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Removing/Refitting - Turbodiesel engine

NOT AVAILABLE AT TIME OF GOING TO PRESS

MANUAL HEATING AND VENTILATION

NOT AVAILABLE AT TIME OF GOING TO PRESS

MANUALLY CONTROLLED HEATING

- Description 97

(*) : See Turbodiesel engine

(**) : See T. Spark 16V engine

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VOLUME II

REPAIR INSTRUCTIONS

AUXILIARY ORGANS

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Alfa Romeo 

UPDATE CHART

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VOLUME II REPAIR INSTRUCTIONS

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WARNING:

The "145-146 - INSTRUCTIONS FOR REPAIR" manual refers to both models according to the following logic:

for the parts in common, the information refers to model 145, while for the parts specific to model 146 special pages, or, where necessary, whole groups, have been added.

For further details refer to the indexes (blue cards) at the beginning of each group.

INTRODUCTION

The "145-146 - Repair Instructions" Manual is composed of three volumes as follows:

- Volume I
 - Technical Data;
 - Engines;
 - Mechanical Groups.
- Volume II
 - Heating-Ventilation;
 - Bodywork.
- Volume III
 - Electric system;
 - Electrical system diagnosis.

For overhauling engines and mechanical groups refer to the following manuals:

- PA493600000000 REPAIR INSTRUCTIONS - ENGINE OVERHAUL.
- PA494200000000 REPAIR INSTRUCTIONS - OVERHAULING MECHANICAL GROUPS.

In order to facilitate consultation, the structure of the manual mirrors the functional groups already defined for the "Repair Flat-rate Manual" in use by Alfa Romeo Authorized Service Network.

The characteristic data and the tables for vehicles identification are contained in the "Technical Data" at the beginning of Volume I.

The "Model identification" tables should be consulted before carrying out repair work in order to identify the model of the vehicle, the engine size and the groups which form the vehicle.

How to use this manual

The aim of this manual is to supply the Alfa Romeo Service Personnel with a tool enabling them to rapidly identify faults and to render the corrective interventions precise and efficient.

The manual shows the procedures relative to the removal and refitting and dismantling operations and the checks relative to the various groups forming the vehicle.

The procedures are illustrated in detail as are the procedures for using the tools. An appropriate symbology and explanatory texts next to the fundamental technical drawings make a complete and rapid consultation of the manual possible.

The procedures illustrate complete component disassembly procedures and should only be carried out in their entirety when absolutely unavoidable. The procedures for "assembly" and "refitting" are normally obtained by reversing the procedure followed for disassembly or removal in reverse and only the reassembly procedures which are significantly different are illustrated.

For information relative to the electrical systems on-board the vehicle refer to section 55 "ELECTRIC SYSTEM" and to the successive 55 "ELECTRIC SYSTEM DIAGNOSIS" which gives the wiring diagrams and the description of each function, the connector tables, the location of the components, the tables for fault diagnosis and the technical data for checking the components.

All the information contained in this manual is updated at the time of publication.

Alfa Romeo reserves the right to make any modifications to its products that it deems necessary without warning. However the technical information and updates to this manual will be supplied as soon as possible.

Symbology

A specific symbology has been used in this manual to permit a rapid identification of the main technical information supplied.

The list of symbols is given below.

	removal/disassembly				exhaust
	refitting/re-assembly				Lubricate only with engine oil
	tighten to the torque				torque for tightening in oil
	caulk nut				engine r.p.m.
	adjustment/regulation				ovalization
	visual check				taper
	lubricate				eccentricity
	weight difference				flatness
	angular value				diameter
	pressure				linear dimension
	temperature				parallelism
	brake system air purge				service with grease
	surfaces to be treated				heating temperature
	interference				seal
	play				service with engine oil
	intake				grease
					CAUTION!
					WARNING!

Warnings for the operator

All the operations must be carried out with the greatest care to prevent damage occurring to the vehicle or persons.

- The use of Alfa Romeo specific tools are indicated for some procedures. These tools must be used to ensure safety and to avoid damaging parts involved in the procedure.
- To free parts which are solidly stuck together, tap with an aluminium or lead mallet if the parts are of metal. Use a wooden or resin mallet for light alloy parts.
- When dismantling ensure parts are marked correctly if required.
- When refitting lubricate the parts, if necessary, to prevent seizing and binding during the initial period of operation.
- Using adhesive paper or clean rags cover those parts of the engine which, following disassembly, present openings which may allow dust or foreign material to enter.
- When refitting, the tightening torques and adjustment data must be respected.
- When substituting the main component(s) the seal rings, oil seals, flexible washers, safety plates, self-locking nuts and all worn parts must also be replaced.
- Avoid marking the internal coverings in the passenger compartment.

Substitution of groups or disconnected parts must be carried out using original spare parts only. Only in this way can the suitability and perfect operation of each organ be guaranteed.

- The words **CAUTION** and **WARNING** accompany those procedures where particular care should be taken to prevent damage occurring to people or vehicle parts.



CAUTION:
used when insufficient care could cause damage to people



WARNING:
used when insufficient care could cause damage to the vehicle or its component parts.

- The safety regulations applied to workshops should be respected. Where necessary the manual also lists the specific precautions to be taken to prevent dangerous situations from arising.



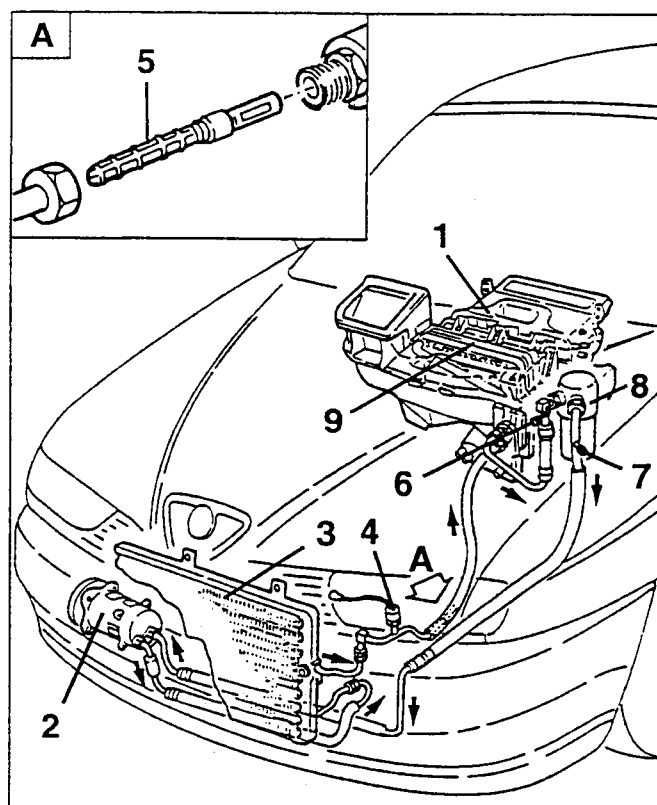
When using chemical products follow the safety indications given on the safety cards which the supplier is obliged to deliver to the user (in Italy in compliance with D.M. n.46/1992).

NOTE:

It is possible that for certain subjects were not completed in time for printing.

However these subjects are given and highlighted in the indices of the single groups.

It is the duty of the Technical Services to supply documentation regarding these subjects as soon as possible through updates or "Technical Bulletins".

SYSTEM

1. Heating and ventilation unit
2. Compressor
3. Condenser
4. Three-level pressure switch (trinary)
5. Expansion valve
6. Needle valve for charging/draining R134a on the low pressure pipe
7. Needle valve for charging/draining R134a on the low pressure pipe
8. Drier filter
9. Evaporator

DESCRIPTION

The heating and ventilation system is of the manual type with air conditioner.

The system can be represented by three sections:

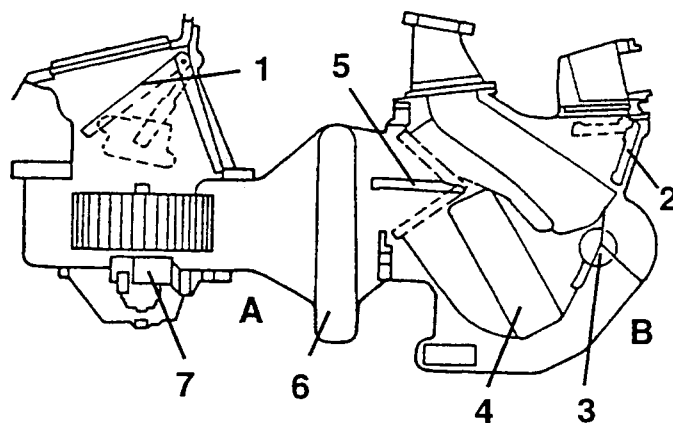
- a unit comprising the air ducting system and the heater - distributor unit.
- a closed circuit that generates cold (air conditioner).
- a control unit for certain functions of the system.

DUCTING SYSTEM AND HEATER - DISTRIBUTOR UNIT

Two types have been adopted, one described and illustrated in the various procedures with the words "two bowden" and in the other "three bowden". The variations in relation to the preceding type are given in a specific paragraph.

The assembly comprising the ducting system (A) and the heater- distributor unit (B) is shown in diagram form in cross-section in the figure below.

The ducting system (A) can in turn be divided into two parts, a lower and an upper section; one end of the latter is suitably shaped to be connected with the opening in the services box.



1. Outside air/recirculation vent
2. Upper distribution vent
3. Lower distribution vent
4. Heater radiator
5. Mixing vent
6. Evaporator
7. Fan

In the upper front section, in line with the outside air inlet, there is a second opening that communicates with the passenger compartment (air inlet for the recirculation function).

Between the two air inlet openings, inside the ducting system, there is a motorised flap which is duly directed to shut off one of the two openings. The flap is controlled through a leverage by an electric actuator (motor) fastened on the outside of the system.

Inside, opposite the air inlets there is the evaporator which represents the cooler.

The fan is fitted in the lower section in correspondence of the air inlets and it operates at different speeds.

Two bowdens are connected on the lefthand side of the heating- distributor unit which are operated by the controls and suitably direct the lower, upper and air mixing and distribution flaps and they also control the position of the tap fitted on the heater radiator inlet.

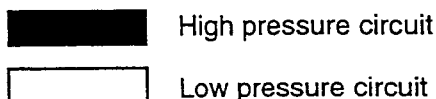
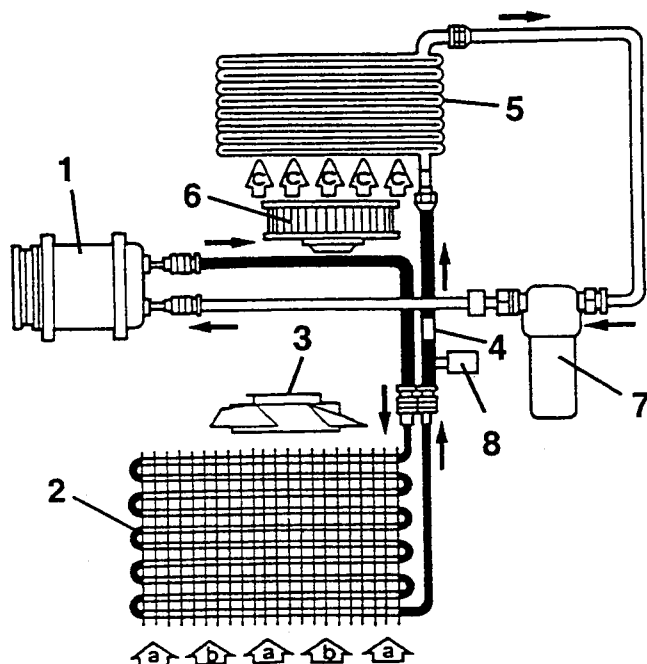
AIR CONDITIONING CIRCUIT

The circuit shown in diagram form in the figure below mainly comprises the following parts:

- a compressor fitted on the engine, which draws in the cooling liquid from the evaporator;
- a condenser, fitted in front of the engine cooling radiator (high pressure circuit);
- an evaporator in the ducting system;
- a drier filter.

The above parts are connected to one another by suitable hoses. On the hose connecting the condenser to the evaporator a three-level pressure switch has been fitted and this is the only part of the system with control and safety functions.

An expansion valve has also been inserted in the same hose.



- Flow of air to cool the condenser leading from the front grille when the vehicle is on the move.
- Flow of air to cool the condenser generated by the corresponding fan when the car is at a standstill or travelling slowly (queues).
- Flow of air for the evaporator generated by the corresponding fan installed in the heater - distributor unit.

- Compressor
- Condenser
- Condenser fan
- Expansion valve
- Evaporator
- Evaporator fan
- Drier filter
- Three-level pressure switch (trinary)

The air conditioner unit cools and dehumidifies the air before it reaches the passenger compartment. It operates according to a common refrigeration cycle containing R134a fluid exploiting the change from liquid to gas and viceversa to absorb and release a considerable amount of heat.

During operation, two pressure levels are created which are maintained on one side by the compressor and on the opposite side by the expansion valve at the evaporator inlet. Two needle valves are fitted on the hoses for charging and draining the system.

The refrigerating fluid leaves the compressor as a gas at high temperature and high pressure. It then enters the condenser where it is cooled and comes out as a liquid.

The expansion valve located on the evaporator inlet atomizes the fluid and lowers its pressure which leads to a decrease in its temperature.

The fluid which is still in a liquid state enters the evaporator where it is vapourized absorbing heat from the air directed onto the fins of the fan.

The air in contact with the cold walls of the evaporator loses a high percentage of its humidity which, when condensed is drained outside the car through a special drainage tube.

The fluid in a gaseous state leaves the evaporator and passes into the drier filter which absorbs any particles of water which, if allowed to continue around the circuit would freeze and block the expansion valve reducing or eliminating the efficiency of the cycle.

A three-level pressure switch is inserted in the high pressure circuit of the refrigerating fluid near the drier and controls the turning on and off of the compressor.

Refrigerating fluid

For the above air conditioning system the new **ecological fluid R134a** is used which does not contain chlorofluorocarbon (CFC), one of the chemical agents that causes the reduction of the ozone layer of the atmosphere.

The systems working with R134a are readily distinguished by the wording "R134a" printed on its main components.



Refrigerating fluid R134a cannot be mixed with the Freon 12 used in the conditioning systems of the previous cars; therefore, NEVER USE FREON 12 FOR ANY REASON WHATSOEVER for the conditioners with R134a.

All the components of the system are specifically for the use of R134a and ARE NOT INTERCHANGEABLE with those of the cars using R12.

The draining/recovery station is specifically for R134a fluid.

(Refer to the specific Tool Bulletins for further details).

CONTROL UNIT

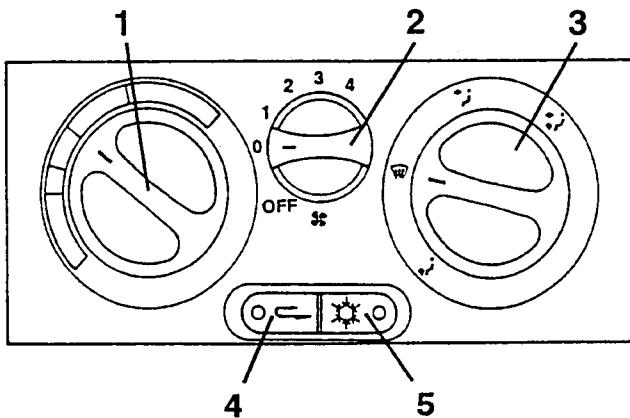
Positioned on the right-hand side of the upper cross-member this momentarily deactivates the air conditioning system under some conditions of engine operation where the engine is required to deliver maximum power to the wheels thus eliminating the absorption of power by the compressor (for example, during overtaking, rapid acceleration etc.).

The control unit activates the following operating logic, or rather, two different operating logics at low and at high rpm.

- below 2000 rpm, as soon as the full load contact closes, the compressor electromagnetic joint is de-energized and it is re-connected as soon as the switch opens;

- above 2000 rpm the compressor supply is cut off for only 8 sec. after which it is restored.

a thermal contact is fitted on the thermostatic cup which cuts off the compressor if the engine temperature reaches over 111°C.

CONTROL PANEL**1. Air temperature adjustment knob**

The heating is shut off when the knob is turned completely to the left; the temperature of the air is gradually increased turning the knob rightwards: maximum heating is obtained when the knob is turned completely to the right.

2. Fan control knob

When this is on 0 the fan is shut off; to switch it on, turn it clockwise and set it on the speed required.

The flow of air to the passenger compartment can be shut off setting the above knob to the OFF position.

3. Air flow distribution control knob

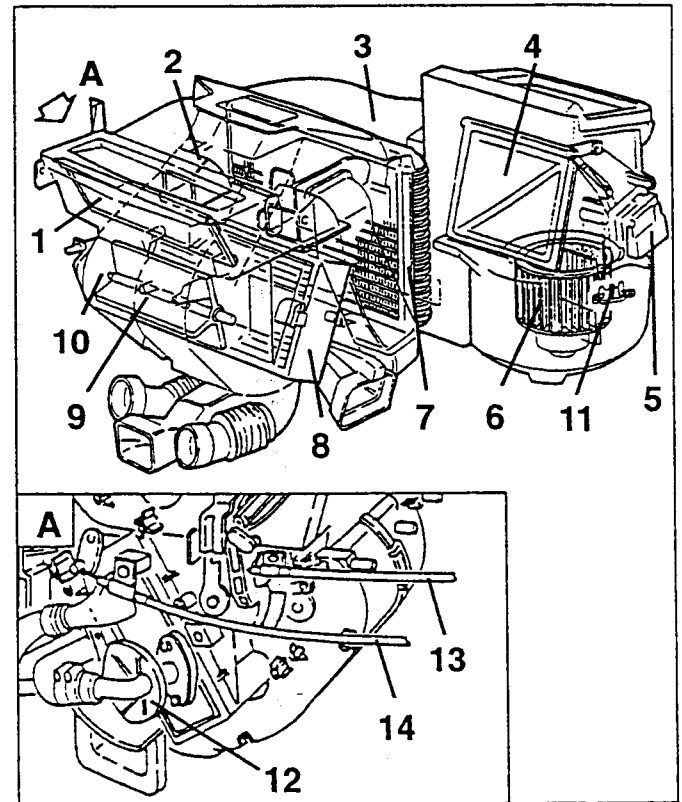
This distributes the air flow among the different vents.

4. Outside air or recirculation control button

When this is pressed it shuts off the outside air inlet and admits recirculation air.

5. Air conditioning control button

This is pressed to turn on the manual air conditioner.

IDENTIFICATION AND LOCATION OF THE COMPONENTS IN THE DUCTING SYSTEM AND HEATER - DISTRIBUTOR UNIT

1. Upper distribution vent

2. Mixing vent

3. Ducting system

4. Outside air/recirculation flow adjustment vent

5. Electric actuator for outside air/recirculation flow adjustment vent

6. Electric fan

7. Evaporator

8. Heater radiator

9. Lower distribution vent

10. Heater-distributor unit

11. Fan speed resistance

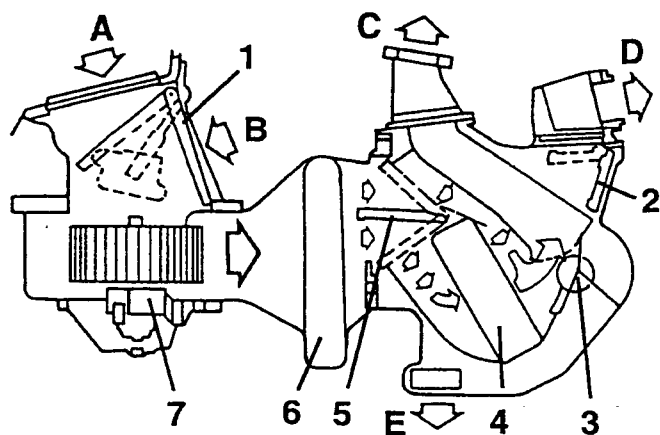
12. Heater radiator coolant inlet tap

13. Distribution vents control cable

14. Mixing vent and heater radiator inlet tap control cable

PATH OF THE AIR IN THE DUCTING SYSTEM AND HEATER-DISTRIBUTOR UNIT

The flow of outside air (A), see diagram below, is ducted to the heater-distributor unit passing through the motorized adjustment flap (1), the fan (7) and the evaporator (6) where, if the conditioner is operating, it is cooled and dehumidified. When the recirculation function is activated the flow of air (B) leads directly from the passenger compartment.



- A. Outside air flow
- B. Recirculation air flow
- C. Air flow from windscreen vents
- D. Air flow from front, centre and side vents
- E. Air flow from vents front and rear seat foot level
- 1. Outside air and recirculation air flow adjustment flap
- 2. Upper distribution vent
- 3. Lower distribution vent
- 4. Heater radiator
- 5. Mixing vent
- 6. Evaporator
- 7. Electric fan

Depending on the position of the mixing vent (5), the flow of air leading from the evaporator (6) is all sent to the distribution vents (2 and 3) or it passes either partially or totally through the heater radiator (4) and then to the distribution ports (2 and 3).

Depending on the position of the upper (2) and lower (3) distribution vents, the flow of air is directed to the various outlets and vents.

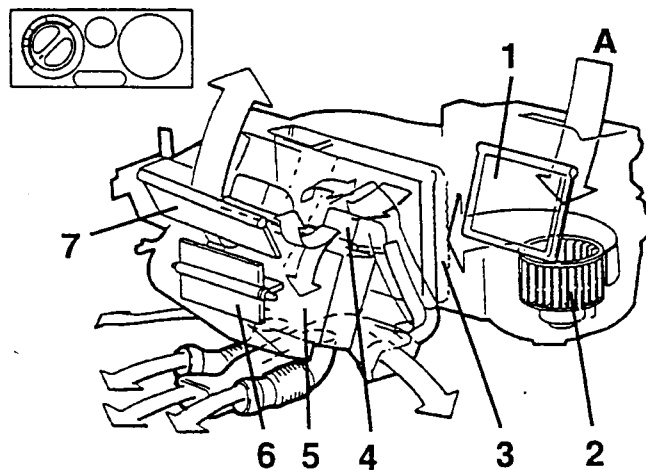
Generally, the fan is used with recirculation air under the following two conditions:

- when the environment outside the car is polluted (queues, tunnels, etc.);
- when it is necessary to lower the temperature in the passenger compartment quickly (prolonged parking in direct sunlight during the summer months).

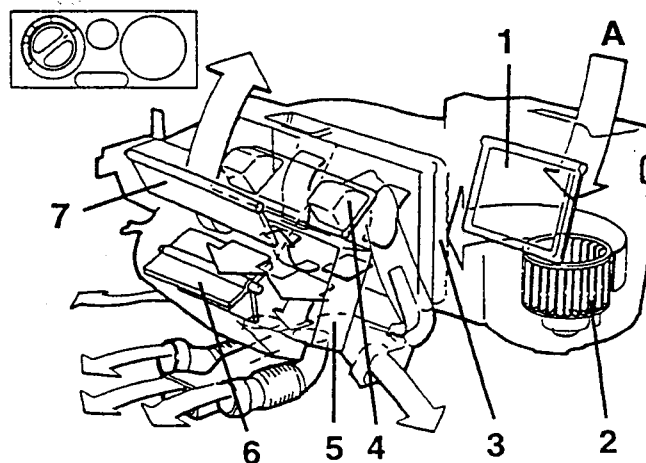
VIEWS OF THE AIR DISTRIBUTION FLOWS IN THE AIR DUCTING SYSTEM AND HEATER-DISTRIBUTOR UNIT

In the following diagrams the outside air/recirculation adjustment vent is shown in the position for admitting outside air (A).

Coldest position: the flow of outside air (A), passes through the fan (2), reaches the evaporator (3), finds the mixing vent (4) in the position that shuts off the heater radiator (5), so it wholly by-passes it and reaches the lower distribution vent (6) and the upper one (7) from where it is directed to the various vents and outlets depending on the position of the distribution knob.



Warmest position: the flow of outside air (A), passes through the fan (2), reaches the evaporator (3), and finds the mixing flap (4) which directs it wholly onto the heater radiator (5), it reaches the lower distribution vent (6) and the upper one (7) from where it is directed to the various vents and outlets in the passenger compartment depending on the position of the distribution knob.

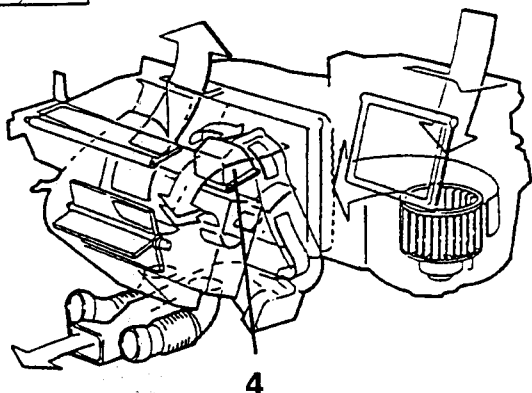


Distribution of the air flow in relation to the positions of the air distribution control knob

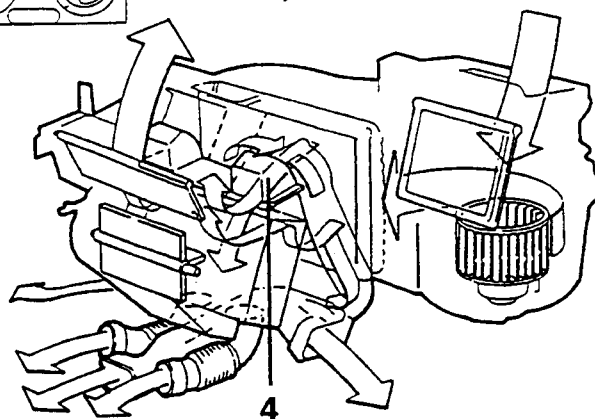
In the following diagrams the mixing vent (4) is shown in an intermediate position between warmest and coldest extremes (mixed air).



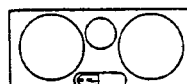
Defrost



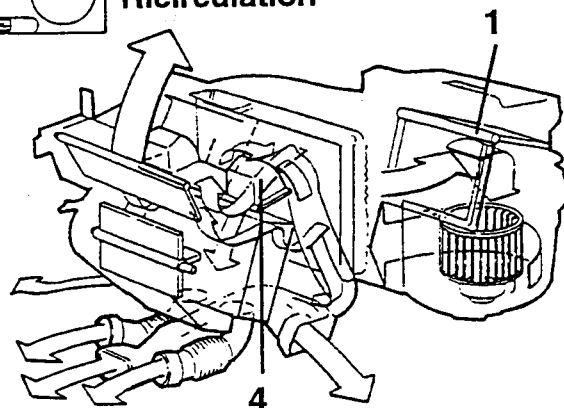
Half front, half to the feet



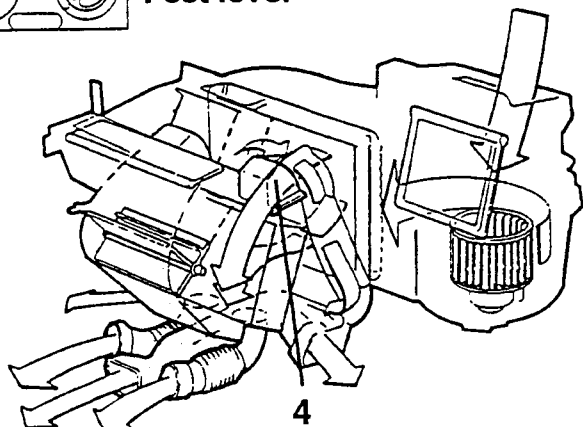
In the following diagram the mixing vent (4) is still shown in the mixed air condition and the recirculation flap (1) completely shutting off the outside air (recirculation air inlet (B)).



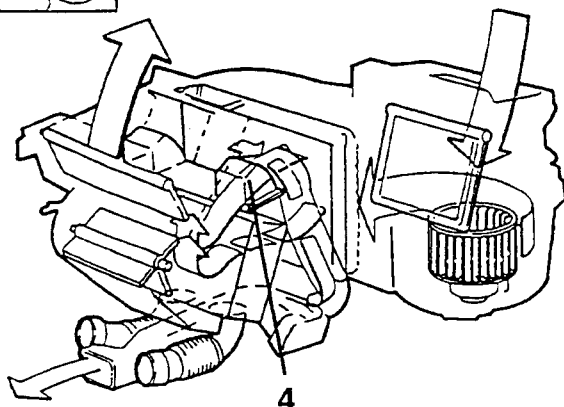
Ricirculation



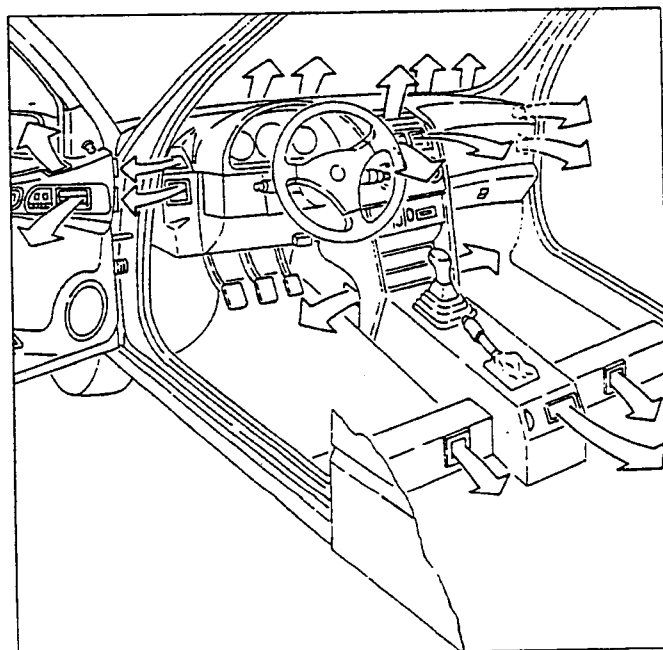
Feet level



Front



AIR FLOW DISTRIBUTION IN THE PASSENGER COMPARTMENT



DESCRIPTION OF THE MAIN COMPONENTS OF THE AIR CONDITIONING SYSTEM

EVAPORATOR

The evaporator is the second heat exchanger of the system and it is formed of aluminium pipes with aluminium fins which increase the heat exchange surface. The evaporator inlet and outlet ducts are welded to the assembly of pipes which forms it. The evaporator is chemically treated to protect it from corrosion. It is the cooling element of the system and it can be crossed by either air leading from the passenger compartment (recirculated) which is always colder and dehumidified, or by outside air to change the air inside the passenger compartment.

As the temperature of the outside or recirculated air that crosses the evaporator is always higher than that of the R134a at low pressure and temperature inside it, this causes evaporation and the change to gas (still at low pressure).

At the same time, the air around the fins of the evaporator is cooled and dehumidified. The humidity that condenses on the evaporator fins is collected and drained off the car.

DRIER FILTER

The drier filter shown schematically in cross-section, is connected by a pipe to the evaporator outlet from which it receives the R134a (mostly in the gaseous state with a minimal quantity of liquid) and the anti-freeze oil.

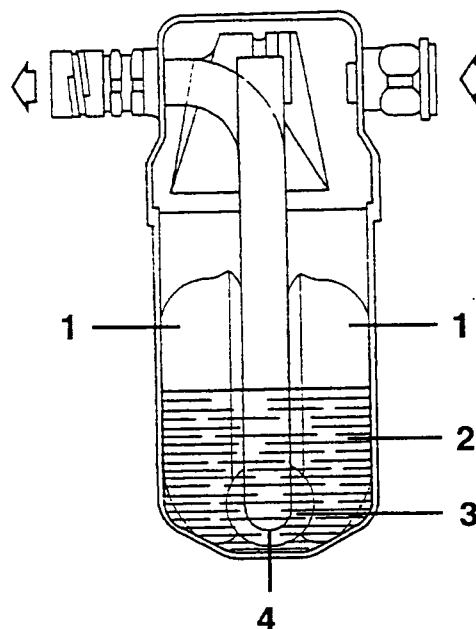
The drier filter carries out different tasks, foremostly that of a separator between the refrigerant in gas state and that in liquid form.

It also acts as a reserve reservoir in which a large amount of the R134a is stored (in the liquid state) in the circuit.

It also serves as a drier through two sachets of SILICAGEL located in the lower section of the filter, which dry any particles of humidity in the system.

For this reason, these accumulators should be carefully stored in a dry place and kept completely sealed until the time of installation.

In the lower section of the shaped pipe which is located inside the accumulator and communicates with its outlet union, there is a hole which serves to ensure that the antifreeze oil returns to the compressor. On this shaped pipe near the oil hole, there is a metal mesh filtering ring.



1. *SILICAGEL sachets*
2. *R134a refrigerant in the liquid state*
3. *Filter*
4. *Hole for oil return to the compressor*

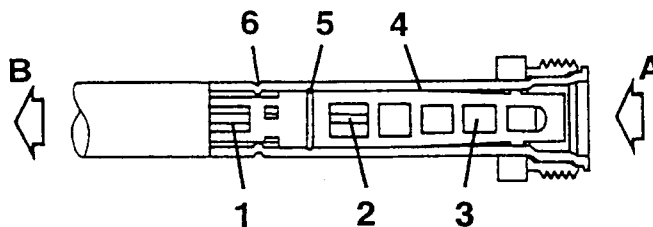
EXPANSION VALVE

The expansion valve, which may be more aptly called an expansion tube, is inserted in the evaporator inlet duct.

This valve, shown in the diagram below, is cylindrical in shape and made from plastic except for the inside of the tube which is metal.

The initial and final sections of the valve are made of very fine metal netting with very small meshes which serve as filters, while the tube has a determinate inside diameter, calibrated to admit the necessary volume of refrigerant fluid when the compressor is operating.

On the outside of the valve there is a rubber ring which seals the inner surface of the evaporator inlet duct.



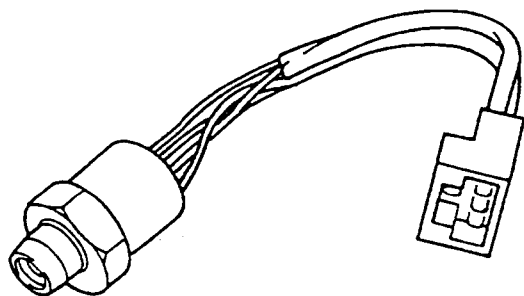
1. *Outlet net filter*
2. *Expansion tube*
3. *Inlet filter net*
4. *Evaporator inlet duct*
5. *Seal ring (O-Ring)*
6. *Expansion valve retainment rolling*

The expansion tube separates the high pressure side of the system from the low pressure side and after it the high pressure R134a in the liquid state leading from the condenser expands, lowering the pressure and temperature without changing its state. When the compressor is turned off, the refrigerant on the high pressure side flows through the expansion tube to the low pressure side until the two pressures are levelled; this reduces the amount of torque required to re-start the compressor.

THREE-LEVEL PRESSURE SWITCH (TRINARY)

The purpose of the three-level pressure switch is to operate the condenser and radiator fan when the car is at a standstill or moving slowly in a queue and the R134a needs to be condensed by forced ventilation as the flow of air caused when the car is travelling at speed fails to be generated.

It also has the task of de-energizing the electromagnetic joint of the compressor pulley when the pressure (high pressure side), reaches dangerous limits despite the action of the condenser and radiator fan or due to a failure, or when, due to a leak or because the outside temperature is below 10°C (and the thermal load is not enough to evaporate the R134a), the pressure is below 2,5 bar.



CONDENSER

The condenser is a heat exchanger formed of copper or aluminium pipes with aluminium fins which increase the thermal exchange surface.

The R134a in gaseous state crossing the coils of the condenser changes to the liquid state (on average at a temperature of 60°C). Insufficient thermal exchange in the system increases the pressure in the system and prevents the complete condensation of the R134a: thus the expansion valve would still receive

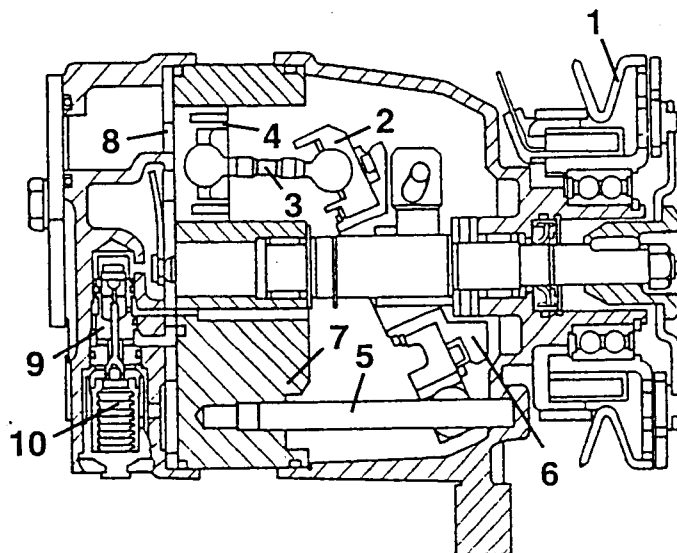
gassy fluid that would considerably reduce the cooling capability of the system.

The condenser is lapped by the air produced as the car travels forward or by the air produced by the special fan when the car is at a standstill or moving slowly in a queue.

COMPRESSOR

The variable-displacement HARRISON V5 compressor shown in diagram form below comprises:

- a block (7) in which the liners on which the pistons (4) run are machined.
- a unit formed of a shaft on which a tilting plate (6) is fitted, on which, by the interposition of roller bearings, a disk (2) rotates guided by a pin (5) integral with the five connecting rods (3) which operate the pistons (4)
- a cylinder head in which the intake and delivery manifolds and the adjustment valve seat (9) are machined
- a plate (8), interposed between the block and the cylinder head on which the intake and delivery valves are machined
- a pulley assembly with electromagnetic joint (1).



1. Pulley with electromagnetic joint
2. Disk
3. Connecting rod
4. Pistons
5. Disk guide pin
6. Sloping plate
7. Block
8. Plate with intake and delivery valves
9. Adjustment valve
10. Adjustment valve control bellows

The reciprocating motion needed to make the pistons run in their liners is obtained through the rotary motion of the tilting plate (6) while the changed displacement depends on the stroke of the pistons and is obtained by the changing of the angle of inclination of the control disk (2) of the connecting rods (3).

The inclination of this plate depends on the pressure difference between the intake duct and the inside of the compressor. This difference is detected by the bellows (10) and causes the actuation of the adjustment valve (9) and the consequent movement of the disk (2)

When the need for conditioned air is high, the adjustment valve (9) sets itself to disclose a gap that connects the intake side with the inside of the compressor; since in this case there is no pressure difference, the compressor works at the highest displacement corresponding to the positioning of the disk as described in the previous section.

When the need for air is lower, the valve sets itself to connect the delivery section with the block and it simultaneously annuls the passage between the latter and the intake side activated previously.

The angle of inclination of the disk carrying the connecting rods is determined by the balance of the two pressures.

A slight difference between the intake pressure and the pressure in the compressor creates a resulting force on the pistons which causes the disk to tilt on its fulcrum pin.

The vertical position of the disk corresponds to displacement of almost nil, thus R134a compression close to zero.

In the compressor when the piston moves away from the head during its stroke it generates a vacuum in the space above.

The difference in pressure causes the R134a in gas state to open the intake valve and fill the cylinder. As soon as the piston begins its stroke towards the head, the intake valve closes and the R134a is compressed until its pressure opens the exhaust valve (delivery).

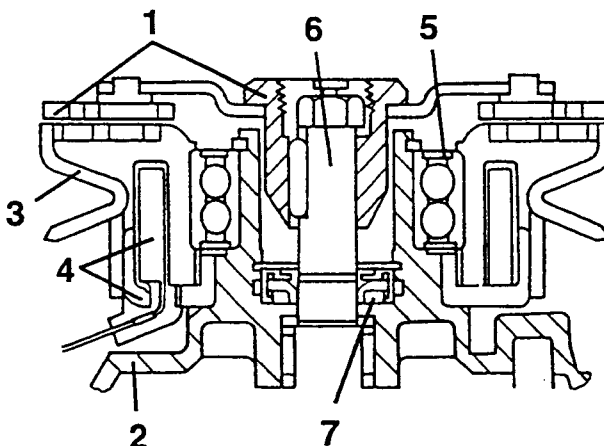
The R134a is at pressure of between $9,81 \div 19,6$ bar ($10 \div 20$ kg/cm²) and a temperature of $80^\circ \div 100^\circ\text{C}$ can therefore be sent to the condenser.

TRANSMISSION OF MOTION TO THE COMPRESSOR

The rotary motion required to operate the compressor is developed thanks to the presence of the pulley/electromagnetic joint assembly shown in the diagram which is formed of the following:

- a plate (1) keyed onto the compressor shaft (6)

- a rotor unit with pulley (3) turning on ball bearings (5)
- an electromagnet (4) controlled by the activation of the air conditioning system.



1. Disk keyed onto the compressor shaft
2. Front compressor support
3. Rotor unit with pulley
4. Electromagnet
5. Ball bearings
6. Compressor shaft
7. Seal

When the air conditioning system is not operating, the pulley (3) operated by the connection belt with the crankshaft idles on the bearing (5) keyed onto the front compressor support (2).

When the air conditioning system is turned on, an electric signal energizes the electromagnet which attracts the disk (1) against the pulley (3) which causes the compressor shaft to turn.

The result is the special feature of this system compared with conventional rotary types, which is the possibility of not requiring the continual engagement/disengagement of the electromagnetic joint, resulting in excessive stresses on same, to activate the compressor.

In fact, the latter, always rotating, alters its operating condition by changing, as described previously, the displacement according to the amount of conditioned air required.

CAUTIONS FOR REMOVAL AND REFITTING

During servicing operations, when the components of the air conditioning system are disconnected, suitably plug the disconnected unions to prevent any damp and dirt from getting into the system.

When refitting the pipe unions always change their O-rings.

Lubricate the threads of the pipe unions with the specified antifreeze oil and tighten them to the specified torque.

In the event of oil leaks from the system during servicing operations top up the system taking account of the estimated amount lost due to leaks.

DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT (TWO BOWDEN)

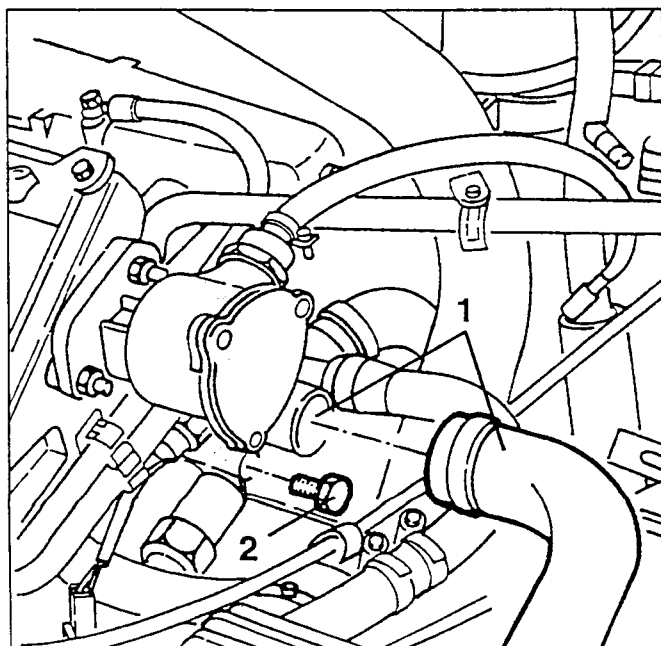
REMOVAL/REFITTING

- Drain the fluid from the air conditioning system (see the specific paragraph).

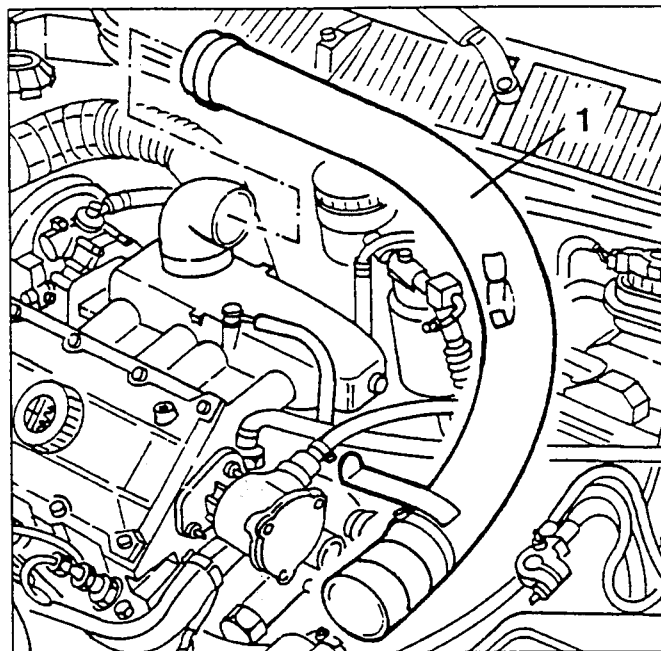
- Remove the battery (see GROUP 55).

1. Disconnect the radiator delivery sleeve from the thermostatic cup and recover the coolant that flows out.

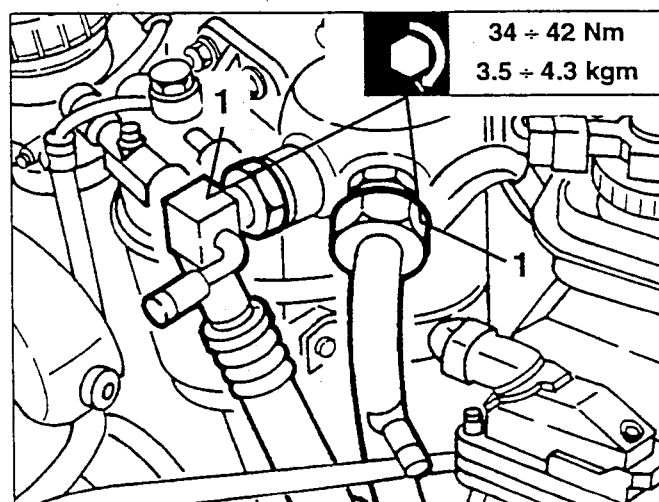
2. Slacken the screw fastening the stiff air inlet pipe.



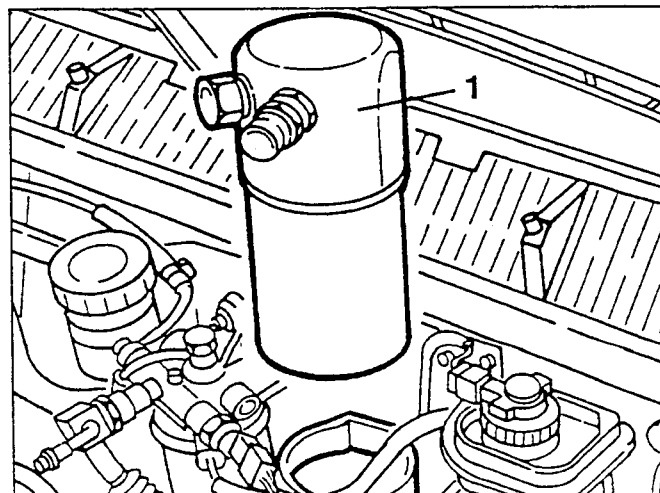
1. Slacken the fastening clamp and remove the stiff air inlet pipe.



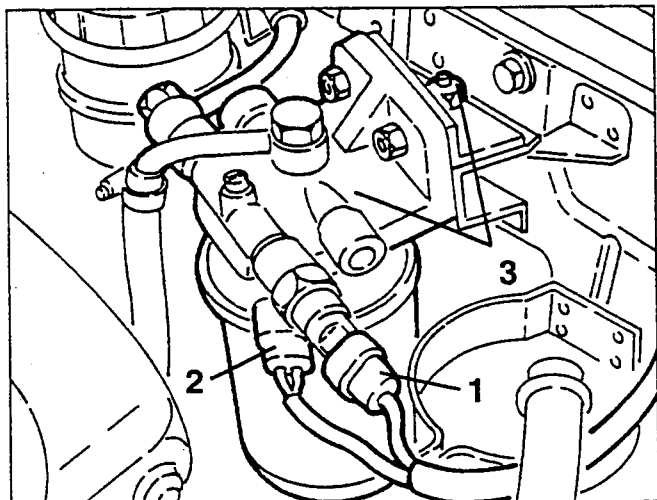
1. Disconnect the refrigerant fluid inlet and outlet pipes from the drier filter.



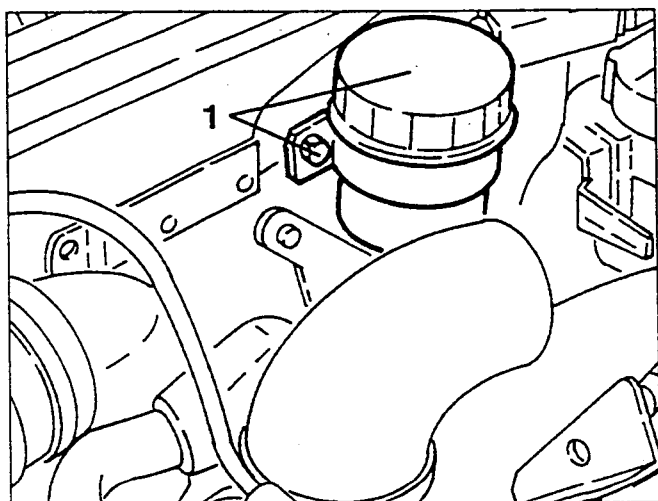
1. Slacken the support clamp and remove it slipping it off upwards.



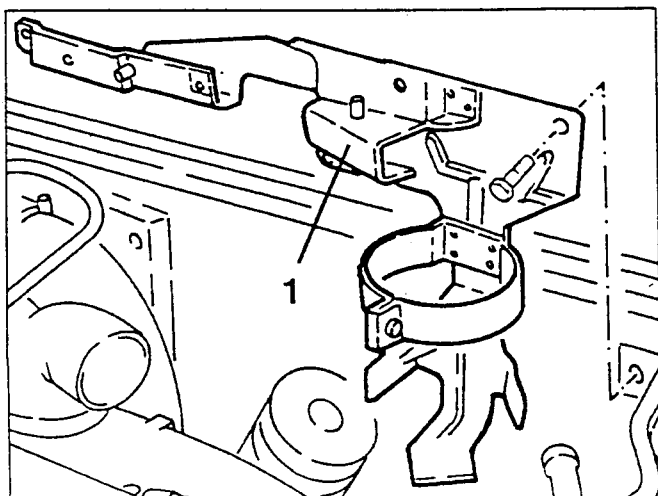
1. Disconnect the electrical connection of the fuel pre-heating device control sensor.
2. Disconnect the electrical connection of the supply to the fuel pre-heating device.
3. Slacken the fuel filter fastening nut, then move it to one side without disconnecting the pipes.



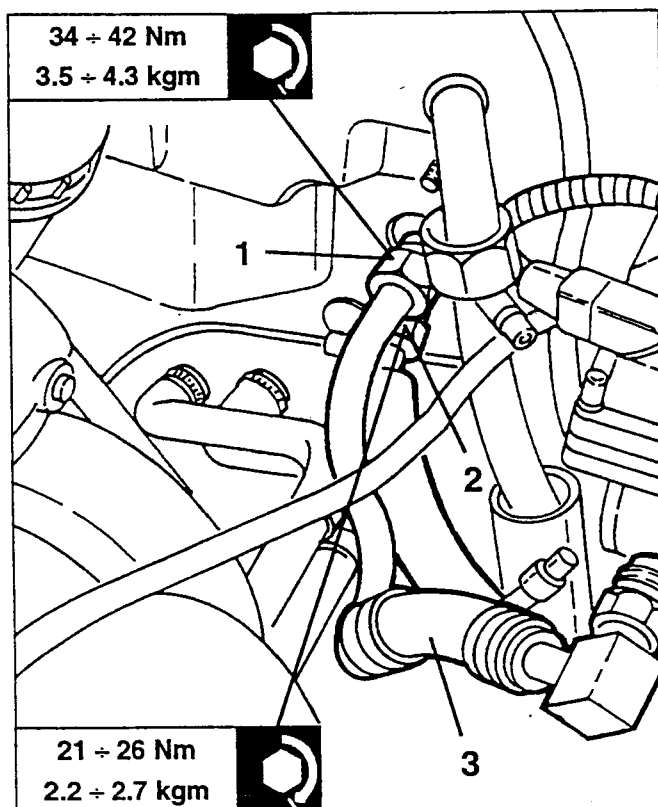
1. Slacken the power steering reservoir nut, then move it to one side without disconnecting the pipes.



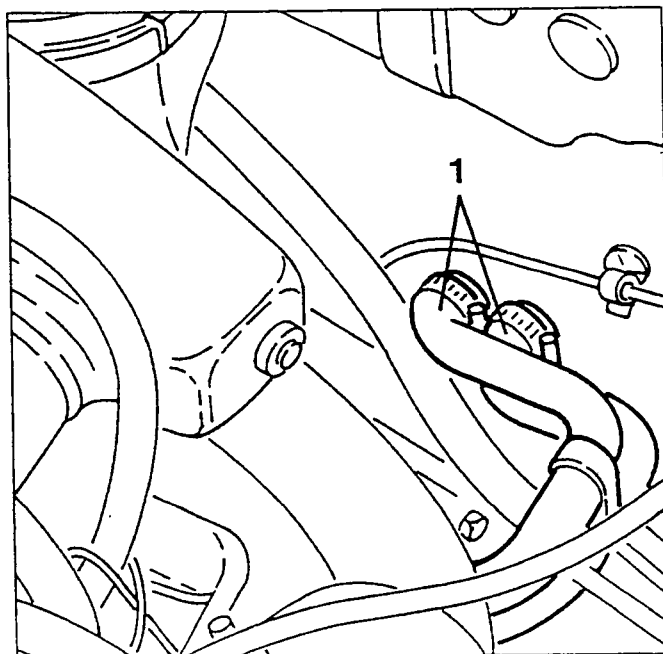
1. Slacken the four fastening screws and remove the support bracket.



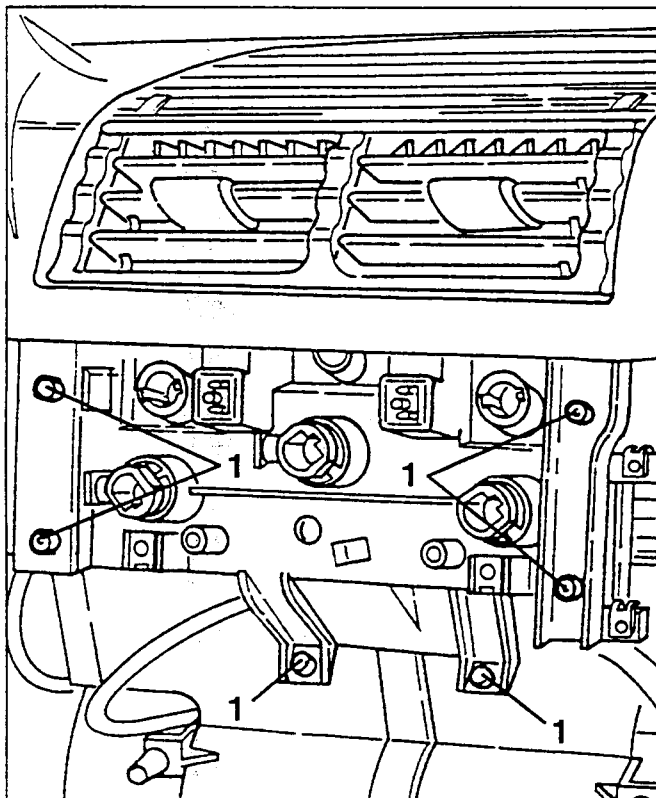
1. Using wrenches N° 1.822.112.000 and N° 1.822.115.000 disconnect the fluid outlet pipe from the evaporator.
2. Using wrenches N° 1.822.111.000 and N° 1.822.113.000 disconnect the fluid inlet pipe from the evaporator.
3. Retrieve the evaporator connection pipe to the drier filter.



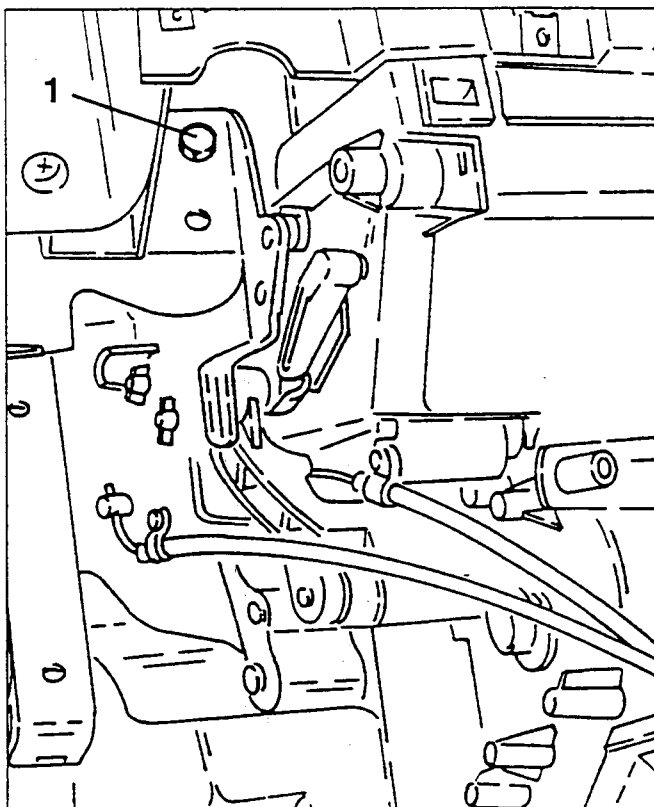
1. Disconnect the two engine coolant radiator delivery and return pipes.



- Remove the lower part of the dashboard and the centre console (see GROUP 70).
- 1. Slacken the fastening screws and lower the heating and ventilation controls.

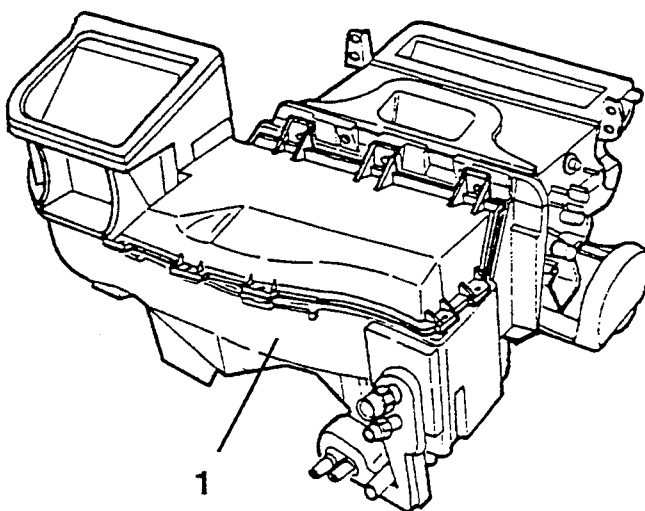
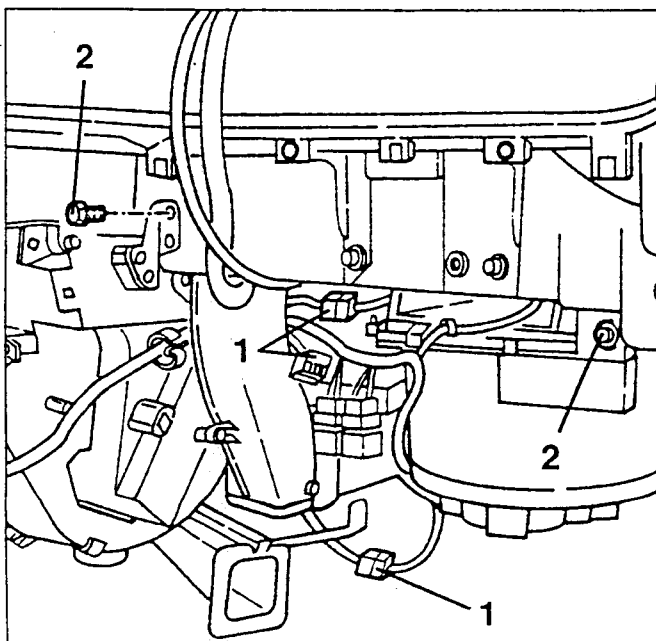


- 1. Slacken the screw fastening the heating and ventilation unit on the lefthand side.



- 1. Remove the heating and ventilation unit.

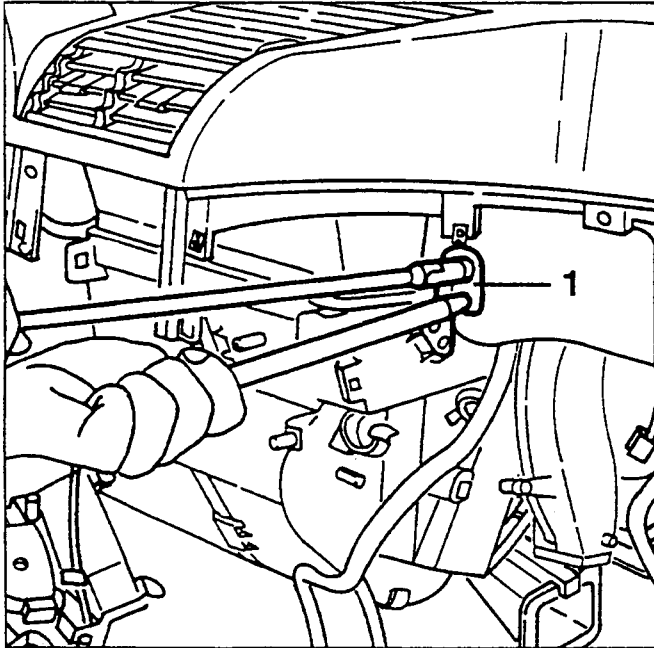
- Remove the two sections of the air flow duct to the rear passenger face level (see GROUP 70).
- 1. Disconnect the electrical connections of the heating and ventilation unit.
- 2. Slacken the three screws fastening the heating and ventilation unit on the righthand side.



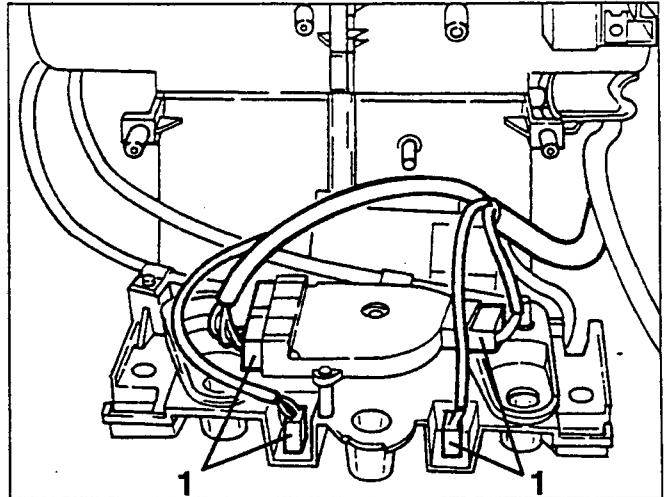
To refit the heating and ventilation unit, reverse the sequence followed for removal, adhering to the following instructions:

- Coat the mouth of the heater, water drain pipes and conditioning pipes with vaseline.
- Assemble the unit taking care to insert the above pipes correctly in the passage holes.

1. Use a centering pin positioned as shown, and centre the group before fixing it.

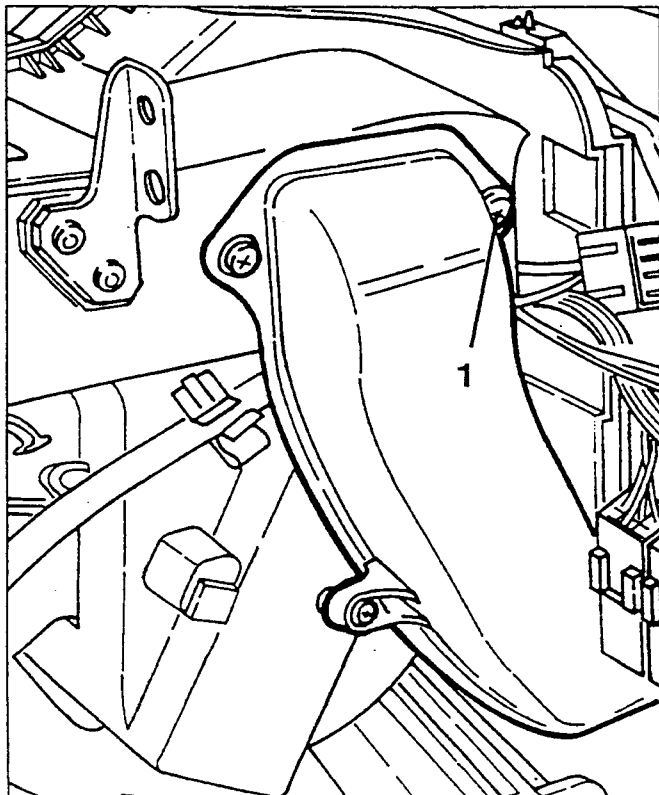


1. Disconnect the four electrical connections from the heating and ventilation controls.

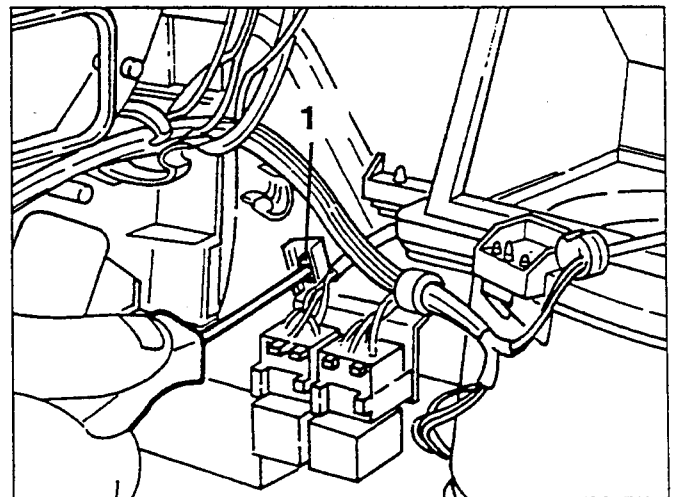


DIS-ASSEMBLY

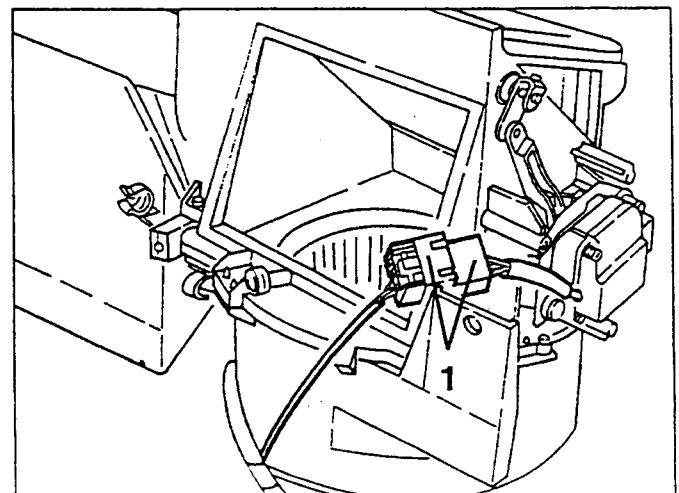
1. Slacken the three fastening screws and remove the air delivery duct to the rear passenger area.



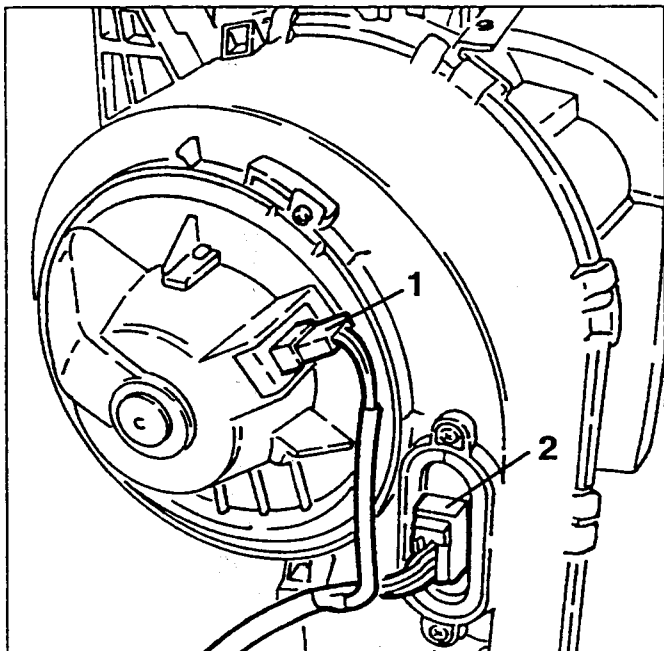
1. Slacken the screw fastening the relay switch support bracket.



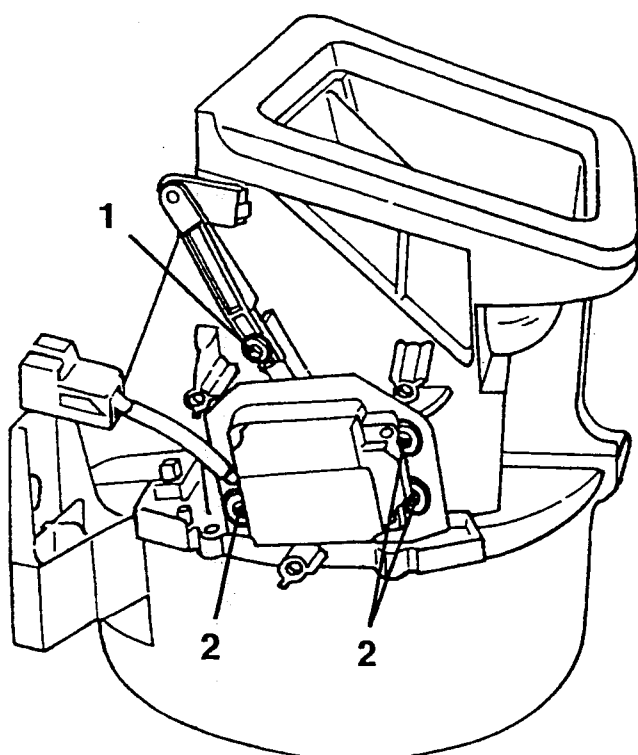
1. Disconnect the electrical connection of the outside air/recirculation mixing vent control motor.



