GROUP 80

AIR CONDITIONING SYSTEM

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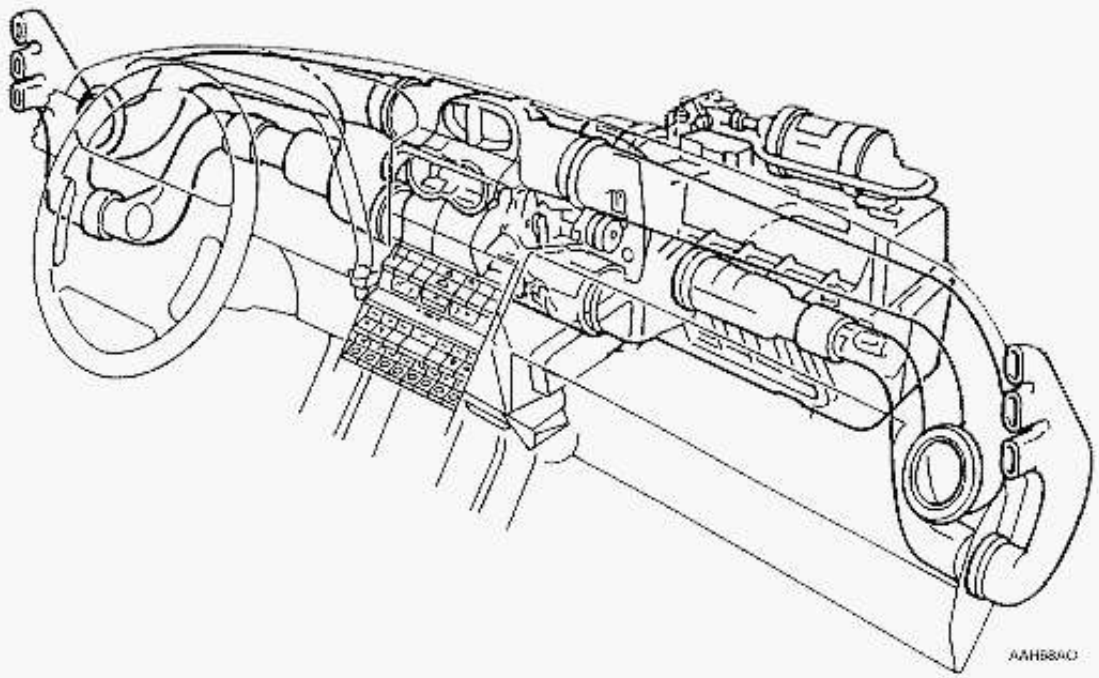
AIR CONDITIONING SYSTEM

GENERAL DESCRIPTION

The automatic heater/ventilation system fitted on the new "164 LS" and "164 ✤ " vehicles guarantees maximum comfort by stabilizing the temperature to the value set by the driver using the controls. The heating/ventilation obtained inside the vehicle is independent from external climatic conditions and driving conditions. The system can operate in two ways: manual and automatic.
In manual mode the user can intervene on the different parameters, such as the speed of the electric fans and the air flow in the passenger compartment as well as on the required temperature.
When in automatic, the user can only set the internal desired temperature; the system reaches and maintains the desired temperature, by automatically modifying the operating parameters in accordance with a pre-established logic, as the external and internal conditions vary.
The automatic heater/ventilation system, from the electronic point of view, is basically made up of a control unit connected to a series of sensors and actuators.
The sensors make it possible to detect, in real time, certain physical operating variables.
The control unit processes the signals received in accordance with algorithms, it makes the necessary comparisons with the values set by the user and emits the control signals to the final actuators in accordance with a appropriate intervention logic.
The electrical part of the system interfaces with th thermodynamic part, made up of an air conditioning un and a heater. Heating is achieved thanks to a suitabl directed flow of hot air originating from the engine area Cooling is achieved through a suitable cooling circu containing the new ecological gas R134a without CFC as a coolant.
R134a gas can not be mixed with FREON 12 used in th systems on previous vehicles, so on the new "164 LS" an "164 ✤ " vehicles:

DO NOT USE FREON 12

The sealed air conditioning circuit is made up of a com pressor activated by the crankshaft through an electro magnetic coupling, an evaporatorand a condenser.
Mechanical flaps allow hot and cold air to be mixed originating from the two systms, and the distribution of th in the passenger compartment.
A dedicated logic controls the movement of a flap, know as the "recirculation flap": this allows the same air take from the passenger compartment to be re-used, whic makes it quicker to reach the pre-established tempera ture or to avoid the inlet of particularly polluted air, i certain driving conditions.
The electric fan can vary its speed through a very wid range.



The automatic heater/ventilation system interfaces with the ignition and injection system.
Given the significant mechanical power value absorbed by the compressor (of the air conditioner), an intervention circuit is envisaged through which the engine management system is able to control the activation of the compressor itself, or to compensate for the effects at low r.p.m. (engine at idle speed).
The control unit is equipped with memory functions which allow the system to recover, during ignition, the heater/ventilation parameters existing when the engine was switched off.
The external temperature, speed of the electric fan and the set temperature are visualized.
In "AUTO" mode the system reaches the nominal conditions in "soft" mode, to avoid violent blows of cold air (when the engine is not yet hot, at start-up).
The direction of the air jet is also controlled in accordance with comfort criteria or for demisting.
The air conditioning system works to stabilize humidity conditions.
To rapidly reach the set temperatures, close the windows and sun roof.
When the vehicle is left in the sun for a long time it is advisable to open the windows for a few moments, in order to quickly change the air.
The heater/ventilation control panel, integrated into the control unit, is equipped with several buttons through which it is possible to intervene with the system's functioning.
In particular, it is possible to:

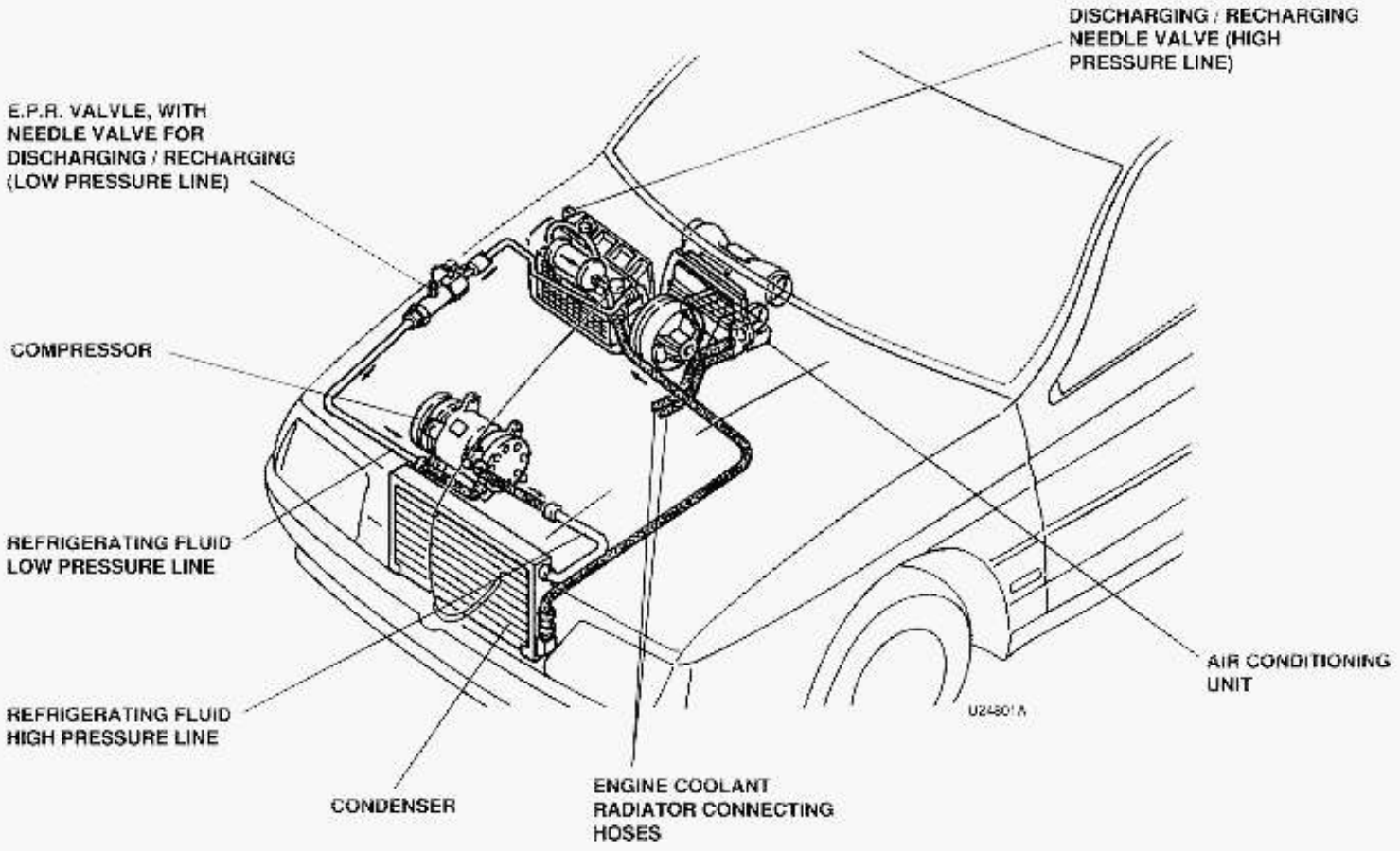
- switch off the heater/ventilation system (OFF);
- disactivate the air conditioner (ECON);
- set the desired internal temperature (TEMP- and TEMP+);
- set fan speed (AIR- and AIR+);
- distribute air flows in passenger compartment;
- activate the demisting function;
- activate the air recirculation function.

The air conditioning unit consists of an evaporator, compressor, condenser, a fluid filter/drier and an expansion valve, located immediately upstream the evaporator.
During operating cycle, two different pressure values are present in the circuit (upstream and downstream compressor), and are constantly maintained by expansion valve located at evaporator inlet port. An E.P.R. valve, located on compressor suction line, maintains the fluid pressure at a minimum set value.
The refrigerating fluid, coming from compressor as high temperature, high-pressure gas, enters the condense where it is cooled and then changes its status to liquid
The fluid passes then through a drier/filter, which filters and removes any water particle from fluid (the water may freeze and clog expansion valve, thus reducing system performance).
The expansion valve, located at evaporator inlet port atomizes the fluid thus reducing its pressure and temperature.
The fluid (still liquid) enters the evaporator, where vapor izes and absorbs heat from air which flows on its fins moved by electric fan.
The air, besides, when comes in contact with evaporato cold walls, loses a great amount of its humidity, which condenses and is discharged outboard through a drain line.
The fluid (now gaseous) comes out from evaporator and is sucked by compressor, thus starting a new cycle.
A three-level pressure switch, located on high-pressure line near the drier/filter, controls compressor switching on and - off.
An anti-frost thermostat (thermal switch) is located in the evaporator, and establishes a further inhibition for compressor power circuit.
The high pressure line is fitted with a safety valve, which prevents overpressure from arising in the circuit.
The system is completed with two needle valves (one on the E.P.R. valve support and the other on line between condenser and drier/filter), which are used to discharge and recharge refrigerating fluid.

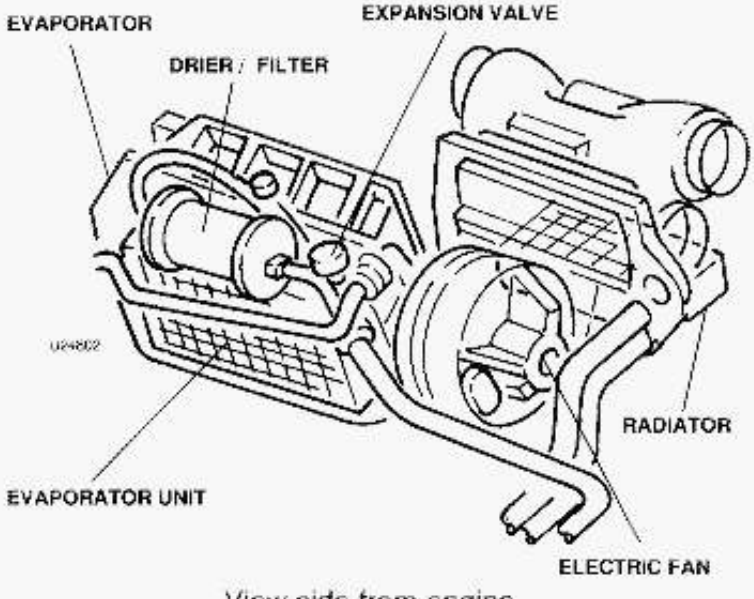
COMPONENTS LOCATION AND IDENTIFICATION

The most significant components included in the conditioning unit, are located between engine compartme and passenger compartment, beneath the dashboar Only the compressor and condenser are located in th vehicle front section.

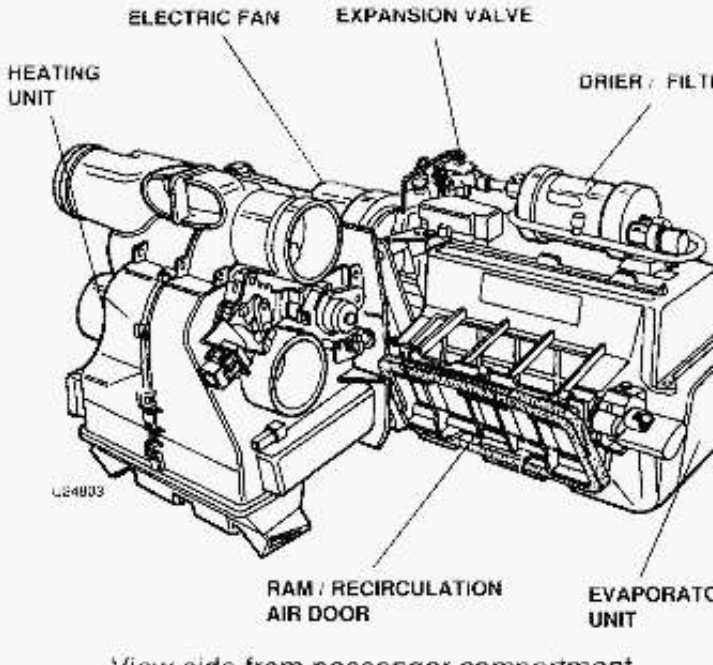
Components and units location



Air conditioning unit - Mechanical components

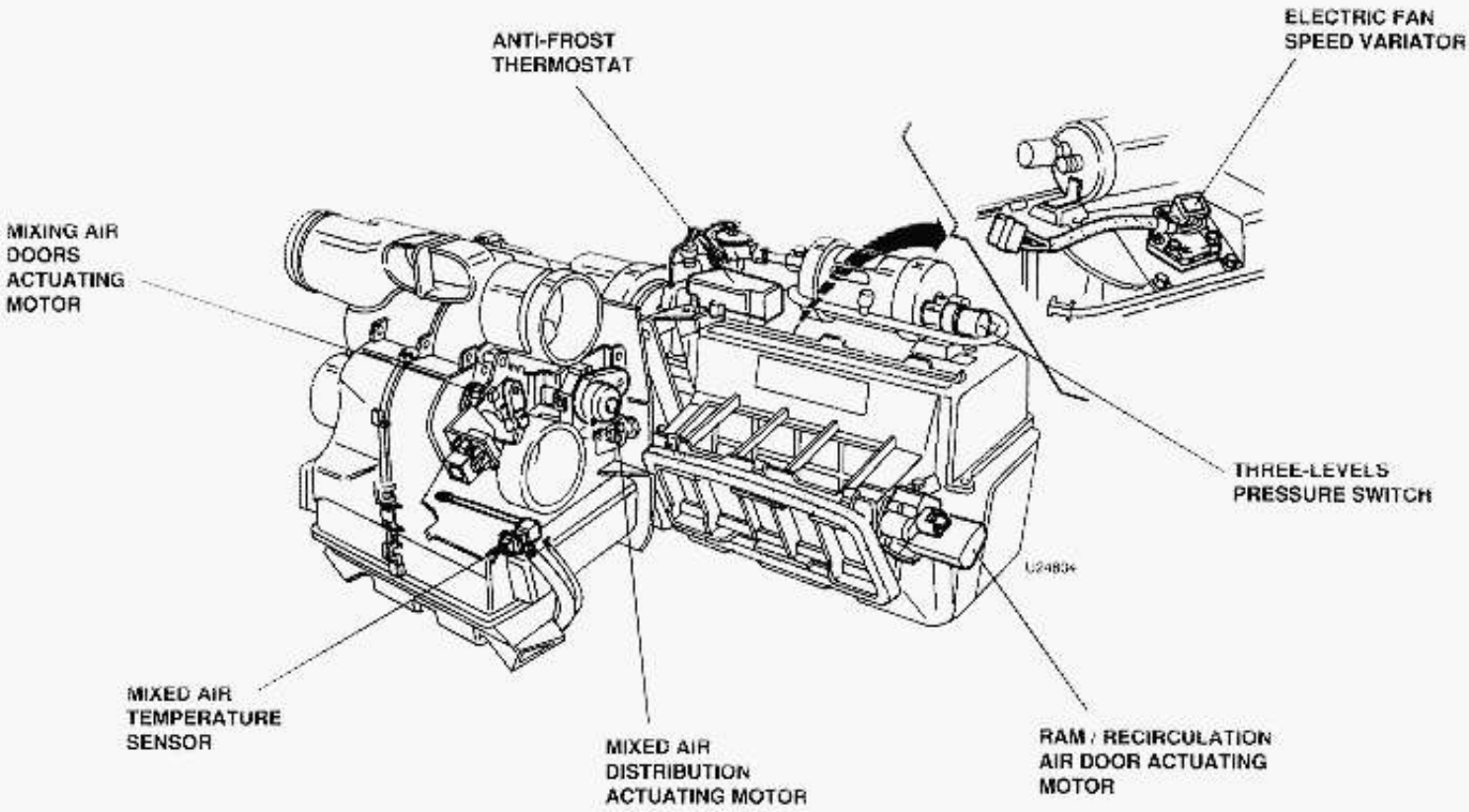


View side from engine

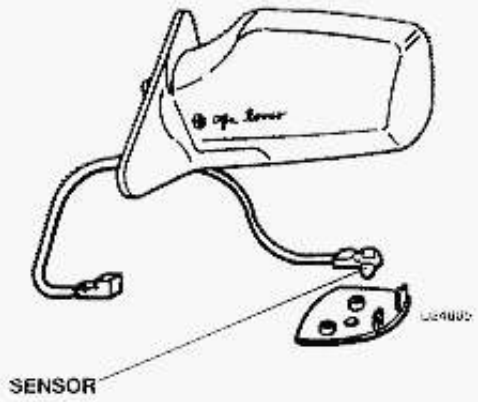


View side from passenger compartment

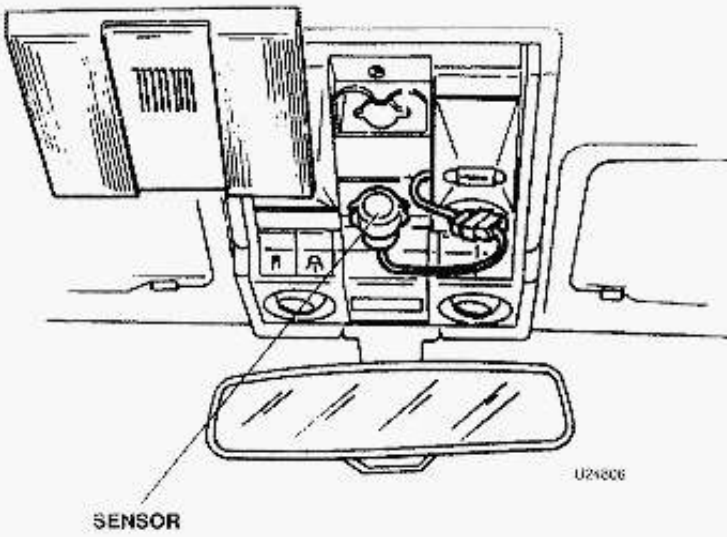
Air conditioning unit - Electrical components (view looking from passenger compartment)



Air conditioning unit - Electrical components



External air temperature sensor



Passenger compartment air temperature sensor

AIRFLOW SCHEMATIC

The following air outlets are available in the passenger compartment:

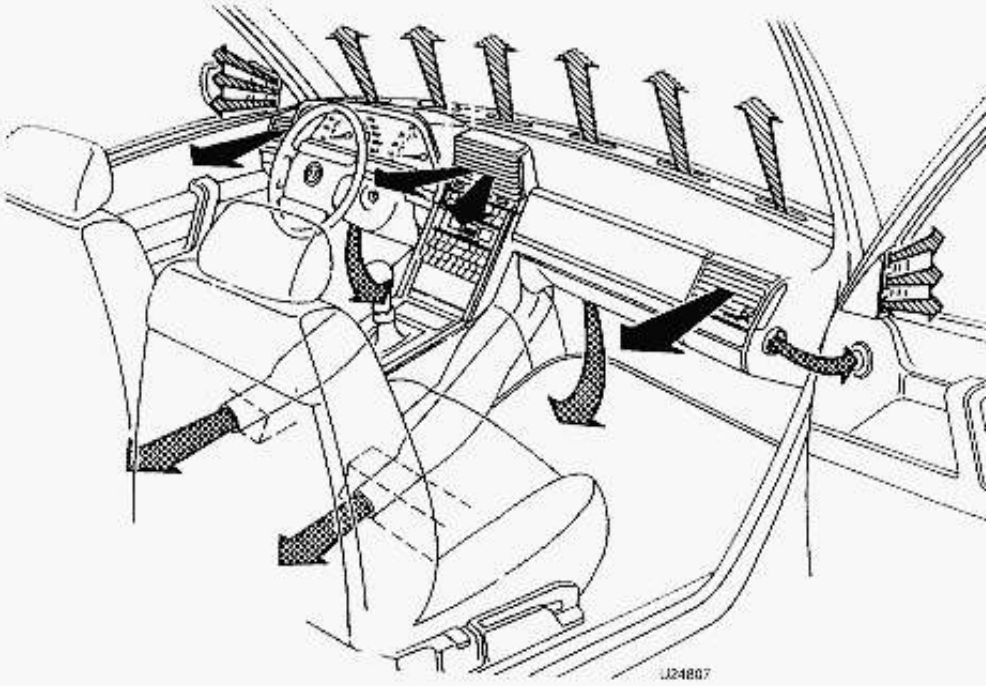
- Center and side adjustable air outlets.
- Lower air outlets and rear seats air passages.
- Windshield and side windows defrosting a outlets.

