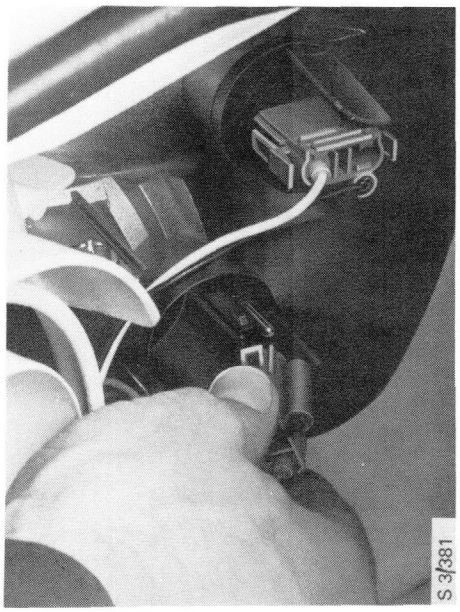
Front light cluster

To remove

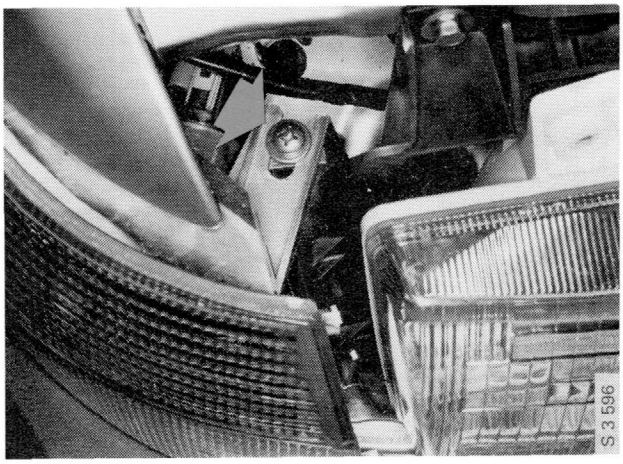
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

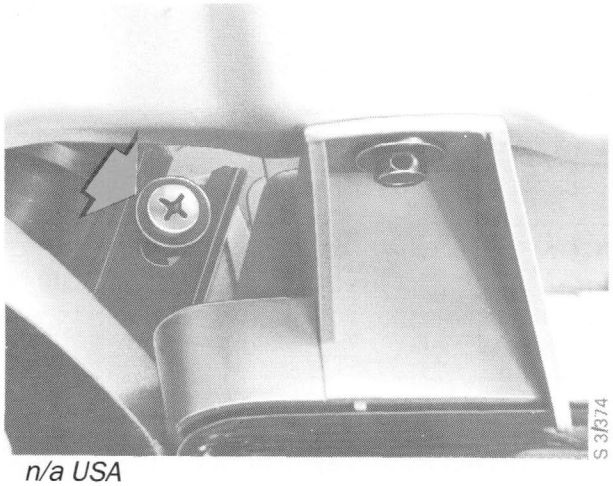
2 Label the electrical leads in the light cluster and disconnect them.



3 Remove the front retaining screw.

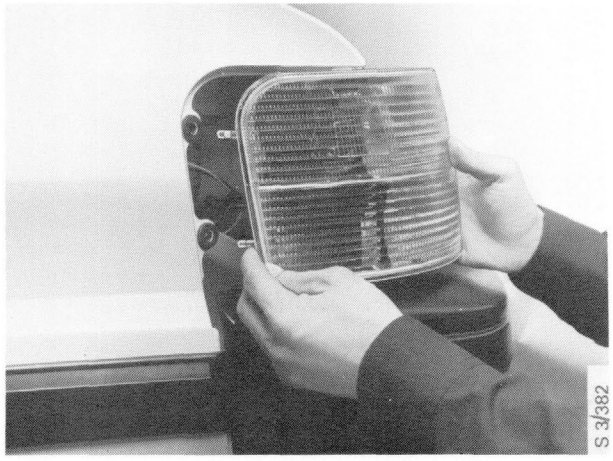


USA only



n/a USA

4 Pull the fitting forwards and withdraw it from its rear fixings (rubber bushes).



To fit

Refit in the reverse order.

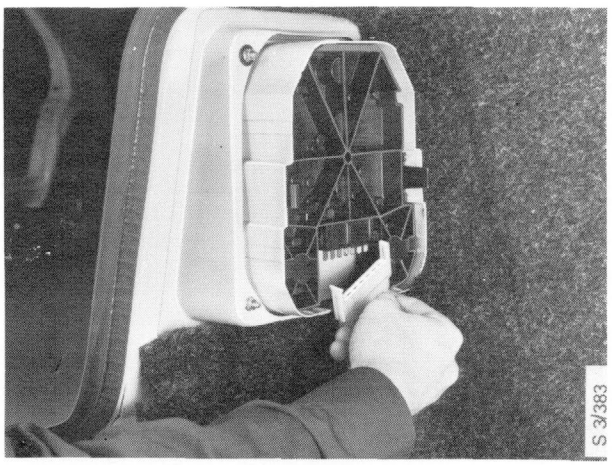
Rear light cluster

To remove

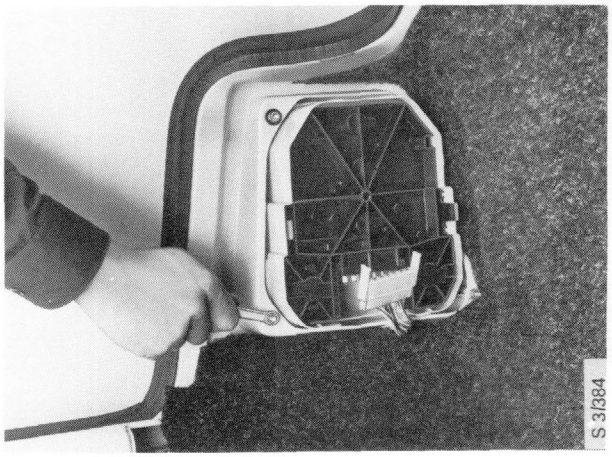
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

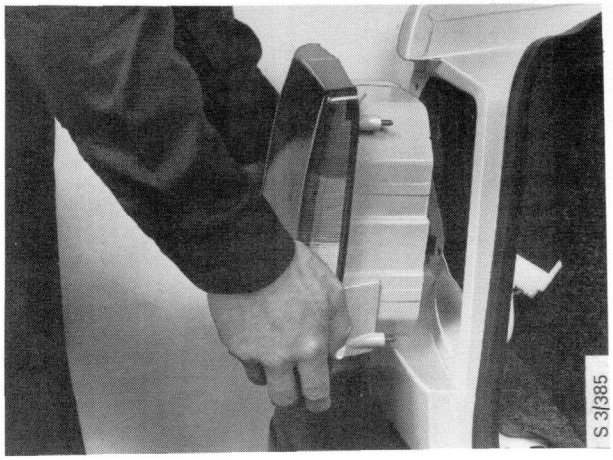
2 Unplug the electrical connector.



4 Lift out the unit.



3 Remove the four securing nuts.



To fit

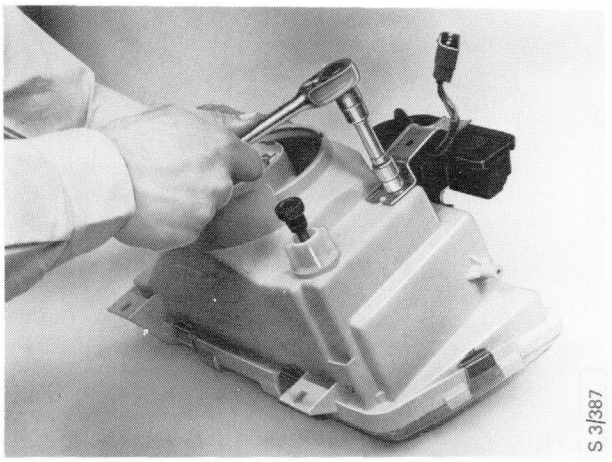
Refit in the reverse order.

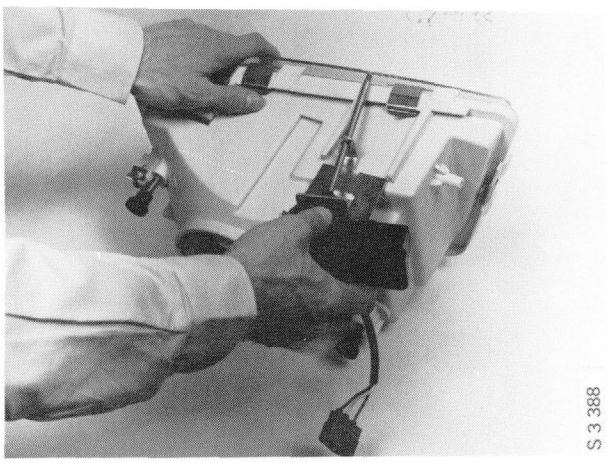
Headlamps

To dismantle (n/a USA)

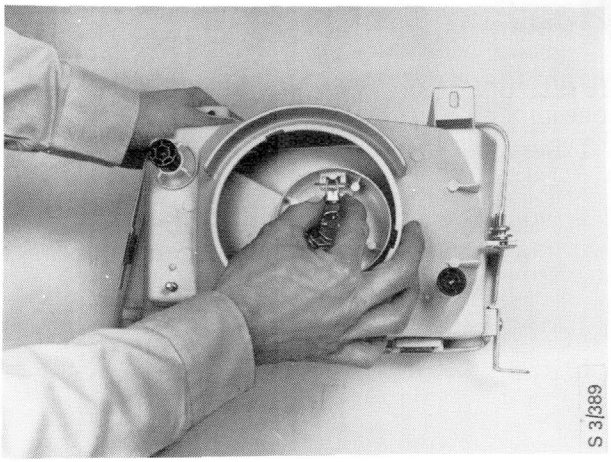
1 Remove the wiper arm and the wiper motor securing screw and pull the motor off the unit.


S 3/386

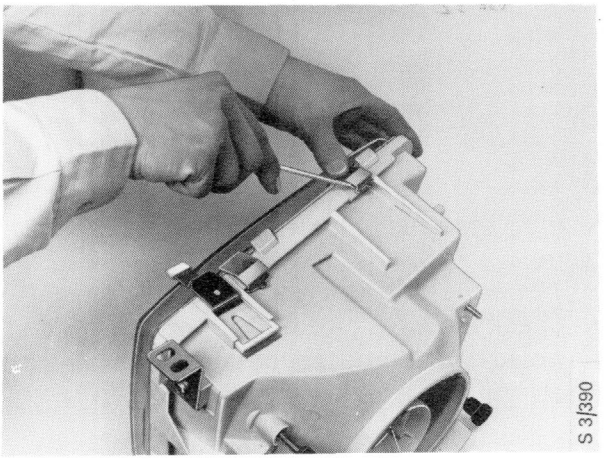

S 3/387


S 3 388

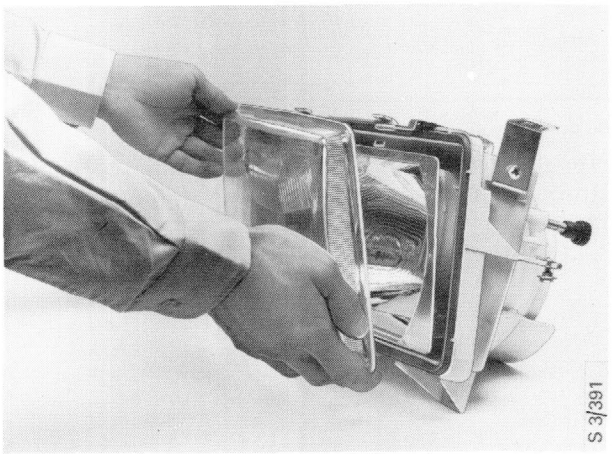
2 Remove the bulb.



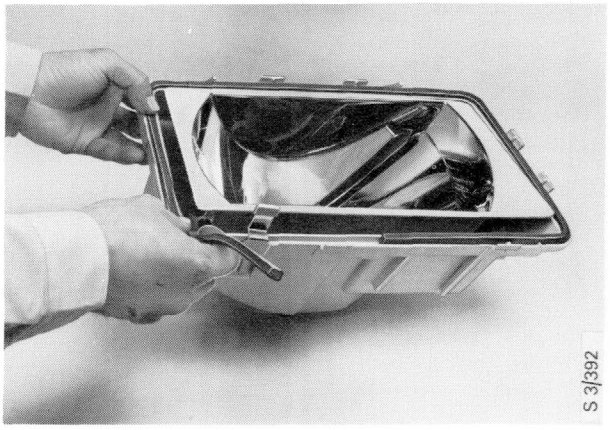
3 Remove the six clips (lever gently against the body of the headlamp unit and not against the glass).



4 Remove the glass complete with gasket.



5 Fit the new gasket carefully to ensure a watertight seal.



To assemble

Reassemble in the reverse order.

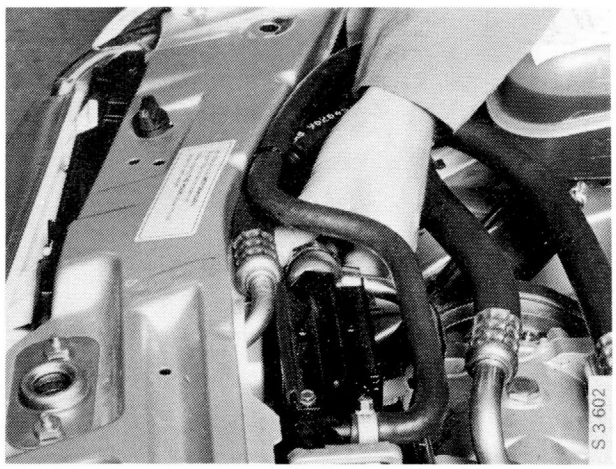
After reassembling and refitting the headlamp, check the headlamp alignment.

Headlamp alignment

Align the headlamps using special aligning equipment.

1 Lift the bonnet.

2 Adjust the lamp by means of the two adjusting screws on the back of the headlamp unit.



Aligning the headlamps with beam setting equipment

- Check the tyres pressures, load the car as it would normally be loaded and position the car at right-angles to the apparatus.
- Set the position of the lens of the apparatus as specified for the make of equipment concerned.

N.B.
Always follow carefully the manufacturer's instructions for using the aligning equipment.

Direction indicators

The direction indicators consist of flashing lights front and rear and on the sides. The indicator lamps are incorporated in the front and rear light clusters, with side repeater lights on the front wings, and flash with an orange light when switched on.

On cars with a USA specification, the direction indicator is combined with a cornering light in the front light cluster. The cornering light emits a white beam of light when the direction indicator for the respective side is operating.

Principle of operation

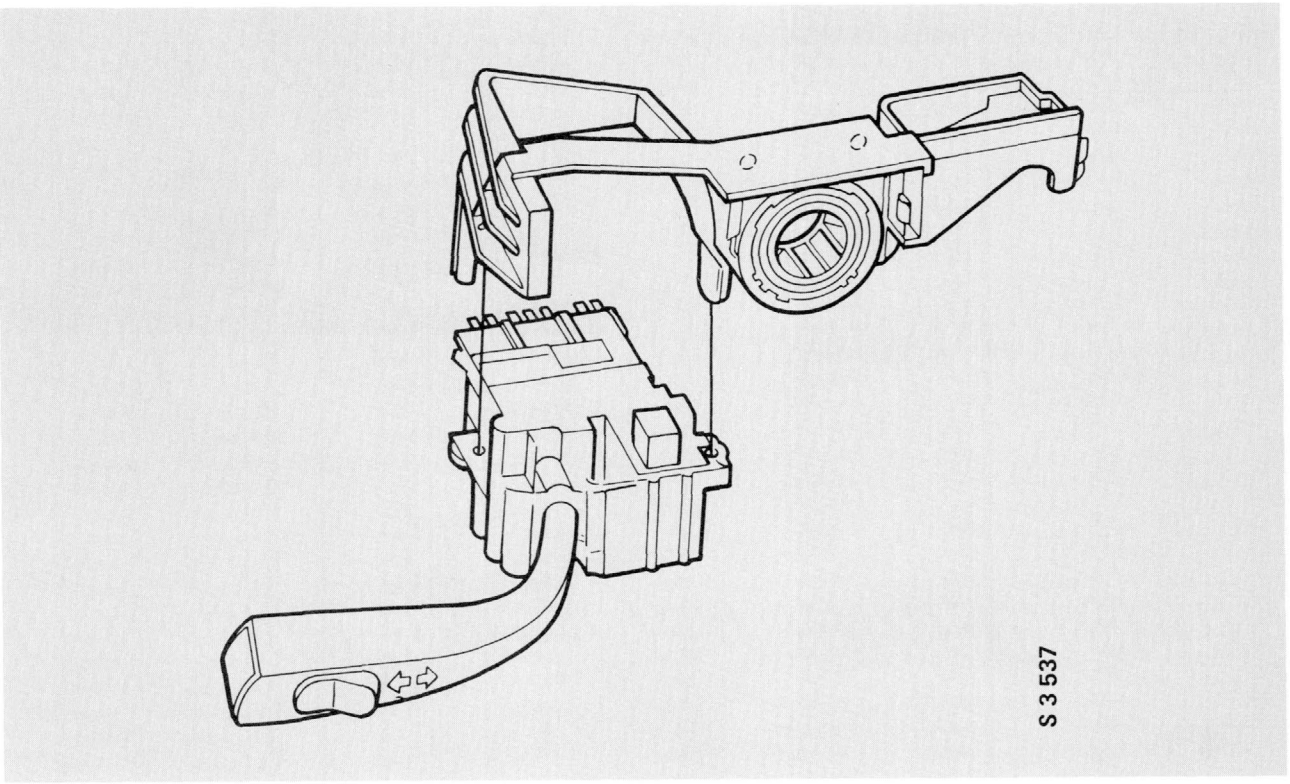
The flashing frequency is controlled by a flasher unit located on the relay panel. The flasher system incorporates two warning lights on the main instrument display panel which flash at the same speed as the direction indicator lights.

If a warning light fails to flash when the indicators are operating, this may be a sign that one of the indicator lamps is not working. With the flasher unit working normally and bulbs of the correct rating fitted, the flashing frequency should be 60 - 120 flashes a minute.

N.B.
If bulbs having a different rating to that specified are fitted, the flasher unit will not operate at the correct frequency.

The direction indicators are controlled by means of a stalk switch to the left of the steering column. The switch also combines a switching function for selection of main or dipped beam.

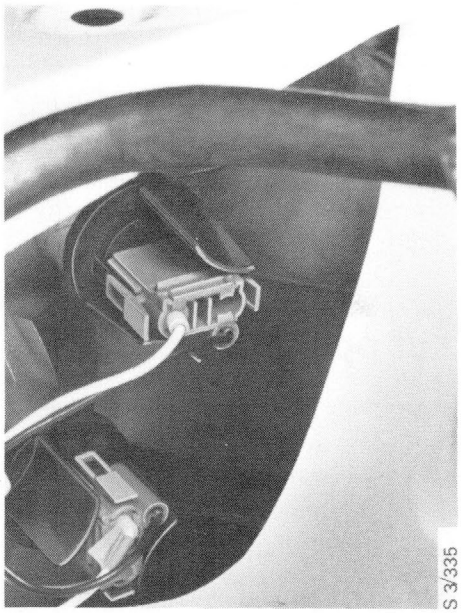
The direction indicators can also be operated as hazard warning lights by means of the switch on top of the flasher switch. When the hazard warning lights are switched on, all direction indicator lamps will flash simultaneously.