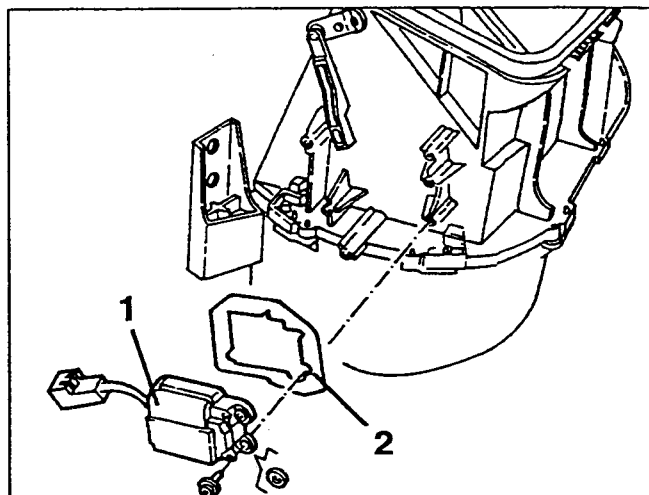
1. Disconnect the electrical connection from the fan.
2. Disconnect the electrical connection from the fan resistance, then remove the cable loom freeing it of the cable clamps.



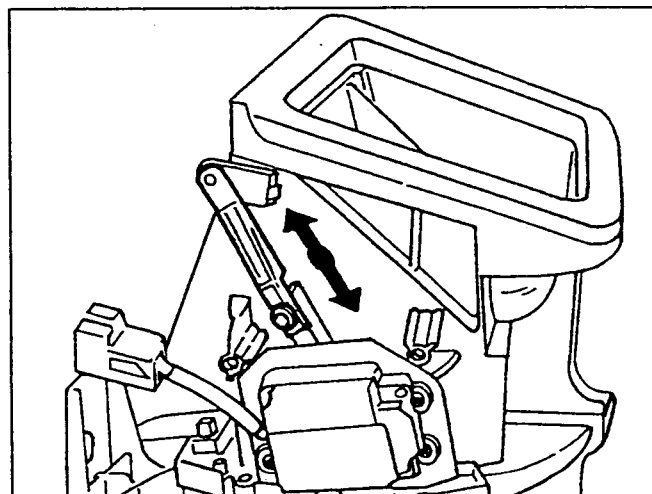
1. Slacken the screw fastening the outside air/recirculation mixing vent control motor tie-rod.
2. Slacken the three screws fastening the outside air/recirculation mixing vent motor.



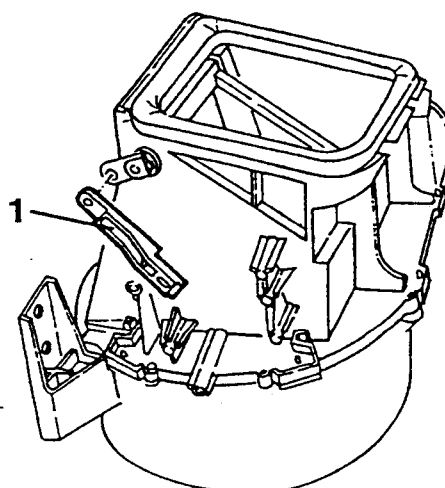
1. Remove the outside air/recirculation mixing vent motor complete with the grommets on the fastening hole.
2. Retrieve the rear plate.



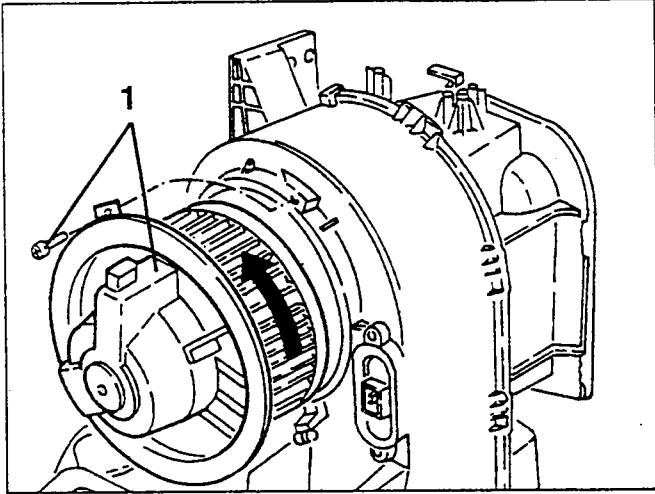
When refitting, adjust opening and closing of the outside air/recirculation mixing vent acting on the control tie-rod as shown in the figure.



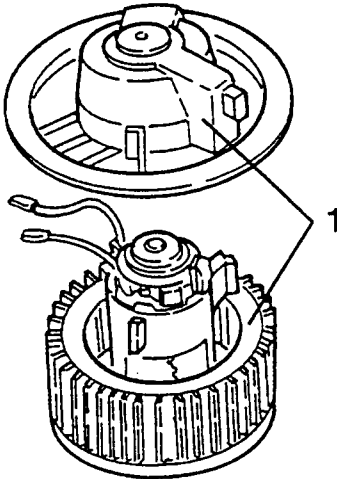
1. Remove the outside air/recirculation mixing vent control tie-rod.



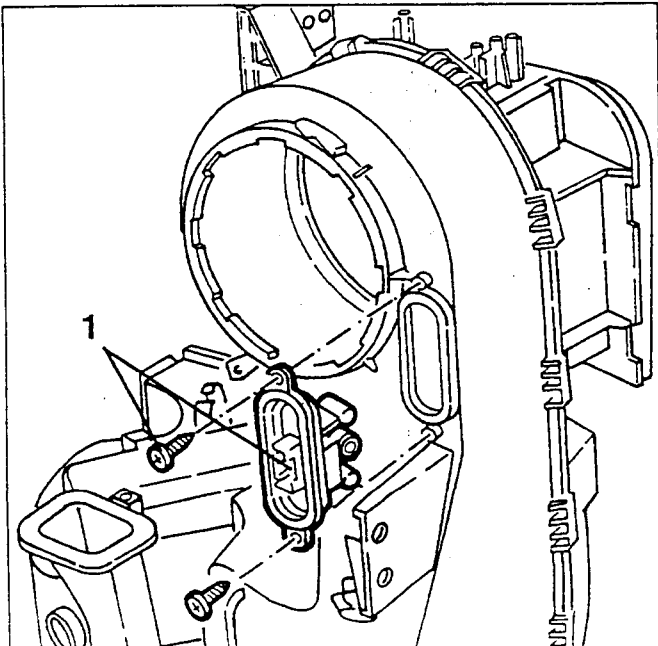
1. Slacken the screw fastening the electric fan, turn it as shown in the figure, then remove it.



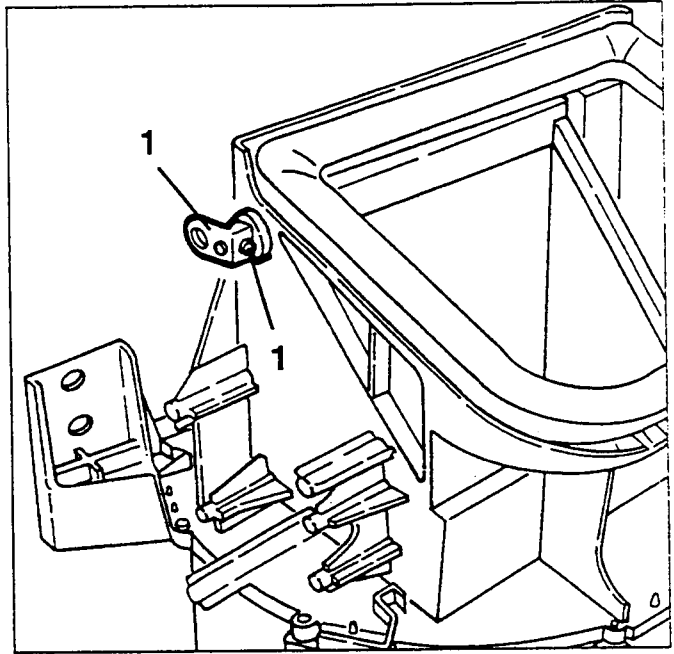
1. Separate the fan from the cover releasing the three rubber catches and removing the two electric cables.



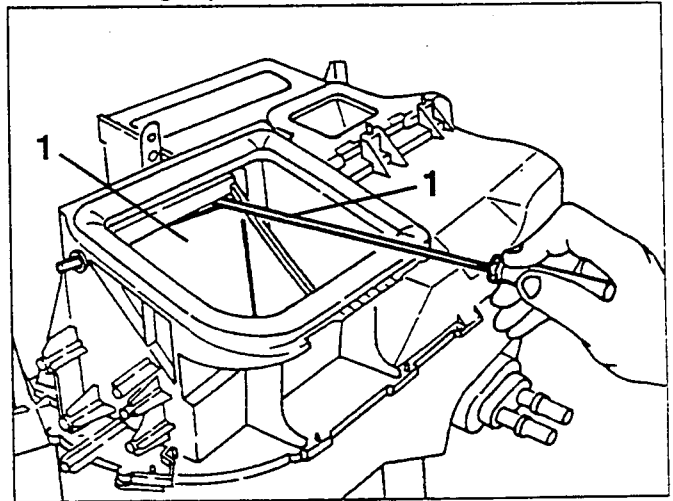
1. Slacken the two fastening screws and remove the fan resistance.



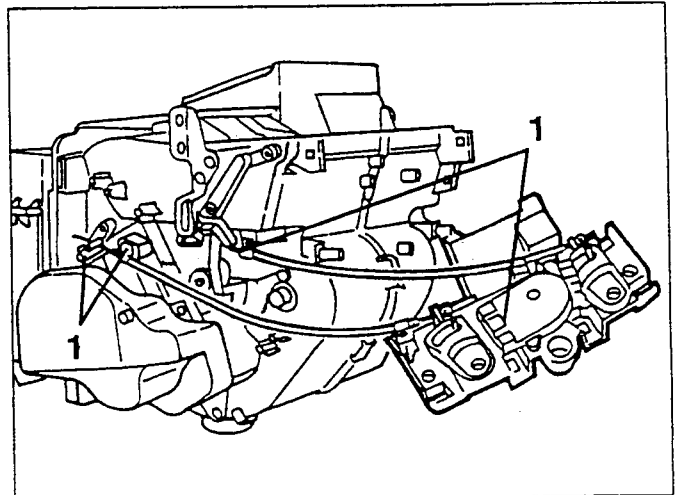
1. Slacken the fastening screw and remove the hook connecting the outside air/recirculation vent control tie-rod.



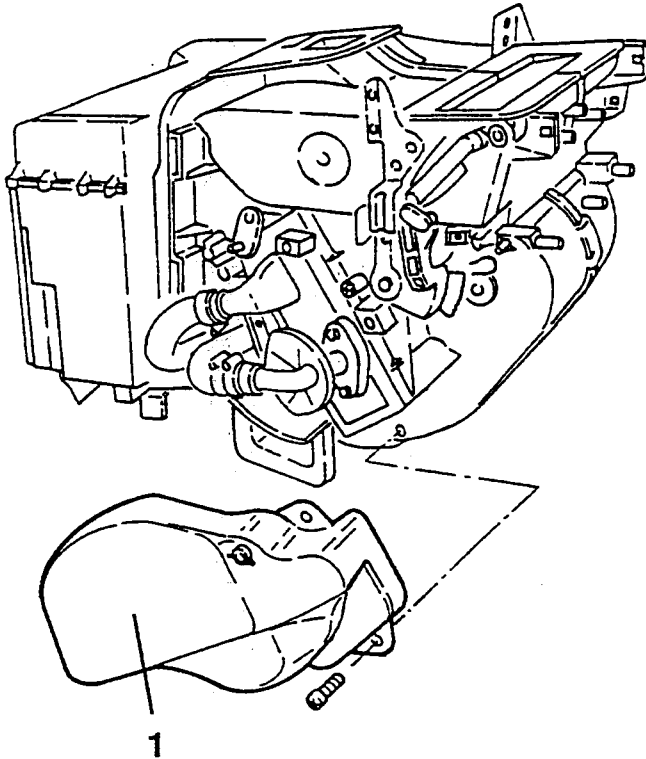
1. Release the outside air/recirculation vent from the two fastening clips and remove it.



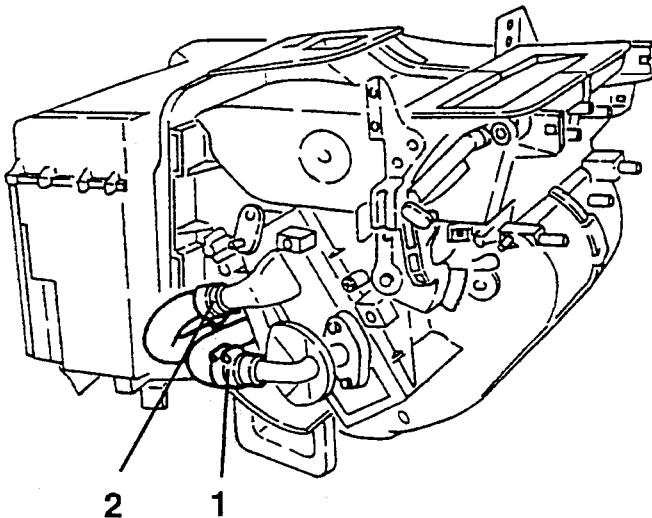
1. Disconnect the two control cables from the heating and ventilation unit and remove them complete with the control units.



1. Slacken the two fastening screws and remove the protection of the coolant fluid pipes at the heater radiator.

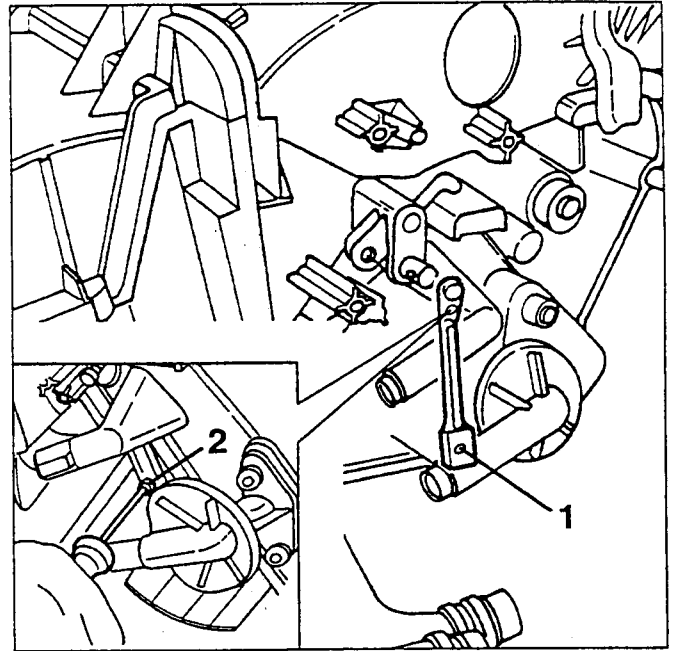


1. Disconnect the coolant fluid inlet pipe from the tap on the radiator.
2. Disconnect the coolant fluid outlet pipe from the tap on the radiator.

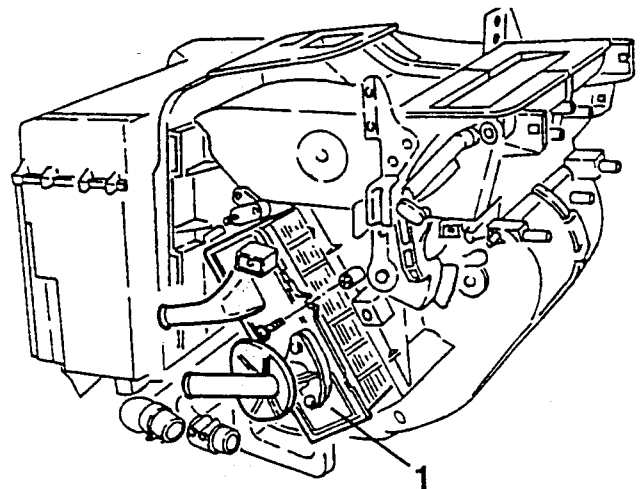


1. Slacken the screw fastening the control tie-rod for the coolant radiator inlet tap.

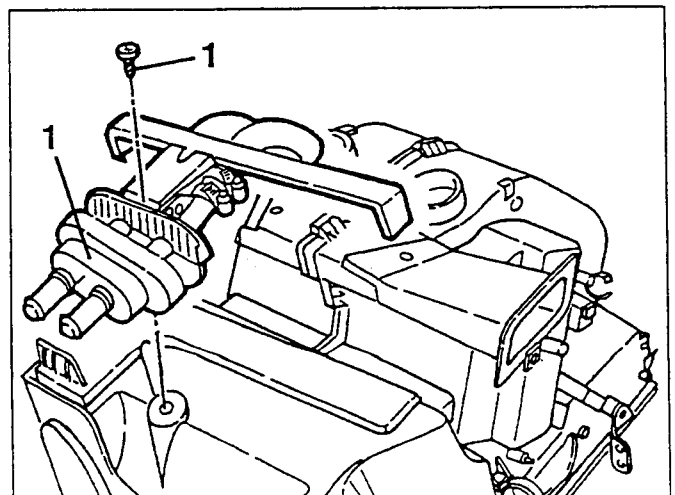
2. Disconnect the tie-rod and remove it.



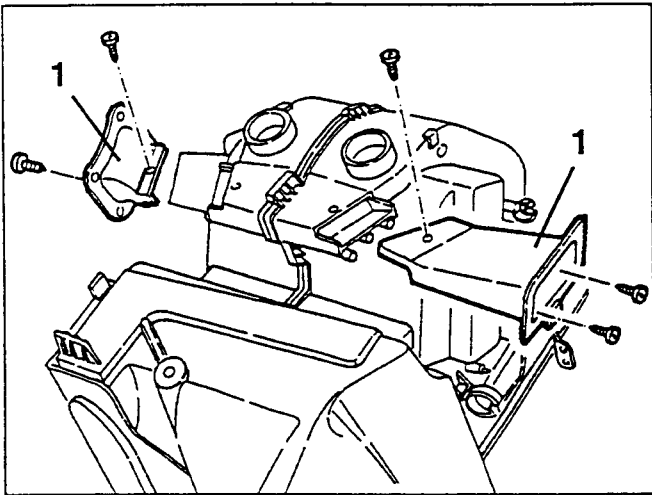
1. Slacken the two fastening screws and take out the heater radiator.



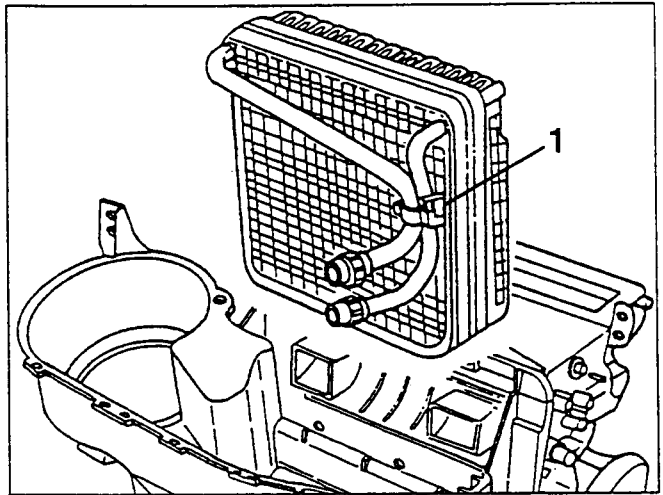
1. Slacken the fastening screw and remove the heater coolant delivery and return pipes.



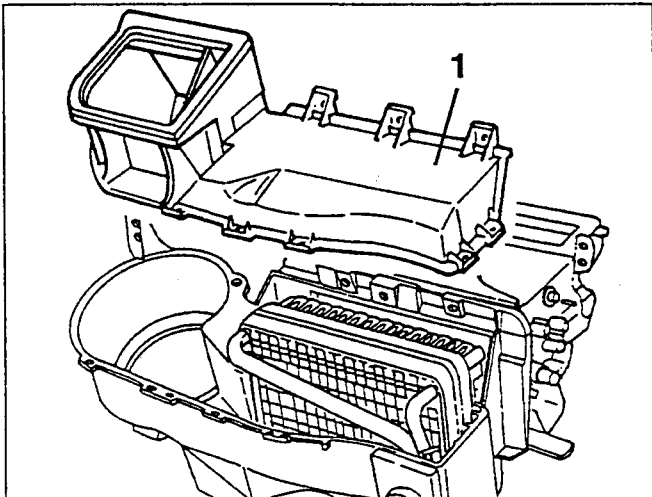
1. Slacken the fastening screws and remove the air delivery ducts to the feet.



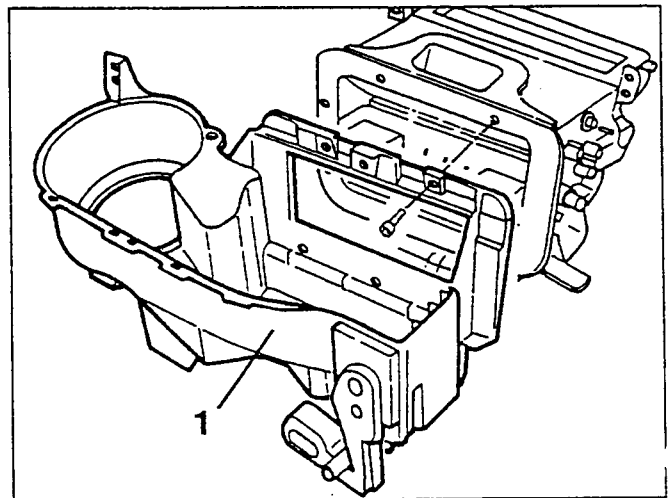
1. Remove the evaporator slipping the pipes out of their seals.



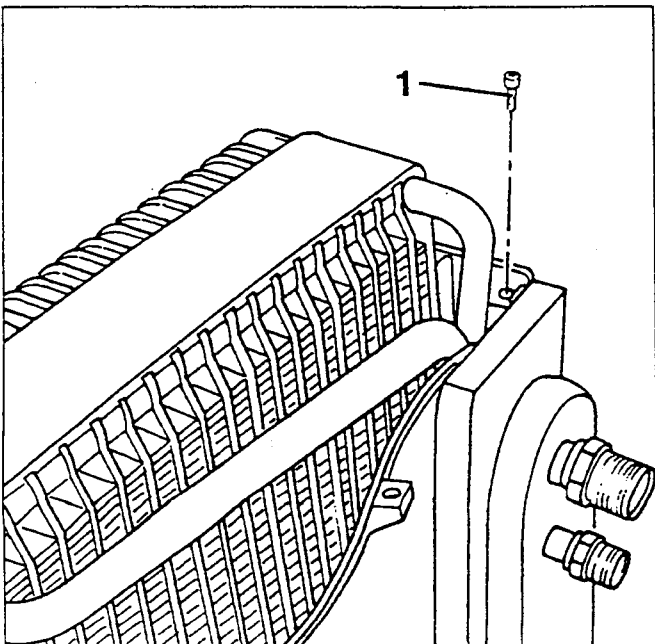
1. Slacken the fastening screws and remove the heater upper half box releasing it from its catches.



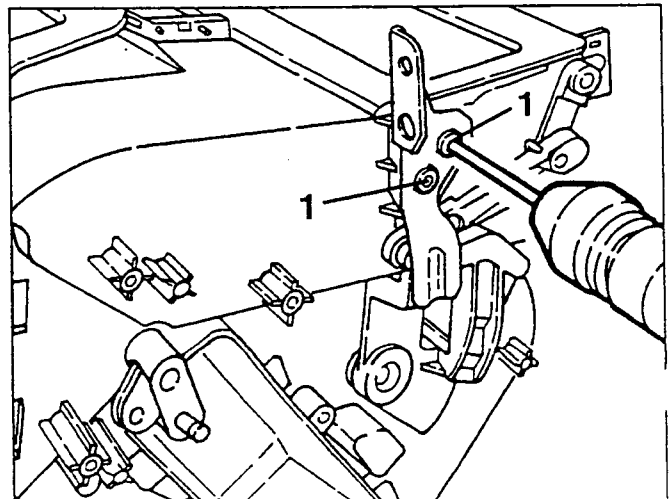
1. Slacken the fastening screws and remove the heater lower half box releasing it from its catches.



1. Slacken the evaporator fastening screw.



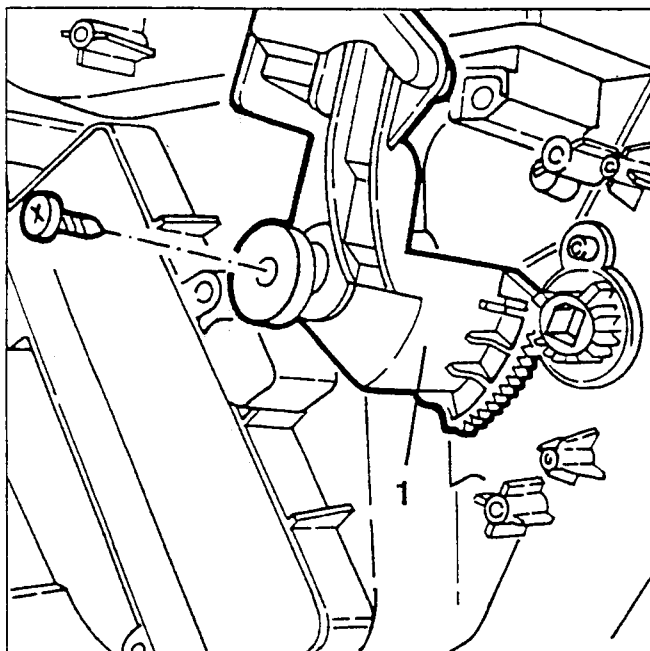
1. Using a drill knock off the two rivets fastening the heating and ventilation unit support bracket.



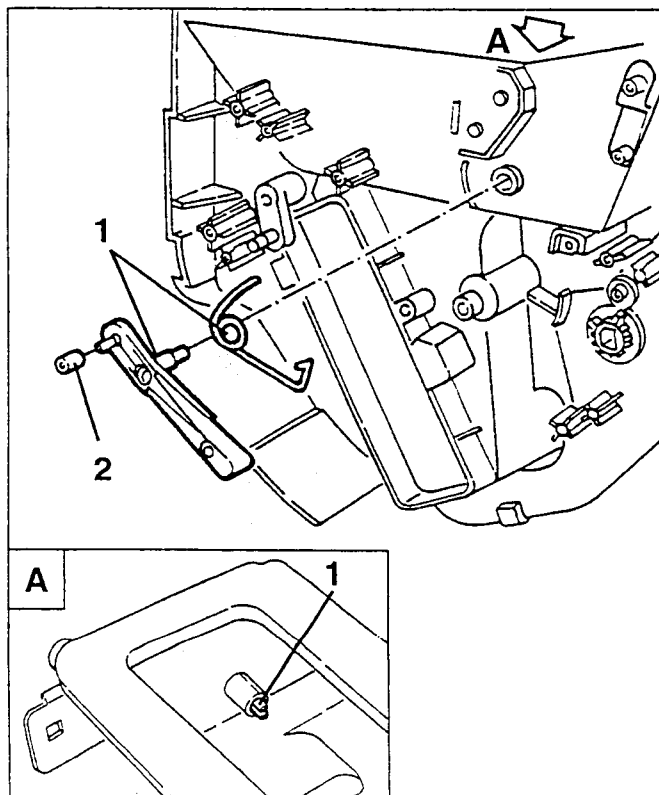
1. Slacken the fastening screw and remove the air distribution vent control leverage.



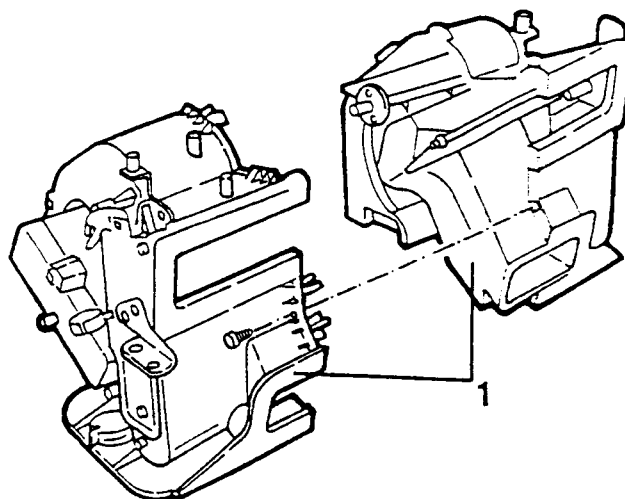
When refitting the leverage make sure that the two notches stamped on the gears coincide.



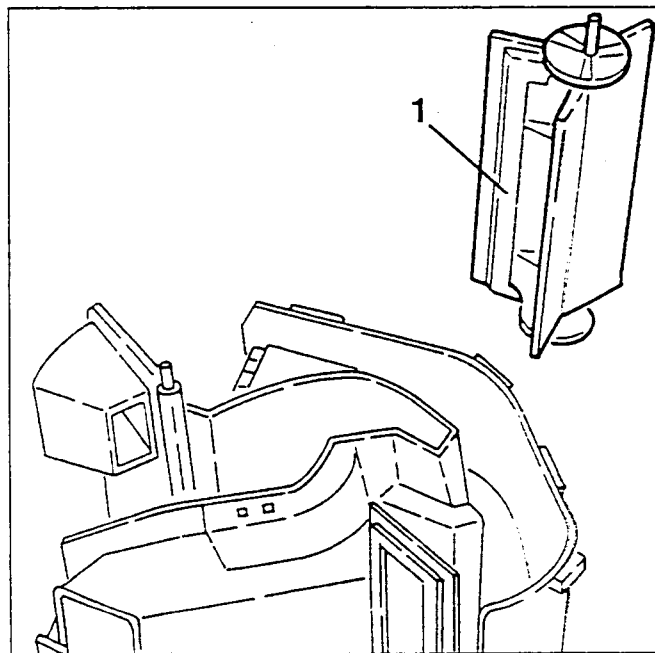
1. Release the clamps of the fastening pin and remove the tie-rod complete with air distribution vent control spring.
2. Retrieve the spacer.



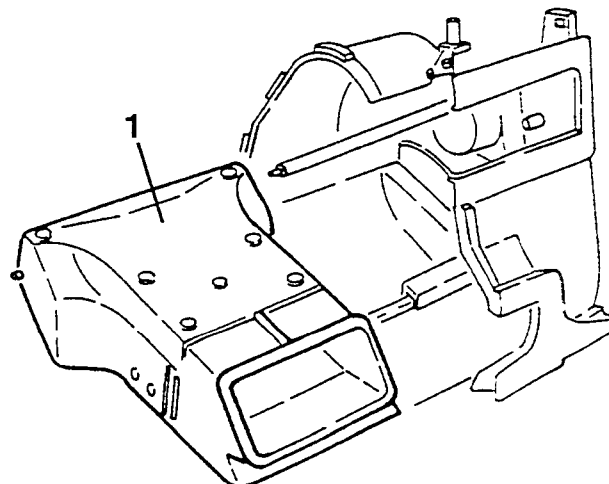
1. Slacken the fastening screws and dis-assemble the half boxes releasing the fastening clamps.



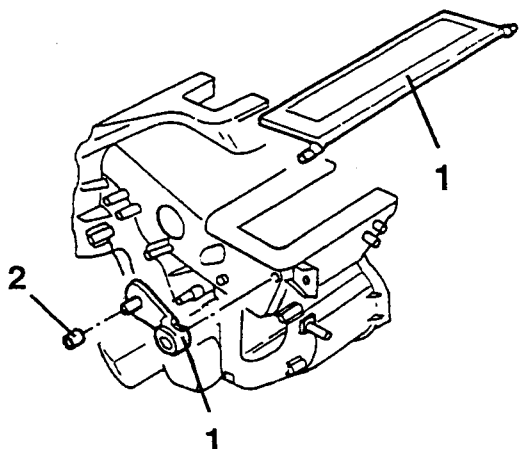
1. Remove the lower distribution vent.



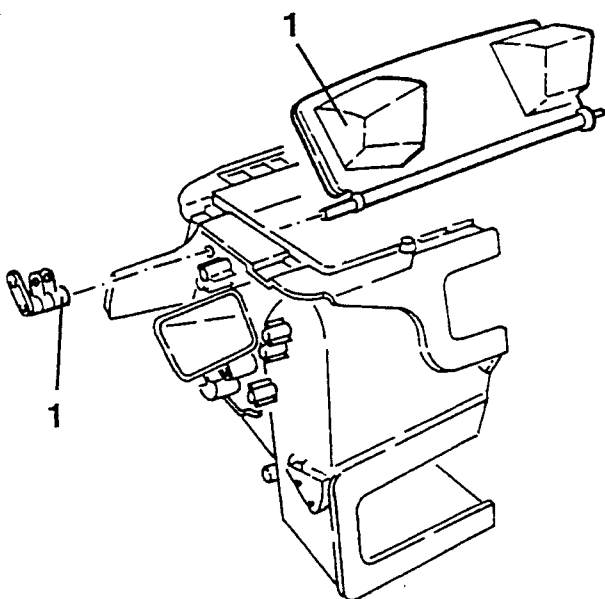
1. Remove the air duct.



1. Remove the fastening leverage and retrieve the upper distribution vent.
2. Retrieve the spacer.



1. Remove the fastening leverage and retrieve the air mixing vent.

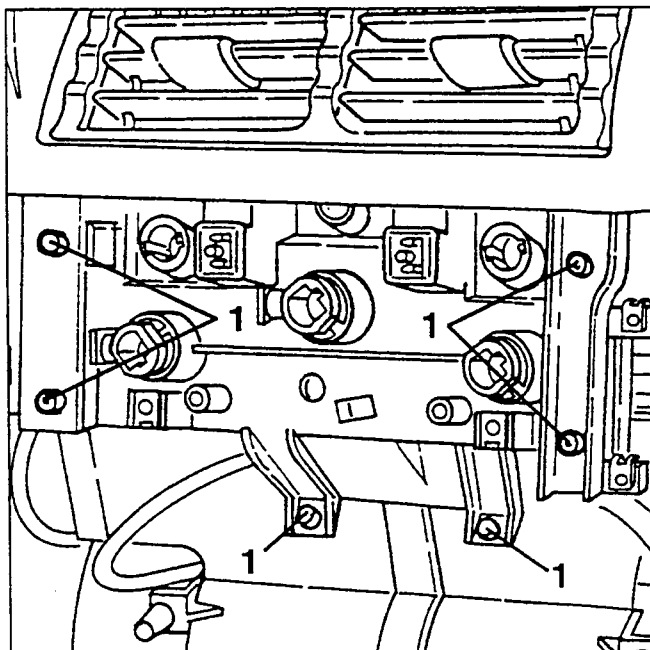


HEATING AND VENTILATION UNIT CONTROLS (TWO BOWDEN)

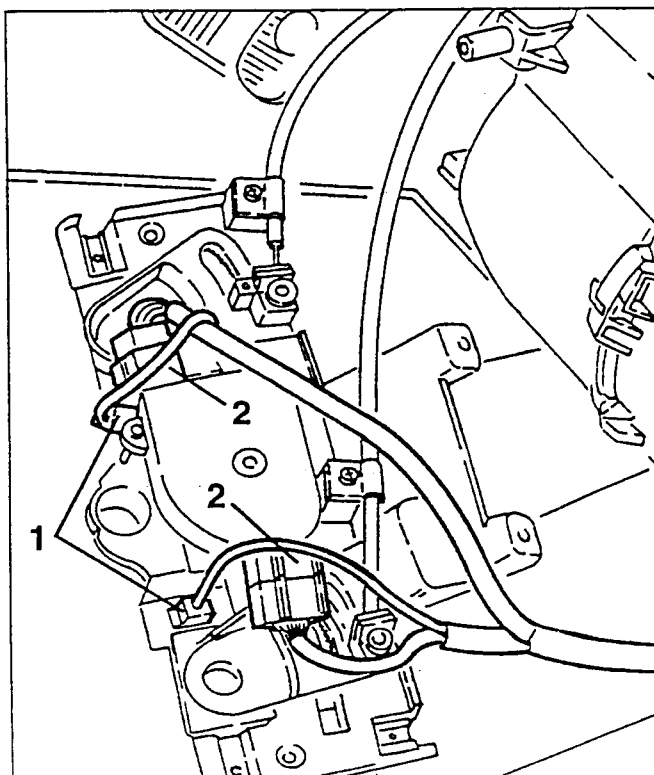
REMOVAL/REFITTING

- Remove the lower part of the dashboard (see GROUP 70).

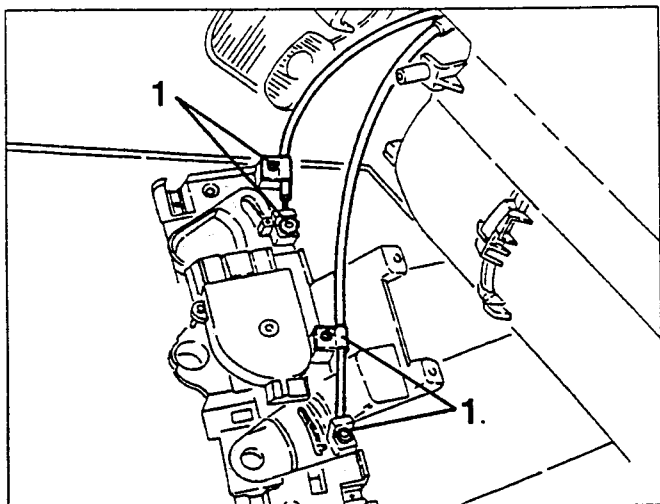
1. Slacken the screws fastening the heater control unit and take it out of its housing.



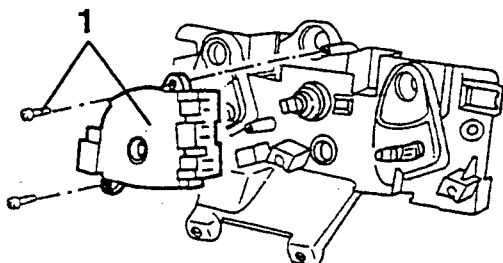
1. Disconnect the two electrical connections for the heater control unit lighting.
2. Disconnect the two electrical connections from the fan speed switch.



1. Remove the fastening washers, slacken the clamp screws and remove the two vent control cables.



1. Slacken the fastening screws and remove the fan speed switch.

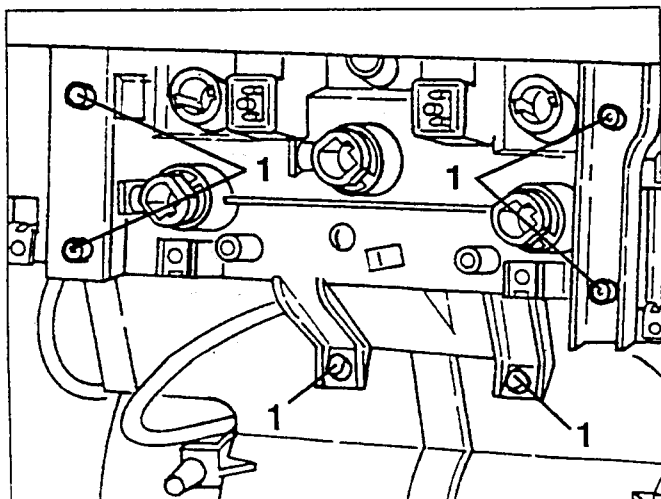


HEATING AND VENTILATION UNIT VENT CONTROL CABLES (TWO BOWDEN)

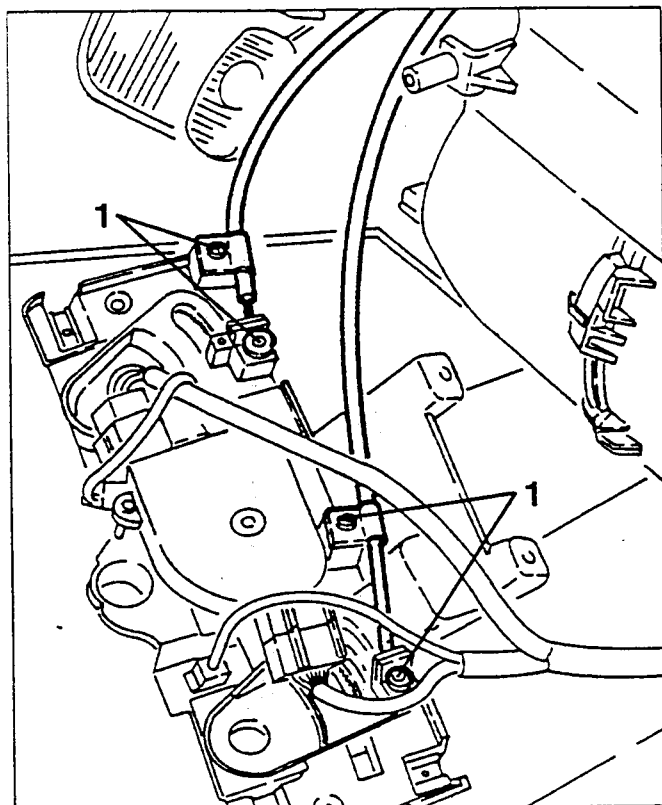
REMOVAL/REFITTING

- Remove the lower part of the dashboard (see GROUP 70).

1. Slacken heater control unit fastening screws and remove it from its housing.

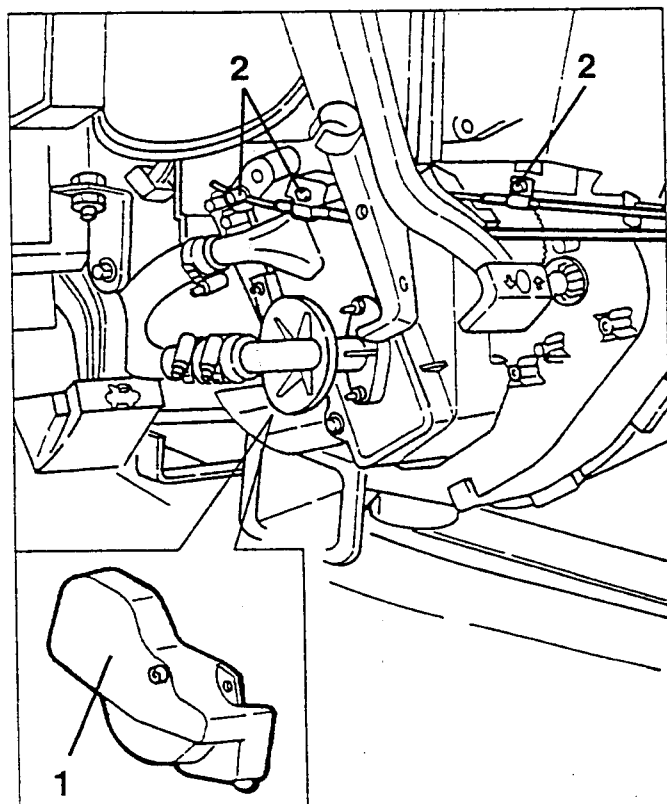


1. Remove the fastening washers, slacken the clamp screws and disconnect the two vent control cables from the control unit.



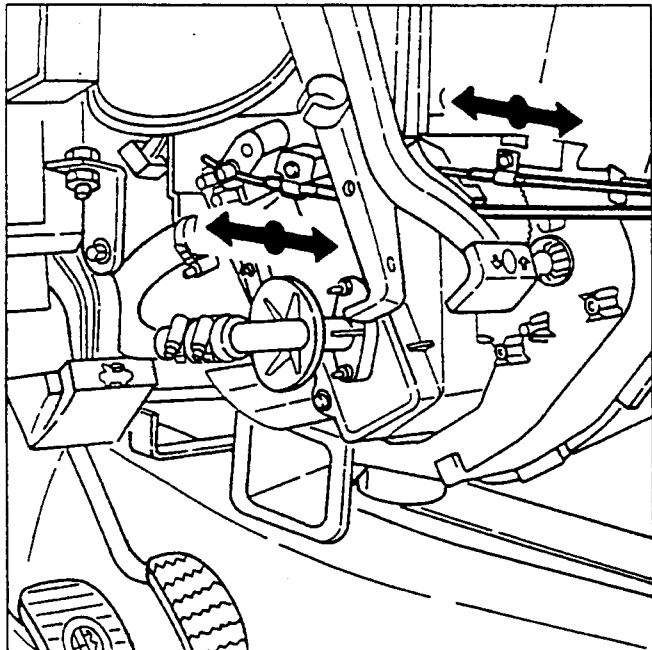
1. Slacken the two fastening screws and remove the coolant hose guard.

2. Slacken the screws fastening the sheaths to the heating and ventilation unit and remove the vent control cables.





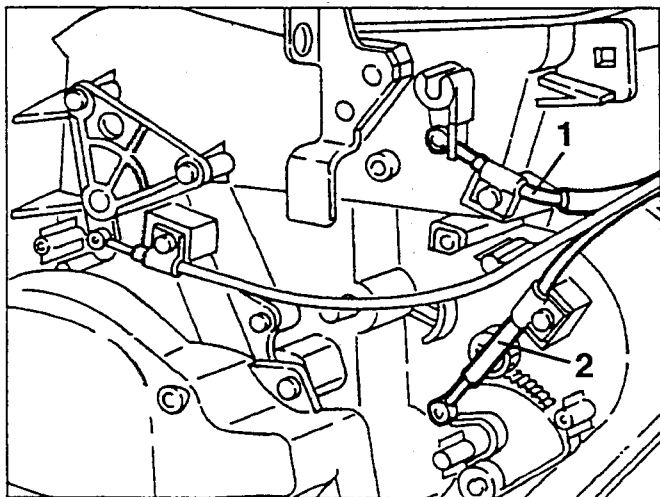
Refit the control cables adjusting them as shown in the illustration before fastening them from the radiator side.



DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT (THREE BOWDEN)

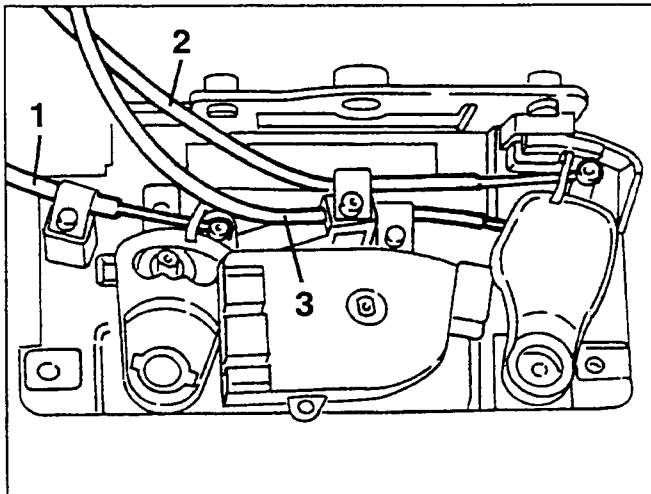
This varies from the "two bowden" versions regarding in relation to the following:

a) The adoption of two front bowden rather than one for the movement of the two air distribution gates and consequent elimination of the transmission levers.



1. Upper distribution gate command bowden
2. Lower distribution gate command bowden

b) For the above variation the command group is also varied, three bowdens being connected instead of two.

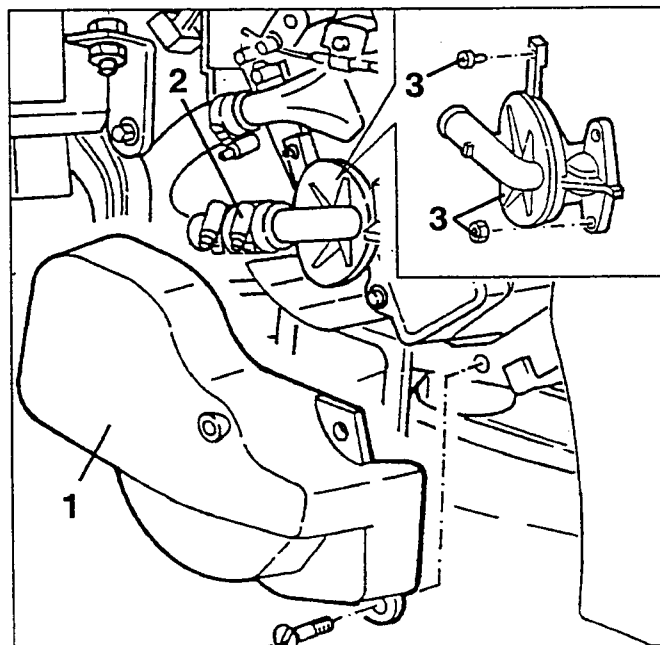


1. Mixing gate command bowden
2. Upper distribution gate command bowden
3. Lower distribution gate command bowden

RADIATOR COOLANT INLET TAP

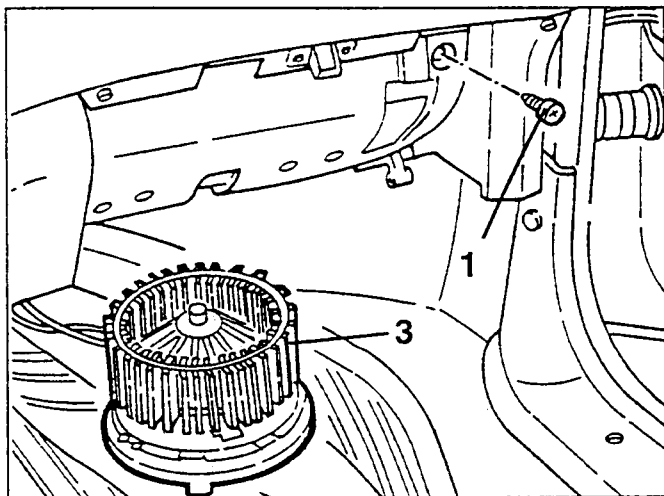
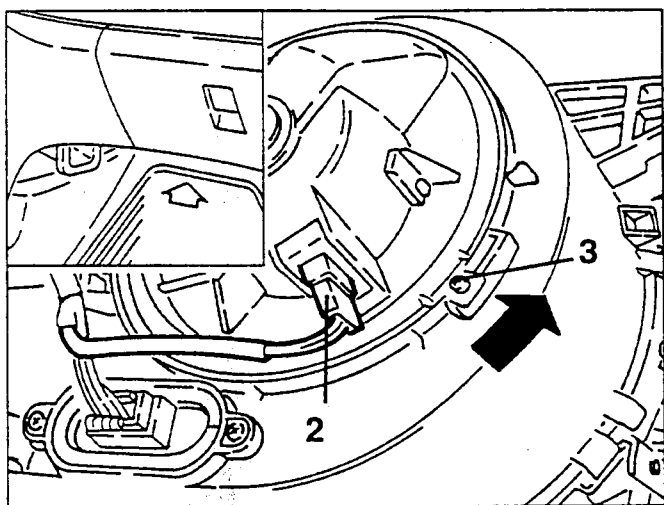
REMOVAL/REFITTING

- Remove the valve unit cover (see GROUP 70).
- 1. Slacken the two fastening screws and remove the protection for the coolant pipes at the radiator.
- 2. Disconnect the coolant inlet pipe from the tap and recover the fluid.
- 3. Slacken the tie-rod fastening screw, the two tap fastening nuts and remove it.

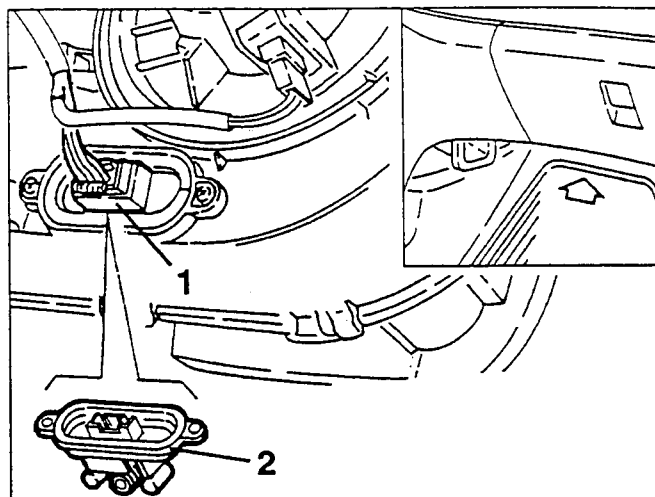


ELECTRIC FAN**REMOVAL/REFITTING**

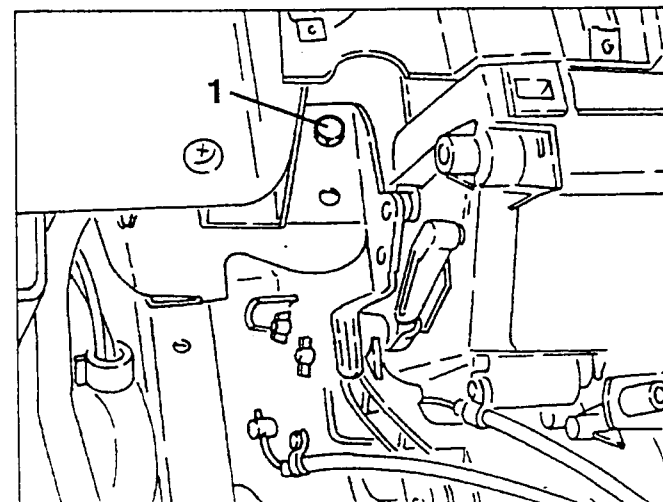
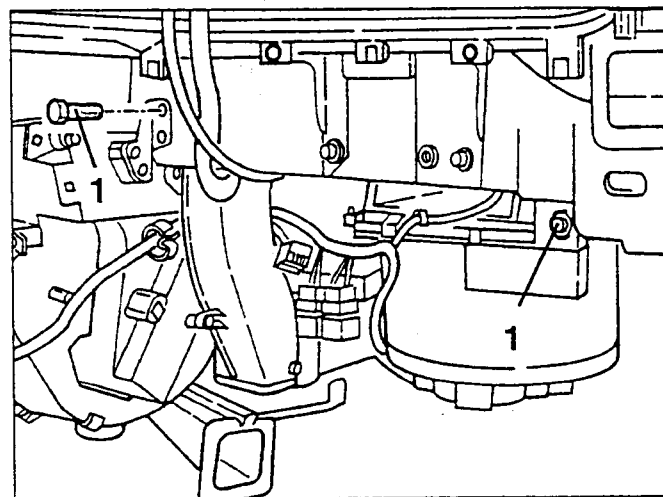
- Disconnect the battery (-) terminal.
- Remove the glove box (SEE GROUP 70).
- 1. Slacken the lower screw fastening the dashboard to be able to remove the fan.
- 2. Disconnect the electrical connection of the fan.
- 3. Slacken the fan fastening screw, turn it as shown in the figure, then remove it raising the mat.

**FAN RESISTANCE****REMOVAL/REFITTING**

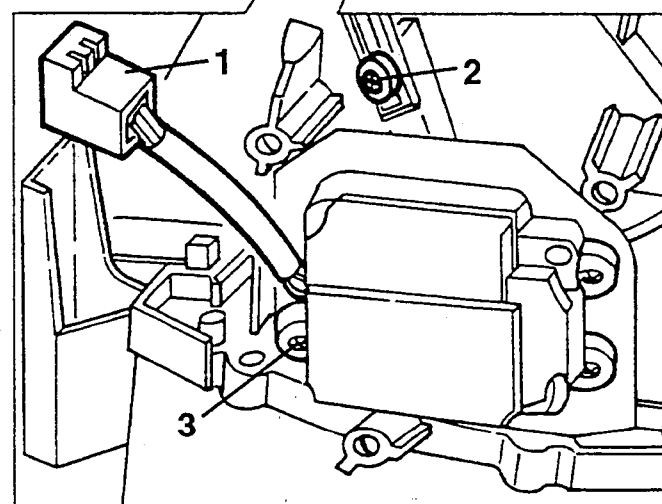
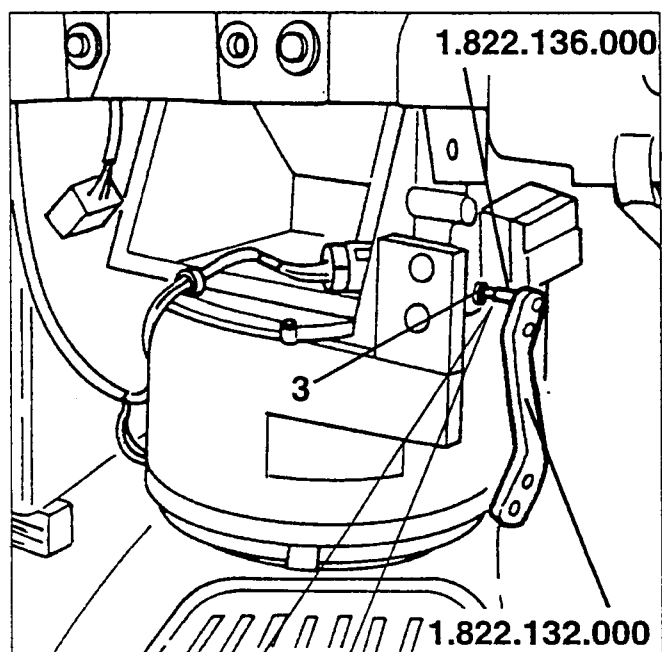
- Disconnect the battery (-) terminal.
- 1. Disconnect the electrical resistance from the fan.
- 2. Slacken the two fastening screws and remove the fan resistance.

**OUTSIDE AIR/RECIRCULATION VENT CONTROL MOTOR****REMOVAL/REFITTING**

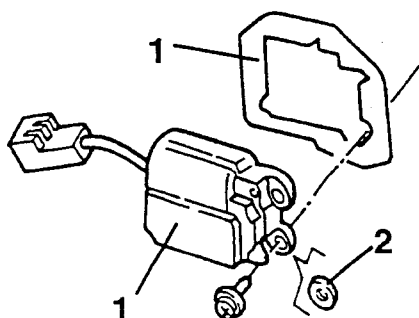
- Remove the lower part of the dashboard (SEE GROUP 70).
- 1. Slacken the four screws fastening the heating and ventilation unit to gain access to the motor.



1. Disconnect the electrical connection of the outside air/recirculation vent control motor.
2. Slacken the screw fastening the outside air/recirculation vent control motor.
3. Slacken the three cross-slotted screws fastening the motor using wrench N° 1.822.132.000 with bit N° 1.822.136.000



1. Remove the outside air/recirculation vent control motor complete with grommets on the fastening holes.
2. Retrieve the rear plate.

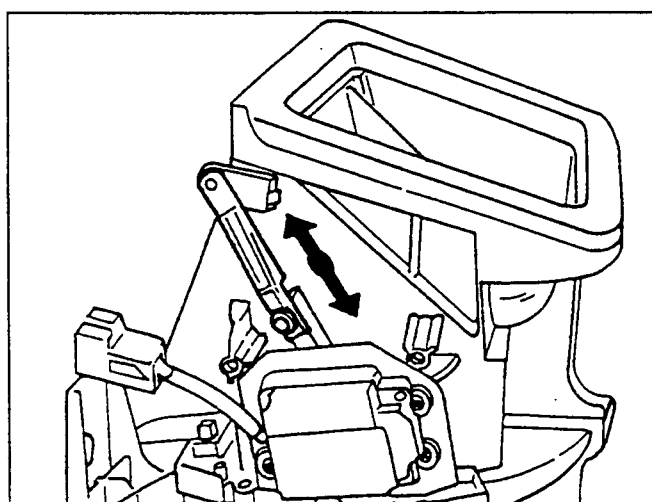


- When refitting replace the cross-slotted screws for fastening the motor with Allen screws to be tightened with wrench N° 1.822.132.000 and bit N° 1.822.136.000



When refitting check:

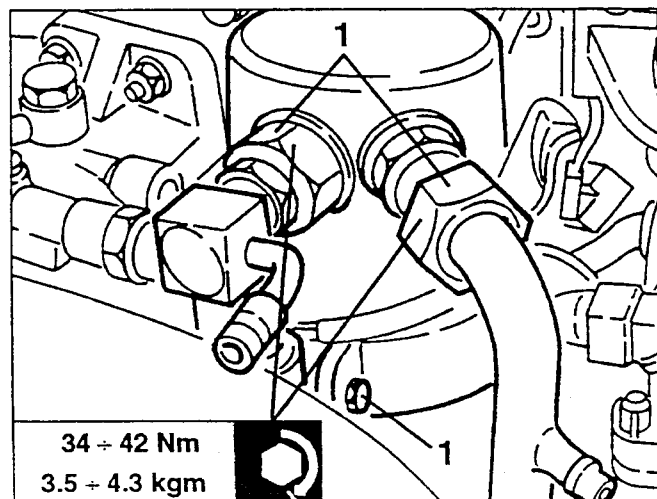
- the correct positioning of the grommets in the motor fastening holes;
- the correct closing of the outside air/recirculation vent through the corresponding control button, if necessary adjust the position of the vent acting on the control tie-rod as illustrated.



DRIER FILTER

REMOVAL/REFITTING

- Drain the freon from the conditioning system (see the specific paragraph).
- 1. From the drier filter disconnect the fluid inlet and outlet pipes.
- 2. Slacken the bolt fastening the clamp and remove the drier filter.

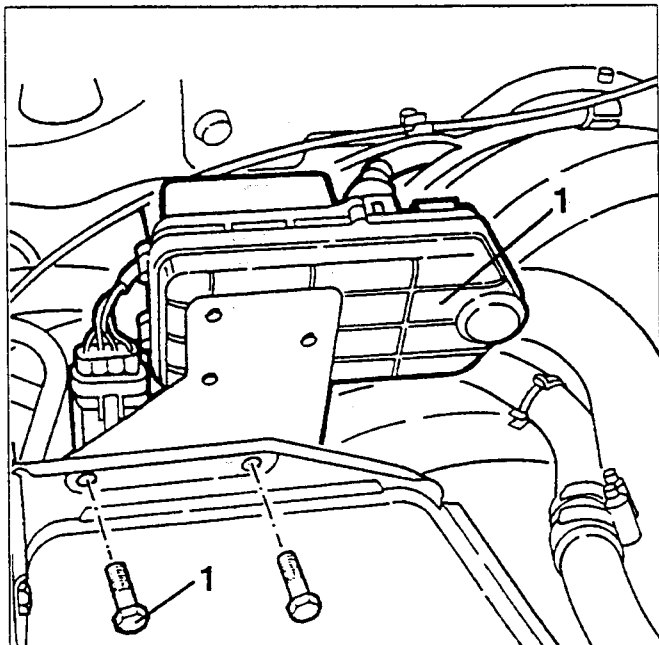


EXPANSION VALVE**REMOVAL/REFITTING**

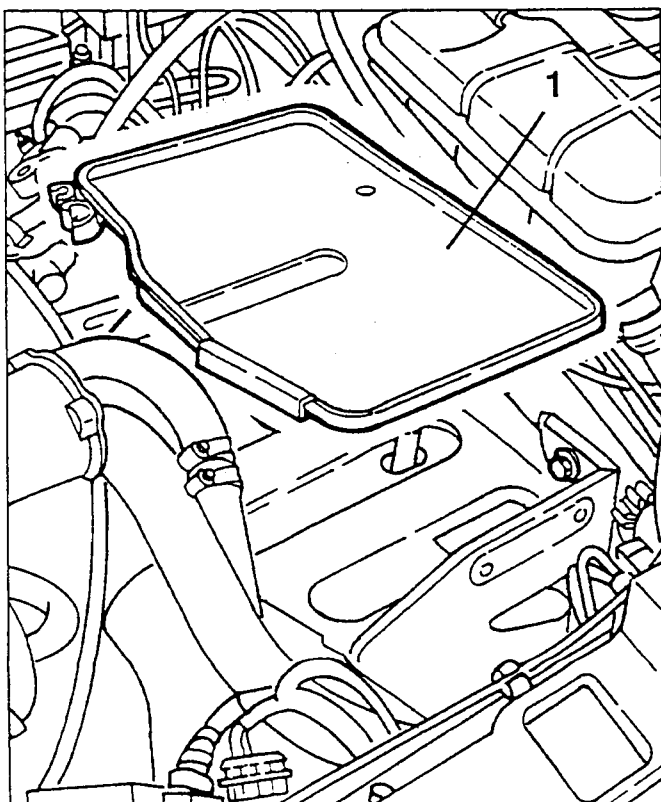
- Drain the fluid from the conditioning system (see the specific paragraph).

- Remove the battery (see GROUP 70).

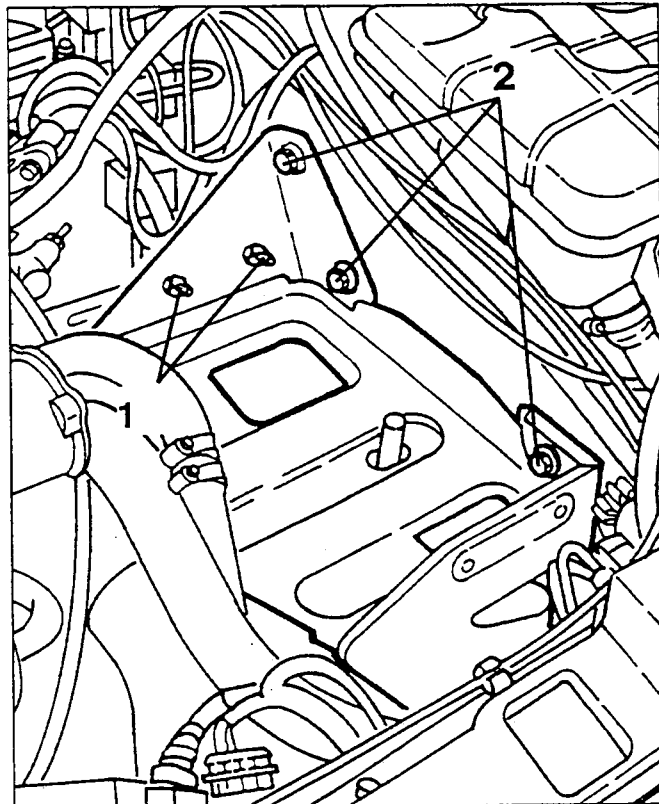
1. Slacken the two screws fastening the support for the relays and connections to the battery, then move it sideways.



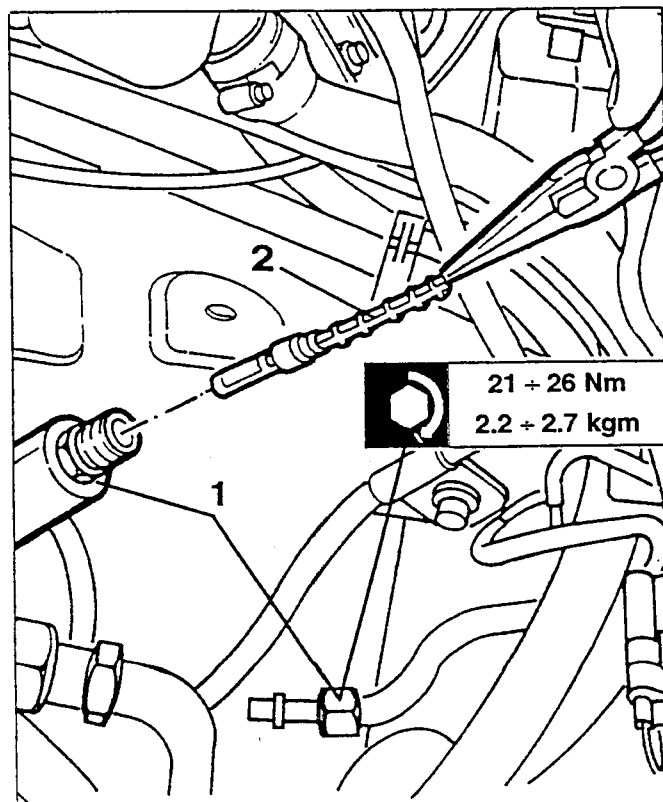
1. Remove the battery acid drain tray.



1. Slacken the two nuts fastening the support bracket for the glow plug control unit to the battery support.
2. Slacken the four fastening screws and remove the battery support.



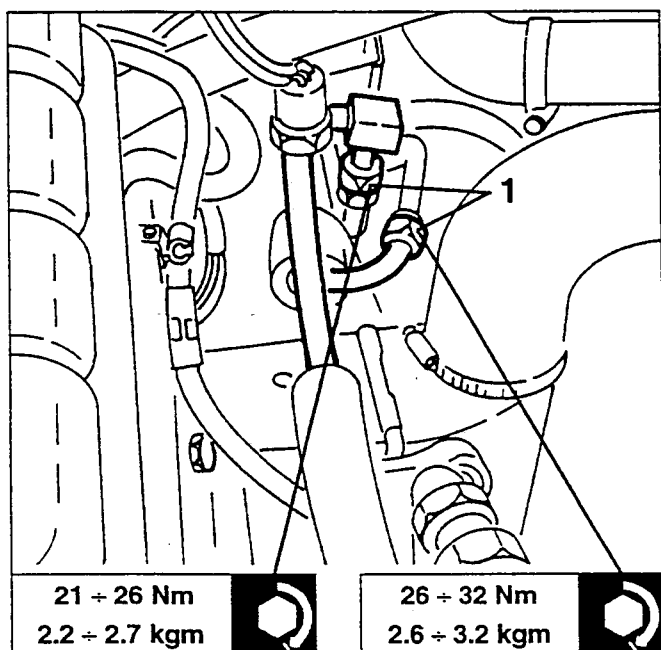
1. Slacken the intermediate union of the fluid delivery pipe from the condenser to the evaporator.
2. Remove the expansion valve.



