SAAB

900

SERVICE MANUAL

8:3 Heating and ventilation system, air conditioning system

M 1979–86–

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Refrigerant

Type		R12	
Refrigerant weight in the system			
1979-1980 models	kg	1.2	
1981 models up to and incl. chassis No. AB1009099 (440 mm long compressor suction line)	kg	1.0	
1981 models up to and incl. chassis No. AB1009100 (1000 mm long compressor suction line + large condenser)	kg	1.15	
1981 models as from chassis No. AC1006000, AC2001800 (1000 mm long compressor suction line + small condenser)	kg	1.0	1.05 (Clarion)

Oil

Type	Refrigeration compressor oil
Viscosity (100 cSt)	520 SUS, 38°C (100°F)
Alternative makes	Suniso 5GS, Texaco, Capella E (WF100) BP, Energol LPT 100

Tightening torques for the compressor

Clutch centre nut Cycling Clutch, 1980:	Nm (lbf ft)	15-20 (11-31)	
Cycling Clutch as from 1981 model:	Nm (lbf ft)	34-42 (25-31)	15 (11) for Clarion
Cylinder head bolts:	Nm (lbf ft)	30-34 (22-25)	15 (11) for Clarion
Oil filler plug:	Nm (lbf ft)	8-12 (6-9)	
Complete service valve:	Nm (lbf ft)	12-17 (9-13)	

Tightening torques for refrigerant hoses
Delco VIR system

Model year		1979-80
Condenser - VIR assembly:		
Condenser	Nm (lbf ft)	14-29 (10-21)
VIR assembly	Nm (lbf ft)	14-20 (10-15)
Condenser - Compressor:		
Condenser	Nm (lbf ft)	33-40 (24-30)
Compressor	Nm (lbf ft)	33-40 (24-30)
VIR assembly - Compressor:		
VIR assembly	Nm (lbf ft)	41-48 (30-35)
Compressor	Nm (lbf ft)	41-48 (30-35)
Service valve	Nm (lbf ft)	17-19 (13-14)
VIR assembly connections to the evaporator		
Large coupling	Nm (lbf ft)	38-45 (28-33)
Smaller coupling	Nm (lbf ft)	20-27 (15-20)
Small coupling	Nm (lbf ft)	7-10 (5-7)

Delco Cycling Clutch system

Model year		1980
Condenser - Dryer receiver:		
Condenser	Nm (lbf ft)	14-20 (10-15)
Dryer receiver	Nm (lbf ft)	14-20 (10-15)
Condenser - Compressor:		
Condenser	Nm (lbf ft)	33-40 (24-30)
Compressor	Nm (lbf ft)	33-40 (24-30)
Dryer receiver - Expansion valve:		
Dryerreceiver	Nm (lbf ft)	14-20 (10-15)
Expansion valve	Nm (lbf ft)	14-20 (10-15)
Evaporator - Compressor:		
Evaporator	Nm (lbf ft)	36-43 (27-32)
Compressor	Nm (lbf ft)	36-43 (27-32)
Service valve	Nm (lbf ft)	17-19 (13-14)
Expansion valve, connection to the evaporator	Nm (lbf ft)	21-27 (15-20)
Expansion valve, compensating pipe coupling	Nm (lbf ft)	7-10 (5-7)

Sankyo cycling clutch system

Model year		1981 -
Condenser - Dryer receiver:		
Condenser	Nm (lbf ft)	14-20 (10-15)
Dryer receiver	Nm (lbf ft)	14-20 (10-15)
Condenser - Compressor:		
Condenser	Nm (lbf ft)	21-28 (15-21)
Compressor	Nm (lbf ft)	25-30 (18-22)
Dryer receiver - Expansion valve:		
Dryer receiver	Nm (lbf ft)	14-20 (10-15)
Expansion valve	Nm (lbf ft)	14-20 (10-15)
Evaporator - Compressor:		
Evaporator	Nm (lbf ft)	28-39 (21-29)
Compressor	Nm (lbf ft)	30-34 (22-25)
Expansion valve, connection to the evaporator	Nm (lbf ft)	21-27 (15-20)
Expansion valve, compensating pipe coupling	Nm (lbf ft)	7-10 (5-7)

Compressor with PAC connection

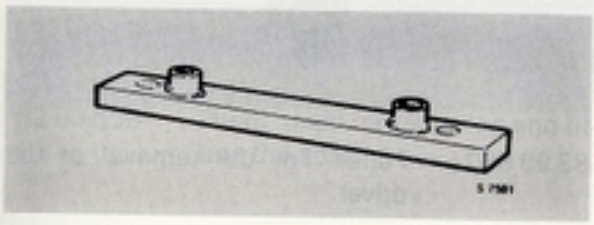
All B202 and B201 from and including 1986 years model (not single carburetor): 22-27 Nm (16-20 lbf ft).

Washer Part No. 80 73 108 should be placed between the screw head and the PAC connection.

Clarion Cycling Clutch system

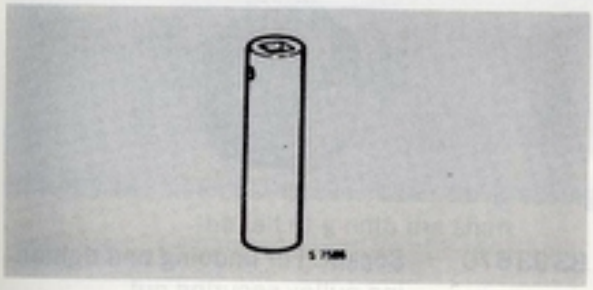
Condenser - Dryer receiver:		
Condenser	Nm (lbf ft)	15 (11)
Dryer receiver	Nm (lbf ft)	15 (11)
Condenser - Compressor:		
Condenser	Nm (lbf ft)	25 (18)
Compressor	Nm (lbf ft)	30 (22)
Dryer receiver - Expansion valve:		
Dryer receiver	Nm (lbf ft)	20 (15)
Expansion valve	Nm (lbf ft)	20 (15)
Evaporator - Compressor:		
Evaporator	Nm (lbf ft)	35 (26)
Compressor	Nm (lbf ft)	35 (26)
Expansion valve, connection to the evaporator	Nm (lbf ft)	25 (18)
Expansion valve, compensating pipe coupling	Nm (lbf ft)	10 (7)

Special tools

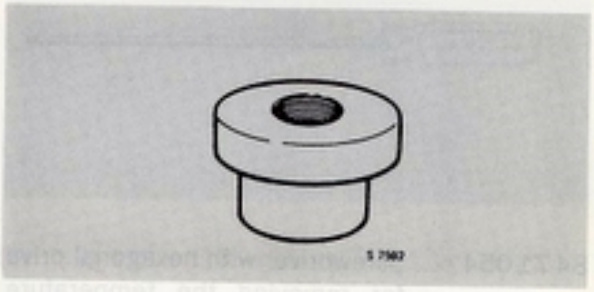


83 93 233 Fixture, compressor

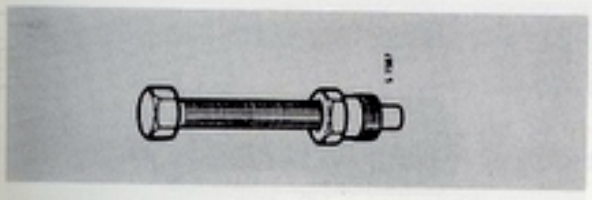
83 93 282 Guide, rotor (Robinair 10471-1)



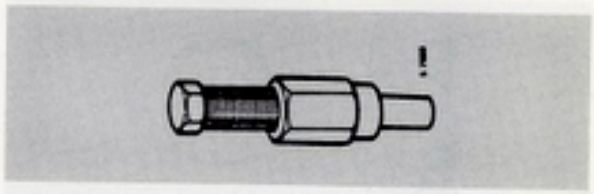
83 93 241 Sleeve, to replace magnetic clutch, KMJ 9399



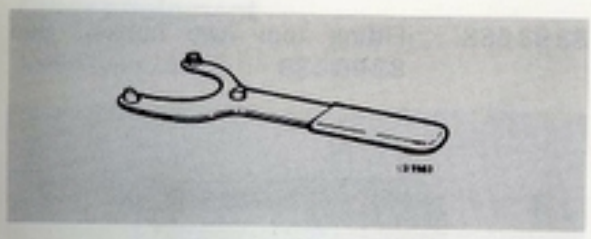
83 93 290 Drift, magnetic clutch, (Robinair 10472)



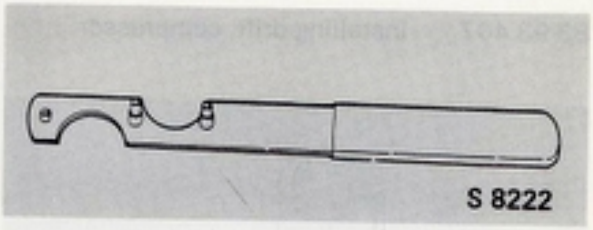
83 93 258 Puller, magnetic clutch (KMJ 9401)



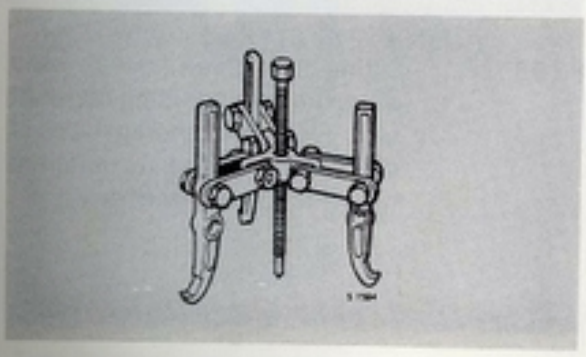
83 93 308 Installing tool (KMJ 9480-01)



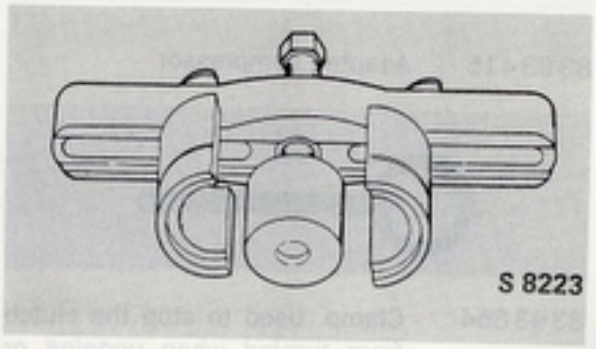
83 93 266 Hook wrench, holding tool (Robinair 10418)



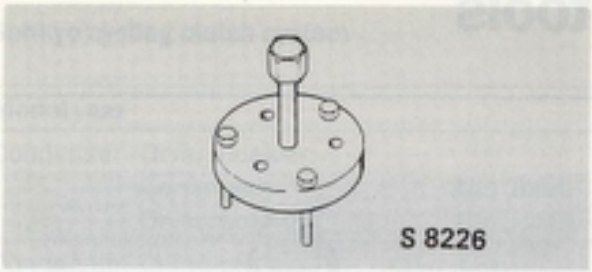
83 93 373 Key, removal of front plate, compressor



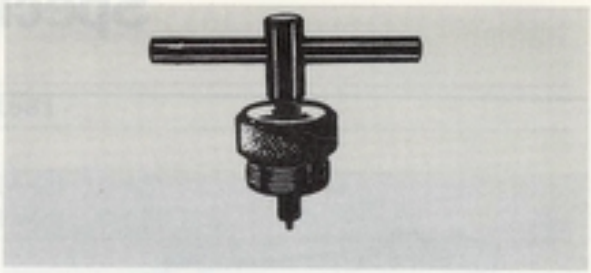
83 93 274 Puller, rotor (Robinair 10471-1)



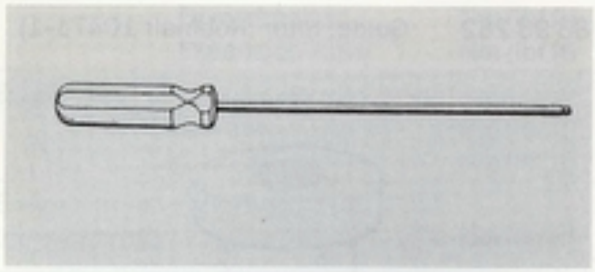
83 93 399 Puller, rotor, compressor



83 93 381 Puller, front plate, compressor

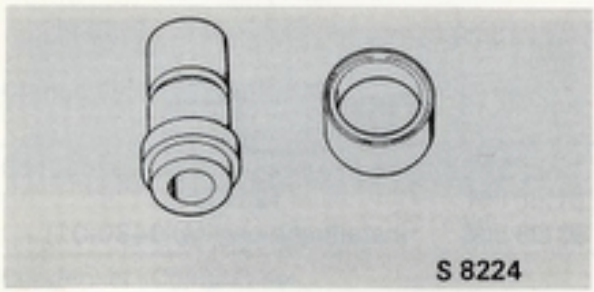


83 93 662 Puller. For the removal of the driver

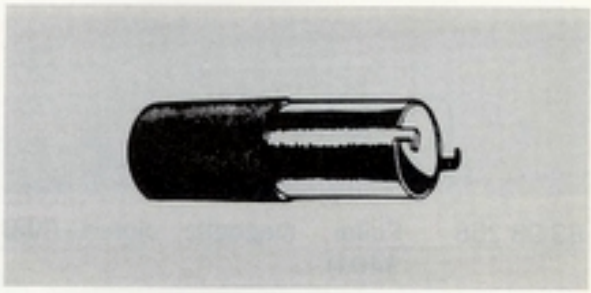


84 71 054 Screwdriver with hexagonal drive for removing the temperature control valve as from the 1980 models

83 93 670 Socket. For undoing and tightening pulley securing nut

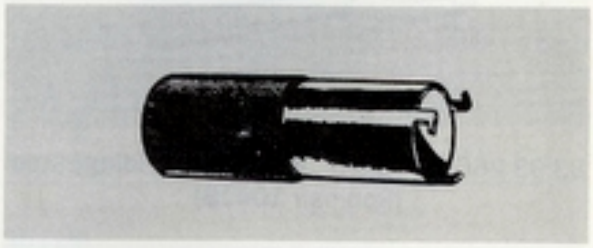


83 93 407 Installing drift, compressor



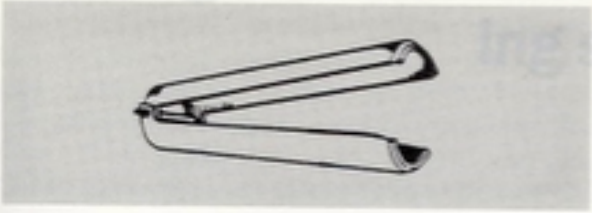
83 93 688 Fitting tool (two hooks). See 83 93 738

83 93 415 Adapter, compressor

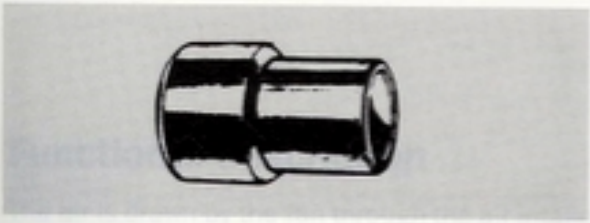


83 93 738 Fitting tool (three hooks). Used for removing and fitting the shaft seal. Since two different types of shaft seal are used, two different types of tool are necessary

83 93 654 Clamp. Used to stop the clutch from turning when undoing or tightening the centre nut



83 93 696 Pliers. Used for removing and fitting the seal

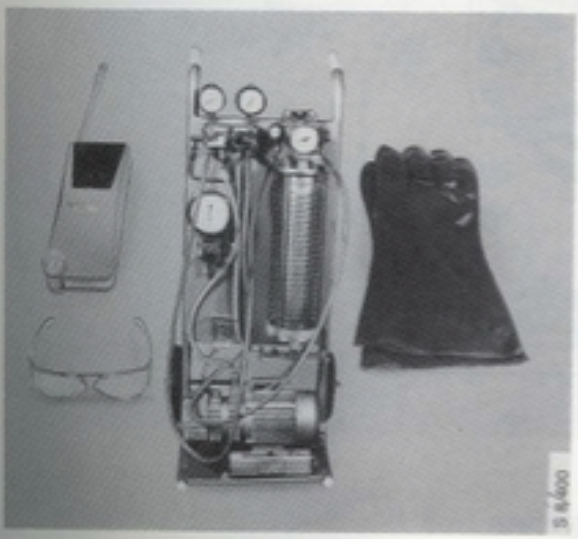


83 93 704 Press sleeve. Used for pressing the felt ring onto the shaft

83 93 712 Protective sleeve. Should be fitted onto the shaft to avoid damaging the shaft seal

Other equipment

Refco type 11705 filling station

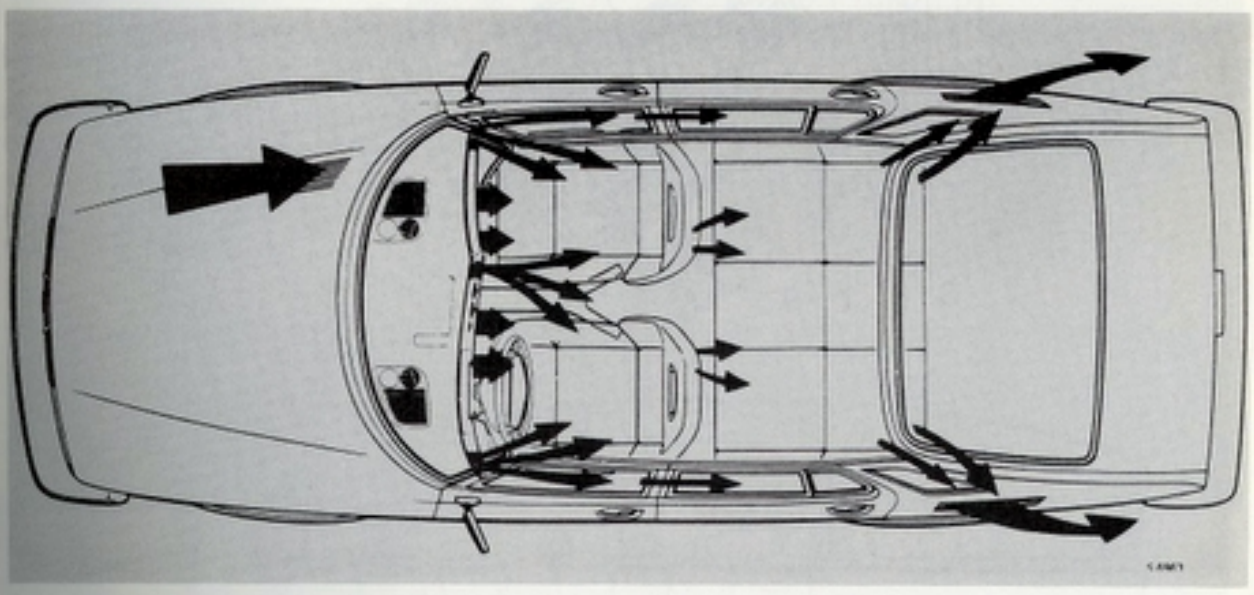


Type TIF 5000 leakage detector

Heating and ventilation system, air conditioning system

Functional description

The air is drawn by the fan through the air intake on the right-hand side of the bonnet or is forced into the inlet by the ram effect when the car is travelling. The air then flows through an efficient filter which arrests particles of dust and dirt. The air then continues through the fan casing and heat exchanger and flows through various ducts to outlets in the facia and at the floor. Air from the interior is exhausted through special air outlets in the luggage compartment.



