SAAB

9000

SERVICE MANUAL

8:3 Heating and ventilation and air conditioning systems

M 1986–88–

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Units

The basic and derived units used throughout the Service Manual are in accordance with the SI system.

For users not familiar with the SI units, some non-Continental units are given in brackets after the respective SI unit.

The following symbols and abbreviations are used:

SI unit	Equivalent unit and symbol
mm	inch (in)
kg	pound (lb)
N	pound-force (lbf)
Nm	pound-force foot (lbf ft)
bar	pound-force per square inch (lbf/in^2) (Also abbreviated: psi)
l (litre)	US liquid quart (liq qt) (Also abbreviated: qts) US gallon (USgal)
°C	°F

Conversion factors

1 in = 25.4 mm	1 mm = 0.039 in
1 lbf = 4.45 N	1 N = 0.23 lbf
1 lbf ft = 1.36 Nm	1 Nm = 0.74 lbf ft
1 psi = 0.07 bar	1 bar = 14.5 lbf/in^2
1 liq qt = 0.95 l	1 l = 1.05 liq qt
1 US liq qt = 0.83 UKqt	1 USgal = 0.83 UKgal

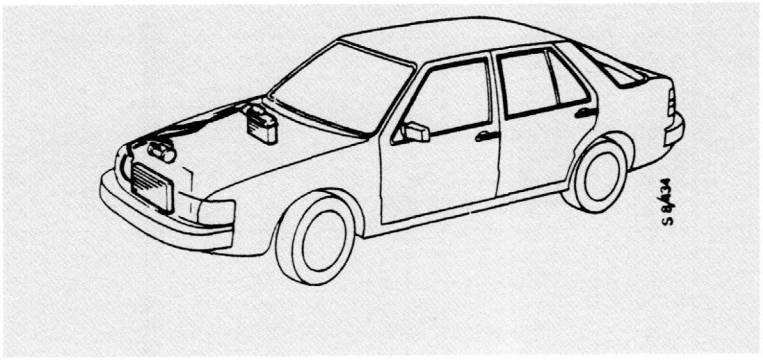
Market codes

The codes refer to market specifications

AT	Austria	FR	France
AU	Australia	GB	Great Britain
BE	Belgium	GR	Greece
CA	Canada	IS	Iceland
CH	Switzerland	IT	Italy
DE	Germany	JP	Japan
DK	Denmark	ME	Middle East
ES	Spain	NL	Netherlands
EU	Europe	NO	Norway
FE	Far East	SE	Sweden
FI	Finland	US	USA

Production: Technical Publications, Saab-Scania, Trollhättan, Sweden

Air conditioning (AC) system



Compressor

Type		Sanden SD 510	Sanden SD 709
No. of cylinders		5	7
Swept volume	cm^3	161	154.9
Refrigerant		R12	R12
Oil capacity (new compressor)	dl	1.35	1.35
Clutch		Electromagnetic	Electromagnetic
Speed range	r/min	500 - 6000	500 - 6000
Weight (including clutch)	kg(lb)	7.7 (17.0)	6.95 (15.3)

Expansion valve

Type		Thermal expansion valve (externally equalized)
Capacity	Ton of refrigeration	2 (24 000 Btu/h)
Superheat	°C (°F)	44± 0.8 (111.2± 2)

Anti-frost thermostat

Make		Ranco
Breaks circuit at:	°C (°F)	+1.5±1.1 (34.5±2)
Makes circuit at:	°C (°F)	5.0 (41.0) (circuit-breaking temp. + maximum lag of 3.6)

Pressure switch, M85

Breaks circuit at:	bar (psi)	2.7 (39.5)
Makes circuit at:	bar (psi)	3.1 (45)

Three-stage pressure switch, M86 onwards

		lst stage	2nd stage	3rd stage
Breaks circuit at:	bar (psi)	1.95±0.24 (28±3.5)	10.7±0.97 (155±14)	26.5±1.95 (380±28)
Makes circuit at:	bar (psi)	2.1±0.34 (30.5±4.95)	14.5±0.97 (210±14)	20.3±1.95 (295±28)

Safety valve

Type		Mechanical
Opens at:	bar (psi)	31±2 (445±29)
Closes at:	bar (psi)	28 (405)

Refrigerant

Type		R12
Quantity	kg (lb)	1.1 (2.43)

Refrigeration oil(lubricant)

Viscosity	520 SUS (113 cSt approx.)38°C (100°F)
Alternative makes	Suniso 5GS Texaco Capella E (WF 100) BP Energol LPT 100

Tightening torques for screw fittings

Compressor:	Discharge	Nm (lbf ft)	30 - 35 (22 - 26)
	Suction	Nm (lbf ft)	35 - 40 (26 - 29.5)
Condenser:	Inlet	Nm (lbf ft)	21 - 28 (15.5 - 20.5)
	Outlet	Nm (lbf ft)	14 - 20 (10.3 - 14.7)
Receiver:	Inlet	Nm (lbf ft)	14 - 20 (10.3 - 14.7)
	Expansion valve	Nm (lbf ft)	14 - 20 (10.3 - 14.7)
Pressure Switch on receiver			
Evaporator		Nm (lbf ft)	14 - 20 (10.3 - 14.7)
Expansion valve		Nm (lbf ft)	20 - 27 (14.7 - 19.9)
Capillary tube to suction pipe		Nm (lbf ft)	7 - 10 (5.2 - 7.3)
Evaporator outlet		Nm (lbf ft)	29 - 38 (21-28)
Safety valve on condensor outlet		Nm (lbf ft)	14 - 20 (10.3 - 14.7)

Compressor tightening torques

Clutch centre-nut	Nm (lbf ft)	34 - 42
Cylinder head bolts	Nm (lbf ft)	30 - 34 (22-25)
Oil filler plug	Nm (lbf ft)	8 - 12 (5.9 - 8.8)
Service valves	Nm (lbf ft)	12 - 17 (8.8 - 12.5)

Belt tension

Measured on IPU tensiometer

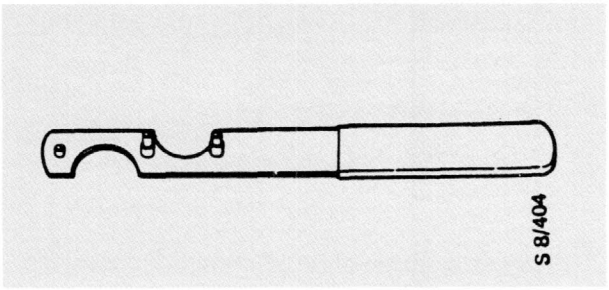
New, unused belt : 535±45 N (120±10 lbf)

Checking tension of existing belt: If the tension is less than 265 N (60 lbf) it is recommended that the belt be tightened to 355±22 N (80±5 lbf)

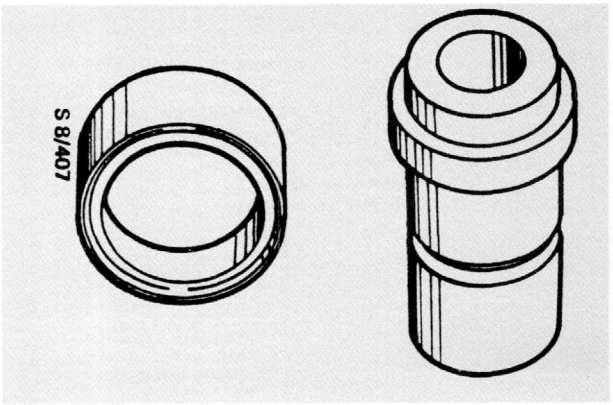
When refitting existing belt: Tighten to 355±22 N (80±5 lbf)

Special tools

AC system

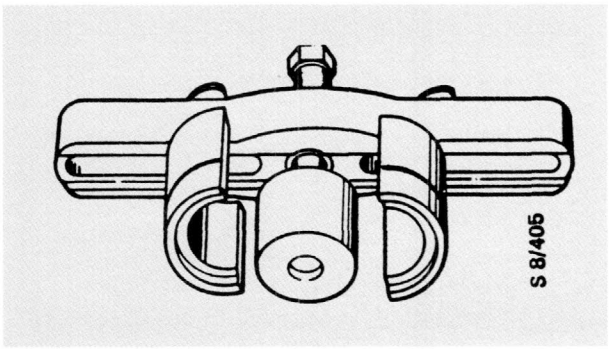


83 93 373 Key for removal of compressor end plate



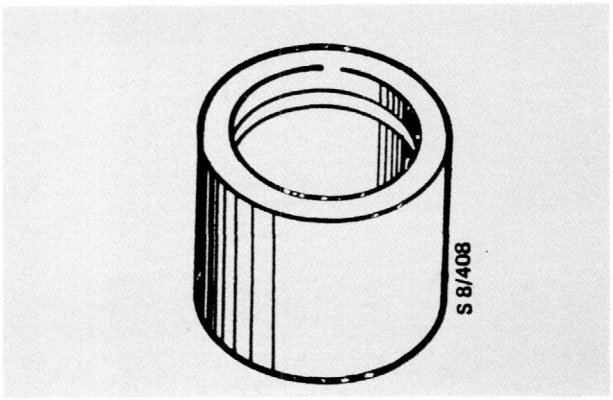
SD 510 83 93 407 Tool for fitting compressor

SD 709 82 92 559 Tool for fitting compressor

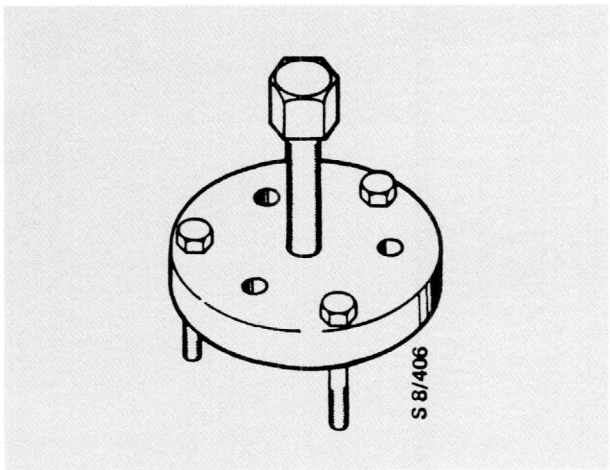


SD 510 83 93 399 Puller for compressor-bearing & pulley assembly

SD 709 82 92 567 Press shanks



83 93 415 Adaptor for compressor



83 93 381 Puller for compressor end plate

Technical description

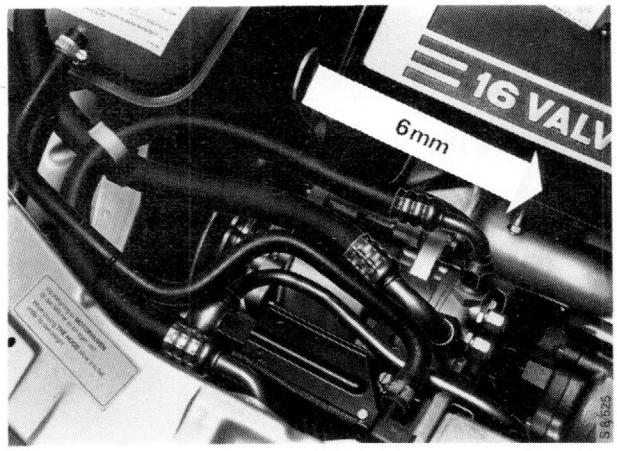
Changes introduced on M86

AC system

Repositioned AC compressor

To facilitate fitting at the factory, the compressor was moved 6 mm nearer to the centre of the car.

This meant that a new mounting bracket and a new groove on the compressor pulley were also required. To position the tensioning device correctly, 6-mm distance pieces were welded onto the tensioning device fixing.



New three-stage pressure switch

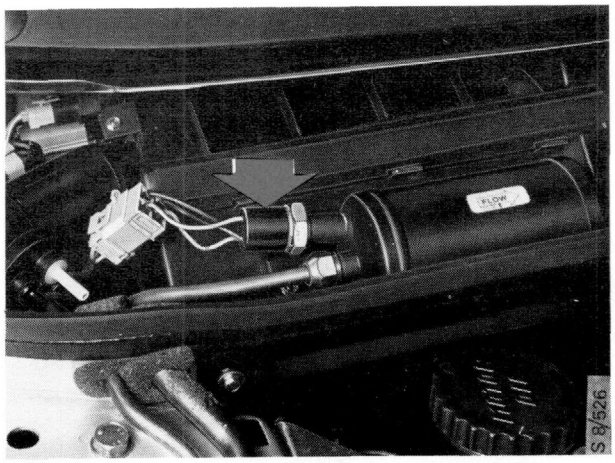
A new three-stage pressure switch, fitted to the receiver, was introduced.

The pressure switch has the following functions:

Stage 1: This allows the compressor to run at temperatures down to freezing point (0 °C/32 °F). At freezing point, the system pressure is approx. 2 bar (29 psi).

Stage 2: Switches on the electric radiator fan when the pressure has risen to approx. 15 bar (218 psi). After the pressure has fallen to approx. 11 bar (160 psi) it switches the fan off again.

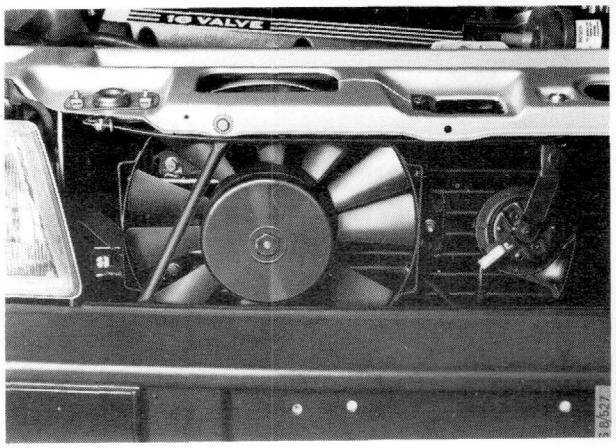
Stage 3: This is a safety function which breaks the power supply to the compressor if the pressure exceeds 27 bar (392 psi). It will allow the compressor to be switched on again after the pressure has fallen to 6 bar (87 psi).



Auxiliary cooling fan

(certain specs. only)

Cars with certain market specifications are equipped with an auxiliary fan located forward of the cooler and radiator assembly. The fan is wired such that it is switched on and off at the same time as the compressor.



Idling-speed compensation

As from chassis No. CG1001945, the AIC system was fitted to all Turbo 16 engines, the earlier solenoid valve being discontinued.

The AIC system operates as follows:

When the AC compressor cuts in, a signal is sent via the ECU for the fuel injection system to the automatic idling-control system, to compensate for the increased load. A larger quantity of air flows past the throttle butterfly via a special by-pass passage in the throttle housing. A delay function incorporated in the AC relay ensures that the idling speed is increased 0.6 seconds before the compressor cuts in.

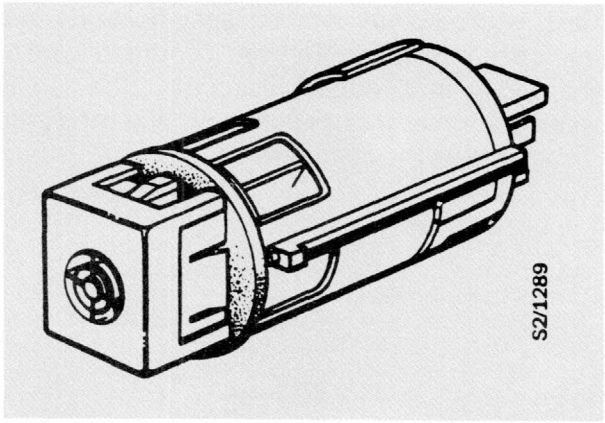
Delayed cut-in of AC compressor on starting

As from chassis No. CG1001945, a 10-second delay function for the AC compressor was added to all cars equipped with AC/ACC, to prevent an additional load being put on the engine during starting. For further details refer to Section 3 (Electrical Systems) of the Manual.

Changes introduced on M87

New interior-air sensor for cars with ACC

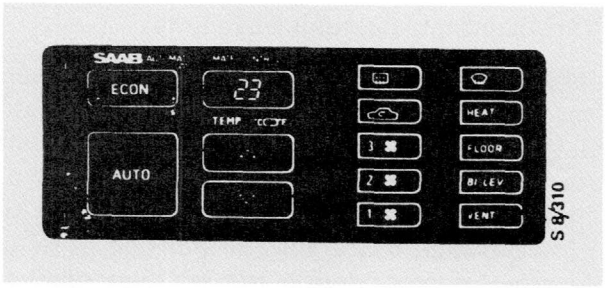
The new interior-air sensor consists of a single unit housing both the sensor and the suction fan motor. In conjunction with the introduction of the new unit, both the flexible duct and the suction fan motor on the bracket for the two other servo-motors were discontinued.



Automatic brightness control for ACC control panel

A light sensor for automatic control of the brightness of the display and LEDs on the ACC control panel was introduced on M87.

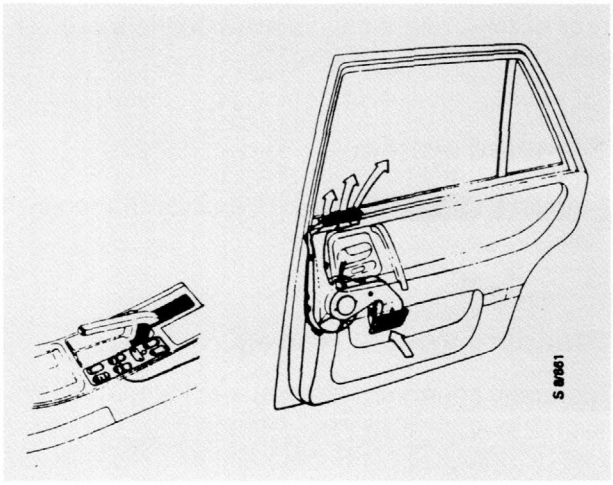
The sensor is located in the LED between the HEAT and FLOOR buttons. When the light intensity inside the car exceeds 200 lux, the display and LEDs will be set to maximum brightness. If the light intensity is below 50 lux, the brightness can only be controlled by means of the dimmer switch on the instrument panel.



Changes introduced on M88

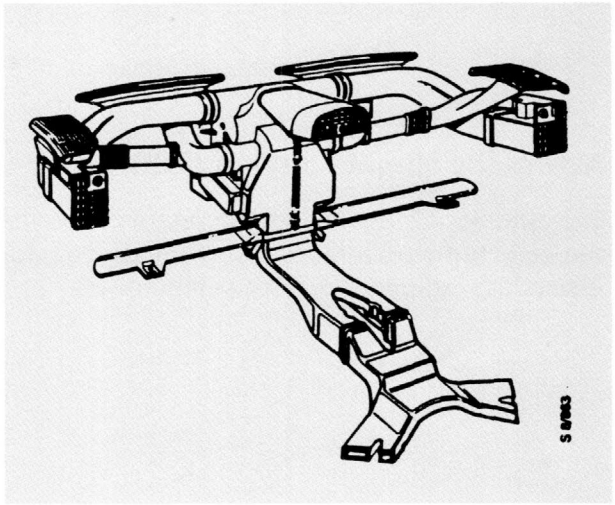
Demister fans for rear-door windows (Turbos with ACC only)

Demister fans for the rear-door windows were introduced on Turbo cars, M88. The fans, which have two speeds, are operated by means of a switch on the centre console.



Front floor ducts - new vents

Front floor ducts with four separate outlets were introduced. The earlier floor vent has been retained, although the supply of air from it has been reduced.



AC compressor

A 7-cylinder AC compressor was introduced. The new compressor is fully interchangeable with the earlier model.

Technical description

Heating and ventilation unit

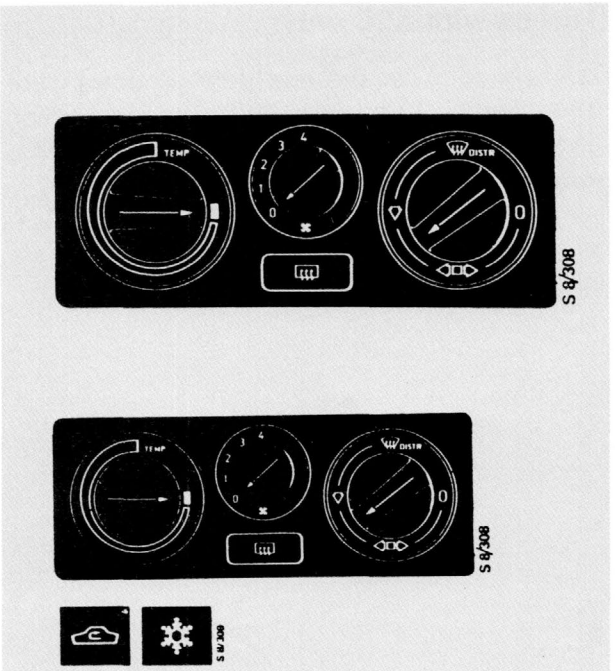
The heating and ventilation unit, located at the rear of the engine bay, is available in three versions:

Standard system

Manually controlled heating and ventilation system

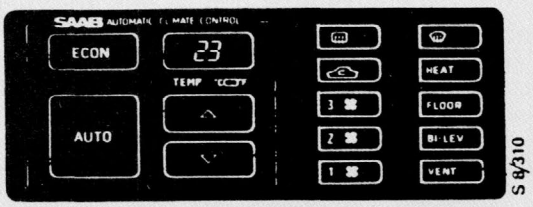
Standard system with AC

Manually controlled heating and ventilation system with AC and air recirculation.



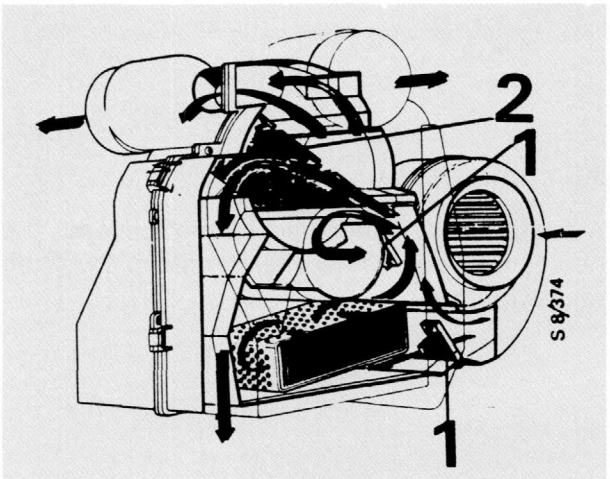
Automatic climate control (ACC)

The automatic climate control system maintains the selected temperature inside the car regardless of the temperature of the ambient air.



Common basic unit

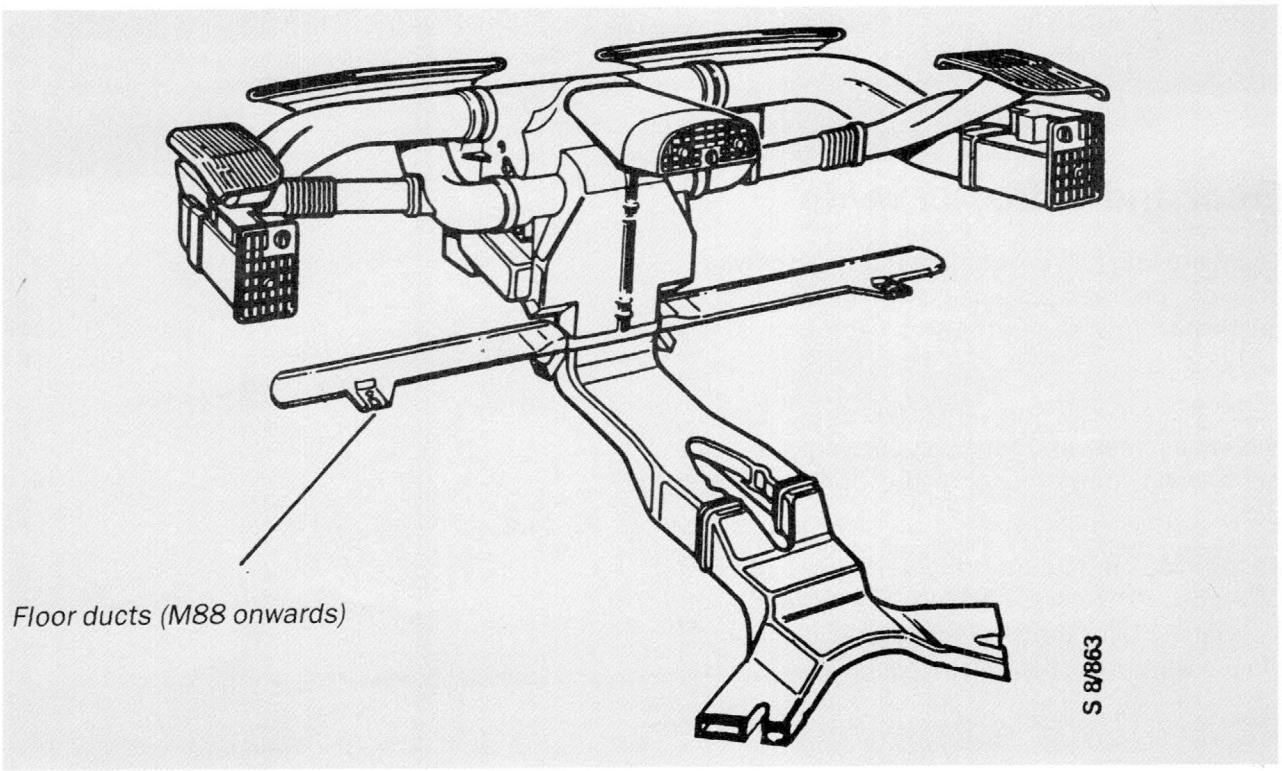
The basic heating and ventilation unit is common to all three systems. Air enters the unit through the air intake beneath the windscreen, flows through the fan housing and is directed by the temperature valve either through the heat exchanger or a by-pass duct. The air distribution valve then directs the air to the selected vents inside the car.
The system is of the blended-air type



1 Temperature valve
2 Air distribution valve

Air distribution system

From the heating and ventilation unit, the air is directed through ducts to the various vents. There are thirteen vents inside the car through which the air can be admitted.

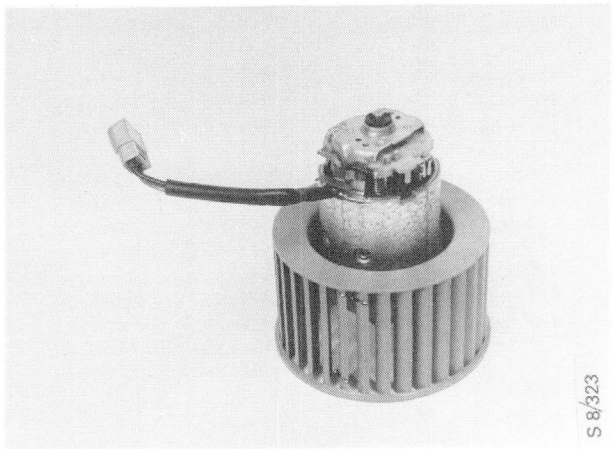


Floor ducts (M88 onwards)

Fan motor and impeller

The fan is of the centrifugal type, with the vanes located around the periphery of the impeller. The impeller is balanced by fitting steel clips between the vanes.

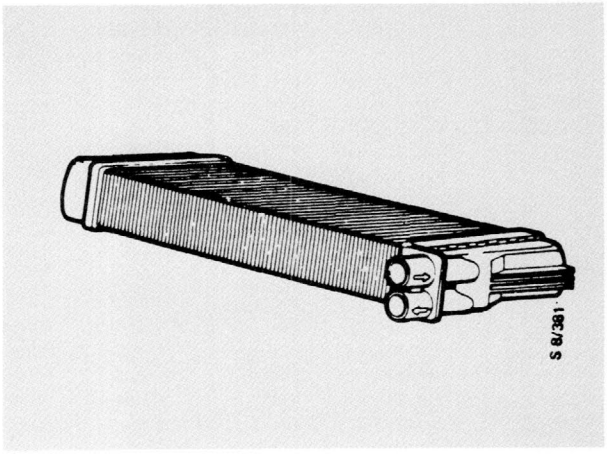
The fan motor, which is of the permanent-magnet type, is located in the engine bay.



Heat exchanger

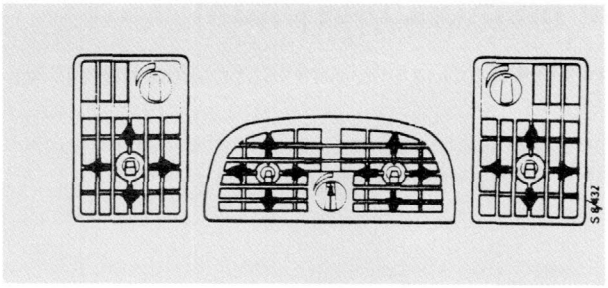
The heat exchanger is located horizontally inside the bottom of the heating and ventilation unit. There is no water valve (heater valve) and the heat exchanger is therefore always hot.

The coolant hoses are connected to the heat exchanger by means of quick-release couplings.



Panel vents

Four vents are incorporated in the fascia and the direction of the air flow can be adjusted individually at each vent, both vertically and laterally. Adjustment of the air flow is infinitely variable between the open and closed positions of the vents.

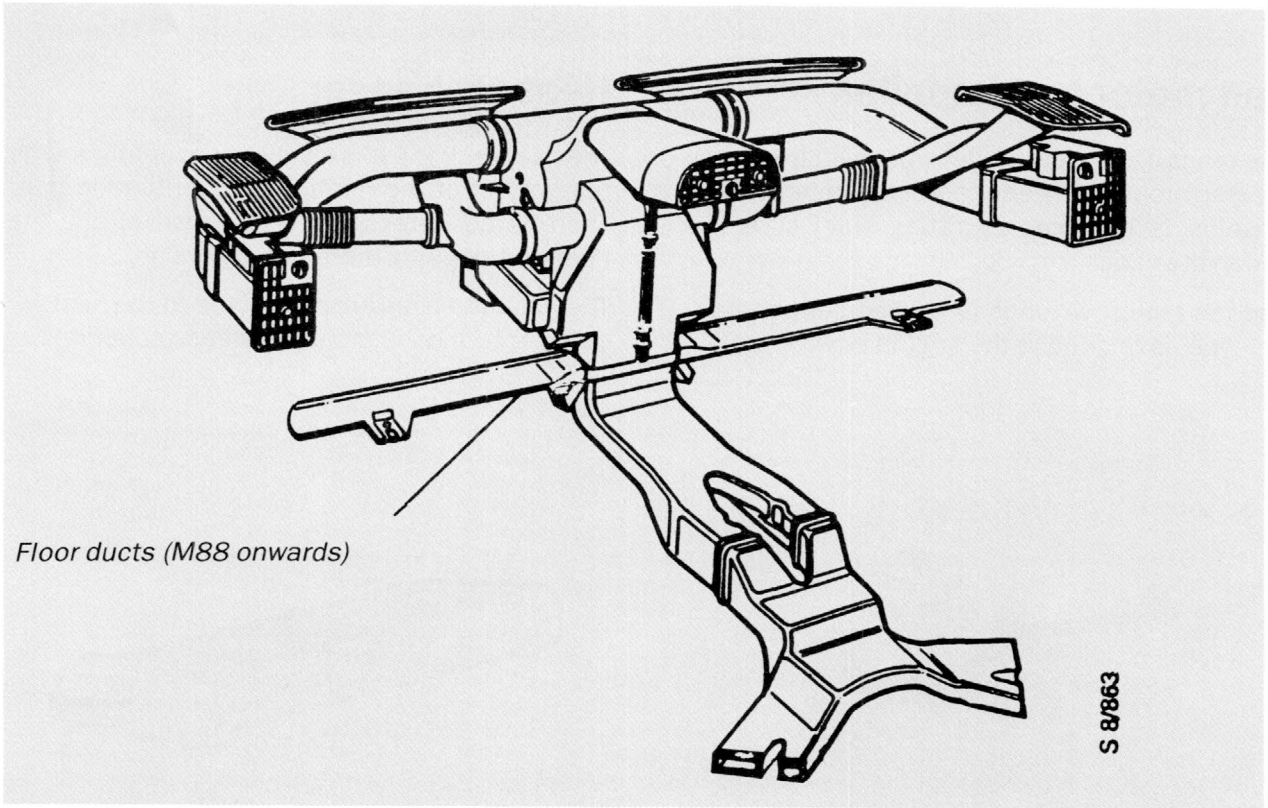


Floor and defroster vents

There are four air vents for the floor, two of which are for the rear-seat passengers. Front floor ducts with four separate vents were introduced on M88.

There are six defroster vents: two direct air onto the windscreen and four smaller vents, two on either side, direct air onto the front side windows.

As from M87 (LHD cars: chassis No. CH1007949 onwards; RHD cars: CH1024270 onwards) all defroster air for the side windows is discharged via the vents incorporated in the speaker grilles.



Floor ducts (M88 onwards)

Standard system (with or without AC)

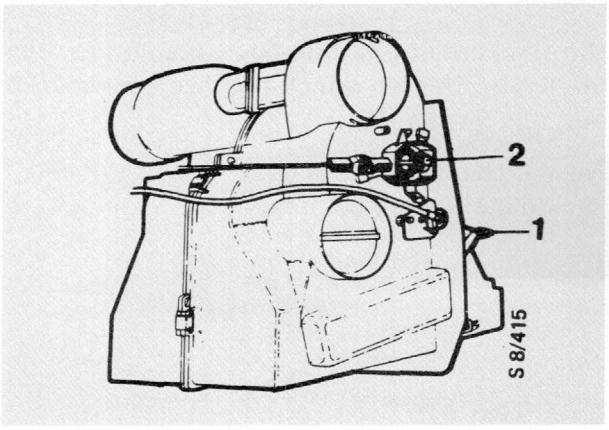
Temperature valve

The temperature valve controls the temperature of the air. Infinitely variable control of the valve is effected by means of a cable from the temperature control on the panel.

Air distribution valve

This valve distributes the air to the various ducts and vents.

Operation of the valve is by means of the air distribution control which, via a link rod, attached at either end by a ball-and-socket joint, operates a bevel gear to the valve.



1 Temperature valve
2 Air distribution valve

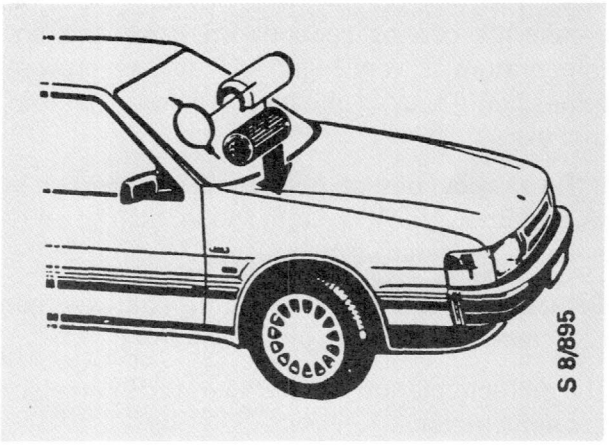
Fresh-air filter for cars without AC

The filter is located inside the engine bay, where it is readily accessible for changing. It has a paper element and provides an effective barrier against:

- All pollen (100%)
- All visible particles
- Oil and soot

The filter greatly reduces the amount of dust that tends to cling to the windscreen, instrument glass and fascia.

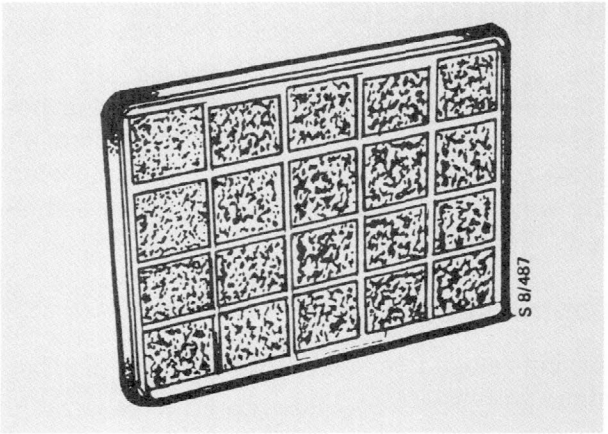
A shroud for the filter was introduced on M87 cars, as from chassis Nos. CH1021173 and CH800853.



Fresh-air filter for cars with AC

The filter is located in the air intake, upstream of the evaporator.

The filter element is made of glass fibre and effectively removes dust particles from the inlet air.



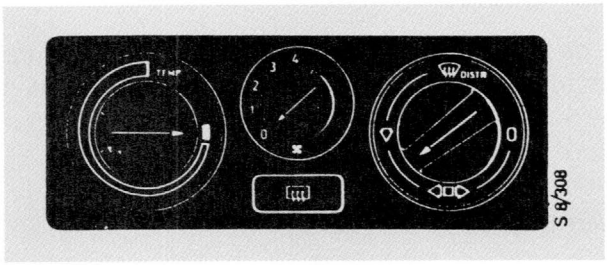
Heater control panel and air distribution (standard systems)

(including systems with manually controlled AC)

Heater control panel

The temperature is infinitely variable between the limits. The fan switch has five positions: 0 (off) and four speeds.

The switch for the rear-window heating is located immediately under the fan switch.



Cars with AC

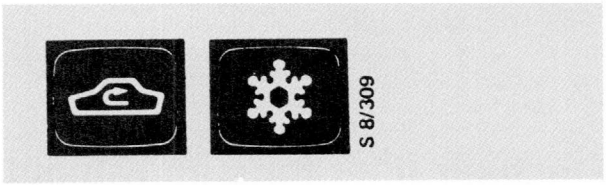
Two pushbutton switches are fitted to the left of the heater control panel in cars with AC: one is the ON/OFF switch for the AC system and the other for recirculation of the air inside the car.

When the air recirculation function is switched on, all (100 %) of the air inside the car is recirculated. The main benefits of the system are to increase the cooling capacity when the ambient temperature is very high, and also to prevent fumes being sucked into the car in traffic jams or tunnels.

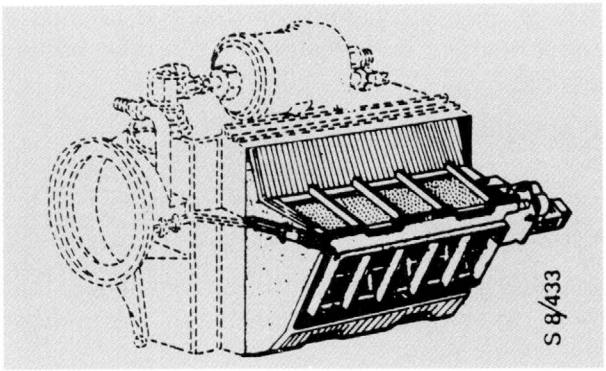
If the air recirculation function is switched on in wet weather, the AC system should also be on to prevent the windows misting up.

Selection of this function during cold weather can cause mist to form on the windows.

The air recirculation valve is operated by an electric servomotor.



Air recirculation AC ON/OFF



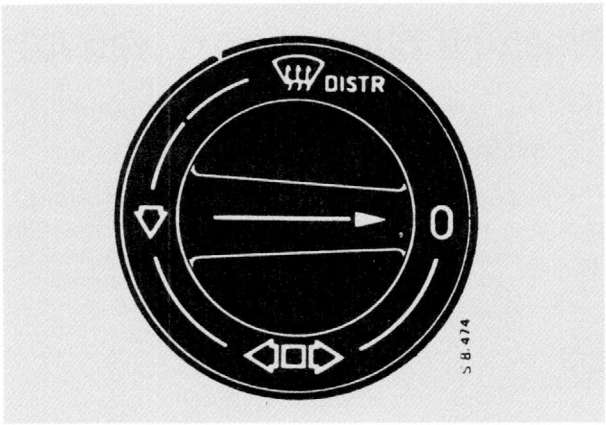
Air recirculation valve and servomotor.

Air distribution

The air distribution control may be set to a number of intermediate detent positions between the four main settings. A certain flow of air is always directed to the defroster ducts to keep the windscreen and front side windows demisted.

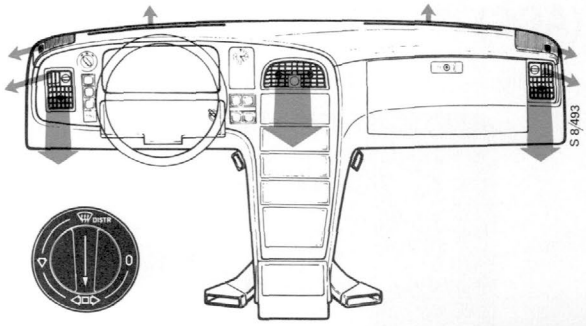
Control set to 'O'

All vents closed. No supply of air. No power to fan motor.



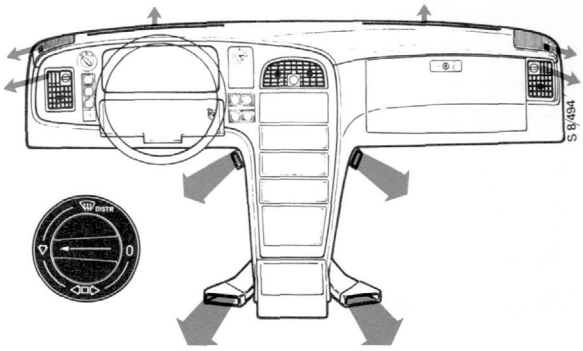
Controls set to ventilation

Air directed through panel vents. Slight leakage through defroster vents (noticeable at high fan speed).
Optional fan speed



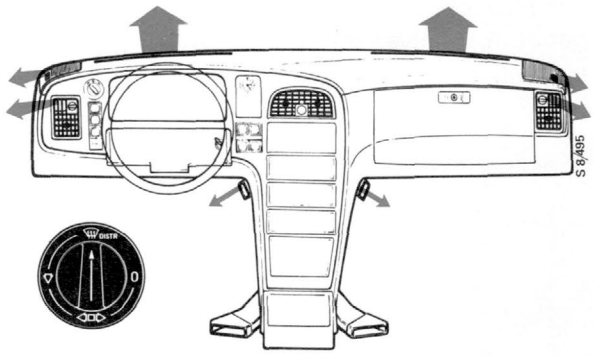
Control set to floor

Air directed through floor vents.
Slight leakage through defroster vents (noticeable at high fan speed).
Optional fan speed



Control set to defrost

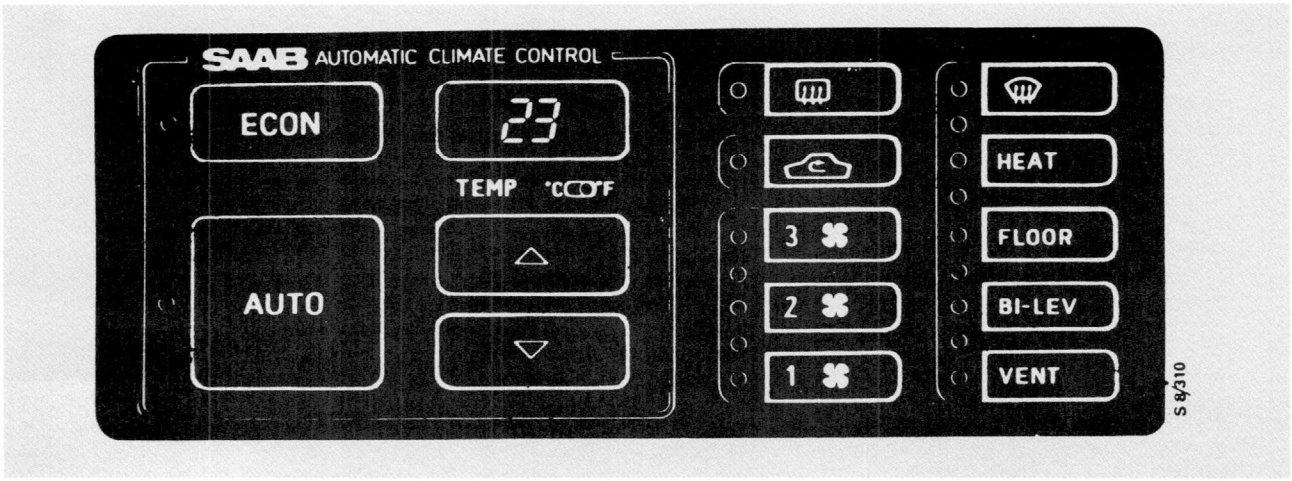
Air directed through defroster vents.
Slight leakage through floor vents (noticeable at high fan speed).
Optional fan speed



N.B.
Extended floor ducts were introduced in all cars as from M88.

N.B.
As from M87 (LHD cars: chassis No. CH1007949 onwards; RHD cars: CH1024270 onwards) all defroster air for the side windows is discharged via the vents incorporated in the speaker grilles.

Automatic climate control (ACC)



The automatic climate control system maintains the selected temperature inside the car regardless of the temperature of the ambient air.

A microprocessor (ECU) monitors and controls the following functions:

- Temperature valve
- Air distribution
- Fan speed
- Air recirculation
- AC compressor
- Rear-window and door-mirror heating

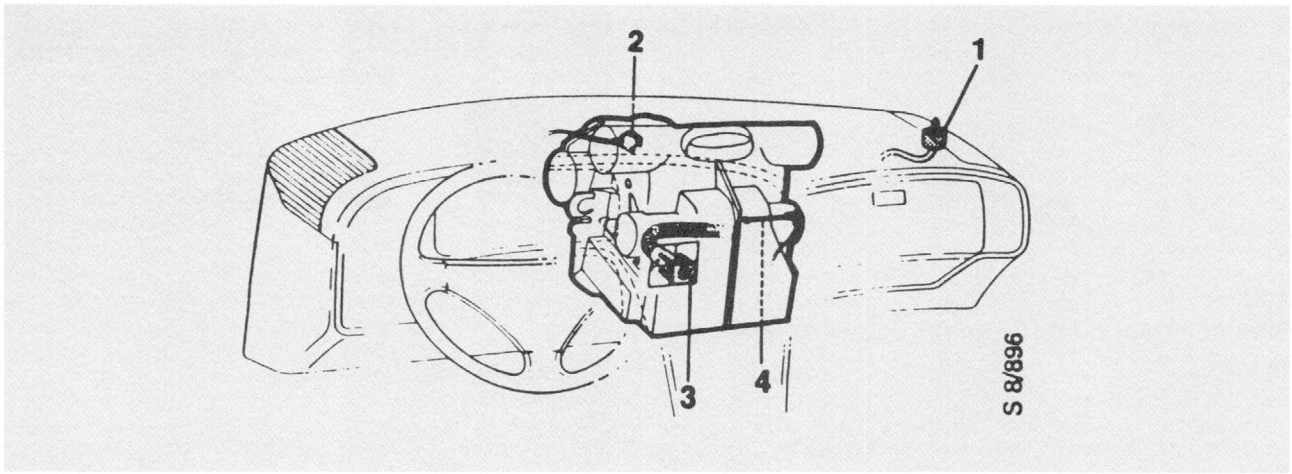
The ECU for the ACC is incorporated in the control panel. It receives information from four sensors and the settings of the controls on the panel.

