



<a href="#">Link</a>
<a href="#">Return</a>
<a href="#">Page 1</a>
<a href="#">Page 2</a>
<a href="#">Page 3</a>
<a href="#">Page 4</a>
<a href="#">Page 5</a>
<a href="#">Page 6</a>
<a href="#">Page 7</a>
<a href="#">Page 8</a>
<a href="#">Page 9</a>
<a href="#">Page 10</a>
<a href="#">Page 11</a>
<a href="#">Page 12</a>
<a href="#">Page 13</a>
<a href="#">Page 14</a>
<a href="#">Page 15</a>
<a href="#">Page 16</a>
<a href="#">Page 17</a>
<a href="#">Page 18</a>
<a href="#">Page 19</a>
<a href="#">Page 20</a>
<a href="#">Page 21</a>
<a href="#">Page 22</a>
<a href="#">Page 23</a>
<a href="#">Page 24</a>
<a href="#">Page 25</a>
<a href="#">Page 26</a>
<a href="#">Page 27</a>
<a href="#">Page 28</a>
<a href="#">Page 29</a>
<a href="#">Page 30</a>
<a href="#">Page 31</a>
<a href="#">Page 32</a>
<a href="#">Page 33</a>
<a href="#">Page 34</a>
<a href="#">Page 35</a>
<a href="#">Page 36</a>
<a href="#">Page 37</a>
<a href="#">Page 38</a>
<a href="#">Page 39</a>
<a href="#">Page 40</a>
<a href="#">Page 41</a>
<a href="#">Page 42</a>
<a href="#">Page 43</a>
<a href="#">Page 44</a>
<a href="#">Page 45</a>
<a href="#">Page 46</a>

**GROUP 80**

# AIR CONDITIONING SYSTEM

## TABLE OF CONTENTS

<p><b>GENERAL DESCRIPTION</b> ..... 80 - 3</p> <p><b>COMPONENTS LOCATION AND IDENTIFICATION</b> ..... 80 - 5</p> <p><b>AIRFLOW SCHEMATIC</b> ..... 80 - 7</p> <p><b>CONTROL PANEL</b> ..... 80 - 9</p> <p><b>DETAIL DESCRIPTION OF AIR CONDITIONING SYSTEM AUTOMATISMS</b> ..... 80 - 11</p> <p><b>SYSTEM COMPONENTS MAINTENANCE</b> ..... 80 - 12</p> <ul style="list-style-type: none"> <li>- Safety precautions ..... 80 - 12</li> <li>- Supplementary maintenance Instructions ..... 80 - 13</li> </ul> <p><b>AIR OUTLETS</b> ..... 80 - 14</p> <ul style="list-style-type: none"> <li>- Center air outlet ..... 80 - 14 <ul style="list-style-type: none"> <li>• Removal ..... 80 - 14</li> <li>• Installation ..... 80 - 14</li> </ul> </li> <li>- Side air outlets ..... 80 - 14 <ul style="list-style-type: none"> <li>• Removal ..... 80 - 14</li> <li>• Installation ..... 80 - 14</li> </ul> </li> </ul> <p><b>AUTOMATIC AIR CONDITIONING CONTROL UNIT</b> ..... 80 - 15</p> <ul style="list-style-type: none"> <li>- Removal ..... 80 - 15</li> <li>- Installation ..... 80 - 15</li> </ul> <p><b>EVAPORATOR UNIT</b> ..... 80 - 15</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 15</li> <li>- Removal ..... 80 - 15</li> </ul>	<ul style="list-style-type: none"> <li>- Installation ..... 80 - 17</li> <li>- Disassembly ..... 80 - 17</li> <li>- Assembly ..... 80 - 18</li> </ul> <p><b>FILTER/DRIER</b> ..... 80 - 18</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 18</li> <li>- Removal ..... 80 - 19</li> <li>- Installation ..... 80 - 19</li> <li>- Inspection ..... 80 - 19</li> </ul> <p><b>CONDENSER</b> ..... 80 - 20</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 20</li> <li>- Removal ..... 80 - 20</li> <li>- Installation ..... 80 - 20</li> <li>- Inspection ..... 80 - 20</li> </ul> <p><b>COMPRESSOR</b> ..... 80 - 21</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 21</li> <li>- Removal ..... 80 - 21</li> <li>- Installation ..... 80 - 22</li> </ul> <p><b>EXPANSION VALVE</b> ..... 80 - 22</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 22</li> <li>- Removal ..... 80 - 22</li> <li>- Installation ..... 80 - 23</li> </ul> <p><b>MIN-MAX PRESSURE SWITCH (TRINARY)</b> ..... 80 - 23</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 23</li> <li>- Removal ..... 80 - 23</li> <li>- Installation ..... 80 - 23</li> </ul> <p><b>AIR CONDITIONING UNIT FAN SPEED CONTROL</b> ..... 80 - 24</p> <ul style="list-style-type: none"> <li>- Removal ..... 80 - 24</li> <li>- Installation ..... 80 - 24</li> </ul>
--	--



GROUP 80

# AIR CONDITIONING SYSTEM

## TABLE OF CONTENTS

<p><b>GENERAL DESCRIPTION</b> ..... 80 - 3</p> <p><b>COMPONENTS LOCATION AND IDENTIFICATION</b> ..... 80 - 5</p> <p><b>AIRFLOW SCHEMATIC</b> ..... 80 - 7</p> <p><b>CONTROL PANEL</b> ..... 80 - 9</p> <p><b>DETAIL DESCRIPTION OF AIR CONDITIONING SYSTEM AUTOMATISMS</b>..... 80 - 11</p> <p><b>SYSTEM COMPONENTS MAINTENANCE</b> ..... 80 - 12</p> <ul style="list-style-type: none"> <li>- Safety precautions ..... 80 - 12</li> <li>- Supplementary maintenance Instructions ..... 80 - 13</li> </ul> <p><b>AIR OUTLETS</b> ..... 80 - 14</p> <ul style="list-style-type: none"> <li>- Center air outlet ..... 80 - 14                             <ul style="list-style-type: none"> <li>• Removal ..... 80 - 14</li> <li>• Installation ..... 80 - 14</li> </ul> </li> <li>- Side air outlets ..... 80 - 14                             <ul style="list-style-type: none"> <li>• Removal ..... 80 - 14</li> <li>• Installation ..... 80 - 14</li> </ul> </li> </ul> <p><b>AUTOMATIC AIR CONDITIONING CONTROL UNIT</b> ..... 80 - 15</p> <ul style="list-style-type: none"> <li>- Removal ..... 80 - 15</li> <li>- Installation ..... 80 - 15</li> </ul> <p><b>EVAPORATOR UNIT</b> ..... 80 - 15</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 15</li> <li>- Removal ..... 80 - 15</li> </ul>	<ul style="list-style-type: none"> <li>- Installation ..... 80 - 17</li> <li>- Disassembly ..... 80 - 17</li> <li>- Assembly ..... 80 - 18</li> </ul> <p><b>FILTER/DRIER</b> ..... 80 - 18</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 18</li> <li>- Removal ..... 80 - 19</li> <li>- Installation ..... 80 - 19</li> <li>- Inspection ..... 80 - 19</li> </ul> <p><b>CONDENSER</b> ..... 80 - 20</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 20</li> <li>- Removal ..... 80 - 20</li> <li>- Installation ..... 80 - 20</li> <li>- Inspection ..... 80 - 20</li> </ul> <p><b>COMPRESSOR</b> ..... 80 - 21</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 21</li> <li>- Removal ..... 80 - 21</li> <li>- Installation ..... 80 - 22</li> </ul> <p><b>EXPANSION VALVE</b> ..... 80 - 22</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 22</li> <li>- Removal ..... 80 - 22</li> <li>- Installation ..... 80 - 23</li> </ul> <p><b>MIN-MAX PRESSURE SWITCH (TRINARY)</b> ..... 80 - 23</p> <ul style="list-style-type: none"> <li>- Description ..... 80 - 23</li> <li>- Removal ..... 80 - 23</li> <li>- Installation ..... 80 - 23</li> </ul> <p><b>AIR CONDITIONING UNIT FAN SPEED CONTROL</b> ..... 80 - 24</p> <ul style="list-style-type: none"> <li>- Removal ..... 80 - 24</li> <li>- Installation ..... 80 - 24</li> </ul>
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80 - 1

**ANTI-FROST THERMOSTAT** ..... 80 - 24

- Removal ..... 80 - 24
- Installation ..... 80 - 25

**AIR RECIRCULATION FLAP CONTROL MOTOR** ..... 80 - 25

- Removal ..... 80 - 25
- Installation ..... 80 - 25

**MIXING AND DISTRIBUTION DOOR MOTORS** ..... 80 - 25

- Removal ..... 80 - 25
- Installation ..... 80 - 26

**OUTSIDE AIR TEMPERATURE SENSOR** ..... 80 - 26

- Removal ..... 80 - 26
- Installation ..... 80 - 26

**CABIN INTERIOR TEMPERATURE SENSOR (WITH MOTOR)** ..... 80 - 27

- Removal ..... 80 - 27
- Installation ..... 80 - 27

**MIXED AIR TEMPERATURE SENSOR** ..... 80 - 27

- Removal ..... 80 - 27
- Installation ..... 80 - 27

**HEATER BLOWER ELECTRIC FAN** ..... 80 - 27

- Removal ..... 80 - 27
- Installation ..... 80 - 28
- Disassembly ..... 80 - 28
- Reassembly ..... 80 - 29

**HEATING RADIATOR** ..... 80 - 29

- Removal ..... 80 - 29
- Installation ..... 80 - 29

**HEATING UNIT** ..... 80 - 29

- Removal ..... 80 - 29
- Installation ..... 80 - 30
- Disassembly ..... 80 - 30
- Reassembly ..... 80 - 30

**INSPECTIONS AND CHECKS** ..... 80 - 30

- Controls operation check ..... 80 - 30
- Self-diagnosis ..... 80 - 34

**COOLING FLUID DISCHARGE** ..... 80 - 35

**COOLING FLUID CHARGING** ..... 80 - 35

**SYSTEM CHARGING** ..... 80 - 39

**TECHNICAL CHARACTERISTICS AND SPECIFICATIONS** ..... 80 - 41

- Fluids and lubricants ..... 80 - 41
- Tightening torques ..... 80 - 41

**TROUBLESHOOTING PROCEDURE** ..... 80 - 42



# AIR CONDITIONING SYSTEM

## GENERAL DESCRIPTION

The fully automatic air conditioning system allows to establish in a very short time and maintain the desired climate conditions inside the vehicle, regardless of vehicle speed and environmental conditions.

All functions are automatically managed by an electronic control unit which receives temperature signals from three separate sensors, processes the information by a microprocessors system, and finally controls electric actuator of the system to maintain selected temperature, optimal airflow and distribution.

The control panel allows the following operations:

- Preselection of desired temperature, within a defined range.
- Modification of air flow speed as regards to automatic values.

- Modification of air flow distribution as regards to automatic values.
- Possibility to close ram air intake by recirculating inner air.
- Possibility to shut-off the system.
- Possibility to exclude automatic operation.

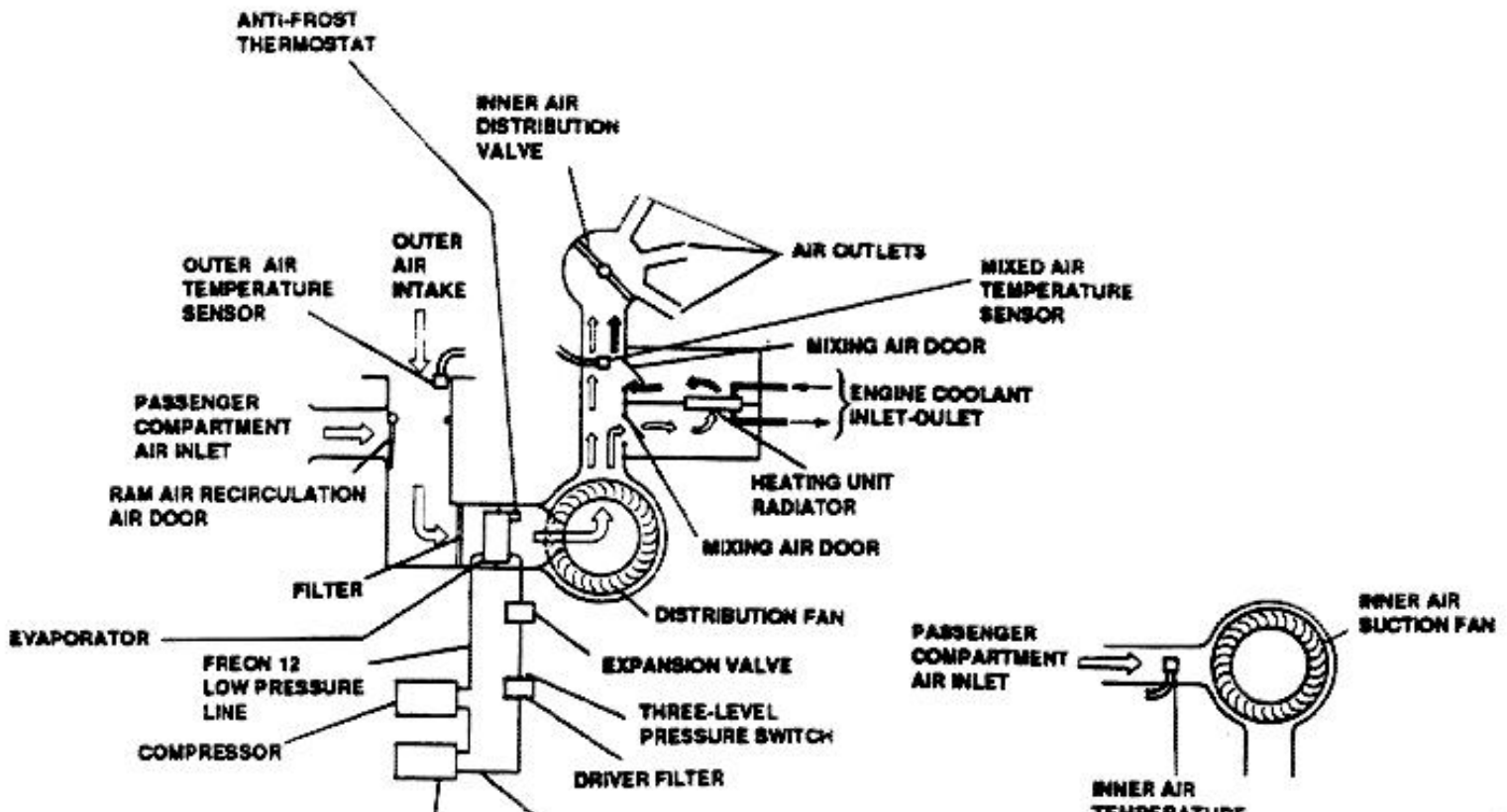
The air recirculation is automatically activated in certain environmental conditions, e.g. very high outside air temperature.

The system is equipped with a memory, which maintains the temperatures and functions activated before shutting down the engine for any subsequent engine start.

The microprocessor is also fitted with an emergency program, which is activated in the event one of the temperature sensors fails: in such instance the microprocessor maintains a pre-setted temperature value, which assures, in any case, comfortable climate conditions inside the vehicle.

The following figure depicts the system functional diagram.

Functional diagram



CONDENSER

FREON 12 HIGH  
PRESSURE LINE

TEMPERATURE  
SENSOR

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80 - 3

The air for conditioning system is sucked from outside or, if air recirculation function is activated, directly from vehicle interior: the selection between the above operations is obtained through power activated "dynamic/recirculation air door".

The air coming from exterior passes through a filter and, in sequence, through evaporator where, if air conditioning system is operating, is cooled, dried and finally accelerated by an electric fan.

The cold air may be totally or partially deviated, by powered mixing door, to the heating unit: the heated air is now mixed with cold air flow by another mixing door.

The mixed air comes to distributor, where a powered valve distributes it to air outlets depending from its angular position.

The system is equipped with three temperature sensors, which sense air temperature in the most significant positions, i.e.:

- Outside air intake.
- Mixed air.
- Vehicle interior air.

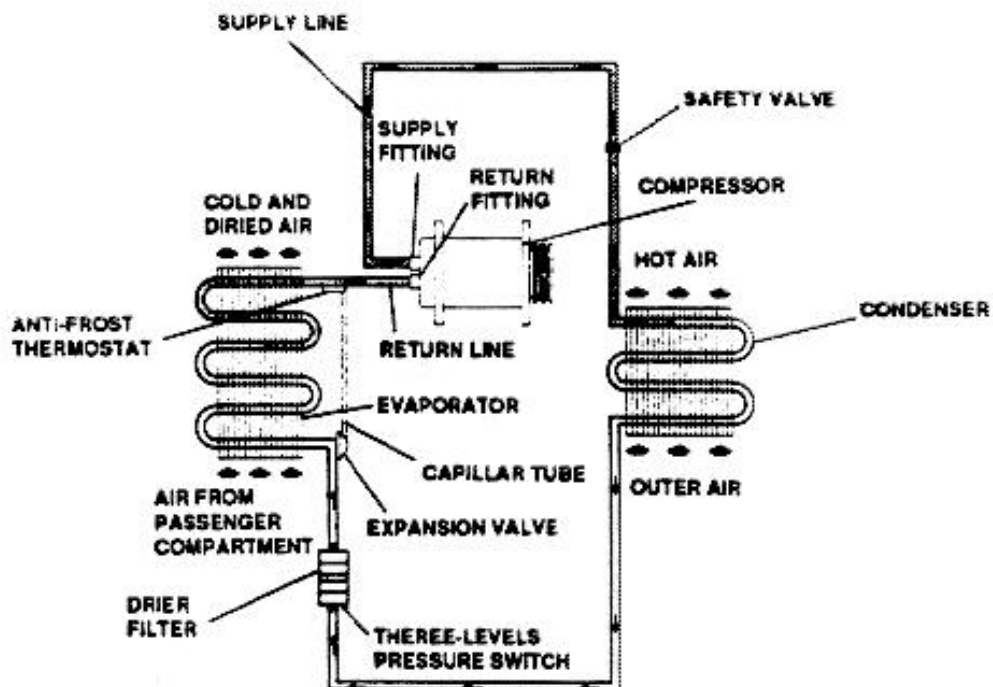
The last sensor is located on cabin roof, near roof lamp, and is equipped with a little electric fan.

The air conditioning unit operates according to a normal refrigerating cycle, where the status changes of a fluid (liquid-to-gas and vice-versa) are used to transfer a great amount of heat.

The system uses FREON 12 (R12) as refrigerating fluid.

Schematic diagram

- HIGH PRESSURE GASEOUS FLUID
- LIQUID FLUID
- LOW PRESSURE GASEOUS FLUID









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 setted value.

The refrigerating fluid, coming from compressor as high-temperature, high-pressure gas, enters into condenser 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 into evaporator, where vaporizes and absorbs heat from air which flows on its fins moved by electric fan.

The air, besides, when comes in contact with evaporator 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-levels 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.

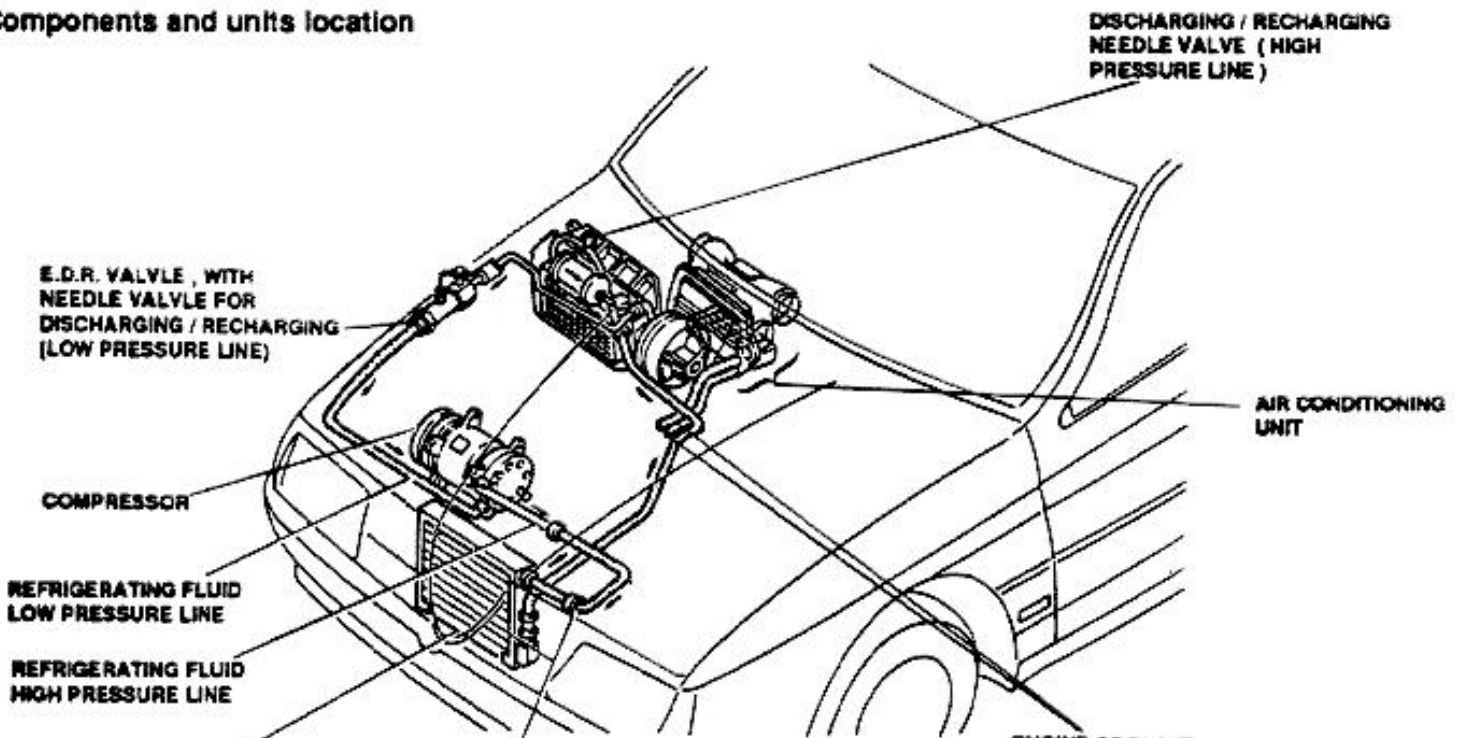
The high pressure line is fitted with a safety valve, which prevents overpressure to generate into circuit.