Air flow, heating and ventilation system

The heating system is controlled as follows:

1 Vacuum-controlled dampers for guiding the flow of air through the system.

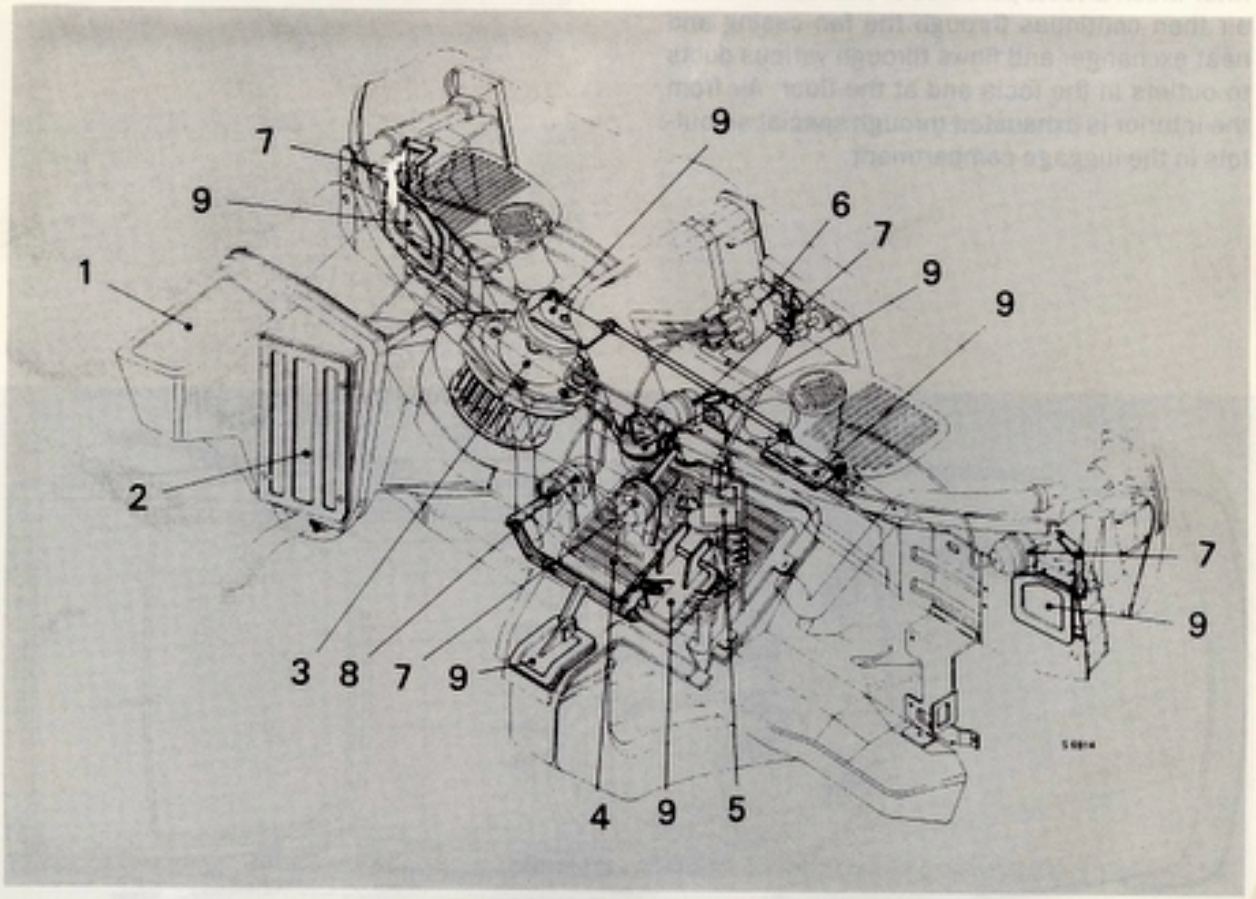
2 Thermostatically controlled, manually adjustable temperature control valve for controlling the flow of engine coolant through the heat exchanger.

3 Switch for controlling the fan speed.

The fan switch can be set for three different fan speeds. The switch has no "off" position, and the fan will therefore always be running, whenever the vacuum distributor is operative. When the air distribution control is set to "0", the supply circuit to the fan will be opened, regardless of the fan switch position. These functions are controlled by microswitches actuated by the air distribution control knob.

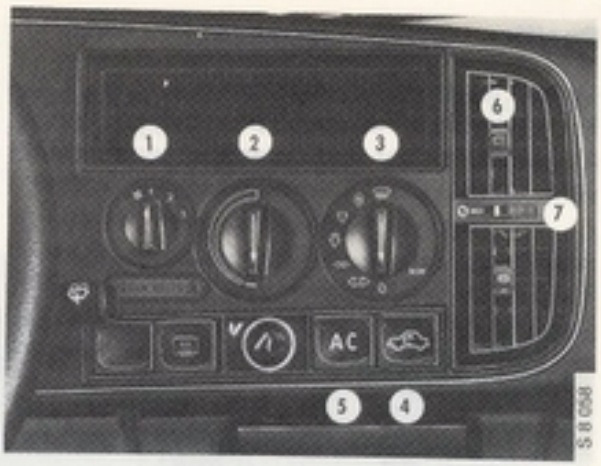
Positions and of the air distribution control are intended for the air conditioning unit that can be incorporated into the ordinary heating and ventilation system. In cars not equipped with an air conditioning system, these positions are used only for supplying fresh air.
As from the 1984 models, cars with an air conditioning system includes a manually controlled air recirculation feature. Air recirculation is started automatically when the air distribution control is set to

Note
Air recirculation should not be used in cold weather, since it may give rise to misting and frosting of the windows.

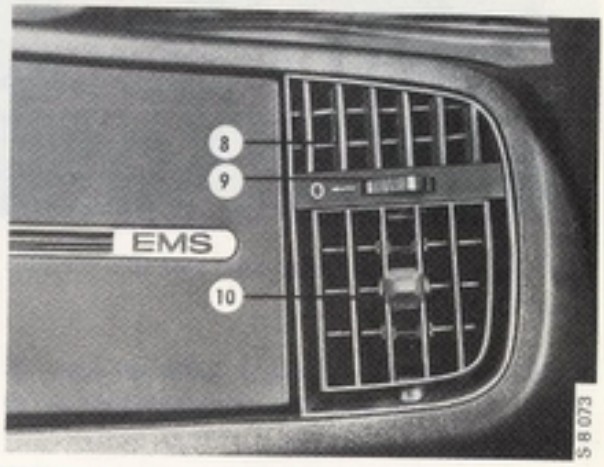


1 Air intake
2 Filter
3 Fan motor
4 Heat exchanger
5 Temperature control valve
6 Air distribution control
7 Vacuum servo, single-stage
8 Vacuum servo, two-stage
9 Vacuum-controlled air dampers

Apart from air to the central panel outlet, all air passes through the heat exchanger. The panel outlets can be closed and opened individually and, consequently, if the central panel outlet is shut, all air entering the car can be heated. In cars with air conditioning, the temperature control is used to regulate the temperature of the incoming cooled air. The outer defroster nozzles for the side windows cannot be closed.



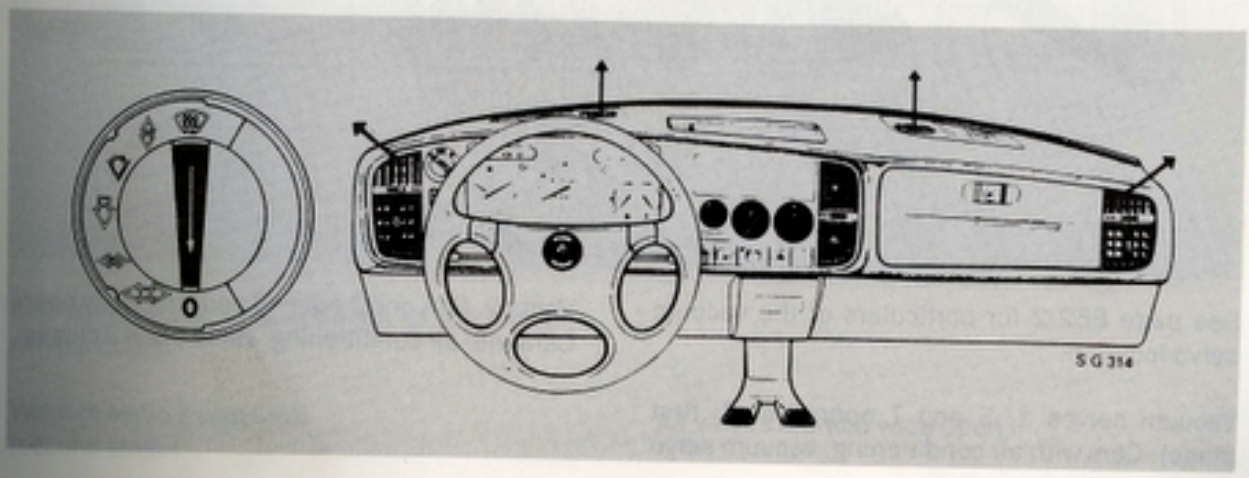
1 Switch for fan motor
2 Temperature control
3 Air distribution control (vacuum distributor)
4 Recirculation switch (as from the 1984 model)
5 AC switch (as from the 1981 model)
6 Centre air outlet
7 Damper control
8 Side window defroster
9 Damper control, out er air outlet
10 Outer air outlet



Flow of air at different settings of the air distribution control

Position 0

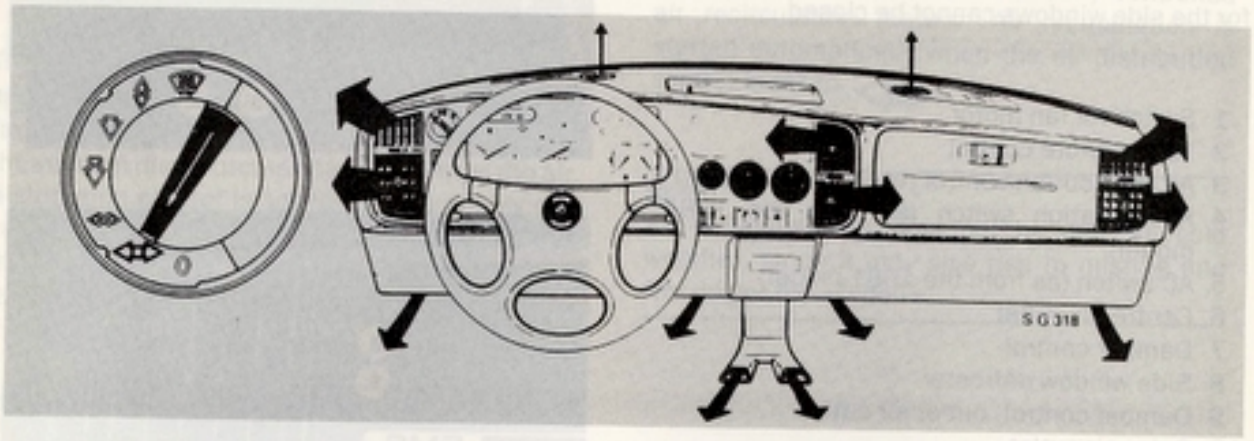
No current to fan motor. All air valves closed, although leakage of air will occur through defroster and outer panel vents.
As from 1984 models, all vents closed in cars with air conditioning.



Position **Fresh air (AC max)**

Current to fan motor, high speed.
No regulation of fan speed possible.
Air valves to floor and outer and central panel vents open.

Defroster outlet closed, but some flow of air.
1979 - 80 models with air conditioning system: Compressor in operation, dampers for floor outlets closed. Recirculation of the air in the interior.
As from the 1981 models: Separate switch provided for the air conditioning system. Recirculation of the air in the interior.



See page 852-2 for particulars of the vacuum servo location.

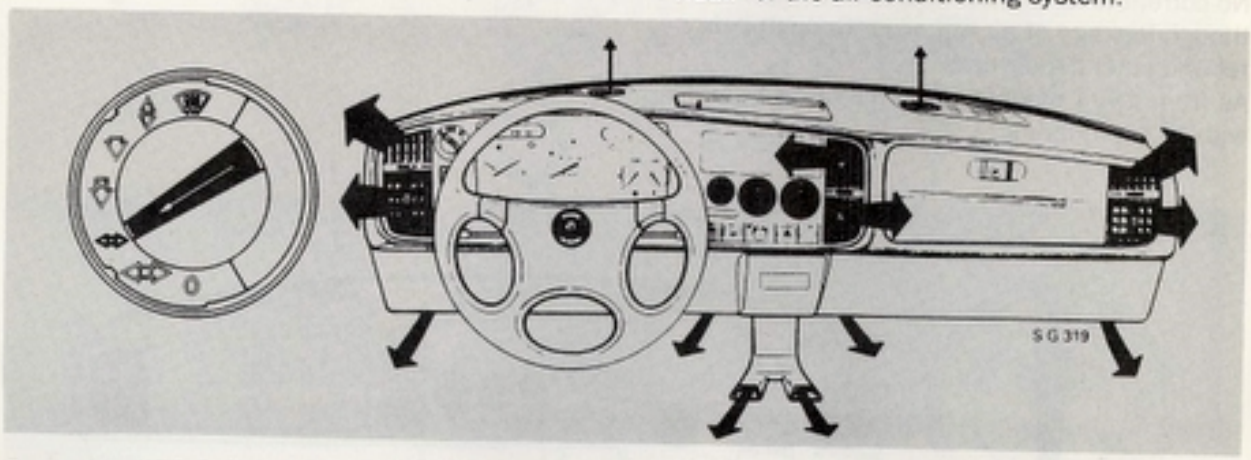
Vacuum servos 1, 5 and 7 operative (7: first stage). Cars with air conditioning: vacuum servo 7 not operating.

Vents 2 and 6 open and 8 and 9 partially open. Cars with air conditioning: vents 8 and 9 closed.

Position **Fresh air (AC fresh)**

Current to fan motor. Regulation of fan speed possible.
Valves for outer and central panel vents open.
Valves for floor area partially open.

Defroster outlet closed, but some flow of air.
1979 - 80 models with air conditioning system: Compressor in operation, flaps for floor outlets closed.
As from the 1981 model: Separate switch provided for the air conditioning system.



See page 852-2 for particulars of the vacuum servo location.

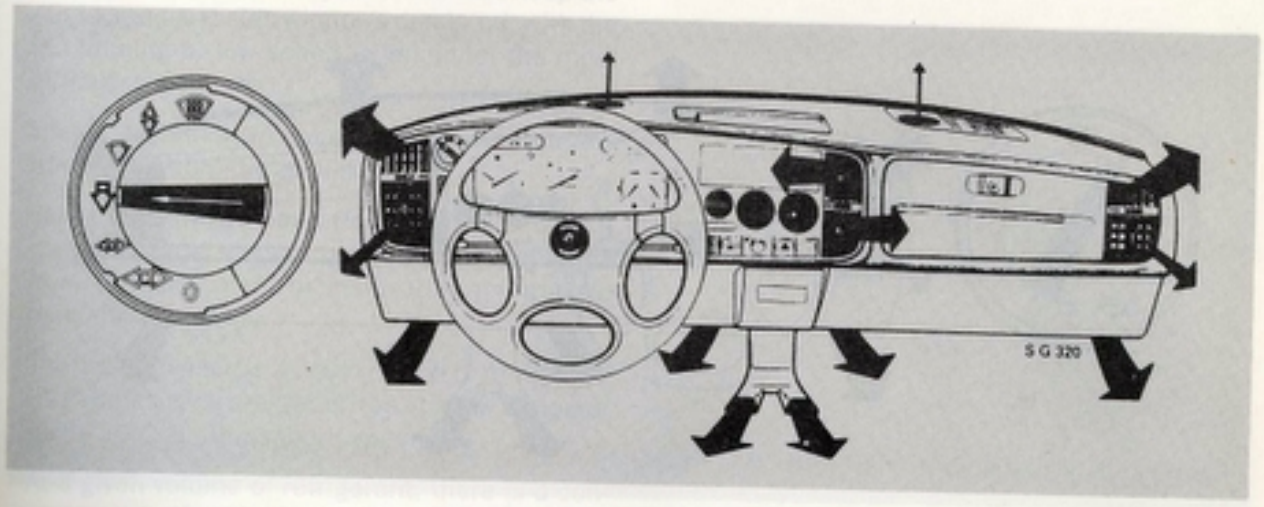
Vacuum servos 1, 5 and 7 operative (7: first stage). Cars with air conditioning: vacuum servo 7 not operating.

Vents 2, 6, 8 and 9 open (8 and 9 partially open). Cars with air conditioning: vents 8 and 9 closed.

Position Ventilation

Current to fan motor. Regulation of fan speed possible.
Air valves to floor and central panel vents open.

Defroster and outer panel vents closed but leakage past valves.



See page 852-2 for particulars of the vacuum servo location.

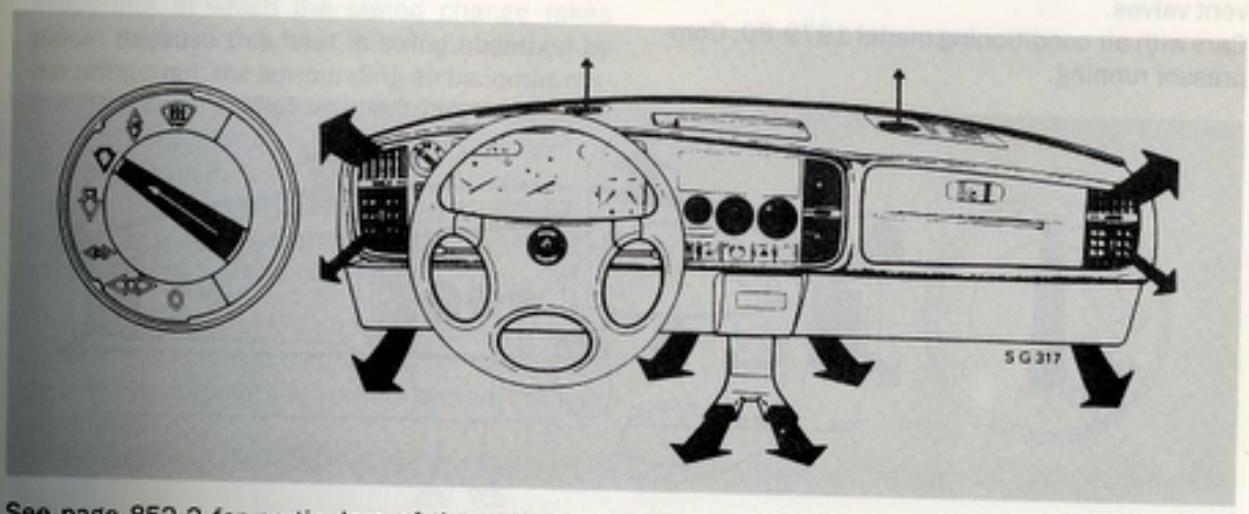
Vacuum servos 5 and 7 operative
7 in the first stage

Air valves 6, 8 and 9 open
(8 and 9 partially open)

Position Floor

Current to fan motor. Regulation of fan speed possible.
Air valves to floor open.

Defroster, outer and central panel vents closed, leakage of air past defroster and outer panel vent valves.



See page 852-2 for particulars of the vacuum servo location.

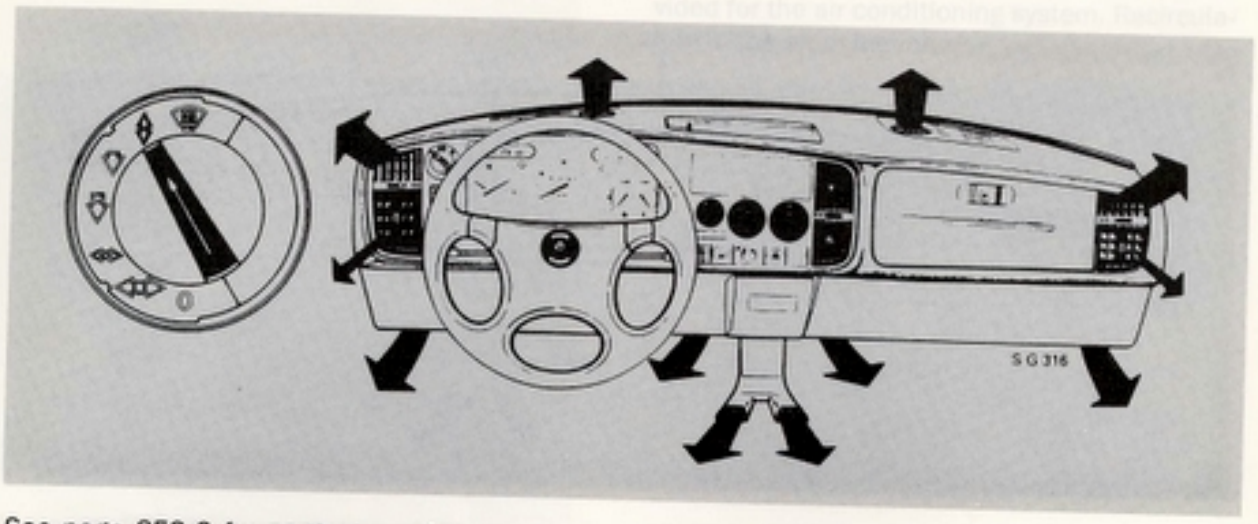
Vacuum servo 7 operative
(second stage)

Air valves 8 and 9 wide open

Position Comfort

Current to fan motor. Regulation of fan speed possible.

Defroster valves open. Floor, outer and central panel vents closed, but air leakage past outer panel vent valves



See page 852-2 for particulars of the vacuum servo location.

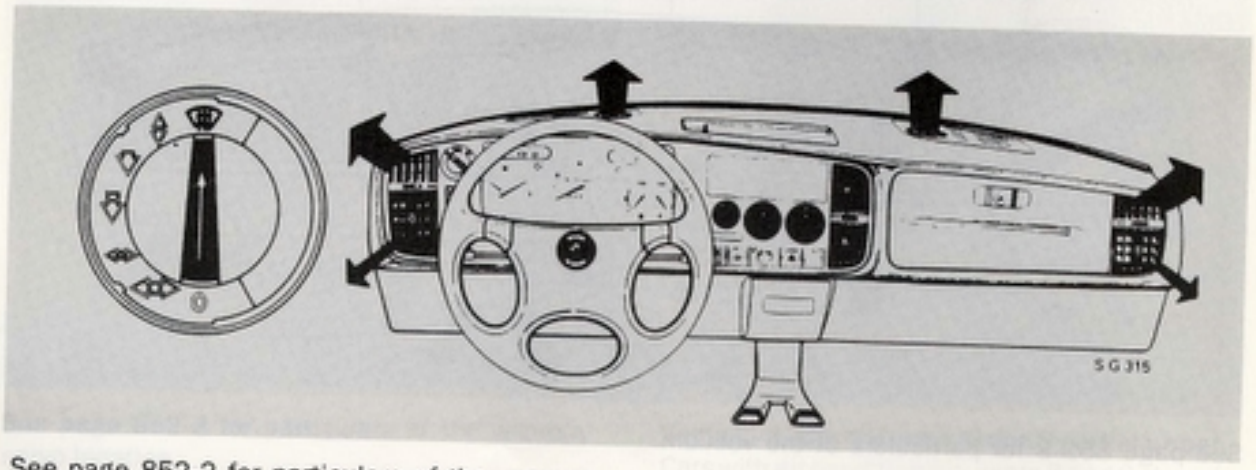
Vacuum servos 3 and 7 operative (7 second stage)

Air valves 4,8 and 9 open (8 and 9 wide open)

Position Defroster

Current to fan motor. Regulation of fan speed possible.