The inside air sensor and the blended air sensor are thermistors, whose electrical resistance varies with temperature.

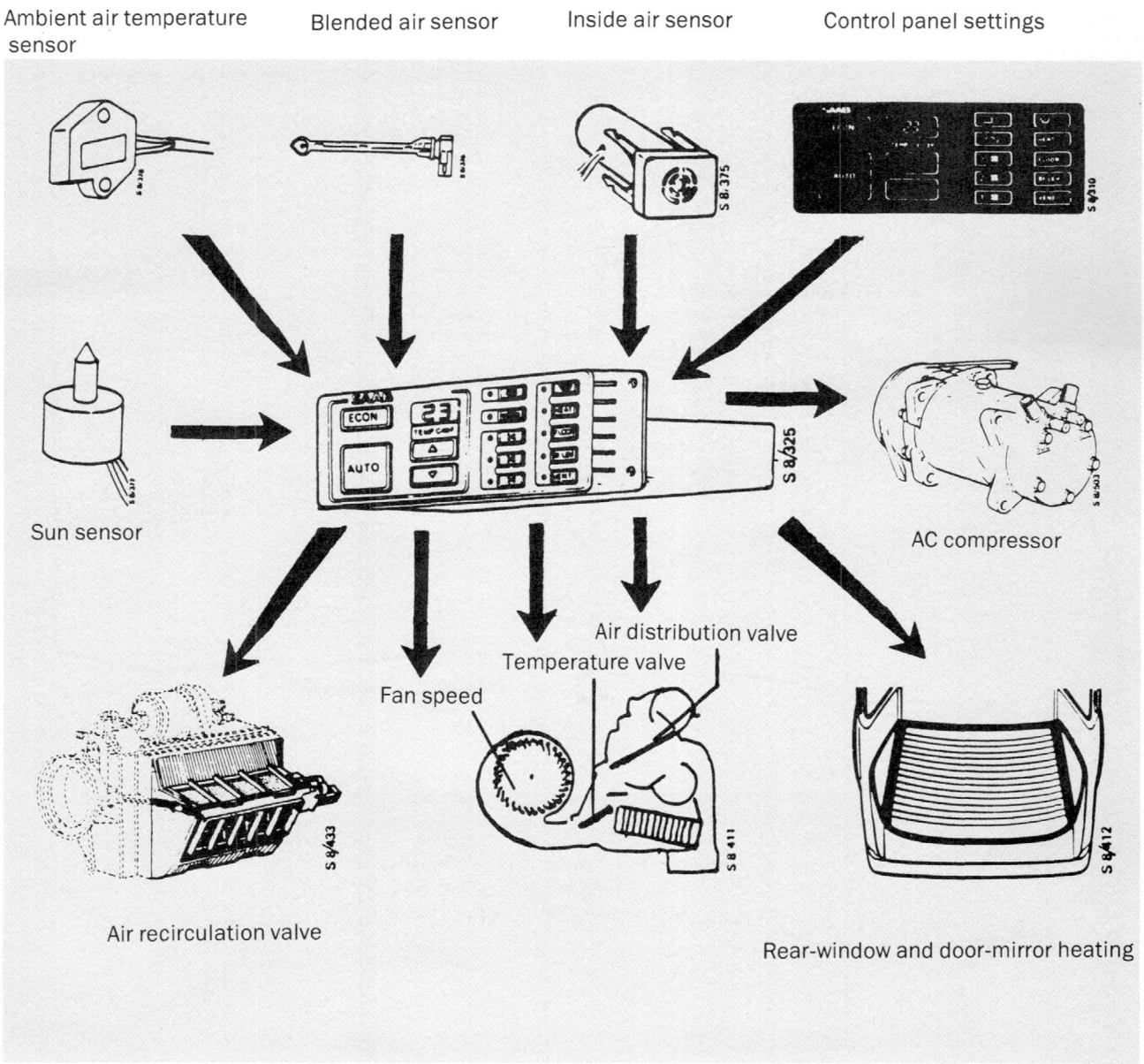
The temperature sensor for the supply air is of the transistor type and located on the outside of the fan casing.

The sun sensor is a photodiode which senses the intensity of the sun. One of the functions based on the information received from this sensor is automatic variation of the fan speed depending on whether the car is exposed to direct sunlight or not.

The sensor downstream of the heat exchanger provides information on the temperature of the air leaving the heat exchanger.

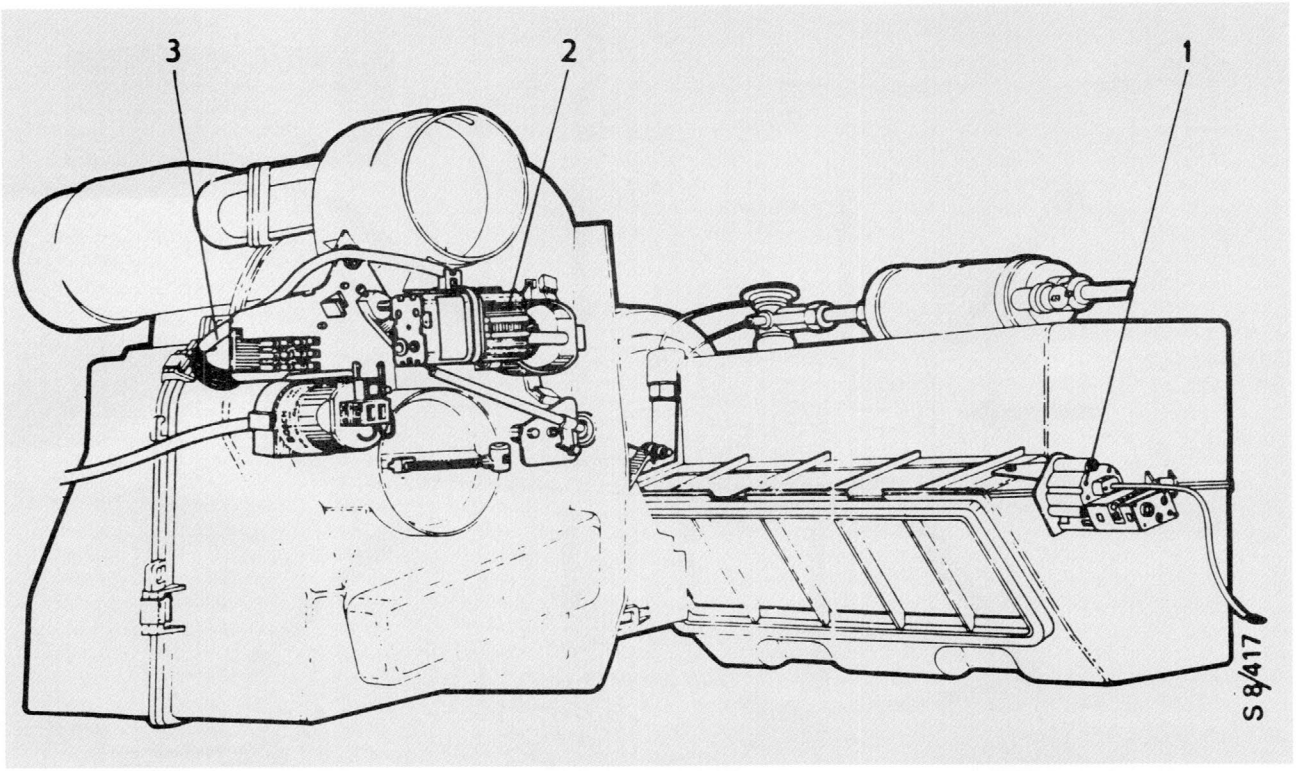


1 Sun sensor (the sensor is located on the LH side in cars with chassis no. CG1007457 or earlier)
2 Ambient air temperature sensor
3 Inside air sensor (as from M87 the suction fan motor and inside air sensor are housed in a single unit)
4 Blended air sensor



Principle of operation of the ACC system

Servomotors (electric actuating motors)



1 Servomotor for air recirculation valve
2 Servomotor for air distribution valve
3 Servomotor for temperature valve

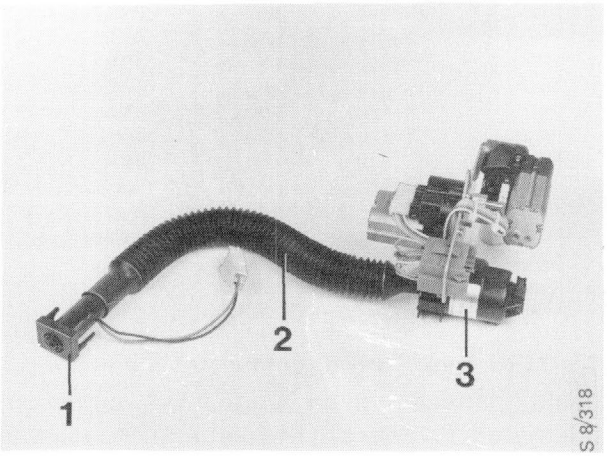
All the valves (for temperature, air distribution and air recirculation) are actuated by servomotors.
The settings of the respective valves are controlled by the ECU for the ACC.

Fan motor for inside air sensor

A constant flow of air across the sensor is necessary for the sensor to be able to sense the temperature of the air. The required air flow is provided by an electric fan.

M86 and earlier models:

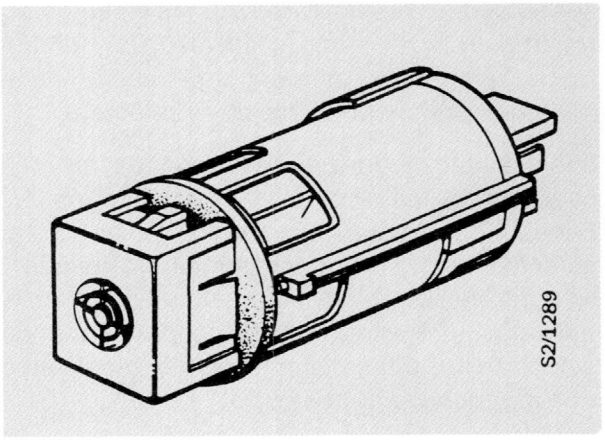
The fan on the heater box is connected to the inside air sensor by means of a flexible duct.



1 Sensor
2 Flexible duct
3 Fan

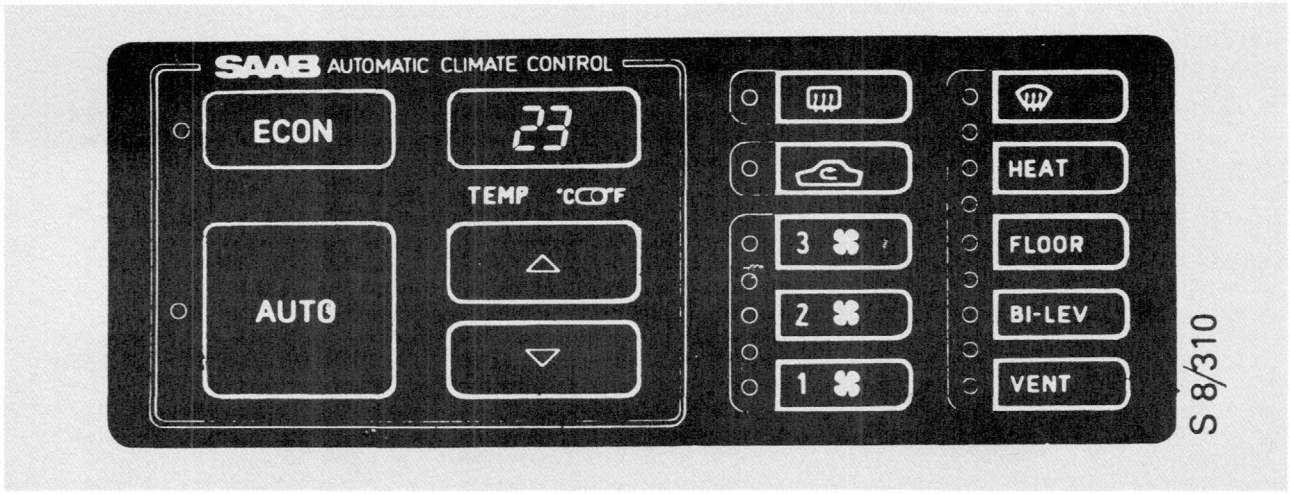
M87 onwards:

The fan and inside air sensor form an integral unit.



Integral fan and inside air sensor unit

ACC control panel



The ACC system is programmed by means of the control panel. When the ignition is switched on, the system is always in the automatic mode and it will bring the temperature of the air inside the car to the selected value as quickly as possible. The indicating light (LED) beside the AUTO button will be on and the other LEDs will indicate the fan speed and air distribution settings selected automatically by the system, and also if the heating for the rear window or door mirrors and/or the air recirculation function have been selected.

It is possible to override the automatic program by pressing one or more of the buttons on the panel. The system will then lock in on the selected function but the remaining functions will still be controlled automatically. The AUTO indicator light will go out as soon as a manual selection has been made (except manual selection of rear-window heating).

If the AUTO button is depressed, or if the same selection button is depressed again, the manually selected mode will be cancelled, the system will revert to automatic mode and the AUTO indicator light will come on.

The rear-window and door-mirror heating and the air recirculation function are also included in the automatic program.

The ACC system is programmed in such a way that, when operating in the automatic mode, it will supply warm air through the floor ducts and cool air through the panel vents.

Starting in cold weather: Initially the automatic program will select the defroster function and fan speed 2. The rear-window heating will also be switched on. Once the blended air sensor senses that the temperature of supply air has reached approximately 50° C (122 °F), the system will direct the air through the floor vents and the fan speed will first increase (LED on between speeds 2 and 3 on the control panel) and then gradually decrease until the selected temperature has been obtained.

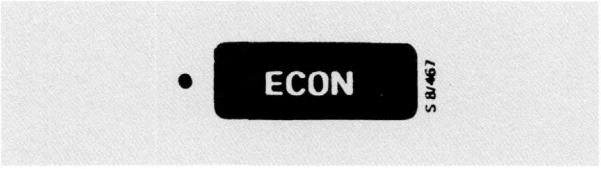
Starting in warm weather: The automatic program will select the VENT (fresh-air) function or BI-LEV, depending on the intensity of the sun, and a high fan speed. The speed of the fan will gradually decrease as the temperature inside the car approaches the selected temperature.

If, ECON has been selected, the compressor will not run. If the temperature of the ambient air exceeds approx. 27 °C (81 °F), air recirculation will also be selected. If the difference between the inside temperature and the selected temperature is greater than 5 °C, the VENT function will be selected.

Function selected by the panel controls

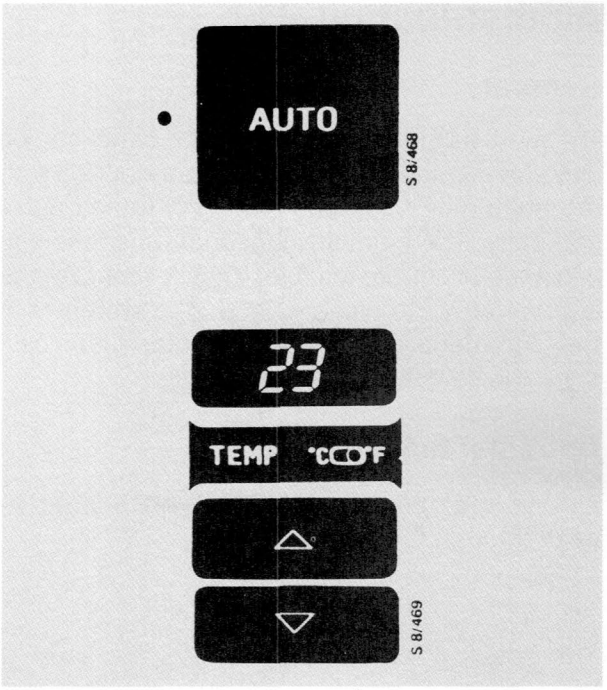
Indicator light on:

Compressor off and all other functions in automatic mode.



Indicator light on:

All functions in automatic mode, regardless of the ambient temperature.



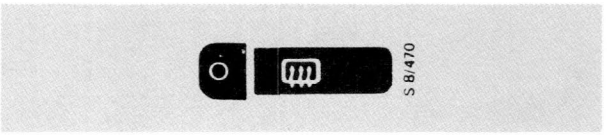
The digital display shows the selected inside temperature, which can be set to between 17 and 27 °C (63-81 °F). The small sliding knob immediately below the digital display is used for switching the display from degrees Celsius to degrees Fahrenheit or vice versa.

When LO is selected (below 17 °C/63 °F), air will be directed through the panel vents and the temperature valve will be closed.

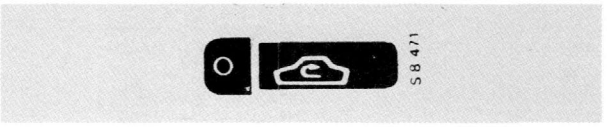
When HI is selected (above 27 °C/81 °F), the fan will run at reduced speed, warm air will be directed to the floor and defroster vents, and the temperature valve will be wide open.

Each time either of these buttons is pressed, the temperature shown on the display will increase/decrease by 1 °C/2 °F.

In the automatic mode, when the system selects the defroster function, rear-window and door-mirror heating will be switched on automatically and off again after 13 minutes. The heating can be switched off sooner by pressing the button. The rear-window heating can also be switched on manually but will still be switched off automatically after 13 minutes. Manual selection of the defroster function will not switch on the rear-window heating.



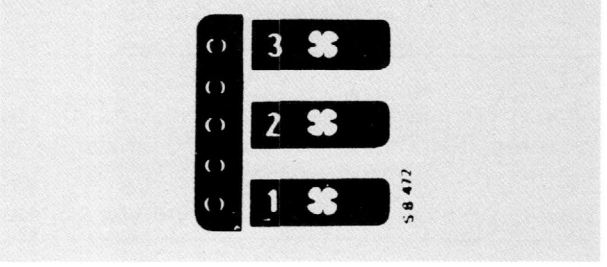
Air recirculation: To select air recirculation manually, press the button, whereupon the indicator light will come on.



N.B.
Air recirculation should be used when selected automatically by the system or to prevent fumes being drawn into the car in a traffic jam, etc.

If air recirculation has been selected automatically, the indicator light will come on.

Fan speed: Three speeds for manual selection. When the system is in the automatic mode, the fan speed is infinitely variable.



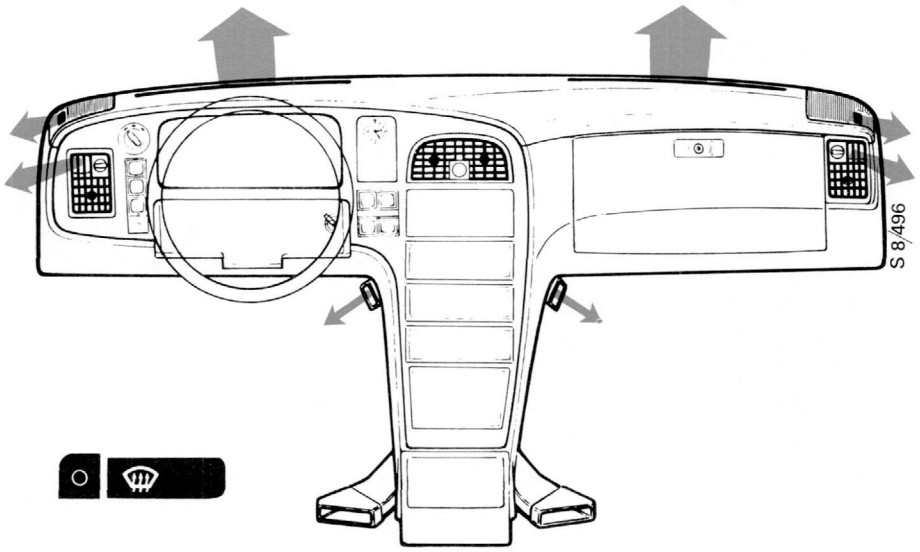
Air distribution

General

The air distribution controls on the panel can be used for manual selection of air distribution with the remaining functions being controlled automatically. The manually selected functions can be cancelled by pressing AUTO or by pressing the appropriate button again. When the system is in the automatic mode, the indicator lights will show the selected functions.

Defroster function

Air directed through defroster vents. Slight leakage through floor vents.

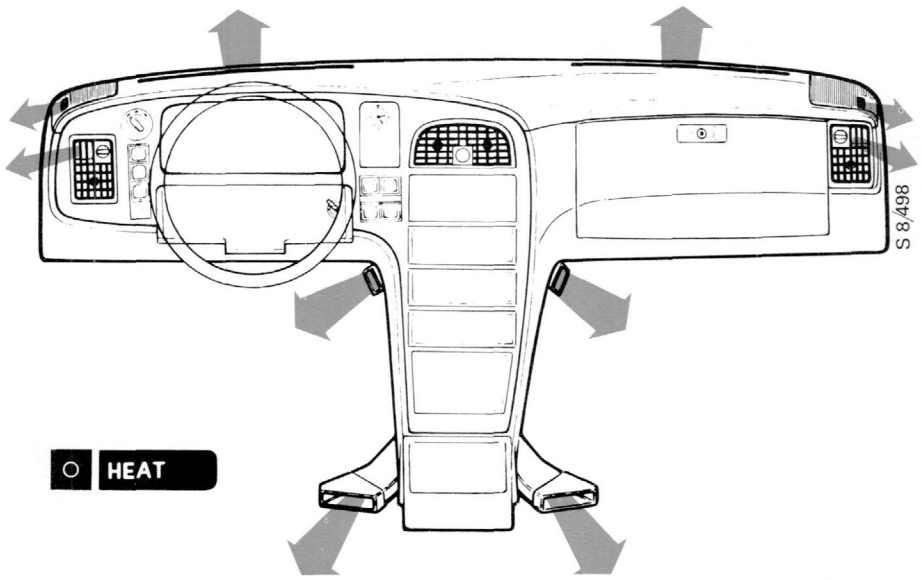


N.B.
Extended floor ducts were introduced in all cars as from M88.

N.B.
As from M87 (LHD cars: chassis No. CH1007949 onwards; RHD cars: CH1024270 onwards) all defroster air for the side windows is discharged via the vents incorporated in the speaker grilles.

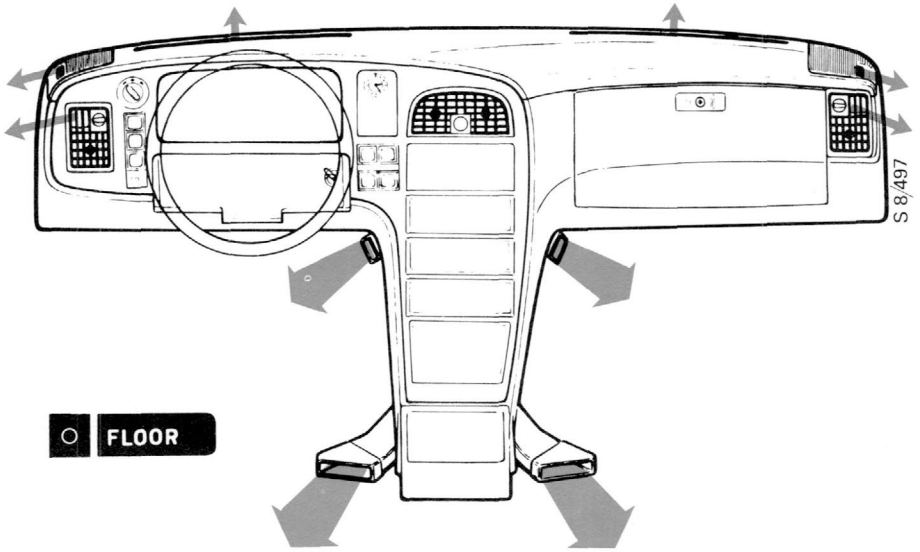
HEAT function

Air directed through the floor and defroster vents. Slight leakage through panel vents.



FLOOR function

Air directed through floor vents. Slight leakage through defroster vents.



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Extended floor ducts were introduced in all cars as from M88.

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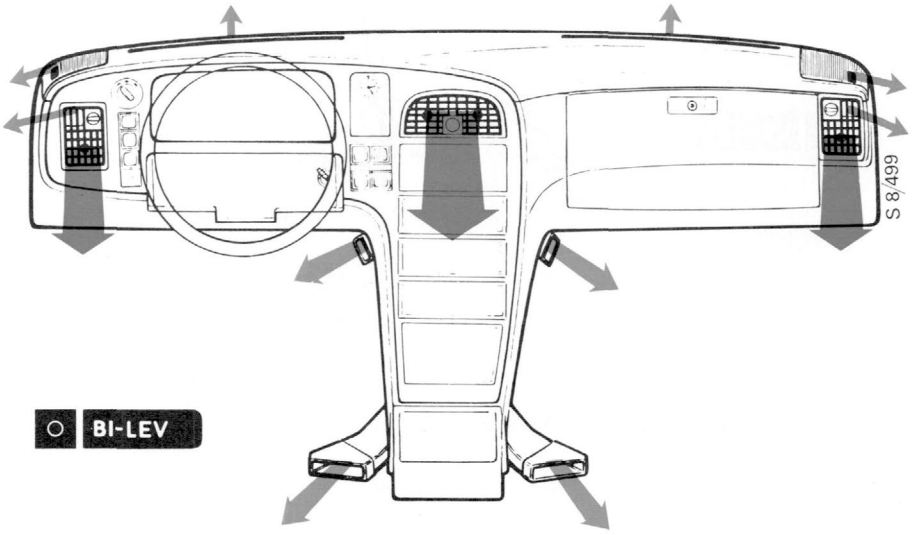
BI-LEV function

Air directed through panel and floor vents. Slight leakage through defroster vents.

N.B.
The air supplied through the panel vents should feel cooler than the air supplied through the floor vents.



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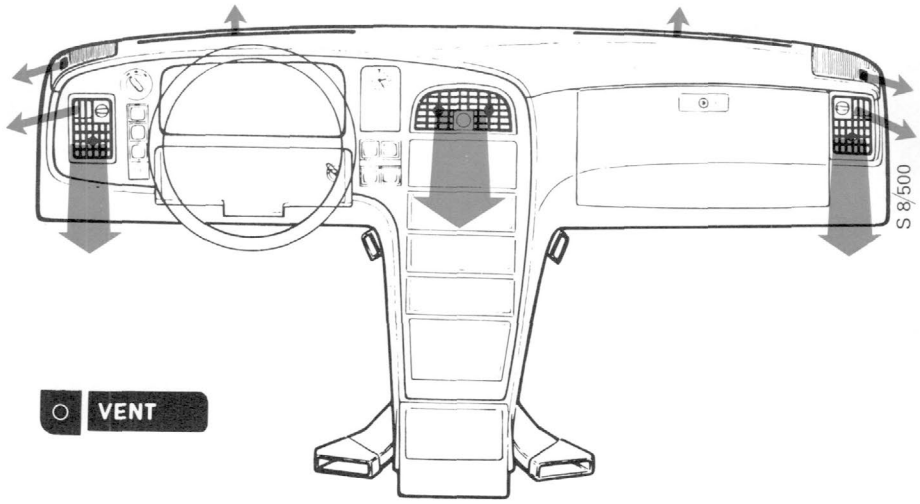
N.B.
As from M87 (LHD cars: chassis No. CH1007949 onwards; RHD cars: CH1024270 onwards) all defroster air for the side windows is discharged via the vents incorporated in the speaker grilles.

VENT function

Air directed through panel vents.



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Extended floor ducts were introduced in all cars as from M88.

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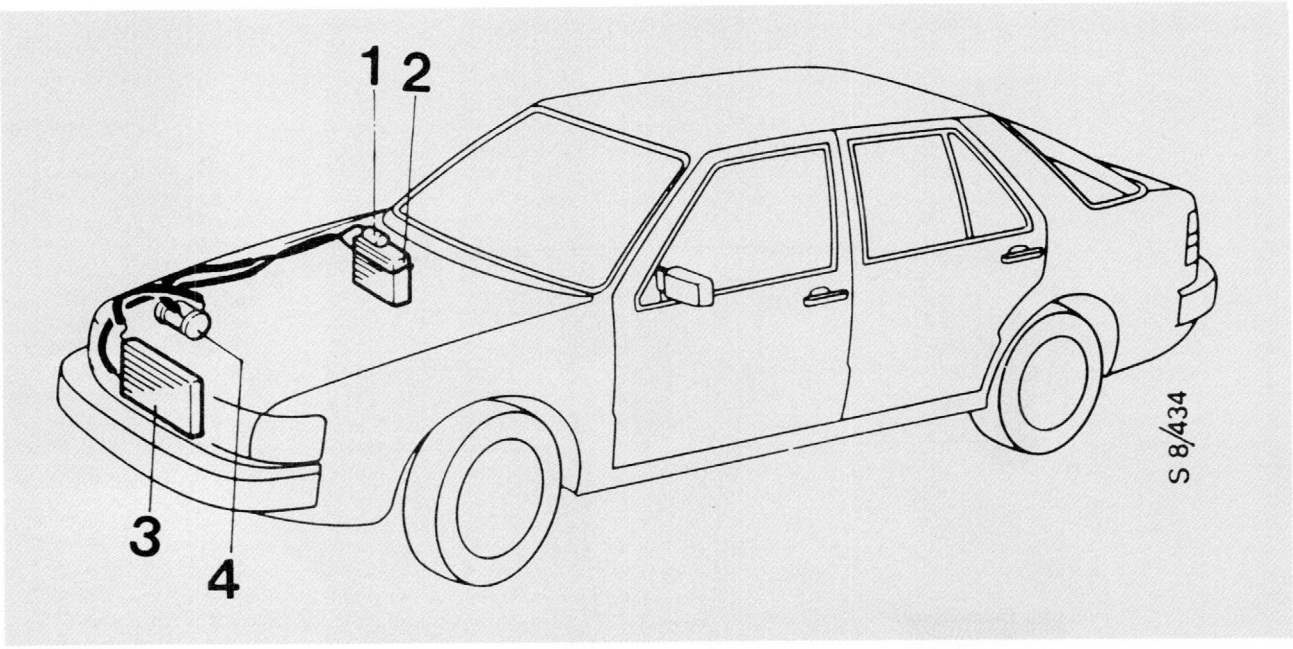
Air conditioning system (AC)



AC system

1 Receiver
2 Evaporator
3 Condenser
4 Compressor

The function of the air conditioning system in the car is to reduce the temperature inside the car to a comfortable level when the outside temperature is high.

In wet weather, the AC system can also keep the windscreen and side windows demisted, with the fan running at low speed, even under the most adverse conditions.

The AC system does not produce cold air but extracts heat from the air inside the car.

Since heat always flows from a hotter body to a cooler one, a medium whose temperature is lower than that of the air inside the car is used to carry the heat away.

The medium used is a liquid refrigerant (Freon or refrigerant R12) which boils and vaporizes at a low temperature (-30 °C at atmospheric pressure).

For a given volume of refrigerant, there is a constant relationship between pressure and temperature, which means, for instance, that if there is a change in pressure there will be a corresponding change in temperature. It is this property that is utilized by the AC system.

The refrigerant circulates through a closed system and a reduction in the pressure in the system raises the temperature of the refrigerant, causing it to boil (vaporize). At the pressure prevailing in this system, the refrigerant vaporizes at an approximate temperature of 0 - 4 °C (32 - 39 °F).

However, to change its state from a liquid to a gas, the refrigerant must be supplied with heat. This heat is taken from the air surrounding the evaporator, in which the change of state takes place. Because this heat is being absorbed by the refrigerant, the surrounding air becomes colder. This same chilled air is then blown into the car by the ventilation fan. The heat absorbed by the refrigerant inside the evaporator is carried to the engine bay where it is dissipated in the air by a condenser, which is cooled by the ram air and/or the cooling fan.

The AC system is of the compressor type, which means that a compressor forces the refrigerant to circulate through the various system components.

Operating principle of the AC system

Evaporator

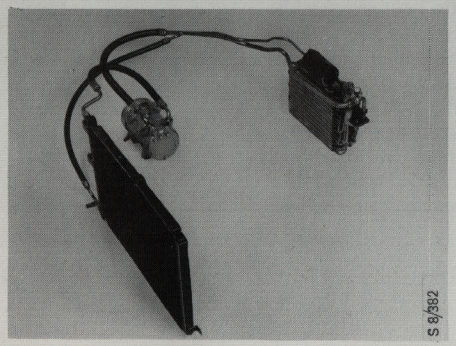
After the refrigerant has entered the evaporator through the expansion valve, it expands. This is because the pressure inside the evaporator is much lower, owing to the suction generated by the compressor. As the refrigerant expands, it changes state by vaporizing. The heat required for this change of state is taken from the air surrounding the evaporator. The now chilled air is blown into the car by the ventilation fan and the refrigerant, now in the gaseous state, flows to the compressor.

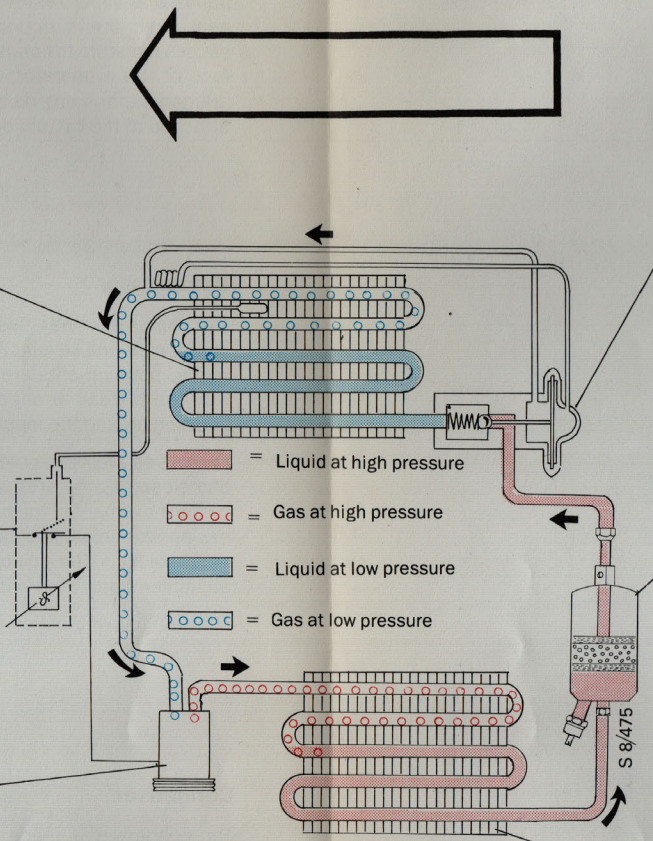
Anti-frost thermostat

The anti-frost thermostat prevents the formation of ice on the evaporator. A capillary tube fitted between the cooling fins on the evaporator senses the temperature. If the tem perature falls below 1.5 °C/35 °F) the electrical circuit to the compresser clutch is broken. Once the temperature at the evaporator has risen to approx. 4.5 °C, (40 °F), the thermostat makes the circuit and the compressor cuts in again.

Compressor

The refrigerant enters the compressor in a gaseous state and at low pressure. Inside the compressor, the refrigerant is compressed, which increases its pressure and temperature. The now hot refrigerant, still in the gaseous state, flows from the compressor to the condenser.





Expansion valve

The refrigerant enters the expansion valve in the liquid state, at high pressure and high temperature. The function of the expansion valve is to regulate the amount of refrigerant admitted to the evaporator. The valve will not admit a greater amount of refrigerant than can be vaporized at a given time. To enable the expansion valve to admit precisely the correct quantity of refrigerant, it is equipped with a temperature sensor and a capillary tube for pressure equalization.

Receiver

The function of the receiver is twofold: to store and to desiccate (remove moisture from) the refrigerant.
The liquid refrigerant enters the receiver at high pressure and high temperature. It flows through a filter unit where it is desiccated and where any solids are separated out. From the receiver, the refrigerant flows in the liquid state to the expansion valve.

A pressure switch fitted to the receiver will break the cir cuit to the compressor if the pressure inside the system falls too low.

Condenser

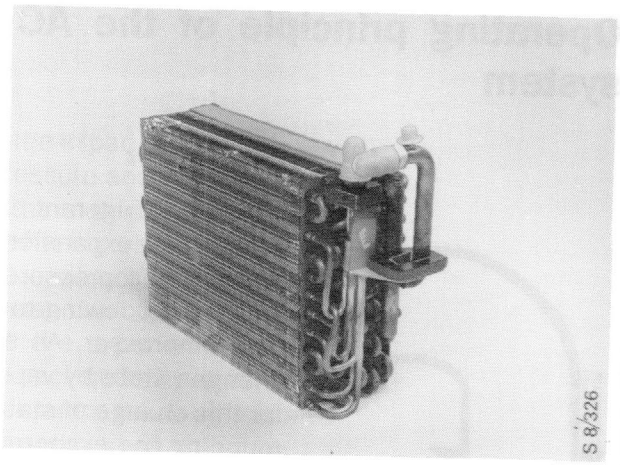
The compressor forces the hot refrigerant at high pressure into the condenser coil. The coil is fitted with cooling fins which are cooled by air flowing across them. The flow of air is produced by the ram effect from the motion of the car and/or by the fan. Since heat always flows from a hotter to a cooler body, the refrigerant transfers some of its heat to the cooler air. As the hot, gaseous refrigerant loses heat, it condenses, changing to the liquid state.
A safety valve fitted in the hose connected to the condenser outlet will allow refrigerant to escape if the pressure inside the system should become excessive.

Saab 9000

Evaporator

The evaporator is of the finned type and fitted with a refrigerant manifold.

When the refrigerant enters the evaporator it expands and vaporizes, at the same time taking heat from the surrounding air. This process causes moisture to condense on the outside surface of the evaporator, and the condensate is drained into the engine bay by means of a hose attached to the bottom of the evaporator body.

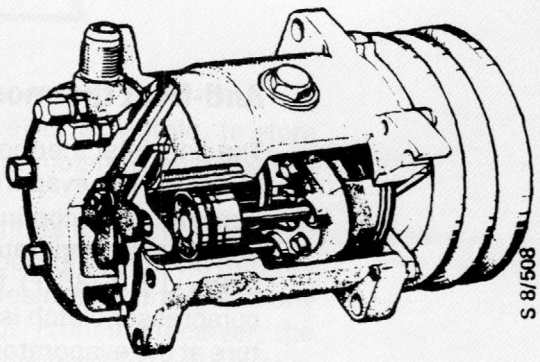


Compressor

The compressor has five cylinders in M87 and earlier cars and seven cylinders in M88 cars onwards: both variants are of the axial-flow type, with the pistons arranged in an annular configuration around the input shaft.

The valves are of the reed type and are opened and closed by the pressure differences created by the movement of the pistons. The compressor has an aluminium body and cylinder head and a steel block. The pistons, which are also aluminium, are fitted with a single piston ring.

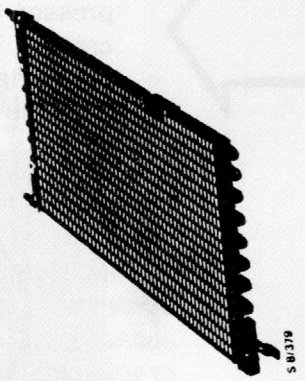
The clutch is of the electromagnetic type.



Condenser

The condenser is made of aluminium and the cooling tubes, arranged in a serpentine configuration, are fitted with cooling fins.

The refrigerant flowing through the condenser is cooled by the ram air and the heat released is dissipated in the surrounding air. A mechanical safety valve is fitted in the hose running from the condenser outlet. If the pressure in the system rises above the preset limit of 3.1 MPa (441 psi), the valve opens. The valve closes again once the pressure has fallen to 2.75 MPa (391 psi). This prevents the other components and hoses in the system being damaged by excessive pressure.

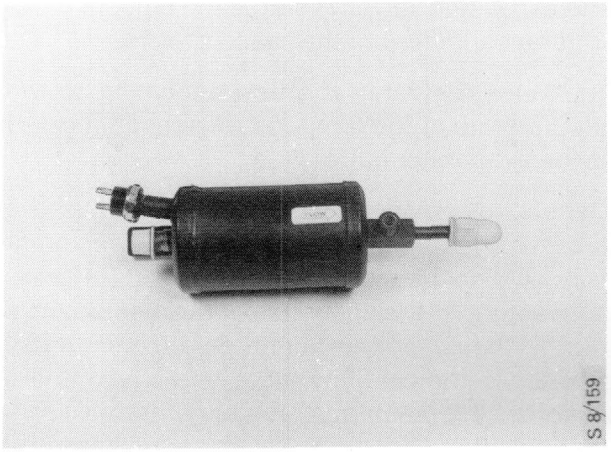


Receiver

The receiver is mounted on top of the evaporator. The function of the receiver is twofold: to store and to desiccate the refrigerant. The refrigerant enters the receiver in liquid state, at high pressure. It flows through the filter unit where it is desiccated and where any solids are separated out. From the receiver, the refrigerant flows to the expansion valve.

A sight glass is fitted to the receiver to give a visual indication of the quantity of refrigerant in the system.

Also fitted on the receiver is a pressure switch.



M85:

The pressure switch isolates the compressor if the pressure in the system falls below 2.7 kPa (38 psi).

The compressor will be switched on again when the pressure reaches 3.1 kPa (44 psi). Thus, the compressor cannot run dry by running when the pressure is too low.

If the ambient temperature falls below approx. 5 °C (41 °F), the pressure in the system will be so low (less than 2.8 kPa/40 psi) that the compressor will not run at all.

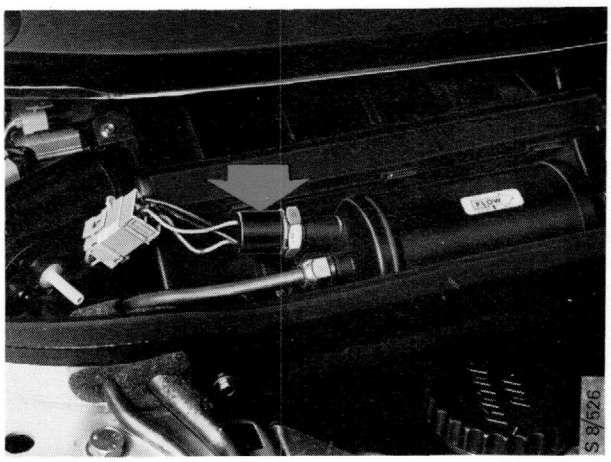
M86 onwards:

The pressure switch has the following functions:

Stage 1 This allows the compressor to run at temperatures down to freezing point (0 °C/32 °F). At freezing point, the system pressure is approx. 2 bar (29 psi).

Stage 2 Switches on the electric radiator fan when the pressure has risen to approx. 15 bar (218 psi). After the pressure has fallen to approx. 11 bar (160 psi) it switches the fan off again.

Stage 3 This is a safety function which breaks the power supply to the compressor if the pressure exceeds 27 bar (392 psi). It will allow the compressor to be switched on again after the pressure has fallen to 6 bar (87 psi).



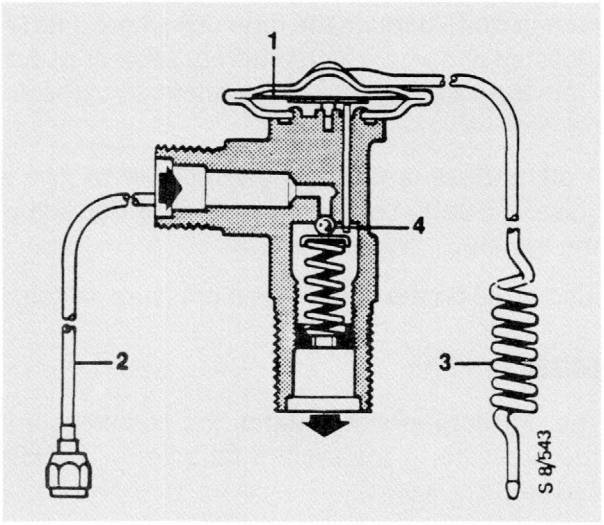
Expansion valve

The expansion valve regulates the amount of refrigerant admitted to the evaporator.

The valve regulates the flow according to the temperature at the temperature sensor, located in the evaporator outlet pipe.

Depending on the temperature, and thus the pressure, in the evaporator outlet, a given pressure acts on the top of the diaphragm. The pressure acting on the underside of the diaphragm is that in the evaporator outlet pipe (communication is via the capillary tube). Via a disc and a pushrod, the diaphragm actuates the valve regulating the flow of refrigerant into the evaporator.

If too much refrigerant is admitted to the evaporator, the system will be flooded, and not all of the refrigerant will vaporize - resulting in poor cooling capacity. This may also damage the compressor, as refrigerant in liquid state can be drawn in (producing hammering). If too little refrigerant is admitted, vaporization will occur too early, which also results in poor cooling.