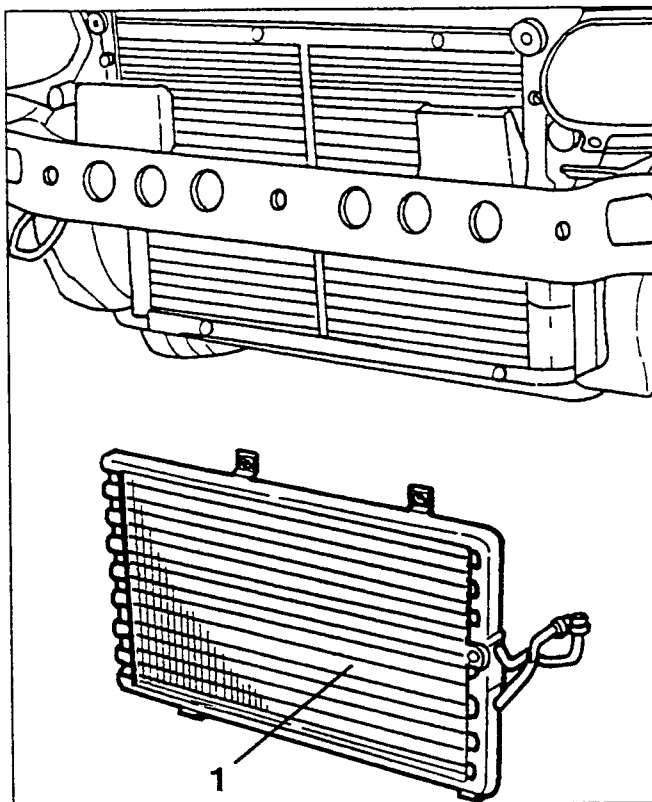
CONDENSER**REMOVAL/REFITTING**

- Set the car on a lift.
- Drain the fluid from the conditioning system (see the specific paragraph).
- Remove the radiator grille and the front bumper (see GROUP 70).
- Remove the battery (see GROUP 55).
- Follow the first three steps described in the "EXPANSION VALVE" paragraph.

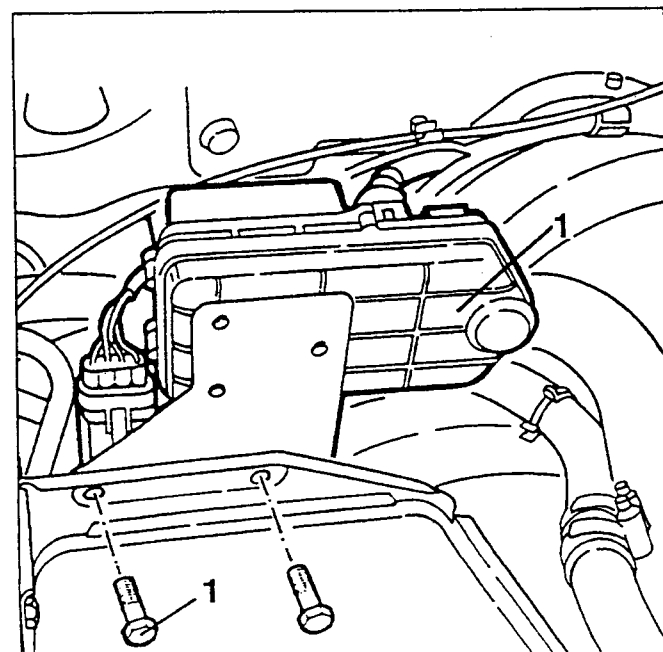
1. From the condenser disconnect the freon inlet and outlet pipe unions.



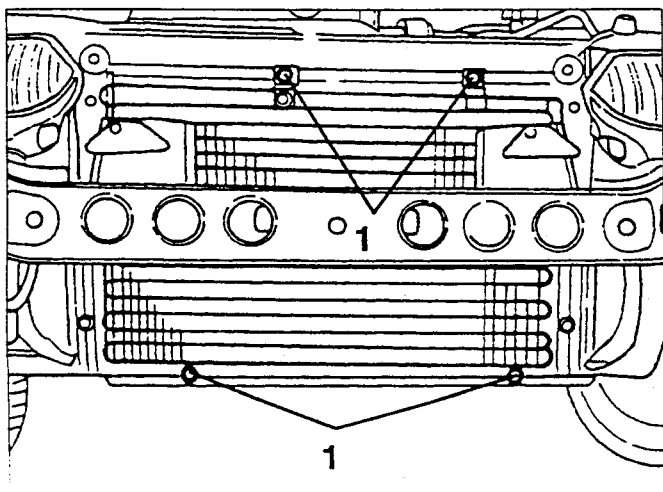
1. Remove the condenser pulling it downwards.

**THREE-LEVEL PRESSURE SWITCH (TRINARY)****REMOVAL/REFITTING**

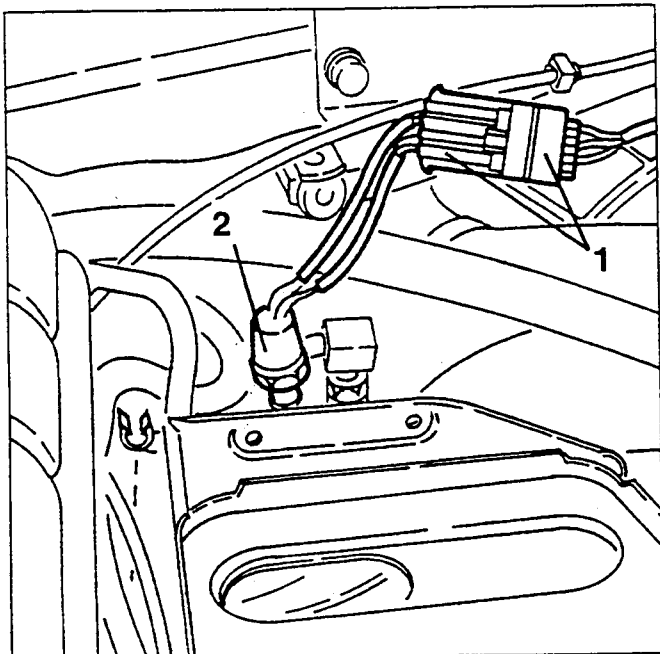
- Remove the battery (see the specific group).
- 1. Slacken the two screws fastening the support for the relays and connections to the battery, then move it sideways.



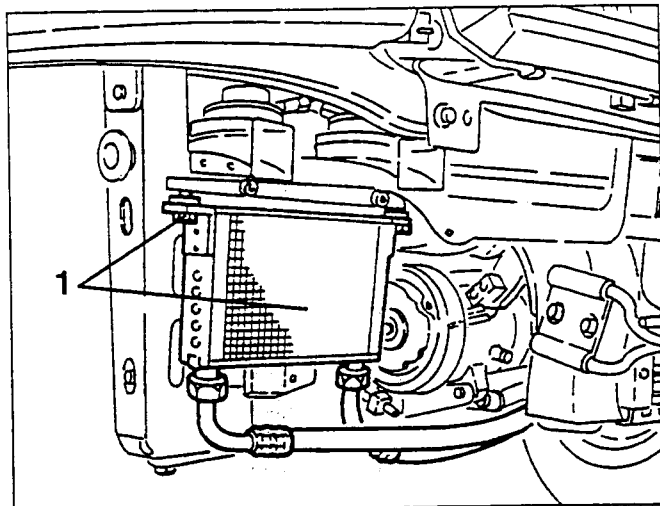
- Raise the car.
- 1. Slacken the four screws fastening the condenser to the radiator.



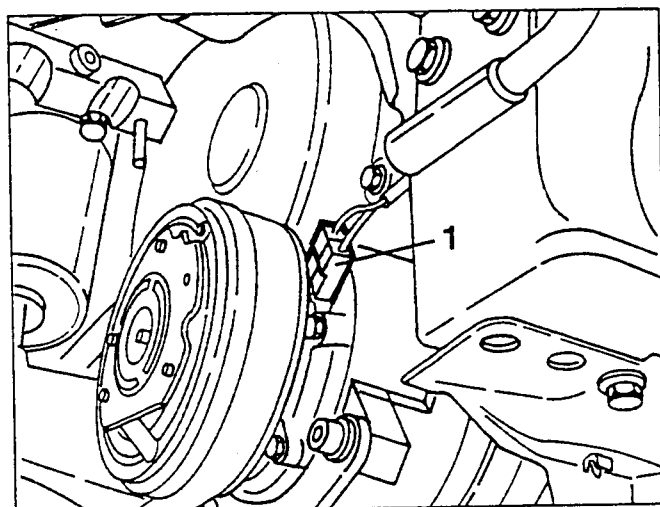
1. Disconnect the electrical connection of the three-level pressure switch.
2. Slacken and remove the three-level pressure switch.



1. Slacken the two fastening nuts and move the engine oil radiator sideways without disconnecting the pipes.



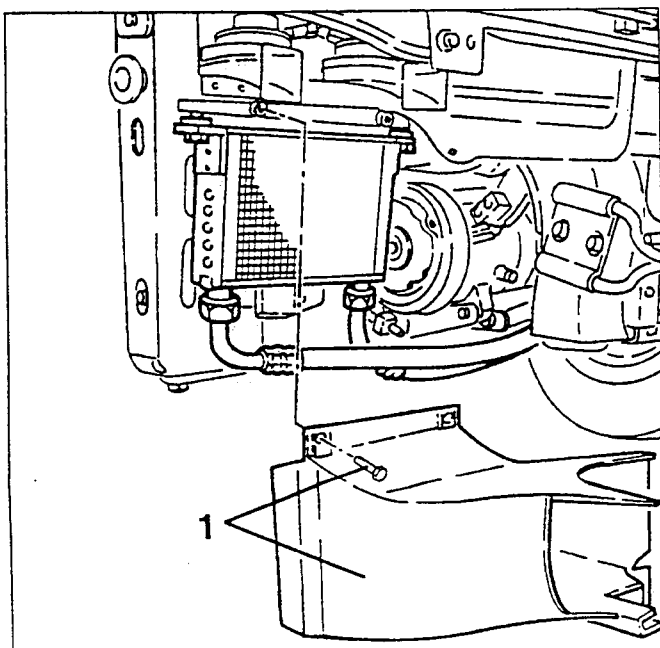
1. Disconnect the two electrical connections from the conditioner compressor.



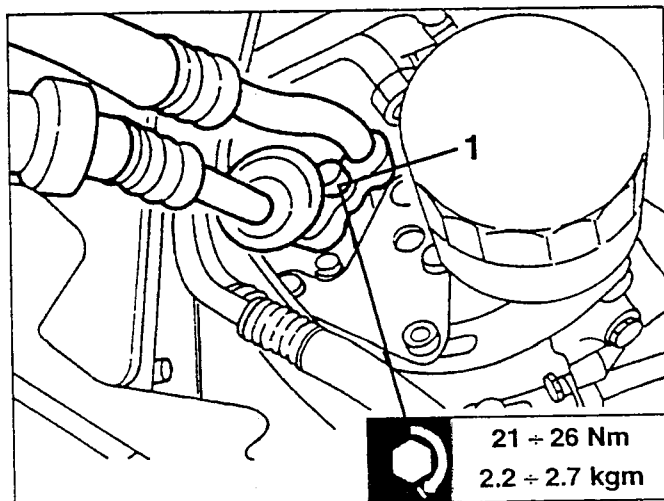
COMPRESSOR

REMOVAL/REFITTING

- Set the car on a lift.
 - Drain the fluid from the conditioning system (see specific paragraph).
 - Remove the radiator grille and front bumper (see GROUP 70).
 - Raise the car.
1. Slacken the fastening screws and remove the air ducting system to the engine oil radiator.

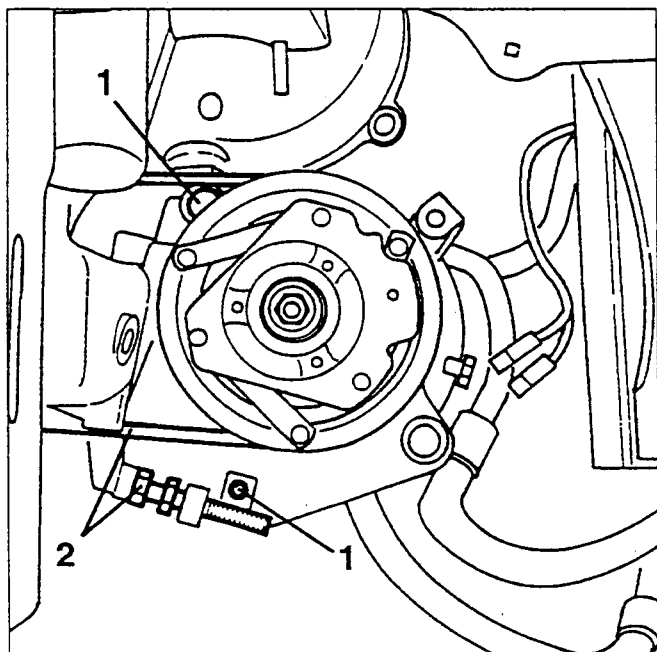


1. Slacken the fastening screw and disconnect the two freon pipes from the compressor.

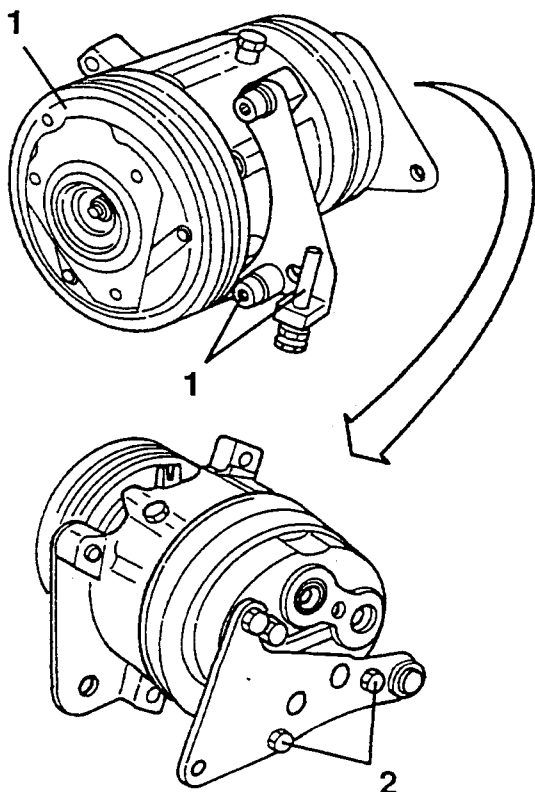


21 ÷ 26 Nm
2.2 ÷ 2.7 kgm

1. Slacken the compressor fastening bolts.
2. Working on the micrometric screw for tensioning the drive belt, after loosening the locknut, relieve the belt tension and take it off the compressor.



1. Completely unscrew the bolts loosened previously and remove the compressor complete with bracket.
2. On the bench slacken the fastening screws and separate the brackets from the compressor.



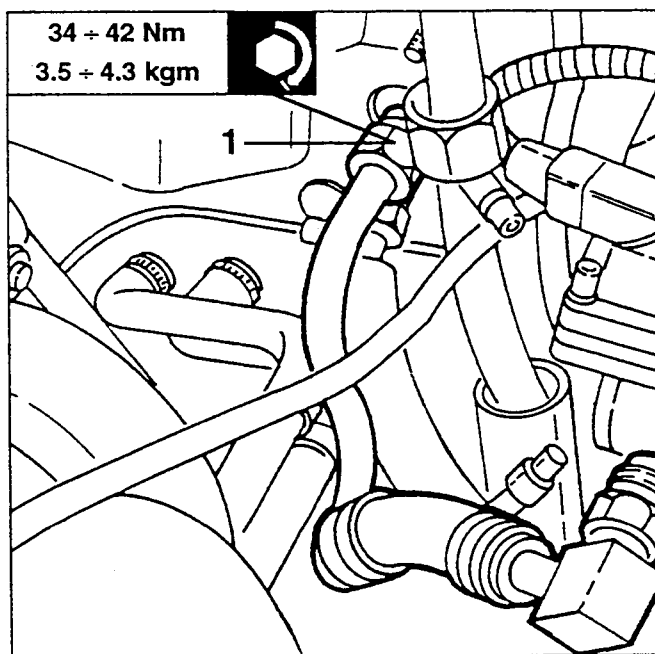
- When refitting, tension the conditioner compressor drive belt (see GROUP 00).

PIPING FROM EVAPORATOR TO DRIER FILTER

REMOVAL/REFITTING

- Drain the fluid from the conditioning system (see specific paragraph)
- Remove the battery (see GROUP 55).
- Follow the first seven steps described in the "DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT" paragraph.

1. Using wrenches N° 1.822.112.000 and N° 1.822.115.000 disconnect the pipe in question from the evaporator and remove it.

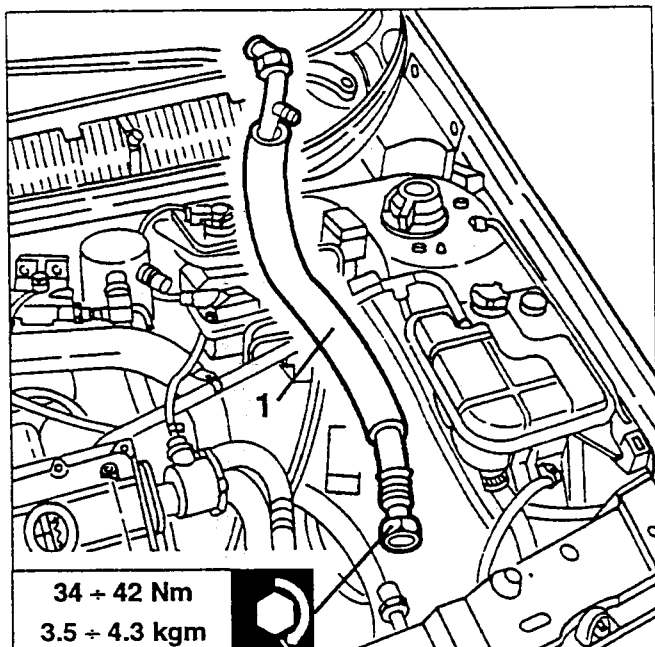


PIPE FROM DRIER FILTER TO COMPRESSOR

REMOVAL/REFITTING FIRST SECTION

- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the battery (see GROUP 55).
- Follow the first three steps described in the "EXPANSION VALVE" paragraph.

1. Disconnect the two unions of the section of pipe in question and remove it.

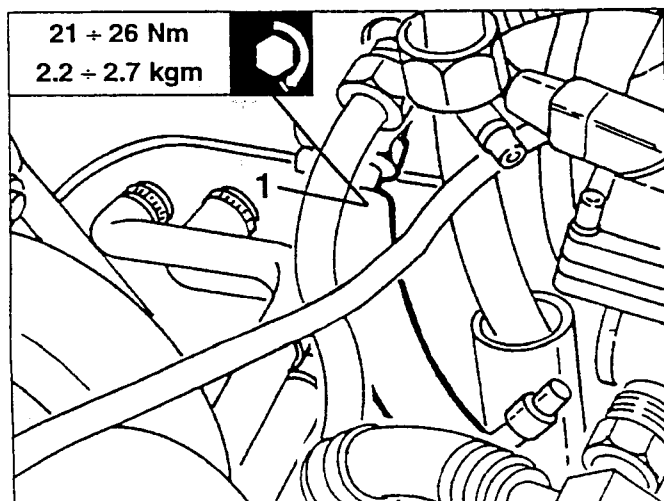


PIPE FROM CONDENSER TO EVAPORATOR

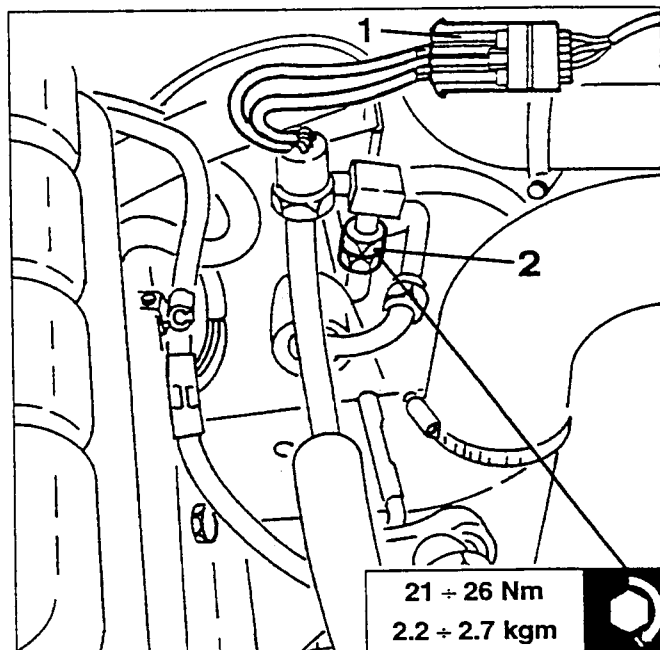
REMOVAL/REFITTING

- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the battery (see GROUP 55).
- Follow the first seven steps described in the "DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT" paragraph.
- Follow the first three steps described in the "EXPANSION VALVE" paragraph.

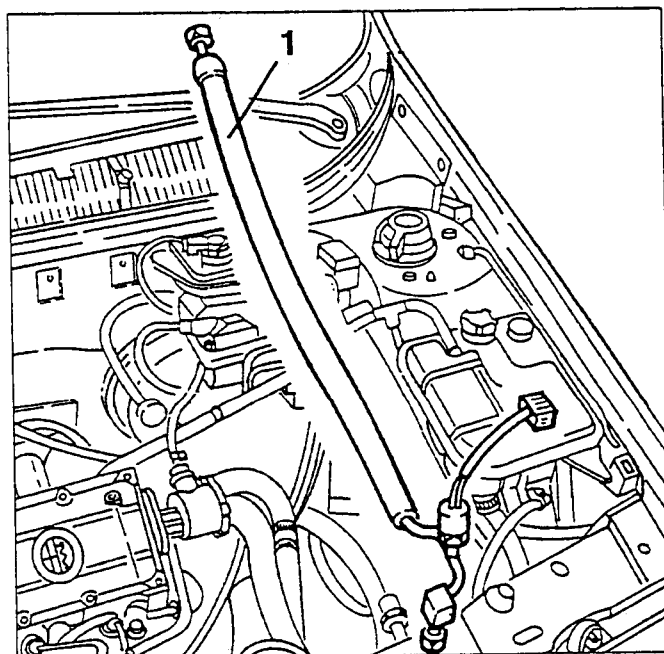
1. Using wrenches N° 1.822.111.000 and N° 1.822.113.000 disconnect the union of the pipe in question from the evaporator



1. Disconnect the electrical connection of the three-level pressure switch.
2. Disconnect the union of the pipe in question from the condenser.



1. Remove the pipe in question complete with three-level pressure switch and expansion valve.



COMPRESSOR SIDE PIPES

REMOVAL/REFITTING

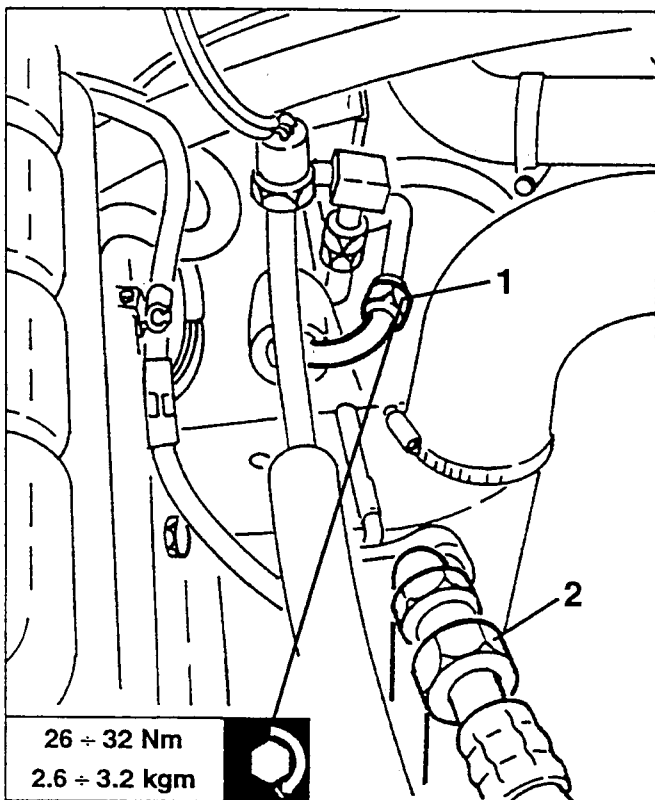
- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).

- Remove the radiator grille and front bumper (see GROUP 70).

- Follow the first three steps described in the "EXPANSION VALVE" paragraph.

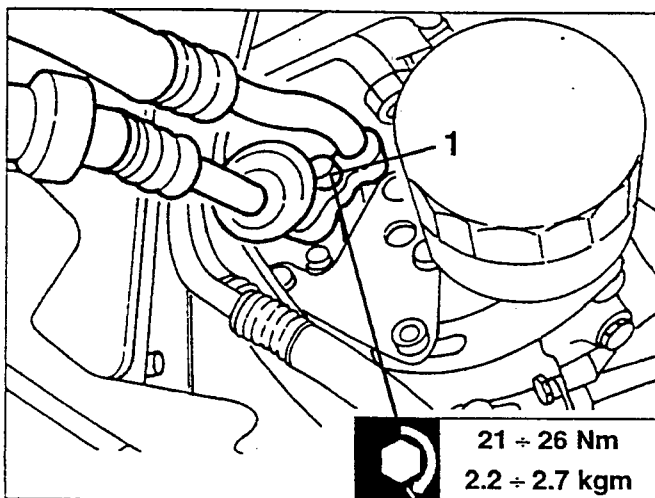
1. Disconnect the union of the pipes in question from the condenser.

2. Disconnect the intermediate union of the pipes in question.

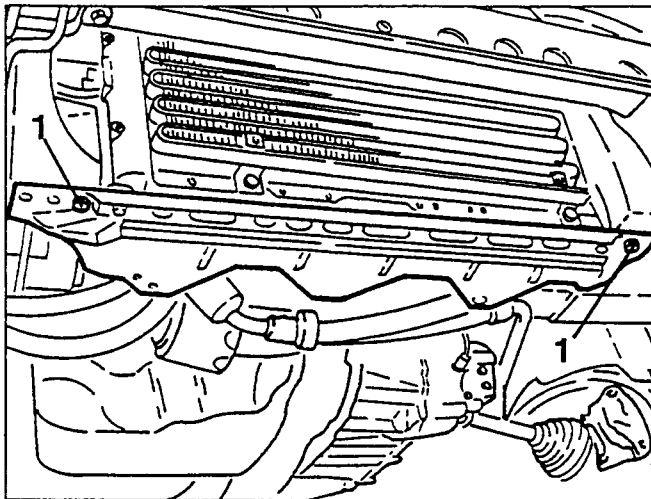


- Raise the car.

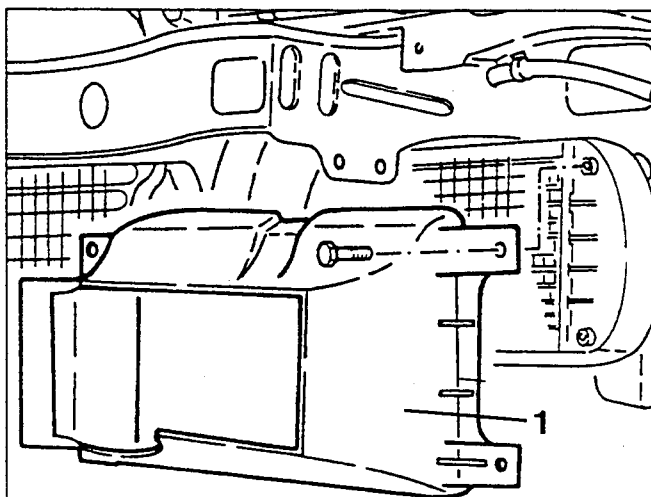
1. Slacken the fastening screw and disconnect the pipes in question from the compressor.



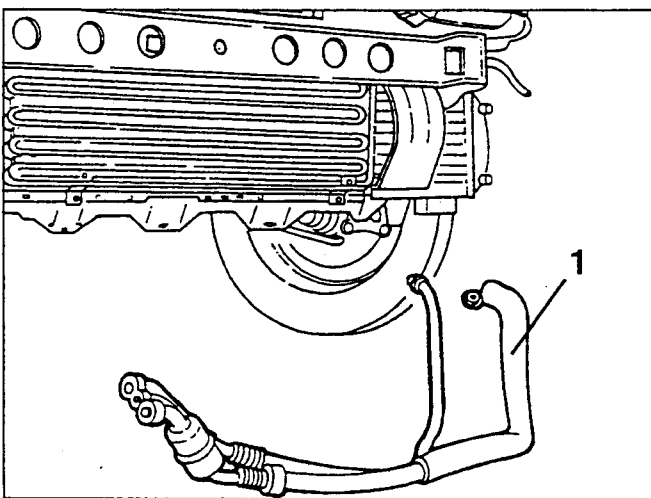
1. Slacken the fastening nuts and remove the lower radiator cross rail.



1. Slacken the fastening screws and remove the air ducting system from the intercooler.



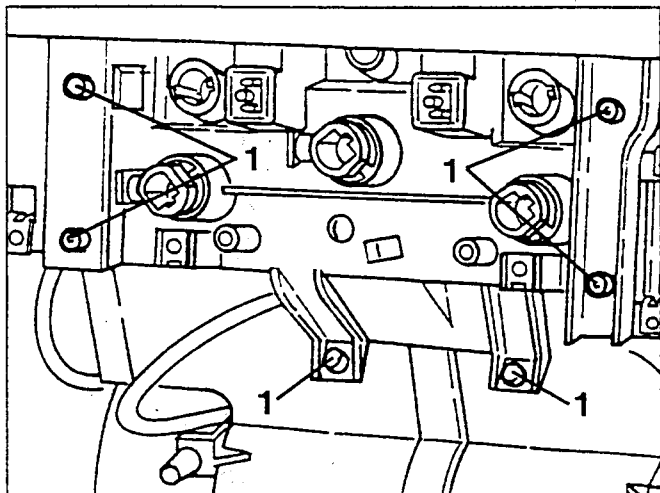
1. Remove the pipes in question.



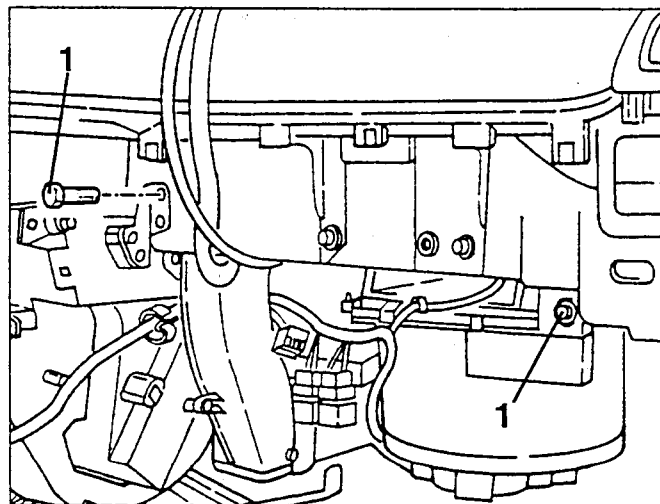
HEATER RADIATOR**REMOVING/REFITTING**

- Remove the lower part of the dashboard and the centre console (see GROUP 70).

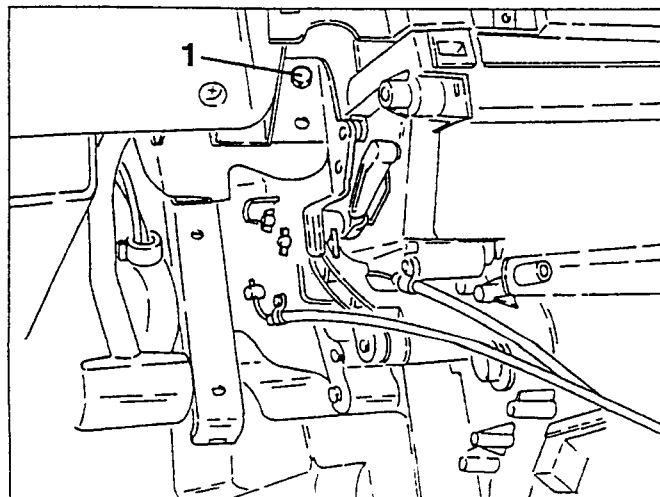
1. Slacken the fastening screws and lower the controls.



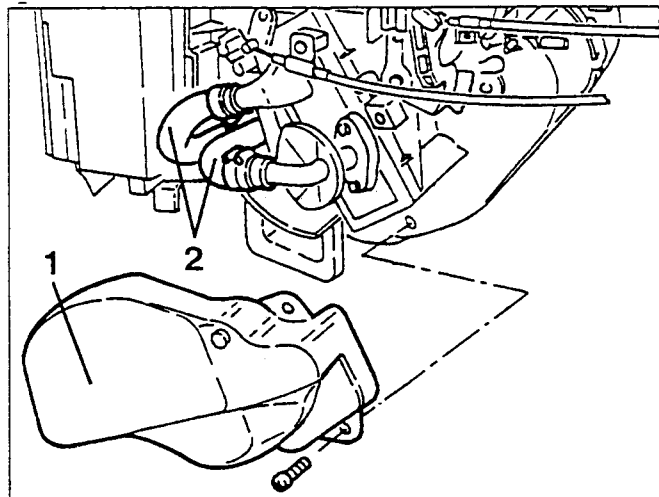
1. Slacken the three screws fastening the heating and ventilation unit on the righthand side.



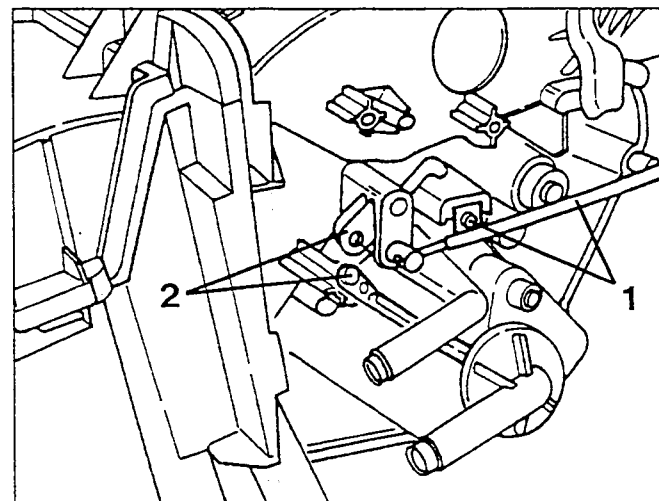
1. Slacken the screw fastening the heating and ventilation unit on the lefthand side.



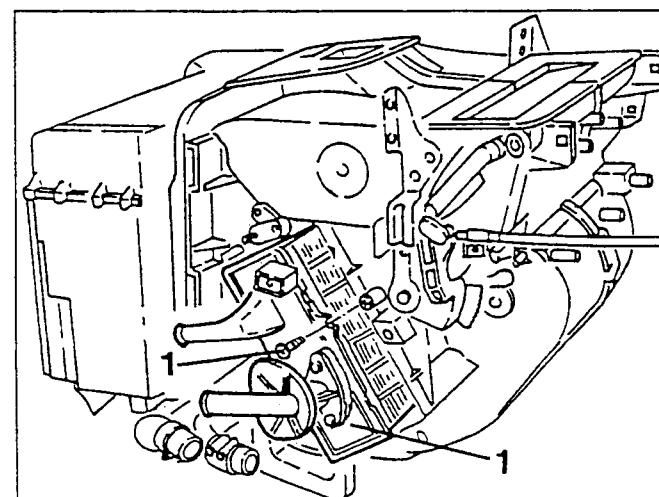
1. Slacken the fastening screws and remove the coolant pipe guard.
2. Disconnect the coolant fluid inlet and outlet pipes.



1. Remove the mixing port-coolant fluid inlet cock control cable.
2. Disconnect the fluid inlet cock control rod at the top.



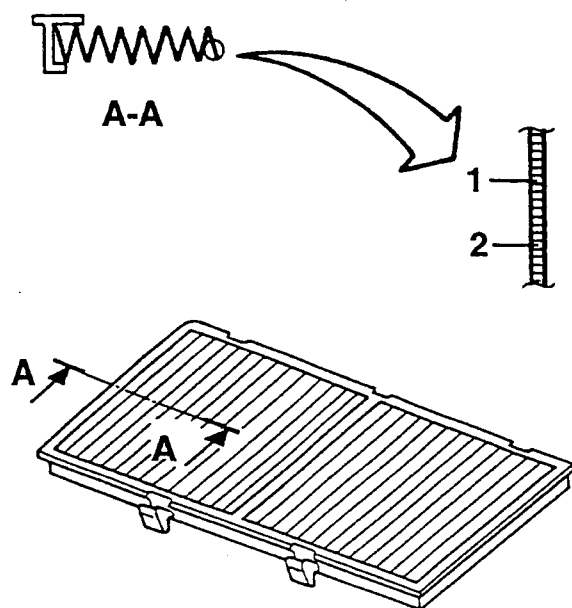
1. Move the unit enough to slacken the two fastening screws and take out the heater radiator.



POLLEN FILTER (upon request for the Versions /Markets for which it is foreseen)

The heating and ventilation unit may be fitted with a special dust/pollen filter formed of polyester fibres outside and electrostatically charged polycarbonate fibres inside (see figure).

This filter combines the mechanical filtering action of the air with an electrostatic effect so that the outside air admitted to the passenger compartment is cleaned and free of contaminants such as dust, pollen, etc., on condition of course, that the door windows are shut.



1. Polycarbonate fibres
2. Polyester fibres (non woven fabric)

NOTE:

The conditions of the filtering element should be checked once a year, preferably at the beginning of the warm season. It should be checked more frequently when the car is usually used in town or dusty areas.

REMOVAL/REFITTING

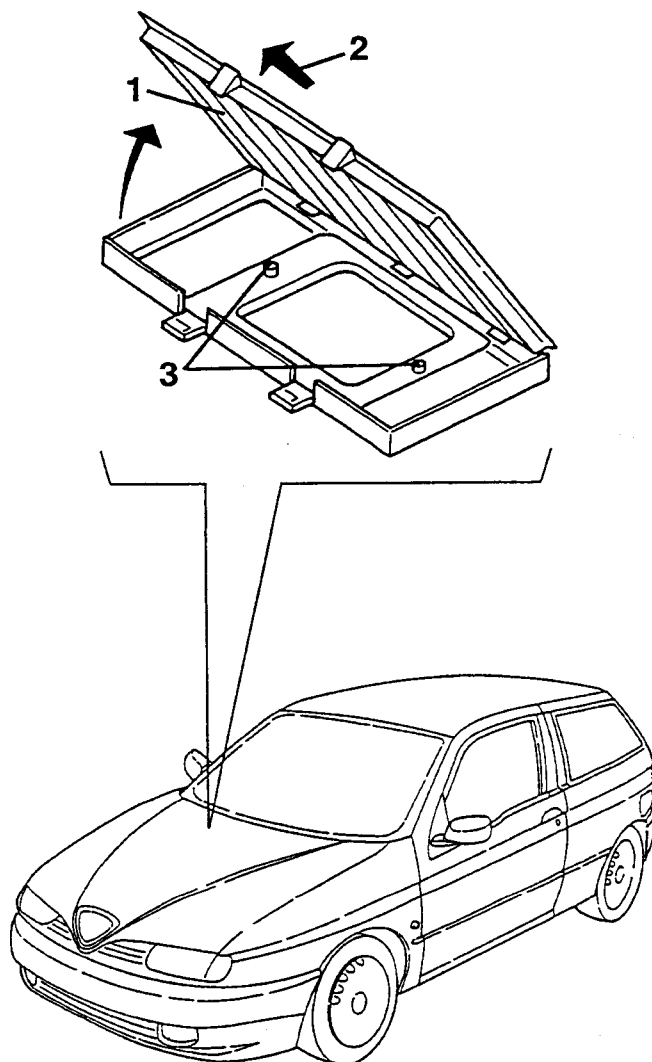


WARNING:

The failure to replace the filter or its incorrect installation can considerably reduce the effectiveness of the heating and ventilation system.

- Remove the air intake grille (see GROUP 70).

1. Raise the filtering element that is snap fastened by two hooks.
2. Remove the filtering element complete with frame; remove the element from the frame and replace it with a new one.
3. If necessary, remove the filtering element housing, slackening the two screws fastening it to the panel beneath.



LOCATING LEAKS IN THE SYSTEM

Check that all the unions are tightened. If leaking persists, check the presence of the O-rings on the unions, then add a certain amount of R134a to the system (appr. 200 gr.), find the leak using a leak detector, then drain the fluid and mend the leak. Use one of the leak detectors described in the special Tool Bulletins.

EMPTYING THE SYSTEM- RECOVERING THE REFRIGERANT FLUID

The safety rules given in the introduction must be adhered to. It is especially important to bear in mind the following:



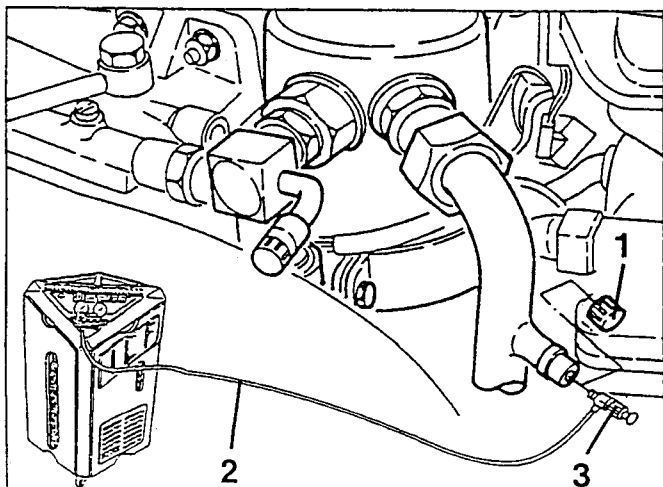
Any refrigerant fluid R134a spilt accidentally from the system or from the draining and recovery equipment can become toxic if very close to flames or in the presence of certain metals (magnesium and aluminium for example) in the form of fine particles or dust. It is therefore wise to work without free flames and in well-aired environments with the extractor system operating.

Avoid prolonged contact of the skin with refrigerant fluid R134a during evaporation as the low temperature (appr. -30°C) it reaches at the end of expansion can cause cold "burns". It is therefore wise to use leather or thick fabric gloves.

The eyes must absolutely be protected from contact with the fluid as the very low temperature can cause serious harm to them.

Discharge of the refrigerant fluid to the atmosphere is an environmental hazard. Only use the specific equipment specified in the Tool Bulletins and described below for draining R143a from the system.

1. Slacken and remove the plug of the valve on the low pressure pipe.
2. Connect the drainage pipe to the drainage/recovery station.
3. Fit the special quick coupling pipe provided with the R143a recovery equipment on the valve and completely drain the fluid from the system, following the directions given in the instructions for the equipment.



RECHARGING THE REFRIGERANT FLUID

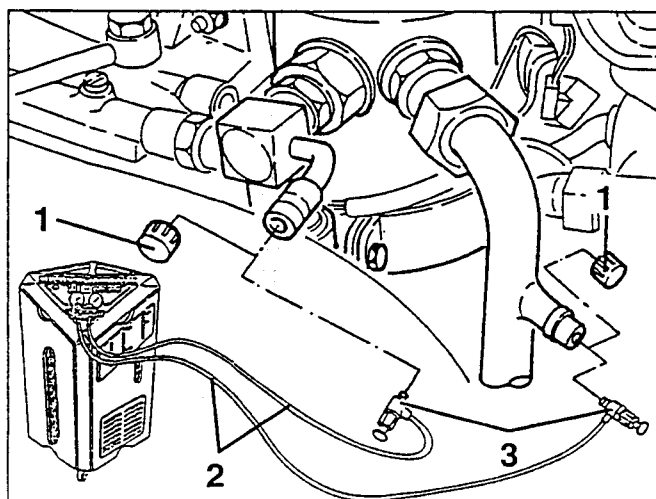
1. Slacken and remove the caps from the rapid coupling valves located on the low pressure hoses.

2. Connect the drainage pipe to the refrigerant fluid drainage/recovery station.

WARNING:

Adhere to the technical specifications (see GROUP 00) for the quantity of R134a to be used for recharging.

3. Connect the high and low pressure union pipes to the corresponding quick coupling valves and begin the R134a recharging procedure following the directions in the instructions of the equipment.



R134a is a fluid which, if used with suitable care, is harmless for both persons and cars: however, as it is kept under pressure, it is subject to physical transformations which can make it harmful if it is not kept under perfect control. Therefore, the following warnings must be strictly adhered to.

The coolant is normally stored in metal cylinders: never expose the cylinders to sunlight for prolonged lengths of time, an increase in temperature increases the pressure that could exceed the safety limit.

During cold weather, difficulty is likely in transfer from the metal cylinder to the charging station due to the low pressure in the cylinder: in this case, before transferring, leave the cylinder for about twenty minutes in a heated place at temperatures not exceeding 35°C, and never using a free flame to warm the cylinder. Never leave the charging station cylinder completely full for long lengths of time.

Before recharging the system, top up the compressor with the oil removed during drainage (see the following paragraph).

To top up the lubricating oil in the conditioner compressors for R134a, only use the quantity and type of oil specified.

When recharging refrigerant fluid R134a only use the special equipment described in the specific Tool Bulletins.

TOPPING-UP THE OIL LEVEL IN THE COMPRESSOR

NOTE:

The compressor oil level should only be topped up when presumably a considerable amount has been leaked due to damage or disconnections of the conditioning unit components or when the system is drained/recharged.

In the event of operations in the engine compartment involving leaving the pipes of the system exposed to the air for more than six hours, topping up is insufficient and the compressor lubricating oil needs to be changed completely, proceeding as described in the following point C (after washing the system - see the specific paragraph).

To top up the oil level only use oil of the type specified in the specifications (see GROUP 00).

A) "SLOW" SYSTEM DRAINING - In case of Routine Maintenance

When draining the system using the equipment described previously, the compressor oil removed is collected in a special graduated container.

- Before recharging the refrigerant fluid, top the system up with the quantity marked on the container, plus 15 cm³.

- Use a syringe to send the oil through the special hole on the evaporator outlet pipe.

B) "QUICK" SYSTEM DRAINING (In under 5 minutes)

In the case of Accidental Breakages

Under these circumstances it is not possible to determine the exact quantity of the oil lost. Replace it as described above, in all cases with 50 cm³ of oil.

N.B.: if for some reason, the compressor is removed and refitted follow the description given in point C.

C) DRAINAGE FOLLOWED BY REMOVAL AND REFITTING OF THE COMPRESSOR

- Drain the R134a fluid from the conditioning system.
- Remove the compressor (see the specific paragraph).

- Remove the plug from the oil drainage/charging hole and drain off all the oil contained in the compressor (N.B. turn the compressor a few times by hand to send all the oil out).

- Refill with oil of the specified type and quantity given in the specifications (see GROUP 00).

- Re-assemble the compressor on the car.

- Recharge the system.

N.B.:

When the compressor is replaced with a new one it is not necessary to top up the system because the compressor supplied as spare is already provided with the specified amount of oil.

WASHING THE SYSTEM



In the event of damage or breakage of the compressor or of other components of the system, the system should

be accurately washed.

Washing should also be carried out to remove any damp if the pipes are left open exposed to the atmosphere for over six hours during operations in the engine compartment.

Proceed as follows:

- If the compressor has suffered damage that might have caused the presence of metal in the pipes, the connection pipes (unions) to the compressor should be blown with compressed air.

- Fill with 1.5 ÷ 2 kg of R134a on the high pressure side - red tap.

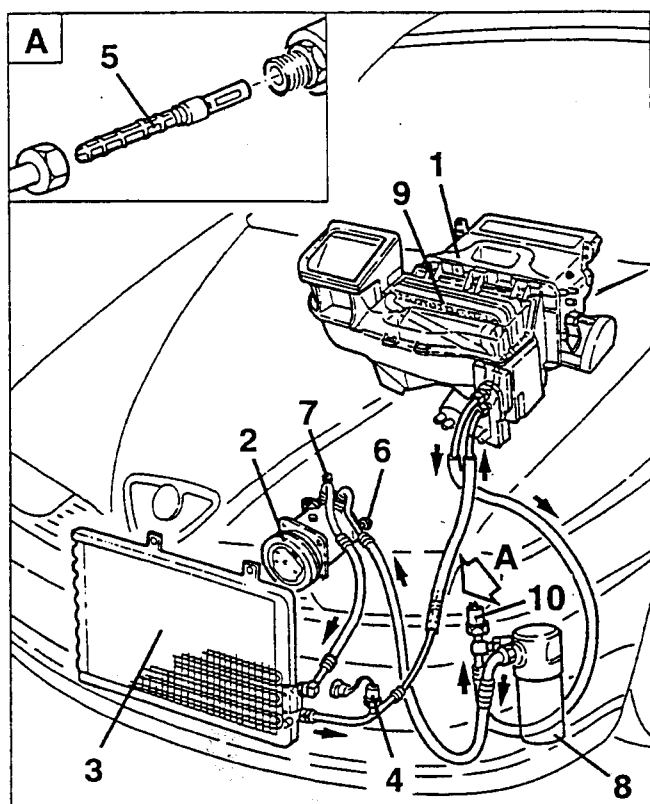
- Carry out recovery operations from the low pressure side.

- Fill a second time with 1.5 ÷ 2 kg of R134a (use the same fluid).

- Connect the system with the special drainage/recovery system described previously.

- After washing, change the drier filter and clean the filter of the expansion valve (when fitted).

- Recharge the system as described previously.

SYSTEM

1. Heating and ventilation Unit
2. Compressor
3. Condenser
4. Three-level pressure switch (trinary)
5. Expansion valve
6. Needle valve for draining/recharging
R134a on the low pressure pipe
7. Needle valve for draining/recharging
R134a on the high pressure pipe
8. Drier filter
9. Evaporator
10. Minimum pressure switch

DESCRIPTION

The heating and ventilation system for the models with boxer engines is substantially the same as the one fitted on the model with turbodiesel engine. The main differences from this system are the following:

- the adoption of a compressor with fixed rather than variable displacement;
- the adoption of a minimum pressure switch;
- different positioning of the system components in the engine compartment.



BELOW ARE GIVEN THE VARIANTS (FOR EXAMPLE THE MONOGRAPHIC PARTS AND PROCEDURES) TO THIS SYSTEM IN RELATION TO THE TURBODIESEL VERSION

STRATEGY FOR CONNECTING AND DISCONNECTING THE COMPRESSOR

The compressor is controlled by the engine electronic injection management system which adapts the idle speed when the compressor is connected, or it cuts off the connection.

IAW injection system management

In addition to adapting the idle speed each time the compressor is connected, this injection system temporarily disables (appr. 10 sec) the compressor connection if high engine power is required.

MP3.1 injection system management

This injection system only adapts the engine idle speed each time the compressor is connected.

M2.10.3 injection system management

The injection system control unit carries out the following strategies:

- it adapts the engine idle speed each time the compressor is connected; if the engine speed falls below 700 rpm, the compressor is disconnected;
- in the need for high power (high speed - above 6000 rpm engine at full load - max throttle opening) it momentarily cuts off the supply to the compressor;
- it does not allow the compressor to be connected when starting the engine until normal operating conditions have been reached.

DESCRIPTION OF THE MAIN COMPONENTS OF THE AIR CONDITIONING SYSTEM**MINIMUM PRESSURE SWITCH**

The purpose of the minimum pressure switch is to de-energize the electromagnetic joint of the compressor pulley when the pressure (in the accumulator) reaches a mean rating of 1.72 bar re-energizing it again when the pressure reaches the mean rating of 3.17 bar, in order to maintain the cold required and to prevent the evaporator from freezing.

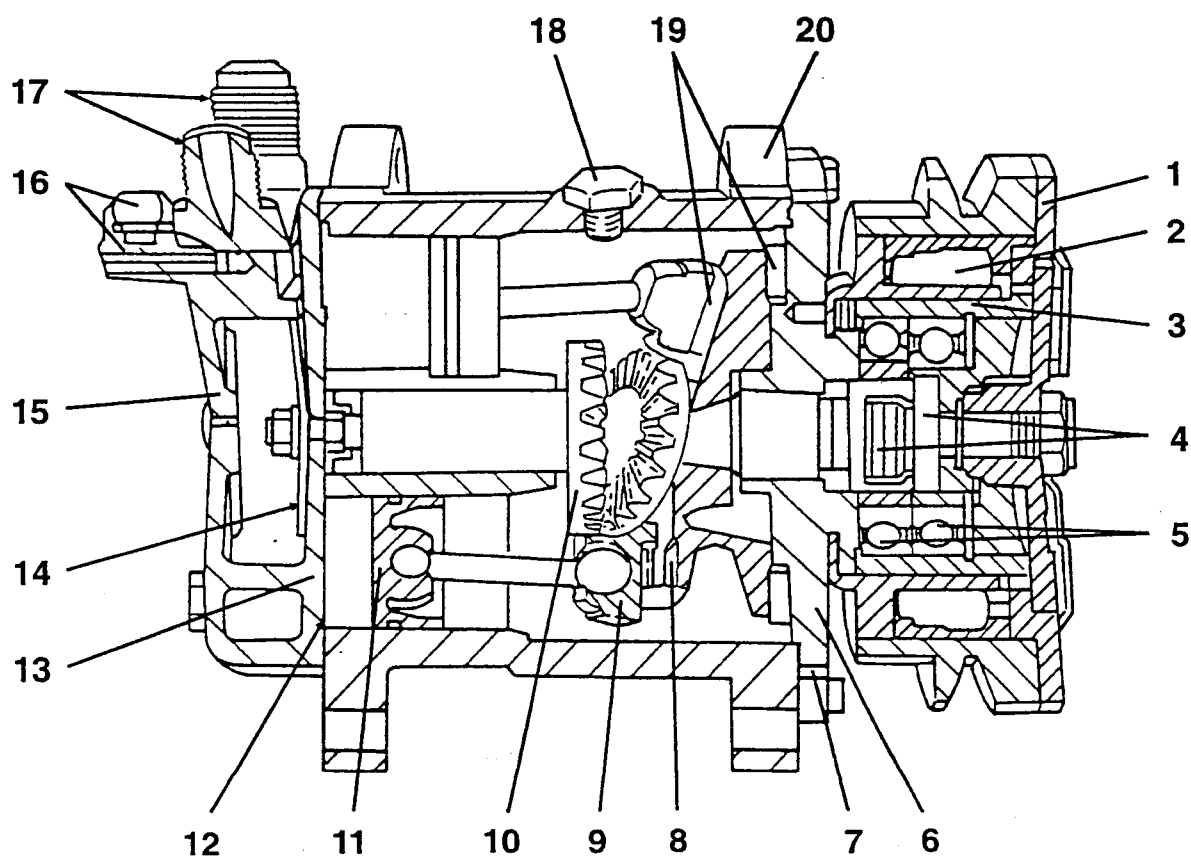
It also protects the compressor disconnecting the electromagnetic joint from its pulley when the pressure of the refrigerant falls below 1.58 bar due to a leak or when the environment temperature falls below 2.7°C.

COMPRESSOR

The SANDEN compressor shown in diagram form in the cutaway view below comprises the following:

- a block (20);
- seven pistons (11) complete with corresponding connecting rod;
- a plate (13) with one-way blade type delivery and intake valve that operates automatically;
- a cylinder (15) head on which the intake and exhaust ducts are machined (17).

The reciprocating motion needed for the pistons to run in their liners is developed by the rotary motion of a tilted plate (rotor 8) on which, with the interposition of roller (18) a plate (9) rests to which the connecting rods of the pistons (11) are connected by ball joints. The plate (9) is unable to rotate and it articulates on two toothed gears (10).



1. Clutch plate
2. Electromagnet
3. Rotor with pulley
4. Set of seals
5. Ball bearings
6. Front plate
7. Seal ring
8. Rotor
9. Connecting rod carrier plate
10. Antirotation gear

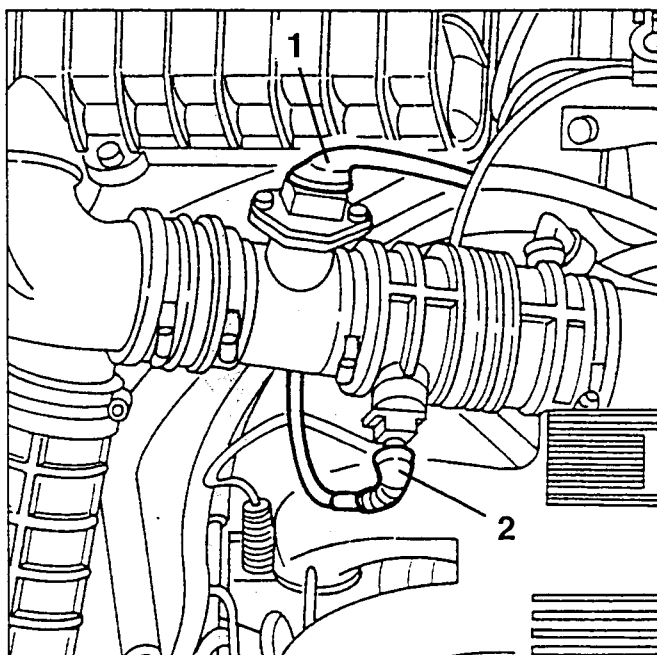
11. Piston
12. Seal for valve plate
13. Valve plate
14. Cylinder head seal
15. Cylinder head
16. Service needle valve
17. Intake and delivery ducts
18. Oil filler plug
19. Roller thrust bearings
20. Compressor block

DUCTING SYSTEM AND HEATER - DISTRIBUTOR UNIT (TWO BOWDEN)

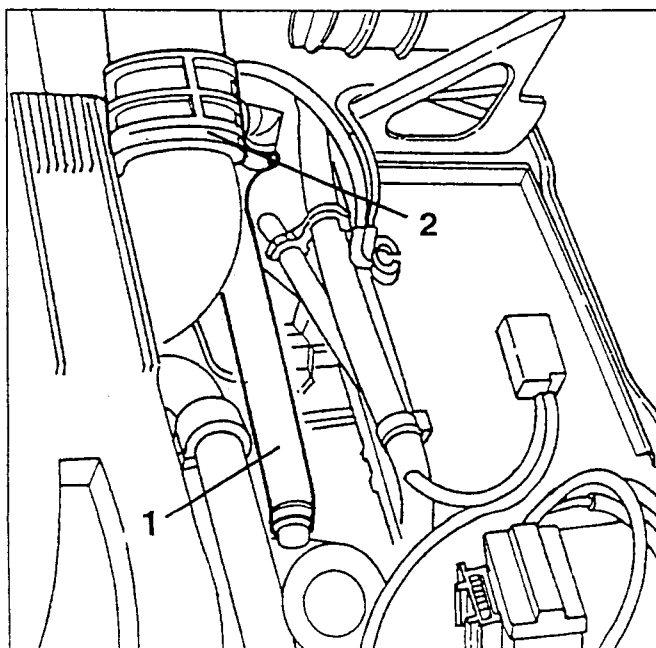
REMOVAL/REFITTING

- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the battery with its acid drain tray (see GROUP 55).

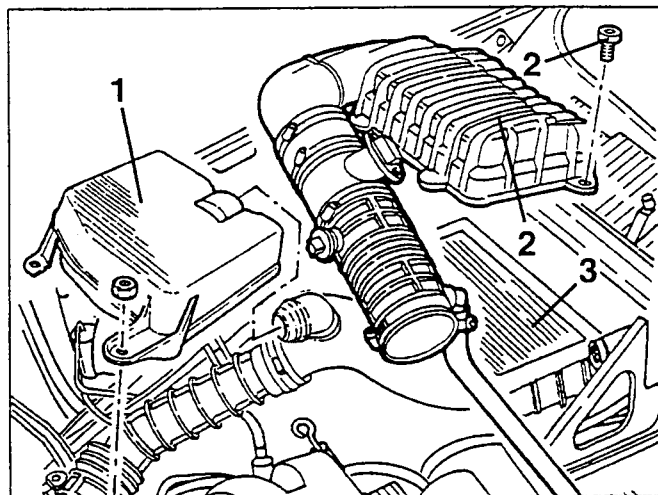
1. Disconnect the electrical connection from the air flow meter.
2. Disconnect the electrical connection from the intake air temperature sensor.



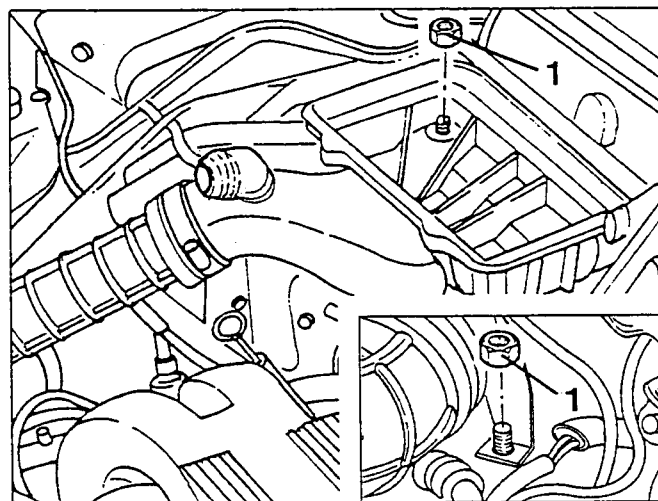
1. Disconnect the oil vapour recovery pipe from the engine oil filler.
2. Disconnect the corrugated sleeve from the intake box.



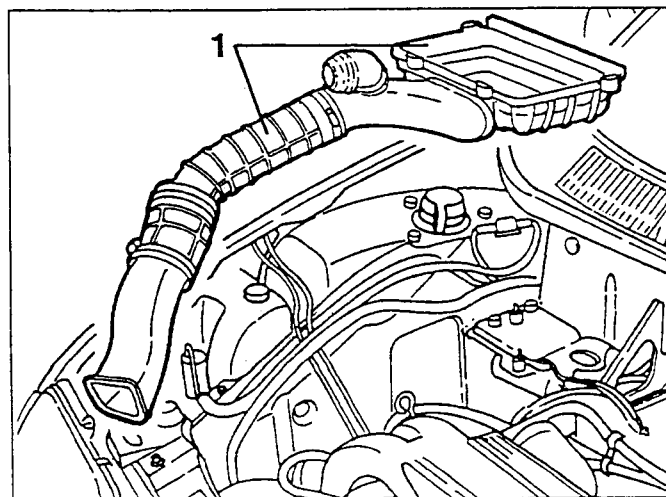
1. Remove the resonator
2. Slacken the four fastening screws and remove the air cleaner cover complete with sleeves.
3. Remove the filtering element.



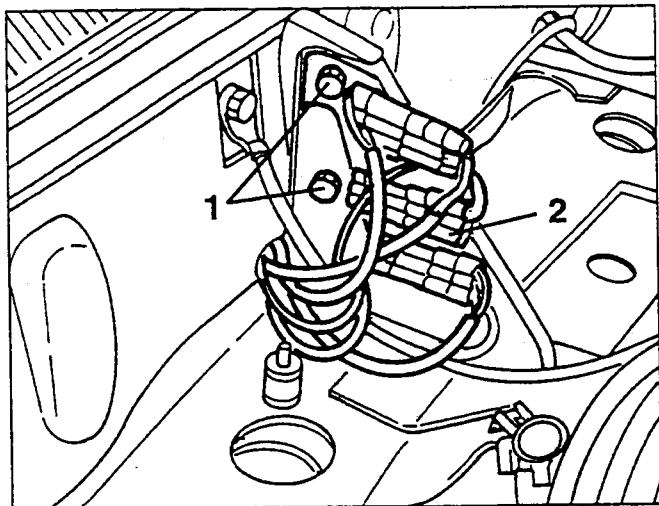
1. Slacken the three air cleaner fastening nuts and the front bolt fastening the air intake sleeve.



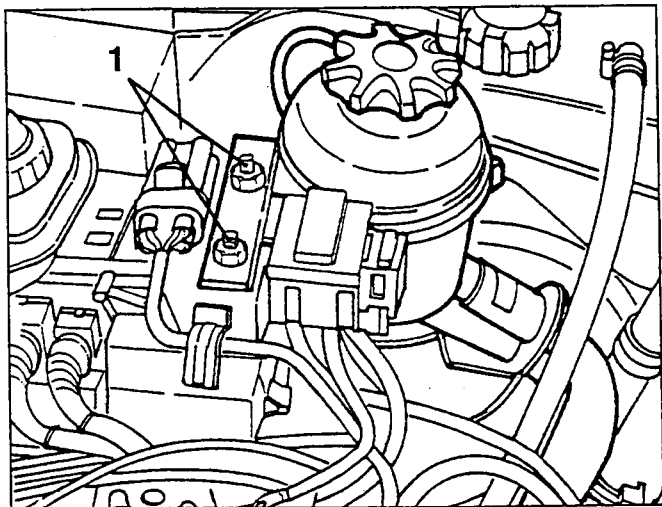
1. Remove the air cleaner box complete with air intake sleeve.



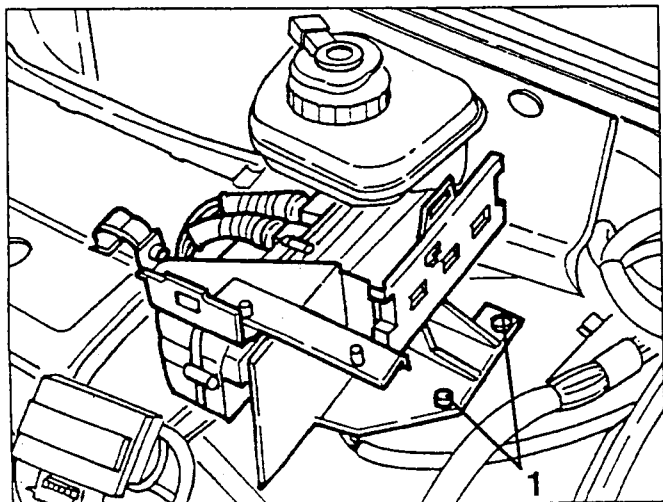
1. Slacken the two screws fastening the power steering crossrail support bracket.
2. Move the electrical connections away from the power steering crossrail support bracket.



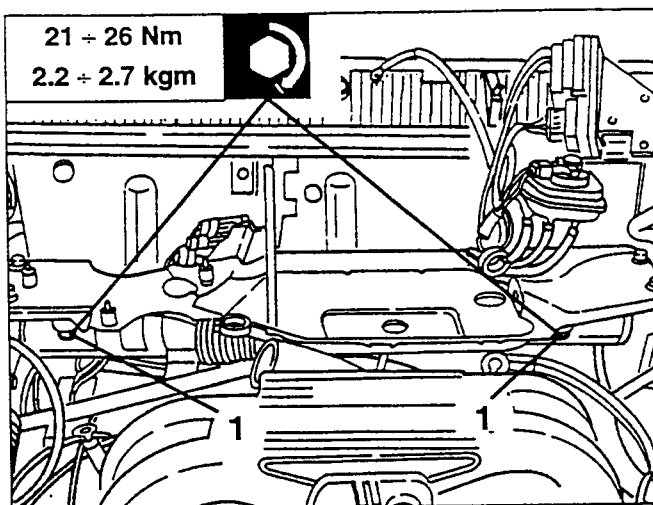
1. Slacken the two fastening screws and move the power steering reservoir sideways without disconnecting the pipes.



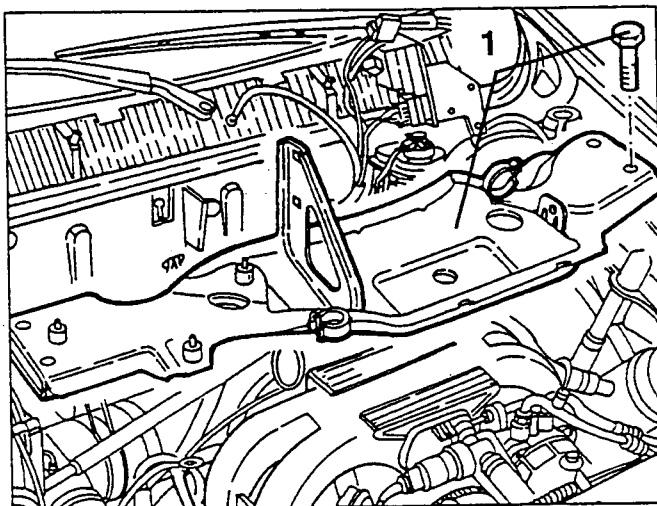
1. Free the support bracket of the relay switches from the electrical connections, then slacken the fastening screws and move it to one side.



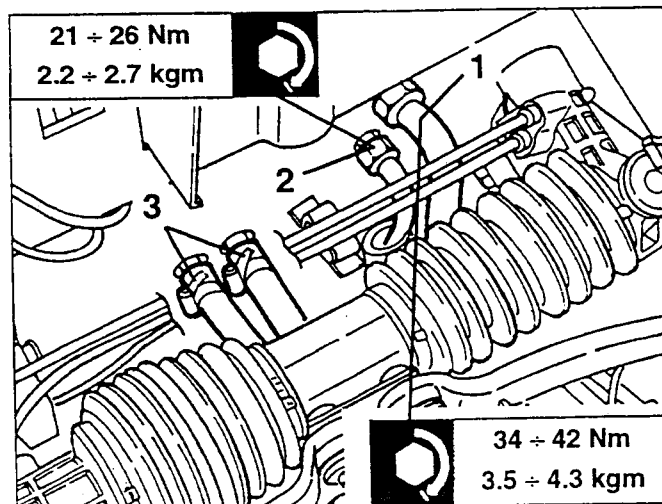
1. Slacken the four screws fastening the power steering box to the support crossrail.



