

# **Opel Astra Opel Kadett**

## **Workshop Manual**

### **Section D**

# **Heating and Ventilation System, Air Conditioning**

Issued by: Service Division  
Delta Motor Corporation  
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# HEATING AND VENTILATION



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# AIR CONDITIONING

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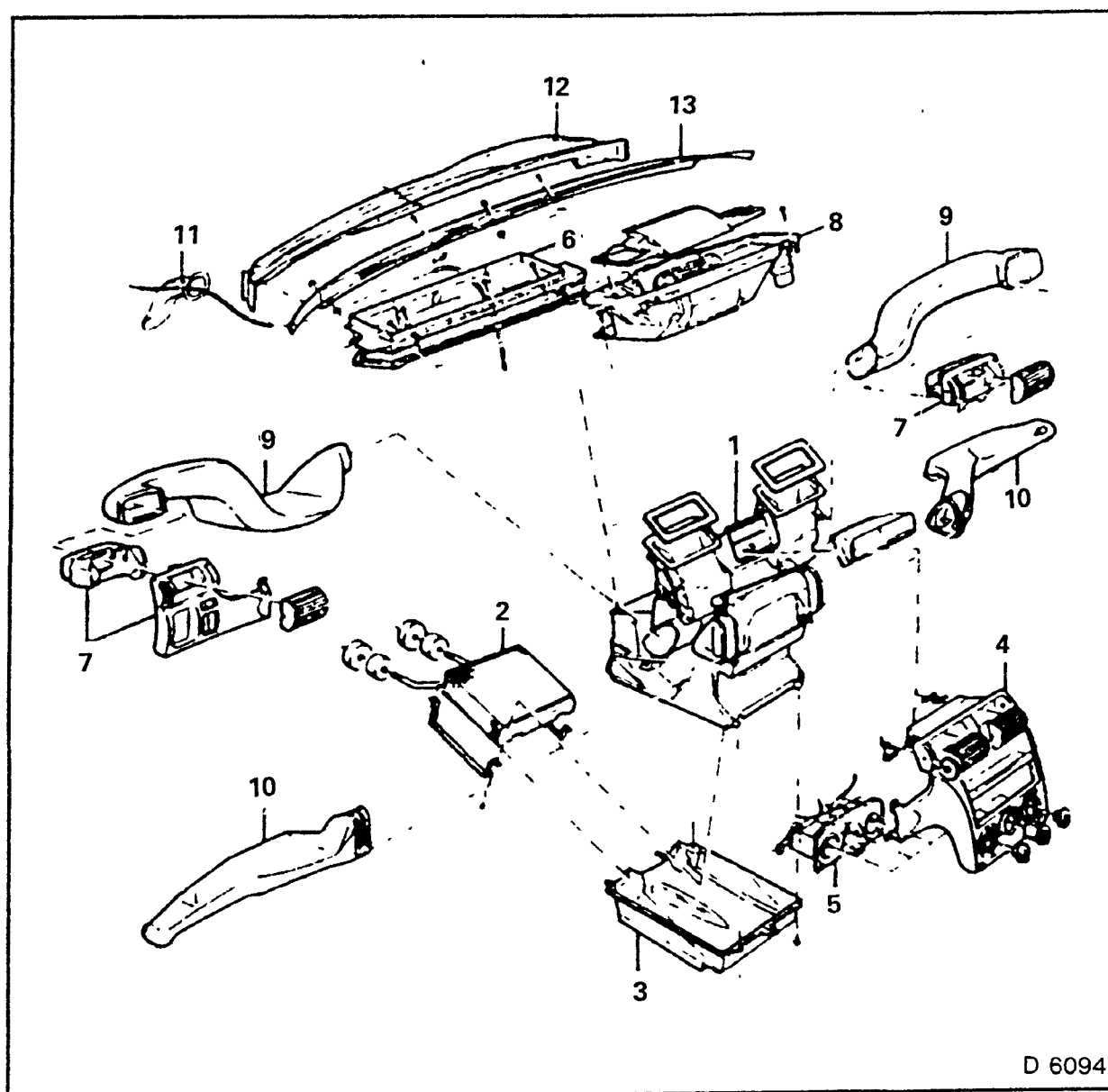


Fig 1

## Arrangement of Components for Mixed Air Heating

- 1 — Air distribution housing
- 2 — Heater core
- 3 — Heater core lower cover
- 4 — Cover, centre
- 5 — Heating operating unit
- 6 — Water housing
- 7 — Ventilation nozzle housing
- 8 — Fan
- 9 — Side air distribution duct
- 10 — Centre air distribution duct
- 11 — Water drainage
- 12 — Water deflector
- 13 — Wind protective panelling

## Ventilation Nozzle Inset — Remove and Install

### REMOVE, DISCONNECT

1. Lever out ventilation nozzle inset.

### INSTALL, CONNECT

1. Press in ventilation nozzle inset until it catches.

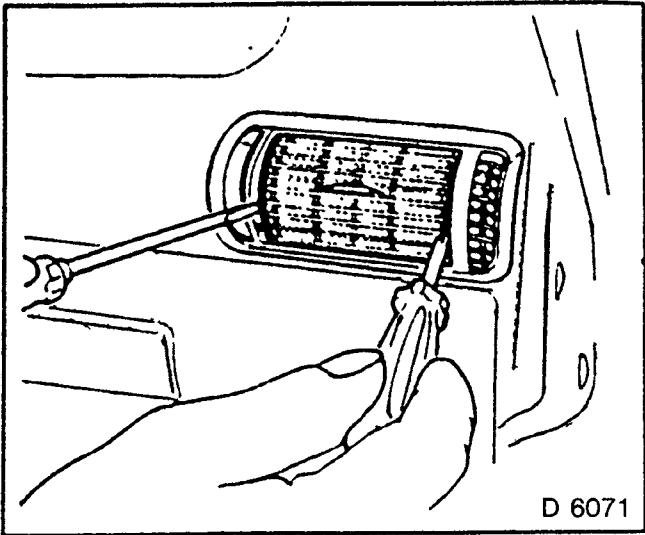


Fig. 2

## Ventilation Nozzle Housing, — Remove and Install (Driver's Side)

### REMOVE, DISCONNECT

1. Signal switch panelling.
2. Switch for lamps
3. Fog lamp.
4. Headlamp height adjustment — Section N.
5. Ventilation nozzle inset.

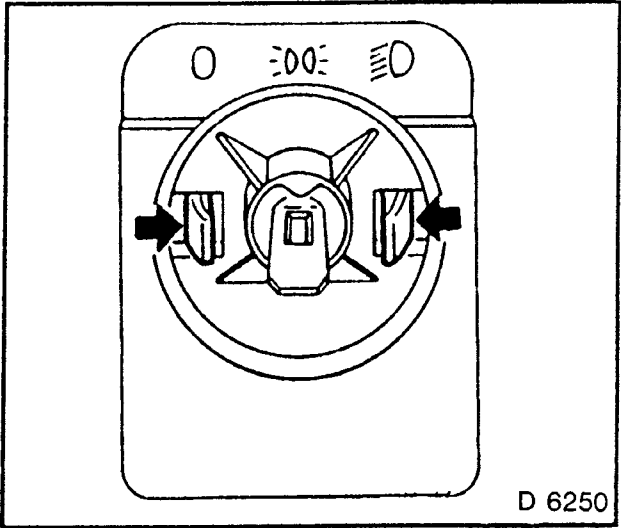


Fig. 3

### REMOVE, DISCONNECT

1. Ventilation nozzle housing.
2. Wiring harness plug.

### INSTALL, CONNECT

1. Wiring harness plug.
2. Ventilation nozzle housing — check connection to air duct.
3. Ventilation nozzle inset.
4. Switch.
5. Signal switch panelling.

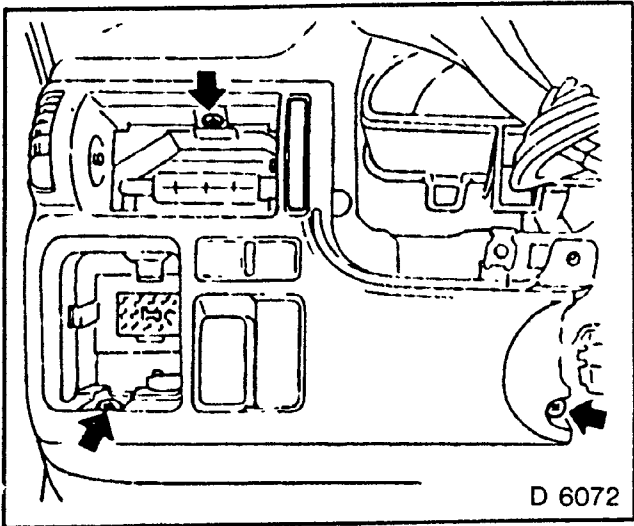


Fig. 4

# Ventilation Nozzle Housing, — Remove and Install (Passenger Side)

## REMOVE, DISCONNECT

- 1. Ventilation nozzle inset.
- 2. Glove compartment.
- 3. Ventilation nozzle housing.

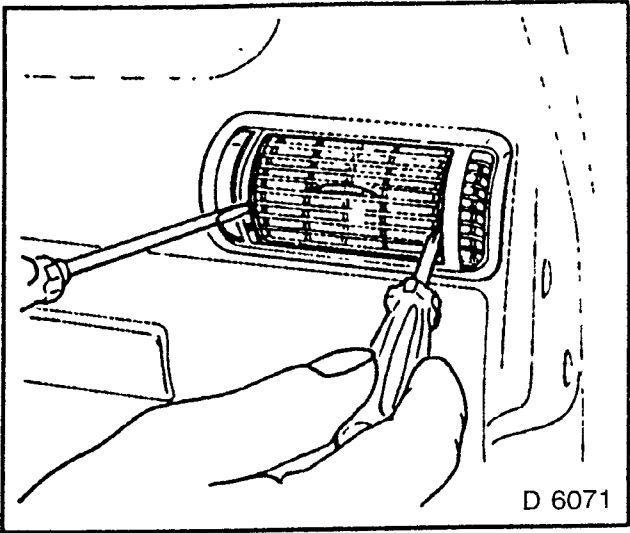


Fig. 5

## INSTALL, CONNECT

- 1. Ventilation nozzle housing — check connection to air duct.
- 2. Glove compartment.
- 3. Ventilation nozzle inset.

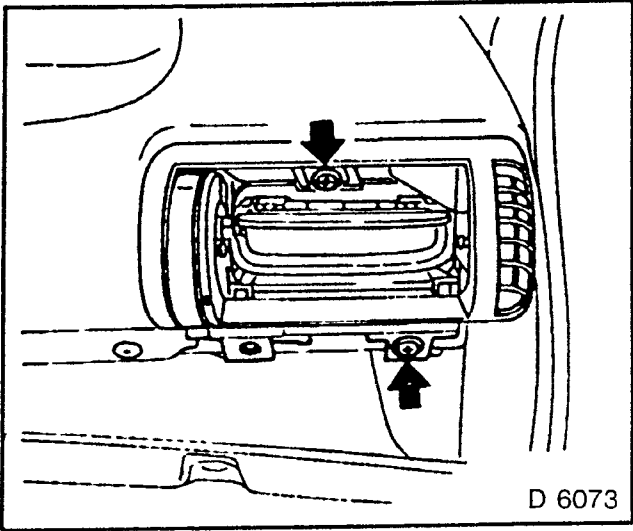


Fig. 6

**Cover, Centre, — Remove and Install**

**REMOVE, DISCONNECT**

- 1. Signal switch panelling — Section N.

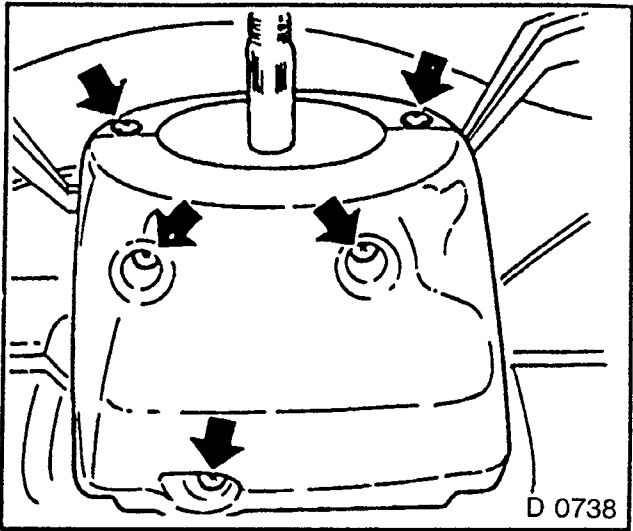


Fig. 7

**INSTALL, DISCONNECT**

- 1. Instrument housing cover.

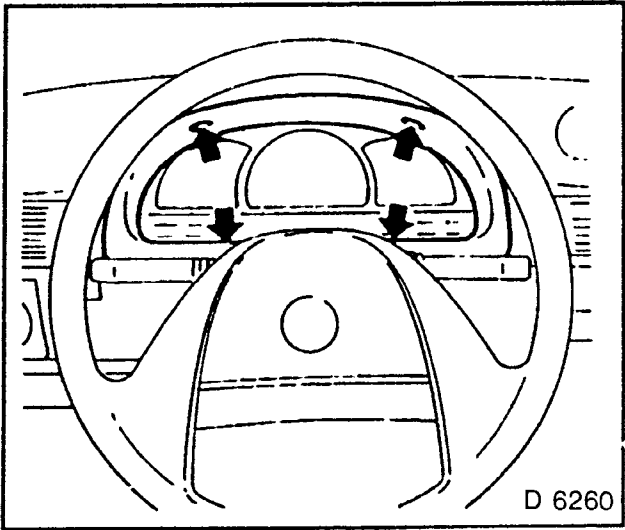


Fig. 8

**REMOVE, DISCONNECT**

- 1. Hazard warning lamps switch, function display — Section N
- 2. Radio recess — Section R.

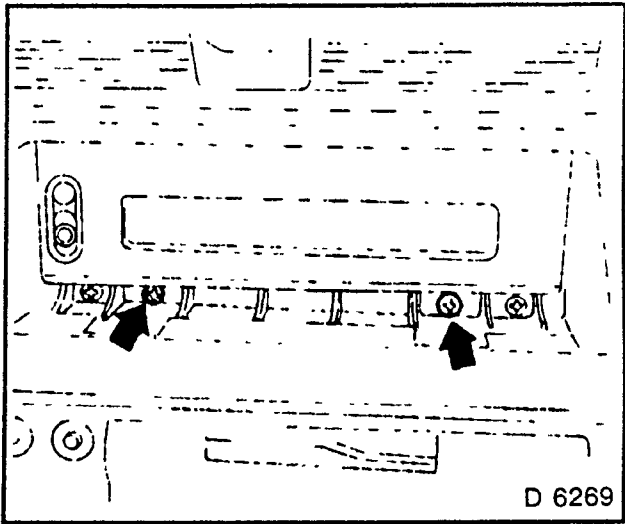


Fig. 9



**REMOVE, DISCONNECT**

- 1. Centre ventilation nozzle insets.

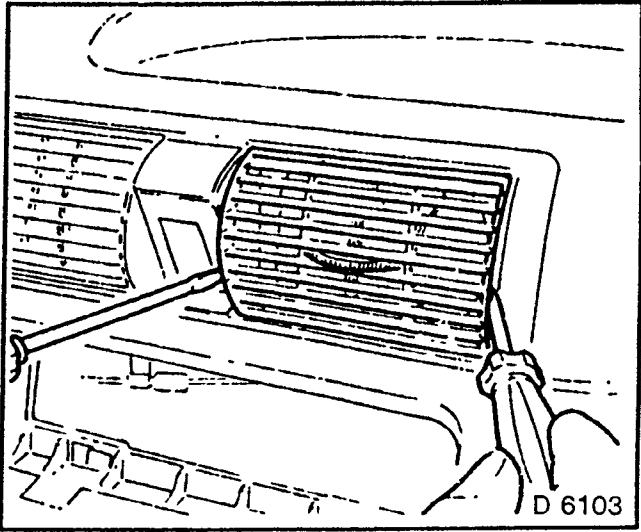


Fig. 10

**REMOVE, DISCONNECT**

- 1. Unclip actuating rod sideways from carrier.

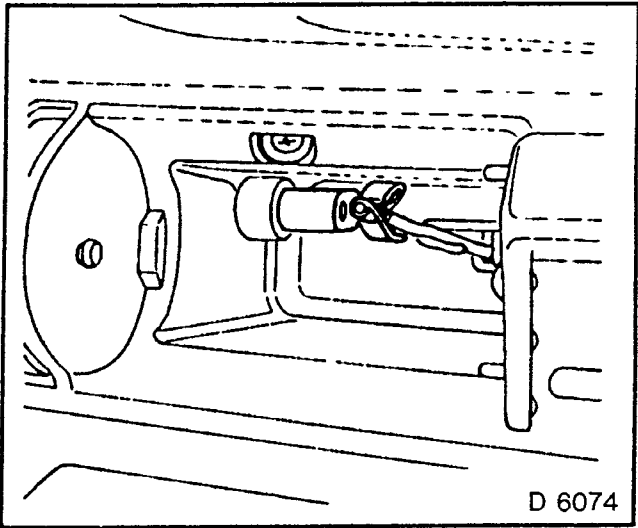


Fig. 11

**REMOVE, DISCONNECT**

- 1. Cover.
- 2. Centre.

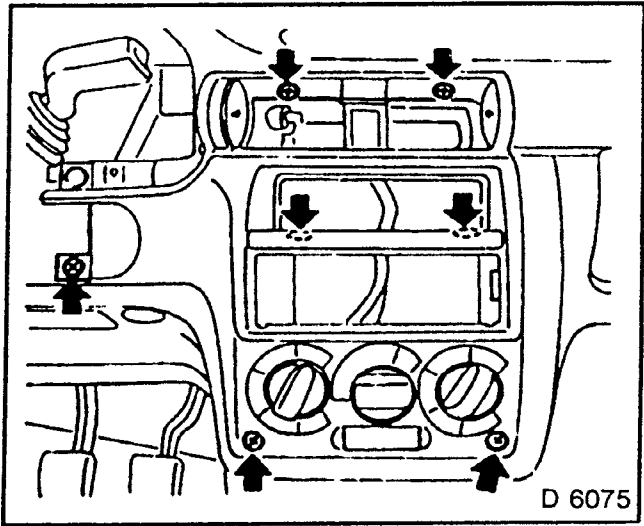


Fig. 12

**REMOVE, DISCONNECT**

- 1. Switch for ventilation/heating/fan.
- 2. Heating operating unit.
- 3. Hazard warning lamps wiring harness plug.

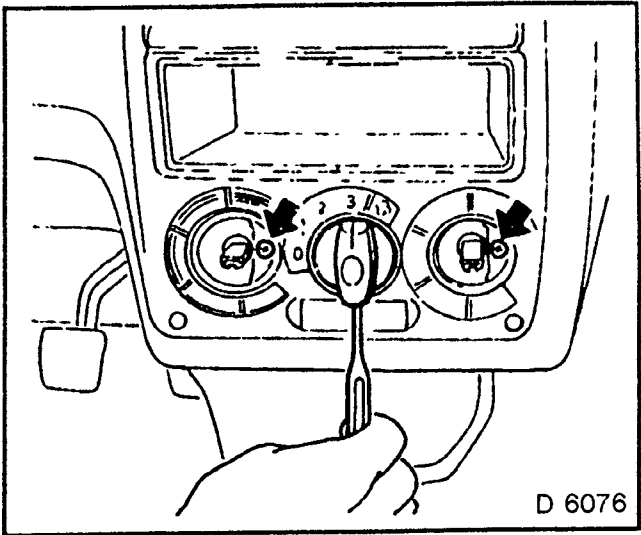


Fig. 13

**INSTALL, CONNECT**

- 1. Hazard warning lamps wiring harness plug.
- 2. Heating operating unit.
- 3. Cover.
- 4 Centre.
- 5. Switch.
- 6. Actuating rod — ventilation flap must close fully.
- 7 Ventilation nozzle insets
- 8. Radio
- 9. Function display
- 10.Hazard warning lamps switch.
- 11.Instrument housing cover.
- 12.Signal switch panelling.

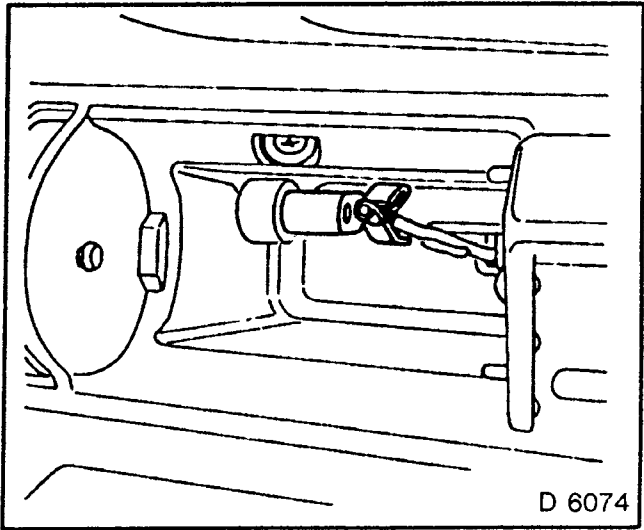


Fig. 14

# Heating Operating Unit — Remove and Install

## REMOVE, DISCONNECT

- 1. Cover.
- 2. Centre — Section D.

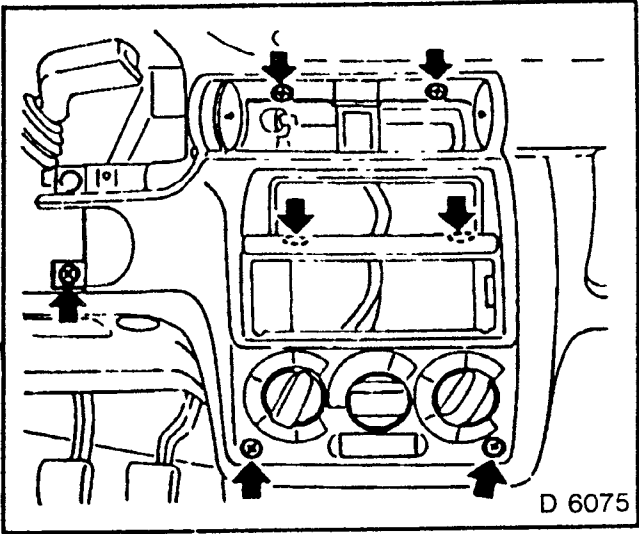


Fig 15

## REMOVE, DISCONNECT

- 1. Bowden cables.
- 2 Mixed air/AC switch
- 3 Wiring plug.

## INSTALL, CONNECT

- 1. Wiring plug.
- 2 Mixed air/AC switch.
- 3. Bowden cables.
- 4 Cover.
- 5. Centre.

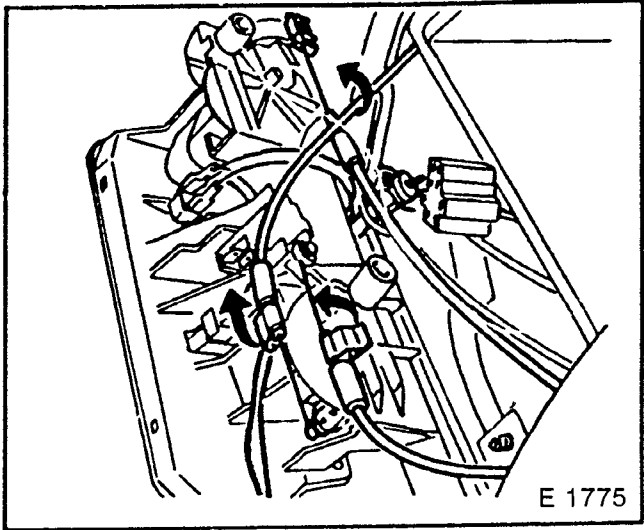


Fig 16

## Mixed Air Flap Bowden Cable — Replace

### REMOVE, DISCONNECT

1. Cover.
2. Centre.
3. Heating operating unit — Section D.

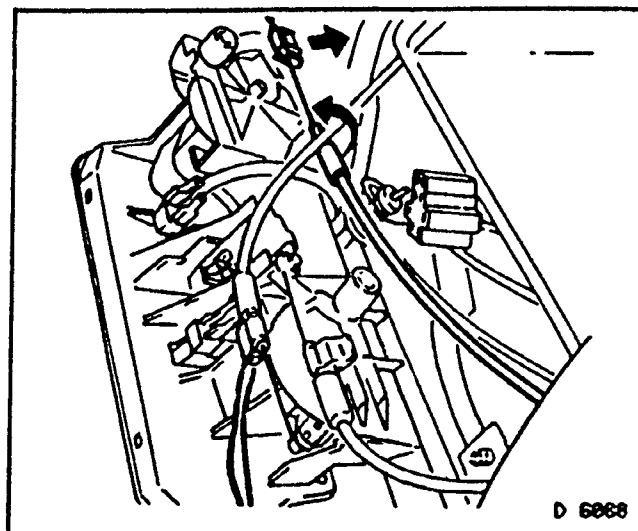


Fig. 17

### REMOVE, DISCONNECT

- 1 Footwell panelling/storage compartment (passenger side).
2. Vehicles with air conditioning only: airduct.
- 3 Bowden cable.

### INSTALL, CONNECT

1. Check for correct operation of Bowden cable (Bowden cable can be moved within the clip on the operating unit).
2. Footwell panelling/storage compartment (passenger side).
3. Heating operating unit

Fig. 18 applies to vehicles with air conditioning as well.

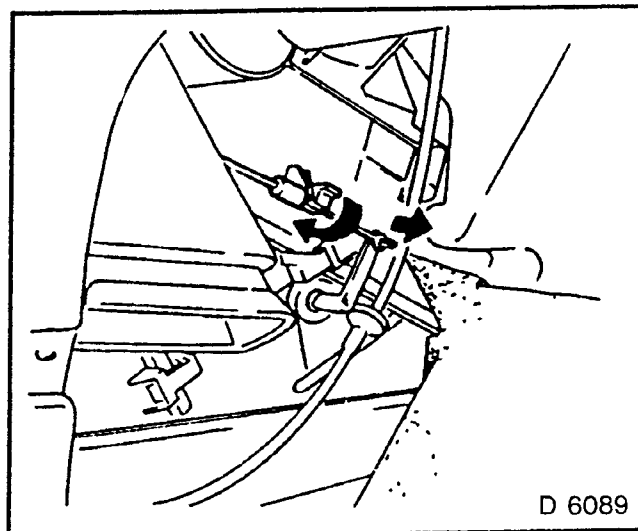


Fig. 18

## Bowden Cable for Upper Air Distribution — Replace

### REMOVE, DISCONNECT

1. Cover.
- 2 Centre, with heating operating unit — Section D.

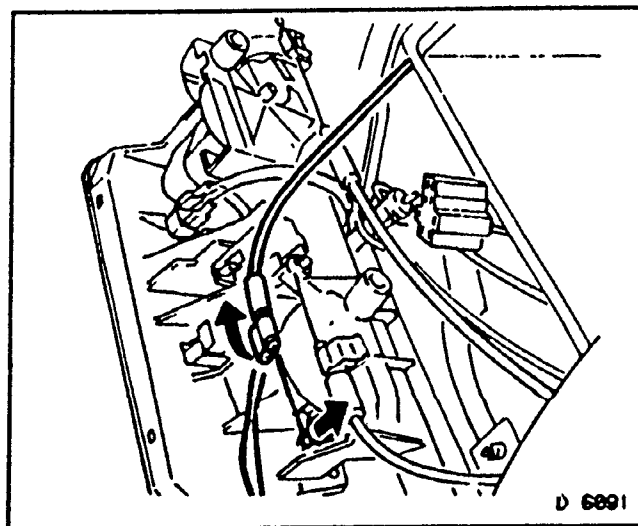


Fig. 19

**REMOVE, DISCONNECT**

- 1. Instrument housing — Section C.
- 2. Bowden cable.