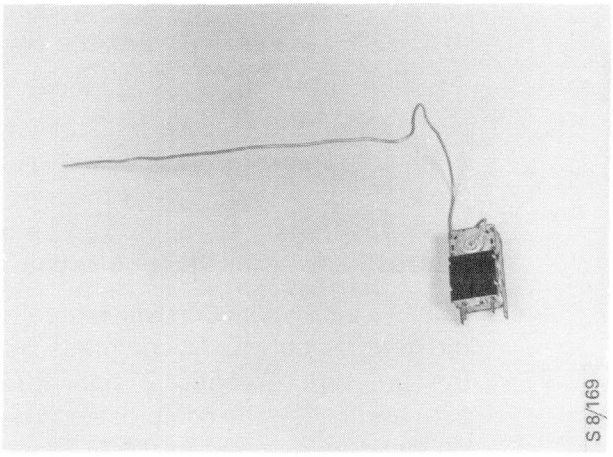
1 Diaphragm
2 Capillary tube
3 Temperature sensor
4 Valve

Anti-frost thermostat

The anti-frost thermostat is fitted on top of the evaporator. The task of the anti-frost thermostat is to prevent the formation of frost or ice on the evaporator cooling fins.

A capillary tube is fitted between the evaporator fins to sense the temperature.

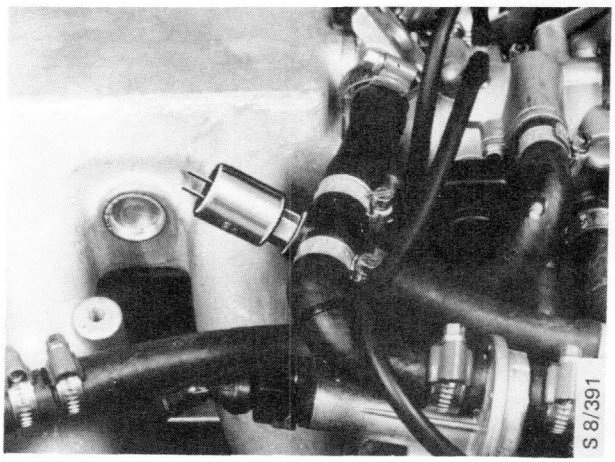
If the temperature falls to 1.5 °C (35 °F) the thermostat breaks the power supply to the compressor. Once the temperature of the evaporator has risen to approx. 4.5 °C (40 °F) the compressor will cut in again.



Idling-speed compensation

Chassis No. CG1001944 and earlier:

When the compressor cuts in, a greater load is put on the engine. Thus, if the engine is idling, the idling speed could fall too low. To compensate for this, the system incorporates a solenoid valve (idling-control valve) which opens an air port in the inlet manifold when the compressor cuts in. This increases the quantity of air supplied to the engine (and thus the quantity of fuel), thereby ensuring that the engine idles at a constant speed.



Chassis No. CG1001945 onwards:

With the introduction of an automatic idling control (AIC) system on all cars with effect from the above Chassis No., the solenoid valve for idling-speed compensation was discontinued.

The AIC system operates as follows:

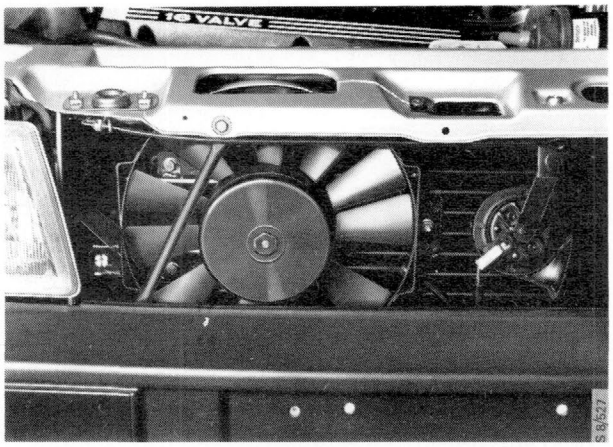
When the AC compressor cuts in, a signal is sent via the ECU for the fuel injection system to the automatic idling-control system, to compensate for the increased load. A larger quantity of air flows past the throttle butterfly via a special by-pass passage in the throttle housing. A delay function incorporated in the AC relay ensures that the idling speed is increased 0.6 seconds before the compressor cuts in.

Delayed cut-in of AC compressor on starting.

As from chassis No. CG1001945, a 10-second delay function for the AC compressor was added to all cars equipped with AC/ACC, to prevent an additional load being imposed on the engine during starting. For further details refer to Section 3 (Electrical Systems) of the Service Manual.

Auxiliary cooling fan

An auxiliary cooling fan, located forward of the radiator and cooler assembly, is fitted to M86 and later cars to cer tain specifications. The fan is wired in such a way that it is switched on and off at the same time as the compressor.



Heating and ventilation system and air conditioning system

Common to all systems

Standard system and system with ACC

Cars with ACC

Cars with AC

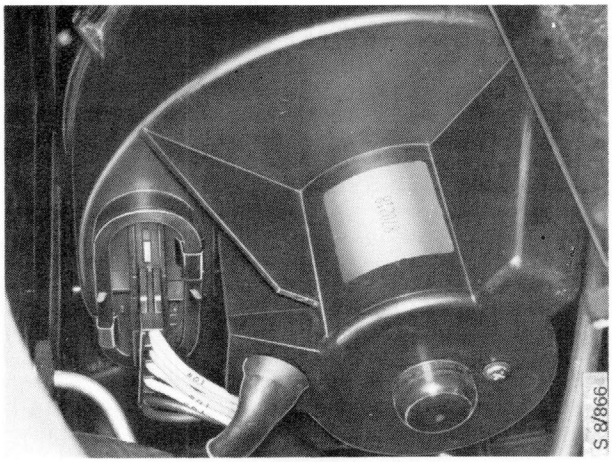
Demister fans for rear-door windows

Common to all systems

To change the fan resistor (N/A to cars with ACC)

Remove the LH cover at the air intake and the intake grille.

Unplug the connector for the fan resistor, release the clip and withdraw the resistor. Fit the new resistor.



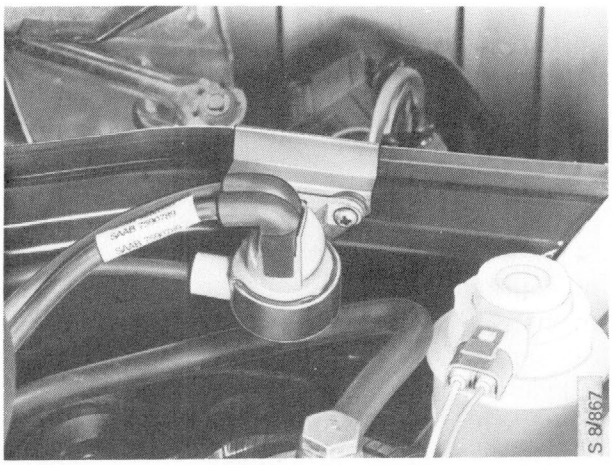
To change the fan motor

(N/A to cars with AC/ACC)

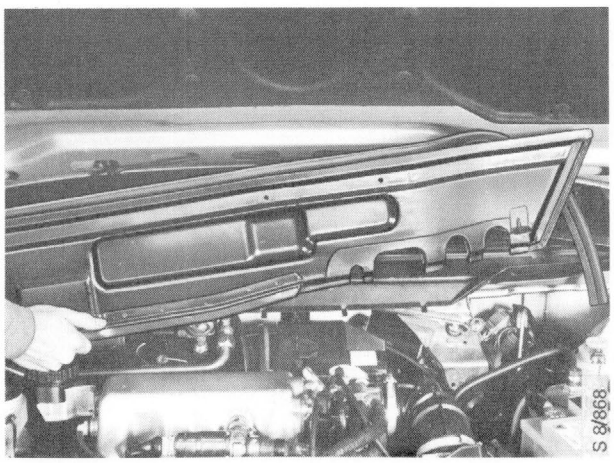
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Remove the LH and RH covers and the air intake grille.

3 Detach the seal from the false bulkhead panel and lift off the signal converter.



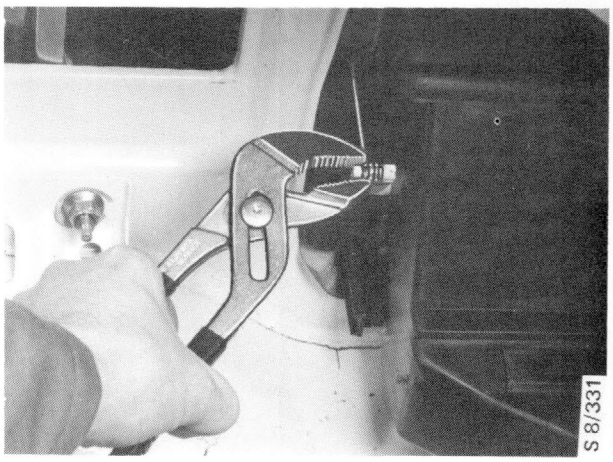
4 Remove the false bulkhead panel.



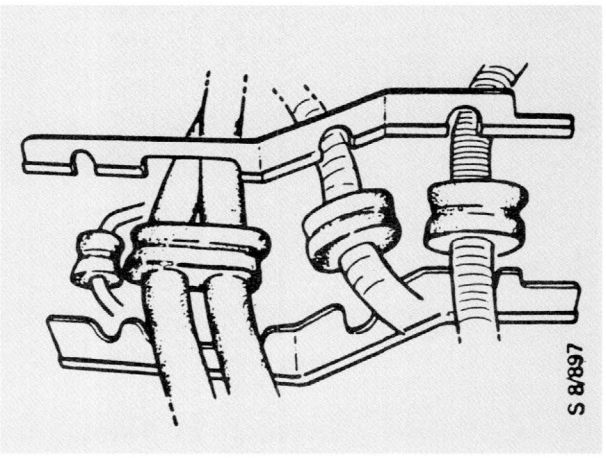
5 Remove the fresh-air filter and shroud.

6 Unplug the connectors for the fan motor and fan resistor.

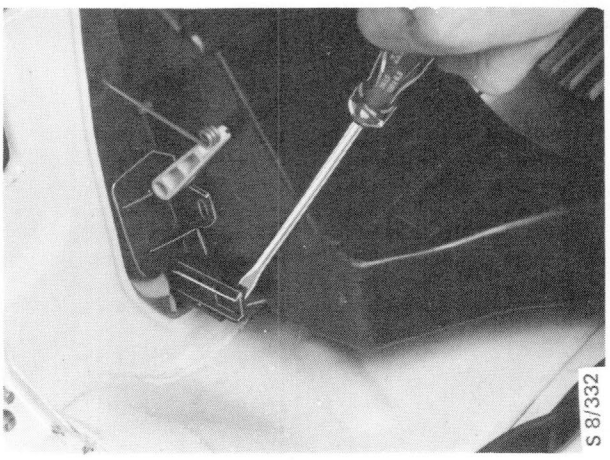
7 Disconnect the temperature control cable.



8 Remove the lead-through panel from the bulkhead (four screws).

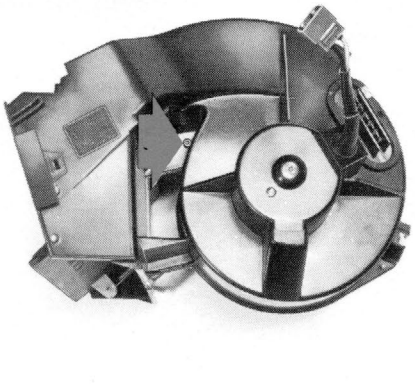


9 Release the clips on either side of the fan casing and swivel it diagonally upwards.



10 Turn the fan downwards, move it towards the RH side of the car and lift it out.

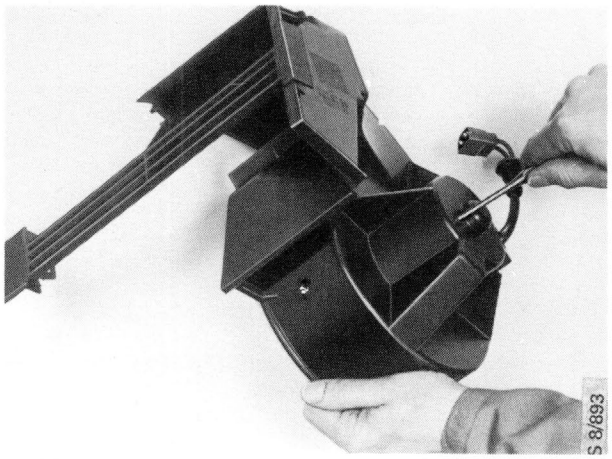
11 Remove the four plastic clips and screws holding the fan casing together.



S 8/892

12 Remove the intermediate section from the fan casing and pull the casing apart.

13 Undo the retaining screw for the fan motor and press out the motor.



S 8/893

Refit in the reverse order.

To change the fan motor

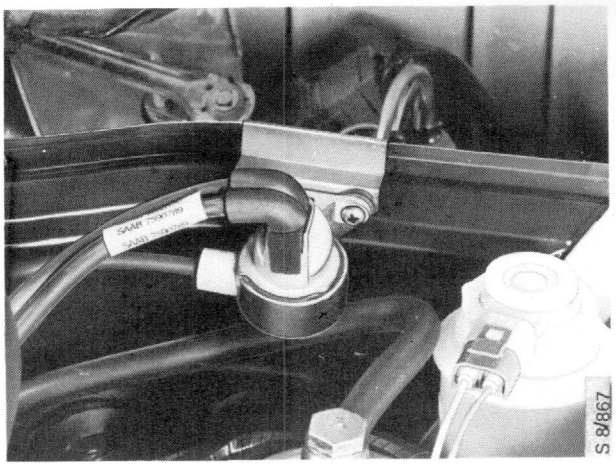
(cars with AC/ACC only)

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

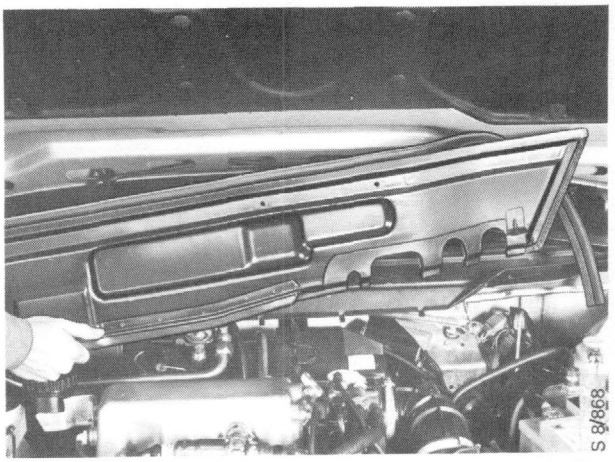
2 Remove the following:

- Bonnet
- Wiper arms
- Covers on the evaporator and wiper motor
- The plastic drainage moulding below the windscreen moulding

3 Pull the seal off the false bulkhead panel and lift out the signal converter.

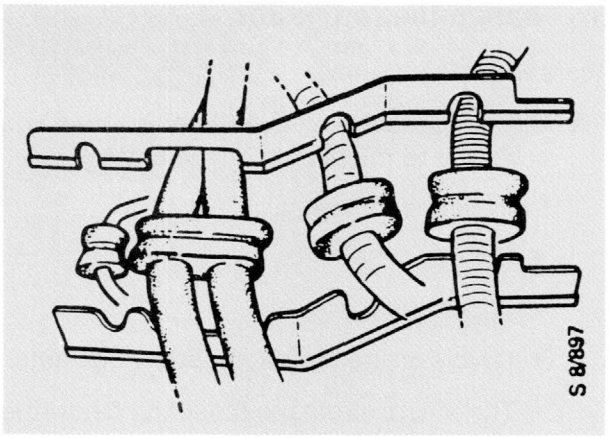


4 Remove the false bulkhead panel.

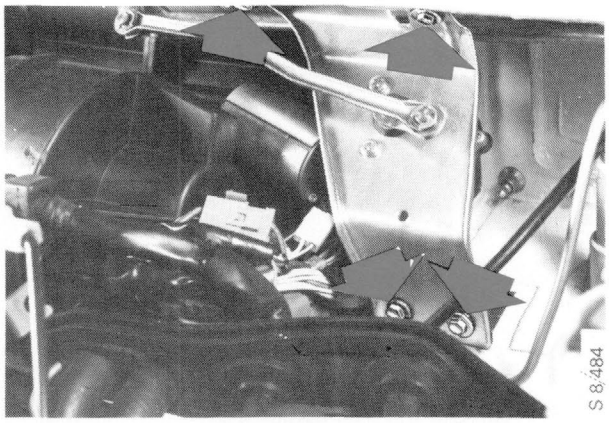


5 Unscrew and push the ECU out of the way.

6 Remove the lead-through panel from the false bulkhead (four screws).

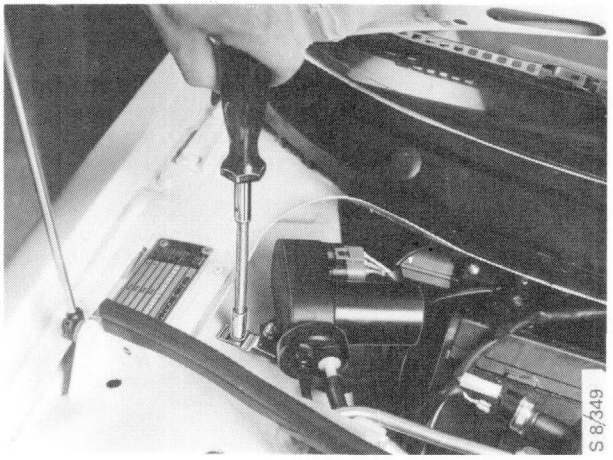


7 Snip through the cable tie, unplug the connectors and remove the wiper assembly complete.

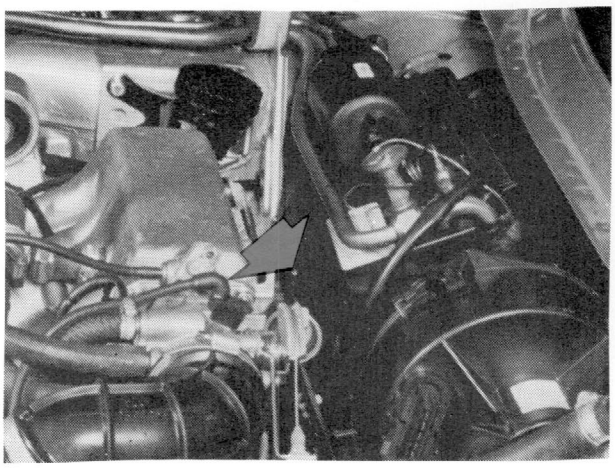


8 Drain a few litres of coolant from the cooling system. Remove the grommets from the coolant hoses and disconnect the coolant hoses from the heat exchanger (quick-release couplings).

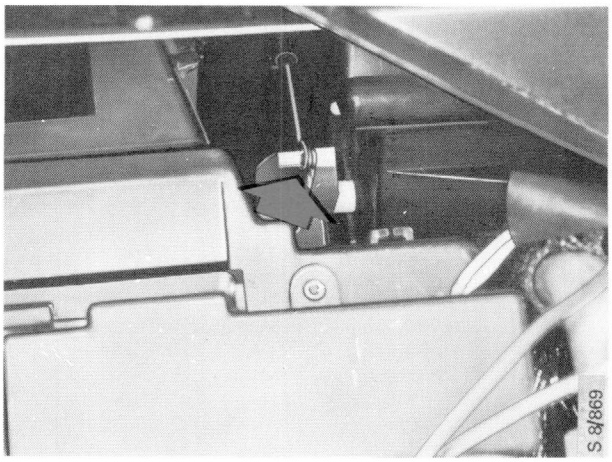
9 Where applicable, unscrew and swivel the vacuum pump for the cruise control system out of the way.



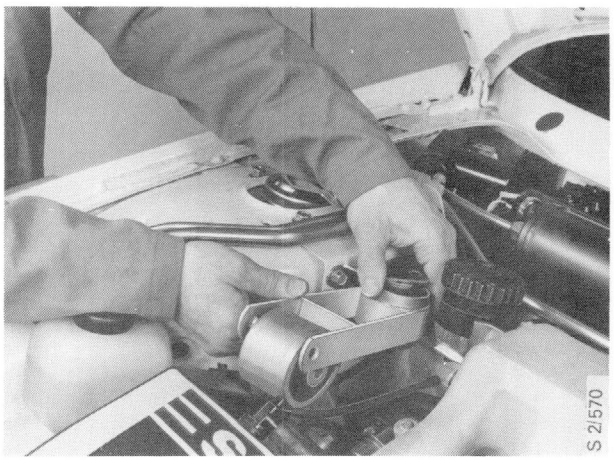
10 Undo the securing screw for the evaporator and remove the clips for the refrigerant hoses.



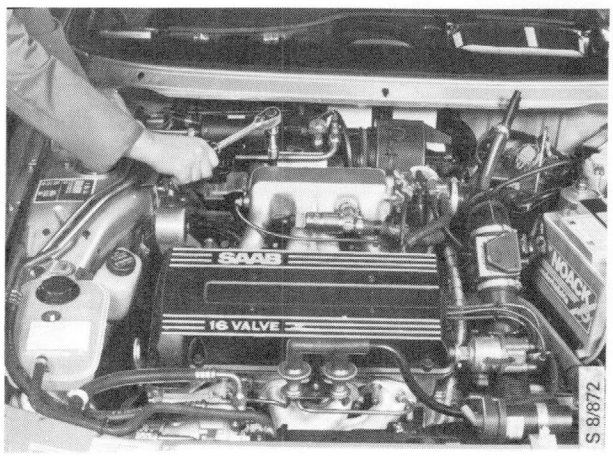
11 Remove the lock washer and disconnect the cable for the temperature valve.



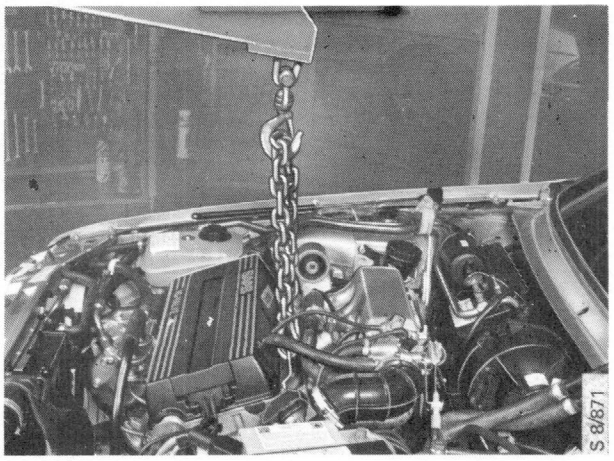
12 Unbolt and remove the engine stay.



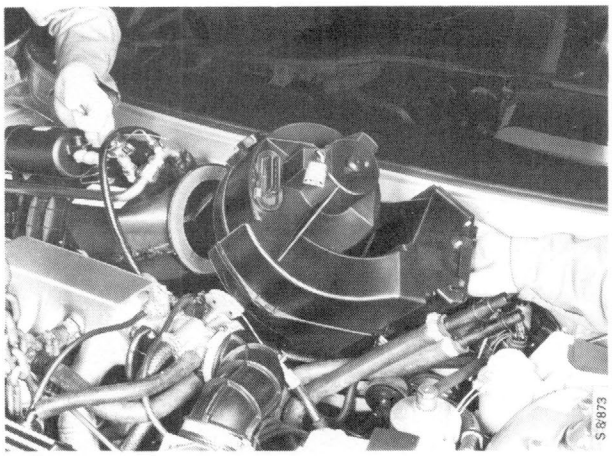
13 Undo the nut on the rear engine mounting.



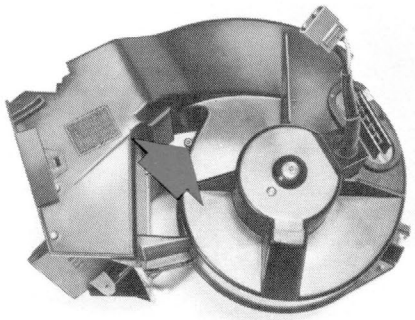
14 Attach the lifting sling to the rear lifting lug and raise the engine a little.



15 Carefully lift the evaporator and remove the fan assembly complete by releasing the clips on either side and swivelling the fan assembly diagonally upwards.

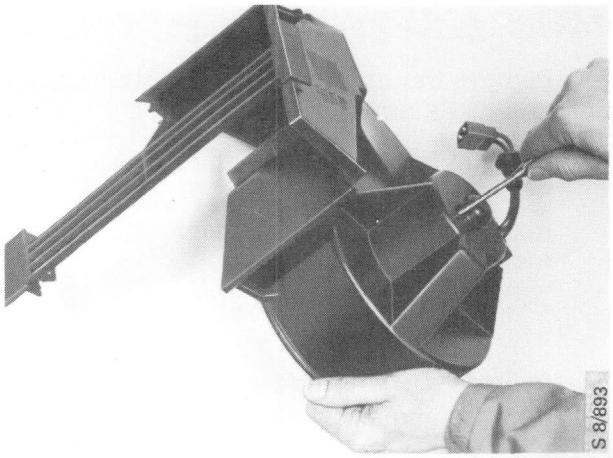


16 Remove the four plastic clips and screws holding the fan casing together.



17 Remove the intermediate section from the fan casing and separate the two halves of the casing.

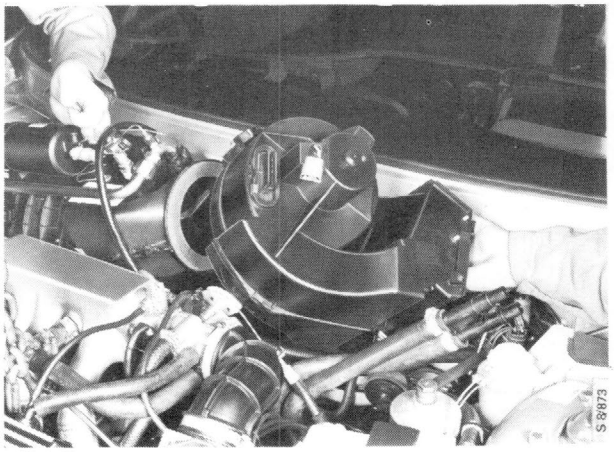
18 Remove the securing screw for the fan motor and press out the motor.



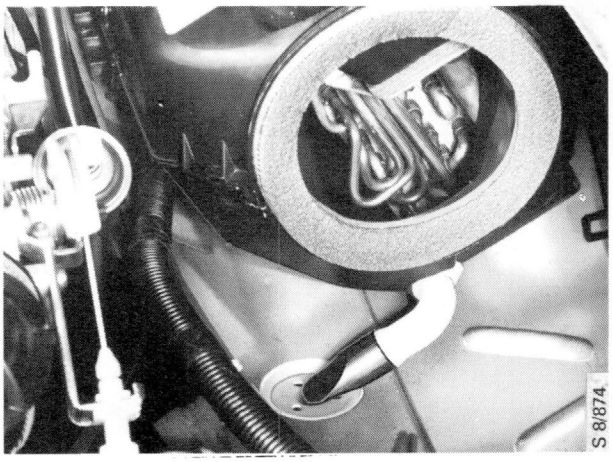
Refit in reverse order.

Hints on refitting

Lift the evaporator assembly.
Slide the fan casing into position.
Hook the top edge of fan casing over the heatong and ventilation unit.
Press the fan casing fully home, making sure the clips are properly engaged.



Check that the seal between the evaporator and the fan casing is properly in position.
Check that the drain pipe from the evaporator is correctly positioned.



N.B. To enable the position of the dra inpipe to be shown, the fancasing is not shown in the picture.

When reconnecting the hoses to the heat exchanger, make sure that the 'O' rings are not left in the heat exchanger. Fit new 'O' rings, lubricated with petroleum jelly, in the hose couplings.

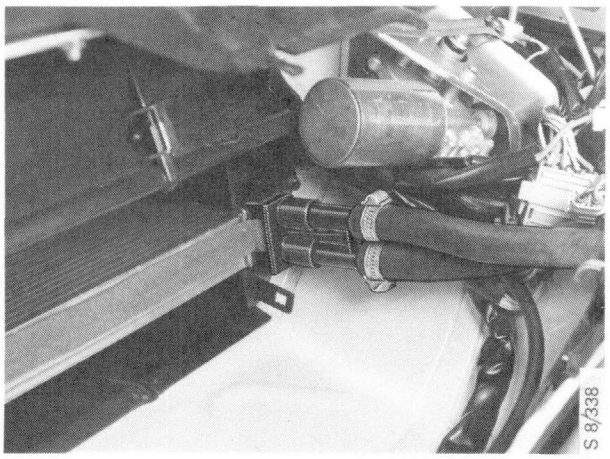
After reconnecting the hoses and topping up the coolant level, pressure test the cooling system.

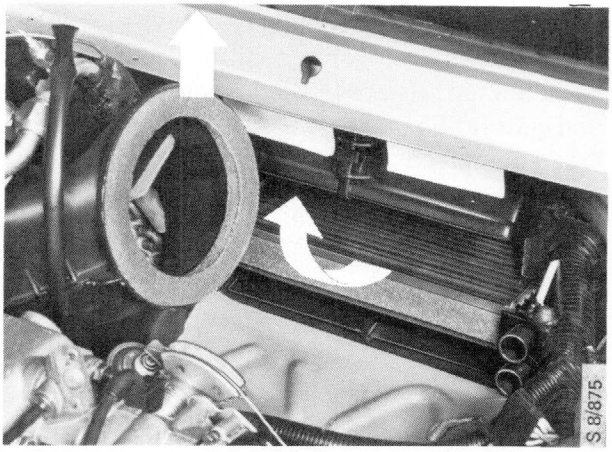
To change the heat exchanger

1 Remove the fan (as detailed in the subsection, 'To change the fan motor').

2 Cars not fitted with AC/ACC:
Drain the coolant.
Release the catch and disconnect the hoses from the heat exchanger.
Withdraw the heat exchanger.

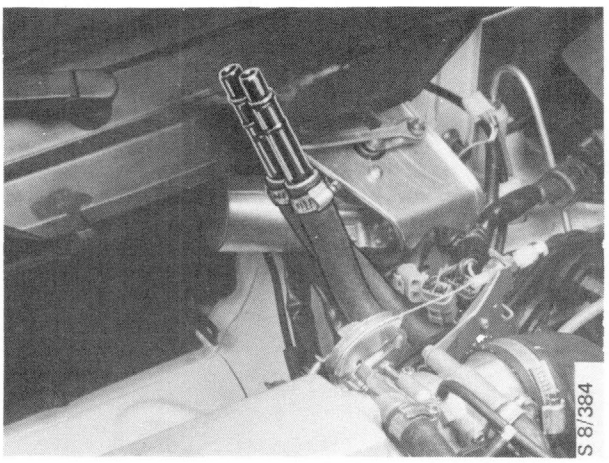
3 Cars with AC/ACC:
Release the catch and disconnect the hoses from the heat exchanger.
Lift up the evaporator.
Withdraw the heat exchanger.





Before reconnecting, check the hose fittings.

Fit new 'O' rings, lubricating them with petroleum jelly.



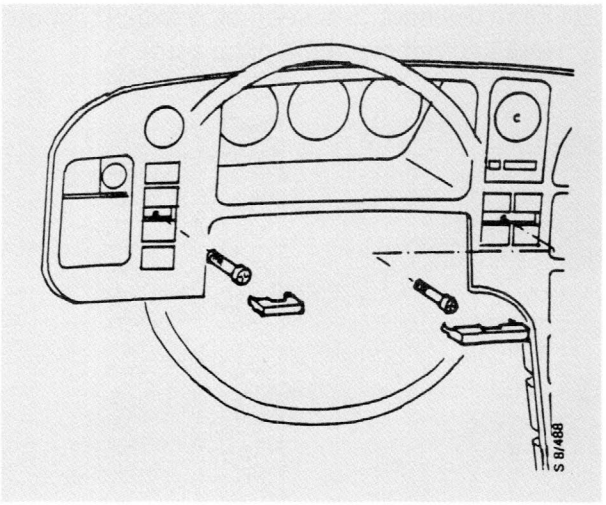
After refitting the heat exchanger, connecting the hoses and topping up with coolant, pressure test the cooling system.

Air distribution system

To change the driver's side panel vent

1 Remove the screw caps on either side of the steering wheel.

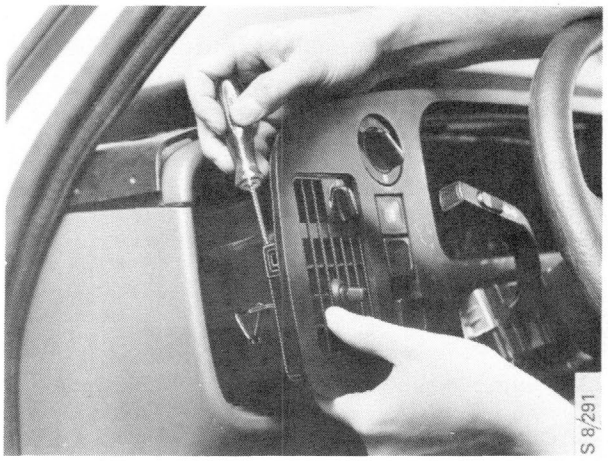
Remove the screws.



2 Withdraw the panel lighting rheostat.

3 Carefully pull away the panel surround and release the panel vent by pressing in the three catches (in some cars the vent is also retained by spring fasteners).

Remove the vent.



When refitting.

4 Fit the vent onto the ducts for the panel and defroster vents.

5 Refit the surround over the vent, making sure that the catches are properly engaged.

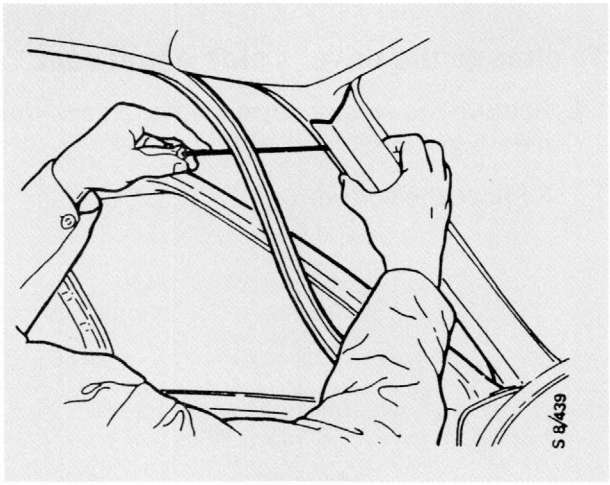
6 Refit the rheostat.

7 Fit the screws and screw caps.

8 Using a hook made of piano wire, pull the vent into position.

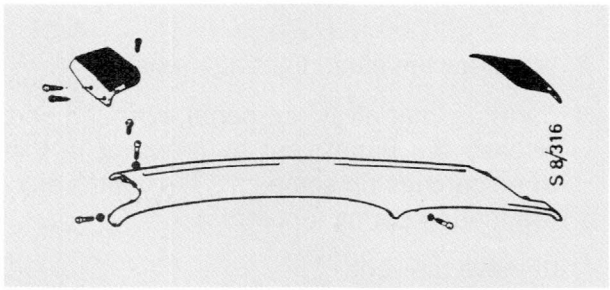
To change the centre panel vent

1 Ease the door trim seal away from the A pillars and remove the A pillar trim.



2 Remove the speaker grilles.

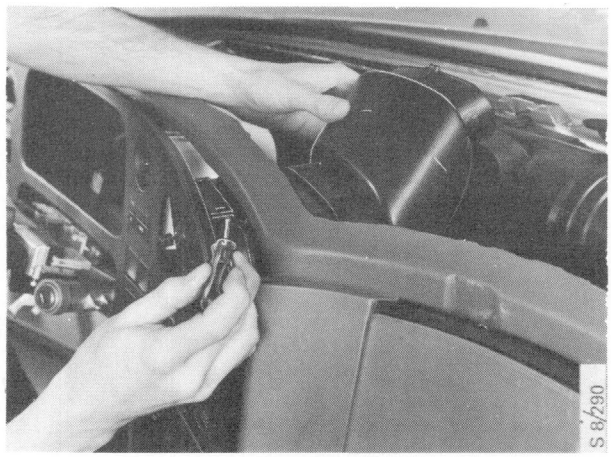
3 Undo the screws and, lifting the leading edge, pull the fascia top towards you to release the catch at the back.



4 Press the panel vent and duct towards you.

5 Disconnect and remove the duct by pressing it up.

6 Release the panel vent catches and lift the vent out from behind.

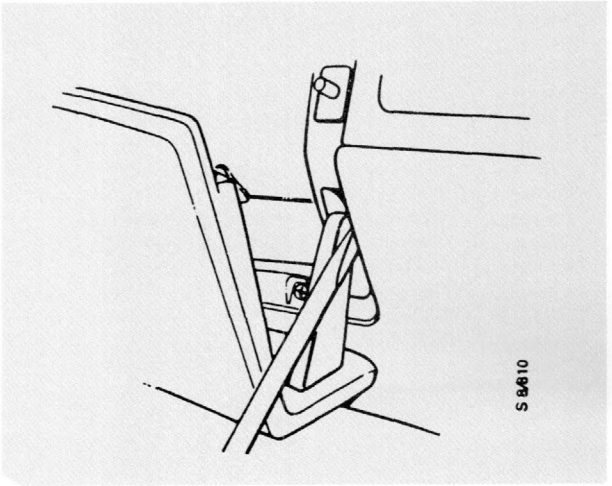


When refitting, make sure that the duct catches are properly engaged.

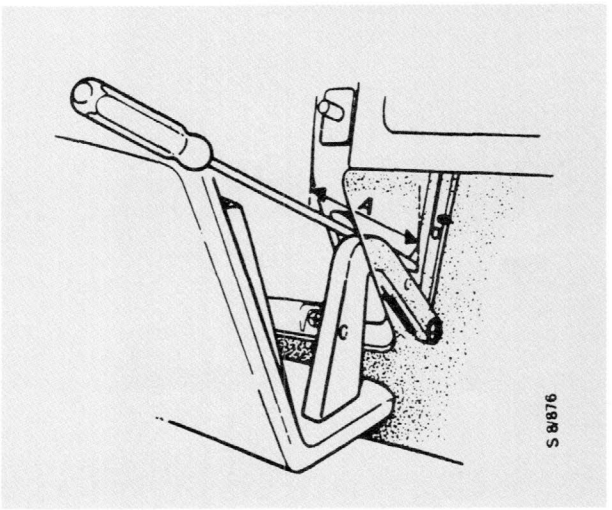
To change the passenger-side panel vent

1 Drop the glove-compartment flap right down, easing the flap restraints outwards to enable them to pass the stops. Pull the glove-compartment light into the compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



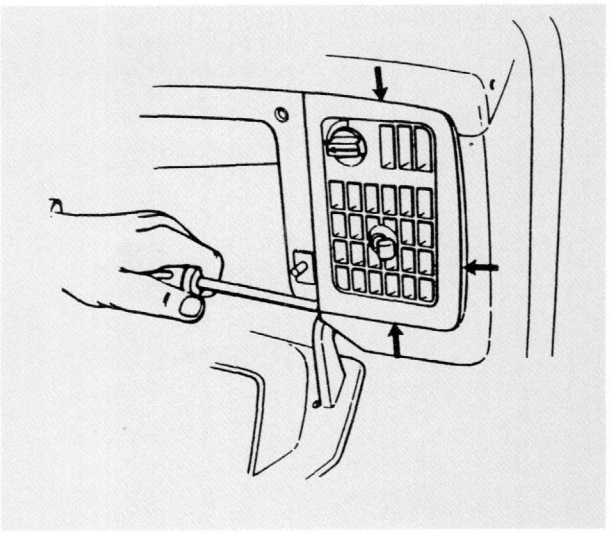
Non adjustable flap



Adjustable flap

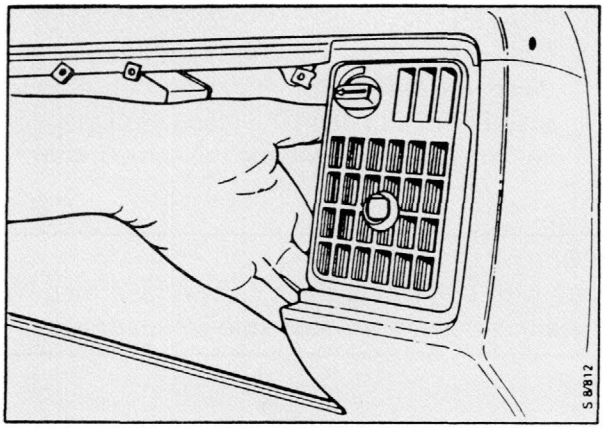
A = 100 mm

2 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.

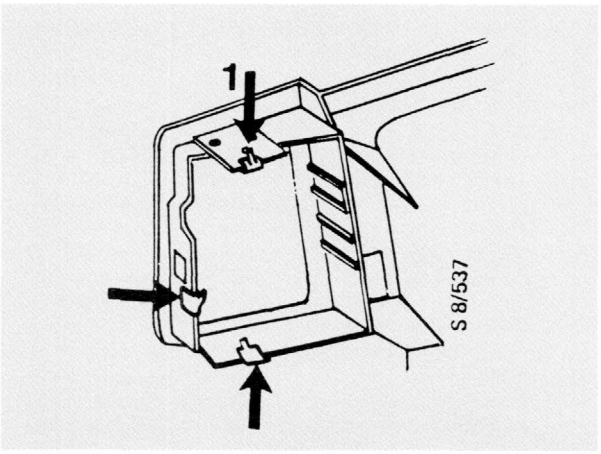


When refitting:

3 Fit the vent onto the defroster duct.

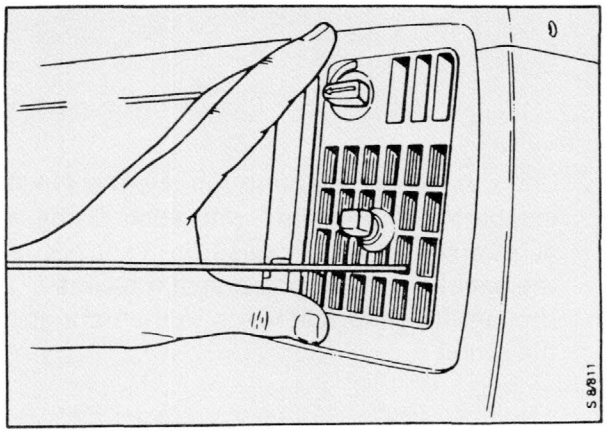


4 Make sure that the clips are properly engaged, reconnect the electrical leads and fit the glove compartment.



1 Early models only.

5 Using a hook made of piano wire, pull the vent into position.



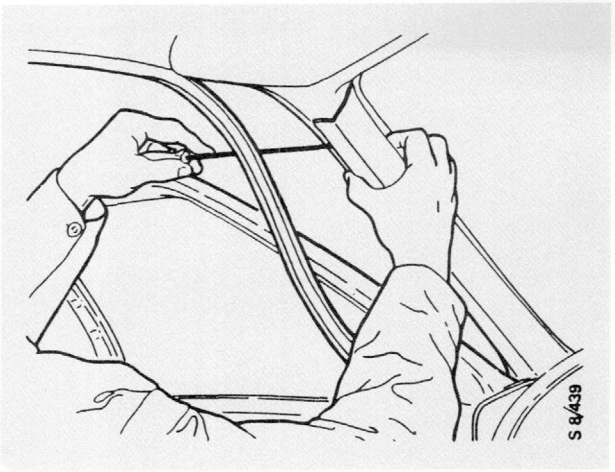
Heater box (Heating and ventilation unit)

To remove

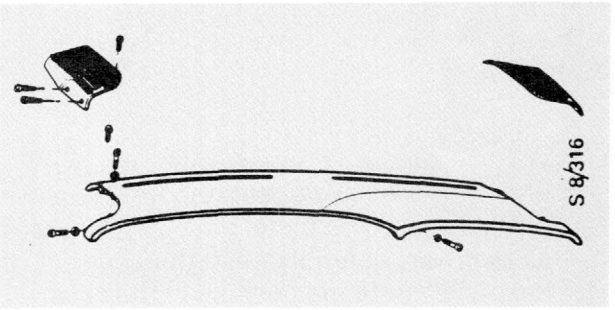
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Remove the fan and heat exchanger as detailed earlier.

3 Ease the door trim seal away from the A pillars and remove the A pillar trim.

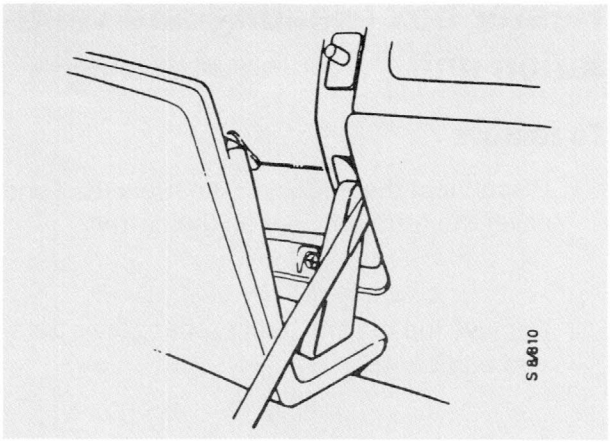


4 Remove the speaker grilles and fascia top panel.
Cars with ACC: Unplug the connector for the sun sensor.

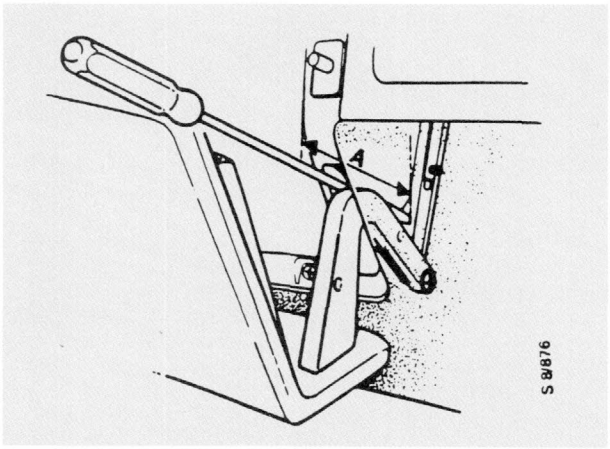


5 Drop the glove-compartment flap right down, easing the flap restraints outwards to enable them to pass the stops. Pull the glove-compartment light into the compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



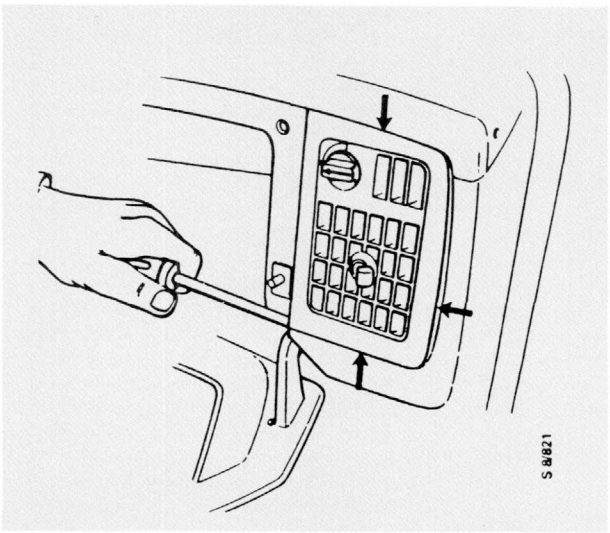
Non adjustable flap



Adjustable flap

A = 100 mm.