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 compartment and passenger compartment, beneath the dashboard. Only the compressor and condenser are located in the vehicle front section.

### Components and units location



**CONDENSER**

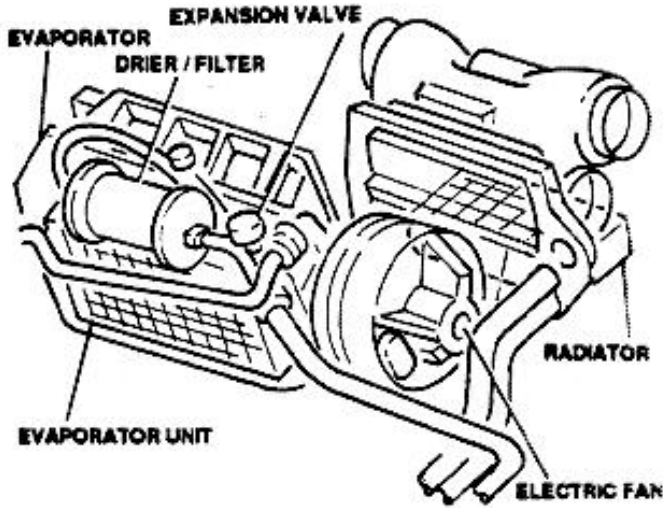
**SAFETY VALVE**

**ENGINE COOLANT  
RADIATOR CONNECTING  
HOSES**

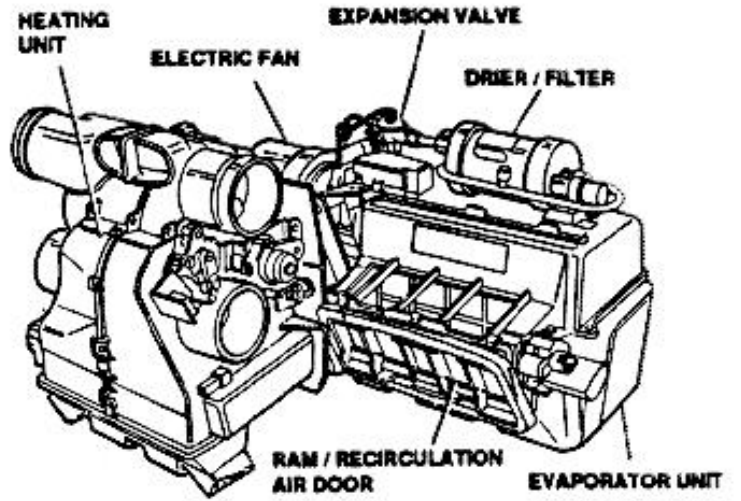
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**80 - 5**

**Air conditioning unit - Mechanical components**

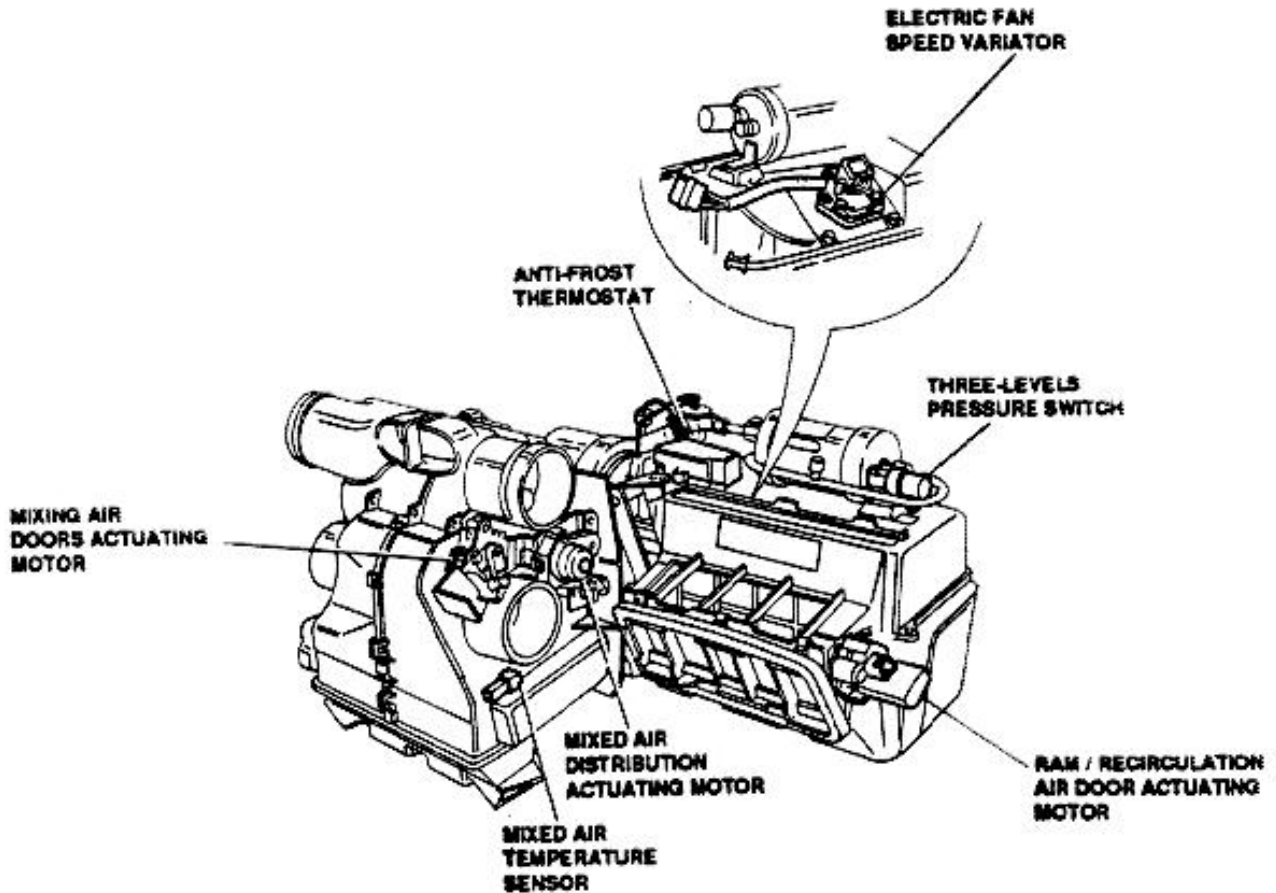


View looking from engine



View looking from passenger compartment

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








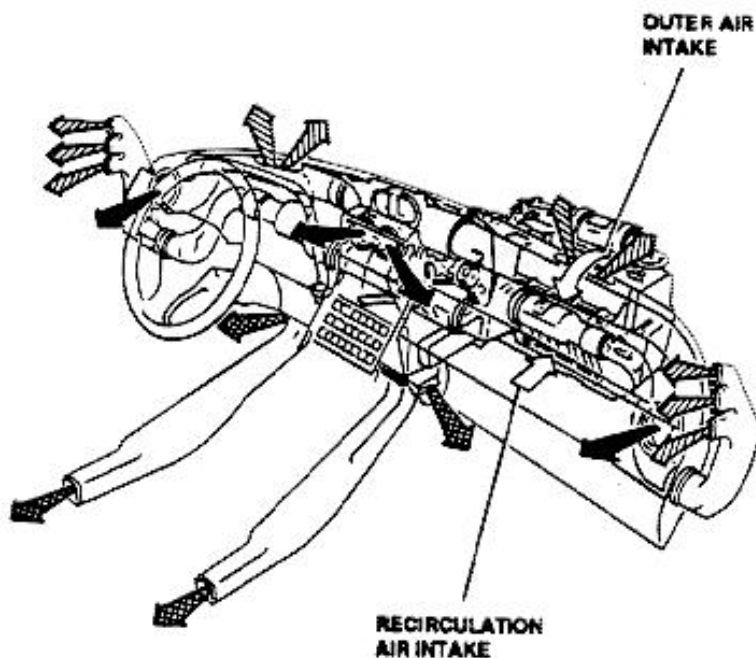
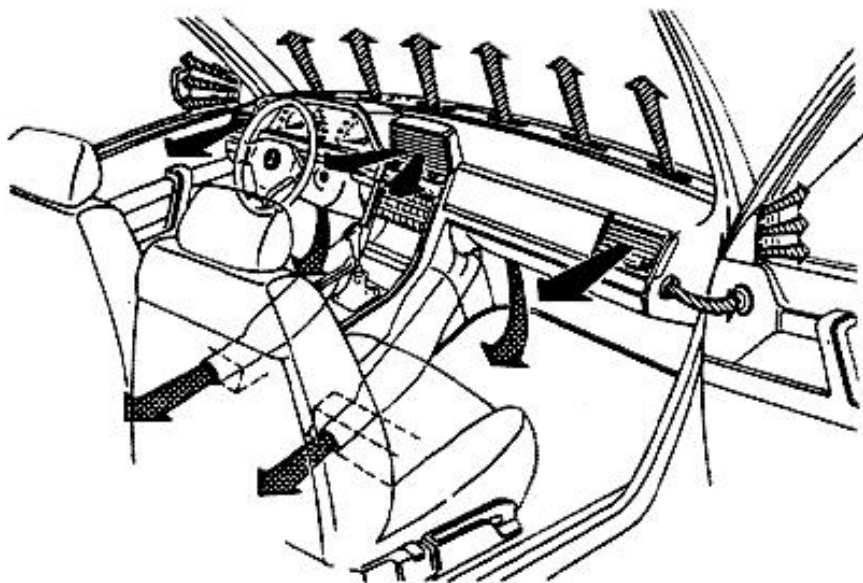
## AIRFLOW SCHEMATIC

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 air outlets.

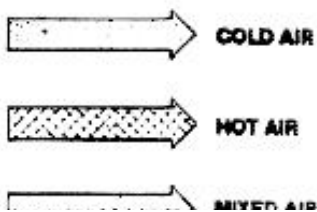
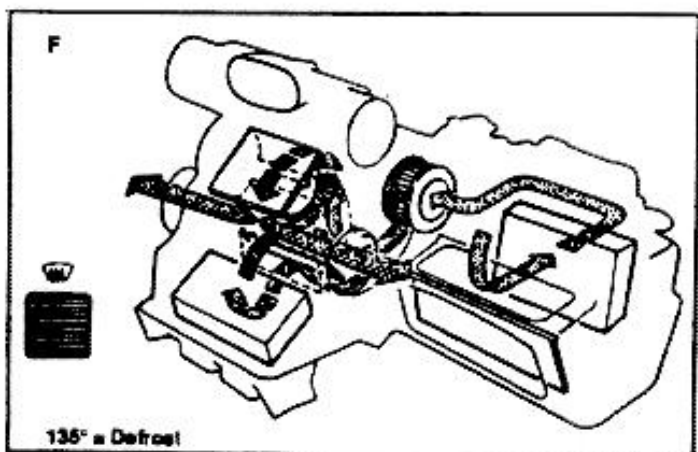
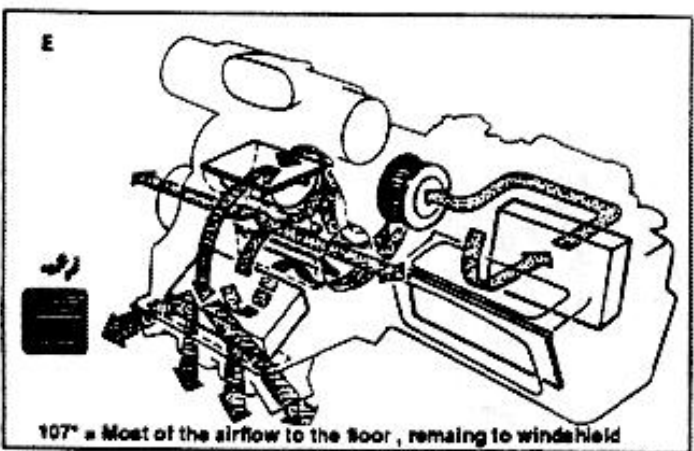
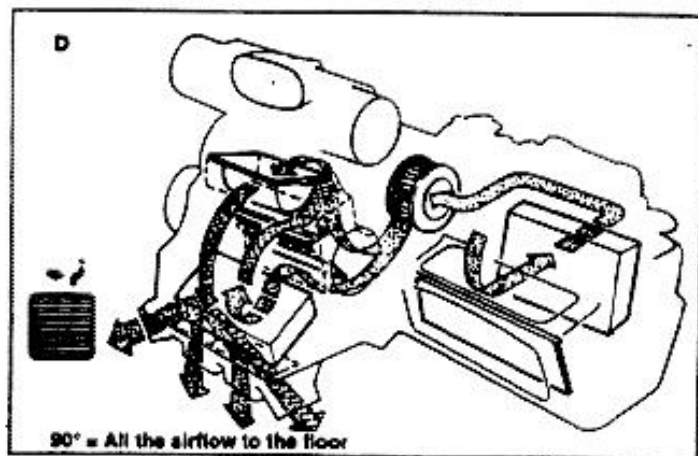
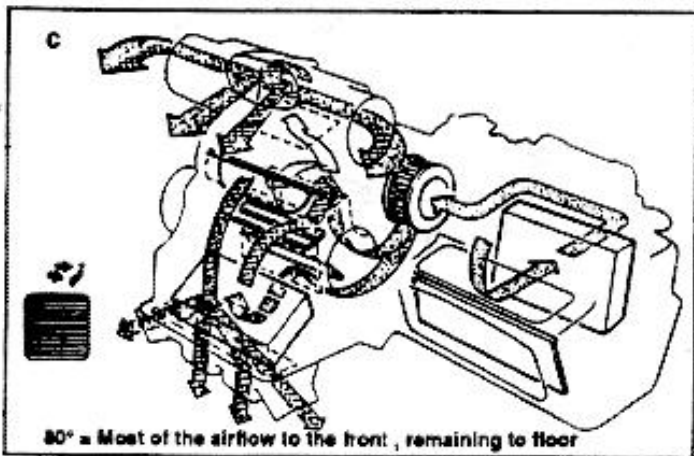
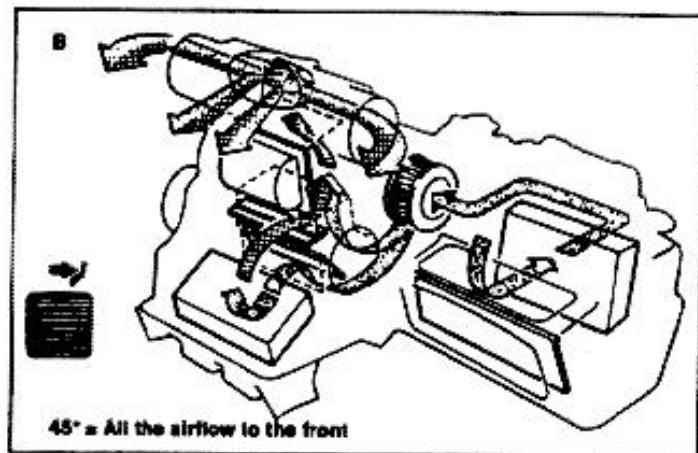
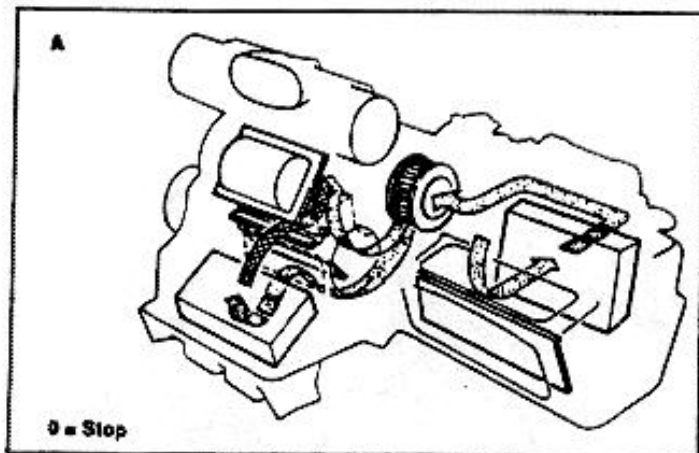
### Airflow schematic

-  CENTER AND SIDE AIR OUTLETS
-  WINDSHIELD AND SIDE WINDOWS AIR OUTLETS
-  LOWERS AND REAR SEATS AIR OUTLETS





The distribution door position controls the airflow as per the following scheme:







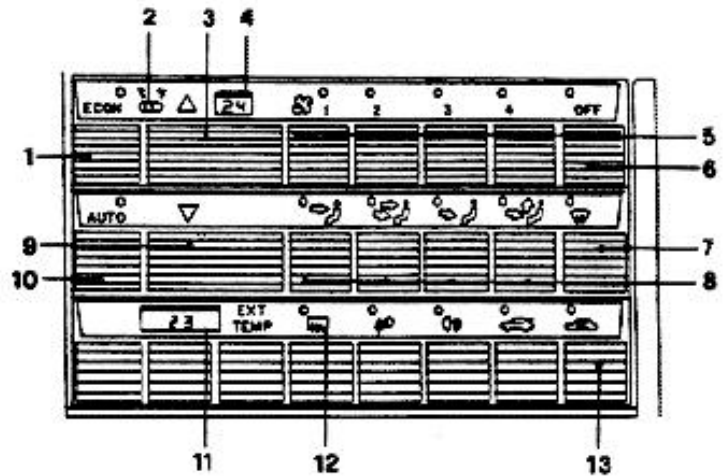
## CONTROL PANEL

1. Air conditioning disengagement switch, with indicator light.
2. Temperature selector switch ( $^{\circ}\text{C}/^{\circ}\text{F}$ ).
3. Temperature setting switch (increase).
4. Selected temperature display.
5. Fan speed manual selector switch, with indicator light.
6. System ON/OFF switch, with indicator light.
7. Defrosting switch, with indicator light.
8. Air distribution selector switches, with indicator light.
9. Temperature setting switch (decrease).
10. Air conditioning operation switch.
11. Outside temperature display (in  $^{\circ}\text{C}$  or in  $^{\circ}\text{F}$ , depending on position of selector switch 2).
12. Heated rear window switch, with indicator light.
13. Air recirculation switch, with indicator light.

**NOTE:** When the vehicle speed is lower than 30 km/h (19 MPH), the display (11) operates as follows:

- If the temperature is increasing, the value displayed is the last temperature value stored before the speed decreased below the limit; the outside temperature is updated after the speed has been maintained over 30 km/h (19 MPH) for at least one minute.
- If the temperature is decreasing, the value displayed is the effective temperature.

Front view of control panel



The automatic air conditioning control panel, shown in the above figure, is an integral part of electronic control unit. The function of each control is described in detail in the Operation and Maintenance Manual. The following description is related only to the main controls.

### AUTO switch

Automatic operation of the system is selected by pressing the AUTO switch, and the driver is only requested to set the desired temperature on display (4) acting on switches (3) or (9).

In high outside temperature conditions the outside ram air supply is cut - off to reduce the transient phase to a minimum: in this condition the air recirculation function is activated, and the related indicator light illuminates.

The electric fan speed and air distribution mode automatically selected by the system can be changed by pressing the switches (5) or (8) to respectively change the fan speed or the air distribution mode; in any case the temperature control remains on the automatic mode.

To restore the fully automatic operation of the system press again the AUTO switch.

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



### WARNING:

The road surface temperature could be lower than the air temperature sensed by the system temperature bulb; therefore, during the cold season, the road surface could be frozen even if the outside temperature displayed is greater than  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ).



### ECON switch

This switch disables the operation of the air conditioning, while the system continues to operate in the automatic mode, the inside temperature is maintained to the preset value (during the heating phase) by means of the outside air and the heater.