Defroster valves open. Floor, outer and central panel vents closed, but leakage past outer panel vent valves.
Cars with air conditioning model 1979-80: Compressor running.



See page 852-2 for particulars of the vacuum servo location.

Vacuum servo 3 operative

Air valves 4 open

Air conditioning system (AC)

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

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

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

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

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

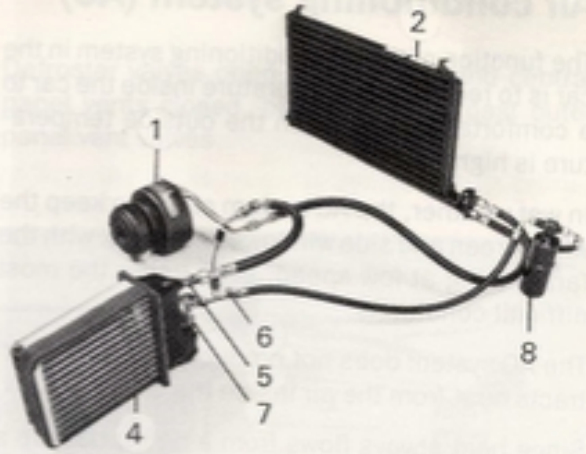
At a given volume of refrigerant, there is a constant relationship between pressure and temperature, which means, for instance, that if there is a change in pressure there will be a corresponding change in temperature. It is this property that is utilized by the AC system.

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

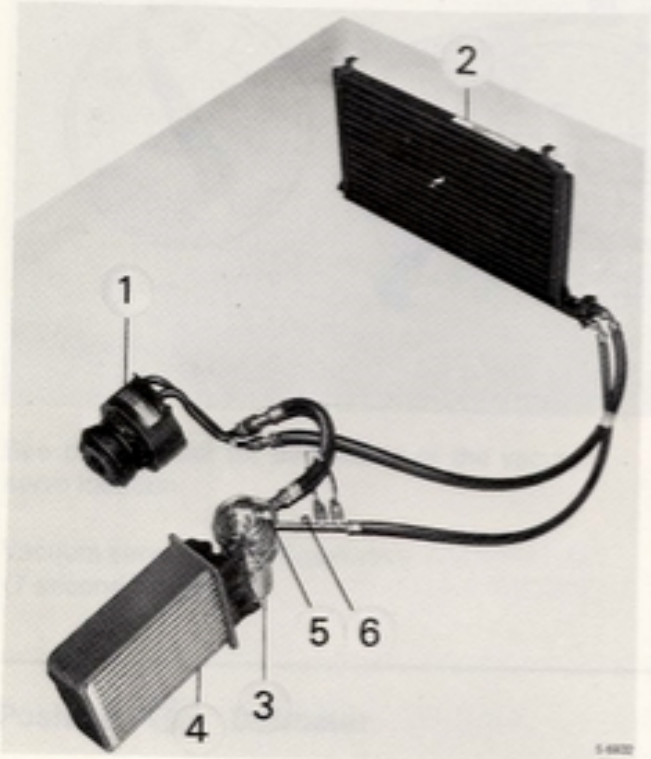
However, to change its state from a liquid to a gas, the refrigerant must be supplied with heat. This heat is taken from the air surrounding the evaporator in which the stated change takes place. Because this heat is being absorbed by the refrigerant, the surrounding air becomes colder. This same chilled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

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

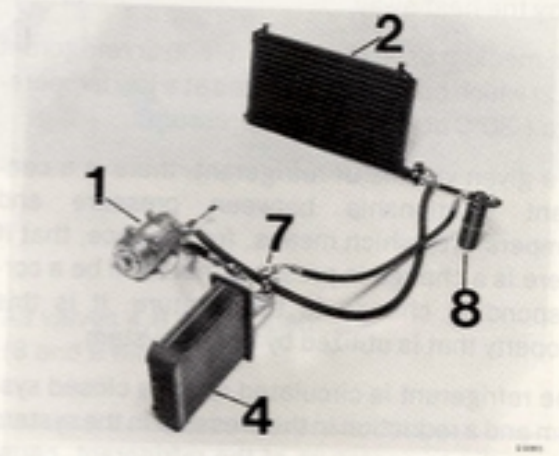
Cars are at present fitted with two different systems which mainly differ in their control function. During the 1980 models, the "VIR" system was replaced by the "Cycling Clutch" system. The Cycling Clutch system was produced in two versions, which differ on the 1980 and 1981 models. These are factory- fitted. A third version - the Clarion Cycling Clutch system - has also been fitted to cars.



Cycling clutch system, 1980 models



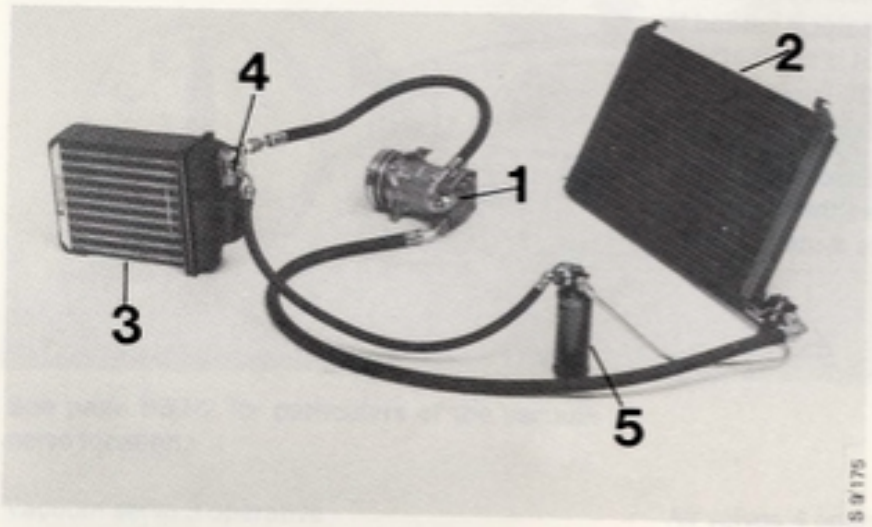
VIR-system



Cycling Clutch system, as from the 1981 model

Air conditioning unit

1 Compressor
2 Condenser
3 VIR assembly (suction throttling valve, expansion valve, filter)
4 Evaporator
5 Service outlet, low pressure
6 Service outlet, high pressure
7 Expansion valve
8 Receiver shell



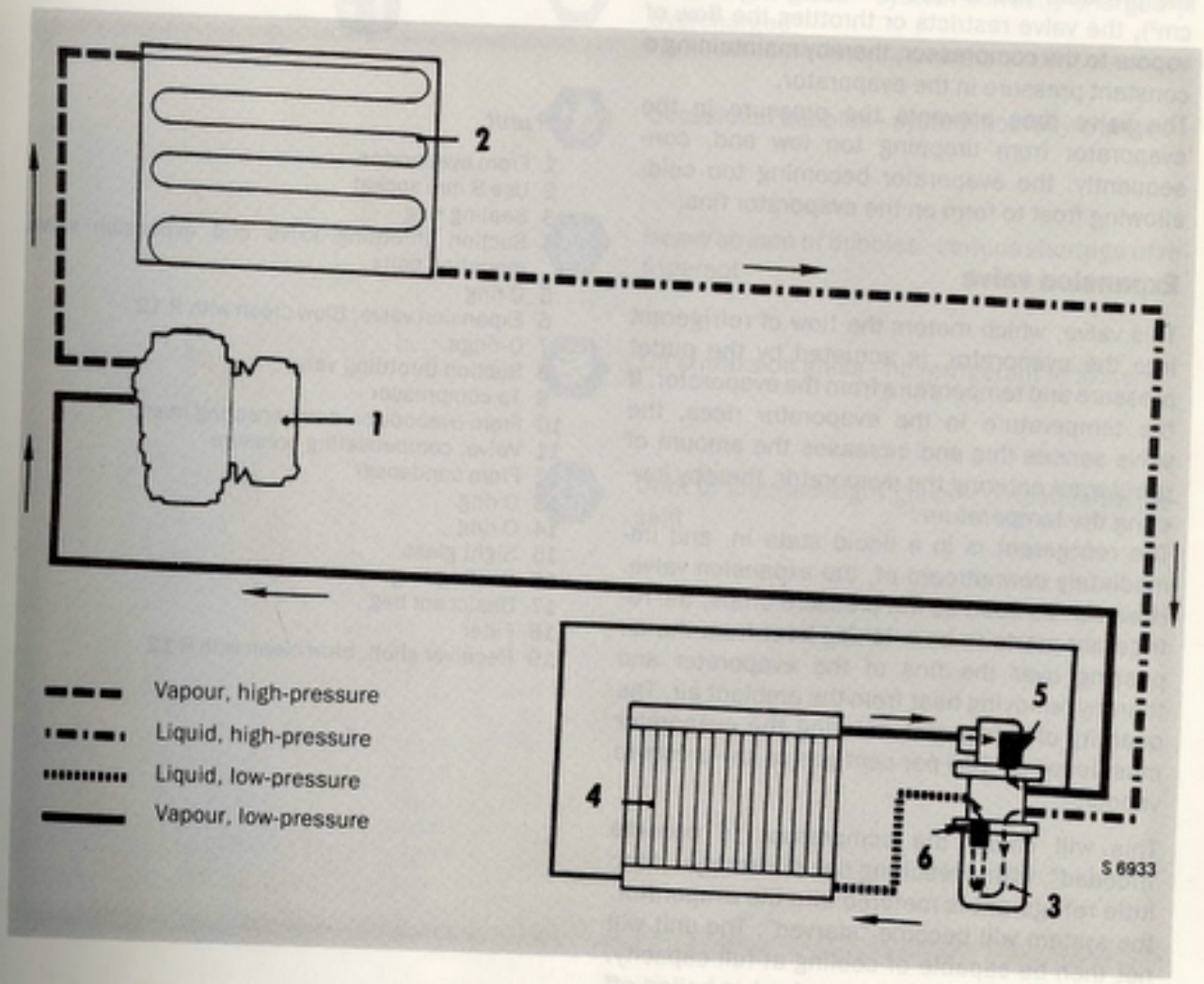
The Clarion Cycling Clutch system

1 Compressor
2 Condenser
3 Evaporator
4 Expansion valve
5 Filter/dryer receiver

Operation of the VIR system, 1979 models

The main components in the mechanical system are the evaporator, compressor, condenser and valve-in-receiver (VIR) assembly.
The VIR assembly contains the expansion valve, the suction throttling valve and the shell housing the filter and desiccant. A special refrigerant, R12, absorbs heat inside the evaporator by changing from liquid into vapour. The air which flows over the fins of the evaporator is cooled and dried. As it passes through the compressor, the heat-carrying vapour is pressurized and reaches a temperature that is considerably higher than that of the ambient air. The vapour proceeds to the condenser where it gives up its heat and returns to a liquid state (condenses).

The condensation (the condensed refrigerant) is filtered, desiccated and stored under pressure in the receiver. The expansion valve meters the refrigerant into the evaporator, whereupon the pressure drops. This causes the refrigerant to boil (evaporate) and in doing so heat is extracted from the warm air passing over the fins of the evaporator. This heat is carried by the refrigerant through the compressor to the condenser where it is dissipated into the air flowing over the fins.



Flow through the system

1 Compressor
2 Condenser
3 VIR assembly
4 Evaporator
5 Suction throttling valve
6 Expansion valve

System components

VIR-system

This section describes the circulation of the refrigerant through the system and the function of the various components.

Valves in Receiver (VIR) assembly

The VIR assembly is the system control unit and is fitted direct to the evaporator. The assembly houses the following components.

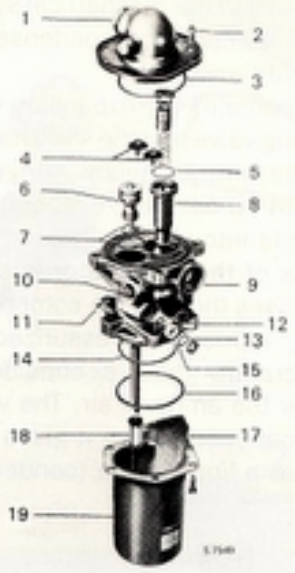
Suction throttling valve

The valve is actuated by the outlet pressure from the evaporator (the low- pressure side). When the pressure has dropped to 29 lb/in² (2.1 kg/cm²), the valve restricts or throttles the flow of vapour to the compressor, thereby maintaining a constant pressure in the evaporator.
The valve thus prevents the pressure in the evaporator from dropping too low and, consequently, the evaporator becoming too cold, allowing frost to form on the evaporator fins.

Expansion valve

This valve, which meters the flow of refrigerant into the evaporator, is actuated by the outlet pressure and temperature from the evaporator. If the temperature in the evaporator rises, the valve senses this and increases the amount of refrigerant entering the evaporator, thereby lowering the temperature.
The refrigerant is in a liquid state in, and immediately downstream of, the expansion valve. However, as soon as the pressure drops, the refrigerant starts to boil, taking heat from the air passing over the fins of the evaporator and thereby removing heat from the ambient air. The quantity of refrigerant entering the evaporator must leave as 100 per cent gas or low-pressure vapour.

This will cause the compressor to become "flooded", with a resulting risk of damage. If too little refrigerant is metered into the evaporator, the system will become "starved". The unit will not then be capable of cooling at full capacity. The refrigerant will have vaporized or boiled off before reaching the evaporator outlet. When the exactly correct quantity of refrigerant is metered, the refrigerant will be in a liquid state immediately downstream of the expansion valve and will change to saturated vapour having a temperature difference of between 5 and 10°C (overheating) at the outlet.



VIR unit

1 From evaporator
2 Use 8 mm socket
3 Sealing ring
4 Suction throttling valve and expansion valve mounting bolts
5 O ring
6 Expansion valve. Blow clean with R 12.
7 O-rings
8 Suction throttling valve
9 To compressor
10 From evaporator, compensating hose
11 Valve, compensating pressure
12 From condenser
13 O ring
14 O ring
15 Sight glass
16 Sealing ring
17 Desiccant bag
18 Filter
19 Receiver shell, blow clean with R 12

Receiver

The receiver is the component in which the quantity of refrigerant required to provide a steady flow to the expansion valve is filtered, desiccated and stored.

The VIR assembly is provided with a sight glass which shows if there is sufficient refrigerant in the system. The service outlet for the low-pressure side of the system is located at the top of the VIR assembly.

Clear sight glass - system correctly charged or overcharged

Occasional bubbles - system not fully charged

Heavy stream of bubbles - serious shortage of refrigerant

Oil streaks on glass - no refrigerant in system

Dark or clouded sight glass -contaminants present

Delco compressor, 1979 models

Compressor

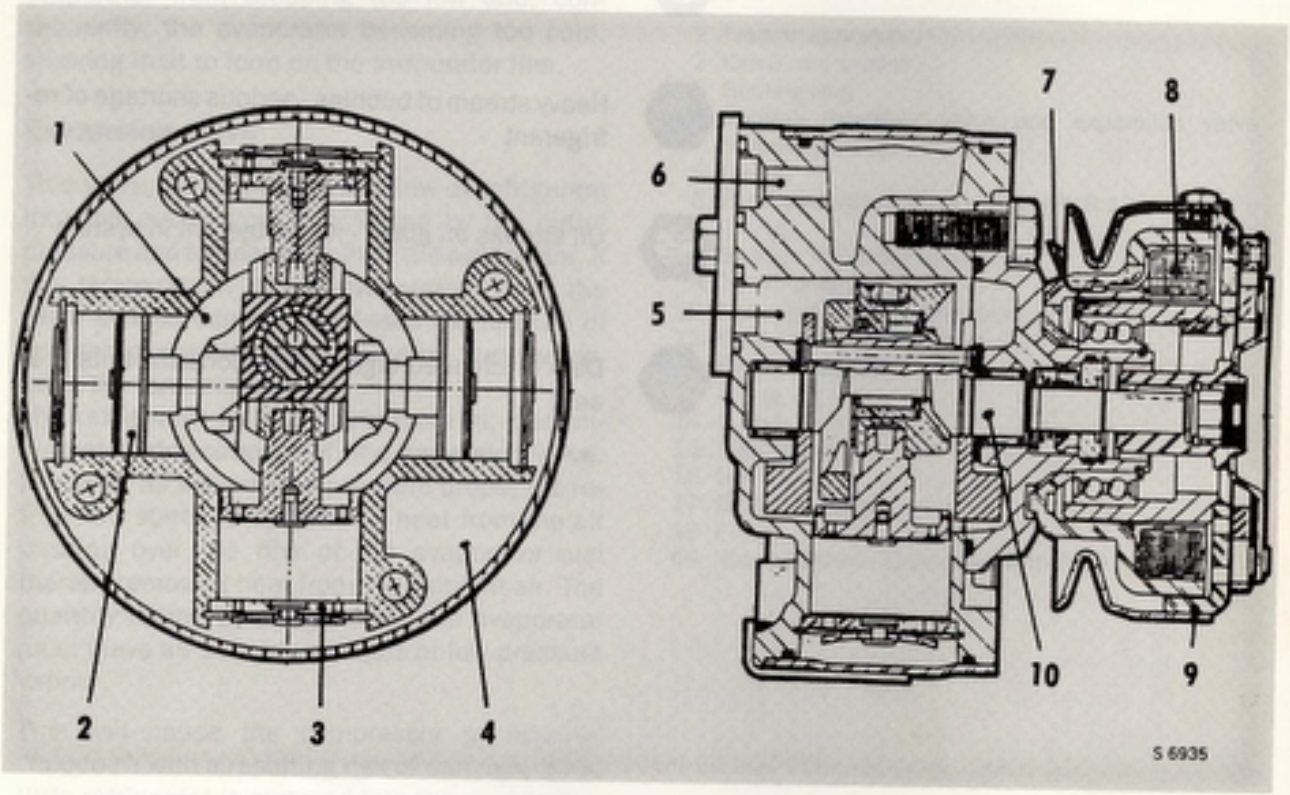
The compressor pressurizes and directs the refrigerant through the system. The pressure and temperature increases occurring in the compressor enable condensation of the refrigerant to take place in the condenser. The compressor is a 4-cylinder unit and of centrifugal design. The pistons and cylinders incorporate valves that are opened and closed by the pressure differences caused by the movement of the pistons.
To prevent the compressor from being overheated and damaged, a temperature-sensing switch is fitted which, when actuated, will cause a safety fuse to blow, thereby breaking the circuit to the compressor's magnetic clutch. Overheating is caused by the system operating with too little refrigerant in the low-pressure side of the compressor.

Caution

Do not confuse this compressor with the compressor for the cycling clutch system which has exactly the same external appearance. The pressure- sensitive switches in these compressors have entirely different functions.

The VIR system compressor is stamped with model no. 1131061 or 1131223.

Note: Compressor 1131061 has non-metric threads while 1131223 has metric threads.



Compressor with magnetic clutch

1 Crankcase, low-pressure side
2 Piston and valves (4)
3 Cylinder valves (4)
4 High-pressure side
5 Low-pressure inlet
6 High-pressure outlet
7 12V connection
8 Field coil
9 Magnetic clutch
10 Crankshaft

Condenser

The condenser converts the vaporized refrigerant to the liquid state (condensation). During this process heat is given off and then diffused by the air passing over the fins of the condenser. This heat, that has been removed in the process of converting a gas to liquid, is the same heat absorbed in the evaporator to convert a liquid to a gas, with the addition of heat from the pressure increase caused by the compressor.