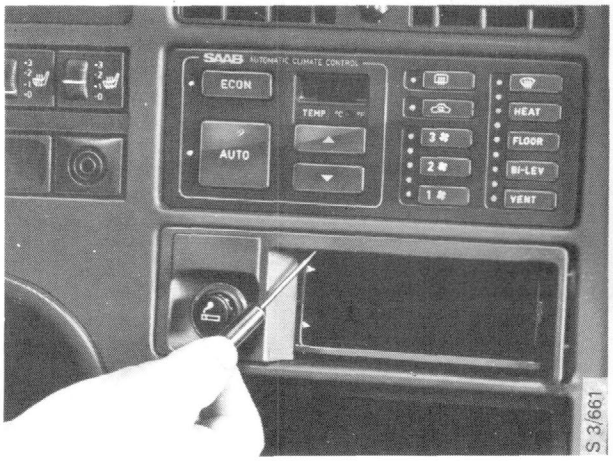
6 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



7 Unscrew and drop forward the power distribution panel.

8 Remove the ashtray.

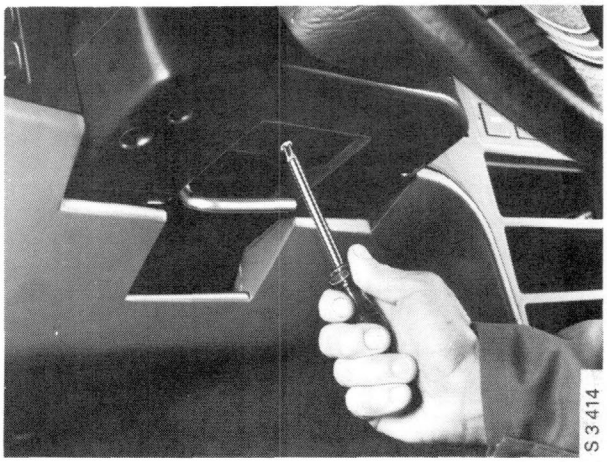
9 Bend down the two catches at the top and pull forward the ashtray housing. Unplug the connectors from the cigar lighter and ashtray light.



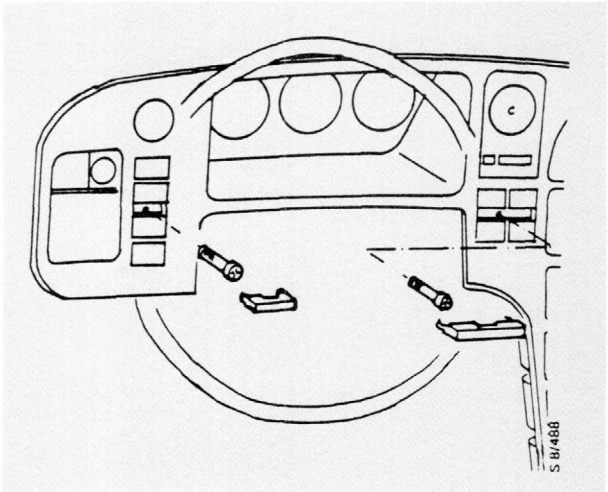
10 Pull the steering wheel forward to the limit of its travel.

11 Remove the steering wheel (see subsection 641 of the Manual).

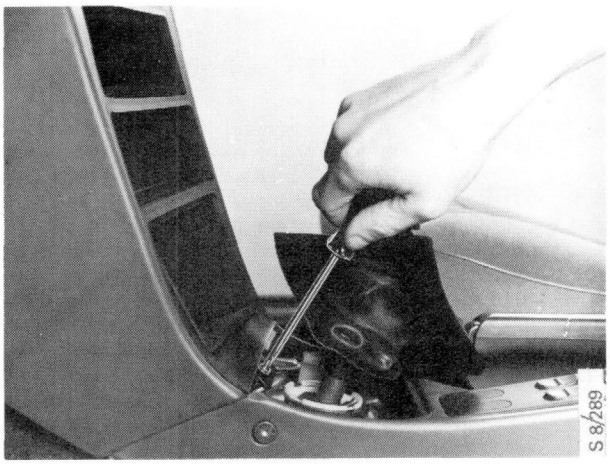
12 Remove the covers from the steering-column joint.



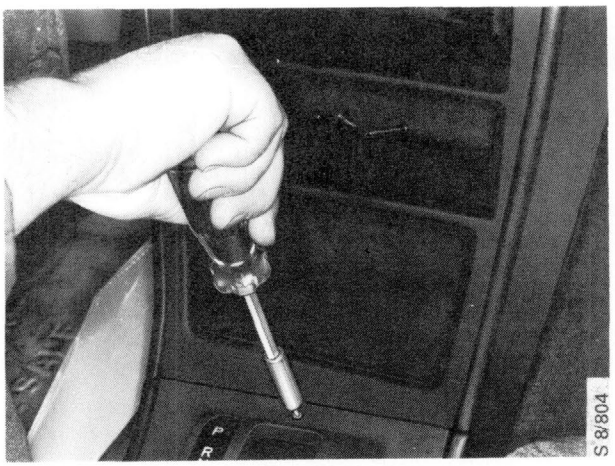
13 Remove the screw caps and the screws in the instrument surround.



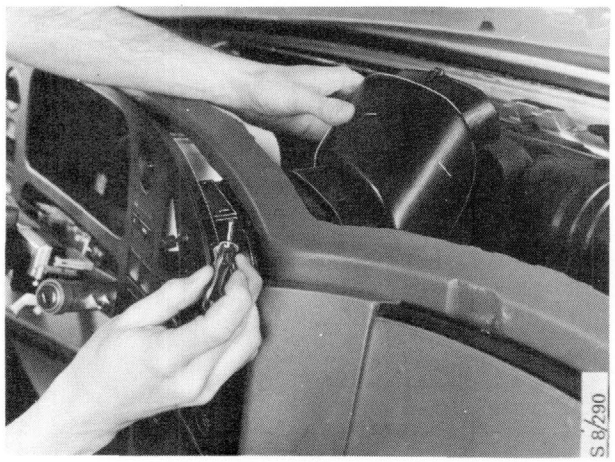
14 Manual cars:
Put the gear lever in reverse.
Remove the screw under the gaiter.



Automatics:
Remove the plug and the screw in the gear-selector cover.



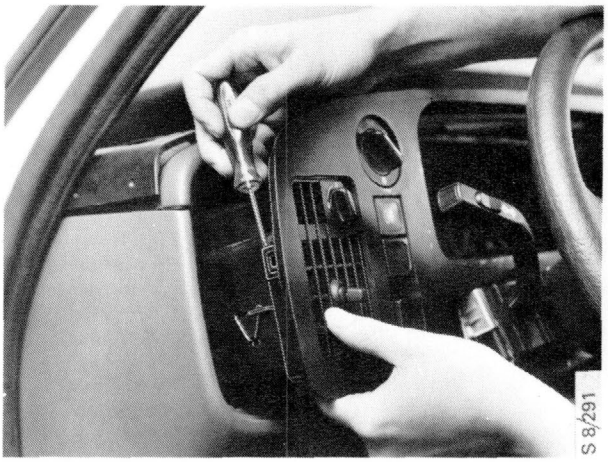
15 Remove the centre vent and the air duct.



Standard system and standard system with AC:
Release the four clips on the control panel and pull the panel forward. Disconnect the link rod for the air distribution valve, the bevel gear for the temperature control valve (make sure temperature control is set to 0) and all the electrical connectors.

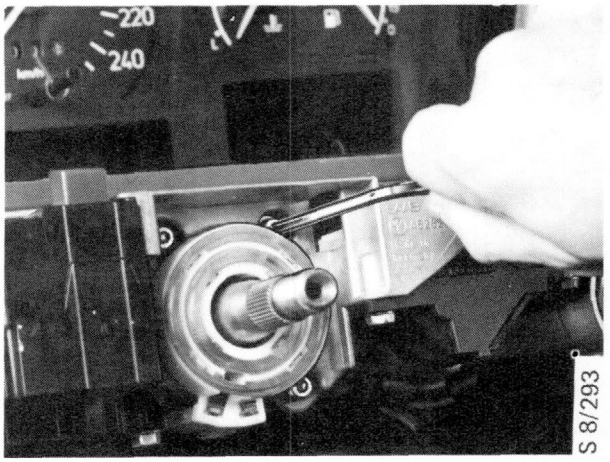
ACC system:
Pull forward the climate control unit, disconnect the 25-pin connector and earth lead, and snip through the cable tie.

16 Press the side panel vent out of the surround.

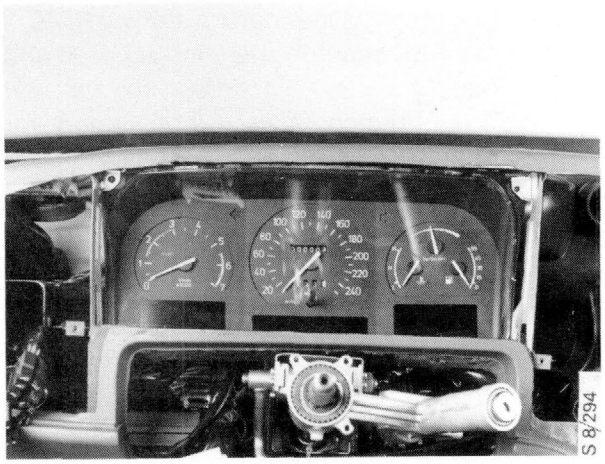


17 Unplug the connectors from the switches and the clock/DCC unit. Label the connectors to facilitate refitting.
Lift off the instrument surround.

18 Remove the stalk switch assembly, labelling the connectors to facilitate refitting.

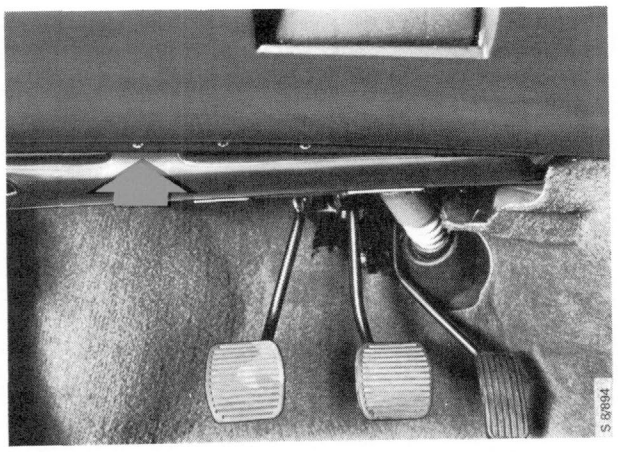


19 Remove the screws in the main instrument display panel.



20 Remove the acoustic insulation from underneath the display panel and the panels from the centre console.

21 M88 onwards:
Remove the LH and RH floor ducts.

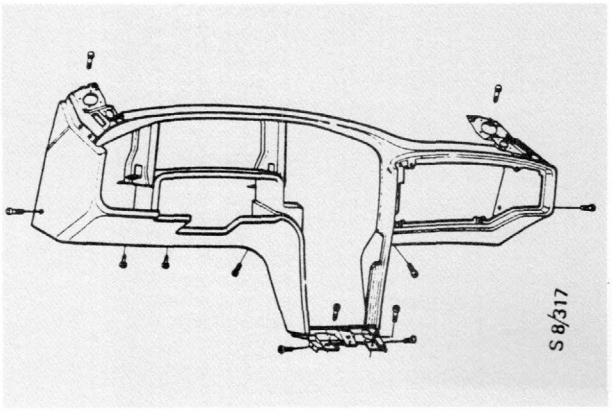


22 Remove the screws securing the defroster ducts on either side.

23 Snip through the cable tie on the loom to the LH duct (RHD cars: RH air duct).

24 Unplug the electrical leads to the speakers.

25 Undo the screws and lift off the dash panel.



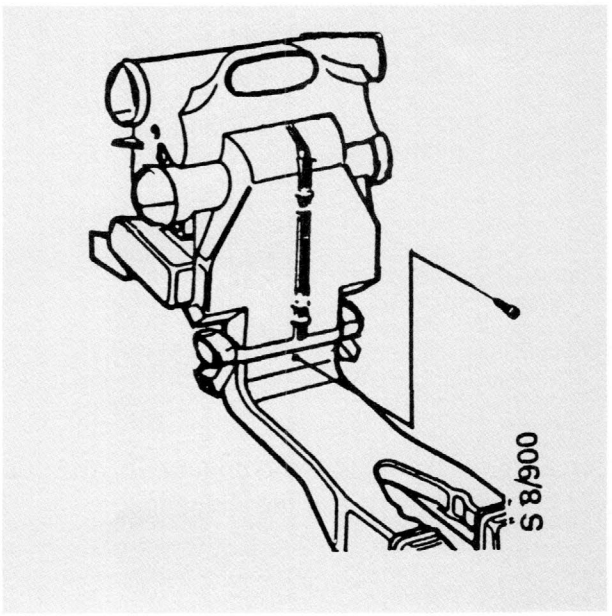
26 Release the cable tie from the heater box to enable the to power distribution panel to be lowered to the floor.

27 Lower the main instrument display panel.

N.B.
Cover the glass to prevent scratching

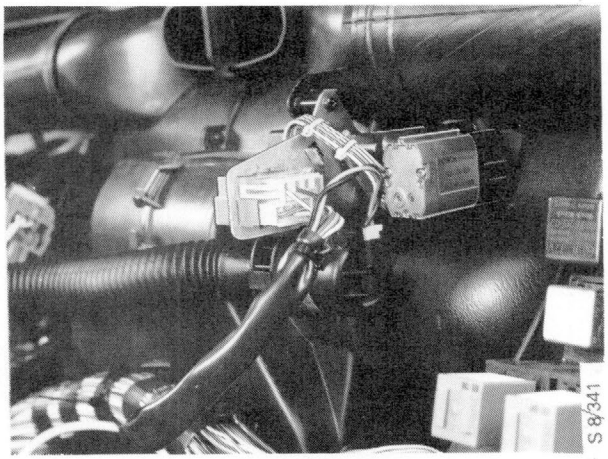
28 Remove the ducts and the defroster vents on either side.

29 Undo the screw and lift off the duct for the rear floor.



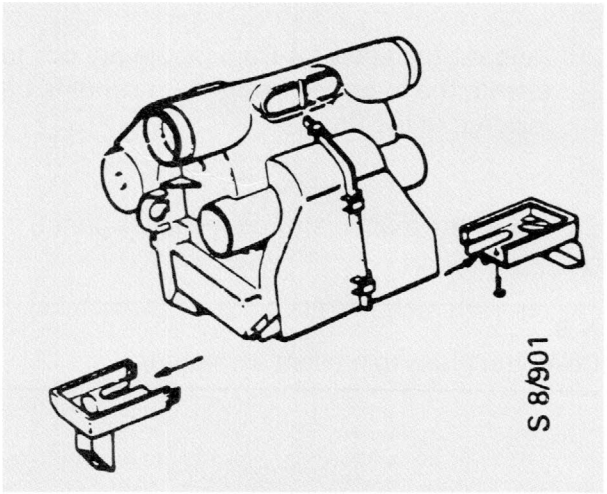
30 Unscrew the plastic clip securing the wiring loom to the bottom of the heater box.

31 Unplug the connectors from the servomotor, fan motor and blended air sensor (cars with ACC only).

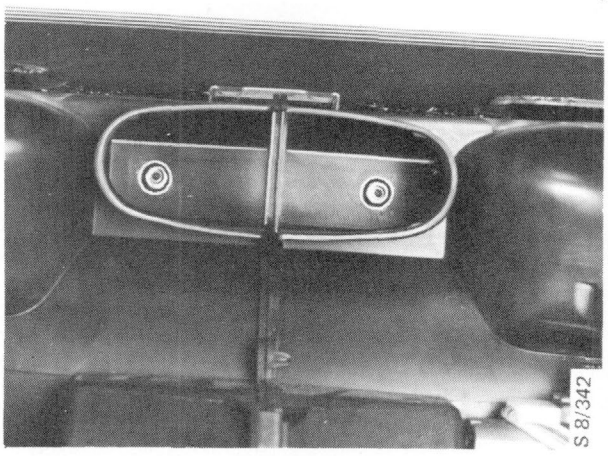


M85-86

32 Remove the floor vents.



33 Undo the screws in the heater box.



34 Release the clips in the engine bay and pull out the grommet for the wiring loom.

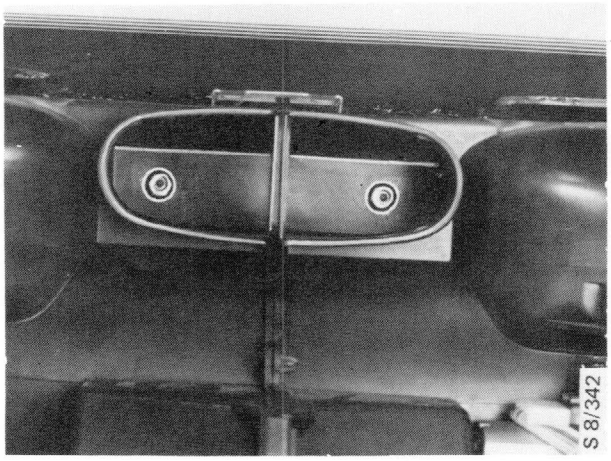
35 Lift the heater box diagonally upwards. The lower part sits in a groove between the bulkhead and the dash panel frame.

To refit

1 Fit a new seal between the heater box and the bulkhead.

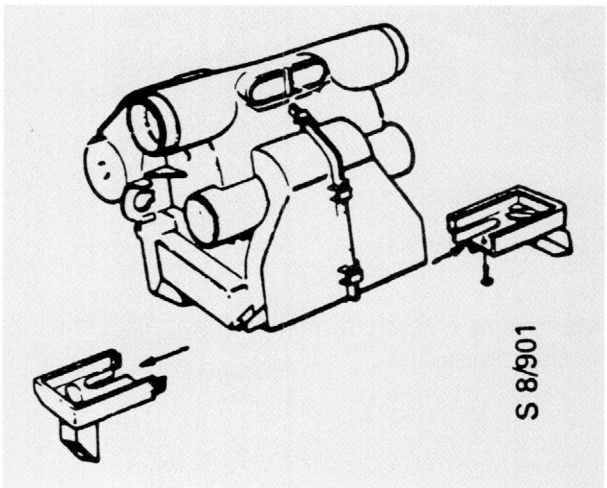
2 Position the heat exchanger inside the box. Lower the heater box in position, making sure that the lower section engages the groove.

3 Refit the screws.



4 Refit the grommet.

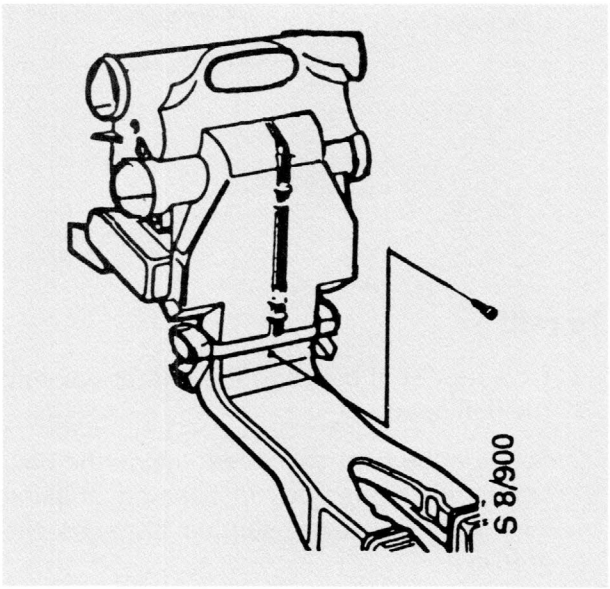
5 Refit the floor vents.



6 Plug on the connectors for the servomotor, fan motor and blended air sensor (cars with ACC only).

7 Refit the plastic clip securing the wiring loom to the bottom of the heater box.

8 Fit the air duct for the rear floor.

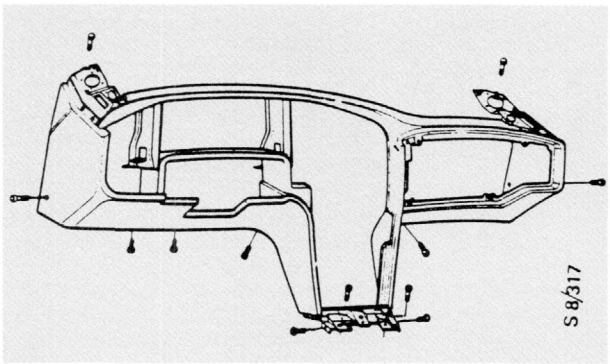


9 Fit the defroster vents and defroster ducts.

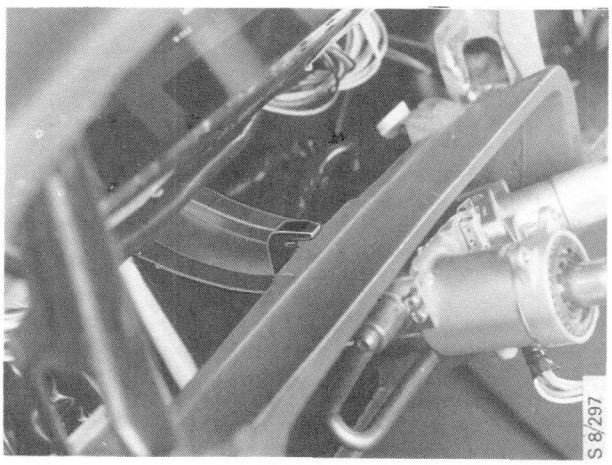
10 Hang the power distribution panel roughly in position and tie the wiring loom to the heater box.

11 Place the main instrument display panel on the steering column bracket.

12 Refit the dash panel, tightening the screws.



Make sure that the dash panel engages the slot in the retainer.



13 Refit the screws for the main instrument display panel.

14 Connect the speaker leads.

15 Fit the air ducts to the side vents at either end.

16 Tie the wiring loom to the LH duct (RHD cars: RH duct).

17 Refit the screws securing the LH and RH defroster ducts.

18 Connect the vent in the instrument surround to the flexible duct.

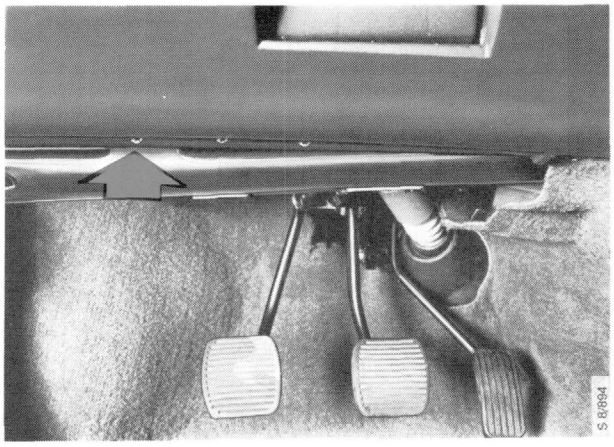
19 Reconnect the electrical leads behind the instrument surround.

20 Fit the centre panel vent and flexible duct.

21 Refit the instrument surround in the dash.

22 Plug in the connectors and refit the stalk switch assembly.

23 M88 onwards:
Fit the LH and RH floor ducts.



24 Refit the heater control panel/climate control panel.

25 Fit the covers over the steering column joint.

26 Fit the steering wheel (see subsection 641 of the Manual).

27 Refit the power distribution panel.

28 Refit the glove compartment and vent.

29 Refit the fascia top, speaker grilles and A-pillar trim.

30 Refit the ashtray housing and ashtray.

31 Refit the panels on the centre console and the acoustic insulation below the dash panel.

32 Refit the fan.

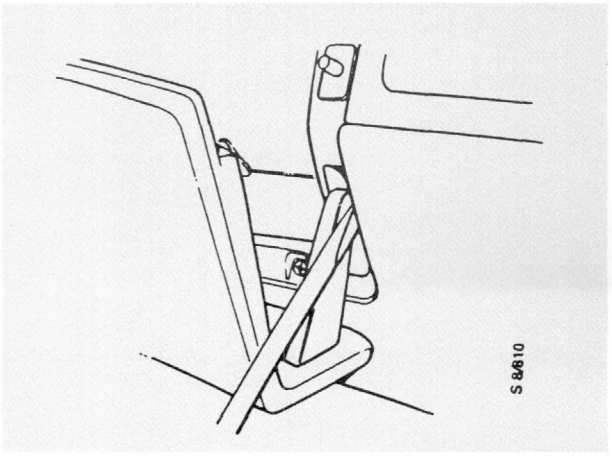
33 Reconnect the battery.

Standard system and system with AC

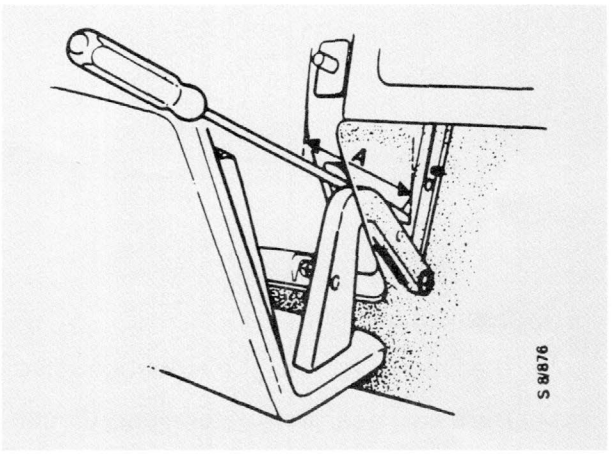
To change the control panel

1 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



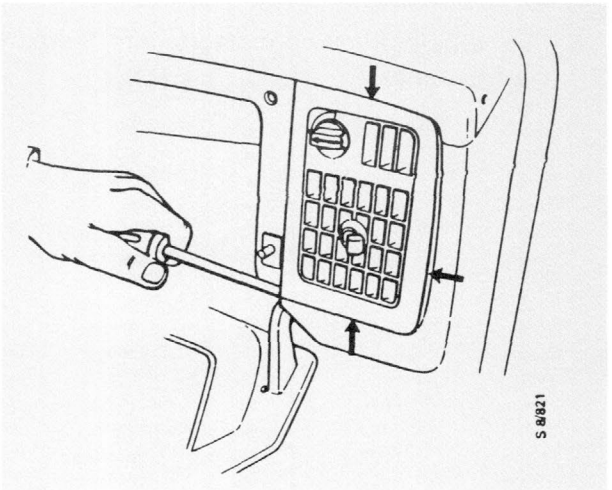
Nonadjustable flap



Adjustable flap

A = 100 mm.

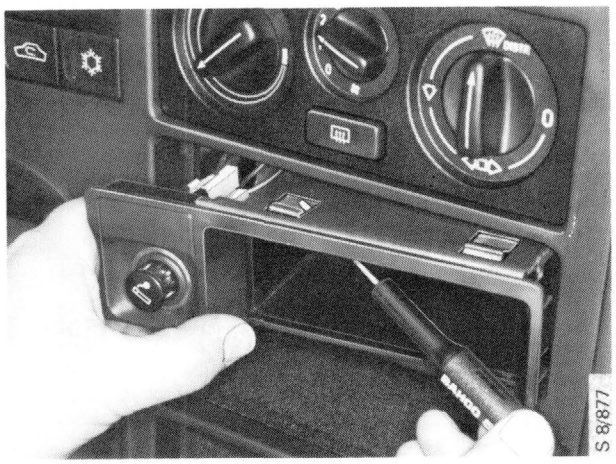
2 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



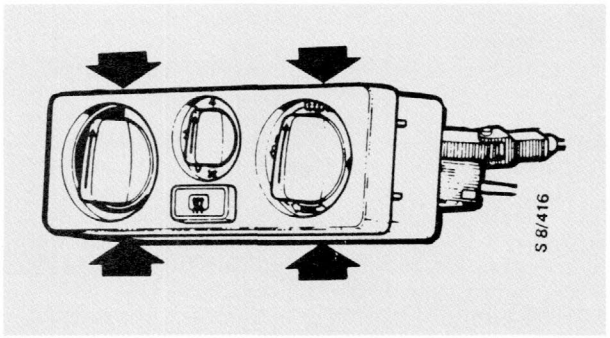
3 Drop forward the power distribution panel.

4 Remove the ashtray.

5 Bend down the two catches at the top and pull forward the ashtray housing.



6 Press and release the four catches on the heater control panel and pull the panel forward.

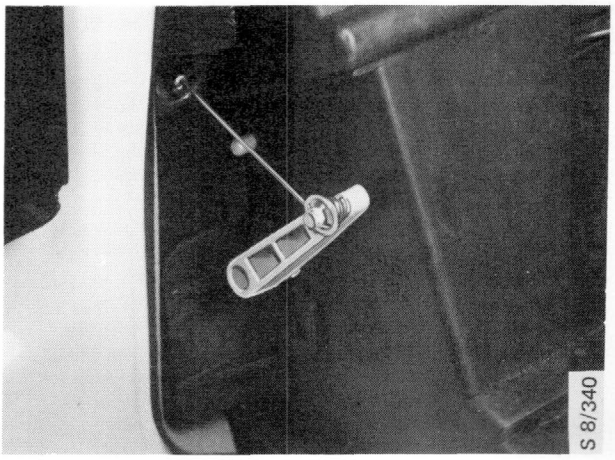


7 Disconnect the following:

- The link rod for the air distribution valve
- The bevel gear for the temperature control valve (make sure the temperature control is set to 0)
- All electrical connectors.

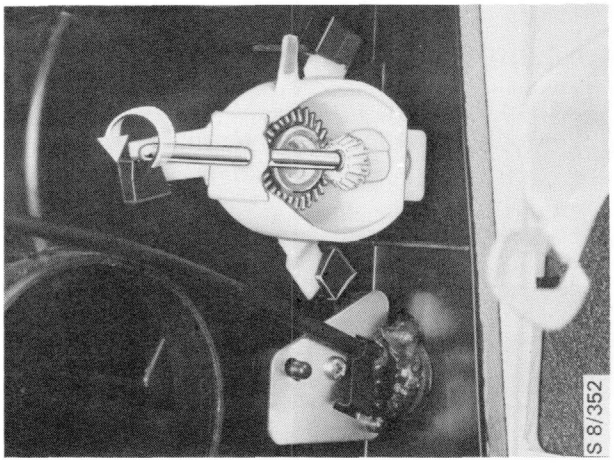
8 Plug all electrical connectors onto the new control panel.

9 Fit the bevel gear for the temperature control valve as follows:
Make sure that the valve in the engine bay is in the position for cold, i.e. away from the bulkhead. Set the temperature control to cold.
Fit the bevel gear to the heater control panel.

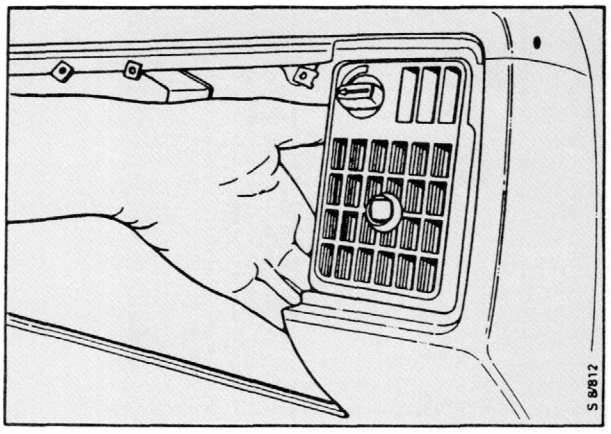


10 Fit the link rod as follows:
Rotate the pinion spindle anticlockwise as far as it will go. Set the air distribution control to 0. Fit the link rod with the orange-coloured part towards the spindle on the control panel.

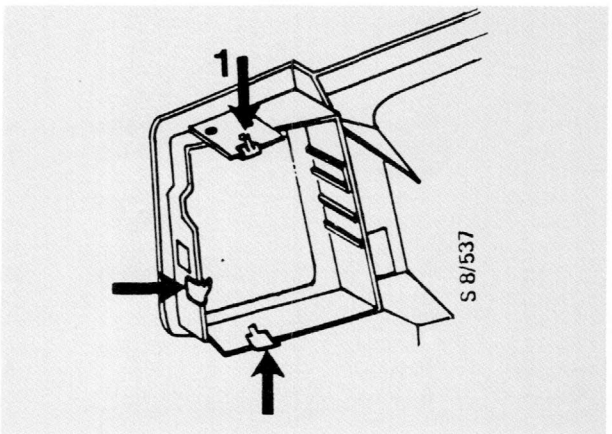
Refit the control panel, pressing it into position. Check that the controls are working properly.



11 Refit the fresh-air vent to the defroster flexible duct.

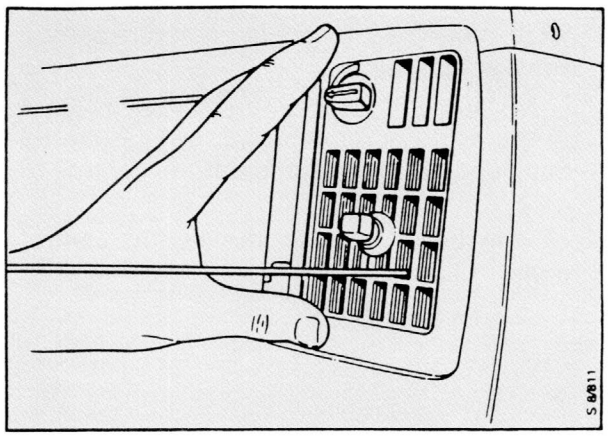


12 Make sure that the clips are properly engaged, reconnect the electrical leads and fit the glove compartment.



1 Early models only.

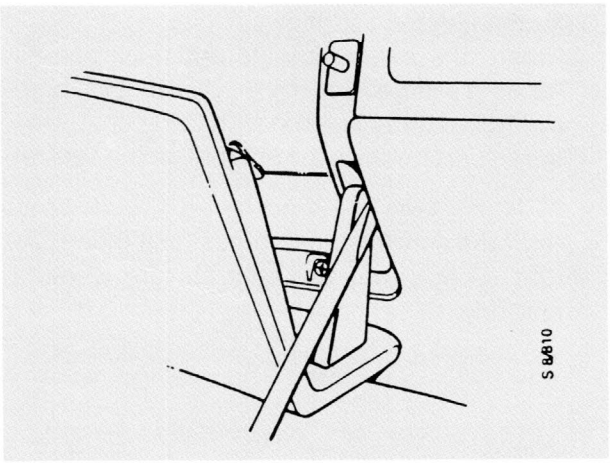
13 Using a hook made of piano wire, pull the vent into position.



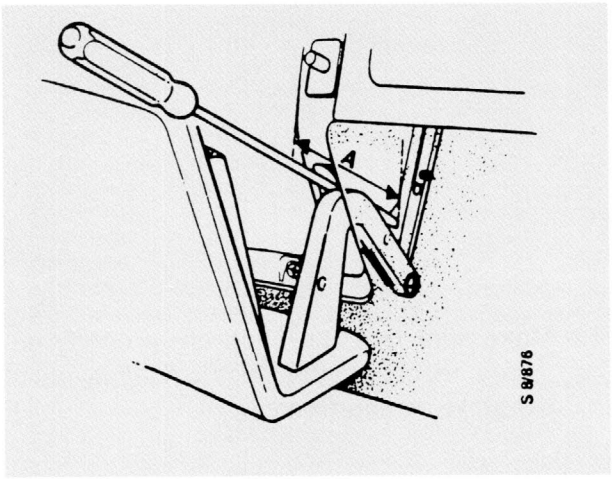
To change the temperature control cable

1 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



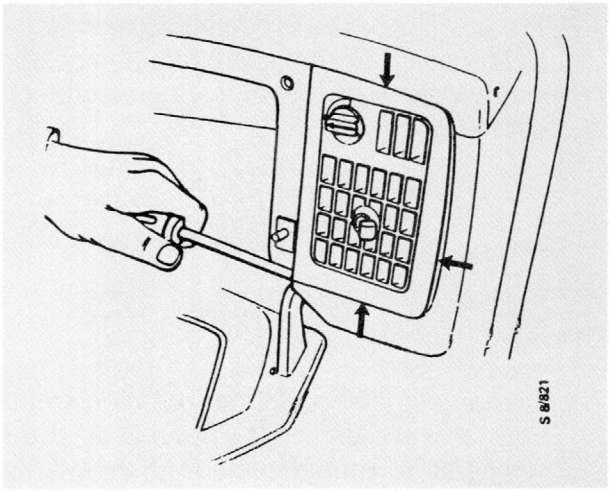
Nonadjustable flap



Adjustable flap

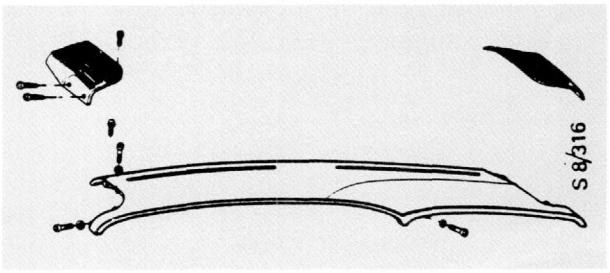
A = 100 mm.

2 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



3 Ease the door trim seals away from the A pillars and remove the A-pillar trim.

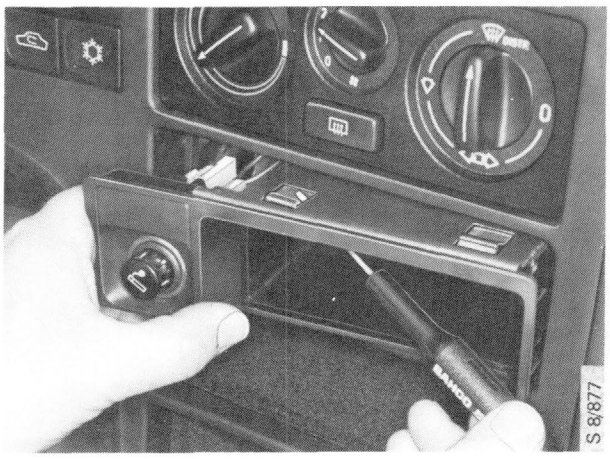
4 Remove the speaker grilles. Undo the screws and, lifting the leading edge, pull the fascia top towards you to release the catch at the back.



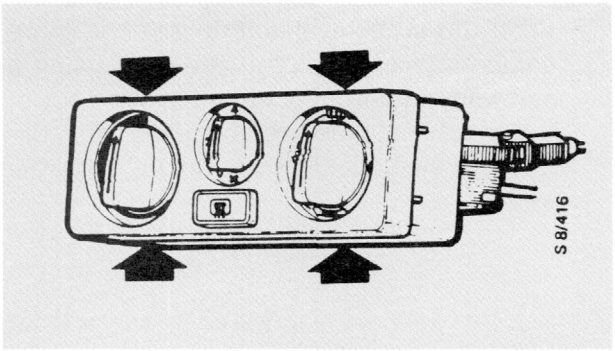
5 Unscrew and drop forward the power distribution panel.

6 Remove the air ducts for the side panel vents and the defroster. Remove the windscreen defroster vents.

7 Remove the ashtray. Bend down the two catches at the top and pull forward the ashtray housing.

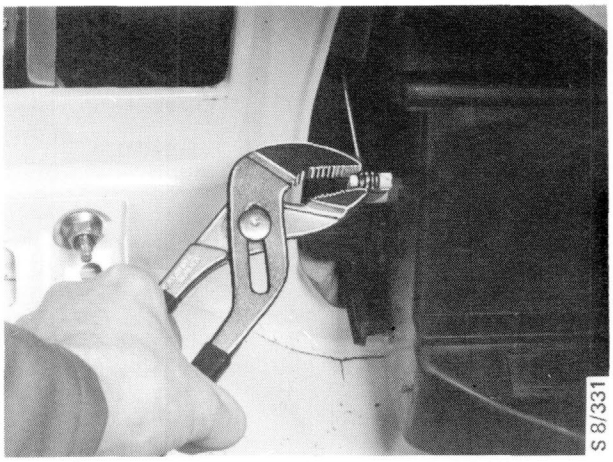


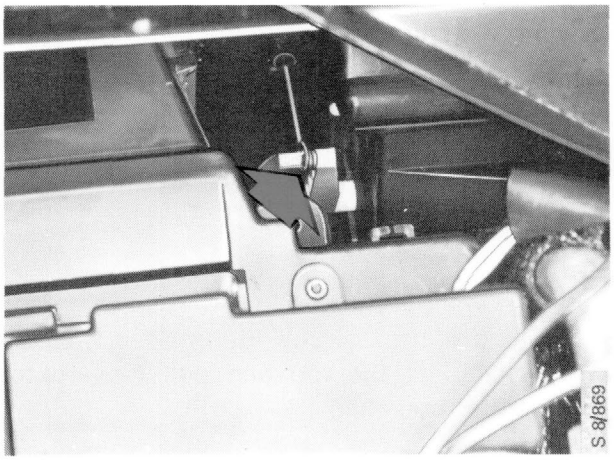
8 Press and release the four catches on the heater control panel and pull the panel forward. Make sure the temperature control is set to 0.



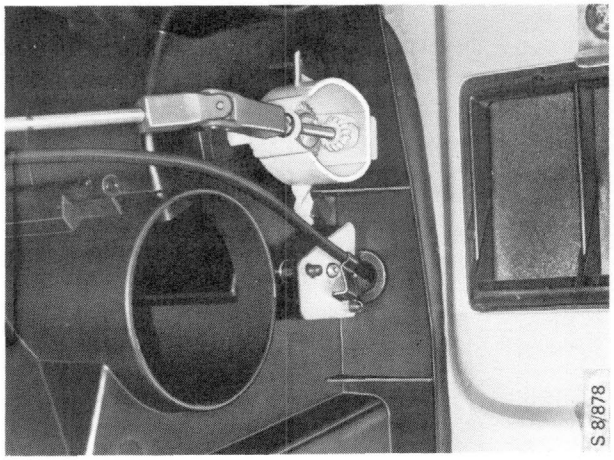
9 Disconnect the link rod for the air distribution valve and detach the bevel gear for the temperature control cable from the control panel.

10 Remove the shroud from the fresh-air filter/evaporator.
Remove the cable lock washer from the valve in the engine bay and detach the cable.



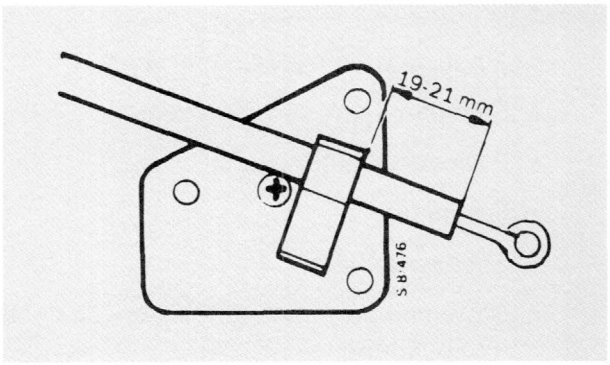


11 Remove the bracket complete with clip and cable from the control unit and release the cable from the bracket.



12 Release the cable from the temperature control valve.

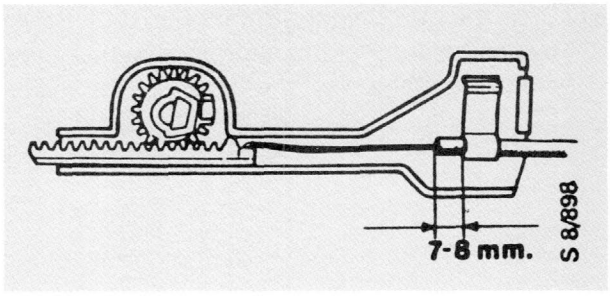
13 Fit a new cable to the bracket. Make sure the length of cable sheathing projecting is 19 - 21 mm (0.75 - 0.83 in).



14 Fit the cable to the valve spindle in the engine bay.

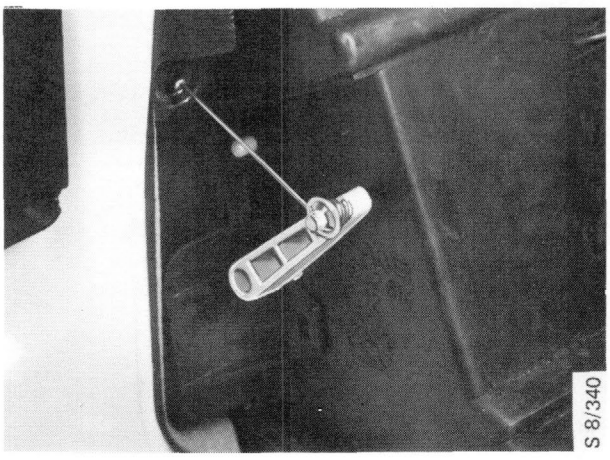
15 Refit the bracket complete with clip and cable to the control unit.

16 Reconnect the cable to the gear. Make sure that the length of cable sheathing protruding is 7 - 8 mm (0.27 - 0.32 in).



17 Fit the bevel gear to the control panel as follows:
Make sure that the valve in the engine bay is set to cold position, i.e. away from the bulkhead.