Changing the bulbs

Front indicators

1 Twist the bulb holder to release it.

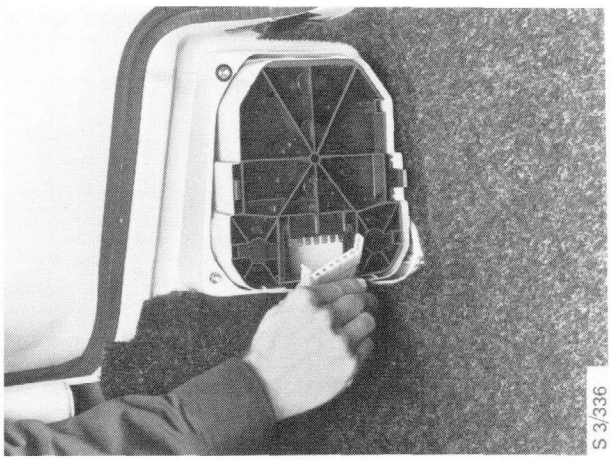


2 Pull out the bulb holder and change the bulb. Do not touch the glass of the new bulb with your fingers.

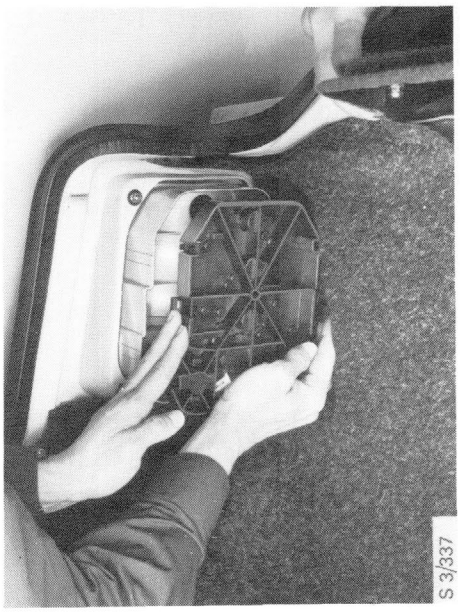
3 Fit the bulb holder and secure it by twisting.

Rear indicators

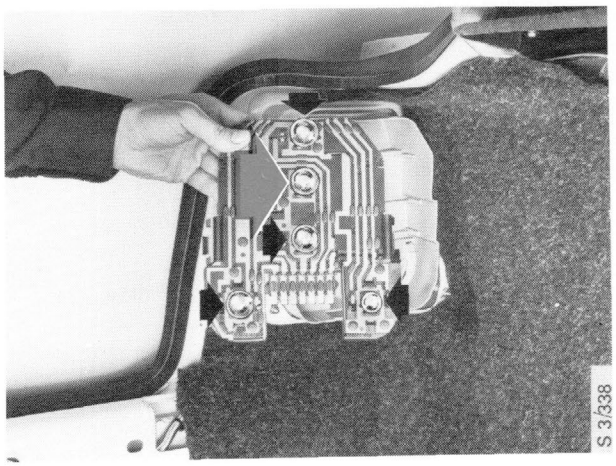
1 Unplug the electrical connector.



2 Depress the clips and withdraw the bulb holder completely.



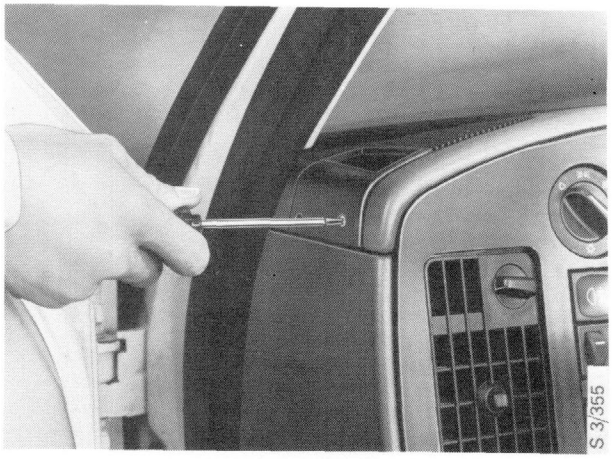
3 Change the bulb, taking care not to touch the glass of the new bulb with the fingers.



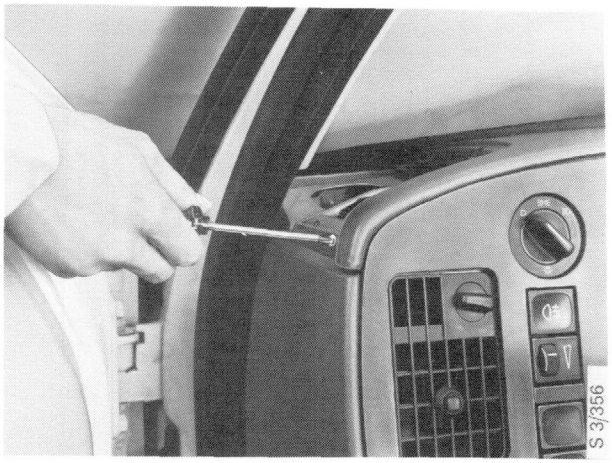
4 Insert the bulb holder and plug on the connector.

Indicator warning (repeater) lights on the instrument display panel

1 Remove the speaker grilles on either side of the panel.



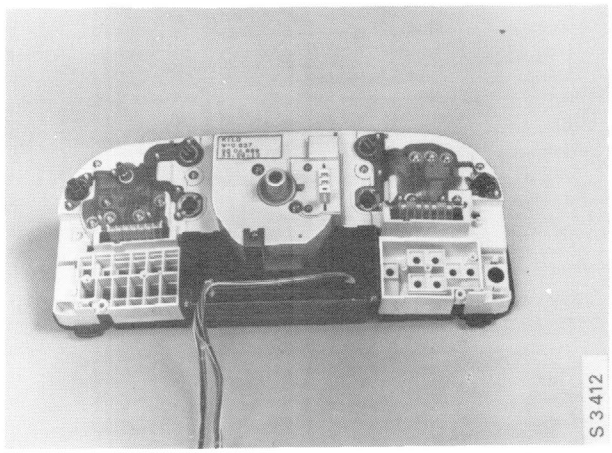
2 Unscrew the top section of the instrument panel (seven screws including one in the glove compartment).



3 Lift off the top section.

4 Remove the duct.

5 The bulbs are now accessible for changing.



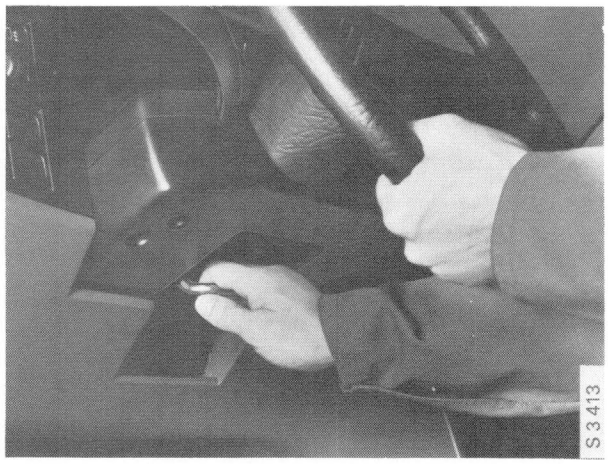
Direction-indicator stalk switch

To remove

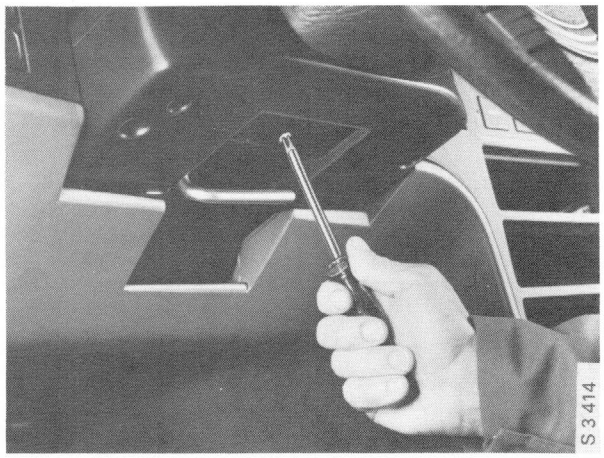
1 Disconnect the negative (-) battery lead.

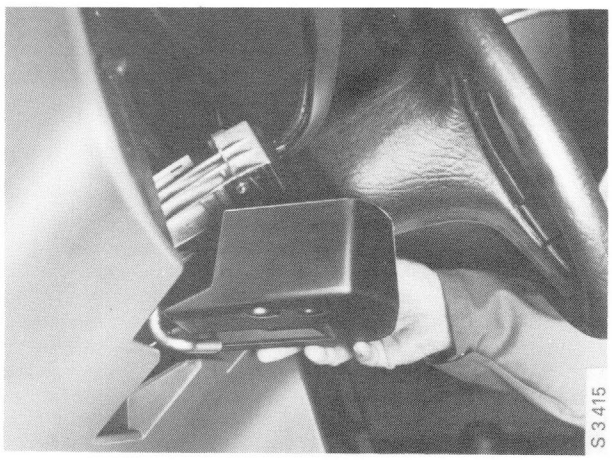
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Pull out the steering wheel as far as it will go.

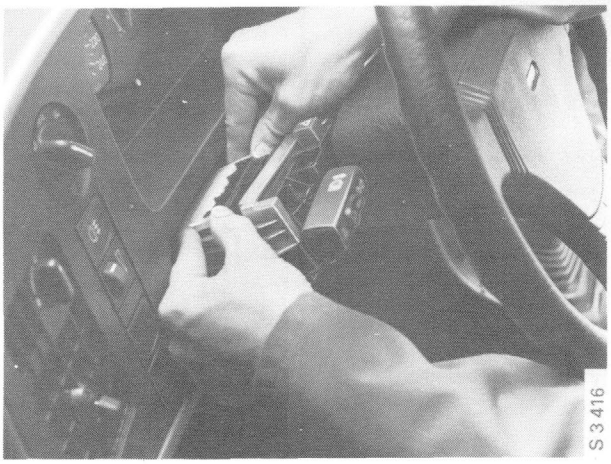


3 Remove the four covers from the steering column bearing bracket (four screws).

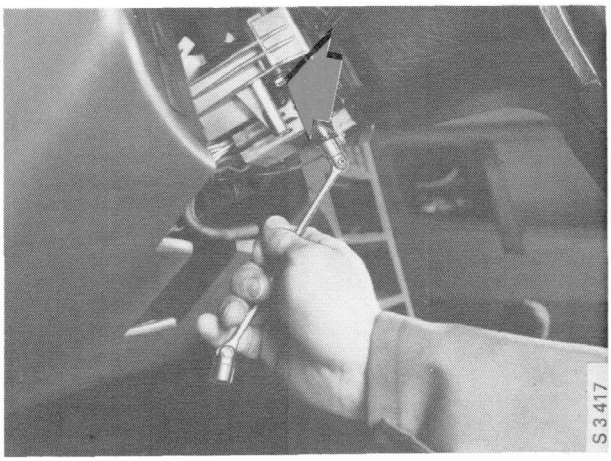




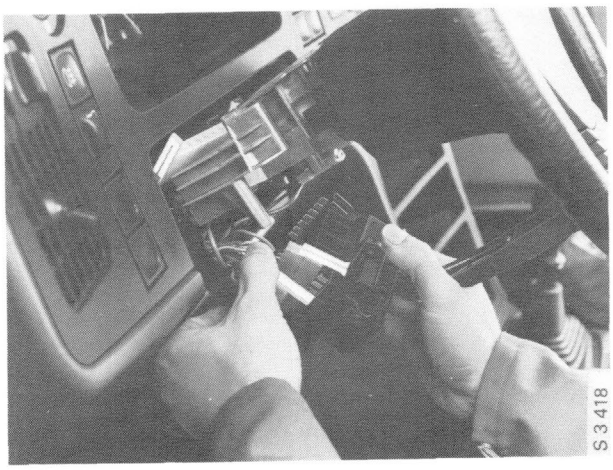
4 Unplug the top connector.



5 Remove the two stalk-switch retaining screws.



6 Pull out the switch and unplug the lower connector.



To fit

Refit in the reverse order.

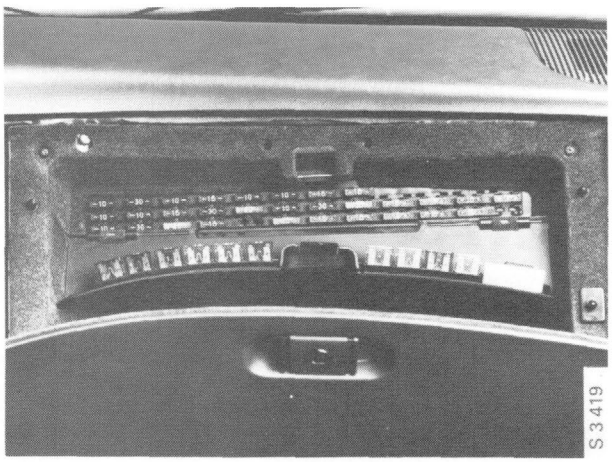
Flasher unit

To remove

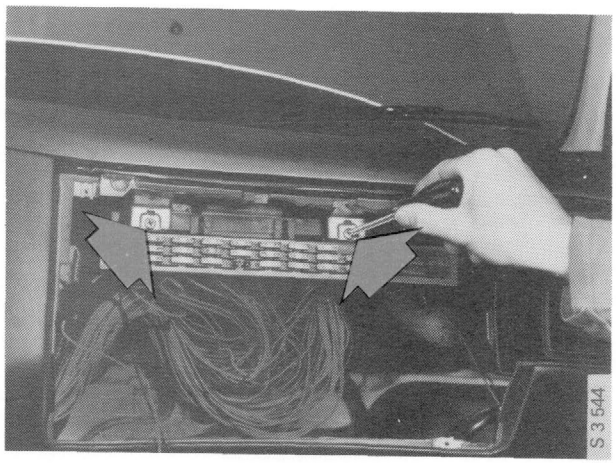
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

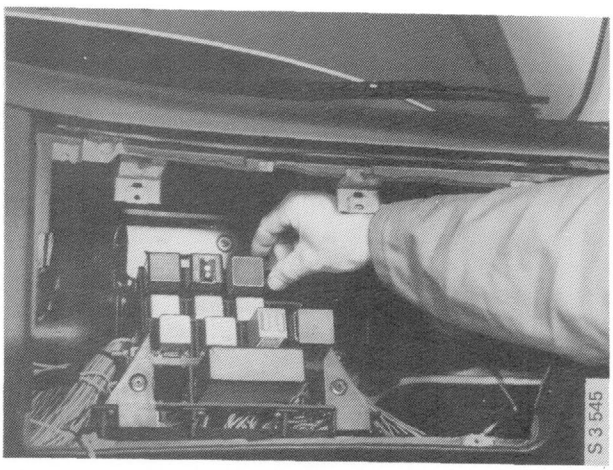
2 Remove the glove compartment.



3 Remove the relay-panel retaining screws. Pull forward the relay panel



4 Remove the flasher unit.



To fit

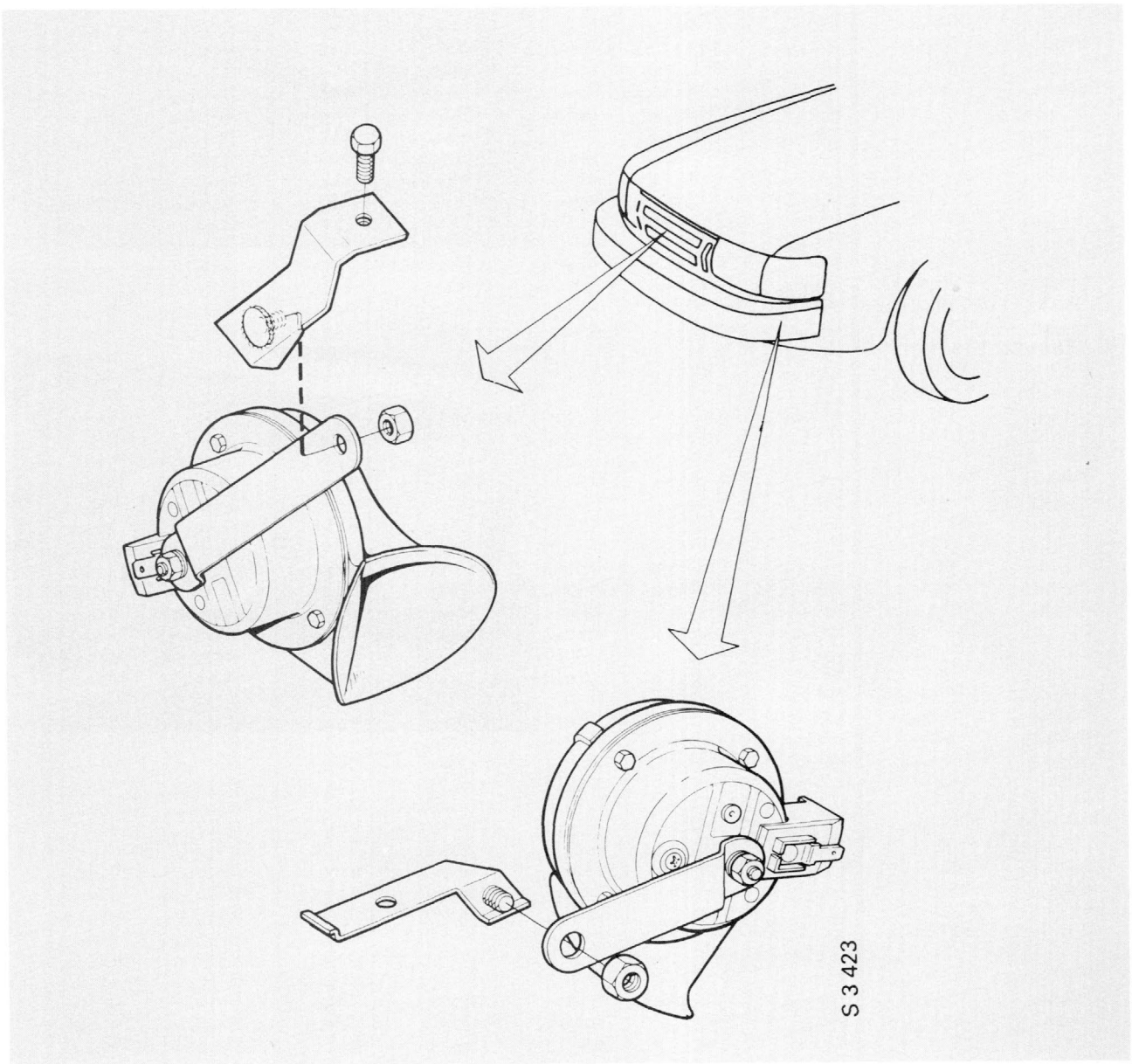
Refit in the reverse order.