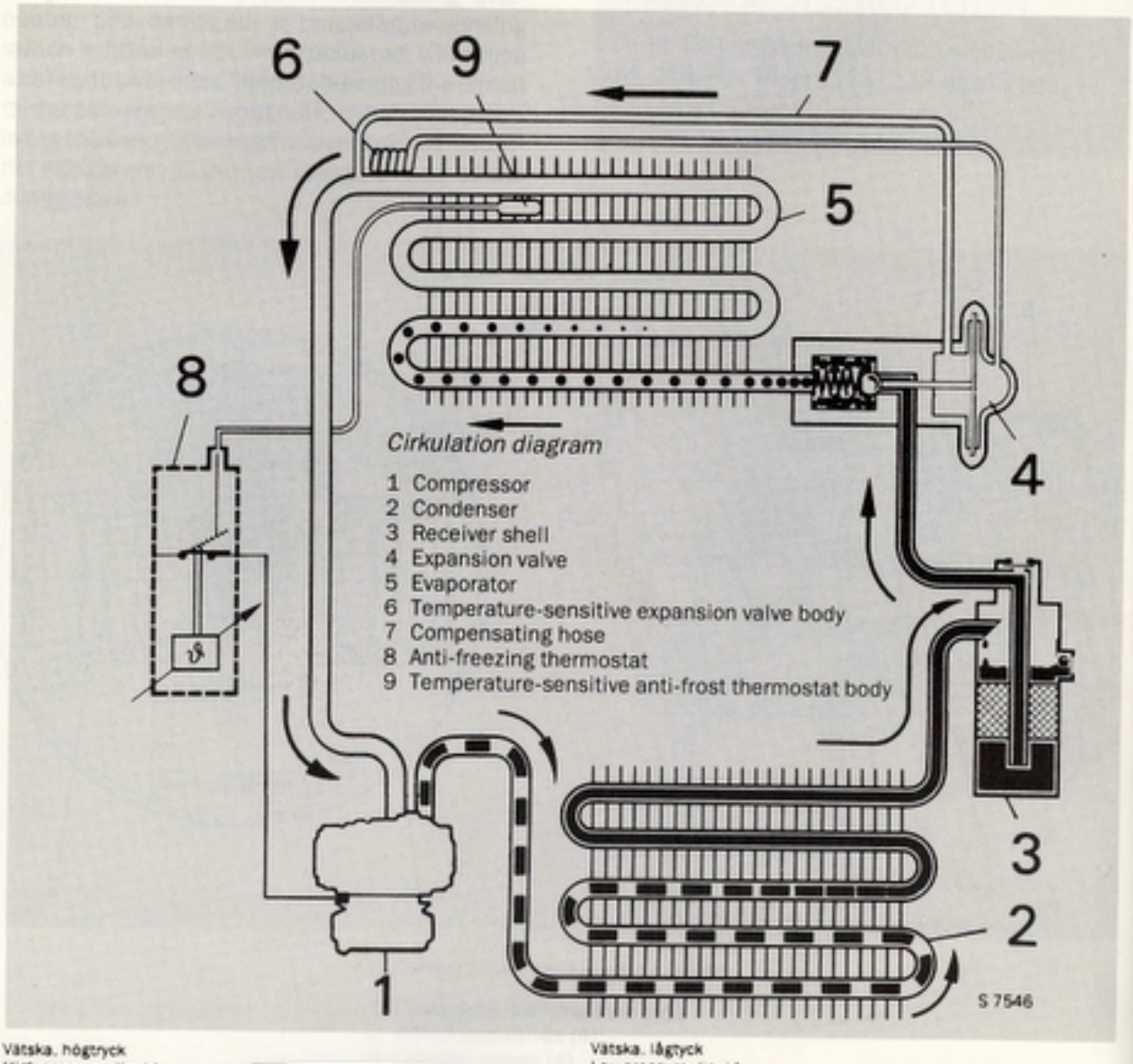
Operating principle

Cycling clutch system as from the 1980 models

The main components in the mechanical system are the evaporator, compressor, condenser, themostatic expansion valve, anti-frosting thermostat and dryer receiver.

The refrigerant absorbs heat inside the evaporator by changing from a liquid into a vapour. The air which flows over the fins of the evaporator is cooled and demoisturized.

As it passes through the compressor, the heat-carrying vapour is pressurized and reaches a temperature that is considerably higher than that of the ambient air. The vapour proceeds to the condenser where it gives up its heat and returns to a liquid state (condenses). The condensation (the condensed refrigerant) is filtered, desiccated and stored under pressure in the receiver. The expansion valve meters the refrigerant into the evaporator, whereupon the pressure drops. This causes the refrigerant to boil (evaporate).



Vätska, högtryck
High pressure, liquid
Hochdruck, flüssig
Liquide, haute pression

Vätska, lågtyck
Low pressure, liquid
Niederdruck, flüssig
Liquide, basse pression

Ånga, högtryck
High pressure, vapor
Hochdruck, gasförmig
Vapeur, haute pression

Ånga, lågtryck
Low pressure, vapor
Niederdruck, gasförmig
Vapeur, basse pression

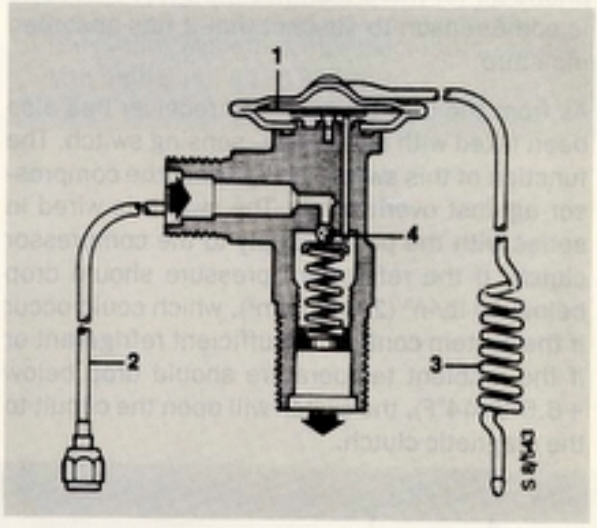
System components

Cycling clutch system

This section describes the circulation of the refrigerant through the system and the function of the various components.

Expansion valve

This valve, which meters the amount of refrigerant injected into the evaporator, is governed by the pressure and temperature at the evaporator outlet. The valve senses increases in the temperature in the evaporator and increases the amount of refrigerant supplied, thereby lowering the temperature again. The refrigerant is in a liquid state in, and immediately downstream of, the expansion valve. However, as soon as the pressure drops, the refrigerant starts to boil, and this change in state removes heat from the air passing over the fins of the evaporator. In this way heat is removed from the ambient air. The quantity of refrigerant entering the evaporator must be evacuated as 100% gas or low-pressure vapour. If too much refrigerant is metered into the evaporator, the system will be "flooded" and the refrigerant will not vaporize. The increase in pressure will prevent the refrigerant vaporizing and there will also be insufficient room for it to expand.
If too little refrigerant is metered into the evaporator the system will become "starved". The unit will not then be capable of cooling at full capacity; the refrigerant will have vaporized and boiled off before reaching the evaporator. When the correct quantity of refrigerant is metered, it will be 100 % liquid immediately downstream of the expansion valve and 100 % gas at the outlet.



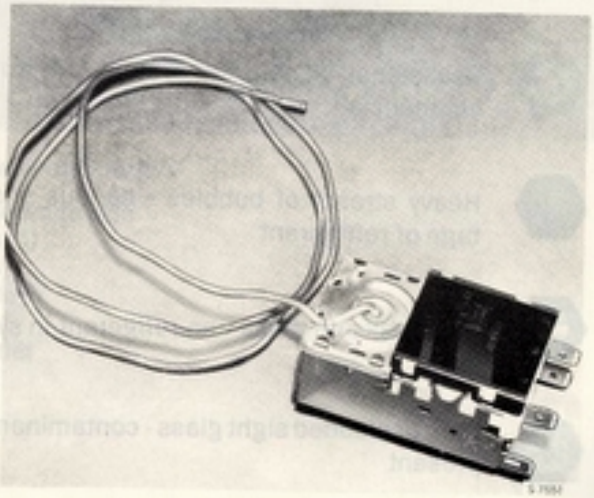
Expansion valve

1 From receiver shell
2 To evaporator
3 Compensating hose
4 Temperature-sensitive body

Anti-frost thermostat

The anti-frost thermostat is a device which prevents the evaporator fins from freezing and ice from forming.
A capillary tube is located between the fins and senses their temperature.

The thermostat is connected in series to the compressor's magnetic clutch. When the temperature in the evaporator drops below 35°F (1.5°C) the current to the magnetic clutch is cut off and the compressor stops. When the temperature in the evaporator rises to 5°C the thermostat closes and the compressor starts.

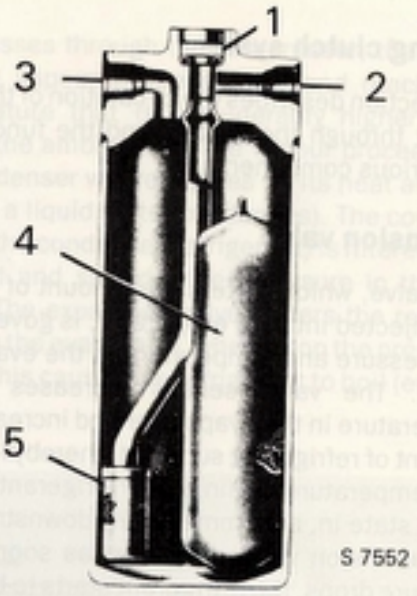


Dryer receiver

The dryer filters, dehumidifies and stores the refrigerant necessary for supplying the expansion valve with a steady flow of refrigerant.

The dryer receiver need not be replaced if the system performs satisfactorily. If the system has been opened up, the dryer receiver need only be replaced if the system has been open to atmospheric air for more than five minutes, or if there is some reason to suspect that it has absorbed moisture.

As from the 1981 model, the receiver has also been fitted with a pressure- sensing switch. The function of this switch is to protect the compressor against overheating. The switch is wired in series with the power supply to the compressor clutch. If the refrigerant pressure should drop below 40 lb/in² (2.8 kgf/cm²), which could occur if the system contains insufficient refrigerant or if the ambient temperature should drop below +6.5°C (44°F), the switch will open the circuit to the magnetic clutch.



Receiver shell

1 Sight glass
2 To expansion valve
3 From condenser
4 Desiccant
5 Filter

The dryer receiver is also equipped with a sight glass which shows whether the system contains sufficient refrigerant.

Clear sight glass - system correctly charged or overcharged

Occasional bubbles - system not fully charged

Heavy stream of bubbles - serious shortage of refrigerant

Oil streaks on glass - no refigerant in system

Dark or clouded sight glass - contaminants present

AC, Clarion

Delco compressor, 1980 models

The compressor pressurizes the refrigerant and forces it through the system. The pressure and temperature increases occurring in the compressor enable condensation of the refrigerant to take place in the condenser. The compressor is a four-cylinder unit of centrifugal design. The pistons and cylinders incorporate valves that open and close as a result of the pressure differences caused by the reciprocating movement of the pistons.

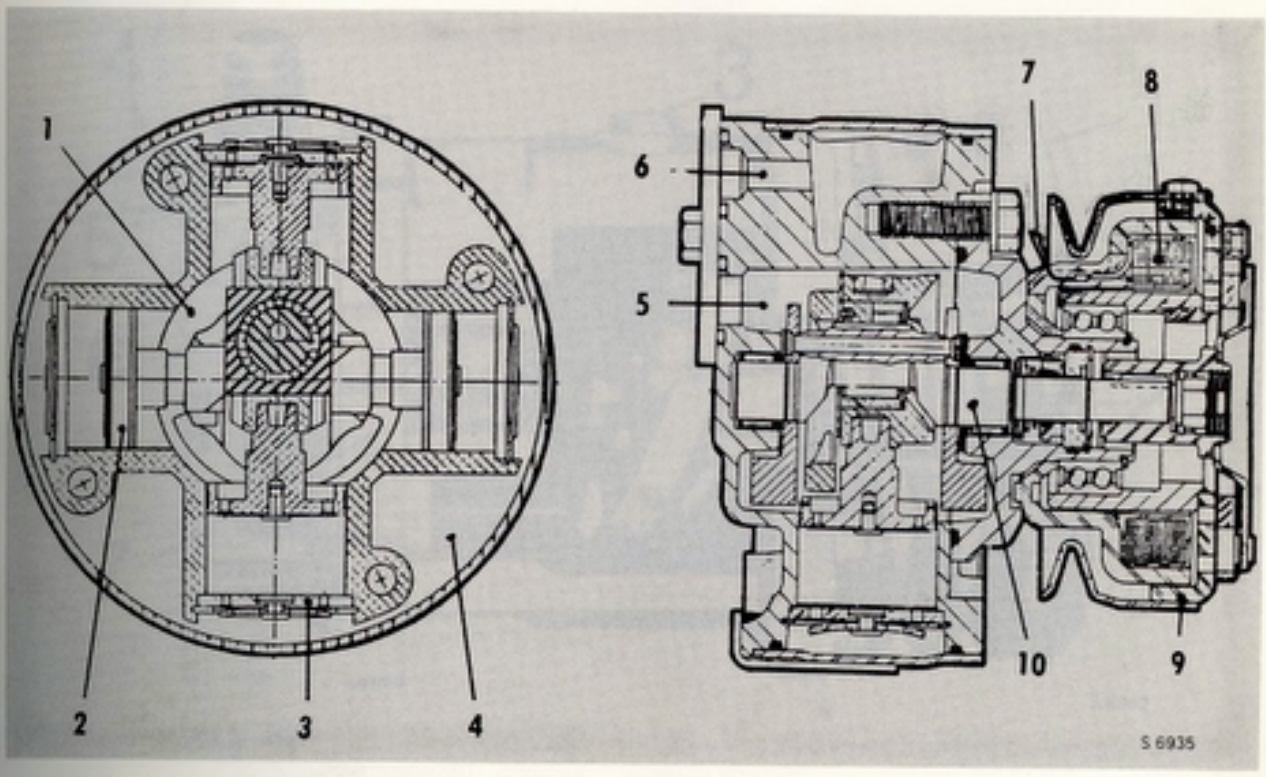
A pressure-sensitive switch is provided on the high-pressure side of the compressor to protect it from damage by overheating. In normal operation the compressor's magnetic clutch is earthed through this switch.

If the vapour pressure drops below 40 lb/in² (2.8 kgf/cm²), which can occur if there is insufficient refrigerant in the system or if the ambient temperature drops below 6.5°C (44°F), the switch breaks the circuit to the electro-magnetic clutch.

Caution

Do not confuse this compressor with the compressor for the VIR system which has exactly the same external appearance. The pressure-sensitive switches in these compressors have entirely different functions.

The cycling system compressor is stamped with model no. 1131331.



Compressor with magnetic clutch

1 Crankcase, low-pressure side
2 Piston and valves (4)
3 Cylinder valves (4)
4 High-pressure side
5 Low-pressure inlet
6 High-pressure outlet
7 12 V connection
8 Field coil
9 Magnetic clutch
10 Crankshaft

Compressor, Clarion

The compressor is of the swash-plate type. It is also of the reciprocating type and has ten horizontal cylinders with double-acting pistons. The valve system comprises individual swash plates located between the compressor housing and the cylinder heads. The valves are opened and closed by the pressure differences created by the action of the pistons. Service valves for the system are incorporated in the rear cylinder head of the compressor.

Caution

The compressor has an oil filler plug which must be removed unless the system has been drained of refrigerant. N.B. The plug cannot be used for checking the oil level.

To change the air filter 1979-1982 models

Undo the four retaining screws and withdraw the filter. Fit a new filter. Change the filter every 18 000 miles (30 000 km).

Caution

Avoid touching the filter element
The filter element contains glass fibres which can cause skin irritation.
WEAR PROTECTIVE GLOVES WHEN HANDLING THE FILTER.

1983 models onwards: The cover is incorporated in the filter casing and secured by four plastic clips. To remove the cover, turn the clips a 1/4 turn clockwise or anti-clockwise.

To refit, reverse the removal procedure.

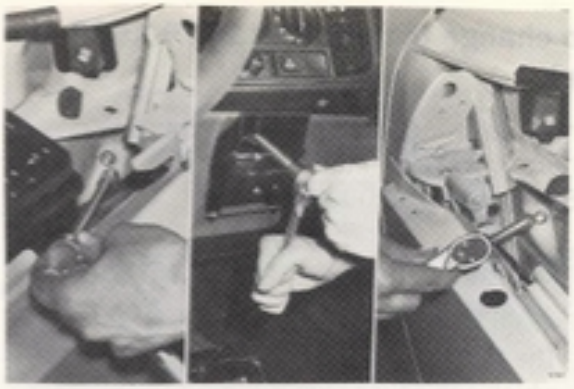
To change the heat exchanger and temperature control valve, 1979 models

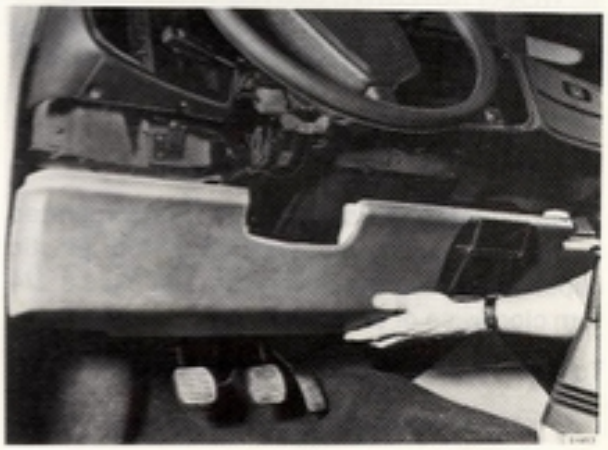
Remove the heat exchanger and valve from the car as one unit.

1 Remove the cover under the switches on the steering column

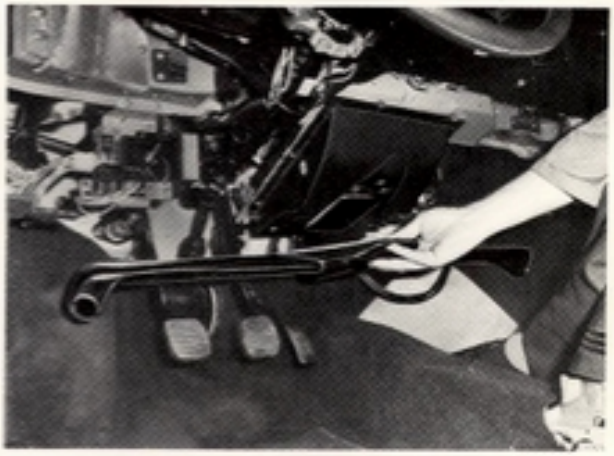
2 Certain cars have a front centre console which must be removed (see section 853 "Interior equipment").

3 Remove the lower section of the instrument panel.



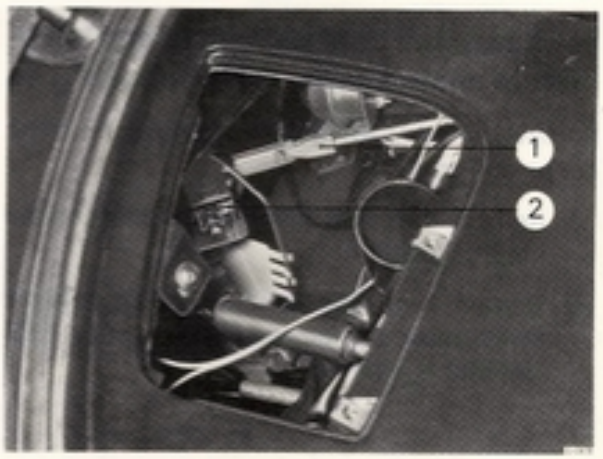


4 Remove the air diffuser (5 screws).



5 Remove the left-hand defroster/speaker grille

6 Remove the control rod from between the water valve and the control knob by sliding the rod forward as far as it will go, so that it comes free from the knob.
Next, pull the rod back to free it from the water valve. The plastic joint at the control knob is accessible from underneath once the switches below the heater controls have been pressed backwards.



1 Control rod, water valve
2 Water valve

7 Remove the lower section of the heater housing.

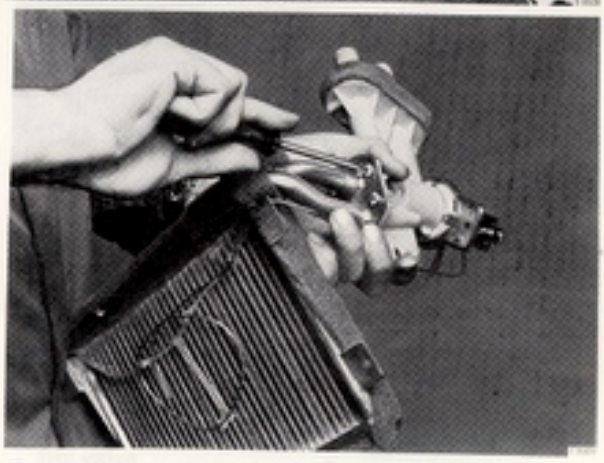
8 Drain off sufficient coolant to enable the hoses to the water valve in the engine compartment to be disconnected without spillage. To prevent coolant leaking onto the carpeting, plug the hose ends before removing the heat exchanger/water valve.

9 Separate the heat exchanger with water valve from the heater housing and guide it backwards and downwards. To make sure there is room for the water valve to pass between the heater housing and the steering column, unhook the brake pedal return spring and depress the pedal slightly.