Airflow schematic

CENTER AND SIDE AIR OUTLETS

WINDSHIELD AND SIDE WINDOWS AIR OUTLETS

LOWER AND REAR SEATS AIR OUTLETS



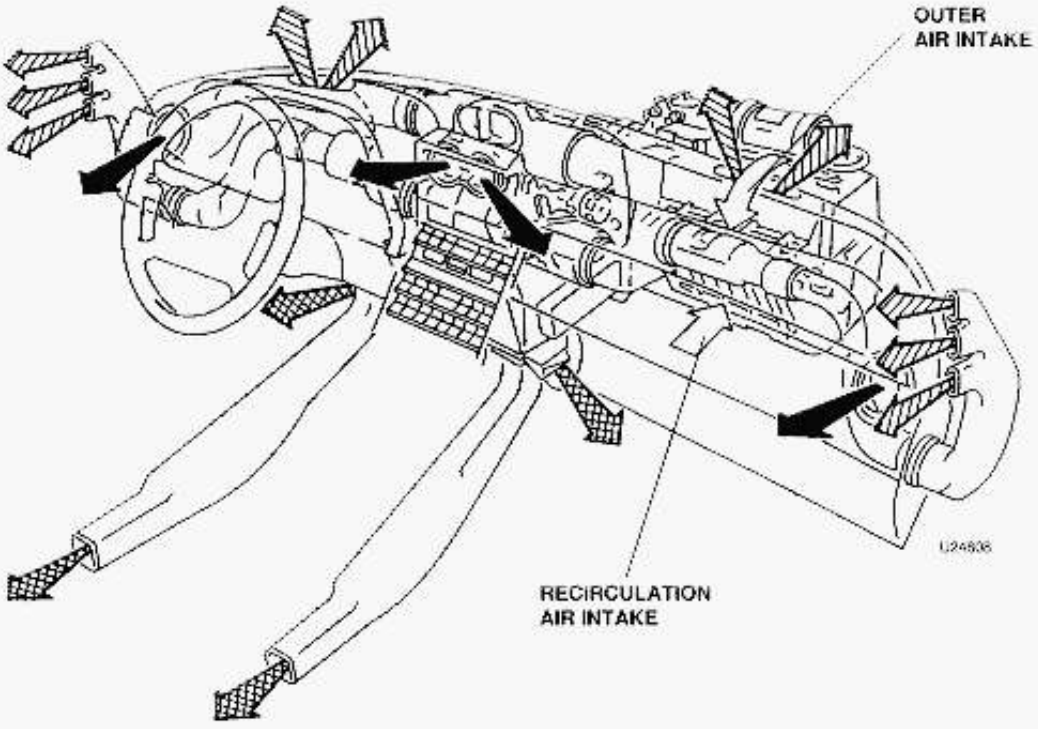


Fig. A

$\alpha = 0°$

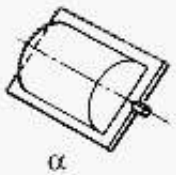


Fig. B

$\alpha = 45°$

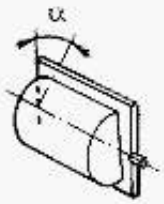
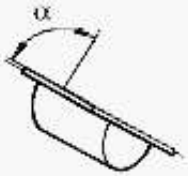


Fig. C

$\alpha = 70°$

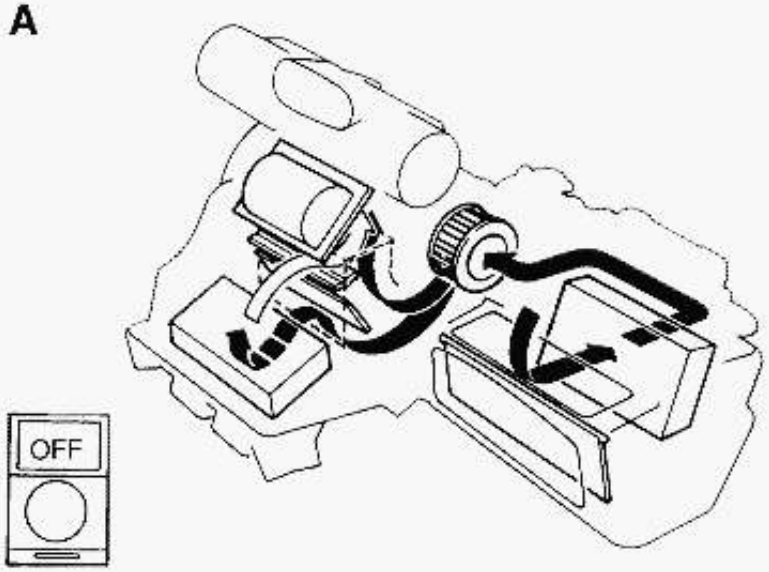


COLD AIR

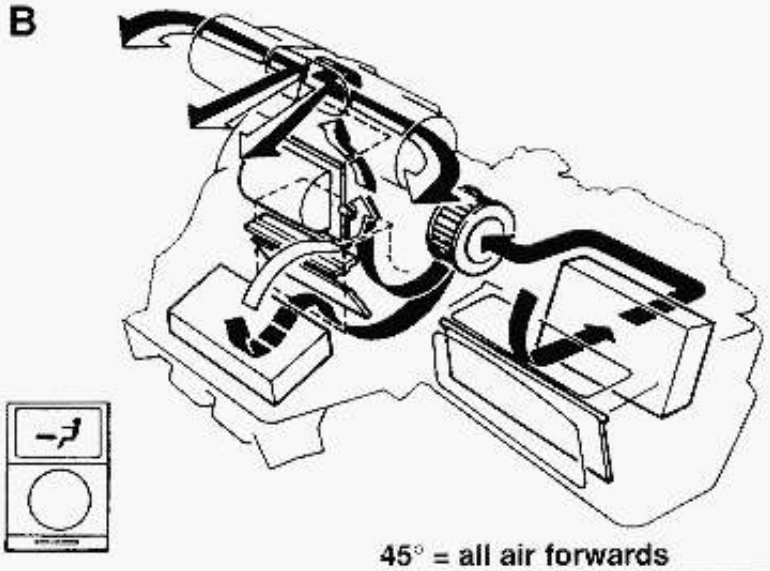
HOT AIR

MIXED AIR

A

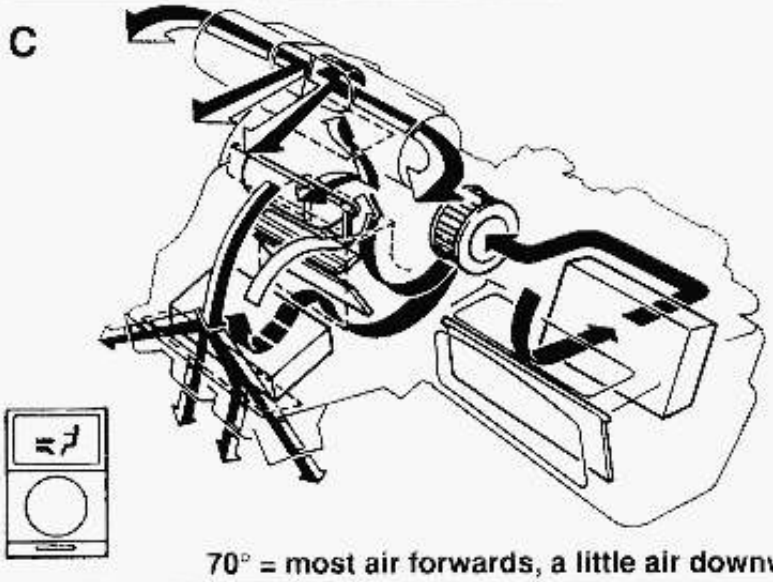


B



45° = all air forwards

C



70° = most air forwards, a little air downwards

Fig. D

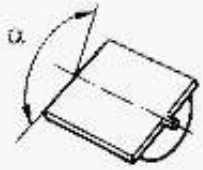
α =90°

Fig. E

α = 115°

Fig. F

α = 135°

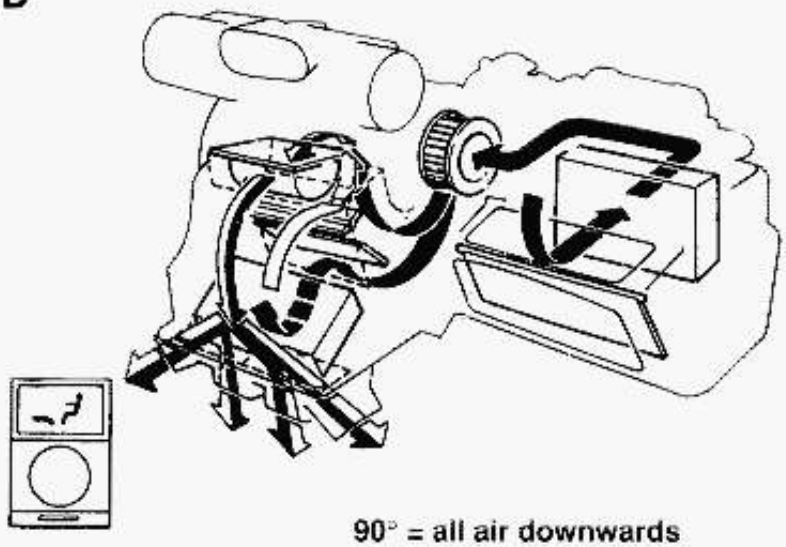


COLD AIR

HOT AIR

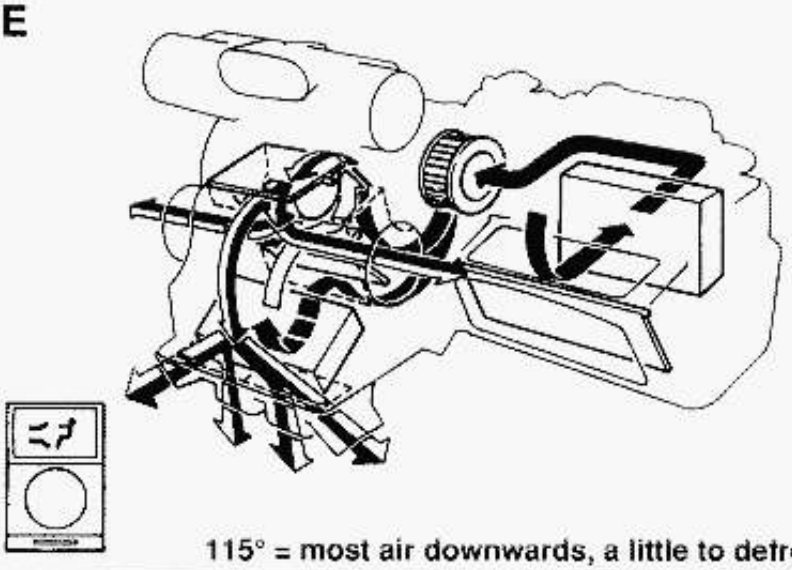
MIXED AIR

D



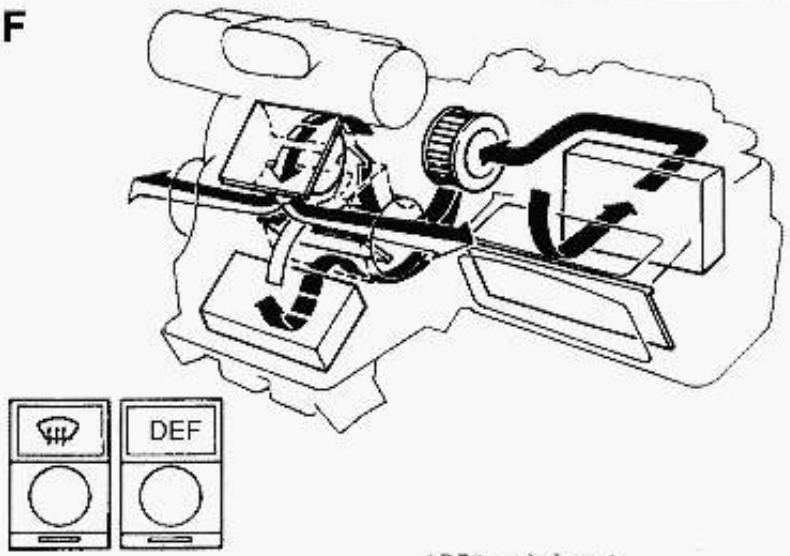
90° = all air downwards

E



115° = most air downwards, a little to defrost

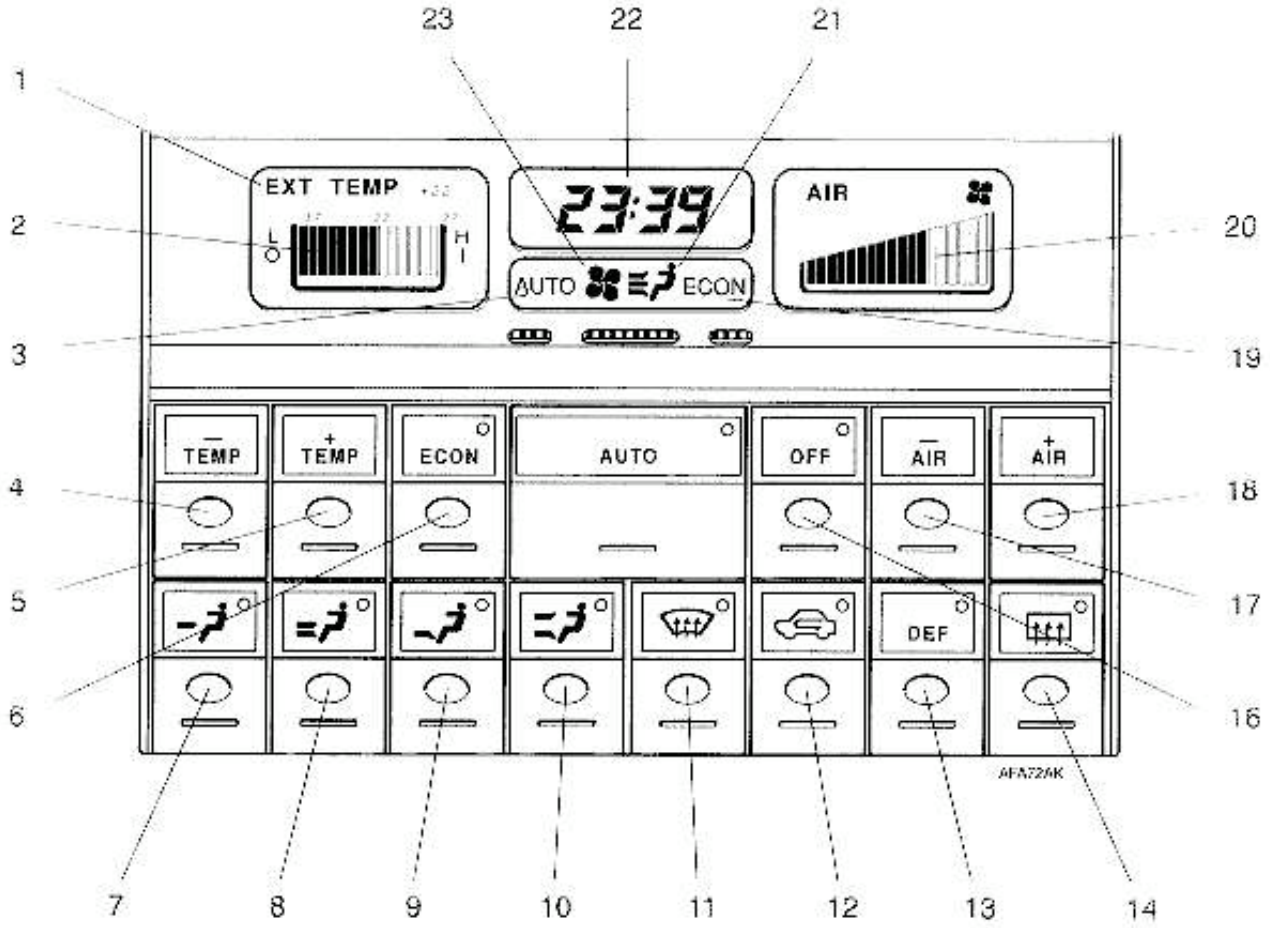
F



135° = defrost

CONTROL FUNCTIONS

The setting and activation of the heater/ventilation system is carried out using the buttons on the control panel of the control unit, illustrated in the figure below:



Automatic heating-ventilation system control unit

1. External air temperature indicator
2. Requested air temperature
3. System functioning in automatic
4. Internal temperature decrease control button
5. Internal temperature increase control button
6. Compressor disactivation control button with luminous indicator
7. Air distribution control button with luminous indicator
8. Air distribution control button with luminous indicator
9. Air distribution control button with luminous indicator
10. Air distribution control button with luminous indicator
11. Air distribution control button with luminous indicator
12. Automatic functioning control button with luminous indicator
13. Air recirculation control button with luminous indicator
14. Defrosting control button with luminous indicator
15. Heated rear screen control button with luminous indicator
16. System exclusion control button
17. Fan speed decrease control button
18. Fan speed increase control button
19. System functioning in manual indicator
20. Electric fan speed indicator
21. Air distribution manual selection indicator
22. Clock
23. Fan speed manual selection indicator

Compressor disactivation button ECON (6)

By activating the **ECON** push button, the compressor is disactivated and the recirculation flap is positioned to "external air".
The system continues to function in automatic by exploiting external air and the heater to bring the temperature in the passenger compartment to the requested value.
The recirculation function can still be activated manually.
The ECON function can be disabled by pressing the **AUTO** button, which brings the system back into automatic.

Automatic functioning control button (12)

By activating the **AUTO** button, the system automatically adjusts the temperature and all system functions, ventilation, air distribution and recirculation,in relation to the temperature set and the conditons signalled to the control unit by the sensors.
The electronic control unit memorizes the last function chosen relative to air distribution and ventilation so, if the engine stops with the heater/ventilation system in AUTO, or another function requested by the user, the next time it is started the system will maintain the last function chosen.

NOTE: At low outside temperature the air conditioning system shuts off automatically

Requested temperature adjustment buttons (4 and 5)

By activating the buttons **TEMP-** and **TEMP+**, the temperature set on the display is modified by one point for every impulse.
The set temperature range goes from 17°C (63°F) to 27°C (81°F) with the extreme marked by the letters **LO** (low) and **HI** (high).
If an extreme temperature is set, visualized on the display with the letters **LO**, the system will set the heater/ventilation to maximum cooling and the fan speed will also be set to maximum (air from front vents).
If an extreme temperature is set, visualized on the display by the letters **HI**, the system will set the heater/ventilation system to maximum heating and the fan speed will be set to maximum (air to defrost).

Fan speed regulation buttons (17 and 18)

The buttons **AIR+** and **AIR-** are used to increase ar decrease fan speed without altering the requested ter perature which will remain in automatic; when one of th two fan speed regulation buttons is activated, the aut matic functioning indicator AUTO is turned off (3) and th fan speed manual regulation indicator comes on (23).
By activating the **AIR+** button, the fan speed is increase the **AIR-** button decreases the fan speed; one point on th display will be either lit up or turned off every time th buttons are pressed.
If the **AIR+** or **AIR-** buttons are kept pressed down, the fa speed will increase or decrease continuously.
The speed of the fan selected manually is activated usir the **AUTO** button (12).

Air recirculation control button (13)

By activating this button, the **RECIRCULATION** functio is activated, which induces the control unit to comman the vent to suck in the air to be mixed, directly into th passenger compartment and the compressor is activa ed.
With the recirculation function activated, the compress remains activated even if the ECON button is pressed
With the recirculation function activated if the intern temperature is greater than 10°C (50°F), the compress remains activated.

NOTE:

The compressor is activated or remains activated only
- the temperature detected by the external sensor higher than 5° C (41°F);
- consensus from defrost thermostat
- consensus from trinary (Q20 - 3 stage pressu switch).

The temperature control remains in "automatic" and th function can be disactivated by pressing the button aga or by pressing the AUTO button.

Defrost control button (14)

By activating the **DEF**, the defrost function is activate which induces the control unit to command the mixed a distribution drum to maximum opening (a=135°) and mai taining the following conditions for approx. 5 minutes:

- increase in fan speed;
- increase in air temperature with respect to the set value;
- air flow directed towards the front windows only
- activation of rear heated screen (this function can be disactivated by pressing the specific button);
- compressor activated (in relation to external temperature).

By activating this function the system automatic functioning indicator will go off (12) and the warning lights for the functions that are activated come on.
The temperature control remains in "automatic" and the function can be disactivated, before the programmed 5 minutes, by pressing the button again or pressing the AUTO button; the return to the AUTO condition is controlled gradually by reducing the air flow and temperature and maintaining the distribution towards defrost until the conditions previous to the defrost DEF button being activated have returned.

Air distribution control button (7)

By activating this button, it induces the control unit to direct the flow of air completely towards the central vents; the temperature control remains in "automatic" and the function can be disactivated by pressing the button again or by pressing the AUTO button.

Air distribution control button (8)

By activating this button, it induces the control unit to direct the flow of air in part towards the central vents and in part downwards; the temperature control remains in "automatic" and the function can be disactivated by pressing the button again or by pressing the AUTO button.

Air distribution control button (9)

By activating this button, it induces the control unit to direct the air flow completely downwards; the temperature control remains in "automatic" and the function can be disactivated by pressing the button again or by pressing the AUTO button.