Horn, horn controls

The Saab 9000 is fitted with two windtone horns tuned to give two notes: one high and one low.

One of the horns is located between the radiator and the radiator grille and the other inside the left-hand wheel arch.

The horn is actuated by the three buttons incorporated into the steering wheel.



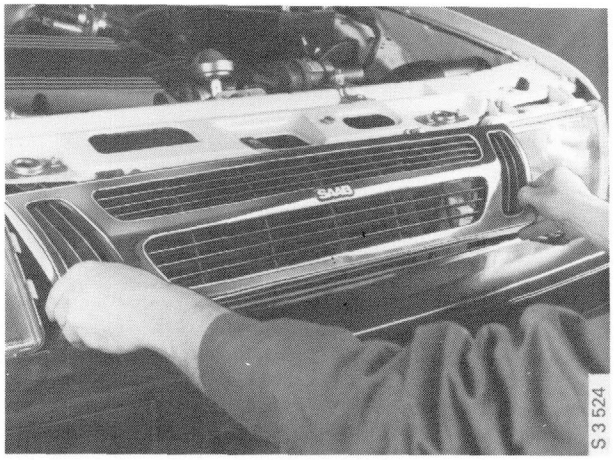
Horn

To remove

1 Disconnect the negative (-) battery lead.

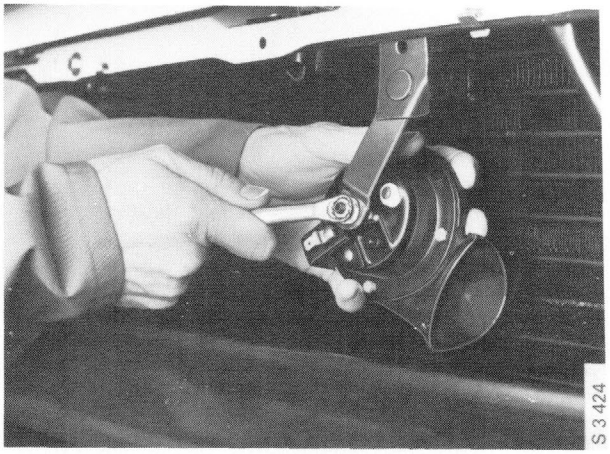
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Remove the radiator grille.

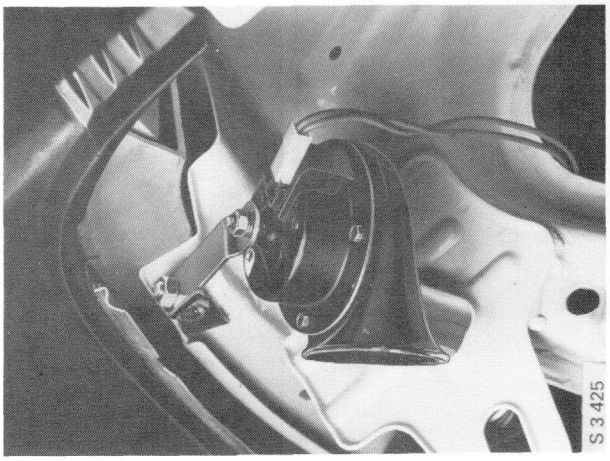


3 Pull off the electrical connector.

4 Remove the horn.



5 Pull off the connector from the horn.



6 Remove the horn.

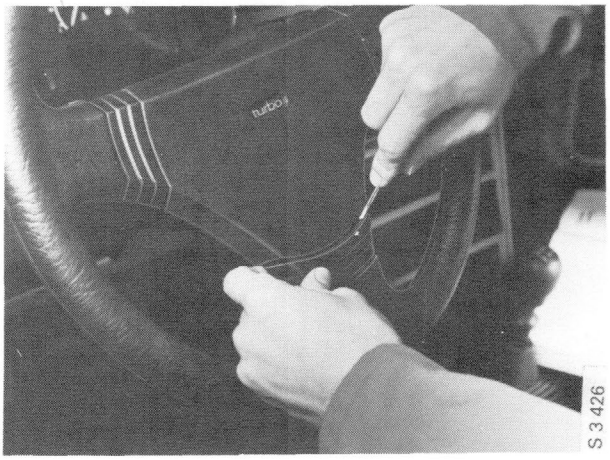
To fit

Refit in the reverse order

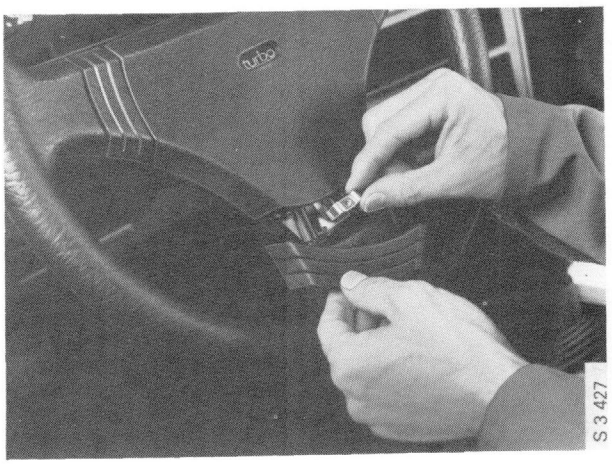
Horn switch

To remove

1 Remove the three horn buttons.



2 Lift out the spring contacts.



To fit

Refit in the reverse order

Wipers and washers

The wiper and washer equipment comprises a unit for the windscreen and, on cars with a specification for Canada, a separate system for each headlamp. The wiper motors incorporate an automatic parking function which always returns the wipers to the same position when they are switched off.

The wiper system for the windscreen includes a two-speed motor and an intermittent relay for intermittent operation of the wipers.

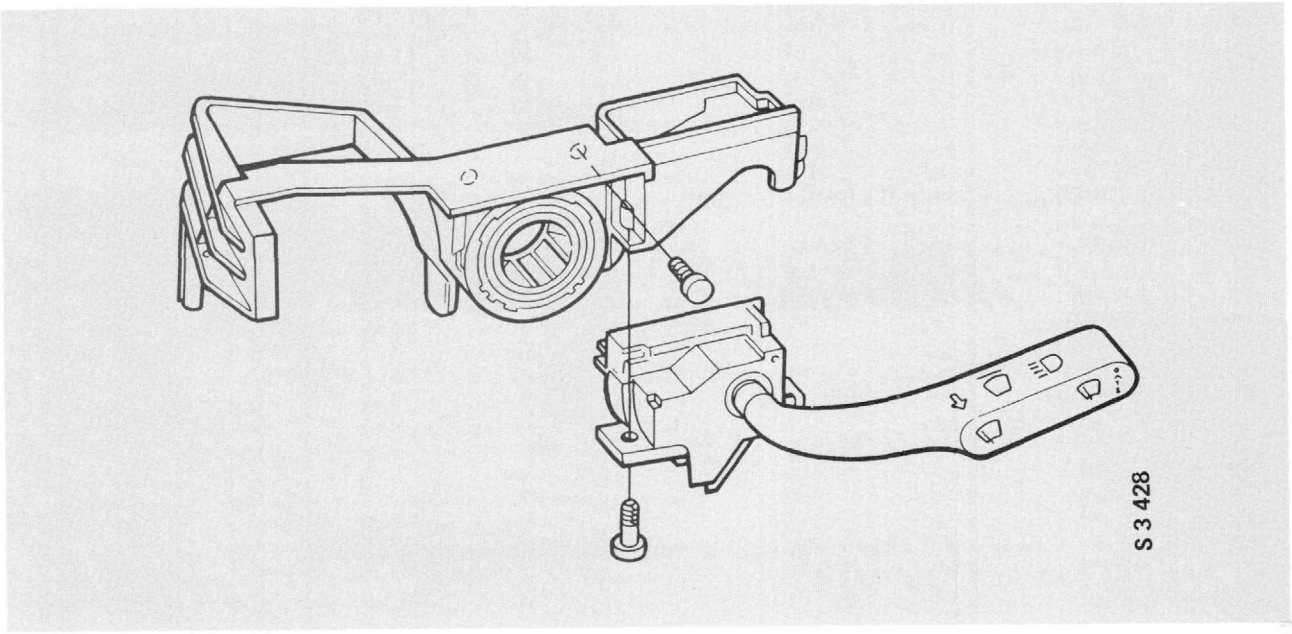
The headlamp-wiper system consists of a separate motor for each wiper, fitted underneath the headlamps. The motors have inbuilt overload protection (e.g. to avoid damage to the motor if the wiper blade is frozen to the glass) consisting of a switch actuated by a PTC resistor connected in series with the motor. A diode in the supply circuit prevents current being reversed and flowing from the motor to the washer pump.

The washer system consists of a fluid reservoir with a built-on pump and fluid-level switch, and hoses and nozzles for the headlamps and windscreen.

The washer reservoir holds about 4.2 l and is mounted under the bonnet on the left-hand wing. The washer pump and fluid level switch are housed inside the bottom section of the reservoir. The fluid-level switch lights up a warning lamp on the instrument display panel when the volume of washer fluid falls below approximately 0.5 l.

The nozzles for the windscreen washers are fitted in the bonnet. The nozzle on the driver's side has two jets and the one on the passenger's side one jet. A non-return valve in the hose to the windscreen-washer nozzles prevents the hose draining when the washers are switched off. The nozzles for the headlamp washers are incorporated in the wiper arms. A pressure valve in the supply hose to these nozzles opens when the pressure has risen to between 0.35 and 0.50 bar. The purpose of this is to guarantee a certain supply of fluid to the windscreen washers before the headlamp washers start to operate.

The wiper/washer systems are operated by means of a stalk switch to the right of the steering column.



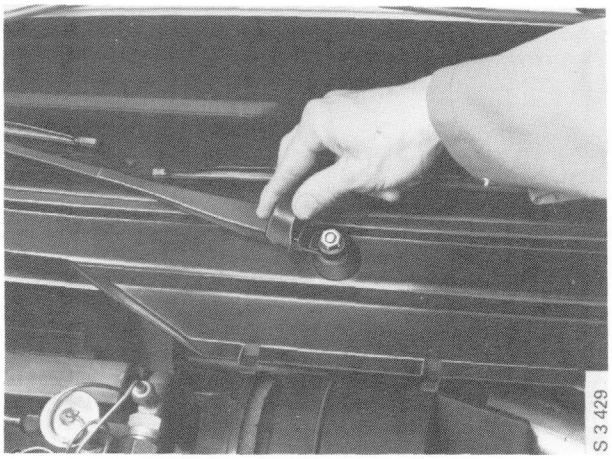
Windscreen-wiper mechanism

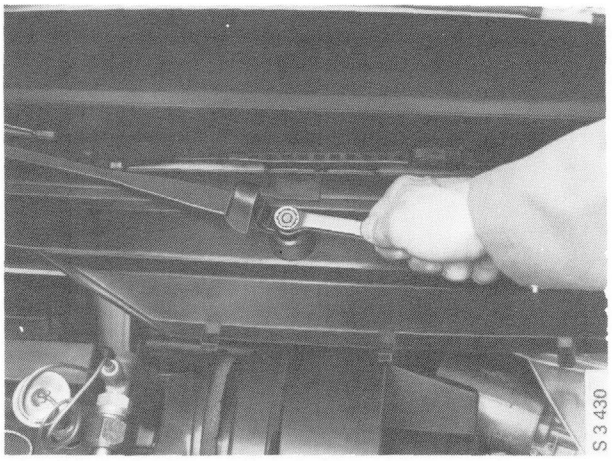
To remove

1 Disconnect the negative (-) battery lead.

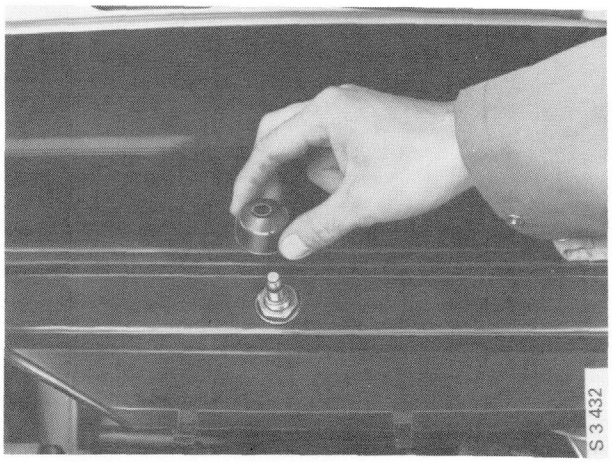
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Raise the covers on the wiper arms, remove the nuts and lift off the arms.

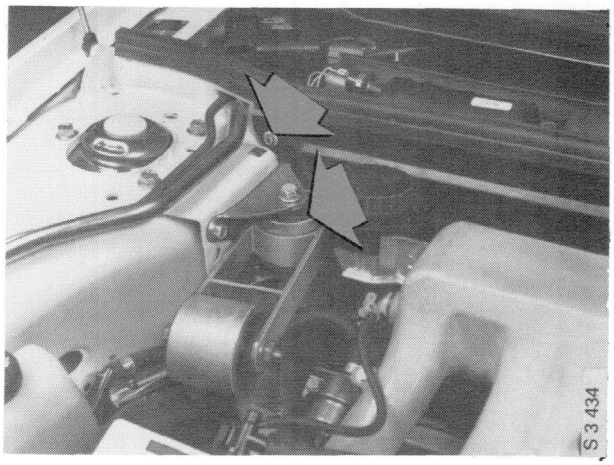




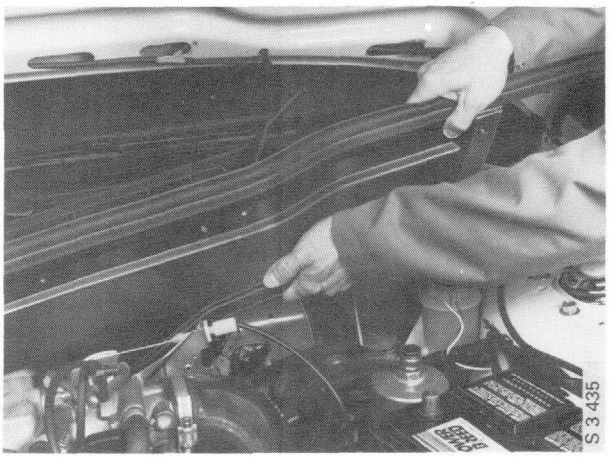
3 Remove the rubber grommets from the spindles.



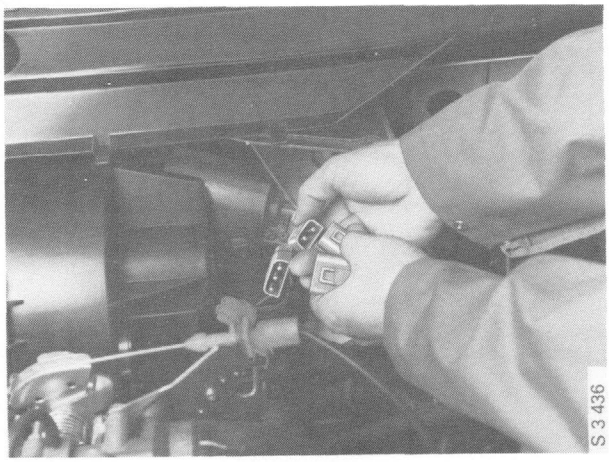
4 Remove the four bulkhead panel bolts.



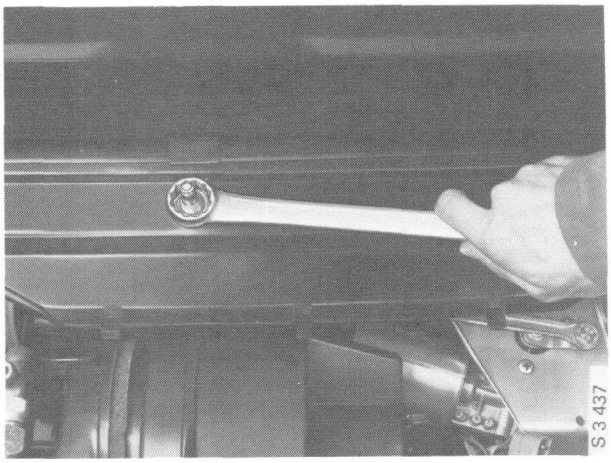
5 Lift out the bulkhead panel.



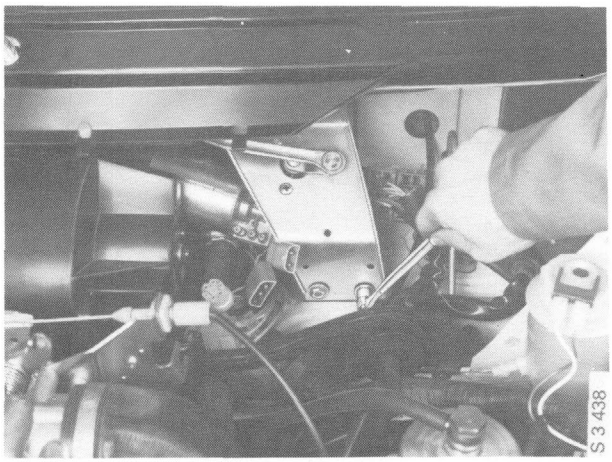
6 Unplug the connectors to the wiper motor.