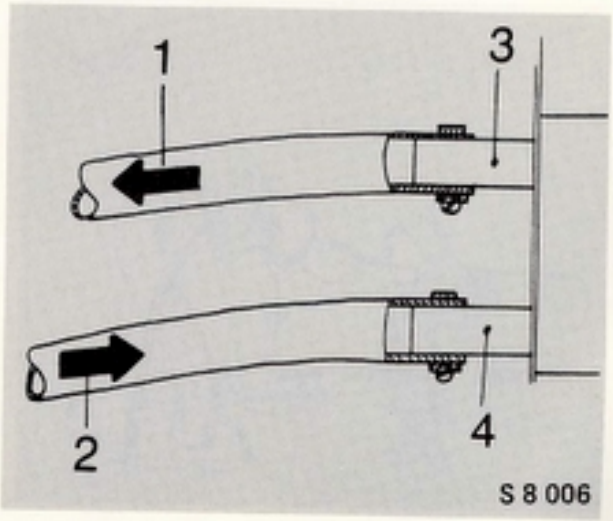
10 Remove the capillary tube from the heat exchanger (where applicable) and the screws/bolts in the water valve flange.

11 Always renew the gasket for the water valve flange. Handle the capillary tube with care, never allowing it to become kinked or creased.

Refit in the reverse order.



Temperature control valve, 1979 models



Water hose connections

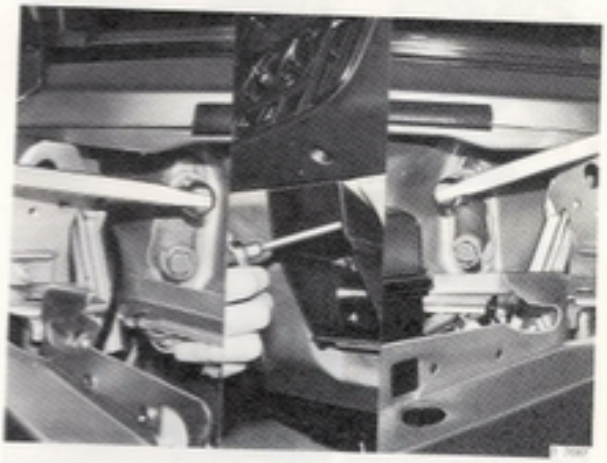
1 To engine coolant pump
2 From coolant distribution pipe, connected to the engine block
3 Upper connection branch on the temperature control valve
4 Lower connection branch on the temperature control valve

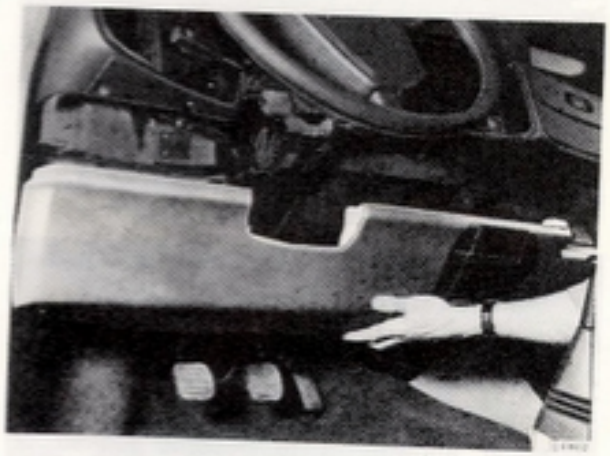
Temperature control valve, as from the 1980 models

To change the temperature control valve

1 Remove the bottom section of the facia.

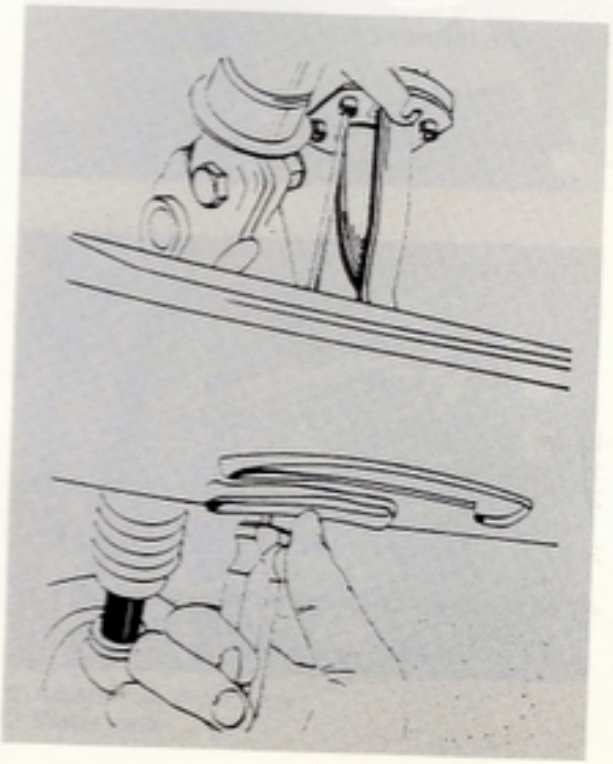
2 Remove the left-hand speaker grille.





3 Disconnect the two water hoses from the valve in the engine compartment (about 3 dl of water will run out).

4 Use screwdriver 84 71 054 to remove the valve.

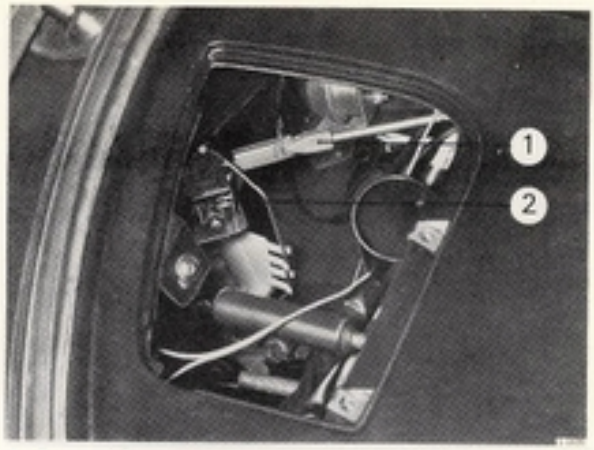


5 Release the control rod from the valve.

6 Fit the O-rings to a new valve and secure them in position with a dab of gasket compound.

7 Fit the valve. Fit the control rod when the temperature control is in the shut-off position and the flat surface on the plastic stem of the valve points upwards (valve closed).

N.B. The mounting holes in a new valve are not tapped. The screws are thread- forming (self-tapping).

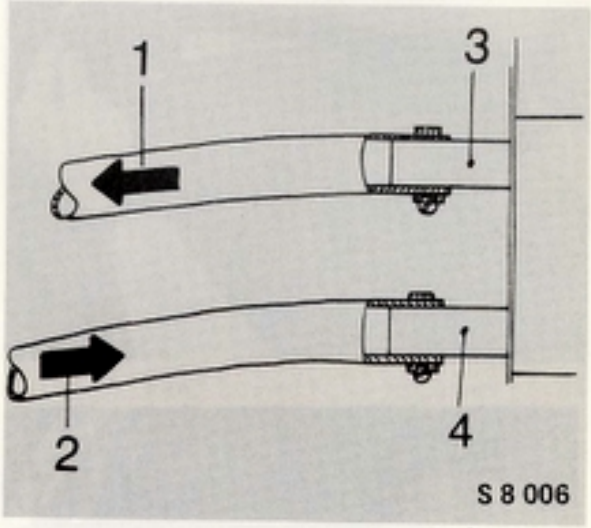


1 Control for the temperature control valve
2 Temperature control valve

8 Connect the coolant hoses in the engine compartment to the valve.

9 Top-up with coolant, and pressure-test and vent the system. Check it for tightness.

10 Fit the defroster grille and the bottom section of the facia.



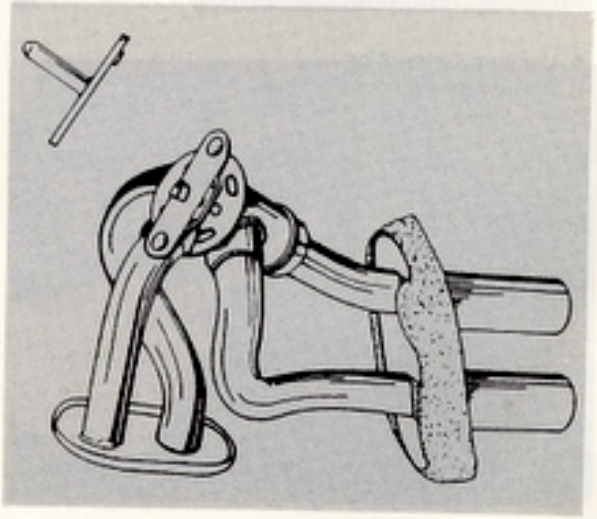
Water hose connections

1 To the engine coolant pump
2 From the coolant distribution pipe, connected to the engine block
3 Upper connection branch on the temperature control valve
4 Lower connection branch on the temperature control valve

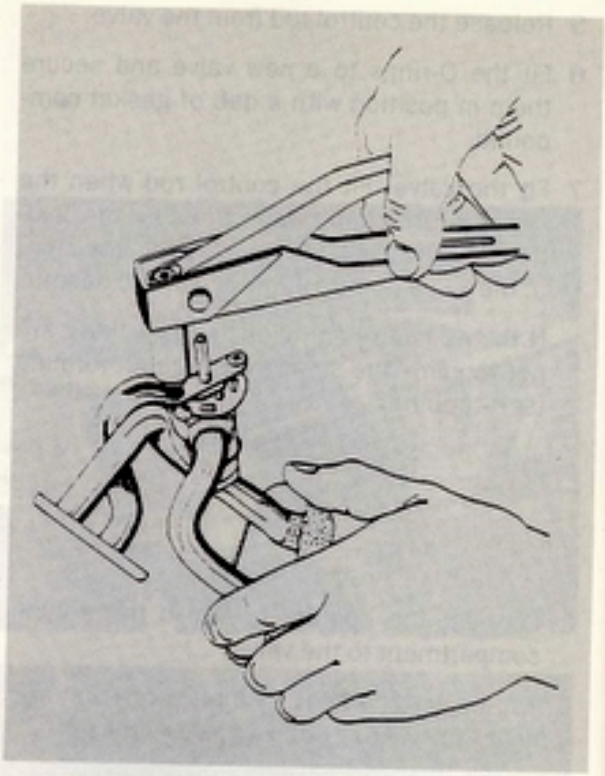
To change the drive pin on the temperature control valve

1 Remove the valve.

2 Remove the drive pin from the valve by means of a grinder or by drilling out the rivets.



3 Pop-rivet a new drive pint to the valve. The drive pin is designed so that it can only be fitted in one way.



Note

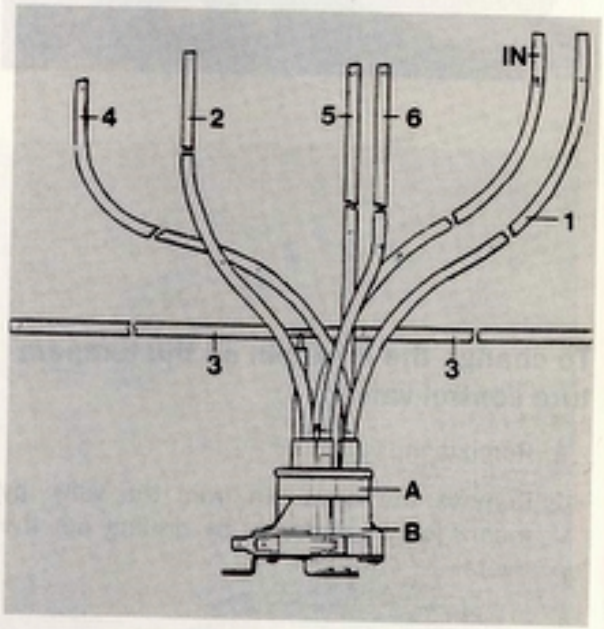
If the temperature control valve must be replaced due to leakage, drain the coolant and flush the system with water.

This is due to the fact that the anti-corrosion additive in the coolant will eventually be consumed, which increases the risk of corrosion.

Vacuum hoses

IN = 850 mm
1 = 850 mm, recirculation damper
2 = 550 mm, centre facia outlet
3 = 50 + 750 + 750 mm, outer facia outlet
4 = 400 mm, defroster
5 = 500 mm, floor damper, left-hand
6 = 550 mm, floor damper, right-hand

A. Vacuum connection
B. Air distribution control



To change the fan motor

1 Disconnect the cable from the positive pole of the battery.

2 Remove the steering wheel and both speaker/defroster grilles.

3 Remove the four facia-retaining screws.

4 Tilt the panel towards the rear and disconnect the electrical connections and the hoses from the air distribution control.

5 Remove the facia.

6 Remove the screws retaining the top of the facia at the windscreen.

7 Remove the screws retaining the top of the facia under the glove compartment.

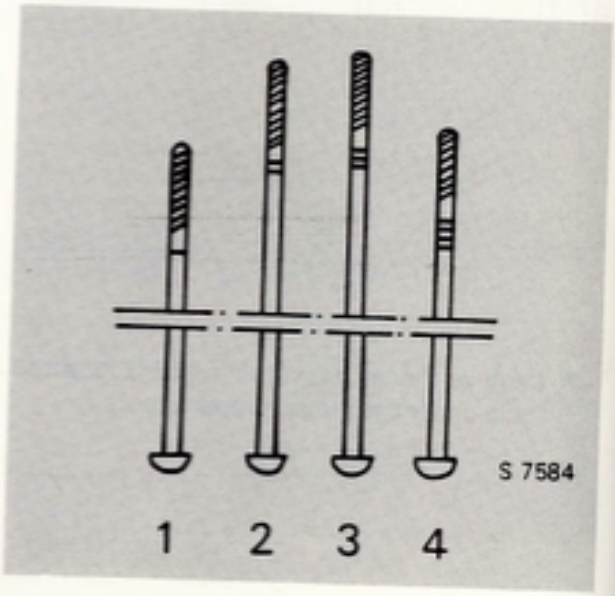
8 Lift off the top of the facia

9 Disconnect the electric cables from the fan motor and remove the retaining screws for the right-hand defroster damper housing.

10 Remove the fan motor retaining screws and lift out the motor.

Fit the fan motor in the reverse order.

Note
The four screws retaining the switch panel are of different lengths. The screws are marked with grooves. The lengths are shown in the figure below.



1 176 mm
2 205 mm
3 210 mm
4 189 mm

Cars with AC

General directions for work on the AC system

Precautions against moisture entering the system, etc.

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

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

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

Desiccant inside the receiver

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

Installation of a completely new system

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

Note
Whenever possible, the system should be charged immediately after fitting, to prevent problems of corrosion arising. Further details are given in the section dealing with charging of the system.

Replenishing the refrigeration oil

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

Slow leaks (longer than 24 hours)

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

Compressor

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

Other components

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

Sudden leakage (e.g. due to burst hose)

In the event of sudden leakage, some lubricating oil will often be lost with the refrigerant. When components are replaced, the new components must then be filled with the oil quantities tabulated below. Pour the oil directly into the hose or component.

Compressor, Delco, Sankyo	Quantity drained from removed compressor +0.3 dl.	
Clarion	Only quantity drained from the removed compressor	
Evaporator	0.5 dl	(0.4 dl for Clarion)
Dryer	0.2 dl	(0.1 dl for Clarion)
Condenser	0.2 dl	
Hose	0.2 dl	(0.1 dl for Clarion)
VIR assembly	0.2 dl	

Safety precautions

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

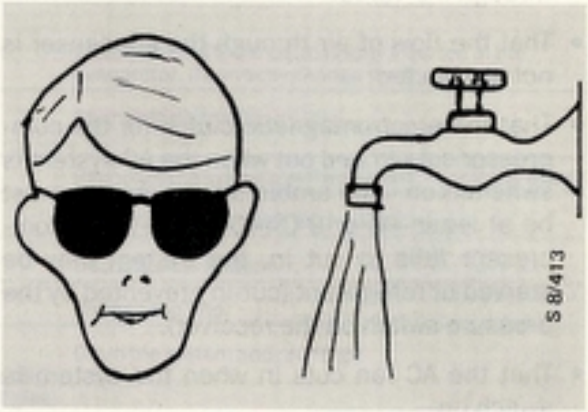
Always wear closely fitting protective goggles when refrigerant is likely to escape or be released.

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

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

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

If any discomfort remains, sight is impaired or vision misty, rush to a doctor or hospital.



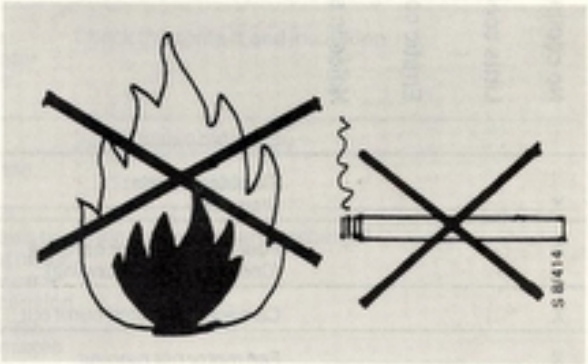
Warning

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

Warning

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

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



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

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

Fault tracing and fault-tracing list for the Cycling Clutch

Check the following before following the fault-diagnosis table:

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

How to use the fault diagnosis table

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

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

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

Fault-tracing block diagram for Cycling Clutch

The system cools inadequately or not at all

First:

- Check the belt tension.
- Check that the condenser is clean.
- Start the engine. Set the air distribution control at AC max.
- Check that air is evacuated from the panel vents.
- Check that the compressor switch turns on and off when the air distributor control is turned from AC max. to 0 and back. Up to and including 1980 models.
- Check that the compressor clutch engages and disengages when the switch is depressed (as from 1981 models).

Preparation:
– Set the idling speed at 1500 r.p.m.
– Open the right hand door(do not place the car in direct sunlight)

If there is no refrigerant in the system, the compressor will not start.

Check the sight glass for visible bubbles

Visible bubbles

Insufficient refrigerant.
– Check the system for leaks.
– Seal the leaks.
– Discharge the system, see page 854-38
– Charge the system, see page 854-38
– Start the unit and check that the system is sealed.

The system cools normally

No visible bubbles

The system is either full of refrigerant, over-full or empty.
Check that the compressor pipe on the high-pressure side is warm and the low-pressure pipe is cold.
If not, discharge the system and recharge it.

The system still cools insufficiently or not at all.

Connect the high- and low-pressure gauges (idling speed 1500 r.p.m.).

Low pressure on low-pressure side (< 14 psi, 1.0 kp/cm^2)

Continue at A, page 854-35

Normal pressure on low-pressure side (21-28 psi, 1.5-2.0 kp/cm^2

Check the pressure on the high-pressure side

Low pressure on the high-pressure sie (<142 psi, 10 kp/cm^2)

Discharge the system and remove the expansion valve. Check whether the valve filter is blocked. Clean and check if the valve is clear by blowing through it. If not, replace the expansion valve. If the expansion valve is correct, replace the receiver shell.

Normal pressure on the high-pressure side (149-220 psi, 10.5-15.5 kp/cm^2)

The air-conditioning system is correct. Check that the heating system water valve closes completely. If it does the system is not completely full of refrigerant. Add 7 ozs. (2 hg) R12 or discharge the system and completely recharge.

High pressure on low-pressure side (>36 psi, 2.5 kp/cm^2)

Continue at B, page 854-35

No

Check whether the exterior of the evaporator is covered with ice.

Yes

Check that the anti-frost thermostat capillary is correctly situated in the evaporator.

Capillary correctly positioned.

Replace anti-frost thermostat.

A, continuation from page 854-34

Check whether the flow of refrigerant is restricted.
1. Check whether the receiver shell is cold and frosty. If so, discharge the system and replace the receiver shell.
2. If not, check whether the expansion valve is blocked as follows: Discharge the system. Remove the expansion valve and check whether the valve filter is blocked. Clean and check if the valve is clear by blowing through it. If not, replace the expansion valve. If the expansion valve is correct replace the receiver shell.

B, continuation from page 854-34

Is the compressor switch working in on/off cycles?

Yes

Replace the anti-frost thermostat.

No

The compressor is continually connected

Disconnect the voltage supply to the compressor switch.

Compressor disconnected

Check the pressure on the high-pressure side. Idling speed 1500 r.p.m.

Low pressure on the high-pressure side (<142 psi, 10 kp/cm^2)

1. Check that the compressor's magnetic clutch rotates freely. If so, measure the voltage to the magnetic clutch (must not fall below 11 V). If voltage is correct, replace magnetic clutch.
2. If magnetic clutch is correct, replace compressor.

Compressor still connected

Faulty compressor switch.

High pressure on the high-pressure side (>242 psi, 17 kp/cm^2)

1. Check that the radiator fans are working.
2. Check that there is a good contact to the sensitive body of the expansion valve.
3. Check that the system is not over-full with refrigerant as follows: Position a thermometer in the middle panel vent.
   Idling speed 1500 r.p.m. Slowly release the refrigerant from the system and note the temperature at the air vent and the pressure on the high-pressure side.

The temperature at the air vent drops when the pressure on the high-pressure side drops.

Check the system for leaks. Seal the leaks, discharge the system and recharge.

The temperature at the air vent increases when the pressure on the high-pressure side drops.