The fan speed and the air distribution mode automatically selected by the system can be changed by pressing the switches (5) and (8) to respectively change the fan speed and the air distribution mode.

### OFF switch

The OFF switch turns off the climate system completely. Pressing the OFF switch, prevents air entry inside the vehicle and switches off the electric fan.

The engagement of this switch is indicated by the illumination of the indicator light just over the switch, while the display (4) continues to indicate the preselected temperature.

The outside temperature is still indicated on the display (11).

To restore the climate system operation, there are two procedures:

- Press again OFF switch to reset system to the conditions prior to the engagement of the OFF switch.
- Press AUTO switch to reset system to the automatic mode.

### ▲ and ▼ temperature setting switches

These two switches are used to set the desired temperature inside the vehicle. Any time the switch (3) is pressed, the temperature setting is increased of 1°C (2°F). Vice-versa the temperature setting is decreased of 1°C (2°F) if pressing the switch (9).

The temperature setting range is from 18°C (64 °F) to 32°C (92° F); the upper and lower limits are associated to the "LO" and "HI" symbols.

The "LO" symbol indicates that the system is providing maximum cooling, while the "HI" symbol indicates maximum heating.

### ● fan speed switches

These switches allow the manual selection of various fan speeds. To restore the automatic fan speed control press the AUTO switch.

### ☰ air recirculation switch

This switch cuts-off the inlet of outside air in the vehicle. In this mode the air conditioning system draws the air directly from inside the vehicle.

To disengage this mode press again the switch ☰

At high outside temperatures this mode could engage automatically. To allow a minimum air change with the AUTO switch engaged, the system automatically draws at intervals some air from the outside, even if the recirculating mode has been selected.

This operating mode is indicated by blinking of related LED.

### ↘ switch

By pressing this switch all the airflow is directed towards the floor. Temperature control is still automatic.

### ↙ switch

By pressing this switch most of the airflow is directed towards the floor, while the remaining part is directed towards the front door windows and the windshield for defrosting and demisting.

Temperature control is still automatic.

### ↗ switch

By pressing this switch most of the airflow is directed to the front side of the vehicle, while the remaining part is directed towards the floor.

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80 - 10

### switch

By pressing this switch all the airflow is directed to the front side of the vehicle. The temperature control is still automatic.

**NOTE:** To return to the automatic air distribution mode press the AUTO switch.

### switch (defrosting)

By pressing this switch the airflow is directed to the windshield outlets to help defrosting.

### switch (rear window defogger)

By pressing this switch the heating resistances in the rear window (and heating resistances for the windshield and external rearview mirrors if installed) are energized for an initial period of 20 minutes; subsequent pressing of the switch ensures an additional 10 minutes heating period provided that the previous heating period is terminated. The activation of the rear window heating is indicated by the indicator light over the control switch, as well as by an additional indicator light on the instrument panel.



#### CAUTION:

Start the engine before switching on the rear window defogger.

## DETAIL DESCRIPTION OF AIR CONDITIONING SYSTEM AUTOMATISMS

### Setting air temperature to required value

The memory of 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 a signal output which controls the air mixing door.

### Fan speed setting

Also the fan speed setting is the result of 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 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 electronic control unit depending on outside temperature.

The control unit output can position the door in "RECIRCULATION" or in "OUTSIDE AIR" position, or in intermediate position (20% outside air and 80% recirculating air). If the outside temperature is above 27°C (80.6°F), the control unit sets the door in "RECIRCULATION" position, thus drawing air from vehicle interior; if the outside temperature is 26°C (78.8°F) or below, the door will be positioned so as outside air will be drawn.

### Cold engine start

The air conditioning control unit automatically eliminates the troubles which often occur in winter during cold engine starts.

When the engine coolant temperature is below 20°C (68°F), the electronic control unit automatically sets the system for maximum windshield defrost, operates fan at



first speed, positions recirculation door to draw outside air and sets cold/hot air door for maximum hot position.

The system, in such a manner, prevents cold air from entering into the vehicle: the air, in fact, cannot be heated due to low temperature of coolant passing through heating radiator.

When the coolant temperatures is between 20°C (68°F) and 40°C (104°F), the electric fan automatically increases to second speed.

When the coolant temperature is greater than 40°C (104°F), the system automatically starts to operate in "AUTOMATIC" mode, following the presetted parameters.

To avoid a sudden change in electric fan speed, however, the system automatically increases fan power supply with a rate of 1 ampere per second until the speed programmed by control unit is reached.

### Overcharge suppression at engine start

Due to the very high current load of the cranking, it is advisable to switch off all the other electrical loads during start, in order to avoid excessive current drainage from battery.


If the battery is not fully charged or during cold season, it may be that engine fails to start if, in addition to cranking motor, other electrical devices are switched on (e.g. heated rear window, headlamps, windshield wipers, air conditioning compressor solenoid, electric fan).


In order to avoid the above mentioned instance, an auxiliary contact, actuated by ignition key, sends an electrical signal to air conditioning control unit which, in turn, de-activates all electrical devices of air conditioning/heating system during engine start.

When the system is again powered after engine start, the electronic control unit restores operating mode depending on temperature setting and temperature detected by sensors.

### Self-diagnosis

The electronic control unit incorporates a special self-diagnosis program, which allows to detect system failures and to show the related failure code on temperature display.

To activate the self-diagnosis program, depress simultaneously "AUTO" and "  " switches.

The duration of self-diagnosis program is 20 seconds: at the end of this time interval, the display shows the number of failures in the system. By depressing "  " switch, the display shows in sequence all failure codes (one code each time switch is depressed).

The failure codes and related meanings are listed at page 34.

**NOTE:** The self-diagnosis procedure should be carried-out only by qualified personnel. The vehicle's user should not perform this test.

## 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 FREON 12. This fluid, colorless both in liquid and gaseous statuses, has a boiling point of -29.8°C (-21.7 °F) at atmospheric pressure and therefore is in gaseous-status at ambient temperature. FREON 12 vapors are heavier than air, flameproof and normally non-explosive.



**WARNING:**

The FREON 12 is poisonous; it is not corrosive unless mixed with water.



**WARNING:**

Always use safety goggles when performing any maintenance on air conditioning system.

At ambient temperature and pressure, the FREON 12 evaporates very quickly, and therefore freezes whatever comes in contact with it. Particular care must be taken to avoid FREON 12 to contact skin or eyes.



---

80 - 12



**WARNING:**

Always use safety goggles when performing any maintenance on air conditioning system. Make sure that a bottle of sterile mineral oil is promptly available. If FREON 12 contacts eyes, apply a few drops of mineral oil, which absorbs quickly the FREON 12. Then rinse eyes with a great amount of fresh water. Call immediately medical attention, even if irritation has ceased before the first-aid treatment.



**WARNING:**

Do not heat FREON 12 above 52°C (125.6°F): it may explode.

The FREON 12 is stored in metal bottles: never expose bottles to direct sunrays for prolonged period.

In some instances, it may be necessary to heat moderately the bottles to increase internal pressure, so that bottle pressure is higher than vehicle air conditioning system pressure.

If heating is required, place the bottle for 20 minutes approximately in ambient not warmer than 35°C (95°F).

Never heat bottle with torch flames or any other means which can excessively increase bottle temperature or pressure.

Never weld or steam clean components of air conditioning system, nor perform such operations near air conditioning system.



**CAUTION:**

Keep bottles in vertical position during system charging. If bottles are in horizontal position or with valve downward, the FREON 12 may enter into system as liquid, thus damaging compressor.



**WARNING:**

Operate in a well ventilated area. Dispose FREON 12 in an appropriate collecting system and comply, in any case, all applicable laws and rules.

A great amount of FREON 12 in a restricted area can reduce the oxygen quantity, thus causing suffocation.

The FREON 12 vapors are not normally toxic, unless they come in contact with open flames. Do not discharge FREON 12 near open flames. Where using flame-type leak detector, a toxic mixture is generated. Never inhale vapors from leak detector.



**CAUTION:**

The FREON 12 should never come in contact with polished metal surfaces, because it can cause oxidation. Do not spill FREON 12 on any surface. The FREON 12 is highly corrosive if combined with water, and can seriously damage all metal surfaces.



**WARNING:**

Never keep a FREON 12 bottle fully charged for prolonged periods.

**SUPPLEMENTARY MAINTENANCE INSTRUCTIONS**

- Disconnect negative lead from battery before any maintenance operation.
- Discharge FREON 12 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 into 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 (SUN OIL COMPANY - Suniso 46) and

torque fittings to prescribed torque.

80 - 13

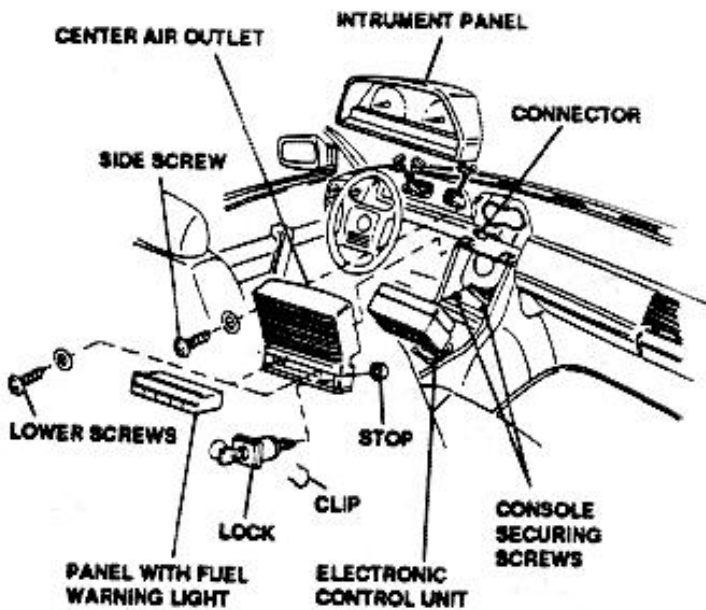
## AIR OUTLETS

### CENTER AIR OUTLET

#### REMOVAL

**NOTE:** Disconnect negative lead from battery before starting procedure.

1. Remove instrument panel (see Group 43).
2. Withdraw electronic control unit with control panel (see removal procedure of "AUTOMATIC AIR CONDITIONING CONTROL UNIT").
3. Push fuel panel from rear side, disconnect electrical connector then remove it.
4. Remove lower and side securing screws.
5. Unscrew by two turns the console securing screw, in order to make easy removal of air outlet.
6. Remove air outlet by pulling it forward and upward.
7. Remove stop.
8. Remove clip.
9. Remove lock.



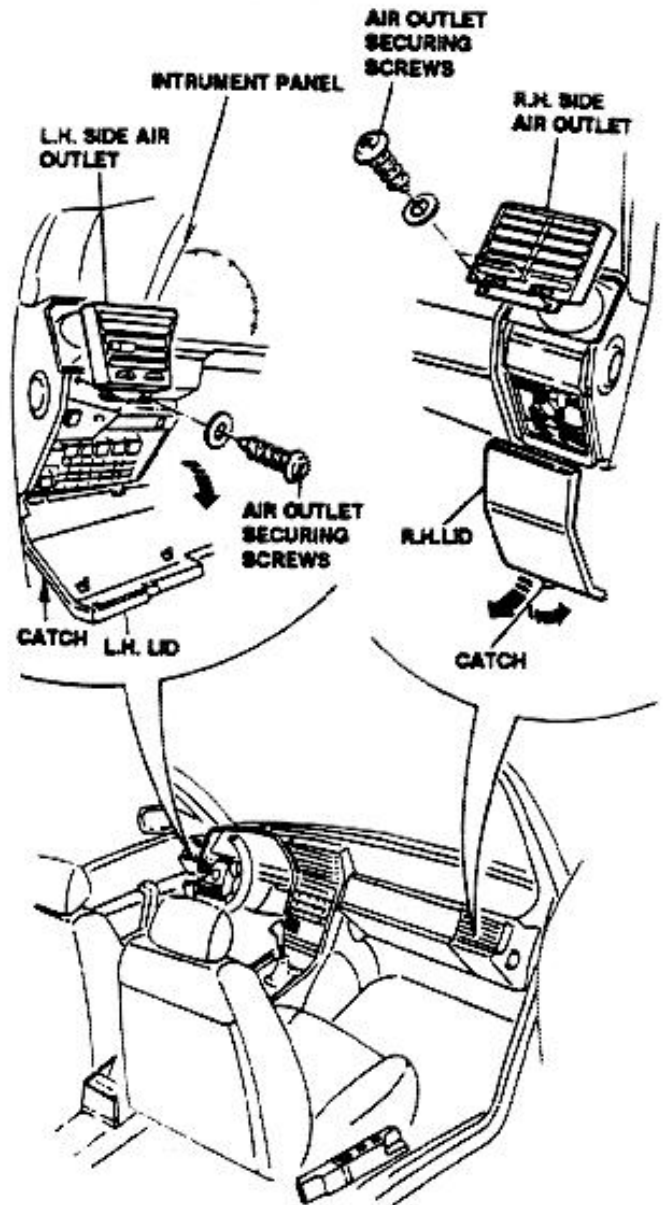
#### INSTALLATION

Proceed in reverse order; don't forget to tighten console 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 panel, without disconnecting wiring (see Group 43).
4. Remove two securing screws.
5. Remove side air outlets.



#### INSTALLATION

Proceed in reverse order.

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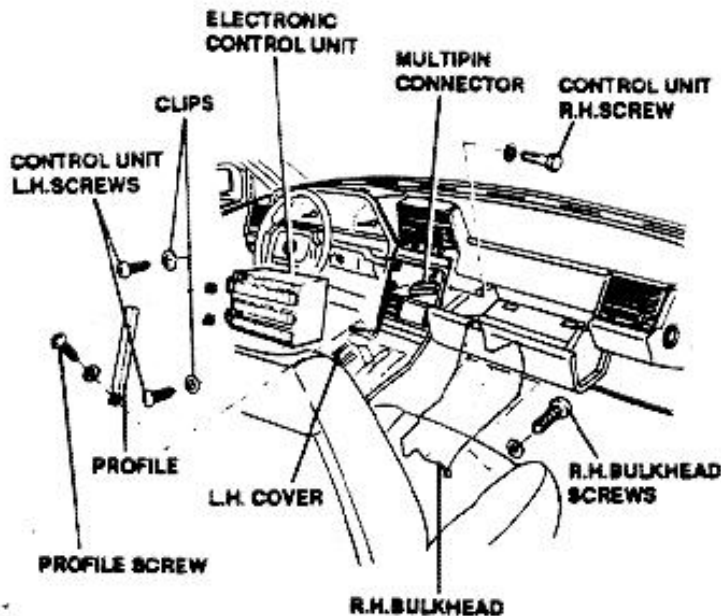
80 - 14

## AUTOMATIC AIR CONDITIONING CONTROL UNIT

### REMOVAL

**NOTE:** Disconnect negative lead from battery before starting procedure.

1. Slightly move away transmission L.H. cover (see arrow) to gain access to screws securing profile.
2. Remove screws then remove profile.
3. Remove two control unit L.H. securing screws then remove two clips.
4. Remove two screws which secure R.H. bulkhead to console then remove bulkhead.
5. Open glovebox and remove control unit R.H. securing screw.
6. Move away electronic control unit as necessary to gain access to connector.
7. Disconnect multi-pin connector by releasing locking clip.
8. Remove control unit.



### INSTALLATION

Proceed in reverse order.

## EVAPORATOR UNIT

### DESCRIPTION

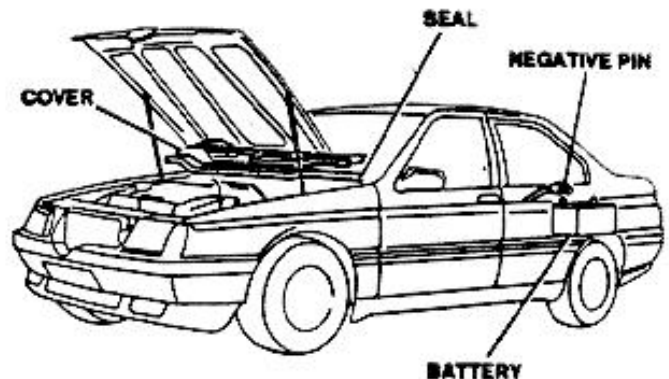
The evaporator unit consists of two half-boxes jointed together, containing the evaporator in which refrigerating fluid expands and cooling finned tubes. The outside air passes through a flowmeter and filter: the flow meter sends an electrical signal to automatic air conditioning control unit. A powered-door can prevent outside air to enter into 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 into evaporator when condensate drains outboard. If the tube end is damaged, the condensate cannot be drained correctly. Replace tube if damaged.

### REMOVAL

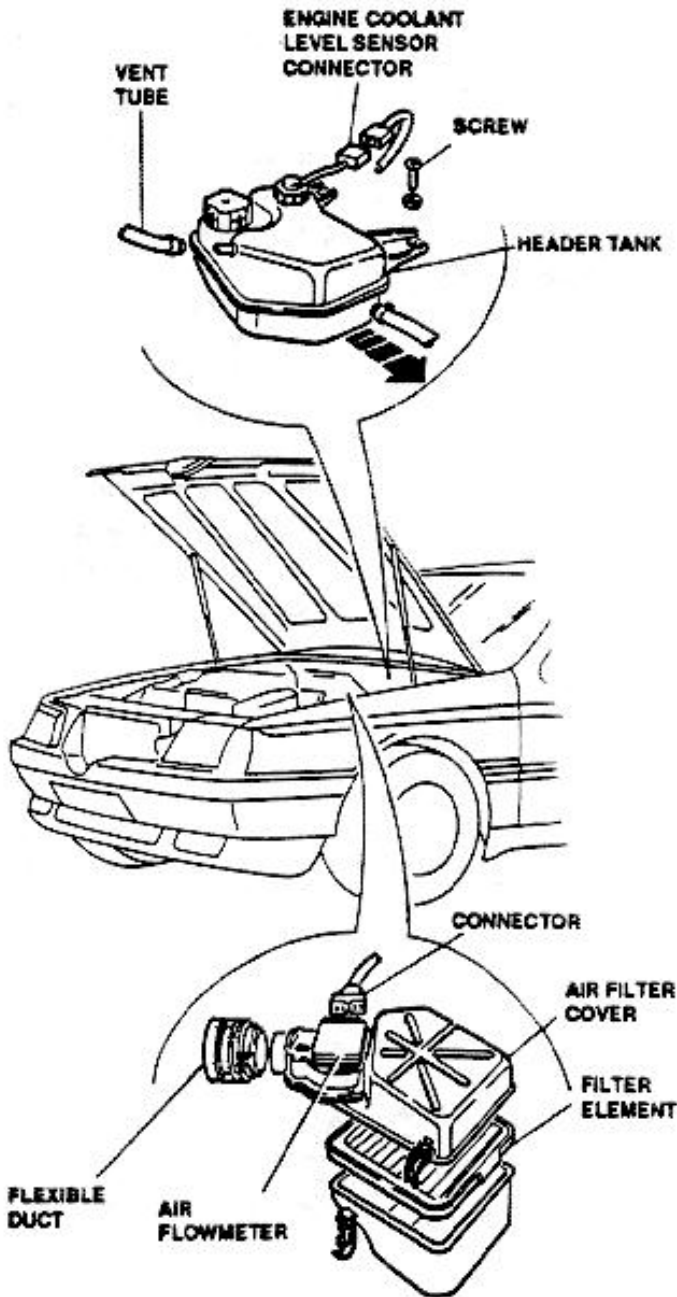
1. Disconnect negative (-) lead from battery.
2. Remove cover from accessory compartment.
3. Remove seal.
4. Discharge FREON 12 from system (see "COOLING FLUID DISCHARGE" procedure).



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.