Air distribution control button (10)

By pressing this button, the control unit directs the air flow in part downwards and in part towards the windscreen the temperature control remains in automatic and the function can be disabled by pressing the same button again or by pressing the AUTO button

Air distribution on windscreen control button (11)

By activating this button, the control unit directs the air flow completely towards the windscreen; the temperature control remains in "automatic" and the function can be disactivated by pressing the button again or by pressing the AUTO button.

NOTE: Activating one of these air distribution buttons (7, 8, 9, 10 and 11) or the fan speed button (17, 18), the automatic functioning indicator AUTO (12) is switched off and the indicator for the requested function is switched on: in any of these conditions, the control unit will try to keep the temperature level at the value set by the user.

Heated rear screen button (15)

By activating this button, the screen demisting function will be activated for approx. 20 minutes.
Every time it is activated, by acting on the button, it will remain activated for a further 10 minutes.
It should be remembered that it is only possible to reactivate it if the previous session is over, otherwise pressing the button will disactivate the function.

CAUTION:
Start the engine before switching on the rear window defogger

System excluded button (16)

Pressing the **OFF** button will exclude the heater/ventilation system completely and air from outside the vehicle is prevented from entering; the function can be disactivated by pressing the button again or by pressing the AUTO function.

DETAILED DESCRIPTION OF AIR CONDITIONING SYSTEM AUTOMATISMS

Setting air temperature to required value

The memory of the electronic control unit stores some correcting factors, in relationship to outside and inside temperatures. The inside temperature setting output is the result of preset temperature (shown on display) and correcting factor determined by detection of outside temperature.

Cold air and hot air mixing control

The position of control door is setted depending on the following factors: outside temperature, required/corrected temperature (which is different from temperature shown on display) and difference between required/corrected temperature and vehicle inside temperature.
The result of the above listed parameters is an output signal which controls the air mixing door.

Fan speed setting

Also the fan speed setting is the result of a combination between outside temperature value and difference between outside temperature and required/corrected temperature.

Mixed air distributor control

The mixed air distribution door position is controlled by the electronic control unit, which sends a signal proportional to mixed air distribution door angle and to cold/hot air mixing door angle.

Recirculation door control

The recirculation door position is controlled by the electronic control unit depending on outside temperature.
The command supplied by the control unit moves the flap from "RECIRCULATION" to "EXTERNAL AIR" without stopping at intermediary positions. Consequently with external temperatures above 29°C (84°F), the control unit sets the flap to "RECIRCULATION" taking air from the passenger compartment, while with external temperatures below 27°C (81°F), the flap will be positioned to let air into the vehicle from outside.

Cold engine start

Using a specific operational logic, the automatic heate ventilation system automatically resolves problem which often arise in winter when starting the vehicle wit cold engine.
The electronic control unit detects external temperature between -40° C (-40°F) and +10° C (50°F) and sends a to the defrost function, starts the fan operating at firs speed, positions the flap in order to intake air from outsid and commands the air to be mixed at maximum hea through the system actuators.
The above procedure prevents cold air from being let int the passenger compartment. In fact, the air can not b heated by the heater matrix in the engine cooling syster due to the excessively low temperature of the coolar itself. However, when the control unit detects that the a temperature downstream from the heater matrix outle has exceeded 45° C (113°F), the system will start t function in automatic, in accordance with the progran installed; however, in order to avoid sharp variations i fan speed, the system will gradually increase the suppl to the fan by 1 Ampere/second until the speed envisage by the electronic control unit is reached.

Overcharge suppression at engine start

The high current absorption by the starter motor means is not advisable to employ other users when starting th engine, so as to avoid overloading the battery.
In fact, if the battery is not fully charged or during th winter period, it could be difficult to start the engine if th current absorption by the starter motor, which is alread very high, is increased by adding other high level charge such as the heated rear screen, main beam/dipped head lights, windscreen wipers, air conditoning compresso electromagnet, heater/ventilation electric fan.
For this reason the supply to the activating relay of th compressor electromagnet and the supply to the electri fan are cut-off when the starter motor is functioning (ke in "RUN" position).
After start-up, in the automatic function, the electroni control unit will activate the programmed commands o the basis of the temperature set on the display and th temperatures detected by the sensors, with the exceptio of the fan control, which is forced to function at first spee for approx. 60 seconds.
Once this period has elapsed, there will be a gradua progression towards the higher speeds, with an increas

in fan power equal to 1 Ampere/second, until the speed requested by the heater/ventilation system is reached.

SYSTEM COMPONENTS MAINTENANCE

SAFETY PRECAUTIONS

Maximum ATTENTION should be given when performing any maintenance on air conditioning system.
The air conditioning system is filled with R134a.
This fluid, colorless both in liquid and gaseous status, has a boiling point of -29.8°C (-21.7 °F) at atmospheric pressure and therefore is in gaseous-status at ambient temperature. R134a vapors are heavier than air, flame-proof and normally non-explosive.

CAUTION:
The R134a cooling gas cannot be mixed with the normal Freon 12 used in conventional air conditioning systems of the previous models; consequently, DO NOT USE FREON 12 on the "164 MY 94" new air conditioners.

WARNING:
The R134a is poisonous; it is not corrosive unless mixed with water.

WARNING:
Always use safety gasolines when performing any maintenance on air conditioning system.

At ambient temperature and pressure, the R134a evaporates very quickly, and therefore freezes whatever comes in contact with it.
Particular care must be taken to avoid R134a from contacting skin or eyes.

WARNING:
Always use safety goggles when perform ing any maintenance on air conditionin system. Make sure that a bottle of steril mineral oil is promptly available. If R134 contacts eyes, apply a few drops of minera oil, which absorbs quickly the R134a. The rinse eyes with a huge amount of fres water. Immediately coll a doctor, even irritation has ceased before the first-ai treatment.

WARNING:
Avoid prolonged exposure of skin with th cooling R134a gas during the expansio phase, as the very low temperature reache at the end of this stage (-29.8°C - 21.7°F) ca cause "burns" due to an excessive col condition. It is thus suggested to wea leather o thick fabric gloves.

The R134a is stored in metal bottles: never expos bottles to direct sunrays for prolonged period.
In some instances, it may be necessary to heat moder ately the bottles to increase internal pressure, so tha bottle pressure is higher than vehicle air conditionin system pressure.
If heating is required, place the bottle for 20 minute approximately in ambient not warmer than 35°C (95°F
Never heat bottle with torch flames or any other mean which can excessively increase bottle temperature o pressure.
Never weld or steam clean components of air condition ing system, nor perform such operations near air cond tioning system.

CAUTION:
Keep bottles in vertical position during sys tem charging. If bottles are in horizonta position or with valve downward, th R134a may enter the system in liquid sta tus, thus damaging compressor.

WARNING:

Operate in a well ventilated area. Dispose R134a in an appropriate collecting system and comply, in any case, with all applicable laws and rules.

A great amount of R134a in a restricted area can reduce the oxigen quantity, thus causing suffocation.

The R134a vapors are not normally toxic, unless they come in contact with open flames. Do not discharge R134a near open flames. Where using flame-type leak detector, a toxic mixture is generated. Never inhale vapors from leak detector.

CAUTION:

The R134a should never come in contact with polished metal surfaces, because it can cause oxidation. Do not spill R134a on any surface. The R134a is highly corrosive if combined with water, and can seriously damage all metal surfaces.

WARNING:

Never keep a R134a bottle fully charged for prolonged periods.

SUPPLEMENTARY MAINTENANCE INSTRUCTIONS

- Disconnect negative lead from battery before any maintenance operation.
- Discharge R134a before removing any component of air conditioning system.
- After removal of any component of the system, plug lines to prevent moisture and foreign matter to enter the lines.
- Discard all O'rings removed: installation of new O'ring is required at any installation.
- Coat threads of lines and fittings with antifreezing lubricant (SANDEN E13M6 "PAG") and torque fittings to prescribed torque.

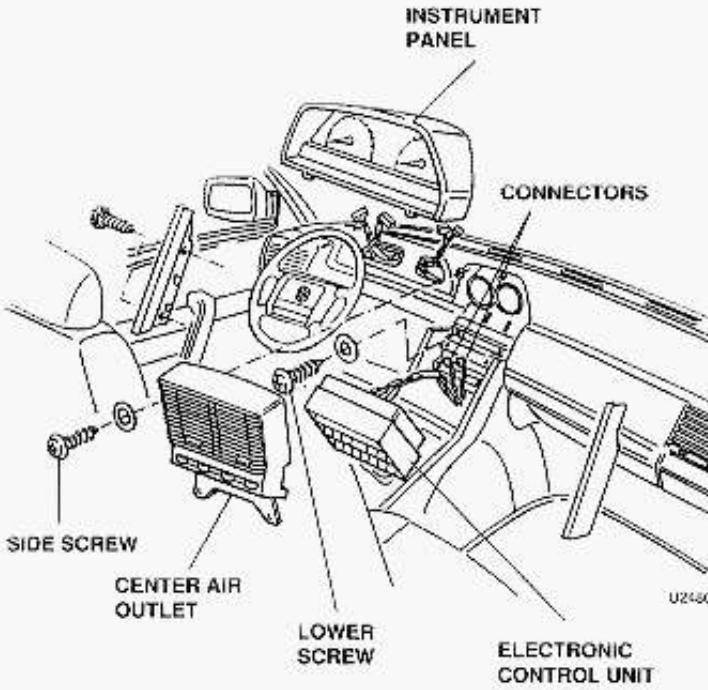
AIR OUTLETS

CENTER AIR OUTLET

REMOVAL

NOTE: Disconnect negative lead from battery b fore starting procedure.

1. Remove instrument panel (see **Group 43**).
2. Withdraw electronic control unit with control par (see removal procedure of **"AUTOMATIC AIR CO DITIONING CONTROL UNIT"**).
3. Disconnect electrical connector then remove it.
4. Unscrew two lower screw.
5. Remove side screw.
6. Remove center air outle.



INSTALLATION

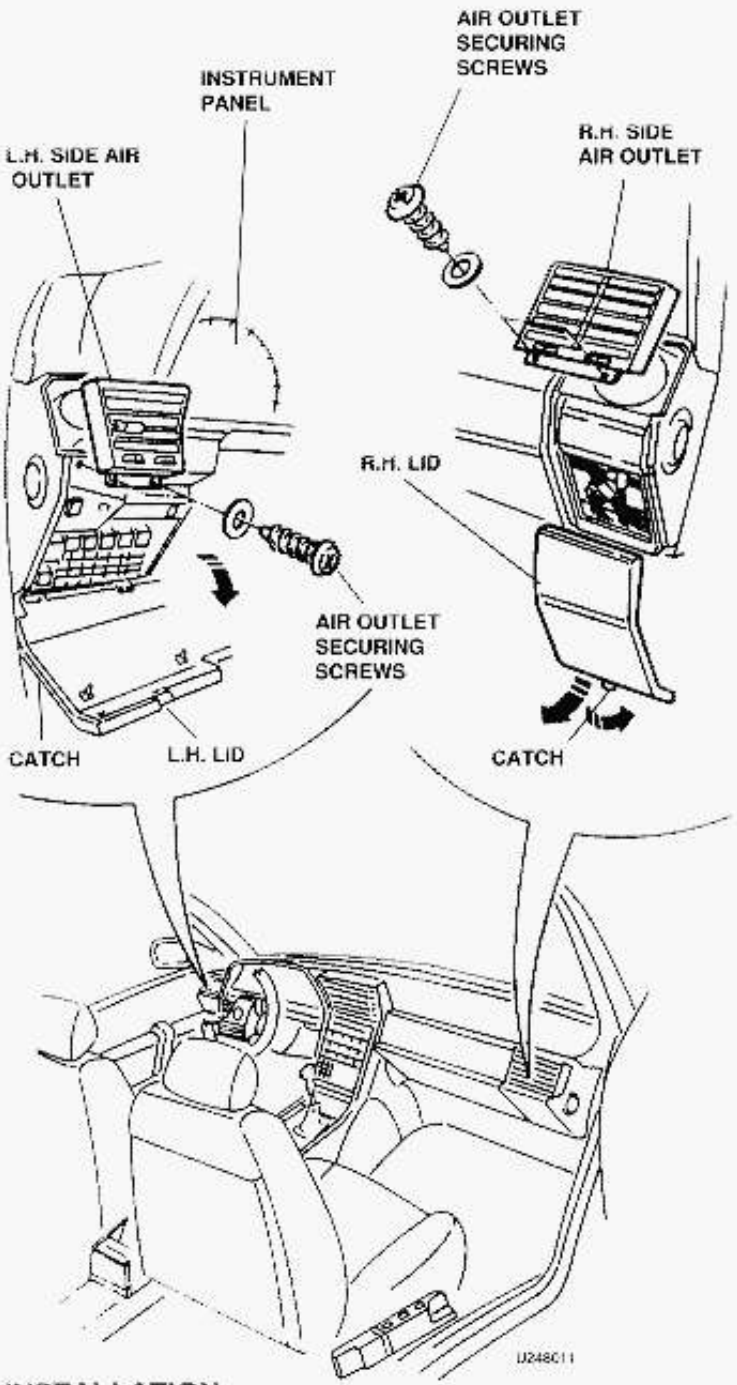
Proceed in reverse order; do not forget to tighten conso securing screws.

SIDE AIR OUTLETS

REMOVAL

1. Unlock R.H. lid catch and open lid.
2. Unlock L.H. lid catch and open lid.
3. On L.H. side only, displace lightly instrument pane without disconnecting wiring (see **Group 43**).

4. Remove two securing screws.
5. Remove side air outlets.



INSTALLATION

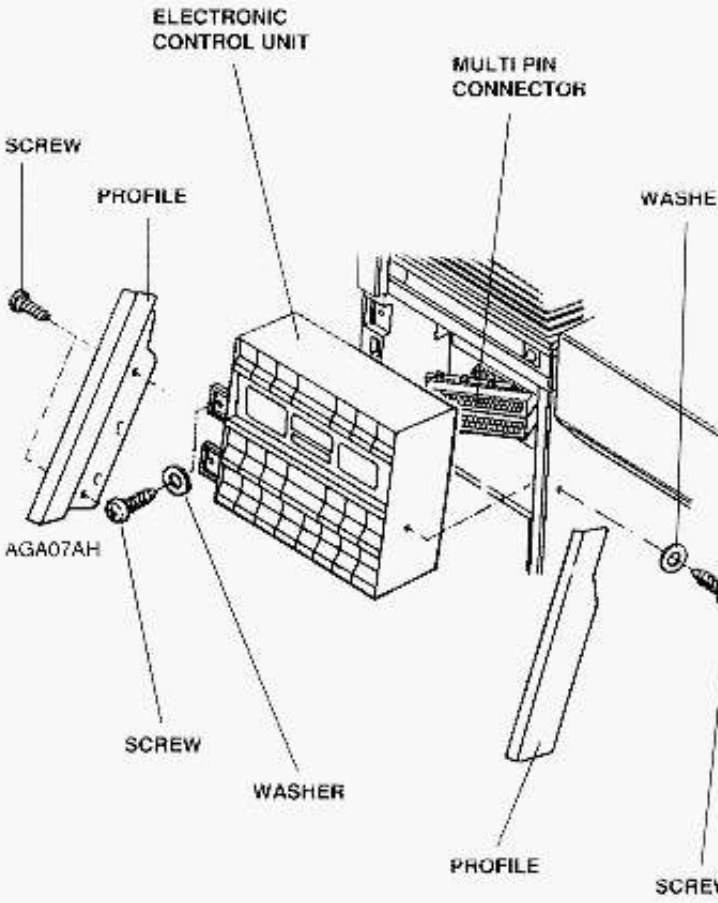
Proceed in reverse order.

AUTOMATIC AIR CONDITIONING CONTROL UNIT

REMOVAL

NOTE: Disconnect negative lead from battery before starting procedure.

1. Remove screws then remove profile.
2. Remove R.H. gearbox tunnel trim (refer to group 66)
3. Remove three control unit L.H. securing screws the remove two washers.
4. Move away electronic control unit as for as neces sary to gain access to connector.
5. Disconnect multi-pin connector.
6. Remove control unit



INSTALLATION

Proceed in reverse order.

EVAPORATOR UNIT

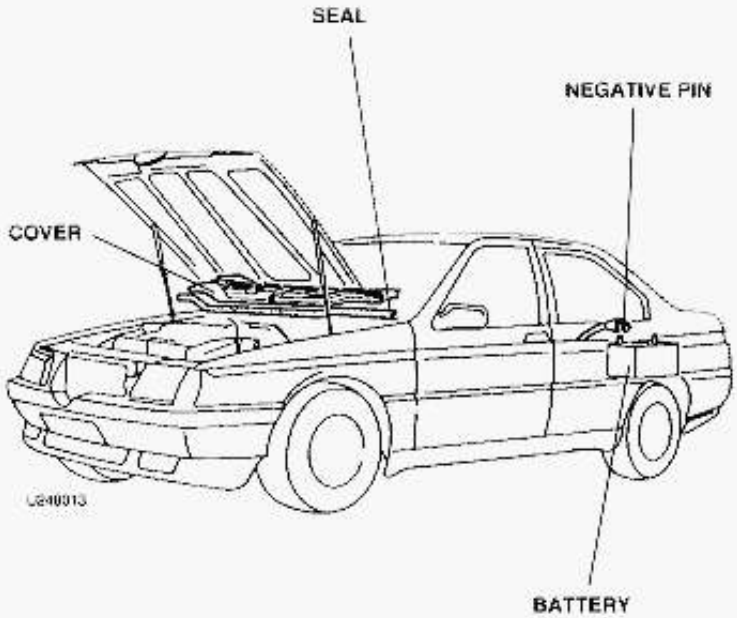
DESCRIPTION

The evaporator unit consists of two half-boxes jointe together, containing the evaporator in which refrigeratin fluid expands and cooling finned tubes. The outside a passes through a flowmeter and filter: the flow mete sends an electrical signal to automatic air conditionin control unit. A powered-door can prevent outside air fron

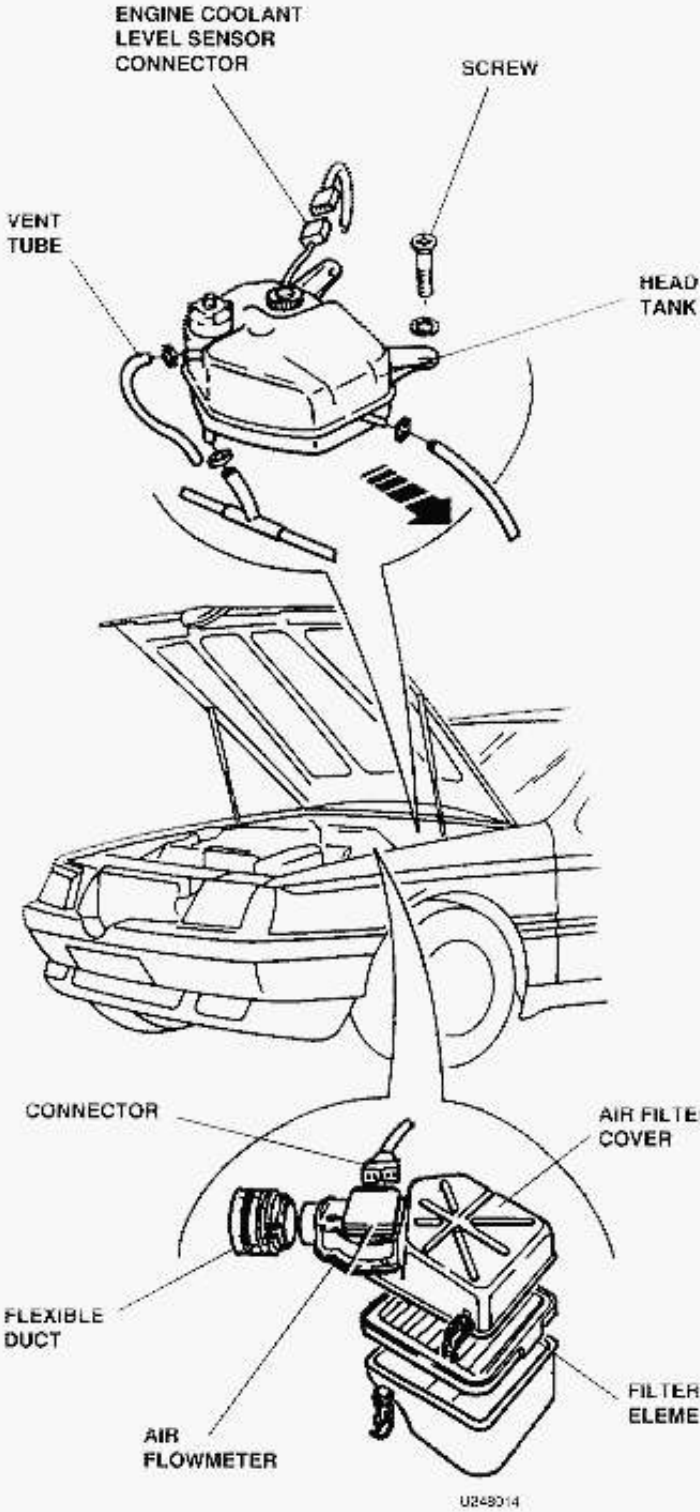
entering the vehicle, allowing air recirculation from passenger compartment interior.
A drain tube, located in the evaporator lower side, discharges outboard the condensate which generates by air cooling. It is very important that drain tube is free of obstruction, in order to prevent condensate to be trapped into evaporator.
The tube end shape allows air to enter the evaporator when condensate drains outboard. If the tube end is damaged, the condensate cannot be drained correctly. Replace tube if damaged.