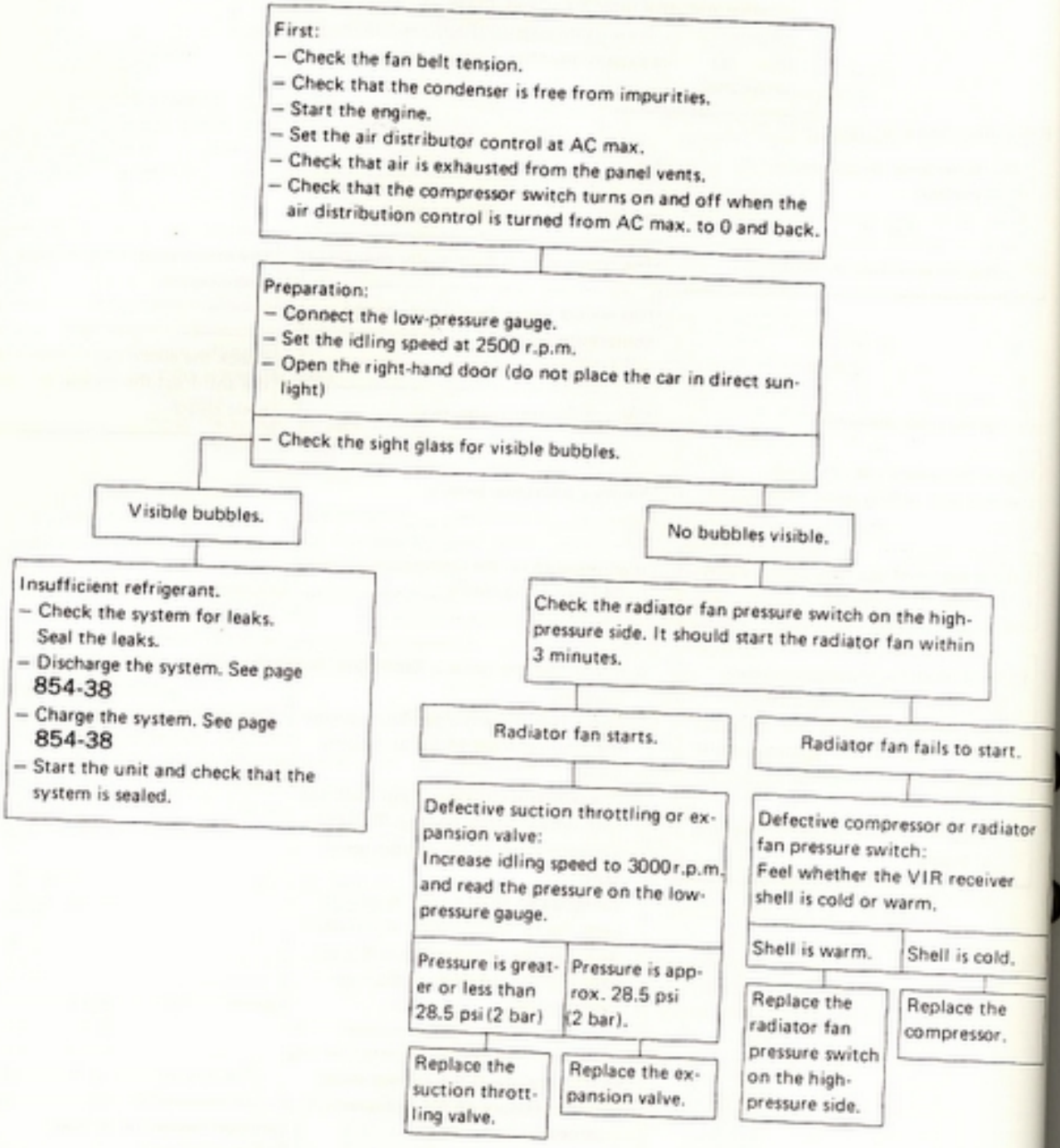
Defective expansion valve. Replace.

The compressor is continually disconnected.

Check the electric circuit through the anti-frost thermostat and magnetic clutch.

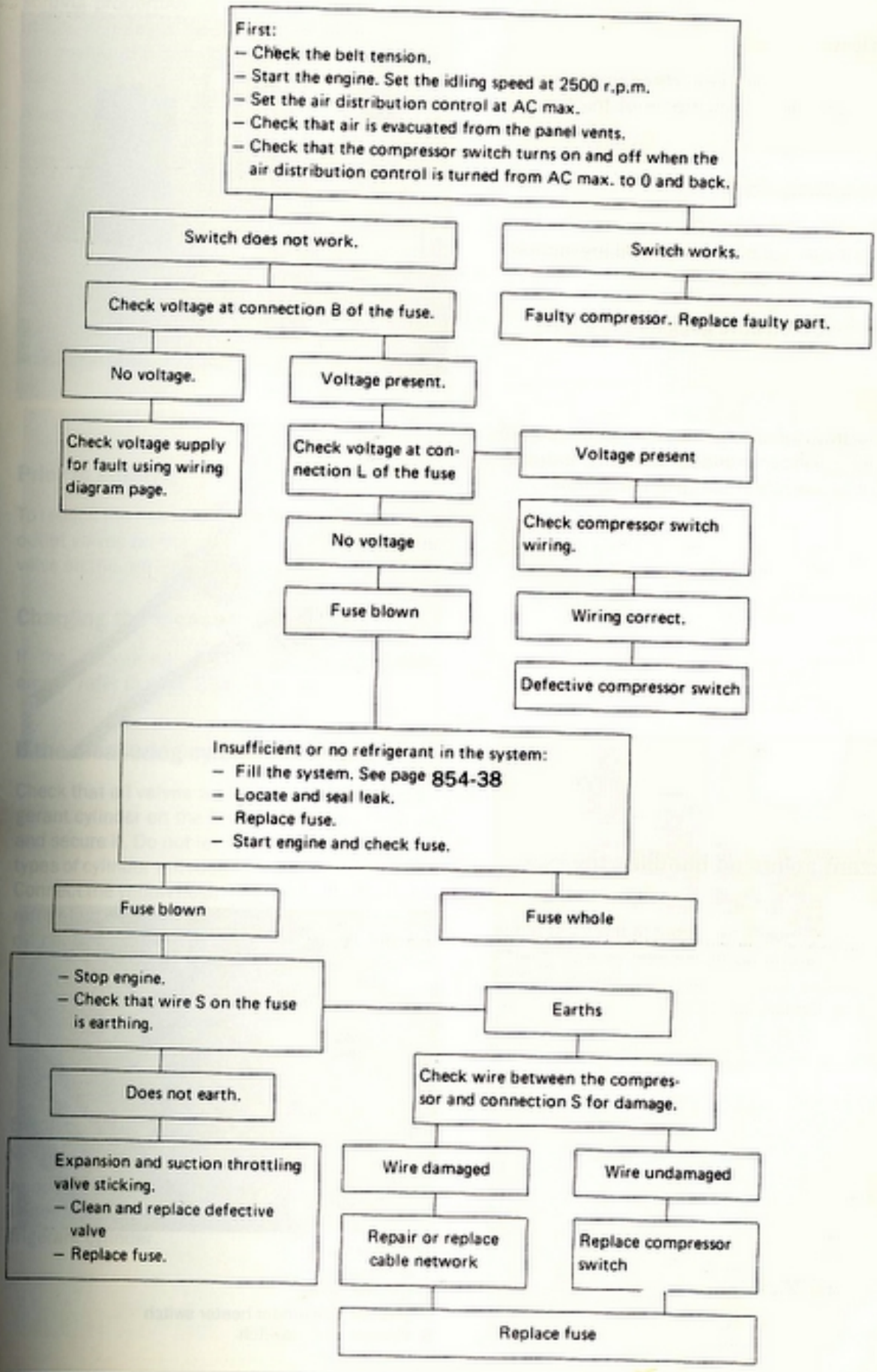
Fault diagnosis VIR system

Inadequate cooling



VIR system

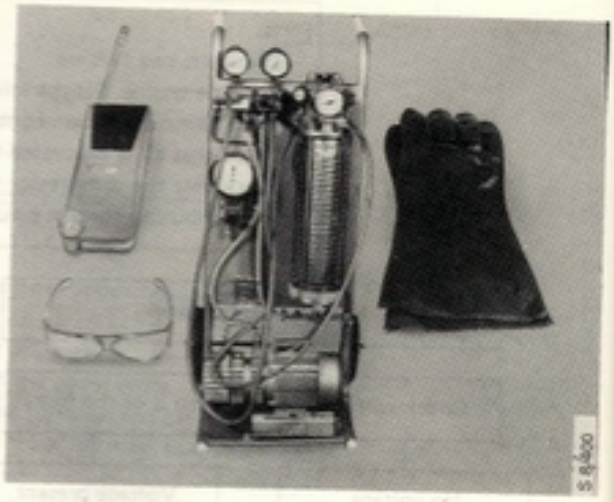
The system does not cool at all



Draining and charging the system (refrigerant)

Caution

Before work is started, disconnect the cable from the negative pole of the battery.



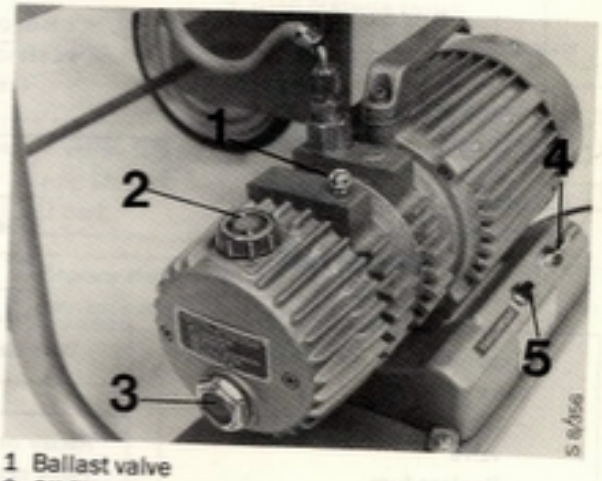
Equipment required

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

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

Important points on handling the equipment

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



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

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

Always keep vacuum pump oil in a sealed container.

Warning

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

Prior to storage

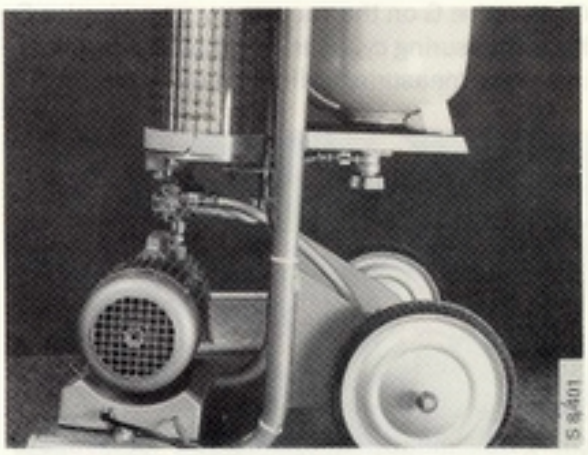
To reduce the risk of leakage, close the input and outlet valves on the measuring cylinder and the valve on the refrigerant cylinder.

Charging the measuring cylinder

If the measuring cylinder is not completely empty, refer to page 854-41.

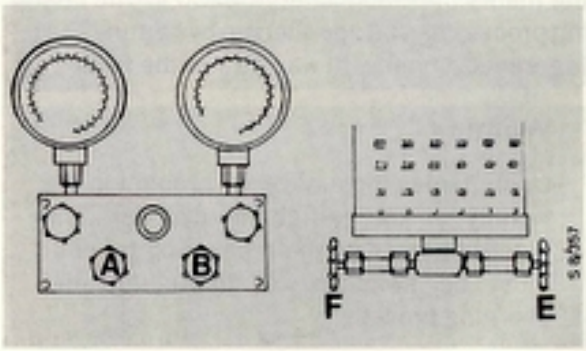
If the measuring cylinder is empty:

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



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

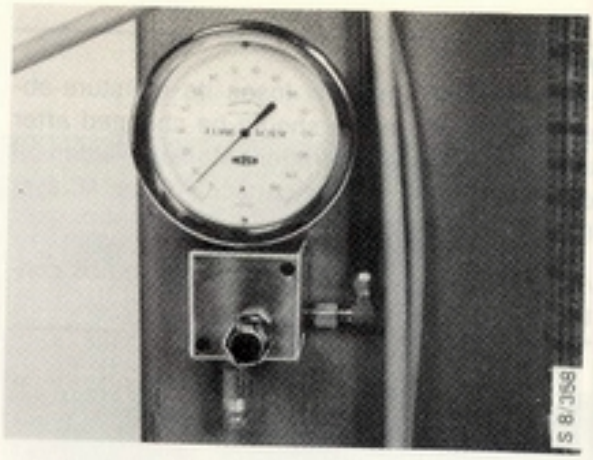
A vacuum will now be raised in the measuring cylinder and the hose as far as the valve on the refrigerant cylinder.



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

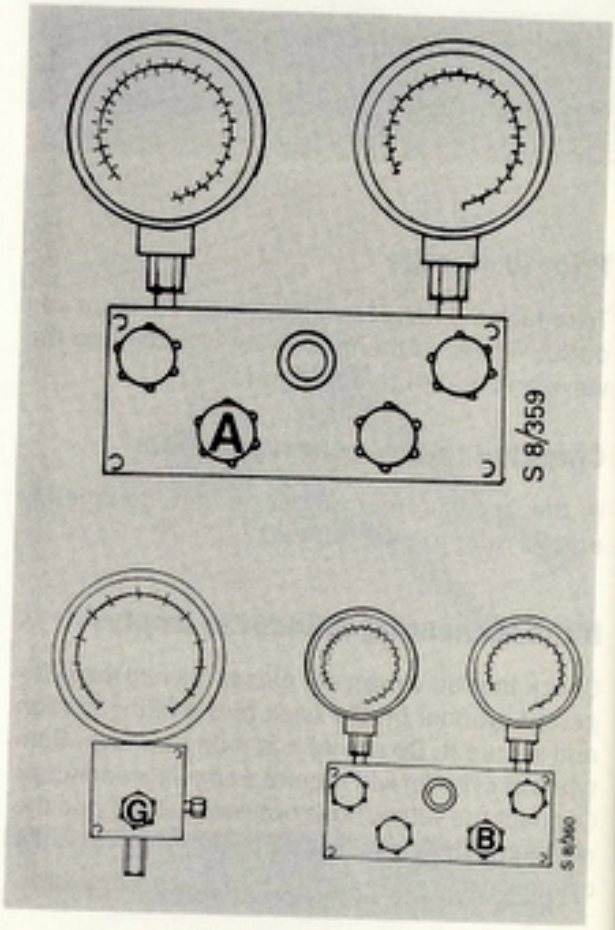
Check the vacuum by slowly opening valve G.

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



To check that the measuring cylinder is tightly sealed

Close valve A (to isolate the circuit from the vacuum pump). The reading on the vacuum gauge should not rise.

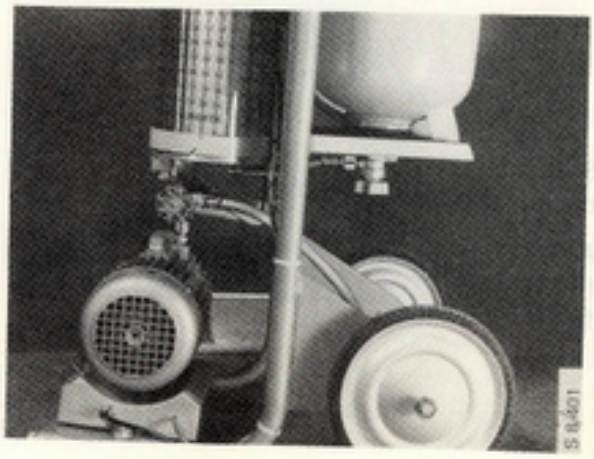


Close valve G on the vacuum pump and valve B. If the measuring cylinder is tightly sealed, charging of the measuring cylinder may be started.

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

Warning

Open flames must never be brought in the vicinity of the refrigerant cylinder. The electric heater on the measuring cylinder must be switched off throughout the charging process.



If the measuring cylinder is not completely empty

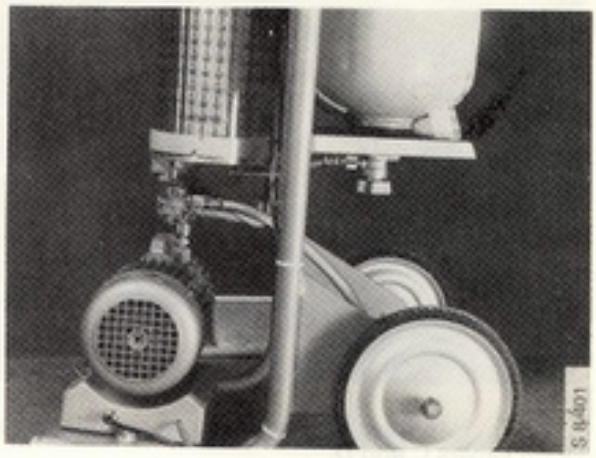
Check that all the valves are closed and that the refrigerant cylinder is connected to the measuring cylinder.

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

The charging process can be speeded up by heating the refrigerant cylinder with warm air or the like.

Warning

Open flames must never be brought in the vicinity of the refrigerant cylinder. The electric heater on the measuring cylinder must be switched off throughout the charging process.



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

Close all valves after charging.

When changing the refrigerant cylinder:

Purge the air from the hose between the refrigerant cylinder and the measuring cylinder.

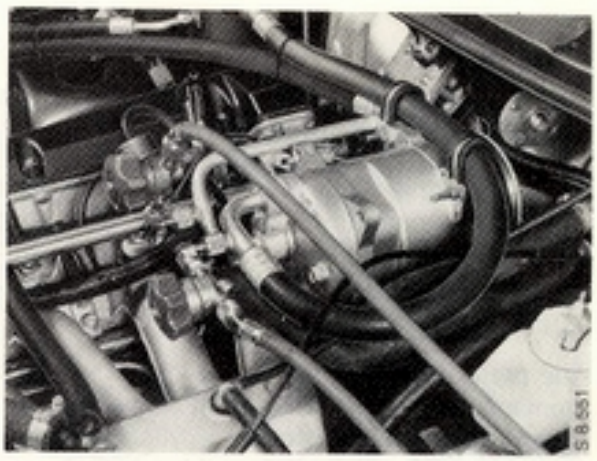
Draining the refrigerant

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

Connectors must only be screwed finger tight. Disconnect the negative (-) lead from the battery.

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

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

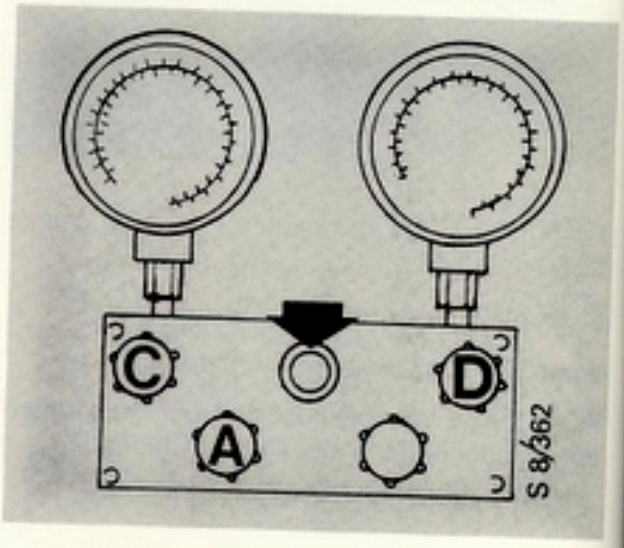


Connections for draining the system

Disconnect the yellow hose from the vacuum pump and insert it in the end of an exhaust extraction hose. Open the valves on the compressor.

Open valves C and D.

Slowly open Valve A and carefully release the gas. Check that no liquid is visible in the sight glass on the gauge set.



Note
If the refrigerant is allowed to discharge too quickly, refrigerant oil may be lost.

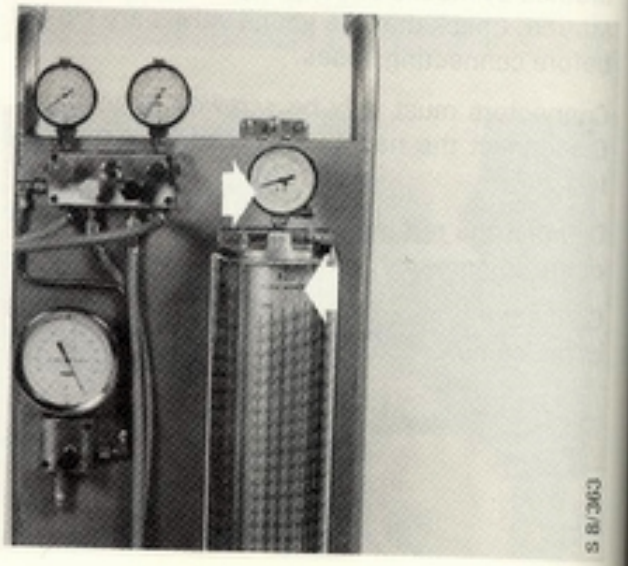
When the reading on the gauges shows '0' bar and the system is empty: close all valves. Reconnect the hose to the vacuum pump.