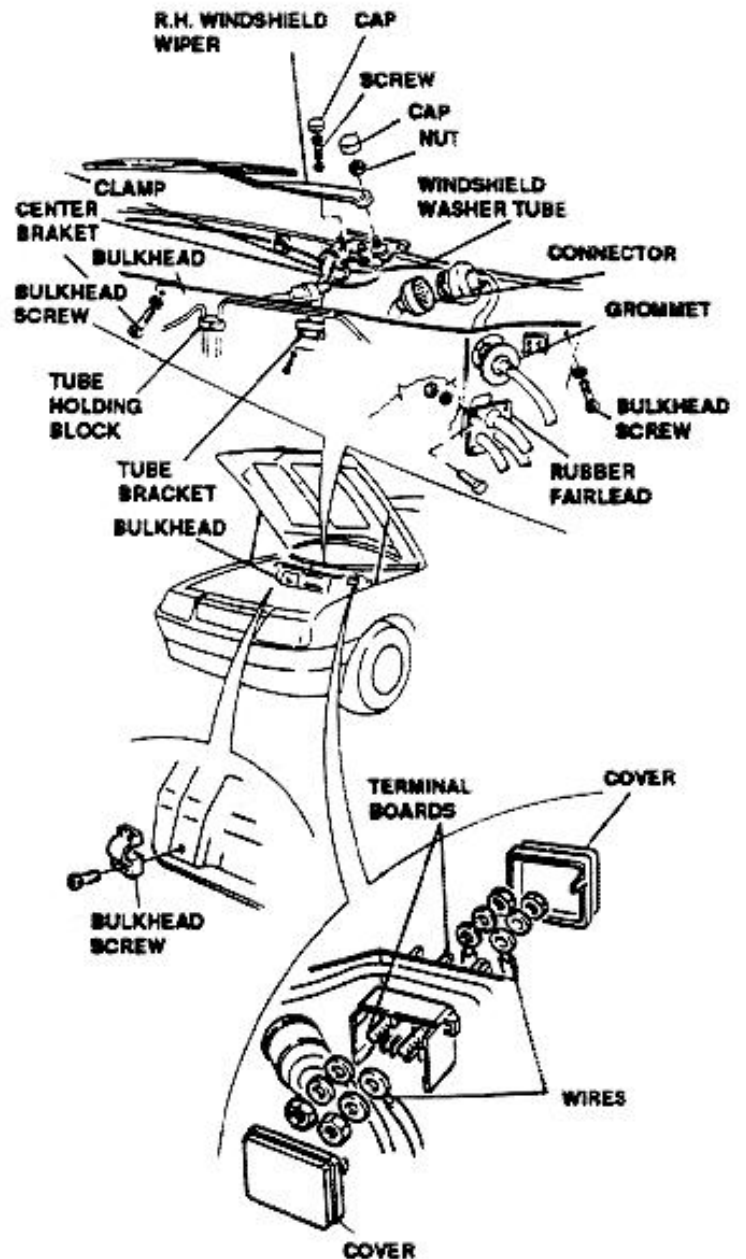


- 10. Remove securing screws and move away the engine coolant expansion reservoir.



- 11. Remove terminal board covers.
- 12. Remove securing nuts and disconnect wirings from bulkhead.
- 13. Disconnect electrical connectors, remove grommet from bulkhead and withdraw wiring and connector through hole.
- 14. Remove securing bolts and move forward the rubber fairlead.
- 15. Remove screws and washer securing tube bracket to bulkhead; disconnect tubes from tube holding block.

- 16. Remove cap, remove R.H. windshield wiper nut and remove windshield wiper arm.
- 17. Disconnect windshield washer tube from center bracket.
- 18. Remove cap and remove screw and washer securing center bracket upper side.
- 19. Remove center bracket.
- 20. Remove securing screws then remove bulkhead.







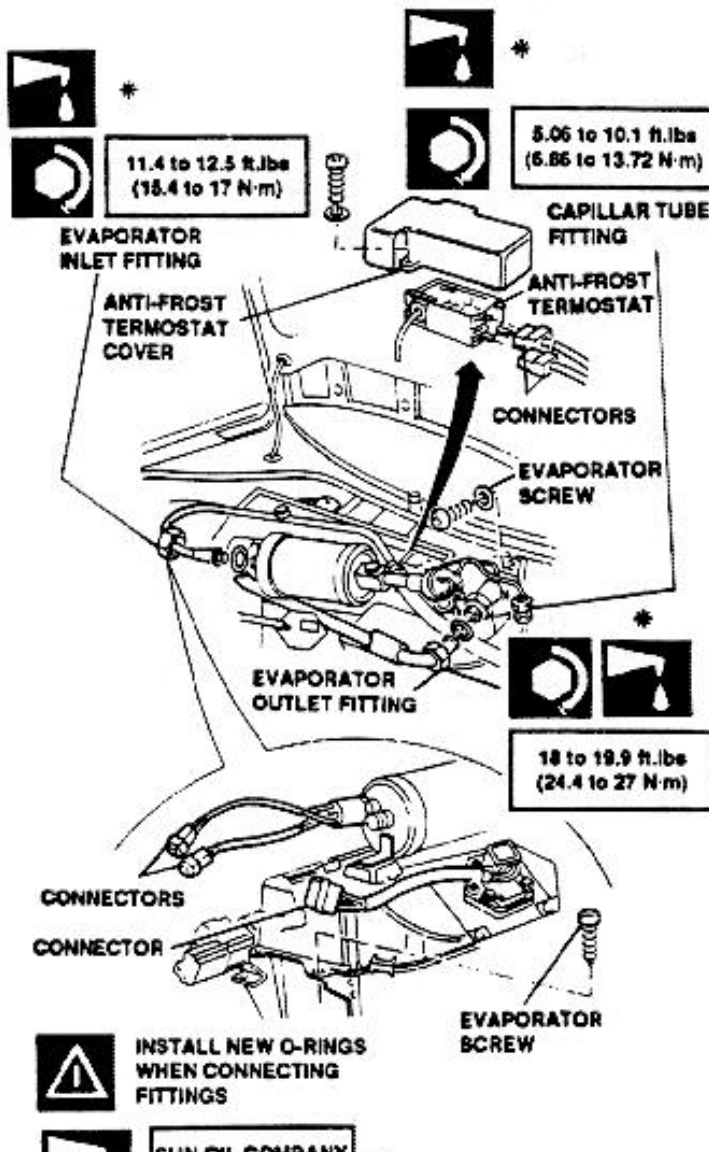


21. Remove securing screws then remove anti-frost thermostat cover.
22. Disconnect air conditioning wiring.



**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.



**INSTALLATION**



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

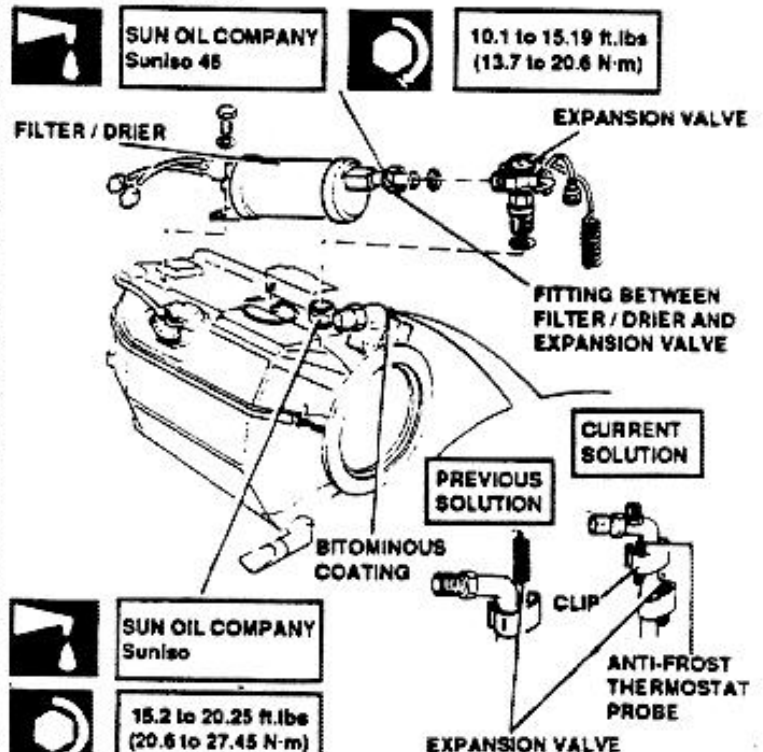
Proceed in reverse order for installation; lubricate as indicated and torque fittings to prescribed torque values; replace O-rings on all fittings with new items. Charge the system with coolant fluid after installation.

**DISASSEMBLY**



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

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





SUNISO 48

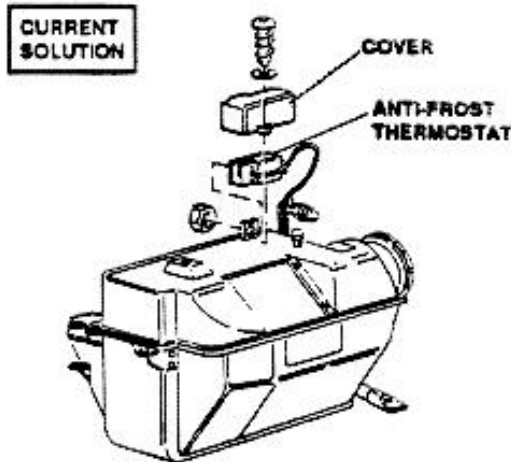
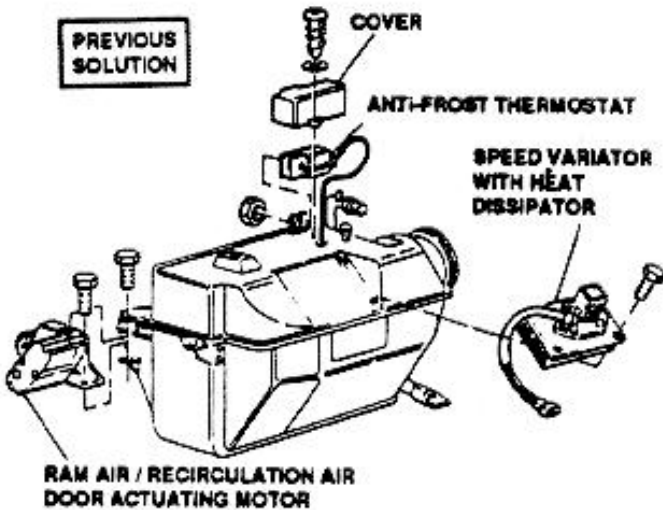


PROBE

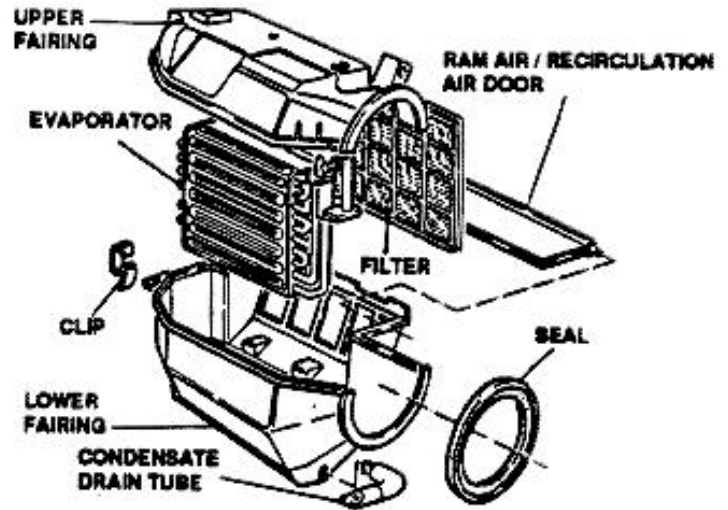
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80 - 17

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



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



**ASSEMBLY**



**CAUTION:**

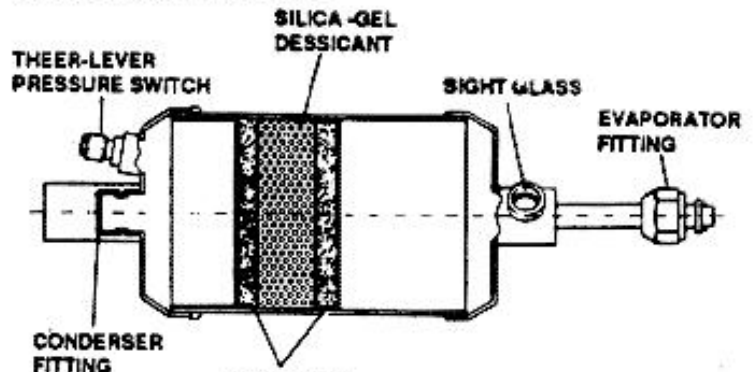
Hex fitting should be held with suitable wrench to avoid excessive stress on weldings.

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.

**FILTER/DRIER**

**DESCRIPTION**

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



ROCK-WOOL  
FILTER LAYER

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80 - 18

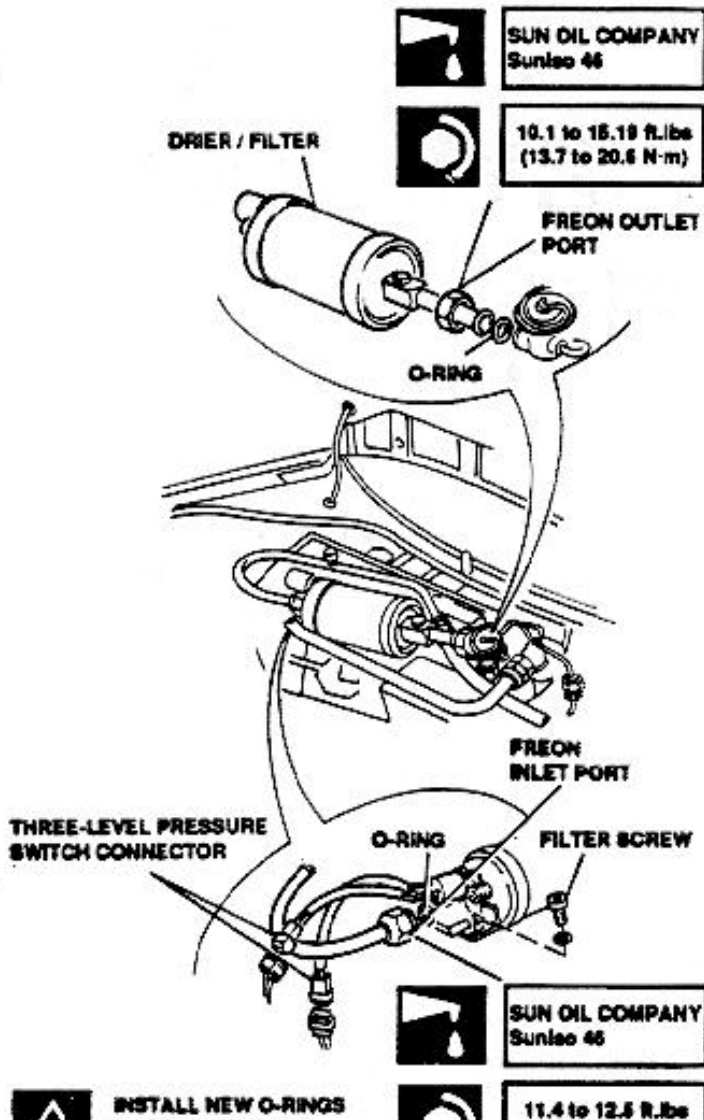
## REMOVAL

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

**CAUTION:**

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

5. Unscrew fitting of FREON Inlet tube.
6. Remove securing screw.
7. Unscrew fitting of FREON outlet tube.
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 of excessive humidity, which can damage it and reduce useful life. If filter/drier cannot be installed for any reason within 15 minutes from removal, seal filter/drier inlet and outlet ports and related system tubes with suitable plugs.

If filter/drier remains disconnected without plugs, it should be replaced.

When installing a new filter/drier, retain plugs for re-use during future maintenance 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 humidity.

Probable cause is a prolonged loss of cooling fluid due to system leakage



**WHEN INSTALLING  
FITTINGS**



**(15.4 to 17 N·m)**

See to system leakage.

- Cooling fluid leaks from sight glass or inlet and outlet fittings.
- Filter clogged; the above trouble can be detected by checking if any temperature difference exists between inlet and outlet filter/drier tubes.

**NOTE:** Replace filter/drier every two cooling fluid rechargings.

## CONDENSER

### DESCRIPTION

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

### REMOVAL

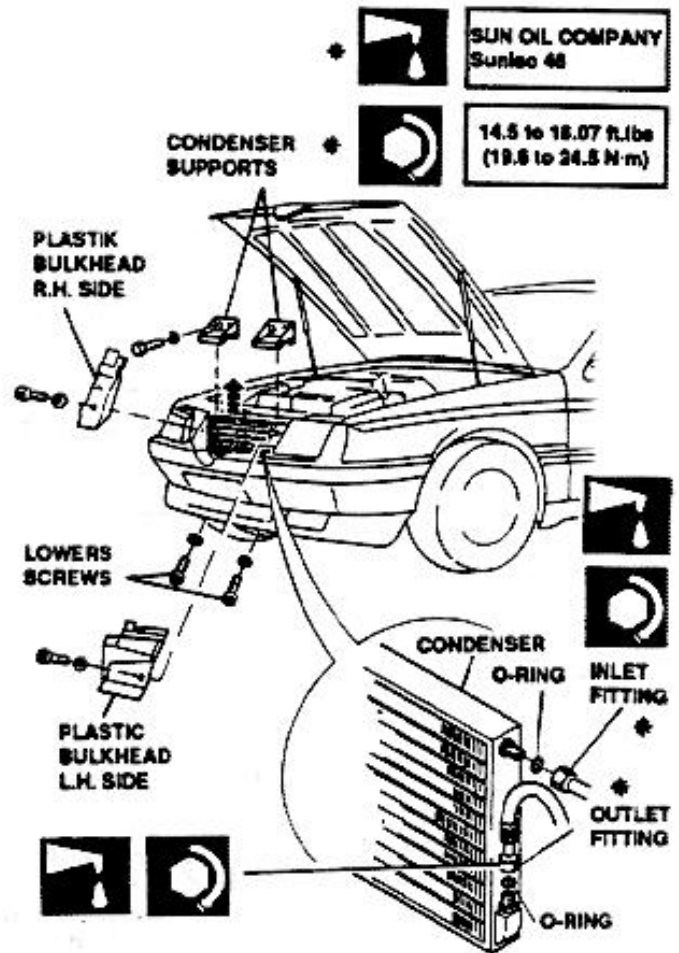
1. Disconnect negative (-) lead from battery.
2. Discharge FREON from system (see "COOLING FLUID DISCHARGE" procedure).
3. Remove securing screws and remove plastic bulkheads.



**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.



INSTALL NEW O-RINGS WHEN INSTALLING FITTINGS

### 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-levels pressure switch, the condenser does not operate correctly.





Carry-out the following procedure, proceeding in the listed order:

- a. Check three-levels 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.  
Straighten any bent or deformed pin 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.

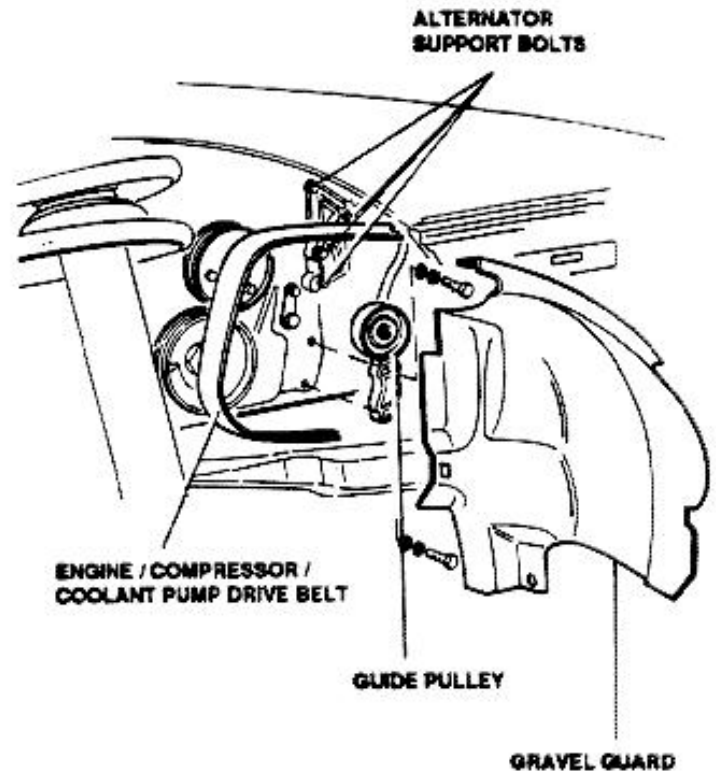
The compressor drive pulley is connected to shaft by a solenoid coupling, which is activated by electronic control unit.

The compressor gearings are lubricated by a special-to-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

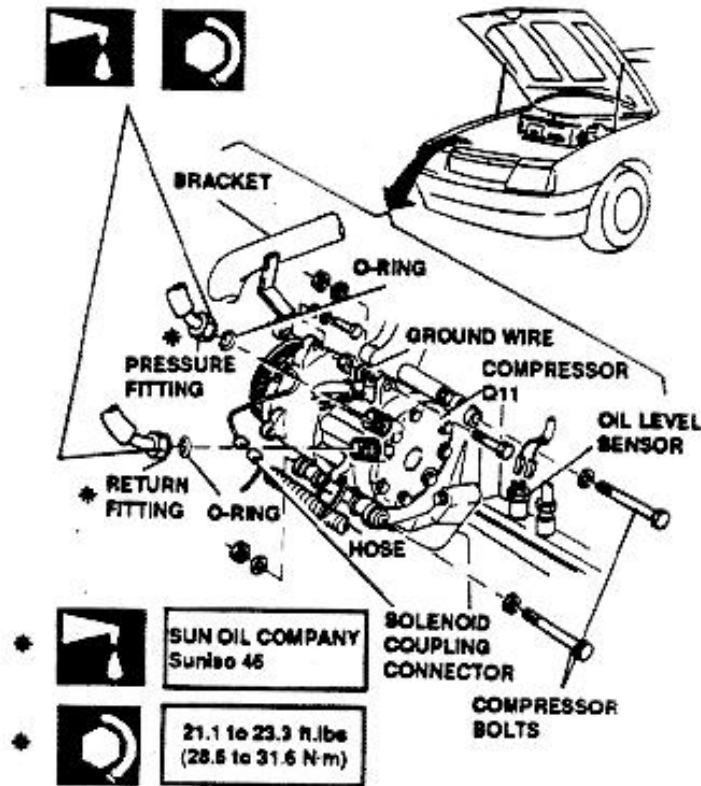
1. Disconnect negative (-) lead from battery.
2. Discharge FREON from system (see "COOLING FLUID DISCHARGE" procedure).
3. Place vehicle on lift platform.
4. Lift front R.H. side of vehicle

5. Remove front R.H. wheel and gravel guard.
6. Remove securing bolts and remove guide pulley.
7. Remove engine/compressor/coolant pump drive belt.
8. Unscrew three bolts securing alternator bracket.
9. Rotate alternator downward to loosen drive belt.