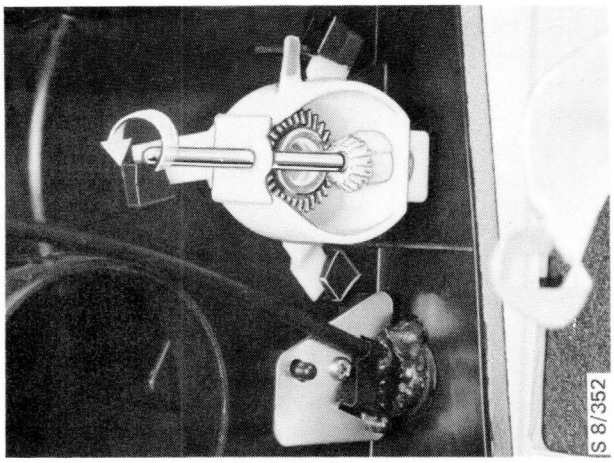
Set the temperature control to cold and fit the bevel gear to the heater control panel.



18 Fit the link rod for the air distribution valve as follows:

Rotate the pinion spindle anticlockwise as far as it will go.

Set the air distribution control to 0. Fit the link rod with the orange-coloured part towards the spindle on the control panel.



19 Fit the control panel.

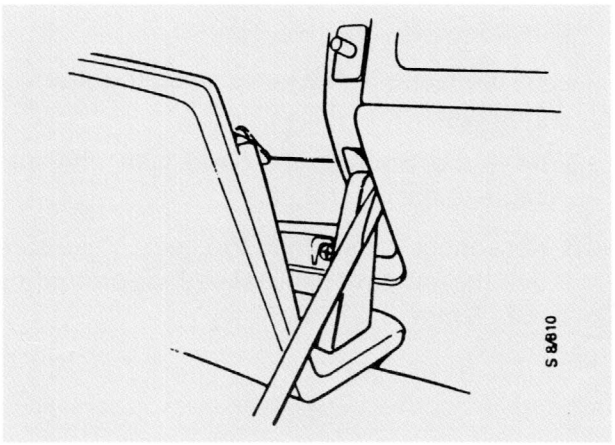
20 Check that all the controls and functions are working properly.

21 Refit the following:

- Defroster air ducts.
- Air ducts for the side panel vents
- Side panel and defroster vents
- Power distribution panel
- Fascia top
- Speaker grilles
- Glove compartment (guiding the air ducts into position)
- A-pillar trim and door trim seals

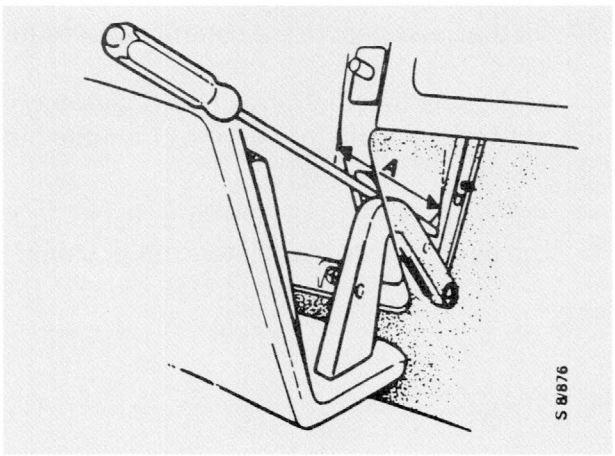
To change the link rod and bevel gear assembly for the air distribution valve

1 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.



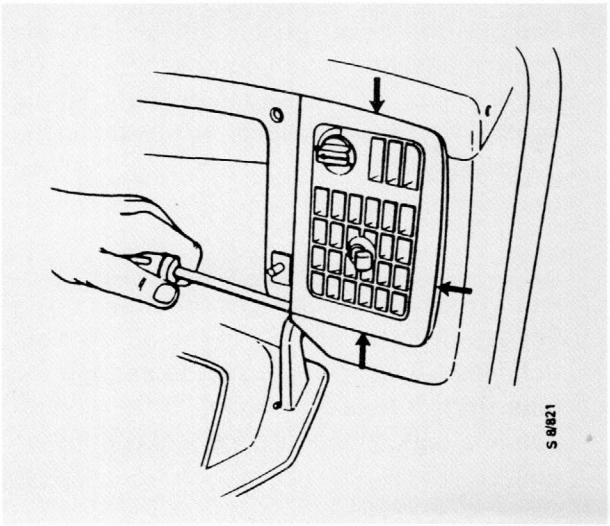
Nonadjustable flap

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



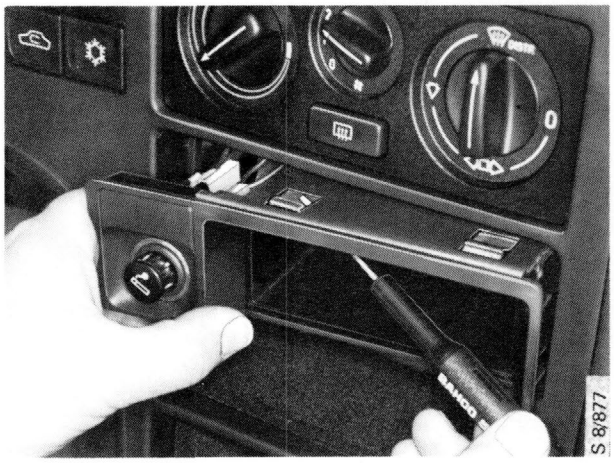
Adjustable flap *A = 100 mm.*

2 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



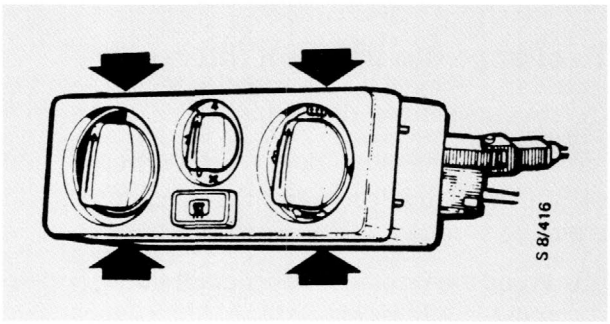
3 Unscrew and drop forward the power distribution panel.

4 Remove the ashtray. Bend down the two catches at the top and pull forward the ashtray housing.



5 Press and release the four catches on the heater control panel and pull the panel forward. Make sure the temperature control is set to 0.

Detach the link rod for the air distribution valve from the back of the panel.

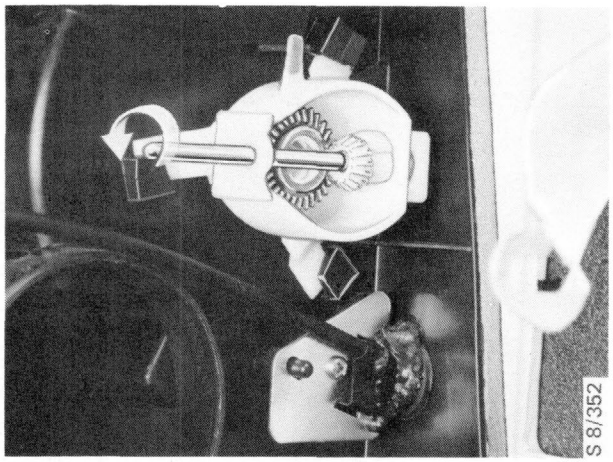


6 Remove the bevel gear housing from the heating and ventilation unit by pressing the tab on top of the housing to the right, at the same time, lifting the housing to release the other lugs. Withdraw the gear housing from the valve.

7 Fit the new gear housing as follows:
Engage the gear spindle in the air distribution valve. Twist the housing to engage the lugs from the gear housing in the corresponding lugs on the heating and ventilation unit.

Fit the link rod as follows:

Rotate the pinion spindle anticlockwise as far as it will go. Set the air distribution control to 0. Fit the link rod with the orange-coloured part towards the spindle on the control panel.


S 8/352

8 Press the control panel back into place and check that all the controls are working properly.

9 Refit the ashtray housing and ashtray.

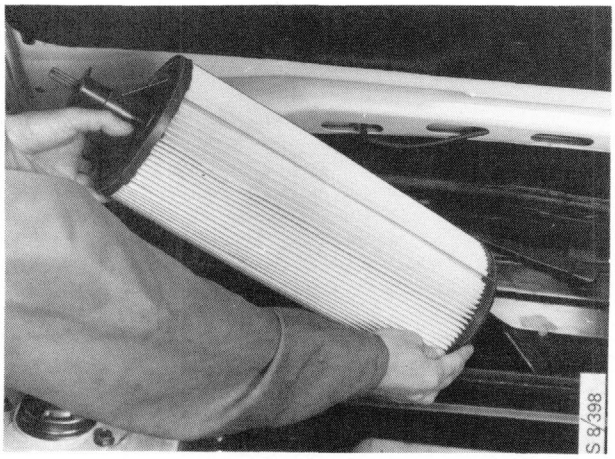
10 Refit the glove compartment and vent.

To change the fresh-air filter

(N/A to cars with AC or ACC)

As from Chassis Nos. CH1021173 and CH8000853, the fresh- air filter is equipped with a plastic shroud.

1 Press the filter towards the right wing and remove the filter element.


S 8/398

2 Transfer the spring-loaded spindle from the old filter element to the new one.

3 Guide the spindle into its seating, press the filter towards the right wing and push it home.

Cars with ACC

Precautions to be taken before starting work on the ACC system

To avoid damaging the electronic components in the climate control unit, the following precautions must always be taken:

- Before starting any work on the ACC system, disconnect the negative (-) battery lead.
- Before starting any electric welding work, disconnect the negative (-) battery lead, the connector on the alternator voltage regulator and the 25-pin connector to the climate control unit.
- Before connecting any test instruments or starting any fault-diagnosis work disconnect the 25-pin connector for the climate control unit.
- M88 onwards:

  When the ignition is on, the cooling fin on the governor for the cabin fan is live (12 V). If the fin should be earthed, the governor will be irreversibly damaged.

Fault-diagnosis in the ACC system

A fault-diagnosis and monitoring program is included in the climate control unit in the ACC system. Certain functions are monitored continuously when the system is operating, but others must be checked manually.

The following functions are monitored automatically while the system is operating:

The inside air sensor, the ambient air temperature sensor and the blended air sensor.

In the event of a malfunction in any of the sensors, an emergency program will be initiated. The fault can then be diagnosed by a manually initiated test.

The following functions are not monitored automatically:

The servomotors for the temperature valve, air distribution valve and the air recirculation valve, and the fan motor and fan control unit. Nor is the sun sensor monitored automatically on the road.

Manual fault diagnosis

The climate control unit runs through a diagnosis program and then displays the number of faults discovered, with a code for each.

The following types of fault are indicated:

- Break in circuit continuity
- Short-circuit
- Component failure
- Motor seizure
- Reversed polarity (electric motor)

However, the program will not indicate if the fault is in a component or in the wiring, e.g. if the type of fault is a break in circuit continuity or a short-circuit.

Example: The error code (2U) indicates a break in continuity in the ambient air temperature sensor circuit. This means that the connectors, wiring and sensor must be checked to ascertain whether power is reaching the sensor. If power is present, fit a new sensor. If the fault still persists, fit a new climate control unit.

N.B.
Before starting any work on the system, always disconnect the 25-pin connector for the climate control unit. The control unit can be damaged by above- normal voltages.

For more-detailed fault diagnosis, refer to section 3:2 of the Manual.

Procedure for manual fault-diagnosis work

Press the AUTO and VENT buttons simultaneously and release.

The climate control unit will now run through the fault-diagnosis program (this takes approx. 40 seconds), indicated by '88' being flashed on the display. At the end of the program, the number of faults detected will be shown on the display. Press VENT once, and the first error code will be displayed. Press the button again, and the second error code will be displayed, and so on.

To revert to the normal program, press AUTO.

Component	Error code indicating short-circuit	Error code indicating break in circuit continuity
Inside air sensor	1C	1U
Ambient temperature sensor	2C	2U
Blended air sensor	3C	3U
	Reversed polarity	Other fault
Servomotor for temperature valve	5C	5U
Servomotor for air distribution valve	6C	6U
Servomotor for air recirculation valve	Internal short circuit or seizure 7C	Break in circuit continuity or shorting to earth 7U
Control signal lead 635	Break in circuit continuity or short circuit to earth or positive (+) side of battery AC	
Cabin fan motor/governor	Break in main circuit. Seized motor. Defective governor. AU	
Climate control unit	EU	

Diagnosis of other faults M85-86

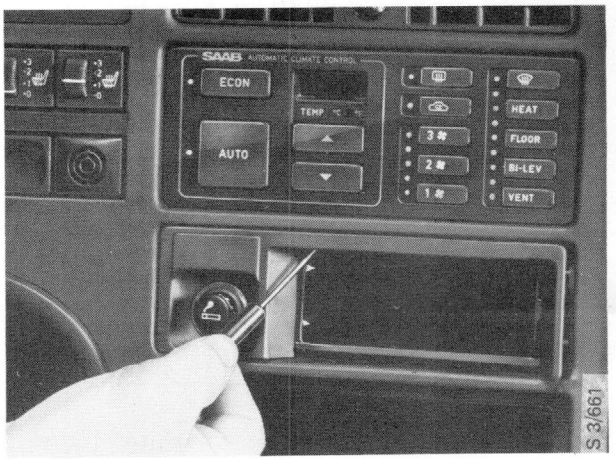
Symptom	Action
Fluctuating temperature inside car. Air inside car cool warm temperature selected. Air inside car warm - cool temperature selected.	Check the connections in the hose between the inside air sensor and the fan motor.

To change the climate control unit

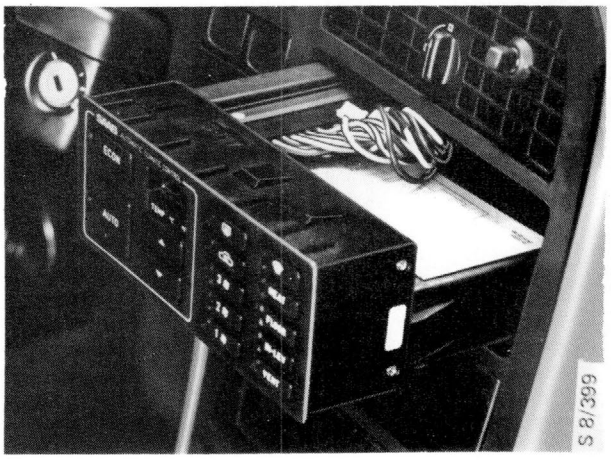
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Remove the ashtray.

3 Bend down the two catches at the top and pull forward the ashtray housing.



4 Remove the climate control unit: disconnect the 25-pin connector and earth lead. Snip through the cable tie on the loom.



5 Connect the 25-pin connector and earth lead to the new climate control unit. Fit a cable tie round the loom.

6 Refit the ashtray housing and ashtray. Reconnect the battery.

To change the bevel gear for the air distribution valve

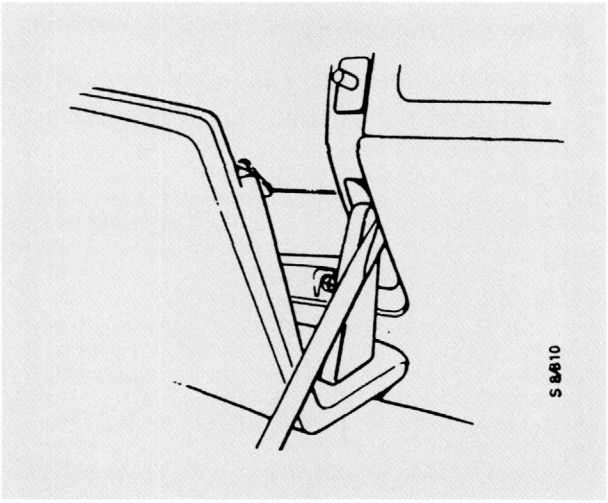
Cars with ACC

1 Press the temperature increase button until 'HI' appears on the display.

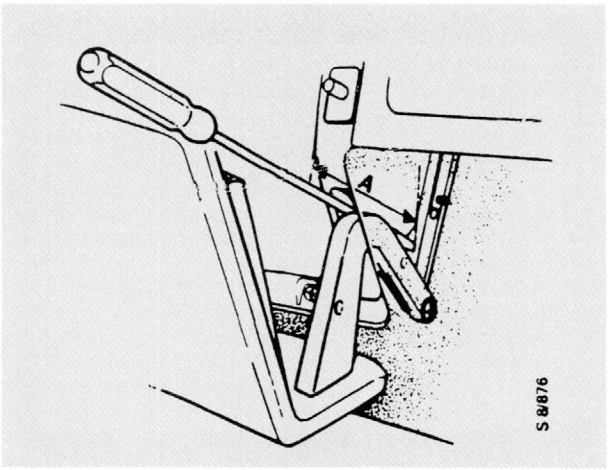
2 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

3 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



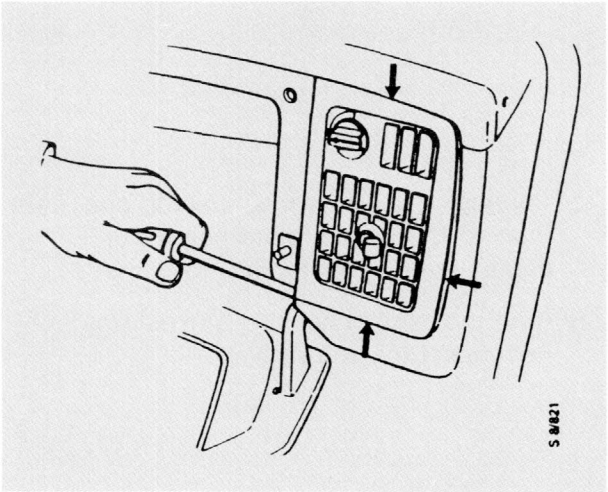
Nonadjustable flap



Adjustable flap

A = 100 mm.

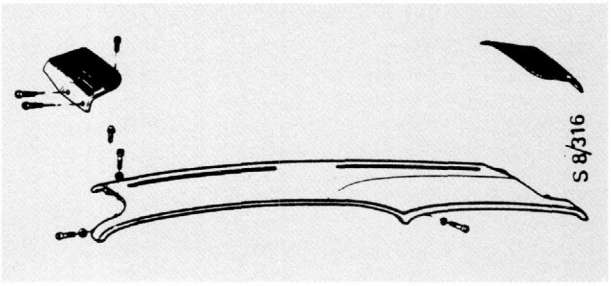
4 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



5 Unscrew and drop forward the power distribution panel.

6 Remove the trim from the A pillars.

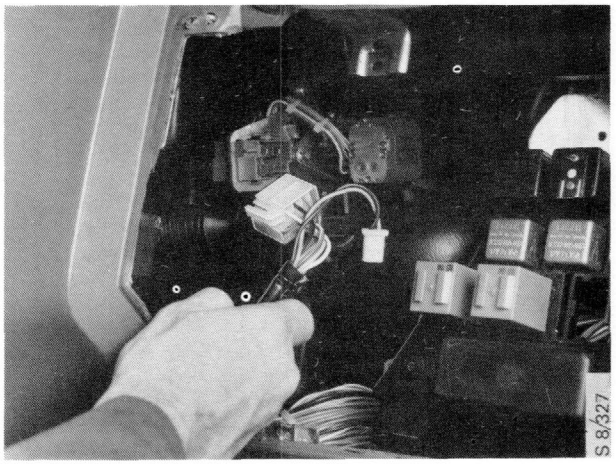
7 Remove the speaker grilles.
Undo the screws and, lifting the leading edge, pull the fascia top towards you to release the catch at the back.



M85 and 86:

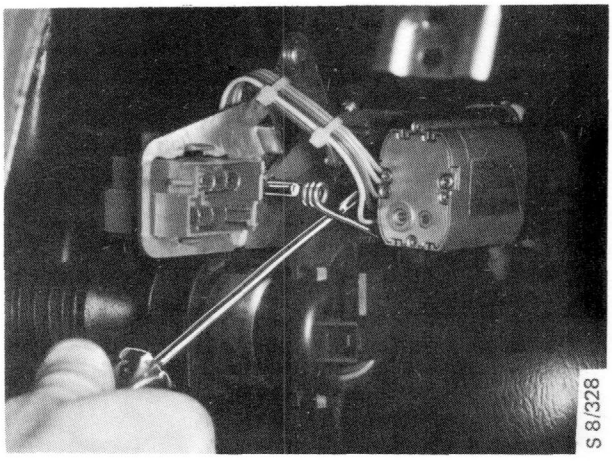
8 Unplug the connectors for the servomotors and the fan for the fresh-air sensor.

8 M87 onwards:
Unplug the connector for the servomotor.



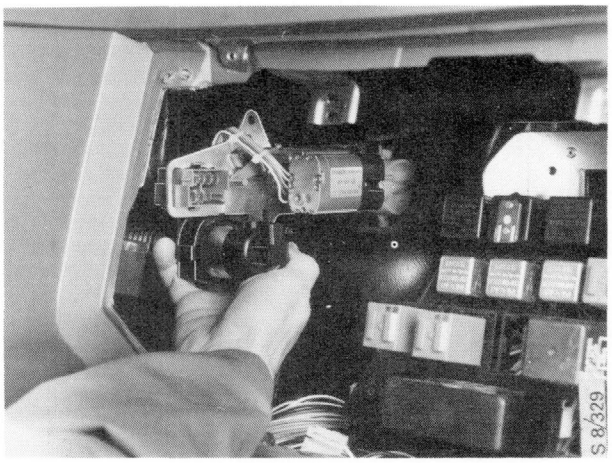
M85 and 86

9 Remove the lock washer and disconnect the cable from the servomotor.



10 Unscrew the bracket and pull it forward complete with motors.
M85 and 86 only:
Disconnect the flexible duct from the inside-air sensor.

11 Lift out the bracket complete with motors.



M85 and 86

12 Remove the air ducts for the side panel vent and the defroster. Unscrew the windscreen defroster vent.

13 Free the gear housing from the heating and ventilation unit by pressing the tab on top of the housing to the right, at the same time twisting the housing to release the other tabs. Pull the gear housing off the valve.

To fit

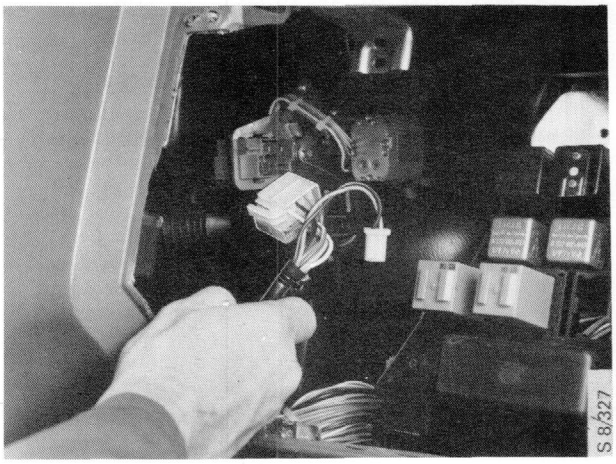
1 Fit the new gear housing as follows:
Engage the gear spindle in the air distribution valve and twist the housing to engage the tabs on the housing in those on the heating and ventilation unit.

2 M85 and 86 only:
Release the ACC control panel and pull it forward a bit.

3 Refit the motor assembly bracket.
Make sure that the bevel-gear spindle is correctly engaged and that the temperature-control cable is on the correct side of the bracket.

4 Tighten the bracket retaining screws. Connect the cable to the temperature control and fit the lock washer.

5 Plug in the connectors for the servomotors and fan.
M85 and 86 only:



6 Reconnect the flexible duct to the fresh-air sensor and fit the ACC control panel.

7 Reconnect the duct for the side panel vent and fit the defroster vent.

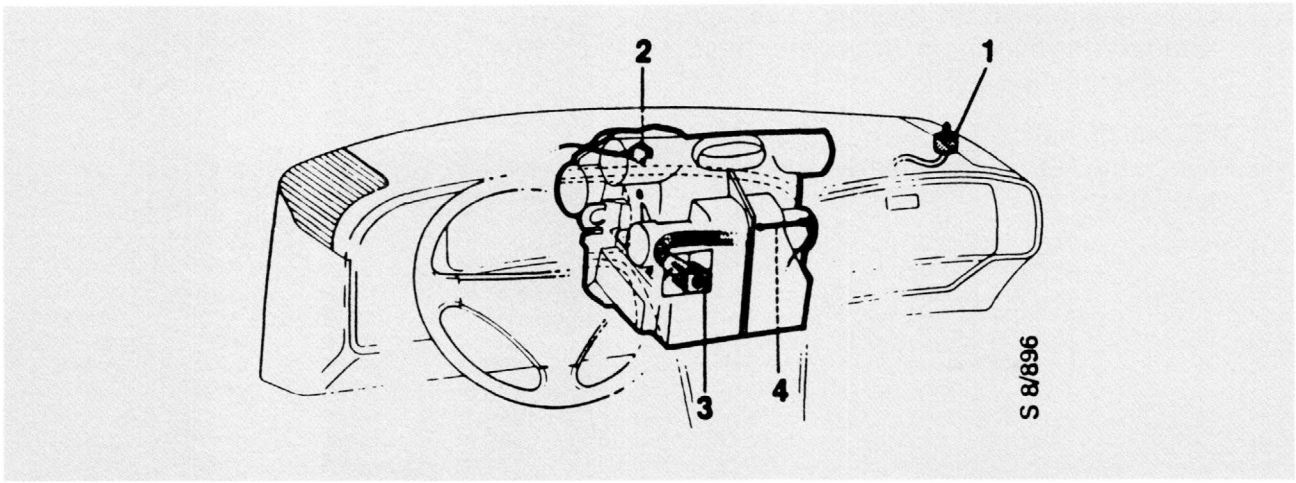
8 Refit the fascia top, the speaker grilles and the A-pillar trim.

9 Put back the power distribution panel.

10 Refit the glove compartment.

11 Reconnect the battery.

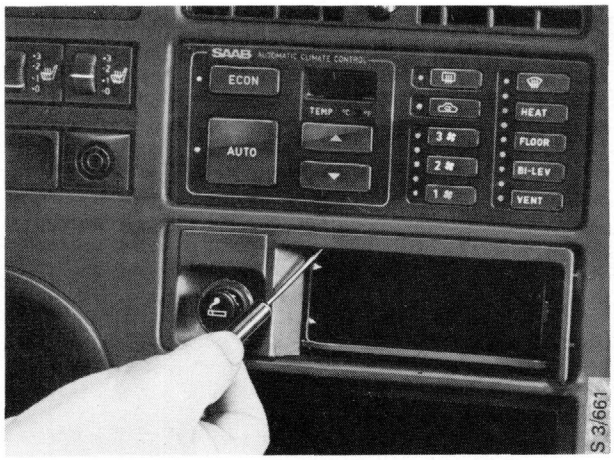
Sensors



1 Sun sensor (in cars with Chassis No. CG1007457 or earlier, the sun sensor is located on the LH side).
2 Ambient air temperature sensor.
3 Inside air sensor (as from M87, the fresh-air fan and inside air sensor are housed in one unit)
4 Blended air sensor

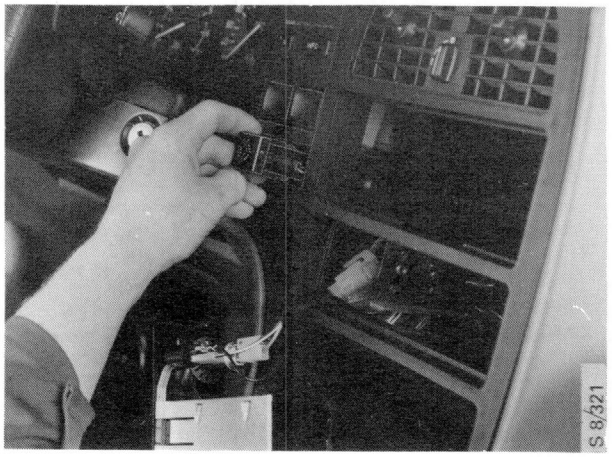
To change the inside air sensor (M85 and 86 only)

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.
2 Remove the ashtray.
3 Bend down the two catches at the top and pull forward the ashtray housing.



4 Remove the ACC control panel, unplug the 25-pin connector and disconnect the earth lead. Snip through the cable tie.

5 Remove the inside air sensor and unplug the connector.



6 Fit the new inside air sensor. Make sure there are no kinks in the hose and that the hose is properly connected to the sensor.

7 Reconnect the 25-pin connector and earth lead. Fit a cable tie to the loom and refit the ACC control unit.

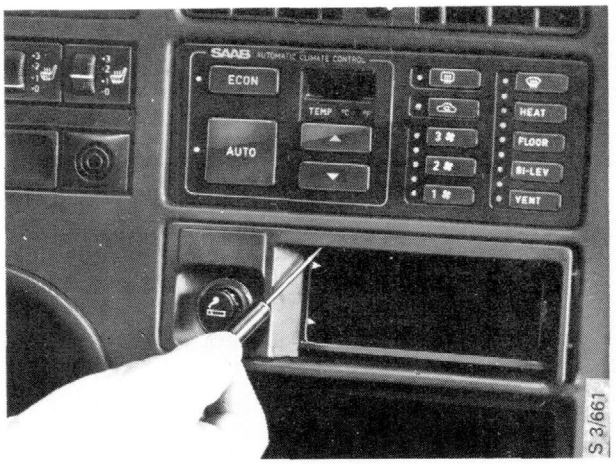
8 Refit the ashtray housing and ashtray. Reconnect the battery.

To replace the inside air sensor. (M87 onwards)

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Remove the ashtray.

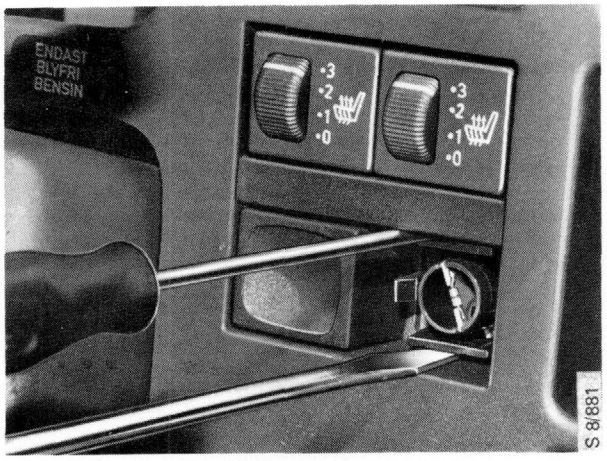
3 Bend down the two catches at the top and pull forward the ashtray housing.



4 Pull the ACC control panel forward.

5 Remove the grille from the inside air sensor.

6 Using two screwdrivers, remove the sensor by easing it back. Unplug the connector.



7 Fit the new inside air sensor and refit the grille.

8 Refit the ACC control panel, ashtray housing and ashtray.

9 Reconnect the battery.

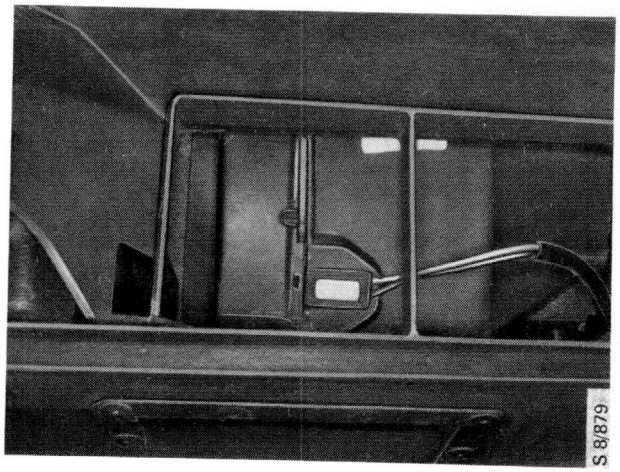
To change the ambient air temperature sensor

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Unscrew and remove the air intake grille (when fitted).

3 Unplug the connector and remove the sensor.

4 When fitting the new sensor, make sure that the actual probe (bare-metal surface) is to the top.



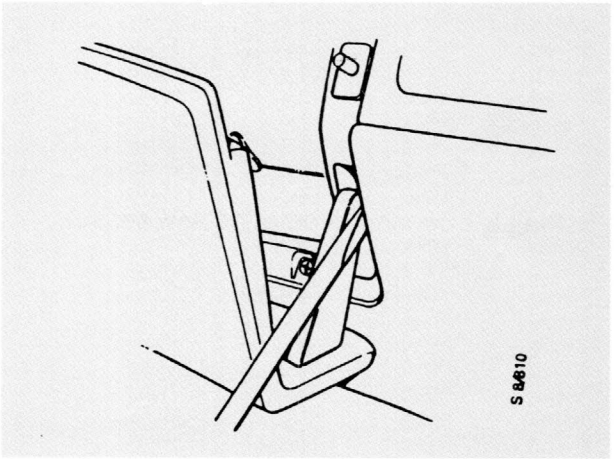
5 Refit the air intake grille (when applicable) and reconnect the battery.

To change the blended air sensor

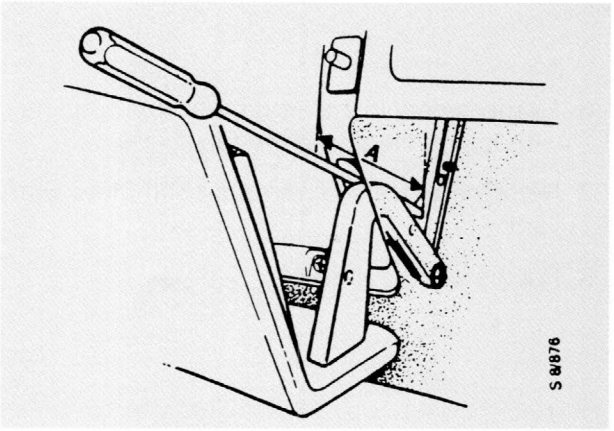
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



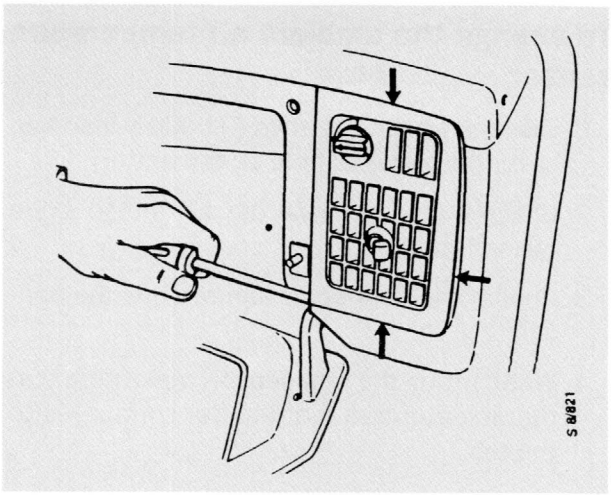
Nonadjustable flap



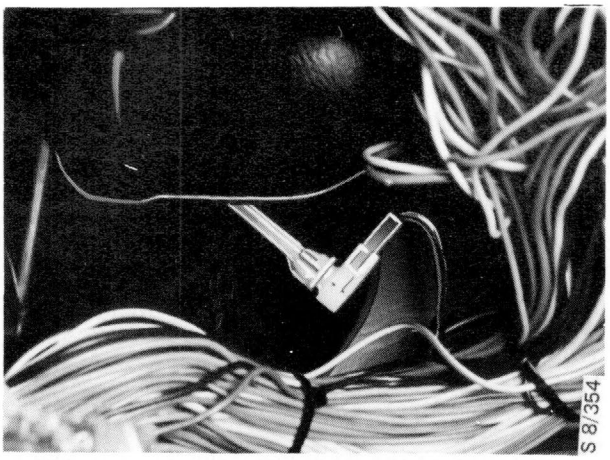
Adjustable flap

A = 100 mm.

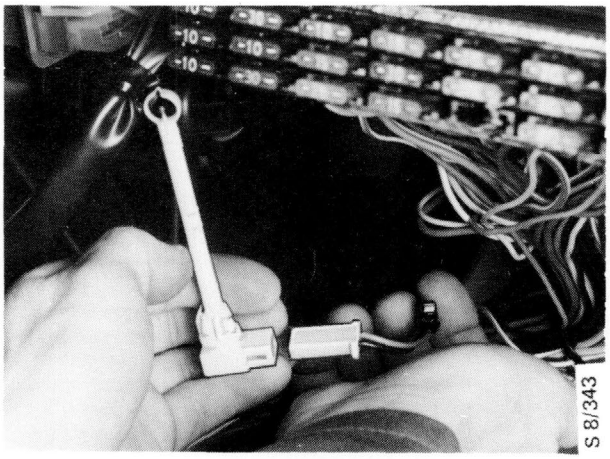
3 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



4 Pull the blended air sensor out of the air-distribution housing and unplug the connector.



5 Plug the connector onto the new sensor.



6 Fit the sensor in the air-distribution housing, with the connector to the top.

7 Refit the glove compartment complete with vent.

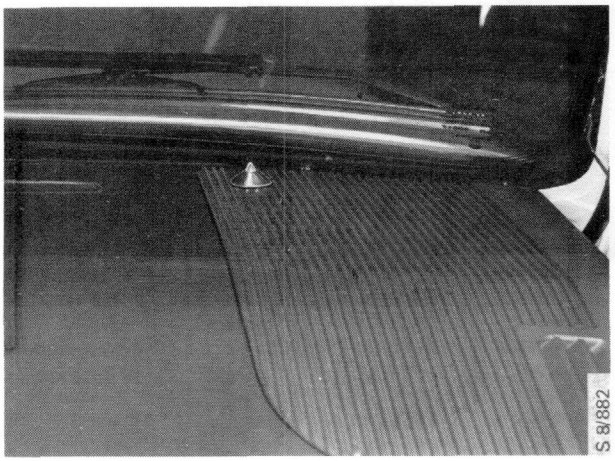
8 Reconnect the battery.

To change the sun sensor

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Ease the door trim seals away from the A pillar and remove the pillar trim.

3 Remove the speaker grille.



During the 1986 model year, the sun sensor was moved from the LH to the RH side.

4 Unplug the connector and remove the sensor (if speakers are fitted, these must be removed to enable access to be gained to the connector). The sun sensor is fixed by means of double-sided adhesive tape. Clean the surfaces thoroughly before fitting the new sensor.

Servomotors

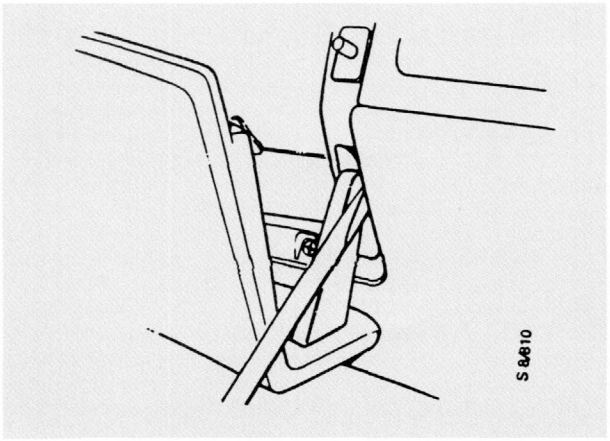
To remove

1 Press the temperature-selector button (with red arrow) until HI appears on the display.

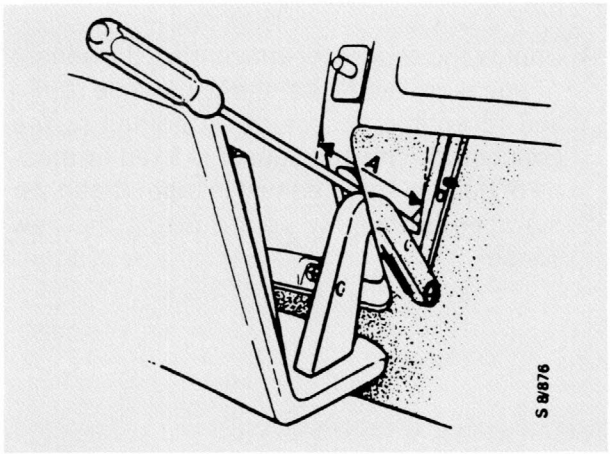
2 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

3 Drop the glove-compartment flap right down by easing out the flap restraints so that they clear the stops. Pull the light into the glove compartment.

N.B.
Cars with adjustable flaps can be identified by the adjusting screws inside the compartment.



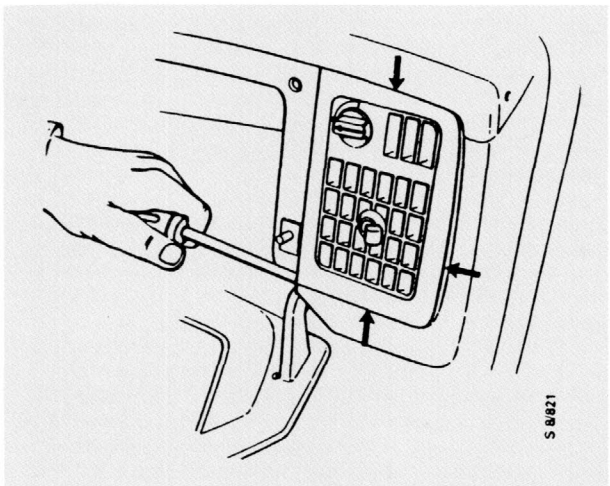
Nonadjustable flap



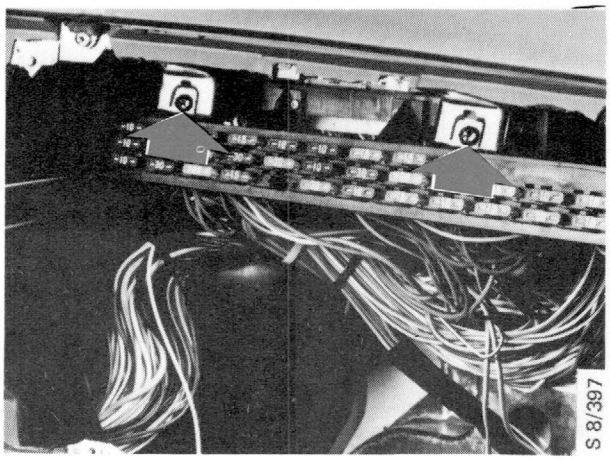
Adjustable flap

A = 100 mm.

4 Undo the six screws and remove the glove compartment complete with vent. Using a screwdriver, carefully ease the vent out of the panel - note the position of the clips. Unplug the electrical leads to the light and the switch.



5 Unscrew and drop forward the power distribution panel.

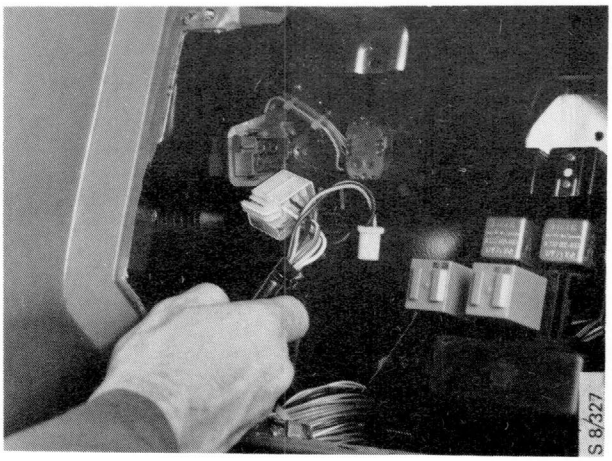


M85 and 86 only:

6 Unplug the connectors for the servomotors and the fan for the inside-air sensor.

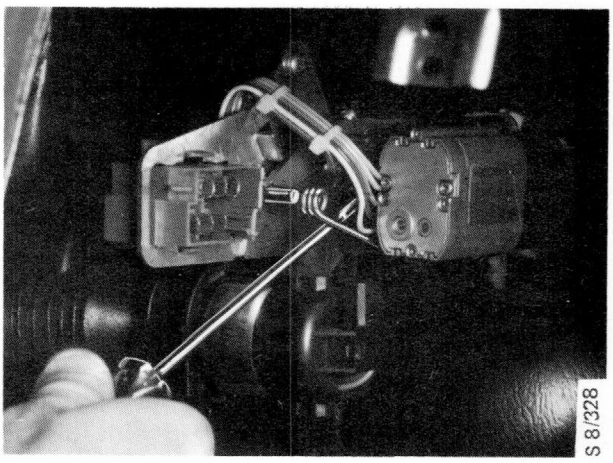
M87 onwards:

6 Unplug the servomotor connector.



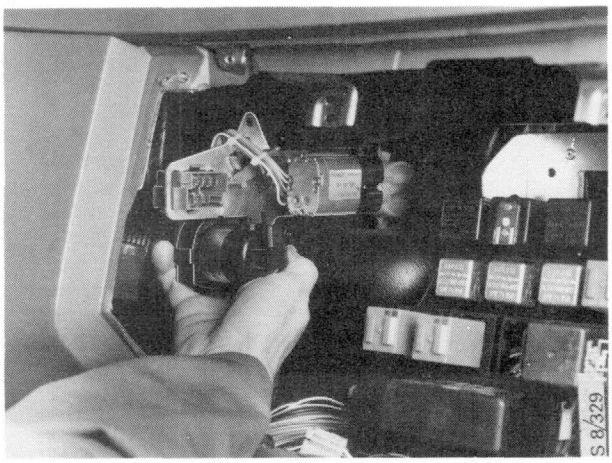
M85 and 86

Remove the lock washer and disconnect the cable from the servomotor.



7 Unscrew the bracket and withdraw it complete with motors.
M85 and 86 only:
Disconnect the flexible duct from the inside air sensor.

8 Lift out the motor bracket assembly.



To refit

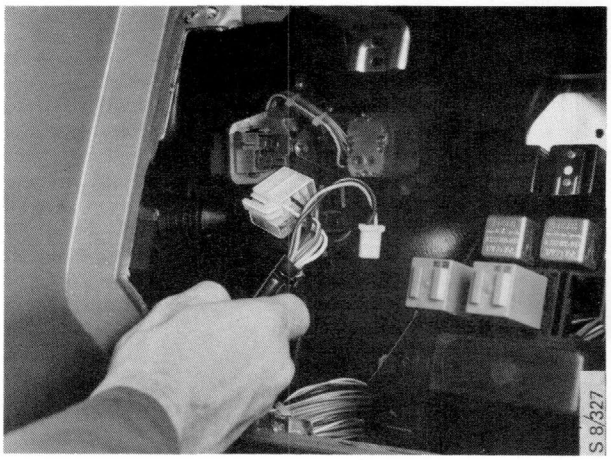
N.B.
The servomotors are preset at the factory and must not be run before they are fitted in the car!