Charging the refrigerant

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

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

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



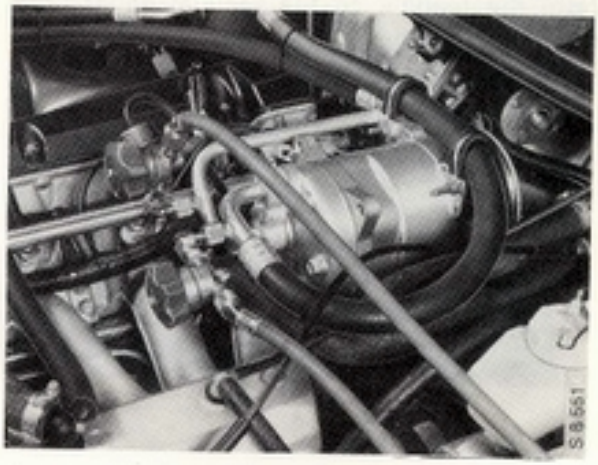
Connections for charging

The connectors must only be screwed on finger tight. Disconnect the negative (-) lead from the battery.

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

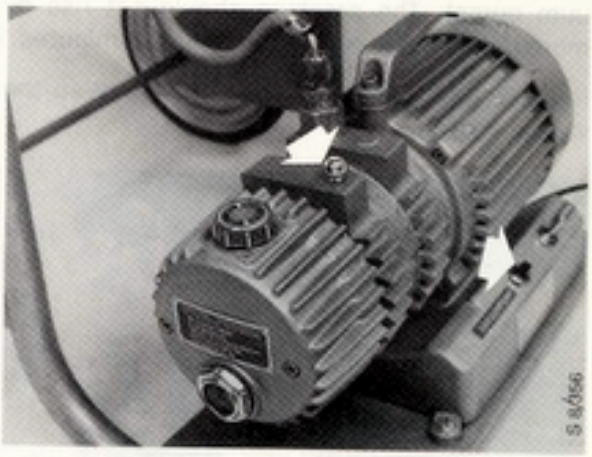
Connect the **blue hose to the low-pressure side** of the compressor, marked Suc.

Open the valves on the compressor.



Connections for charging the system

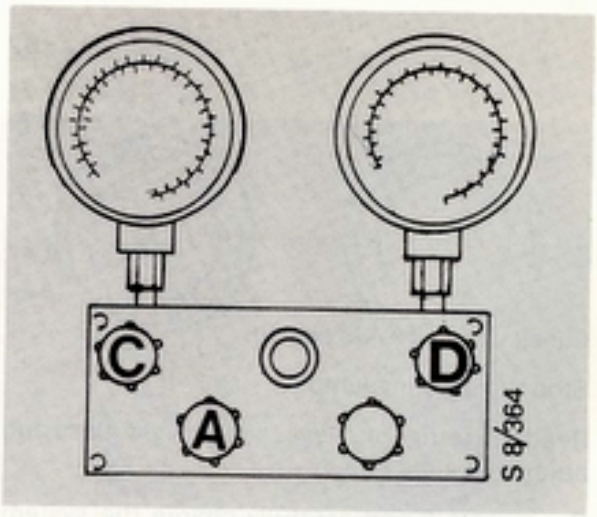
Start the vacuum pump and open the ballast valve.



Check that the valves of the filling station are closed.
Open valves, C, D and A, B.

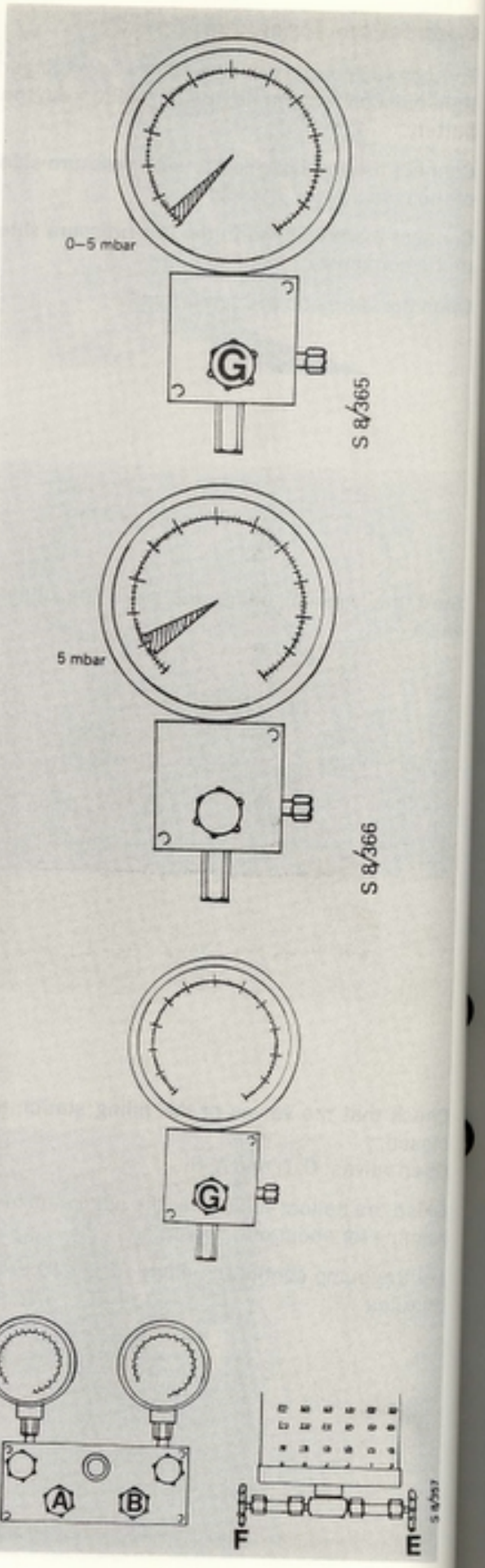
Close the ballast valve after the pump has been running for about one minute.

Let the pump continue running for a further ten minutes.



Check the vacuum by opening valve G.

Note the reading on the vacuum gauge. The reading should be below 5 mbar.



To check that the system is tightly sealed

Close valve A (isolating the circuit from the vacuum pump). The pressure should not rise by more than 5 mbar over a period of five minutes.

Remedy any leaks. Run the pump to raise the vacuum again.

To test for leaks in the system

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

Check that valve A is closed.

Stop the vacuum pump.

Read the refrigerant level on the sight glass and adjust the sight glass.

Open valve F and carefully charge the system with 200 grammes of refrigerant.

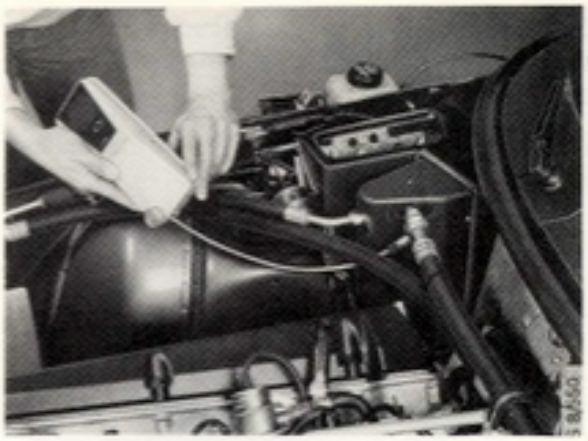
Shut valve F.

Connect the cable to the negative pole of the battery and start the engine.

Use a leak detector to check all connections.

The detection of a leak will be indicated by a steady bleeping changing to a rapid, higher-frequency bleeping.

Remedy any leaks.



Final charging of the system

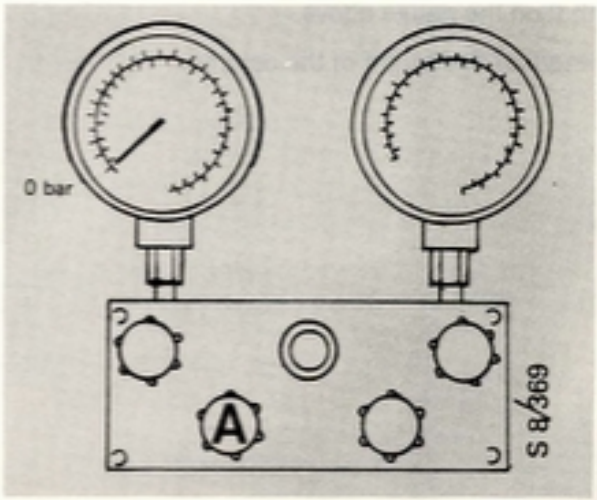
Before finally charging the system, all refrigerant in the system must be drained and a vacuum must be raised in the system by the vacuum pump.

Proceed as follows:

Disconnect the hose from the vacuum pump and insert the end in an exhaust extraction hose.

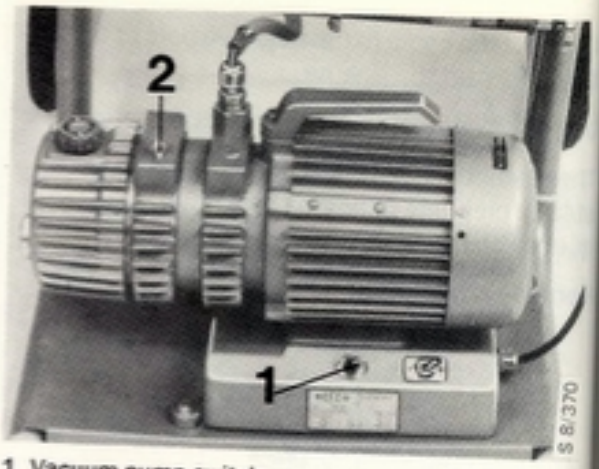
Open valve A carefully to release a slow flow of refrigerant (to prevent refrigeration oil being discharged with the refrigerant).

When the reading on the gauge has fallen to '0' bar, close the valve.



Connect the hose to the vacuum pump and switch on the heating element for the measuring cylinder.

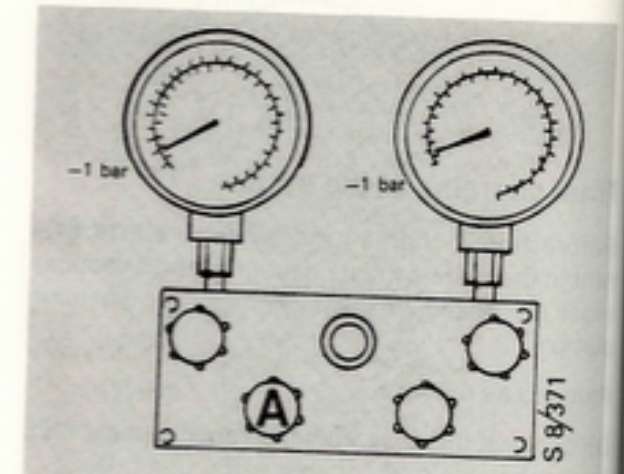
Start the vacuum pump and open the ballast valve.



1 Vacuum pump switch
2 Ballast valve

Open valve A. Close the ballast valve after about one minute.

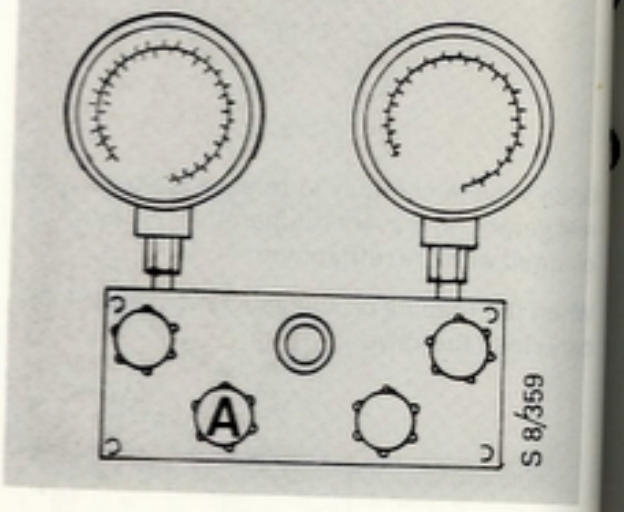
Let the vacuum pump continue to run for about twenty minutes after the reading on the gauge has reached -1 bar.



Close valve A. Check that valve G is closed.

Switch off the vacuum pump. Rotate the scale on the measuring cylinder to the same reading as that on the gauge above.

Read off the height of the column.



Open valve F and admit refrigerant carefully into the system.

Fill the system with the quantity of refrigerant in accordance with the specification.

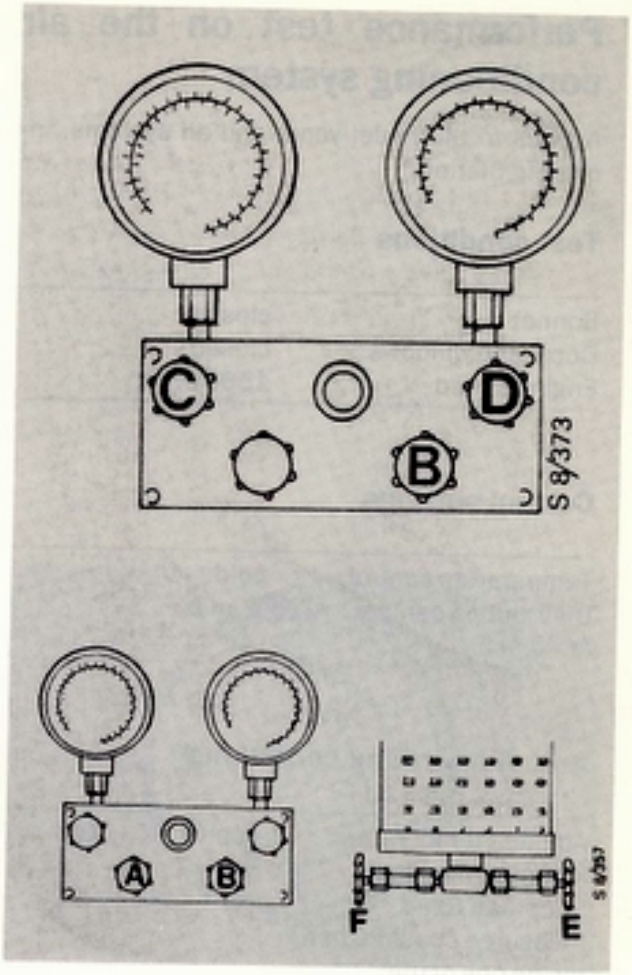
Close valves F, B, C and D.

Switch off the heating of the measuring cylinder.

Shut off the valves at the compressor in the car.

Check that all valves on the filling station are closed. Disconnect the hoses from the compressor and fit protective caps.

Carry out a performance test as described on the next page.



Performance test on the air conditioning system

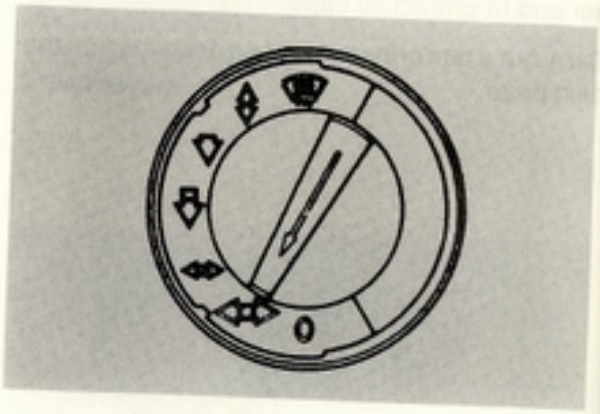
Applies to all model years and all systems, including Clarion

Test conditions

Bonnet	closed
Doors and windows	closed
Engine speed	1500 r/min

Control settings

Temperature control	cold
Distribution damper	max
AC switch	"on"



Actual operating conditions

Ambient temperature	approx. 15 - 30°C
Measurement time	5 min
Supply air temp. measured about 20 mm inside one of the outer facia outlets	10°C max.

If the specified temperature is not achieved

Check that no engine coolant leaks when the temperature control valve is closed. If the temperature in the outer facia outlets is appreciably higher than in the centre outlet, this indicates that engine coolant is leaking through the temperature control valve when the valve is closed. (The air discharged through the centre outlet does not flow through the heat exchanger.)

If the temperature control valve is not faulty, see under the heading "Fault tracing".

Pressures in the AC system, as from the 1984 models

The following pressures should be regarded as guidelines and indicate whether or not the system operates at normal values. Note that the test conditions are not the same as during the performance test.

Test conditions

Bonnet	half-open
Front doors	open
Engine speed	1500 r/min

Control settings

Temperature control	Closed
Distribution control	Max
AC switch	Closed
Facia outlets	Fully open
Recirculation damper	Check that the damper is fully closed

The AC system must be filled with the correct quantity of refrigerant.

Recorded operating conditions - Saab 900 as from the 1984 models

Ambient air temp. measured at the front of the bumper, °C	Pressure measured on the suction side of the compressor (marked "SUC"), bar		Pressure measured on the discharge side of the compressor (marked "DIS"), bar	
	Comp. on	Comp. off	Comp. on	Comp. off
20	2.6	1.3	9.0	16.5
25	2.6	1.3	9.5	17.0
30	Comp. runs continuously	Working press. 1.4	Comp. runs continuously	Working press. 17.8
35	Comp.runs continuously	Working press. 1.6	Comp. runs continuously	Working press. 19.5
40	Comp. runs continuously	Working press. 1.8	Comp. runs continuously	Working press. 20.7
	Tolerance: ± 0.2 bar		Tolerance: ± 1 bar	

Checking the high and low-pressure switches

(N.B. Both switches operate on the high-pressure side.)

The high-pressure switch (actuation range 290-350 lb/in² (21-25 kg/cm²), which is connected in series with the magnetic clutch on the compressor, makes the circuit when non-pressurized. If the pressure in the high-pressure side reaches 350 lb/in² (25 kg/cm²), the switch breaks the circuit to the magnetic clutch. The circuit is made again as soon as the pressure has dropped by 42-82 lb/in² (3-6 kg/cm²).

To test the functioning of the switch, run the engine at idling speed, set the AC system to maximum cooling and isolate the radiator fan temporarily. (Make sure the engine does not overheat.)

The cooling fan switch regulates the radiator fan - an essential function if the system is to achieve effective cooling. The switch is connected in parallel with the conventional thermostatic switch in the cooling system and breaks the circuit when non-pressurized.

The operating range for the switch is between 11 and 16 kgf/cm². When the pressure on the high-pressure side enters this range, the conventional radiator fan cuts in. Once the pressure has dropped by about 70 lb/in² (5 kg/cm²) the fan cuts out again, unless, of course, the engine is running hot and the fan would normally be running, actuated by the thermostatic switch. To test the functioning of the switch, run the engine at idling speed and set the AC system to maximum cooling.
(When fitted, isolate the auxiliary fan.)

Changing the VIR assembly and evaporator

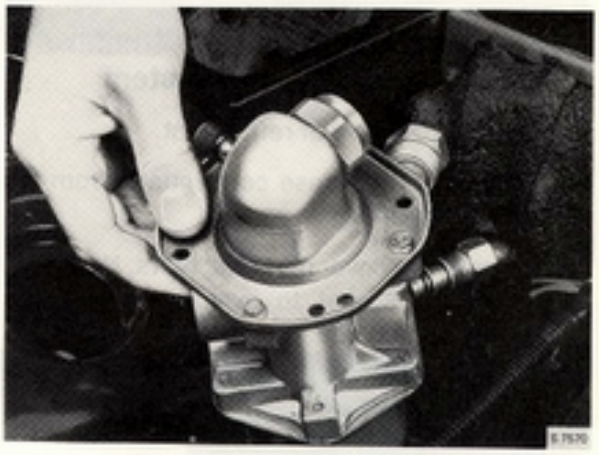
Discharge the refrigerant from the system (refer to the section on charging and discharging of the system). Disconnect the refrigerant lines from the VIR assembly.
Undo the four bolts holding the evaporator in position and remove it. Undo the three pipe joints between the VIR assembly and the evaporator.

Refit in the reverse order. See the "Technical specification" for the tightening torques. Top up with refrigeration oil. (See the section on refrigeration oil.) Lubricate all pipe couplings with refrigeration oil. Charge the system with refrigerant. (See the section on discharging and charging.)

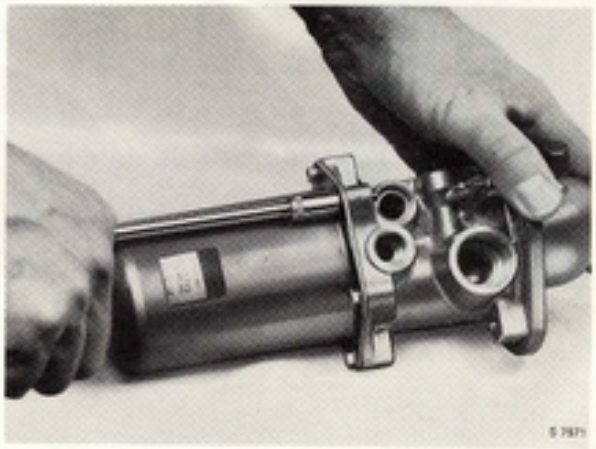
Note
To prevent the unnecessary intrusion of moisture into the system components, blank off all openings and do not re-open until they are to be connected.