10. Remove bolt securing tube bracket to compressor.
11. Disconnect "Faston" connectors from oil level sensor. Record connectors color for reinstallation.
12. Remove bolt securing ground wire.
13. Disconnect wiring from solenoid-coupling.
14. Remove clamp then disconnect hose from compressor flange.
15. Disconnect pressure and return fittings.
16. Remove two bolts then remove compressor





**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 change, 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 evaporator, in order to obtain the complete fluid evaporation.

**REMOVAL**

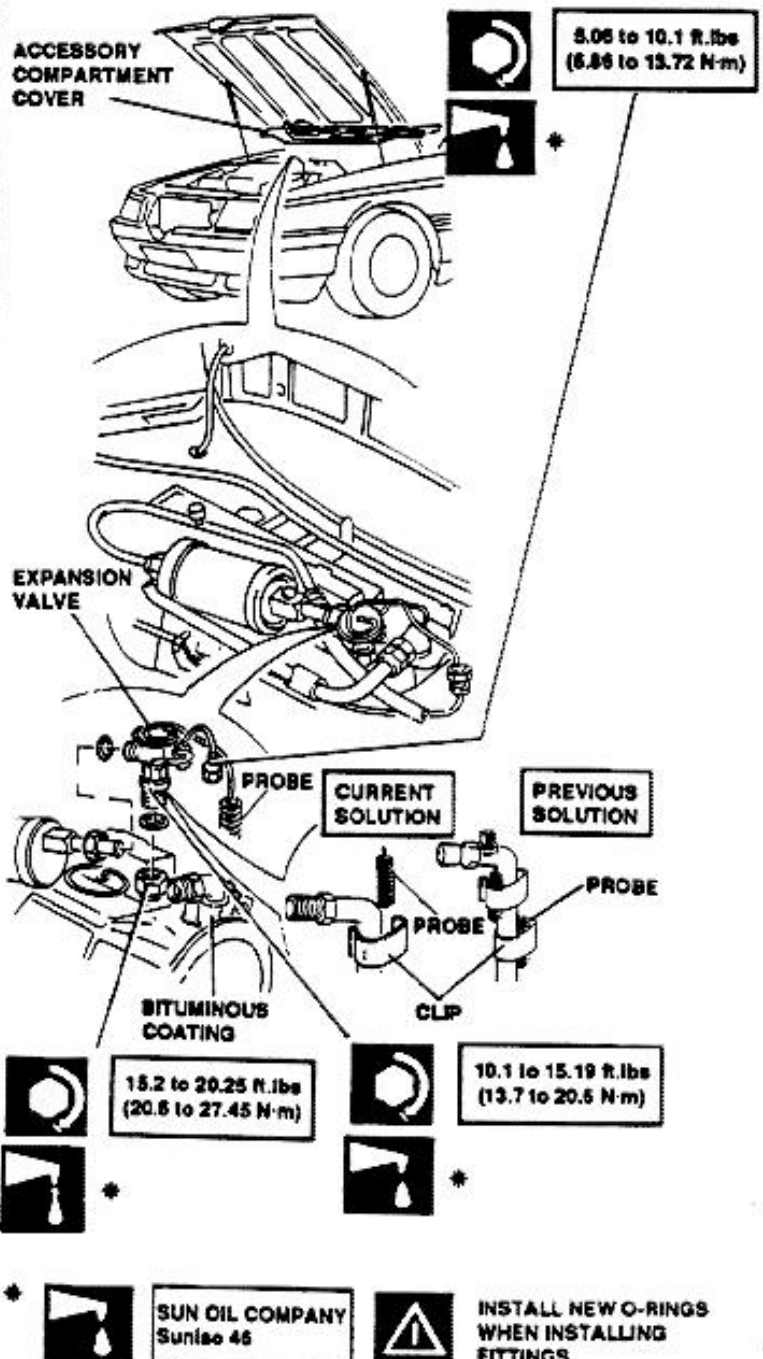
1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Discharge FREON from system as per applicable procedure.

4. Move away the bituminous coating.
5. Disengage clip and remove probe.



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

6. Unscrew fittings and remove expansion valve.



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80 - 22

## 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:

- Compressor pulley solenoid coupling circuit cut-off: pressure lower than 200 kPa (29 psi) or higher than 2700 kPa (391.5 psi).
- Condenser electric fan switching-on: pressure higher than 1500 kPa (217.5 psi).
- Condenser electric fan switching-off: pressure lower than 1100 kPa (159.5 psi).

### REMOVAL

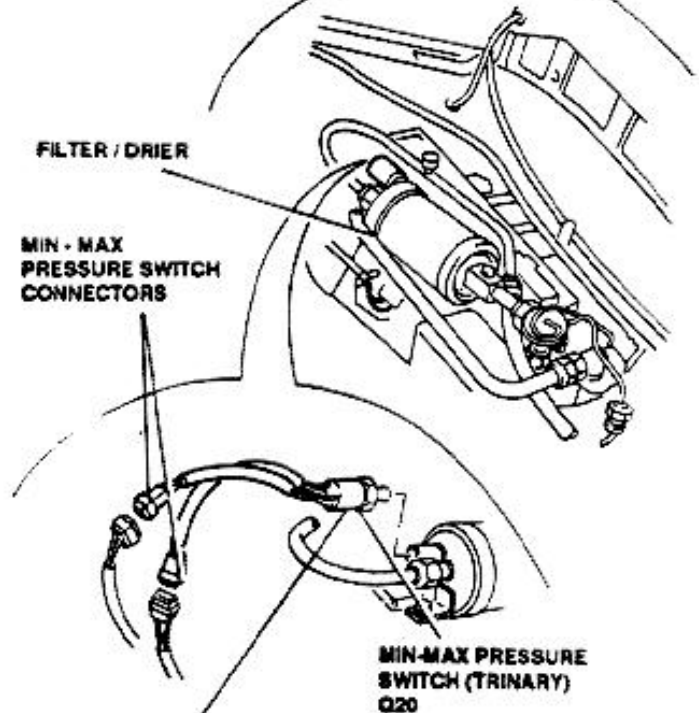
1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment cover.
3. Discharge FREON from system (see "COOLING FLUID DISCHARGE" procedure).
4. Disconnect electrical connectors from min-max pressure switch.
5. Unscrew pressure switch and remove it from filter/drier.

ACCESSORY  
COMPARTMENT  
COVER



FILTER / DRIER

MIN - MAX  
PRESSURE SWITCH  
CONNECTORS



MIN-MAX PRESSURE  
SWITCH (TRINARY)  
Q20



SUN OIL COMPANY  
Suniso 46



14.8 to 16.2 ft.lbs  
(20 to 22 N-m)

## INSTALLATION

Proceed in reverse order, then charge system with cooling fluid.

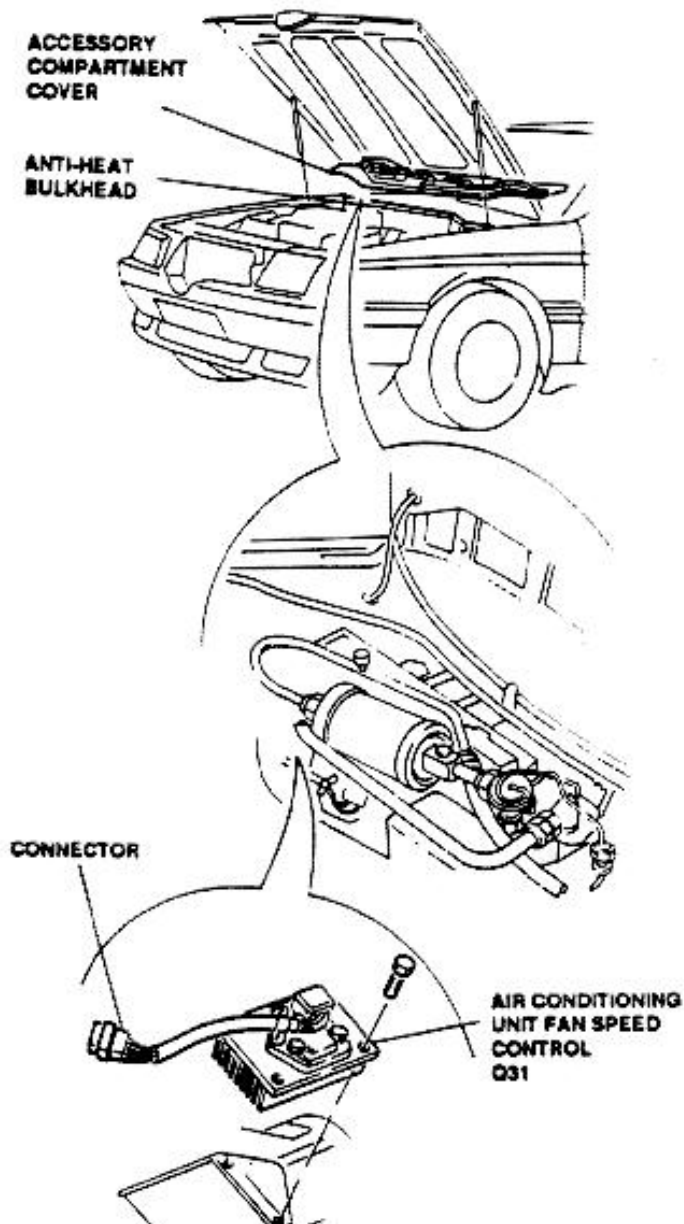
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80 - 23

# AIR CONDITIONING UNIT FAN SPEED CONTROL

## REMOVAL

1. Disconnect negative (-) lead from battery.
2. Removal 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.



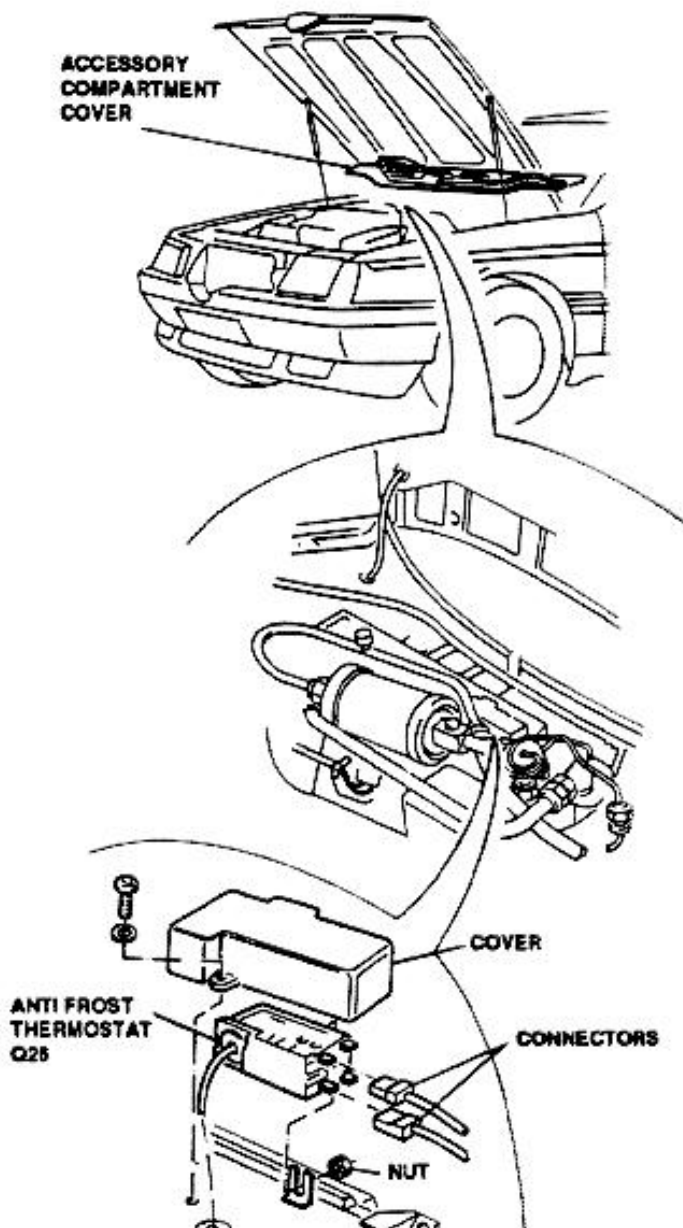
# INSTALLATION

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 by withdrawing probe from evaporator unit.







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80 - 24



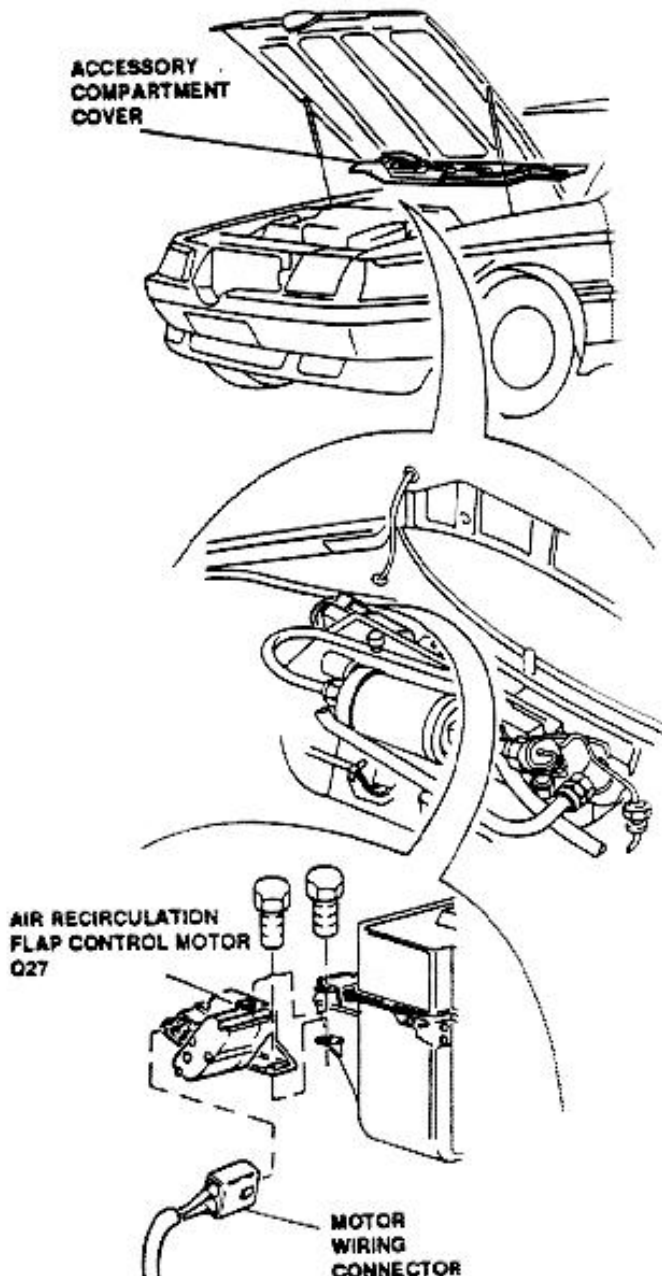
### INSTALLATION

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.



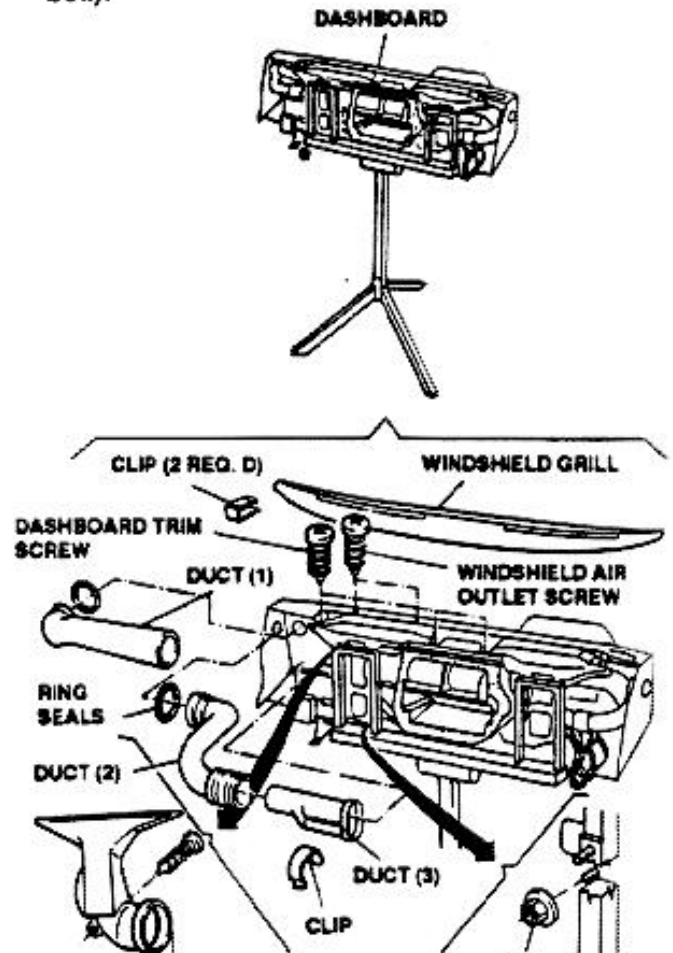
### INSTALLATION

Proceed in reverse order

### MIXING AND DISTRIBUTION DOOR MOTORS

#### REMOVAL

1. Remove complete dashboard from vehicle (see Group 66) and place it on a suitable swinging workbench.
2. Release three clips and remove windshield grill.
3. Remove three of four screws securing dashboard trim to frame.
4. Remove securing nut and slightly separate dashboard trim from frame.
5. Remove ducts (1) and (2) complete of 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 and remove it (at installation replace with a hex-head bolt).





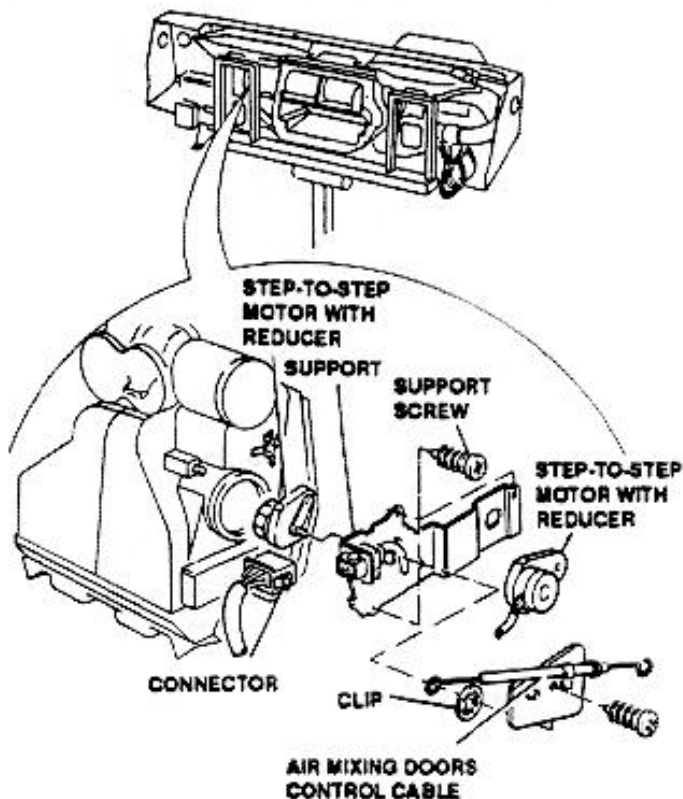
AIR OUTLET

NUT

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80 - 25

9. Disconnect wiring by gaining access through dash-board 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.



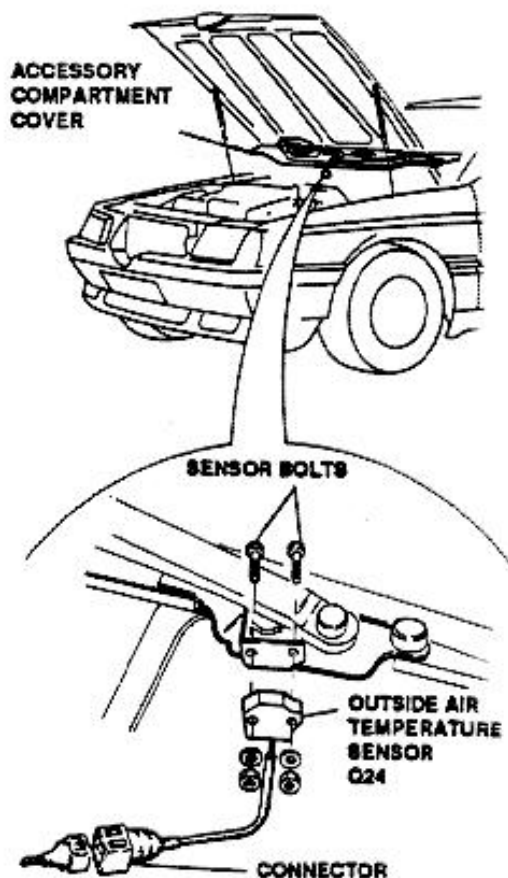
**INSTALLATION**

Proceed in reverse order.