**INSTALL, CONNECT**

- 1. Bowden cable.
- 2. Instrument housing.
- 3. Cover.
- 4. Centre.

Fig. 20 applies to vehicles with AC as well.

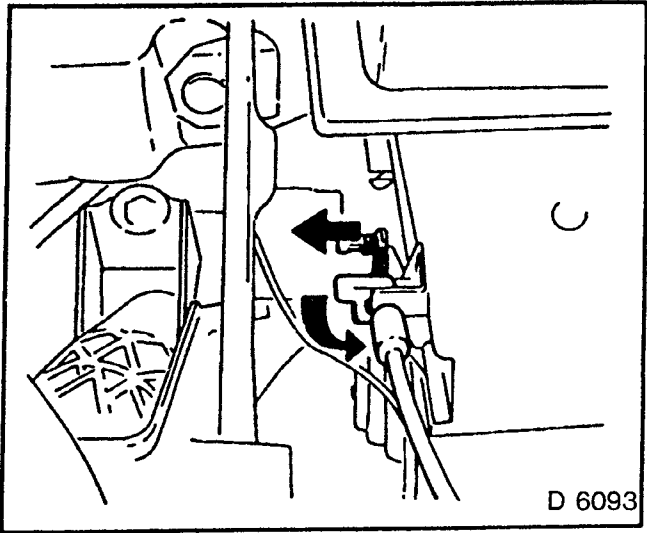


Fig. 20

**Bowden Cable for Lower Air Distribution — Replace**

**REMOVE, DISCONNECT**

- 1 Cover.
- 2. Centre, with heating operating unit — Section D.

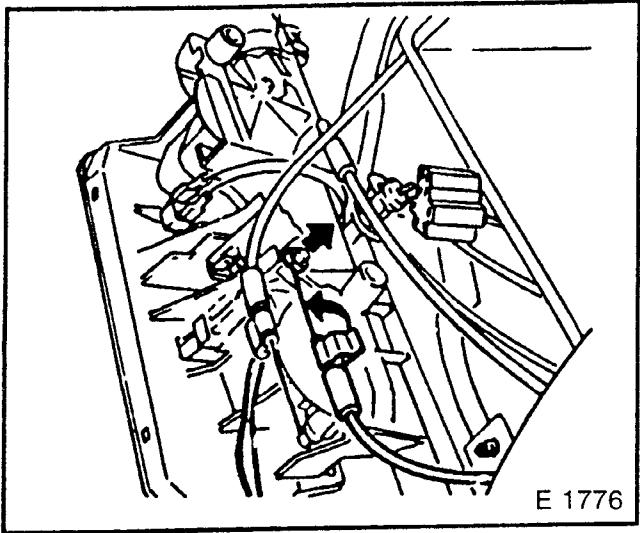


Fig 21

**VEHICLES WITHOUT AC:**

**REMOVE, DISCONNECT**

- 1 Bowden cable.

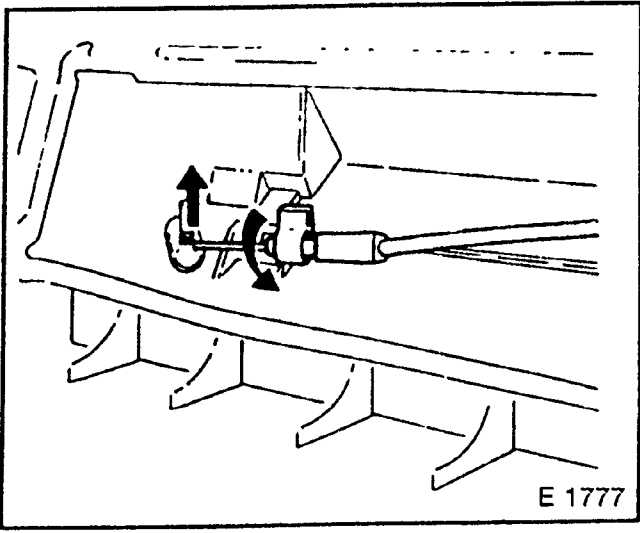


Fig. 22

**VEHICLES WITH AC:**

**REMOVE, DISCONNECT**

- 1. Glove compartment.
- 2. Bowden cable.

**INSTALL, CONNECT**

- 1. Bowden cable.
- 2. Glove compartment.
- 3. Cover.
- 4. Centre.

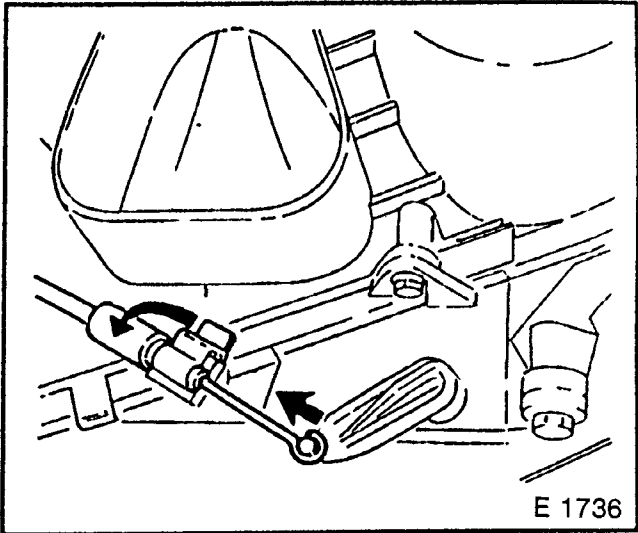


Fig. 23

# Heater Core — Remove and Install

## REMOVE, DISCONNECT

- 1. Heater core lower cover. See Section C.
- For clearer representation fig. 24 shows instrument panel removed.

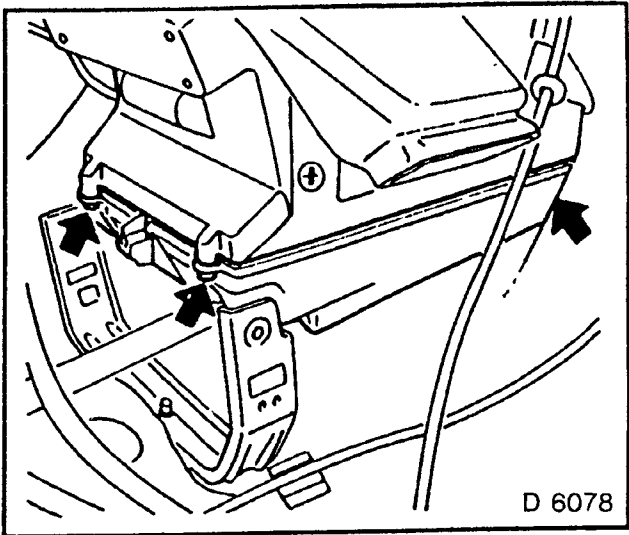


Fig. 24

## INSTALL, CONNECT

- 1. Hose clips on coolant hoses.
- Feed hose = right  
Return hose = left (to cooling system return flow).

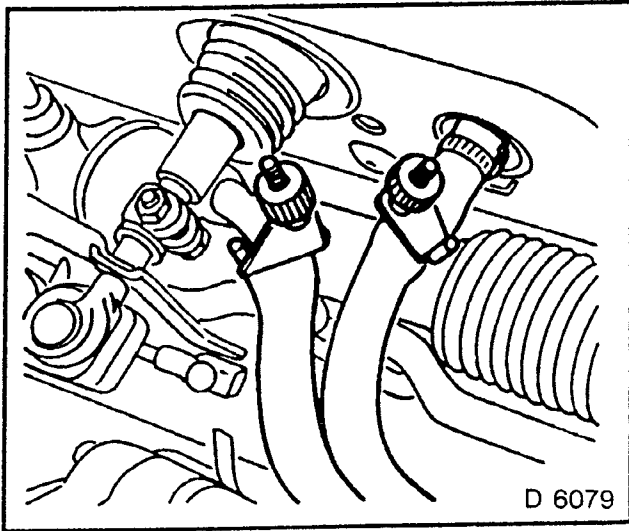


Fig 25

## REMOVE, DISCONNECT

- 1. Coolant hoses from heater core — collect coolant.
- 2. Close off heater core pipes
- 3 Heater core

## INSTALL, CONNECT

- 1 Heater core
- 2. Heater core lower cover.
- 3. Centre console.
- 4. Coolant hoses — remove hose clips.
- 5. Fill up coolant and bleed cooling system — Section J.

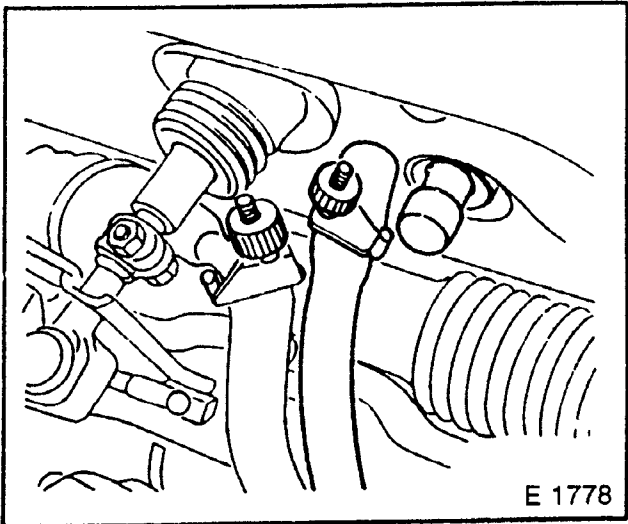


Fig 26

# Heater Core (Air Conditioning) — Remove and Install

## REMOVE, DISCONNECT

1. Hose clips from coolant hoses.
1. Tube and orifice valve assembly.

2. Evaporator to Accumulator Hose Assembly.

3. Evaporator.

4. Bulkhead Assembly.

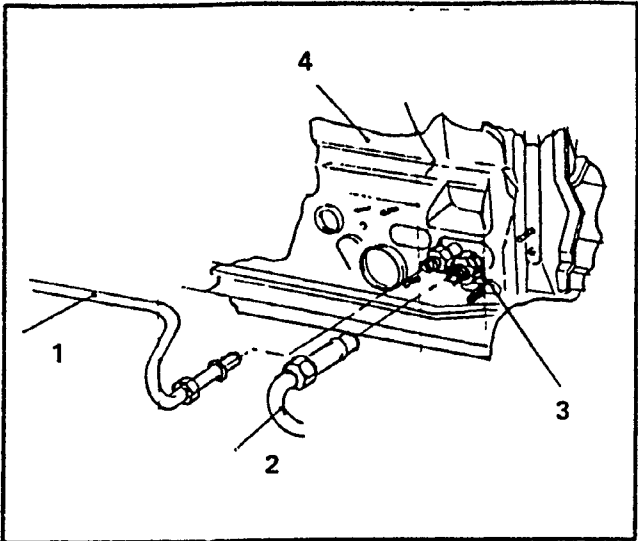


Fig. 27

2. Centre Console — Section C.
3. Footwell centre panelling.

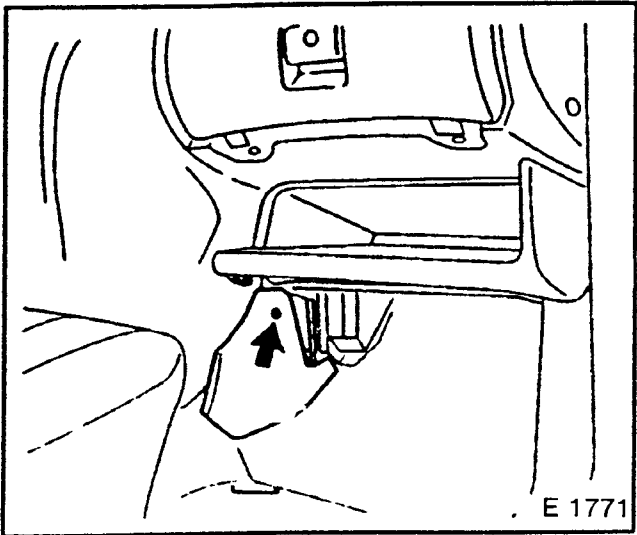


Fig. 28

## REMOVE, DISCONNECT

1. Rear airflow guide connection cover

Fig. 29 shows operation with air distribution housing removed

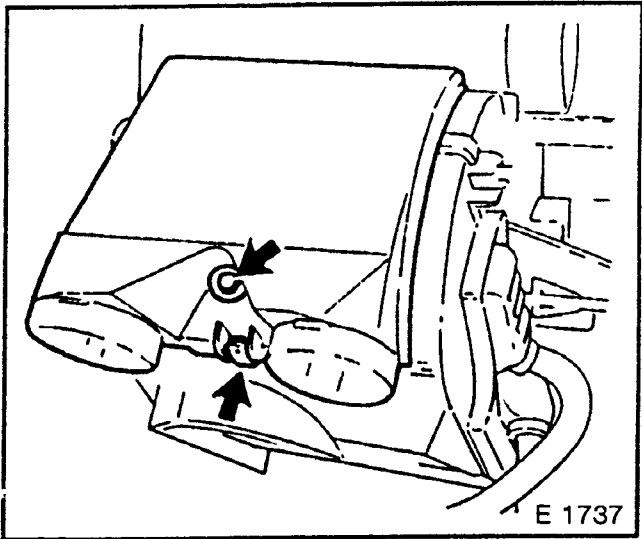


Fig. 29



- 2. Lower cover fastening bolts (1) — on revised version.
- 3. Release bolts (2)
- 4. Clamps (3).

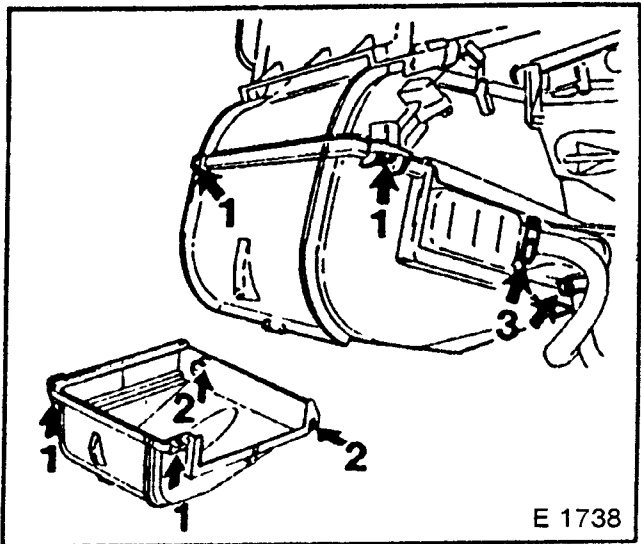


Fig. 30

**REMOVE, DISCONNECT**

- 1. Pipes from heater core — collect any remaining coolant
- 2. Lower cover and heater core.
- 3. Heater core from lower cover.

**INSTALL, CONNECT**

- 1. Heater core with new seals to lower cover.
- 2. Lower cover and heater core to air distribution housing.
- 3. Pipes to heater core — close off clamps
- 4. Rear air flow guide connection cover.
- 5. Footwell centre panelling.
- 6. Footwell storage compartment.
- 7. Centre console
- 8. Remove hose clips.
- 9. Fill coolant.

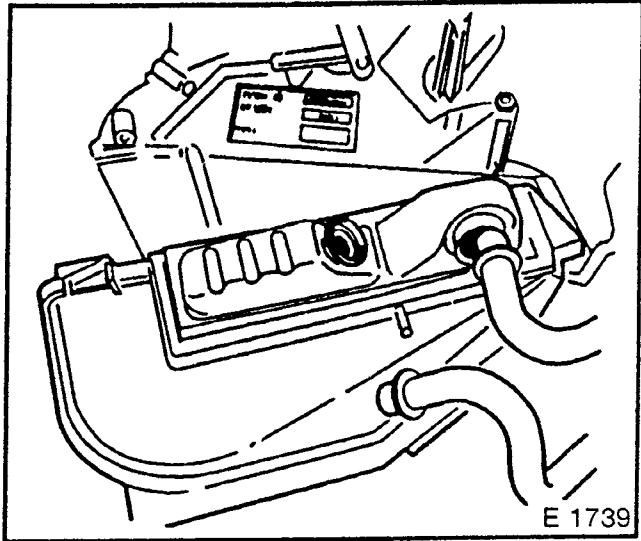


Fig. 31

# Air Distribution Housing — Remove and Install

## REMOVE, DISCONNECT

### VEHICLES WITH AC:

#### Drain AC — Section D.

- 1. Coolant hoses from heater core — using hose clips.
- 2. Collect coolant.
- 3. Close off heater core pipes.

Fig. 32 also applies to vehicles with AC.

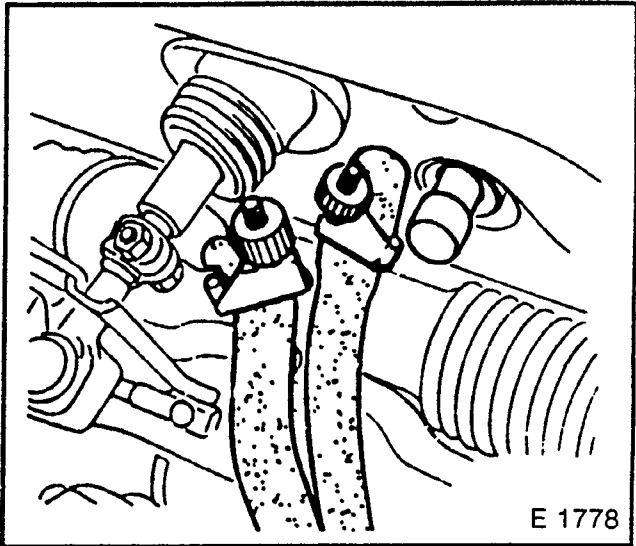


Fig. 32

### VEHICLES WITH AC:

- 1. Close off refrigerant line apertures.
- 2. Flange — condensation drain hose.
  - 1. Tube and orifice valve assembly
  - 2. Evaporator to Accumulator Hose Assembly.
  - 3. Evaporator.
  - 4. Bulkhead Assembly.

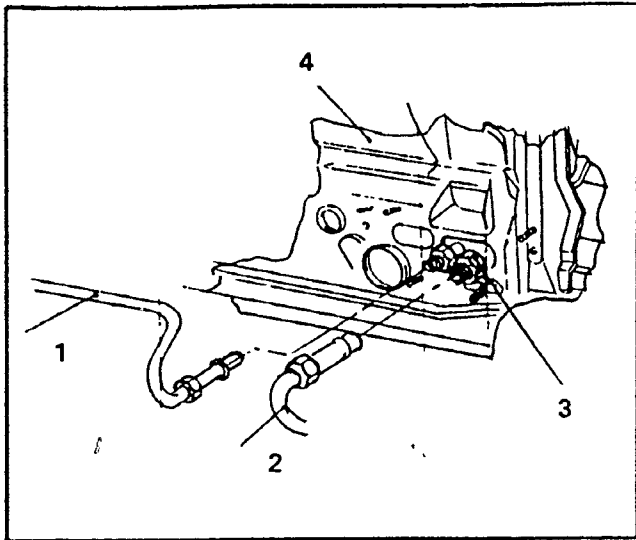


Fig. 33

## REMOVE, DISCONNECT

- 1. Instrument panel upholstery — Section C.
- 2. Air distribution housing from bulkhead.

Fig. 34 shows vehicle without AC.

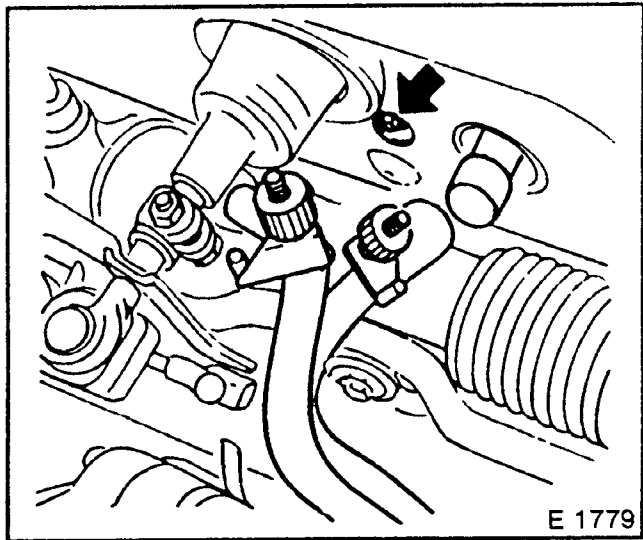


Fig. 34

Fig. 35 shows vehicle with AC.

- 1. Tube and orifice valve assembly.
- 2. Evaporator to Accumulator Hose Assembly.
- 3. Evaporator.
- 4. Bulkhead Assembly.

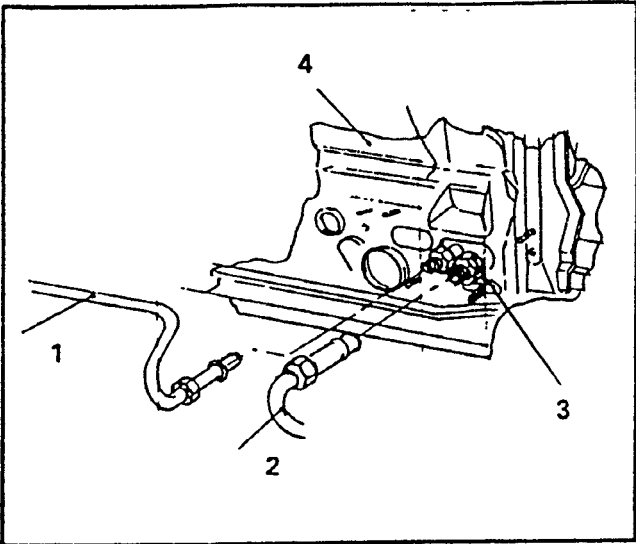


Fig. 35

**REMOVE, DISCONNECT**

- 1. Fan motor wiring harness plug
- 2. Hose.
- 3. Clean air filter housing
- 4. Air distribution housing

**INSTALL, CONNECT**

- 1. Air distribution housing.
- 2. Lower air distribution housing fastening.
- 3. Coolant hoses — remove hose clips.  
Feed hose = right  
Return hose = left (to cooling system return flow).
- 4. Instrument panel upholstery

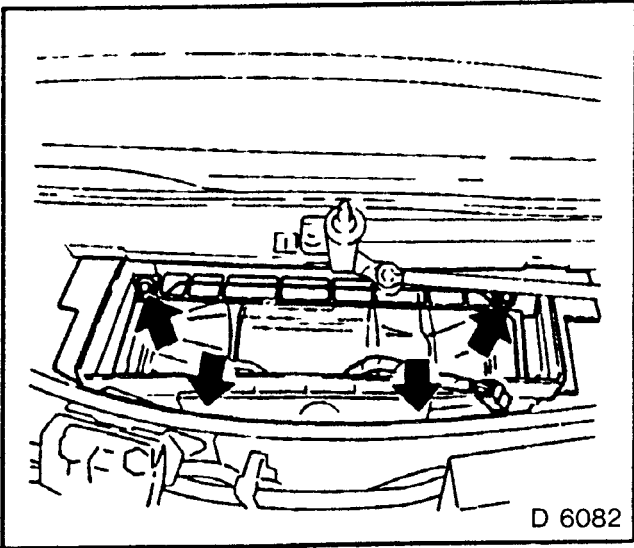


Fig. 36

**VEHICLES WITH AIR CONDITIONING:**

- 1. Refrigerant line.
- 2. Condensation drain hose flange.  
Evacuate and charge AC.
- 2. Fill up coolant and bleed cooling system  
— Section J.

## Fan Motor — Remove and Install

### REMOVE, DISCONNECT

- 1. Hose.
- 2. Clean air filter housing.

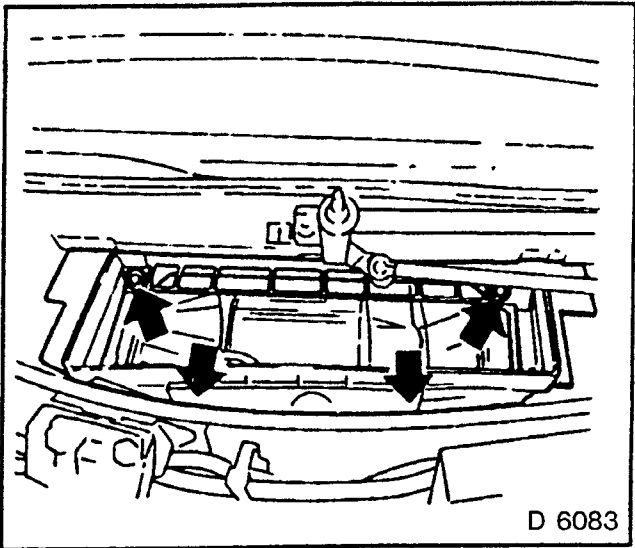


Fig 37

### REMOVE, DISCONNECT

- 1. Fan housing upper part.
- 2. Wiring harness plug.
- 3. Fan motor.

### INSTALL, CONNECT

- 1. Fan motor.
- 2. Wiring harness plug.
- 3. Fan housing upper part.
- 4. Hose.
- 5. Clean air filter

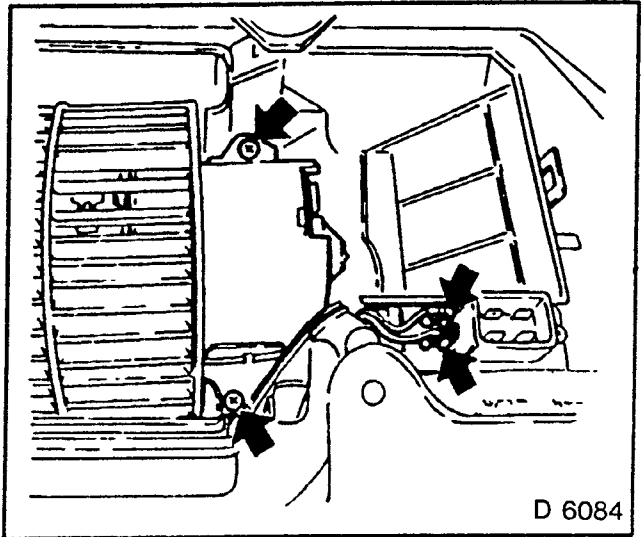


Fig 38

## Fan Housing — Remove and Install

### REMOVE, DISCONNECT

- 1. Air distribution housing
- 2. Fan housing.
- 3. Fan motor.
- 4. Fan motor series resistor.