REMOVAL

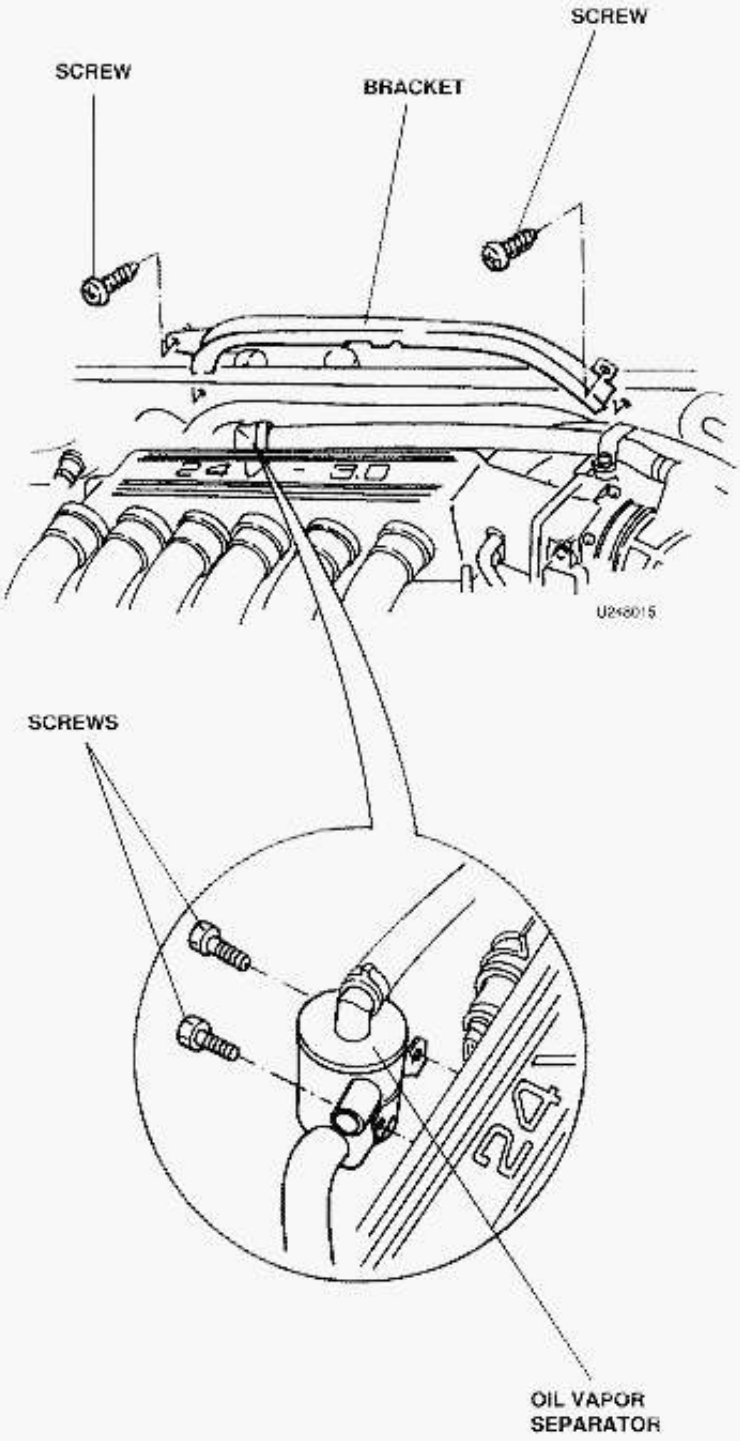
1. Disconnect negative (-) lead from battery.
2. Remove cover from accessory compartment.
3. Remove seal.
4. Discharge R134a from system (see **"COOLING FLUID DISCHARGE"** procedure).

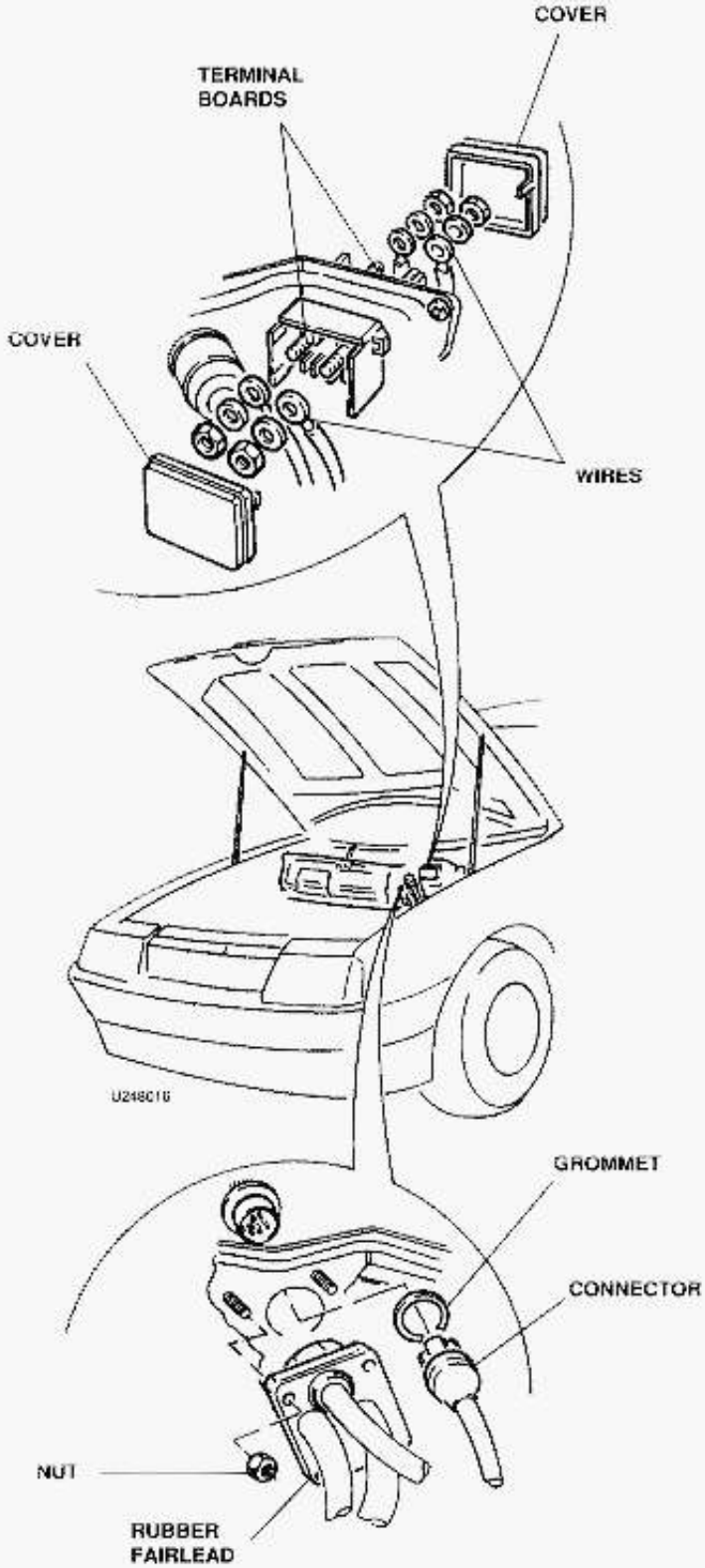


5. Disconnect flexible duct and electrical connector from flowmeter.
6. Remove air filter.
7. Remove air filter element.
8. Disconnect engine coolant level sensor wiring.
9. Disconnect reservoir vent tube.
10. Remove securing screws and move away the engine coolant expansion reservoir.

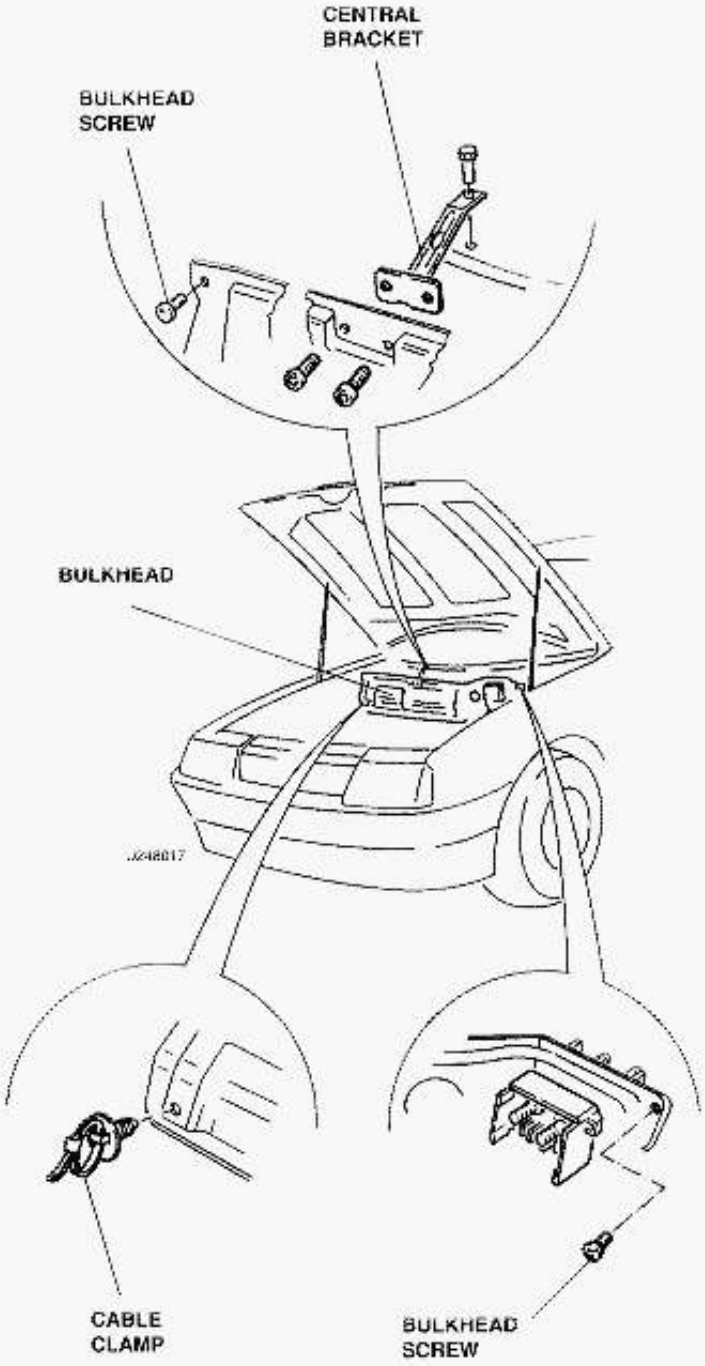


11. Slacken the fixing screws and move away the vapor separator.
12. Separate the oil vapor recovery tube.
13. Slacken the two fixing screws and remove the cab securing bracket from the accessory compartme bulkhead.





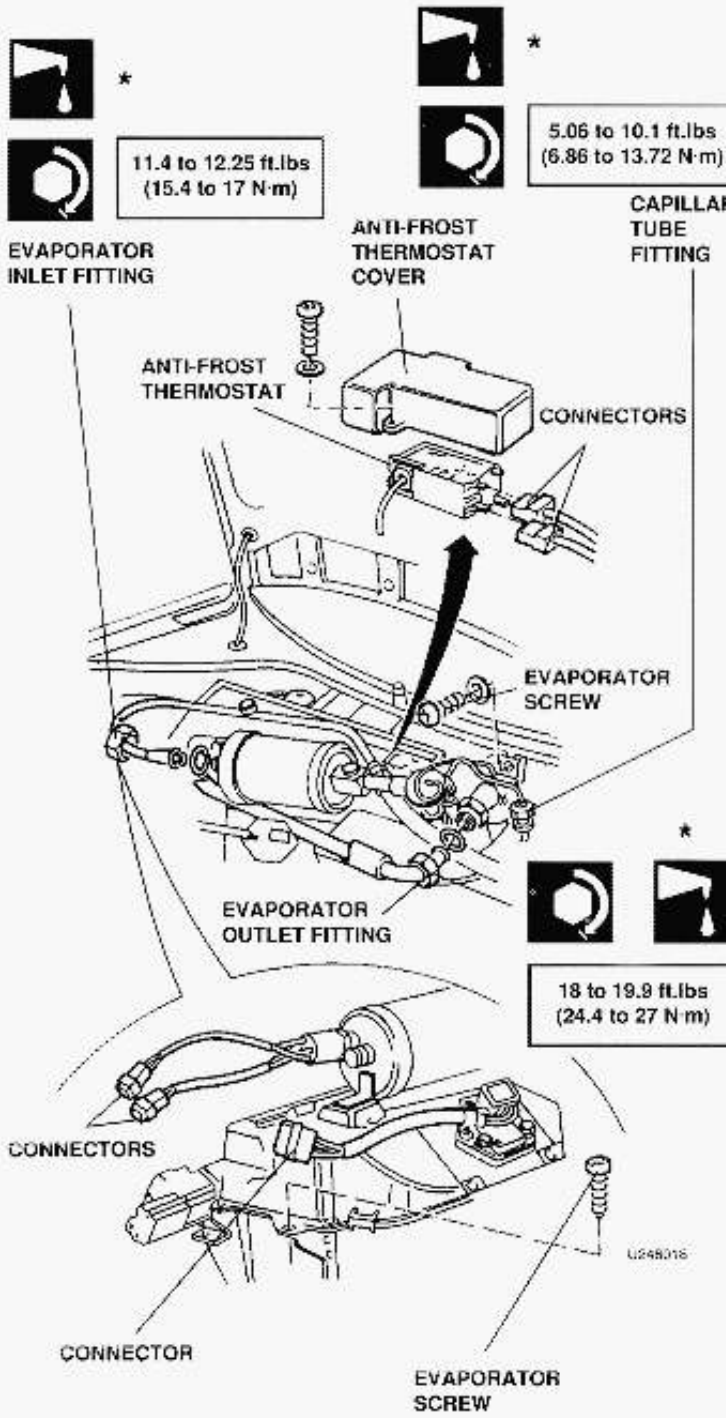
14. Remove terminal board covers.
15. Remove securing nuts and disconnect wirings from bulkhead.
16. Disconnect electrical connectors, remove grommet from bulkhead and withdraw.
17. Remove securing nuts and move forward the rubber fairlead.
18. Slacken the fixing screws and nuts of the centra bracket, then remove the bracket.
19. Slacken the bulkhead fixing screws, then remove the bulkhead.
20. Cut the cable clamp and move away the cables from the bulkhead.



21 Remove securing screws then remove anti-frost thermostat cover.
22. Disconnect air conditioning wiring.

CAUTION:
Always use two wrenches when disconnecting fittings, to avoid excessive stress on welding.

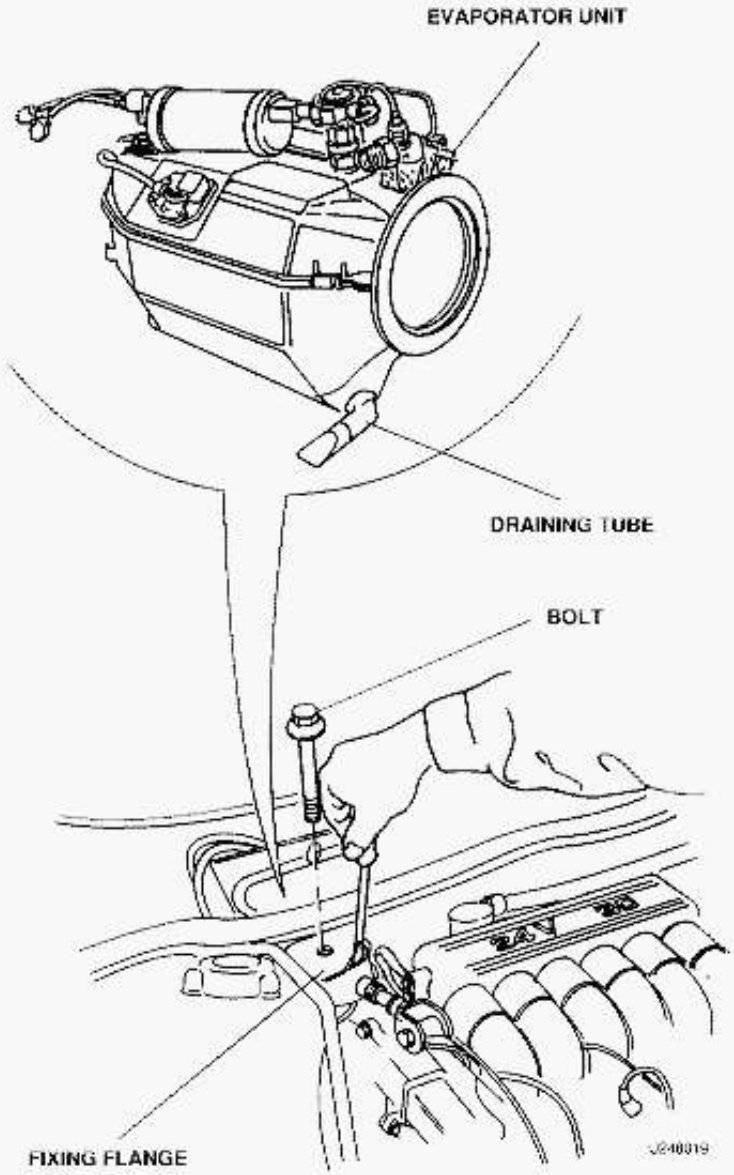
23. Unscrew filter/drier inlet fitting.
24. Unscrew filter/drier outlet fitting.
25. Disconnect capillar tube fitting between expansion valve and low pressure line.
26. Remove screws securing evaporator unit to vehicle body.
27. Separate evaporator unit fan then remove it.



INSTALL NEW O-RINGS WHEN INSTALLING FITTINGS

SANDEN E13 M6 "PAG" *

28. Remove the bolt.
29. By levering on the engine upper fixing flange, move engine away from the evaporator unit.
30. Remove the evaporator unit complete with its electric fan.
31. When reassembling, check if the draining tube is correctly positioned downwards.



INSTALLATION

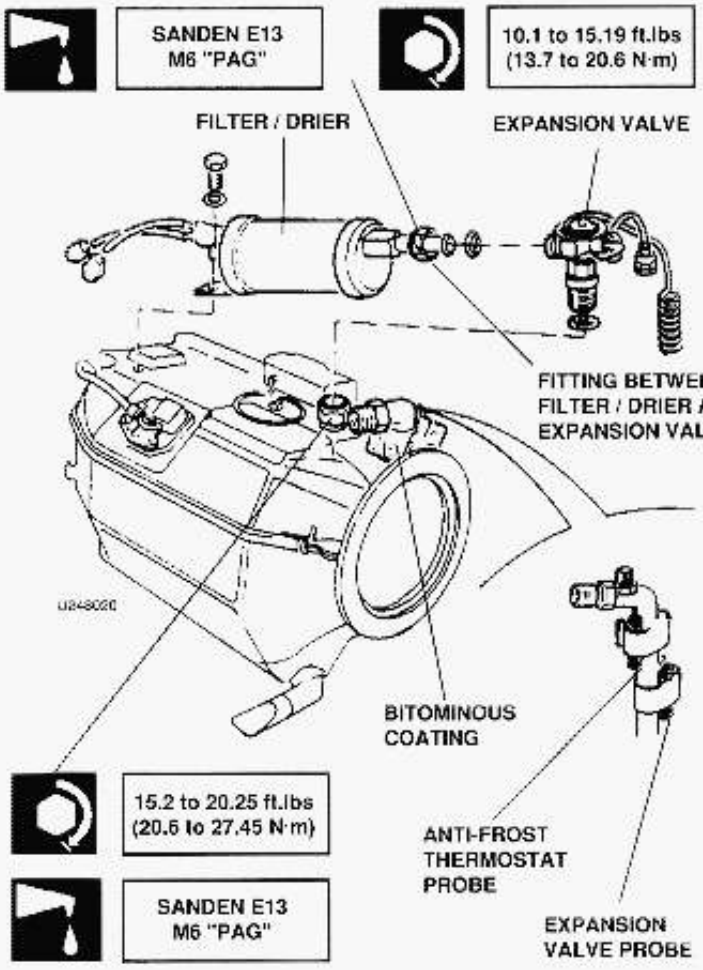
CAUTION:
Hex fitting should be held with suitable wrench to avoid excessive stress on weldings.

Proceed in reverse order for installation; lubricate a indicated and torque fittings to prescribed torque values replace O'rings on all fittings with new items.
Charge the system with coolant fluid after installation.

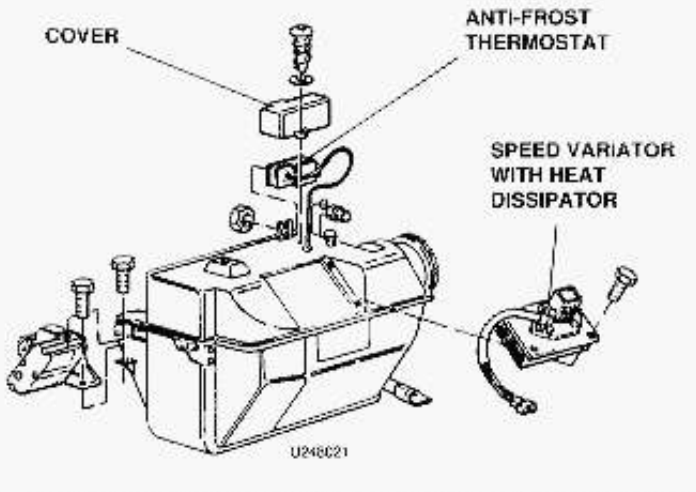
DISASSEMBLY

CAUTION:
Always use two wrenches when discon necting fittings to avoid excessive stres on weldings.