**OUTSIDE AIR TEMPERATURE SENSOR**

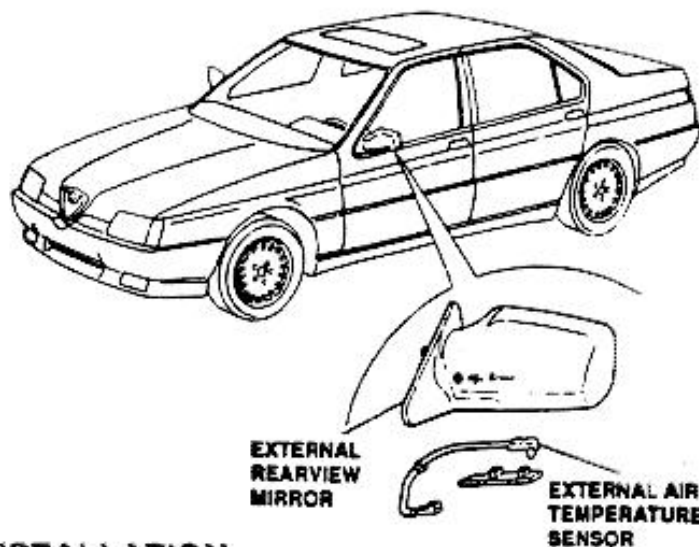
**REMOVAL (PREVIOUS SOLUTION)**

1. Disconnect negative (-) lead from battery.
2. Remove accessory compartment door.
3. Disconnect wiring.
4. Remove two outside air temperature sensor bolts and remove sensor.



**REMOVAL (CURRENT SOLUTION)**

1. Remove the drive side external rearview mirror.
2. Remove the external air temperature sensor from the external rearview mirror.



**INSTALLATION**

Proceed in reverse order.

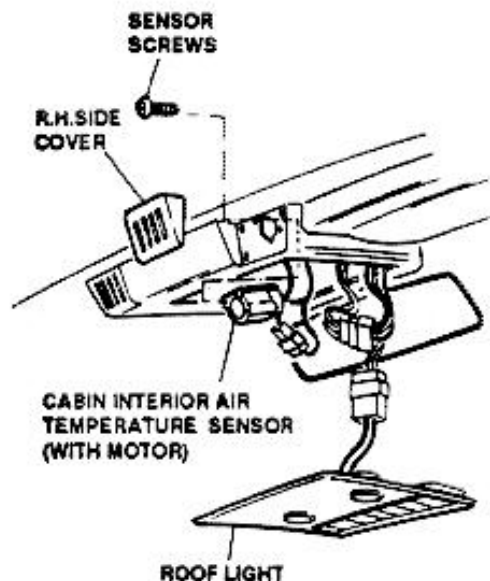




## CABIN INTERIOR TEMPERATURE SENSOR (WITH MOTOR)

### REMOVAL

1. Disconnect negative (-) lead from battery.
2. Remove roof light R.H. side cover.
3. Using a screwdriver as a lever, withdraw roof light; leave it dangling connected to wiring.
4. Remove two sensor screws, disconnect wiring and remove sensor.



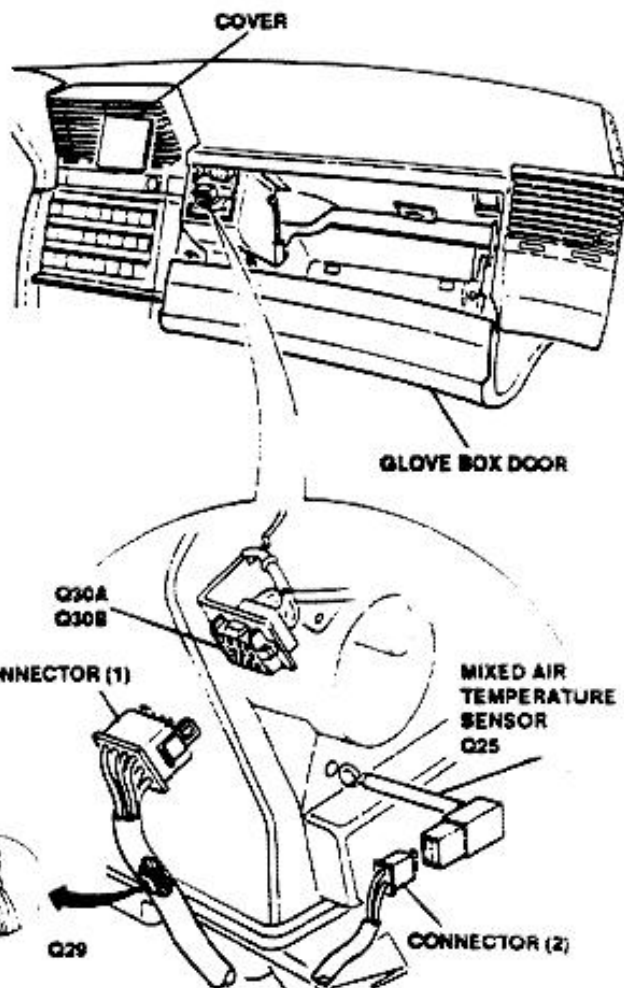
### INSTALLATION

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

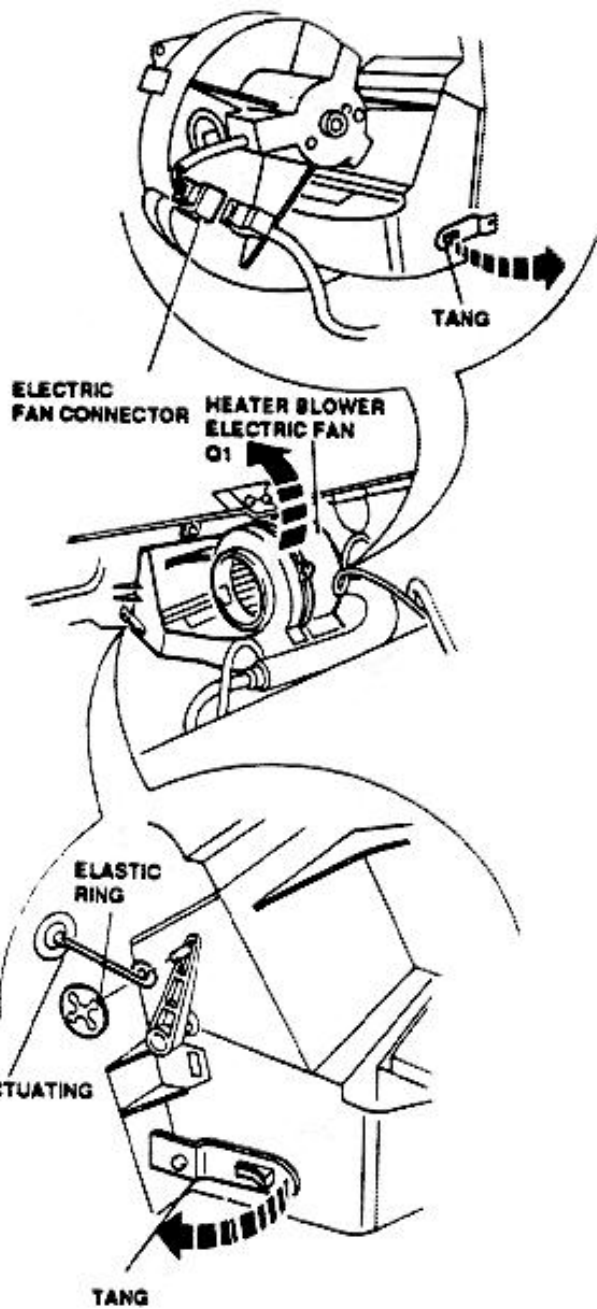
Proceed in reverse order.

## HEATER BLOWER ELECTRIC FAN

### REMOVAL

1. Remove evaporator unit.
2. Disconnect electric fan connector.
3. Remove elastic ring and disconnect door actuating cable.
4. Disconnect two securing tangs.
5. Remove complete electric fan by rotating it upwards.





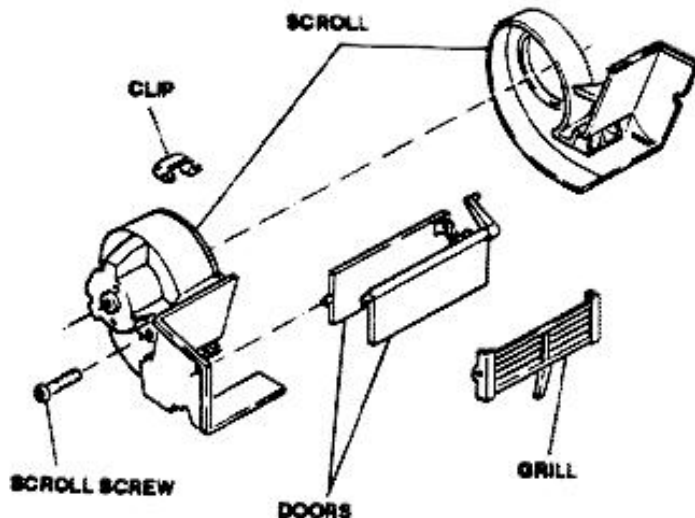
**INSTALLATION**

Proceed in reverse order.

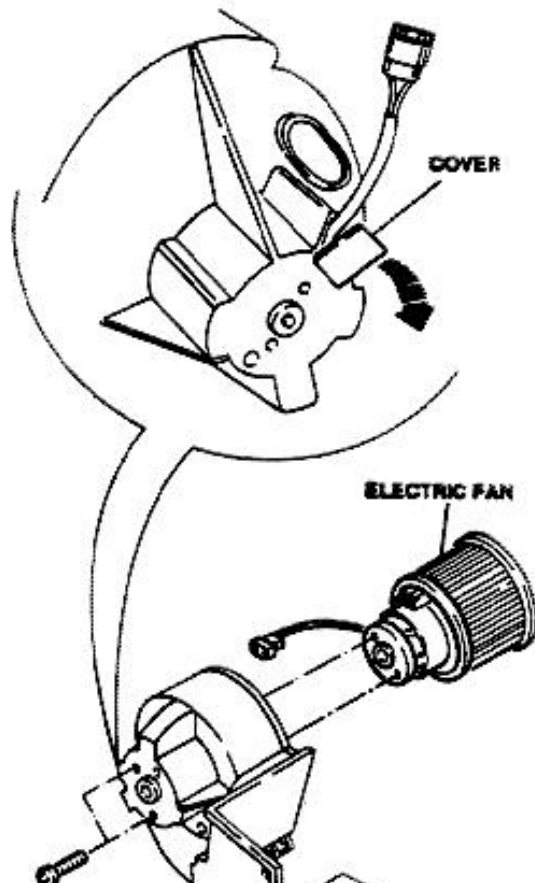
**DISASSEMBLY**

1. Disengage scroll securing clips.
2. Remove scroll securing screw.

4. Separate two half-scroll.
5. Remove doors.



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





**3. Remove grill (restrained).**

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**80 - 28**



### REASSEMBLY

Proceed in reverse order.

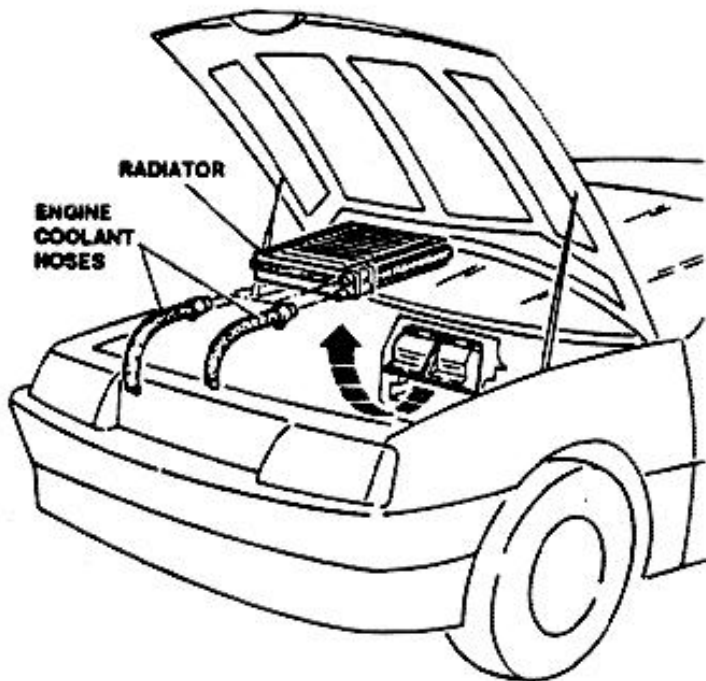
### HEATING RADIATOR

#### 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.



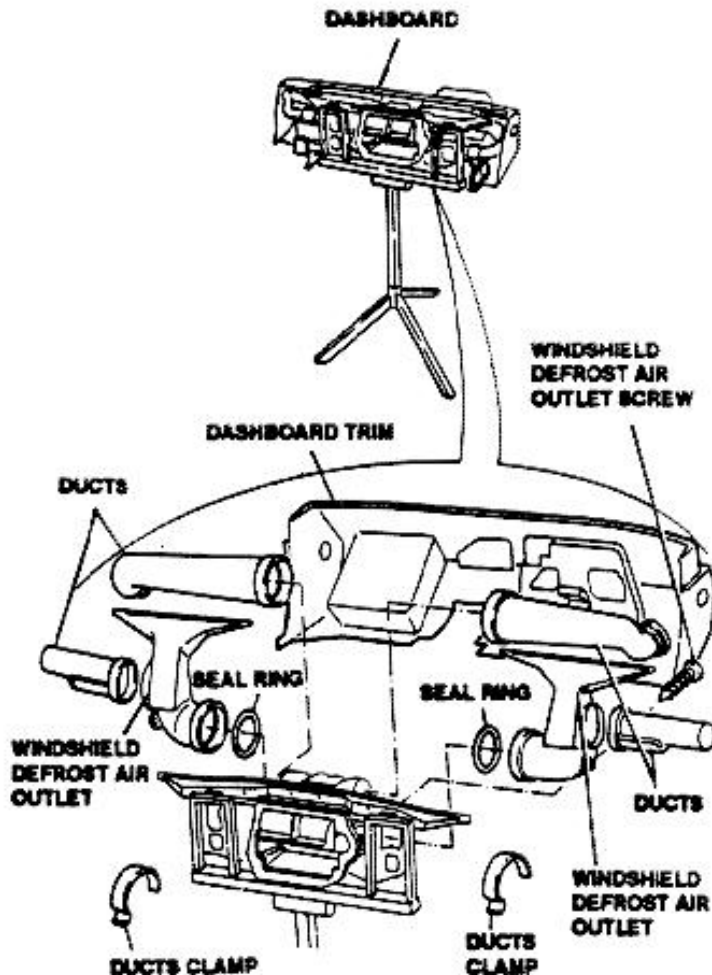
#### INSTALLATION

Proceed in reverse order. Refill engine cooling system (see Group 00).

### HEATING UNIT

#### REMOVAL

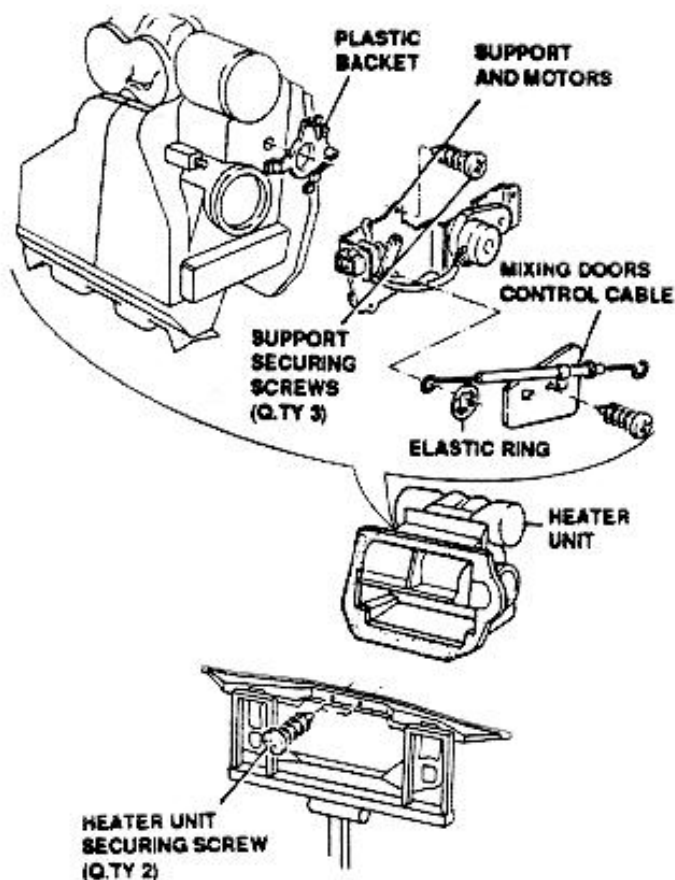
1. Remove complete dashboard from vehicle (see Group 66) and place it on a suitable workbench.
2. Remove dashboard trim from frame (see Group 66).
3. Remove duct clamps.
4. Remove ducts.
5. Remove two windshield defrost air outlets securing screws.
6. Remove windshield defrost air outlets and retain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



7. Remove two screws securing heating unit to the frame.



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.

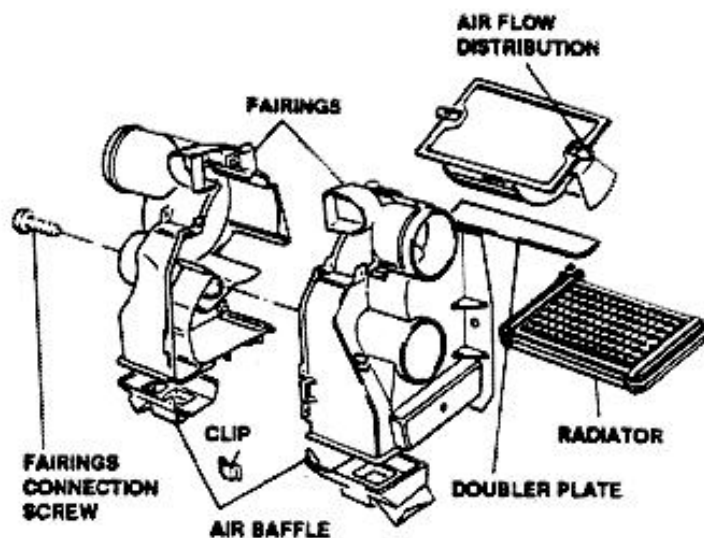


## INSTALLATION

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 and surfaces.

## INSPECTIONS AND CHECKS

### CONTROLS OPERATION CHECK

To check controls operation, start engine and run it at idle speed.

Perform then the following operations.

### SYSTEM SHUT-OFF

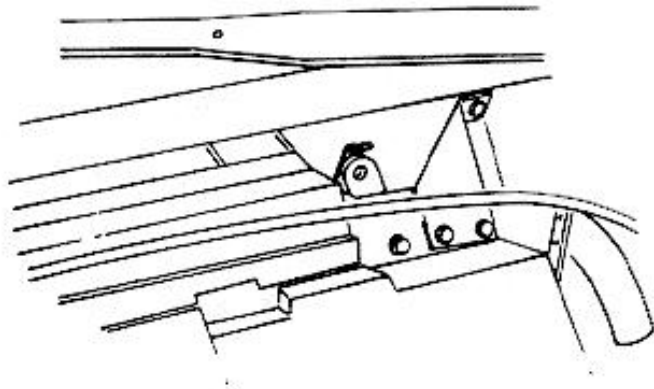
Depress OFF pushbutton and check that related LED illuminates. All other LEDs shall remain extinguished. Check that "Outside Temperature" display shows the ambient temperature and "Selected Temperature" display continues to indicate the preset temperature. Check that system is excluded, fan is non-operating, 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 rotated clockwise).