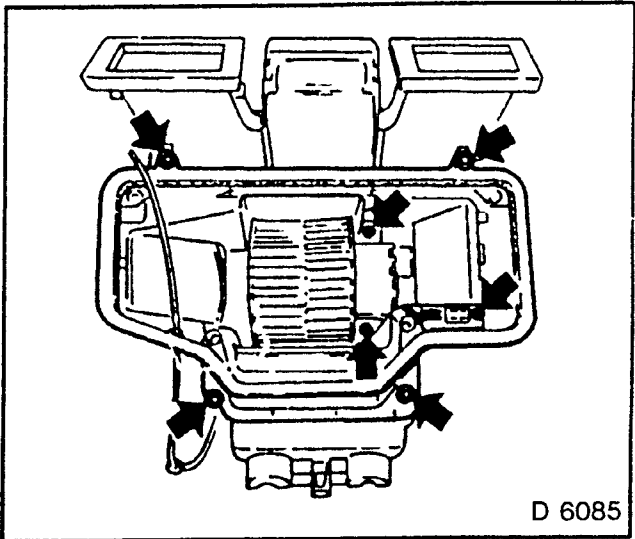


Fig. 39

**INSTALL, CONNECT**

- 1. Fan motor series resistor.
- 2. Fan motor.
- 3. Fan housing.
- 4. Air distribution housing.

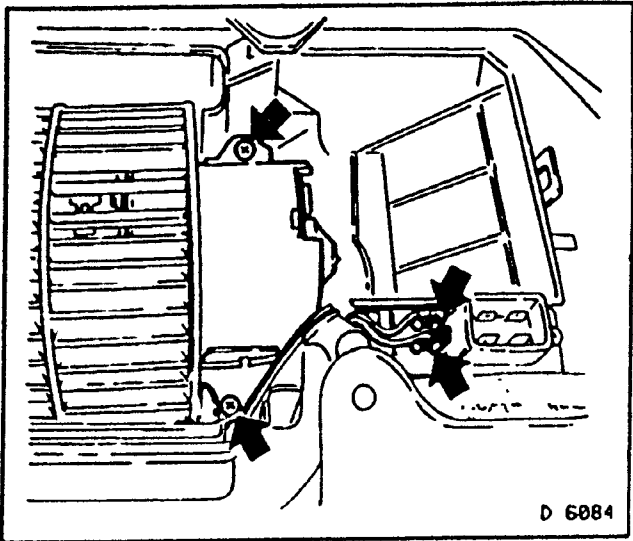


Fig. 40

**Fan Motor Series Resistor — Replace**

**REMOVE, DISCONNECT**

- 1 Wiring plug
- 2. Fan motor series resistor.

For clearer representation Fig. 41 shows fan case removed.

**INSTALL, CONNECT**

- 1 Fan motor series resistor — ensure that it engages.
- 2 Wiring plug.

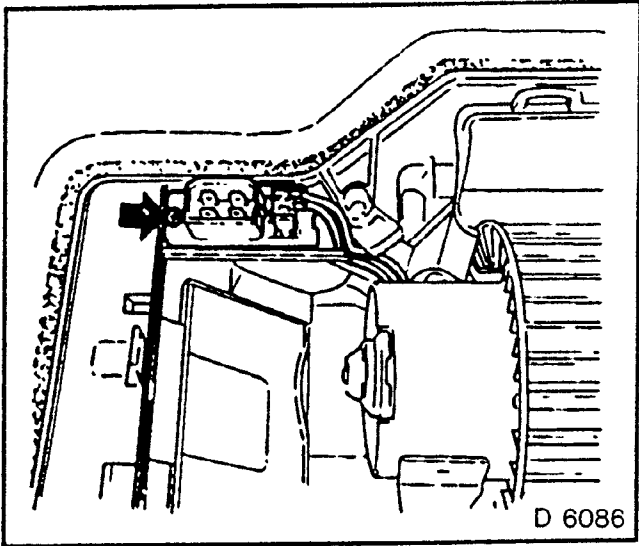


Fig. 41

**Mixed Air/AC Switch — Remove and Install**

**REMOVE, DISCONNECT**

- 1 Heating operating unit.
- 2 Release wiring harness plug (1) (if present).
- 3 Mixed air/AC switch.

Fig. 42 also applies to vehicles without AC.

**INSTALL, CONNECT**

- 1. Mixed air/AC switch.
- 2. Heating operating unit.

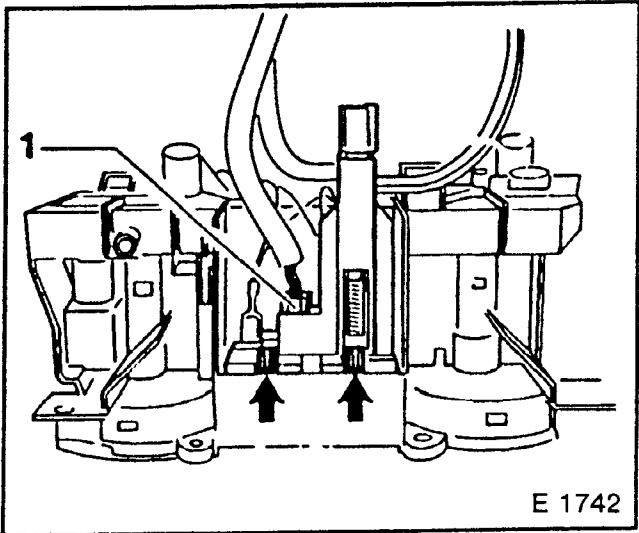


Fig. 42

# Switch for Fan/Heated Rear Screen

## — Remove and Install

### REMOVE, DISCONNECT

- 1. Rotary knob — with drift.
- 2. Unclip switch.

### INSTALL, CONNECT

- 1. Switch.
- 2. Rotary knob.

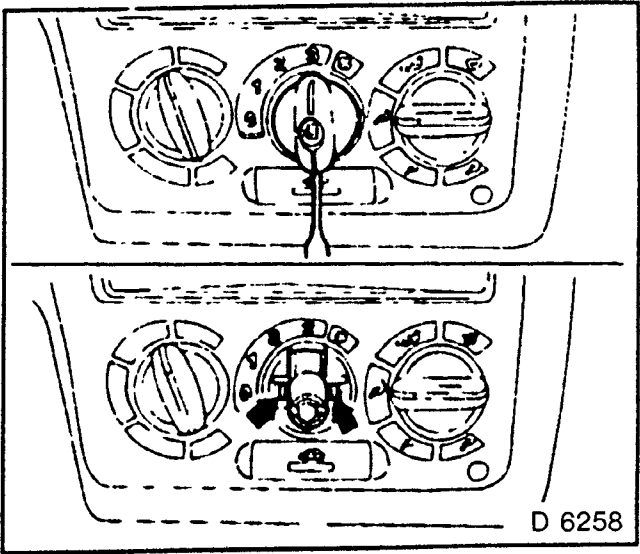


Fig 43

# Mixed Air Actuation Vacuum Unit

## — Replace

### REMOVE, DISCONNECT

- 1. Glove compartment — Section C.
- 2. Unclip actuating rod.
- 3. Hose.
- 4. Unclip vacuum unit.

### INSTALL, CONNECT

- 1. Vacuum unit
- 2. Hose.
- 3. Actuating rod
- 4. Glove compartment.

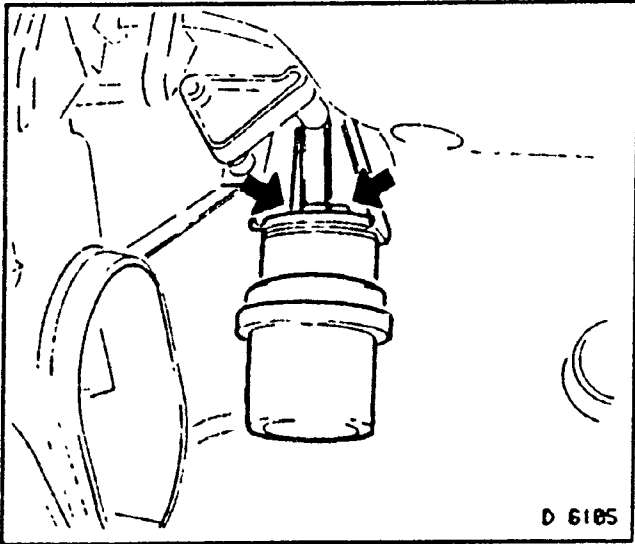


Fig. 44

## AIR CONDITIONING

### General Instructions for the Repair and Storage of Air Conditioning Components

1. Always ensure that connections are closed when storing components of the refrigerant circuit.
2. Attaching parts with missing closures or which have been penetrated by dirt, grease or moisture, should not be installed.
3. Pipes, hoses and individual components may only be installed if the attaching parts are in perfect condition.
4. To equalize temperatures and prevent moisture condensing, these components must be at room temperature.  
Closure caps (plugs) must not be removed until immediately before connection.  
Retain closure plugs from new parts for future repair work.
5. A completely or partially assembled system must not be left unconnected for any longer than is absolutely necessary.
6. The accumulator must not be connected until all other parts of the system have been connected.
7. Use new O-rings from the Parts and Accessories Department range only.
8. Before assembly, O-rings and all pipe and hose connection joints must be lubricated with a small amount of refrigerant oil. See Technical Data.
9. In order to avoid twisting and kinking at the connection, the stationary part must be counterheld when tightening.
10. Connections may only be tightened to the prescribed torque.
11. After repairs on components of the refrigerant circuit, connections must always be checked for leaks using a leak detector.
12. Measure the amount of compressor lubricant in the replaced component.

## Safety Regulations for Handling Refrigerant

**WHEN HANDLING REFRIGERANTS ALWAYS WEAR PROTECTIVE GOGGLES AND GLOVES.** At normal atmospheric pressure and normal ambient temperatures refrigerant evaporates so quickly that if it comes in contact with skin or eyes it can freeze the tissue. If such contact should occur, **RINSE THE AFFECTED PARTS IMMEDIATELY WITH PLENTY OF COLD WATER AND CONSULT A PHYSICIAN IMMEDIATELY.**

**AVOID SUBJECTING AIR CONDITIONING SYSTEM COMPONENTS TO HEAT:**

- **DO NOT** allow vehicles with an air conditioning system to remain in a drying oven for longer than 20 minutes at 80°C/176°F unless the system has been evacuated.
- When dewaxing a vehicle or steam-cleaning the engine compartment, **NEVER** apply a steam jet directly to the air conditioning system components.

**WHEN WORKING ON THE REFRIGERANT CIRCUIT, THE WORKPLACE MUST BE WELL VENTILATED.**

Inhalation of highly concentrated refrigerant in the form of gas leads to dizziness and choking sensations.

**WORK ON THE REFRIGERANT CIRCUIT MUST NEVER BE CARRIED OUT FROM A SERVICE PIT.** Gaseous refrigerant is heavier than air and can collect in pits in highly concentrated form.

**WHEN REMOVING SERVICE HOSE CLAMPS, THE HOSE SHOULD NEVER BE POINTED IN ONE'S OWN DIRECTION, AS SMALL AMOUNTS OF REFRIGERANT MAY STILL ESCAPE.**

**REFRIGERANT MUST NOT BE ALLOWED TO COME INTO CONTACT WITH FLAMES OR WITH INCANDESCENT BODIES** (e.g. during welding operations).

**KEEP REFRIGERANT BOTTLES AWAY FROM DIRECT HEAT. NEVER HEAT REFRIGERANT BOTTLES ABOVE 50°C/122°F.**

The pressure in refrigerant bottles depends on the temperature of the refrigerant. The higher the temperature of the refrigerant, the higher the pressure. If the refrigerant is heated e.g. by sunshine or by another source of heat, excessive pressure can build up, which can cause the bottle to explode.

**ON VEHICLES WITH AIR CONDITIONING, DEWAXING AND CLEANING OF THE ENGINE WITH STEAM JETS MUST BE CARRIED OUT WITH CAUTION.** On no account must air conditioning components be exposed directly to the steam jet. This would lead to dangerous increases in pressure. The same precautions apply to **WELDING OPERATIONS**. For **PAINTING OPERATIONS** the air conditioning system must be drained before beginning work if the vehicle is to stay in the drying oven for more than 20 minutes at 80°C/176°F. **DO NOT OVER-FILL REFRIGERANT BOTTLES.**



# Air Conditioning Arrangement

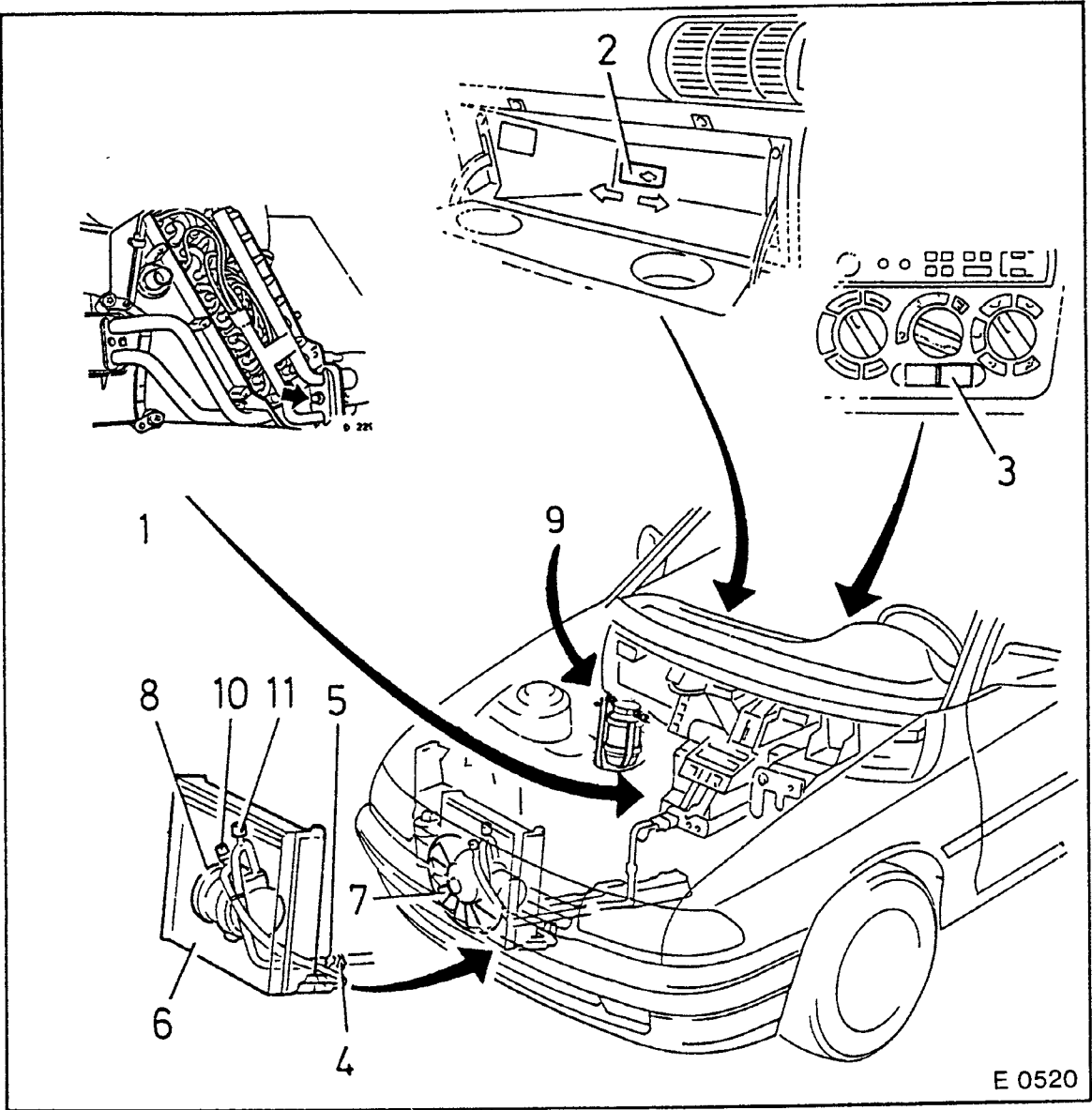


Fig 46

- |   |                                       |
|---|---------------------------------------|
| 1 — Evaporator                                      | 7 — Booster fan                       |
| 2 — Glove compartment refrigeration sliding control | 8 — Compressor                        |
| 3 — Air conditioning switch                         | 9 — Accumulator                       |
| 4 — Triple switch                                   | 10 — High pressure service connection |
| 5 — Motronic switch                                 | 11 — Low pressure service connection  |
| 6 — Condenser                                       |                                       |

# Air Distribution in Vehicle

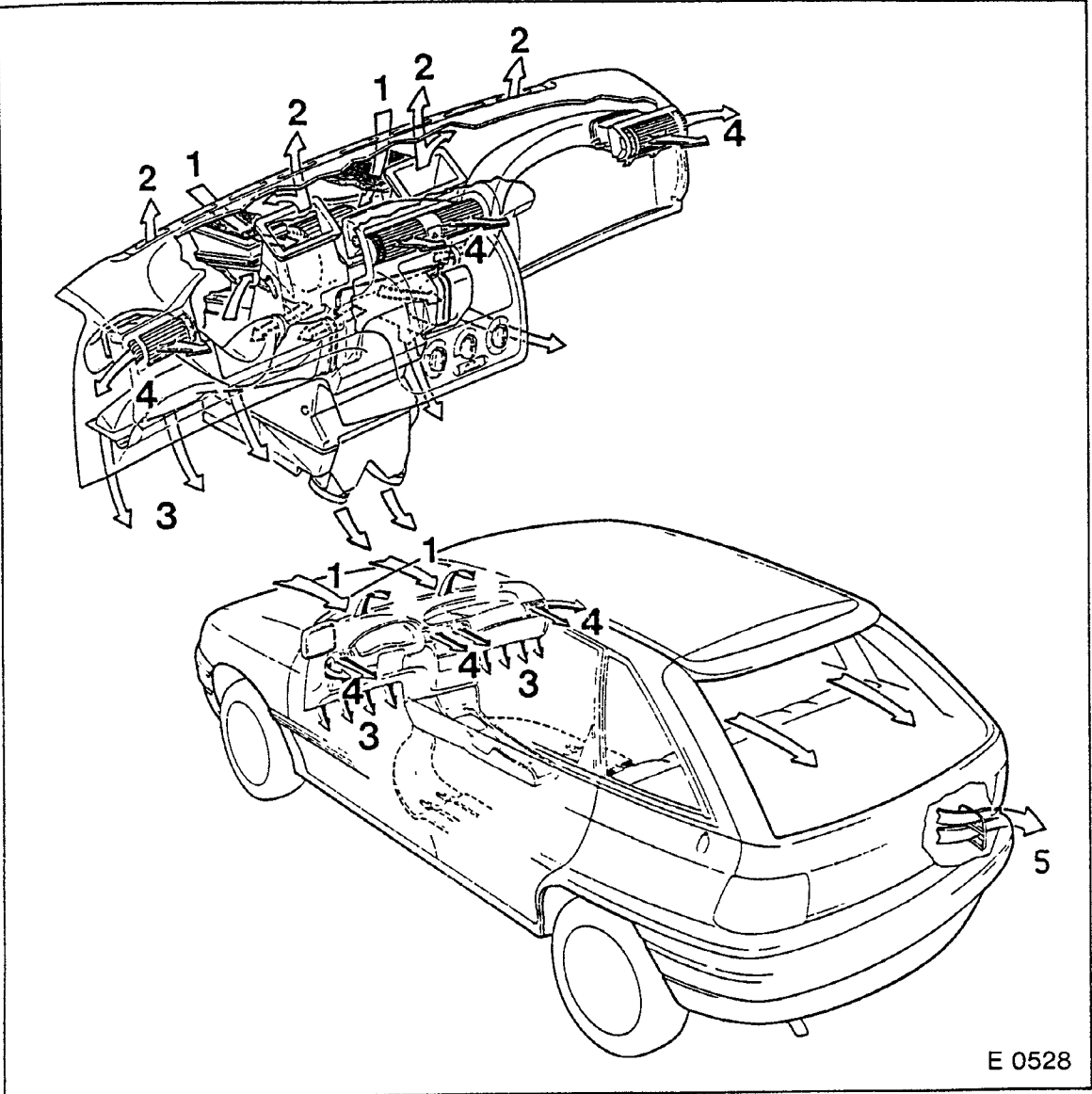


Fig. 47

**OPERATING CONTROLS**

The air conditioning system is switched on via the Air Conditioning switch (5) (switch telltale illuminates). The fan operates at stage 1, but this can be increased by turning the switch clockwise.

- 1 Temperature switch
- 2 Fan switch
- 3 Air distribution switch
- 4 Recirculating air switch
- 5 Air Conditioner switch

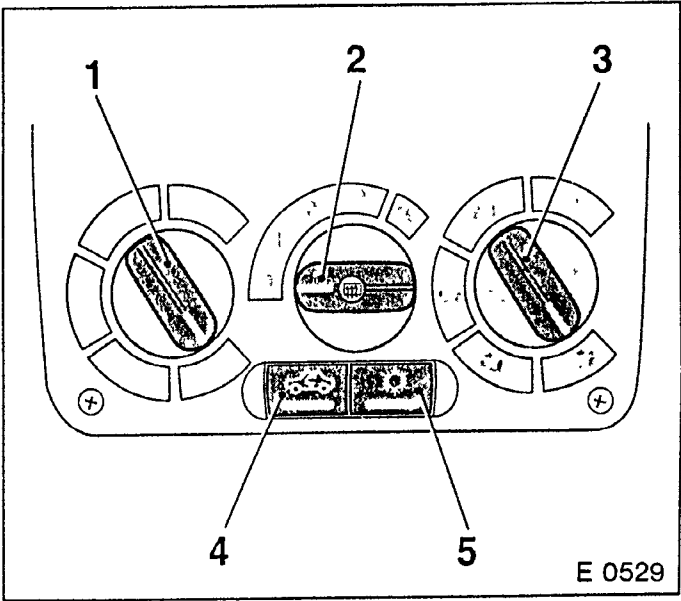


Fig 48

**ADJUSTING THE COOLING FUNCTIONS**

**MAXIMUM COOLING**

If the vehicle has been subjected to prolonged heat and sunshine, open the windows briefly to allow the hot air to escape quickly

Switch on AC switch, recirculating air switch, temperature switch to left ("cold"), fan switch to highest stage, air distribution switch to "head level" and open all nozzles.

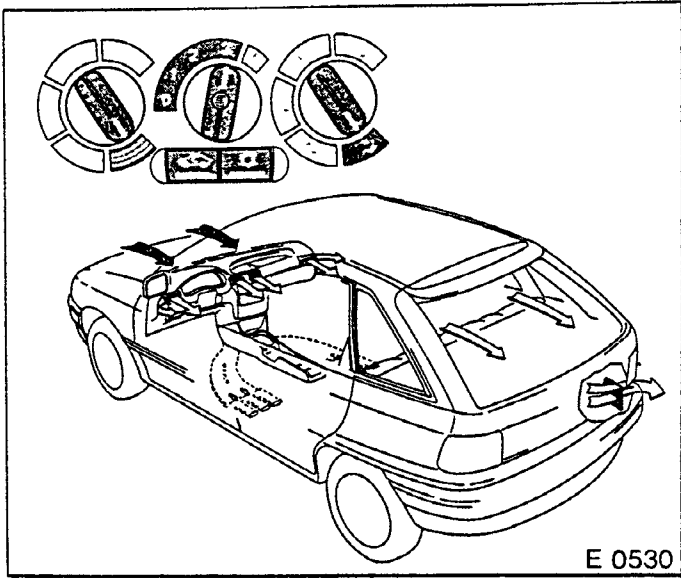


Fig. 49

**NORMAL COOLING**

Press AC switch on, recirculating air switch off, temperature switch to left ("cold"), set fan switch to stage required, air distribution switch to "head level" and open all nozzles.

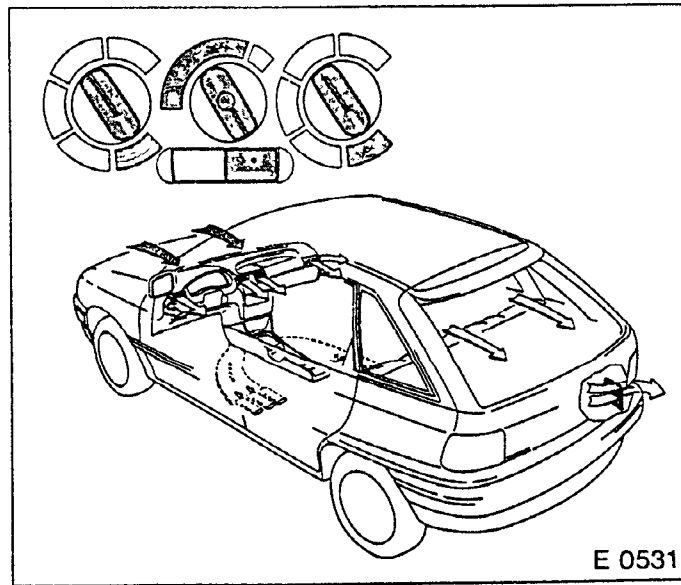


Fig 50

**AIR COOLING WITH TEMPERATURE LEVELS**

Press AC switch on, recirculating air switch off, temperature switch as required\*, set fan switch to level required, air distribution switch to head/foot level or to footwell and open nozzles as required.

\*Warm air flows to front footwell and to the side ventilation nozzles, cooler air from the centre nozzles.

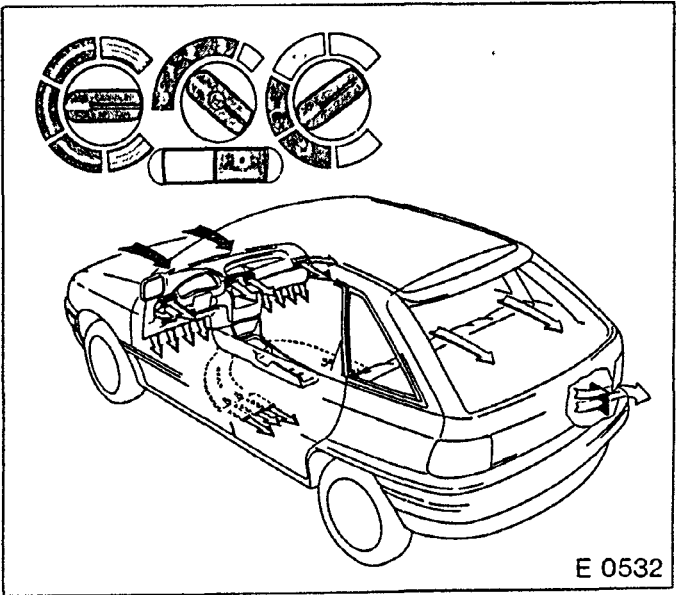


Fig. 51

**DEMISTING AND DE-ICING WINDOW PANES**

Switch on AC (to speed up demisting, compressor switches on if engine ambient temperature is over +4°C/39°F), temperature switch to right ("warm"), set fan as required, air distribution switch to windscreen or windscreen/front footwell and close all nozzles

**NOTE:**  
IF WINDSCREEN MISTS UP WHEN VEHICLE IS NOT OPERATING AND UNDER CERTAIN WEATHER CONDITIONS, SWITCH ON DEMISTING AND DE-ICING SYSTEM FOR SHORT PERIOD.