1. Slacken the four fastening screws and remove the power steering unit support crossrail.

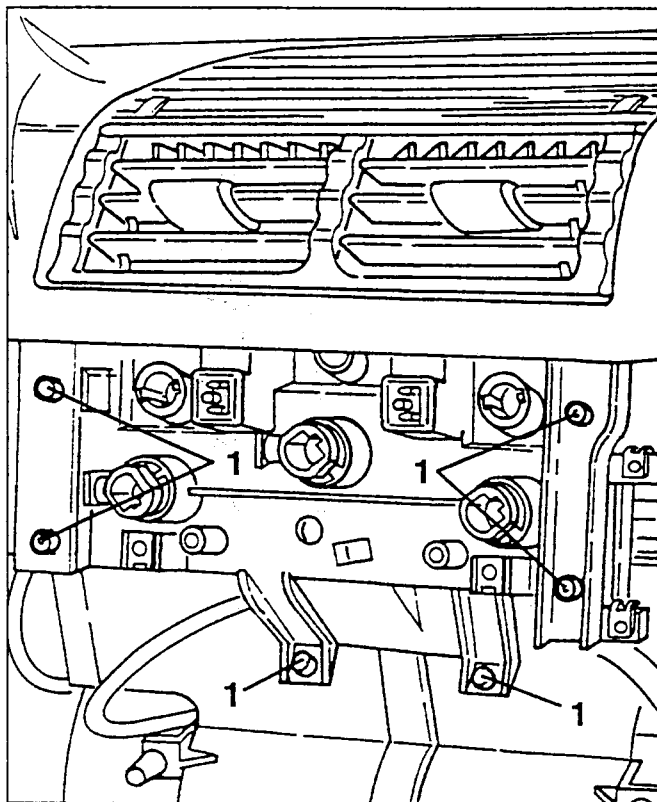


1. Using wrenches N° 1.822.112.000 and N° 1.822.115.000 disconnect the fluid outlet pipe union from the evaporator.
2. Using wrenches N° 1.822.111.000 and N° 1.822.113.000 the fluid inlet pipe union from the evaporator.
3. Disconnect the two coolant inlet and outlet pipes from the radiator and recover the coolant fluid.



- Remove the lower part of the dashboard and the centre console (see GROUP 70).

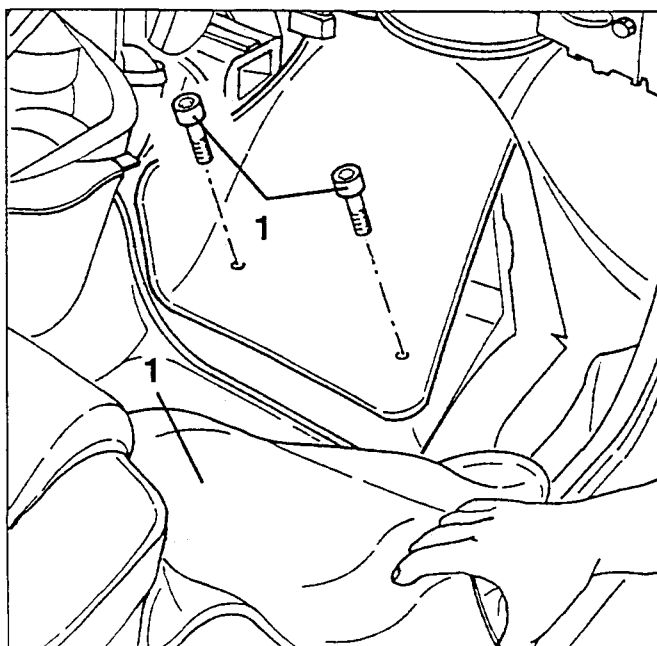
1. Slacken the four fastening screws and lower the heating and ventilation unit controls.



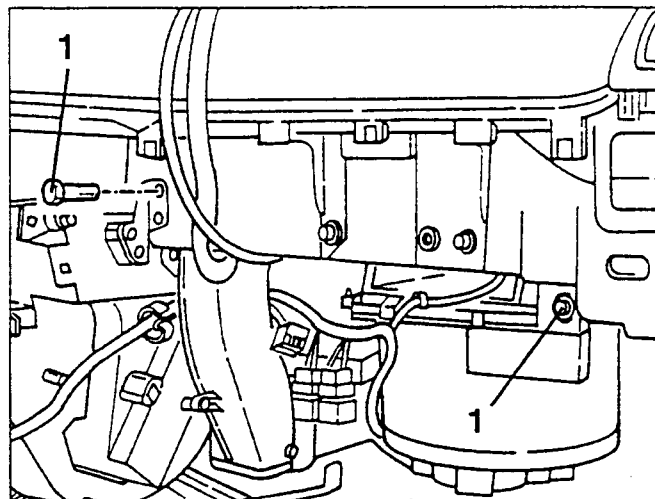
- Remove the two sections of air delivery pipe to the rear passenger face level (see GROUP 70).

- Disconnect the electrical connections of the heating and ventilation unit.

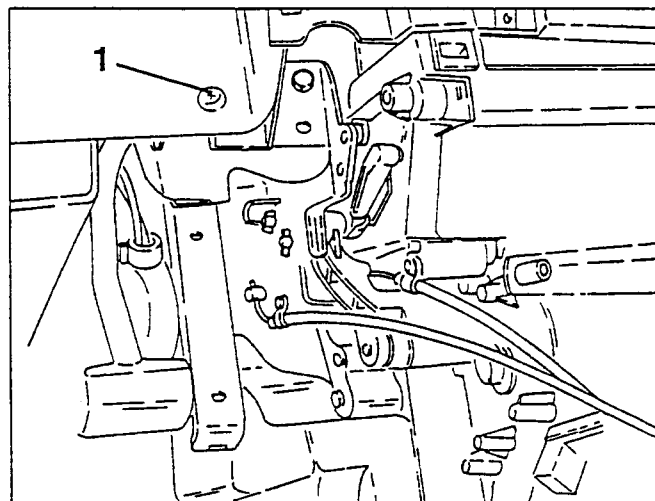
1. Move aside the floor mat, slacken the two fastening screws and remove the control unit cover.



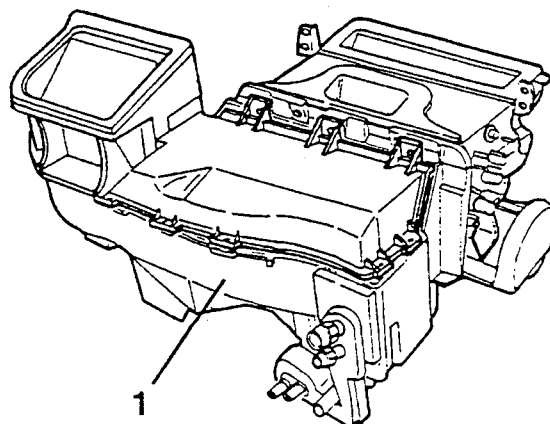
1. Slacken the three screws fastening the heating and ventilation unit on the righthand side.



1. Slacken the screw fastening the heating and ventilation unit on the lefthand side.



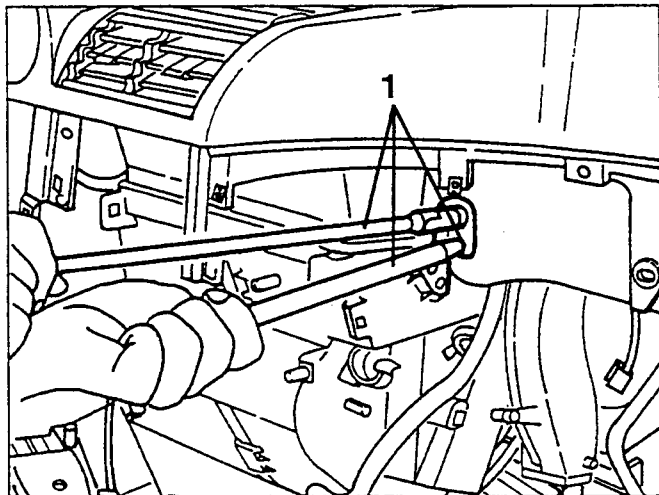
1. Remove the heating and ventilation unit.





Refit the unit reversing the sequence followed for its removal, adhering to the following instructions:

- Coat the mouth of the heater, water drain and R134a pipes with vaseline.
- Assemble the unit making sure that the above pipes are correctly inserted in the passage holes.
- 1. Use a centering pin positioned as shown, and centre the group before fixing it.



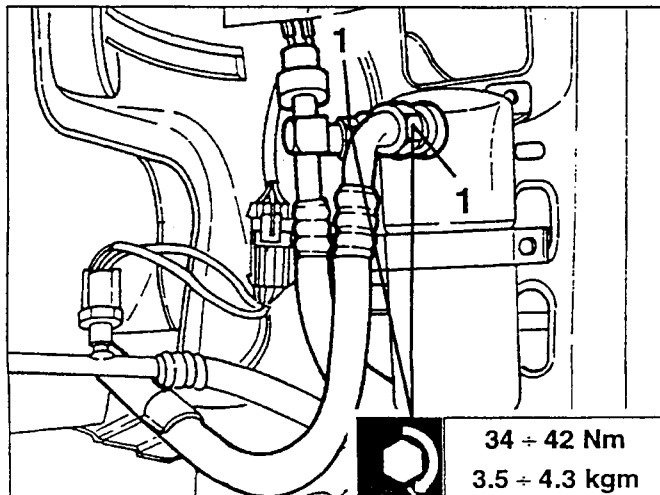
DIS-ASSEMBLY

- Proceed as described for the turbodiesel version.

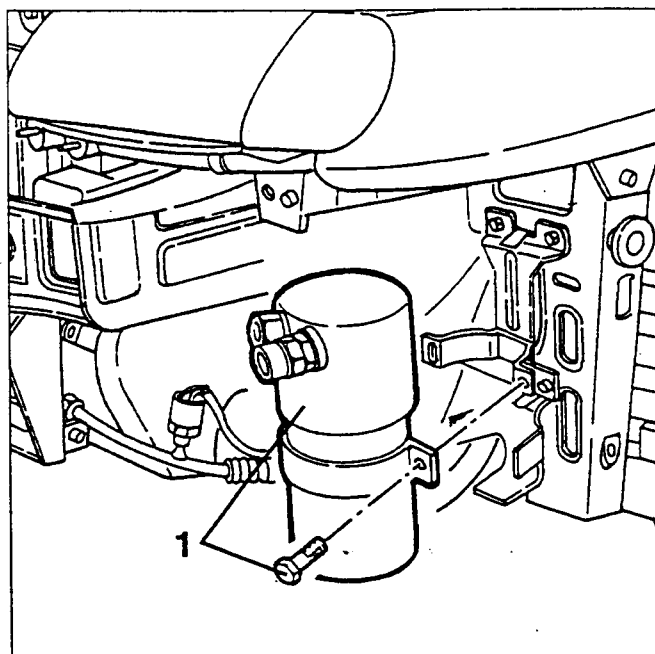
DRIER FILTER

REMOVAL/REFITTING

- Set the car on a lift.
- Disconnect the battery (-) cable.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the radiator grille and front bumper (see GROUP 70).
- 1. Disconnect the two refrigerant fluid inlet and outlet pipe unions from the drier filter.



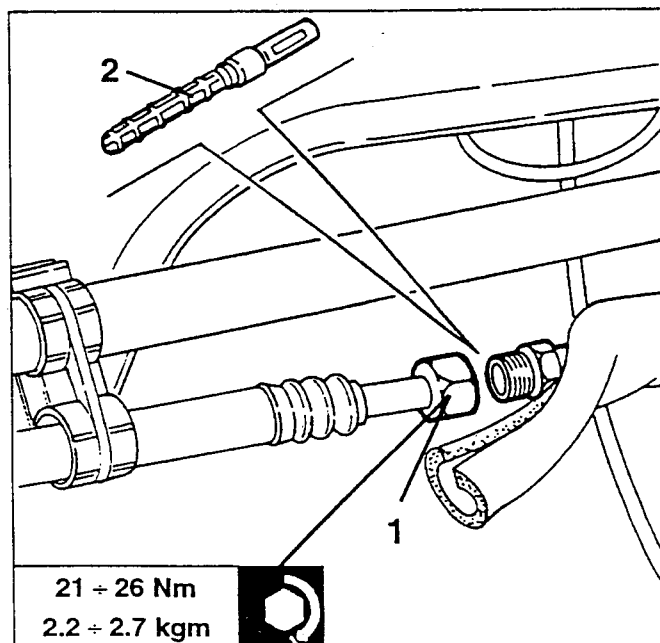
1. Slacken the clamp screw and remove the drier filter.



EXPANSION VALVE

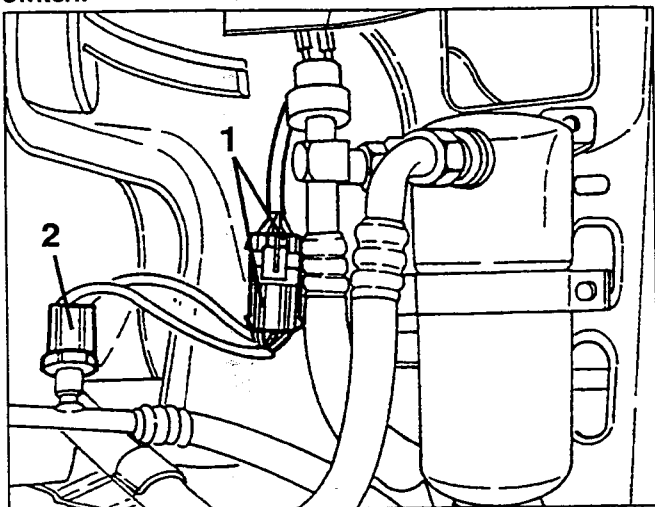
REMOVAL/REFITTING

- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the left front wheel and wheel house.
- 1. Slacken the intermediate union of the freon delivery pipe from the condenser to the evaporator.
- 2. Pull out and remove the expansion valve.

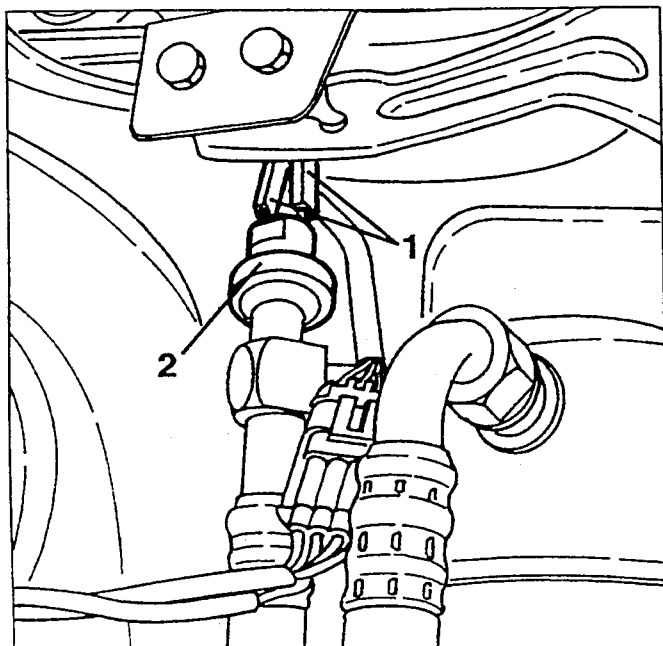


THREE-LEVEL PRESSURE SWITCH (TRINARY)**REMOVAL/REFITTING**

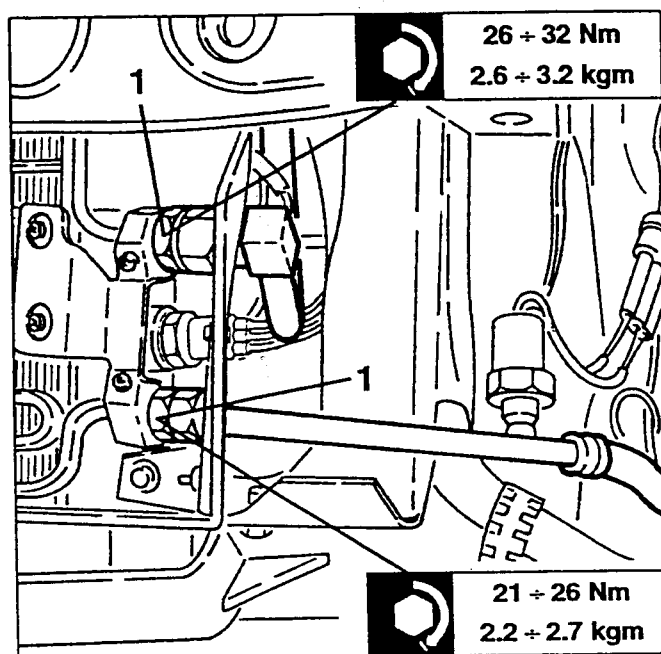
- Set the car on a lift.
- Remove the radiator grille and front bumper (see GROUP 70).
- 1. Disconnect the electrical connection of the three-level pressure switch.
- 2. Slacken and remove the three-level pressure switch.

**MINIMUM PRESSURE SWITCH****REMOVAL/REFITTING**

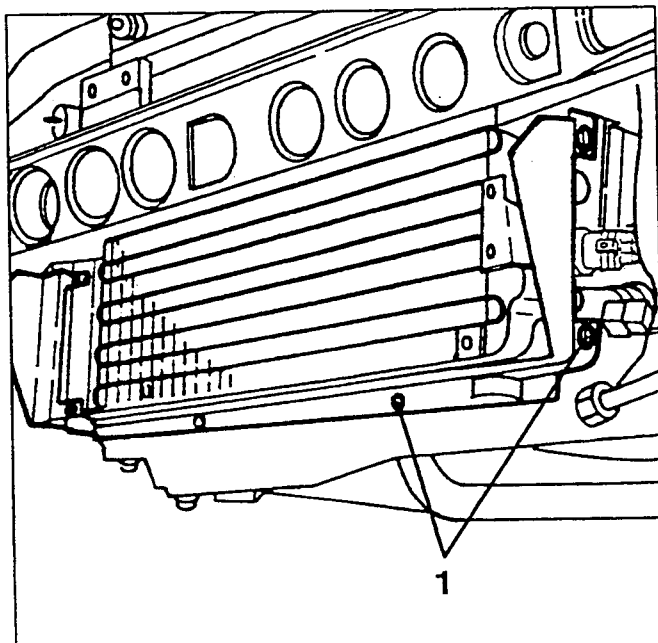
- Set the car on a lift.
- Remove the radiator grille and front bumper (see GROUP 70).
- 1. Disconnect the two electrical connections from the minimum pressure switch.
- 2. Slacken and remove the minimum pressure switch.

**CONDENSER****REMOVAL/REFITTING**

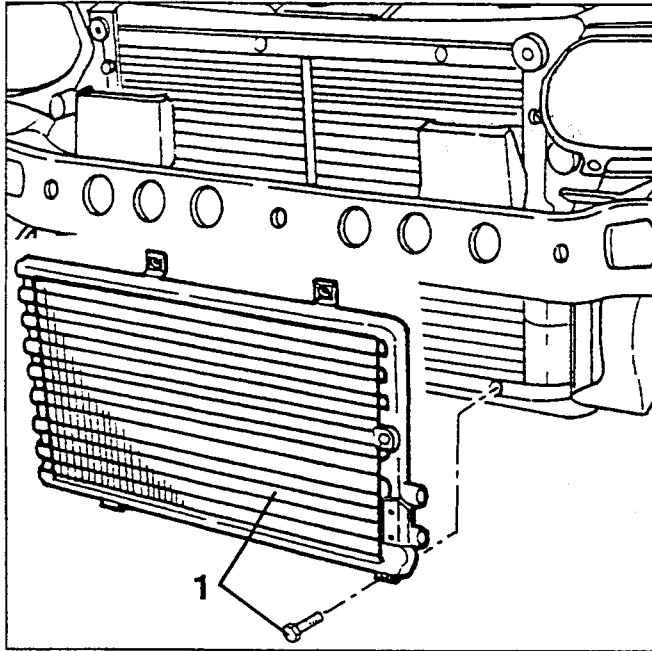
- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the radiator grille and front bumper (see GROUP 70).
- 1. Disconnect the refrigerant fluid inlet and outlet pipe unions from the condenser.



1. Slacken the fastening screws and remove the air ducting system.



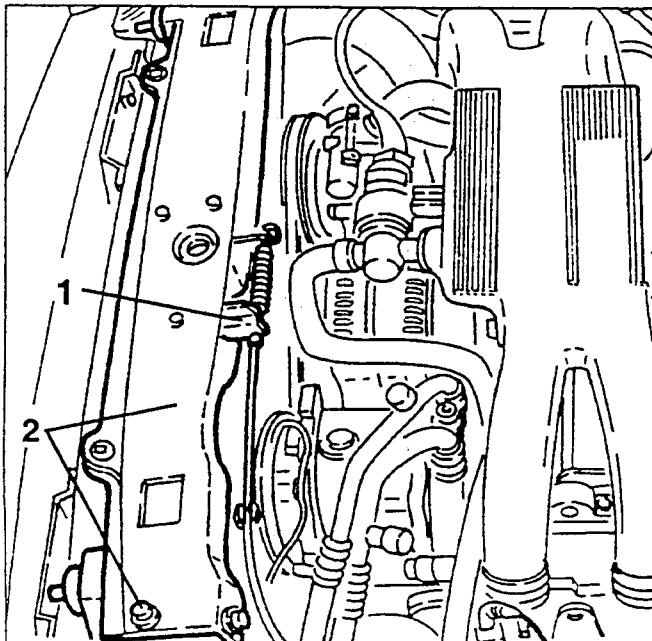
1. Slacken the four fastening screws and remove the condenser.



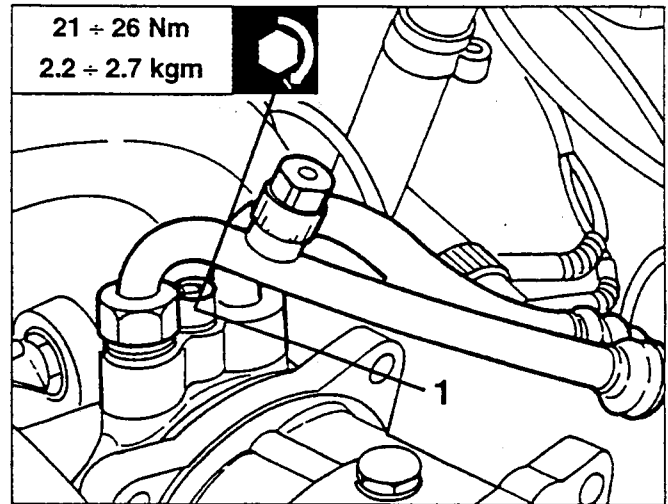
COMPRESSOR

REMOVAL/REFITTING

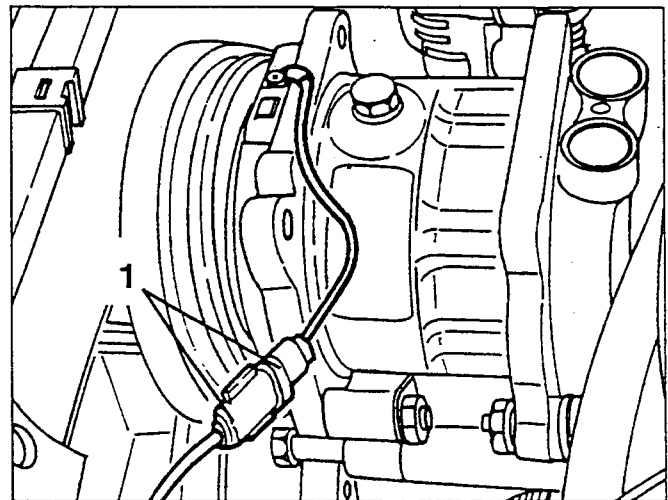
- Drain the fluid from the conditioning system (see specific paragraph).
 - Disconnect the battery (-) terminal.
 - Remove the radiator grille (see GROUP 70).
1. Disconnect the opening cable from the bonnet lock.
 2. Slacken the fastening screws and remove the upper radiator crossrail.



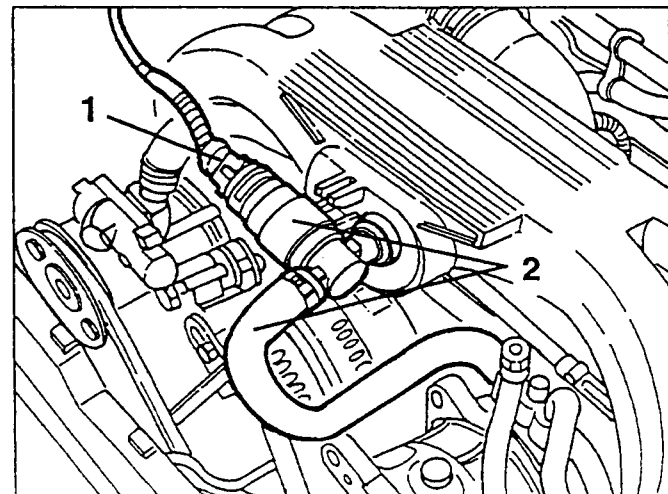
1. Disconnect the fluid inlet and outlet pipe unions from the compressor slackening the corresponding screw.



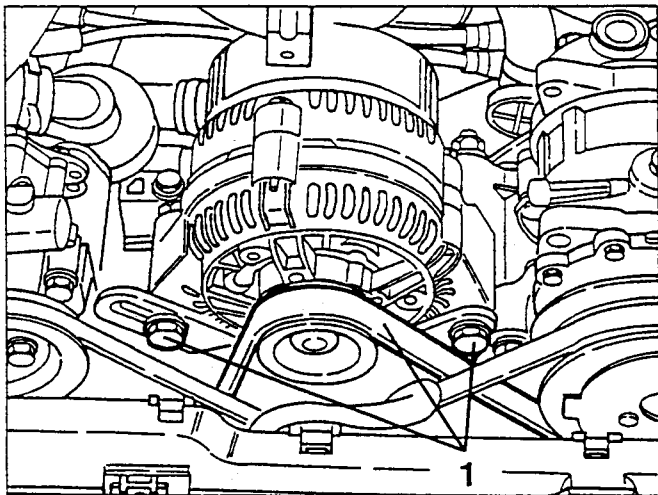
1. Disconnect the compressor electrical connection.



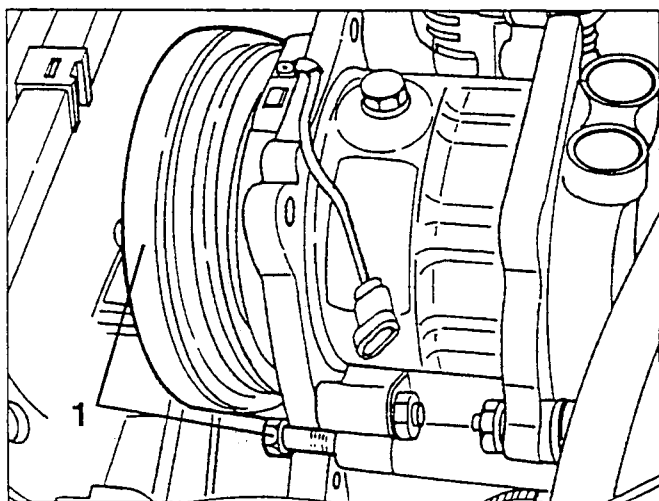
1. Disconnect the electrical connection from the idle speed actuator.
2. Slacken the clamp and disconnect the idle speed actuator from the intake box and move it to one side.



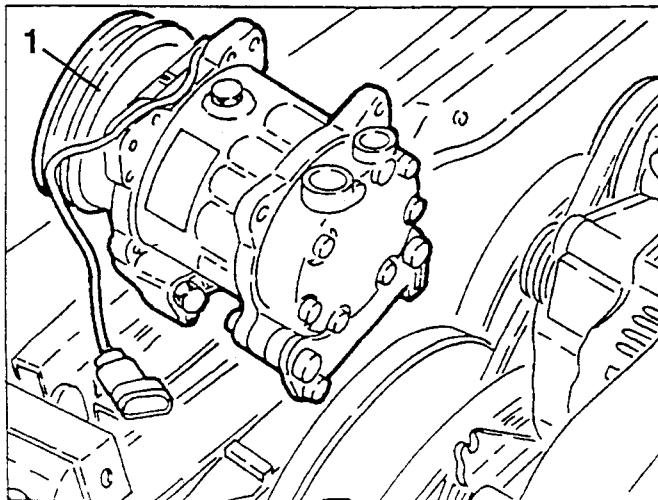
1. Slacken the two alternator fastening bolts and remove the drive belt.
- Completely unscrew the two bolts slackened previously and move the alternator just enough to disconnect the electrical connections.



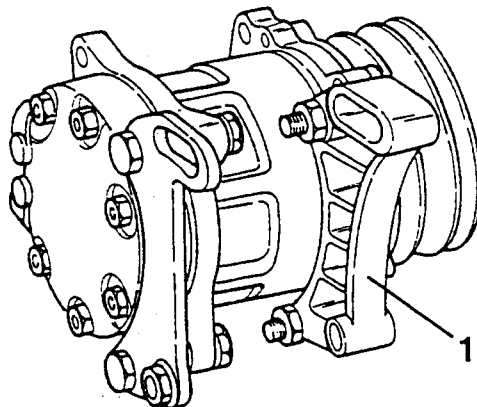
1. Slacken the right bolt and left screw fastening the compressor and remove the drive belt.



1. Completely unscrew the fastening bolt and screw and remove the compressor.



1. On the bench, slacken the fastening bolts and separate the brackets from the compressor.



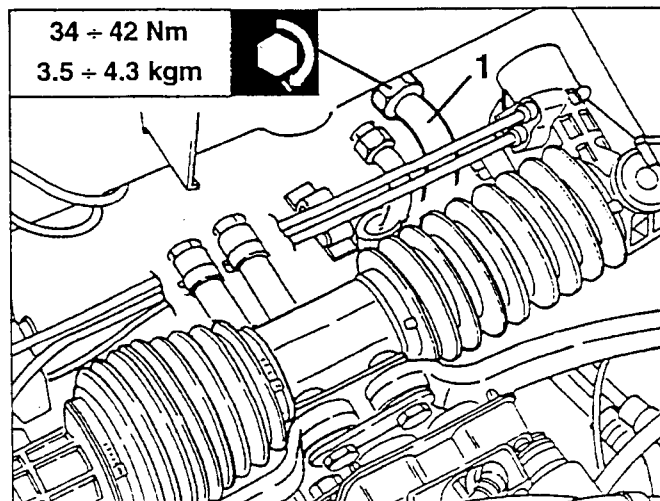
- When refitting, tension the compressor drive belt and the alternator - water pump drive belt (see GROUP 00).

PIPE FROM EVAPORATOR TO DRIER FILTER

REMOVAL/REFITTING

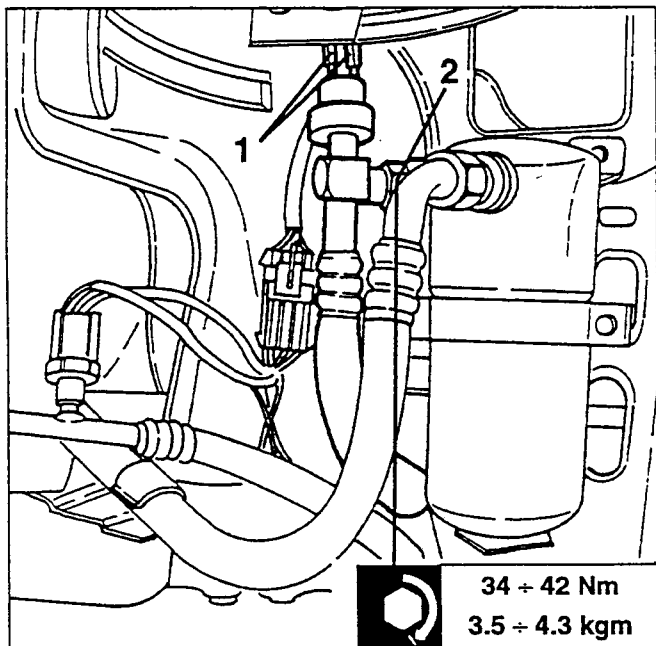
- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the radiator grille and front bumper (see GROUP 70).
- Remove the left front wheel.
- Remove the battery with its acid drain tray (see GROUP 55).
- Follow the first ten steps described in the "DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT" paragraph.

1. Using wrenches N° 1.822.112.000 and N° 1.822.115.000 disconnect the freon outlet pipe union from the evaporator.

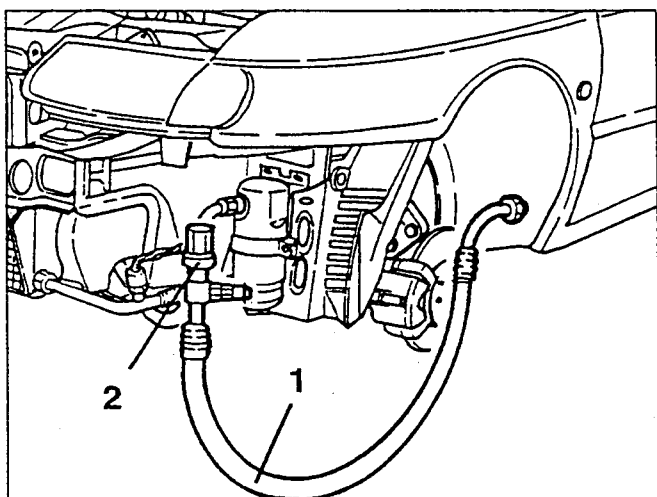


- Raise the car.

1. Disconnect the two electrical connections from the minimum pressure switch.
2. Disconnect the union of the pipe in question from the drier filter.



1. Remove the pipe in question disconnecting it from its clamps.
2. On the bench, slacken and remove the minimum pressure switch from the pipe.



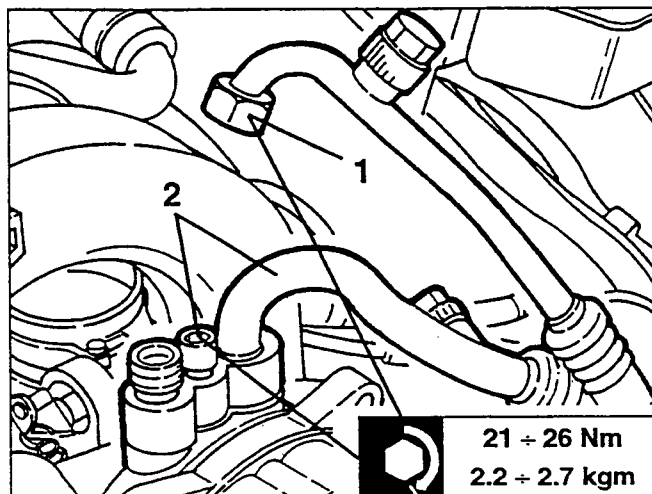
PIPE FROM THE DRIER FILTER TO THE COMPRESSOR

REMOVAL/REFITTING

- Set the car on a lift.
- Drain the fluid from the conditioner system (see specific paragraph).

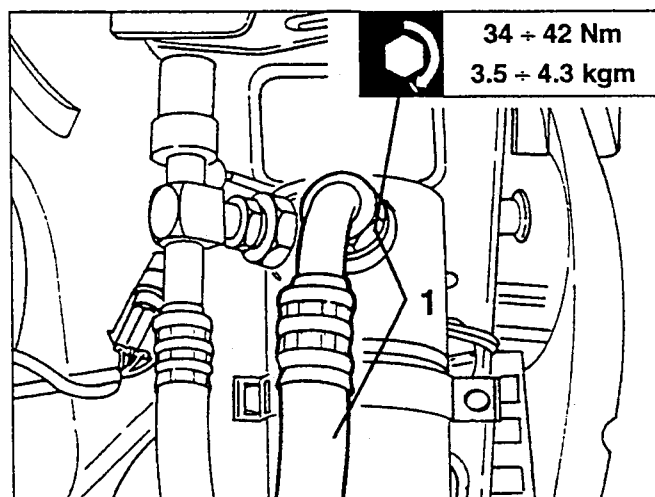
- Remove the radiator grille and front bumper (see GROUP 70).

1. Disconnect condenser connection pipe union from the compressor.
2. Slacken the fastening screw and disconnect the pipe in question from the compressor.



- Raise the car.

1. Disconnect the union of the pipe in question from the drier filter and release it from the hose clamps to remove it.



PIPE FROM THE CONDENSER TO THE EVAPORATOR

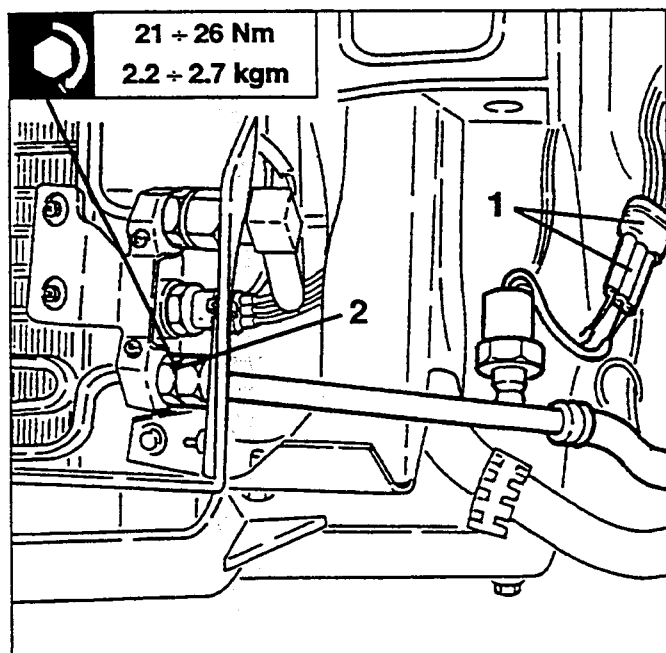
REMOVAL/REFITTING

- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the radiator grille and front bumper (see GROUP 70).
- Remove the left front wheel.
- Remove the battery with its acid drain tray (see GROUP 55).

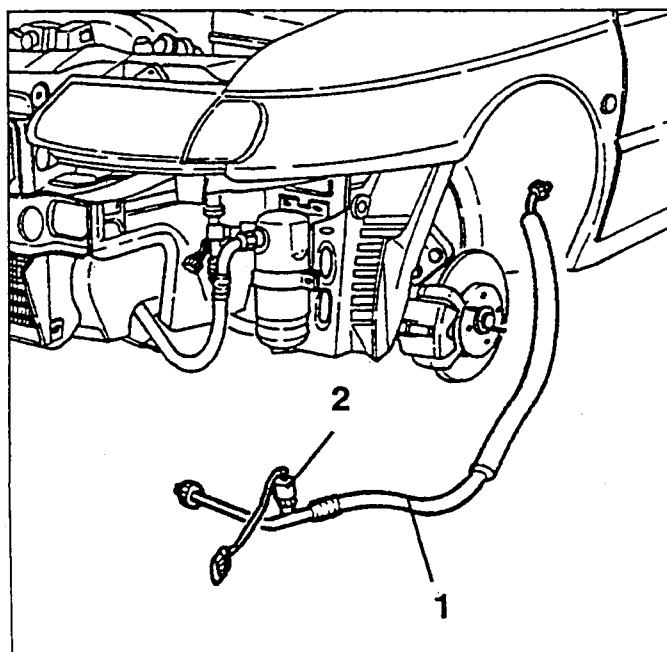
- Follow the first ten steps of the procedure described in the paragraph "DUCTING ASSEMBLY AND HEATER - DISTRIBUTOR UNIT" without disconnecting the two inlet and outlet hoses carrying the engine coolant to and from the heater.

- Raise the car.

1. Disconnect the electrical connection of the three-level pressure switch.
2. Disconnect union of the pipe in question from the condenser.



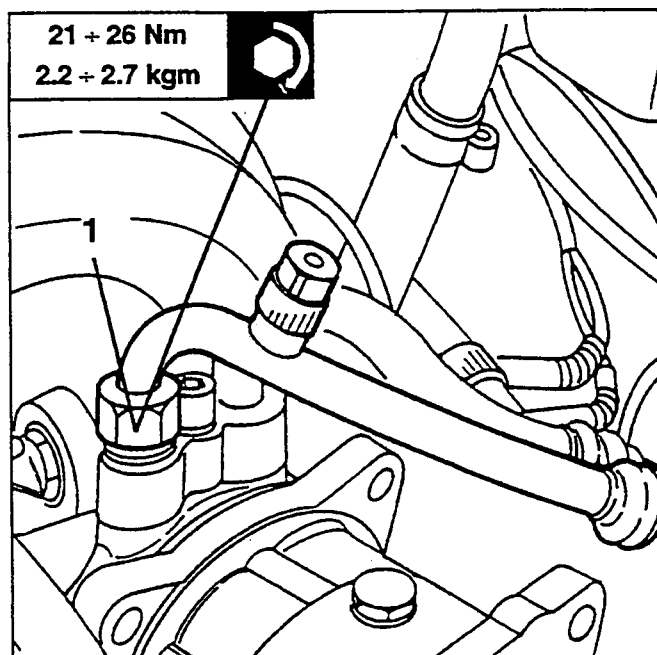
1. Remove the pipe in question freeing it of its clamps.
2. On the bench, slacken and remove the three-level pressure switch from the pipe.



PIPING FROM THE CONDENSER TO THE COMPRESSOR

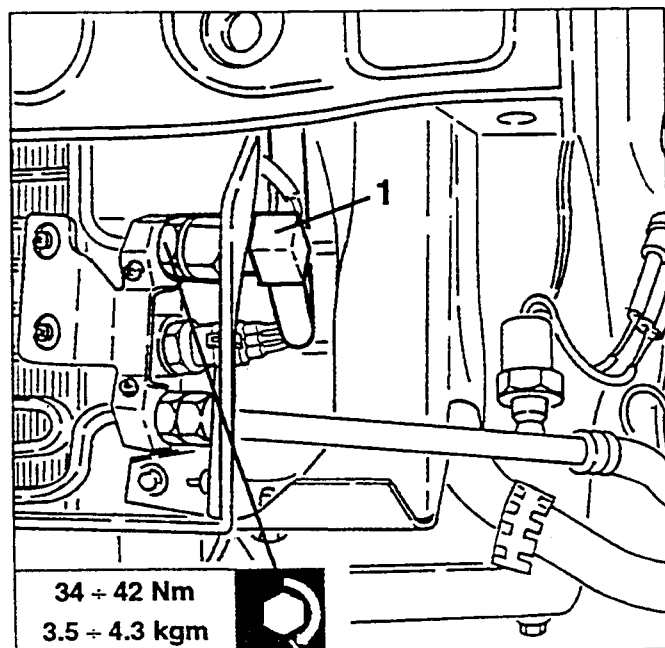
REMOVAL/REFITTING

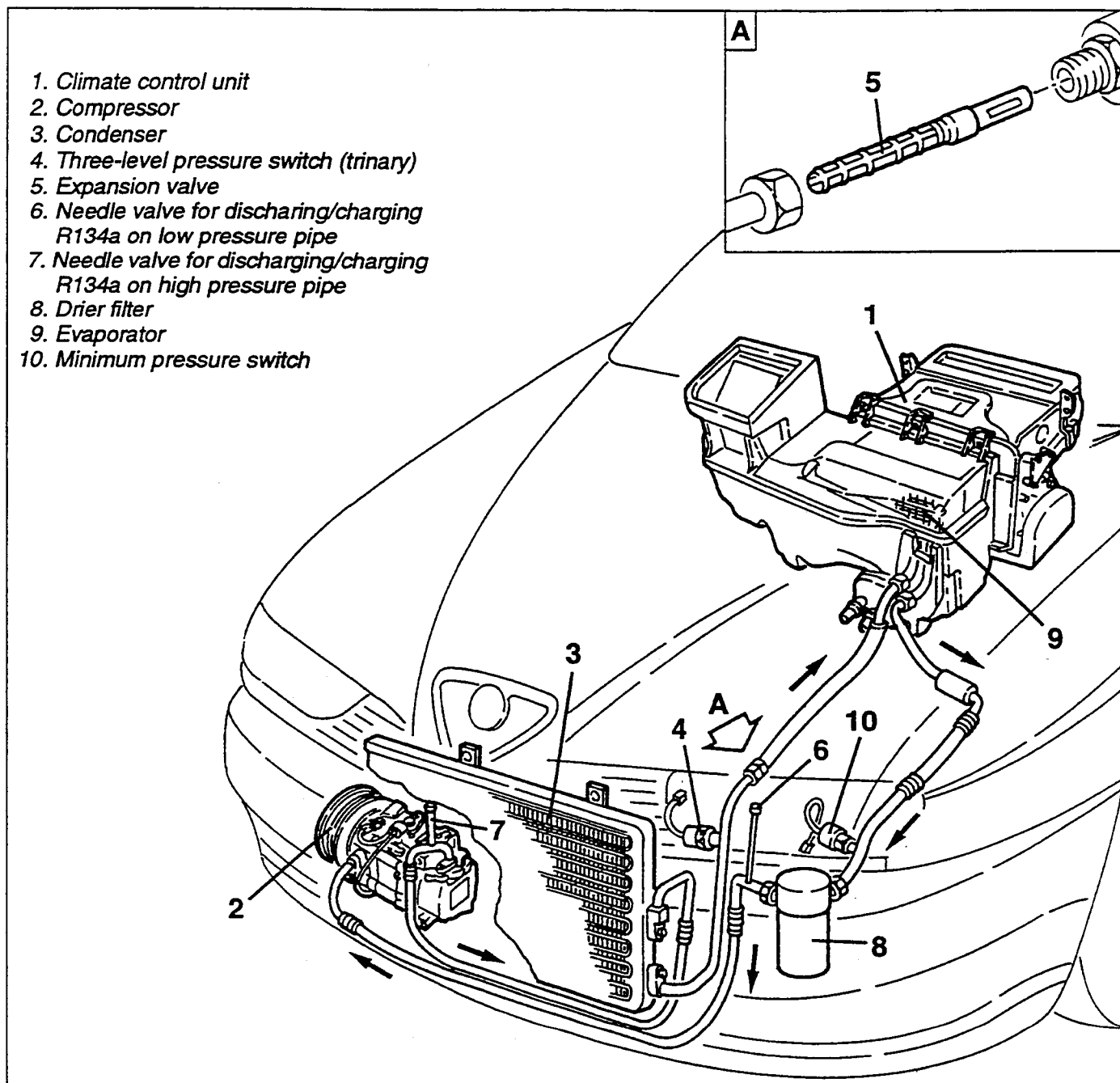
- Set the car on a lift.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the radiator grille and front bumper (see GROUP 70).
- 1. Disconnect the union of the pipe in question from the compressor.



- Raise the car.

1. Disconnect the union of the pipe in question from the condenser then remove it.



SYSTEM**DESCRIPTION**

The climate control system for models with T. Spark 16V engine is substantially the same as the one installed on the model with turbodiesel engine.

The main differences of this system are:

- the adoption of a minimum pressure switch.
- the adoption of a compressor with variable displacement which makes it possible to "follow" the load required by the system without engagement/disengagement of the compressor joint. In fact, the change in the flow rate of the coolant fluid in relation to the pressures involved makes it possible to compensate

the change in the number of revolutions of the compressor (connected with engine rpm) to adapt the amount of "cold" produced according to the requirements of the system.

- a different position of the system components in the engine compartment.

NOTE: BELOW WE ARE GIVING THE DIFFERENCES OF THIS SYSTEM CONCERNING THE DESCRIPTIONS AND PROCEDURES COMPARED WITH THE TURBODIESEL MODEL.

COMPRESSOR CUT-IN AND CUT-OUT STRATEGY

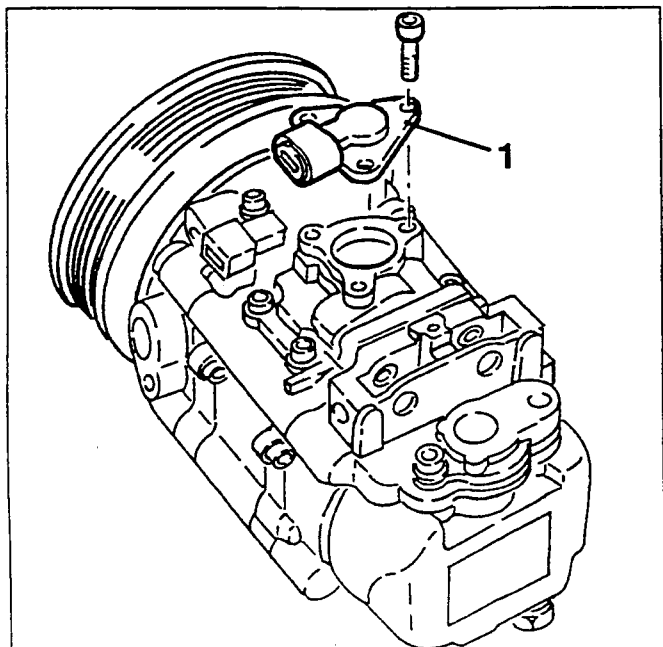
Compressor engagement is operated by the electromagnetic joint controlled by the electronic injection management system of the engine. Indeed the compressor absorbs a fair amount of power to the disadvantage of the overall output of the engine, and in certain instances, this must be avoided:

- at idle speed the engine must adapt its own speed taking account of this increase in absorbed power;
- when the engine is started or when high load is required, the compressor is cut off to leave all the available power for the engine.

With the M 2.10.3 injection system, the control unit carries out the following strategies:

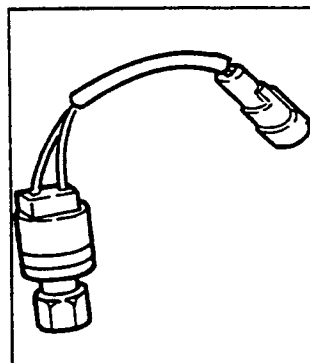
- it adapts the engine idle speed each time the compressor is engaged; if the speed falls below 700 rpm the compressor is disengaged;
- in the event of the need for high power (high speed, over 6000 rpm, full load, maximum throttle opening), it cuts off the compressor momentarily;
- when the engine is started it prevents the compressor from being engaged until normal operating conditions are reached.

NOTE: You are reminded that the NIPPONDENSO TV14SC compressor with which this version is fitted, automatically cuts off the compressor through the safety thermal contact (1) if the temperature of the coolant fluid inside the compressor exceeds 160 °C.

**DESCRIPTION OF THE MAIN COMPONENTS OF THE AIR CONDITIONING SYSTEM****MINIMUM PRESSURE SWITCH**

The purpose of the minimum pressure switch is to de-energise the electromagnetic joint of the compressor when the pressure (in the drier filter) reaches appr. 1.8 bar, in order to keep the cold required, but prevent the evaporator from freezing.

The minimum pressure switch also protects the compressor by disengaging the electromagnetic joint, from its pulley, when the pressure of the coolant fluid falls to very low levels owing to a leak.

**COMPRESSOR**

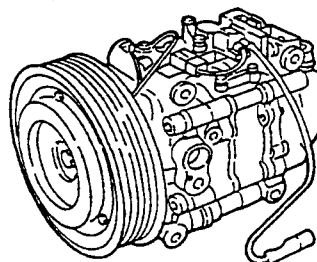
This is a NIPPONDENSO TV14SC with variable displacement: this parameter is automatically changed by the compressor itself according to the load (difference in pressure upstream and downstream of it): a special valve opens a by-pass which cuts off part of the fluid from the compression stage: the displacement can be reduced to 17% of the maximum level.

Adjustment takes place on the intake pressure:

- a **low intake pressure** makes the system **reduce the displacement**. This takes place for example when the refrigerating cycle is working in the best conditions: high engine rpm (thus also of the compressor), high heat exchange at the condenser, etc; (without a compressor with this variable configuration the compressor would be engaged and disengaged continuously);

- on the other hand, a **high intake pressure** **increase the displacement** to its maximum level.

This takes place for example with low engine speeds and for high requirement for "cold".



Composition and operation

It comprises a body (1) within which a chamber (2) has been made.

Four blades (3) turn in the chamber pulled by a hub (4) the axis of rotation of which does not coincide with the theoretical axis of the chamber.

Due to the particular geometry of the chamber, as the blades turn, they always stay in contact with the inner surface of the chamber: this way the volume in the compartments between one blade and the other changes during rotation.

Two covers are fastened to the body (1), a front one (5) and a rear one (6) containing respectively an intake or low pressure chamber (7) and a high pressure chamber (8). The gas, taken in by the union (9) on the cover (5), passes through the low pressure chamber (7) and the slit (10) machined on the body (1).

The gas is then compressed and sent out through the duct (11) in the high pressure chamber (8) and admitted to the system through the union (12).

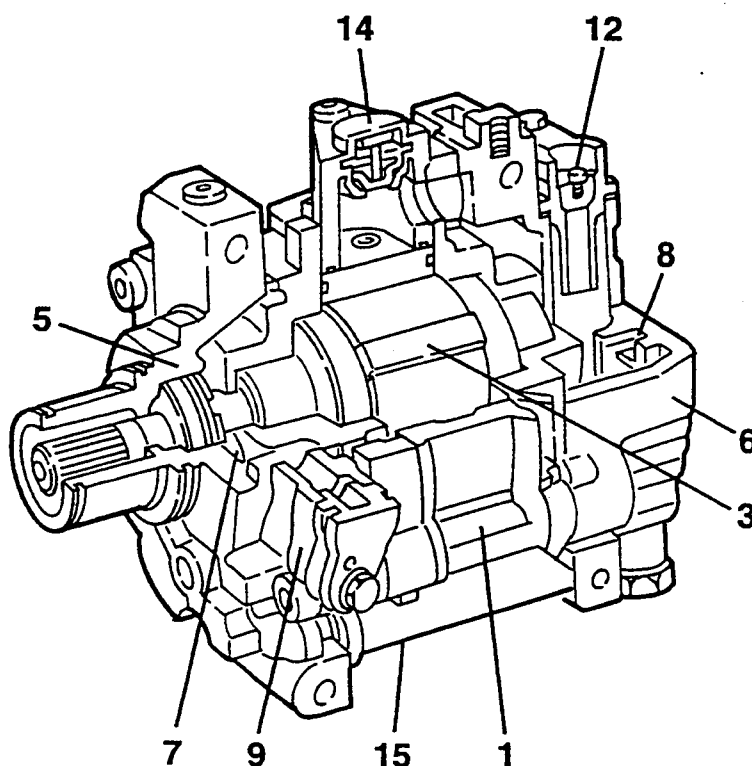
The reed valve (13) prevents the high pressure gas from returning into the compressor.

On the upper part of the body there is a thermal contact (14) connected in series to the electromagnetic joint. When the temperature reaches dangerous levels (over 160 °C), the thermal contact (14) disengages the compressor: it engages it again if the temperature falls below 140 °C.

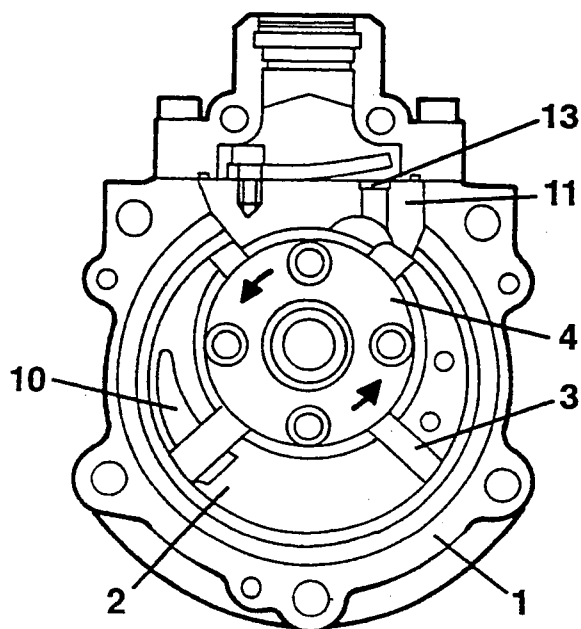
This prevents the compressor from operating in dangerous situations such as the lack of refrigerant fluid or oil.

The pressure regulator (15) in the lower section of the compressor adjusts the flow rate of the fluid in the compressor as described below.

1. Body
2. Chamber
3. Blades
4. Hub
5. Front cover
6. Rear cover
7. Intake or low pressure chamber
8. High pressure chamber
9. Union



10. Slit
11. Duct
12. Union
13. Reed valve
14. Thermal contact
15. Pressure regulator



Displacement control

Displacement control is obtained by a pneumatic device incorporated in the compressor, which by-passes part of the gas in the compression stage to the inlet, i.e. into the low pressure chamber.

When this system is activated it reduces the displacement in the compressor gradually and continuously to appr. 17% of the total.

The device comprises a piston (A) which can run in the cylinder (C) countered by the spring (B).

When the piston is positioned as in Fig A, it cuts off the holes (D) which put compartment (E), in which the gas starts being compressed, into communication with the low chamber (F).

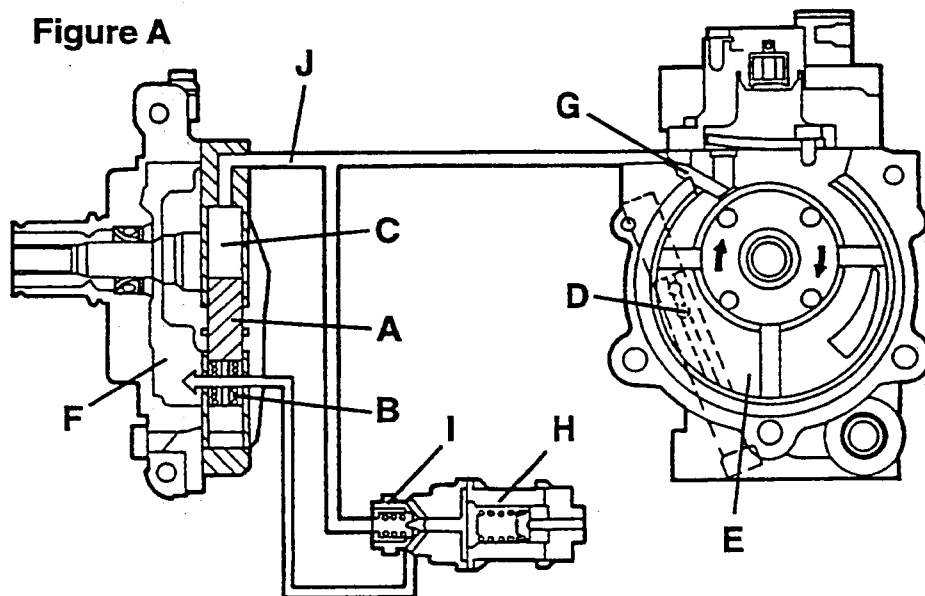
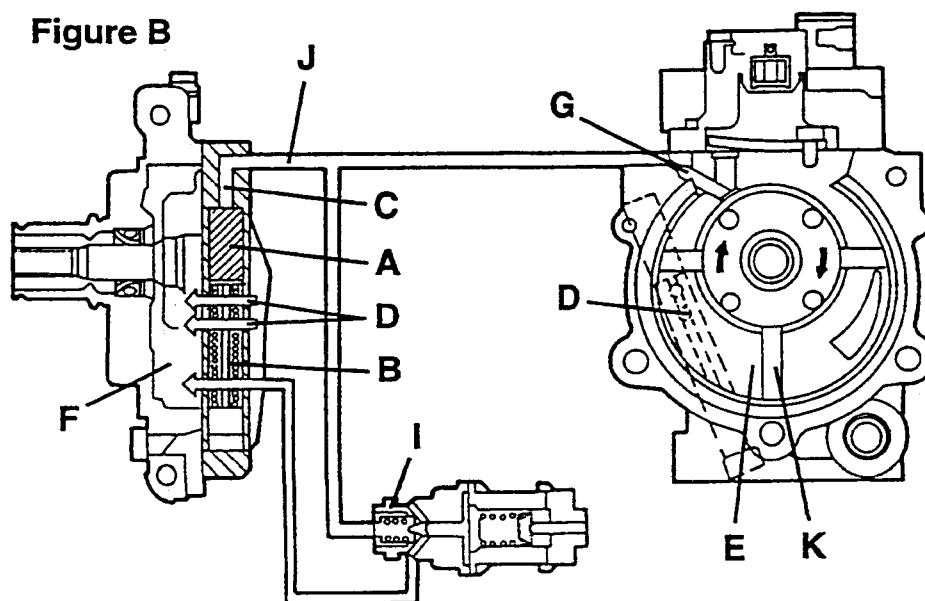
Viceversa, when piston (A) is in the position of Fig. B, holes (D) put the two chambers into communication. The piston is operated by a small amount of pressurised gas, withdrawn by the duct (J) which communicates with the calibrated hole (G).

The pressure regulator (H) is adjusted by the difference in pressure between the intake - chamber (F) - and the delivery: with a high intake pressure, the valve (I) is closed, and the pressure of the gas acts on the piston (A) taking it to the position of Fig.A. Holes (D) are cut off and by-passing does not take place, and in chamber (E) compression of the gas begins as described later.

When the intake pressure falls, the regulator (H) opens the valve (I) allowing the pressurised gas in the duct (J) and cylinder (C), to discharge into the low pressure chamber (F).

Piston (A) is pushed by the spring (B) allowing the by-pass holes (D) to open.

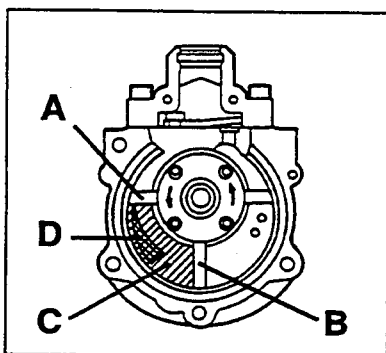
This way, part of the gas in the chamber (E) - start of compression - can flow into the low pressure chamber (F), until the blade (K), has passed the holes (D); this reduces the amount of gas in the chamber (E) thereby reducing the displacement of the compressor.

Figure A**Figure B**

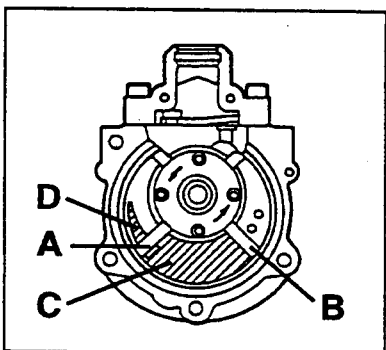
- A. Piston
- B. Spring
- C. Cylinder
- D. Holes
- E. Compartment
- F. Low pressure chamber
- G. Calibrated hole
- H. Pressure regulator
- I. Valve
- J. Duct
- K. Blade

Normal operation
(100% displacement - by-pass closed)**Intake**

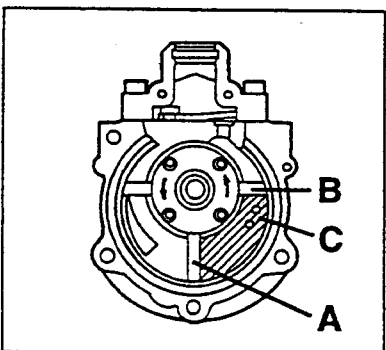
The gas is drawn in by the intake port (D) due to the gradual expansion of the compartment (C), delineated by blades (A) and (B). This is the start of the compression stage.



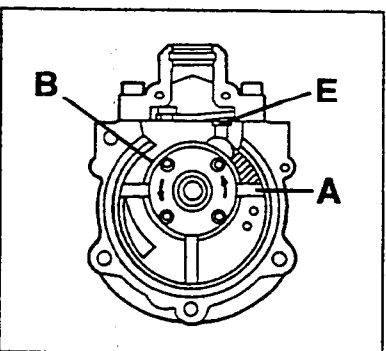
The new position of the blades (A) and (B) cause compartment (C) to be at its maximum volume. Blade (A) cuts off communication between compartment (C) and port (D) completing the intake stage.

**Compression**

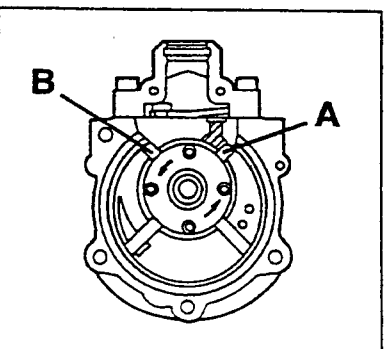
Compartment (C) reduces its volume thereby increasing the pressure of the gas: this is the start of the compression stage.

**Exhaust**

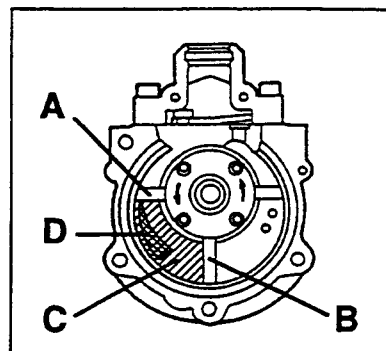
The pressure of the gas further increases until the reed (E) opens: in this precise moment the compression stage ends and exhaust begins.



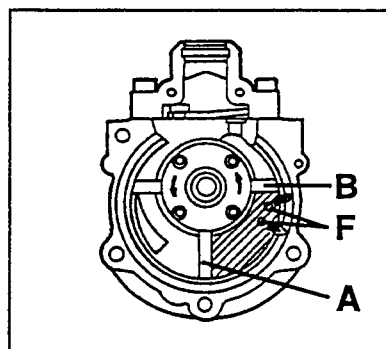
When blades (A) and (B) take the position shown in the diagram the exhaust stage ends.

**Operation with reduction of the displacement**
(Down to 17% of the displacement - by-pass open)**Intake**

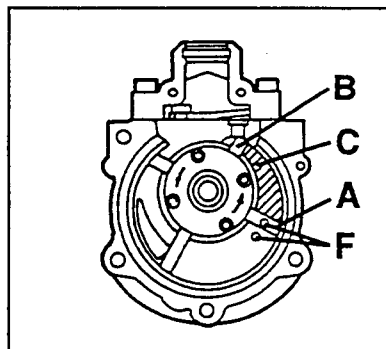
The gas is drawn in by the intake port (D) due to the gradual expansion of compartment (C), delineated by blades (A) and (B): this is the start of the compression stage.

**By - pass**

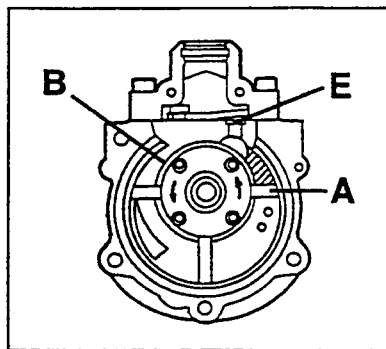
If the holes (F) are open part of the gas flows out: the compression stage does not start yet.

**Compression**

Once past the holes (F), compartment (C) reduces in volume thereby increasing the pressure of the remaining gas (down to a minimum of 17% of the total): the compression stage starts.

**Exhaust**

The pressure of the gas further increases until it opens the reed valve (E): in this precise moment the compression stage ends and exhaust begins.



Lubrication

The lubricating oil is contained in the high pressure chamber (A).

When the compressor is operating the high pressure in the chamber pushes the oil through the calibrated hole (B) into the inner moving components.

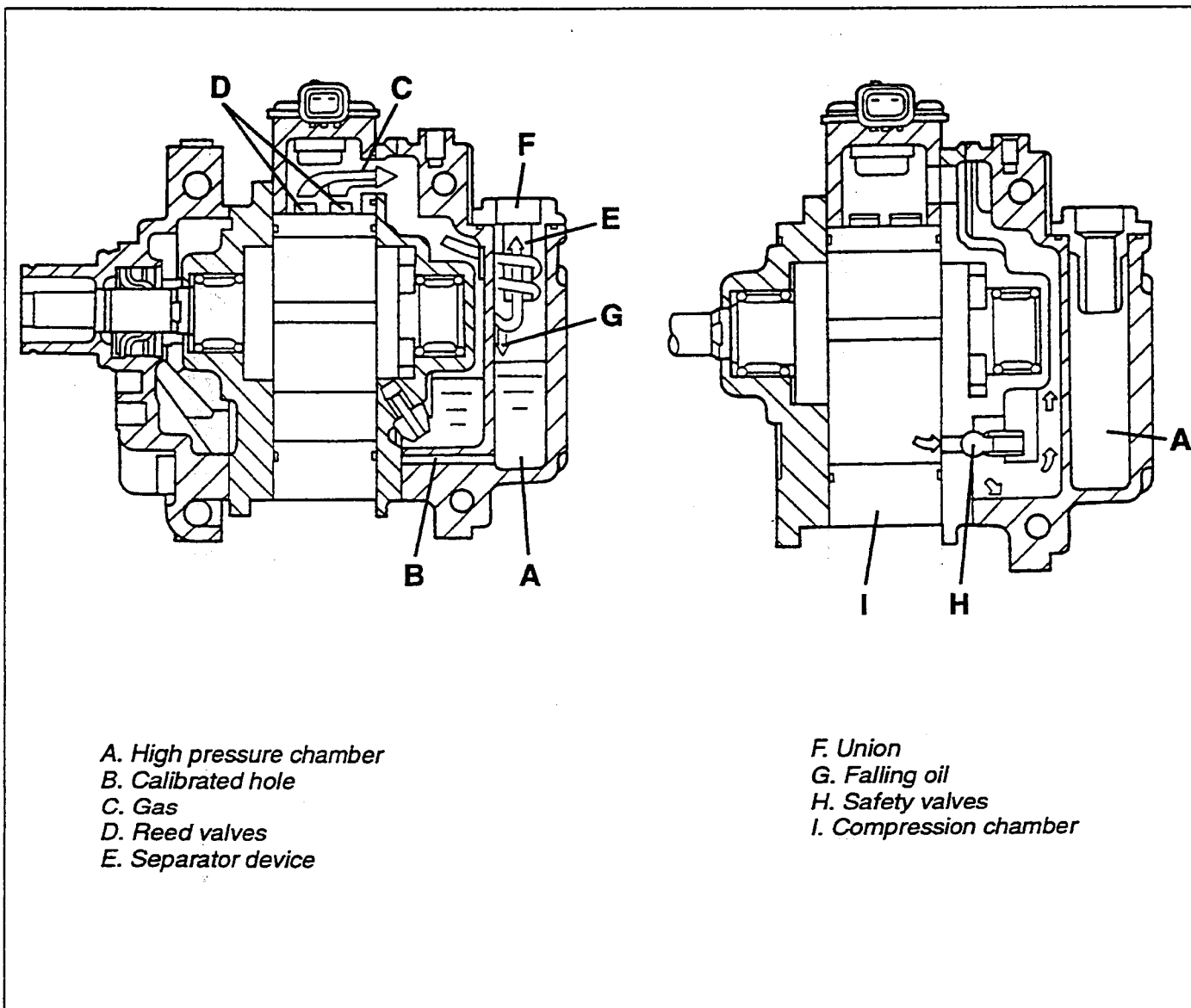
The oil mixed with gas (C) is sent out through the reed valves (D) in the high pressure chamber.