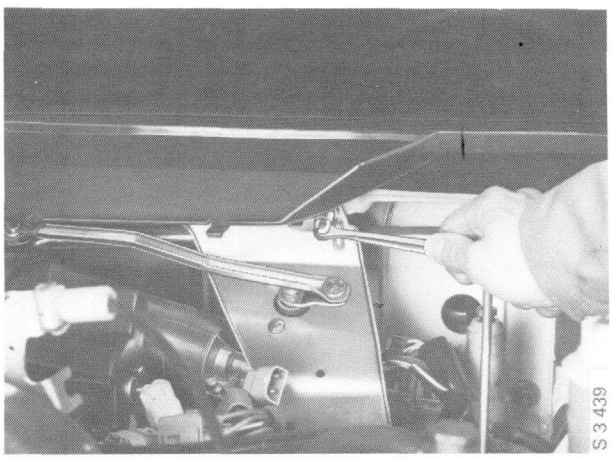


7 Remove the spindle nuts.

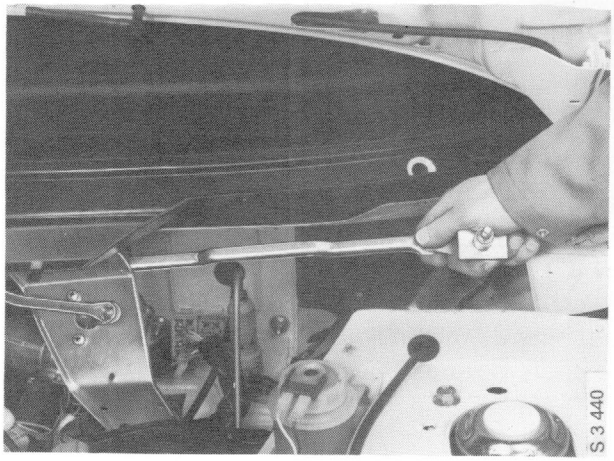


8 Remove the four securing bolts for the wiper-motor bracket.

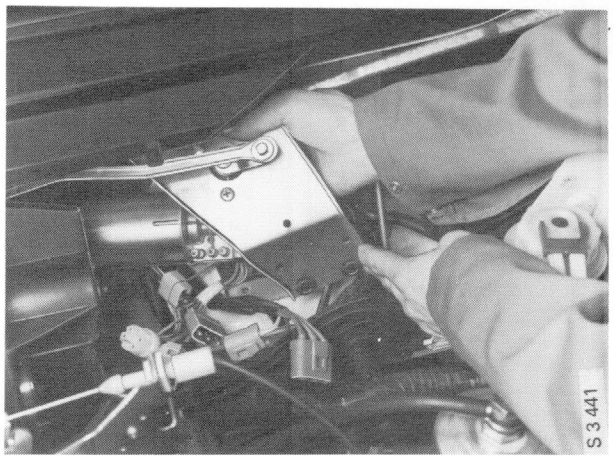




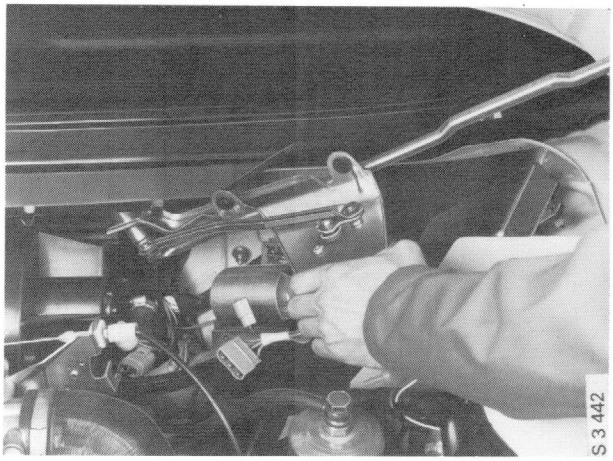
9 Push down and pull forward the pushrod for the left- hand wiper.



10 Lift out the wiper motor complete with bracket and push- rod linkage.



To ease removal, hold down the leads under the wiper- motor bracket as the motor is withdrawn.



To fit

Refit in the reverse order.

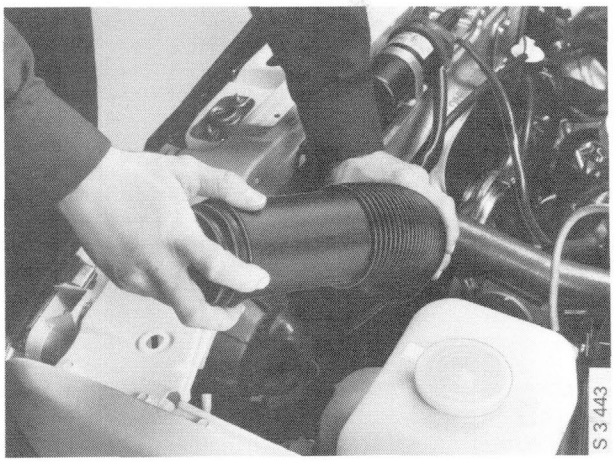
Headlamp wiper assembly

To remove, left-hand side (n/a USA)

1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

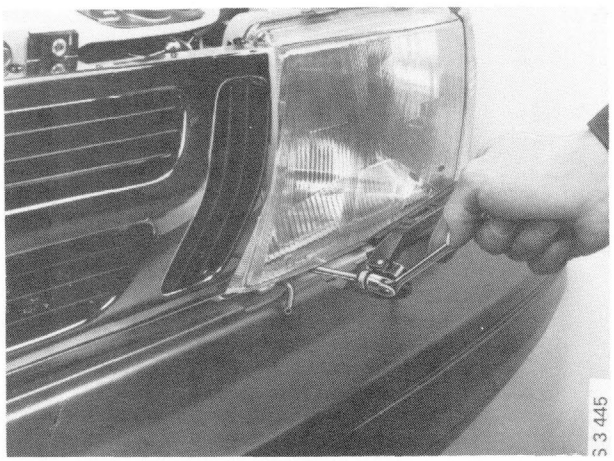
2 Remove the air intake duct.


S 3 443

3 Disconnect the washer hose at the wiper arm.

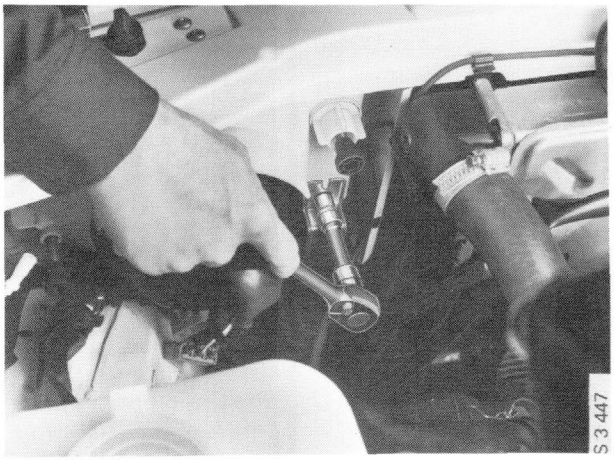

S 3 444

4 Raise the cap over the wiper-arm spindle and remove the nut. Pull off the wiper arm.


S 3 445

5 Unplug the wiper-motor connector.

6 Undo the nut on the wiper-motor clamp and remove the clamp.



7 Remove the wiper motor by pulling it back.

To fit

Refit in the reverse order.

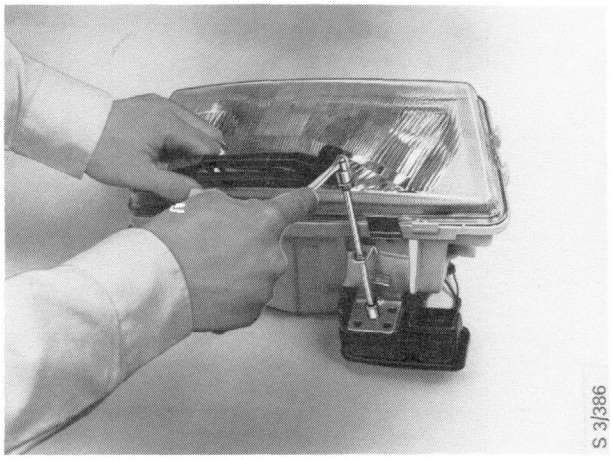
To remove, right-hand side (n/a USA)

1 Disconnect the negative (-) battery lead.

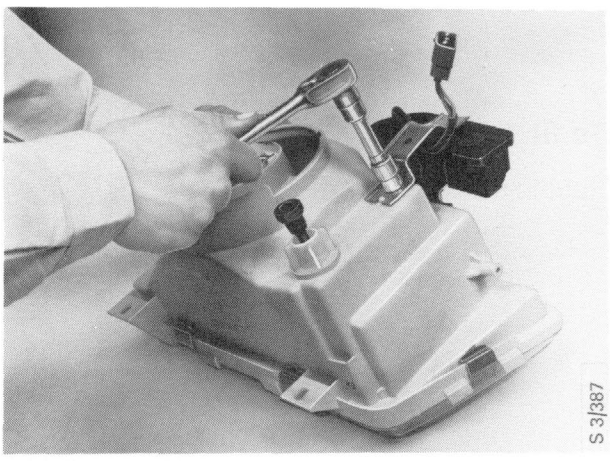
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Remove the headlamp (see Section 351).

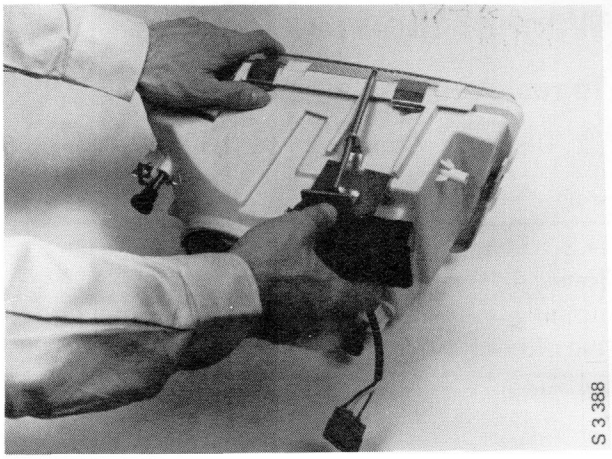
3 Raise the cap over the wiper-arm spindle and remove the nut. Pull off the wiper arm.



4 Undo the nut on the wiper-motor clamp and remove the clamp.



5 Remove the wiper motor by pulling it back.



To fit

Refit in the reverse order.

After refitting the headlamp, check the alignment.

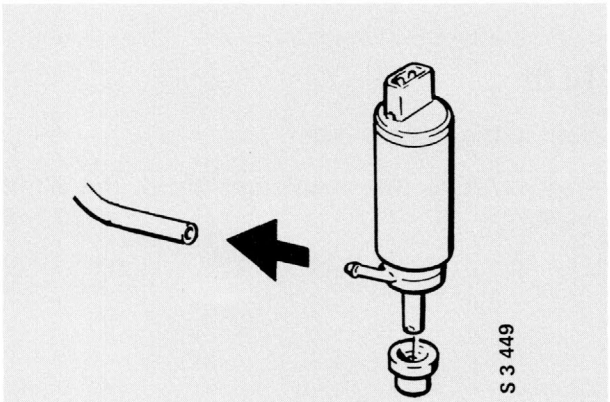
Washer-fluid reservoir

To remove

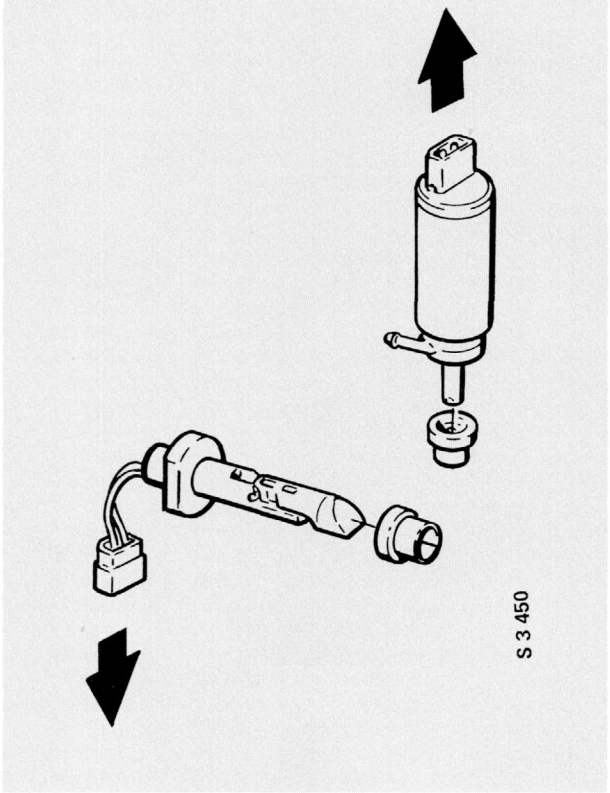
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

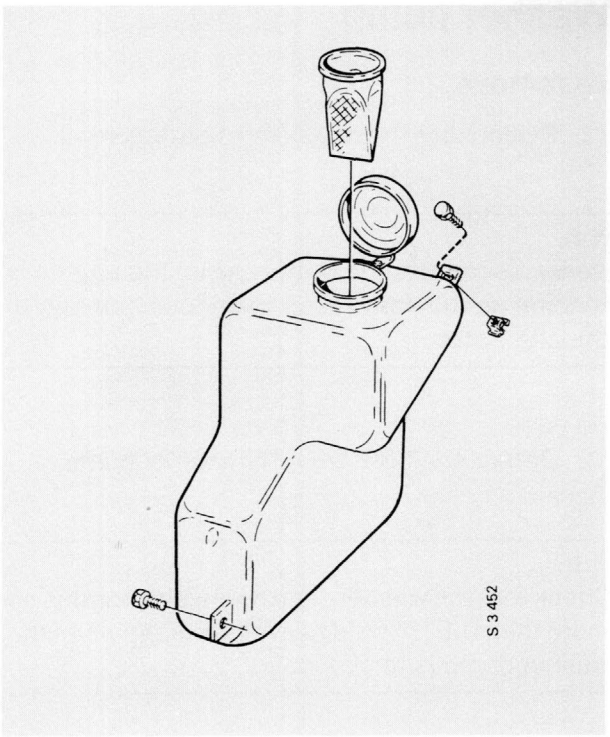
2 Detach the hose from the washer pump.



3 Unplug the connectors from the washer pump and fluid- level switch.



4 Undo the two reservoir securing bolts. Lift out the reservoir.



To fit

Refit in the reverse order.

Washer pump

To remove

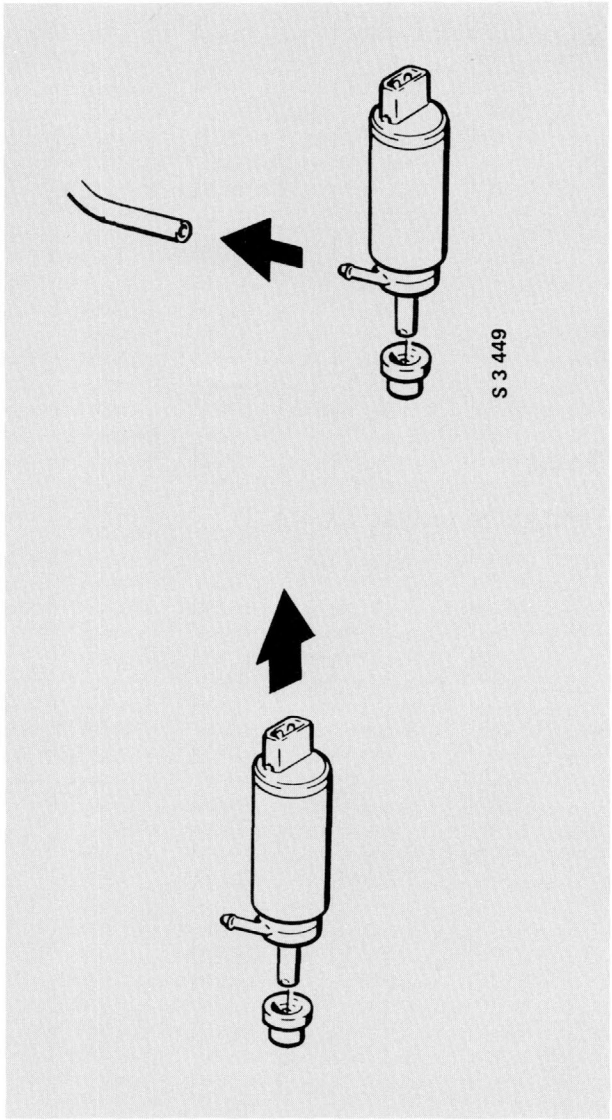
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

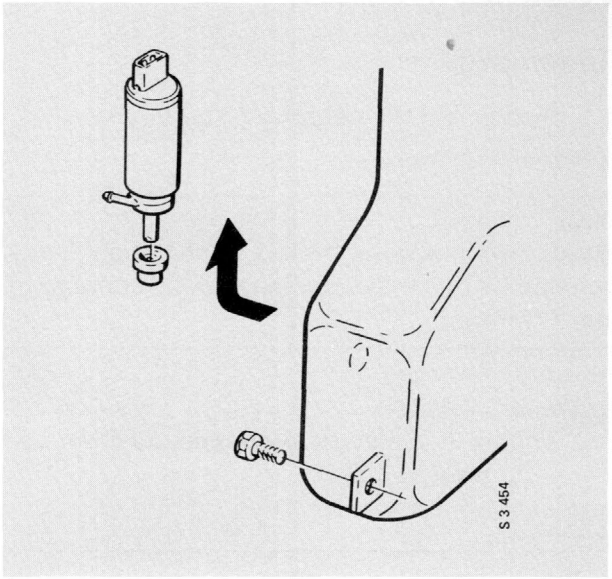
2 Detach the hose from the washer pump.

N.B.
Check that the washer-fluid reservoir contains no more than 0.5 l of fluid to avoid spillage when the washer pump is removed.

3 Unplug the electrical connector at the pump.



4 Remove the pump by easing it out slightly and then withdrawing it straight up through the rubber bush.



To fit

Refit in the reverse order

Fluid-level switch

To remove

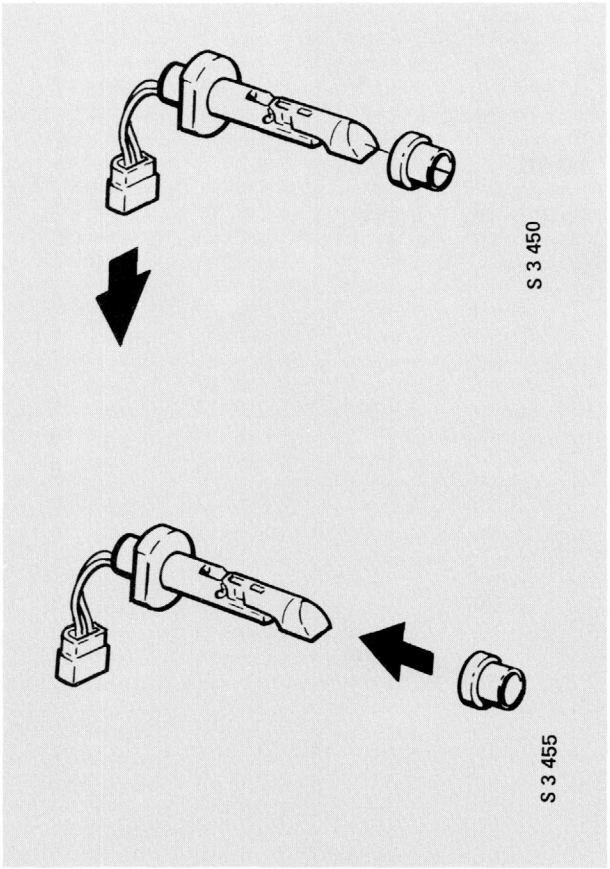
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Unplug the electrical connectors from the fluid-level switch.

N.B.
Check that the washer-fluid reservoir contains no more than 0.5 l of fluid to avoid spillage when the fluid level switch is removed.

3 Remove the fluid-level switch by withdrawing it straight up through the rubber bush.



To fit

Refit in the reverse order.

Electrical controls and switches

Steering-column switches/controls

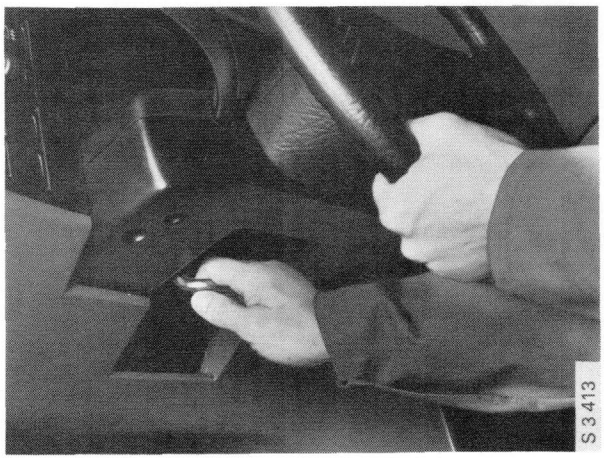
Controls/switches for selection of main/dipped beam, for the direction indicators, wipers and washers, cruise control and the ignition system are located on the steering column. The horn switch is also housed at the top of the column.