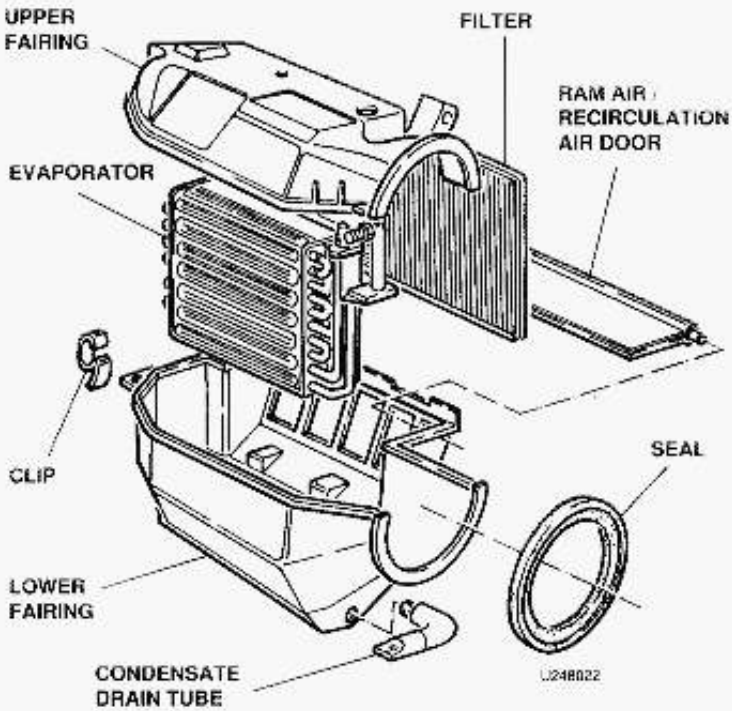
1. Unscrew fitting and disconnect filter/drier from ex pansion valve.
2. Remove securing screw and remove filter/drier.
3. Move-away the bituminous coating.
4. Unlock clip and disengage probe from the expansio valve
5. Unlock clip and disengage probe from the anti-fros thermostat.
6. Unscrew fittings from expansion valve and remove i



7. Remove screws and remove anti-frost thermostat cover.
8. Remove securing nut and remove anti-frost thermostat by withdrawing probe from evaporator unit.
9. Remove securing screws and remove heat dissipator complete with speed variator.
10. Remove securing screws and remove ram air/recirculation air door actuating motor.



11. Remove spongy-rubber seal, taking care not to damage it.
12. Remove securing clips and separate upper fairing from lower fairing.
13. Remove ram air/recirculation air ducts.
14. Remove filter.
15. Remove evaporator from lower fairing.
16. Remove condensate drain tube.



ASSEMBLY

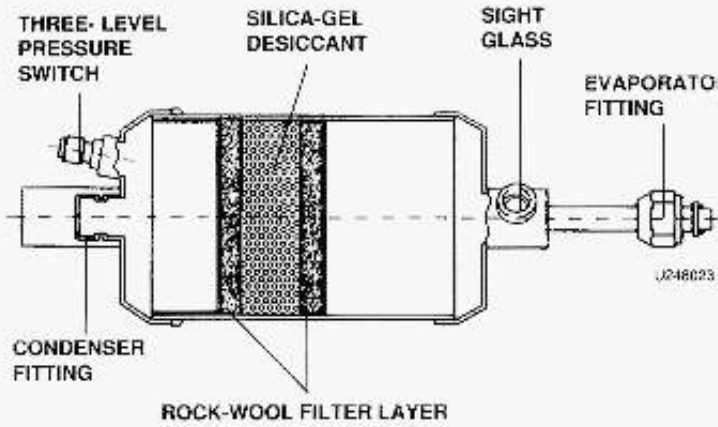
CAUTION:
Hex fitting should be held with suitabl wrench to avoid excessive stress on welc ings.

Proceed in reverse order for installation; lubricate a indicated and torque fittings to prescribed torque values replace O'rings on all fittings with new items.

FILTER/DRIER

DESCRIPTION

The filter/drier is installed downstream of condenser, an is therefore passed by coolant fluid in liquid-state. Th filter/drier eliminates solid particles and moisture fro coolant fluid, and operates as an accumulator durin system load changes. The following illustration depicts schematic of filter/drier.

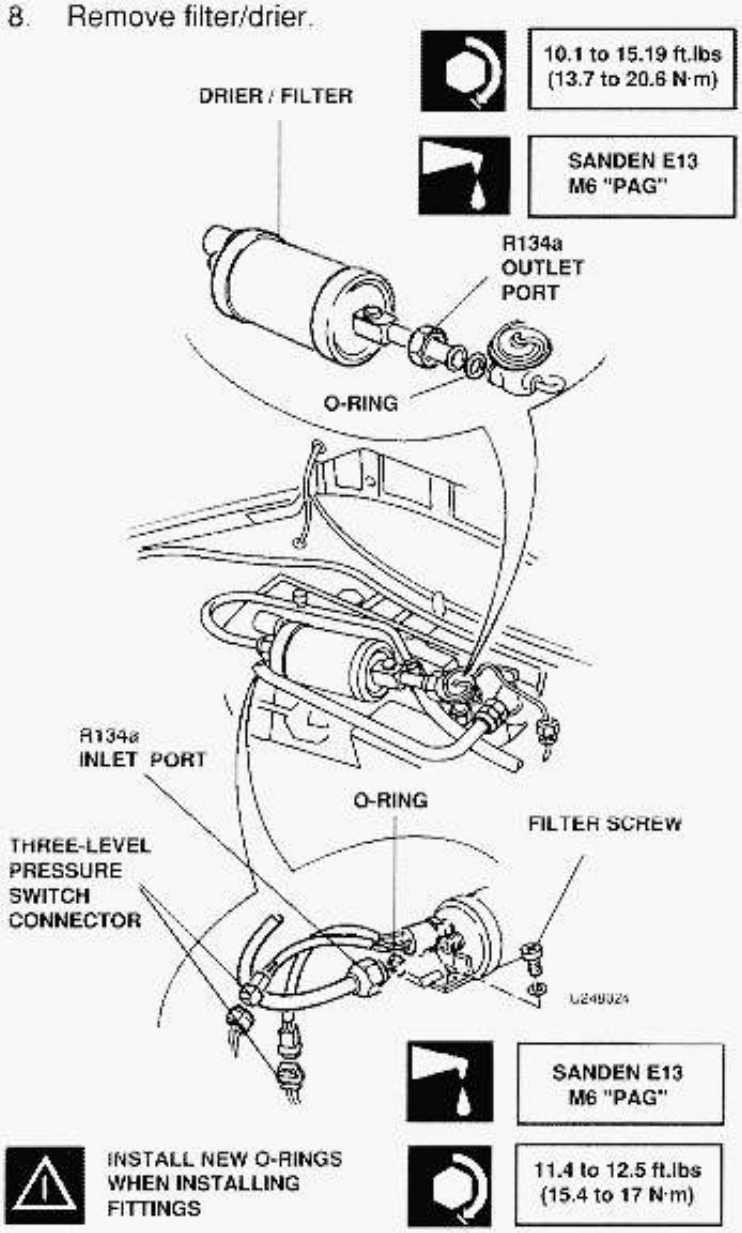


REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover grille.
3. Discharge R134a from system (see **"COOLIN FLUID DISCHARGE"** procedure).
4. Disconnect three-level pressure switch.

CAUTION:
Always use two wrenches when discon necting fittings, to avoid excessive stres on weldings.

5. Unscrew fitting of R134a inlet tube.
6. Remove securing screw.
7. Unscrew fitting of
8. Remove filter/drier.



INSTALLATION

CAUTION:
Hex fitting should be held with suitable wrench to avoid excessive stress on weldings.

Proceed in reverse order for installation; lubricate as indicated and torque fittings to prescribed torque values; replace O'rings on all fittings with new items.

Recharge system with coolant.

NOTE: The filter/drier should be installed within 15 minutes from removal to avoid entry o excessive humidity, which can cause dam age and reduce operating life. If filter/drie cannot be installed for any reason within 1 minutes from removal, seal filter/drier inle and outlet ports and related system tube with suitable plugs.
If filter/drier remains disconnected withou plugs, it should be replaced.
When installing a new filter/drier, retai plugs for re-use during feature mainte nance operations.

INSPECTION

The filter/drier should be replaced if troubles are found The more common troubles and the related causes, are listed here below:

- The "Silica-Gel" desiccant contained in the filter drier is saturated, and cannot absorb further humid ity.
  Probable cause is a prolonged loss of cooling fluid due to system leakage.
- Cooling fluid leaks from sight glass or inlet and outle fittings.
- Filter clogged; the above trouble can be detected by checking if any temperature difference exists be tween inlet and outlet filter/drier tubes.

NOTE: Replace filter/drier every two cooling fluid recharging operations.

CONDENSER

DESCRIPTION

The condenser consists of a flat aluminum tube, coil shaped and finned. It is installed forward of engine cool ant radiator to exploit the minimum ram air for therma exchange.

REMOVAL

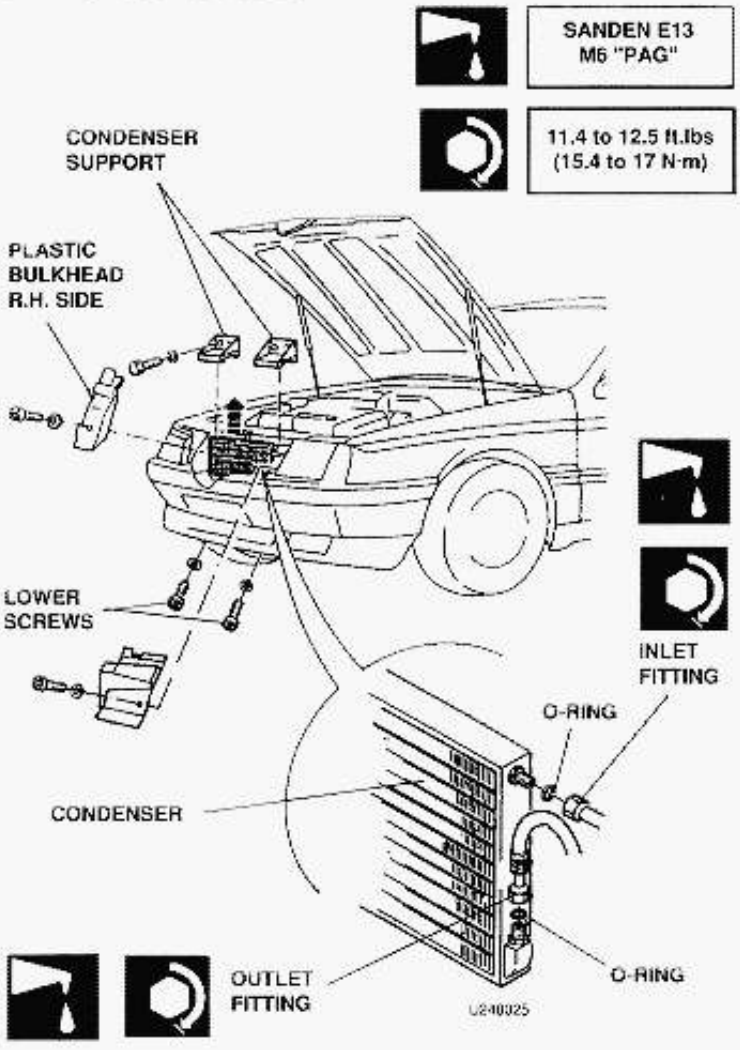
1. Disconnect negative (-) lead from battery.
2. Discharge R134a from system (refer to **"COOLING**

FLUID DISCHARGE" procedure).

3. Remove securing screws and remove plastic bulkheads.

CAUTION:
Always use two wrenches when disconnecting fittings, to avoid excessive stress on weldings.

4. Unscrew condenser inlet fitting.
5. Remove lower securing screws.
6. Remove securing screws and remove condenser supports.
7. Lift-off condenser.
8. Unscrew condenser outlet fitting.
9. Remove condenser.



INSTALLATION

CAUTION:
Hex fitting should be held with suitable wrench to avoid excessive stress on weldings.

Proceed in reverse order for installation; lubricate fittings and torque to prescribed value.
Charge the system with cooling fluid after installation.

INSPECTION

If during operation high temperature is found downstream condenser, and compressor disengages due to intervention of three-level pressure switch, the condenser does not operate properly.
Carry-out the following procedure, operating as follows:

a. Check three-level pressure switch for proper operation: if defective, replace with a serviceable unit.
b. If pressure switch is serviceable, check that condenser is not obstructed externally. If obstructed remove all foreign matter.
   Straight any bent or deformed fin to allow air to circulate freely through condenser.
c. If condenser is not obstructed externally, check for leakage or internal clogging.
   Replace condenser if leaks are found.
   If condenser is internally clogged, attempt to remove clogging using nitrogen.

COMPRESSOR

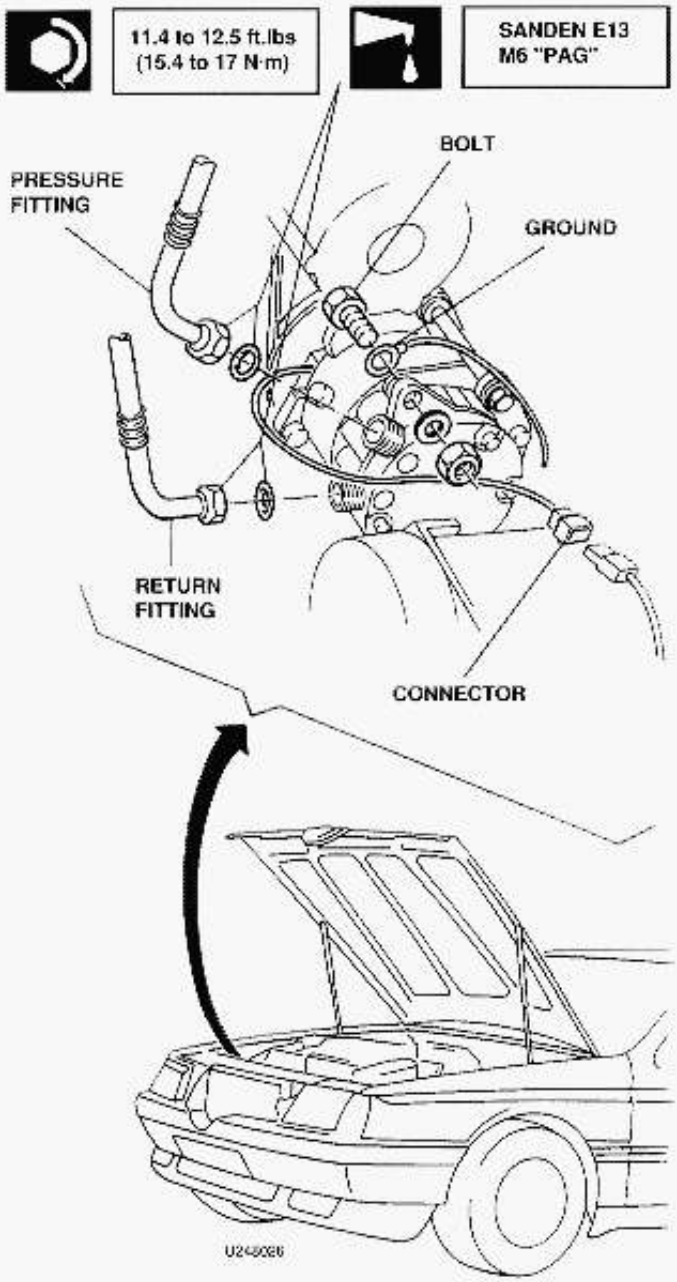
DESCRIPTION

The compressor sucks cooling fluid from evaporator (gaseous state) and compresses it in high-pressure line.
The compressor drive pulley is connected to shaft by a solenoid coupling, which is activated by electronic control unit.
The compressor gearings are lubricated by a special-type oil filled by manufacturer; during operation, approximately 30% of oil is distributed in the system: at oil replacement, only 70% of compressor capacity is necessary to refill compressor.

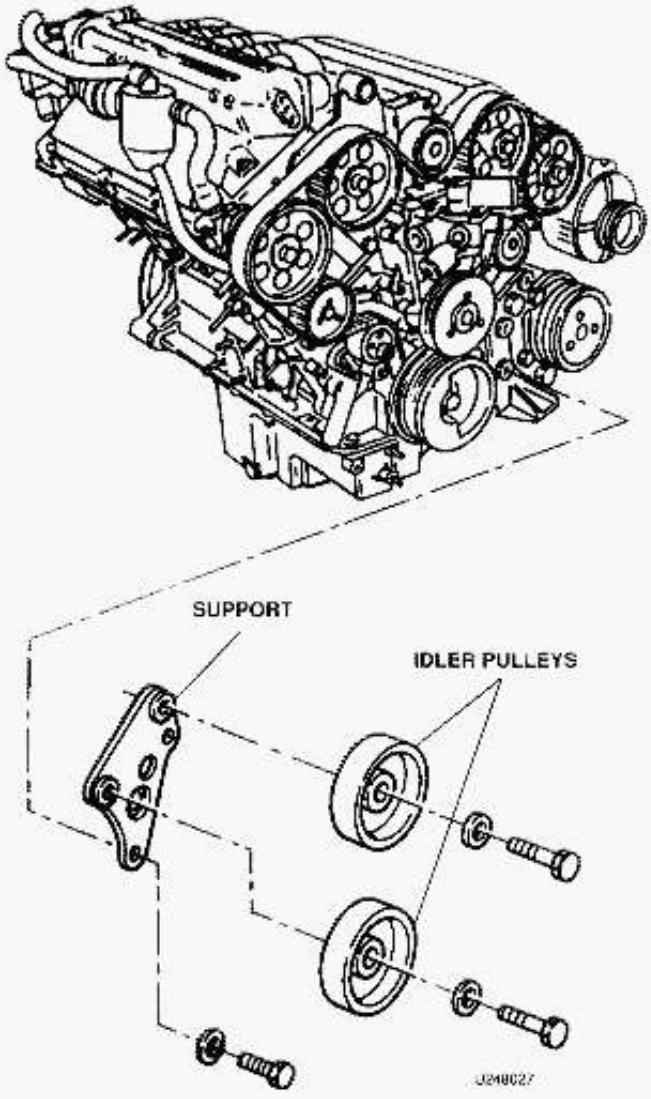
REMOVAL

Set the compressor in operation for at least 10 minutes with the engine at idle speed.

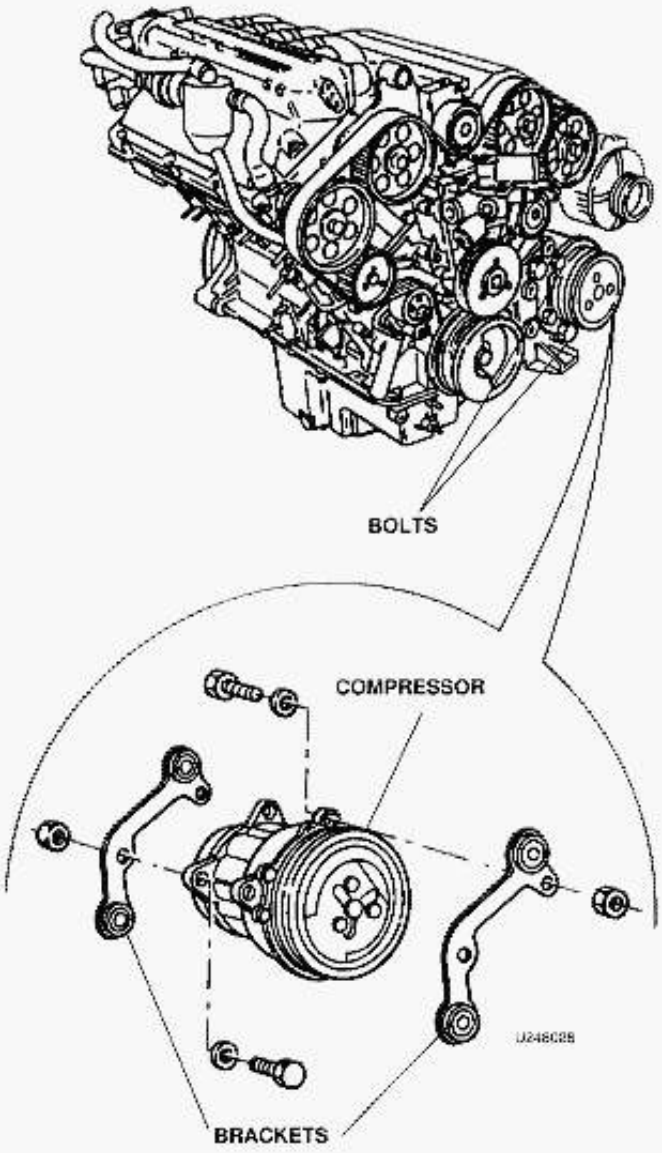
1. Disconnect negative (-) lead from battery.
2. Discharge Gas R134a from system (see **"COOLING FLUID DISCHARGE"** procedure).
3. Place vehicle on lift platform.
4. Unplug the supply cable connector of the electro-magnetic coupling.
5. Unscrew the bolt and disconnect the ground cable.
6. Unscrew the fitting and separate the delivery tube (high pressure) from compressor.
7. Unscrew the fitting and separate the return tube (low pressure) from compressor.



8. Remove the front right wheel complete with its fende panel (refer to Group 75).
9. Remove the accessory drive belt (refer to Group 00)
10. Remove the engine oil dipstick support (refer t Group 01).
11. Slacken the fixing screws and remove idler pulleys
12. Slacken the fixing screws and remove idler pulle support.



13. Unscrew the fixing bolts and remove the compresso complete with its brackets.
14. Unscrew the fixing bolts and remove the brackets.
15. Proceed to the compressor oil level check.



INSTALLATION

Proceed in reverse order for installation, lubricate fittings and torque to prescribed value. Adjust belts tension (see **Group 00**). Charge the system with cooling fluid after installation.