A separator device (E) installed in the gas outlet union

separates it from the oil (G) which falls by gravity into the bottom of the chamber (A) while the gas flows out of the union (F).

This device makes it possible to minimise the quantity of oil admitted into the system piping thereby increasing the thermal yield.

The compressor is also fitted with two safety valves (H) which relieve any overpressure in the compression chamber (I).



INSTRUCTIONS FOR REMOVING/REFITTING

During servicing operations, when the components of the air conditioner system are disconnected, plug the unions suitably to prevent damp and dirt from getting into the system.

When refitting the pipe unions always replace the O-Rings on them.

Lubricate the threads of the pipe unions with the specified antifreeze oil and tighten the unions to the specified torque.

In the event of any losses of oil from the system during servicing operations, restore the amount of oil in the system calculating the losses.

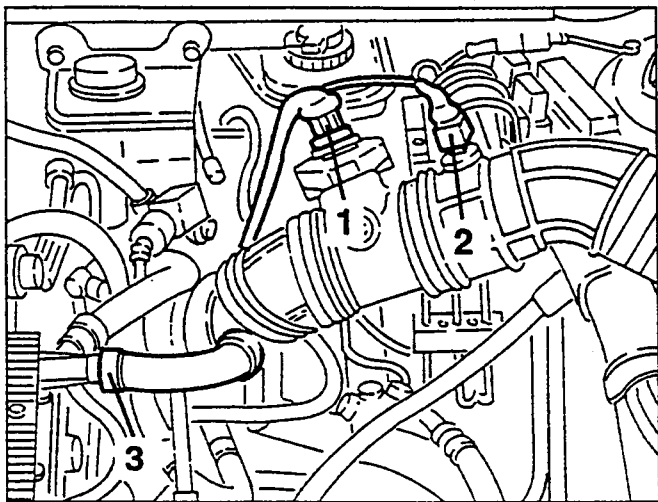
DUCTING UNIT AND HEATER - DISTRIBUTOR (TWO BOWDENS)

REMOVING/REFITTING

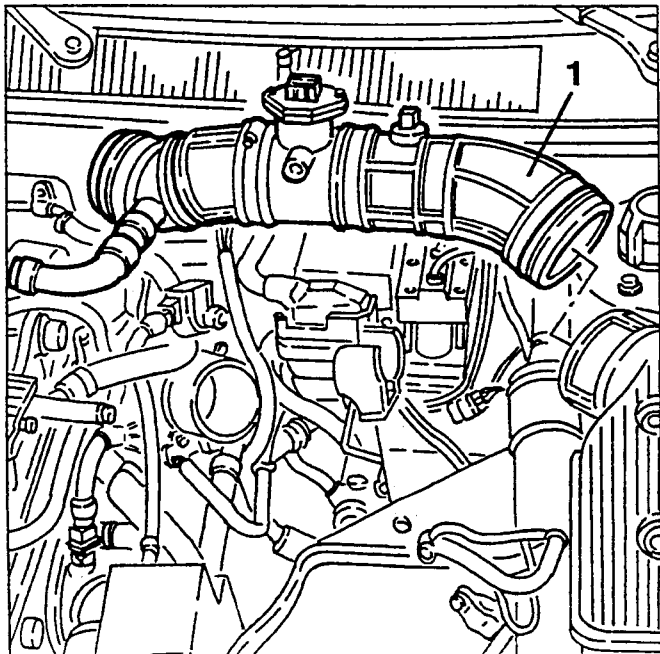
- Drain the fluid from the climate control system (see specific paragraph).

- Remove the battery (see specific paragraph).

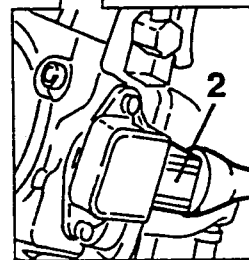
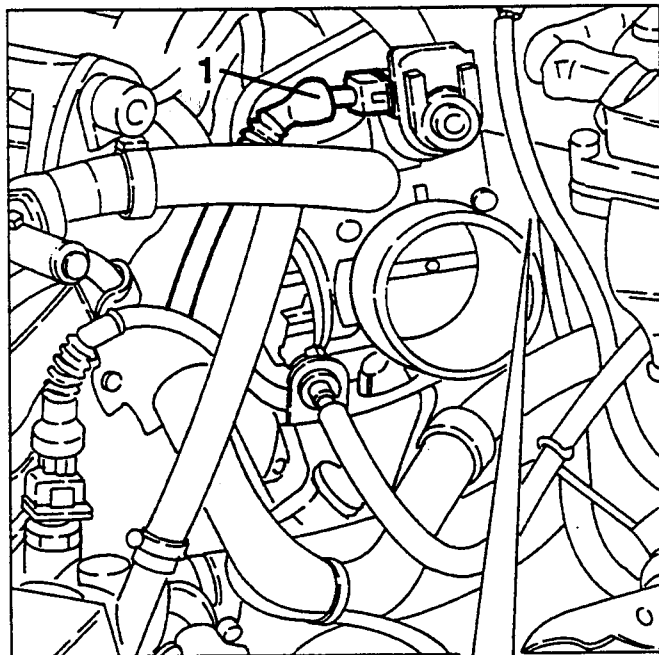
1. Disconnect the electrical connection from the air-flow meter.
2. Disconnect the electrical connection from the intake air temperature sensor.
3. Slacken the fastening clamp and disconnect the oil vapour recirculation pipe from the cylinder head cover.



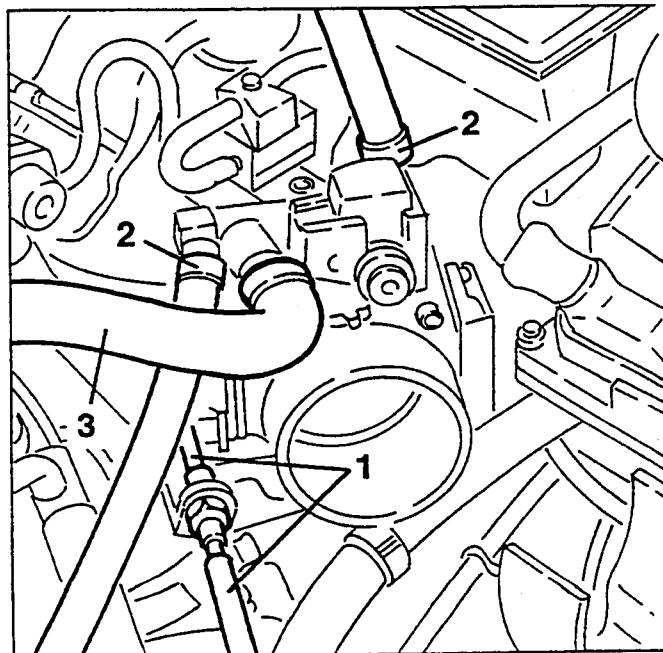
1. Slacken the fastening clamps and disconnect the corrugated sleeve complete.



1. Disconnect the electrical connection from the constant idle speed actuator.
2. Disconnect the electrical connection from the throttle potentiometer.

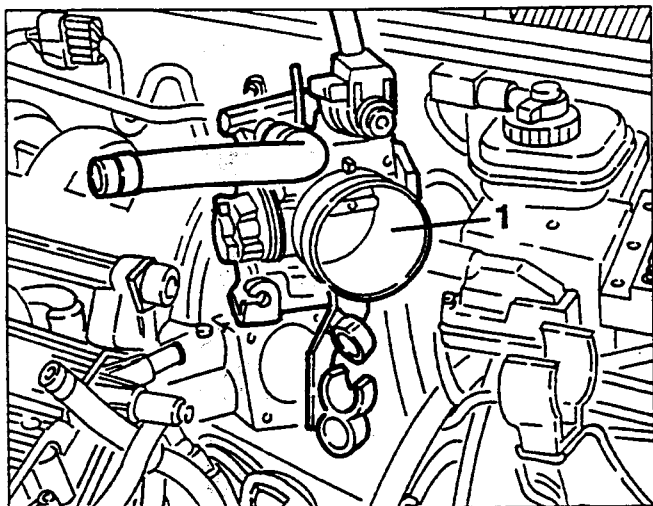


1. Disconnect the accelerator cable from the throttle body.
2. Disconnect the throttle body coolant inlet and outlet pipes.
3. Disconnect the idle speed oil vapour recirculation pipe.

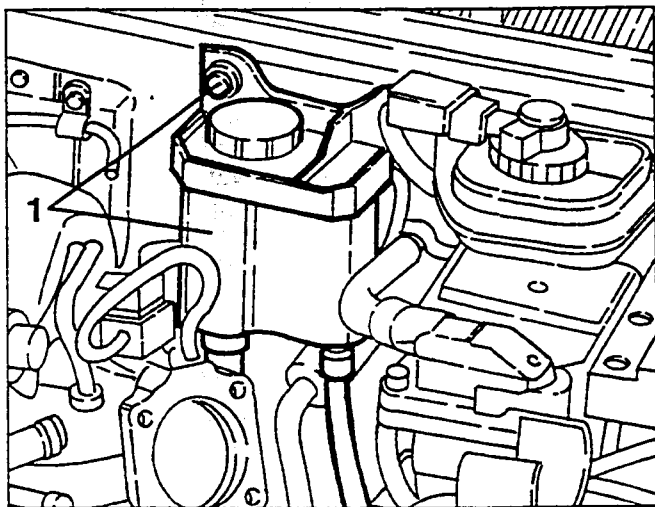


- Release the pipes from the fastenings on the bracket under the throttle body.

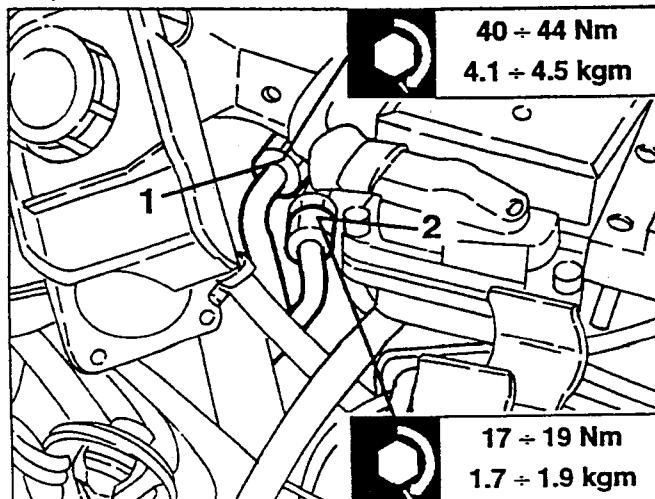
1. Slacken the four fastening screws and remove the throttle body complete.
- Remove the seal.



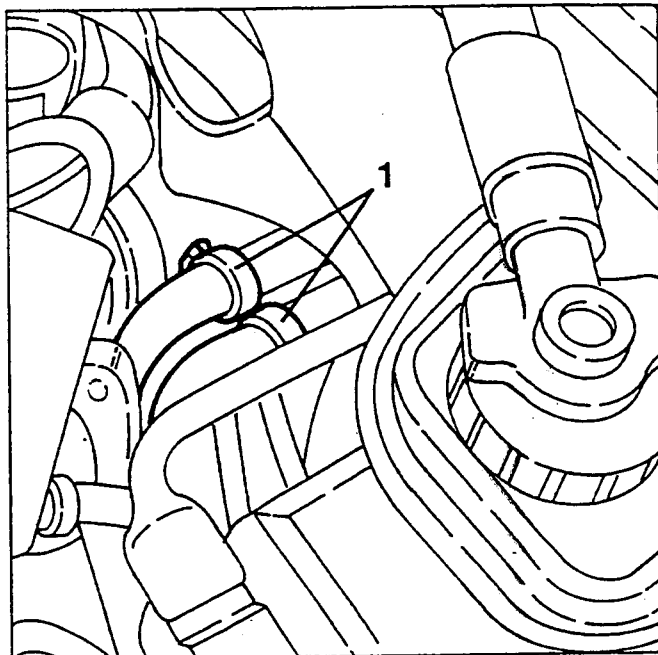
1. Using a suitable syringe partially empty the power steering oil reservoir, then slacken the screws fastening the power steering oil reservoir and move it aside without disconnecting the pipes.



1. Using wrenches no. 1.822.112.000 and no. 1.822.115.000, disconnect the evaporator fluid outlet pipe.
2. Using wrenches no. 1.822.111.000 and no. 1.822.113.000, disconnect the fluid inlet pipe from the evaporator.

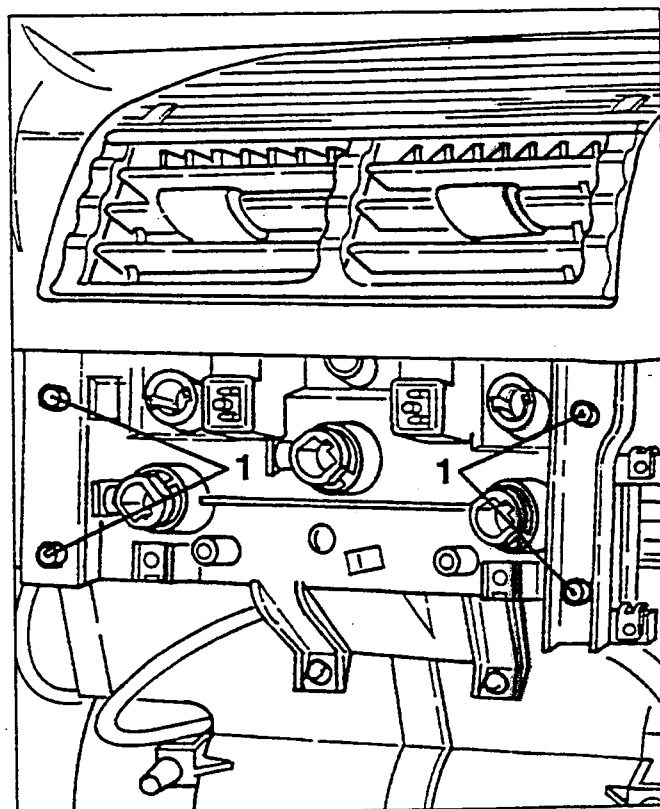


1. Disconnect the coolant fluid inlet and outlet pipes from the climate control system recovering it in a suitable recipient.



- Remove the lower part of the dashboard and the centre console (see GROUP 70).

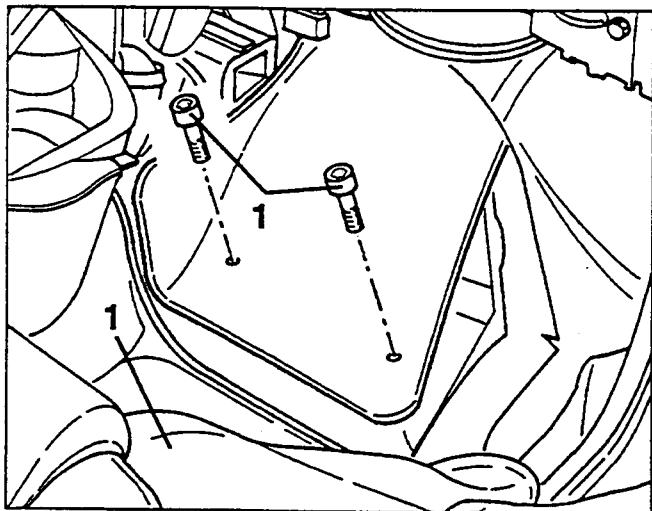
1. Slacken the four fastening screws and lower the climate control unit controls.



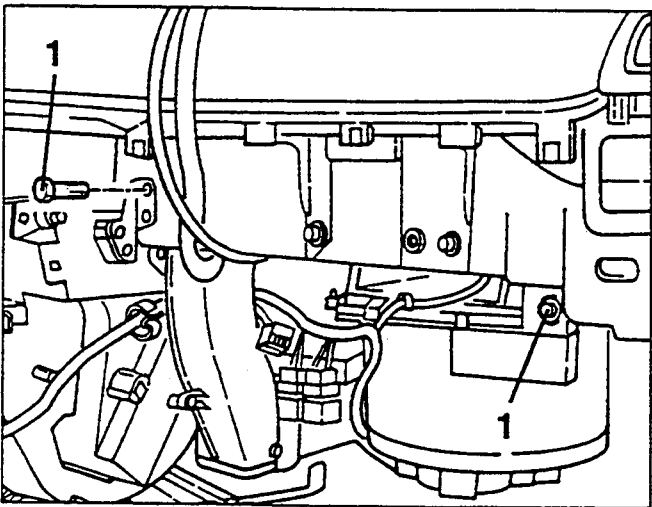
- Remove the two sections of air delivery duct to the rear seat (see GROUP 70).

- Disconnect the electrical connections of the climate control unit.

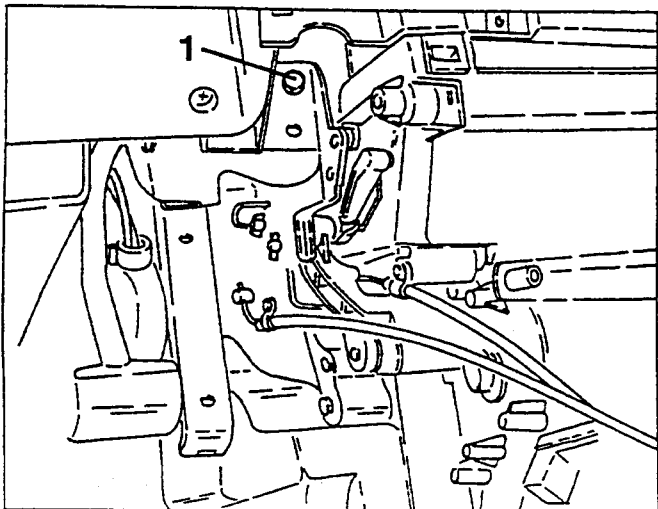
1. Move aside the floor mat, slacken the two fastening screws and remove the control unit cover.



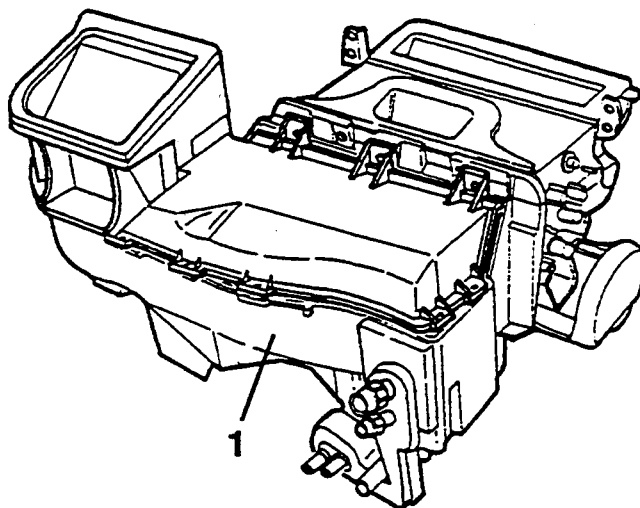
1. Slacken the three right-hand screws fastening the climate control unit.



1. Slacken the screw fastening the left-hand side of the climate control unit.



1. Remove the climate control unit.

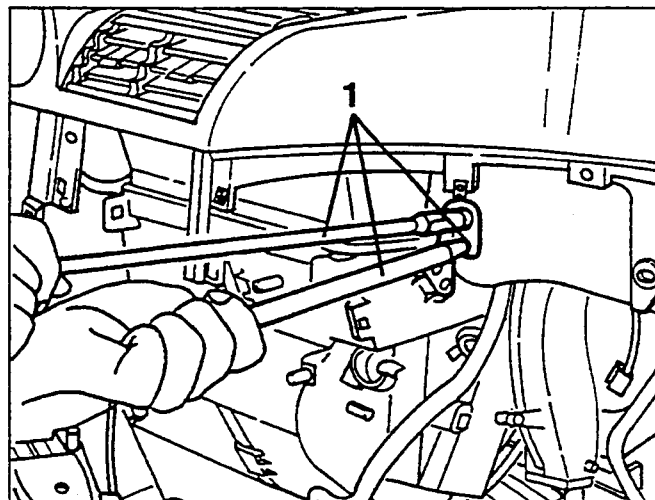


Re-assemble the climate control unit reversing the sequence followed for removal and observing the instructions below.

- Coat the mouth of the heater, water drain and coolant fluid pipes with vaseline.

- Assemble the climate control unit taking care to correctly insert the above-mentioned pipes in their holes.

1. Using a dowel positioned as illustrated, centre the position of the unit before fastening it.



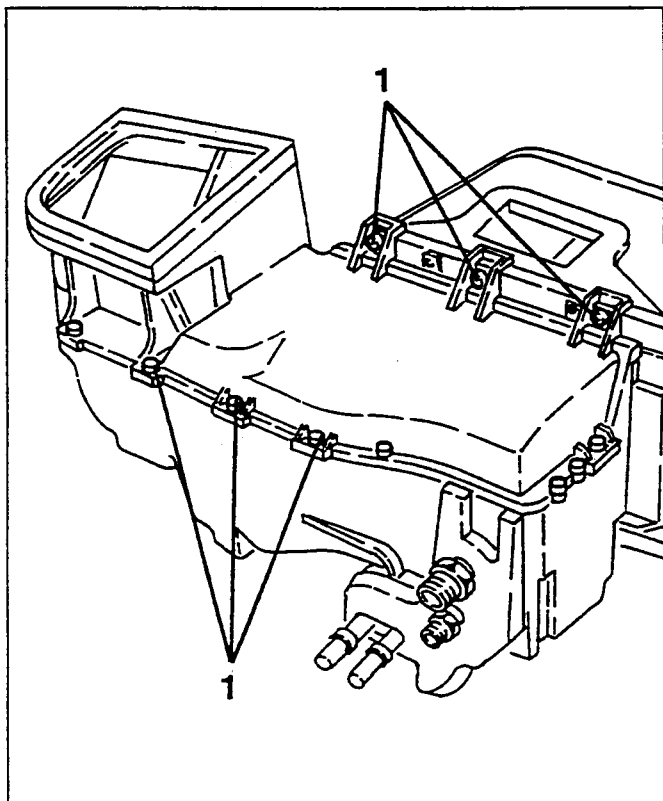
DIS-ASSEMBLY

- Proceed as described for the Turbodiesel version.

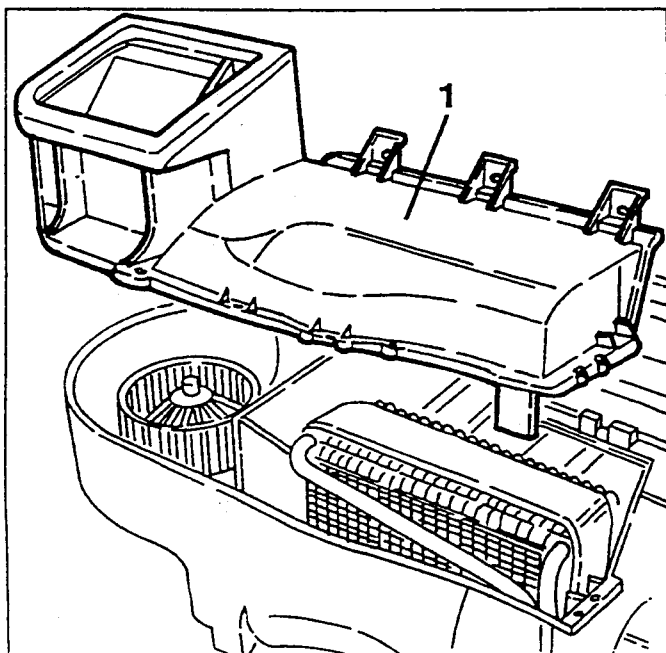
EVAPORATOR**REMOVING/REFITTING**

Remove the "Ducting unit and heater - distributor" as described in the corresponding procedure.

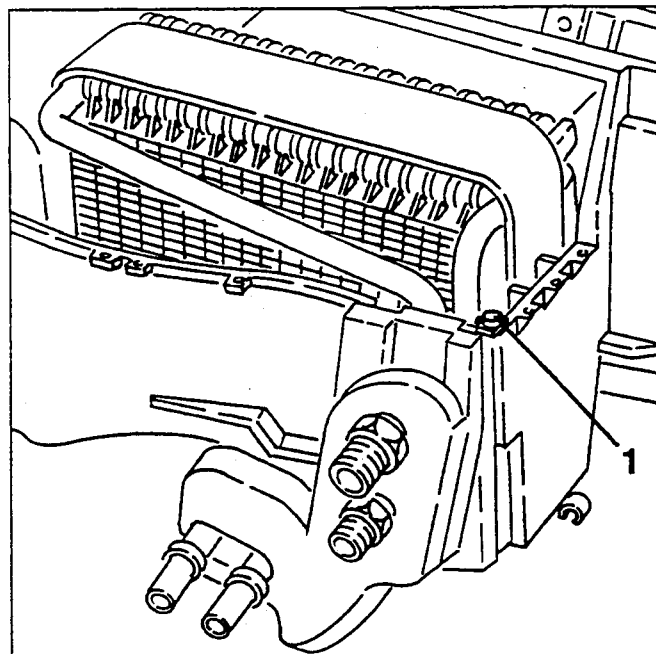
1. Slacken the screws fastening the upper half box to the ducting - distributor unit.



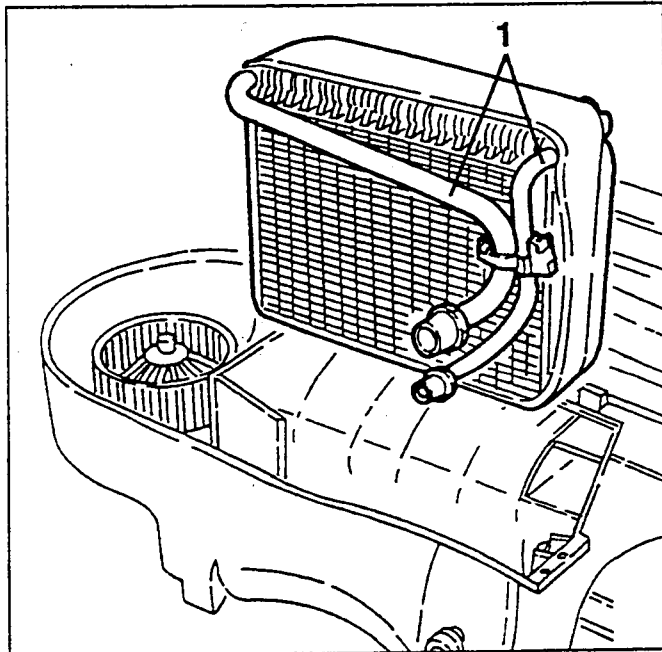
1. Remove the upper half box releasing it from the fastening clamps.



1. Slacken the screw fastening the evaporator to the ducting - distributor unit.



1. Remove the evaporator taking care to withdraw the pipes from the seals.



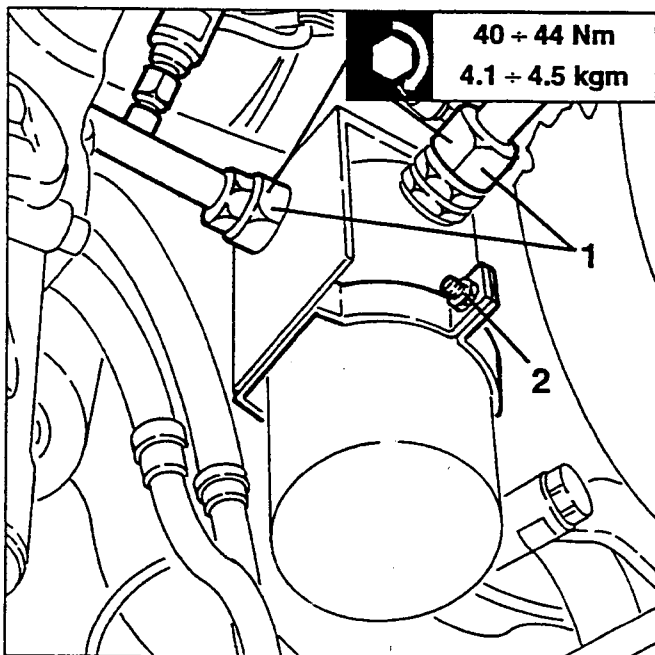
DRIER FILTER**REMOVING/REFITTING**

NOTE: In this system the spare drier filter is supplied with a certain amount of lubricating oil.

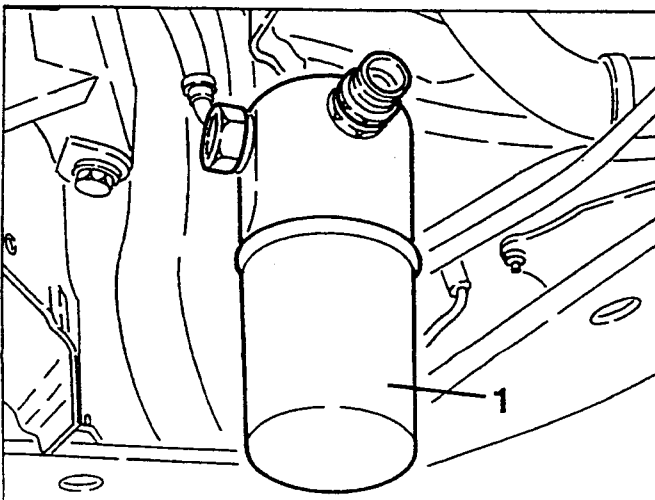
The filter should be changed only when the expansion valve is clogged or if the evaporator is faulty due to internal corrosion, or when the accumulator is leaking.

It is not necessary to replace the filter if it is distorted for some reason (eg. crash) unless it leaks.

- Set the car on a lift.
- Drain the fluid from the climate control unit (see specific paragraph).
- 1. Disconnect the coolant fluid pipe fittings from the filter.
- 2. Slacken the drier filter support clamp.

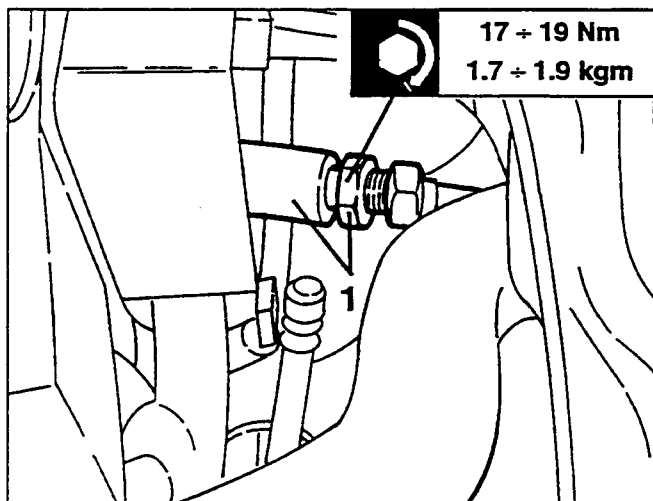


1. Remove the drier filter.

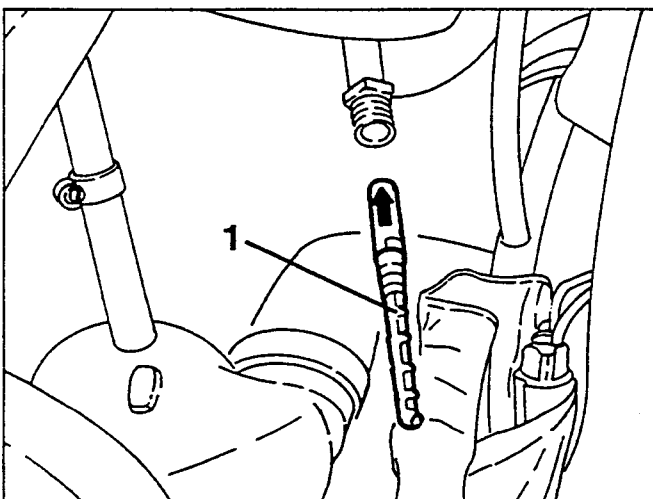
**EXPANSION VALVE****REMOVING/REFITTING**

- Drain the fluid from the climate control unit (see specific paragraph).

1. Withdraw the insulating cover as far as necessary, then disconnect the intermediate union on the pipe connecting the condenser to the evaporator.



1. Withdraw the valve using pliers taking care not to damage it.

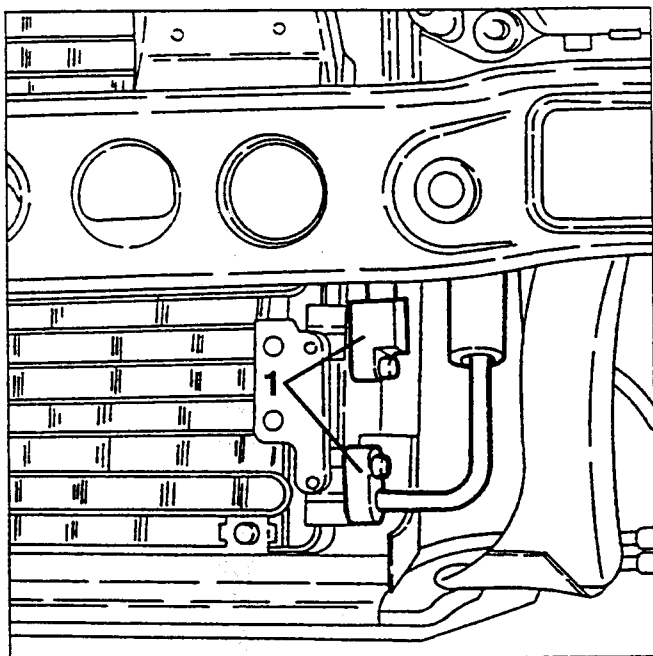


When refitting insert the expansion valve in the pipe with the arrow stamped on it pointing in the direction of the flow of the coolant.

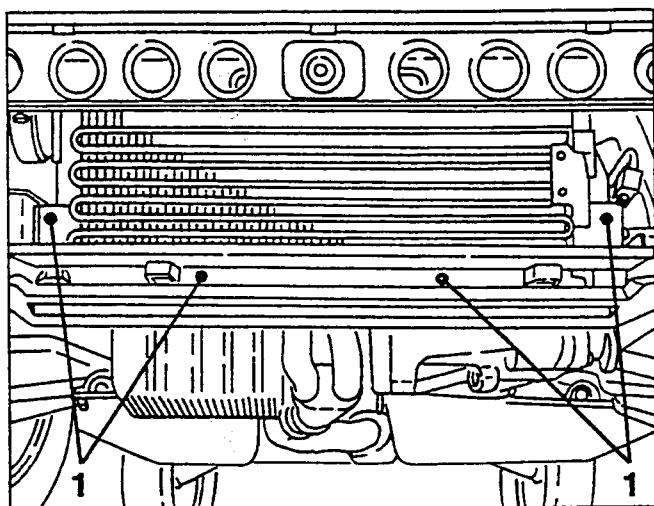
CONDENSER**REMOVING/REFITTING**

- Set the car on a lift.
- Drain the fluid from the climate control unit (see specific paragraph).
- Remove the front bumper (see specific paragraph).

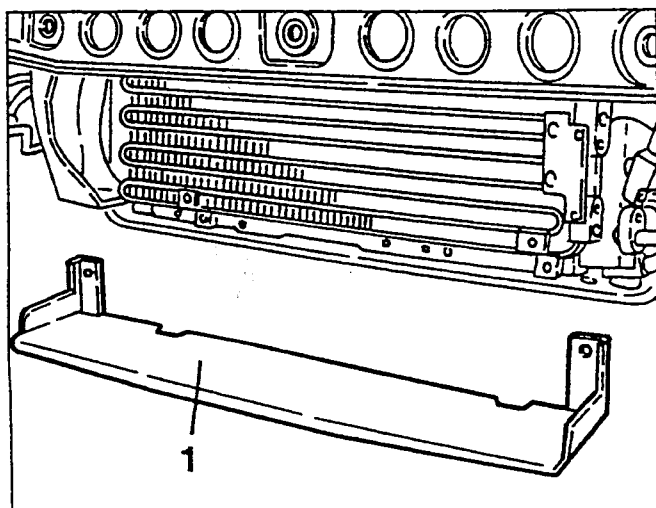
1. Slacken the two fastening screws and disconnect the two coolant inlet and outlet pipes from the condenser.



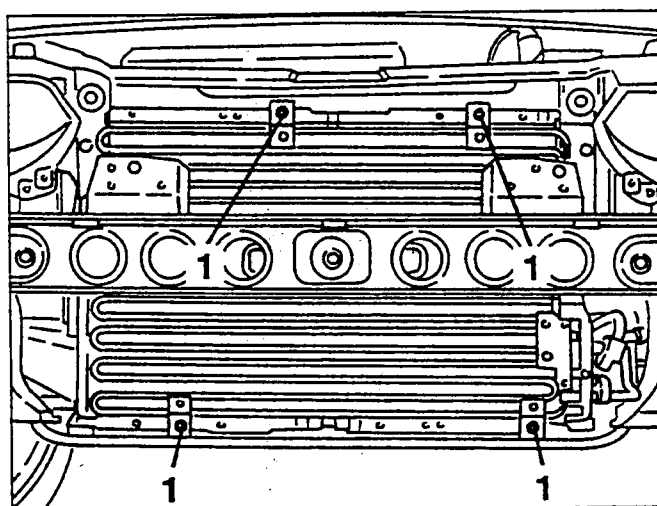
1. Slacken the four screws fastening the air duct to the engine coolant fluid radiator.



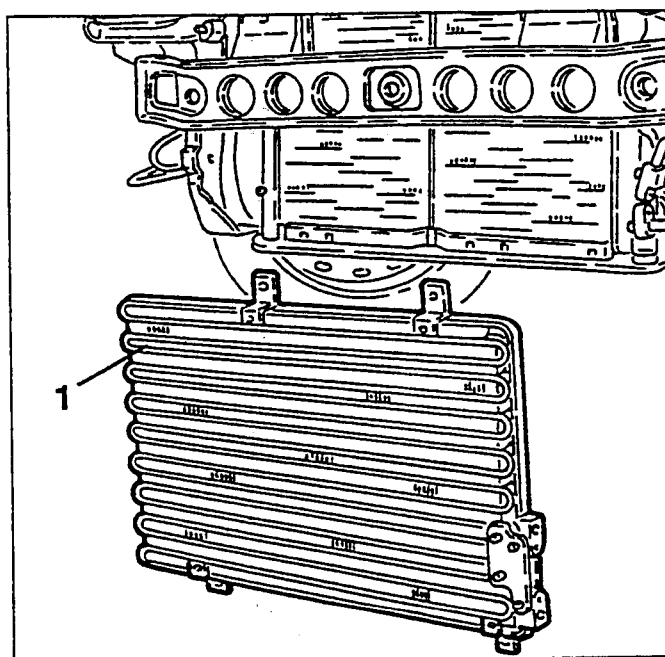
1. Remove the air duct.



1. Slacken the four screws fastening the condenser of the climate control system to the radiator of the engine cooling system.



1. Remove the condenser withdrawing it from below.



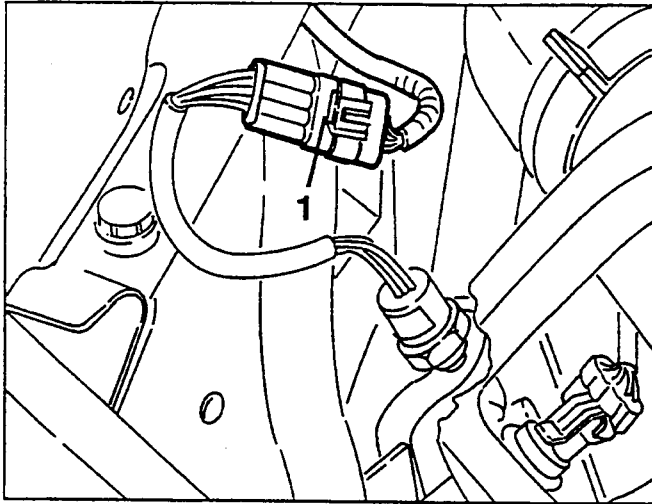
THREE - LEVEL PRESSUR SWITCH (TRINARY)

REMOVING/REFITTING

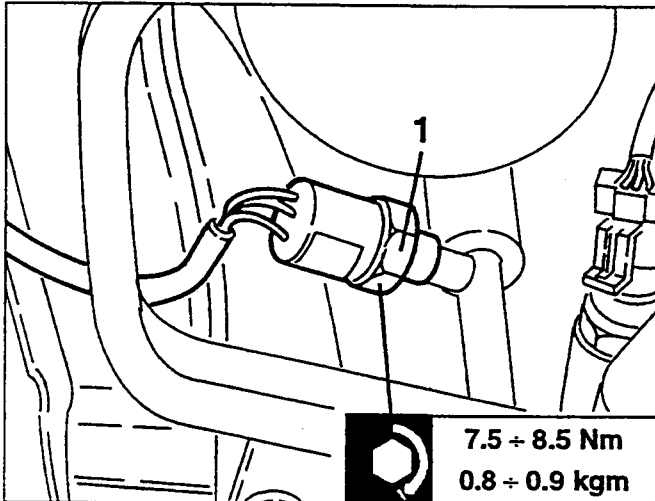
NOTE: Due to a non return valve on the pipe, the pressure switch can be removed without having to drain the coolant fluid.

- Set the car on a lift.
- Disconnect the battery (-) terminal.

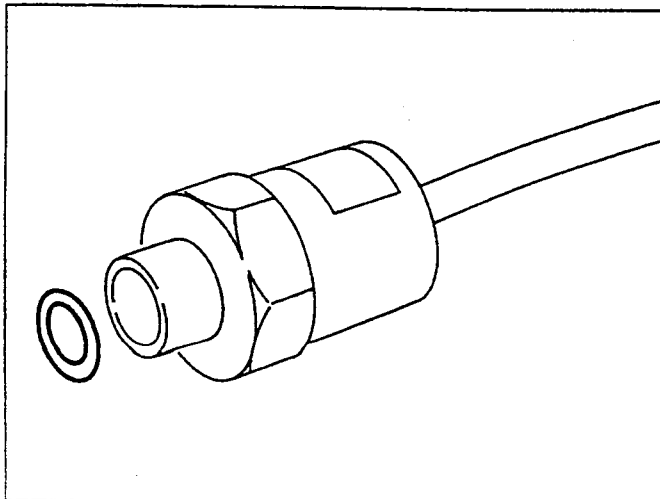
1. Disconnect the electrical connection of the three-level pressure switch.



1. Slacken and remove the three-level pressure switch.



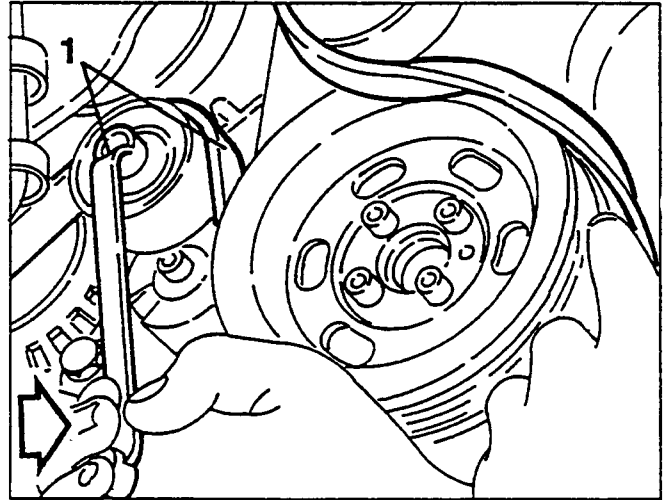
Before refitting the pressure switch make sure of the presence of the seal ring on the pressure switch itself and that it is intact.



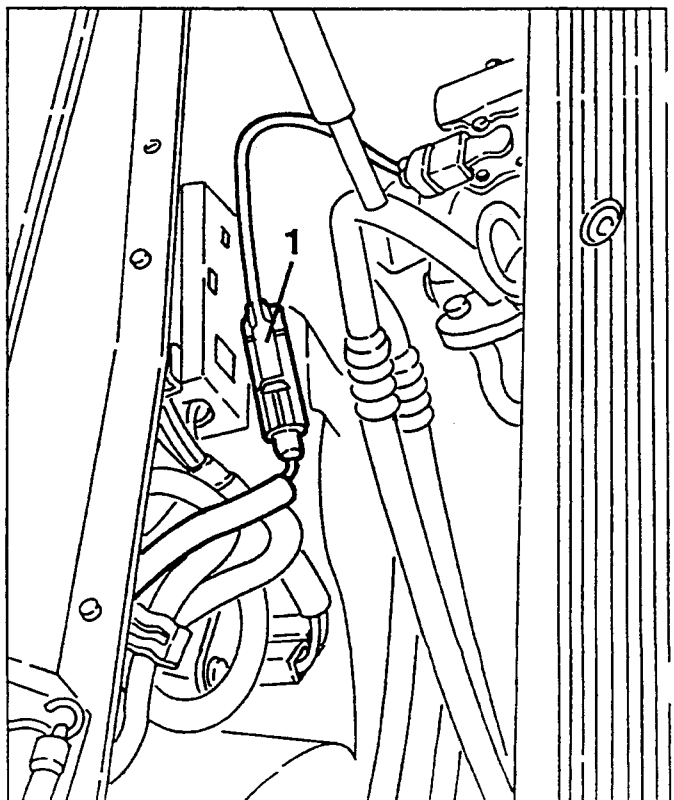
COMPRESSOR

REMOVING/REFITTING

- Set the car on a lift.
- Disconnect the battery (-) terminal.
- Drain the fluid from the conditioning system (see specific paragraph).
- Remove the right front wheel and mud flap.
- 1. Working as illustrated on the guide pulley, slacken the tension of the auxiliary components drive belt and remove it.

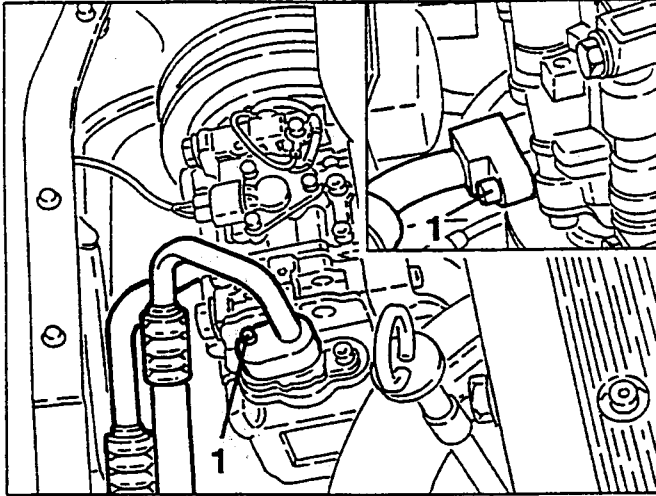


1. Disconnect the electrical connection of the compressor.

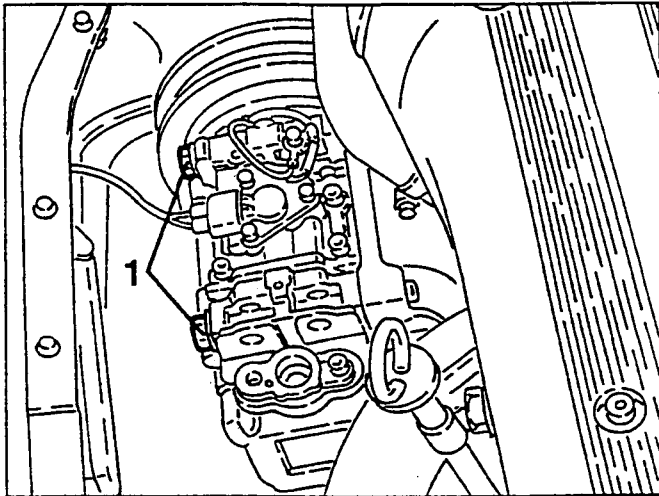


1. Slacken the fastening screws and remove the unions of the compressor coolant fluid inlet and outlet pipes.

NOTE: Suitably plug the compressor inlet and outlet holes to prevent dirt and humidity from getting in.



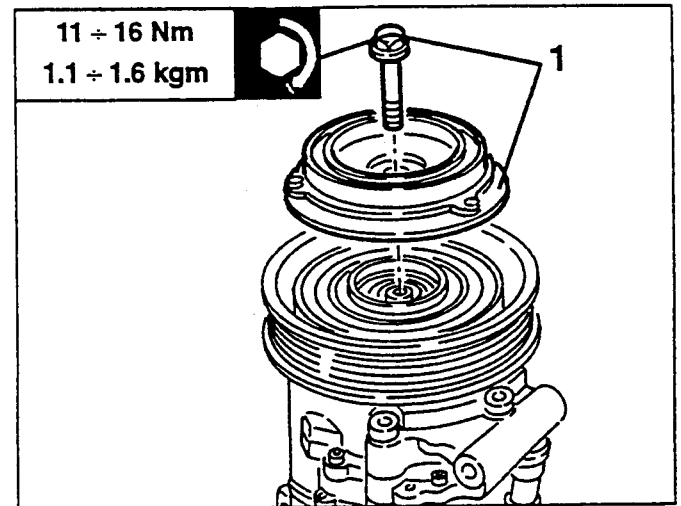
1. Slacken the four screws fastening the support bracket and remove the compressor.



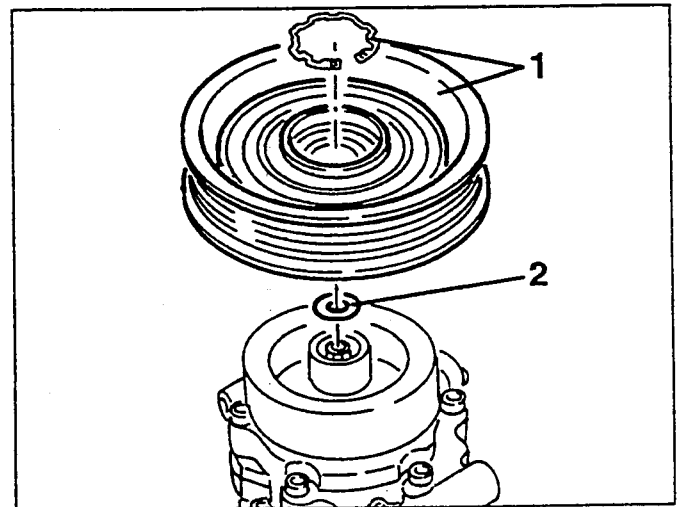
NOTE: The spare compressor is supplied pressurised with nitrogen to prevent the entrance of damp and dirt; during assembly it is therefore necessary to remove the plugs of the inlet and outlet unions slowly and with the compressor positioned absolutely as illustrated below (with the cover facing upwards).

REMOVING THE ELECTROMAGNETIC JOINT

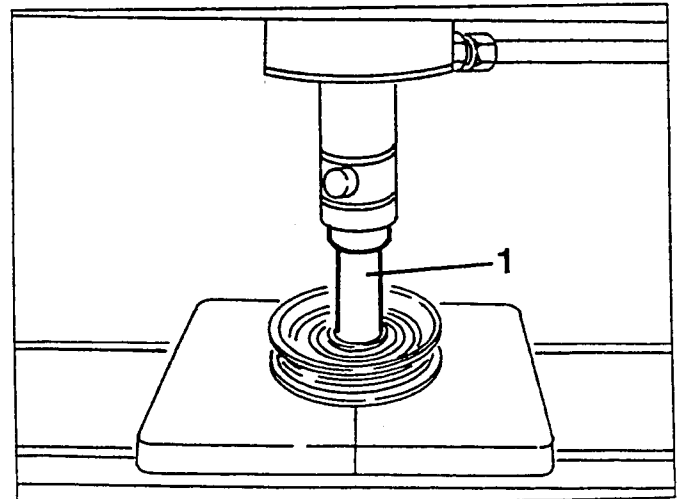
1. Slacken the fastening screw and remove the hub of the electromagnetic joint from the compressor.



1. Remove the circlip and withdraw the pulley of the electromagnetic joint.
2. Retrieve the thrust ring.

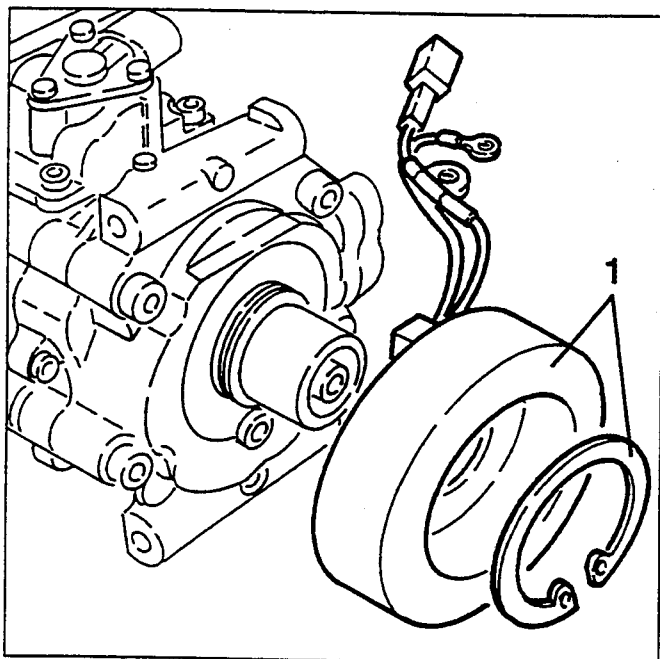


1. Working under a press and using a suitable punch, remove the bearing from the pulley.



- Disconnect the earth cable and the electrical connection to the safety thermal contact.

1. Remove the circlip and remove the electromagnet complete with electrical cables.



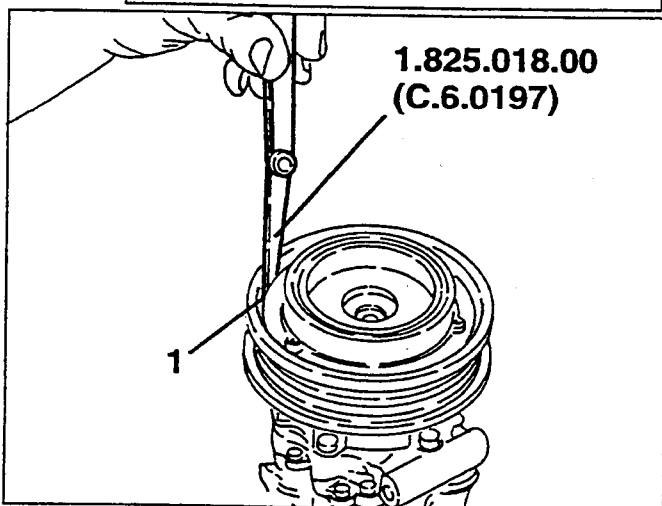
When refitting it is necessary to check that the clearance between the hub and the pulley of the electromagnetic joint is within the specified limit, proceeding as follows.

1. Before assembling the hub, between the pulley and the hub insert the curved thickness gauge no. 1.825.018.000 (C.6.0197) and check that the clearance is within the specified limits.



Clearance between hub and pulley of the electromagnetic joint

$0.5 \pm 0.15 \text{ mm}$



- If the measurement is not within the specified limits add or remove the special thrust rings between the hub and the compressor shaft.

- After adjustment tighten the electromagnetic joint fastening screw to the specified torque.

MINIMUM PRESSURE SWITCH

REMOVING/REFITTING

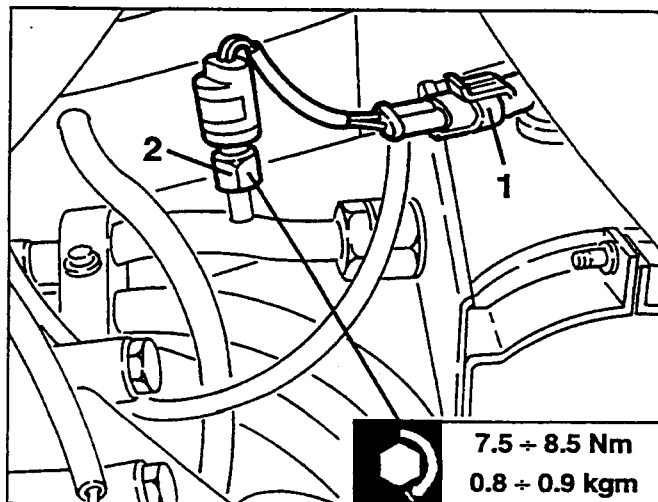
NOTE: Due to the presence of a non return valve on the pipe the minimum pressure switch can be removed without having to drain the coolant fluid.

- Set the car on a lift.

- Disconnect the battery (-) terminal.

1. Raise the car, then disconnect the electrical connection of the minimum pressure switch.

2. Slacken and remove the minimum pressure switch.



PIPE FROM COMPRESSOR TO CONDENSER

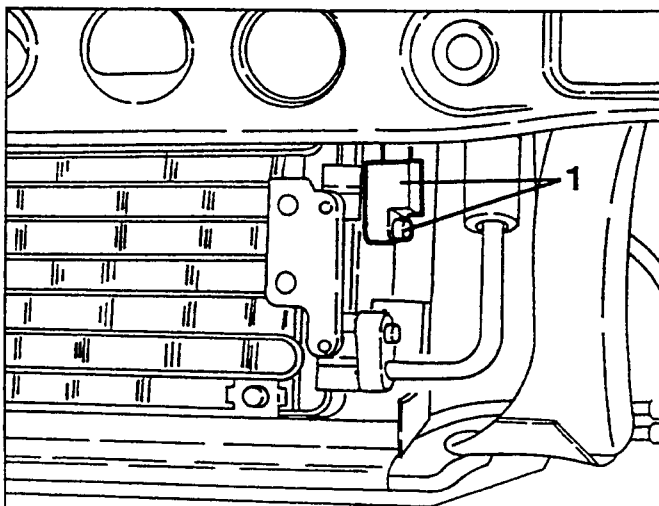
REMOVING/REFITTING

- Set the car on a lift.

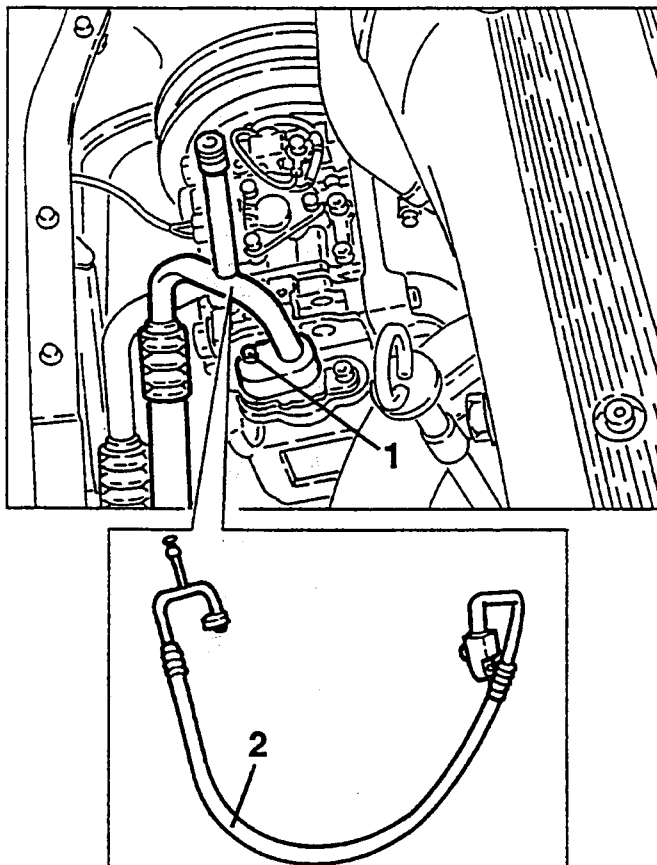
- Drain the fluid from the conditioning system (see specific paragraph).

- Remove the il paraurti anteriore (see specific paragraph).

1. Slacken the fastening screw and disconnect from the condenser the fluid delivery pipe leading from the compressor.



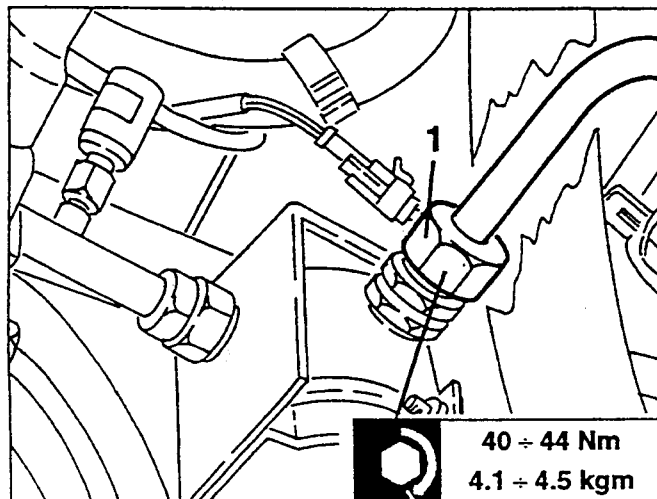
1. Slacken the fastening screw and disconnect the fluid delivery pipe to the condenser from the compressor.
2. Release the clamp fastening the pipe connecting the compressor to the condenser and remove it.



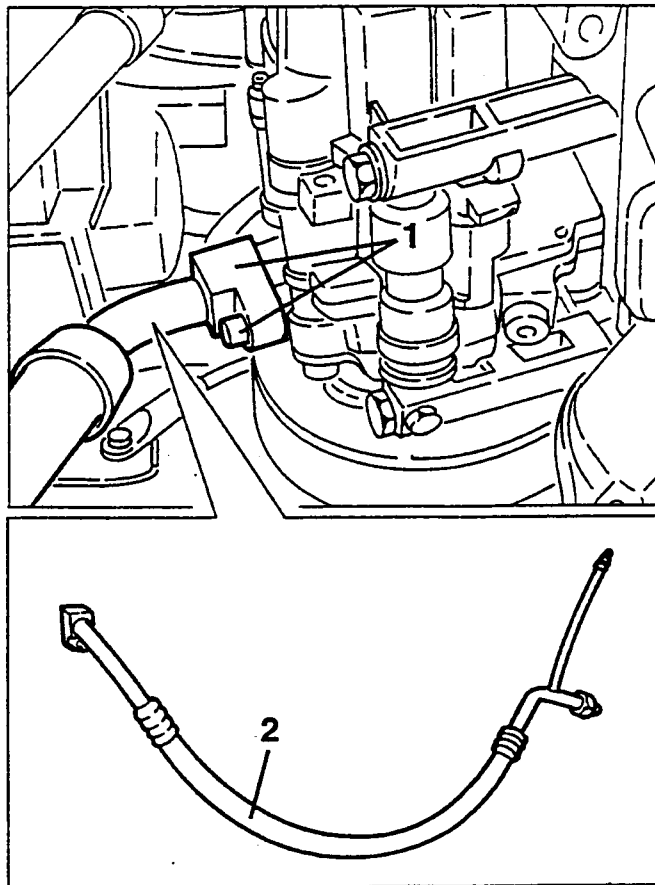
PIPE FROM DRIER FILTER TO COMPRESSOR

REMOVING/REFITTING

- Set the car on a lift.
 - Drain the fluid from the climate control unit (see specific paragraph).
1. Disconnect the union of the delivery pipe to the compressor from the drier filter.



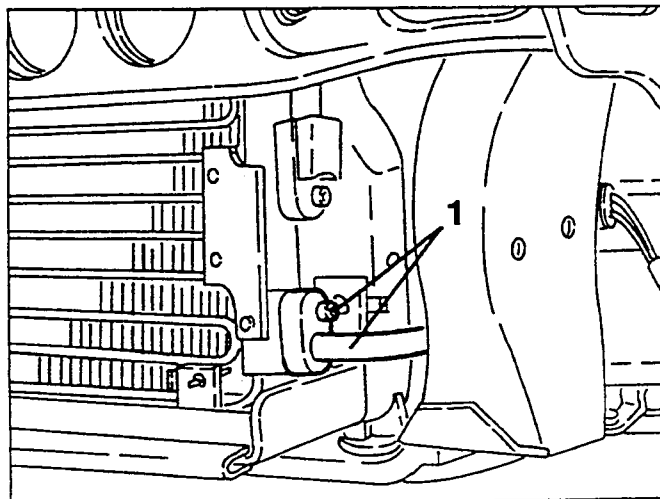
1. Slacken the fastening screw and disconnect the pipe leading from the compressor from the drier filter.
2. Release the clamp fastening the pipe connecting the drier filter to the compressor.



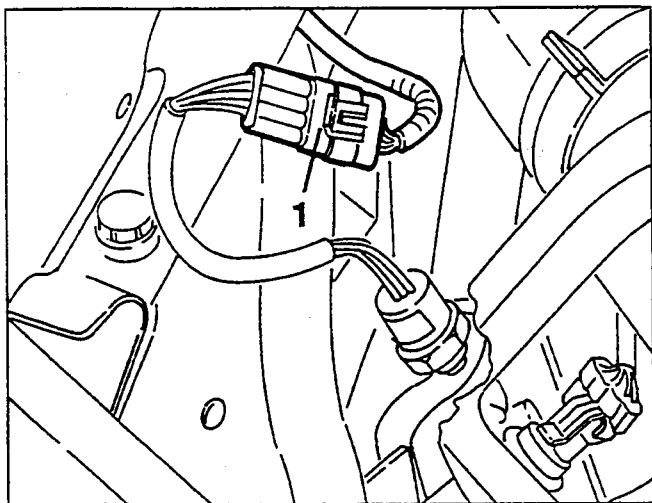
PIPE FROM CONDENSER TO EXPANSION VALVE

REMOVING/REFITTING

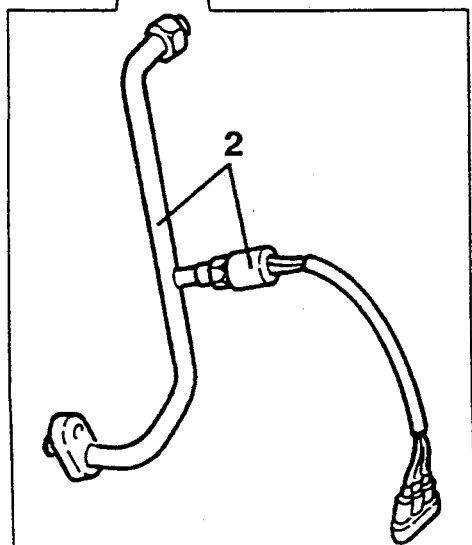
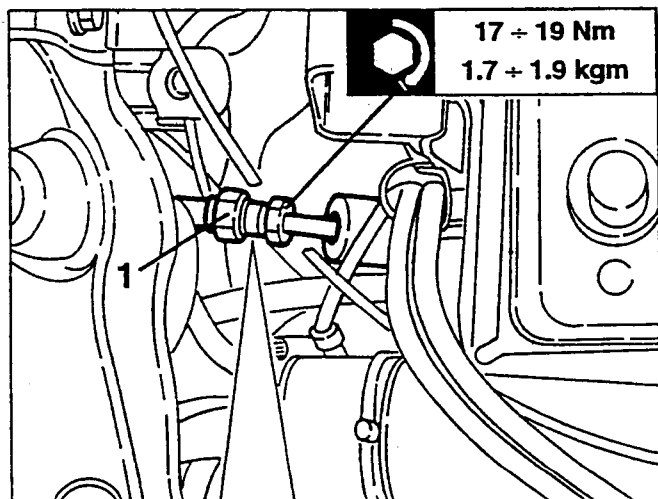
- Set the car on a lift.
 - Drain the fluid from the conditioning system (see specific paragraph).
 - Remove the il paraurti anteriore (see specific paragraph).
1. Slacken the fastening screw and disconnect the coolant fluid outlet pipe from the condenser.



1. Disconnect the electrical connection of the three-level pressure switch.



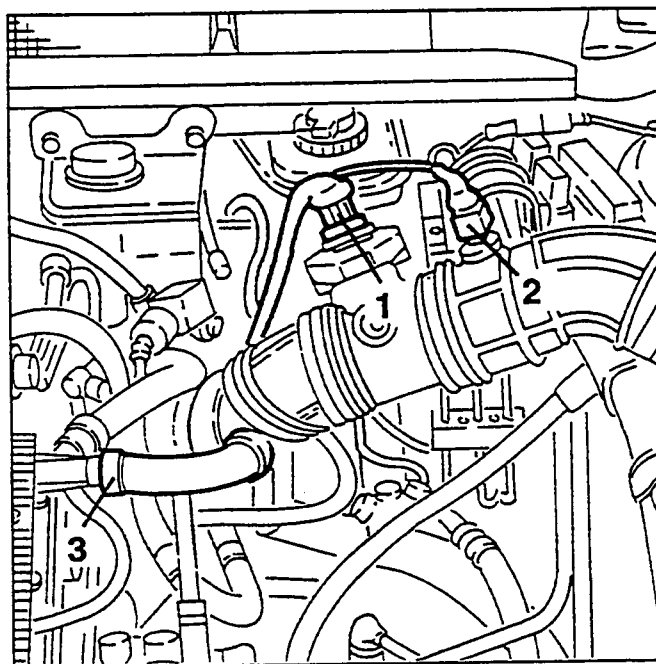
1. Withdraw the insulating cover, then disconnect the union on the expansion valve.
2. Remove the section of coolant fluid delivery pipe from the condenser to the expansion valve complete with three-level pressure switch and, if necessary, separate them on the bench.