1 M85 and 86 only:
Pull forward the ACC control panel.

2 Refit the motor assembly bracket.
Make sure that the bevel-gear spindle is correctly engaged and that the temperature-control cable is on the correct side of the bracket.

3 Tighten the bracket retaining screws. Connect the cable to the temperature control and fit the lock washer.

4 Plug in the connectors for the servomotors and fan.



5 M85 and 86 only:
Reconnect the flexible duct to the inside-air sensor and fit the ACC control panel.

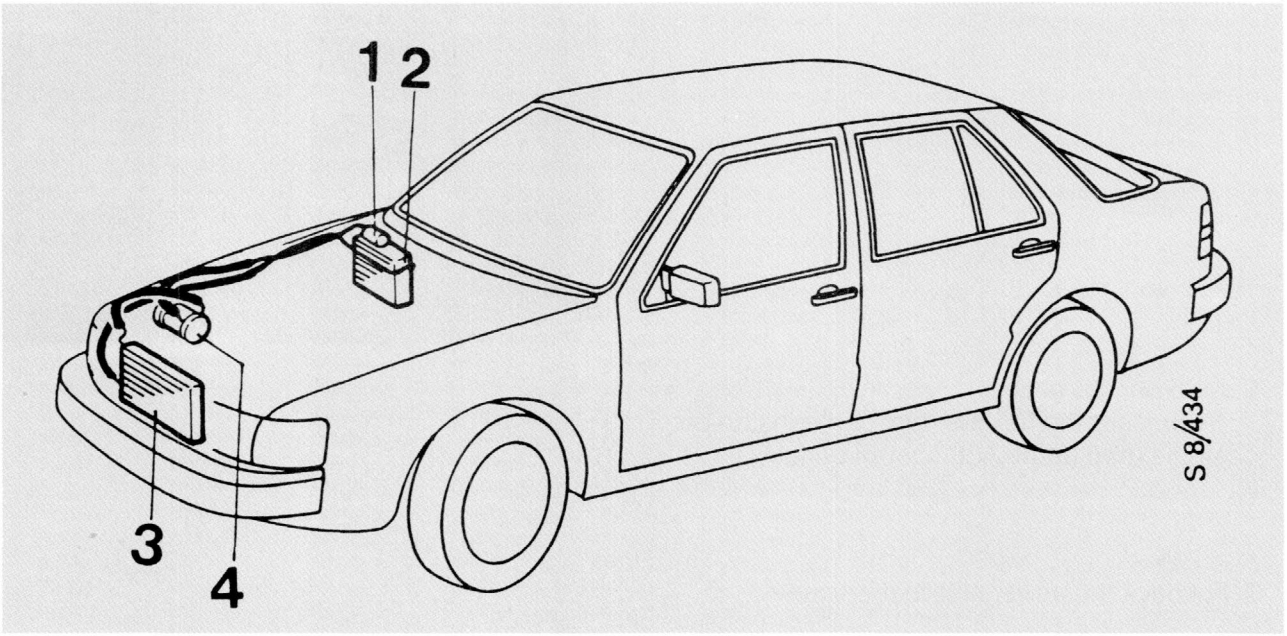
6 Put back the power distribution panel.

7 Refit the glove compartment making sure that the air ducts are positioned properly.

8 Reconnect the battery.

Cars with AC

General directions for work on the AC system



1 Receiver
2 Evaporator
3 Condenser
4 Compressor

Precautions against ingress of moisture etc.

Any damage resulting in leaks in the system must be rectified immediately, to prevent moisture or foreign bodies entering the system. To reduce the risk of moisture entering the system while work is in progress, it is vital that all components be kept clean and dry. Always keep the refrigeration oil in a sealed container to prevent the oil absorbing moisture from the air.

Plugs used to blank off ports in new components should not be removed until immediately before the component is to be connected.

If the car has been involved in a collision, a careful inspection must be made of all components that could have been affected. Pay special attention to soldered joints. Bent or cracked pipes must always be replaced - never attempt to repair them. If it is suspected that dirt may have entered a component, inspect and clean the component thoroughly.

Desiccant inside the receiver

The receiver should be replaced if the system has been open for more than five minutes. The system is regarded as being open if any component is uncapped.

Installation of a completely new system

The compressor is charged with refrigeration oil. No oil should be added to any other component.

N.B
Whenever possible, the system should be charged with refrigerant immediately after fitting, to guard against corrosion. Full details of how to charge the system are given in a separate section.

Replenishing the refrigeration oil

If the system is overcharged with refrigeration oil, its cooling capacity will be diminished. Conversely, an insufficient charge of refrigeration oil will result in the compressor being damaged. In conjunction with work to repair leaks or when a component is being replaced, the refrigeration oil must be replenished. The amount of additional oil required by the individual components will depend on whether the leakage has been rapid or slow.

Slow leaks (longer than 24 hours)

If the leak has been slow, refrigeration oil will not normally have been lost. However, the following procedure should be followed if a component is being replaced at the same time.

Compressor

Drain the refrigeration oil from the old compressor and measure the volume. Completely drain the new compressor as well. Thereafter, recharge the new compressor with the same volume of oil as that drained from the old one (minimum charge volume: 1 dl/0.2 USpint).

Other components

Drain off the refrigeration oil from the old component and measure the volume. Charge the new component with the same volume of oil before fitting.

Rapid leaks (e.g. burst hose)

If a rapid leak has occurred, refrigeration oil will often have been lost with the refrigerant. Thus, if a new component is to be fitted, it should be charged with refrigeration oil as follows:

Compressor	Volume of oil drained from old compressor + 0.3 dl
Evaporator	0.5 dl
Receiver	0.2 dl
Condenser	0.2 dl
Hose	0.2 dl

Safety precautions

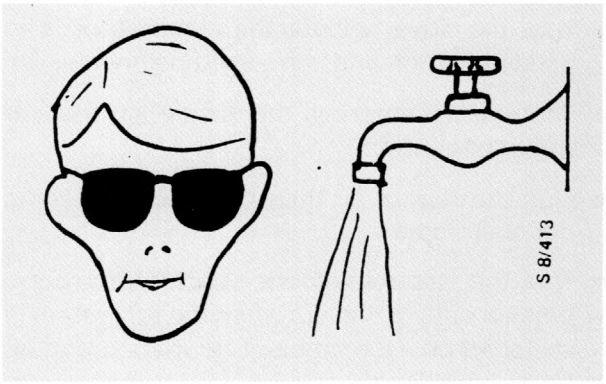
Before starting work on the AC system, read and observe the following.

Always wear closely fitting protective goggles when handling refrigerant and when refrigerant is likely to escape or be released. Wear protective gloves and cover all exposed skin as a precaution against frostbite and similar injury.

If the skin should come into contact with the refrigerant, bathe the affected part with cold water and treat as for frostbite.

In the event of refrigerant coming into contact with the eye, bathe the eye with large quantities of cold water from the tap, preferably for about 15 minutes.

If any discomfort remains, sight is impaired or vision misty, seek medical help without delay.

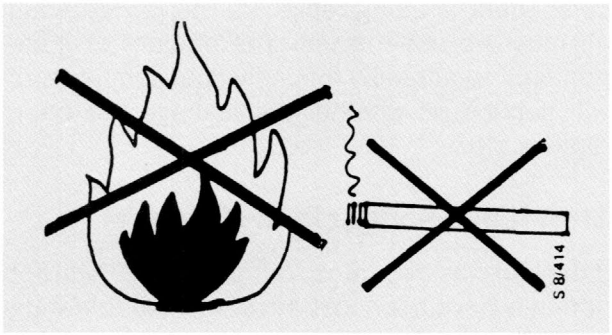


Warning

If a refrigerant cylinder is heated, the pressure inside the cylinder will increase, and the cylinder may explode.

Warning

Poisonous gases are formed if the refrigerant is heated. Such gases, if inhaled, can do severe damage to the lungs.



When handling refrigerant, never allow naked flames, cigarettes, etc., in the area, as poisonous gases are produced when the refrigerant comes into contact with a source of heat. In high concentrations, such gases have a pungent odour.

N.B.
Even in concentrations so low that no odour can be detected, if inhaled, the gases can seriously damage the lungs.

Symptoms can arise several hours after exposure to the gases, in some cases as much as a day later.

Fault diagnosis

Check the following before following the fault-diagnosis table:

- That the drive belt for the compressor is in good condition and correctly tensioned.
- That air is entering the inside of the car through the vents.
- That the flow of air through the condenser is not obstructed.
- That the electromagnetic clutch for the compressor cuts in and out when the AC system is switched on - the ambient temperature must be at least 8 or 9 °C (46 - 48 °F). If the compressor fails to cut in, the system may be starved of refrigerant (cut-in prevented by the pressure switch on the receiver).

  M85 only:

- That the AC fan cuts in when the system is switched on.

How to use the fault-diagnosis table

Identify the possible cause of the relevant symptom (marked by an 'X' in the table) and read along the line. Identify all possible causes and then decide which is the most likely. Perform all the simple checks first. Note that the possible causes are not listed in any order of probability.

Symptom

No cooling	Poor cooling	Erratic cooling	Noise in system	Possible cause	Action
				Electrical faults:	
X				Blown fuse	Check the fuses (if necessary, refer to wiring diagram)
x				Poor connection or earthing (Compressor not running)	Check all leads
X				Compressor clutch burnt out	Replace the clutch
X				Fan motor not running	Check electrical connections and fan motor
	X	X		Fan motor running erratically (Play or fractured component in motor)	Check and replace if necessary
		X	X	Break or poor contact in the compressor clutch winding (clutch slips in and out)	Replace the clutch
			X	Fan motor whining or touching casing	Check
				Mechanical faults:	
X	X		X	Slack drive belt	Adjust or replace the belt
	X			Blockage in air duct	Check and clean
			X	Clutch bearing worn or out of true	Replace the bearing
	X		X	Compressor worn or insecurely fitted	Overhaul the compressor and tighten fixings.

Symptom

No cooling	Poor cooling	Erratic cooling	Noise in system	Possible cause	Action
				Systemfaults:	
X				Anti-frost thermostat fails to make circuit to compressor	Check that the thermostat is fully inserted in the evaporator. If correctly fitted, change the thermostat
X				Expansion valve stuck open	Replace the expansion valve
X				Leak in system	Recharge the system and test for and repair any leaks
X				Blockage in hose or component	Check the flow through each component
X				System starved of refrigerant	Recharge the system
	X			Air filter clogged on inlet side	Change the filter
	X		X	Insufficient refrigerant in the system (whistling noise from expansion valve on evaporator - bubbles visible in the sight glass)	Drain the system and recharge
	X			Expansion valve capillary tube damaged (Tube empty of medium)	Replace the expansion valve
	X			Receiver clogged	Replace the receiver
	X	X		Moisture in the system. Cooling good initially (for a few minutes) and then deteriorating. Alternatively, deterioration at high ambient temperature	Drain the system, replace the receiver and recharge with refrigerant
	X			Air in the system (Bubbles visible in sight glass)	Drain the system, change the receiver and recharge with refrigerant
		X		Frosting on air side of evaporator	Make sure that the capillary tube for the anti-frost thermostat is correctly located between the fins on the evaporator. If so, replace the thermostat.
		X		Play in anti-frost thermostat	Check the thermostat and replace if necessary.
		X		Coil on expansion valve capillary tube not making good contact with evaporator outlet pipe or poorly insulated from air temperature.	Check the contact and insulation.
		X		Interval between cut-in and cut-out temperature of anti-frost thermostat too great	Replace the thermostat
			X	**System flooded:** Causes rumbling noise or vibration in high-pressure line, gurgling noise in compressor, excessive compressor and suction pressure, hissing noise in expansion valve and bubbles or vapour in sight glass. If the compressor valves have been damaged by an excess charge of refrigerant in the system, the compressor pressure will be too low.	**Drain the system and recharge.**
			X	Excessive moisture in the system can cause noise in the expansion valve	Drain the system. Replace the receiver and recharge the system with refrigerant

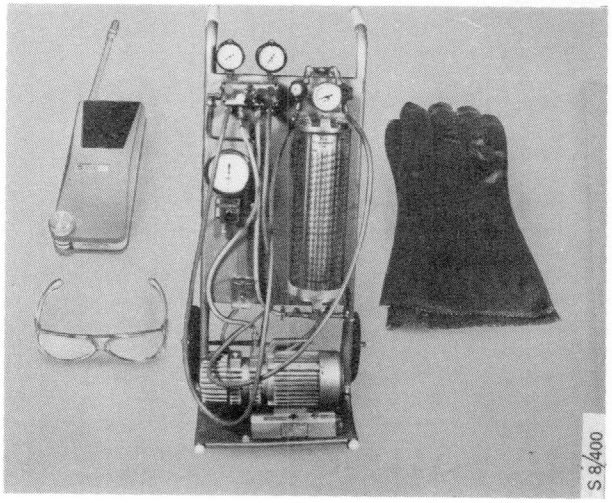
Draining and charging the system (refrigerant)

Warning

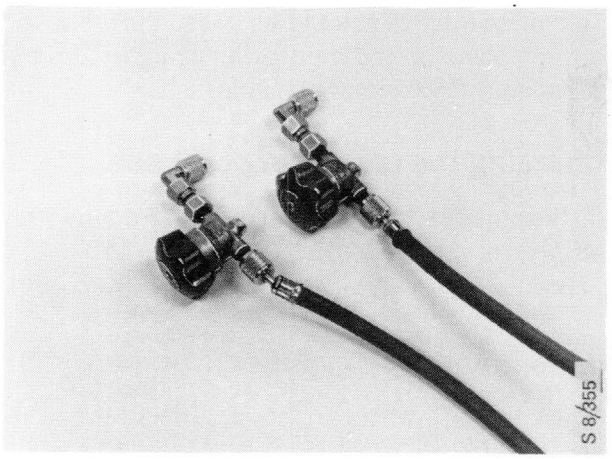
Before starting work, disconnect the negative (—) battery lead.

Equipment required

Filling station - Refco 11705
Refrigerant cylinder connected to filling station
Leak detector - TIF 5000
Thermometer
Closely fitting protective goggles and gloves

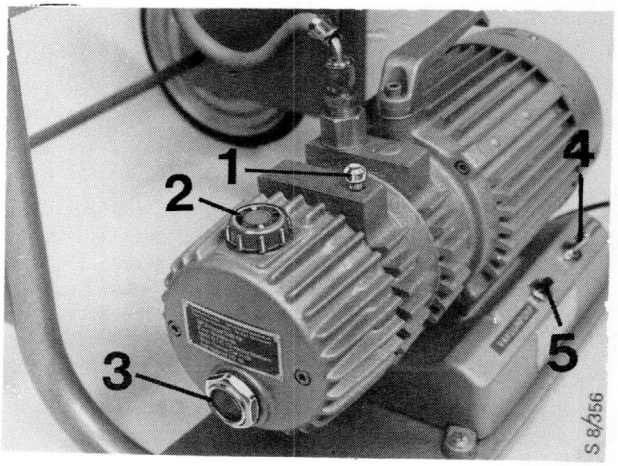


Valves with extension pieces for connection to the hoses are recommended. These minimize refrigerant losses when charging the system.



Important points on handling the equipment

Before use: Check the oil level in the sight glass on the vacuum pump. If necessary, top up with Virginia 2890 special vacuum pump oil or the equivalent. Do not overfill.



1 Ballast valve
2 Oil filler cap
3 Oil sight glass
4 Measuring cylinder heater switch
5 Vacuum pump switch

N.B.
Since the oil gradually loses its moisture-absorbing properties, it should be changed after about 20 hours of operation. Moisture-laden oil diminishes the dry-running capacity of the AC system.

Always keep vacuum pump oil in a sealed container.

Warning

Never expose the refrigerant cylinder and measuring cylinder to high temperatures - 50 °C (122 °F) or above - direct sunlight or the like.
Danger of explosion!

Prior to storage

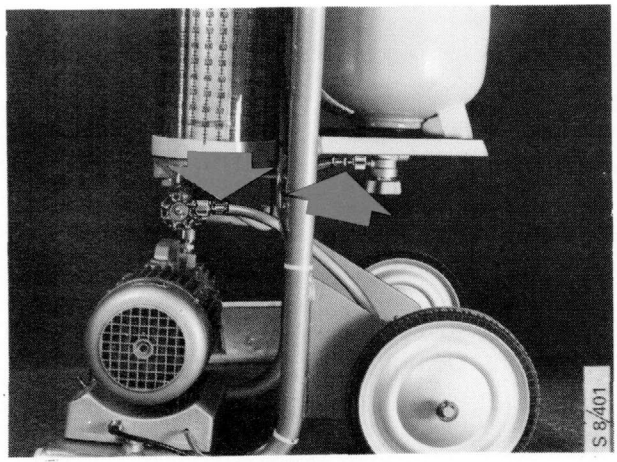
To reduce the risk of leakage, close the input and outlet valves on the measuring cylinder and the valve on the refrigerant cylinder.

Charging the measuring cylinder

If the measuring cylinder is not completely empty, refer to page 854-62.

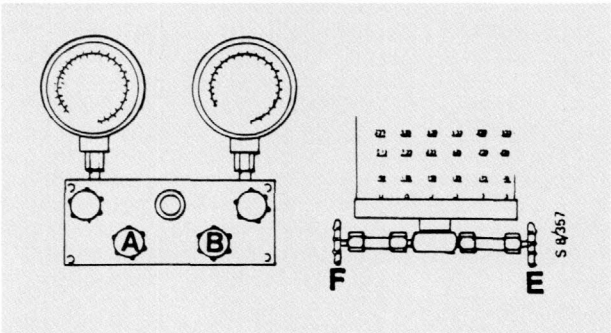
If the measuring cylinder is empty:

Check that all valves are closed. Invert the refrigerant cylinder on the back of the filling station and secure it. Do not let it rest on the valve. Some types of cylinder will require a special connector. Connect the yellow hose between valve E and the refrigerant cylinder. Do not open the valve on the cylinder.



Start the vacuum pump with the ballast valve open. Open valves A, B, E and F.

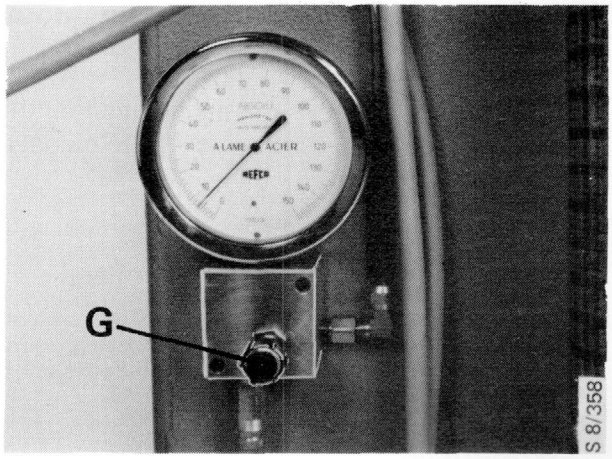
A vacuum will now be raised in the measuring cylinder and the hose as far as the valve on the refrigerant cylinder.



After the pump has been running for about a minute, close the ballast valve. Let the vacuum pump continue to run for a further five minutes.

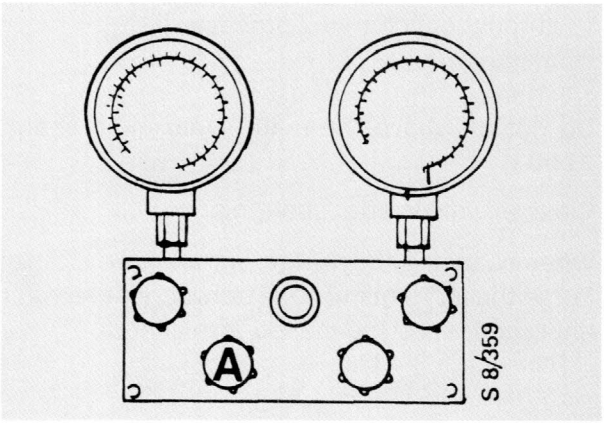
Check the vacuum by slowly opening valve G.

Note the reading on the gauge. The reading should be below 10 mbar.

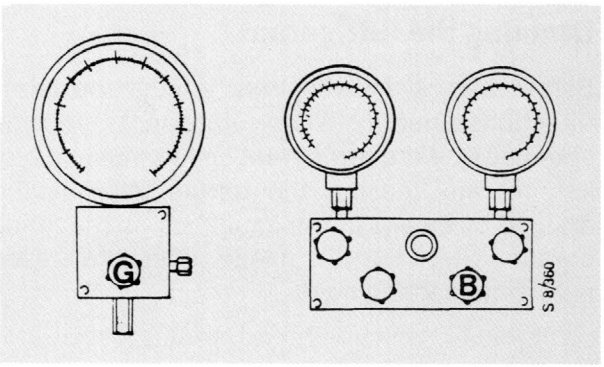


To check that the measuring cylinder is tightly sealed.

Close valve A (to isolate the circuit from the vacuum pump). Make sure that the reading on the vacuum gauge has not risen.



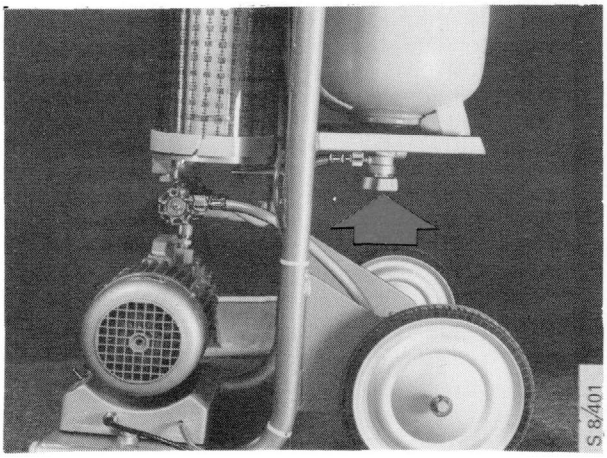
Close valve G on the vacuum pump and valve B. If the measuring cylinder is tightly sealed, charging of the measuring cylinder may be started.



Open the valve on the refrigerant cylinder to charge the measuring cylinder. Do not fill above the mark - maximum charge 2250 g. The charging process can be speeded up by heating the refrigerant cylinder, e.g. with warm air.

Warning

No naked flames! Ensure the electric heater on measuring cylinder switched off throughout charging process!

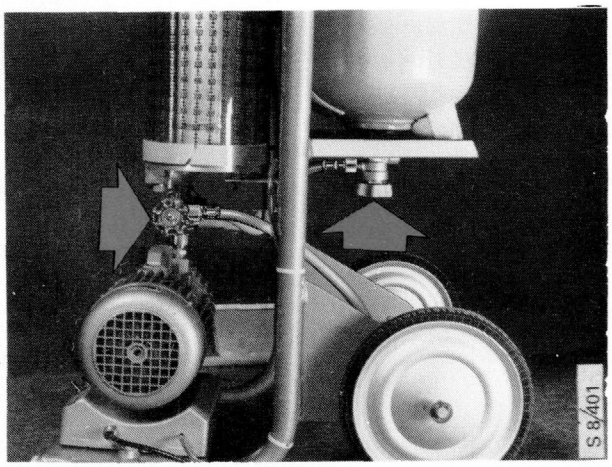


If the measuring cylinder is not completely empty

Check that all the valves are closed and that the refrigerant cylinder is connected to the measuring cylinder.

Open the valve on the refrigerant cylinder and inlet valve E on the measuring cylinder.

The charging process can be speeded up by heating the refrigerant cylinder, e.g. with warm air.



Warning

No naked flames! Ensure the electric heater on measuring cylinder switched off throughout charging process.

Do not fill above the mark - maximum charge 2250 g.

Close all valves after charging.

When changing the refrigerant cylinder:
Purge the air from the hose between the refrigerant cylinder and the measuring cylinder.

Draining the refrigerant

Before starting any work, read through the safety directions carefully. When components are to be changed or if the refrigerant circuit must be broken for any reason, the refrigerant must be drained by means of the gauge set on the filling station. Check that the gauge valves are closed before connecting hoses.

Connections for draining the system

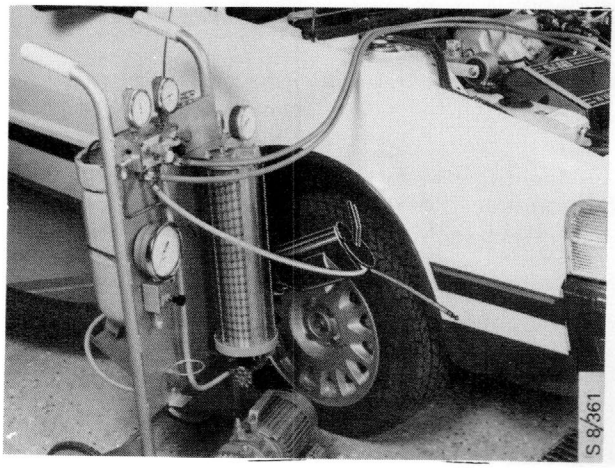
The fittings must only be screwed on finger tight. Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

Connect the **red hose to the high-pressure side** of the compressor, marked DIS.

Connect the **blue hose to the low-pressure side** of the compressor, marked SUC.

Connections for draining the system

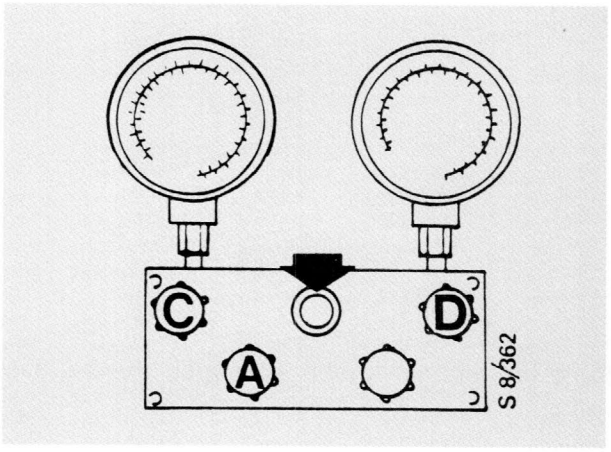
Disconnect the yellow hose from the vacuum pump and insert the end in an exhaust evacuation system hose.
Open the valves on the compressor.



Open valves C and D

Open valve A slowly and carefully release the gas. Check that no liquid is visible in the sight glass on the gauge set.

N.B.
If the refrigerant is allowed to discharge too quickly, refrigeration oil may be lost.



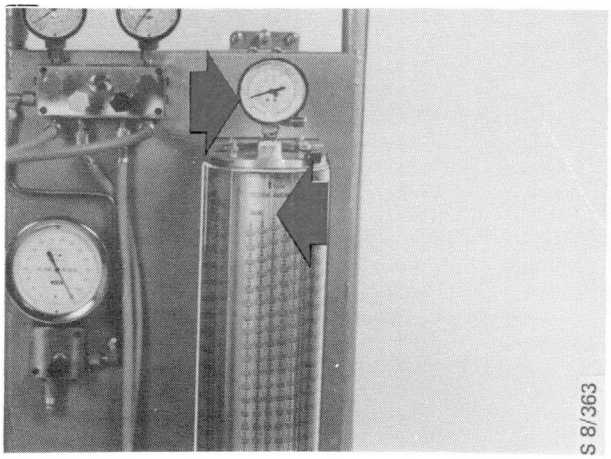
When the gauges read 0 bar and the system is empty: close all valves. Reconnect the hose to the vacuum pump.

Charging with refrigerant

Before starting work, read through the safety directions carefully. Check that a sufficient quantity of refrigerant is in the measuring cylinder (at least 1350 - 1400 g). The scale can be rotated; use the one marked R12.

The pressure in the measuring cylinder is read from the gauge on top of the measuring cylinder. (The pressure in the measuring cylinder varies with the temperature of the refrigerant.) Rotate the R12 scale on the measuring glass to the same value indicated on the gauge.

Example: The reading on the gauge is 4.9. Rotate the measuring glass so that the 4.9 mark comes immediately above the column of refrigerant.



Connections for charging the system

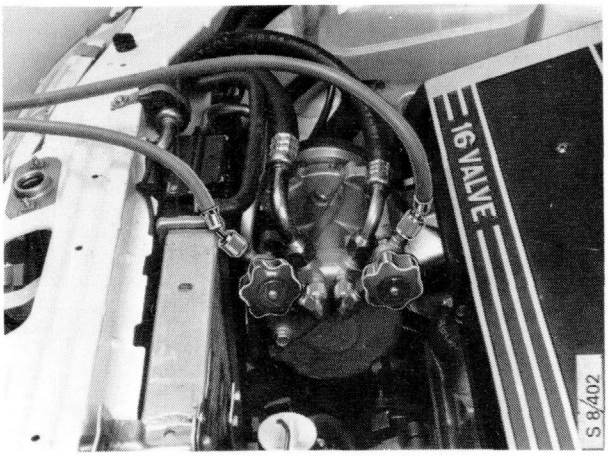
Make sure that the valves on the filling station are all closed.

The fittings must only be screwed on finger tight. Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

Connect the **red hose to the high-pressure side** of the compressor, marked DIS.

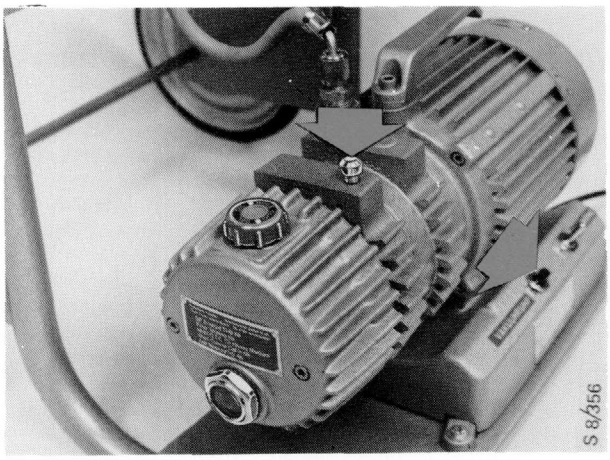
Connect the **blue hose to the low-pressure side** of the compressor, marked SUC.

Open the valves on the compressor.



Connections for charging the system

Start the vacuum pump and open the ballast valve.

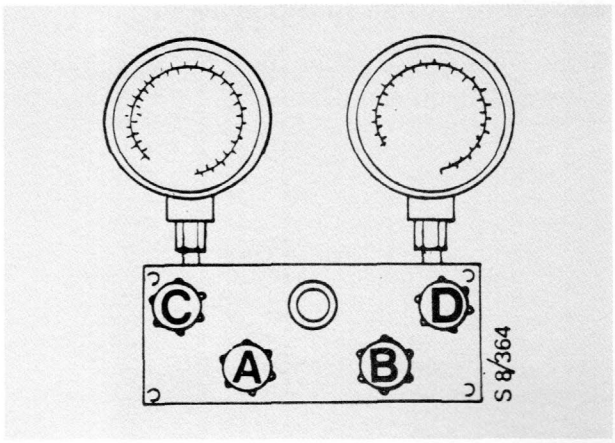


Open valves A, B, C, D and G.

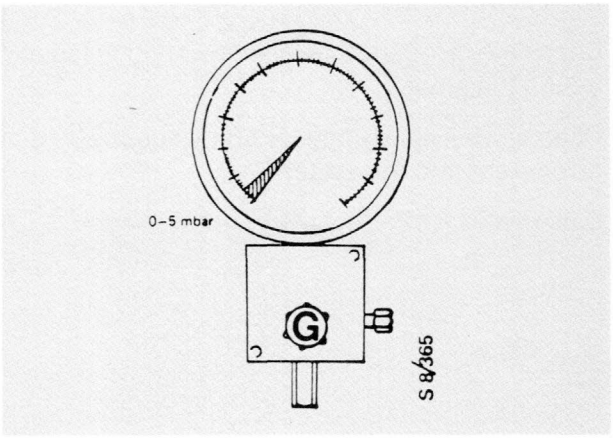
Close the ballast valve as soon as the reading on the vacuum gauge (G) has fallen below 10 mbar.

Switch on the heater for the measuring cylinder. Run the vacuum pump for 30 minutes after the reading on the gauge is -1 bar.

Switch off the heater for the measuring cylinder.

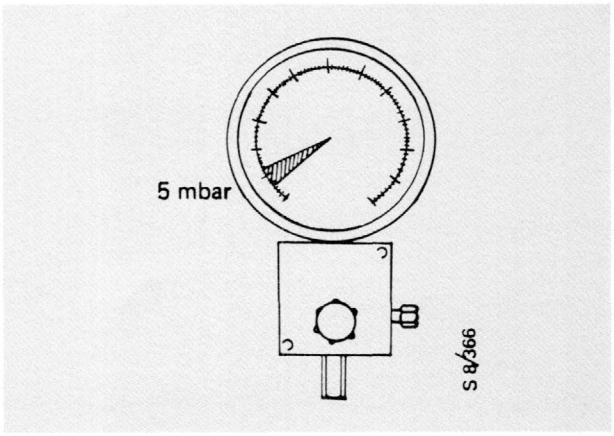


Check the reading on the vacuum gauge - the vacuum should be less than 5 mbar.



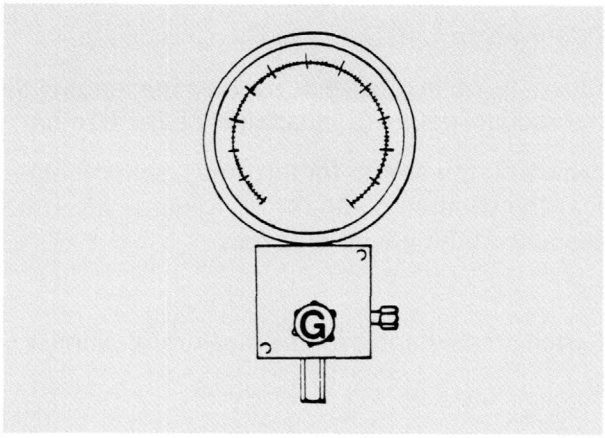
To check that the system is tightly sealed

Close valve A (to isolate the circuit from the vacuum pump). The pressure should not rise by more than 5 mbar over a period of five minutes. Rectify any leaks and run the vacuum pump again.



To test for leaks in the system

Close valve G (the gauge must not be subjected to excessive pressure).



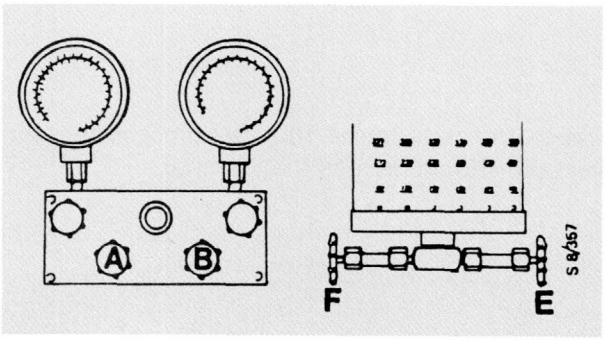
Check that valve A is closed.

Switch off the vacuum pump.

Check the refrigerant level in the sight glass and adjust the glass.

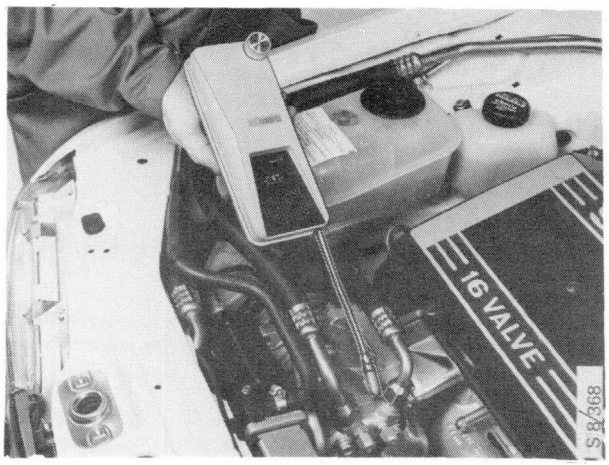
Open valve F slowly and carefully admit 200 g of refrigerant into the system.

Close valve F.



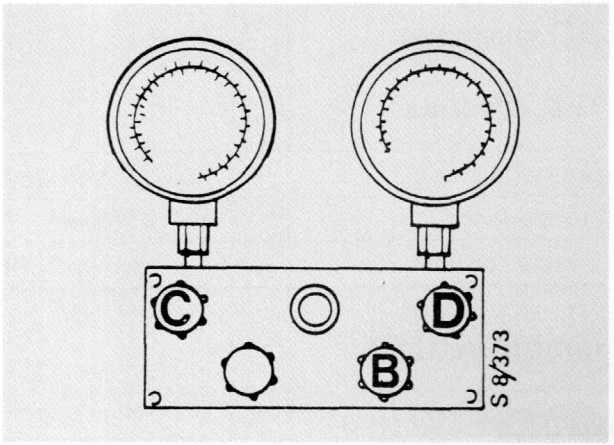
Use the leak detector to check all connections. A change from a steady bleeping to a rapid bleeping indicates a leak.

Rectify any leaks.



When the system is completely leak-free:

Open valve F and fill the system with the specified quantity of refrigerant - 1100 g (40 oz). (Remember that 200 g of refrigerant has already been added.)



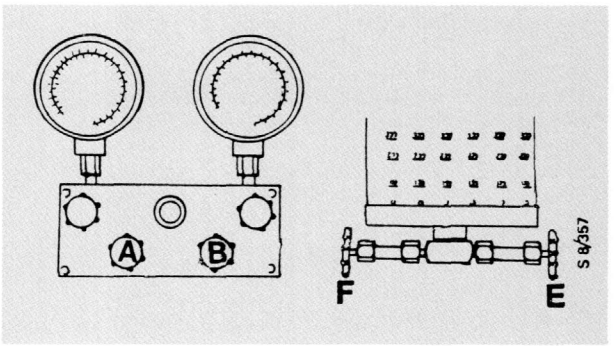
Close valves F, B, C and D.

Close the valves on the compressor in the car.

Make sure that all valves on the filling station are closed.

Carry out a performance test as detailed on next page.

Disconnect the hoses from the compressor and replace the end caps.



Testing the performance of the AC system

Test criterias

Bonnet	Closed/Open
Front doors	Closed
Engine speed	33 r/s (2000 rpm)

Control settings

	Manual AC	ACC
Fan speed	4	3 (selected manually)
Temperature	Cold	LO
Air distribution valve	 (VENT)	VENT (selected manually)
Air recirculation	Yes	Yes (selected manually)

Performance chart (valid after 5 minutes' operation)

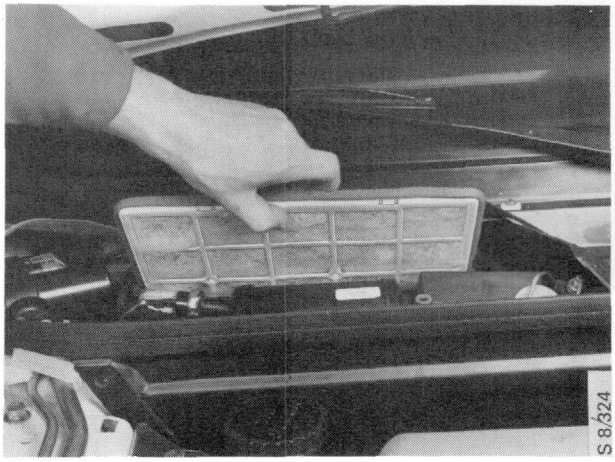
Approx. ambient temperature Temperature of the supply air measured approx. 100 mm inside the centre panel vent		20°C (68°F) 6 - 10 °C (43 - 50 °F)	30°C (86°F) 6 - 10 °C (43 - 50 °F)	40°C (104°F) 10 - 12 °C) (50 - 54 °F)
Compressor cut-in/cut-out pressure, measured on low-pressure side of compressor (SUC).	Cut-in: Cut-out:	2.6 bar 1.4 bar	2.6 bar 1.4 bar	2.6 bar 1.4 bar
Compressor cut-in/cut-out pressure, measured on high-pressure side of compressor (DIS):	Cut-in: Cut-out:	9.0 bar 13.5 bar	12.0 bar 17.0 bar	16.0 bar 20.0 bar

AC system components

To change the fresh-air filter

(Cars with AC and ACC only)

1 Remove the cover from the evaporator, release the fasteners, open the top and withdraw the filter.



2 Fit the new filter with the recesses in the frame at the bottom and towards the rear.

3 Close the top and secure the fasteners. Refit the cover on the evaporator.

To remove the evaporator

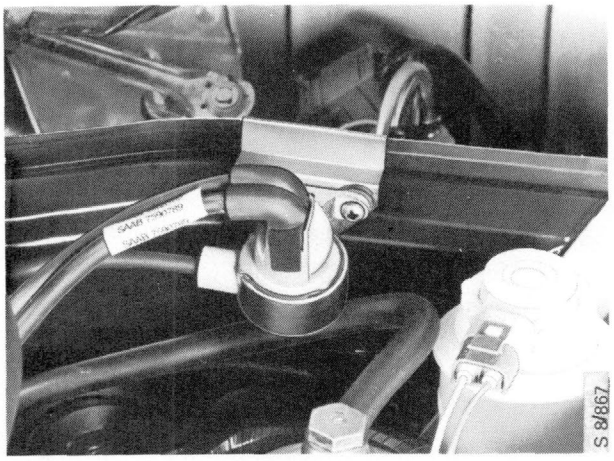
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Drain the refrigerant from the system, following the instructions given elsewhere in this section.

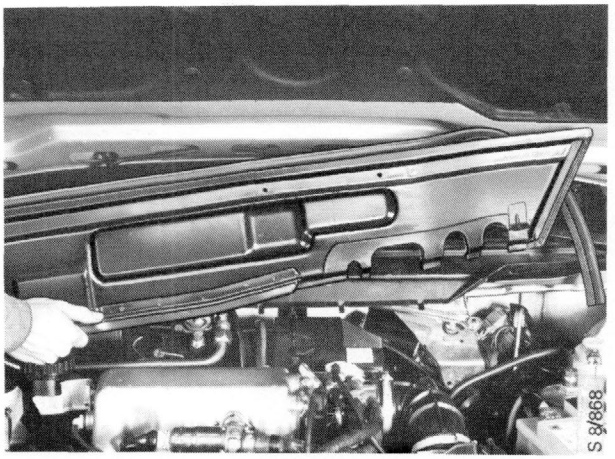
3 Remove the following:

- Bonnet
- Wiper arms
- Evaporator and wiper motor covers
- Plastic channel below windscreen moulding

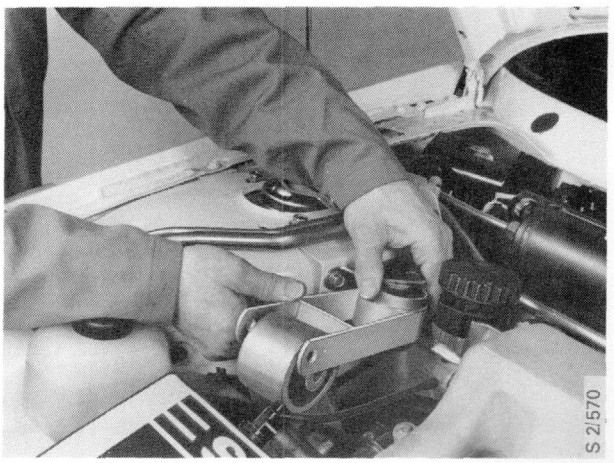
4 Release the seal from the false bulkhead panel and lift out the signal converter.

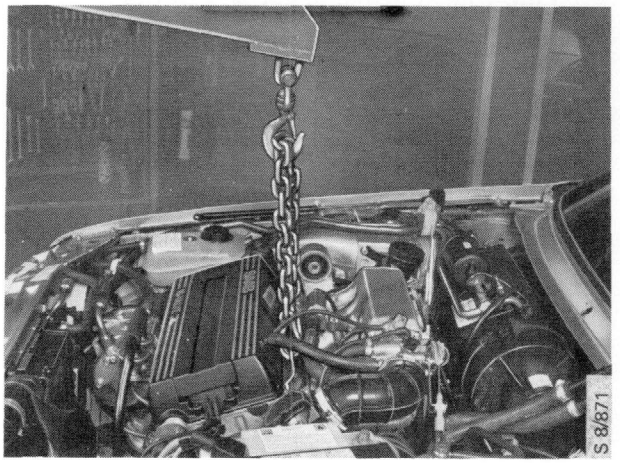


5 Remove the false bulkhead panel and the top fixing for the oil filler pipe.

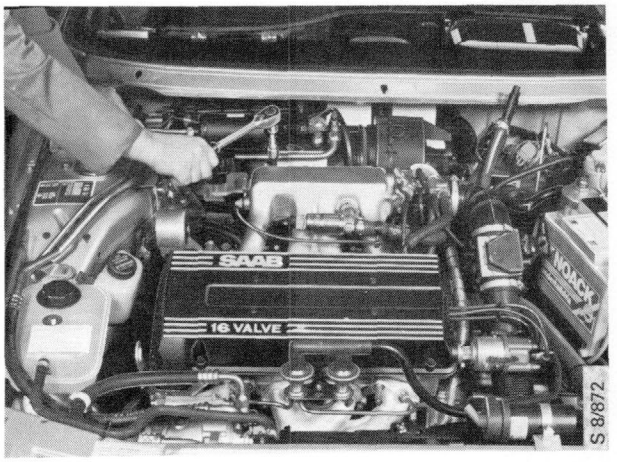


6 Unbolt the engine stay and the rear engine mounting.





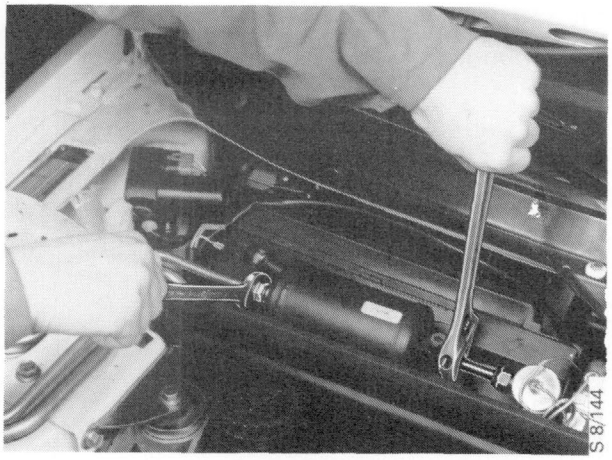
7 Attach the lifting sling to the rear lifting lug on the engine.