EXPANSION VALVE

DESCRIPTION

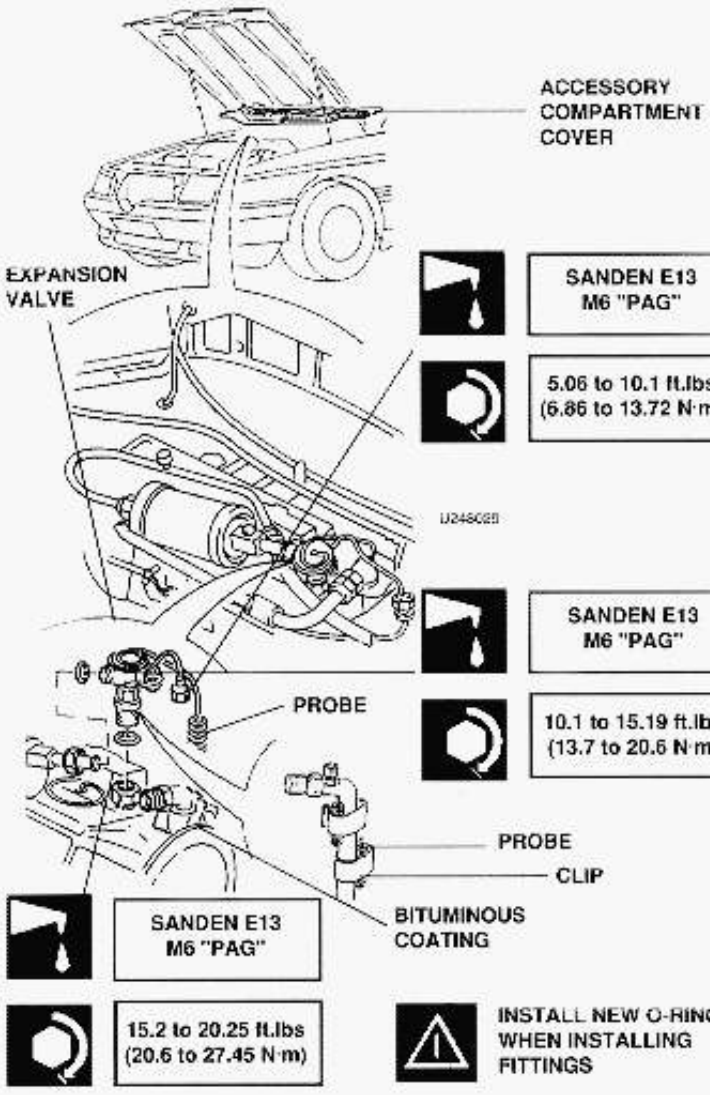
The expansion valve, located at evaporator inlet, includes an expansion nozzle controlled by a modulating thermostatic unit. Since the air conditioning system pressure depends on engine speed, which changes, continuously during run, the expansion valve is equipped with a thermostat probe which controls the nozzle opening, depending on fluid temperature at evaporator outlet. In such a way, a proper fluid flow is always sent to evapo rator, in order to obtain the complete fluid evaporation

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Discharge R134a from system as per applicab procedure.
4. Move away the bituminous coating.
5. Disengage clip and remove probe.

CAUTION:
Always use two wrenches when disco necting fittings, to avoid excessive stres on weldings.

6. Unscrew fittings and remove expansion valve.



INSTALLATION

CAUTION:
Hex fitting should be held with suitable wrench to avoid excessive stress on weldings.

Proceed in reverse order for installation; lubricate as indicated and torque fittings to prescribed torque values. Recharge system with cooling fluid after installation.

MIN-MAX PRESSURE SWITCH (TRINARY)

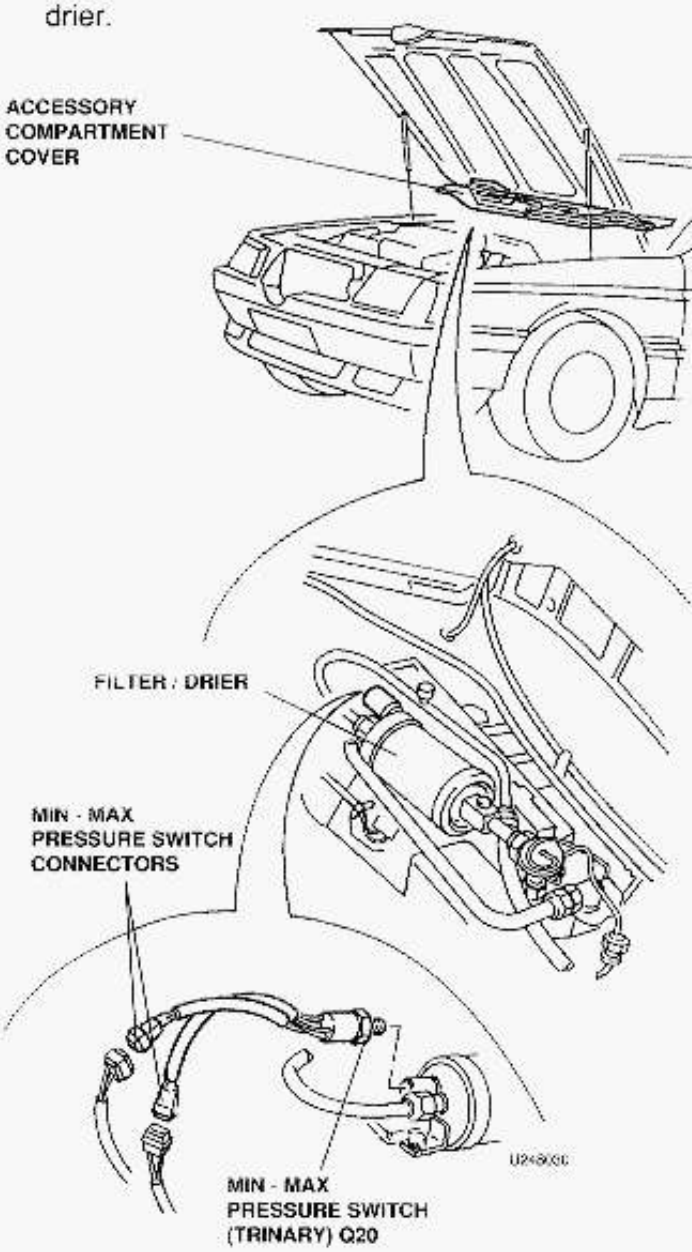
DESCRIPTION

The min-max pressure switch cuts-off the compressor pulley solenoid coupling circuit if cooling fluid pressure (in high-pressure line) is too low or too high, and switches-on condenser electric fan if ram-air is insufficient due to vehicle low speed.
The min-max pressure switch setting values are:

- Check that the pressure contact switch Q20 functions correctly by testing the continuity between pin 1 and 2 of the minimun and maximum bulbs:
  - with pressure <250 kpa (36,25 psi) circuit open
  - with pressure from 250 kpa (36,25 psi) to 2500 kpa (325,6 psi) circuit closed
  - with pressure >250 kpa (362,5 psi) circuit open
- Check that the pressure contact switch Q20 functions correctly by testing the continuity between pin 1 and 2 of the bulb switch controls the engine cooling fan:
  - with pressure <1550 kpa (224.75 psi) circuit open
  - with pressure >1550 kpa (224.75 psi)circuit closed

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Discharge R134a from system (see **"COOLING FLUID DISCHARGE"** procedure).
4. Disconnect electrical connectors from min-max pressure switch.
5. Unscrew pressure switch and remove it from filte drier.



SANDEN E13 M6 "PAG" | 11.4 to 12.5 ft.lbs (15.4 to 17 N·m)

INSTALLATION

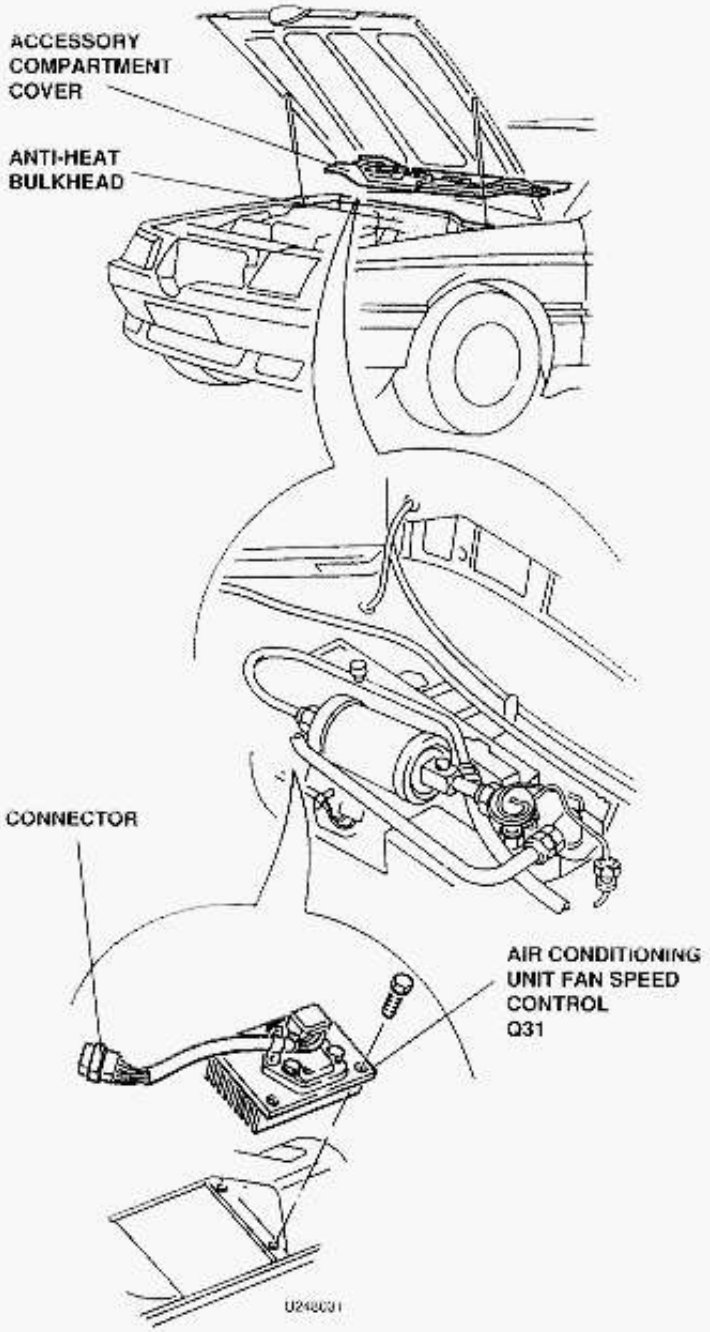
Proceed in reverse order, then charge system with coo ing fluid.

AIR CONDITIONING UNIT FAN SPEED CONTROL

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.

3. Remove anti-heat bulkhead from accessory compartment.
4. Disconnect air conditioning unit fan speed control connector.
5. Remove securing screws then remove air conditioning unit fan speed control.



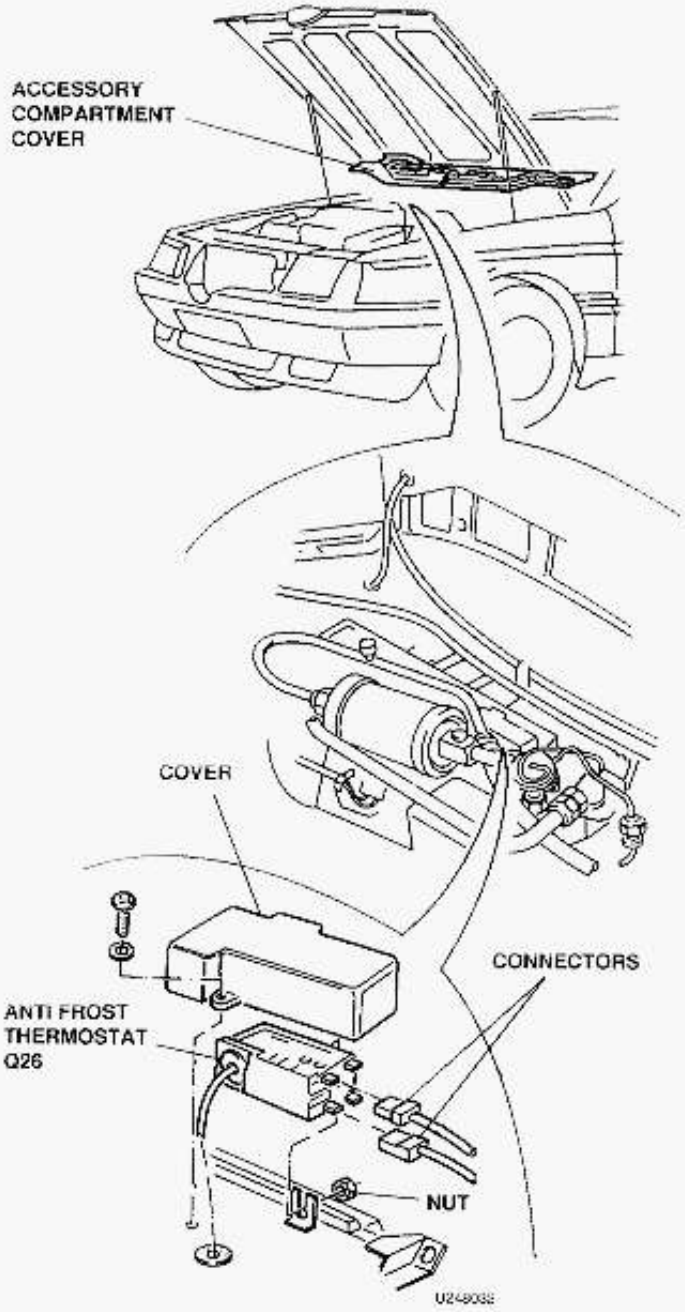
INSTALLATION

Proceed in reverse order.

ANTI-FROST THERMOSTAT

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Remove two securing screws then remove cover.
4. Disconnect wiring.
5. Unscrew nut and remove anti-frost thermostat withdrawing probe from evaporator unit.



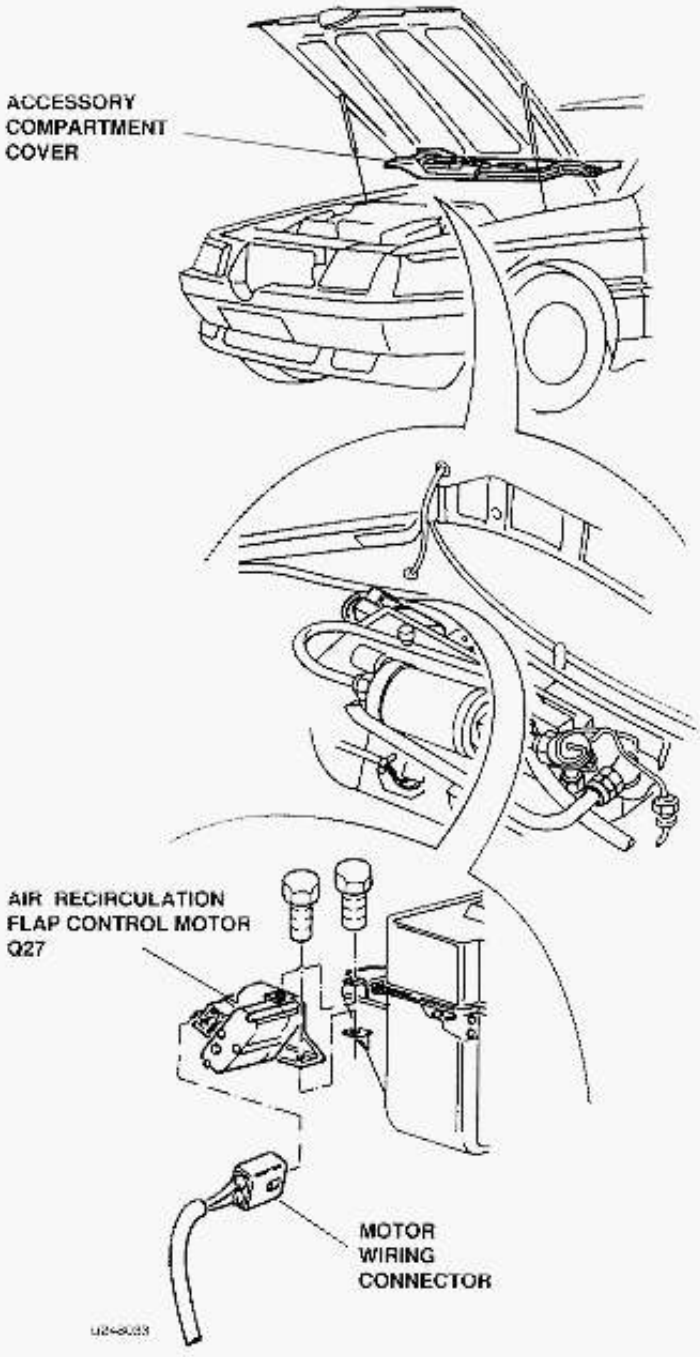
INSTALLATION

Proceed in reverse order.

AIR RECIRCULATION FLAP CONTROL MOTOR

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Disconnect motor wiring connector.
4. Remove two securing screws then remove air recirculation flap control motor.



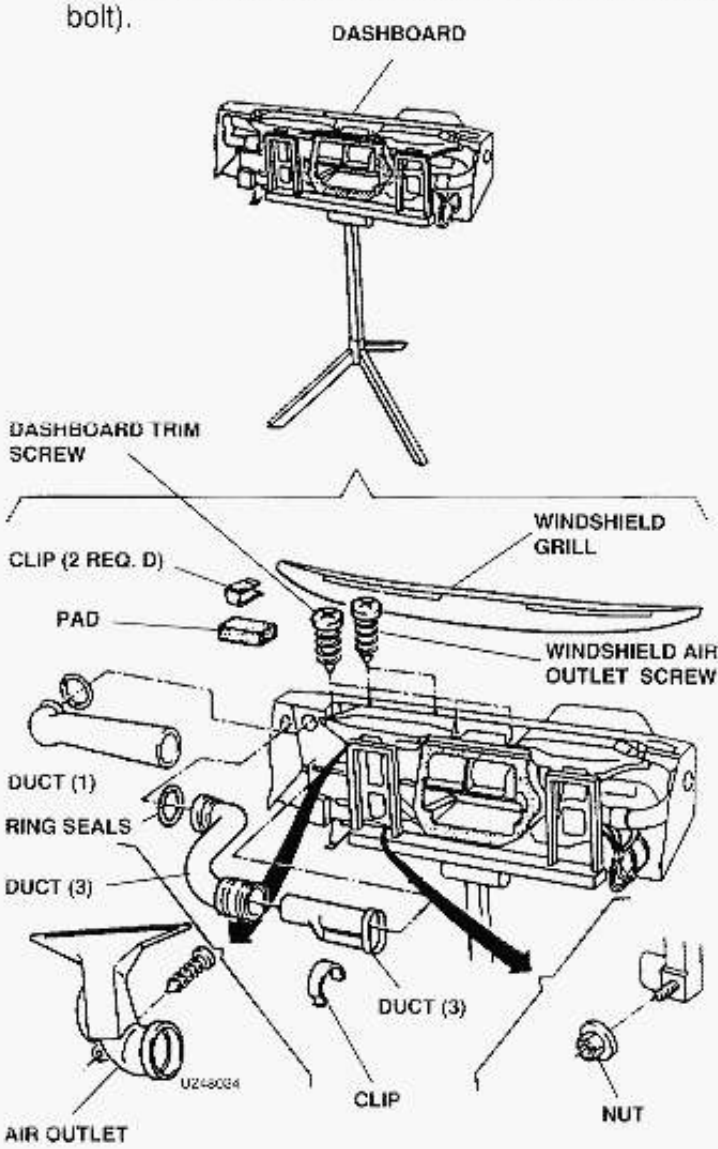
INSTALLATION

Proceed in reverse order

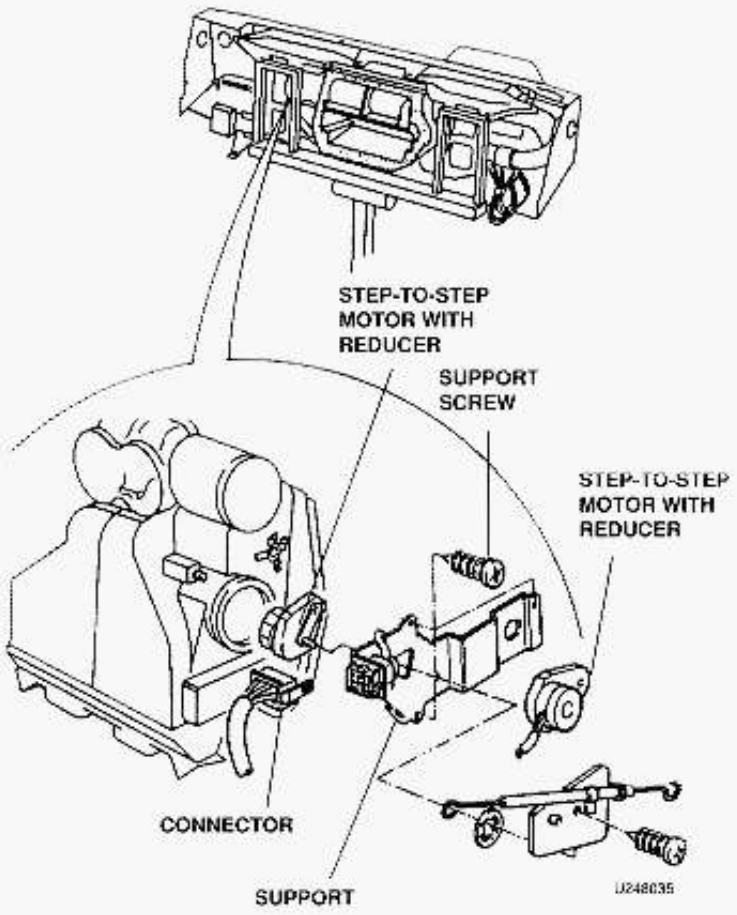
MIXING AND DISTRIBUTION DOOR MOTORS

REMOVAL

1. Remove complete dashboard from vehicle (se **Group 66**) and place it on a suitable swinging work bench.
2. Release three clips and remove windshield grill.
3. Remove three of four screws securing dashboar trim to frame.
4. Remove securing nut and slightly separate dash board trim from frame.
5. Remove ducts (1) and (2) complete with ring seals
6. Release clip and remove duct (3).
7. Remove two screws securing windshield air outlet
8. Shear-off screw securing windshield air outlet an remove it (at installation replace with a hex-hea bolt).