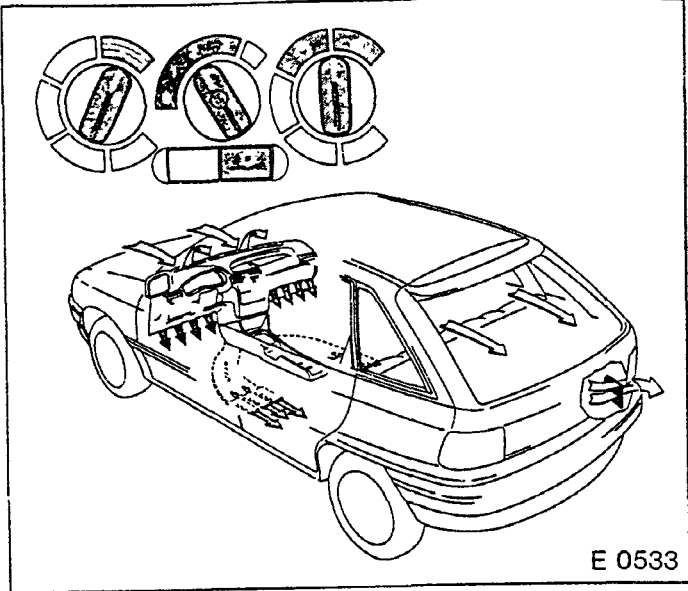


Fig. 52

**GLOVE COMPARTMENT REFRIGERATION**

When the air conditioning system is switched on, the glove compartment refrigeration can be switched on or off with sliding control.

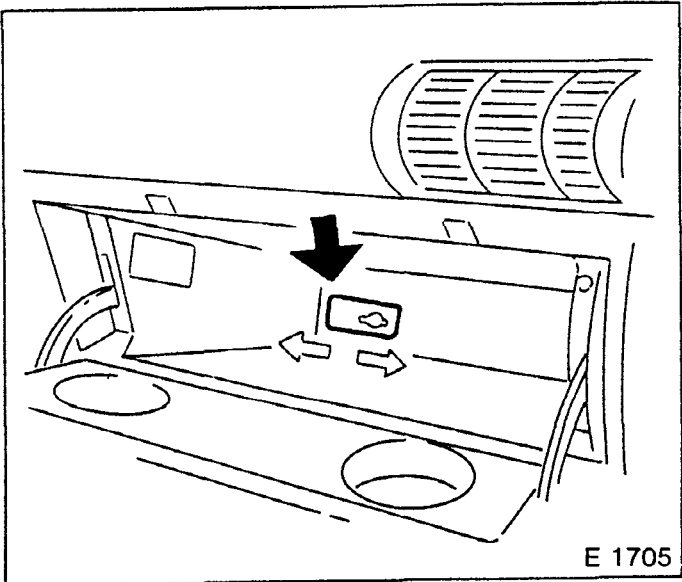


Fig. 53

Refrigerant Circuit

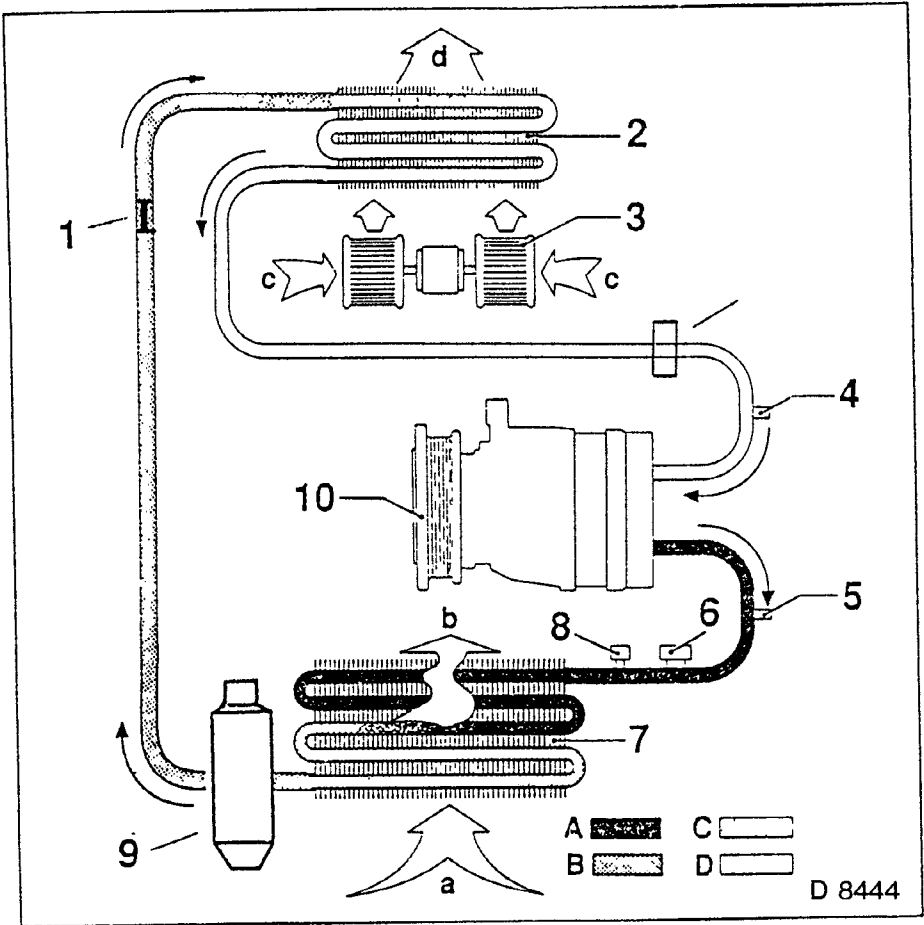


Fig. 54

- 1 — Orifice valve

2 — Evaporator

3 — Fan

4 — Low pressure service connection

5 — High pressure service connection

6 — Triple switch (low pressure safety, high pressure safety and booster fan)

7 — Condenser

8 — Motronic switch

9 — Accumulator

10 — Compressor
- a — Outside air

b — Warm air

c — Uncooled air

d — Cooled air

A — High pressure vapour

B — High pressure liquid

C — Low pressure liquid

D — Low pressure vapour

# Description of Refrigerant Circuit

The compressor (1) sucks low pressure and temperature refrigerant vapour out of the evaporator (2) and compresses this vapour to a high pressure and temperature.

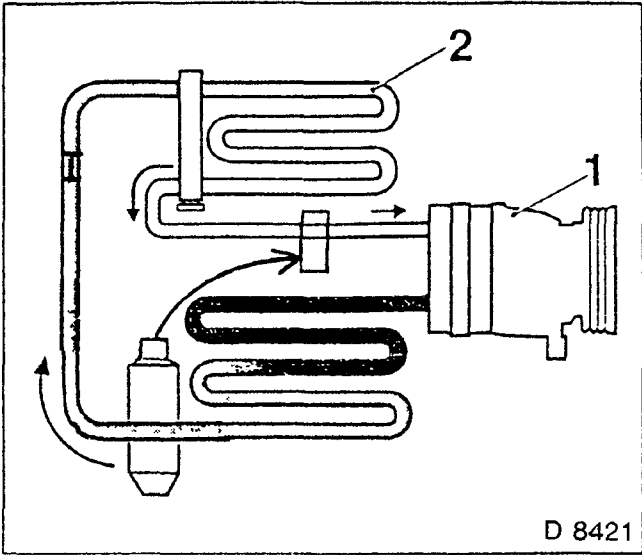


Fig. 55

The compressor (1) compresses the hot refrigerant vapour into the condenser (3). The colder outside air causes the temperature of the hot refrigerant vapour in the condenser to fall below boiling point and the vapour condenses to liquid.

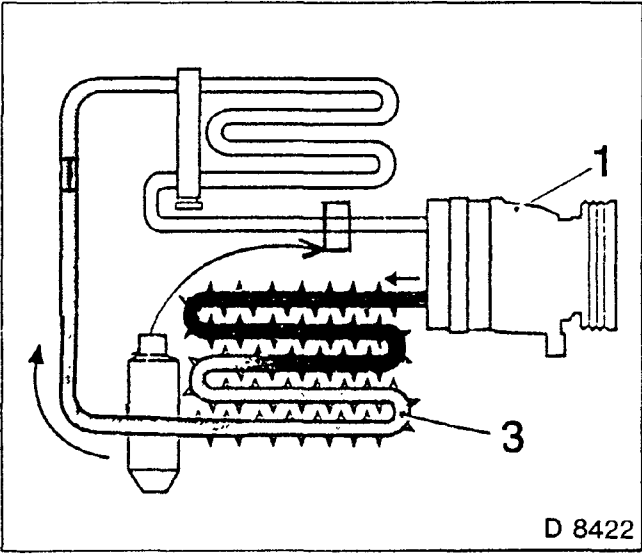


Fig. 56

The liquid refrigerant flows from the condenser (3) to the orifice valve (4).

The orifice valve restricts the diameter of the tube and forms the interface between the high and low pressure phases of the refrigerant circuit.

Finally the refrigerant reaches the evaporator (2). The lower pressure in the evaporator causes the refrigerant to turn to vapour. In doing so it extracts the heat from the immediate environment and the air passing through the evaporator is cooled. The refrigerant is then sucked back into the compressor.

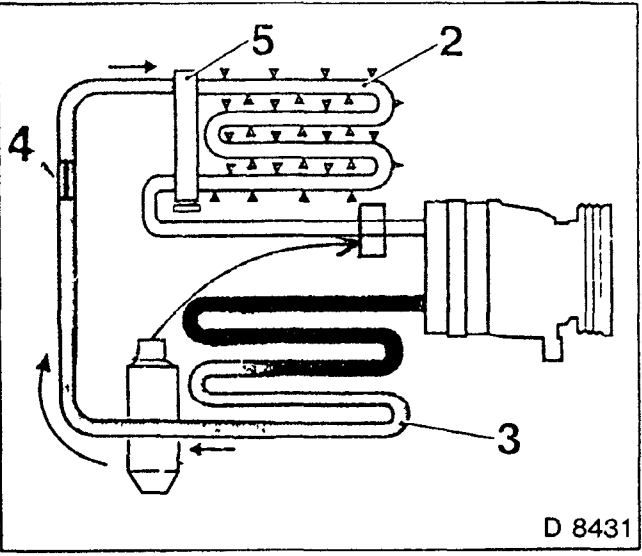


Fig. 57

# Compressor

The compressor sucks the refrigerant vapour out of the evaporator and compresses it to a higher pressure. In the process the temperature of the refrigerant vapour rises.

The compressor is attached to the engine and is driven by a ribbed V-belt with automatic tensioner.

The positive engagement between crankshaft pulley and compressor is via a magnetic coupling.

- 1 — Marker
- 2 — Pressure relief valve
- 3 — Fluid drain plug
- 4 — Magnetic coupling plug contact
- 5 — Pulley with magnetic coupling
- 6 — Outlet to condenser
- 7 — Inlet from evaporator
- 8 — Control valve

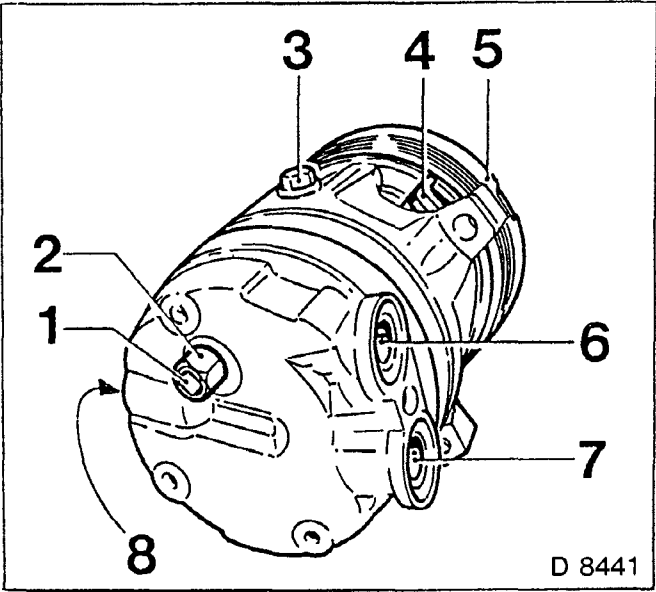


Fig. 58

## SERVICE

When storing the compressor, ensure that all connection points are closed so that no moisture or dirt can enter. They should not be opened until immediately before installation.

The pressure relief valve is equipped with a sticker that serves as a marker. If the marker is missing, this is a sign that refrigerant has escaped via the valve.

The only service operations that should be performed on the compressor are replacement of the control valve, pressure relief valve and the pulley/magnetic coupling assembly. When installing the assembly, the gap (1) between pulley and magnetic coupling must be correct. The gap (1) should not exceed 0.4 to 1.0 mm.

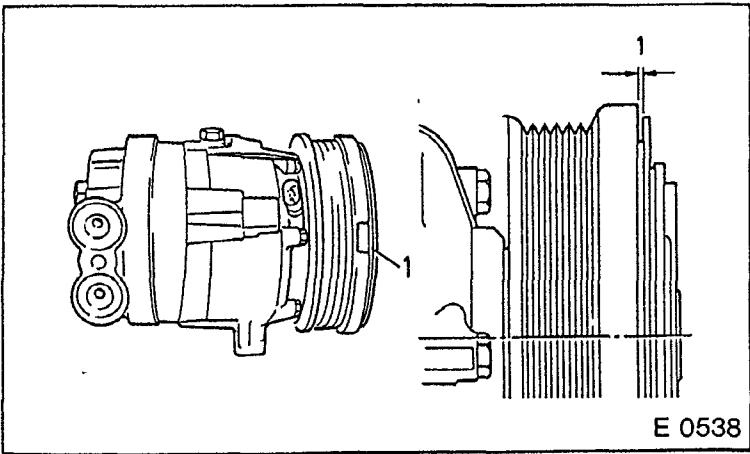


Fig. 59

CIRCUIT DIAGRAM —  
COMPRESSOR

- K 6     Air conditioning relay
- K 26    Cooler fan relay
- K 60    Compressor relay
- K 90    Relay in conjunction with automatic transmission
- S 20    Triple switch
- S 20-1   Compressor low pressure switch
- S 20-2   Compressor high pressure switch
- S 20-3   Booster fan switch
- S 101   Compressor switch
- S 109   Compressor Motronic switch
- S 128   Coolant temperature switch
- V 8     Compressor diode
- Y 1     Compressor coupling

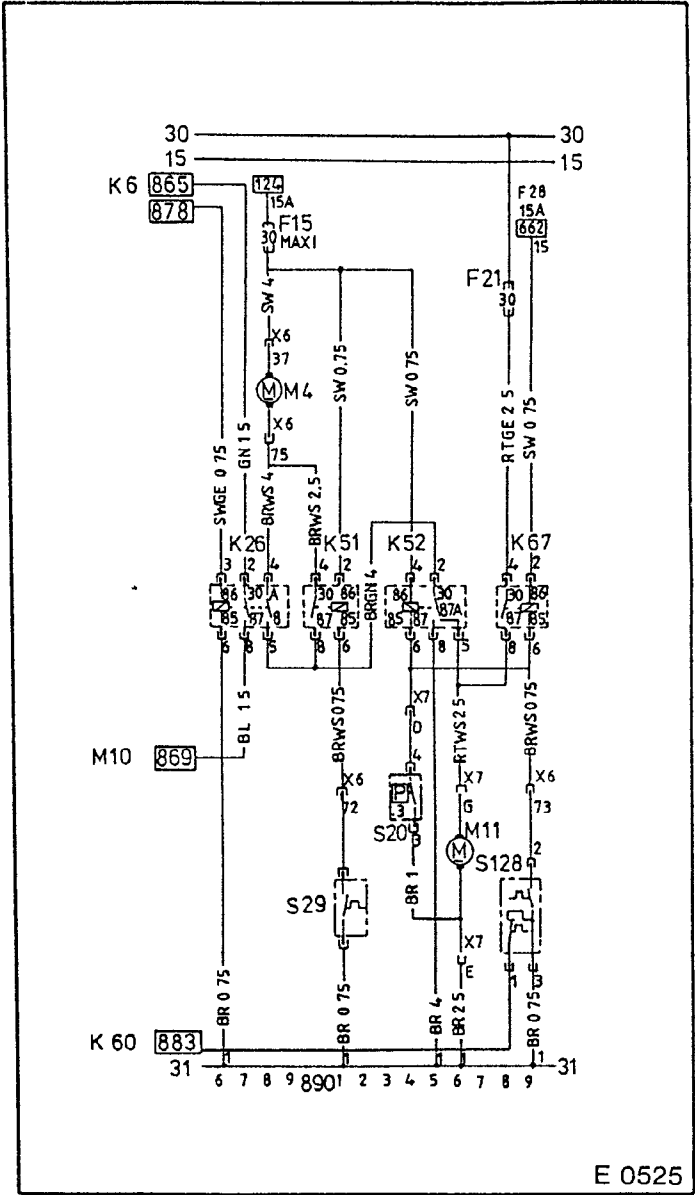


Fig. 60



# COMPRESSOR LUBRICANT

The compressor lubricant lubricates the moving parts of the compressor. It is a BVM oil, specially chosen to harmonise with refrigerant R-12a. This special oil circulates along with the refrigerant throughout the entire refrigerant circuit.

The compressor is filled with the full complement of compressor lubricant (approximately 300 ml) before initial operation of the air conditioning system begins. When the system starts to function, the refrigerant carries the lubricant with it through the refrigerant circuit. When the system comes to rest, the lubricant is distributed proportionally throughout the various components.

## Compressor Lubricant — Top up

- See compressor lubricant and total capacity as indicated on page 71, Technical Data.
- The total amount of compressor lubricant to be topped up is composed of the amount in the parts being replaced and of the amount that escapes while the air conditioning is being drained. This amount of new compressor lubricant is filled directly into the component on installation.
- New compressors are filled with the amount of compressor lubricant required for the entire refrigerant circuit.
- When replacing the compressor, first measure the amount of compressor lubricant in the old compressor
- Drain the compressor lubricant from the new compressor into a clean container. Fill the new compressor with the amount of lubricant that was in the old compressor.

## DESIGN OF COMPRESSOR

The compressor has five cylinders with variable stroke. The compressor control valve regulates displacement which determines refrigerant flow.

When the compressor load is increased, the flow of refrigerant is reduced by means of a by-pass, preventing damage due to overloading.

- 1 — Piston
- 2 — Wobble disc
- 3 — Magnetic coupling connection
- 4 — Magnetic coupling
- 5 — Drive shaft
- 6 — Pulley
- 7 — Guide ball
- 8 — Guide rod
- 9 — Control valve
- 10 — Valve plate

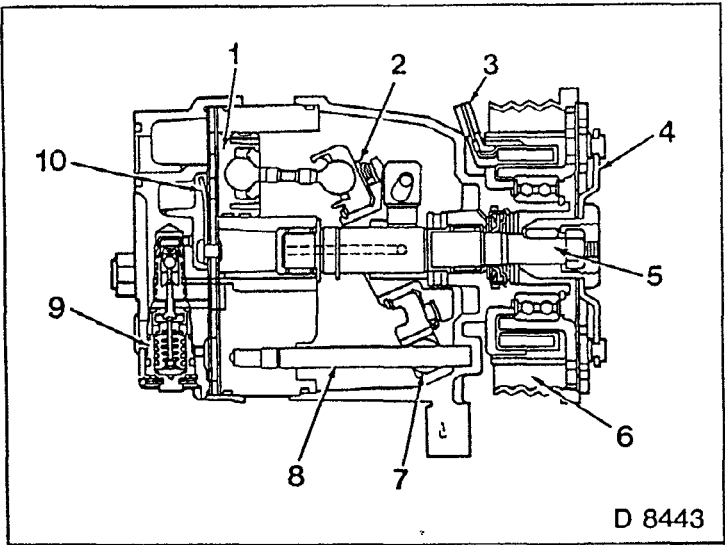


Fig. 61

**DISPLACEMENT VARIATION**

The wobble disc activates all five pistons, which are axially arranged. It is installed in a shell bearing and swivels on one side. At the opposite side it moves along a guide rod.

When the compressor is switched on, the swivel mechanism does not operate. The drive shaft causes the centre of the wobble disc to rotate.

When the wobble disc is at almost right angles to its bearings, the plate wobbles only slightly, the piston stroke is at minimum and there is hardly any refrigerant flow.

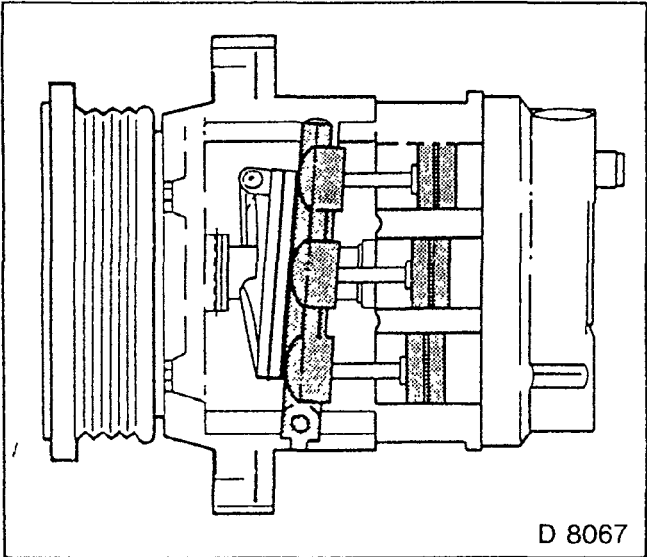


Fig. 62

If the wobble disc is at maximum, the plate wobbles more vigorously, the piston stroke is greater and the flow capacity of the compressor reaches maximum

The high pressure of the refrigerant circuit is exerted at the piston face. The internal pressure of the compressor housing is exerted on the piston base. This internal pressure is controlled by the control valve.

As soon as the relationship of these two pressures changes, the pistons move in the direction of the lower pressure. As the pistons and the wobble disc are connected, the attack angle that the wobble disc takes up varies until both pressures are equal.

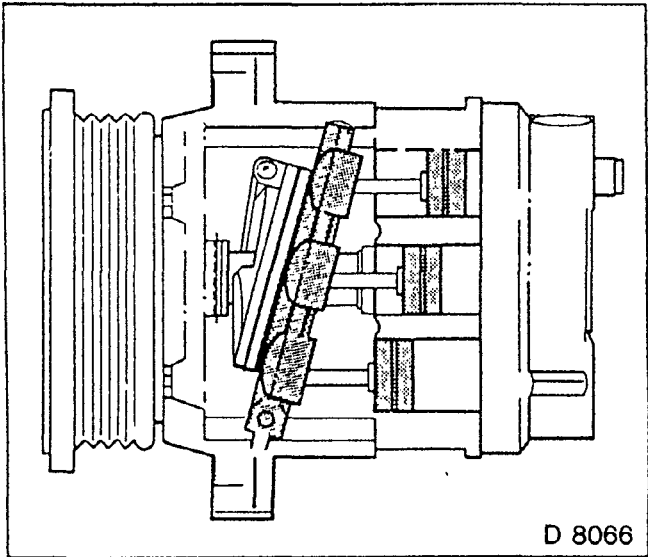


Fig. 63

PERFORMANCE CONTROL AND  
FUNCTIONING OF CONTROL  
VALVE

The control valve regulates the performance of the AC system, ensuring that the system always operates with the greatest possible efficiency. This control is necessary in order to ensure that variable engine speeds and outside temperatures do not lead to variable quality in the air conditioning system and to avoid icing of the evaporator. The temperature of the intake air into the passenger compartment is regulated simply by mixing uncooled air via the temperature switch.

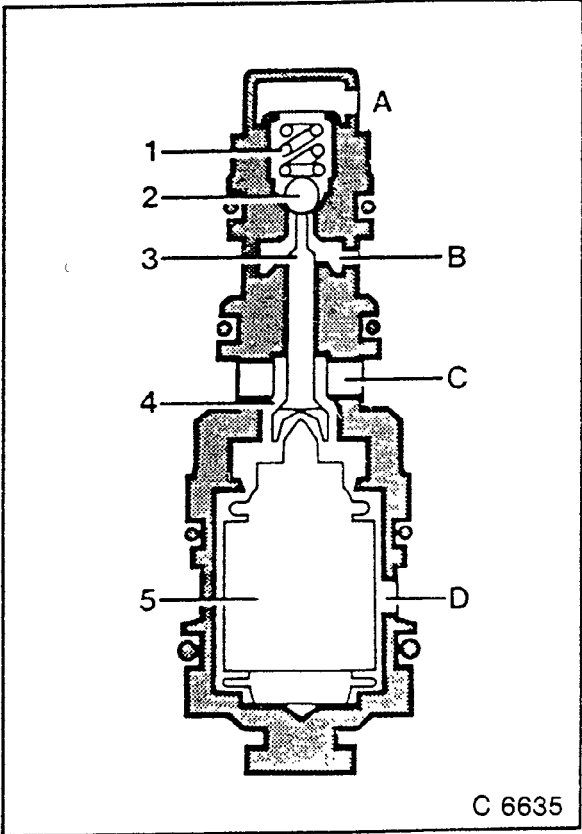
As the pressure on the high pressure side of the refrigerant circuit is almost constant, the force exerted on the piston face side remains nearly constant as well. Only by changing the counterforce on the piston floor, by increasing or reducing the internal pressure of the housing, can the attack angle be changed.

The internal pressure of the compressor housing is controlled by the control valve. The control valve is located on the rear of the compressor.

There is a metal diaphragm (5) with vacuum in the valve and is effected by the pressure on the low pressure side of the refrigerant circuit.

High pressure on the low pressure side compresses the diaphragm, while low pressure causes it to expand. The contraction and expansion of the diaphragm affects the valve ball (2) and the valve constriction (4). Both are joined by the valve stem (3) and are either opened or closed by the pressure of the spring (1) or the counterpressure of the diaphragm.

In this way the valve ball regulates the increase and the valve constriction the decrease in the internal pressure of the compressor housing



- |                        |                                      |
|------------------------|--------------------------------------|
| 1 — Spring             | A — Pressure from high pressure side |
| 2 — Valve ball         | B — Outlet to compressor interior    |
| 3 — Valve stem         | C — Inlet from compressor interior   |
| 4 — Valve constriction | D — Outlet to low pressure side      |
| 5 — Diaphragm          |                                      |

Fig 64

For performance control the following are important:

**1. HIGH PERFORMANCE REQUIREMENT**

High pressure on the low pressure side affects the diaphragm. This contracts and causes the ball valve to close the delivery of high pressure and at the same time open the valve constriction. The refrigerant in the compressor housing can move to the suction side and the internal pressure of the housing is reduced. The attack angle of the wobble disc is enlarged and the piston stroke increased.

Compressor displacement is regulated to give maximum performance.

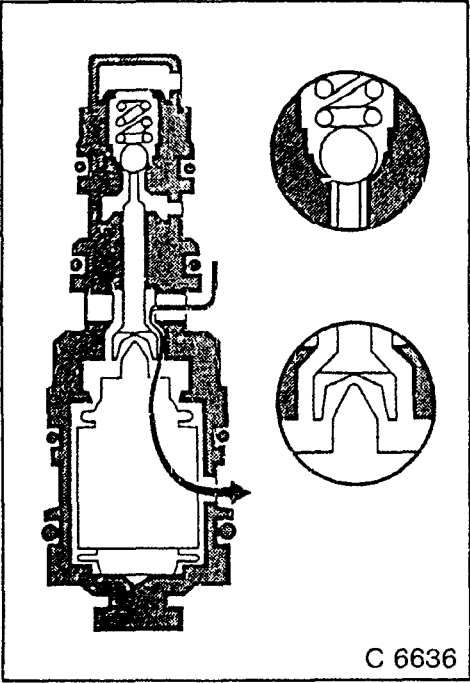


Fig. 65

**2. LOW PERFORMANCE REQUIREMENT**

Low pressure on the low pressure side affects the diaphragm. This expands and the valve constriction is closed. Refrigerant vapour cannot move to the suction side from the compressor housing. The valve ball clears the way for delivery of high pressure refrigerant and the internal pressure of the housing is increased. The attack angle of the wobble disc becomes narrower and piston stroke is reduced.