To change the direction-indicator switch

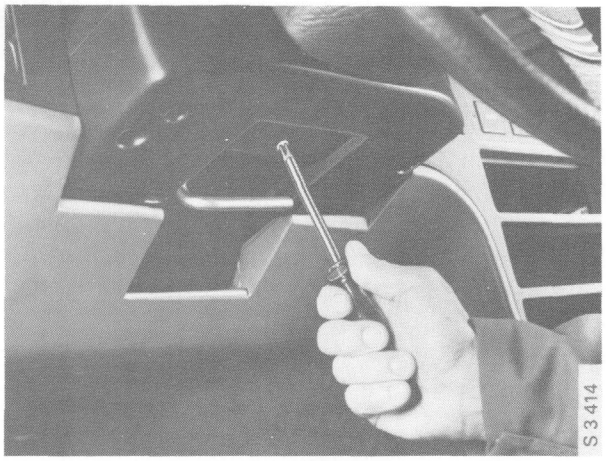
1 Disconnect the negative (-) battery lead.

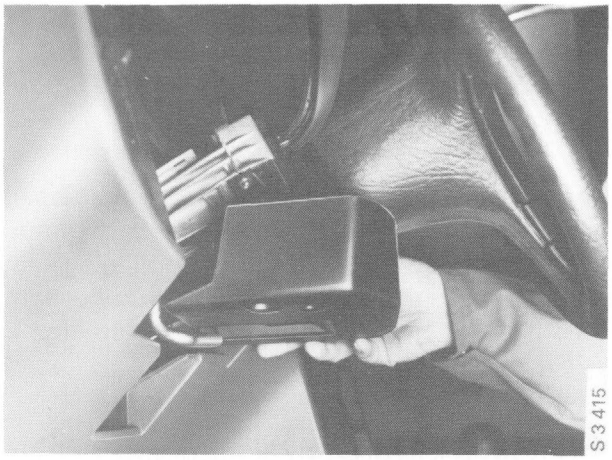
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Pull out the steering wheel as far as it will go.

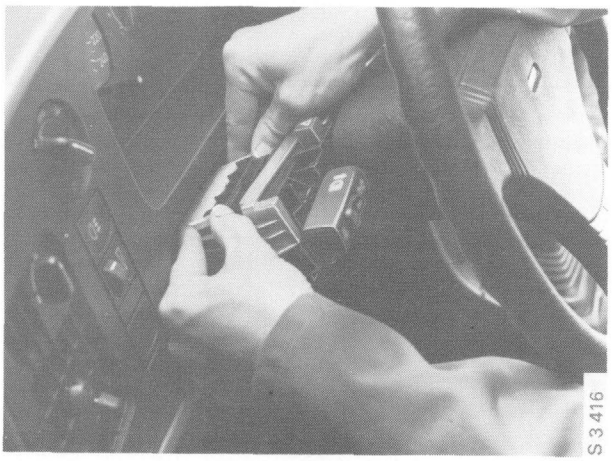


3 Remove the covers from the steering column bearing bracket (four screws).

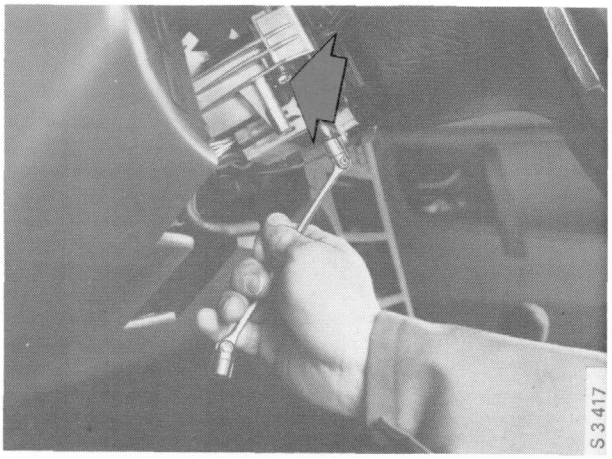




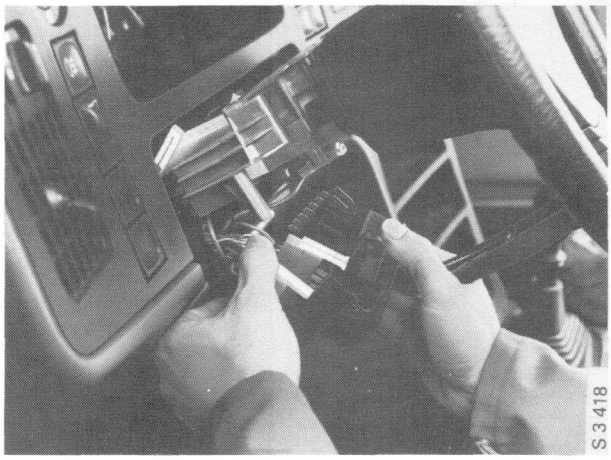
4 Unplug the top connector.



5 Remove the two stalk-switch retaining screws.



6 Pull out the switch and unplug the lower connector.

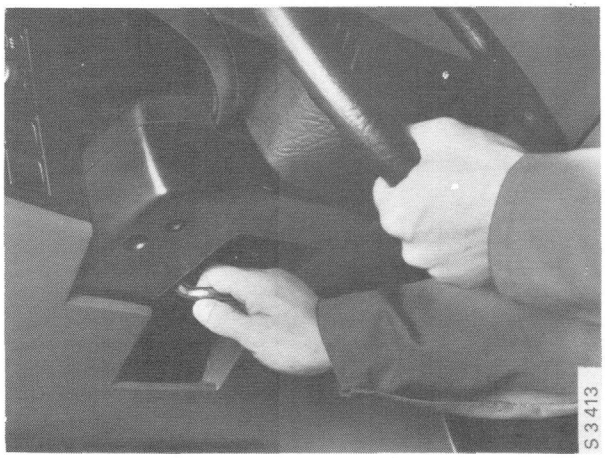


To change the wipe/wash stalk switch

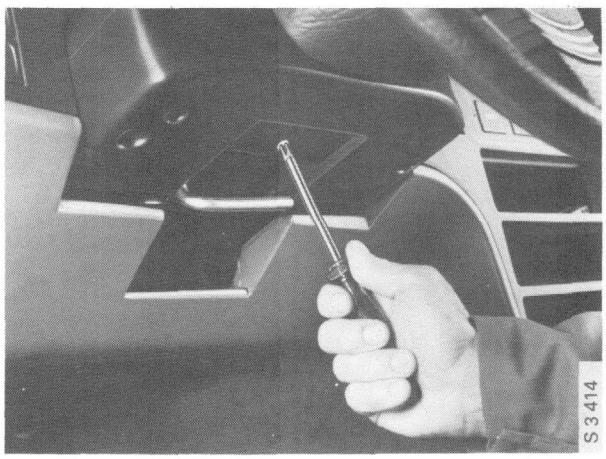
1 Disconnect the negative (-) battery lead.

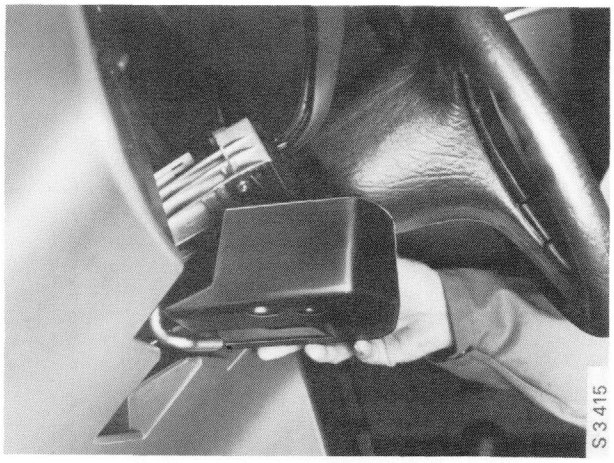
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Pull out the steering wheel as far as it will go.



3 Remove the covers from the steering column bearing bracket (four screws).





4 Unplug the connector.

5 Remove the switch securing screws.

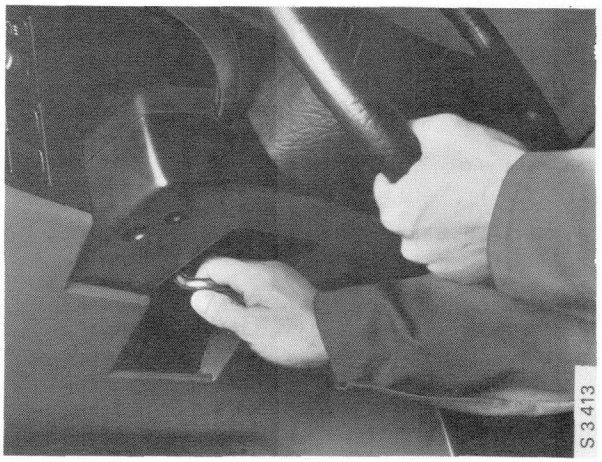
6 Pull out the wipe/wash stalk switch.

To change the ignition switch

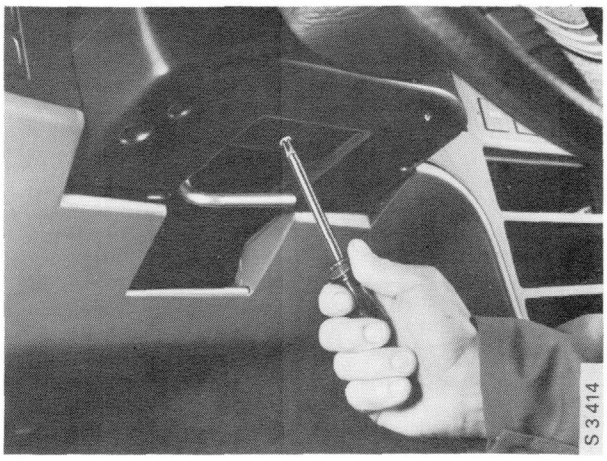
1 Disconnect the negative (-) battery lead.

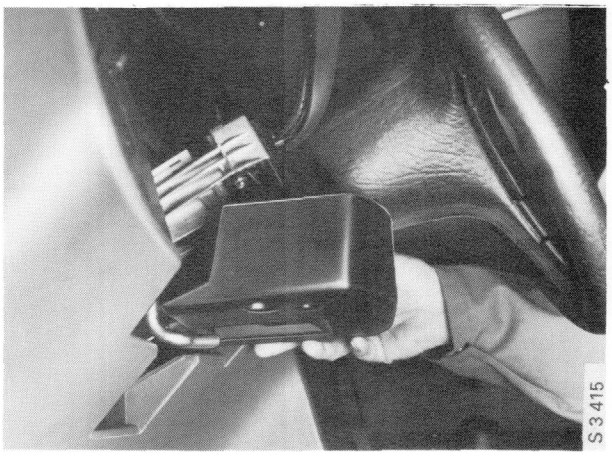
N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Pull out the steering wheel as far as it will go.

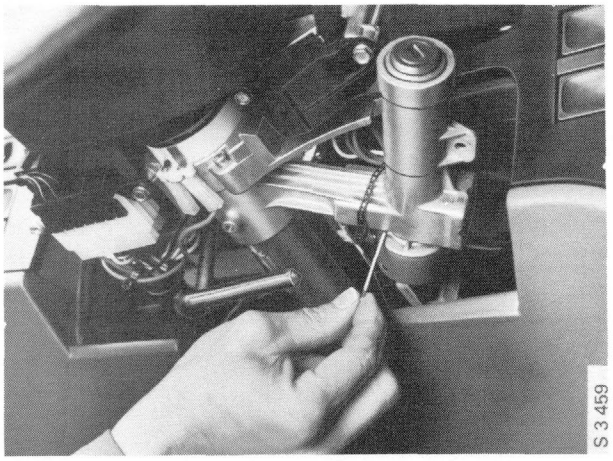


3 Remove the covers from the steering column bearing bracket (four screws).

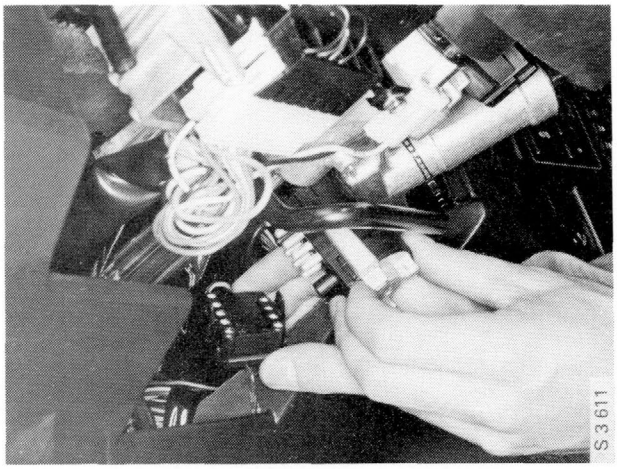




4 Remove the two Allen screws from underneath the switch unit.

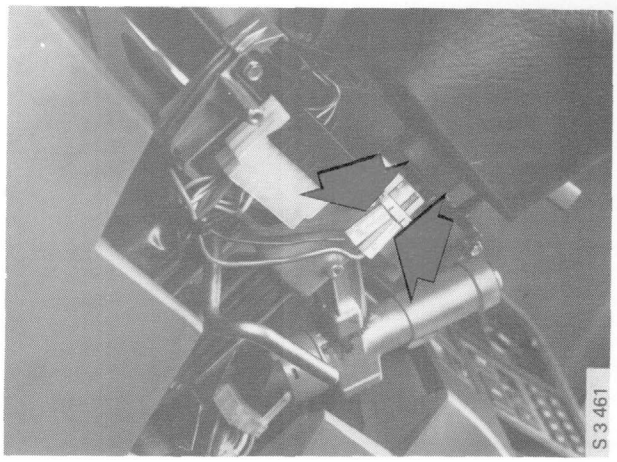


5 Pull forward and unplug the electrical connector for the ignition switch.



Horn switch

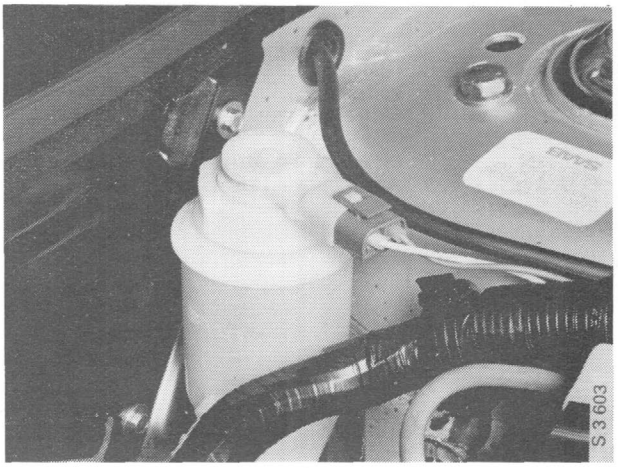
The connector for the horn switch is located underneath the steering column.



Brake warning light switch

The switch for the brake warning light is fitted in the filler cap on the brake fluid reservoir. The switch is actuated by a float which senses the fluid level in the reservoir. When the fluid drops below a predetermined level, the switch closes and the warning light on the instrument panel comes on.

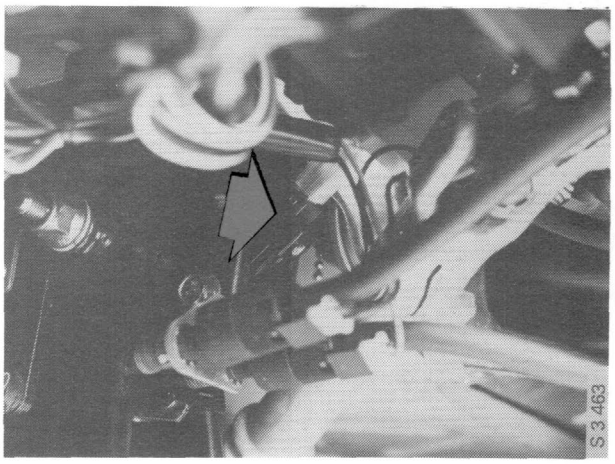
To check whether the switch is operating properly, depress the contact in the centre of the filler cap.



Brake light switch

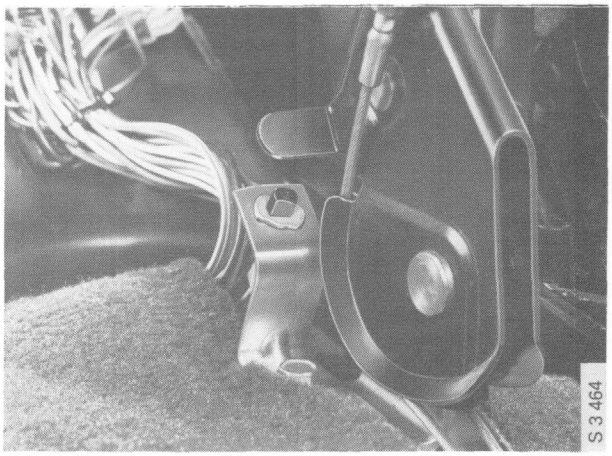
The brake light switch is actuated mechanically by the brake pedal. The switch is located in the pedal assembly adjacent to the pushrod to the brake servo unit.

The switch should be adjusted so that the brake lights will come on when the pedal has been depressed approximately 10 mm.

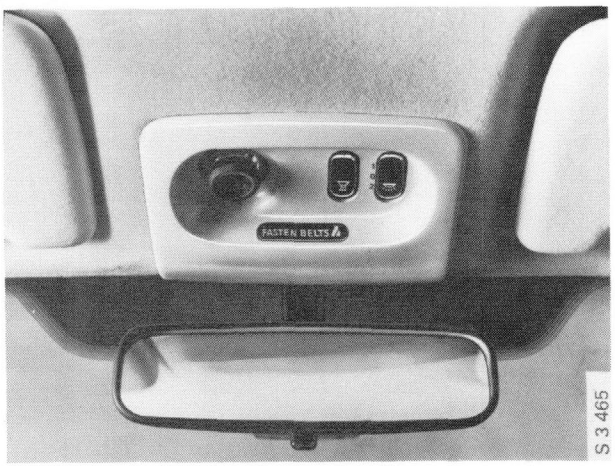


Switch for handbrake warning light

The switch for the handbrake warning light is fitted to a bracket under the handbrake lever. The switch is accessible after the rear section of the centre console has been removed.



Seat belt warning light



A warning light on the overhead panel will come on if a front-seat occupant has neglected to fasten his/her seat belt.

The seat-belt warning system includes the following components:

- Warning light on overhead panel
- Switch in passenger seat
- Contacts in belt buckle.