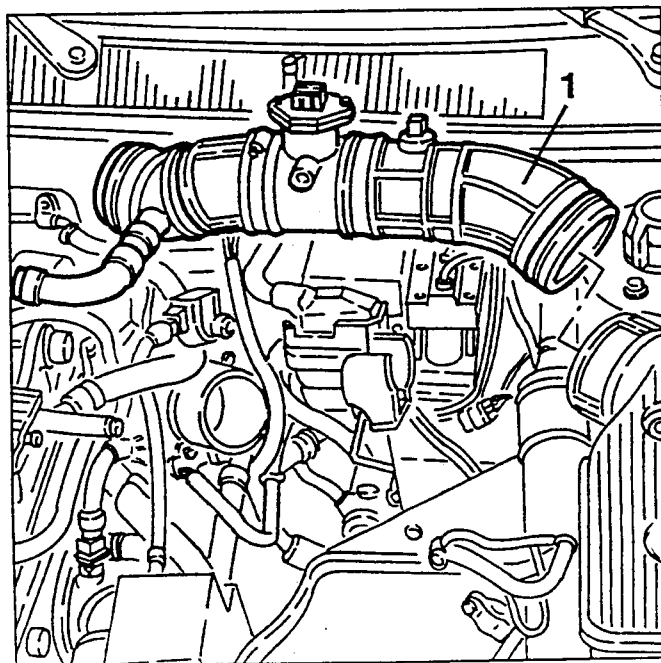
PIPE FROM EVAPORATOR TO DRIER FILTER

REMOVING/REFITTING

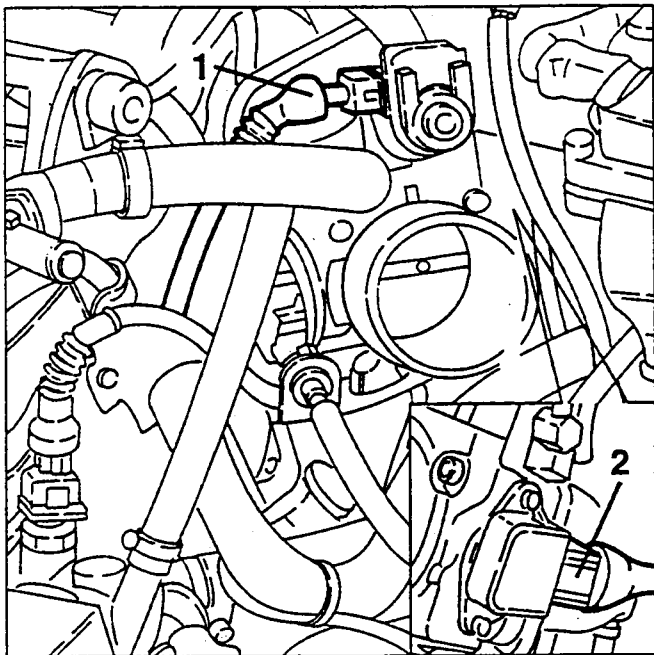
- Drain the fluid from the climate control unit (see specific paragraph).
 - Remove the battery (see specific paragraph).
1. Disconnect the electrical connection from the air-flow meter.
 2. Disconnect the electrical connection intake air temperature sensor.
 3. Slacken the fastening clamp and disconnect the oil vapour recirculation pipe from the cylinder head cover.



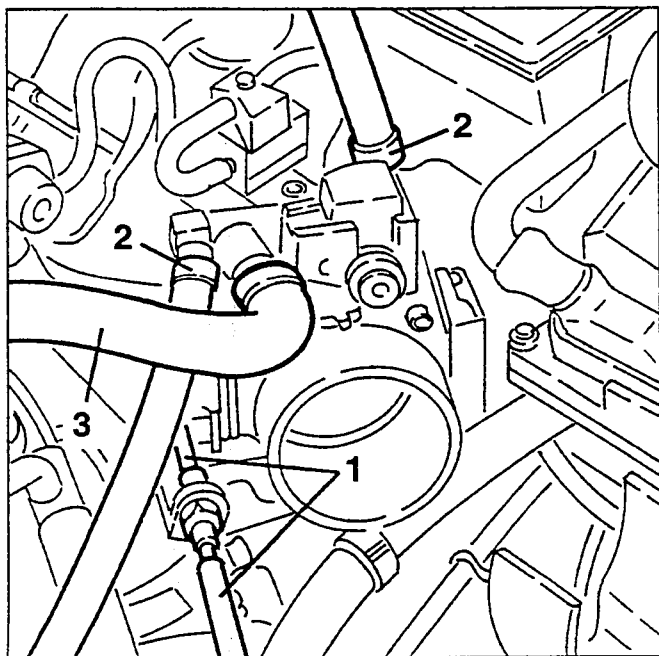
1. Slacken the fastening clamps and remove the th corrugated sleeve complete.



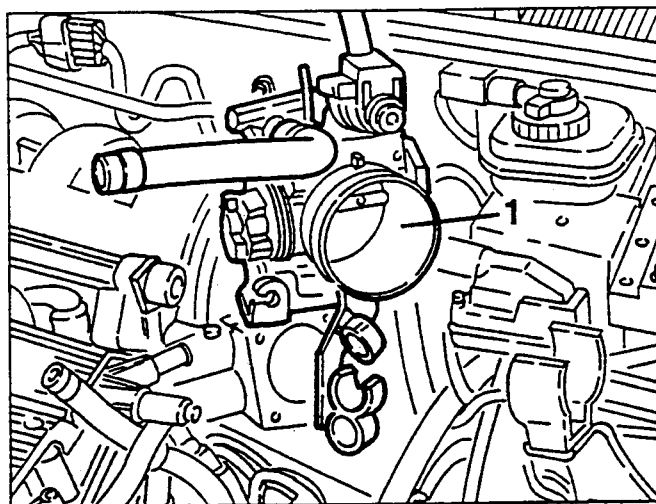
1. Disconnect the electrical connection from the constant idle speed actuator.
2. Disconnect the electrical connection from the throttle potentiometer.



1. Disconnect the accelerator cable from the throttle body.
2. Disconnect the coolant fluid inlet and outlet pipes from the throttle body.
3. Disconnect the idle speed oil vapour recirculation pipe.

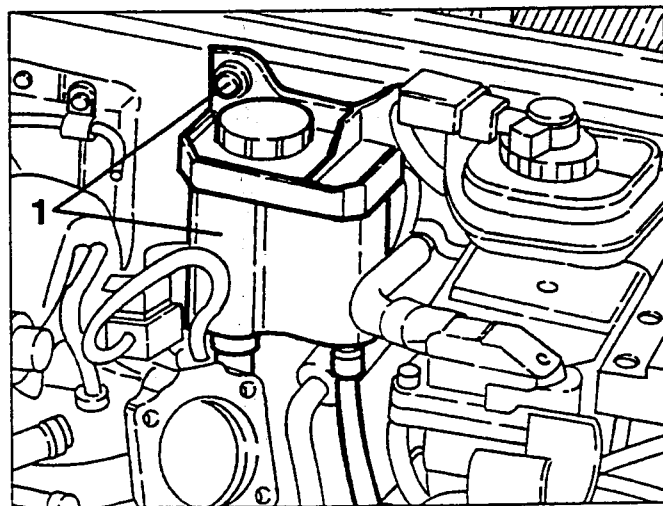


- Release the pipes from the fastenings on the bracket under the throttle body.
- 1. Slacken the four fastening screws and remove the throttle body complete.
- Remove the seal.

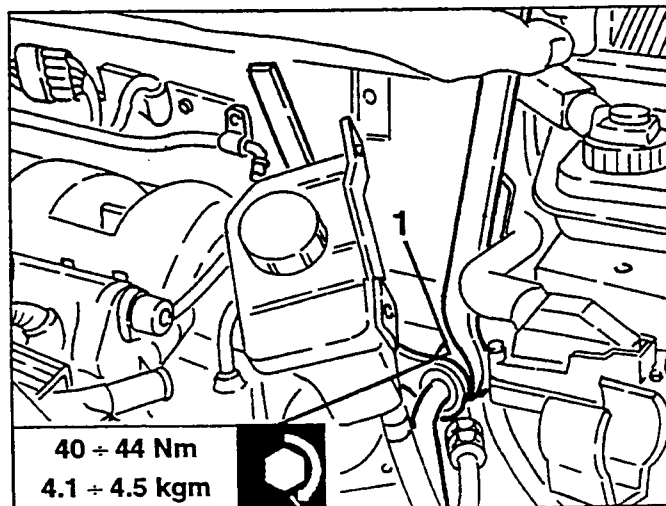


- Using a suitable syringe partially empty the power steering oil reservoir.

1. Slacken the screws fastening the power steering oil reservoir, then move it to one side without disconnecting the piping.



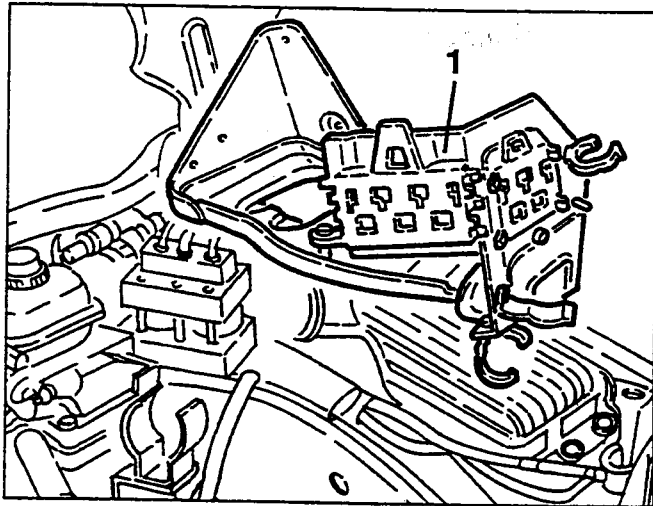
1. Using wrenches no. 1.822.112.000 and no. 1.822.115.000, disconnect the pipe in question from the evaporator.



40 ÷ 44 Nm
4.1 ÷ 4.5 kgm

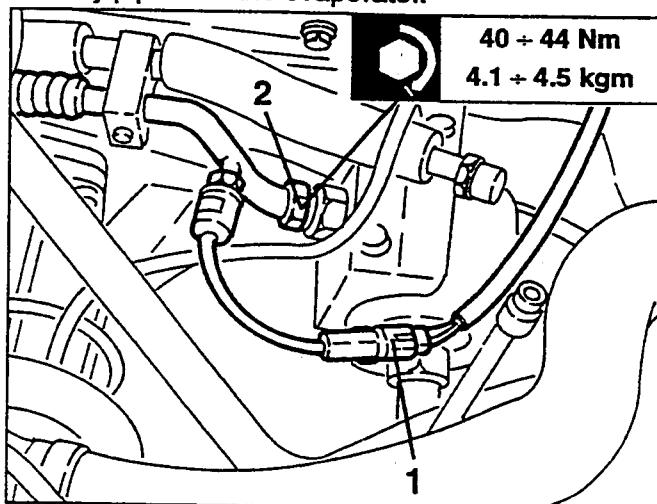
- Remove the relays from the battery support and set them to one side with their cablings so that they do not hinder the following operations.

1. Slacken the fastening screws, then remove the battery support after removing the rear cable support bracket from it.

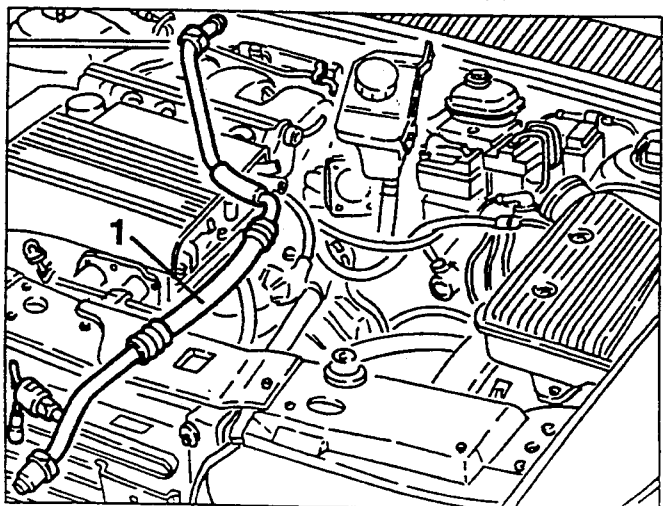


1. Disconnect the electrical connection of the minimum pressure switch.

2. From the drier filter disconnect the coolant fluid delivery pipe from the evaporator.



1. Remove the pipe from the evaporator to the drier filter complete with minimum pressure switch and, if necessary, separate them on the bench.

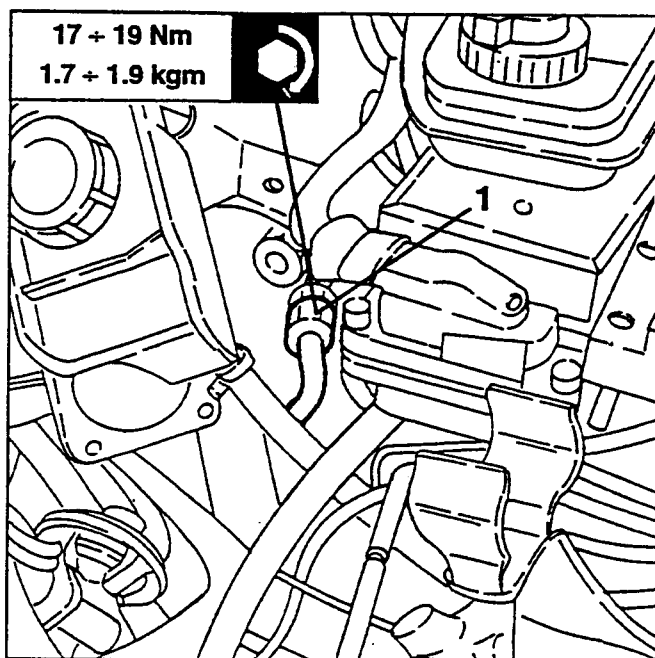


PIPE FROM EXPANSION VALVE TO EVAPORATOR

REMOVING/REFITTING

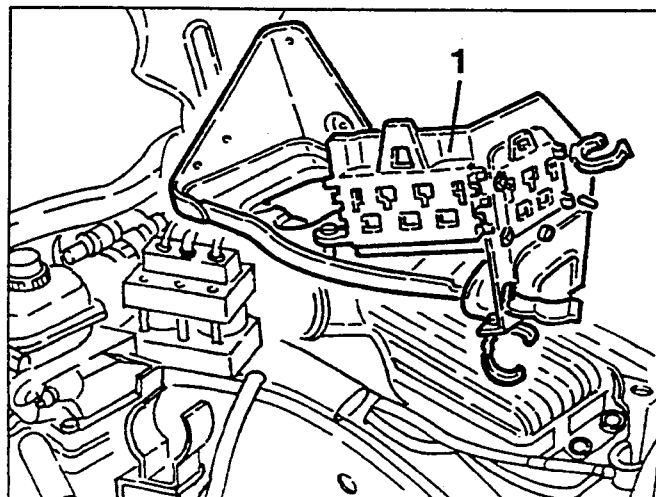
Proceed as described in the previous procedure up to disconnecting the coolant fluid outlet pipe from the evaporator.

1. Using wrenches no. 1.822.111.000 and no. 1.822.113.000, disconnect the pipe in question from the evaporator.

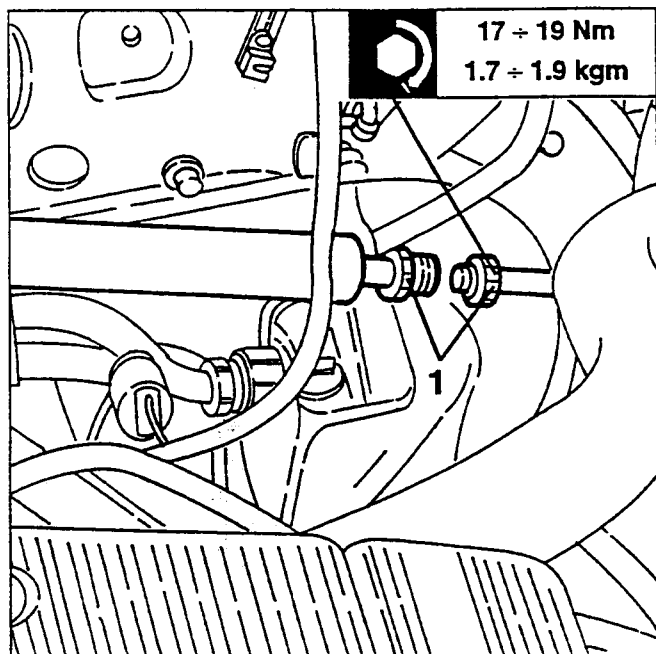


- Remove the relays from the battery support and set them to one side with their cablings so that they do not hinder the following operations.

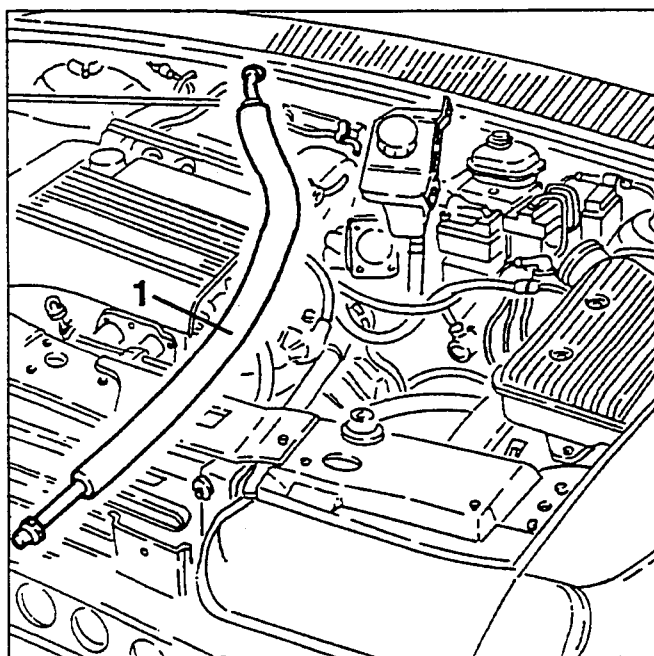
1. Slacken the fastening screws, then remove the battery support after removing the rear cable support bracket from it.



1. Pull back the insulating cover, then disconnect the union on the expansion valve.



1. Remove the section of pipe from the expansion valve to the evaporator.



TOPPING UP THE OIL LEVEL OF THE CLIMATE CONTROL UNIT COMPRESSOR



WARNING:

- The oil level in the compressor should only be carried out when presumably a considerable amount of lubricating oil has leaked due to damage or disconnection of components of the climate control system or if it has been emptied.
 - The oil is highly hygroscopic: avoid leaving the cans open.
- Avoid leaving the compressor and any other part disconnected from the system longer than the time necessary.
- In the event of operations or servicing in the engine compartment with pipes of the system exposed to the air for more than six hours, it is not sufficient to top up the level, the compressor lubricating oil must be replaced completely, proceeding as described in point C.
 - To top up the oil level only use new oil of the type specified in the "TECHNICAL DATA".

N.B. The procedures differ according to the cases.

Five are described below (A, B, C, D, E).

A) "SLOW" SYSTEM DRAINING -

In case of Routine Maintenance (emptying and recharging)

When draining the system using the special equipment, the compressor oil removed is collected in a special graduated container to be found on the equipment.

Before recharging the refrigerant fluid, top the system up with the quantity marked on the container, plus 15 cm³.

If the plug on the compressor and the pipe fittings are not accessible, use a syringe to send the oil through one of the recharging valves (this valve can be removed with a suitable tool comprising a hollow pipe with special groove).

B) "QUICK" SYSTEM DRAINING

(In under 5 minutes) - In the case of accidental breakages

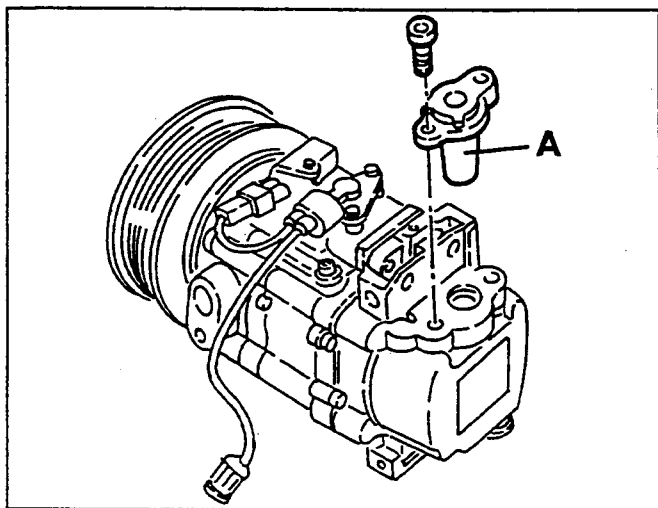
Under these circumstances it is not possible to determine the exact quantity of the oil lost.

Replace it as described above, in all cases with 50 cm³ of oil.

N.B.: if for some reason, the compressor is removed and refitted follow the description given in point C.

C) COMPLETE OVERHAULING OF THE SYSTEM
In the event of washing or "important" operations on the system

- Drain the coolant fluid from the climate control system and flush the system.
- Remove the compressor.
- Remove the oil separator device (A) fastened next to the outlet union of the compressor and drain all the oil contained in the compressor.



- Refill with new oil of the type and in the quantity specified in the "TECHNICAL DATA":
- Refit the compressor on the car and recharge the system.

D) CHANGING THE COMPRESSOR ONLY

- Drain the coolant fluid from the climate control system.
- Remove the compressor.
- Drain the oil from the compressor just removed, collecting it in a suitable recipient.
- Carry out the same operation for the new compressor.
- Fill the compressor with the same amount of oil removed from the old one.
- Refit the compressor on the car.
- Recharge the system, topping up with an additional 15 cm³.

E) CHANGING ONLY THE DRIER FILTER

the drier filter is supplied in production (and also as spare) with a certain amount of oil.

NOTE: this filter is easily distinguished by a label with the writing "CONTAINS 130 C.C. OF NIPPONDENSO N.D.9 OIL".

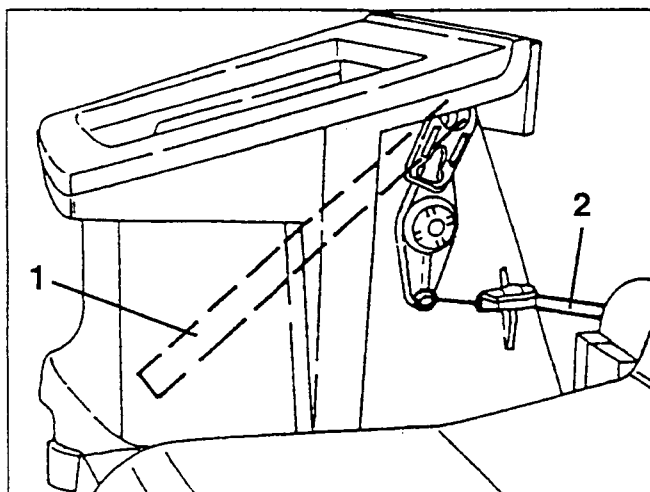
- Drain the coolant fluid from the climate control system.
- Remove the filter.
- Drain the oil from the filter, collecting it in a suitable recipient.
- Carry out the same operation for the new filter.
- Fill the new filter with the same amount of oil drained from the old one (remove or add accordingly).
- Refit the filter on the car.
- Recharge the system, topping up with an additional 15 cm³.

DESCRIPTION

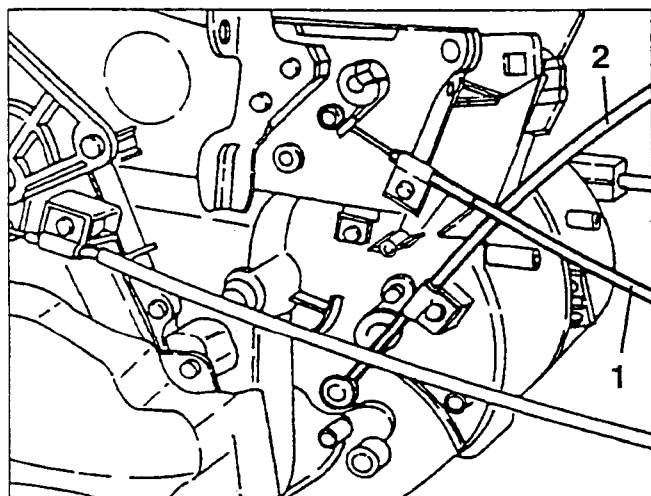
The heater unit is substantially the same as the climate control unit.

The main differences are the following:

- a) There is no evaporator;
- b) The outside air/recirculation flap (1) is not operated electrically by an actuator but by a control cable (2).

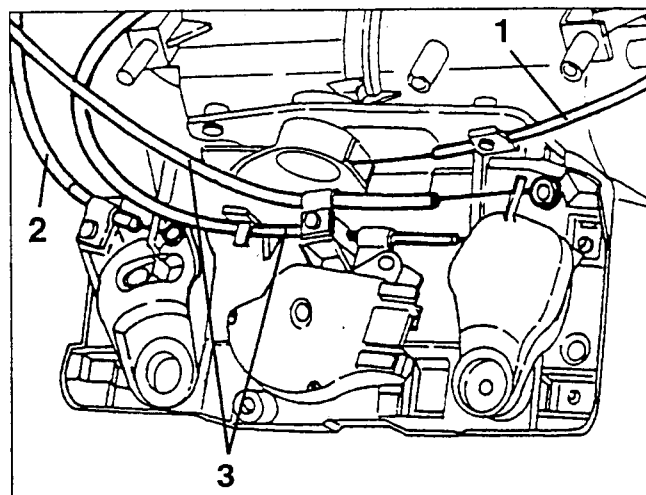


- c) The adoption of two control cables instead of one for moving the two air flow flaps, thus the transmission linkages have been eliminated.



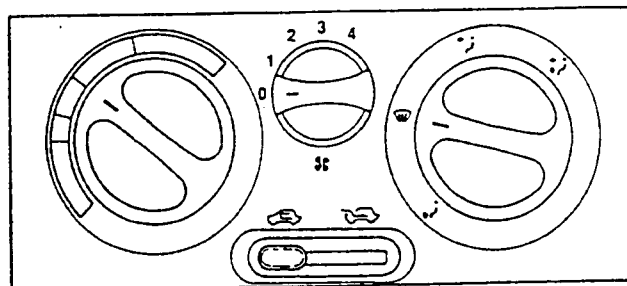
- 1. Upper air flow flap control cable
- 2. Lower air flow flap control cable

- d) Due to the above-mentioned differences, also the control unit differs as it will have four control cables rather than two and an electrical connection less.



- 1. Outside air/recirculation flap control cable
- 2. Air mixing flap control cable (unchanged)
- 3. Air flow flaps control cable

- Therefore, the control panel is without the pushbutton for turning on the compressor and with a lever for manually controlling the outside air/recirculation flap. In addition, the fan control knob no longer has the OFF position for shutting off the inlet of outside air.



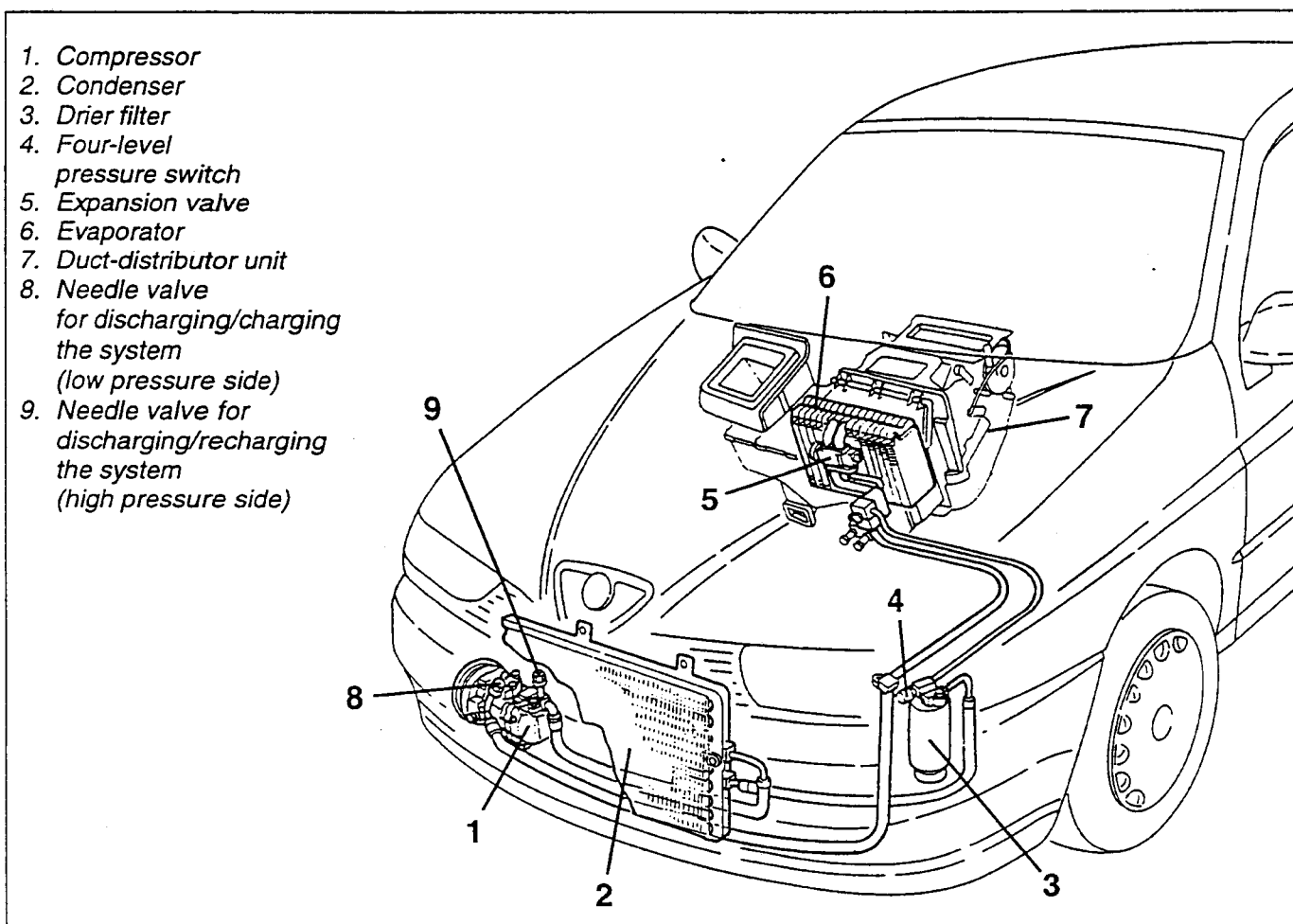
- e) There is no air flow vent to the rear passengers.

DESCRIPTION OF THE SYSTEM

The air conditioning system comprises the following components:

- a variable displacement compressor fastened to the engine by brackets;
- a condenser which is a heat exchanger fitted in front of the engine coolant fluid radiator;
- a drier filter located to the left side of the condenser;

- an evaporator which is the second heat exchanger of the system to be found in the duct-distributor unit;
- an expansion valve fitted on the evaporator inlet duct;
- various pipes and hoses which connect the different components of the system;
- four-level pressure switch installed on the drier filter. Two tubes are welded on the high and low pressure pipes on which a needle valve is fitted which serves for discharging and charging the system.



The system with thermostatic adjustment SEMI-AUTOMATICALLY CONTROLS the climate control system of the car.

In fact, according to the temperature required in the passenger compartment, it manages the following automatically:

- air temperature at the vents;
- fan speed (with constant changing).

Upon manual operation it handles the following:

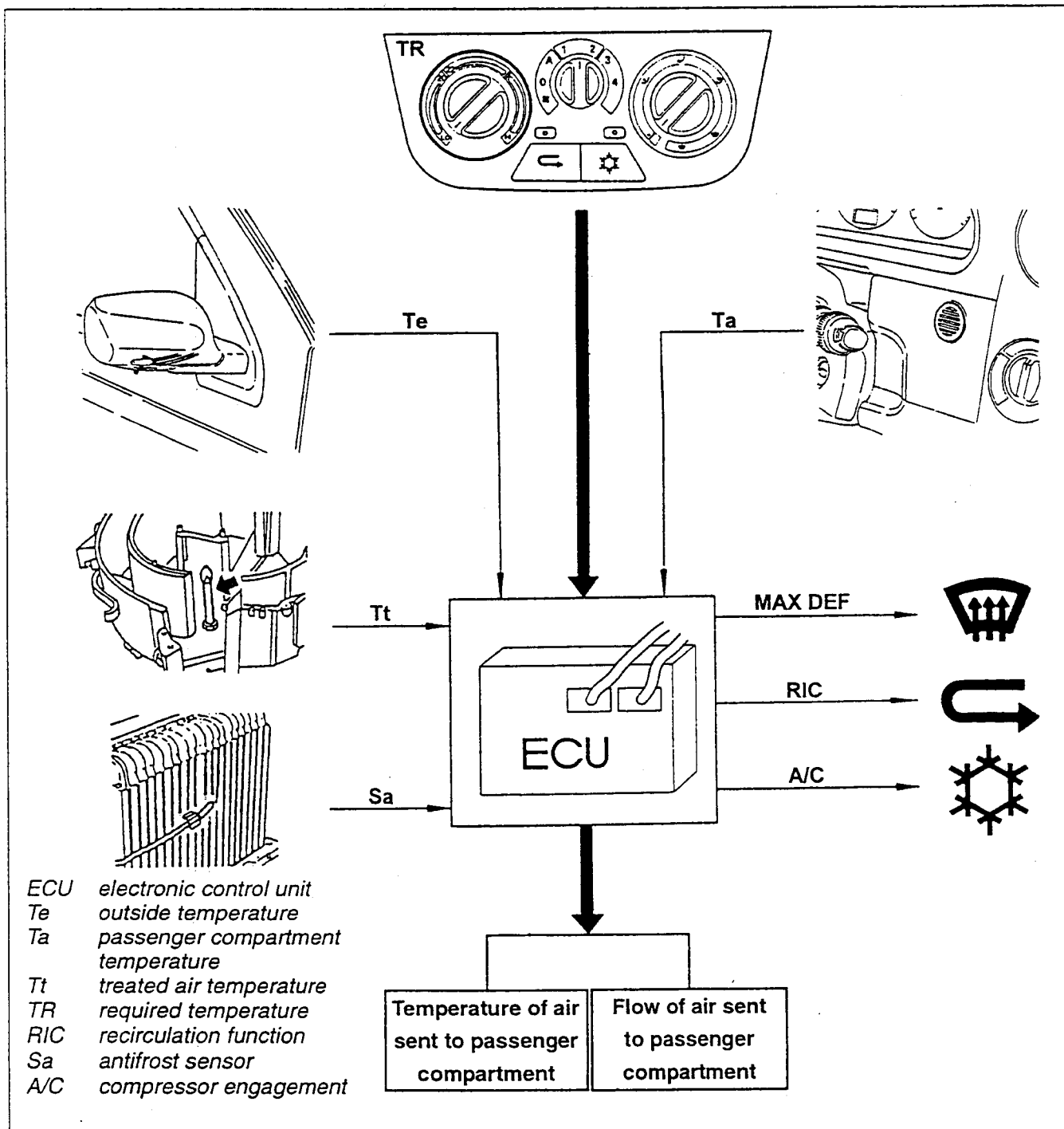
- fixed fan speed (4 speeds);
- compressor engagement (air cooling circuit);
- engagement of air recirculation;
- "MAX DEF" function.

Lastly the distribution of the flows of air to the different vents are adjusted completely manually (through bowden cable).

OPERATING LOGIC

A special control unit manages automatic operation of the system controlling the thermodynamic parameters in order to provide the climatic comfort (temperature and humidity) required by the occupants of the vehicle.

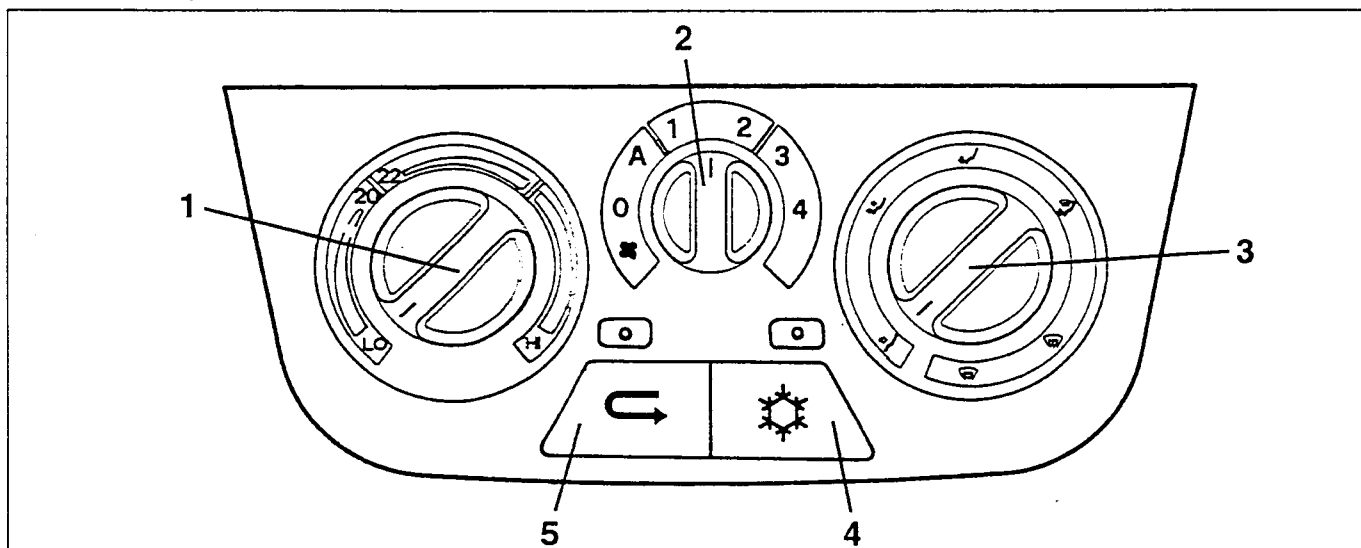
According to the requests received and the temperature conditions detected, the control unit sets certain functions to adapt the temperature of the passenger compartment to the one required.



Through suitable control logics of the sensors and adjustment with "self-teaching" of the actuators, the electronic control unit is capable of recording and memorising a series of faults and failures that may occur in the system.

If these faults occur, the control unit still continues to manage system operation replacing any abnormal

values with suitable "recovery" values which ensure minimal operation though not perfect of the system. For further information, see "ELECTRIC - ELECTRONIC DIAGNOSIS".

CONTROLS

The left knob (1) is used to select the **TEMPERATURE REQUIRED** (between 18 and 30°C): it is connected to a potentiometer which detects the different angular positions and transmits a signal to the electronic control unit for a total of 15 different positions (one per degree centigrade) of which the two extreme positions are "LO" and "HI" which correspond respectively to the request for the highest amount of cool air and the highest amount of warm air. The centre knob (2) adjusts **AIR VENTILATION**: this too, is connected to a potentiometer which detects the different angular positions and transmits a signal to the electronic control unit. There are four possible flow rates that can be set manually in a permanent manner (1, 2, 3 and 4), while in the 'AUTO' position it is the system itself that automatically selects the most suitable temperature for reaching or keeping the required temperature.

NOTE: Position "0" indicates minimum ventilation: the fan is off and only a light flow of air will go through the vents.

NOTE: There are two different maps inside the control unit which correlate the air flow rate and the fan speed: the presence of the pollen filter on the outside air inlet lowers the flow rate - at the same fan speed - in the "dynamic air" condition compared with "recirculation".

The right knob (3) selects **FLOW DISTRIBUTION** of air to the passenger compartment which can take place in five different ways:

selection takes place manually through a cable which controls the movement of the distribution ports.

When the button (4) is pressed, it enables operation of the **COMPRESSOR** (air cooling circuit); when the button is released operation is cut off.

Engagement takes place completely manually: only in the "MAX DEF" mode is the compressor still engaged with the button released.

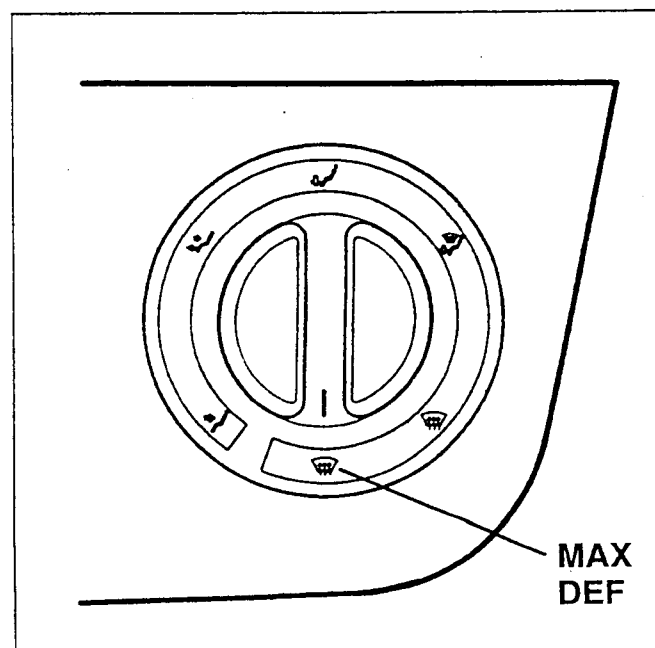
When button (5) is pressed, it engages the **AIR RE-CIRCULATION** function from inside the passenger compartment; when the button is released it allows the inlet of "dynamic" air from outside.

Engagement takes place entirely manually: only in the "MAX DEF" mode is recirculation cut off also with the button pressed.

"MAX DEF" function

When the distribution knob is turned completely clockwise - it activates - through a special microswitch - the "MAX DEF" function for quick defrosting which involves:

- maximum air flow rate;
- mixing with the highest amount of heat available
- recirculation off, regardless of the position of button (5);
- compressor enabled, regardless of the position of button (4).

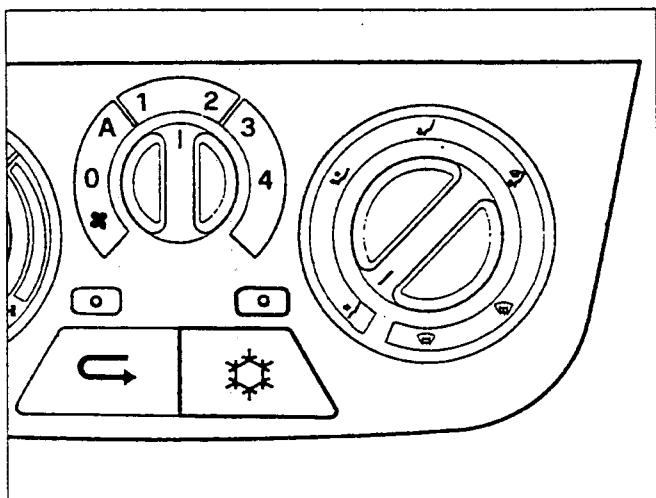


Compressor engagement

When pressed, the button illustrated enables COMPRESSOR OPERATION (air cooling circuit); when the button is released operation is disengaged.

However actual engagement of the compressor depends on the following conditions:

- outside temperature below 5°C: (disengagement below 4°C and re-engagement above 6°C);
- temperature detected by the antifrost sensor: (disengagement below 3.5°C and re-engagement above 5°C).



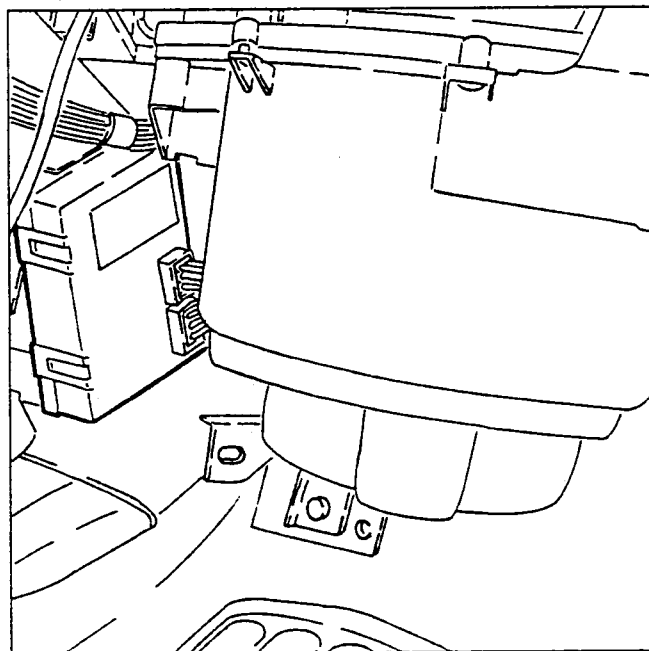
You are reminded that the compressor may also be disengaged by the four-level pressure switch or by the engine control unit. This logic depends on the different engine management control units (see ELECTRIC - ELECTRONIC DIAGNOSIS).

SYSTEM COMPONENTS

ELECTRONIC CONTROL UNIT

The electronic control unit manages automatic operation of the system controlling the thermodynamic parameters in order to provide the climatic comfort (temperature and humidity) required by the occupants of the car.

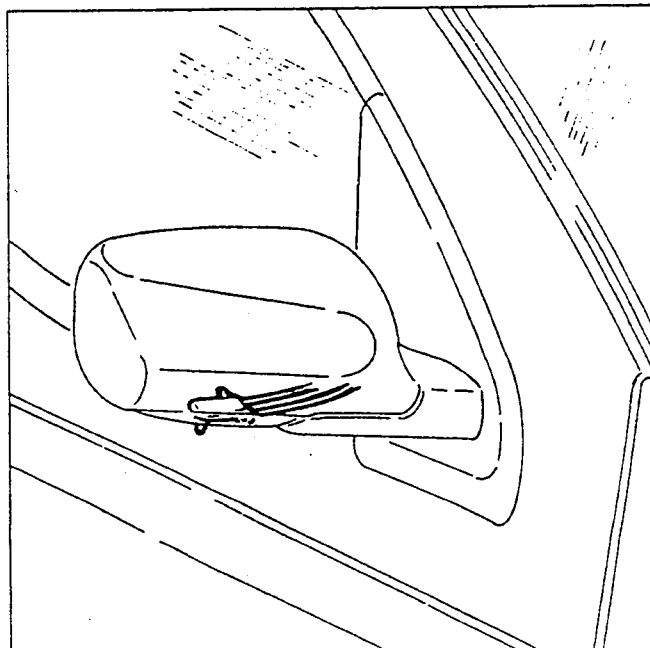
It is on the right side of the duct-distributor unit and access to it is easily gained from the passenger compartment.



OUTSIDE AIR TEMPERATURE SENSOR

This is on the right wing mirror.

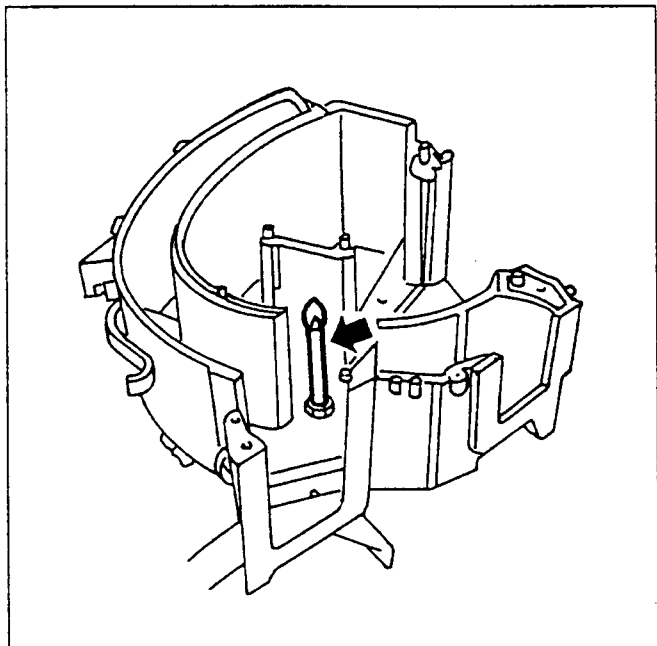
It is an NTC sensor - resistance that lowers with the temperature (R at 25°C = 10 kOhm), with operating range from -30°C to +50°C.



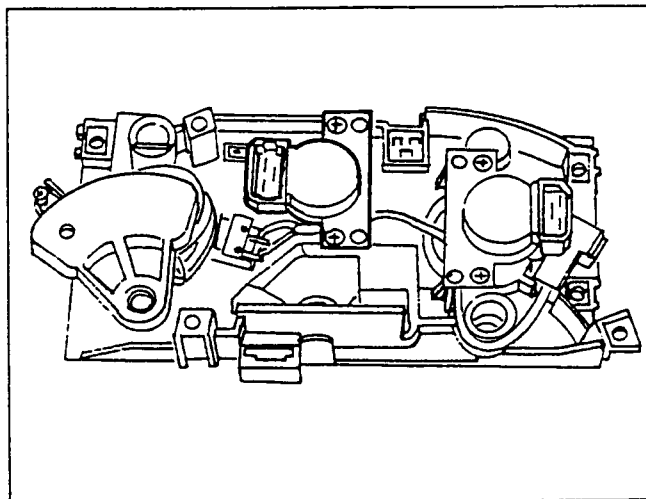
TREATED AIR TEMPERATURE SENSOR

This is inside the distributor unit immediately upstream of the air flow distribution ports to the different vents.

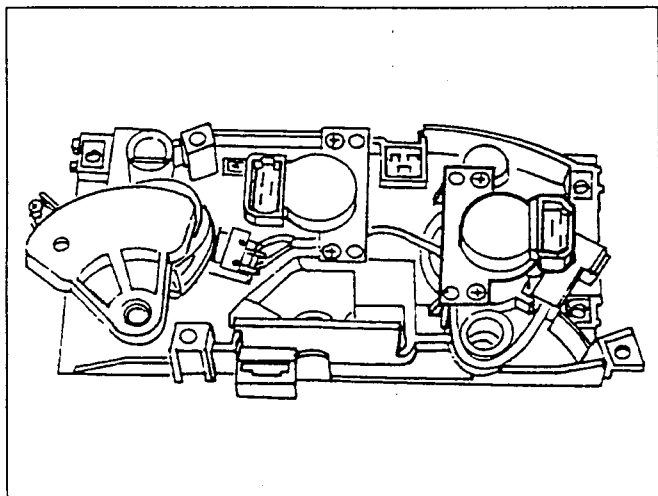
It is an NTC sensor (R at $25^{\circ}\text{C} = 10 \text{ k}\Omega$), with operating range from 0°C to $+80^{\circ}\text{C}$.

**REQUIRED AIR FLOW POTENTIOMETER**

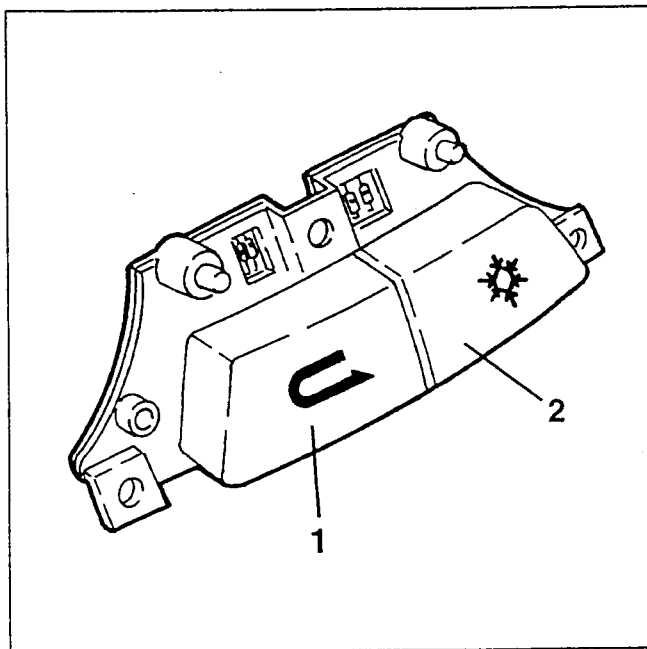
The potentiometer is connected to the air ventilation knob and detects the different angular positions, thereby transmitting a signal to the electronic control unit: there are four possible air flow rates set manually permanently (1, 2, 3 e 4), plus the "AUTO" and "0" position.

**REQUIRED TEMPERATURE POTENTIOMETER**

The potentiometer is connected to the temperature knob and detects the different angular positions, thereby transmitting a signal to the electronic control unit for a total of 15 different positions (one per degree centigrade) the two extreme positions of which are "LO" and "HI".

**SET OF SWITCHES AND RECIRCULATION/COMPRESSOR ENGAGEMENT FUNCTION**

When button (1) is pressed it engages the recirculation function managed entirely manually.
When button (2) is pressed, it enables operation of the compressor of the air conditioning system.

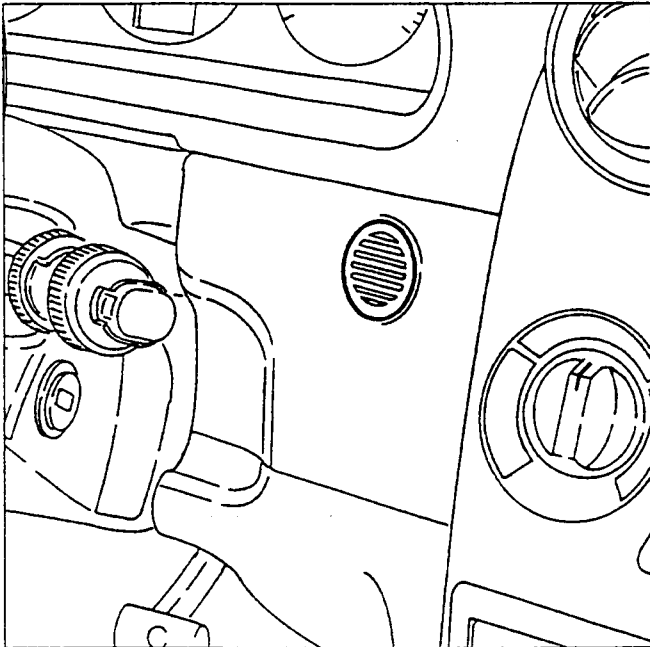


PASSENGER COMPARTMENT TEMPERATURE SENSOR

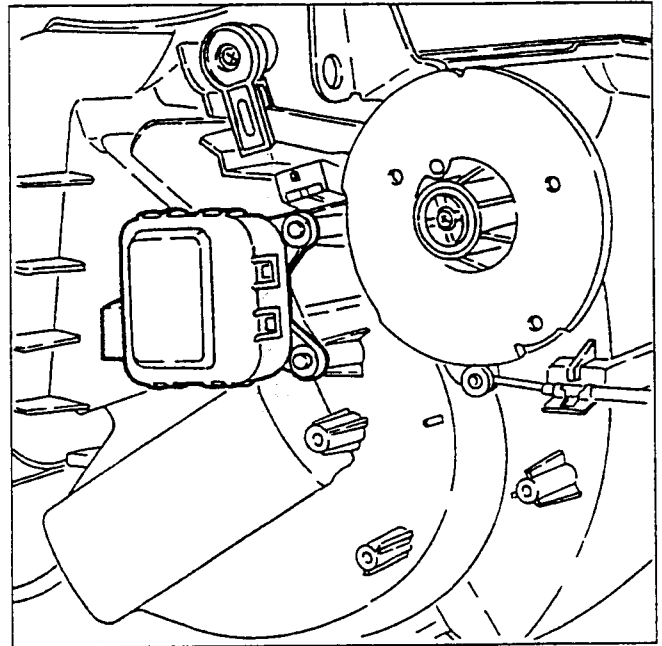
This is on the right hand trim on the driver's side of the dashboard.

It is an NTC sensor (R at 25°C = 2.2 kOhm), with operating range from +5°C to +45°C.

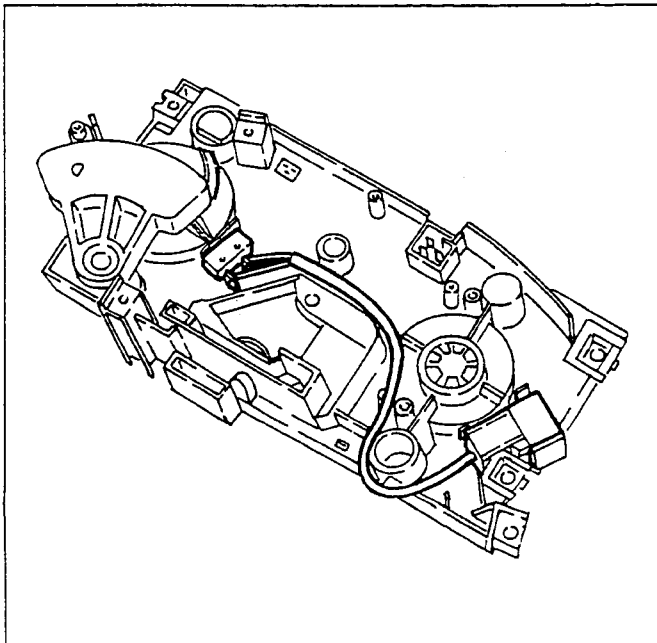
The sensor is "ventilated", i.e. inside it incorporates a small fan that is always supplied so that the temperature reading is not affected by the air stagnating inside the dashboard which would give an unrealistic result.

**ELECTRIC MIXING ACTUATOR**

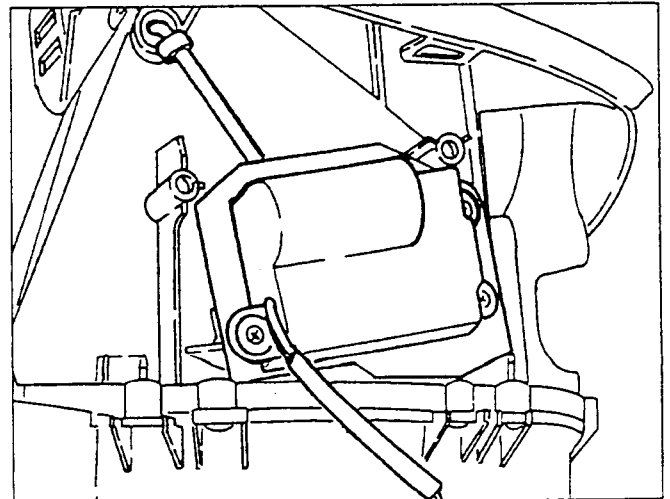
The temperature of the treated air is adjusted by suitably controlling the mixing actuator between hot and cold air which acts on the port which sends or shuts off the flow of incoming air on the heater radiator, crossed by hot water leading from the engine. A motor supplied at 12V controls the rotary movement of a draw pin which acts directly on the mixing port. A potentiometer detects the actual position and acts as "feedback" to the control unit.

**MAX DEF FUNCTION SWITCH**

A special switch activates the MAX DEF function: this is located on the distribution knob; it is an N.O. contact which is closed with the knob turned completely clockwise.

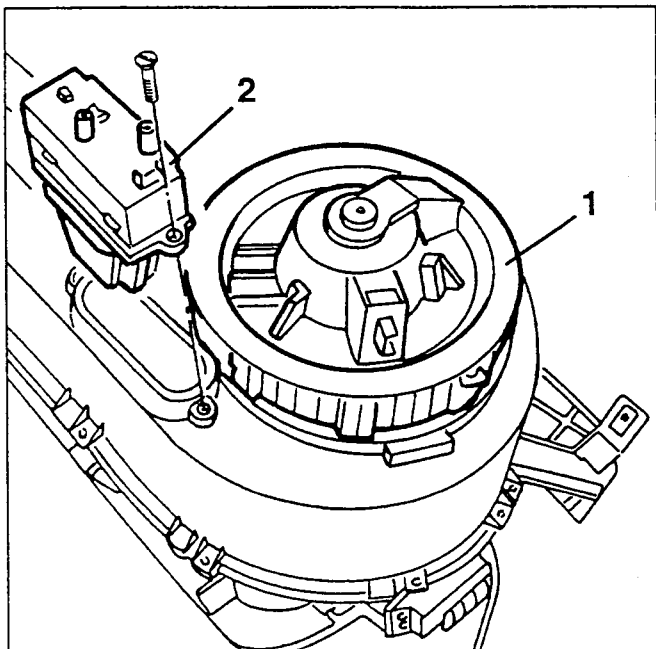
**RECIRCULATION ELECTRIC ACTUATOR**

Rotation of the outside air inlet port is obtained by suitably controlling the recirculation actuator which acts on the port itself passing from the "dynamic air" position to the "recirculation" position. There are NO intermediate positions. A motor supplied at 12V controls the rotary movement of a draw pin which acts directly on the port. Reversing the polarity, movement in the opposite direction is obtained.



FAN WITH ELECTRONIC SPEED REGULATOR

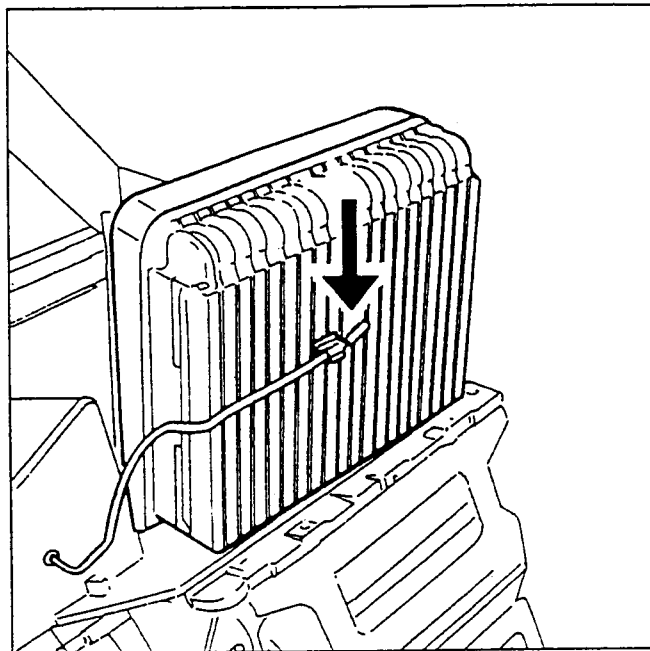
The fan (1) that sends outside or recirculation air towards the duct-distributor unit is supplied at 12V and controlled continuously at different speeds by an electronic regulator (2) located next to it.



ANTIFROST SENSOR

The antifrost sensor is inside the duct-distributor unit, installed directly on the evaporator. It detects the temperature of the evaporator and informs the control unit which - if necessary - turns off the compressor to prevent freezing.

It is an NTC sensor (R at $25^{\circ}\text{C} = 10 \text{ k}\Omega$), with operating range from -5°C to $+25^{\circ}\text{C}$.



DUCT DISTRIBUTOR UNIT

This assembly, shown in cross section below, is the main component of the system and it comprises a duct (1) and a heater distributor unit (2).

The duct (1) is formed of two parts, a lower one and an upper one; the right part of the latter is suitably shaped so that it mates perfectly with the upper right part of the dashboard surface (area under the windscreen of the partition between the engine and passenger compartments) with which it is in contact.

On the upper part of the right hand side of the duct there are two rectangular openings; the first is in an almost horizontal position and coincides with the one on the dashboard thus it communicates with the outside environment, while the other faces the passenger in an almost vertical position and allows the inlet of the air to the passenger compartment.

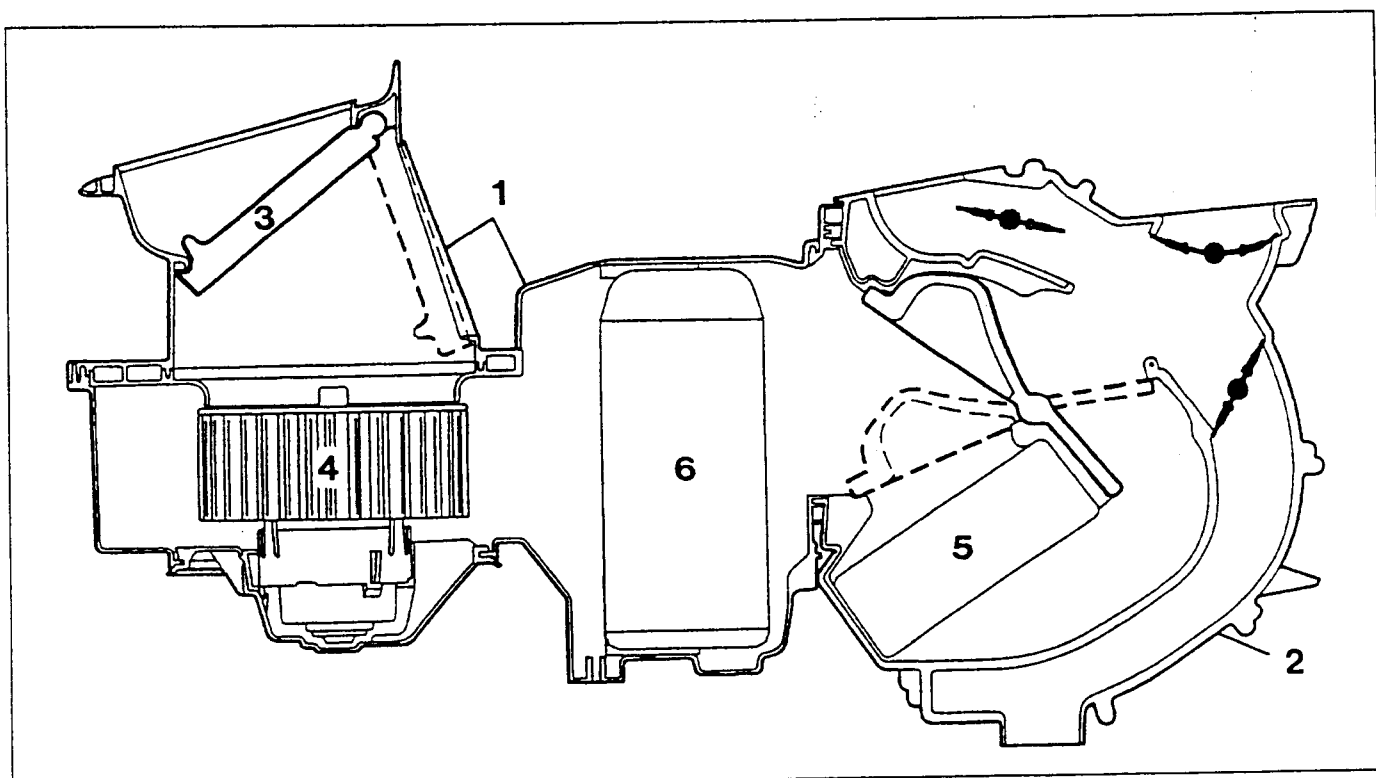
In the upper inner part of the duct there is a flap (3) which, duly directed by the special actuator, can take a position between the limits for closing of one of the above-mentioned openings.

Inside the duct on the lower part in correspondence with the above-mentioned openings, there is a fan (4) which, duly supplied at different voltages can turn at different speeds.

Between the duct (1) and the distributor (2) there is the evaporator (6).

The heater - distributor unit is mainly composed of a box housing the following:

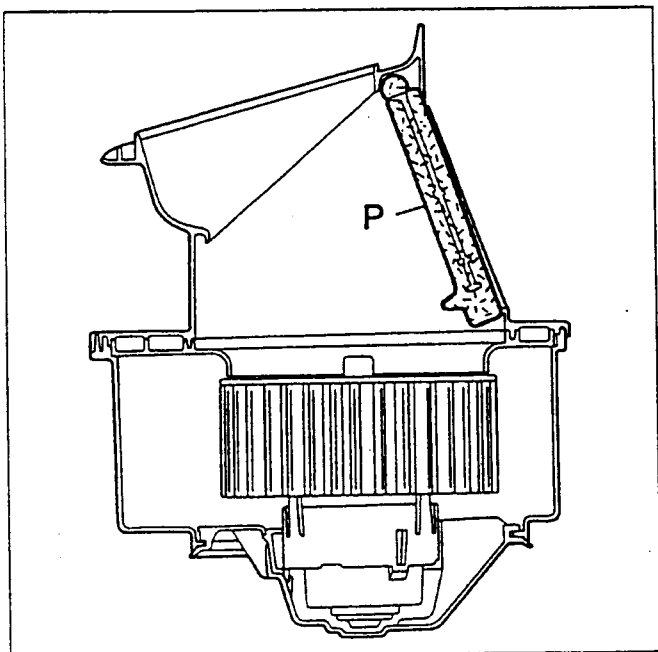
- in the central position, a mixing port which duly directed by a knob through a bowden cable allows or prevents the entire flow of air taken in by the fan (4) or part of it to flow on the finned surface of the heater radiator (5);
- at the bottom centre, the heater radiator (5) the inlet and outlet fittings of which jut from the right side surface of the above-mentioned unit;
- above and at the front, four flaps which duly directed by a knob through a bowden cable, a toothed sector, a disk with grooves acting as distributor, shutter or fully close the section of the inside ducts which send air respectively to the feet, front vents and to the windscreen demisting vents.