9. Disconnect wiring by gaining access through dashboard frame.
10. Release clip, remove securing screw and remove air mixing doors control cable.
11. Remove three screws securing support.
12. Remove support complete with motors.
13. Release clips, disconnect wirings and remove step-to-step motors complete with speed reducers.



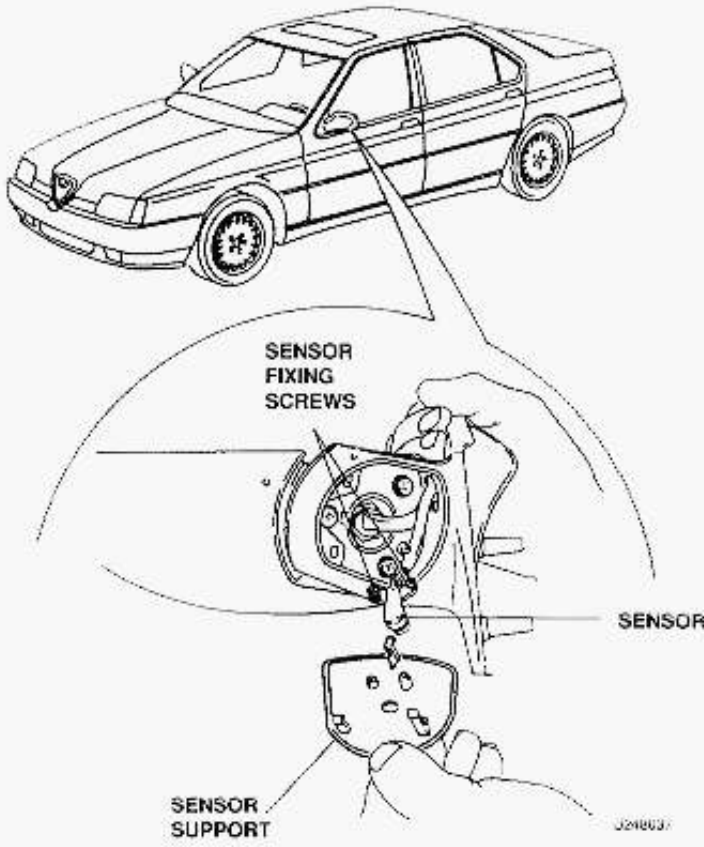
INSTALLATION

Proceed in reverse order.

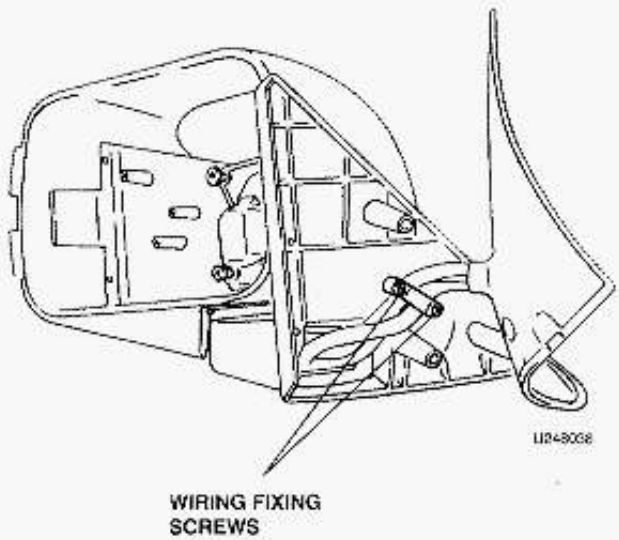
OUTSIDE AIR TEMPERATURE SENSOR

REMOVAL

1. Disconnect nagative (-) lead from battery.
2. Remove the side rearview mirror (refer to Group 55).
3. By levering with the special tool **1.823.015.00** release the external temperature sensor support.
4. Remove the two screws fixing the external temperature sensor to its support.



5. Remove the screws fixing the wiring to the rearview mirror.
6. Remove the sensor complete with its wiring.



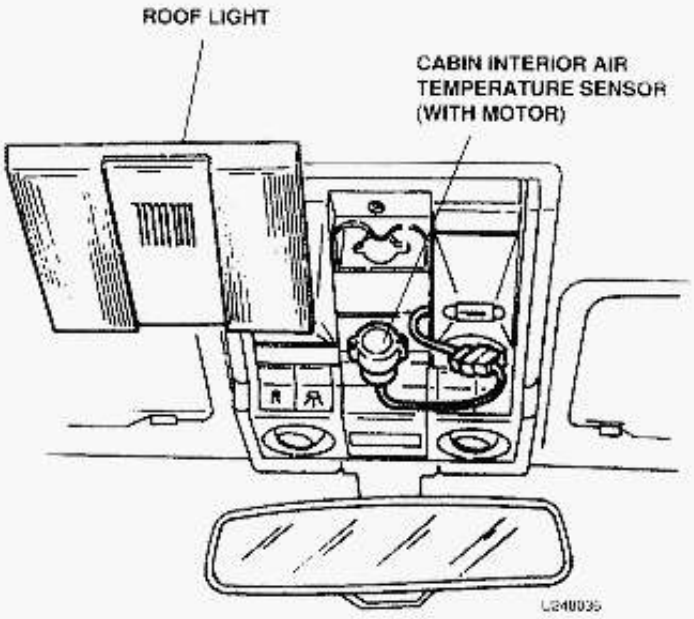
INSTALLATION

Proceed in reverse order.

CABIN INTERIOR TEMPERATURE SENSOR (WITH MOTOR)

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove the transparent cover.
3. Remove the two screws fixing the sensor.
4. Disconnect the wiring and remove the sensor.



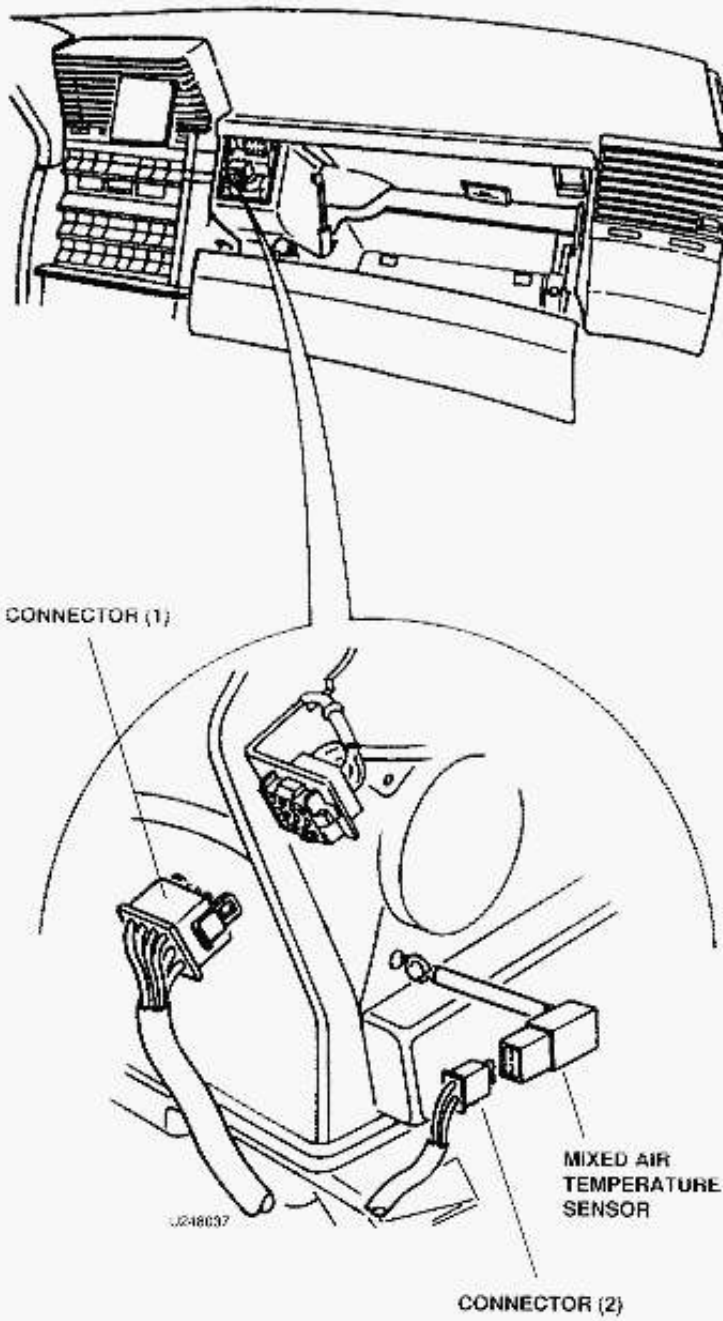
INSTALLATION

Proceed in reverse order.

MIXED AIR TEMPERATURE SENSOR

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Open glovebox lid.
3. Remove cover.
4. Disconnect electrical connector (1) to gain access to sensor.
5. Disconnect electrical connector (2) from sensor.
6. Withdraw and remove sensor.



INSTALLATION

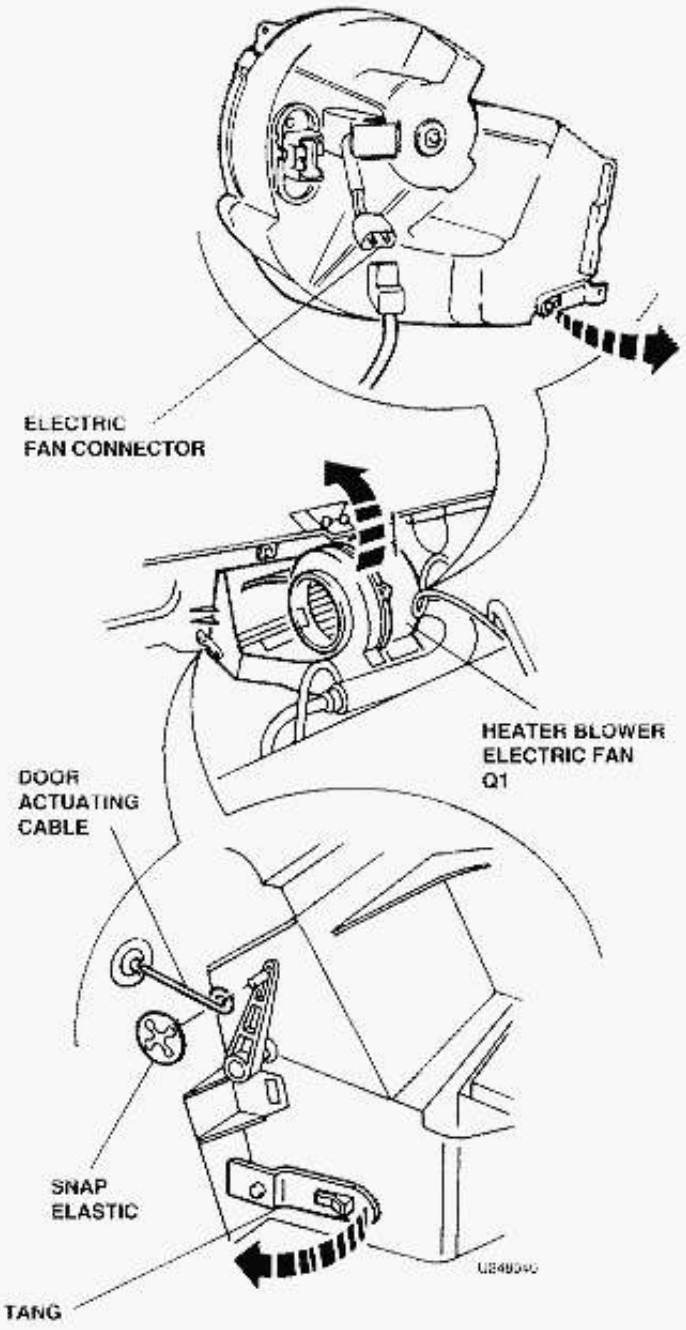
Proceed in reverse order.

HEATER BLOWER ELECTRIC FAN

REMOVAL

1. Remove evaporator unit.
2. Disconnect electric fan connector.

3. Remove snap ring and disconnect door actuating cable.
4. Disconnect two securing tangs.
5. Remove complete electric fan by rotating it upwards.

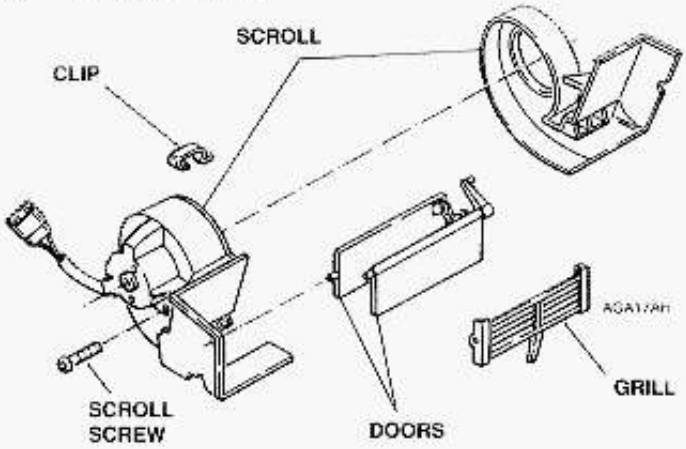


INSTALLATION

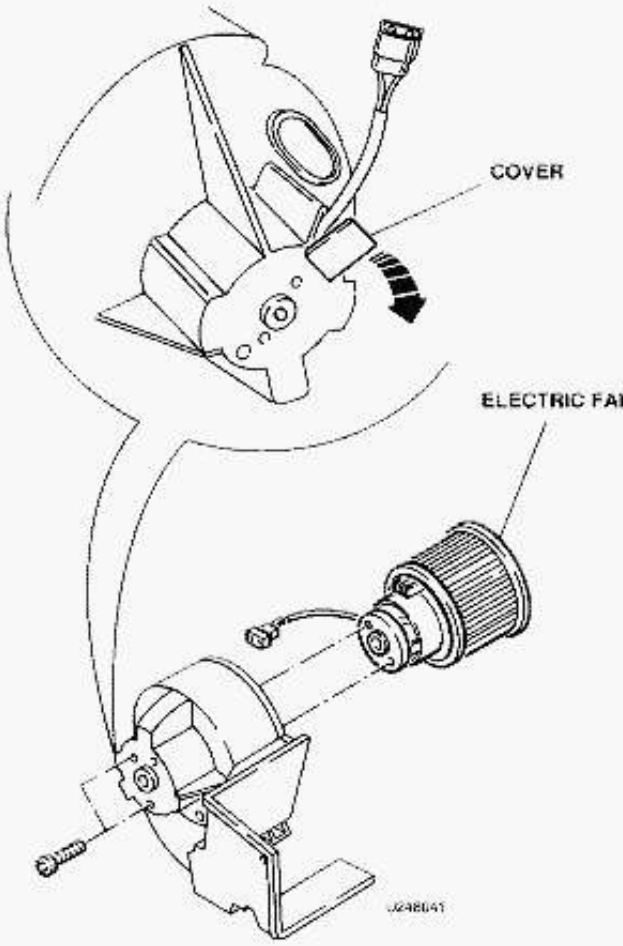
Proceed in reverse order.

DISASSEMBLY

1. Disengage scroll securing clips.
2. Remove scroll securing screw.
3. Remove grill (restrained).
4. Separate two half-scroll.
5. Remove doors.



6. Remove cover (restrained).
7. Remove screws securing electric fan to scroll the remove electric fan complete of wiring.



REASSEMBLY

Proceed in reverse order.

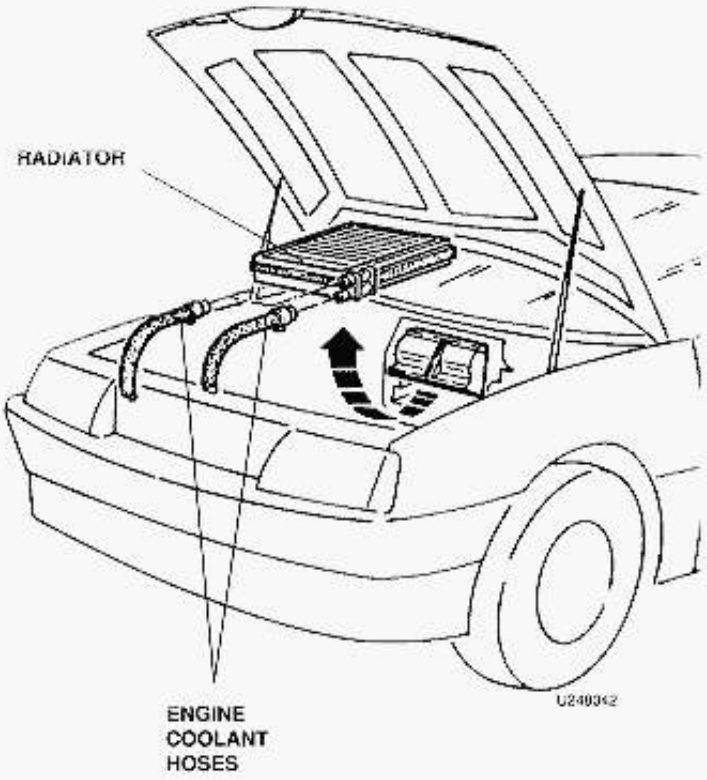
HEATING RADIATOR

REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove evaporator unit and electric fan.
3. Move away and lift heating radiator.
4. Disconnect engine coolant hoses.

NOTE: Collect engine coolant fluid in a suitable container.

5. Remove radiator.



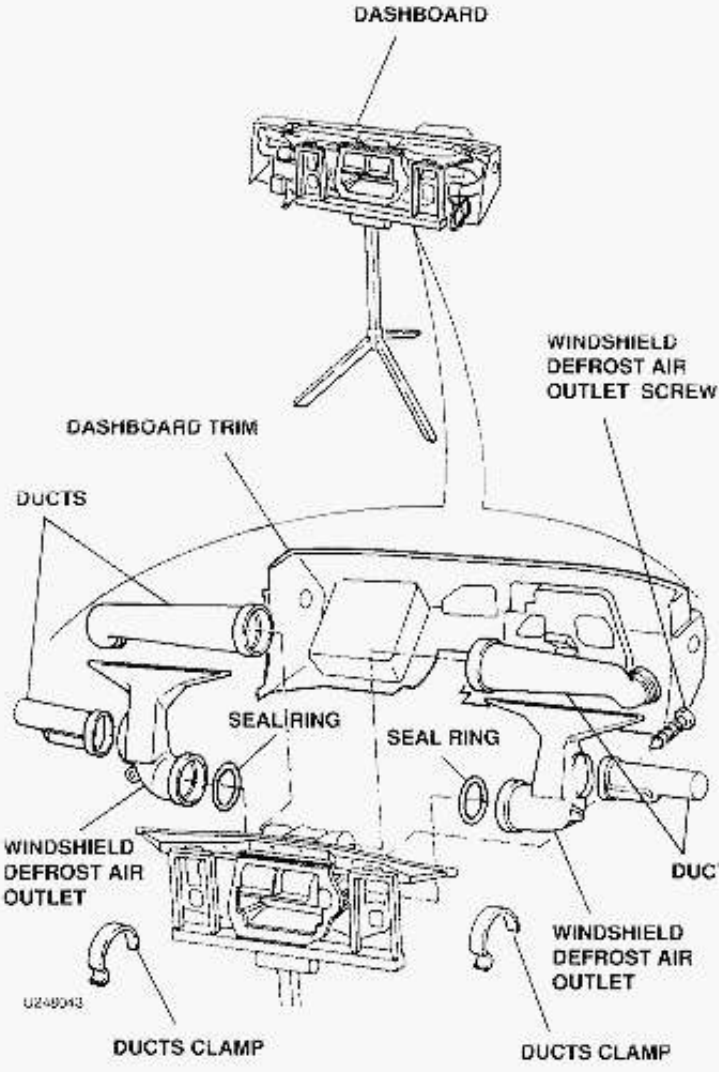
INSTALLATION

Proceed in reverse order. Refill engine cooling system (refer to **Group 00**).

HEATING UNIT

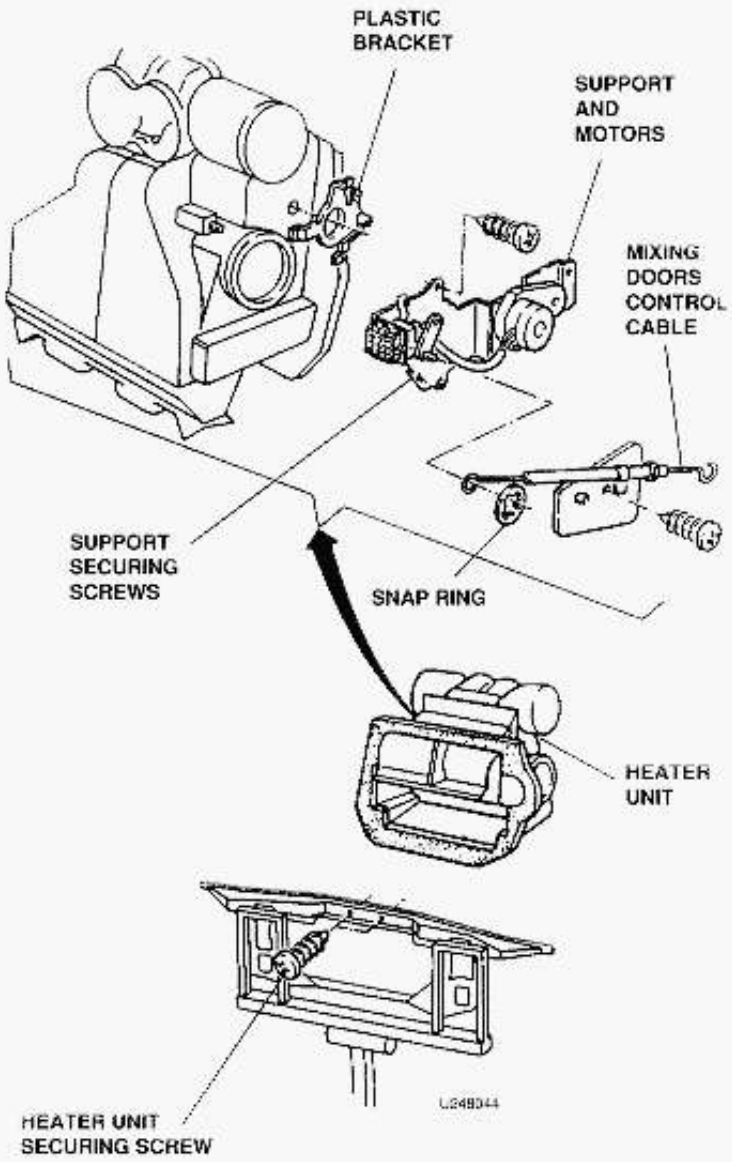
REMOVAL

1. Remove complete dashboard from vehicle (see **Group 66**) and place it on a suitable workbench.
2. Remove dashboard trim from frame (see **Group 66**).
3. Remove duct clamps.
4. Remove ducts.
5. Remove two windshield defrost air outlets securing screws.
6. Remove windshield defrost air outlets and retain sea ring.