The seat belt warning light will come on if the ignition is switched on and:

a The driver's seat belt has not been fastened or

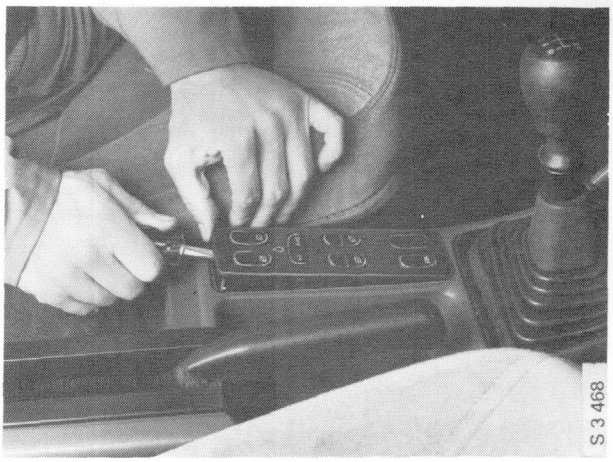
b The front passenger seat is occupied and the seat belt has not been fastened.

Switches for electric windows/ sunroof

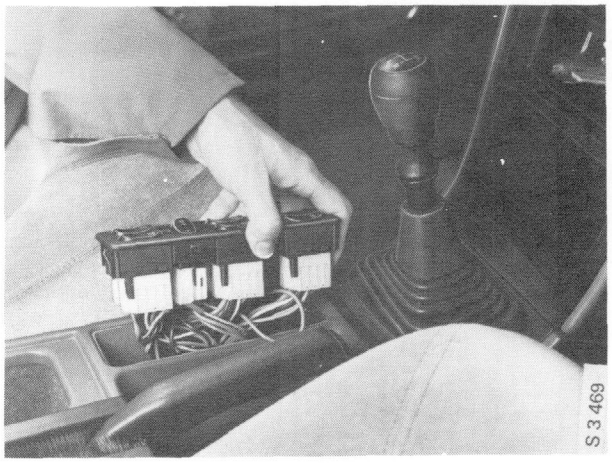
The switches for the electric windows and sunroof are located on the centre console between the front seats. All windows and the sunroof can be operated from this array of switches. A master switch on the panel enables the driver to render inoperative the window switches on the rear doors.

To remove

1 Gently prise up the switch panel using a screwdriver.

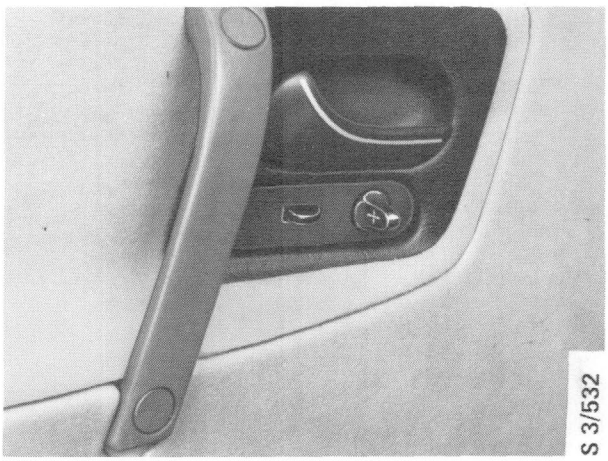


2 Lift off the panel.



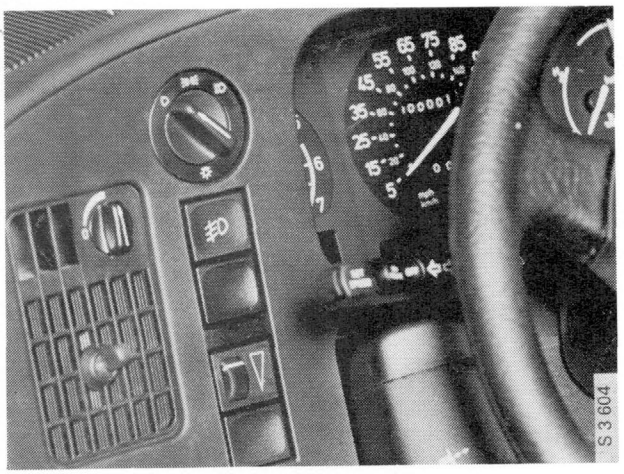
Door-mirror switches

The switches for adjusting the door mirrors are located on the driver's door. The appropriate mirror is selected by means of the forward switch and the selected mirror is then adjusted by means of the rear switch.



Dimmer switch for panel lighting

The dimmer switch for the panel lighting is located to the left of the steering column on the instrument panel.



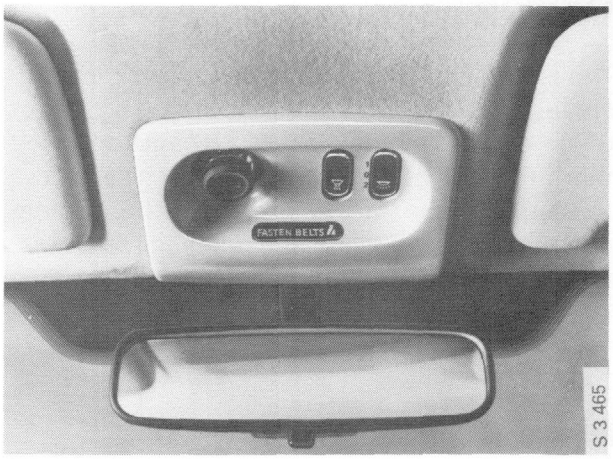
To remove

1 Prise off the knurled knob.

2 Unplug the connector.

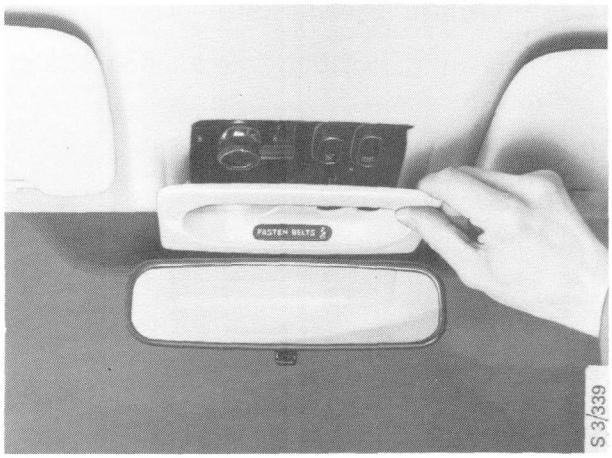
Switches for interior lighting

The main switch for the interior lighting and the switch for the front spotlight are located on the overhead panel. The switches for the rear reading lights are incorporated in the individual lamps. The interior lights are also operated by microswitches in the doors.

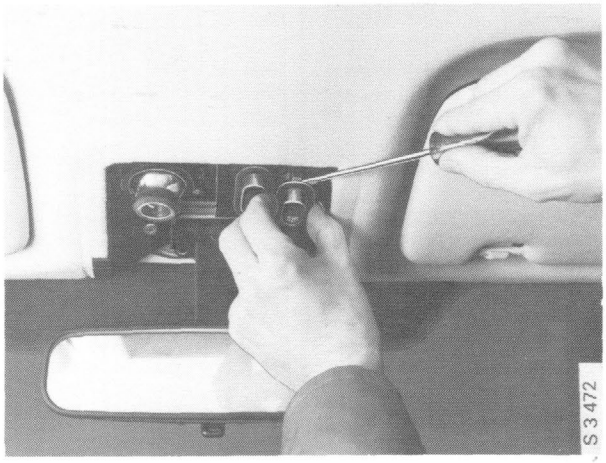


To remove switch on overhead panel

1 Lift off the panel cover.

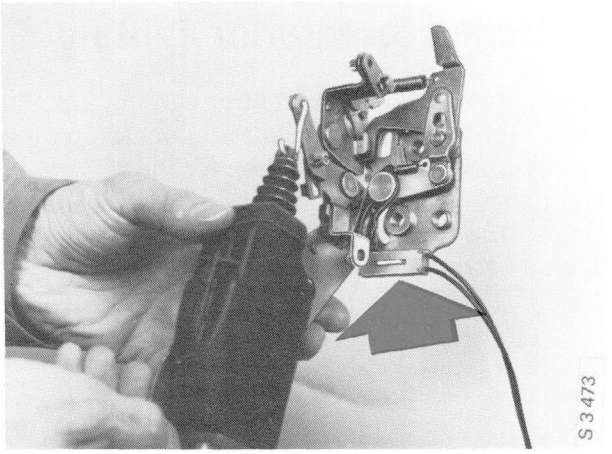


2 Pull out the switch.



Door sensors

The pictogram on the main instrument panel includes warning lights that show that a door or doors is not properly closed. Signals conveying this information are sent by a sensor fitted in the locking mechanism of each door. The sensors contain no moving parts and respond to the position of the magnet in relation to the sensor unit.

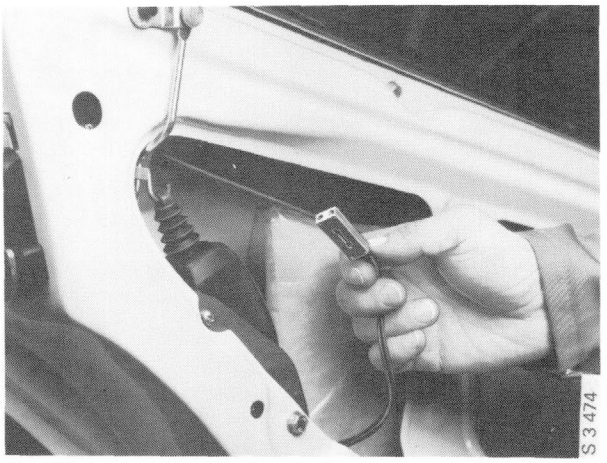


To remove the door sensor

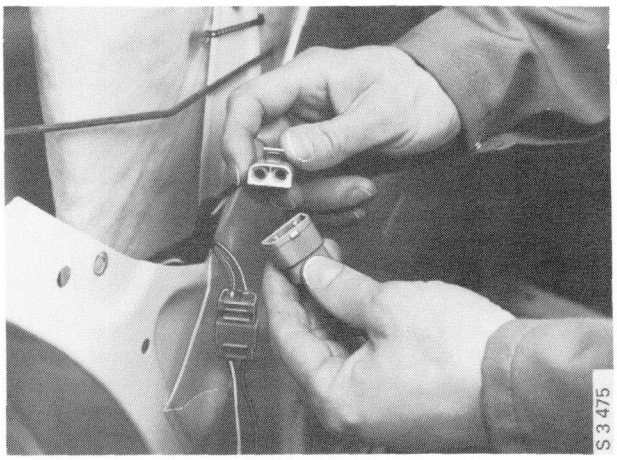
1 Remove the door trim (see Section 851 in Group 8).

2 Remove the plastic foil.

3 Remove the sensor unit.

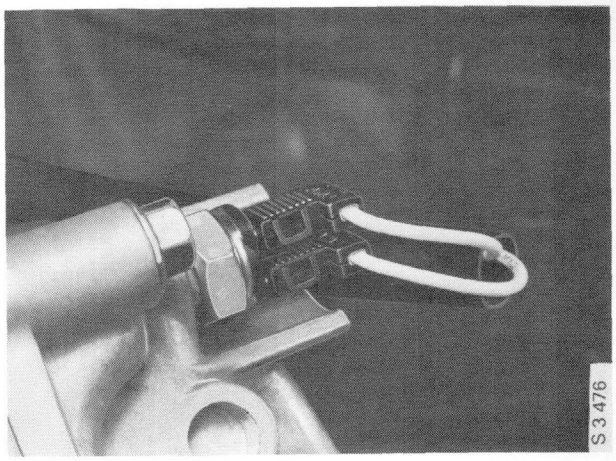


4 Unplug the connector.



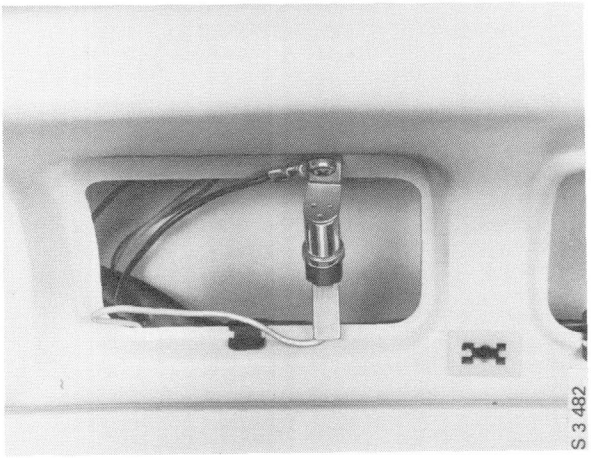
Reversing-light switch

The reversing-light switch is fitted in the left-hand end cover on the gearbox.



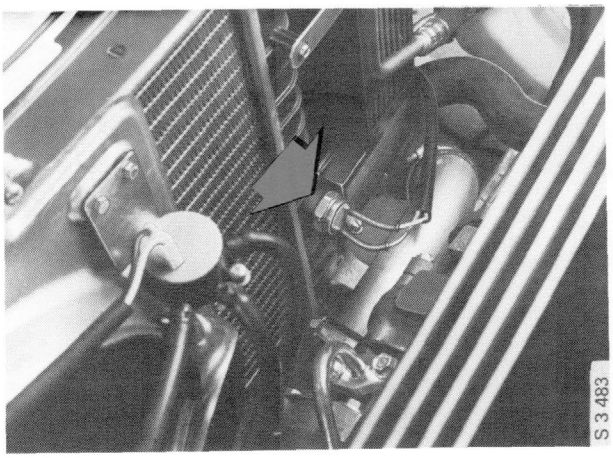
Switch for luggage compartment light

The switch for the luggage compartment light is a mercury switch, located inside the luggage-compartment door. The switch is actuated by opening of the door.



Thermostatic switch for radiator fan

The thermostatic switch for the radiator fan is fitted to the bottom right-hand corner of the radiator.



Cables, fuses and relays

Cables

The wiring network in the Saab 9000 consists of individual colour-coded and insulated cables bound together in wiring looms which run from the power distribution panel (fusebox) located behind the glove compartment inside the car. The power distribution panel also houses the fuses and relays.

To obviate voltage drops due to poor contact in connectors, the wiring network largely consists of a continuous loom. From the power distribution panel, wiring looms run to the engine compartment, the instrument panel, the inside of the car and the rear of the car. Two 8-pin connectors in the engine compartment join the wiring looms for the engine to the main loom.

All wiring connections are made by solder-free connectors. In the event of a problem in a circuit, check that the fault is not the result of poor contact in the relevant connector, resulting in an unnecessary voltage drop.

Should a fuse or fuses blow frequently, or if a breakdown in insulation is suspected, an insulation test should be carried out on the wiring loom.

N.B.
Remember that a short-circuit in the line between the power source and the fuse will not blow the fuse.

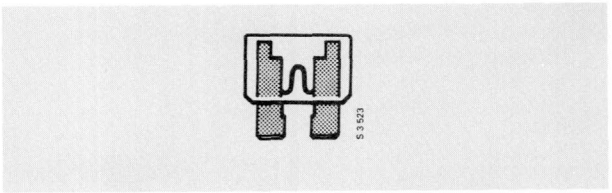
When fitting new cables, always make sure that the cable size is suitable for the current it must carry and that the cable is suitably protected by grommets where it passes through the bodywork, etc., and where it is held by clips.

Wiring diagrams and a description of the principle of operation of the different circuits and systems are given in Group 3:2 of the Service Manual ('Electrical Systems and Wiring diagrams').

Fuses

A number of fuses are fitted in the electrical system of the car to protect the circuits from abnormal surges of current and to reduce the risk of fire from short-circuiting, etc. The fuses are located on the power distribution panel behind the glove compartment. To gain access for checking or changing the fuses, remove the cover from the top of the glove compartment.

The fuses are of the plug-in type with two flat pins which plug into connectors on the power distribution panel.



This type of fuse blows more rapidly than conventional fuses, which means that the circuits are more sensitive to short overloads. It is therefore important when changing a fuse to make sure that the new one is of the correct amperage rating. If the rating is too low, the fuse will easily be blown; if the rating is too high, there is a high risk that components in the circuit may be damaged.

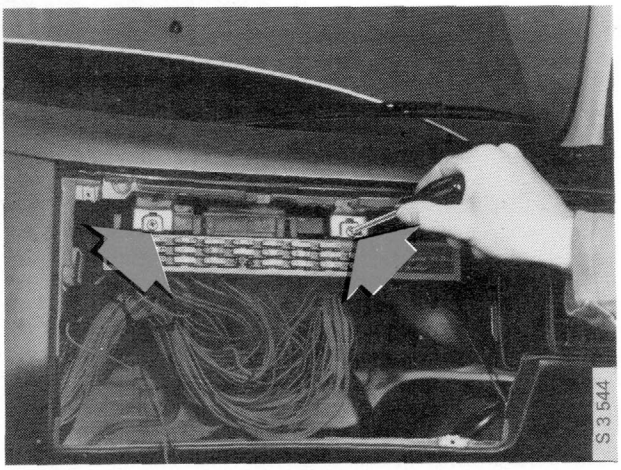
The following fuse ratings are used in the Saab 9000:

Colour	*Value*
Red	10 A
Blue	15 A
Yellow	20 A
Clear	25 A
Green	30 A

In addition to the colour coding, the amp rating is marked on each fuse.

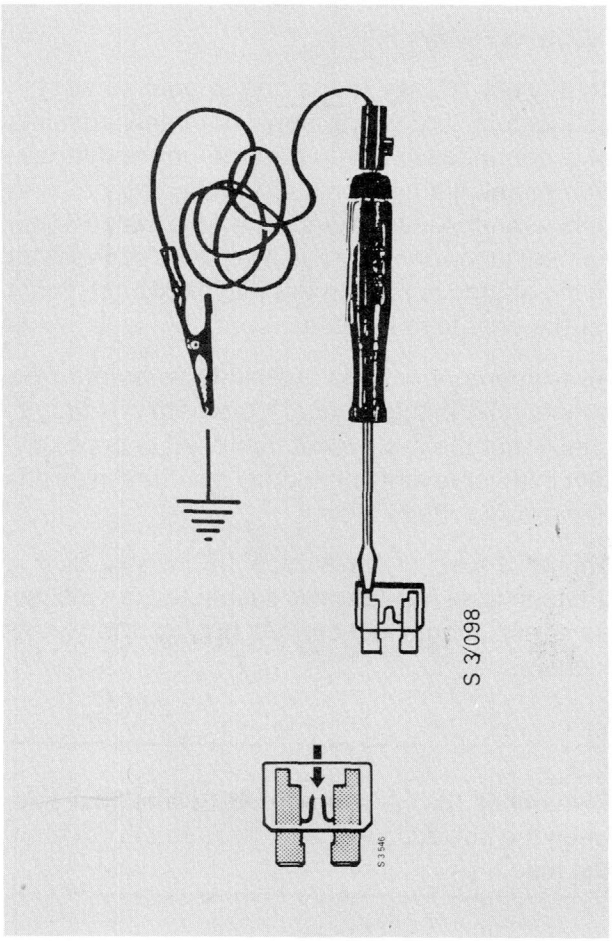
Relays

The relays are also located on the power distribution panel behind the glove compartment. To check or replace a relay, remove the glove compartment and pull the relay unit forward.