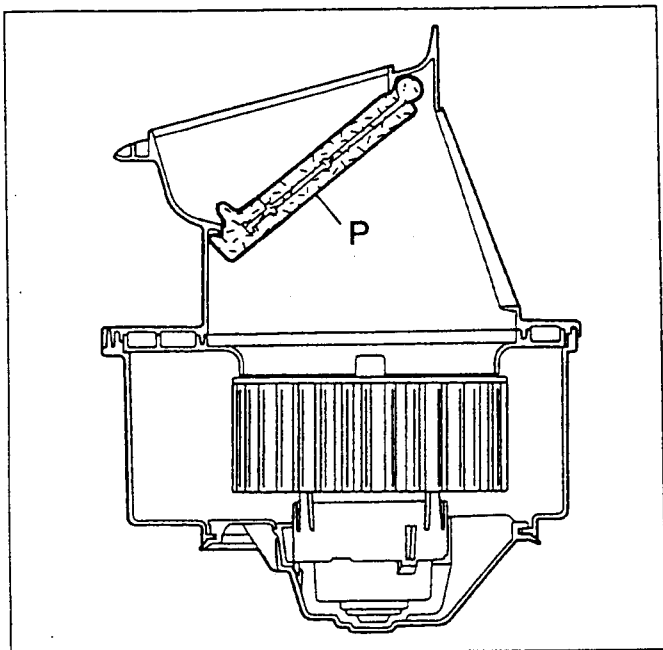
Dynamic/recirculation air

The special actuator turns the air inlet port (P) between two extreme positions.

- The position illustrated shuts inside air inlet, thus the fan withdraws only outside air.



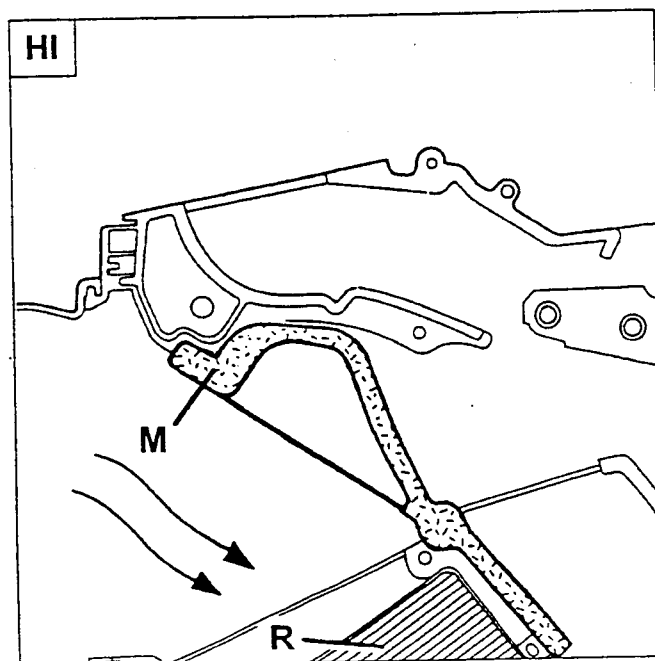
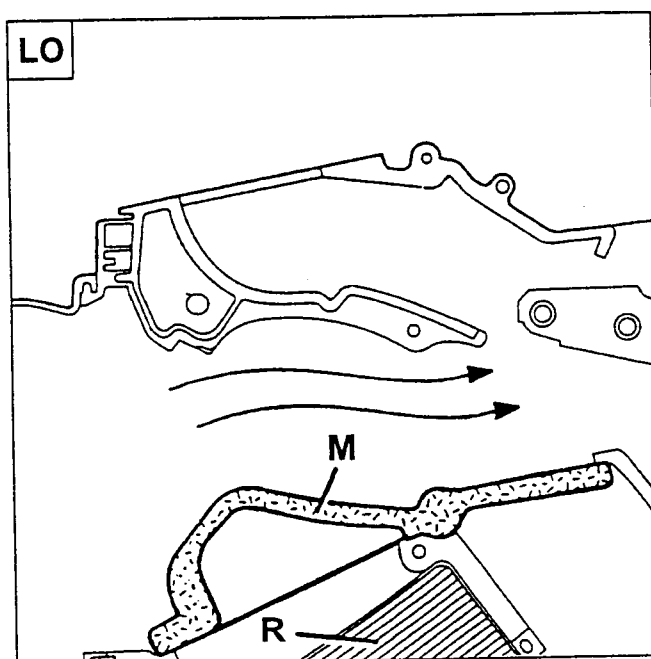
- If the port is turned as illustrated, the outside air is inhibited and recirculation air is withdrawn.

**Hot/cold air mixing**

The special actuator turns the port (M) between the extreme (LO) and (HI) positions.

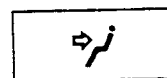
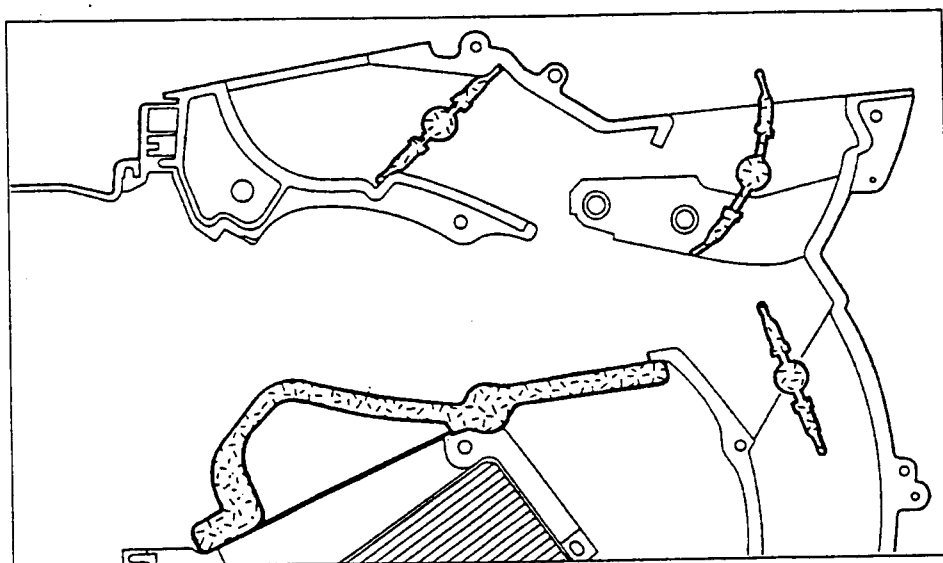
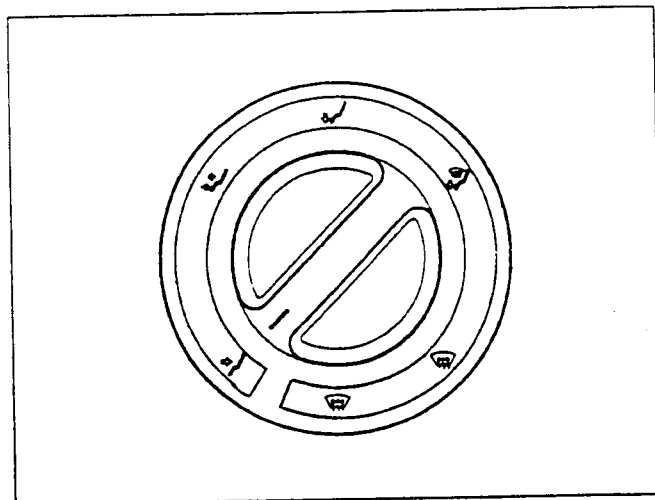
In the (LO) position the flow of air withdrawn by the fan is distributed to the different vents without undergoing any change in temperature as it is unable to flow against the finned surface of the heater radiator (R). When the mixing port is at the limit position (HI) the entire flow of air withdrawn by the fan is compelled to flow against the fins of the heater radiator, therefore warm air at the highest temperature possible will be distributed to the different vents.

When the mixing port is at an intermediate position between the above-mentioned two, only part of the flow of air withdrawn by the fan touches the radiator fins.

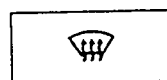
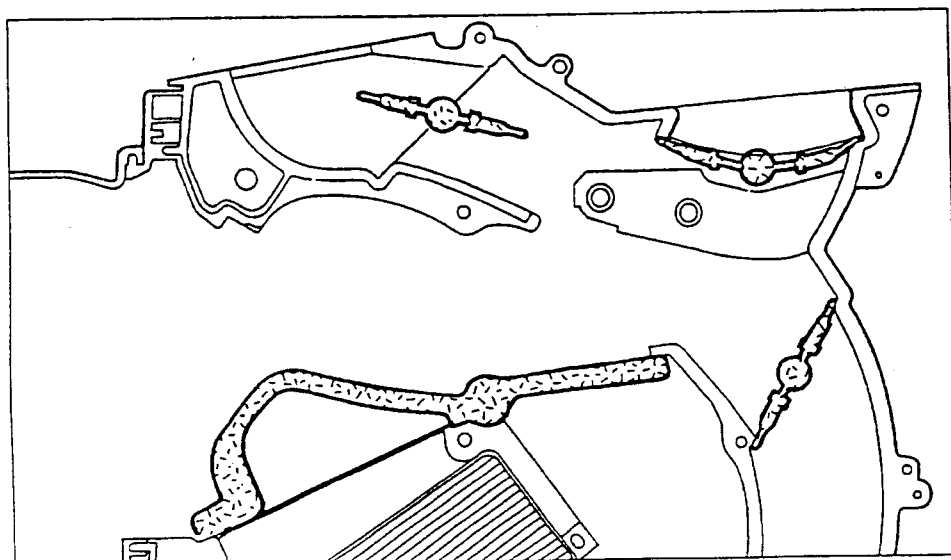


Air distribution

Turning the right knob clockwise suitably turns the four flaps to distribute the air as shown in the different pictograms, i.e. starting from only to the front vents up to only to the windscreen vents as illustrated below.



Detail of position of the different distribution flaps when the knob is turned completely counter-clockwise



Detail of position of the different distribution flaps when the knob is turned completely clockwise

INSTRUCTIONS FOR REMOVING/REFITTING

During maintenance operations, when the components of the air conditioning system are disconnected, suitably plug the disconnected fittings to prevent damp and impurities from being admitted to the system.

When re-installing the pipe fittings always change the O-rings on the actual fittings.

Lubricate the threads of pipe fittings with the specified antifreeze oil and tighten them to the specified torque.

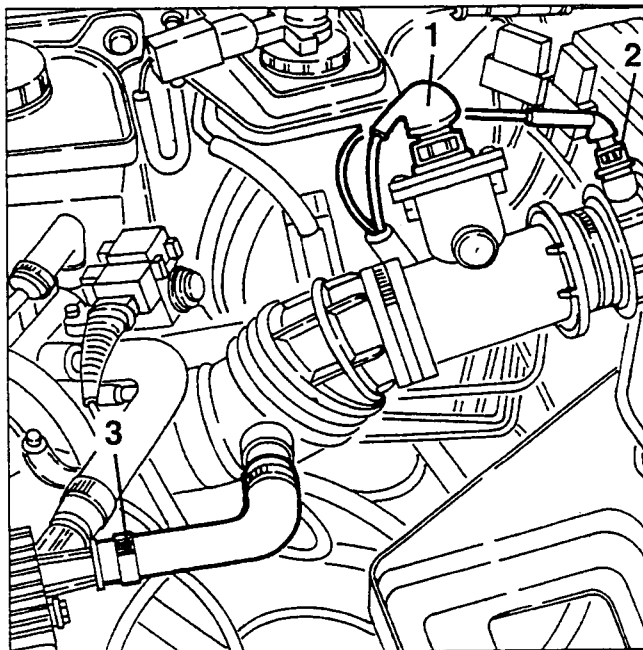
If oil is lost from the system during maintenance operations, restore the quantity of oil in the system calculating such losses.

Removing/refitting the following components:

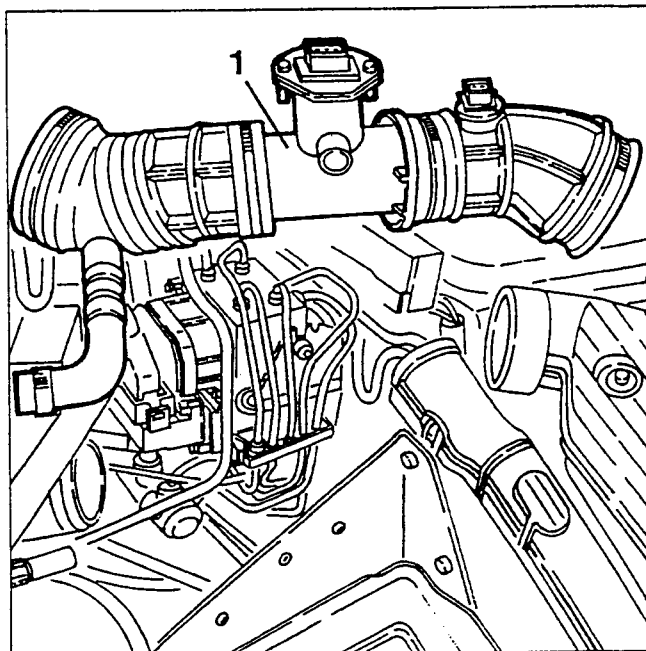
- heater radiator
- expansion valve
- evaporator
- antifrost sensor

is only possible removing the "Duct assembly and heater- distributor unit" from the car and disassembling it up to where necessary.

1. Disconnect the electrical connection from the air flow meter.
2. Disconnect the electrical connection from the intake air temperature sensor.
3. Slacken the fastening clamp and disconnect the oil vapour recirculation pipe from the cylinder head.



1. Slacken the two fastening clamps, then remove the corrugates sleeve complete.

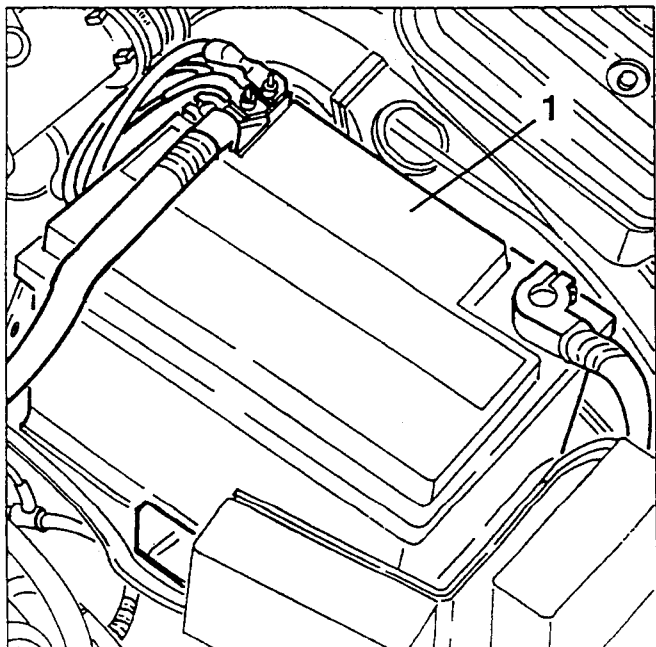


DUCT ASSEMBLY AND HEATER-DISTRIBUTOR UNIT

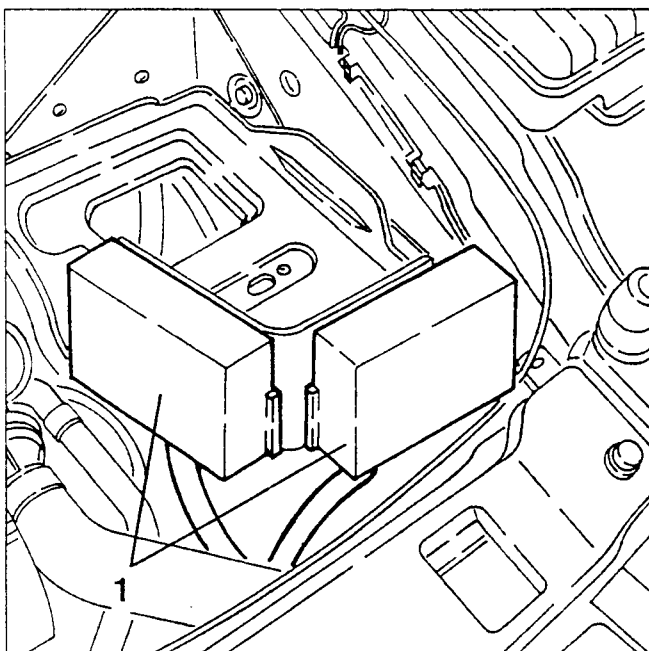
REMOVING/REFITTING

- Discharge the fluid of the climate control system (see specific paragraph).

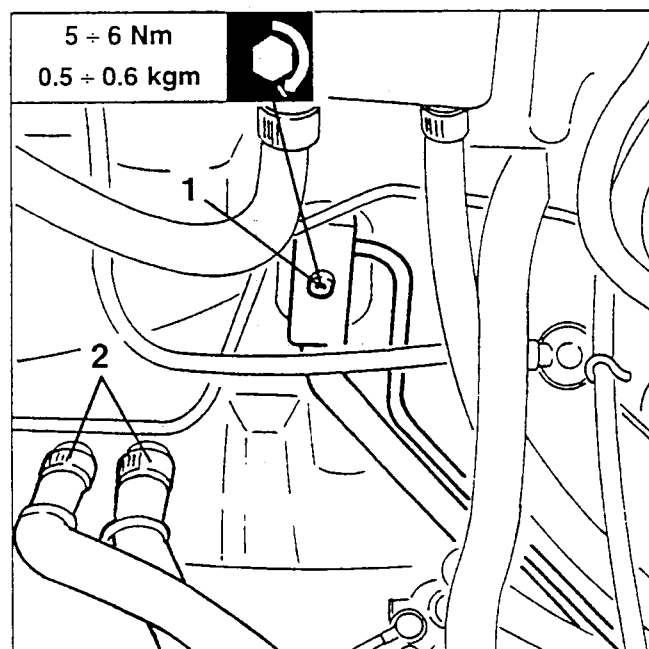
1. Disconnect the terminals, then remove the battery.



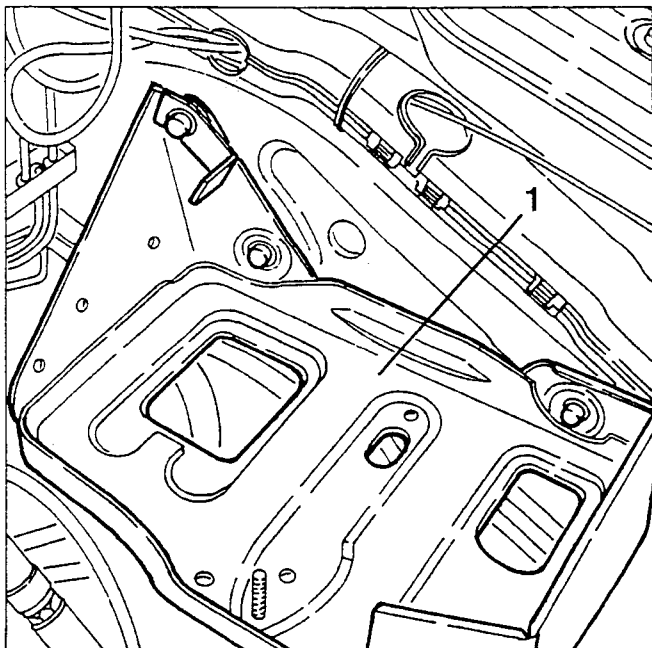
1. From the battery support release the two relay holder supports and set them to one side.



1. Slacken the fastening screw and disconnect the flange of the coolant fluid inlet and outlet pipes from the evaporator.
2. Disconnect the coolant fluid inlet and outlet pipes from the heater of the climate control system collecting the fluid in a suitable container.

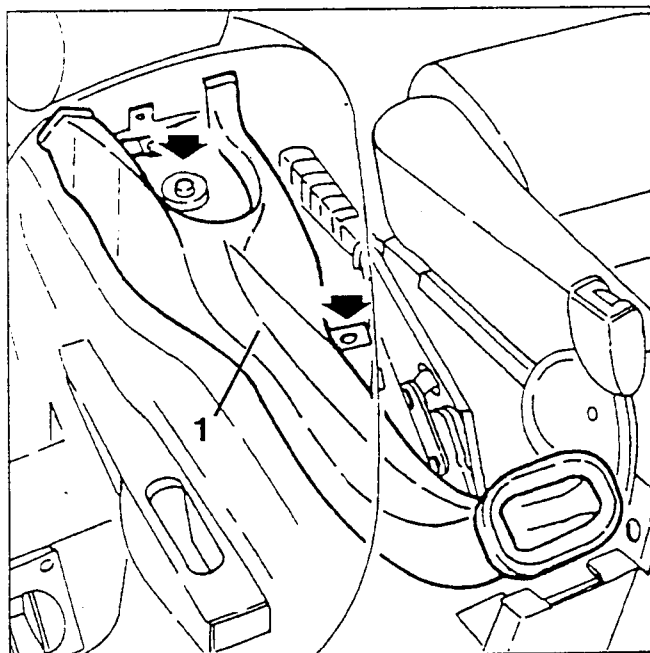


1. Slacken the fastening screws and remove the battery support complete with drain tube after freeing this from the wheel house.

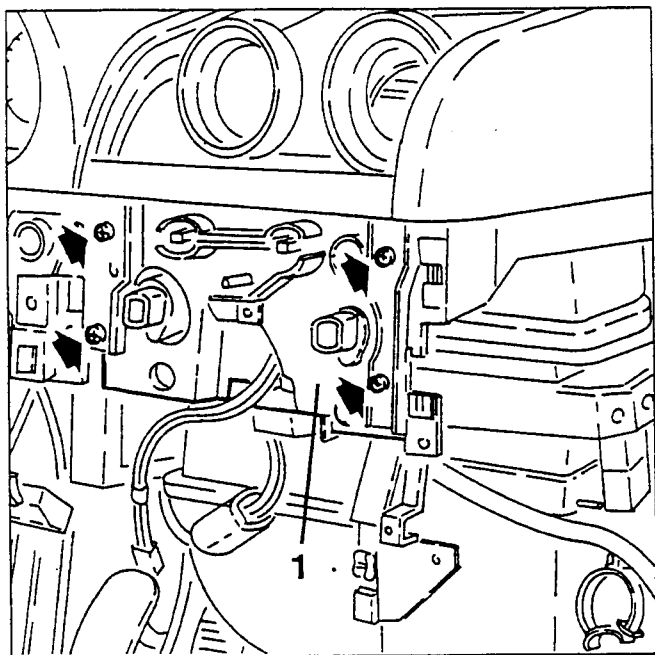


- Remove the lower part of the dashboard and the centre console (see GROUP 70).

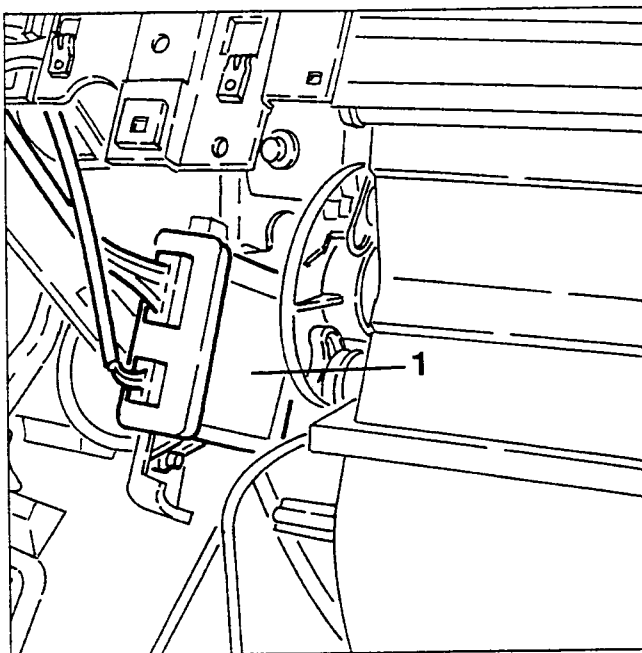
1. Slacken the two fastening screws and remove the rear section of the air delivery duct to the rear passengers' face.



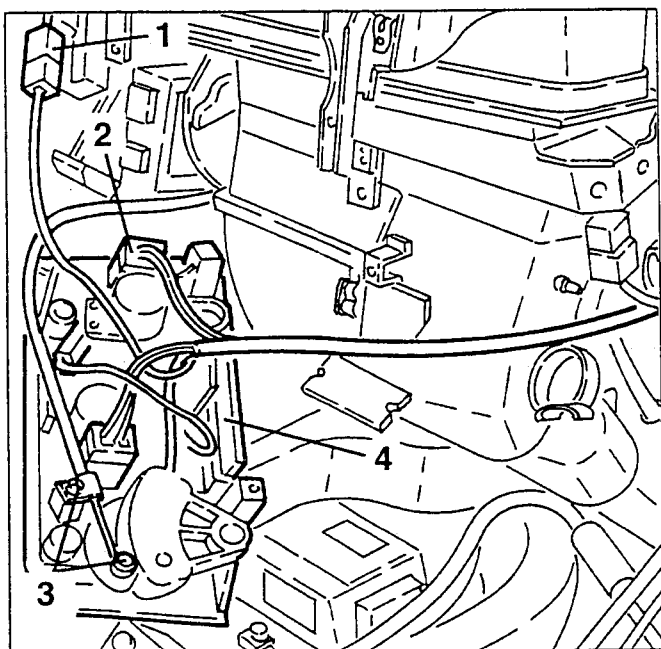
1. Slacken the four fastening screws and lower the controls of the climate control system.



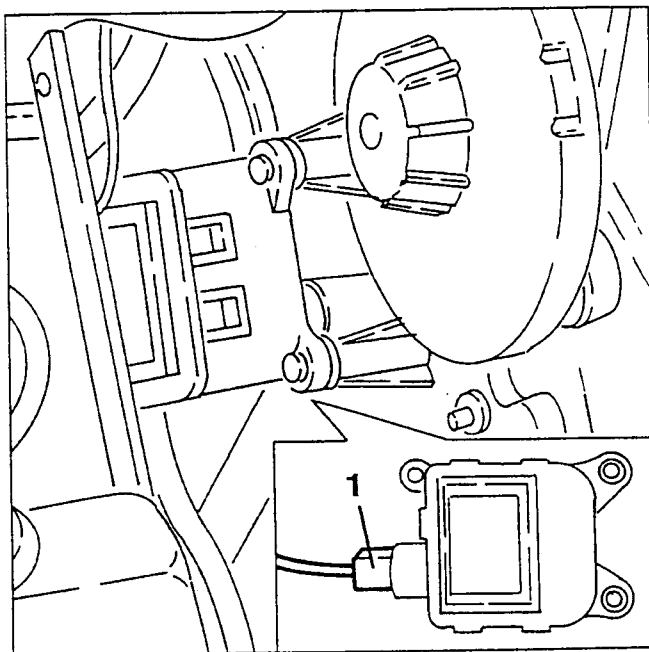
1. Slacken the fasteners, then set aside without disconnecting the electrical connections, the Alfa Romeo CODE control unit.



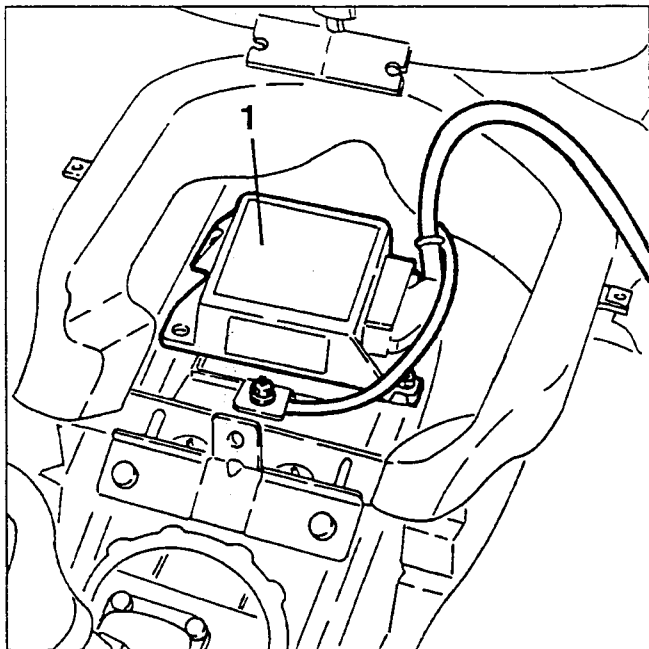
1. Disconnect the electrical connection of the inside air temperature sensor.
2. Disconnect the electrical connections from the climate control system controls.
3. Disconnect from the controls the bowden cable for moving the air distribution ports.
4. Remove the climate control system controls releasing them from the electrical wiring.



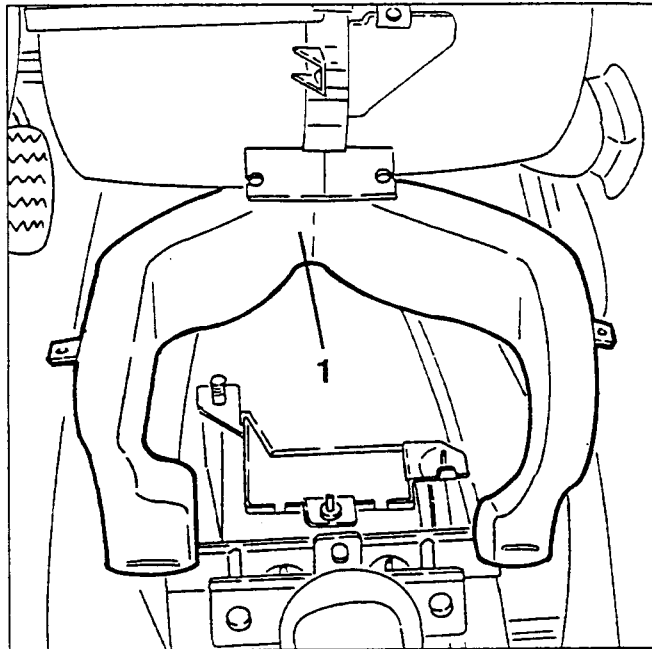
1. Disconnect the electrical connection from the air mixing port control motor.



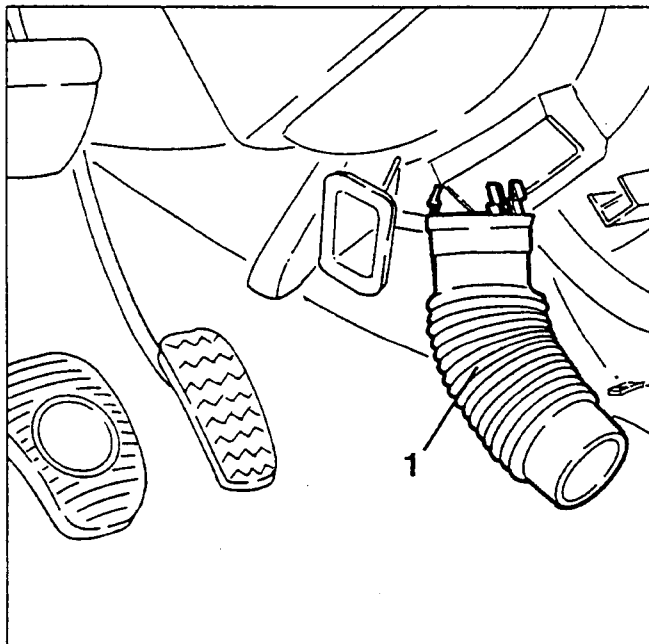
1. Slacken the fasteners, then set aside without disconnecting the electrical connections, the Air Bag control unit.



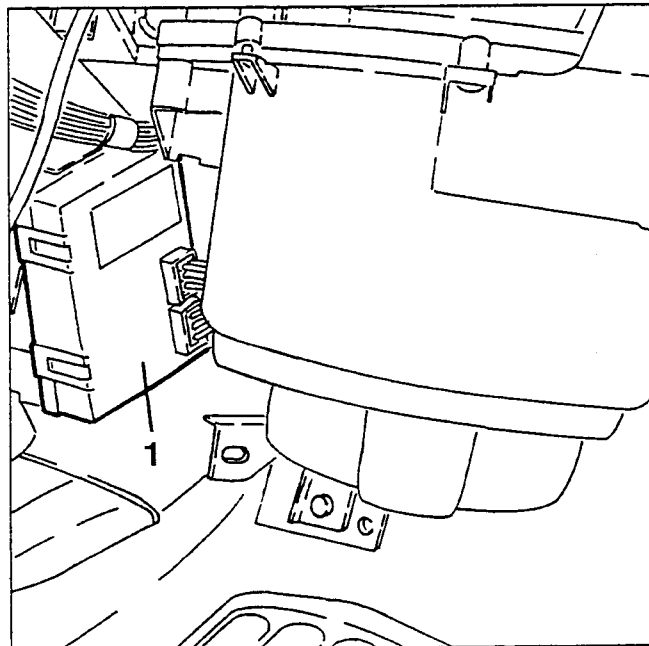
1. Slacken the fastenings and remove the front section of the air delivery duct to the rear passengers.



1. Remove the two elbows with bellows connecting the climate control system to the air delivery duct to the rear passengers' feet.

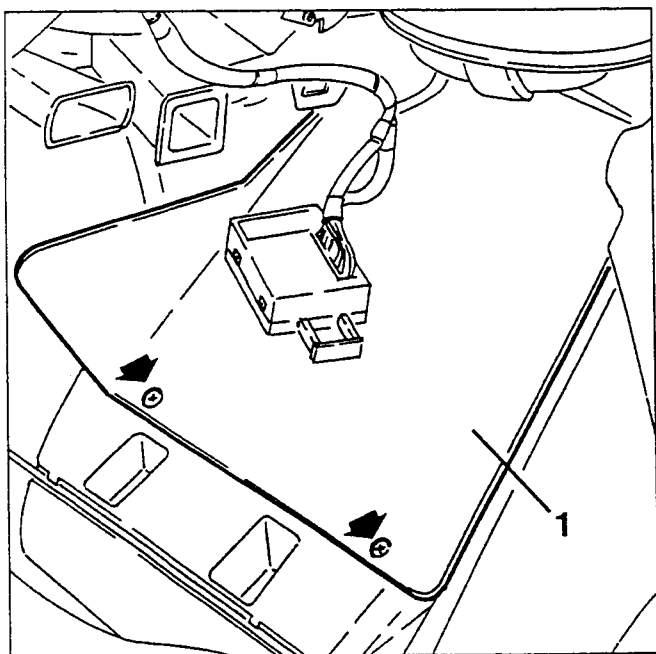


1. Release the climate control unit from the fastening clip, then set it to one side without disconnecting the corresponding electrical connections.



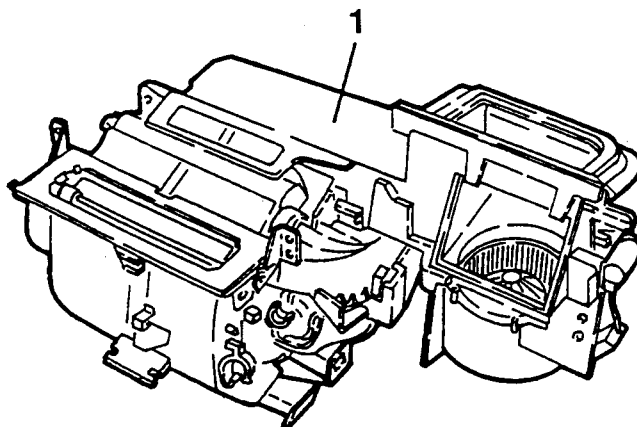
- Disconnect the following electrical connections:
- from the fan
- from the electronic fan speed regulator
- of the recirculation/outside air control motor
- of the treated air temperature sensor.

1. Move the floor mat, slacken the fastening screws and remove the injection control unit cover.



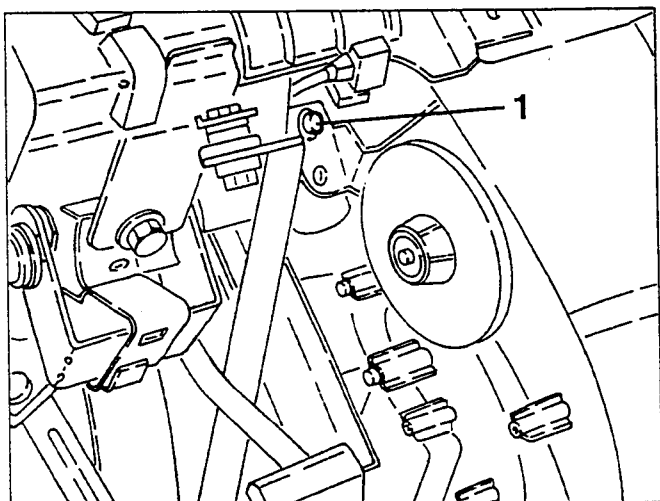
- Slacken the front screws fastening the air grooves to the feet and lower them just enough to remove the climate control group.

1. Withdraw and remove the climate control group.



Refit the unit reversing the sequence followed for removal and adhering to the instructions given below.

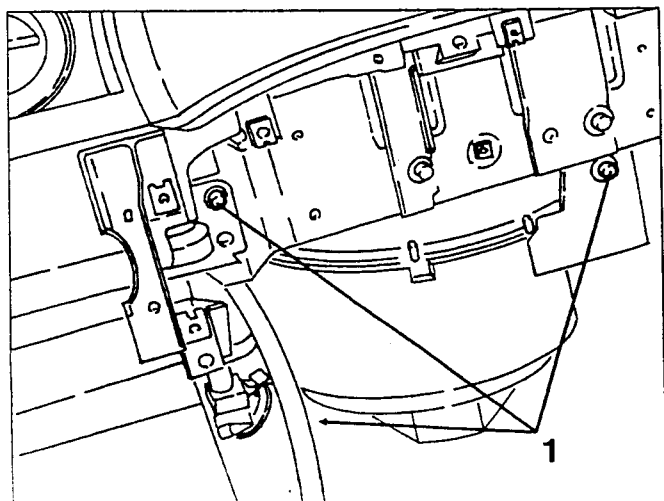
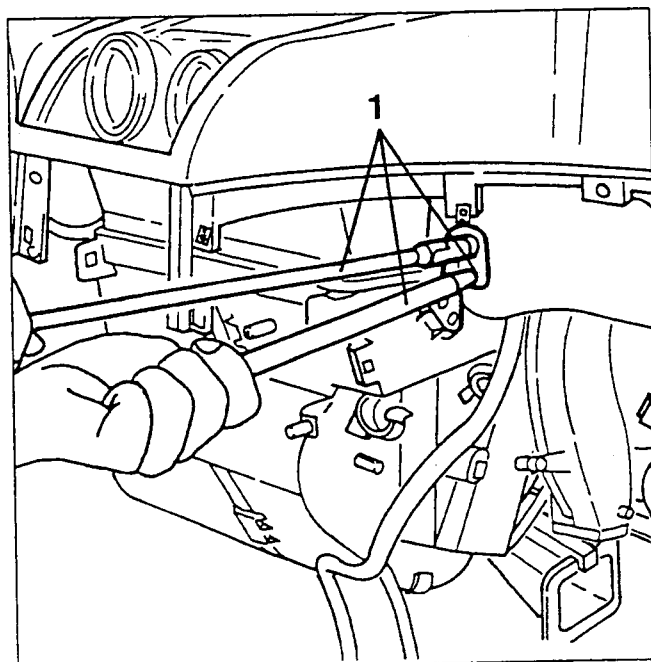
1. Slacken the screws fastening the climate control group to the body.



- Coat the mouth of the heater and water drain pipes with vaseline, and when installing the climate control group make sure that these pipes are inserted correctly in the passage holes.

- Before reassembling the climate control group, remove the sponge under the upper part of the dashboard on the passenger's side and refit it after fastening the group itself.

1. Using a dowel, positioned as illustrated, centre the position of the group before fastening it.

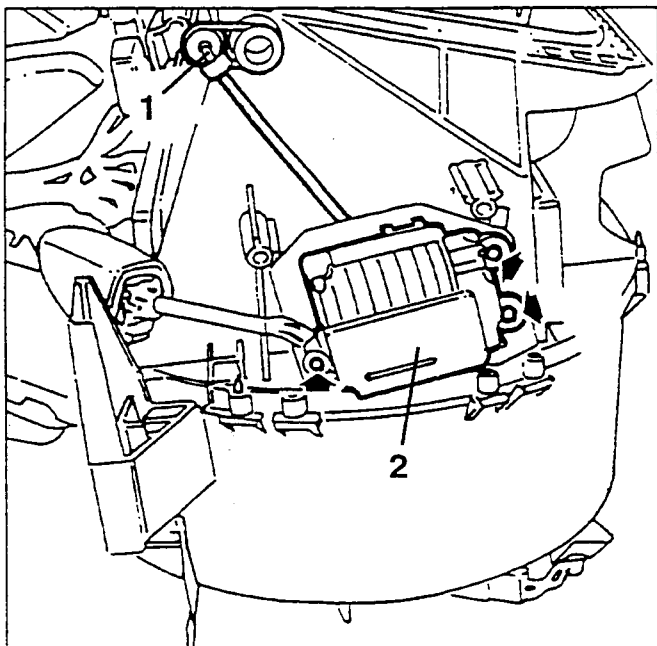


DISASSEMBLY

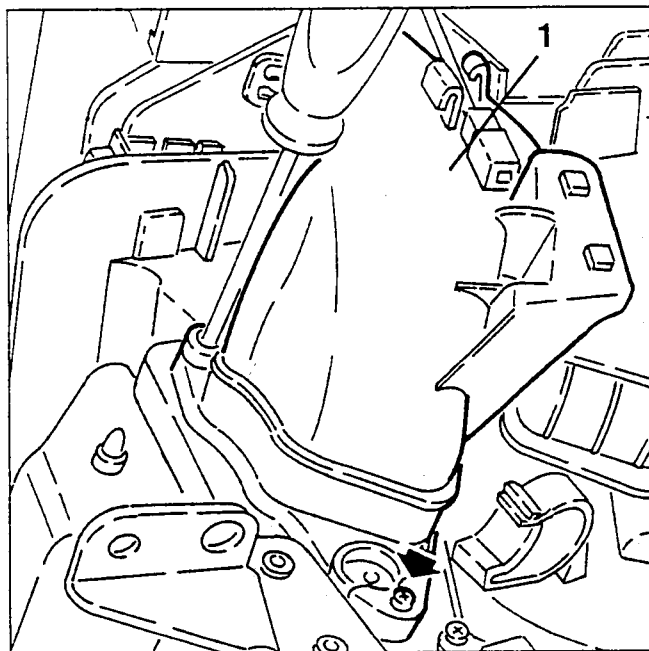
1. Disconnect the control rod from the coupling on the recirculation/outside air port.

2. Slacken the three fastening screws and remove the recirculation/outside air control motor complete with control rod.

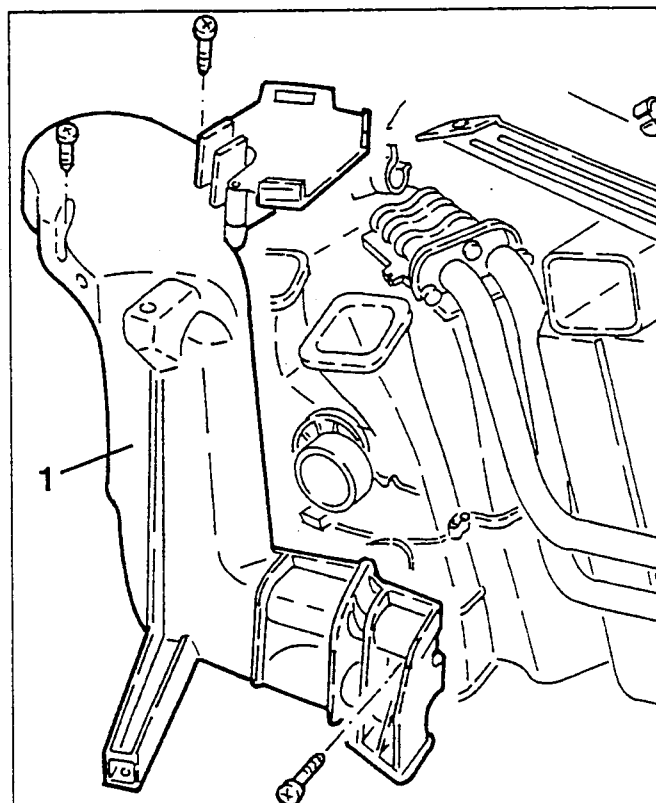
- Retrieve the upper plate and grommets on the fastening holes.



1. Slacken the fastening screws and remove the cover.

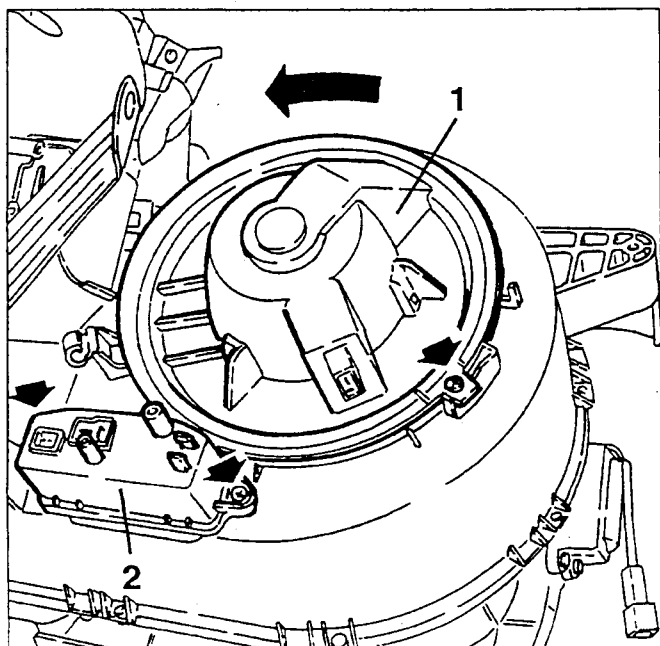


1. Slacken the three fastening screws and remove the heater cover and the corresponding pipes.

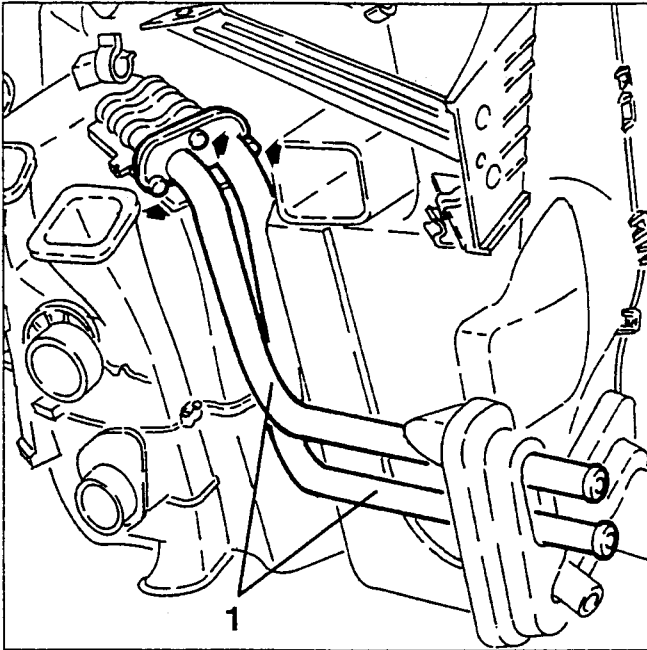


1. Slacken the fastening screw, raise the tab and turn the fan clockwise as far as its stop, then remove it from the climate control group.

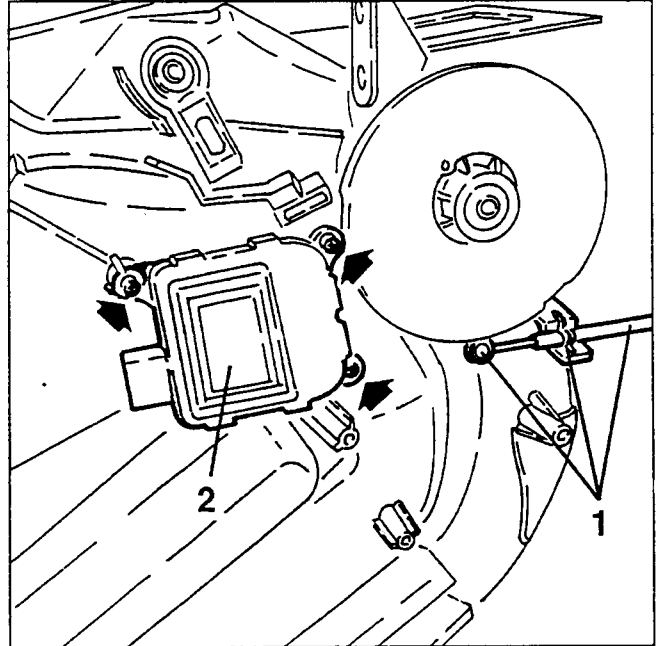
2. Slacken the two fastening screws and remove the electronic fan speed regulator.



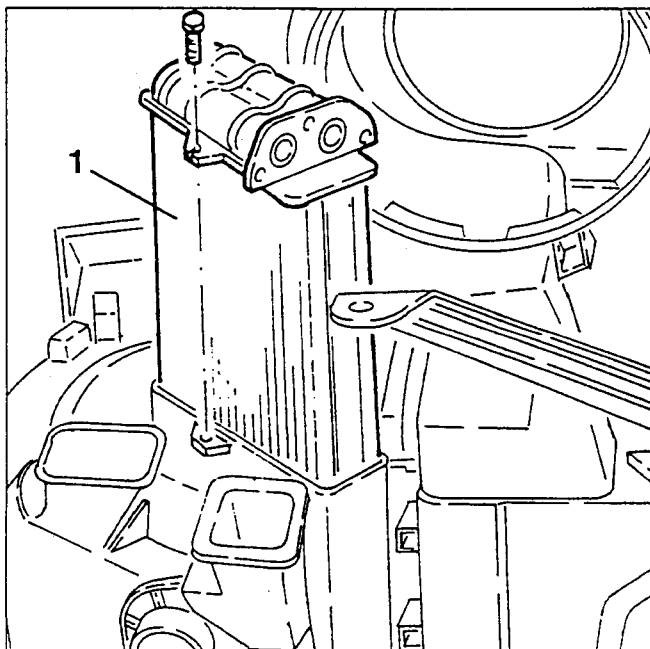
1. Slacken the three fastening bolts of the plate retaining the heater coolant fluid inlet and outlet pipes, then remove them.
- Remove the O-Rings and taper metal seal rings.



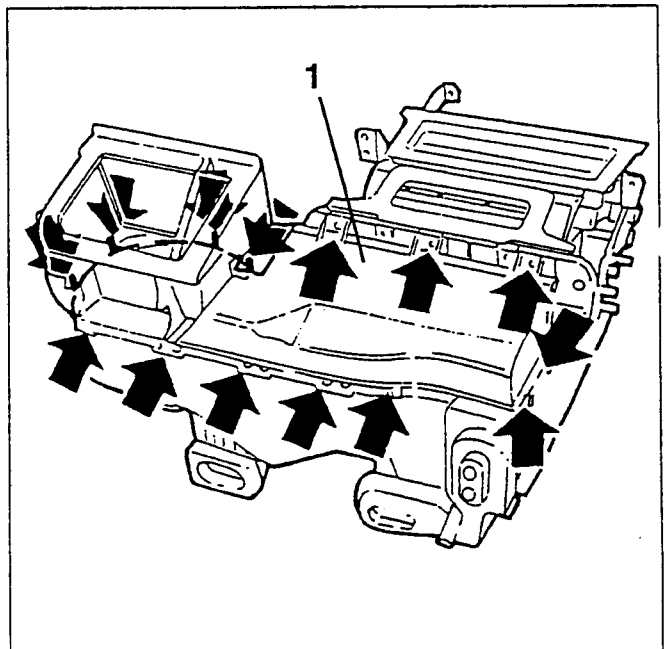
1. Free the air distribution port bowden control cable from its fasteners, then remove it.
2. Slacken the three fastening screws and remove the air mixing port control motor.



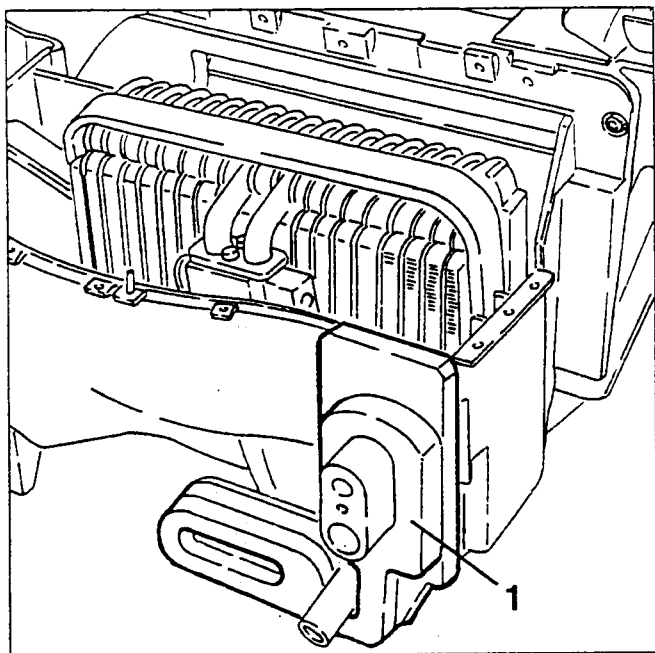
1. Slacken the two fastening screws and withdraw the heater.



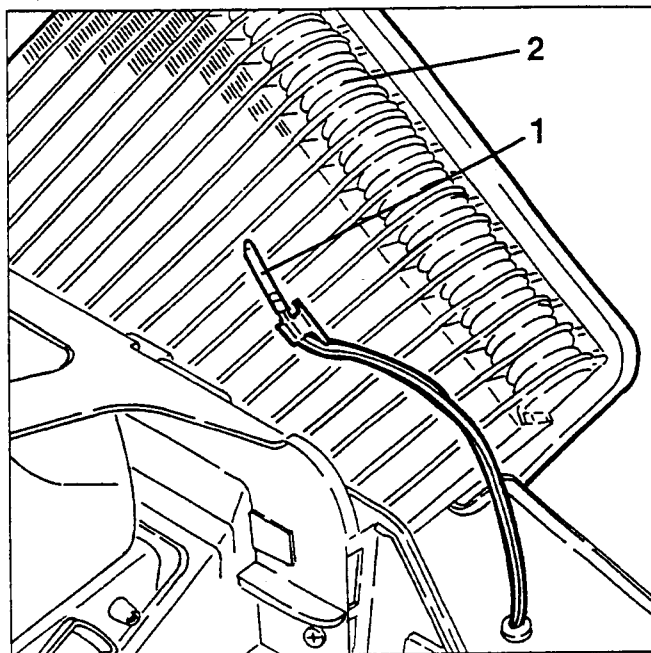
1. Slacken the fastening screws and separate the upper half box from the climate control group.



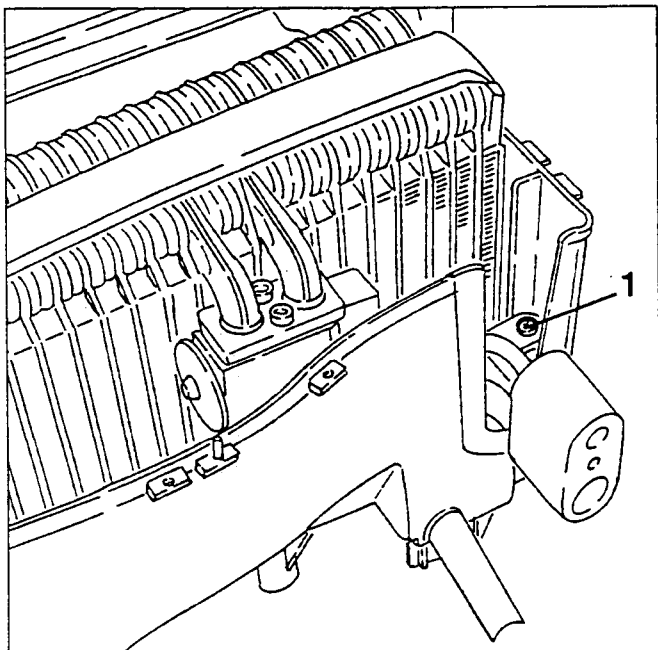
1. Remove the protective sponge.



1. Withdraw the evaporator from its housing just enough to disconnect the antifrost sensor from the clamp on it.
2. Withdraw and remove the evaporator complete with expansion valve.

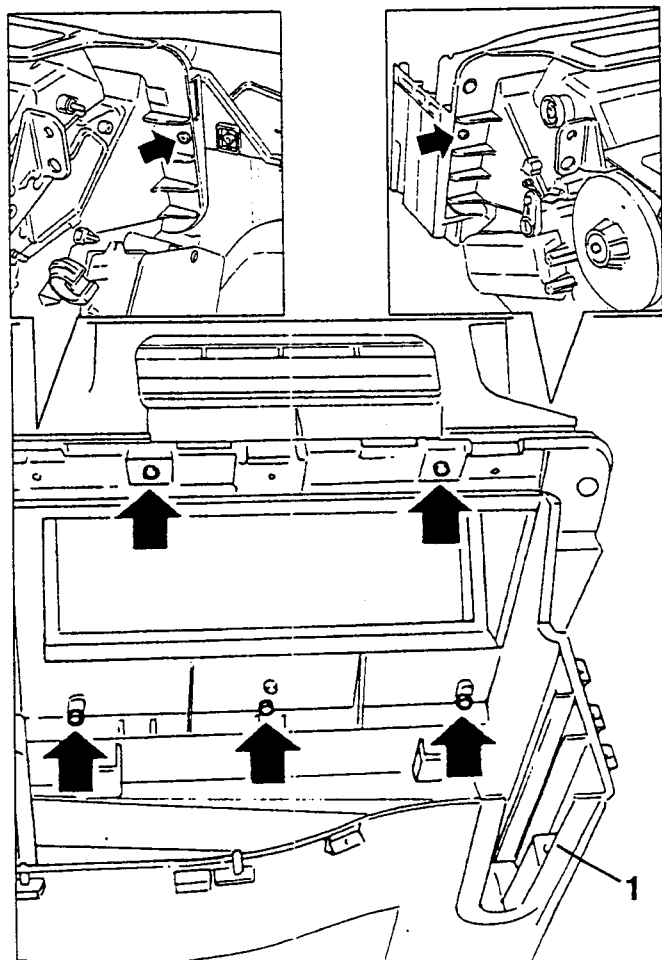


1. Slacken the screw fastening the evaporator.

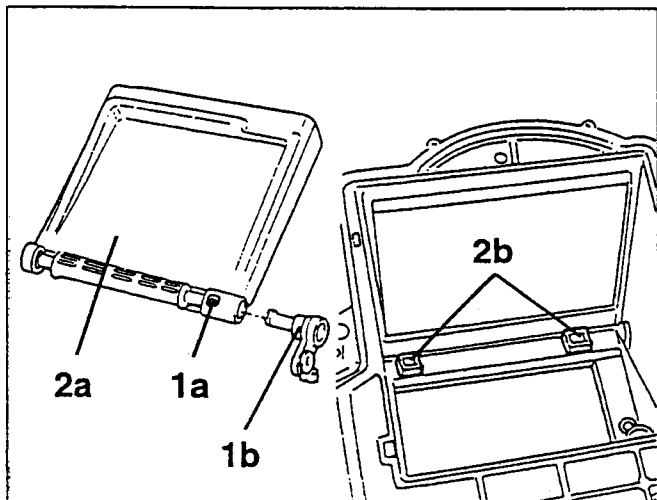


- If necessary, remove the expansion valve from its fittings slackening the fastening screws.

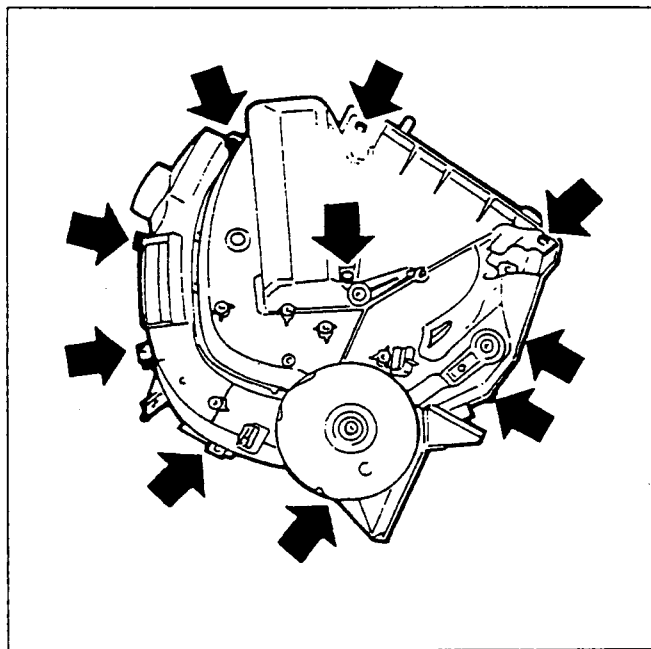
1. Slacken the fastening screws and remove the lower half box from the heater distributor unit.



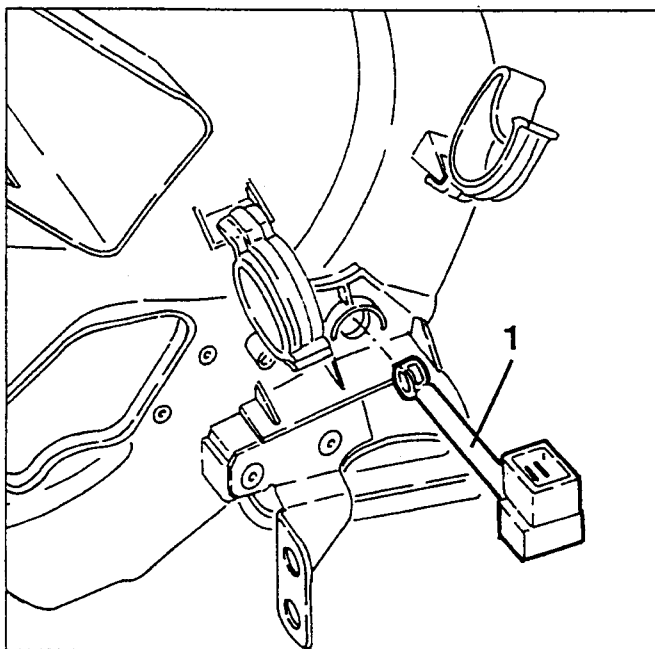
1. Work through the small slot (1a) machined on the air intake port spindle to release from it the tang of lever (1b) which may thus be withdrawn from the upper half box.
2. Release the air intake port (2a) from the upper half box bearing in mind that its spindle is dap fitted and articulates on the tabs (2b).



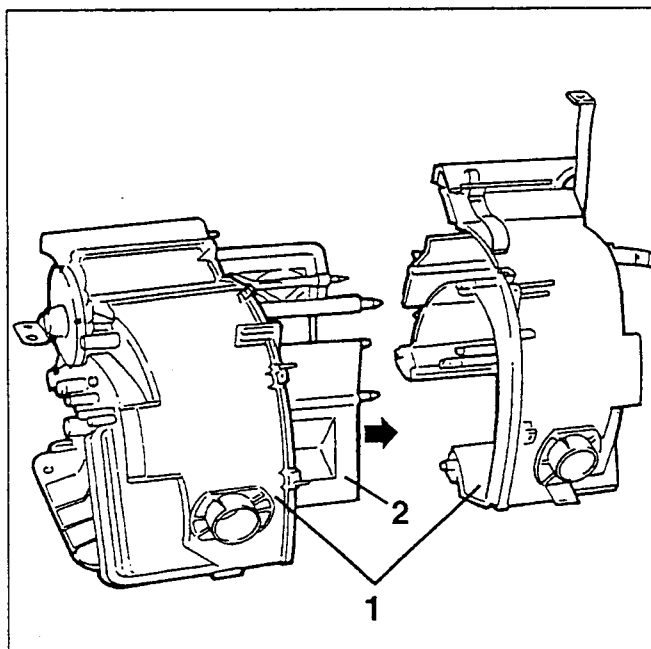
- Slacken the screws illustrated which join the two half boxes of the heater distributor unit.



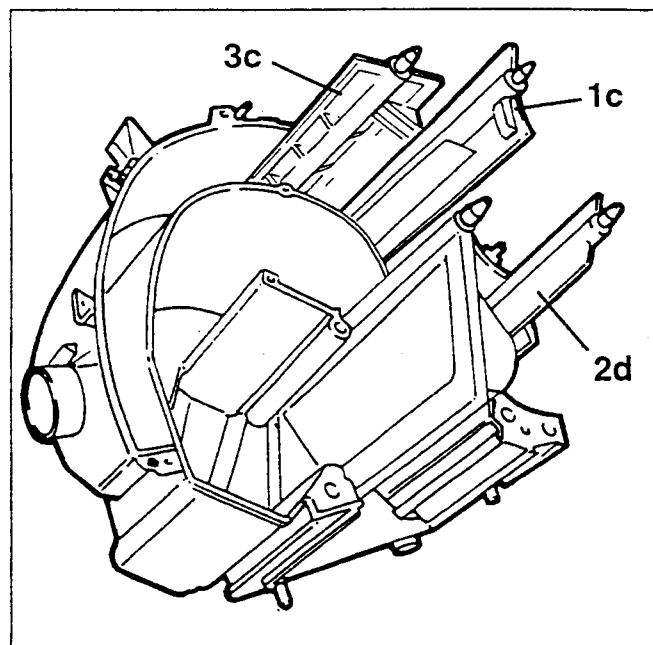
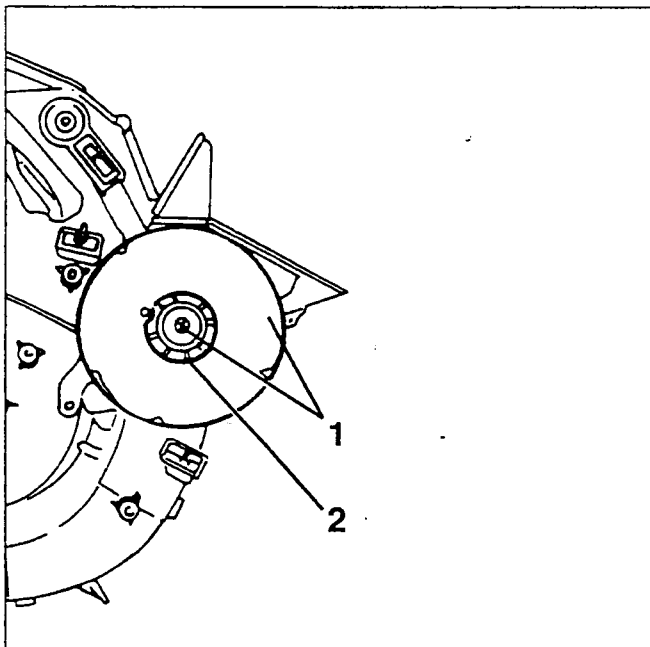
1. Remove the treated air temperature sensor.



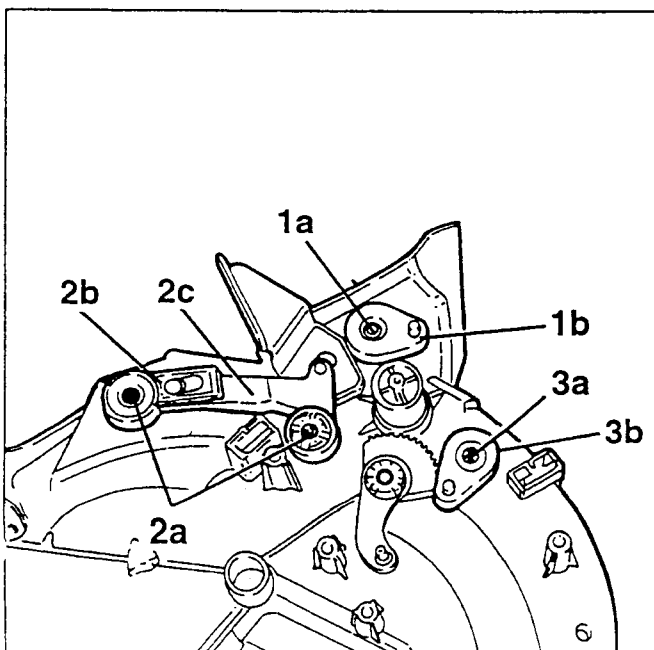
1. Release the right half box from the left one taking care not to damage the ports.
2. Withdraw the mixing port from the left half box.



1. Slacken the fastening screw and remove the distributor disk from the left half box.
2. Retrieve the shaped plastic washer.



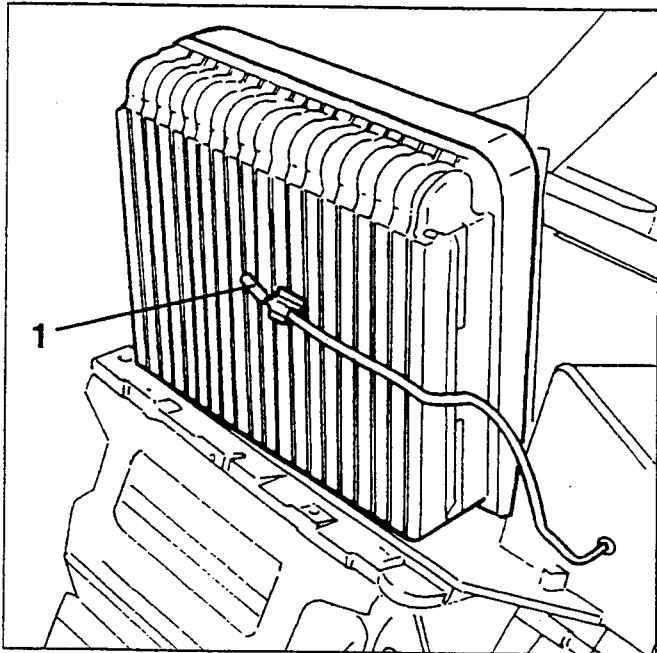
1. Slacken the fastening screw (1a) and release the lever (1b) inserted in a compulsory position on the spindle of rear upper distribution port (1c), then remove the latter from the left half box.
2. Slacken the fastening screws (2a) and release the lever (2b) with the control lever (2c) inserted in a compulsory position on the front upper distribution port spindle (2d), then remove the latter from the left half box.
3. Slacken the fastening screw (3a) and release the lever (3b) from the lower distribution port spindle (3c).