The compressor operates with minimum displacement and minimum performance

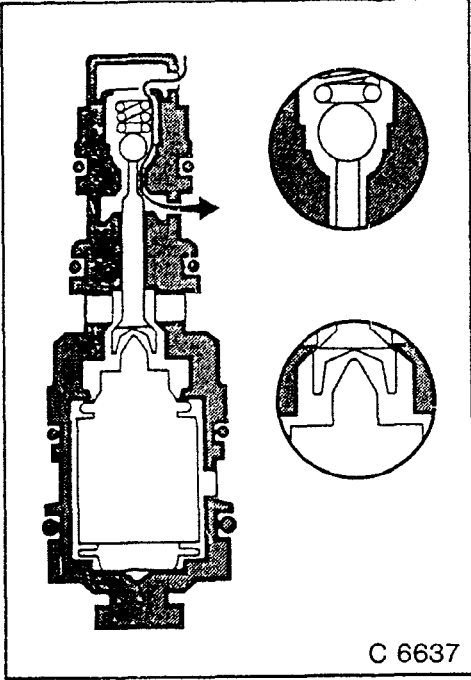


Fig 66

**SERVICE**

When installing the valve, always use new O-rings. Coat the O-rings with mineral oil.  
**NEVER USE COMPRESSOR LUBRICANT FOR THIS PURPOSE.**

## Condenser

The condenser cools the hot refrigerant vapour and condenses it to liquid refrigerant.

The condenser is made up of a continuous aluminium tube connected by plates that act as intensive heat conductors. Temperatures in the condenser reach up to 100°C/212°F.

Due to this additional source of heat and the location of the condenser in front of the vehicle's radiator, the volume of circulating air is reduced and the engine's cooling system affected. A heavy duty radiator and an extra electric fan at the front of the condenser guarantee adequate cooling of both condenser and engine.

The pressure in the condenser is between 800 and 3 000 kPa (8 and 30 bar).

### SERVICE

Always store a condenser with all connecting points closed to prevent moisture and dirt from entering. **DO NOT** remove the stoppers until immediately before installation.

A new condenser is filled with nitrogen to prevent corrosion. When the stoppers are being removed, the nitrogen can be heard to escape due to slight excess pressure.

# Accumulator

The accumulator has two functions.

During service operations that involve opening the refrigerant circuit, small amounts of moisture enter the system. The drier contained in the accumulator absorbs the moisture from the refrigerant, as this could lead to malfunction of the air conditioning system.

The accumulator also filters out residual gaseous refrigerant particles which might adversely affect the orifice valve.

The accumulator is located on the low pressure side of the refrigerant circuit near to the evaporator

## OPERATION OF HARRISON ACCUMULATOR/DEHYDRATOR

A mixture of refrigerant liquid and vapour with oil enters the accumulator/dehydrator from the evaporator. A baffle deflects the liquid refrigerant and oil to the bottom of the accumulator/dehydrator. Vapour is drawn from the top of the accumulator/dehydrator through the outlet tube by the compressor. A small opening in the bottom bend of the outlet tube allows a calibrated amount of oil in the refrigerant solution to return to the compressor for lubrication.

## SERVICE

The accumulator does not need servicing, but must be exchanged every time the refrigerant circuit is opened. It should always be stored with closed connecting points to prevent moisture and dirt from entering. Stoppers should not be removed until shortly before installation.

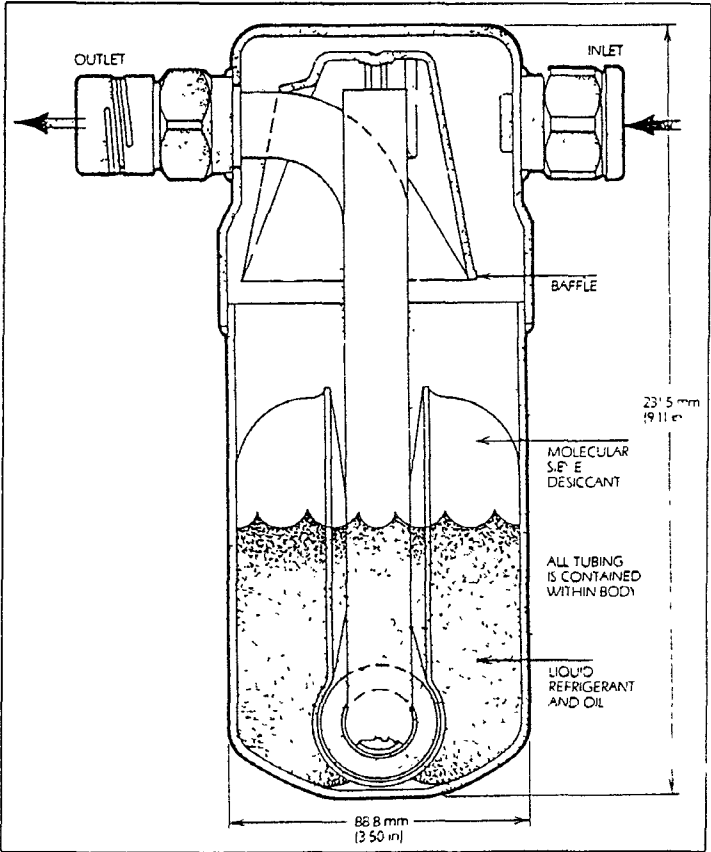


Fig. 67

# Orifice valve

The orifice valve forms the interface between high pressure and low pressure ranges in the refrigerant circuit.

A drop in pressure behind the orifice valve causes the refrigerant to evaporate.

The orifice valve is located between the condenser and the evaporator inlet pipe.

The orifice valve has a calibrated flow diameter.

Location of the orifice valve:

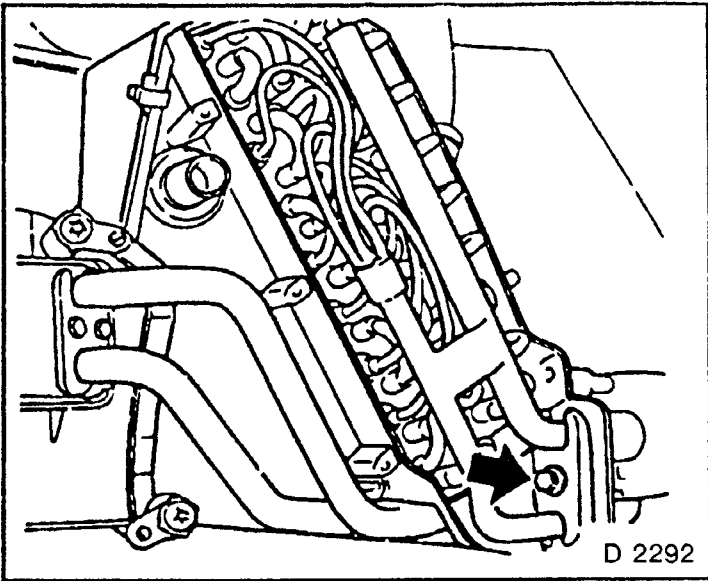


Fig. 68

# Evaporator

As a result of the fall in pressure after passing through the orifice valve, the refrigerant turns to gas in the evaporator and in so doing absorbs heat from the immediate environment

The evaporator is made of aluminium and like the condenser consists of a series of pipes and plates, installed in the air distributor housing in front of the heater core.

Location of evaporator in air distributor housing:

Fresh air flows over the evaporator plates where it is cooled, dried and purified when the evaporator is switched on.

The air is dried and purified as follows:

The moisture in the fresh air making contact with the plates condenses on the cold surface of the evaporator. Dust, pollen, etc. are trapped by the condensed water and washed out along with the condensed water via the condensation waste hoses.

# SERVICE

When a vehicle's engine is switched off after running for a lengthy period with the air conditioner operating, the condensed water may collect in a puddle under the vehicle.

When storing the evaporator, ensure that all connection points are closed so that no moisture or dirt can enter. They should not be opened until immediately before installation.

A new evaporator is filled with nitrogen to prevent corrosion. When the stoppers are being removed, the nitrogen can be heard to escape due to slight excess pressure.

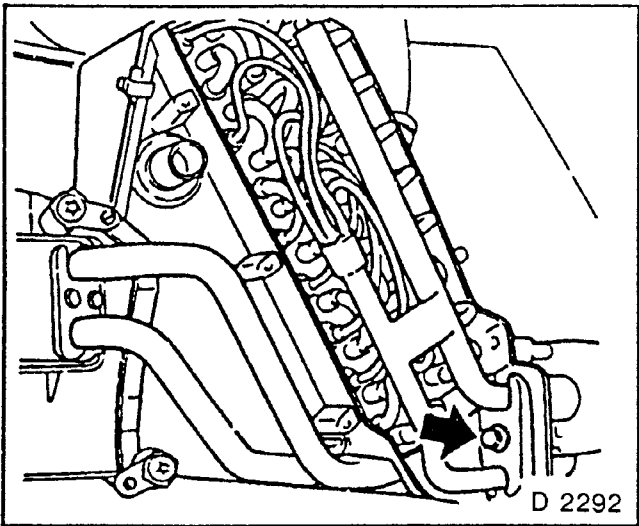


Fig 69

## Air Distribution in Air Distributor Case

The air flow system in vehicles with air conditioning is essentially the same as the system in vehicles with conventional heating and ventilation.

The one component that is essentially different is the evaporator, which is located in the airstream in front of the heater core.

Fresh air is always forced into contact with the evaporator plates before being transported, cooled or not, into the passenger compartment.

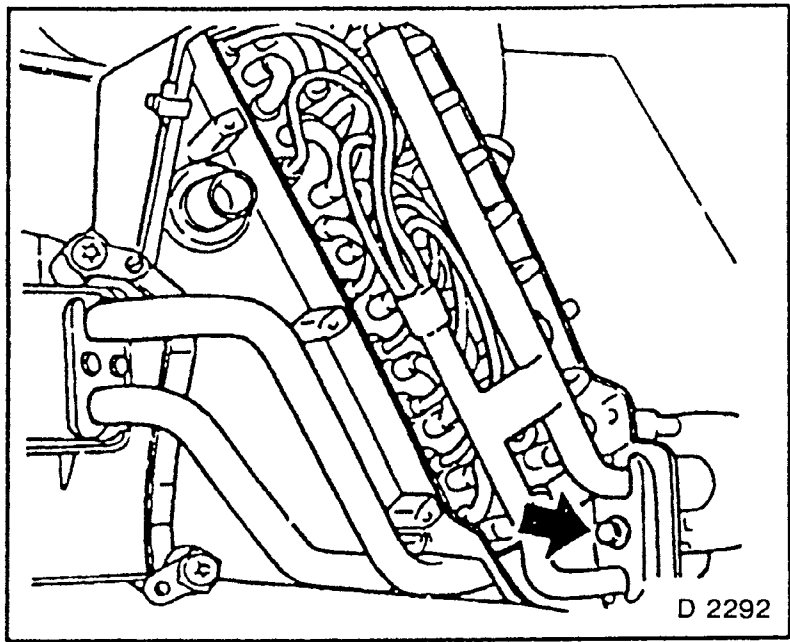


Fig. 70



Booster Fan

The booster fan augments the cooling of the condenser and the engine.

When the air conditioning system is switched on, the booster fan M 11 and radiator fan M 4 are automatically activated. They are switched in sequence via relay K 26, the voltage is halved and both fans operate at stage 1.

The triggering of booster fan switch S 20-3 or coolant temperature switch S 128 causes booster fan M 11 and radiator fan M 4 to be switched in parallel via relay K 67. The fans receive full battery voltage and operate at stage 2.

When the air conditioning system is switched off, radiator fan switch S 29 switches booster fan M 11 and radiator fan M 4 to stage 1 if the coolant becomes too warm, just as it does in the case of vehicles without air conditioning.

CIRCUIT DIAGRAM — BOOSTER FAN

- K 6 AC relay
- K 26 Radiator fan relay
- K 51 Radiator fan relay
- K 52 Radiator fan relay
- K 60 Compressor relay
- K 67 Radiator fan relay
- M 4 Radiator fan motor
- M 10 Heating fan motor
- M 11 Radiator booster fan motor
- S 20-3 Booster fan switch
- S 29 Coolant temperature switch
- S 128 Coolant temperature switch

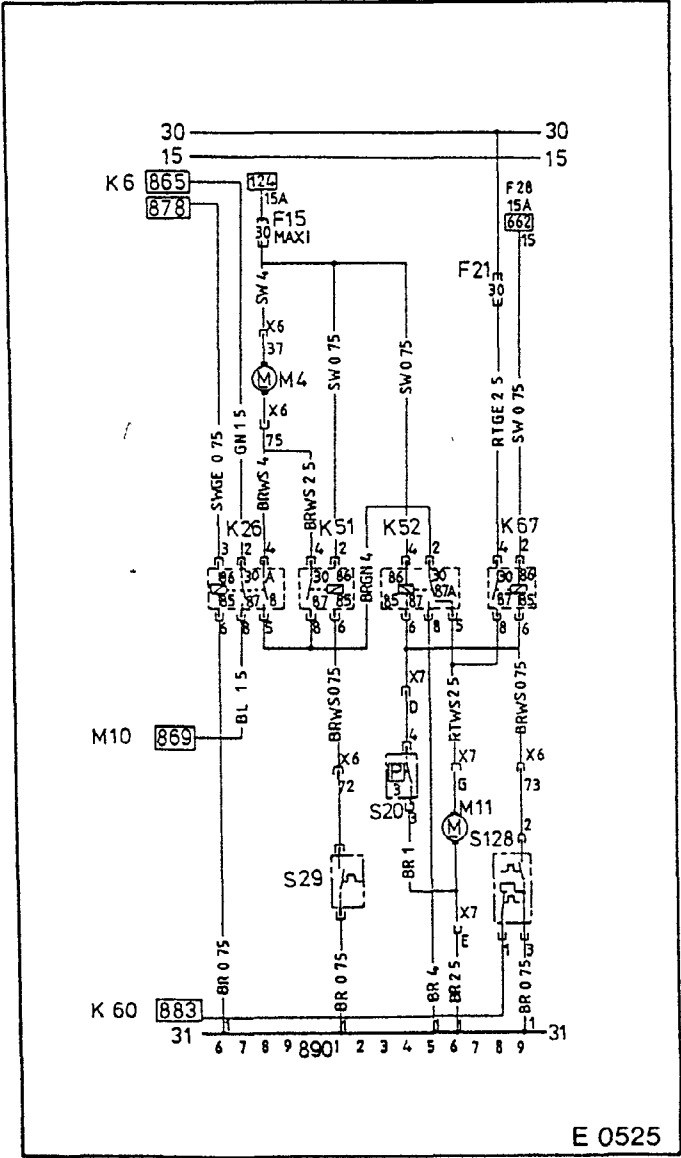


Fig. 71

SERVICE CONNECTIONS

The AC system is connected to the service station by the service connections.

The service connections are equipped with a Schrader valve of the type used in vehicle tyres.

The service connections have screw-on protective caps, which provide additional sealing for the valve and protect it from dirt and damage. The caps are screwed on by hand.

Low pressure service connection (1).

The pressure in the low pressure range of the refrigerant circuit can be measured at the low pressure connection. The prescribed value\* is 190 to 210 kPa (1.9 to 2.1 bar).

High pressure service connection (2).

The pressure in the high pressure range of the refrigerant circuit can be measured at the high pressure connection. The prescribed value\* is 1,000 to 1,800 kPa (10 to 18 bar).

Engine speed approximately 1 500 rpm, AC system on, outside temperature approximately 20°C/68°F

MOISTURE IN REFRIGERANT CIRCUIT

Moisture in the refrigerant circuit is a frequent cause of malfunction of the AC system. It can lead to corrosion of the compressor interior and to irregular performance of the AC system.

Moisture in the refrigerant may have various causes.

- Humidity in the atmosphere condenses and is deposited on or in exposed AC components while service is being performed.
- Atmospheric humidity is diffused in the refrigerant lines in the closed refrigerant circuit.

Careful storage of the components and evacuation of the system after service operations in most cases, prevents moisture from entering the refrigerant circuit. Residual moisture in the refrigerant is removed by the drier in the accumulator.

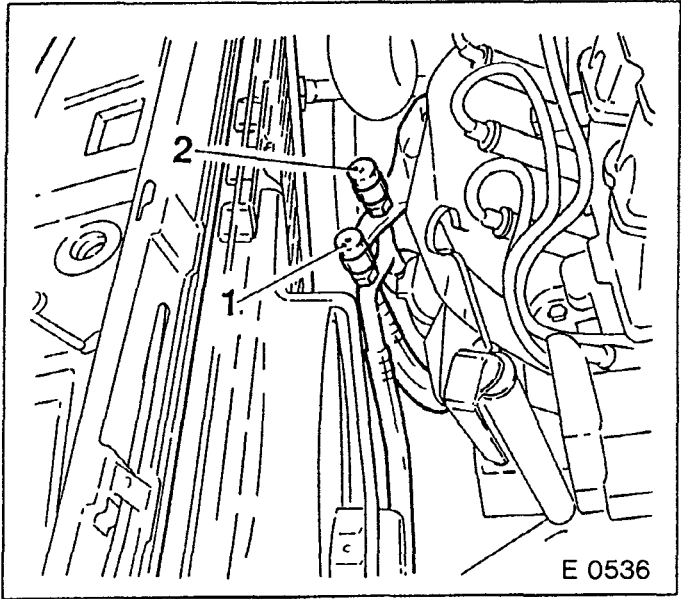


Fig. 72

## Leak Detection in Refrigerant Circuit

Before draining the AC system, the refrigerant circuit must be checked for leaks with the leak detector. If leaks that are present cannot be localised before the system is drained, sealed after draining but before evacuation of the system, air and moisture may enter the system when it is later evacuated.

Leaks in the system occur chiefly at connections. They can be detected in some cases with the naked eye, as the compressor lubricant that escapes combines with dust and dirt from the atmosphere, causing the location of the leak to appear greasy and dirty

- Check connection joints and hoses carefully.
- The vehicle engine should remain switched off when checking for leaks.
- The engine compartment should be well ventilated before checking for leaks with a leak detector as the detector will also react with vapour given off by detergents, antifreeze, fuel, etc
- Movement of air in the engine compartment should be kept to a minimum during leak detection, so that even the minutest leaks can be found.
- When leaks are located, the lower side of the location must be checked in each case, as refrigerant gas is heavier than air.
- The refrigerant circuit must be pressurized for detection of leaks. For this purpose completely drained systems may be filled with approximately 400 g refrigerant.

# Air Conditioning, Drain

## INSPECT

Before the refrigerant circuit is opened for service operations, the system must be drained.

Before draining the air conditioning:

- 1. Check the leaks at the underside (gas is heavier than air) of all connection points on the refrigerant circuit — Leak Detector Unit W13480
- 2. If present, seal leaks.

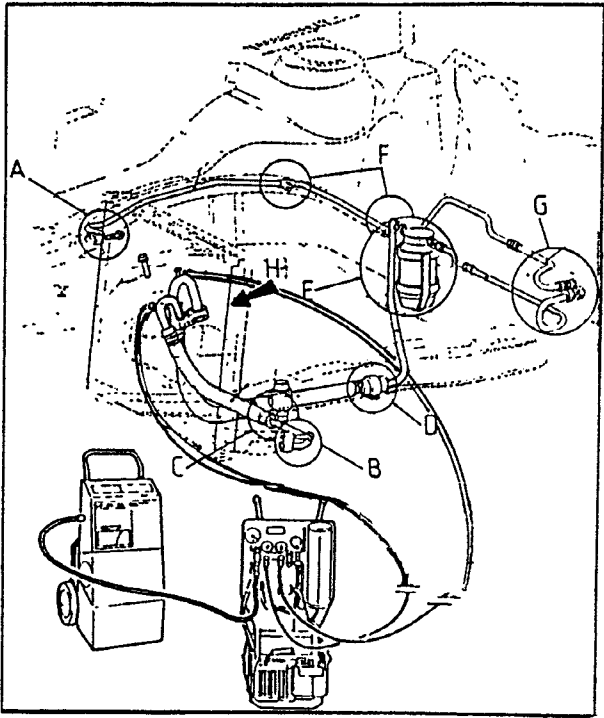


Fig 73

The refrigerant is removed by the service station, recycled and stored. In the draining process some of the compressor lubricant also escapes

Connect Service Station 17351 to AC service connections.

- Red hose to high pressure service connection.
- Blue hose to low pressure service connection.

The service station operating instructions describe how to proceed further.

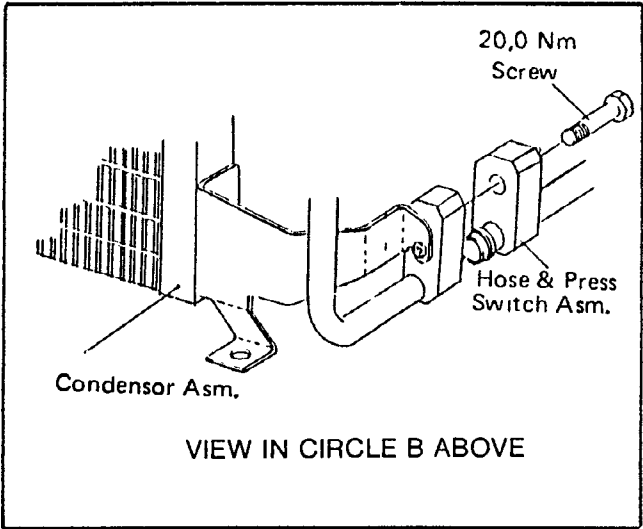
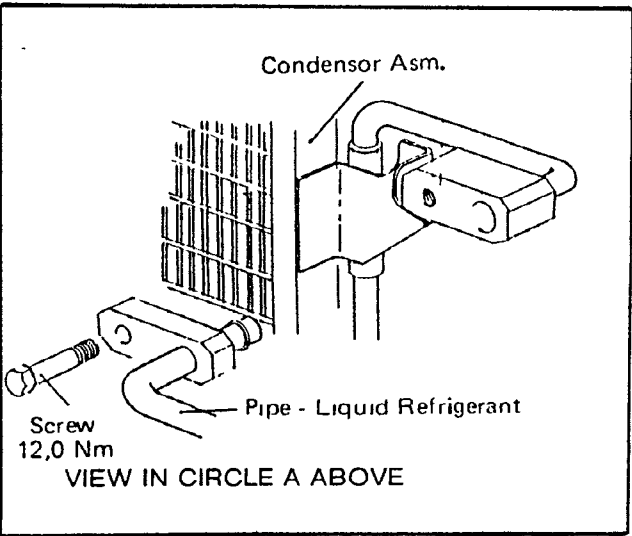


Fig. 74

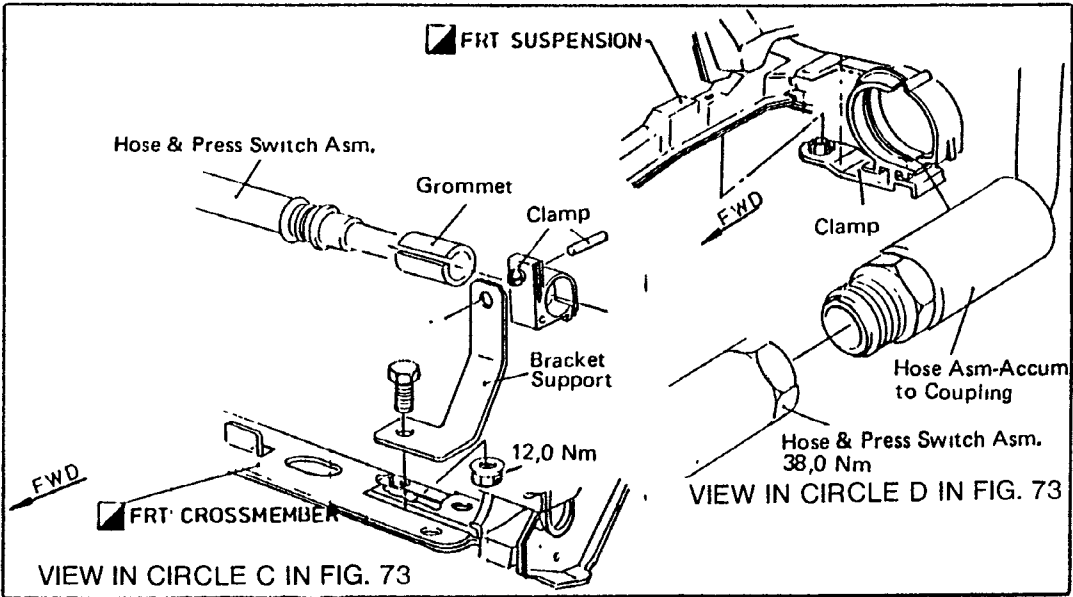


Fig. 75

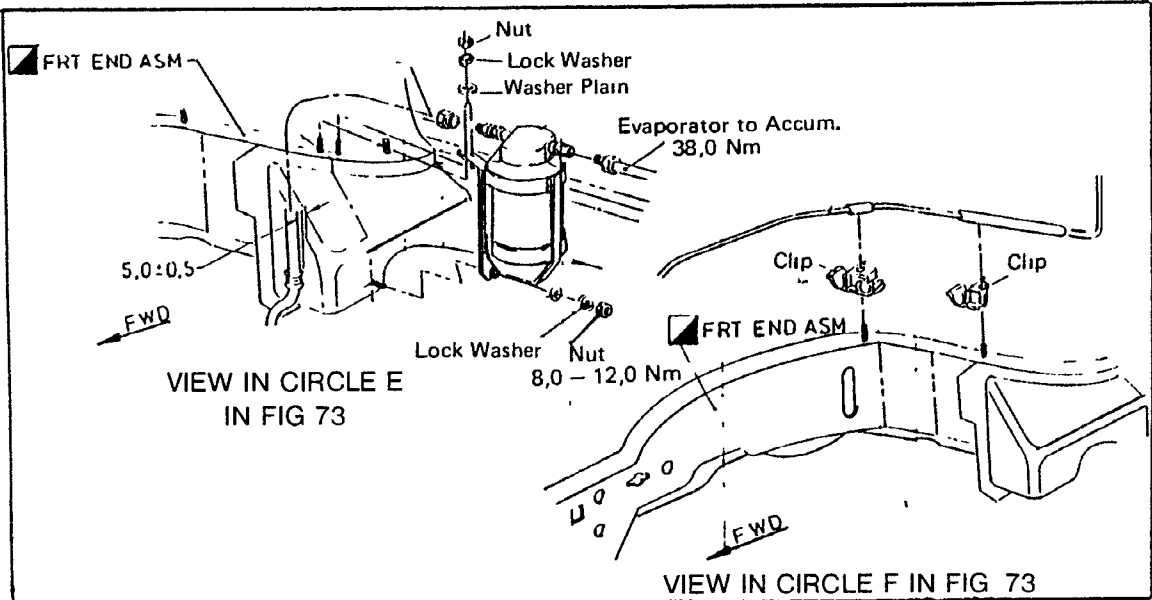


Fig. 76

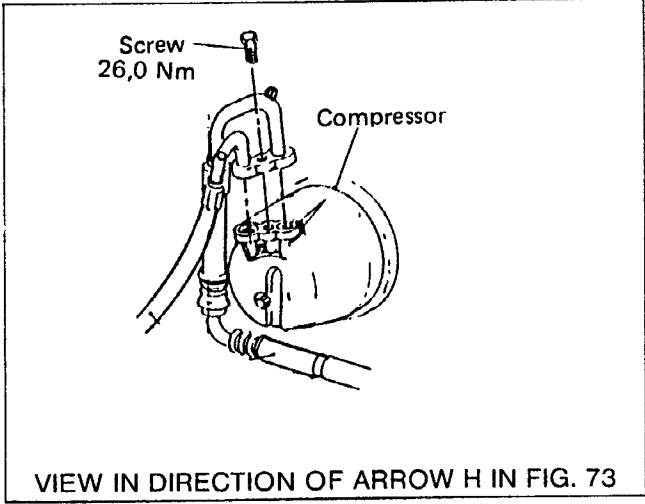
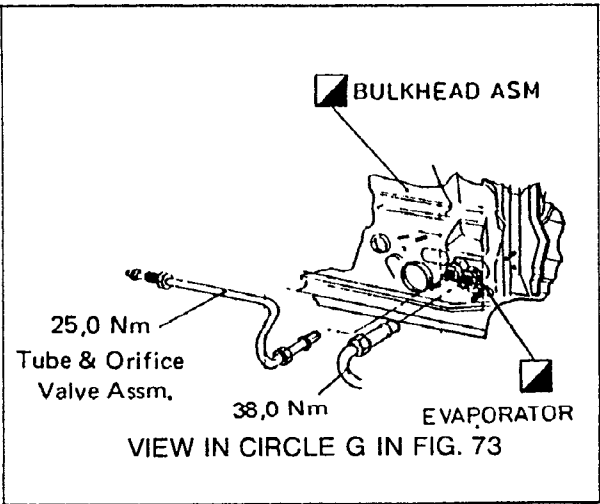


Fig. 77

**INSTALL, CONNECT**

- 1. Red hose from MKM — 721 to high pressure service connection (B).
- 2. Blue hose to low pressure service connection (A). (Fig. 78).  
Yellow hose from MKM — 721 to MKM — 720 See arrow — Fig. 79.
- 3. Drain air conditioning — observe MKM — 720 and MKM — 721 Operating Instructions.