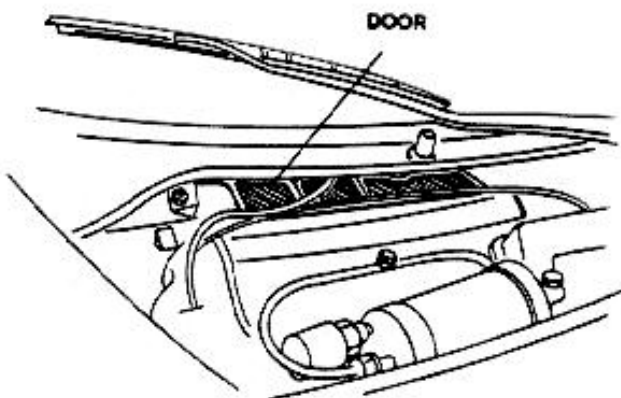
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80 - 30

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The air intake door position can be checked looking by engine compartment. Air intake door should be positioned as shown in the following figure, and should prevent outside air from entering into passenger compartment.



### SYSTEM RE-ACTIVATION

With the system de-activated (OFF pushbutton depressed), depress again the OFF pushbutton: check that related LED extinguishes and LED related to AUTO pushbutton illuminates; check that system operates in the same conditions as before shut-off.

Depress again OFF pushbutton to shut-off system then depress AUTO pushbutton: check that related LEDs extinguish then illuminate, and system operates in automatic mode.

### PASSENGER COMPARTMENT TEMPERATURE SETTING

Set temperature setting control to °C.

Check that at each impulse on ▲ pushbutton, the displayed temperature increases by 1°C, from LO (18°C) to HI (32°C).


Check that at each impulse on ▼ pushbutton, the displayed temperature decreases by 1°C, from HI (32°C) to LO (18°C).

Set temperature setting control to °F.

Check that at each impulse on ▲ pushbutton, the displayed temperature increases by 2°F, from LO (64°F) to HI (92°F).

Check that at each impulse on ▼ pushbutton, the displayed temperature decreases by 2°F, from HI (92°F) to LO (64°F).

### ELECTRIC FAN SPEED VARIATION

Depress  pushbutton and check that related led illuminates.

Depress, in sequence, the electric fan control switches (1, 2, 3 and 4) and check:


- Visually, that related LEDs illuminate then extinguish.
- By sense, that flow through center and side air outlets increases.

Depress, in sequence, electric fan control switches (4, 3, 2 and 1) and check:

- Visually, that related LEDs illuminate then extinguish.
- By sense, that flow through center and side air outlets decreases.

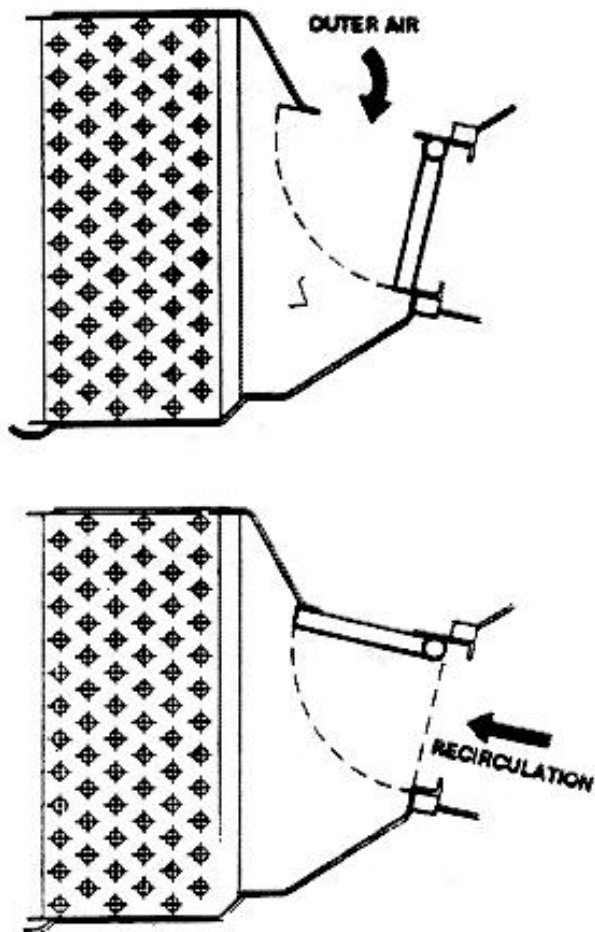
### RECIRCULATION


Check that ram air/recirculation air door in engine compartment is positioned upwards (outside air inlet).

Depress  pushbutton and check that related LED illuminates.

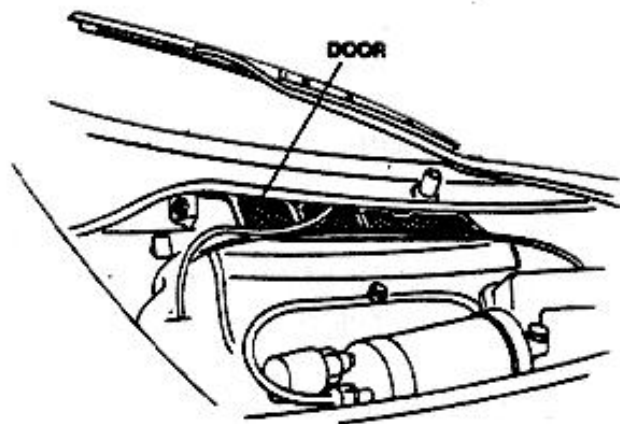
Check that ram air (recirculation air door is positioned as shown in figure to prevent outside air from entering





Depress again  pushbutton and check that related LED extinguishes.

Check that ram air/recirculation air (indicated by arrow) is positioned as shown in figure to allow outside air to enter.



### SYSTEM SHUT-OFF





Check that LED of AUTO pushbutton is illuminated.  
Select temperature to maximum cold.  
Check that compressor is operating.  
Depress ECON pushbutton and check that:



- The related LED is illuminated.
- The LED of AUTO pushbutton is extinguished.
- The compressor shuts-down.

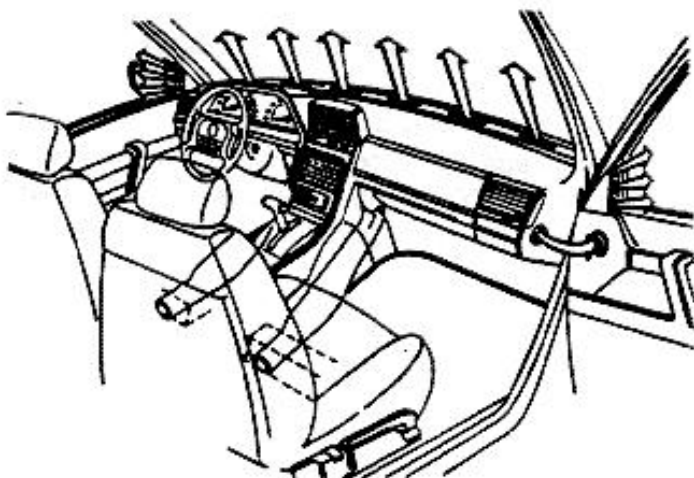
Depress AUTO pushbutton and check that:

- The related LED is illuminated.
- The LED of ECON pushbutton is extinguished.
- The compressor operates normally.

### CONTROL UNIT OPERATION AND AIR FLOW DISTRIBUTION

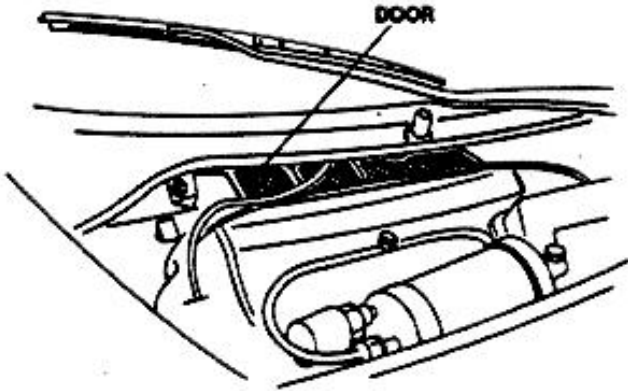
Depress in sequence the three pushbuttons ,  and  and check that related LEDs illuminate (when third pushbutton is depressed, the related LED should illuminate, and LED related to  should extinguish).





Check that air flows through windshield and side windows air outlets (shown in figure) and no air flows through other air outlets. The air intake door should be downwards, to allow outside air to enter into passenger compartment. Depress in sequence AUTO, ,  and check that above described functions operate normally, and check electric fan runs to set speed (2nd speed).

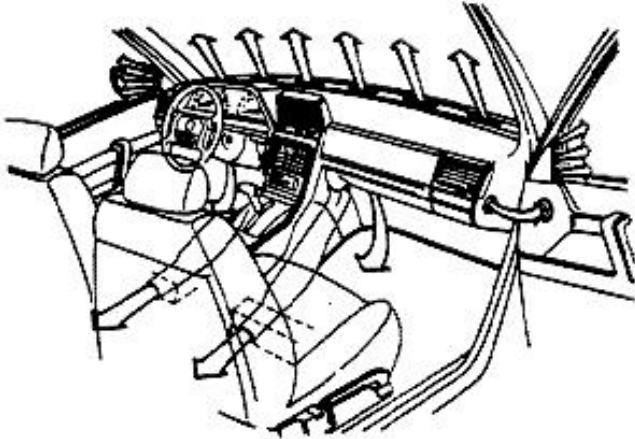








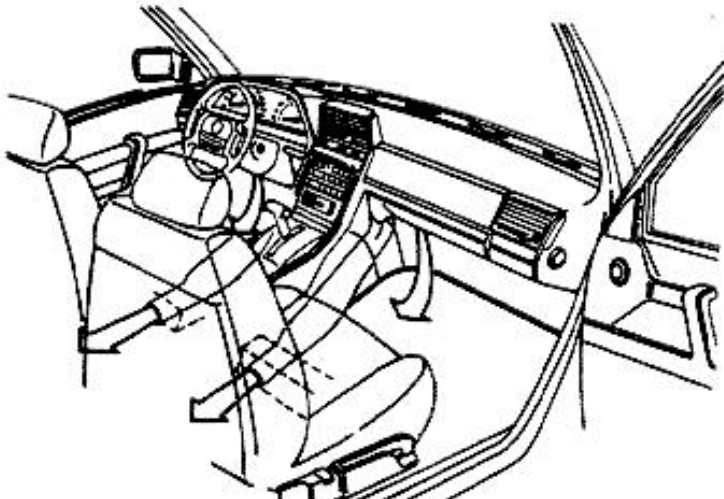








Depress in sequence the three pushbuttons  ,  , and 4  and check that related LEDs illuminate (when second pushbutton is depressed the related LED should illuminate, and LED related to  should extinguish). Check that air flows through windshield, side windows, lower and rear seats air outlets.

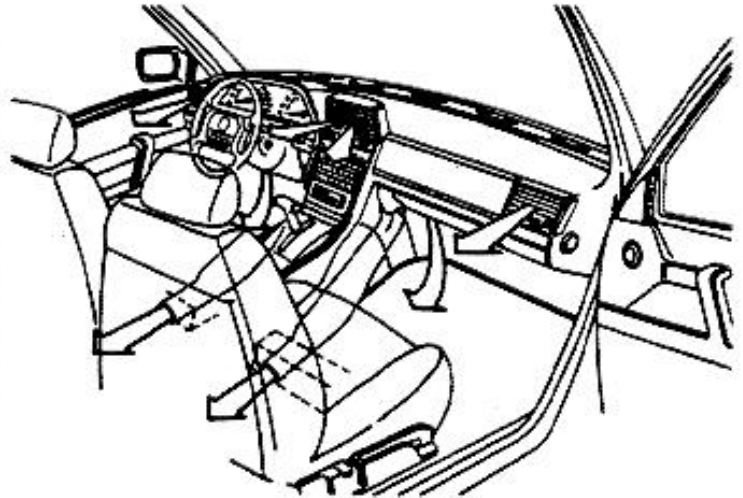




Depress in sequence the three pushbuttons  ,  and 4  , and check related LEDs illuminate (when second pushbutton is depressed the related LED should illuminate, and LED related to  pushbutton should extinguish). Check that air flows through lower and rear seats air outlets.



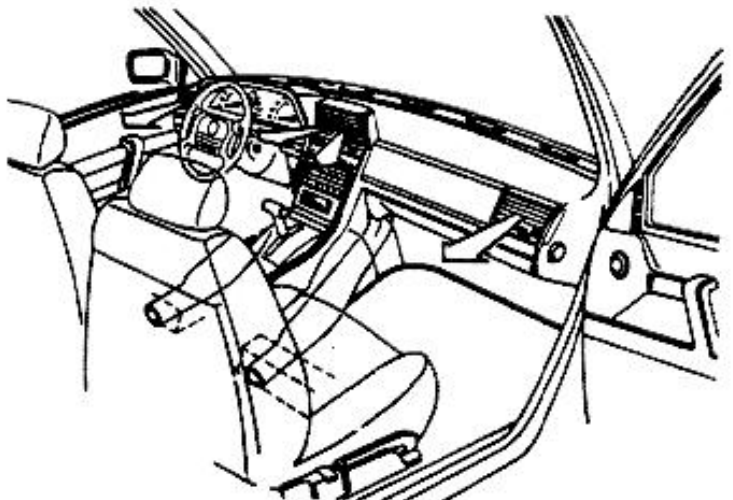
Depress in sequence the three pushbuttons  ,  and 4  , and check related LEDs illuminate (when second pushbutton is depressed the related LED should illuminate, and LED related to  pushbutton should extinguish).

Check that air flows through lower, rear seats, center and side air outlets.




Depress in sequence the two pushbuttons  and 4  and check that related LEDs illuminate.

Check that air flows through center and side air outlets, and no air flows through other air outlets.




**REAR WINDOW HEATING**

Depress  pushbutton and check that related LED illuminates and, after few minutes, check the rear window heating (check by touch).

Check that heating operates for 20 minutes and then automatically shuts-off.




**SELF-DIAGNOSIS**

Simultaneously depress AUTO and  pushbuttons. All dashes illuminate on selected temperature display ( 1888 ).

After self-diagnosis procedure, if trouble (s) is present the display will show a number, which represents the number of trouble.

All LEDs on control panel will flash.

Depress  pushbuttons so many times as trouble number. Each time the pushbuttons is depressed, the display will show either a number followed by a letter or two letters.

The numbers, or the first letter, identify the defective component, while the second letter indicates the type of trouble.

To restore system to normal operation, depress again  or depress AUTO pushbutton.

**FAILURE CODES TABLE**

FAILURE CODE	FAILED COMPONENT	TYPE OF FAILURE
1U	PASSENGER COMPARTMENT SENSOR	OPEN CIRCUIT
1C	PASSENGER COMPARTMENT AIR TEMPERATURE SENSOR	SHORTED
2U	OUTSIDE AIR TEMPERATURE SENSOR	OPEN CIRCUIT
2C	OUTSIDE AIR TEMPERATURE SENSOR	SHORTED
3U	MIXED AIR TEMPERATURE SENSOR	OPEN CIRCUIT
3C	MIXED AIR TEMPERATURE SENSOR	SHORTED
5U	AIR MIXING DOOR MOTOR	OPEN CIRCUIT
5C	AIR MIXING DOOR MOTOR	SHORTED
6U	AIR DISTRIBUTOR DOOR MOTOR	OPEN CIRCUIT
6C	AIR DISTRIBUTOR DOOR MOTOR	SHORTED
7U	RECIRCULATION DOOR MOTOR	OPEN CIRCUIT
7C	RECIRCULATION DOOR MOTOR	SHORTED
8U	SPEED REGULATOR/ELECTRIC FAN	OPEN CIRCUIT OR SHORT CIRCUIT BETWEEN SPEED REGULATOR AND ELECTRIC FAN
8C	SPEED REGULATOR	SHORT CIRCUIT BETWEEN ELECTRONIC CONTROL UNIT AND SPEED REGULATOR, OR SPEED REGULATOR UNSERVICEABLE
EU	ELECTRONIC CONTROL UNIT	





## COOLING FLUID DISCHARGE



### WARNINGS:

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

- The FREON 12 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 FREON with skin: at ambient conditions the FREON expands quickly and reaches  $-29.8^{\circ}\text{C}$  ( $-21.7^{\circ}\text{F}$ ). Serious "burns" may occur.
- Protect eyes from contact with cooling fluid: the sudden low temperature may cause serious injuries.

## PROCEDURE

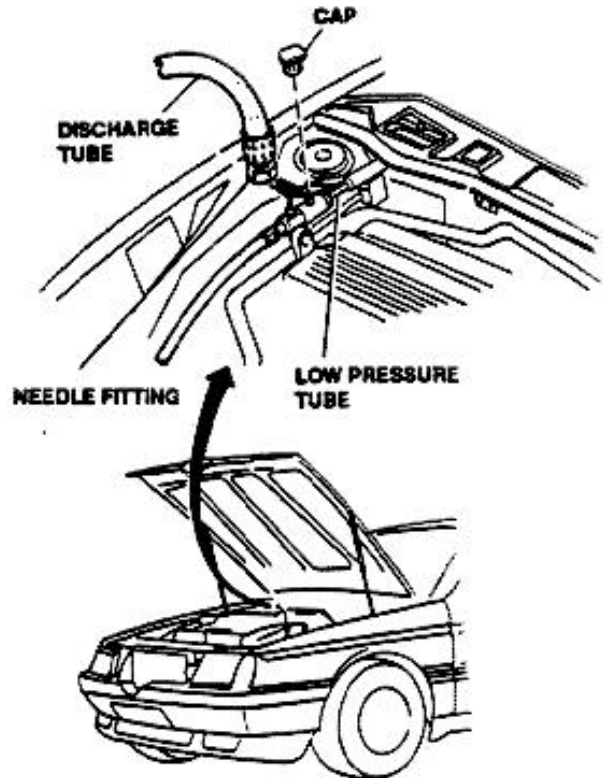
1. Unscrew and remove cap from valve on low pressure line (between evaporator and compressor).



### WARNING:

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

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



## COOLING FLUID CHARGING



### WARNINGS:

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

- The FREON is a non-dangerous fluid for both vehicle and personnel. However, because it is stored under pressure, it can be subject to physical changes which may become harmful if not carefully surveilled. It is necessary to strictly comply with the following precautions.
- The cooling fluid is normally stored in metal bottles: do not expose bottles to sun for prolonged period, since the temperature increase may increase the pressure beyond safety limits.
- During cold season, it may be that transfer of fluid from bottle to charging unit is difficult due to bottle low pressure: in such a case place the bottle for 20 minutes approximately in ambient not warmer than  $35^{\circ}\text{C}$  ( $95^{\circ}\text{F}$ ). Never heat bottle with torch flame. Never leave the charging unit bottle completely full for prolonged time.



**NOTE:** Various types of charging units are available: two types (identified as "Type 1" and "Type 2") are below described. For each type, the related operating instructions are given. The procedure for "Type 1" charging unit is the most complete, because the unit is equipped with a vacuum gauge for checking the system dehydration before charging.

**NOTES:** 1. In the following procedure (related to "Type 1" charging unit), steps 1. thru 9. provide procedure for eliminating all uncondensable gas and the greatest possible quantity of moisture.

The air trapped into the system causes high pressure on compressor delivery line, low performance of the system and oxidation of compressor lubricating oil. The moisture in the system can cause expansion valve malfunctions.

In particular conditions, the moisture can react with cooling fluid thus generating corrosive compounds.

The system dehydration should be performed before charging and after the system has been restored to original conditions, i.e.:

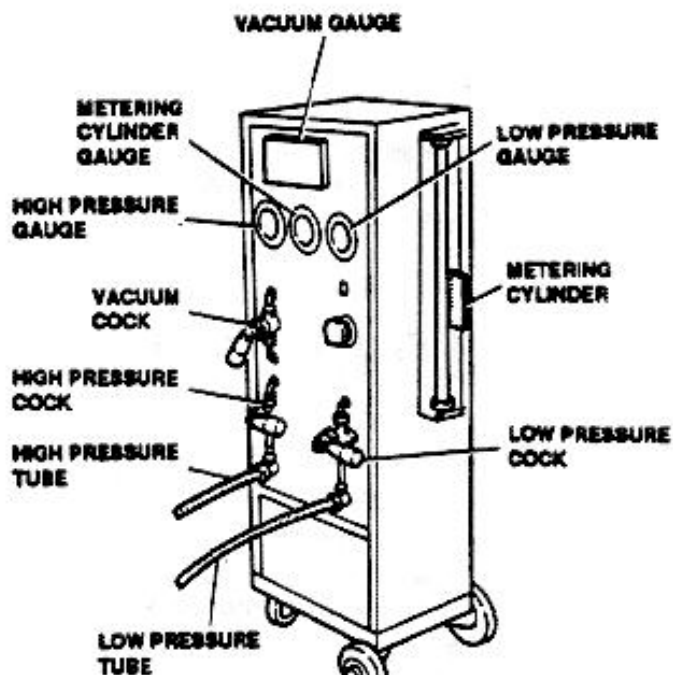
- one or more components have been replaced.
- the fluid has been discharged for compressor oil level check.