8 Lift the engine slightly towards the front.

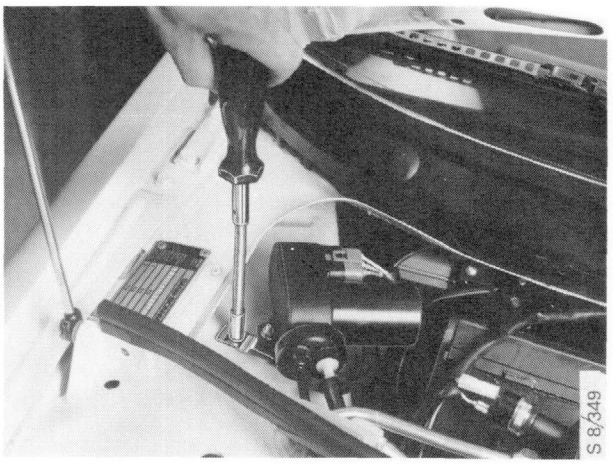
9 Undo the pipe fittings on the inlet side of the receiver and outlet side of the evaporator. Use a second spanner to stop the fitting turning.

Blank off all ports and open pipe ends.

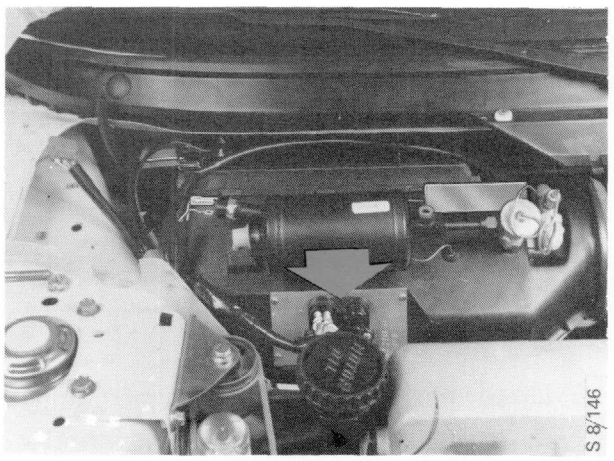


10 Remove the plastic grommet in the panel and undo the fixing for the power-steering fluid reservoir. Move the pipes out of the way.

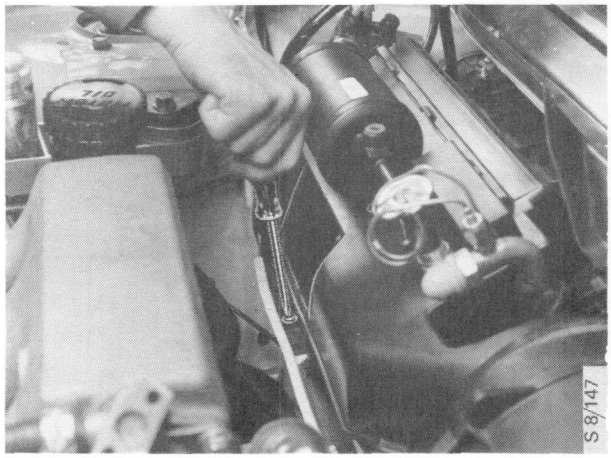
11 Remove the vacuum pump for the cruise control system.



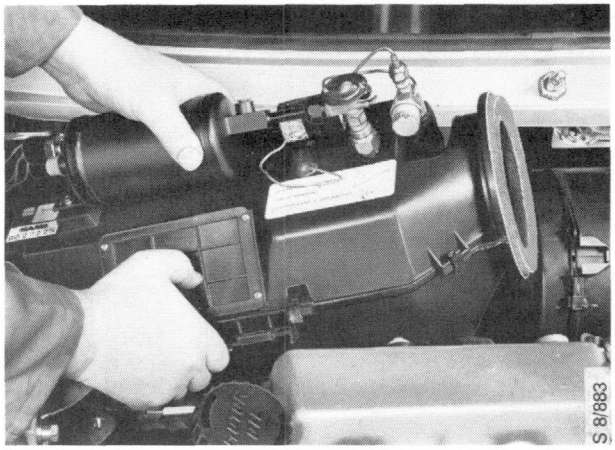
12 Unplug the connectors for the fan control unit (ACC only), the air recirculation valve servomotor, the anti-frost thermostat and the pressure switch on the receiver. Label the electrical leads.



13 Remove the evaporator securing screw.



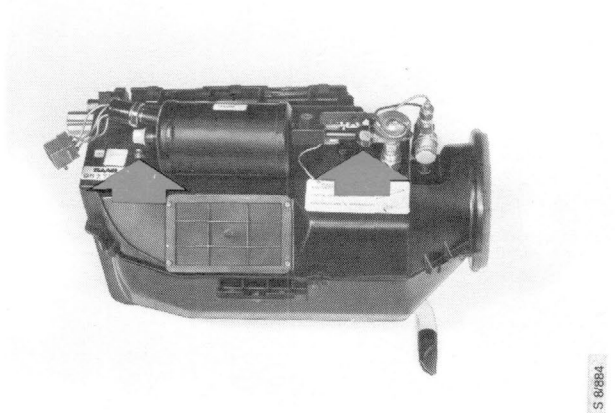
14 Lift the end of the evaporator, move it towards the middle and lift it out of the car.



To dismantle

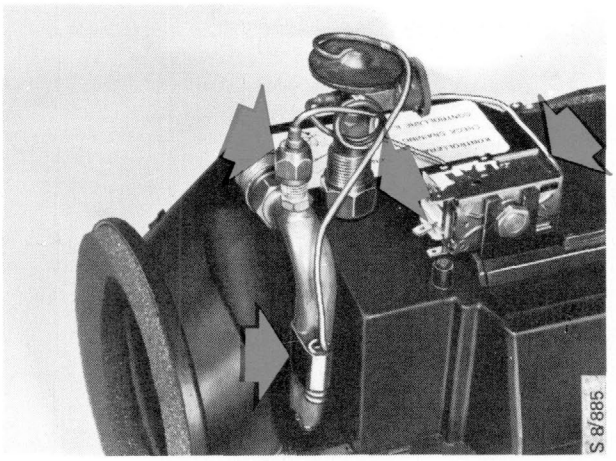
15 Remove the fresh-air filter.

16 Remove the receiver securing screw and disconnect the fitting between the receiver and the expansion valve.



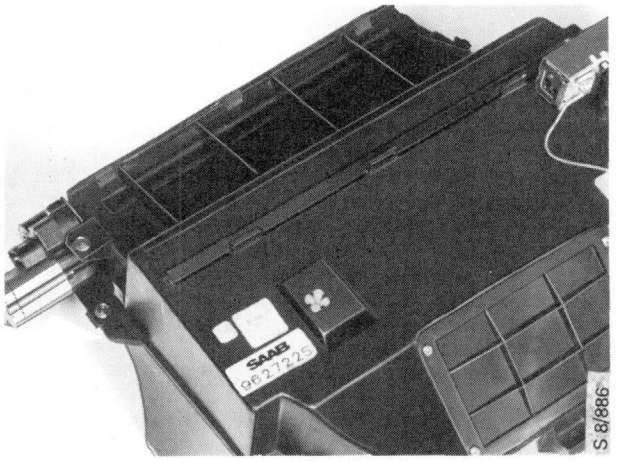
17 Remove the insulation to enable the clips securing the sensor probe to be removed. Disconnect the capillary tube and expansion valve from the evaporator.

18 Remove the anti-frost thermostat.



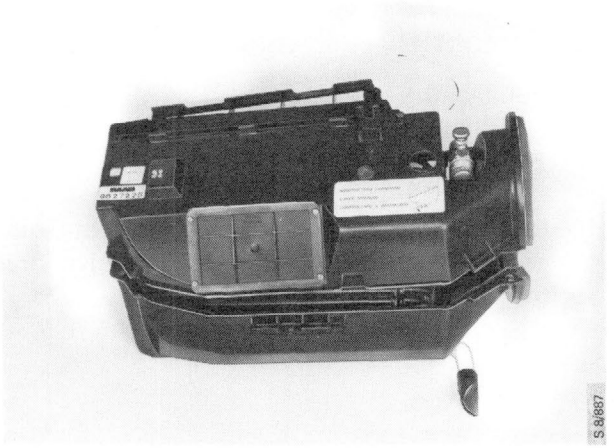
N.B.
Blank off all ports and open pipe ends.

19 Remove the motor for the air-recirculation valve.



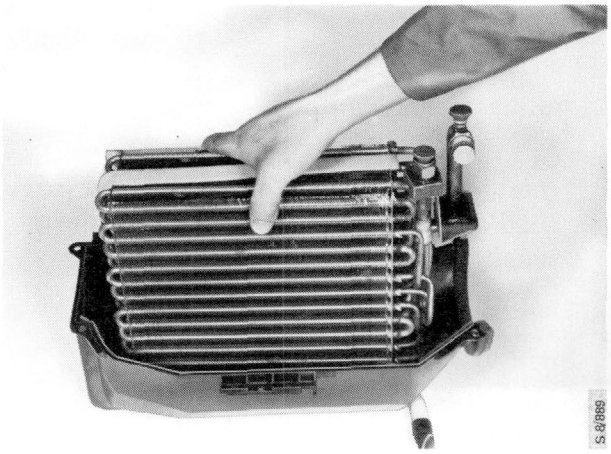
20 Cut through the gasket on the evaporator flange.

21 Release the fastener, separate the two halves of the casing and lift out the evaporator.

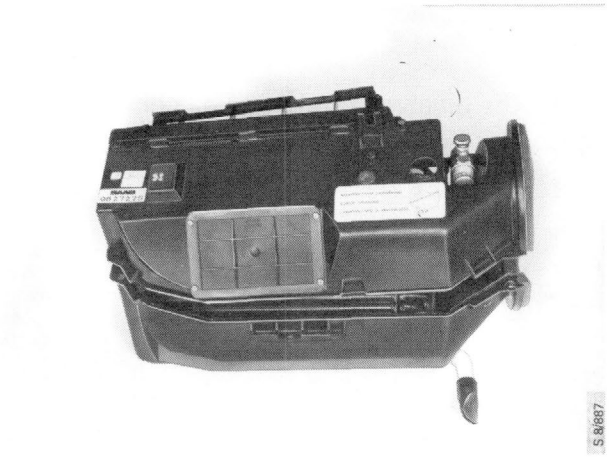


To assemble the evaporator unit

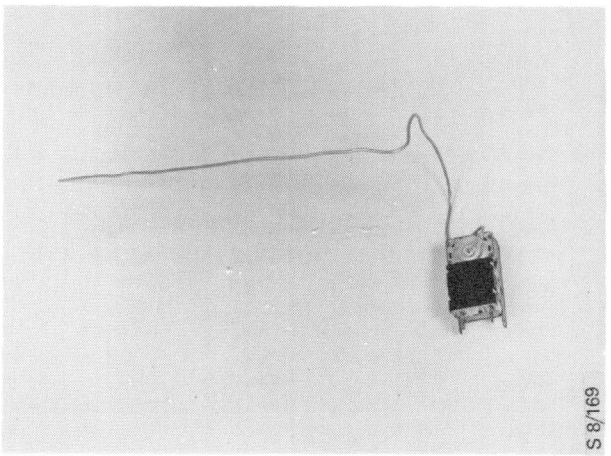
1 Fit the evaporator into the inner grooves in the casing (the outer ones are for the fresh-air filter).



2 Refit the air-recirculation valve and the fresh-air filter. Refit the top half of the evaporator casing and secure the fastener. Make sure that the air- recirculation valve is correctly positioned.
If damaged, replace the gasket.



3 Refit the anti-frost thermostat, making sure that the capillary tube is correctly positioned (pushed fully home).

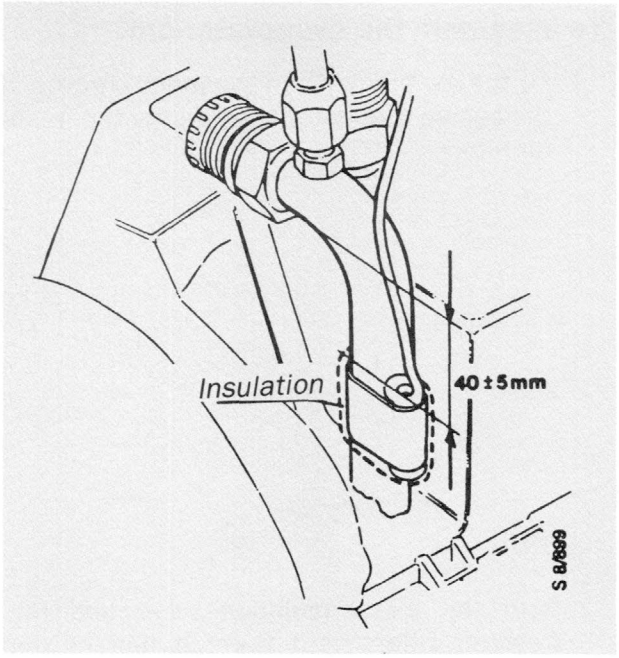


4 Refit the motor for the air-recirculation valve.

5 Fit the expansion valve, leaving the fittings slack.

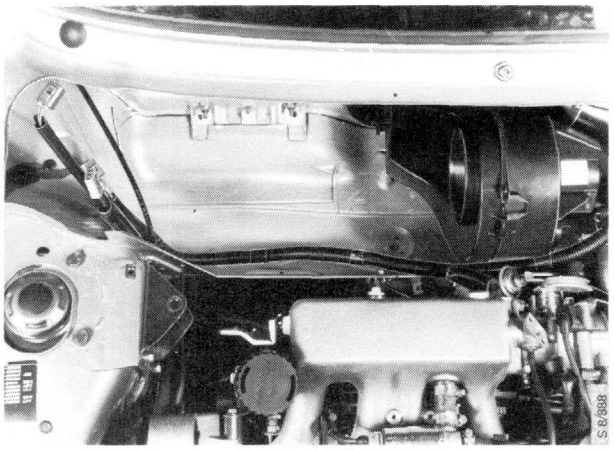
N.B.
Fit new 'O' rings, lubricated with refrigeration oil, in the fittings.

Fit the sensor probe to the evaporator discharge pipe. Make sure that the contact is good. Pack insulation thoroughly around the sensor probe.

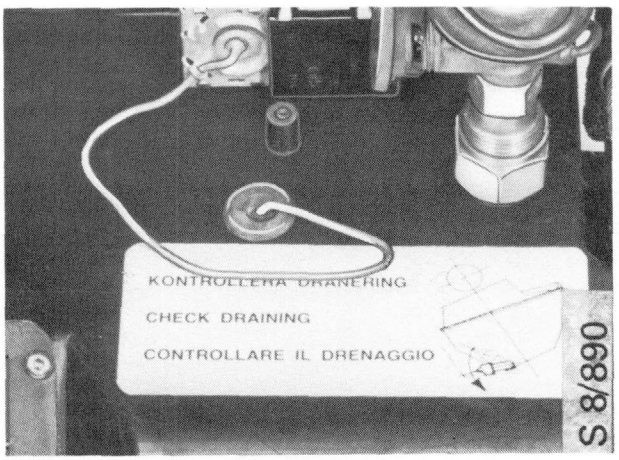


6 Fit the receiver, tightening all connections.

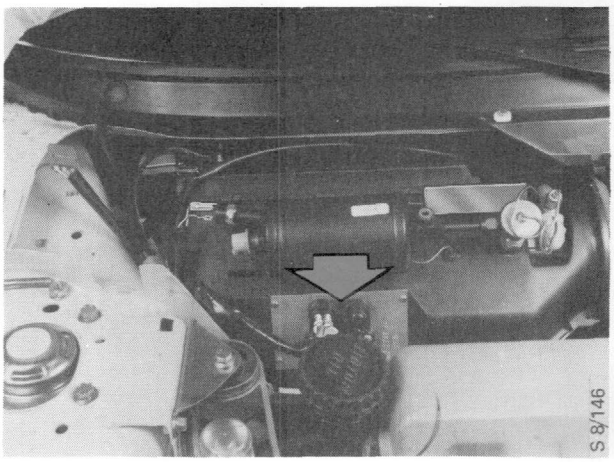
7 Check that the wiring loom is routed correctly in the car.



8 Lift the evaporator into position, centring it such that the gasket is lined up with the fan casing. Refit the evaporator securing screw, making sure that the drain pipe is orientated as shown on the evaporator casing.



9 Reconnect the electrical leads to the fan control unit, air-recirculation valve motor, anti-frost thermostat and pressure switch on the receiver. Fit the cover over the anti-frost thermostat.



10 Refit all the other parts.

11 Recharge the system with refrigerant, following instructions given elsewhere in this section.

12 Reconnect the battery.

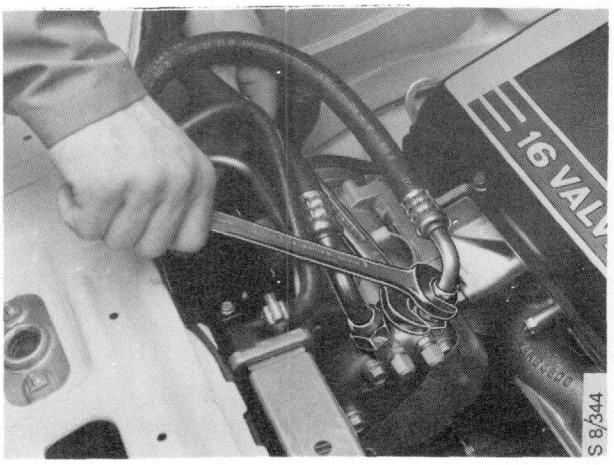
13 Carry out a performance test on the system.

To change the compressor

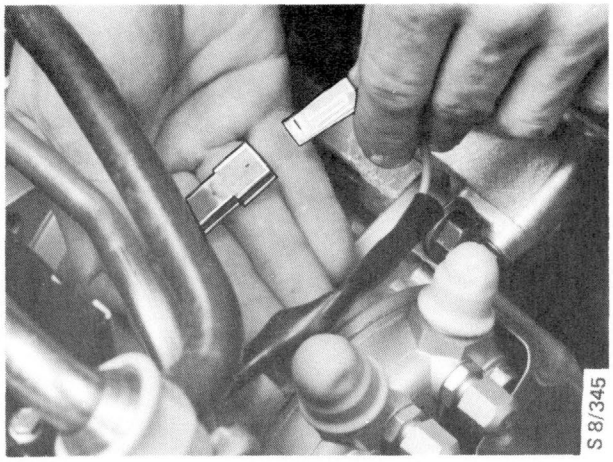
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Drain the refrigerant from the system, following the instructions given elsewhere in this section.

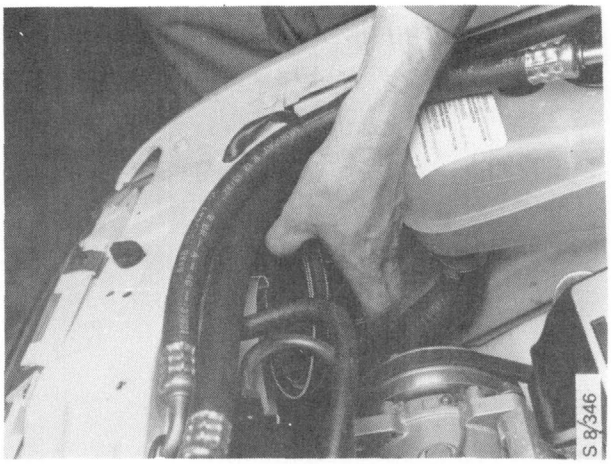
3 Undo the compressor hose connections. Blank off the compressor ports and hose ends.



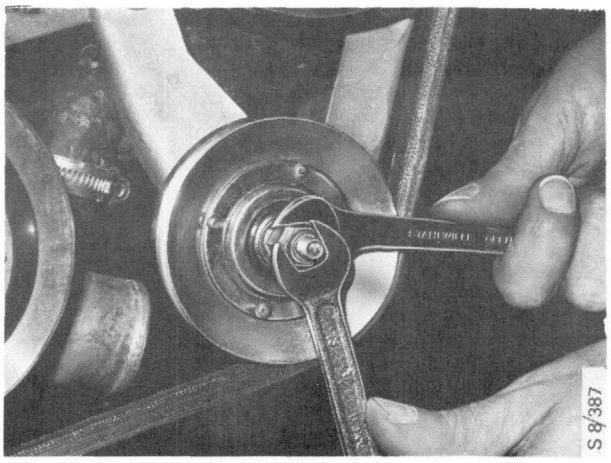
4 Unplug the electrical connector.



5 Remove the plastic cover from the RH headlamp.

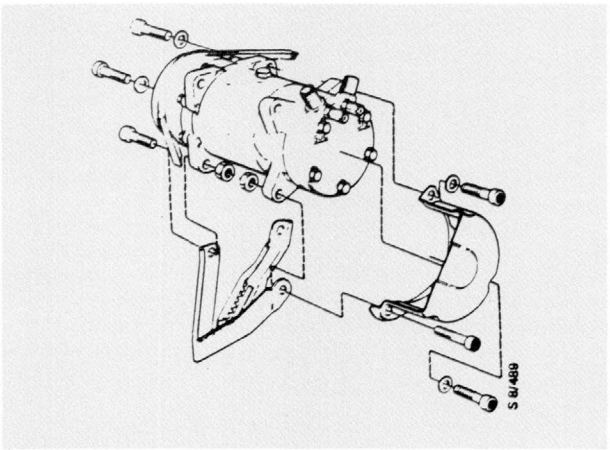


6 Slacken the compressor belt.



7 Remove the belt-tensioner for the compressor. Leave it resting underneath the hose to the expansion tank.

8 Remove the compressor fixing bolts and heat shield. Carefully lift the compressor towards the centre and out of the car.



When changing the compressor

Drain the refrigeration oil from the old compressor and measure the volume. Completely drain the new compressor as well. Thereafter, recharge the new compressor with the same volume of oil as that drained from the old one (minimum charge volume: 1 dl).

On fitting:

9 Check that the belt-tensioner for the compressor is in position and that the drive belt is correctly seated in the crankshaft pulley.

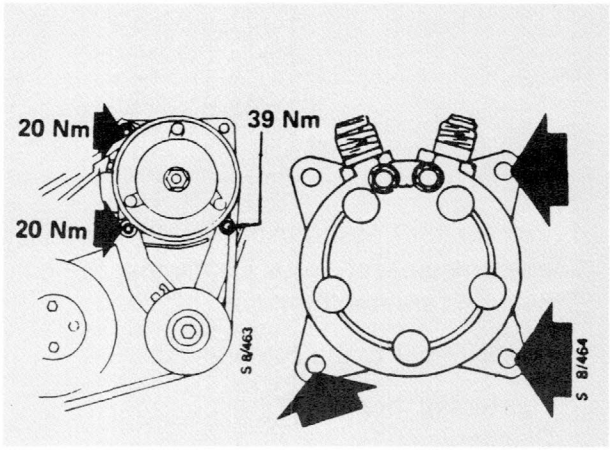
10 Fit the belt tensioner. Fit the remaining securing bolts but leave slack.

N.B.
The following tightening sequence **must** be followed to avoid damaging the compressor fixing lugs and bracket.

Start by tightening the two bolts in the front end of the compressor, as shown, to a torque of 20 Nm (14.8 lbf ft).

Next tighten the two bolts in the rear of the compressor to a torque of 20 Nm (14.8 lbf ft).

Finally, tighten the two remaining bolts to a torque of 39 Nm (28.8 lbf ft).



Compressor viewed from the front

Compressor viewed from the rear

11 Fit the drive belt and tighten in accordance with the following procedure. Use the tensiometer.

When refitting the old belt:

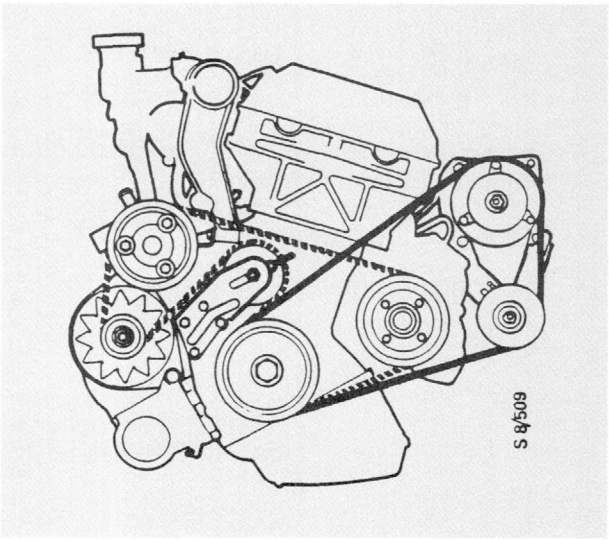
Tighten to 80±5 lb (355±22 N)

When fitting a new belt:

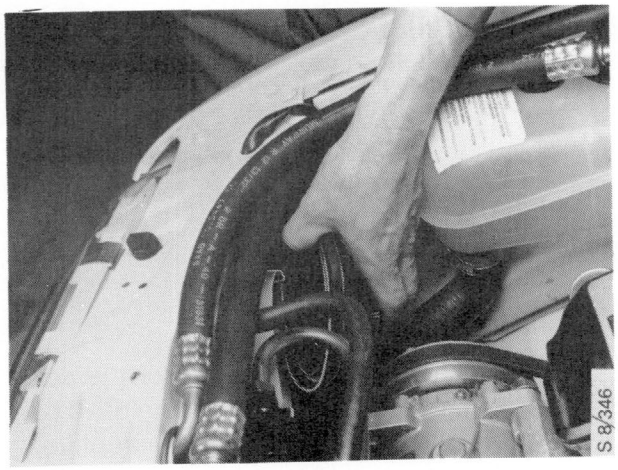
Tighten to 120±10 lb (535±45 N)

When checking the belt tension:

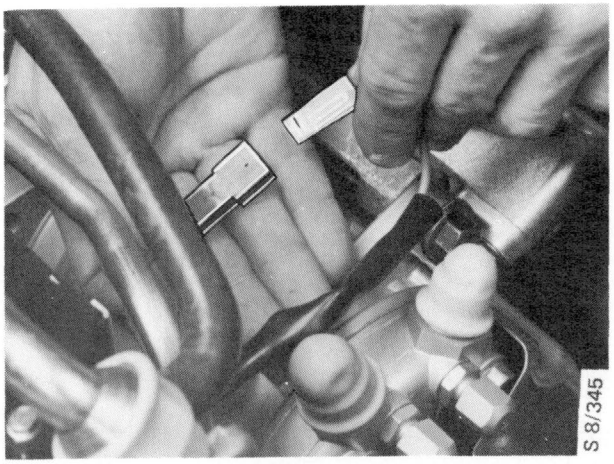
If the belt tension is less than 60 lb (265 N), it is recommended that it be tightened to 80±5 lb (355±22 N).



12 Refit the plastic cover on the RH headlamp.



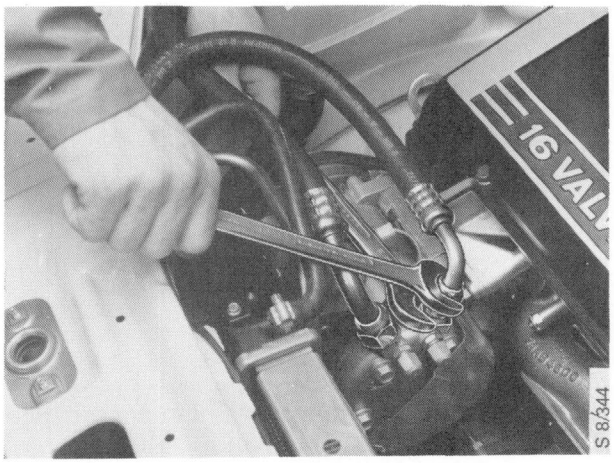
13 Plug together the connector halves. Check to make sure that the leads cannot chafe against the pulley.



14 Remove the caps from the ends of the hoses and compressor ports. Check that the connections are free from dirt.

Fit the hoses to the compressor.

Tightening torques:
Discharge hose:
30 - 35 Nm (22.2 - 25.9 lbf ft)
Suction hose:
35 - 40 Nm (25.9 - 29.6 lbf ft)



15 Charge the system with refrigerant, as detailed elsewhere in this section.

16 Reconnect the battery.

17 Test the performance of the system.

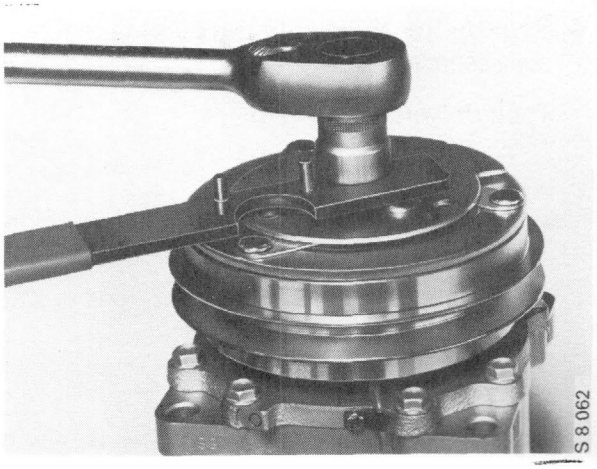
To change the electromagnetic clutch

(Compressor removed from the car)

Mount the compressor in a vice.

1 Remove the centre-nut from the crankshaft.

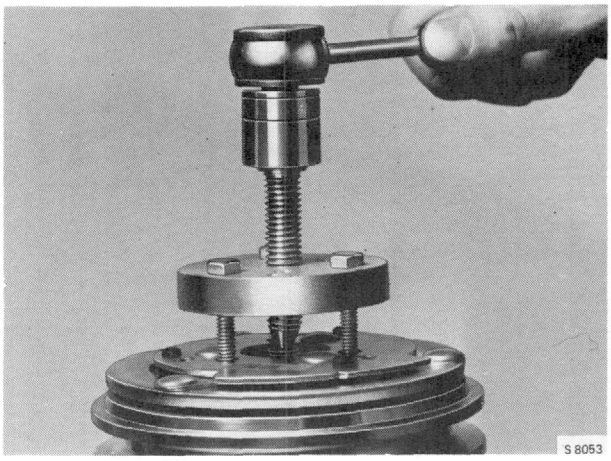
Tools:
Socket: 3/4-inch (19 mm)
Key: 83 93 373

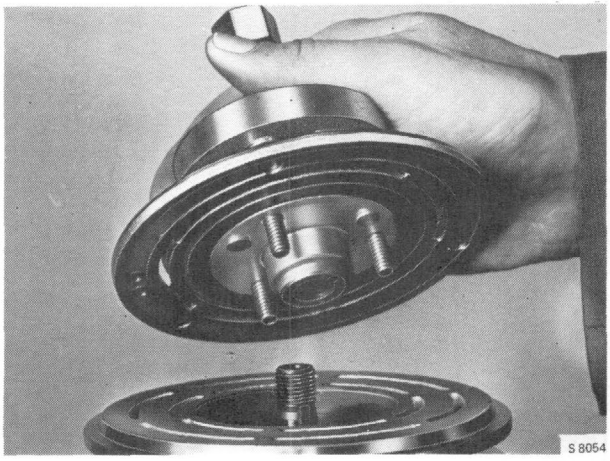


2 Remove the hub and shoe assembly.

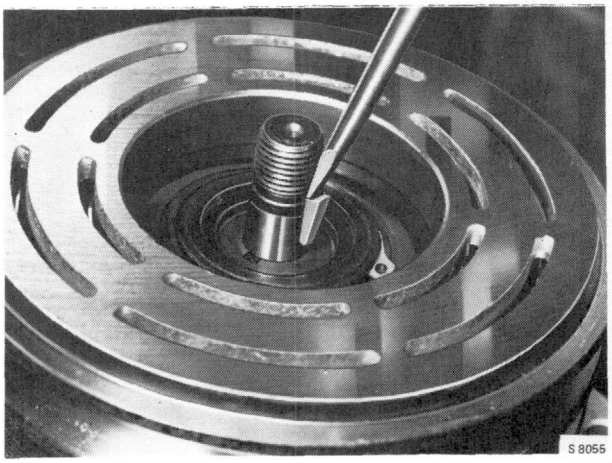
Tools:
Socket: 3/4-inch (19 mm)
Puller: 83 93 381

For the SD 709, the diameter of the three holes in the puller must be enlarged to 9 mm.



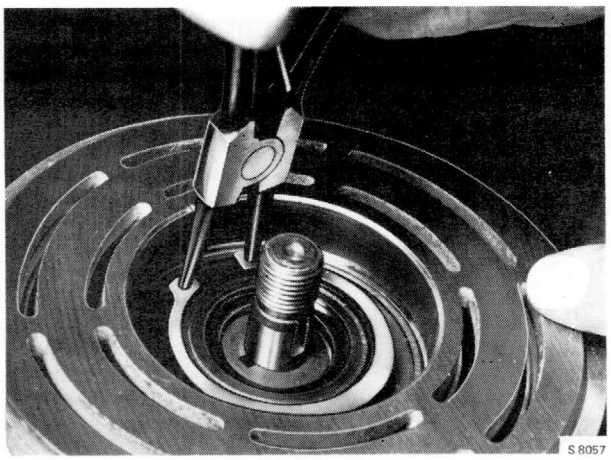


3 Remove the key from the shaft.



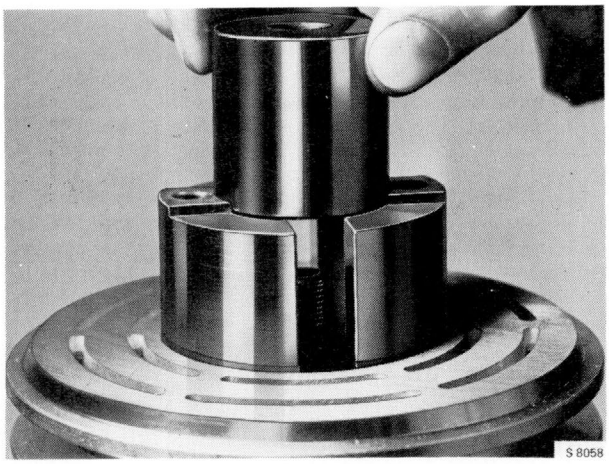
4 Remove the circlips for the bearing and pulley assembly.

Tool: Universal circlip pliers.


S 8057

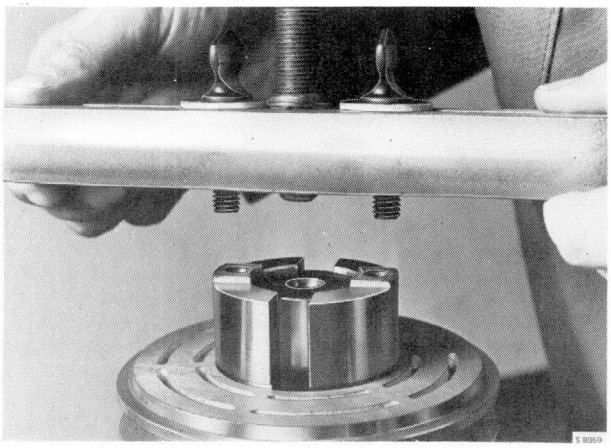
Compressor SD 510 only:

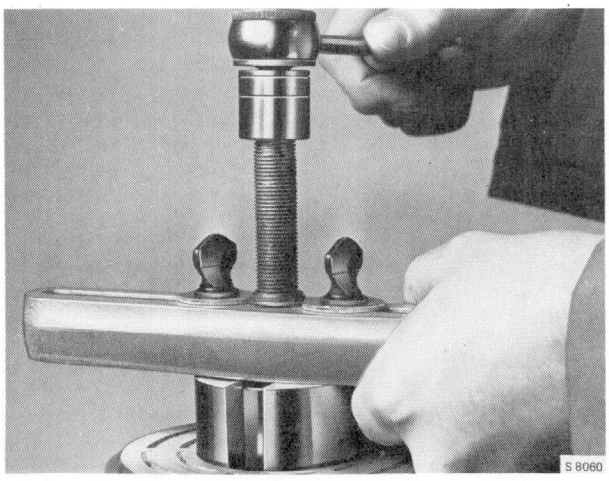
5 Fit puller 83 93 399.


S 8058

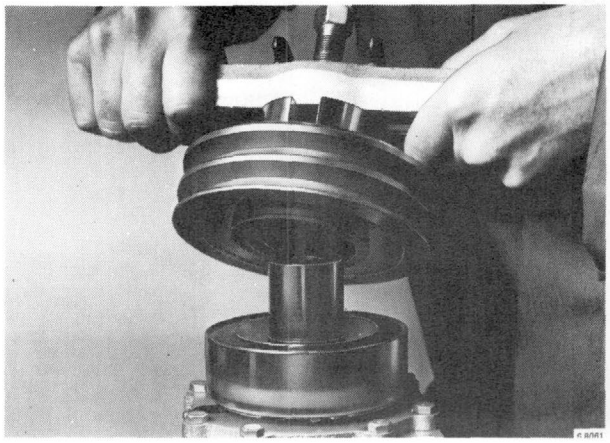
Compressor SD 709 only:

5 Compressor SD 709 only:
Fit puller 83 93 399 complete with press shanks 82 92 567.


S 8059

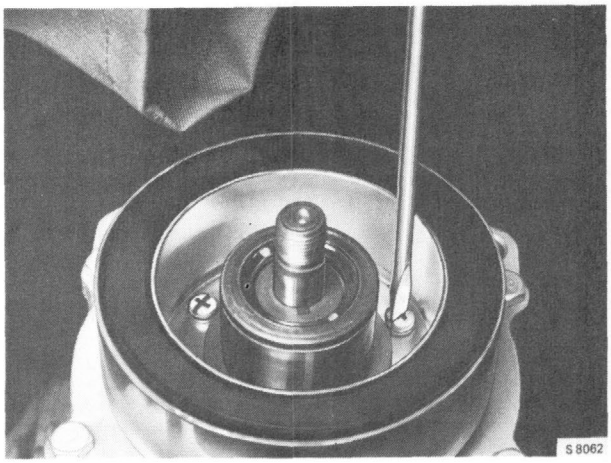

S 8060

6 Remove the pulley assembly.



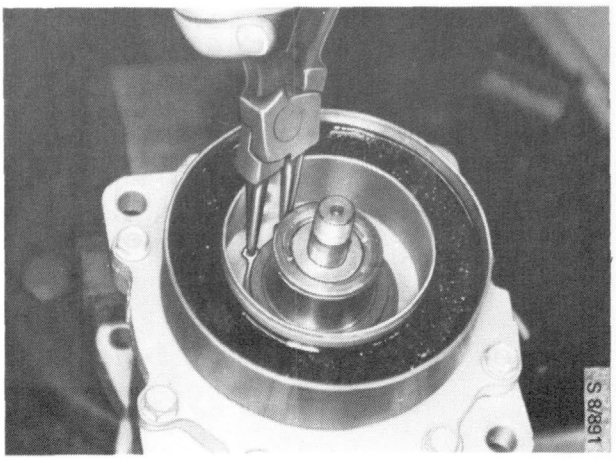
Compressor SD 510 only:

7 Remove the three screws securing the clutch field assembly to the compressor.

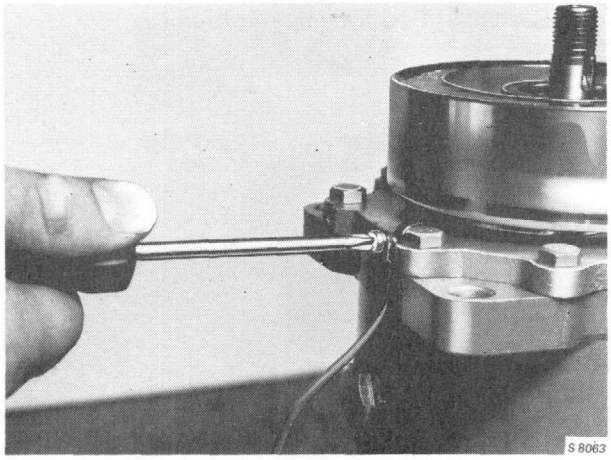


Compressor 709 only:

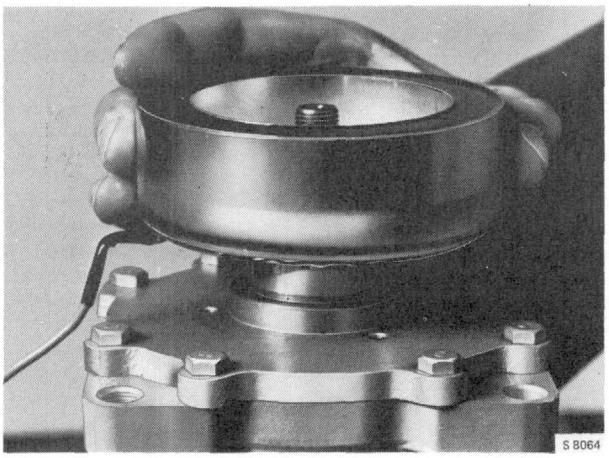
7 Remove the circlip securing the clutch field assembly to the compressor.



8 Remove the screw and cable clip.

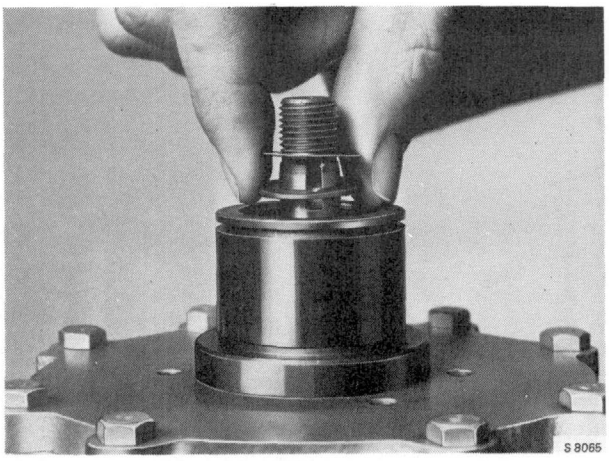

S 8063

9 Lift off the field assembly.

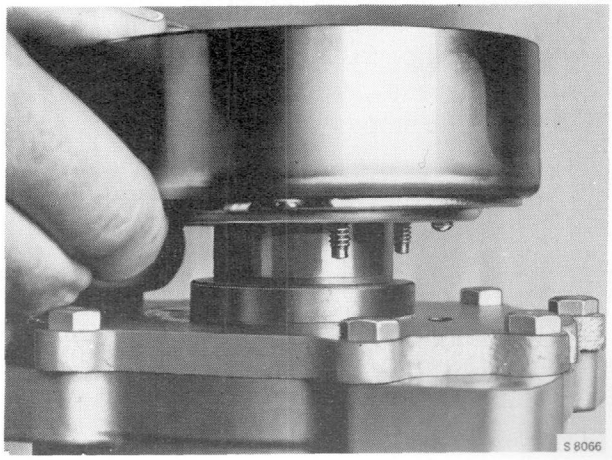

S 8064

To fit

1 Fit the shims for the clutch adjustment, using the same number as removed.


S 8065

2 Fit the field assembly.



N.B.
Make sure that the locating pin on the field assembly engages the hole in the compressor housing.

Compressor SD 510 only:

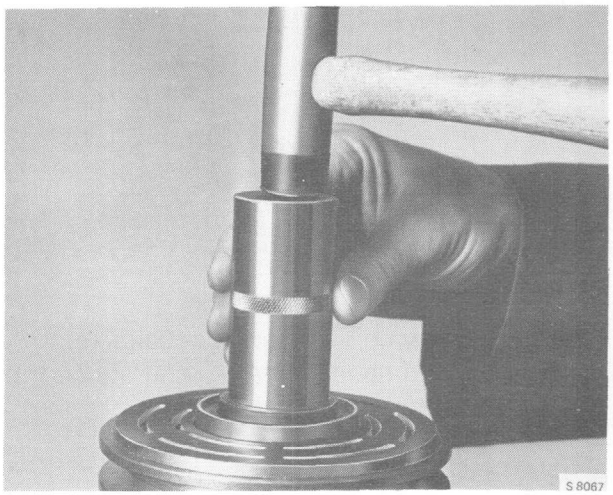
3 Tighten the three screws.

Compressor SD 709 only:

3 Fit the circlip.

4 Fit the cable clip and screw.

5 Mount the pulley assembly on the compressor. Put the special tool set (SD 510: part 83 93 407; SD 709: 82 92 559) on top, making sure that the spacer is orientated such that the pressure will be applied to the inner bearing race. Use a club hammer to force the pulley assembly down into abutment against the compressor casing.



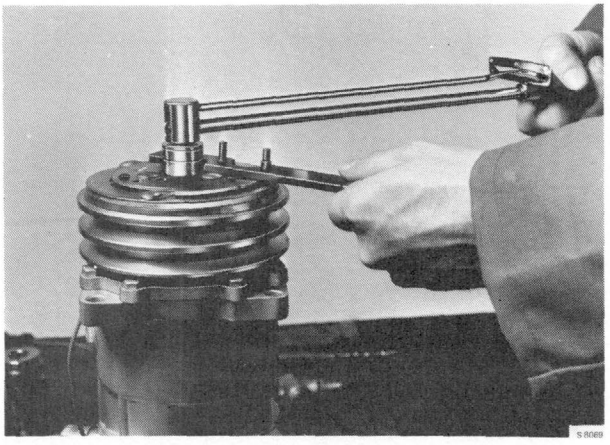
6 Fit the bearing and pulley circlips.

7 Fit the key in the keyway.

8 Mount the hub and shoe assembly on the shaft. Position the adaptor 83 93 415 on the assembly and drive it down until it butts against the stop (shims) on the shaft.