7. Remove two screws securing heating unit to the frame.
8. Remove heating unit.
9. Release clip, remove screw and remove air mixing doors control cable.

10. Remove three securing screws and remove support complete with motors.
11. Remove plastic bracket by rotating it clockwise.

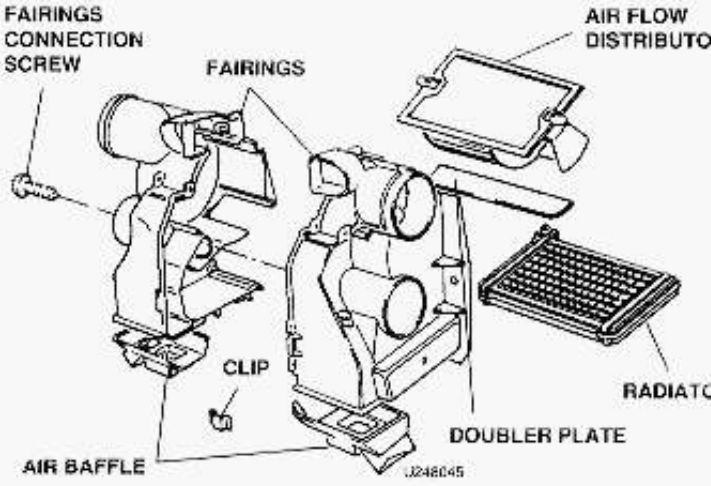


INSTALLATION

Proceed in reverse order.

DISASSEMBLY

1. Remove heating radiator, if necessary.
2. Release clips and remove air baffles.
3. Remove screw which secures fairings together.
4. Release clips and separate fairings.
5. Remove air flow distributor.
6. Remove doubler plate.



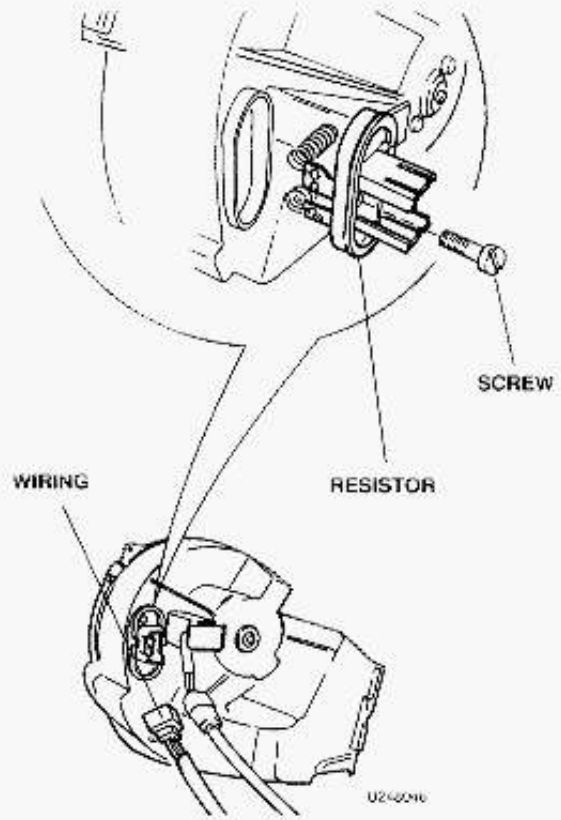
REASSEMBLY

Proceed in reverse order; lubricate air flow distributor an surfaces.

ELECTRIC FAN SPEED RESISTOR

REPLACEMENT

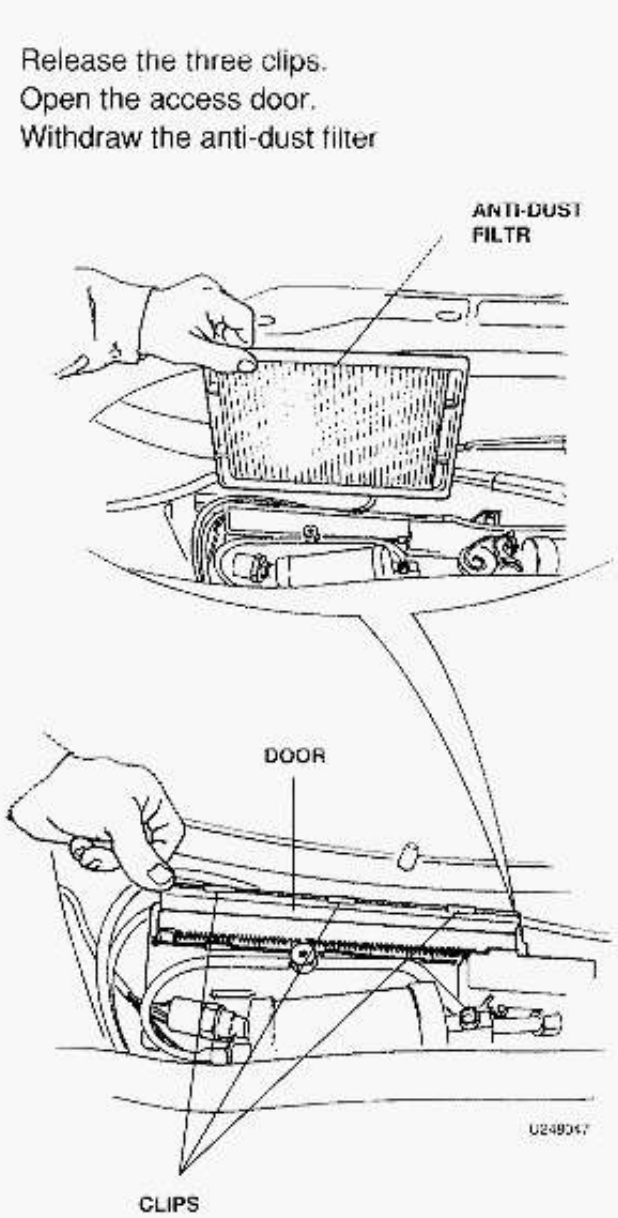
1. Disconnect the wiring.
2. Slacken the fixing screw.
3. Remove and replace the electric fan speed resisto



AIR CONDITIONING SYSTEM AIR FILTER

REMOVAL

1. Release the three clips.
2. Open the access door.
3. Withdraw the anti-dust filter



INSTALLATION

Proceed in reverse order.

INSPECTIONS AND CHECKS

CONTROLS OPERATION CHECK

To check controls operation, start engine and run it at idle speed.
Then perform the following operations.

SYSTEM SHUT-OFF

Depress OFF pushbutton and check that related LED illuminates. All other LEDs shall remain extinguished.
Check that "Outside Temperature" display shows the ambient temperature and "Selected Temperature" display continues to indicate the preset temperature. Check that system is excluded, fan is non-operating, mixing doors are in maximum cold position and air intake door is upwards.

NOTE: The mixing doors are at maximum cold position when the related actuating lever is in position shown in the following figure (completely clockwise rotated).

COOLING FLUID DISCHARGE

WARNINGS:

Comply with safety rules listed in the foreword to maintenance operations. Bear in mind the following:

- **The R134a dispersed during system discharge is not dangerous, but may become toxic if near an open flame.**
  Perform all operations in a well ventilated area, away from open flames.
- **Avoid prolonged contact of R134a with skin: at ambient conditions the R134a expands quickly and reaches -29.8°C (-21.7°F).**
  Serious "burns" may occur.
- **Protect eyes from contact with cooling fluid: the sudden low temperature may cause serious injuries.**

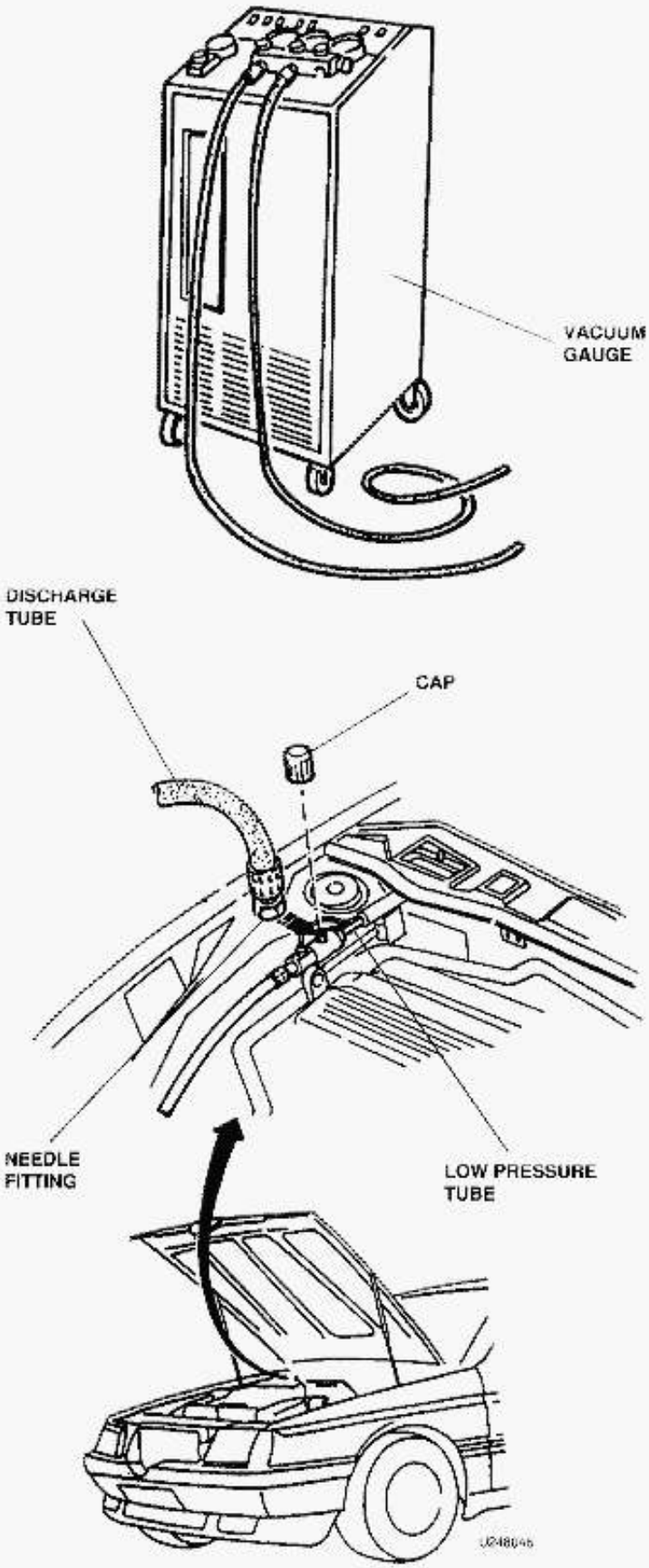
PROCEDURE

1. Unscrew and remove cap from valve on low pressure line (between evaporator and compressor).

WARNING:

Do not Discharge R134a in ambient air: it is dangerous for atmosphere!
Collect R134a in a suitable collection plant

2. Apply discharging tube (equipped with needle fitting) and completely discharge R134a from system. COMPLY STRICTLY WITH ALL LAWS AND RULES RELATED TO ENVIRONMENT PROTECTION.



COOLING FLUID CHARGING

WARNINGS:

Comply with safety rules listed in the fore word to maintenance operations. Bear i mind the following:

- **The R134a is a non-dangerous fluid fo both vehicle and personnel. Howeve because it is stored under pressure, can be subjected to physical change which may become harmful if not care fully surveilled. It is necessary to strictl comply with the following precautions.**
- **The cooling fluid is normally stored i metal bottles: do not expose bottles t sun for prolonged period, since the tem perature increase may increase the pres sure beyond safety limits.**
- **During cold season, transfer of fluid fron bottle to charging unit may be difficu due to bottle low pressure: in such a cas place the bottle for 20 minutes approx mately in ambient not warmer than 35° (95°F). Never heat bottle with torch flame Never leave the charging unit bottle com pletely full for prolonged time.**

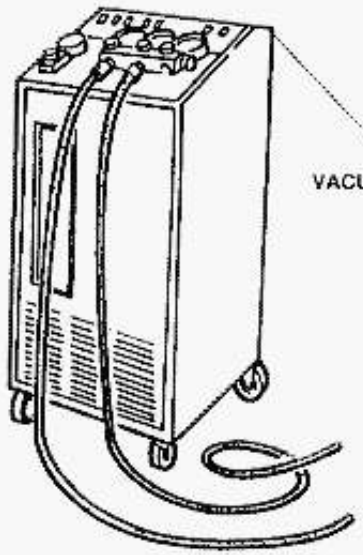
PROCEDURE

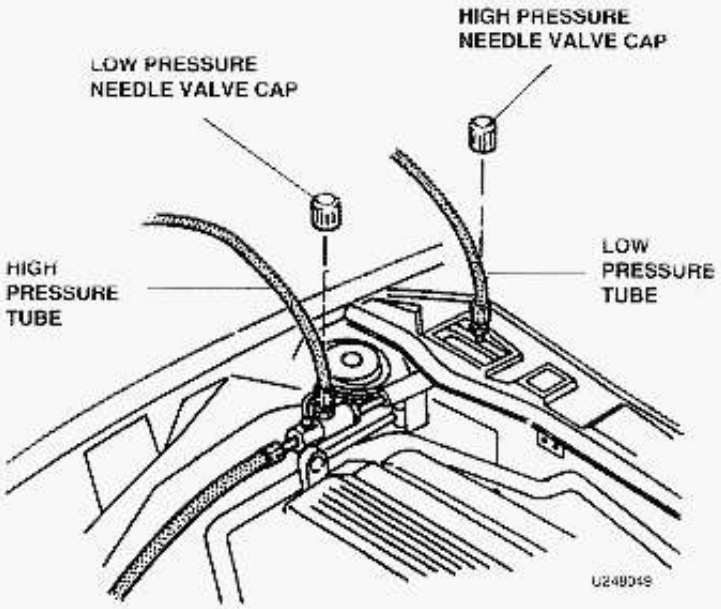
1. Remove caps from high pressure valve.
2. Remove caps from low pressure valve.
3. Connect the union pipes to the cooling fluid discharg ing-charging unit.
4. Connect low pressure tube between charging un cock and valve between evaporator and compres sor.
5. Connect high pressure tube between charging un cock and valve between condenser and filter/drier

WARNING:

Check that low pressure gauge pointe does not move during this operation.
If pointer moves, it indicates leakage Check that tee-fittings are properly tight ened before proceeding.

If leaks continue, check for presence of O'rings on all fittings, then fill system with roog (0.441 lbs) of R134a and identify point with a leakage detector reset with FREON 11.



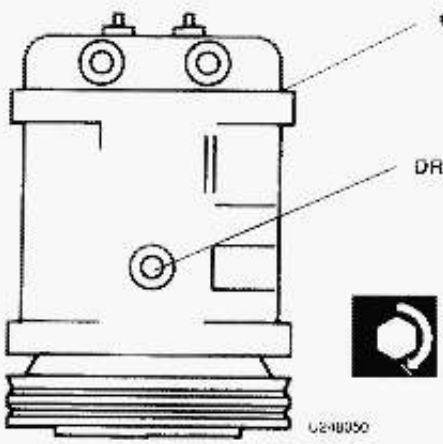


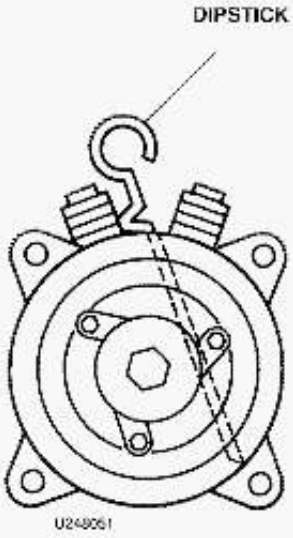
OIL LEVEL CHECK IN THE AIR CONDITIONING SYSTEM COMPRESSOR AFTER DETECTION OF OIL LEAKAGES

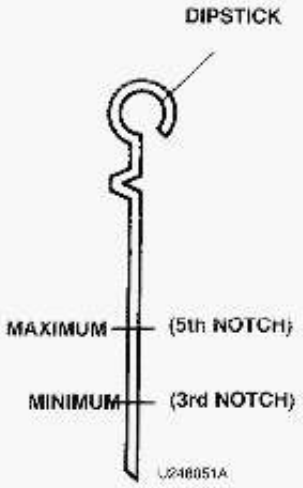
WARNING

- **The compressor oil level check is to be carried out whenever a considerable leakage of lubricating oil has been detected and when such a faulty condition is due to damage or loose connections of the air conditioning system components.**
- **The dipstick fo the oil level check is not included in the special tool set; to buy the oil dipstick No. 32447, plase consult "MURRAY EUROPE S.p.A." Via Boccaccio 1 - 20090 Trezzano S/Naviglio (MI) Italia.**
- **To top up the oil level, make use of SANDEN E13 M6 "PAG" oil.**
- **For the oil quantity in the compressor refer to that specified in the technical specifications in this Group.**

1. Set the compressor in operation for 10 minutes with the engine at idle speed.
2. Discharge the R134a gas from the air conditioning system.
3. Remove the plug from the oil drainage hole.
4. Correctly insert the oil dipstick vertically in the oil drainage hole.
5. Withdraw the oil dipstick and check that the oil level rangs within the 3rd and 5th notch on the graduated dipstick.







6. Top up the oil level, if necessary, to the prescribe values, using SANDEN E13 M6 "PAG" oil only.
7. Tighten th plug on the drainage hole to the prescribe torque value, replacing the oil seal ring in the case o oil leakage.
8. Re-install the compressor on the vehicle.
9. Proceed to the air conditioning system rechargin operations with R134a gas, respecting the quantit indicated in the technical specifications in this Group

TECHNICAL CHARACTERISTICS AND SPECIFICATIONS

FLUIDS AND LUBRICANTS

Application	Type	Name	Q.ty
Air conditioning system charging	GAS	FREON R134a	1.200 kg (2.76 lbs)
Compressor refilling	OIL	SANDEN E13 M6 "PAG"	120 to 150 cm^3 (0.032 to 0,040 gals)
Lines fittings threading	OIL	SANDEN E13 M6 "PAG"	As required

TIGHTENING TORQUES

Compressor inlet and outlet fittings	21.1 to 23.3 ft.lbs	28.6 to 31.6 Nm
Condenser inlet and outlet fittings	14.5 to 18.07 ft.lbs	19.6 to 24.5 Nm
Filter/drier inlet fittings	11.4 to 12.5 ft.lbs	15.4 to 17 Nm
Fitting between filter/drier outlet and expansion valve	10.1 to 15.19 ft.lbs	13.7 to 20.6 Nm
Fitting between evaporator inlet expansion valve	15.2 to 20.25 ft.lbs	20.6 to 27.45 Nm
Evaporator outlet fitting	18 to 19.9 ft.lbs	24.4 to 27 Nm
Expansion valve to evaporator outlet fitting	5.06 to 10.1 ft.lbs	6.86 to 13.72 Nm
Three-level pressure switch	14.8 to 16.2 ft.lbs	20 to 22 Nm
Compressor solenoid coupling elastic disc nut	25.1 to 30.98 ft.lbs	34 to 42 Nm
Fitting between expansion valve and low pressure line	18.1 to 19.9 ft.lbs	24.4 to 27 Nm

TROUBLESHOOTING PROCEDURE

PRELIMINARY CHECK

ELECTRIC FAN UNIT NOISY:
Check the electric fan brushes are not deformed; if necessary replace the electric fan motor.

EVAPORATOR UNIT NOISY:
Check that the expansion valve does not produce anyhowling; if necessary replace the expansion valve.

NOTE: Drain the system prior to carrying out any operation which may cause venting of Gas R134a.

TROUBLES AND SYMPTOMS	TEST REFERENCE
COMPRESSOR NOISY	A

COMPRESSOR NOISY	TEST A

TEST STEPS	RESULTS	REMEDY
A1 BELT ALIGNMENT CHECK - Check that the compressor belt is perfectly aligned between the two pulleys, also checking the relevant assembling and fixing operations	OK ▶	Go to **step A2**
	OK ▶	Tighten the pulley fixing nuts, replace the pulleys, if necessary
A2 BELT TENSIONING CHECK - Check the belt for correct tensioning	OK ▶	Go to **step A3**
	OK ▶	Restore the correct belt tensioning (see **Group 00**)
A3 REFRIGERATING FLUID CHARGE CHECK - Check that the refrigerating fluid charge is not excessive. (It is likely the presence of incondensable gas inside the circuit)	OK ▶	Go to **step A4**
	OK ▶	Drain, dehydrate and refill the system
A4 FIXING POINT CHECK - Check for loosen screws and nuts fixing the compressor to engine unit, or fixing points of other devices to the air conditioning system	OK ▶	Go to **step A5**
	OK ▶	Proceed to the correct tightening of the loosen fixing points
A5 ELECTROMAGNETIC COUPLING CHECK - Check that the electromagnetic coupling does not skid, nor tend to size, or is noisy	OK ▶	Replace compressor
	OK ▶	Replace the electromagnetic coupling

End of test