2. In the following procedure are also listed the leakage checks.

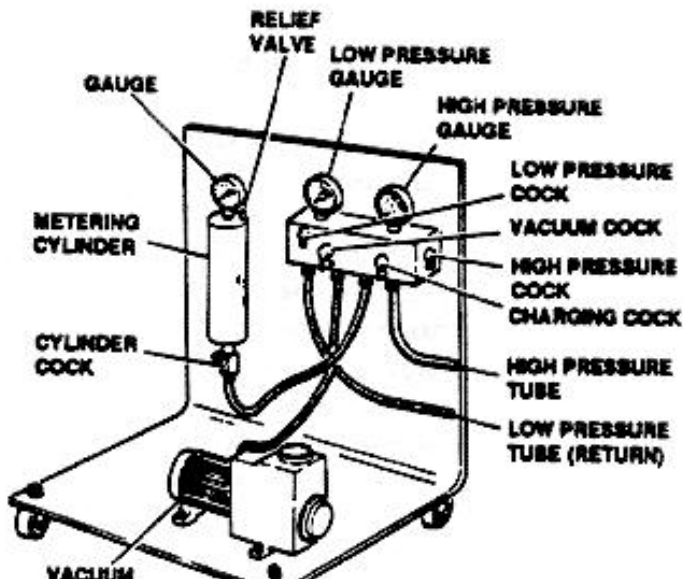
3. The charging procedure requires a suitable charging unit, which should be prepared as per manufacturer instructions.

#### PROCEDURE (charging unit "Type 1").

1. Remove caps from high and low pressure valves.
2. Connect low pressure tube between charging unit cock and valve between evaporator and compressor.
3. Connect high pressure tube between charging unit cock and valve between condenser and filter/drier.



TYPE 1



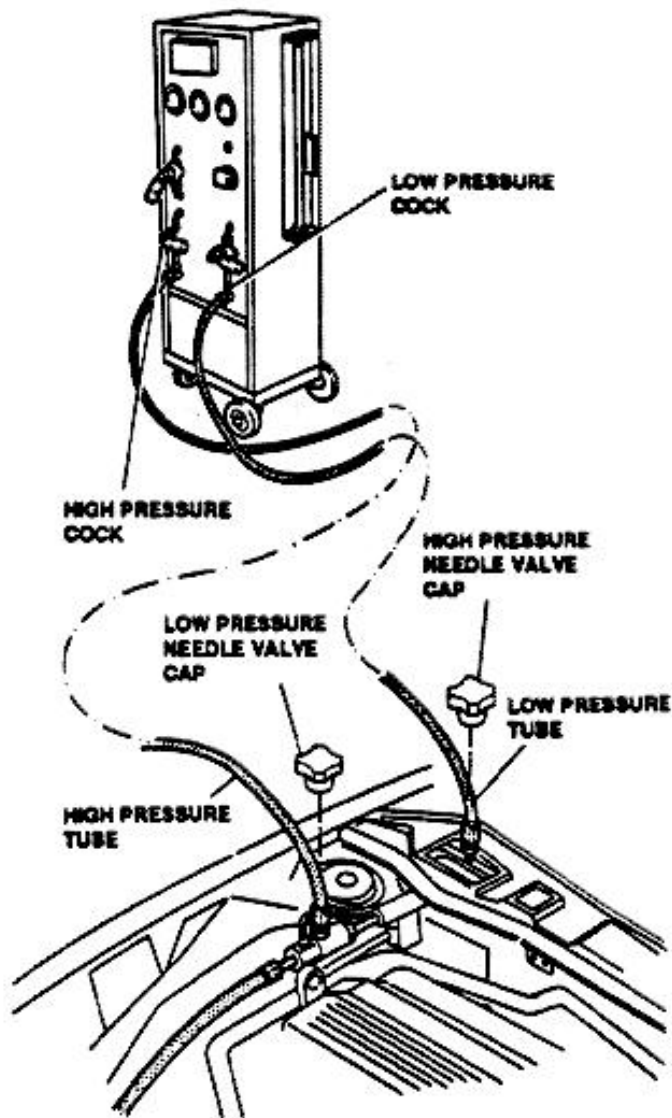


**PUMP**



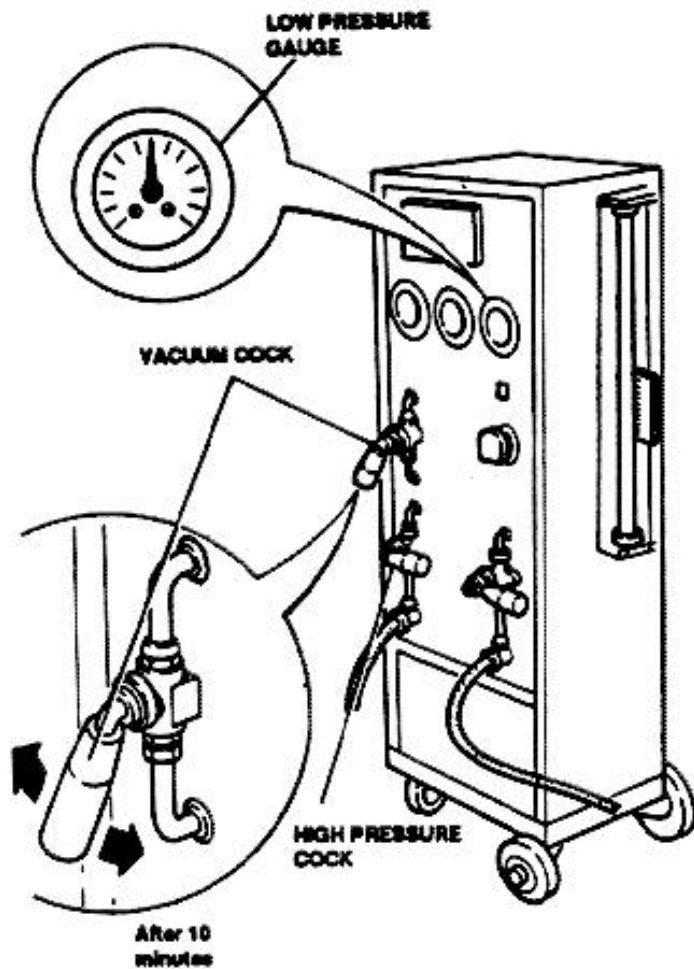
**TYPE 2**

**80 - 36**



4. Actuate the charging unit.
5. Open vacuum cock.
6. Open high pressure cock.
7. After about 10 minutes, close and open several times the vacuum cock.
8. Check that low pressure gauge pointer does not move during this operation. If pointer moves, it indicates leakage. Check that all fittings are properly

If leaks continue, check for presence of O'rings on all fittings, then fill system with 300 g. (0.662 lbs) of FREON 12 and identify leaking point with a leakage detector reset with FREON 11. Discharge all FREON and repair system as necessary.



9. Dehydrate system by maintaining for 30 minutes the vacuum as indicated in figure.



**WARNING:**

The procedure described in the following step 10 should be performed in the order indicated.

10. Close high pressure and vacuum cocks and deactivate charging unit.
11. Position zero of reference index in correspondence

**tightened before proceeding.**

|

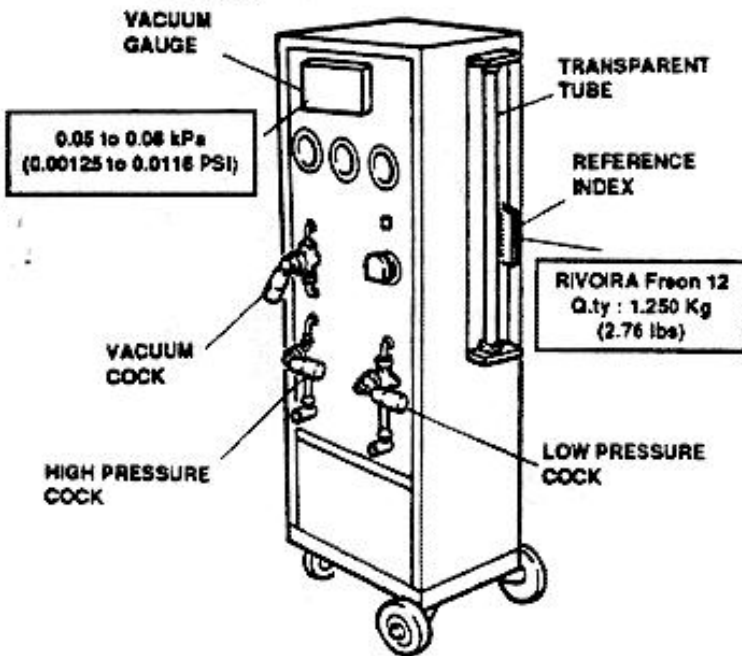
**of FREON level in transparent tube.**

- Slowly open low pressure cock until prescribed quantity of FREON is charged (the quantity is read on reference scale).



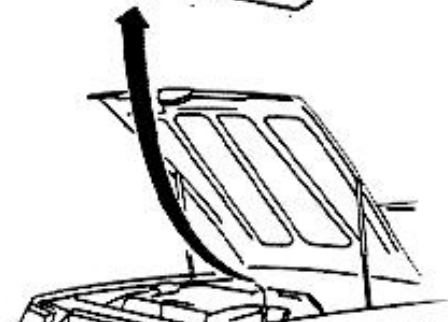
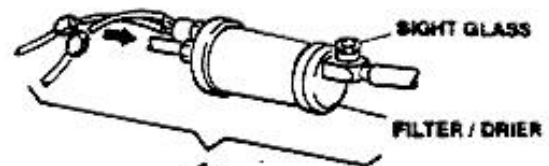
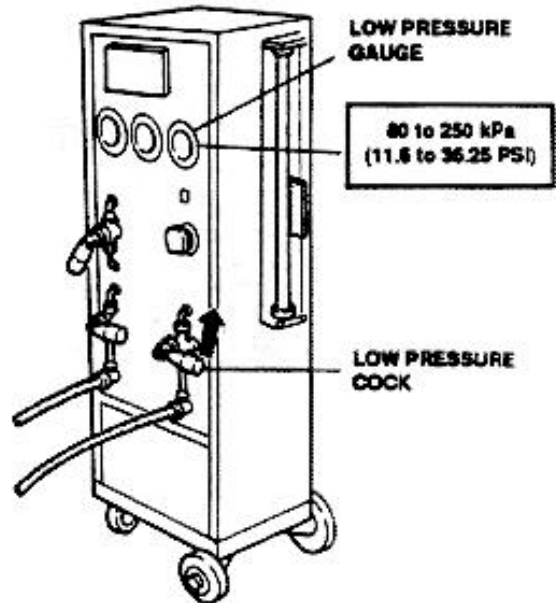
**CAUTION:**  
Open low pressure cock slowly to avoid "water-hammer" in the circuit.

**NOTE:** If the prescribed quantity of FREON does not enter into circuit, start engine, engage compressor and allow compressor to suck FREON.



- Close low pressure cock; maintain FREON compressor connected to charging unit.
- Start engine, operate air conditioning system and check through sight glass on filter/drier that no air bubbles are trapped in the circuit. If air bubbles are found, discharge FREON and repeat charging procedure.
- After 10 minutes of air conditioning operation, with engine running at 1000 to 1200 RPM, read low pressure gauge in the instant when compressor solenoid coupling disengages. The pressure should be 80 to 250 kPa (11.6 to 36.25 psi).
  - If pressure is lower than 80 kPa (11.6 psi), the FREON quantity is insufficient. Discharge FREON, repeat vacuum procedure for 40 minutes and charge system.
  - If pressure is more than 250 kPa (36.25 psi), the FREON quantity is excessive (only compressor or thermostat on evaporator has failed (the thermostat does not disconnect compressor solenoid coupling) If quantity of FREON is excessive, discharge the surplus; if thermostat has failed, check that probe is correctly inserted on evaporator unit.

16. Disconnect charging tubes and reinstall caps.  
17. Using leakage detector reset with FREON 11, check for leakage from fittings. Blow-off with compressed air any trace of FREON 12 from engine compartment before attempting leaks detection procedure.  
18. If leakage are found from any fitting, check for proper tightening. Blow-off any trace of FREON with compressed air then repeat leaks detection procedure. If leakage is still present, discharge FREON and check if O'Ring is correctly installed on affected fitting. Repair as necessary then repeat charging procedure.



THESE QUALITY IS EXCESSIVE (TOO) COMPRES-

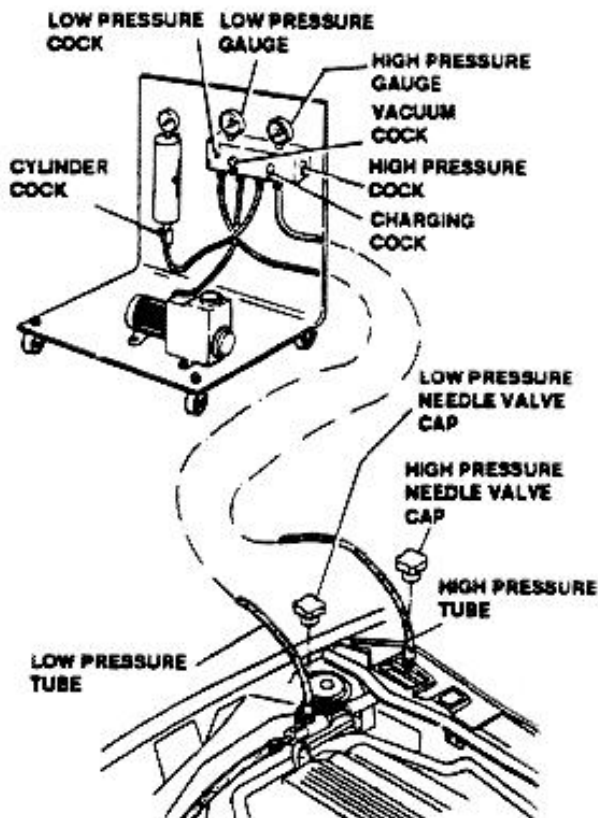


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80 - 38

**PROCEDURE (charging unit "Type 2")****VACUUM REALIZATION**

1. Remove caps from high and low pressure needle valves.
2. Connect low pressure tube between charging unit low pressure cock and valve on tube between evaporator and compressor.
3. Connect high pressure tube between charging unit high pressure cock and valve on tube between condenser and filter/drier.
4. Close charging and cylinder cocks and open vacuum, low and high pressure cocks.
5. Activate charging unit and check that high and low pressure gauge pointers are below zero (vacuum).
6. If vacuum is not present, the FREON circuit leaks.
7. Before proceeding, check that all fittings are properly tightened. If leaks continue, check for presence of O'rings on all fittings, then fill system with 300 g. (0.662 lbs) of FREON 12 and identify leaking point with a leakage detector reset with FREON 11. Discharge all FREON and repair system as necessary. Repeat vacuum procedure.
8. When vacuum has been made, close vacuum cock and stop charging unit motor.

**SYSTEM CHARGING****CAUTION:**

The procedure described below should be performed in the order described.

1. Close low pressure cock.
2. Open charging cock and cylinder cock until system is fully charged.

**NOTE:** If the prescribed quantity of FREON does not enter into circuit, close high pressure cock, start engine, engage compressor and open low pressure cock with extreme care until FREON is transferred from cylinder to vehicle system.

3. Close all cocks and disconnect tubes.

**CYLINDER CHARGING**

1. Close vacuum, high and low pressure cocks.
2. Connect bottle hose to low pressure cock fitting.
3. Open low pressure, charging and cylinder cocks; if cooling fluid does not transfer easily from bottle to cylinder, open relief valve; during charging procedure the bottle be overturned and located over the charging unit.

The pressure gauge on cylinder indicates cooling fluid pressure.

4. Rotate metering cylinder so that scale set related to fluid used (R12) is positioned frontally.
5. Select scale on which top (over maximum level line) is indicated a pressure value corresponding to those indicated by cylinder gauge.

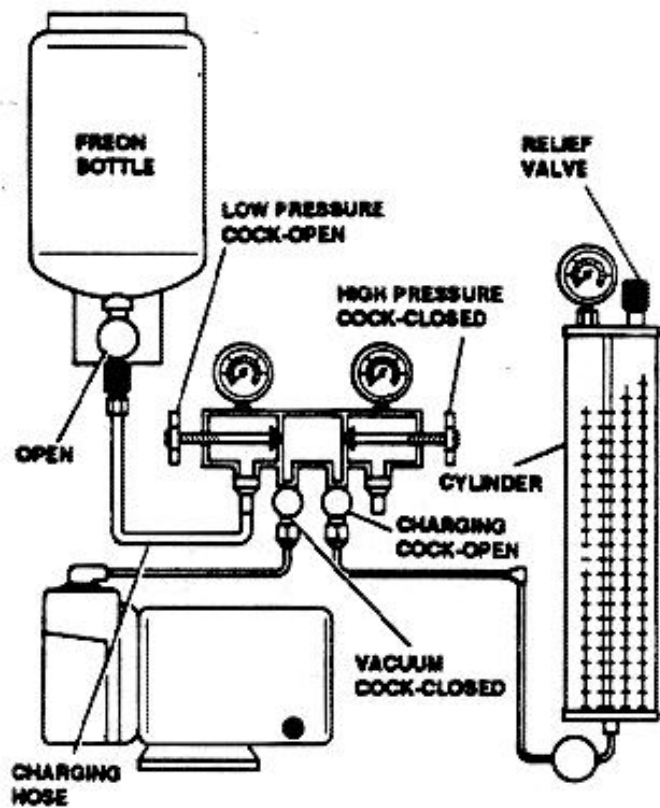
Superpose the selected scale to transparent tube and read R12 quantity.

6. After charging has been completed, close low pressure and charging cocks and disconnect hose.

  
**LOW PRESSURE  
TUBE**

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**80 - 39**







# TECHNICAL CHARACTERISTICS AND SPECIFICATIONS

## FLUIDS AND LUBRICANTS

Application	Type	Name	Q.ty
Air conditioning system charging Compressor refilling	FREON OIL	RIVOIRA FREON 12 SUN OIL COMPANY Suniso 5G	1.250 kg (2.76 lbs) 135 cm <sup>3</sup> (0.03645 gals)
Lines fittings threading	OIL	SUN OIL COMPANY Suniso 46	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-levels 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



**TROUBLESHOOTING PROCEDURE**









**NOTE:** Drain the system prior to carrying out any operation which may cause venting of FREON 12

<b>TROUBLES AND SYMPTOMS</b>	<b>TEST REFERENCE</b>
<b>COMPRESSOR NOISY</b>	<b>A</b>
<b>ELECTRIC FAN UNIT NOISY</b>	<b>B</b>
<b>EVAPORATOR UNIT NOISY</b>	<b>C</b>








<b>COMPRESSOR NOISY</b>	<b>TEST A</b>
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TEST STEPS		RESULTS	REMEDY
<b>A1</b>	<b>BELT ALIGNMENT CHECK</b>		
	- Check that the compressor belt is perfectly aligned between the two pulleys, also checking the relevant assembling and fixing operations	 ▶  ▶	Carry-out <b>step A2</b>  Tighten the pulley fixing nuts, replace the pulleys, if necessary
<b>A2</b>	<b>BELT TENSIONING CHECK</b>		
	- Check the belt for correct tensioning	 ▶  ▶	Carry-out <b>step A3</b>  Restore the correct belt tensioning (see <b>Group 00</b> )
<b>A3</b>	<b>REFRIGERATING FLUID CHARGE CHECK</b>		
	- Check that the refrigerating fluid charge is not excessive. (It is likely the presence of incondensable gas inside the circuit)	 ▶  ▶	Carry-out <b>Step A4</b>  Drain, dehydrate and refill the system
<b>A4</b>	<b>FIXING POINT CHECK</b>		
	- Check for loosen screws and nuts fixing the compressor to the engine unit, or fixing points of other devices to the air conditioning system	 ▶  ▶	Carry-out <b>Step A5</b>  Proceed to the correct tightening of the loosen fixing points



<b>COMPRESSOR NOISY</b>	<b>TEST A</b>
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<b>TEST STEPS</b>		<b>RESULTS</b>	<b>REMEDY</b>
<b>A5</b>	<b>ELECTROMAGNETIC COUPLING CHECK</b>	 	Carry-out step A6  Replace the electro-magnetic coupling
- Check that the electromagnetic coupling does not skid, nor tend to size, or is noisy			
<b>A6</b>	<b>COMPRESSOR CHECK</b>		Replace compressor
- Check that the compressor does not produce knocks or unusual noise			







<b>ELECTRIC FAN UNIT NOISY</b>	<b>TEST B</b>
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<b>TEST STEPS</b>		<b>RESULTS</b>	<b>REMEDY</b>
<b>B1</b>	<b>ELECTRIC FAN BRUSH CHECK</b>		Replace the electric fan motor
- Check that the electric fan brushes are not deformed			


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**80 - 45**

**AIR CONDITIONING SYSTEM**

**EVAPORATOR UNIT NOISY**

**TEST C**

TEST STEPS		RESULTS	REMEDY
<b>C1</b>	<b>EXPANSION VALVE CHECK</b>		Replace the expansion valve
-	Check that the expansion valve does not produce any howling		