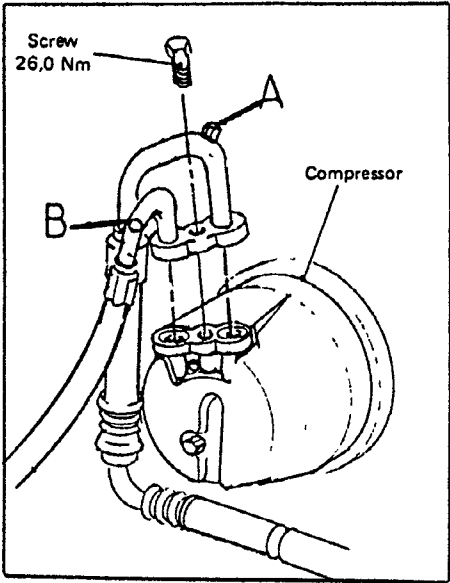


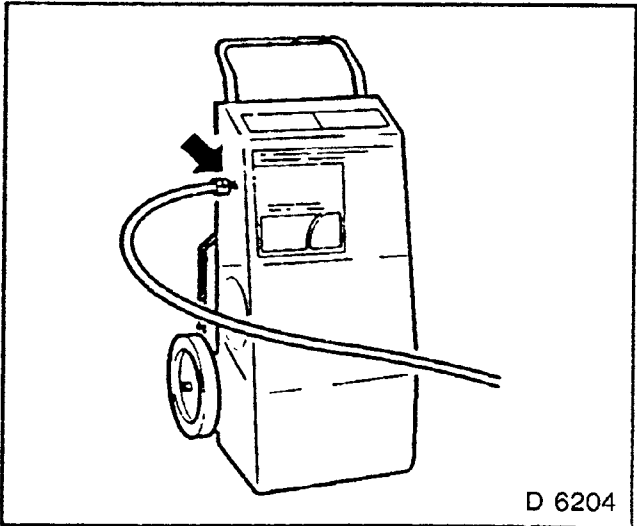
Fig. 78

- 4. Close valve (yellow hose) at service station.
- 5. Disconnect MKM — 720 from MKM — 721.
- 6. Read off amount of escaped refrigerant oil in measuring beaker.
- 7. Refill with same amount of fresh refrigerant oil later.

**WARNING:**  
**OPEN AIR CONDITIONING IMMEDIATELY AFTER DRAINING — AS PRESSURE MAY INCREASE DUE TO REMAINING REFRIGERANT IN AIR CONDITIONING.**

**REMOVE, DISCONNECT**

- 1. MKM — 720 and MKM — 721



D 6204

Fig. 79

# Air Conditioning, Evacuate and Charge

The AC system must be evacuated each time before it is refilled to remove air and moisture from the system.

The boiling point of water rises or falls according to the surrounding pressure. At normal atmospheric pressure of approximately 100 kPa (1.0 bar) its boiling point is 100°C/ 212°F. If the pressure is reduced (evacuation) to approximately 2.3 kPa (0.023 bar) in the AC system, any water contained in the system boils at normal room temperature at 20°C/ 68°F. This is removed as vapour when the service station evacuates the system.

## INSTALL, CONNECT

Red hose from MKM 721 to high pressure service connection (B).

Blue hose to low pressure service connection (A) Fig. 80.

Evacuate air conditioning — observe MKM — 721 Operating instructions.

## INSPECT

1. Check for leaks at the underside (gas is heavier than air) of all connection points on the refrigerant circuit — Leak Detector, Unit W13480.
2. If present, seal leaks.

**NOTE:**  
**FOR DETECTION OF LEAKS,**  
**APPROXIMATELY 300 GRAMMES**  
**REFRIGERANT CAN BE PLACED INTO THE**  
**SYSTEM.**

3. Fill Filling Cylinder from MKM — 721 with 900 grammes R 12 refrigerant
4. Charge air conditioning — follow MKM — 721 Operating Instructions.

## REMOVE, DISCONNECT

1. MKM — 721.

## INSPECT

1. Functioning of air conditioning.

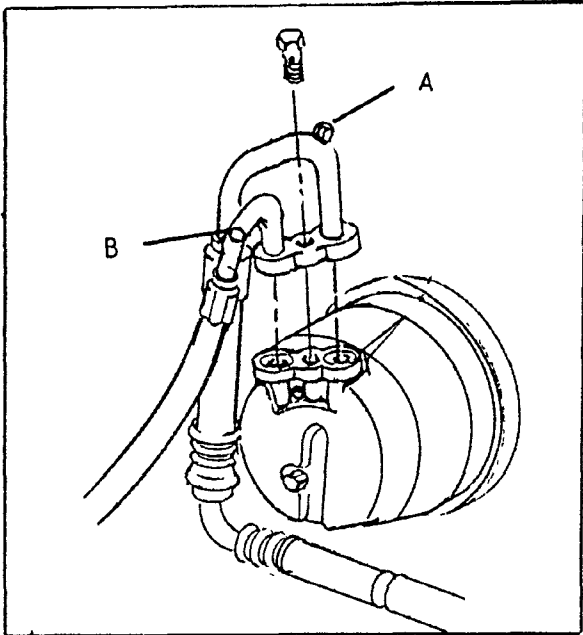


Fig. 80

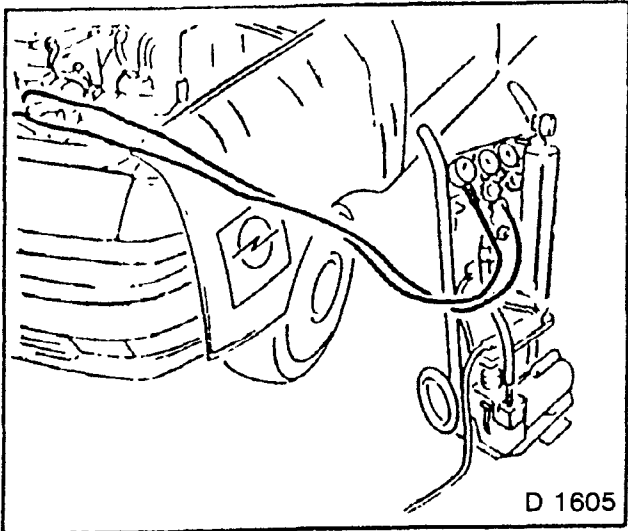


Fig. 81

## Accumulator — Remove and Install

- 1. Drain air conditioning.

### REMOVE, DISCONNECT

- 1. Pipe line (A).
- 2. Pipe line (B).
- 3. Close openings immediately with plugs.
- 4. Accumulator with insulation from bracket.
- 5. Insulation from accumulator.

### INSTALL, CONNECT

- 1. Accumulator with insulation.
- 2. Pipe line (A)
- 3. Pipe line (B).
- 4. Evacuate and charge air conditioning.
- 5. Lubricate new rubber O-rings with refrigerant oil and install.
- 6. Refrigerant oil filling quantity: 45 cm³

### TIGHTEN (TORQUE)

- 1. Pipe and hose lines — see Technical Data

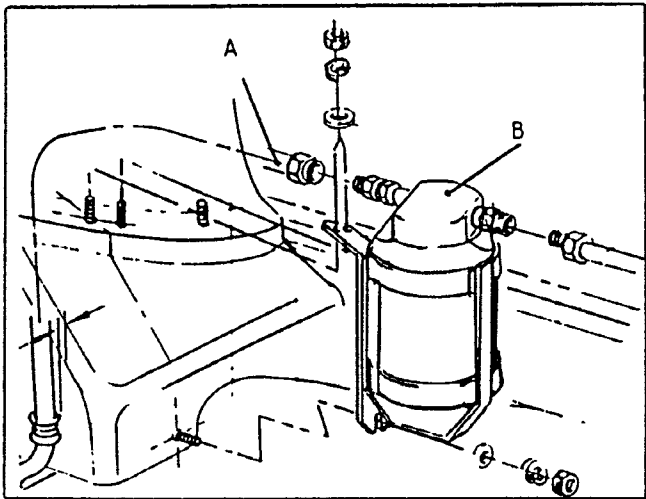


Fig. 82

## Condenser — Remove and Install Accumulator — Replace

### REMOVE, DISCONNECT

- 1. Drain air conditioning.
- 2. Radiator.
- 3. Radiator grille
- 4. Refrigerant line (1)
- 5. Screw

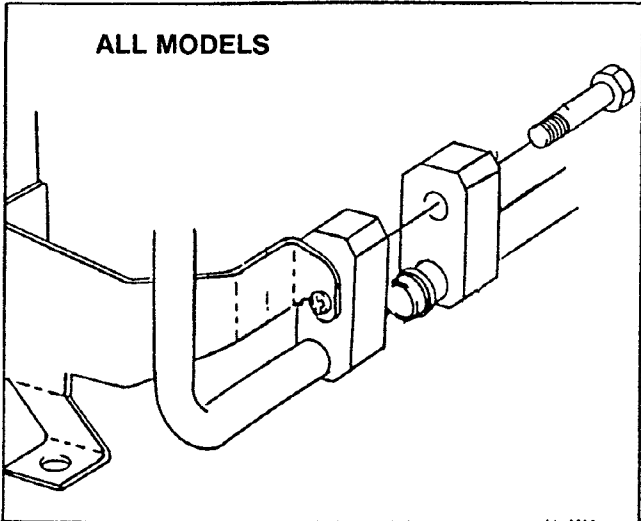


Fig. 83

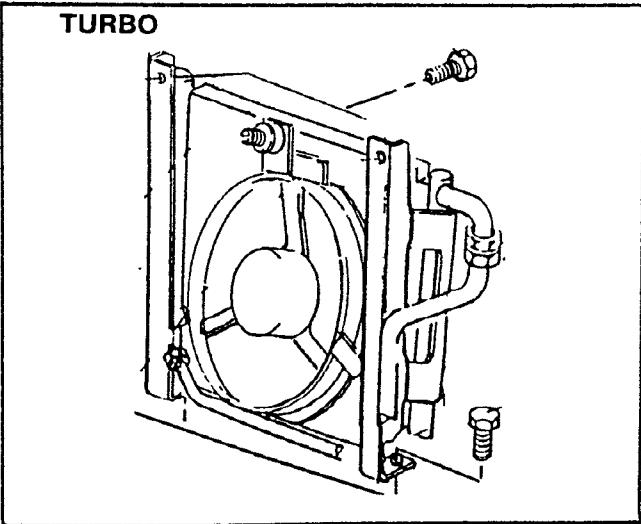


Fig. 84



**REMOVE, DISCONNECT**

- 1. Power steering lines from crossmember (1).
- 2. Condenser from air deflector (2).
- 3. Condenser from vehicle.

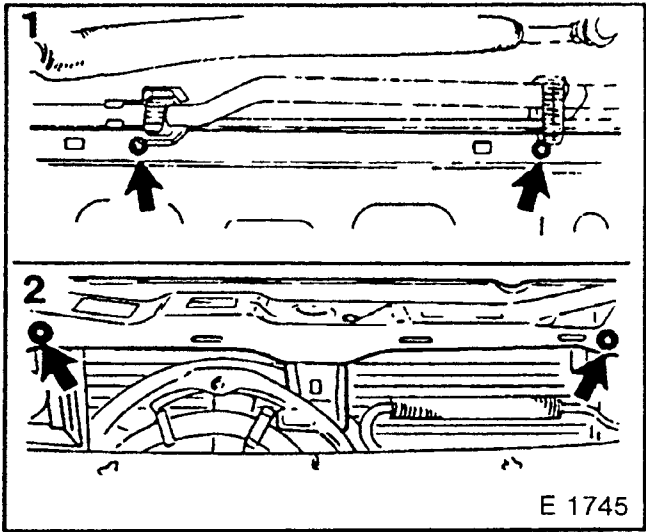


Fig. 85

**INSTALL, CONNECT**

- 1 Condenser to rubber guides in front member and to air deflector.
- 2. Power steering lines to crossmember.
- 3 Screw refrigerant lines with new O-rings.
- 4 Lubricate O-rings with special refrigerant oil.
- 5. Radiator grille.
- 6 Radiator.
- 7 Evacuate and charge air conditioning

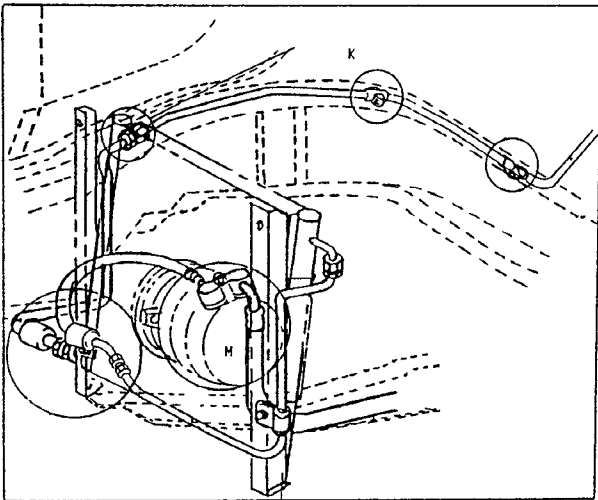


Fig. 86

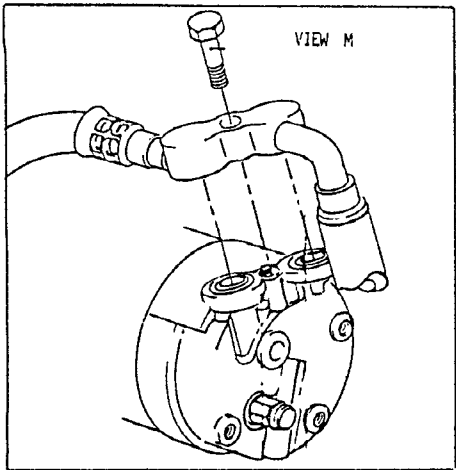


Fig. 88

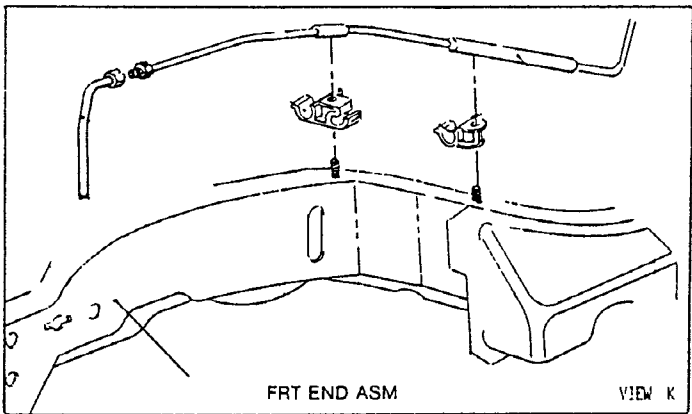


Fig. 87

**INSTALL, CONNECT**

- 1. Condenser to rubber guides in front member and to air deflector.
- 2. Power steering lines to crossmember.
- 3. Screw refrigerant lines with new O-rings.
- 4. Lubricate O-rings with special refrigerant oil.
- 5. Radiator grille.
- 6. Radiator.
- 7. Evacuate and charge air conditioning.

ALL MODELS, EXCLUDING TURBO

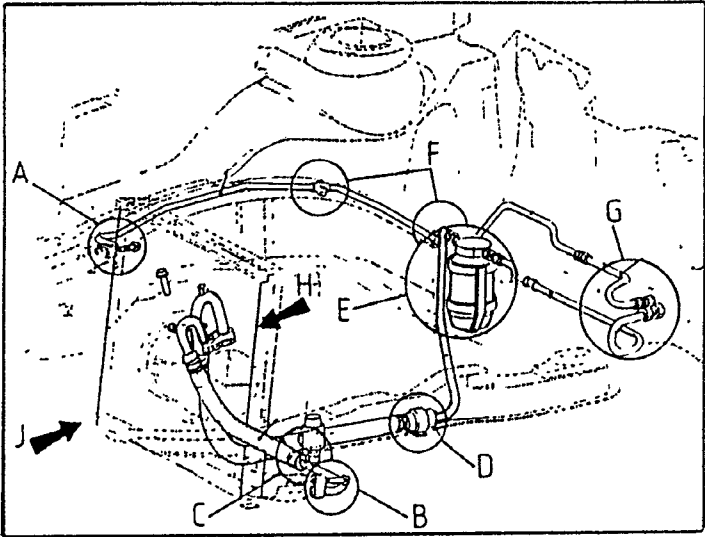


Fig. 89

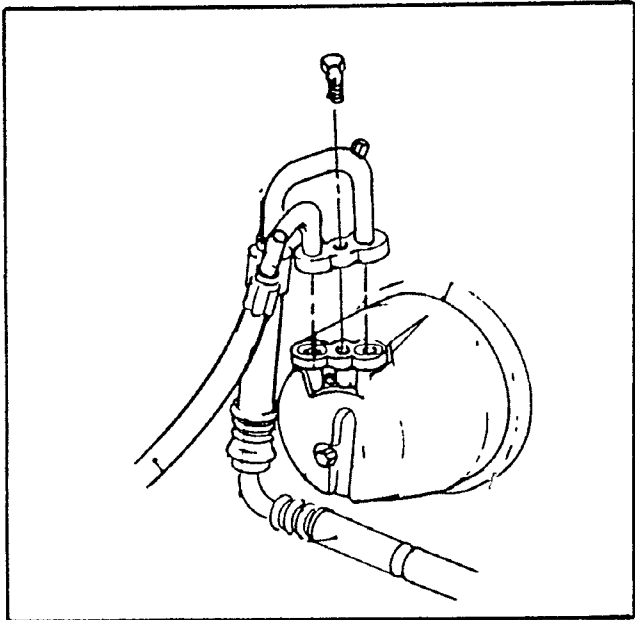


Fig. 90

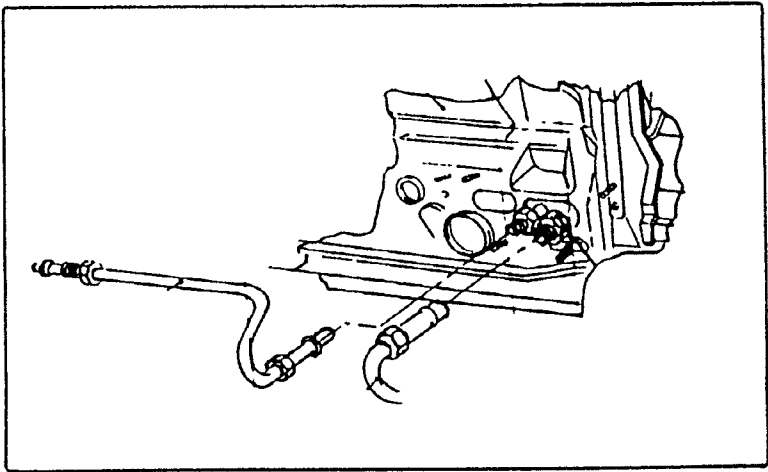


Fig. 91

# Booster Fan — Remove and Install

## REMOVE, DISCONNECT

- 1. Condenser.
- 2. Wiring harness plug.
- 3. Booster fan.

## INSTALL, CONNECT

- 1. Booster fan.
- 2. Wiring harness plug.
- 3. Condenser.

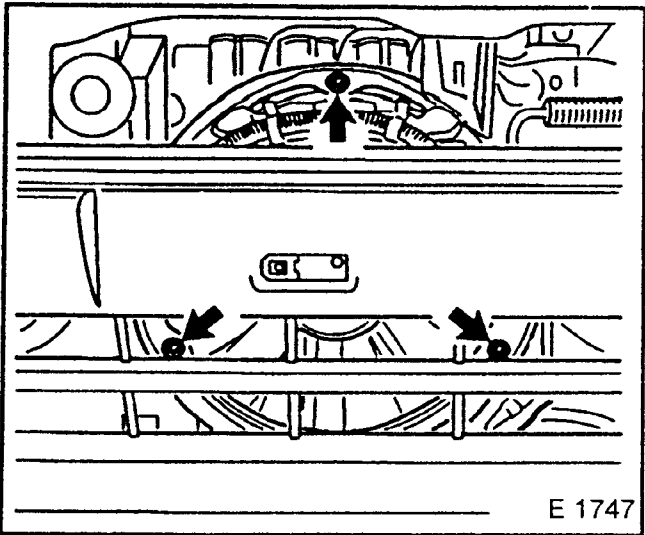


Fig. 92

# Evaporator — Remove and Install

## REMOVE, DISCONNECT

- 1. Drain air conditioning.
- 2. Footwell/storage compartment.
- 3. Upper footwell panelling.
- 4. Air duct.
- 5. Control unit.
- 6. Control unit bracket.

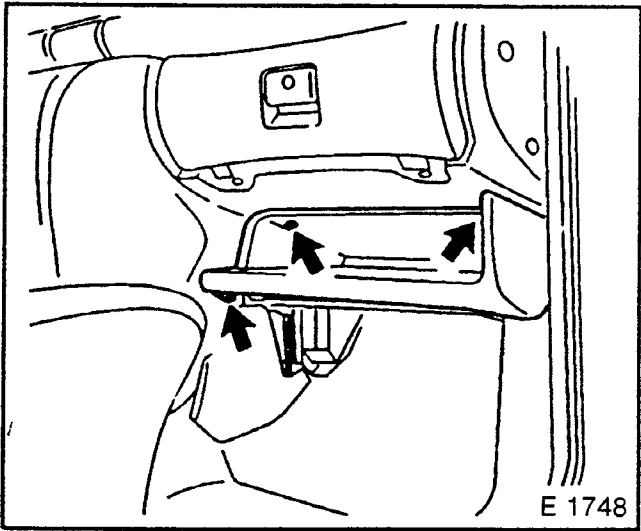


Fig. 93

- 7. Evaporator panelling.

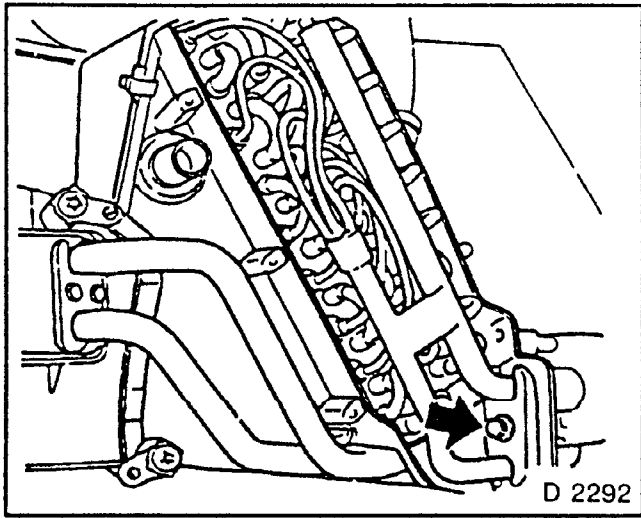


Fig. 94

**REMOVE, DISCONNECT**

- 1. Evaporator connections in passenger compartment.
- 2. Evaporator sideways from evaporator housing.

**INSTALL, CONNECT**

- 1. Evaporator sideways in evaporator housing.
- 2. Connections in passenger compartment and engine compartment.
- 3. Condensation hose.
- 4. Cover on evaporator housing.
- 5. Air distributor duct for right footwell.
- 6. Switch console.
- 7. Footwell panelling.
- 8. Glove compartment
- 9. Evacuate and charge air conditioning.

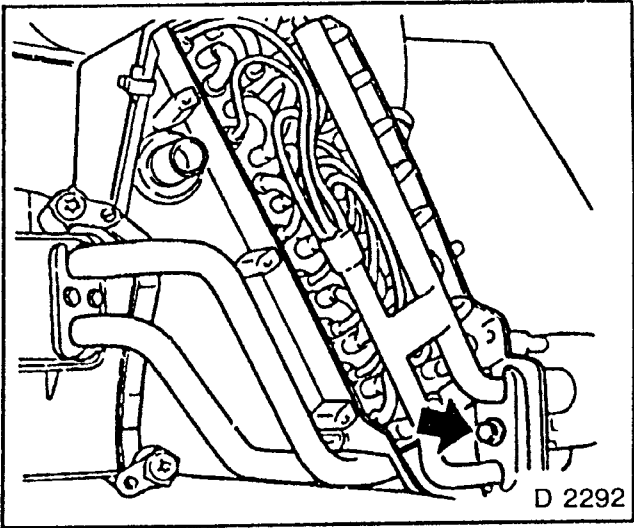


Fig. 95

# Pipes and Hoses

Pipes are of aluminium, in some cases with a heat protection coating.

Installation of Pipes and Flange Connections.