Checking fuses

Two test sockets are incorporated in each fuse to enable the fuse to be checked without the need to remove it. If power is present at both connectors, the fuse is intact.



It is also possible to see whether a fuse has blown by removing it from the panel.

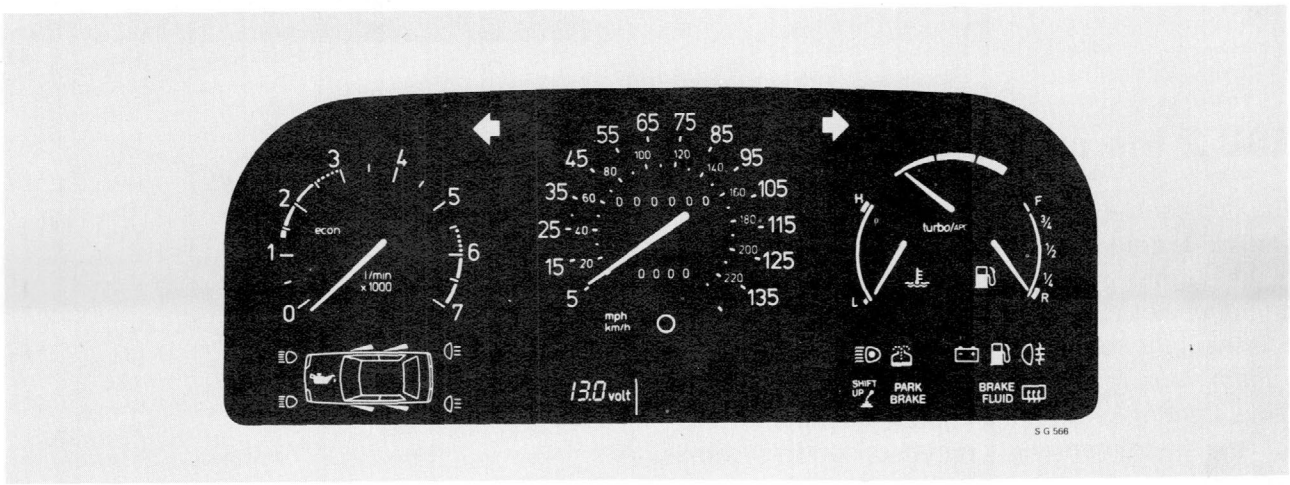
A special tool is provided on the power distribution panel to facilitate the removal and fitting of fuses.

Instruments

Principle of operation

The Saab 9000 has a main instrument display panel located centrally in front of the driver.

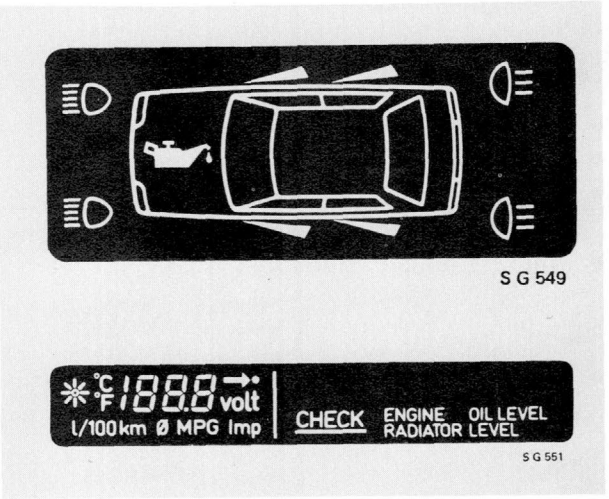
The configuration of the instruments on the display panel is as follows. The three main instruments are, from left to right, the tachometer, the speedometer and the combined temperature gauge, turbo pressure gauge and fuel gauge. The repeater lights for the direction indicators are located at the top of the display panel, left and right of the speedometer in the driver's natural field of view.



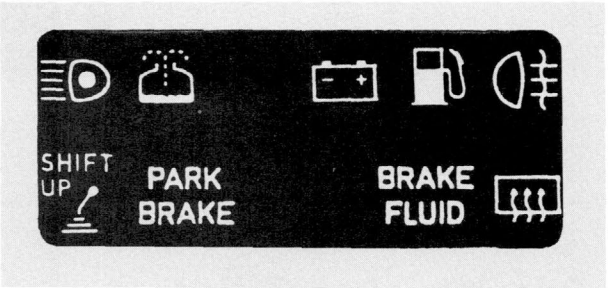
Underneath the tachometer is a pictogram, which warns the driver if any front or rear light is not working, if any door is not properly closed and if the oil pressure is low.

The pictogram, which displays a plan image of the car, always lights up when the ignition is switched on but is then extinguished if all is well. If a fault should arise while the car is being driven, the relevant symbol will light up on the display.

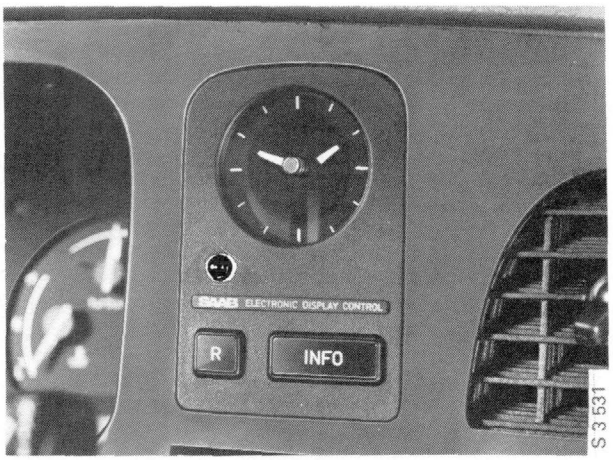
Underneath the speedometer is an electronic LCD display



Underneath the right-hand gauge is an array of warning lights for main beam, handbrake on, low charging current, etc., etc.



The clock is fitted to the right of the main instrument display panel and underneath it are two pushbuttons for controlling the electronic display.



EDU 2 trip computer

The two control buttons for the trip computer, R and INFO, are located below the clock. Adjacent to the buttons is a sensor which ensures that the brightness of the display in daylight changes to suit the light conditions, so that the display will remain clearly visible. When the instrument panel lighting is switched on, the dimmer switch for the instrument lighting also controls the brightness of the computer display.

The trip computer displays the following information:

Zone 1:

- Fuel consumption (current and average)
- Battery voltage (battery condition)
- Range of the car (based on amount of fuel left in the tank and the average fuel consumption)
- Ambient temperature

Zone 2:

- Selector position (reserved for automatic gearbox)

Zone 3:

- CHECK ENGINE
- CHECK OIL LEVEL
- CHECK RADIATOR LEVEL

Battery check

When the ignition is switched on, the computer will display the battery voltage. The lowest value recorded while the starter motor is running will remain on the display until the car pulls away, whereupon the computer will revert to displaying the preselected information. In this way, the driver is kept informed of the condition of the battery.

Selecting the units

The following combinations of units can be selected for the information in Zone 1:

- Km; °C and L/100 km
- Miles; °F and mpg (US gal)
- Miles; °F and mpg (Imp. gal)

To select the desired combination of units, depress the R and INFO buttons simultaneously and hold them depressed for at least four seconds.

Selecting the display function

Each time the INFO button is pressed, the display function will change in the following sequence:

- Average fuel consumption
  (L/100 km ∅; ∅ mpg; ∅ mpg imp.)
- Current fuel consumption
  (L/100 km; mpg; mpg imp.)
- Range
  (∅ km; ∅ mi; ∅ mi)
- Ambient temperature
  (°C; °F)
- Battery voltage
  (Volt)

Average fuel consumption is calculated from the distance covered and the fuel consumption since the function was reset. After the function has been reset, three dashes will be displayed until the car has travelled 200 metres. Unless the system has been reset manually, it will be reset automatically when the aggregate fuel consumption has reached 1342 litres or the distance covered has reached 10480 km.

The range of the car is calculated from the amount of fuel remaining in the tank and the average fuel consumption over the last ten minutes (with the ignition on).

The ambient temperature is recorded between -40°C (-40°F) and +50°C (121°F). The ambient temperature sensor is fitted behind the front spoiler.

Resetting the functions

To reset the average fuel consumption and range functions, hold button R depressed for at least four seconds. Indication that these functions have been reset will be given by all the digit positions in Zone 1 being displayed while the button is held depressed.

Gear selector indicator

The display function in Zone 2 is reserved for cars with automatic transmission.

Display warnings

The significance of the warnings displayed in Zone 3 is as follows:

CHECK ENGINE. This refers to the fuel-injection system and indicates a malfunction, such as a broken filament in the air mass meter.

CHECK OIL LEVEL. This appears on the display when approximately 0.5 litres of engine oil can be added. The oil level is monitored at the time the ignition is switched on and does not operate when the car is running. The ignition must be switched off for at least five minutes before a new check can be made.

CHECK RADIATOR LEVEL. This indicates that the level of coolant in the expansion tank is too low. The coolant level is monitored continuously while the ignition is on.

Error codes

The computer has a self-diagnostic system which indicates a malfunction in parts of the system by means of error codes displayed in Zone 1. The system is fully automatic and the error code will remain on the display until the fault has been remedied.

The following error codes may be displayed:

F1 – Reserved for use in cars with automatic transmission.

F2 – Malfunction of the ambient temperature sensor.

F3 – Malfunction of the fuel level transmitter

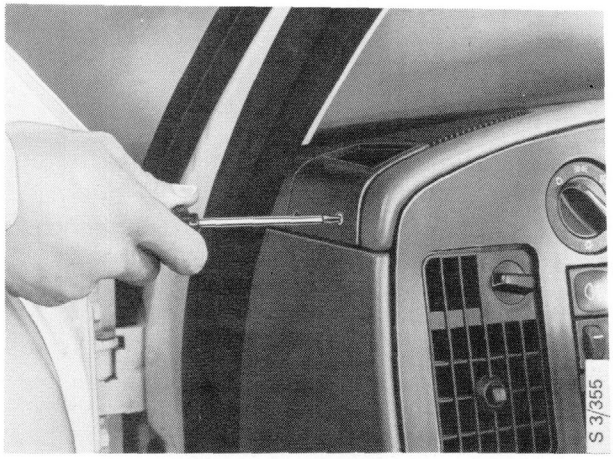
F4 – Malfunction in the computer itself

To remove the main instrument display panel

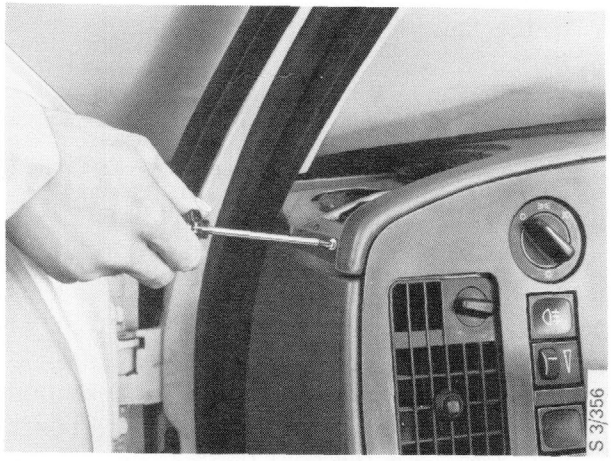
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Remove the speaker grilles on either side of the panel.



3 Unscrew the top section of the instrument panel (seven screws including one in the glove compartment).



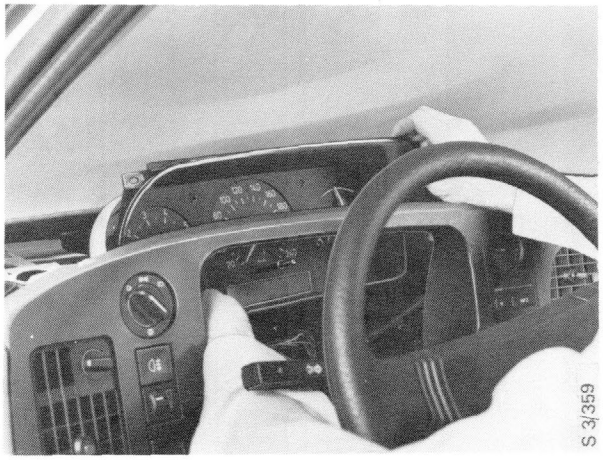
4 Lift off the top section.

5 Remove the duct.

6 Disconnect the speedometer cable, the vacuum hose to the turbo pressure gauge and unplug all connectors to the display panel.

7 Undo the two screws of the instrument display panel.

8 Withdraw the instrument unit from the panel.



To fit

Refit in the reverse order.

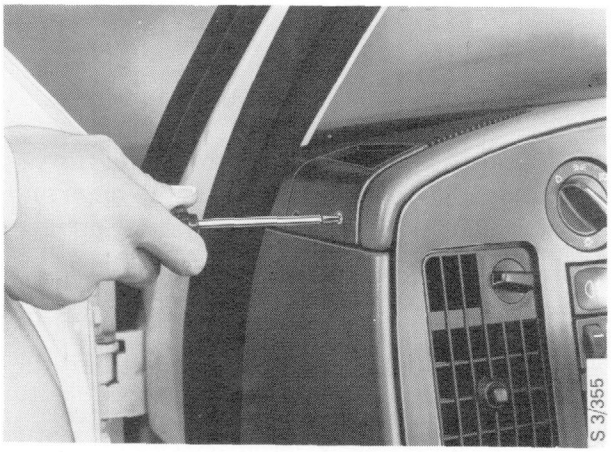
N.B.
Make sure that the air duct connections are a tight fit when refitting the duct.

To remove the clock

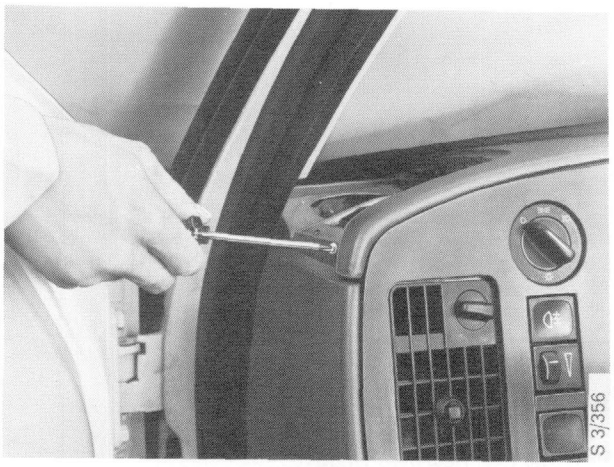
1 Disconnect the negative (-) battery lead.

N.B.
Never disconnect the battery when the engine is running as this may result in serious damage to the alternator.

2 Remove the speaker grilles on either side of the panel.

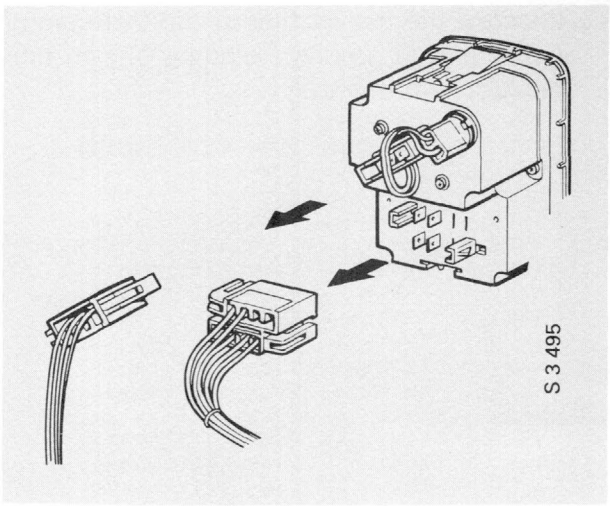


3 Unscrew the top section of the instrument panel (seven screws including one in the glove compartment).



4 Lift off the top section.

5 Unplug the electrical connectors at the clock. Carefully push out the clock.

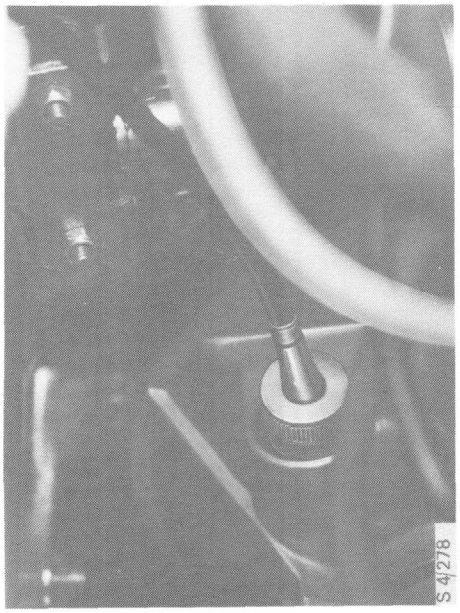


To fit

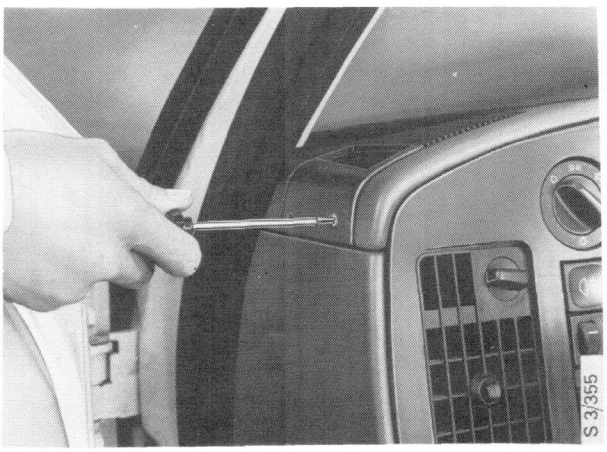
Refit in the reverse order.

To change the speedometer cable

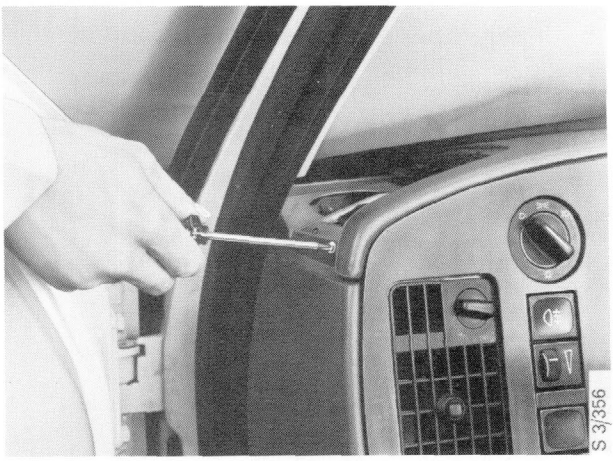
1 Disconnect the speedometer drive at the gearbox.