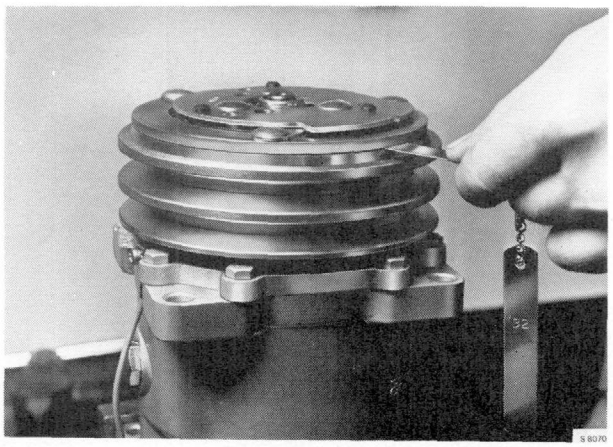
9 Fit the centre-nut.

Tightening torque:
34 - 42 Nm (25.2 - 31.1 lbf ft)



10 Check the clearance between the hub and shoe assembly and the pulley assembly. The clearance should be between 0.40 and 0.80 mm (0.16 - 0.31 in).

If the clearance is outside the limits, remove the hub and shoe assembly and adjust the number of shims.

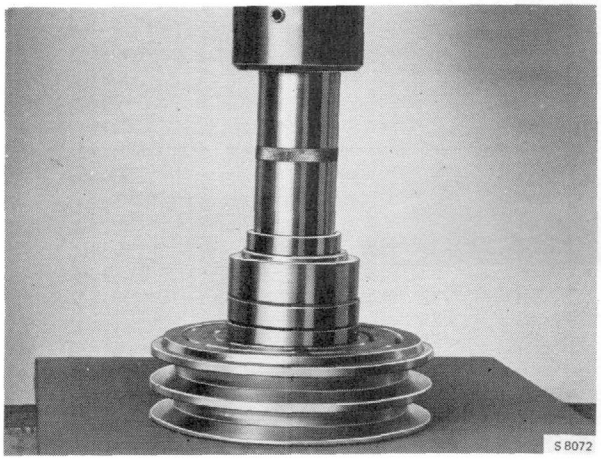


To change the bearings in the pulley assembly

To remove

Remove the circlip.

Place the pulley assembly on a sleeve, the inside diameter of which allows clearance for the outer bearing race. Position the dolly (SD 510: Part 83 93 407; SD 709: Part 82 92 559), on the bearing and press it out of the assembly.

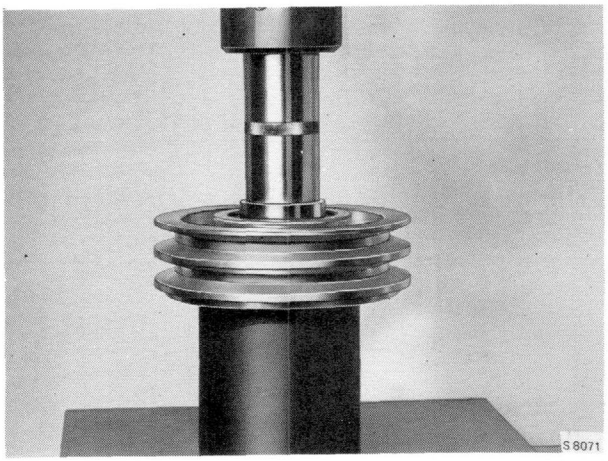


To fit

Stand the pulley assembly on the hub. Centre the bearings. The bearings should be fitted with the sealing surfaces facing away from each other. Place the sleeve (SD 510: Part 83 93 407; SD 709; Part 82 92 559), complete with spacer, on the earing.

N.B.
The spacer must be fitted such th at the pressure will be applied to the outer bearing race.

Press in the bearings and refit the circlip.



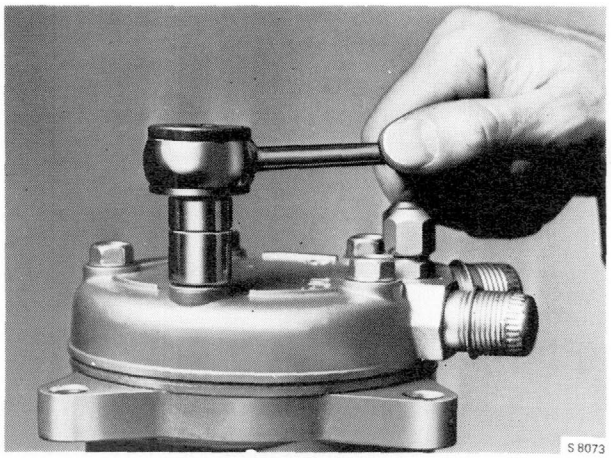
To change the cylinder head and valve housing

N.B.
Scrupulous cleanliness must be observed in all work on the cylinder head, valve housing and service valve.

To remove

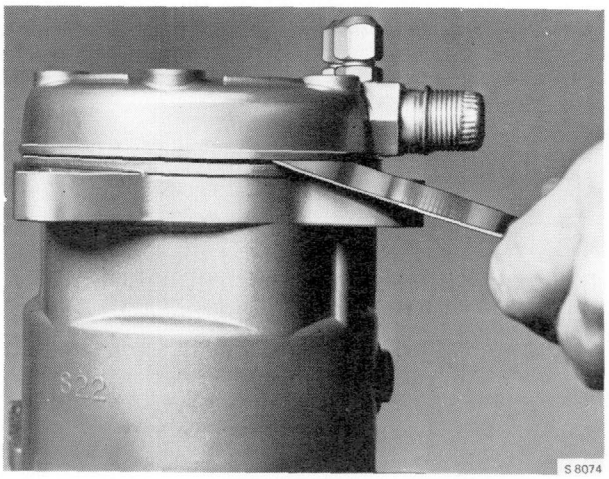
1 Mount the compressor in a vice. Remove the five cylinder head screws.

Tool: 13-mm socket

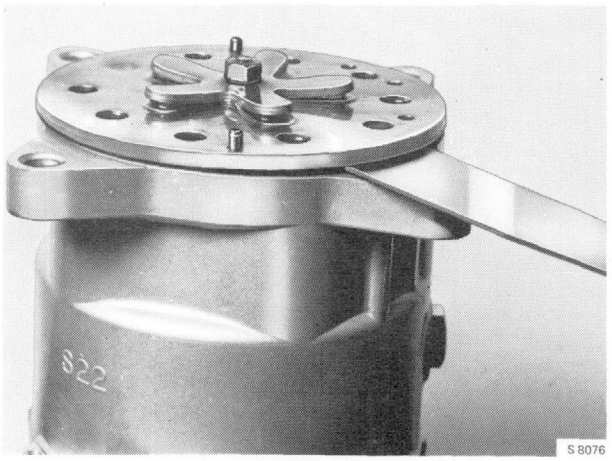

S 8073

2 Carefully lever the head off the valve housing using a gasket scraper.

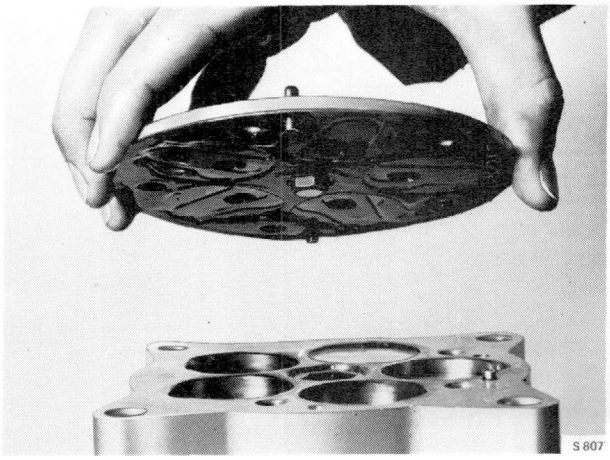
N.B.
Extreme care must be taken not to scratch or score either of the flanges.


S 8074

3 Carefully lever the valve housing off the compressor using a gasket scraper.


S 8076

4 Remove the old gaskets and thoroughly clean the flanges.


S 807

To fit

1 Lubricate the flanges, compressor, valve housing, cylinder head and gaskets with refrigeration oil.

2 Fit the gasket between the valve housing and the compressor.

3 Fit the valve housing on the compressor.

N.B.
Make sure that the locating pins engage the holes in the compressor.

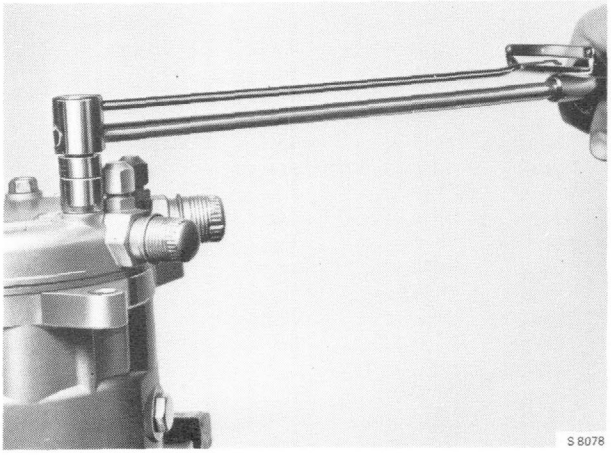
4 Fit the gasket between the valve housing and the cylinder head.

5 Fit the cylinder head.

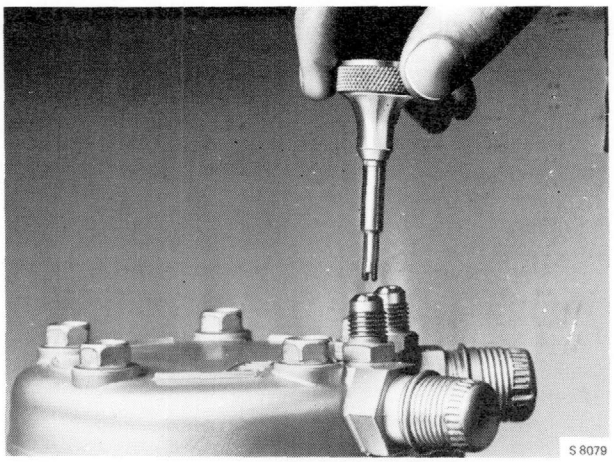
N.B.
Make sure that the locating pins engage the holes in the compressor.

6 Fit the cylinder head screws.

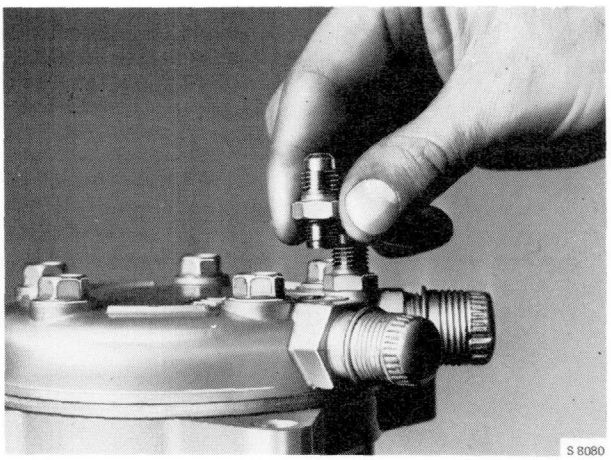
Tighten in two stages:
Stage 1: 10 Nm (7.4 lbf ft)
Stage 2: 30 - 34 Nm (22.2 - 25.2 lbf ft)


S 8078

Service valves



Removing the service valve



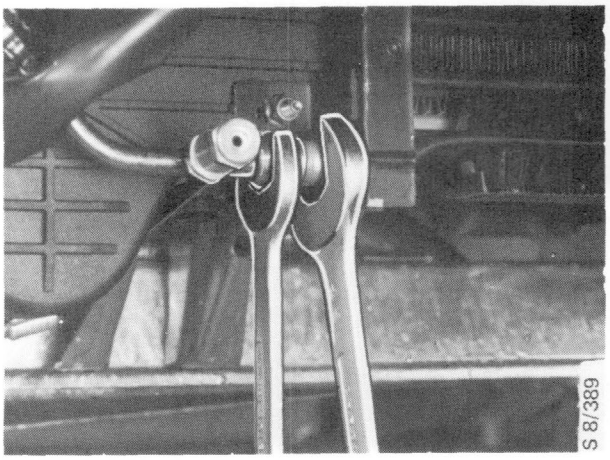
Removing the service valve assembly

To change the condenser

Drain the refrigerant from the system, following the instructions given elsewhere in this section. Raise the front of the car and support it on axle stands.

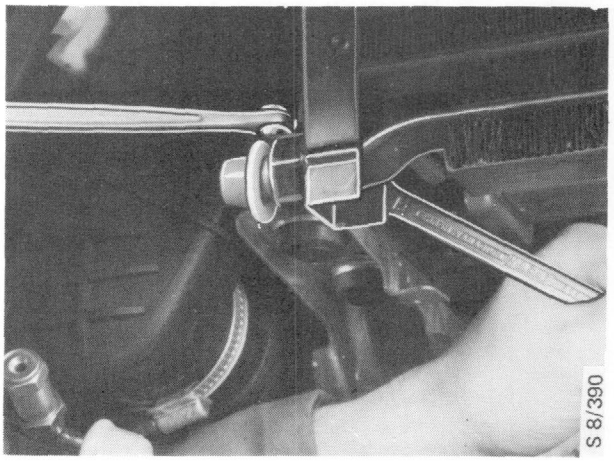
1 Remove the front spoiler and grille.

2 Disconnect the condenser couplings, using a second spanner to stop the coupling turning. Blank off all open ends.


S 8/389

(Where applicable) remove the auxiliary cooling fan from the condenser.

3 Undo the bottom bolts and carefully lift the condenser out of the car from underneath.


S 8/390

Procedure for refitting

Before fitting, charge the condenser with 0.2 dl of refrigeration oil.

Make sure that the locating dowel at the top engages the bush in the front crossmember.

Fit new 'O' rings to the pipe couplings and lubricate them with refrigeration oil before fitting.

Charge the system with refrigerant, as detailed elsewhere in this section.

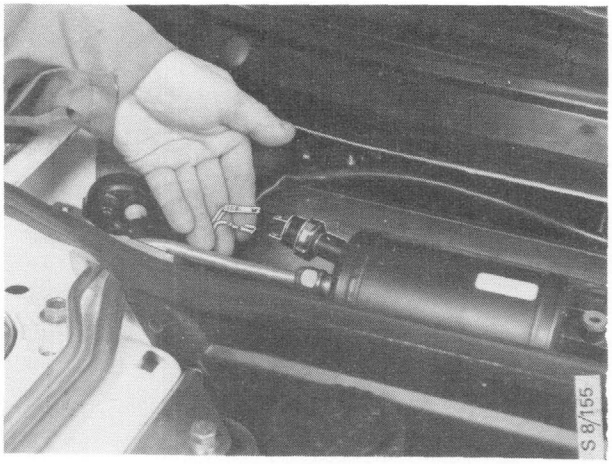
To change the receiver

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

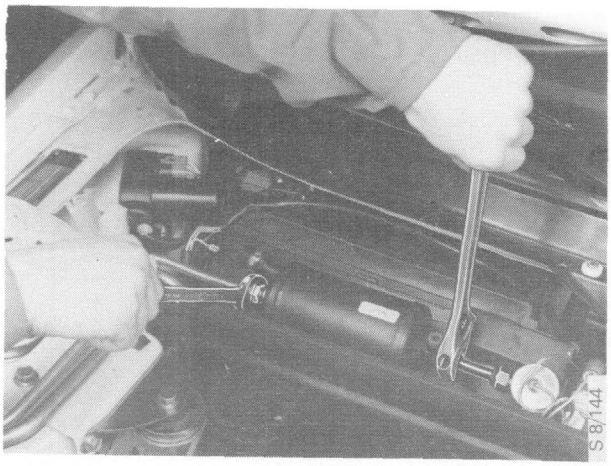
2 Drain the refrigerant from the system, as detailed elsewhere in this section.

3 Remove the cover from the evaporator.

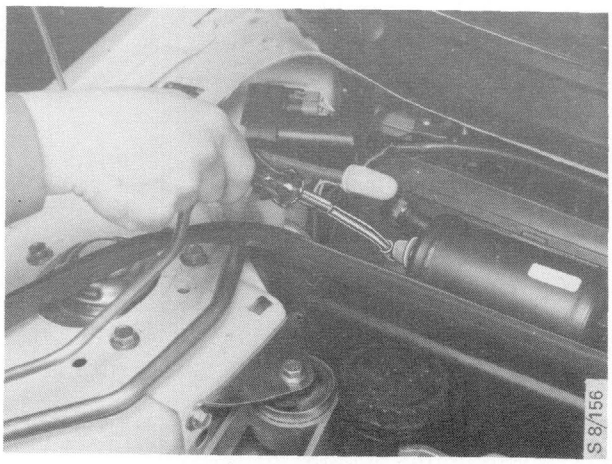
4 Unplug the electrical leads from the pressure switch.



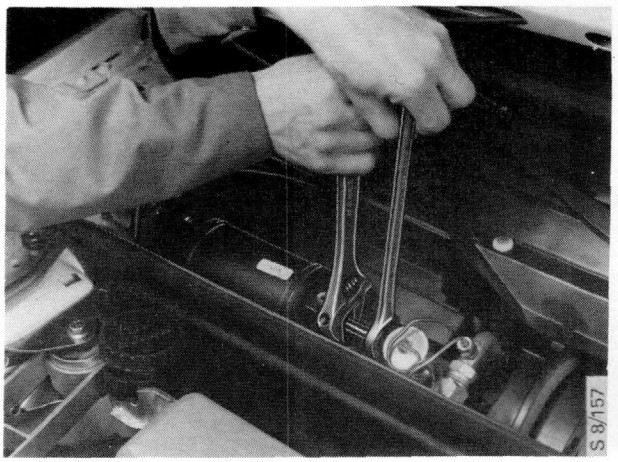
5 Pull away the rubber moulding a little and withdraw the pipe from the plastic grommet. Disconnect the pipe coupling and blank off the open ends.



6 Remove the securing screw for the receiver.



7 Undo the connection to the expansion valve.



8 Lift out the receiver and blank off all open ends.

9 Fit new '0' rings in all connections, having first lubricated them with unused refrigeration oil.

10 Charge the new receiver with 0.2 dl of unused refrigeration oil.

11 Fit the receiver and tighten the couplings.

12 Reconnect the electrical leads to the pressure switch.

13 Pass the pipe through the plastic grommet and press the rubber moulding back into place.

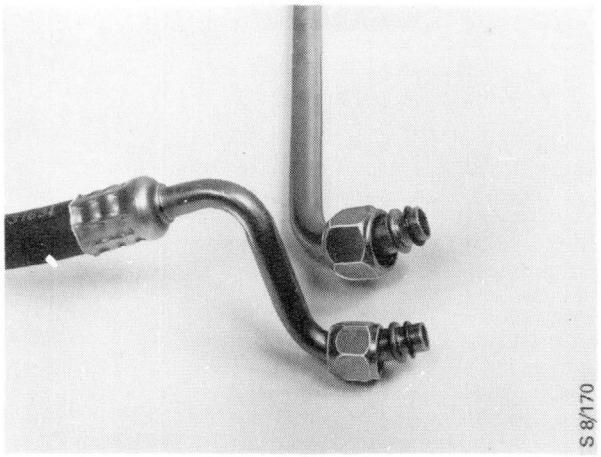
14 Charge the system with refrigerant, as detailed elsewhere in this section.

15 Reconnect the battery.

16 Test the performance of the system.

To change the refrigerant hoses

If there has been a rapid leak of refrigerant from the system, such as from a burst hose, refrigeration oil is likely to have escaped with the refrigerant. The quantity of oil lost must be replaced (refer to 'Technical Data'). The procedure for changing a hose is the same for all hoses.



1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

2 Drain the refrigerant from the system, as detailed elsewhere in this section.

3 Change the defective hose.

4 Recharge, as necessary, with new refrigeration oil. Fit new 'O' rings, lubricated with unused refrigeration oil.

   Refer to 'Technical Data' for details of tightening torques.

5 Recharge the system with refrigerant, as detailed elsewhere in this section.

6 Reconnect the battery and test the performance of the system.

To change the expansion valve

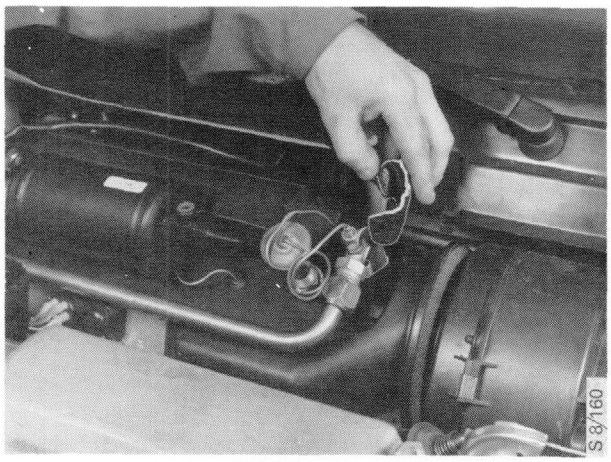
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

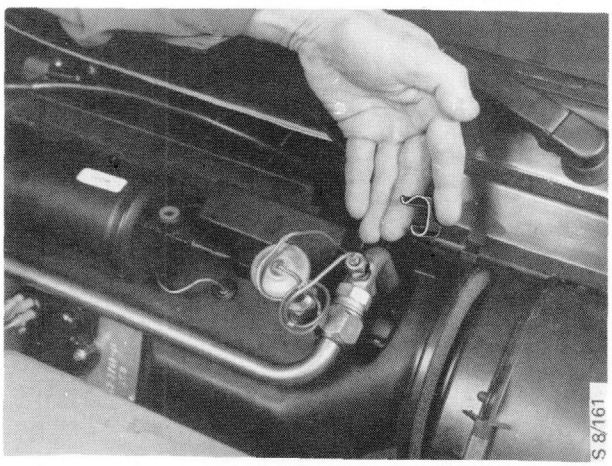
2 Drain the refrigerant from the system, as detailed elsewhere in this section.

3 Remove the cover from the evaporator.

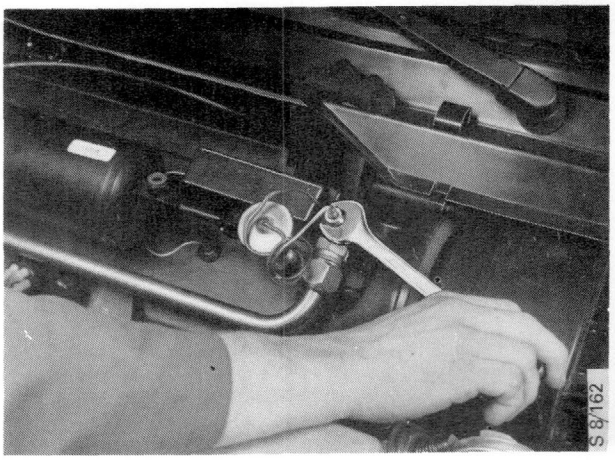
4 Remove the false bulkhead panel in the engine compartment.

5 Remove the insulation and the clip.

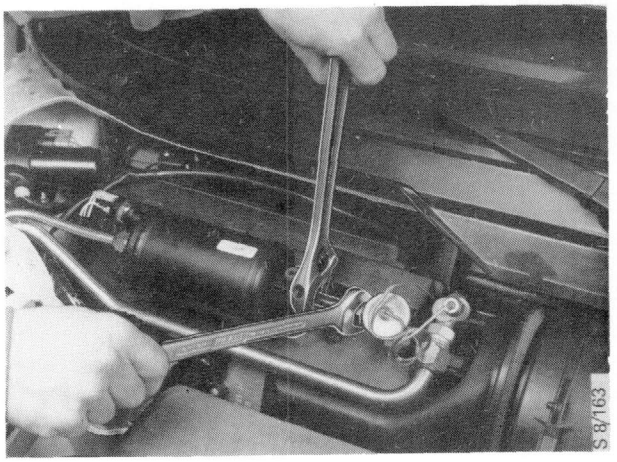


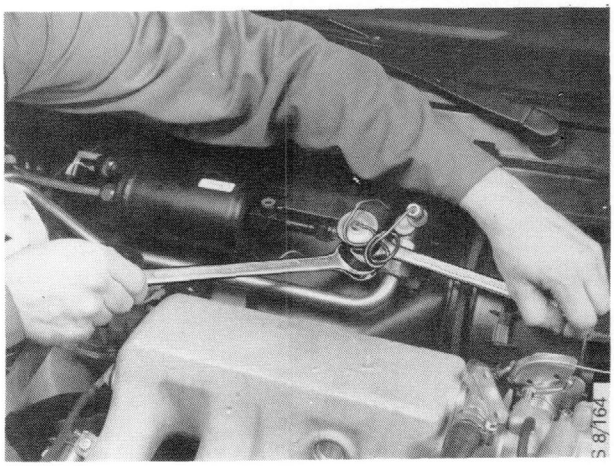


6 Disconnect the capillary tube and blank off the open ends.



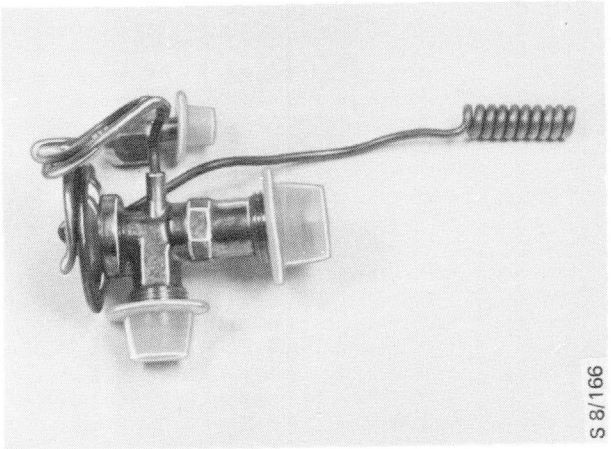
7 Undo the expansion valve couplings, using a second spanner to prevent the coupling turning.





8 Remove the expansion valve and blank off the open ends.

9 Fit new '0' rings in the couplings. Lubricate the '0' rings with refrigeration oil.

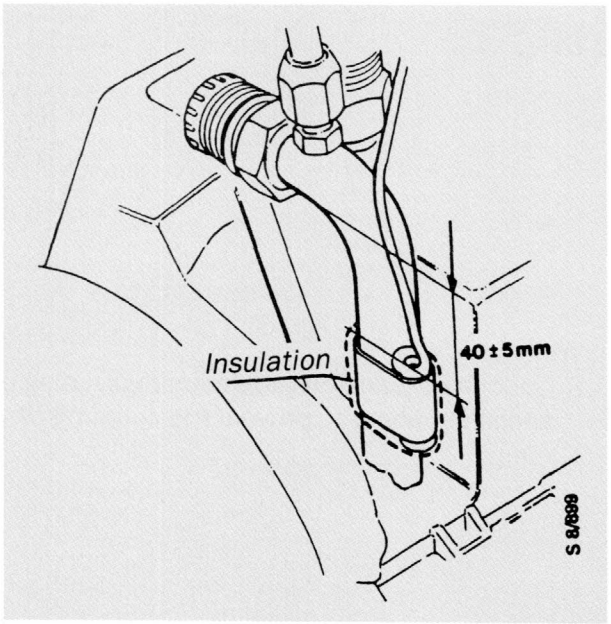


Expansion valve

10 Fit the expansion valve, using a second spanner to prevent the coupling from turning.

11 Tighten the coupling for the capillary tube.

12 Fit the clip and insulation around the temperature sensor probe. Make sure that it is clean underneath the sensor probe and that the probe is in contact with the evaporator pipe.



13 Fit the false bulkhead panel.

14 Recharge the system with refrigerant, as detailed elsewhere in this section.

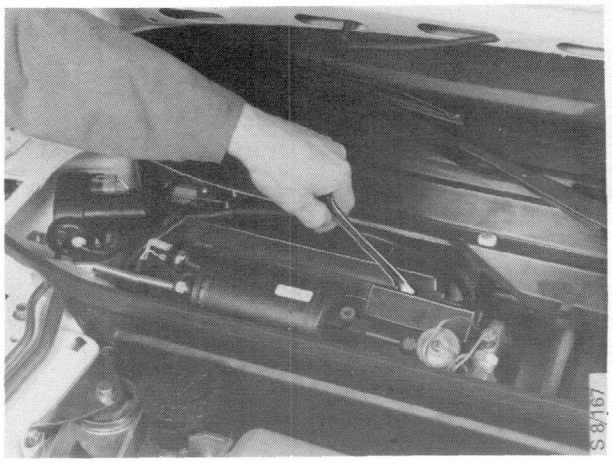
15 Reconnect the battery and test the performance of the system.

To change the anti-frost thermostat

1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

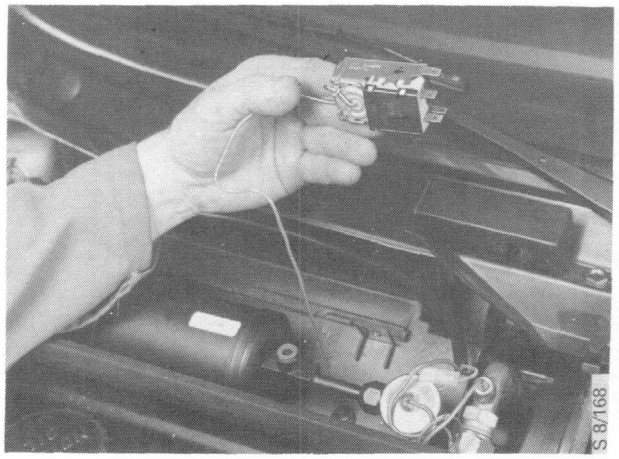
2 Remove the cover from the evaporator.

3 Remove the cover.



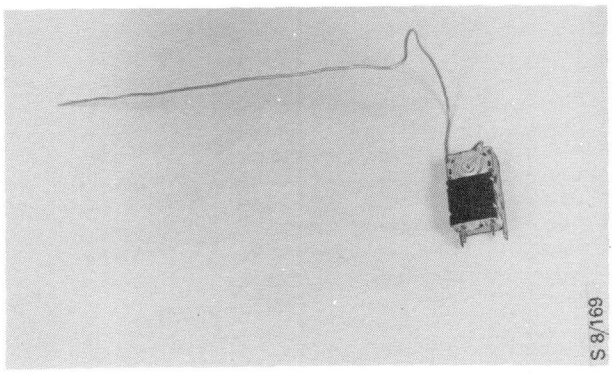
4 Disconnect the electrical leads and remove the thermostat.

Take care not to bend the capillary tube when fitting the new thermostat.



N.B.
Make sure that the capillary tube bottoms inside the evaporator.
This is vital to maintain effective cooling.

Refit the remaining parts in the reverse order.

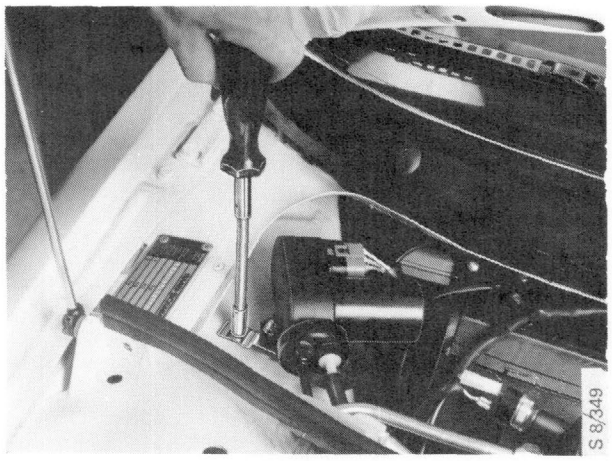


Anti-frost thermostat

To change the servomotor for the air-recirculation valve

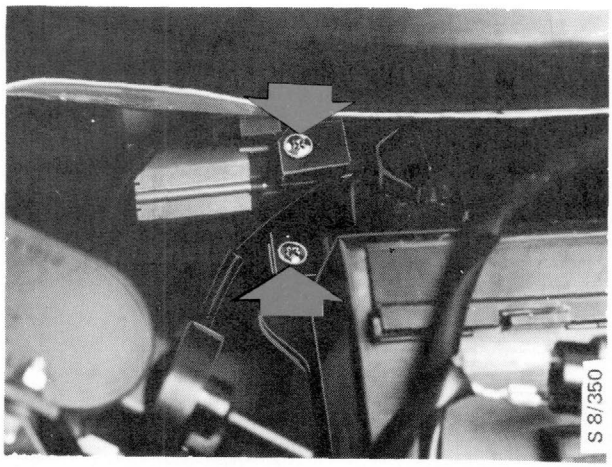
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

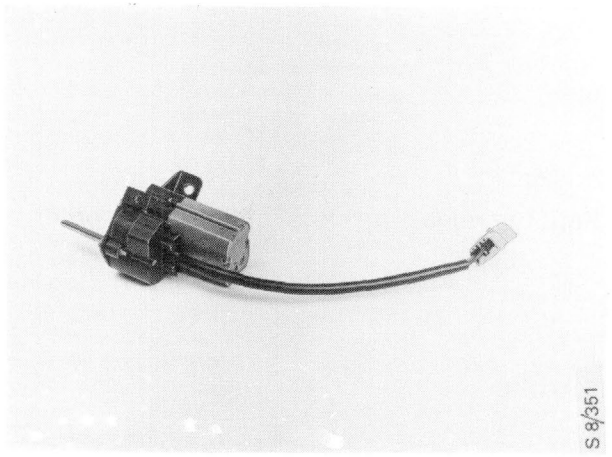
2 Unscrew the vacuum pump for the cruise control system and move it to one side.



3 Unscrew the servomotor.

4 Withdraw the motor and unplug the connector.





Servomotor for air-recirculation valve

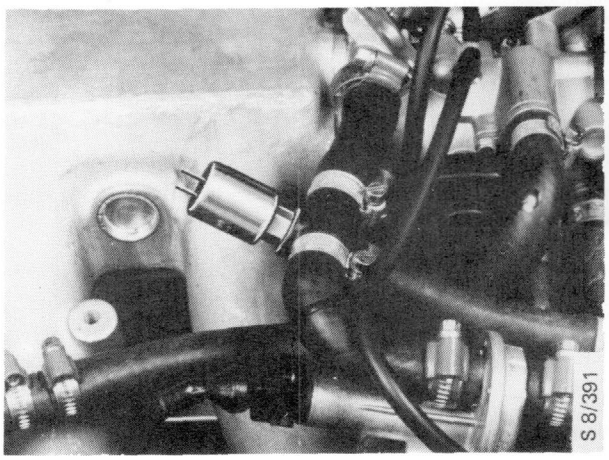
Refit in the reverse order.

Idling-compensation valve

M86 and earlier
Chassis No. CG1001944 or earlier

To change

Disconnect the electrical leads and unscrew the valve.



To check

With the engine running at idling speed, switch on the AC system. Disconnect one of the spade terminals on the idling-compensation valve, whereupon the engine speed should drop. Reconnect the electrical lead.

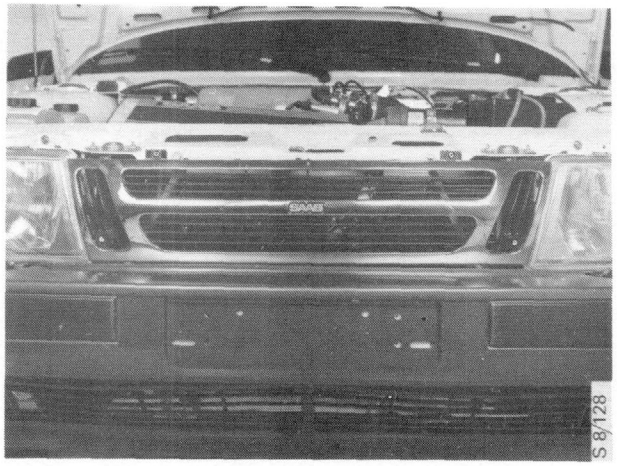
M86, Chassis No. CG1001945 onwards

With the introduction of an automatic idling control (AIC) system on all cars with effect from the above Chassis No., the solenoid valve for idling-speed compensation was discontinued.

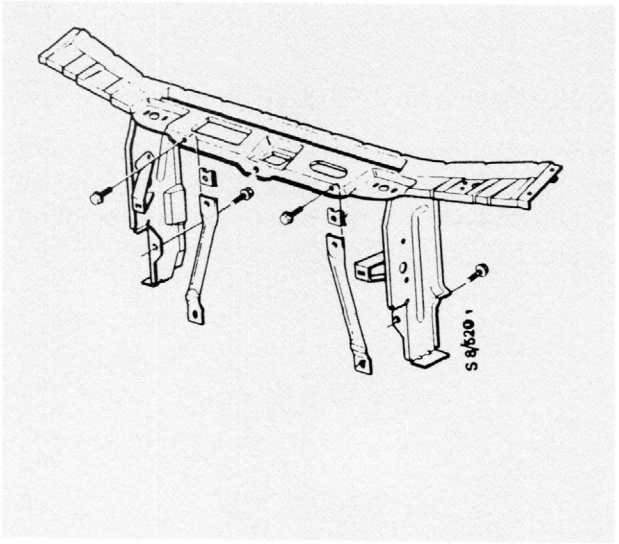
To change the auxiliary cooling fan

(Cars to certain specifications only)

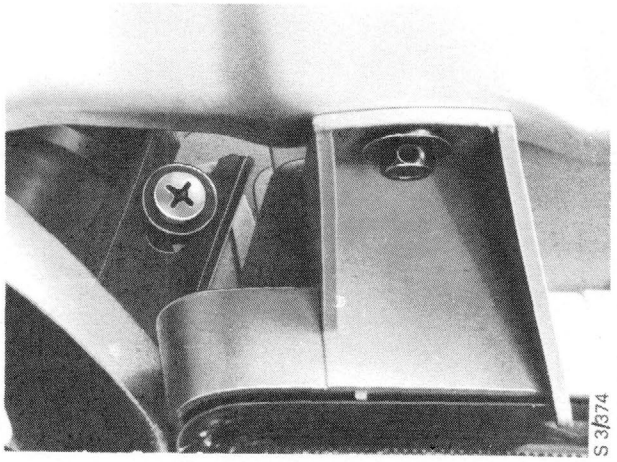
1 Remove the front spoiler and grille.



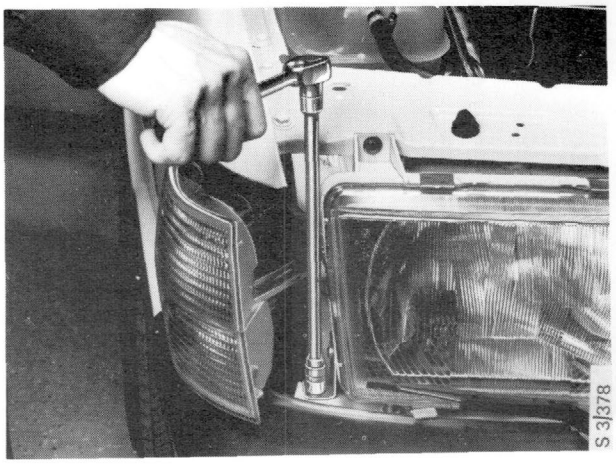
2 Remove the top bolts in the radiator steady bars.
Remove the bolts in the bottom of the radiator member.



3 Slacken the retaining screw in the light cluster and ease out the front of the light fitting.

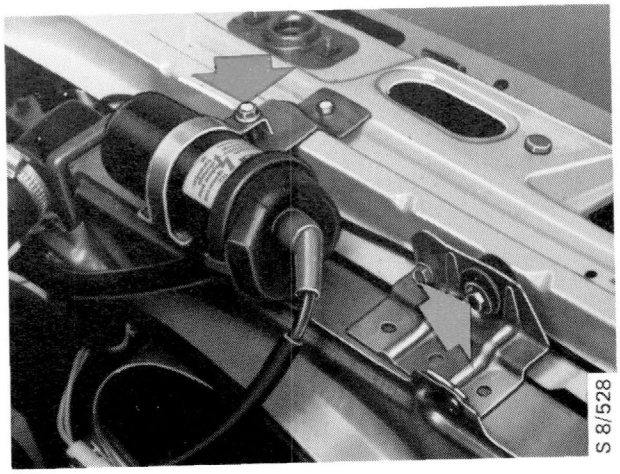


4 Remove the headlights.



5 Undo the bolt for the ignition coil bracket and twist the coil out of the way.

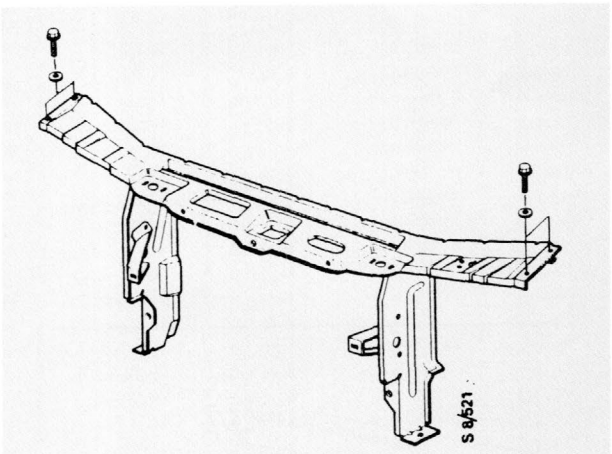
Undo the bolts securing the radiator and cooler assembly to the radiator member.



6 Unbolt the radiator member from the front wings. Unplug the connector for the horn.

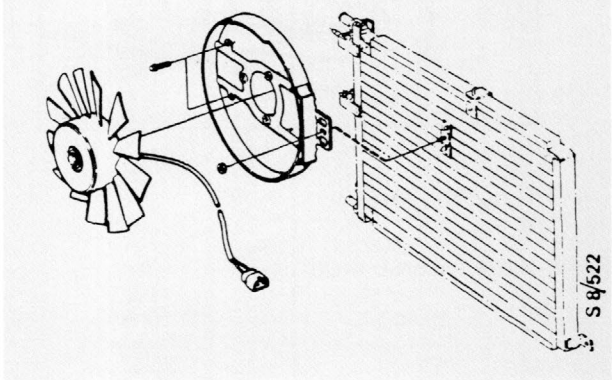
Raise the radiator member and move it out of the way.

N.B.
Take care not to damage the paintwork.



7 Undo the nut and two securing bolts for the fan.

Unplug the connector and lift out the fan.



On fitting:

Apply sealant to the surface on the radiator member in contact with the body.

Check the headlight alignment after completion of the job.

Demister fans for rear-door windows.

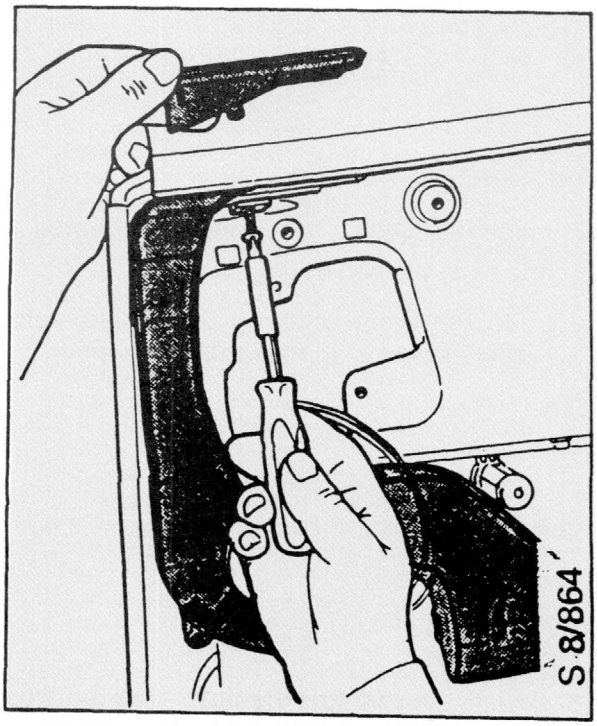
Removal/refitting.

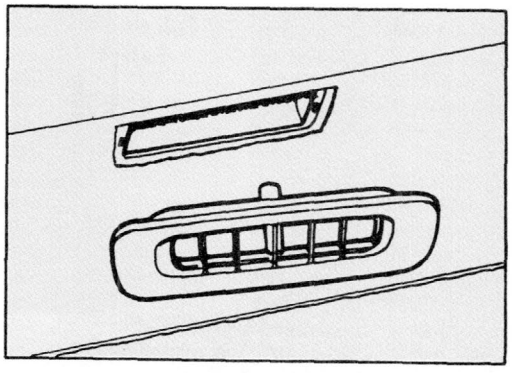
1 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.

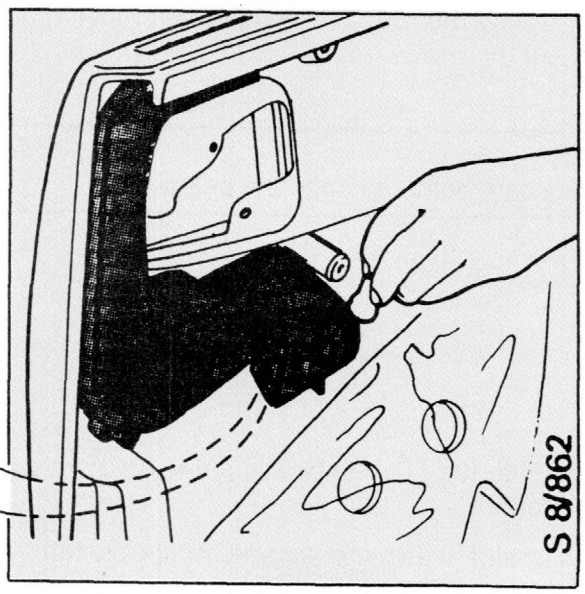
Remove the door trim.

2 Fold back the acoustic felt.

3 Remove the screws securing the air inlet and outlet grilles. Unplug the connector.







4 Lift out the fan.

Refit in the reverse order.

Alphabetical section guide

Saab-Scania AB
Saab Car Division
Nyköping, Sweden

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