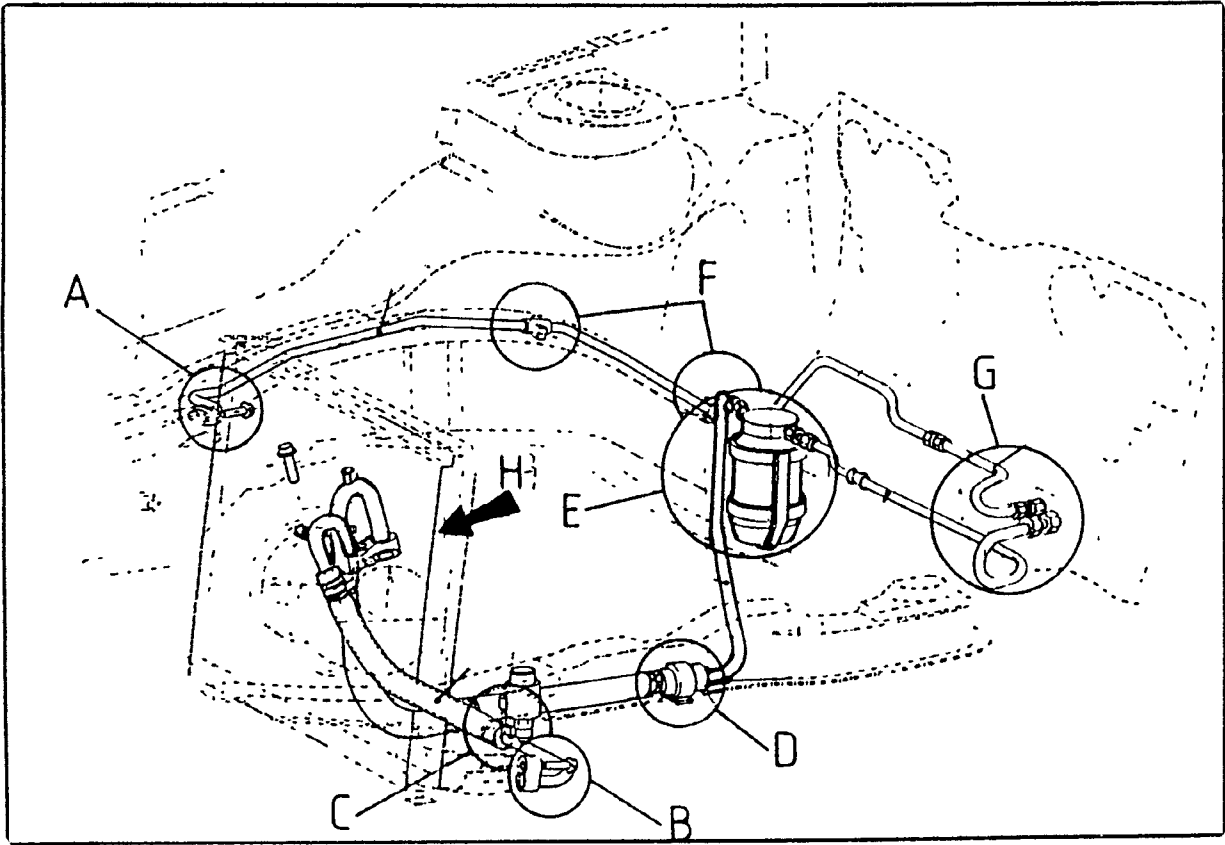


Fig. 96

## Pipe and Hose Lines — Remove and Install

Drain air conditioning.

### REMOVE, DISCONNECT

- 1 Pipe and hose lines.
- 2. Close counterpart with plug immediately.

### INSTALL, CONNECT

- 1. Use new rubber O-rings and insert using refrigerant oil.
- 2 Always counterhold when screwing parts together.
- 3. Evacuate and charge air conditioning.

### TIGHTEN (TORQUE)

Torques — see Technical Data.

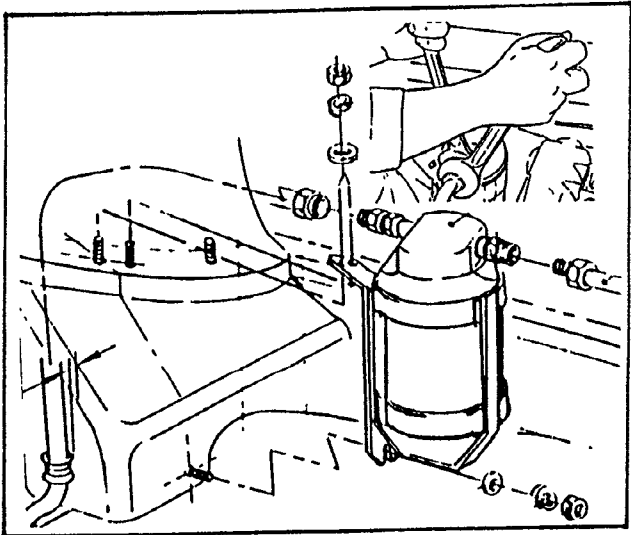
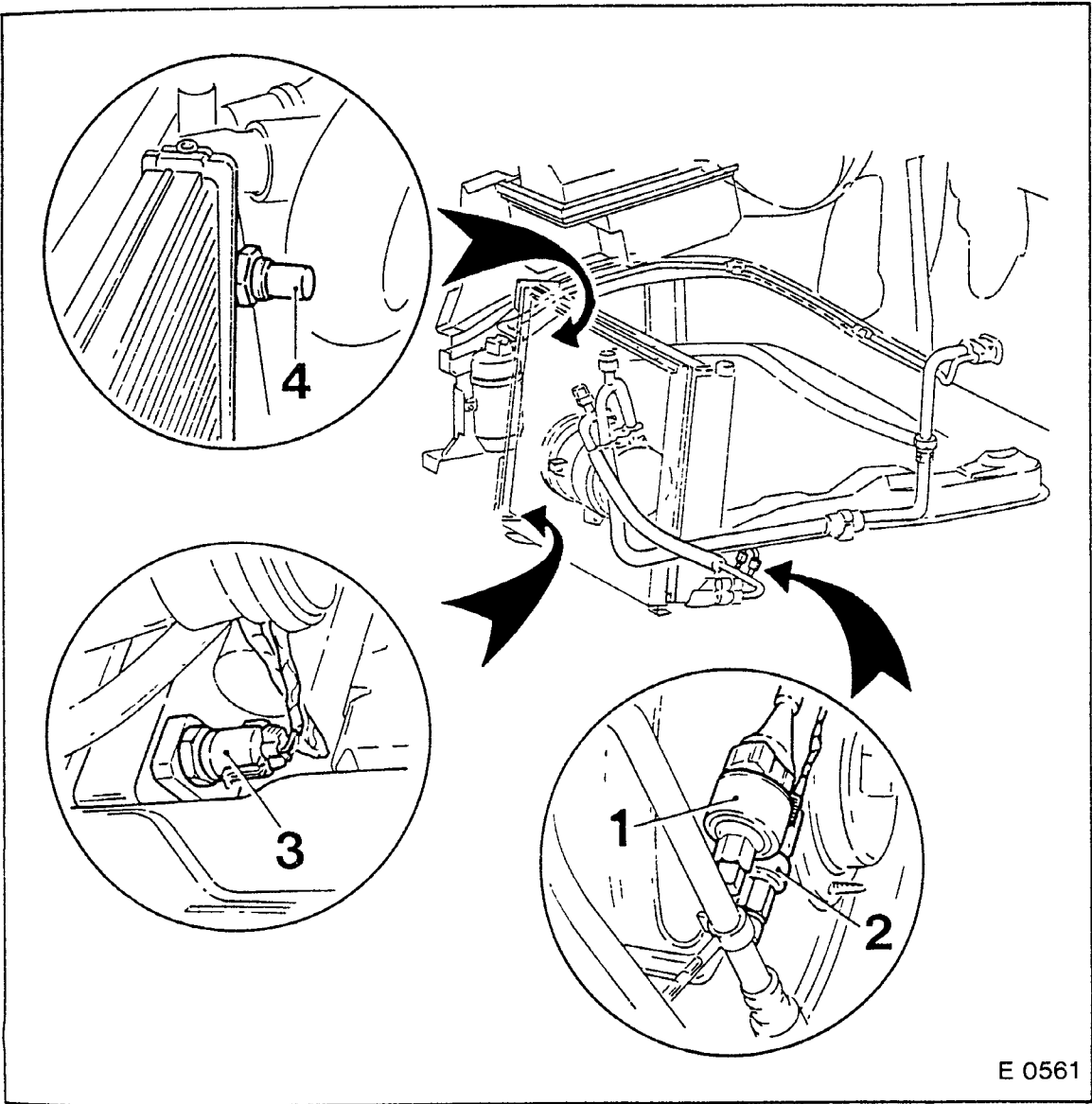


Fig. 97

# Location of Switches

- 1 — Triple switch
- 2 — Motronic switch
- 3 — Coolant temperature switch (S 29)
- 4 — Coolant temperature switch (S 128)



E 0561

Fig 98

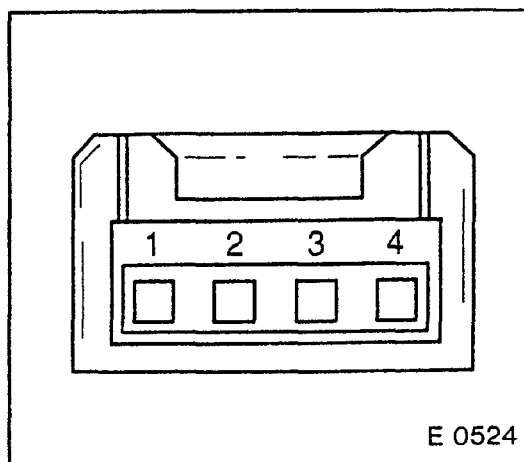
## TRIPLE SWITCH

The triple switch consists of:

- Low pressure safety switch
- High pressure safety switch
- Booster fan switch

It reacts to three different pressure stages in the high pressure line and activates the appropriate switching circuit.

The triple switch is located in the high pressure line between compressor and condenser.



E 0524

Fig. 99

## TERMINAL ASSIGNMENT:

- 1 and 2 = connections for high and low pressure safety switches
- 3 and 4 = booster fan connection

## LOW PRESSURE SAFETY SWITCH

The low pressure safety switch switches off the compressor magnetic coupling when pressure in the refrigerant circuit falls to approximately 180 kPa (1.8 bar). The reason for a drop in pressure is either an outside temperature that is too low, or more generally too little refrigerant, caused by a leak in the refrigerant circuit. As the refrigerant transports the compressor lubricant in the refrigerant circuit and a leak can lead to loss of both, the compressor switches off as a safety measure to protect it from damage caused by lack of lubricant. The low pressure safety switch switches the compressor on again when the pressure exceeds 250 kPa (2.5 bar).

## HIGH PRESSURE SAFETY SWITCH

The high pressure safety switch switches off the magnetic coupling of the compressor if the pressure in the refrigerant circuit exceeds approximately 3 000 kPa (30 bar). Reasons for this can be, for example, dirt on the outside of the condenser, failure of the booster fan, unusually high outside temperature or extreme engine load. The high pressure safety switch switches the compressor on again when pressure drops below normal, approximately 2 000 kPa (20 bar).

## BOOSTER FAN SWITCH

If pressure in the condenser increases, so too does the temperature. To prevent pressures being reached in the refrigerant circuit that are

higher than permitted, if pressure exceeds 1 900 kPa (19 bar) the switch automatically switches the booster fan and the radiator fan from stage 1 to stage 2. When the pressure drops below approximately 1 500 kPa (15 bar) again, the switch switches back to stage 1.

## MOTRONIC SWITCH (ENGINE SPEED INCREASE SWITCH)

When pressure in the refrigerant circuit reaches approximately 1 100 kPa (11 bar), the Motronic switch increases engine idle speed. Loss of engine speed caused by switching on the air conditioning system is compensated for. When pressure falls to 900 kPa (9 bar) the Motronic switch switches off again.

The switch is located in the high pressure line between compressor and condenser.

## COOLANT TEMPERATURE SWITCH

There are two coolant temperature switches installed in the engine cooling system.

The switch (S 29) on the lower side of the radiator is the cooling fan switch which is also used on vehicles without air conditioning. It switches on the radiator fan and booster fan in sequence when the coolant temperature reaches 100°C/212°F. When the temperature drops to 95°C/203°F the radiator and booster fans switch off again.

The switch (S 128) in the upper half of the engine cooling system is a switch with two contacts. At 105°C/222°F one contact switches the booster fan and radiator fan to stage 2 and at 100°C/212°F switches them back to stage 1. The other contact switches the compressor magnetic coupling off at 120°C/248°F and on again at 115°C/239°F.

BLOCK DIAGRAM

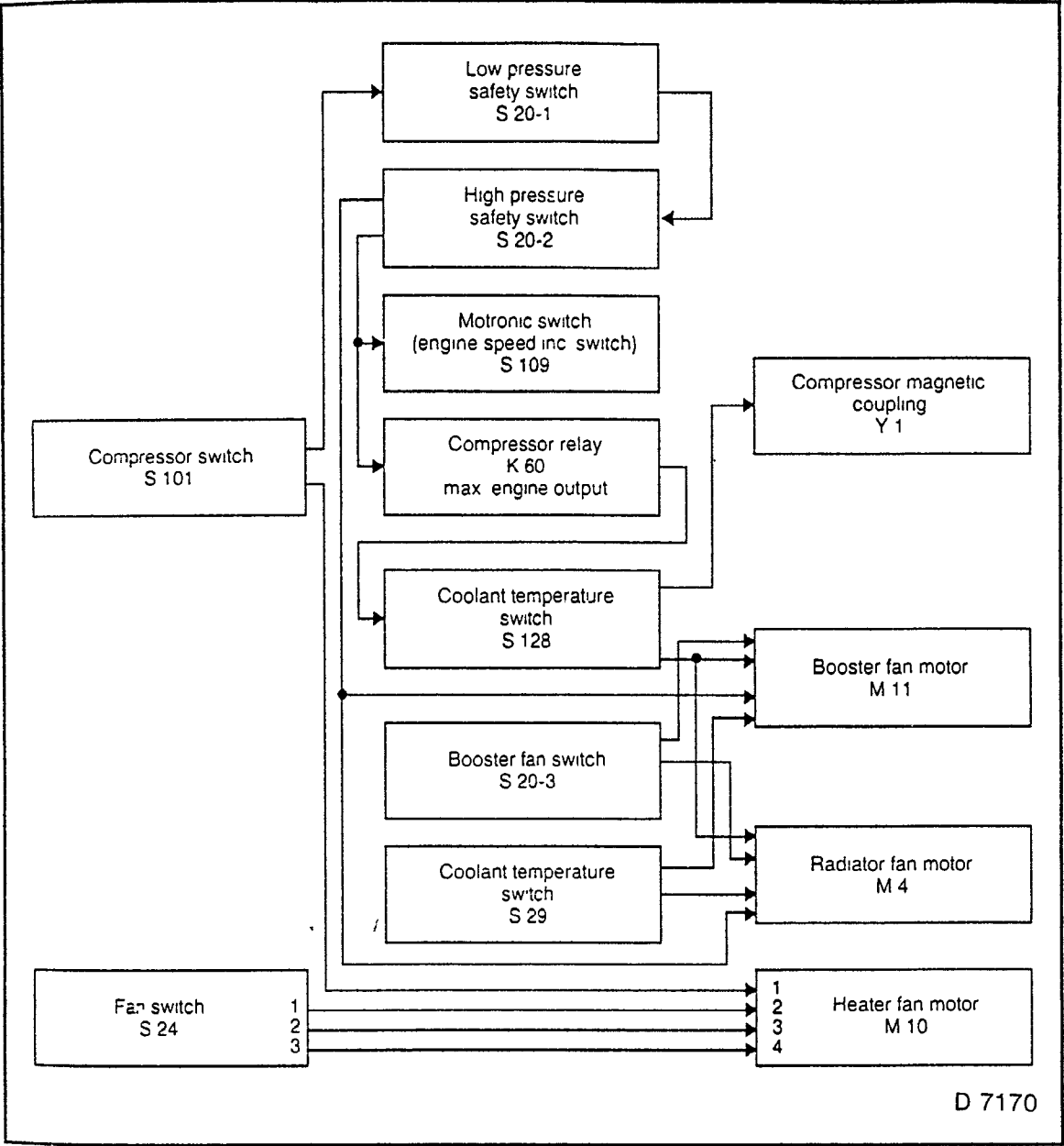


Fig. 100



# Coolant Temperature Switch — Replace

## REMOVE, DISCONNECT

- 1. Drain coolant partly.
- 2. Wiring harness plug.
- 3. Coolant temperature switch.

## INSTALL, CONNECT

- 1. Coolant temperature switch with new seal — 21 Nm.
- 2. Wiring harness plug.
- 3. Top up coolant.

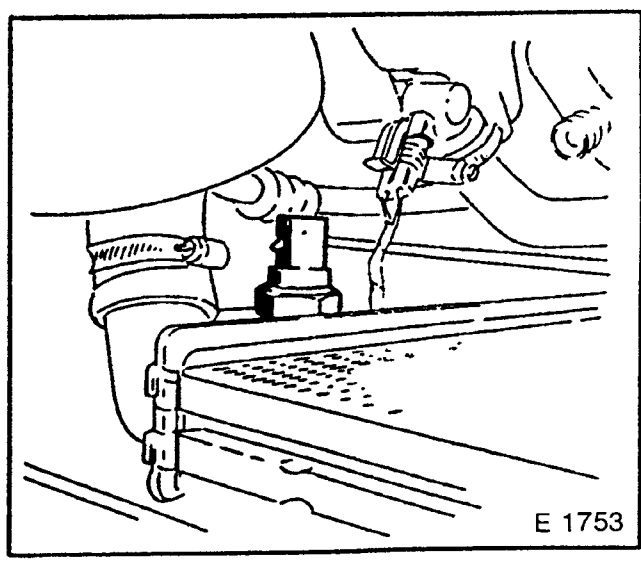


Fig. 101

# Triple Switch — Replace Motronic Switch — Replace

## REMOVE, DISCONNECT

- 1 Drain air conditioning
- 2. Wiring harness plug.
- 3. Switch.

- 1 = Triple switch
- 2 = Motronic switch

## INSTALL, CONNECT

- 1. Switch with new seal — 7 Nm
- 2 Wiring harness plug
- 3. Evacuate and charge air conditioning.

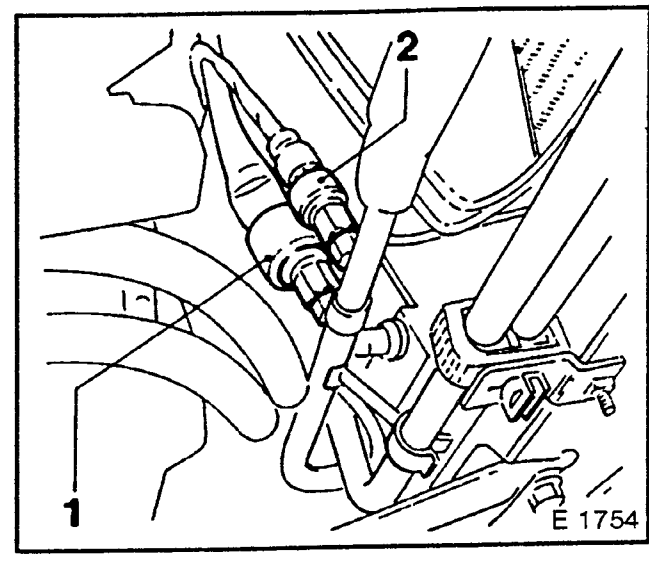


Fig. 102

# Compressor — Remove and Install

## REMOVE, DISCONNECT

- 1. Drain air conditioning.
- 2. Air intake hose.
- 3. Attach engine to Engine Holder KM — 263 — B

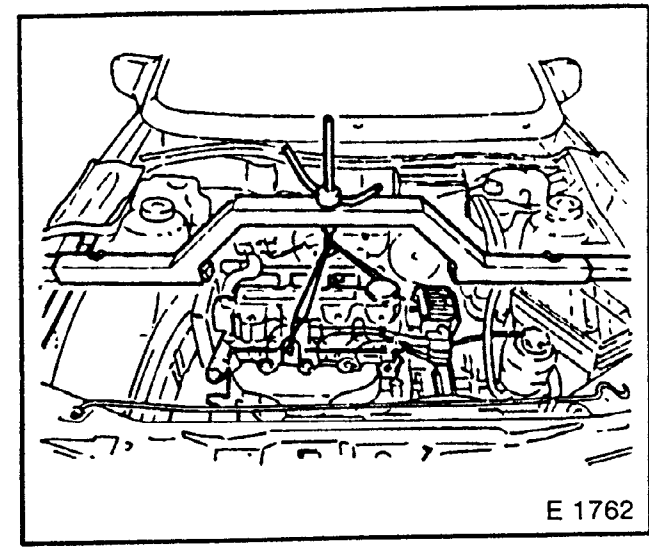


Fig. 103

- 4. Refrigerant line from compressor.

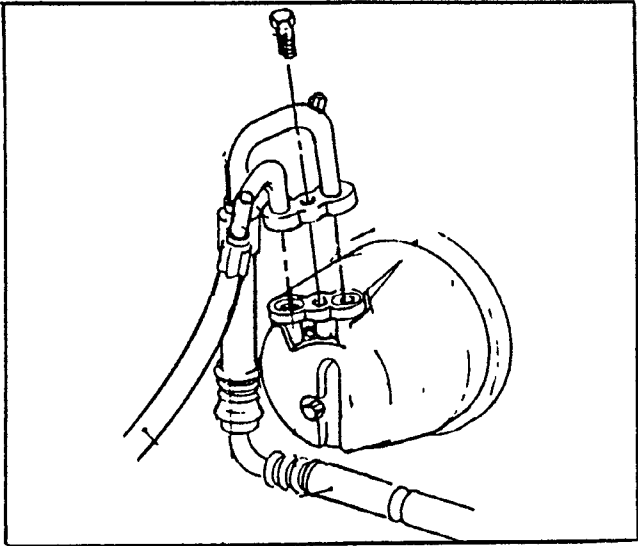


Fig. 104

**REMOVE, DISCONNECT**

- 1. Right engine damping block from side member (1).
- 2. Lower engine slowly.
- 3. Loosen panelling from wheel well.
- 4. Engine suspension bracket from hydraulic pump/compressor support (2).

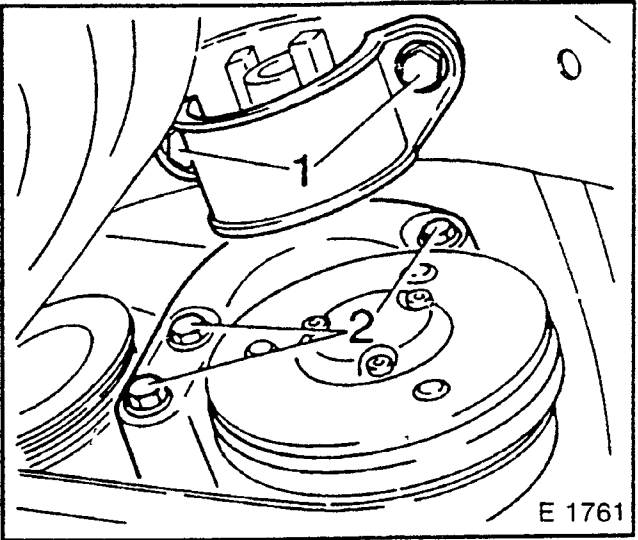


Fig 105

- 5. Pretension ribbed V-belt tension roller in direction of arrow.
- 6. Detach ribbed V-belt

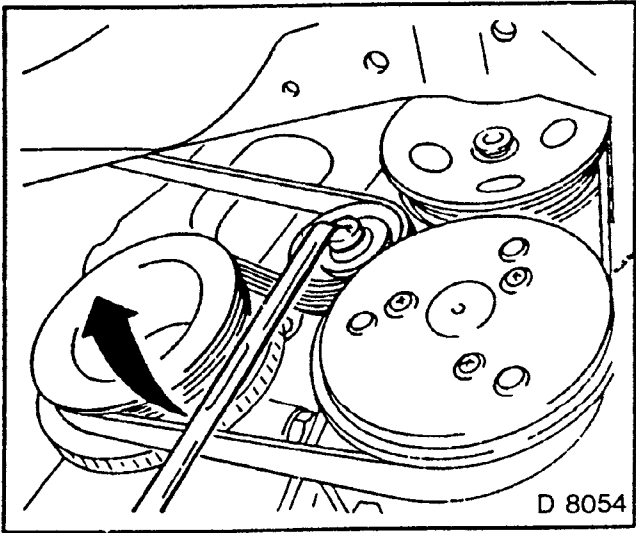


Fig. 106

**REMOVE, DISCONNECT**

- 1. Wiring harness plug (1).

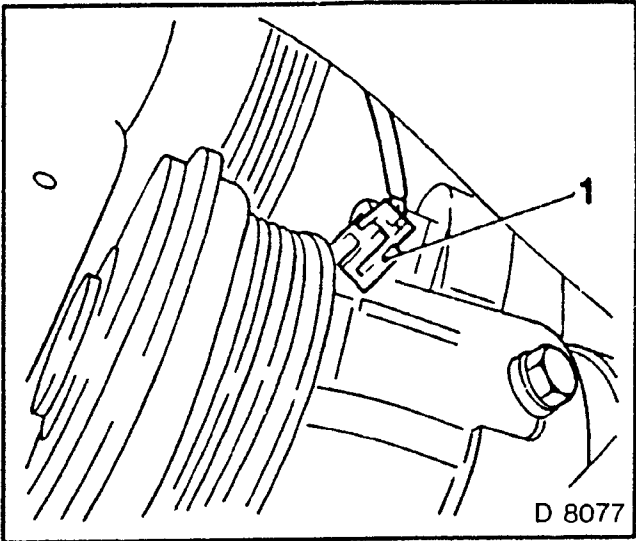


Fig. 107

- 2. Compressor from hydraulic pump/ compressor support (1).

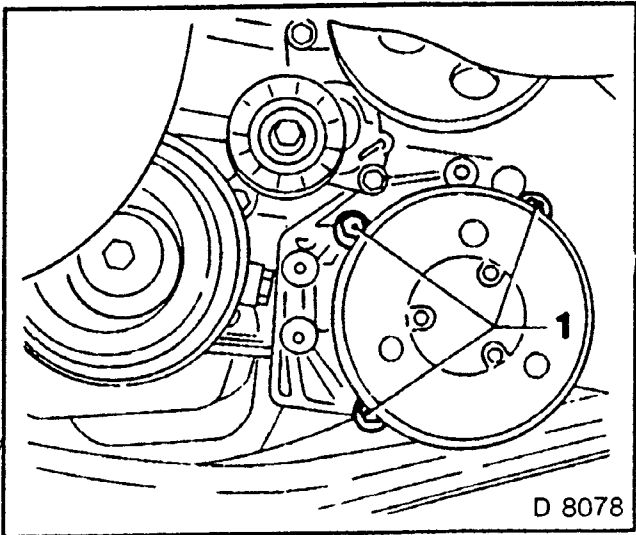


Fig 108

**REMOVE, DISCONNECT**

- 1 Compressor from bracket (1)  
Fig 109 shows exhaust manifold
- 2. Remove compressor.