2 Remove the speaker grilles on either side of the panel.

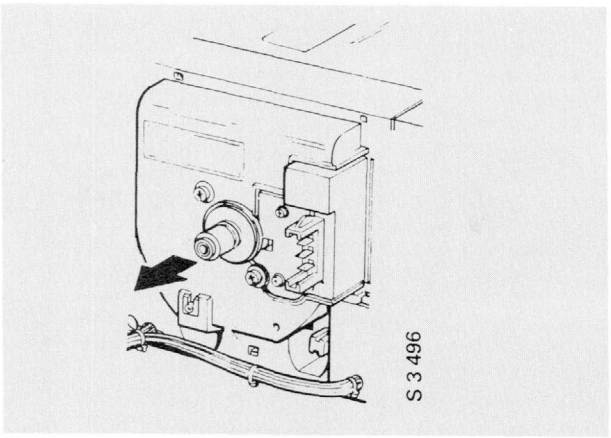


3 Unscrew the top section of the instrument panel (seven screws including one in the glove compartment).

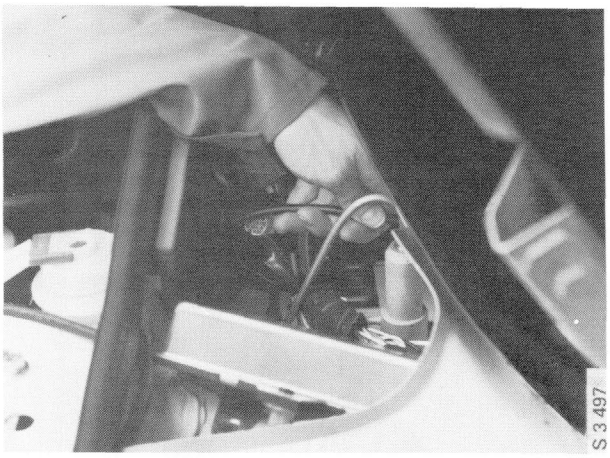


4 Lift off the top section.

5 Disconnect the speedometer cable from the speedometer.



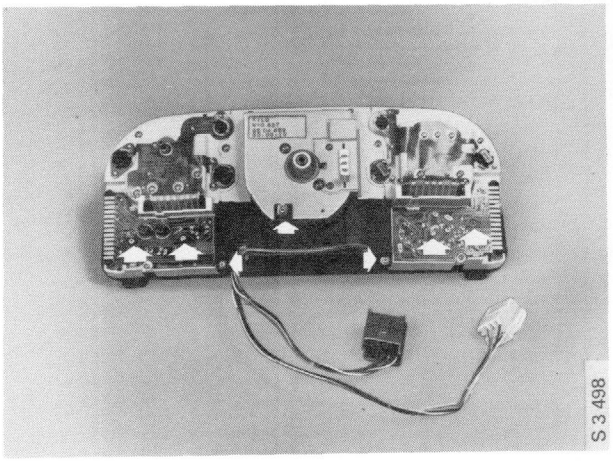
6 Withdraw the cable by pulling it through the bulkhead panel and bulkhead.



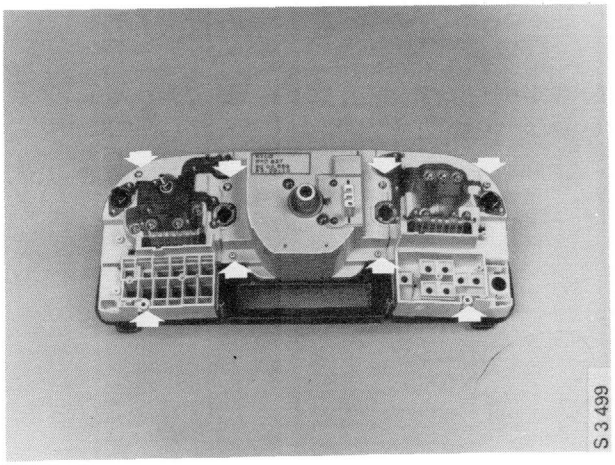
To dismantle the instrument display panel

1 Remove the circuit board with the bulb holders for the pictogram and warning light array.

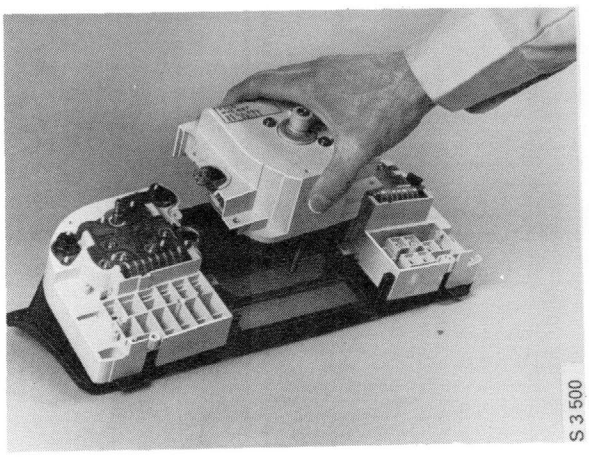
2 Undo the securing screws for the electronic display and lift off the unit.

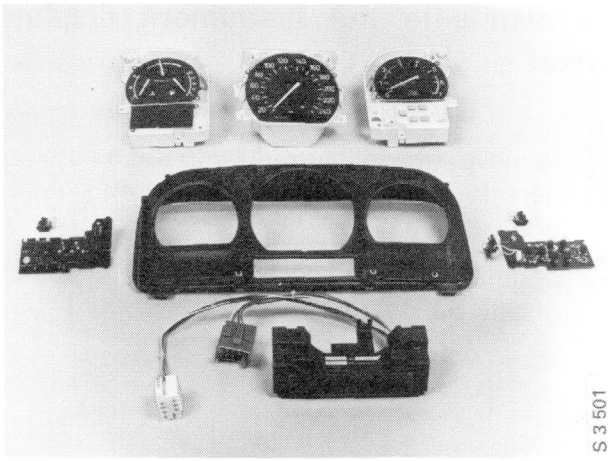


3 Undo the instrument retaining screws.



4 Lift off the speedometer. The other instruments can now be removed.





To assemble

Assemble in the reverse order.

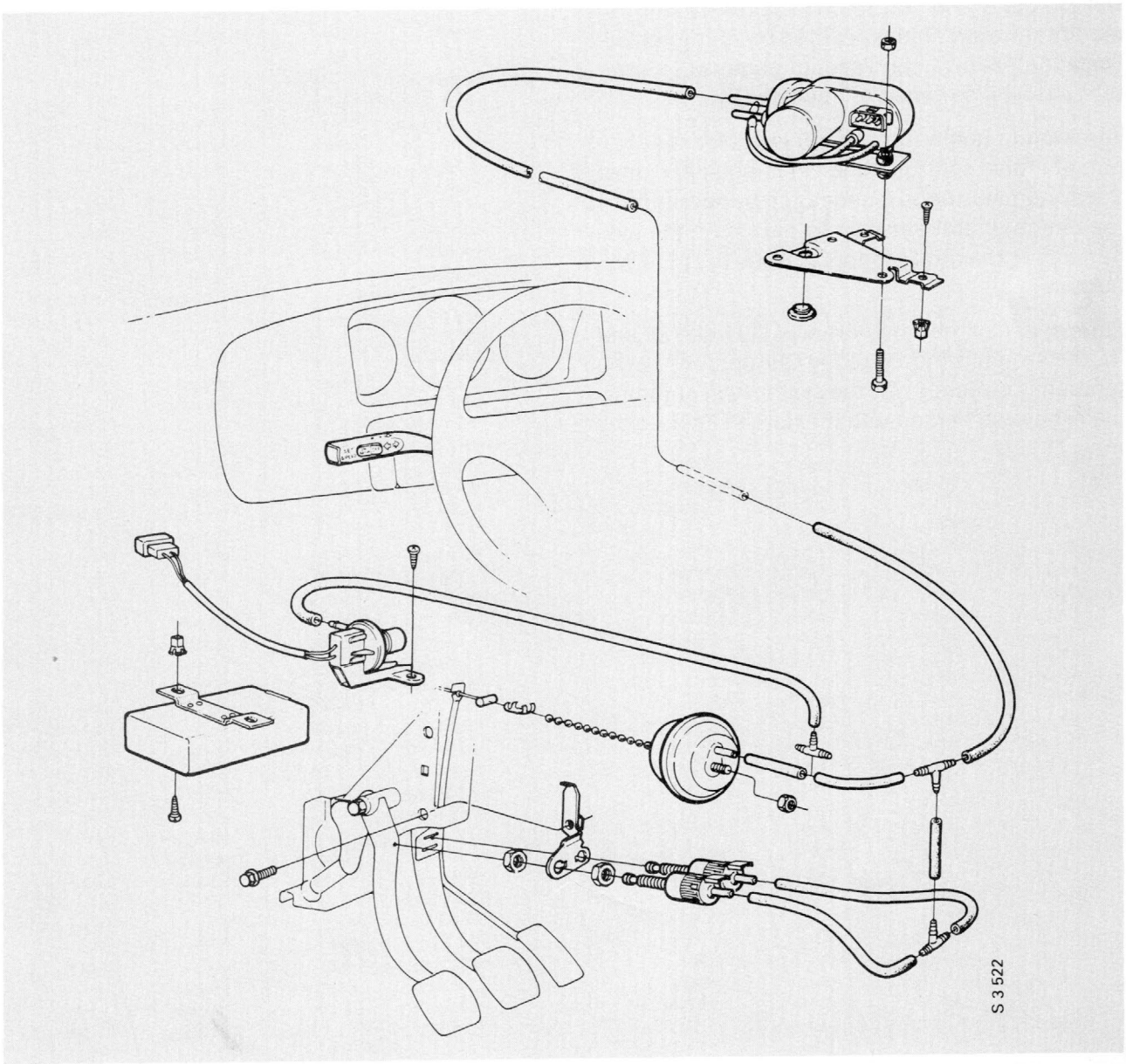
N.B.
Do not confuse the screws as they are of different lengths.

Cruise control

Principle of operation

As the name implies, the cruise control system is designed to keep the car at a speed preselected by the driver, without the need for the driver to keep his foot on the accelerator pedal. The driver sets the system by means of a switch on the direction-indicator stalk. The system will switch off automatically if either the clutch pedal or brake pedal is depressed or if the switch is moved to the OFF position. The cruise control system may be used for speeds between 23 and 112 mph (37 - 180 km/h).

The main components of the system are the stalk switch, incorporating functions for SET SPEED, RESUME, OFF and ON, a speed transducer, vacuum pump, electronic control unit, vacuum regulator and pedal switches.



When the SET SPEED button is pressed, the signal transmitted by the speed transducer is stored in the electronic control unit. The vacuum pump starts running, drawing in the diaphragm in the vacuum regulator and, in turn, acting on the throttle cable. The throttle butterfly is then set to the correct position for the selected speed.

The speed transducer senses any variations in the speed of the car and, via the electronic control unit, sends signals to the vacuum motor to raise or reduce the vacuum to keep the car at the selected speed.

If the driver touches the accelerator pedal for a brief increase in the speed of the car, this will not affect the cruise control system; as soon as the accelerator is released, the system will resume the selected speed. When either the brake pedal or clutch pedal is depressed, the respective pedal switch will break the circuit, the vacuum will collapse and the throttle butterfly will immediately return to the position for idling speed. For added safety, the vacuum pump will simultaneously be switched off electrically.

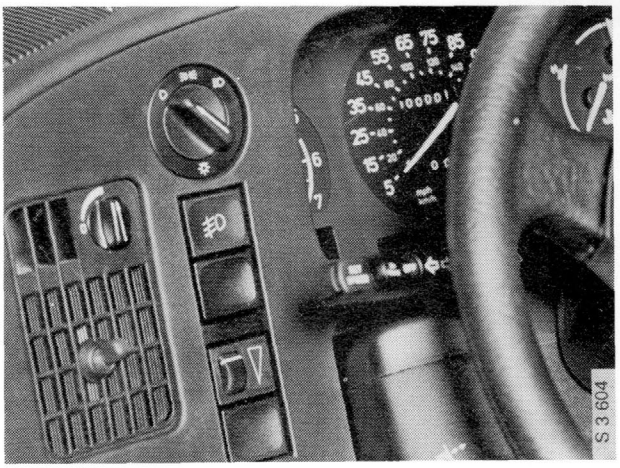
The system has a memory function for resumption of cruise control at the selected speed after the system has been disengaged by operation of the clutch or brake pedal. To switch on the system again, the driver simply presses the RESUME button.

If the speed of the car falls below 23 mph (37 km/h), the switch is moved to the OFF position or the ignition is switched off, the system will automatically be switched off and the data in its memory erased.

Cruise control switch

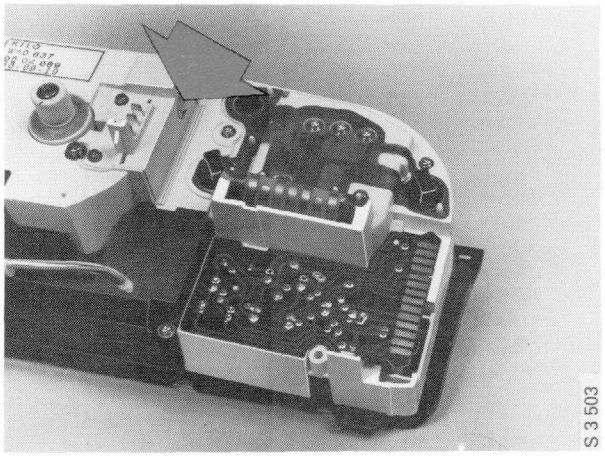
The switch for the cruise control system is incorporated in the direction-indicator stalk.

For instructions on how to remove the switch, refer to Section 361.



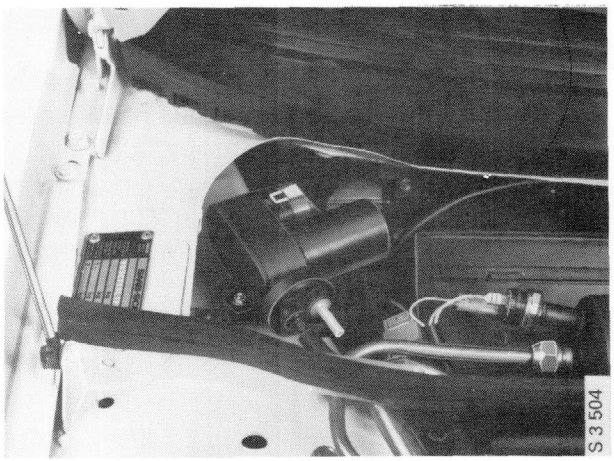
Speed transducer

The speed transducer is fitted on the back of the speedometer. To gain access to the transducer, remove the top section of the instrument panel.



Vacuum pump

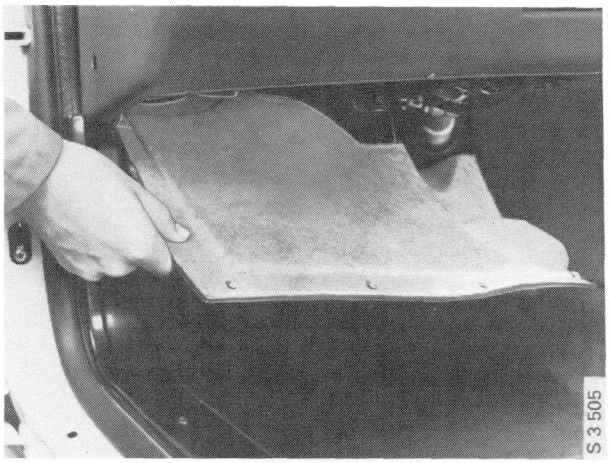
The vacuum pump is located on the right-hand side in the engine compartment, adjacent to the filter for the ventilation air.

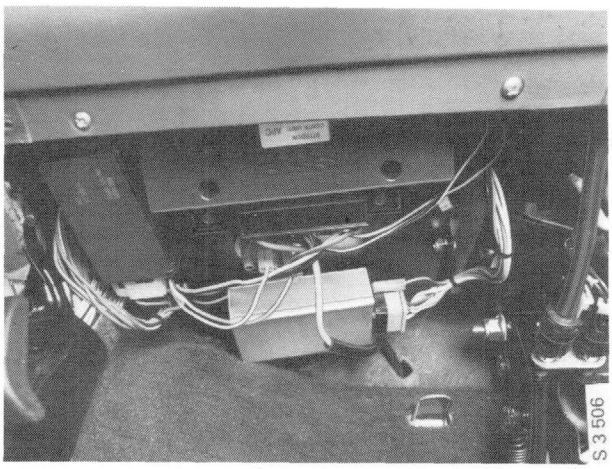


Electronic control unit

The electronic control unit, vacuum regulator and pedal switches are located behind the trim panel fitted below the instrument panel on the left-hand* side of the car. To gain access to these components, remove the trim under the instrument panel. The electronic control unit is mounted on the same bracket as the control unit for the APC system.

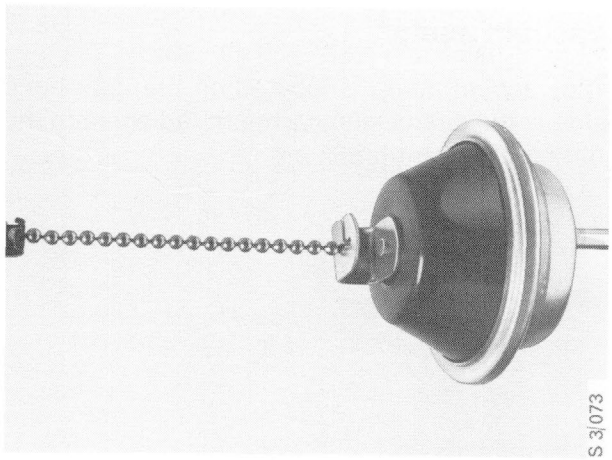
An asterisk (*) in the text indicates that the opposite hand applies to RHD cars.





Vacuum regulator

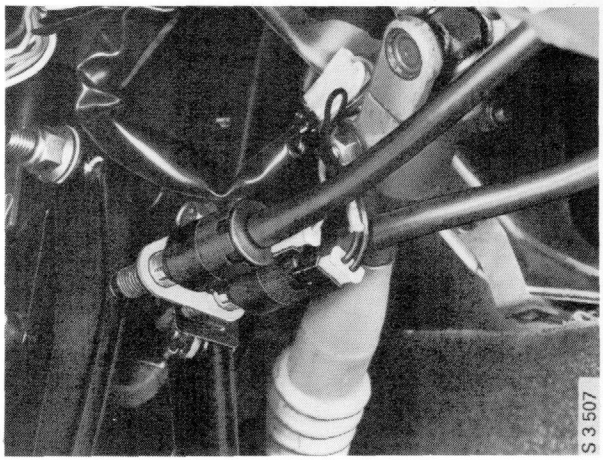
The vacuum regulator is fitted on a bracket beside the accelerator-pedal mounting. Take care when removing and fitting the regulator not to damage the rubber gaiter. Fit the ball chain linking the vacuum regulator to the throttle cable as tight as it will go without moving the throttle cable.



Pedal switches

The pedal switches are fitted on the same bracket as the brake-light switch. Adjust the switches so that there is clearance of 1 mm between the threaded part of the switch and the actuator tip. Make sure that the pedals are in the fully returned position before adjusting the clearance.

N.B.
The pedal switches must never be adjusted such that they will act as a stop for the pedals.



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