REASSEMBLY

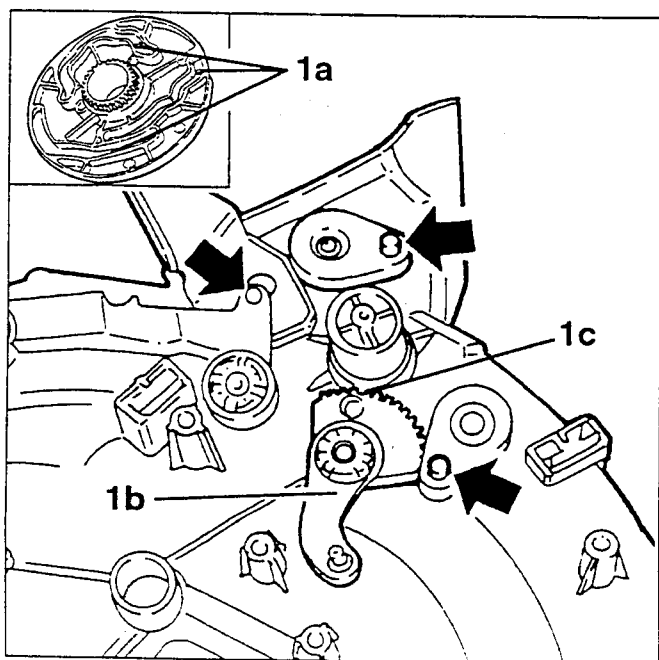
Reverse the sequence followed for disassembly adhering to the following instructions.

1. The sensitive element of the antifrost sensor must be set at the centre of the finned surface of the evaporator, therefore the catch must be inserted in a suitable position to obtain this position.



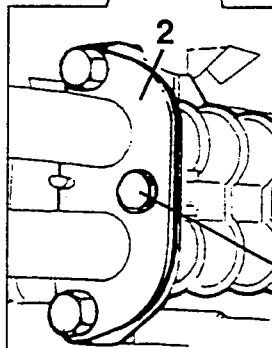
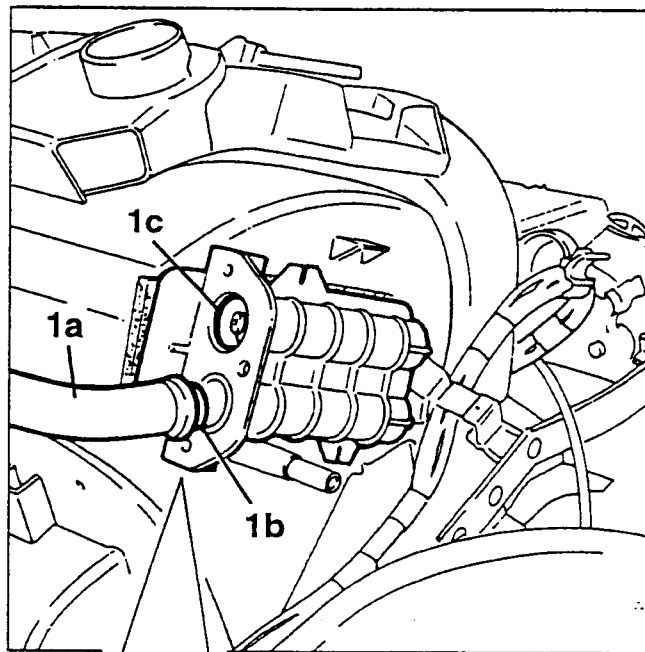
- Before reassembling the distributor disk, carefully lubricate the different grooves, for operating the levers, with TUTELA ZETA 2 grease.

1. Suitably direct the various levers so that their operating pins (indicated by the arrows) are aligned with the holes (1a) on the distributor disk when this is fitted correctly on the toothed sector (1b), i.e. when the relief (1c) of the toothed sector inserted in the special groove of the disk.



1. Before inserting the two metal pipes (1a) in the heater double fitting, check that the taper metal rings are inserted on their ends (1b) and that the O-Rings are inserted on the coupling holes (1c).

2. After inserting the above-mentioned pipes in the double fitting of the heater, fasten them using the plate directed as illustrated and the corresponding screws, taking care not to spoil the seal rings.

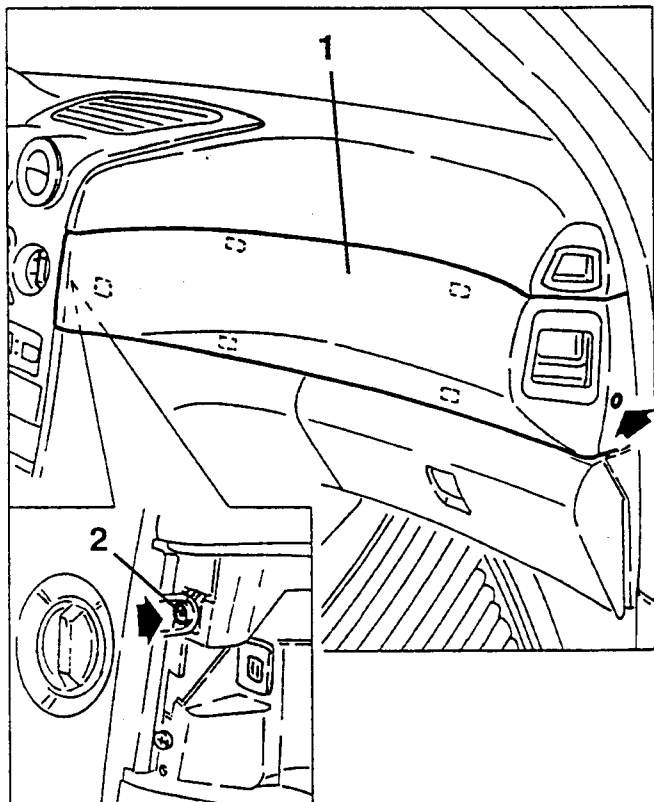


$5 \div 6 \text{ Nm}$
 $0.5 \div 0.6 \text{ kgm}$

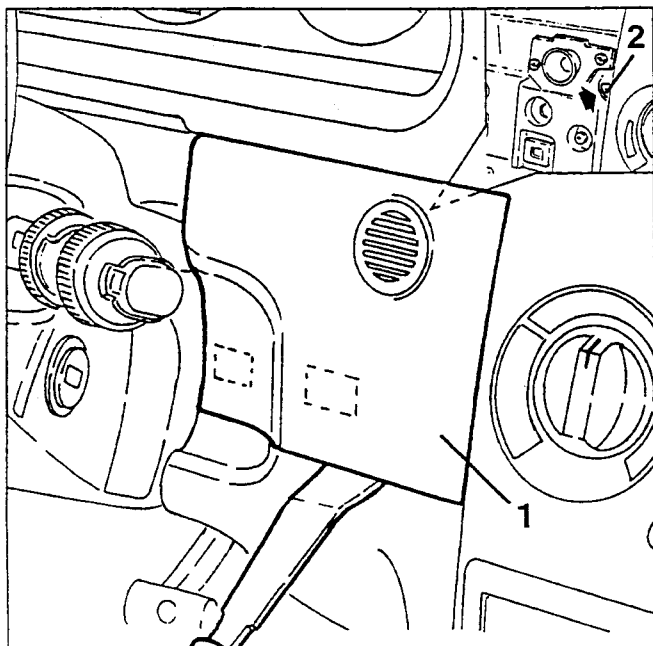
CLIMATE CONTROL SYSTEM CONTROLS**REMOVING/REFITTING**

- Disconnect the battery (-) terminal.

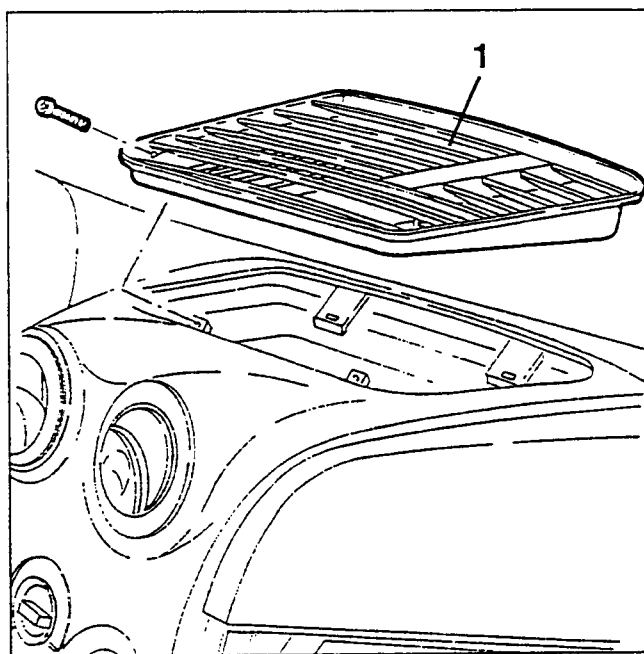
1. Slacken the fastening screw, then prise and remove the passenger side dashboard trim.
2. Slacken the fastening screw illustrated of the climate control system controls module.



1. Remove the right hand driver's side dashboard trim prising it off the fastening clips.
2. Slacken the fastening screw illustrated of the climate control system controls module.

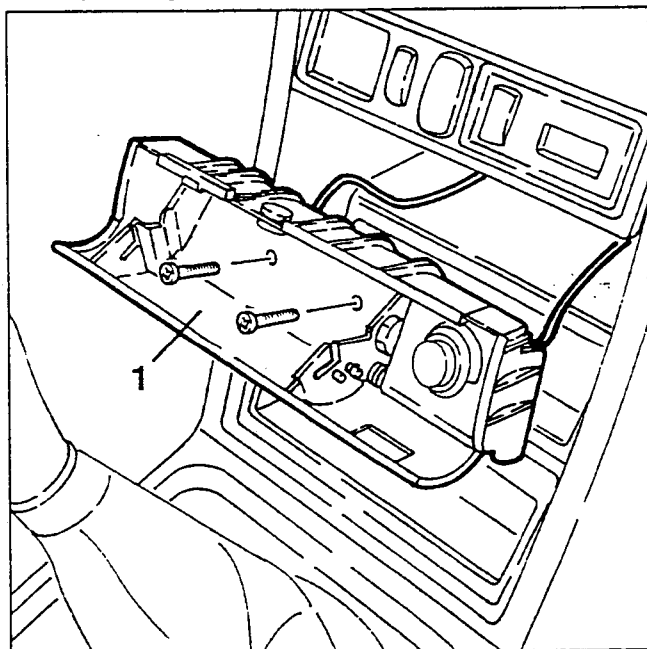


1. Slacken the two fastening screws and remove the upper dashboard air vent.

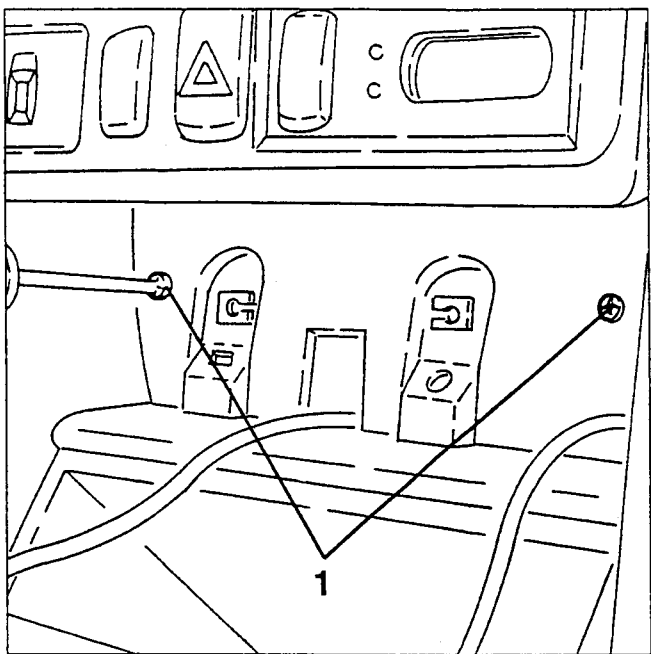


- Remove the ashtray.

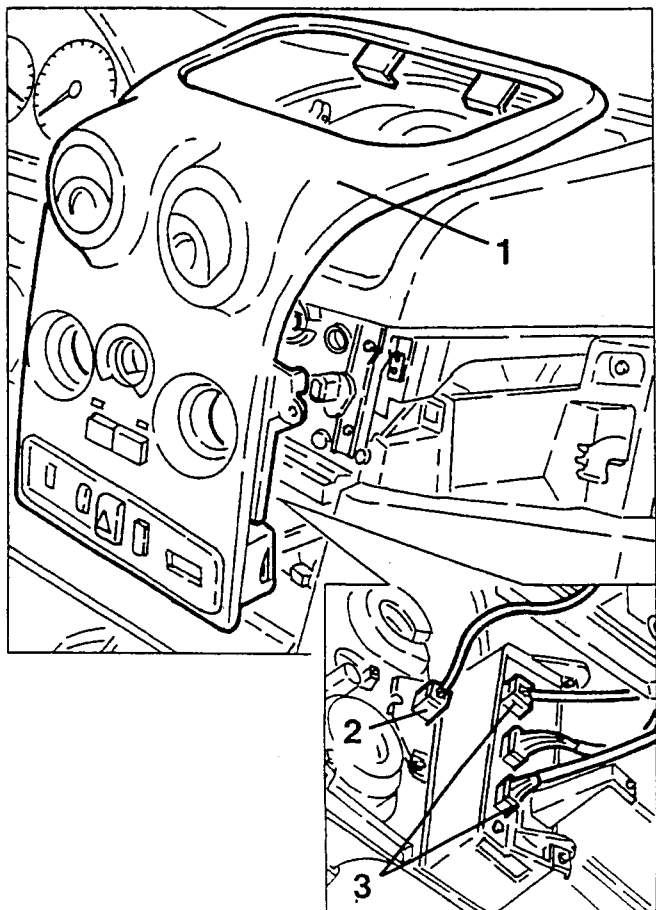
1. Slacken the fasteners, then withdraw the ashtray support and set it aside without disconnecting the corresponding electrical connections.



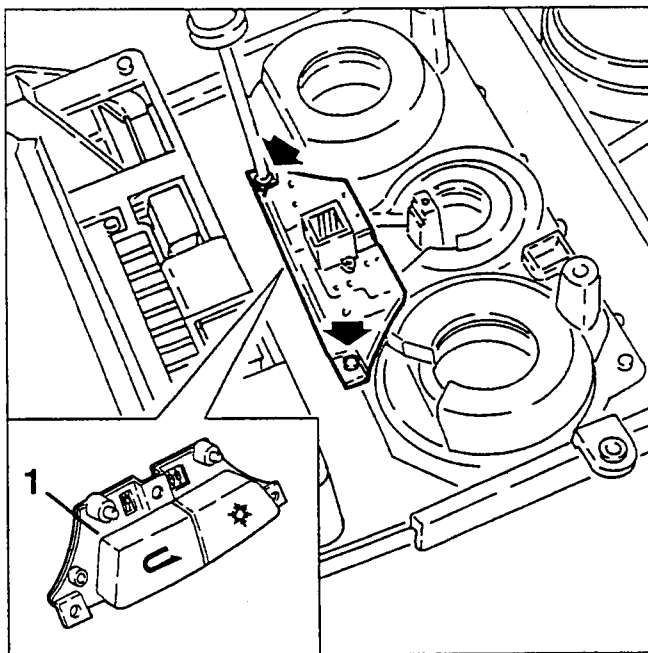
1. Slacken the two screws illustrated fastening the climate control system controls module.



1. Withdraw the three control knobs and back away the module as necessary.
2. Disconnect the electrical connection from the set of air recirculation and compressor engagement switches.
3. Disconnect the electrical connections from the services controls, then remove the climate control system controls module.



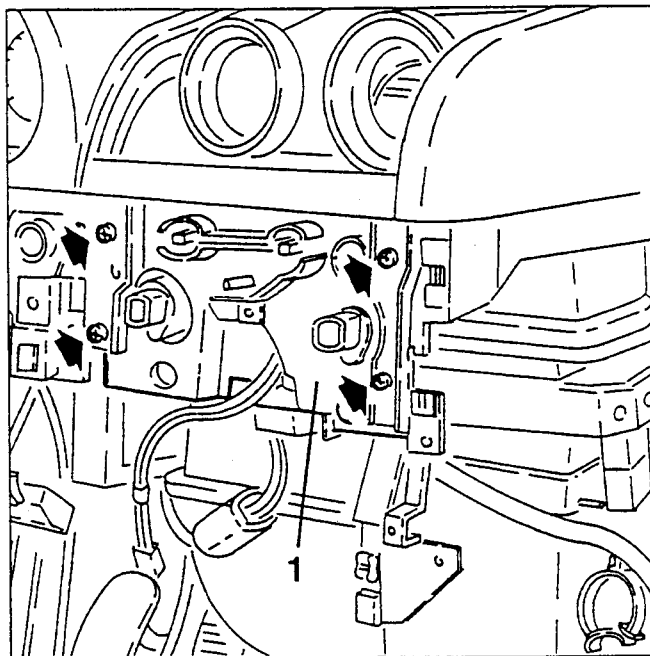
1. On the bench, if necessary, slacken the two fastening screws and remove the set of air recirculation and compressor engagement control switches.



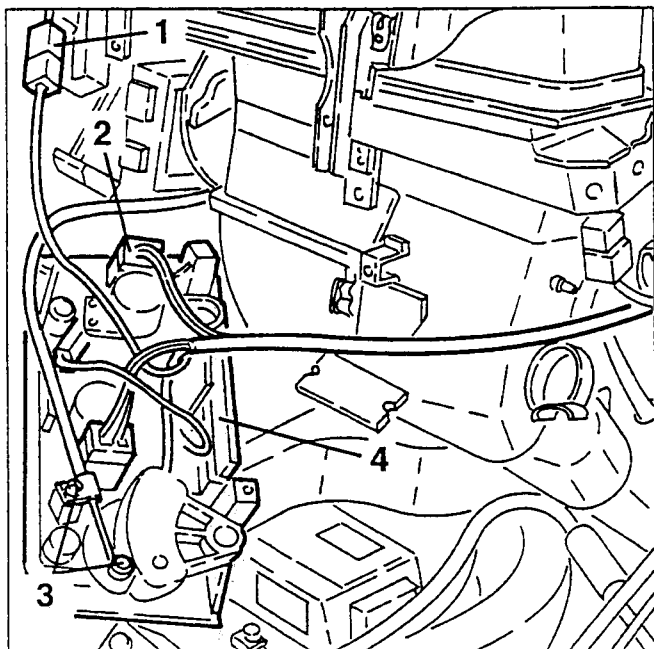
If necessary, also remove the controls group support, as described below.

- Remove the lower part of the dashboard (see GROUP 70).

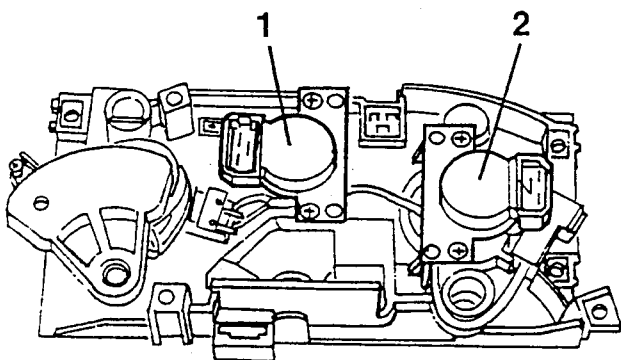
1. Slacken the four fastening screws and lower the climate control system controls group.



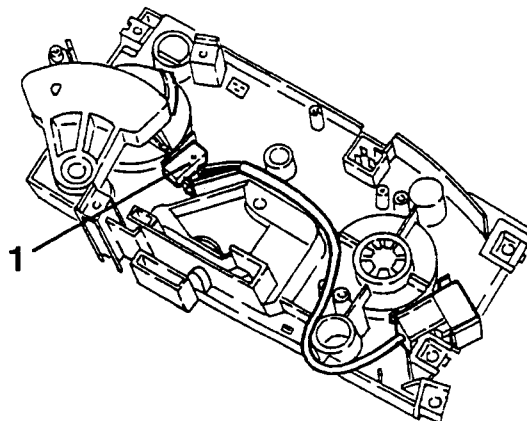
1. Disconnect the electrical connection of the inside air temperature sensor.
2. Disconnect the electrical connections from the climate control system controls support.
3. Disconnect the air distribution port bowden cable from the support.
4. Remove the support releasing it from the electrical wiring.



1. On the bench, if necessary, slacken the two fastening screws and remove the potentiometer for the air flow control knob.
2. Slacken the two fastening screws and remove the potentiometer for the required air temperature selection knob.



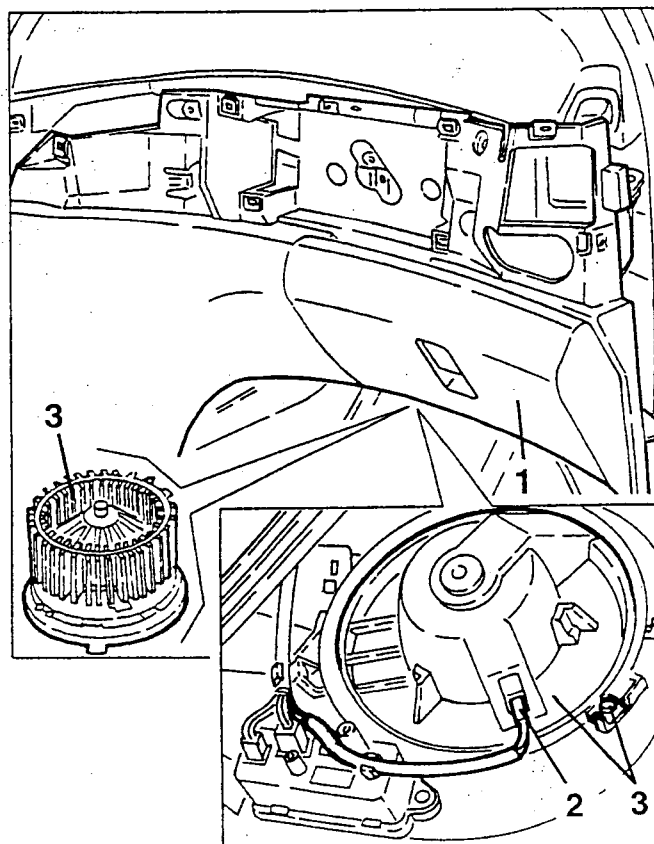
1. Remove the "MAX DEF" function control micro-switch.



FAN

REMOVING/REFITTING

- Disconnect the battery (-) terminal.
- 1. Move away the lower part of the dashboard as illustrated (see GROUP 70).
- 2. Disconnect the electrical connection from the fan.
- 3. Slacken the fastening screw, raise the tab and turn the fan counter-clockwise as far as its stop, then withdraw it from the climate control group.



**ELECTRONIC FAN SPEED
REGULATOR****REMOVING/REFITTING**

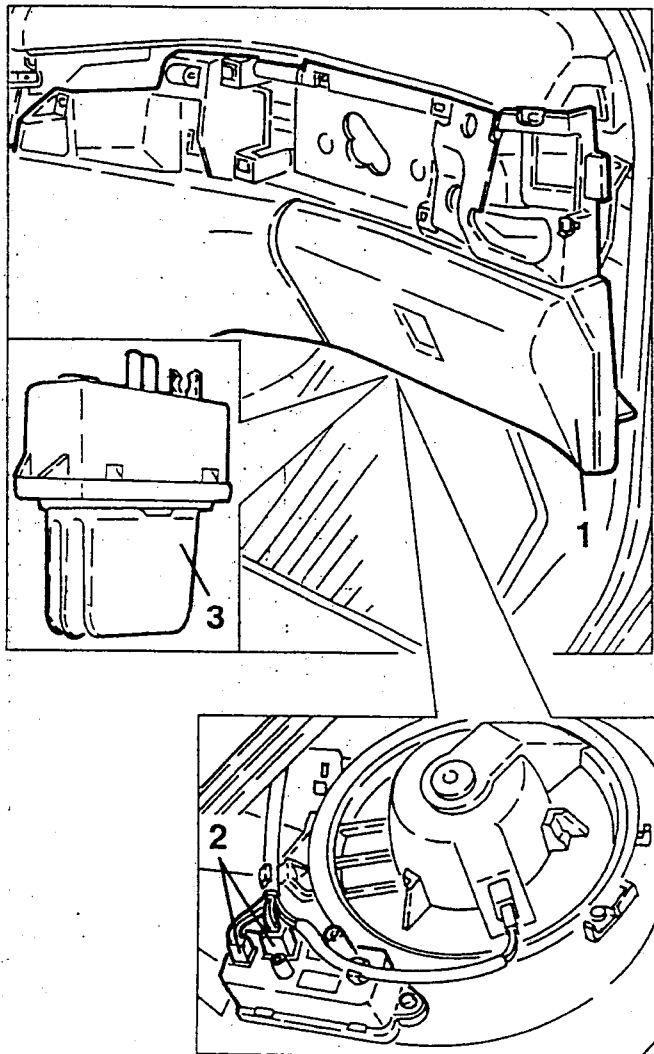
- Disconnect the battery (-) terminal.

1. Move aside the lower part of the dashboard as illustrated (see GROUP 70).

NOTE: To facilitate access to the electronic fan speed regulator, it is advisable to move the floor mat and remove the injection control unit cover.

2. Disconnect the electrical connections from the electronic fan speed regulator.

3. Slacken the two fastening screws and remove the electronic fan speed regulator.

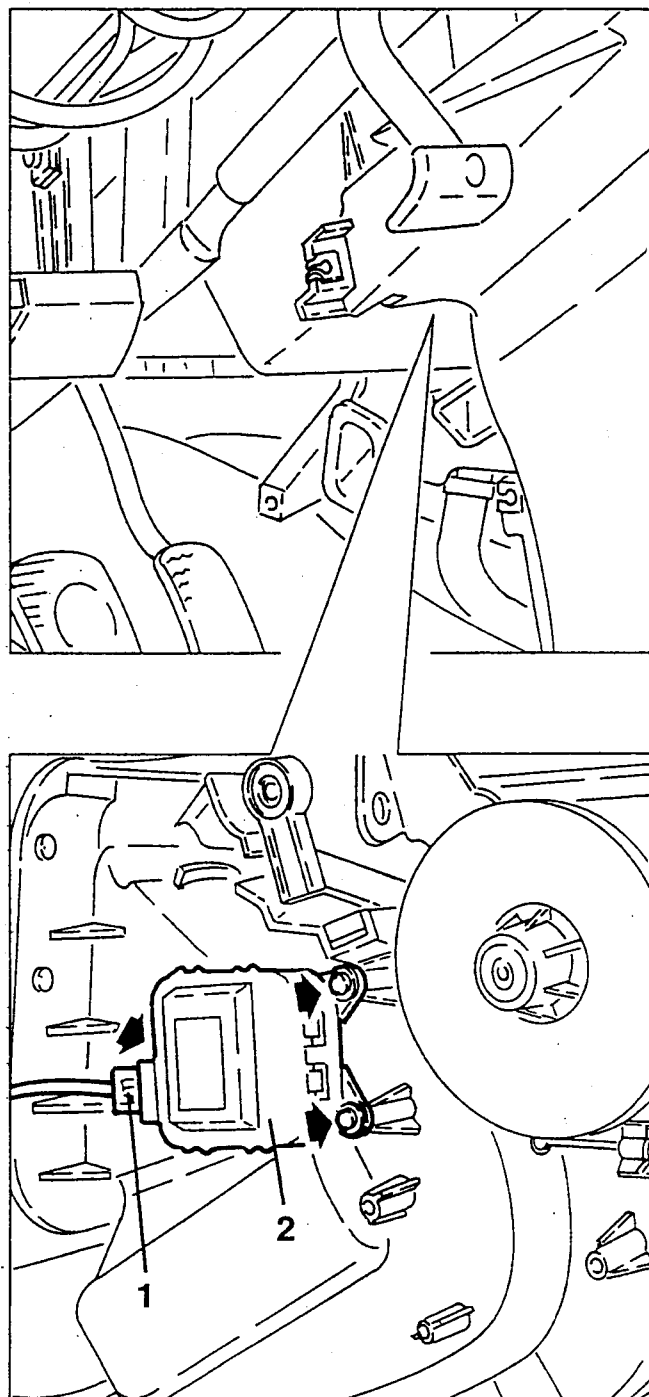
**AIR MIXING PORT
CONTROL MOTOR****REMOVING/REFITTING**

- Disconnect the battery (-) terminal.

- Remove the valve box trim (see GROUP 70).

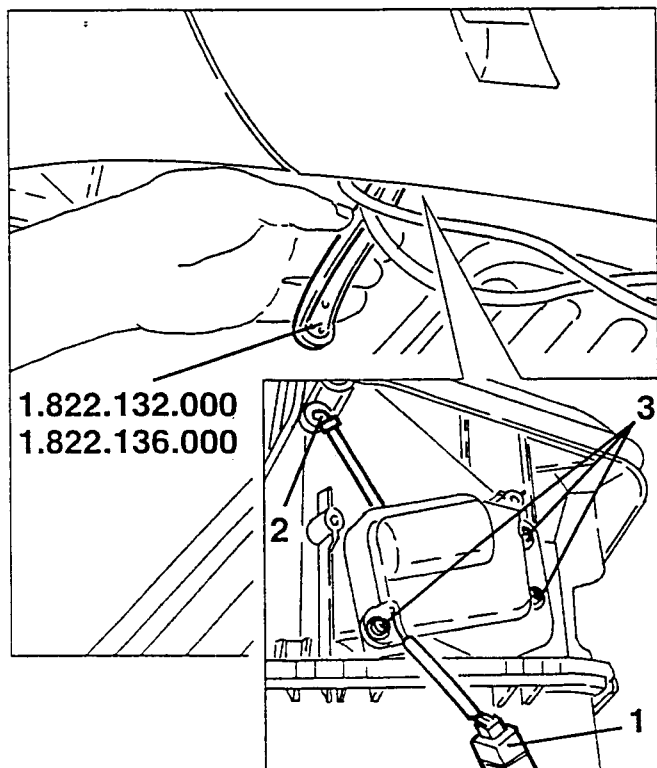
1. Disconnect the electrical connection from the air mixing port control motor.

2. Slacken the three fastening screws and remove the air mixing port control motor.

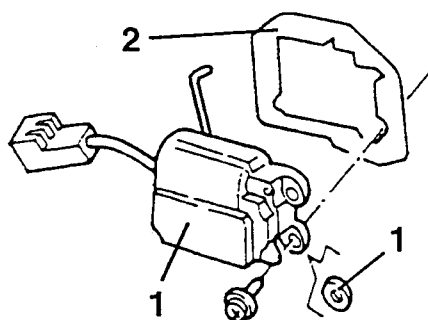


**OUTSIDE/RECIRCULATION
AIR PORT CONTROL MOTOR****REMOVING/REFITTING**

- Disconnect the battery (-) terminal.
- 1. Disconnect the electrical connection of the outside/recirculation air port control motor.
- 2. Disconnect the control rod from the coupling on the outside/recirculation air port.
- 3. Slacken the three cross-slot screws fastening the motor using tool no. 1.822.132.000 with insert no. 1.822.136.000.



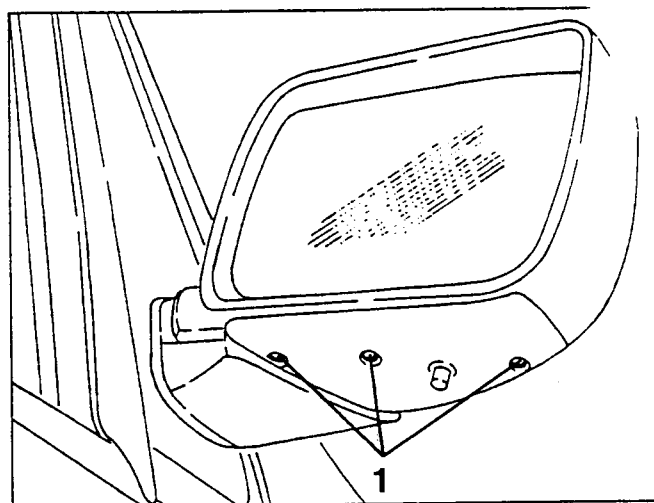
1. Remove the outside/recirculation air port control motor complete with control rod and grommets on the fastening holes.
2. Retrieve the rear plate.



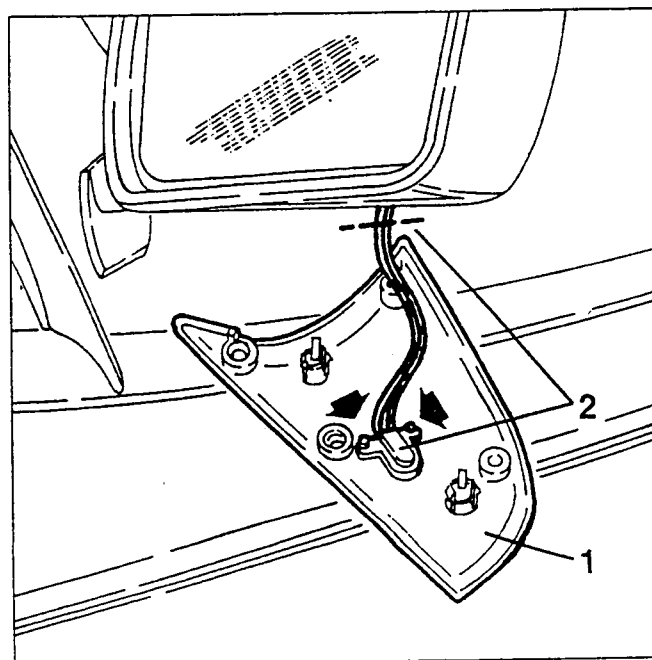
When refitting replace the cross-slot motor fastening screws with socket screws to be tightened with wrench no. 1.822.132.000 and insert of set no. 1.822.136.000.
Also check the correct position of the grommets in the motor fastening holes.

**OUTSIDE AIR
TEMPERATURE SENSOR****REMOVING/REFITTING**

- Disconnect the battery (-) terminal.
- 1. Slacken the fastening screws of the right rear view mirror lower trim.



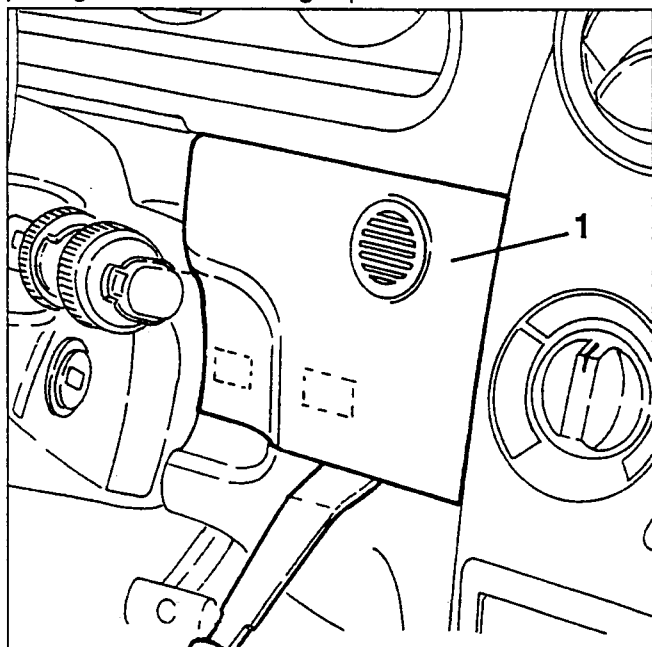
1. Lower the mirror trim as necessary, then remove it after slackening the two screws that fasten it to the outside temperature sensor.
 2. Cut the two electrical cables connecting the outside air temperature sensor where illustrated, then remove it.
- Install a special connector on the electric cables cut previously and on the new outside air temperature sensor to be used.
 - Install the new outside air temperature sensor connecting it with the cable cut previously through the connector fitted.
 - Complete refitting reversing the sequence followed for removal.



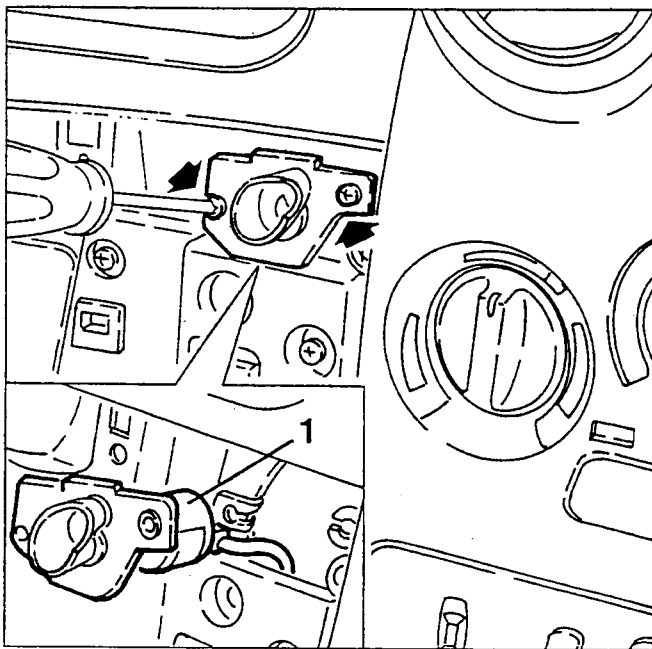
**PASSENGER COMPARTMENT
AIR TEMPERATURE SENSOR****REMOVING/REFITTING**

- Disconnect the battery (-) terminal.

1. Remove the right driver's side dashboard trim prising it off the fastening clips.



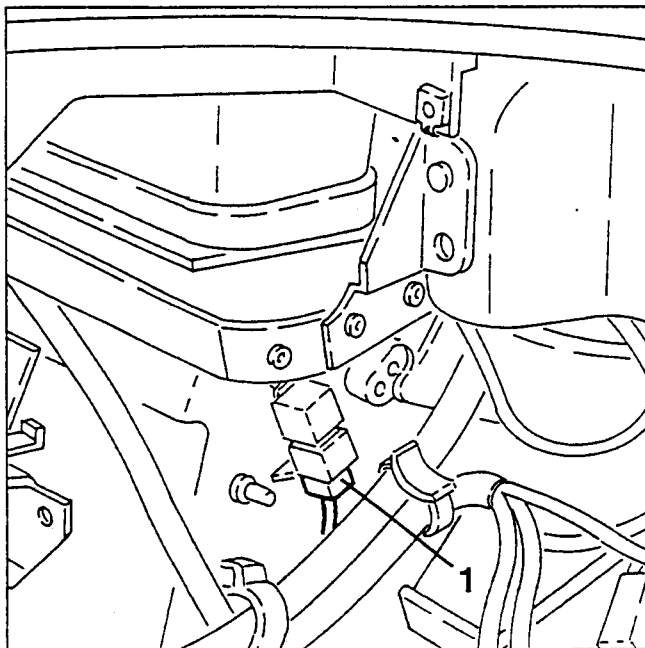
1. Slacken the two fastening screws, then withdraw the sensor just enough to disconnect the electrical connection and remove it.

**TREATED AIR
TEMPERATURE SENSOR****REMOVING/REFITTING**

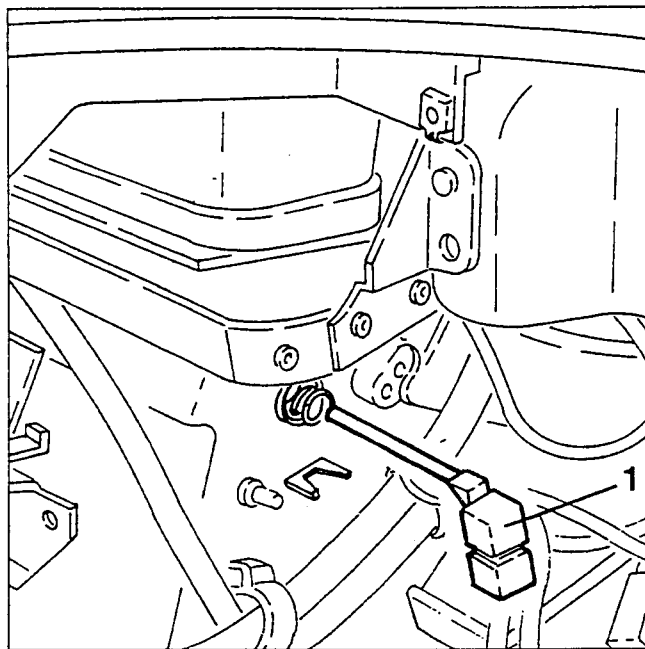
- Disconnect the battery (-) terminal.

- Remove the lower part of the dashboard (see GROUP 70).

1. Disconnect the electrical connection from the treated air temperature sensor.



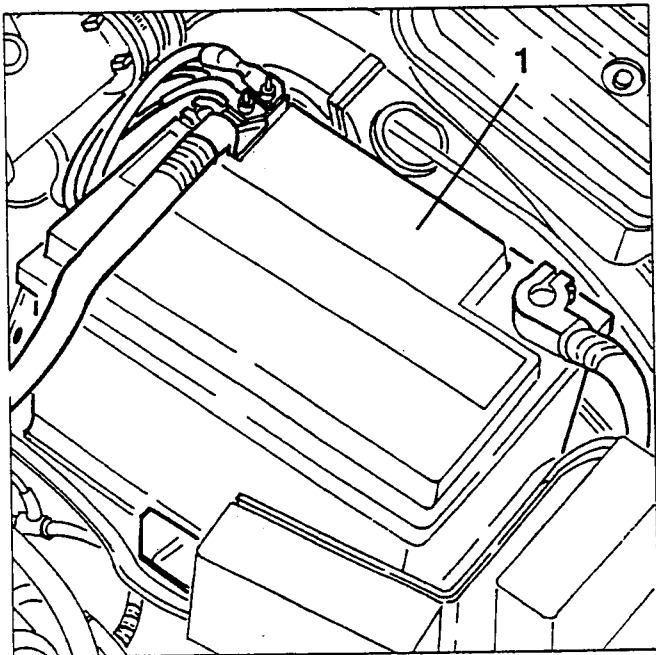
1. Withdraw and remove the treated air temperature sensor from its housing.



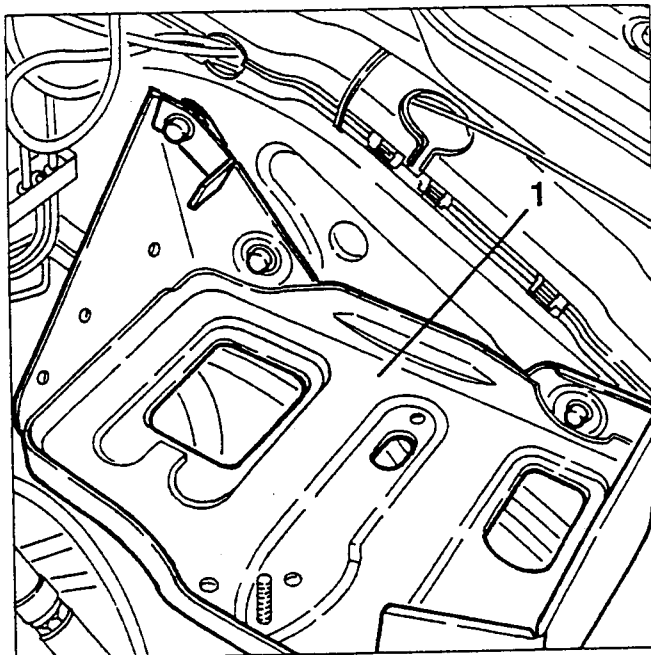
DRIER FILTER**REMOVING/REFITTING**

- Drain the fluid from the climate control system into a suitable container (see specific paragraph).

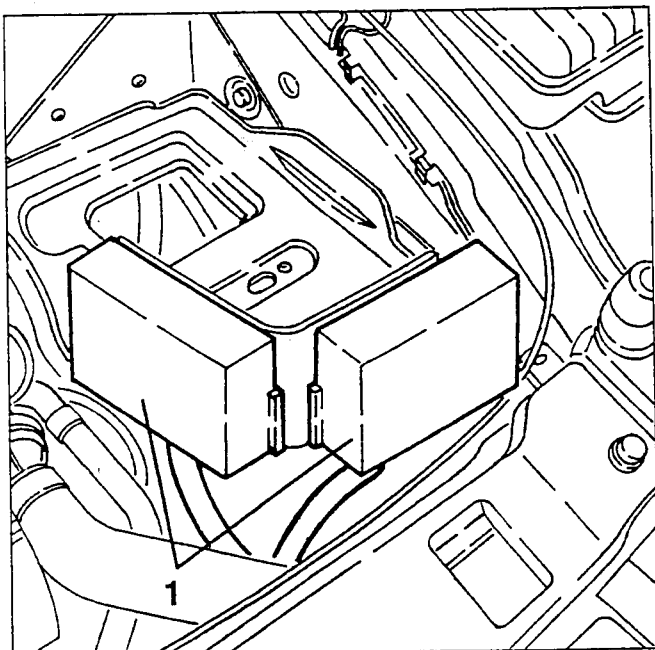
1. Disconnect the terminals and remove the battery.



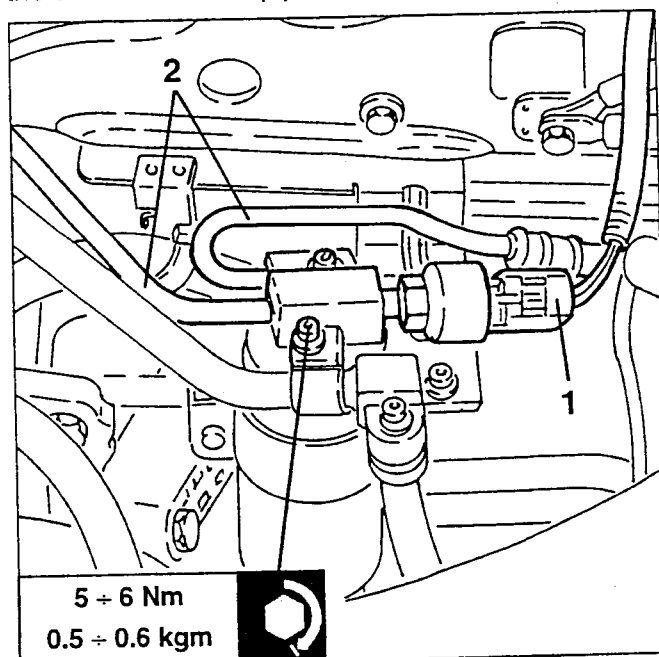
1. Slacken the fastening screws and remove the battery support complete with drain pipe after releasing this from the wheel house.



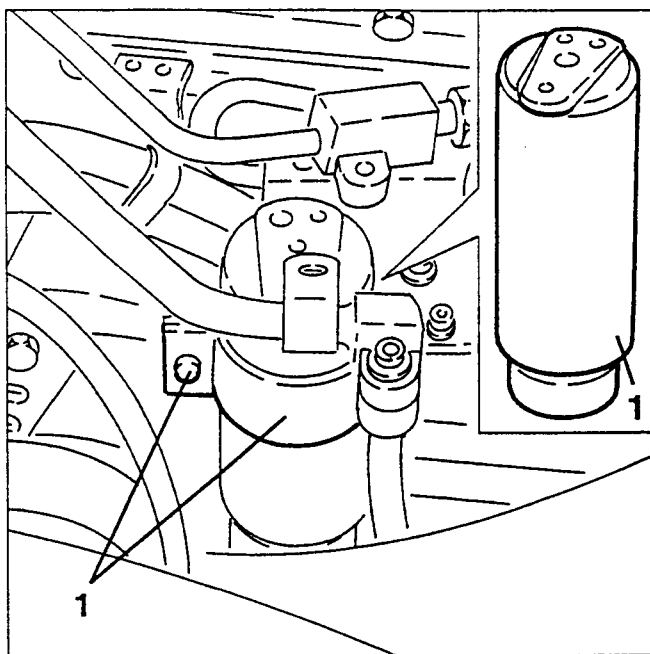
1. Release the two relay boxes from the battery support and set the aside.



1. Disconnect the electrical connection from the four level pressure switch.
2. Slacken the two fastening screws and disconnect the coolant fluid stiff pipes from the drier filter.



1. Slacken the fastening clamp and remove the drier filter withdrawing it upwards.

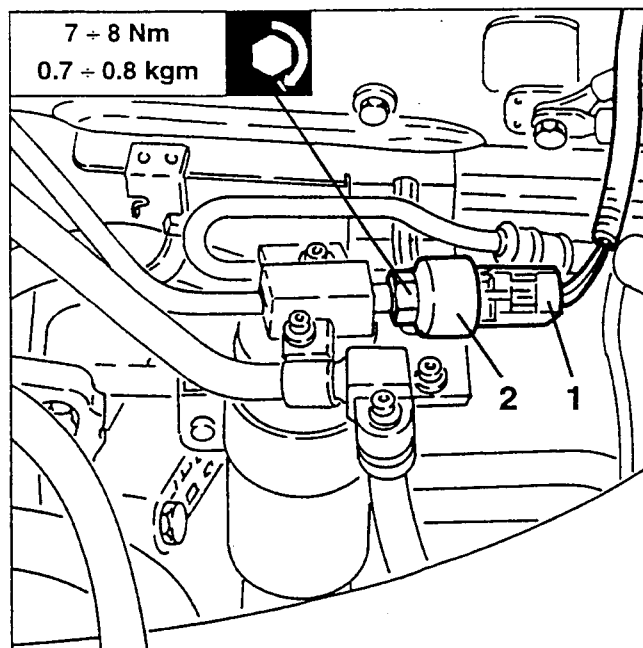


NOTE: To prevent the drier filter from absorbing too much humidity which would adversely affect the way it works, only 15 minutes at the most should lapse from the time it is connected to the system up to the end of assembly; if not, seal with seal plugs the filter inlet and outlet ducts or the free ends of the pipes connected to it.

FOUR-LEVEL PRESSURE SWITCH

REMOVING/REFITTING

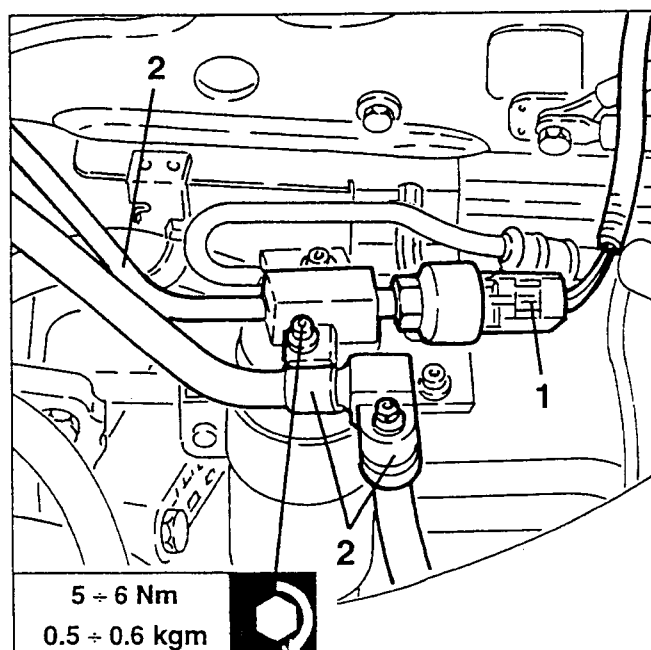
- Disconnect the battery (-) terminal.
- To gain access to the pressure switch, remove the battery and its support proceeding as described in the procedure "Drier Filter - Removing/Refitting".
- 1. Disconnect the electrical connection from the four-level pressure switch.
- 2. Slacken and remove the four-level pressure switch.



PIPES FROM EVAPORATOR TO DRIER FILTER

REMOVING/REFITTING

- Drain the fluid from the climate control system (see specific paragraph).
- Remove the battery, its support and the corrugated sleeve proceeding as described in the procedure "Duct assembly and heater-distributor unit - Removing/Refitting".
- Using a suitable syringe, empty the brake-clutch fluid reservoir.
- 1. Disconnect the electrical connection from the four-level pressure switch.
- 2. Slacken the fastening screw and nut, then disconnect the stiff pipe from the drier filter and the intermediate connector.

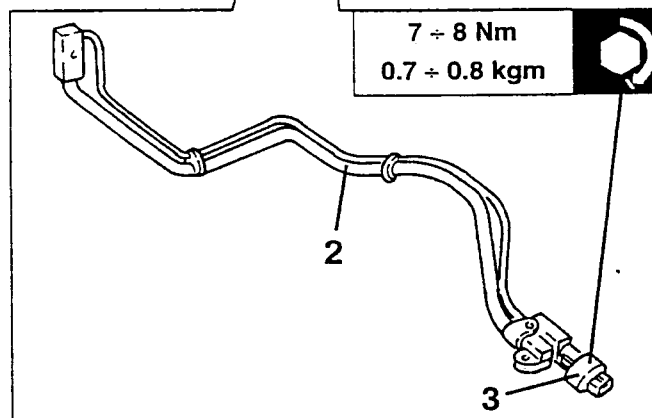
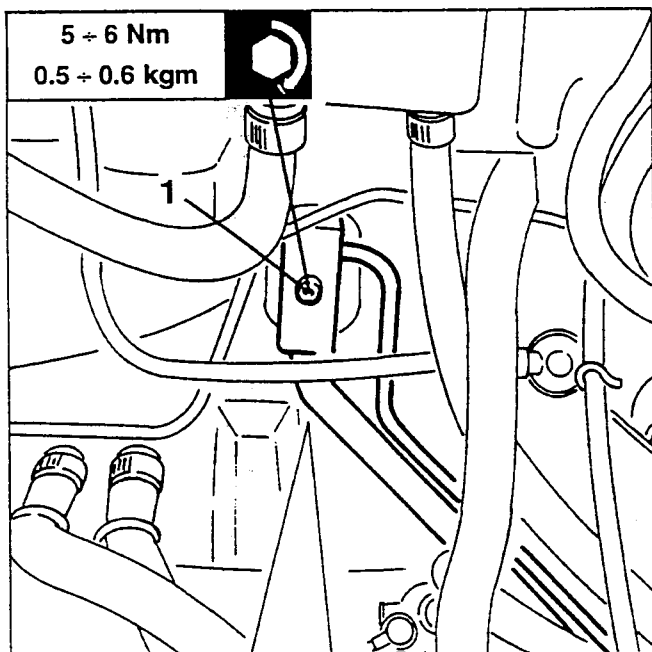


- Remove the power steering piping retainer bracket.
- Remove the damping mass from the gearshift bowden cable support bracket.
- Remove the clutch pump outlet pipe.

1. Slacken the screw fastening coolant fluid inlet and outlet pipes from the evaporator.

2. Remove the pipes connecting the evaporator to the drier filter and to the intermediate connector of the compressor intake pipe.

3. If necessary, on the bench, remove the four-level pressure switch from the pipe.

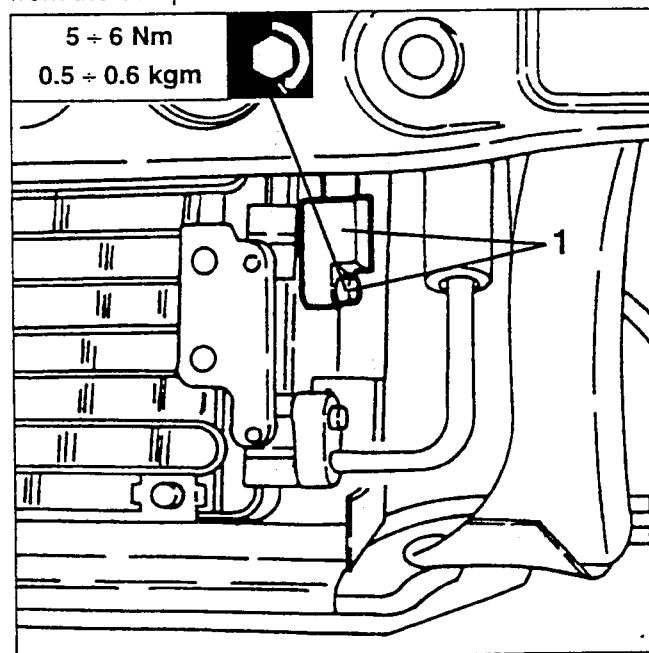


PIPE FROM COMPRESSOR TO CONDENSER

REMOVING/REFITTING

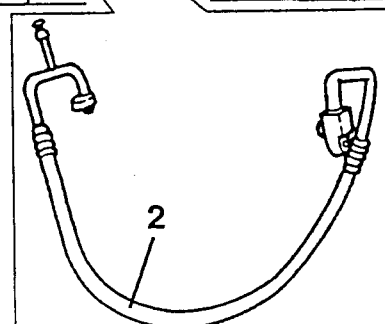
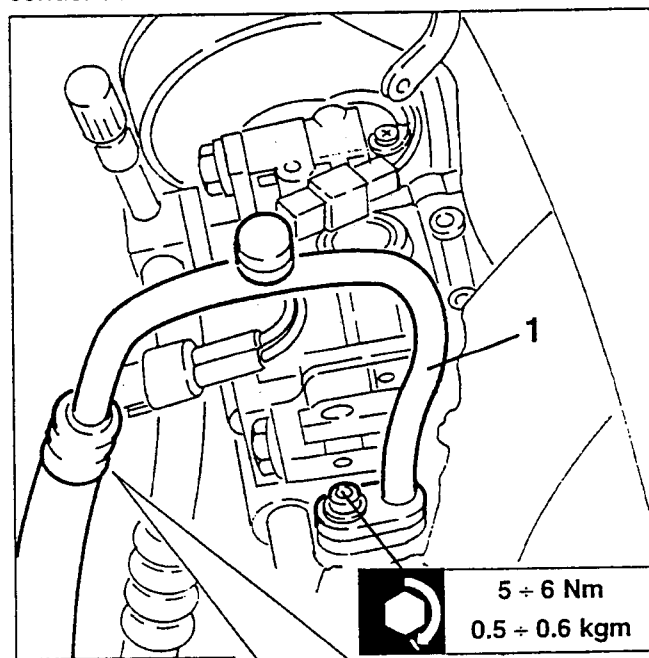
- Set the car on a lift.
- Drain the fluid from the climate control system (see specific paragraph).
- Remove the front bumper (see GROUP 70).

1. Slacken the fastening screw and disconnect from the condenser the coolant fluid delivery pipe leading from the compressor.



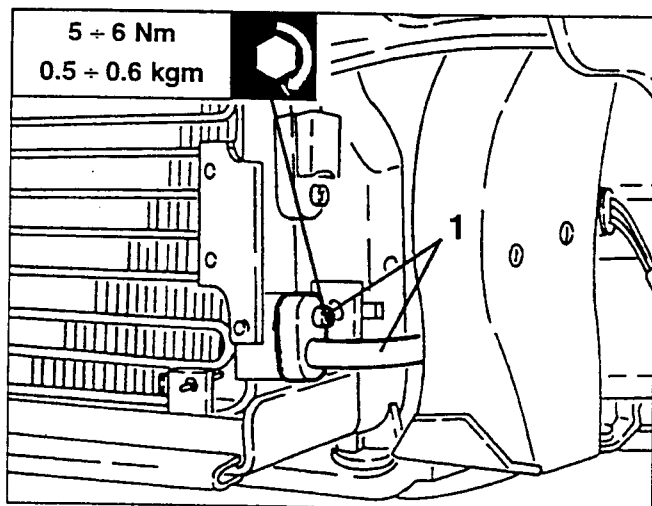
1. Slacken the fastening screw and disconnect from the compressor the coolant fluid delivery pipe to the condenser.

2. Free from the fastening clamps and remove the coolant delivery pipe from the compressor to the condenser.

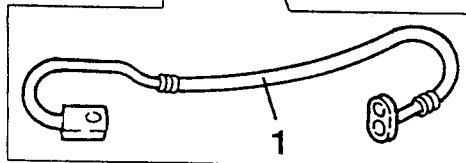
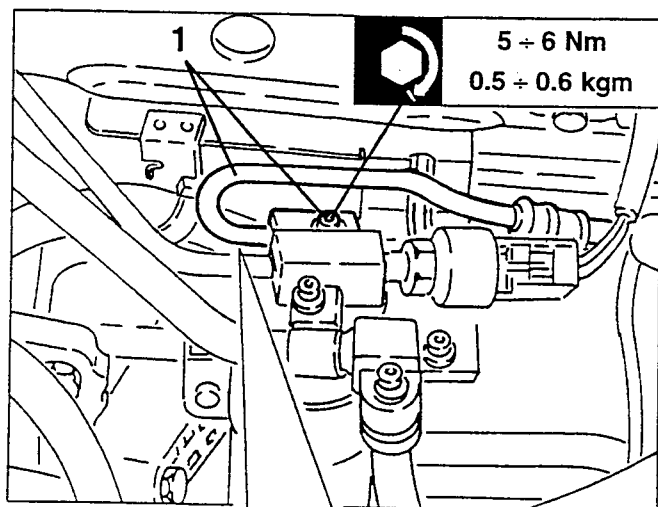


PIPE FROM DRIER FILTER TO CONDENSER**REMOVING/REFITTING**

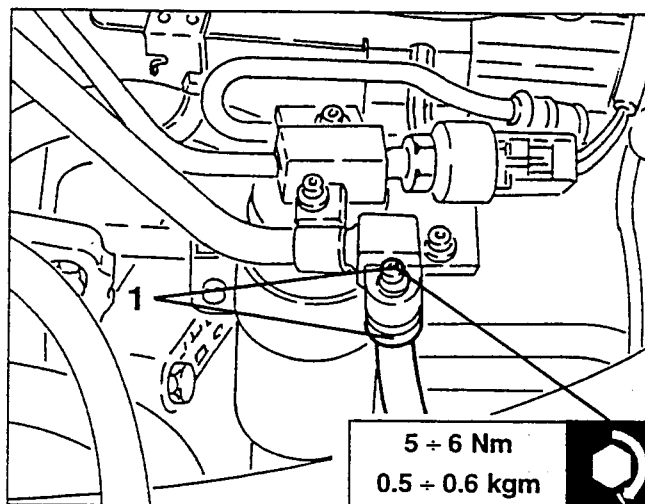
- Set the car on a lift.
 - Drain the fluid from the climate control system (see specific paragraph).
 - Remove the front bumper (see GROUP 70).
1. Slacken the fastening screw and disconnect the coolant outlet pipe from the condenser.



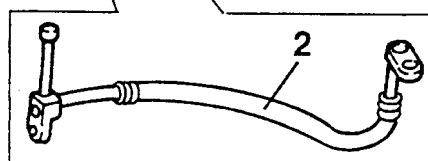
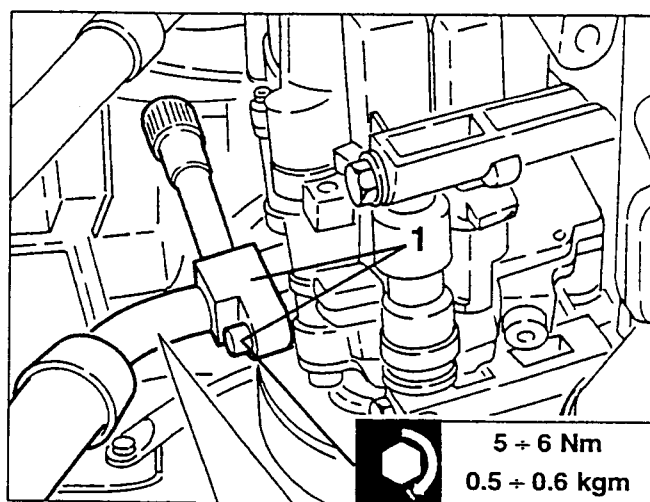
1. Working under the car slacken the fastening screw and disconnect the pipe leading from the condenser from the drier filter, then remove it.

**PIPE FROM THE COMPRESSOR TO THE INTERMEDIATE CONNECTOR****REMOVING/REFITTING**

- Set the car on a lift.
 - Drain the fluid from the climate control system (see specific paragraph).
1. Working under the car, slacken the fastening nut and disconnect the intermediate connector of the coolant delivery pipe from the compressor to the evaporator.



1. Slacken the fastening screw and disconnect from the from the compressor the coolant delivery pipe to the evaporator.
2. Release from the fastening clamps and remove the coolant delivery pipe from the compressor to the intermediate connector.



DESCRIPTION

The assembly represented below in cross-section is the main component of the system and it comprises a duct (1) and a heater distributor unit (2).

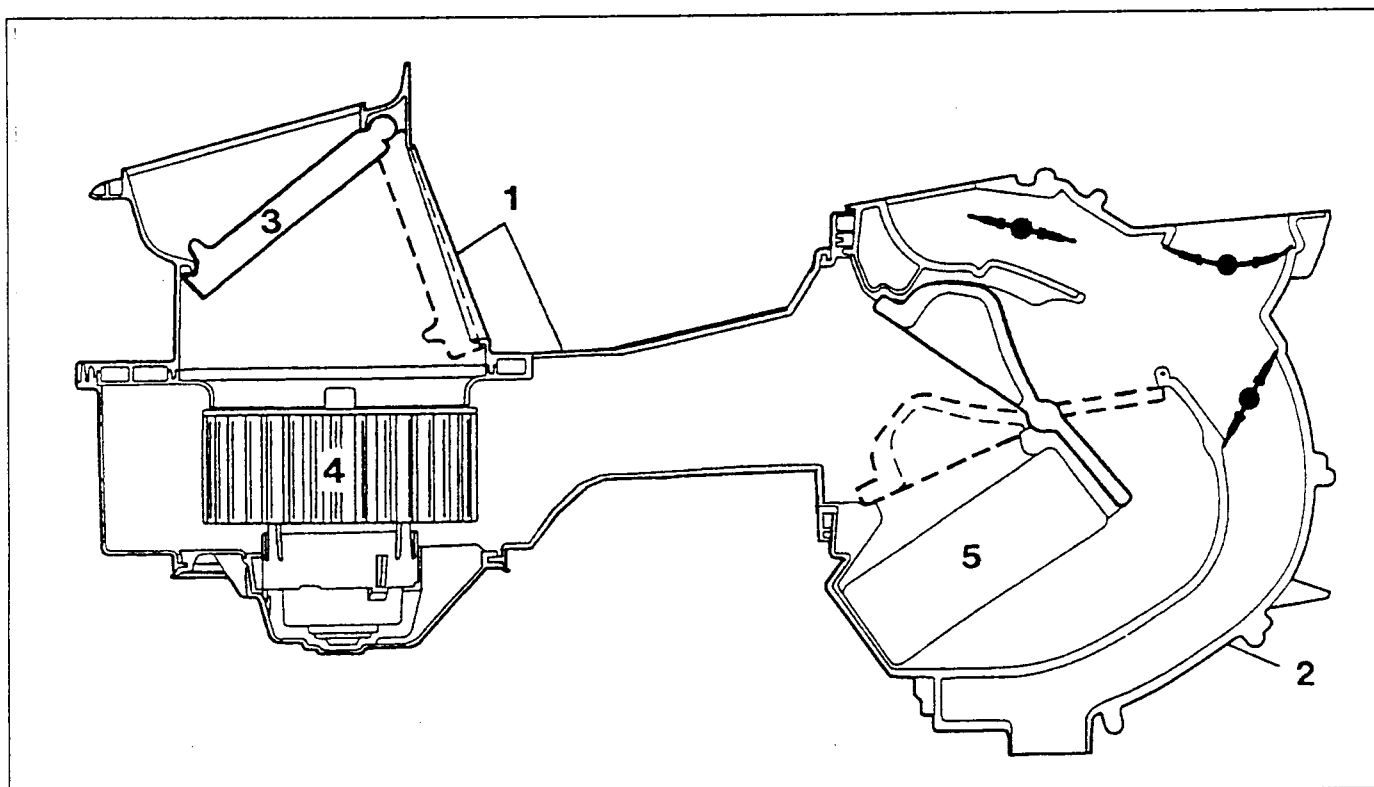
The duct (1) is formed of two sections, a lower one and an upper one; the right hand part of the latter is suitably shaped so that it mates perfectly with the right upper part of the dashboard surface (area under the windscreen of the partition between the engine and passenger compartment) with which it is in contact.

On the upper part of the right hand side of the duct there are two rectangular apertures; the first is in an almost horizontal position and mates with the one on the dashboard, thus communicating with the outside environment, while the other, facing the passenger in an almost vertical position, allows the inlet of the air present in the passenger compartment (recirculation). In the upper inner part of the duct there is a flap (3) which, duly directed through a slider and hose and shaft, can take any intermediate position between the closing limits of the above-mentioned two apertures.

Inside the duct, flap fitted on the lower part in correspondence with the above-mentioned apertures there is a fan (4) which, duly supplied at different voltage ratings, can turn at four different speeds.

The heater - distributor unit mainly comprises a box housing the following:

- centrally a mixing flap which, duly directed by a knob through a bowden cable, allows or prevents the entire flow of air withdrawn by the fan (4), or part of it, to flow against the finned surface of the heater radiator (5);
- at bottom centre the heater radiator (5) the inlet and outlet fittings of which protrude from the right side surface of the above-mentioned unit;
- above and at the front four ports which, duly directed by a knob through a hose and shaft, a toothed sector, a disk with grooves acting as distributor, shutter or fully close the section of the inner ducts which send the air respectively to the feet, front vents and wind-screen demisting vents.



FURTHER INFORMATION ON THE DESCRIPTION OF THE COMPONENTS FORMING THE SYSTEM REMOVING/REFITTING THE LATTER IS NOT AVAILABLE AT THE TIME OF GOING TO PRESS.