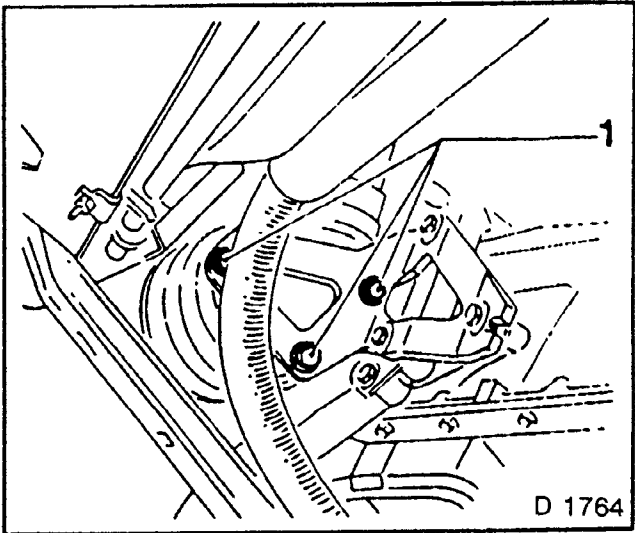


Fig. 109

**INSTALL, CONNECT**

- 1. Compressor to bracket and support.
- 2. Wiring plug
- 3. Refrigerant lines with new O-rings — lubricate O-rings with special refrigerant oil.
- 4. Wiring harness plug.
- 5. Pretension tension roller and attach ribbed V-belt — ribbed V-belt is tensioned automatically.

**INSTALL, CONNECT**

- 1. Engine suspension bracket to support — 60 Nm.
- 2. Panelling to wheel well.
- 3. Engine damping block to side member — recut thread, use locking compound — 65 Nm.

**REMOVE, DISCONNECT**

- 1 Engine bracket.

**INSTALL, CONNECT**

- 1. Air intake hose.
- 2. Evacuate and charge air conditioning

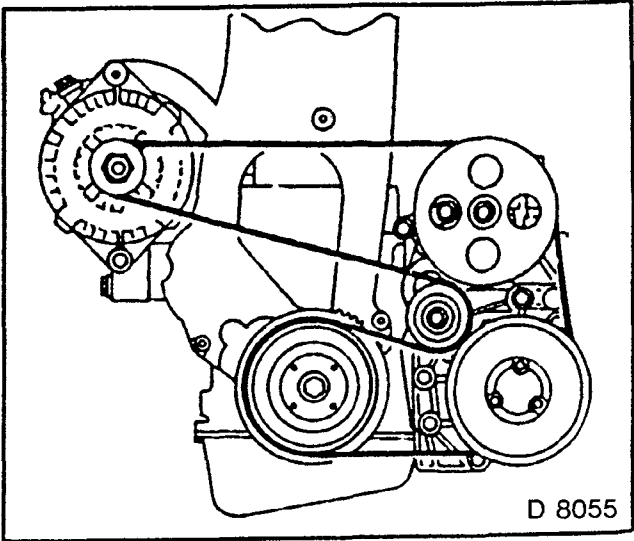


Fig. 110

## Compressor Clutch — Replace

Fig. 111 show operations on removed compressor.

### REMOVE, DISCONNECT

1. Compressor clutch cover.
2. Fastening nuts — counterhold with KM — J — 33027 — A.

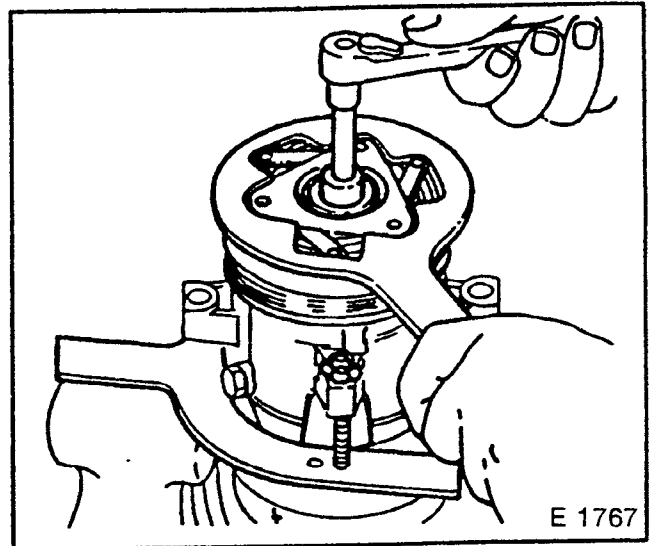


Fig. 111

3. Compressor clutch — KM — J — 33013 — B.
4. Woodruff key.

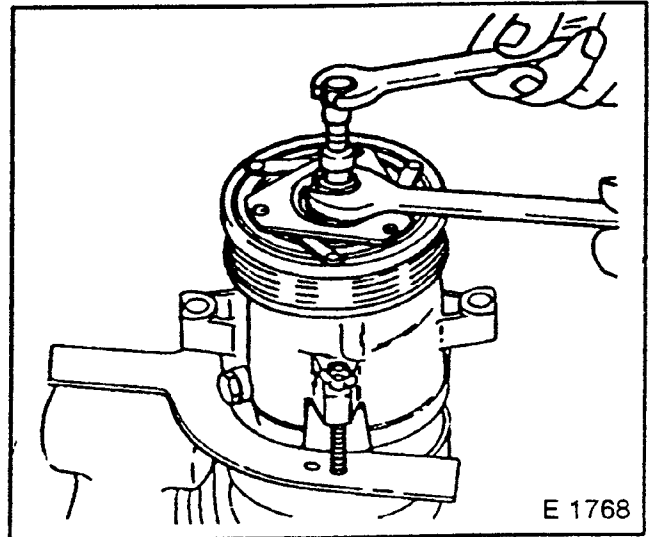


Fig. 112

### INSTALL, CONNECT

1. Woodruff key in shaft groove.
2. Put on compressor clutch — **DO NOT** drive in

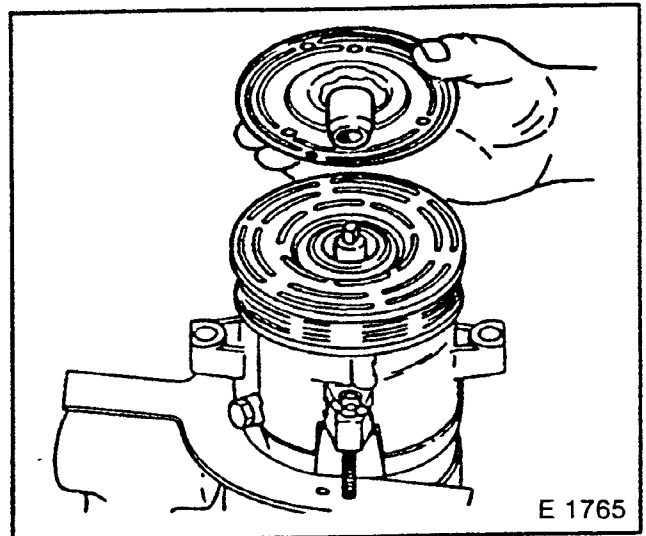


Fig. 113

- 3. Press on compressor clutch — KM — J — 33013 — B — until gap (1) between compressor clutch and pulley assembly is 0.4 to 1.0 mm.
- 4. Fastening nuts — 11 to 22 Nm.
- 5. Compressor clutch cover.

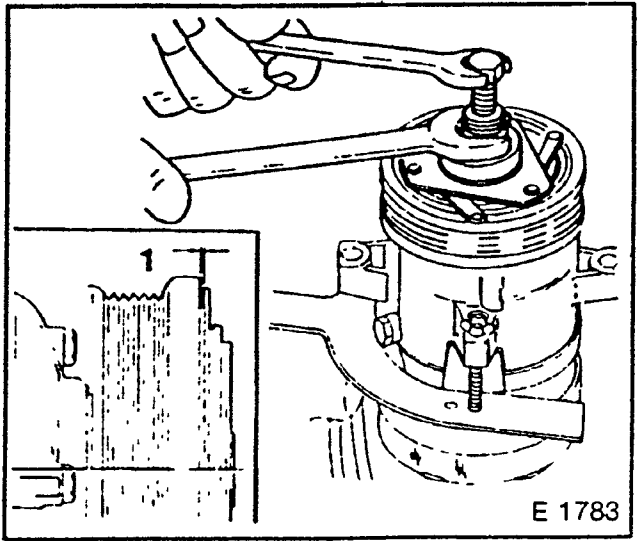


Fig. 114

## Compressor Pulley Assembly — Replace

### REMOVE, DISCONNECT

- 1. Compressor
- 2. Compressor clutch
- 3. Retaining ring.
- 4. Pulley assembly — KM — J — 33020.

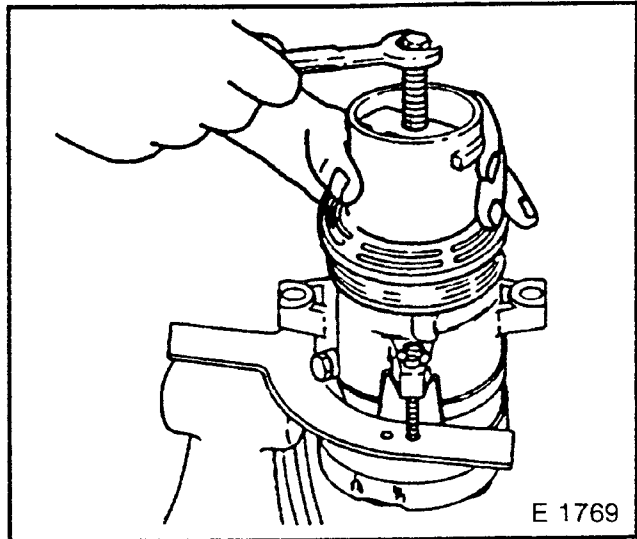


Fig. 115

### INSTALL, CONNECT

- 1. Pulley assembly — KM — J — 33017 (1), KM — J — 33023 (2), KM — J — 8433 (3).
- 2. Retaining ring.
- 3. Compressor clutch.
- 4. Compressor.

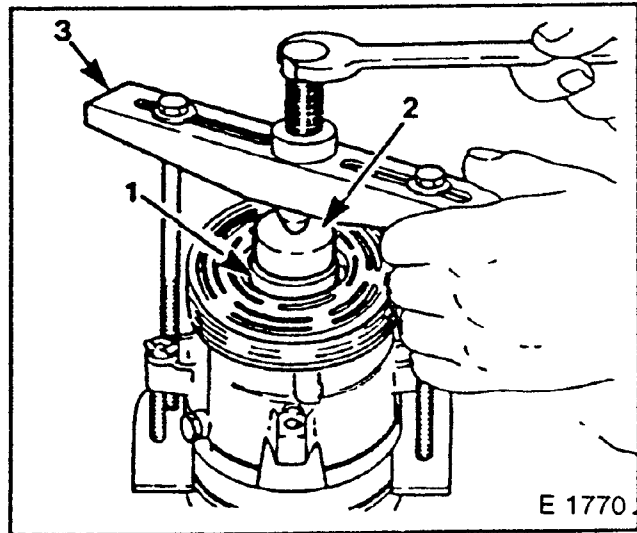


Fig. 116

# Compressor Safety Valve — Replace

**NOTE:**  
IF THE STICKER (1) IS MISSING, THE VALVE HAS BEEN TRIGGERED.

## REMOVE, DISCONNECT

- 1. If necessary, drain air conditioning.
- 2. Safety valve (2) from reverse of compressor.

## INSTALL, CONNECT

- 1. Safety valve with new ring — lubricate O-ring with special mineral oil (Technical Data) — 13.5 to 19 N m
- 2. Evacuate and charge air conditioning.

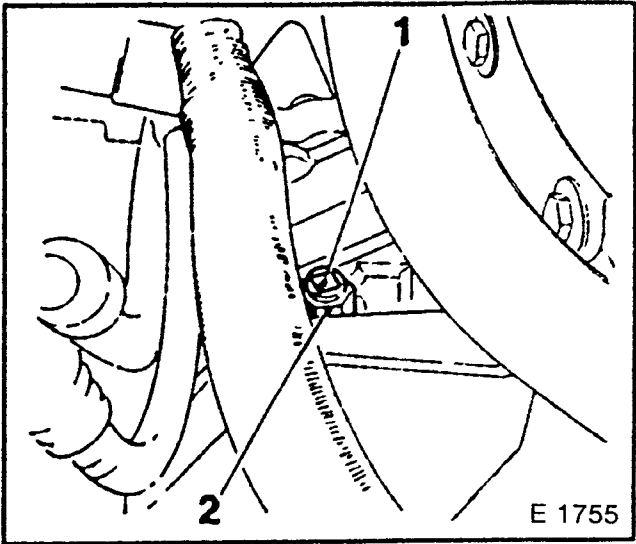


Fig. 117

# Compressor Control Valve —Replace

## REMOVE, DISCONNECT

- 1. Drain air conditioning.
- 2. Retaining ring (1)
- 3. Control valve (2).

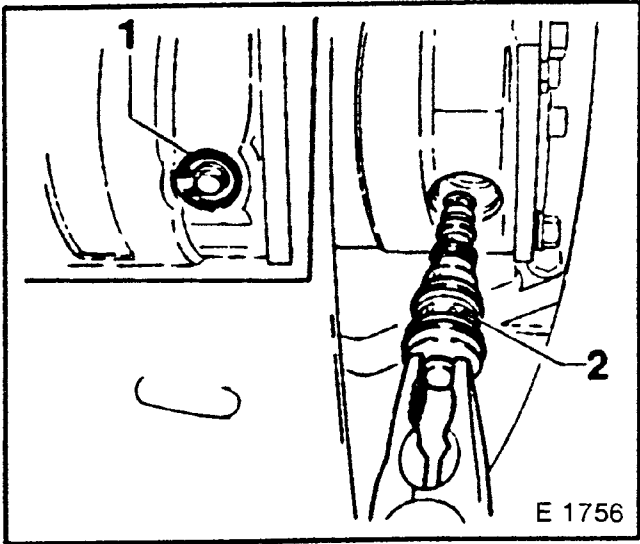


Fig. 118

## INSTALL, CONNECT

- 1. Control valve with new O-rings — lubricate O-rings with refrigerant oil.
- 2. New retaining ring.
- 3. Evacuate and charge air conditioning

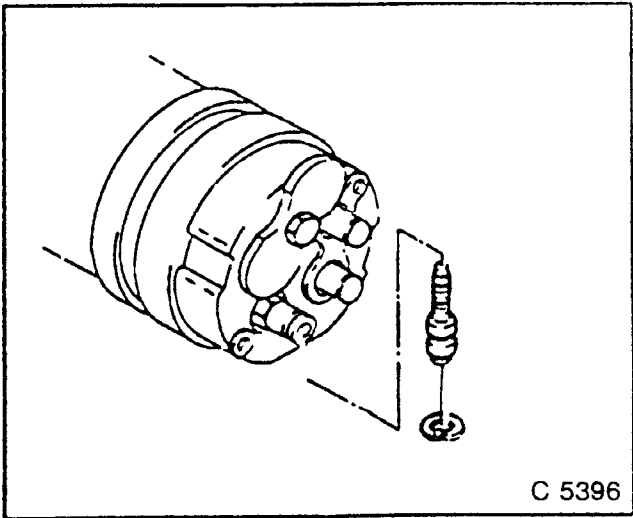


Fig. 119

# Valve — Glove Compartment Cooling — Replace

## REMOVE, DISCONNECT

- 1. Footwell panelling/passenger side storage tray.
- 2. Remove hose from valve.
- 3. Valve — press in lugs.

## INSTALL, CONNECT

- 1. Valve.
- 2. Hose.
- 3. Footwell panelling/passenger side storage tray.

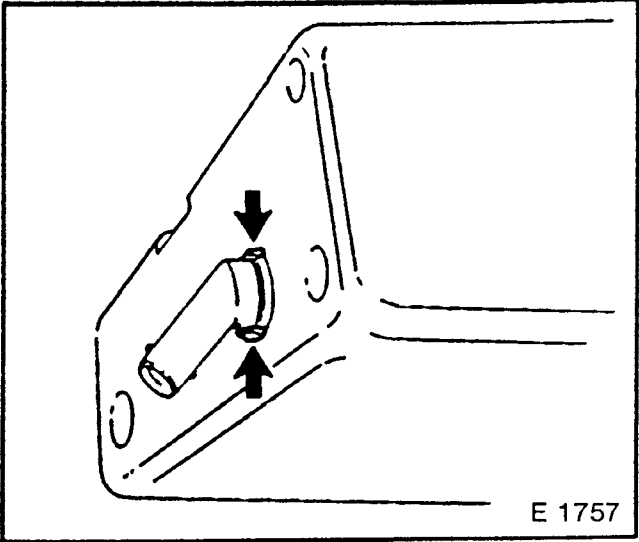


Fig. 120



# SPECIAL SERVICE TOOLS

**MKM — 596    TEMPERATURE GAUGE.**

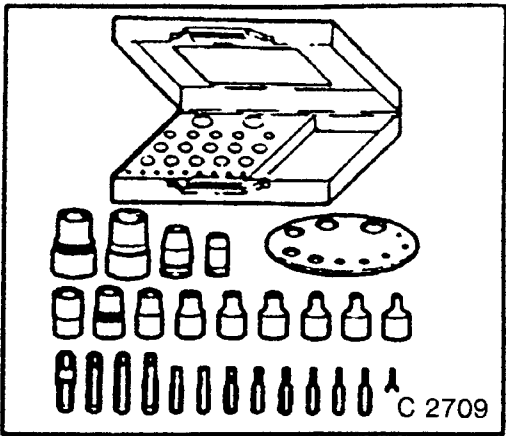
To measure the vent nozzle output temperature.

**MKM — 587 —A    MULTIMETER.**

To measure voltage and resistance.

**MKM — 604 —B    TORX WRENCH SET.**

To loosen/tighten inner/outer TORX bolts.

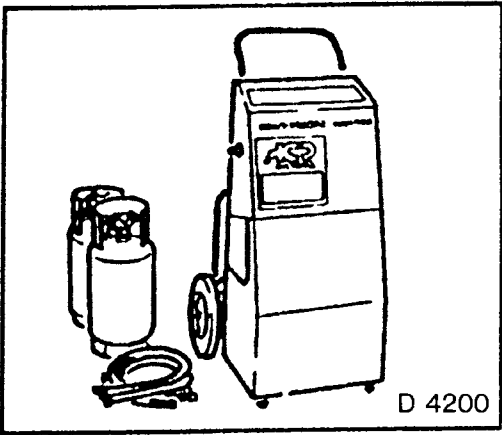


**KM — 609    ELECTRONIC KIT I.**

In conjunction with KM — 587 — A

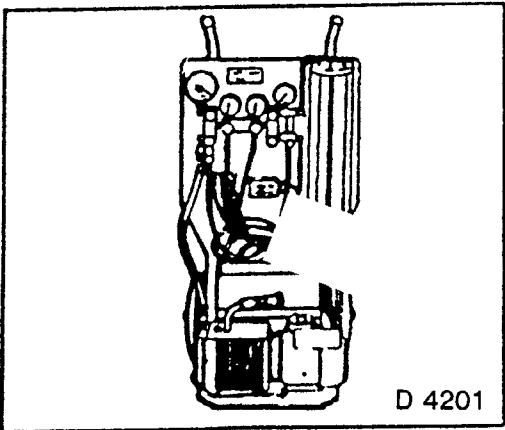
**MKM — 720    RECYCLING STATION.**

To drain the air conditioning system



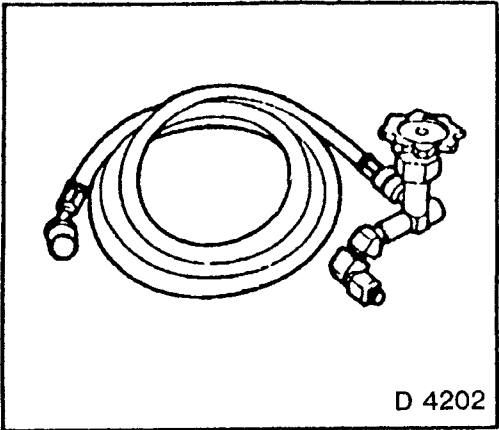
**MKM — 721    EVACUATING AND CHARGING STATION**

To evacuate and charge the air conditioning system.



**MKM — 722    AUXILIARY VALVE.**

For older Kent — Moore Evacuating and Charging Stations.  
In conjunction with MKM — 720.

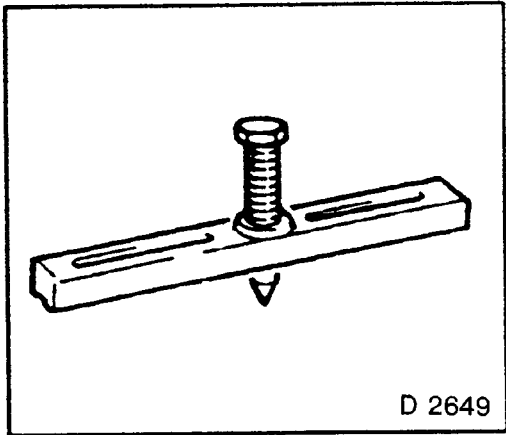


**SERVICE STATION/17734**

To drain, evacuate and charge air conditioning.

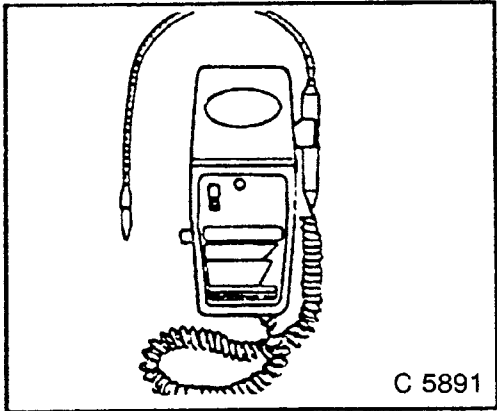
**KM — J — 8433 REMOVER**

To press off compressor pulley assembly.



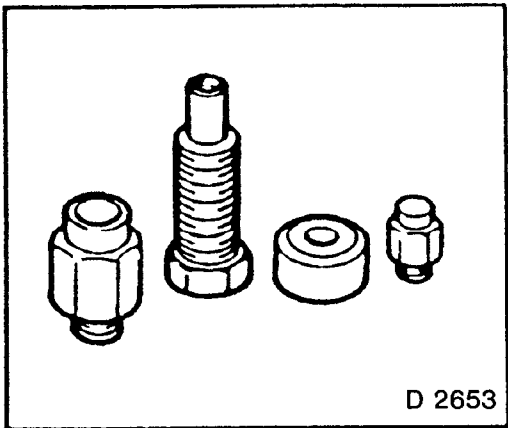
**14950 — A    LEAK DETECTOR UNIT**

To check the air conditioning system for leaks



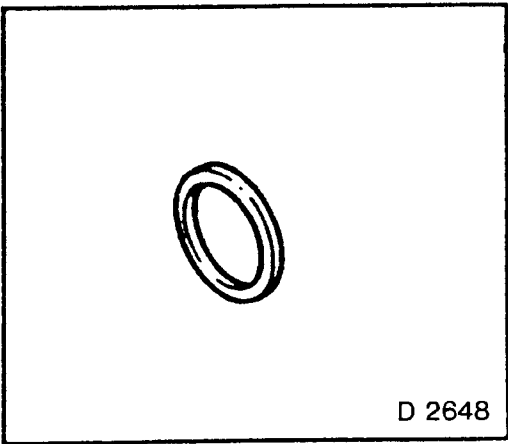
**KM — J — 33013 — B    REMOVER/  
   INSTALLER**

To remove and install compressor clutch.



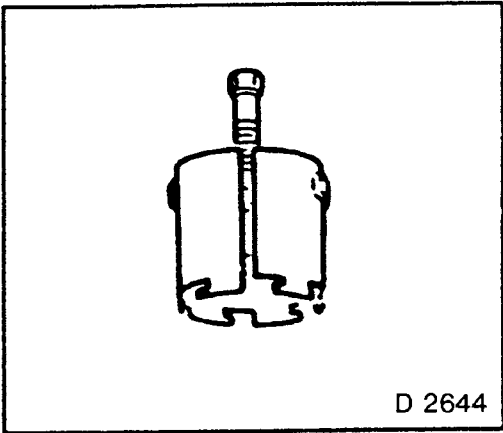
**KM — J — 33017    INSTALLER**

To install compressor pulley assembly.



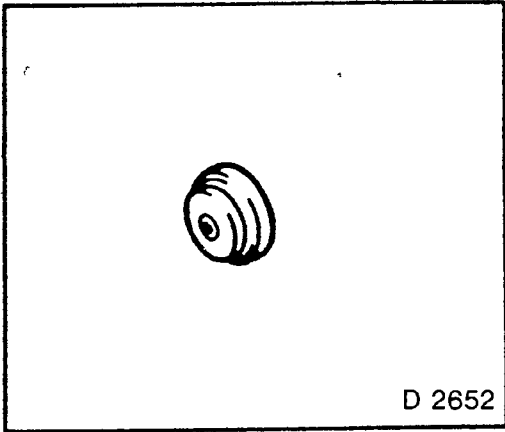
**KM — J — 33020    REMOVER**

To remove compressor pulley assembly.



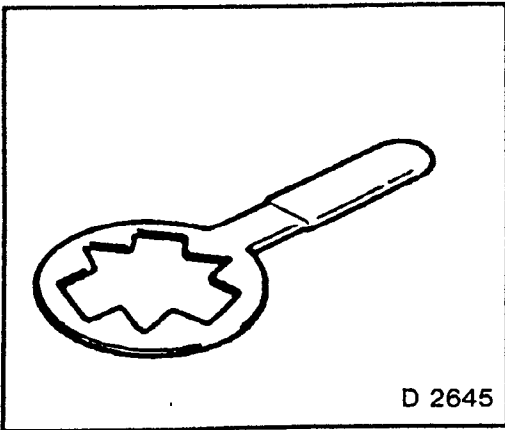
**KM — J 33023    INSTALLER**

To install compressor pulley assembly.



**KM — J — 33027 — A    HOLDING  
WRENCH**

To counterhold compressor clutch.



TECHNICAL DATA

Refrigerant	R-12	Part No. 19-49-870
Compressor lubricant	BVM oil	(90-001-810)
O-ring lubricant	BVM oil	(90-001-810)

FILLING QUANTITIES:

Refrigerant	900 g	
Compressor lubricant	approx. 300 ml	
Pressure in low pressure range	190 to 219 kPa*	1.9 to 2.1 bar
Pressure in high pressure range	1 000 to 1 800 kPa*	10 to 18 bar

\*At approximately 20°C/68°F, engine speed approximately 1 500 rpm, AC system on

SWITCH PRESSURES:

	On	Off
Low pressure safety switch	250 kPa	180 kPa
High pressure safety switch	2 000 kPa	3 000 kPa
Booster fan switch	1 900 kPa	1 500 kPa
Motronic switch	1 100 kPa	900 kPa

SWITCH TEMPERATURES

	On	Off
Coolant temperature switch (S 29)	100°C/212°F	95°C/203°F
Coolant temperature switch (S 128)		
Contact 1	105°C/221°F	100°C/212°F
Contact 2	115°C/239°F	120°C/248°F

Gap between magnetic coupling and pulley	0.4 to 1.0 mm
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SCREW TIGHTENING TORQUES FOR REFRIGERANT LINES:

To compressor	40 Nm
To condenser	27 Nm
To accumulator	20 Nm
To evaporator	20 Nm
Pipe connection	44 Nm

TORQUES:

Pipe outer diameter at connection	Torque	
	for steel*)	for copper or aluminium
Inches	Nm	Nm
1/4	14 — 20	7 — 9.5
3/8	41 — 47	15 — 18
1/2	41 — 47	21 — 27.5
5/8	41 — 47	29 — 37
3/4	41 — 47	38 — 45

\*) The torque values for steel apply only if both connected ends are made of steel.  
If the metals are different, the values for copper/aluminium apply.