Changing the desiccant bag and cleaning the filter - VIR unit

- Drain the system of refrigerant.
- Disconnect all the hose connections to the VIR unit (use two spanners).
- Slacken off the receiver clamp and lift out the VIR unit.



- Remove the receiver shell from the valve unit.



- Clean the filter, receiver shell and refit a new desiccant bag. Dry off with R 12 to avoid moisture.

- Fit new O-rings. Add 0.2 dl of refrigeration oil (can be poured directly into the hose between the compressor and the VIR assembly before this is connected). Lubricate all pipe couplings with refrigeration oil.

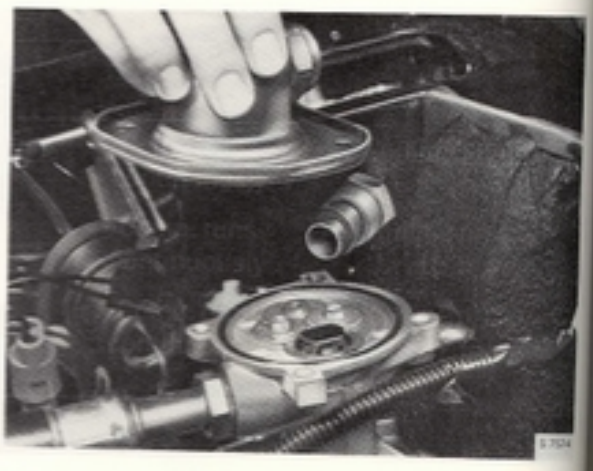
  For tightening torques, see the "Technical specification".

Changing the suction throttling valve and expansion valve - VIR system

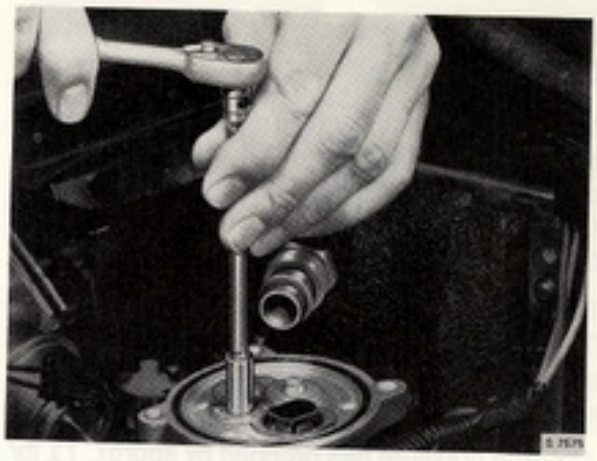
1 Drain the system of refrigerant.

2 Disconnect the hose connections from the VIR unit's cover.

3 Remove the cover retaining bolts. Note. Use an 8 mm socket to avoid damaging the heads of the bolts. Remove the cover.



4 Remove the two bolts holding the suction throttling valve and the expansion valve in position.



5 Lift the valves. A pair of pliers can be used to aid removal.

6 When refitting, fit new O-rings throughout and lubricate the couplings with refrigeration oil.

For particulars of tightening torques, see the "Technical specifications".

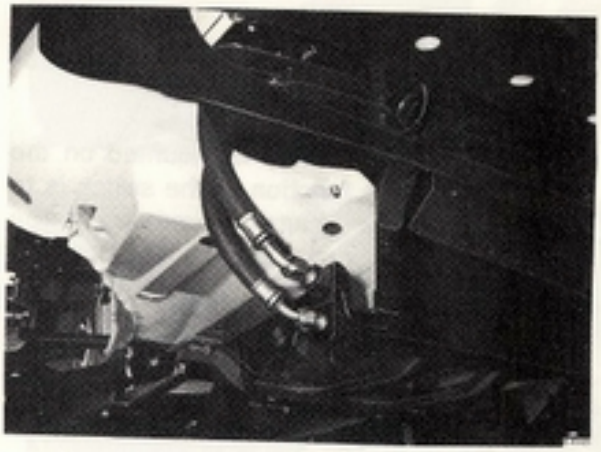
To change the condenser

1 Discharge the refrigerant from the system (see the section on discharging and charging). Disconnect the refrigerant hoses from the compressor and the dryer receiver (VIR assembly).

2 Release the bottom row of spoiler screws.

3 Remove the condenser retaining bolts - two at the top and two at the bottom. Tilt away the spoiler and pull the condenser down so that the refrigerant hoses can be disconnected.

Refit in the reverse order. For particulars of tightening torques, see the "Technical specifications". Top up with refrigeration oil. Lubricate all pipe couplings with refrigeration oil. Charge the system with refrigerant.



Checking the pressure switch operation Cycling clutch system (Delco, Sankyo)

The pressure switch serves primarily as a control device for the radiator fan which is vital for the cooling of the system. When not under pressure the switch is open and connected in parallel with the ordinary cooling system thermocontact.

The pressure switch range is 157-228 lb/in² (11-16 kg/cm²). When the pressure level on the high-pressure side falls within this range the standard radiator fan cuts in.

After the pressure has dropped by approx. 71 lb/in² (5 kg/cm²) the radiator fan will cut out, provided that the engine coolant temperature is not so high that the fan has been energized by the thermocontact.
The pressure switch operation can be checked by running the engine at idling speed and the system at maximum effect which should result in the auxiliary fan cutting out.

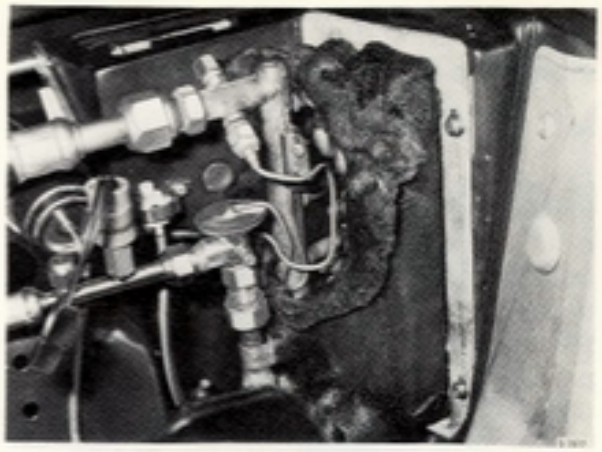
To check the performance of the pressure switch (Clarion)

A pressure-sensing switch is mounted on the dryer receiver. The function of the switch is to protect the compressor against overheating. The switch is wired in series with the power supply to the compressor clutch. If the gas pressure is below 2.1 kgf/cm², which may occur if the system contains insufficient refrigerant or if the ambient temperature is below +0.5°C, the switch will open the circuit to the magnetic clutch.

Replacing the expansion valve Cycling clutch system, as from the 1980 models

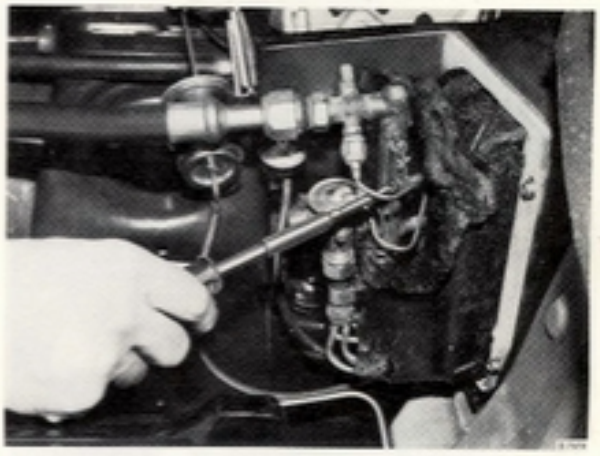
1 Discharge the refrigerant from the system. Release the high-pressure pipe connection at the expansion valve.

2 Fold away the black insulating material. As from the 1984 model, remove the protective cover.

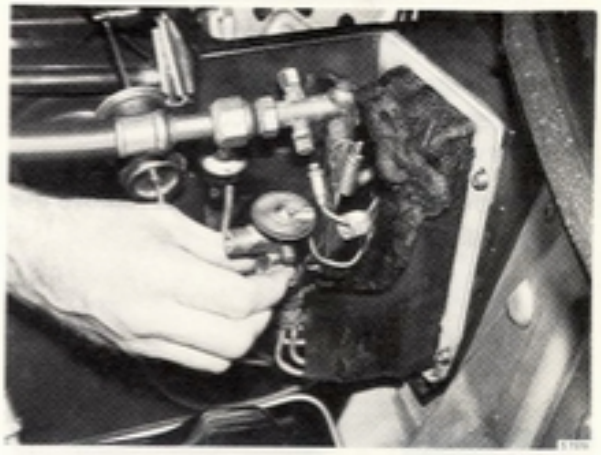


3 Remove the compensating hose from the outlet hose.

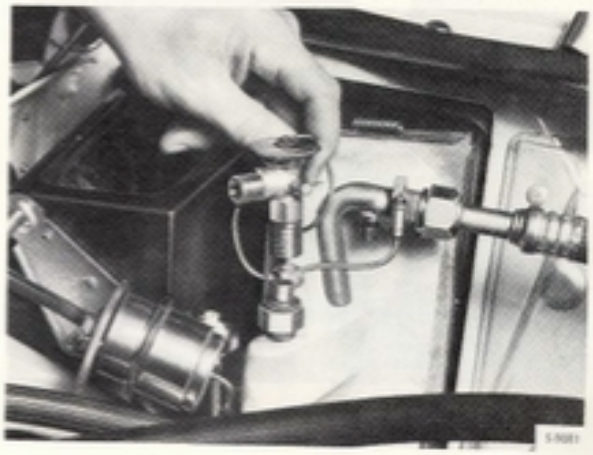
4 Remove the two self-tapping screws holding the expansion valve capillary tube mounting and bend it out of the way.



5 Remove the inlet hose from the expansion valve.



Refit in the reverse order. Lubricate the couplings with refrigeration oil.
For particulars of the tightening torques, see the "Technical specification".
Always use a restraining tool when releasing and tightening the couplings. Charge the system with refrigerant.



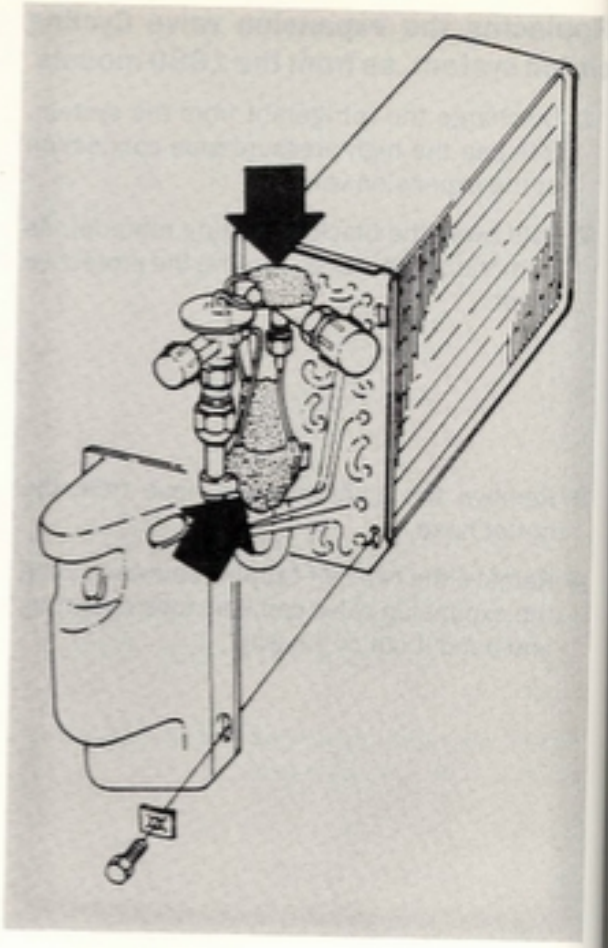
Expansion valve as from the 1981 models

Compensating pipe between the expansion valve and evaporator

Applies to the Borletti evaporator

As from the 1985 model, the compensating pipe has been provided with the type of insulating material used on cars without protective cover. In addition, a piece of insulating material has been fitted to the temperature sensor coil above the evaporator outlet pipe. This has been done to prevent the pipes from coming into contact with one another, thus giving rise to noise.

To identify the evaporator, se page 854-60.

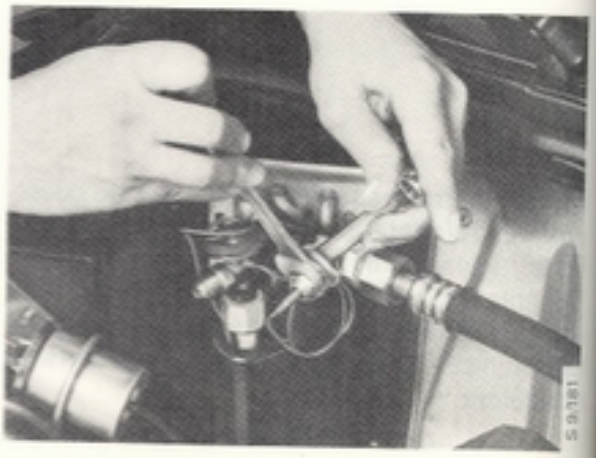


To change the Clarion expansion valve

1 Discharge the refrigerant from the system. Release the hose connection at the expansion valve.

2 Remove the two upper bolts and remove the top half of the cover.

3 Disconnect the capillary tube from the outlet pipe.

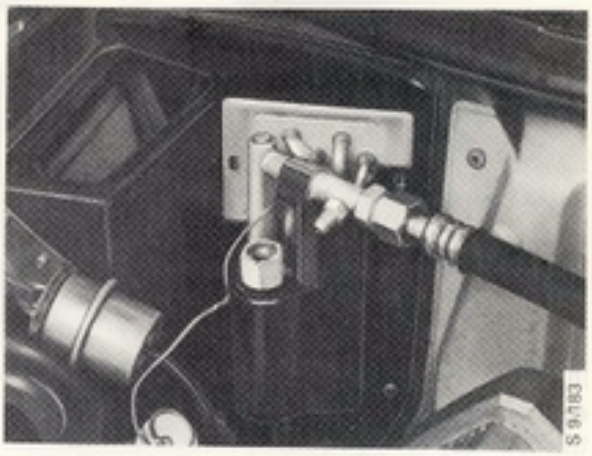


4 Disconnect the expansion valve from the evaporator.

5 Fold back the insulation felt and free the capillary tube from the clip.

Refit in the reverse order. Lubricate the couplings with refrigeration oil.
For particulars of tightening torques, see the "Technical specifications".

Always use a restraining tool when releasing and tightening the couplings. Charge the system with refrigerant.



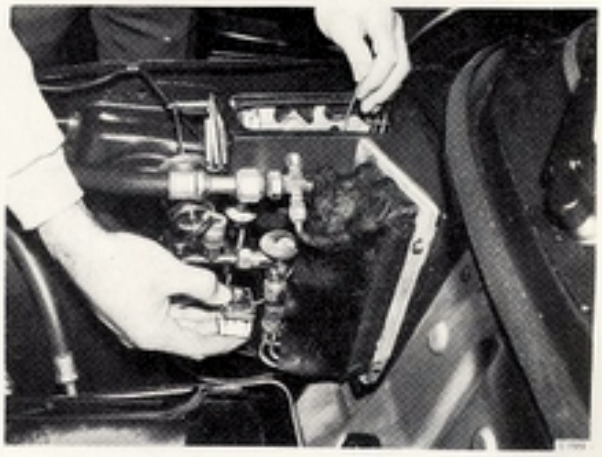
Replacing the anti-frost thermostat Cycling clutch system, 1980 models

1 Disconnect the wires from the thermostat.

2 Remove the thermostat mounting.

3 Extract the rubber grommet for the capillary tube from the air intake box.

4 Remove the capillary tube from the evaporator fins.



To refit, reverse the removal procedure. Note the position of the capillary tube in the evaporator.

Run of capillary tube on the 1980 models

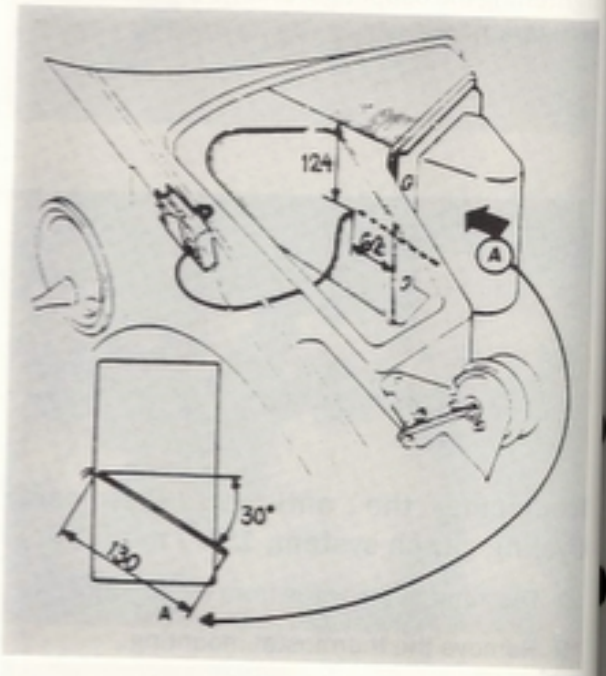
In the event of frosting problems on the evaporator, try to solve the problem by locating the capillary tube as described below.

Carefully withdraw the capillary tube and fit it as shown in the drawing.

Wrap a piece of tape 130 mm from the end of the capillary tube, so that the correct length will be inserted into the evaporator.

Check that the capillary tube is clear of the recirculation damper.

If the new location does not solve the frosting problem, fit a new anti-frosting thermostat.



To change the anti-frosting ther-mostat, as from the 1981 models

1 Remove the large rubber grommet in the right-hand side of the bulkhead.

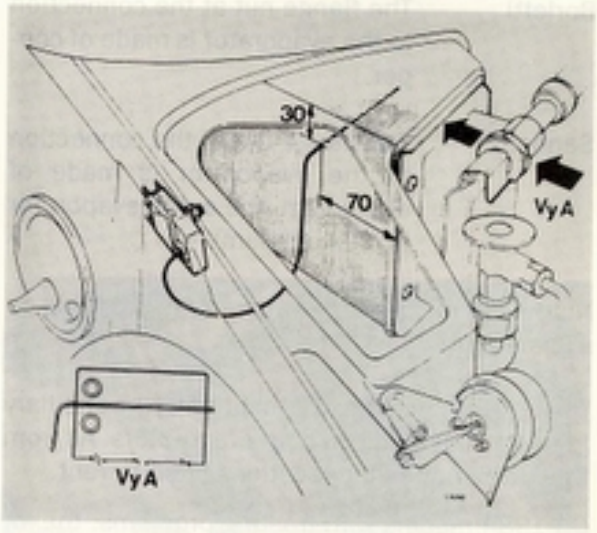
2 Withdraw the capillary tube from the cooling fins of the evaporator.

3 Remove the thermostat retaining nut inside the air intake box.

4 Remove the thermostat through the hole in the right-hand side of the bulkhead and disconnect the cables.

Refit in the reverse order.

Note the location of the capillary tube in the evaporator.



Location of the capillary tube, 1981 - 83 models

Location of the capillary tube, 1981 - 83 models

In the event of frosting problems on the evaporator, try to solve the problem by locating the capillary tube as described below.

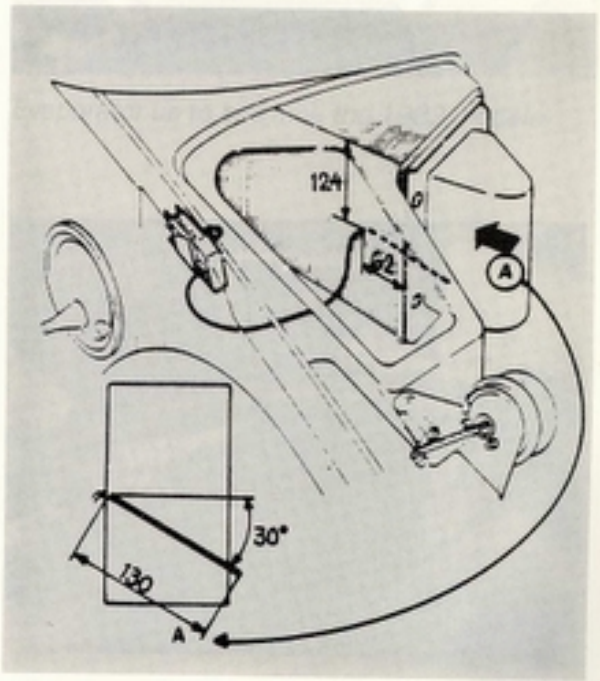
Carefully withdraw the capillary tube and fit it as shown in the drawing.

Wrap a piece of tape 130 mm from the end of the capillary tube, so that the correct length will be inserted into the evaporator.

Check that the capillary tube is clear of the recirculation damper.

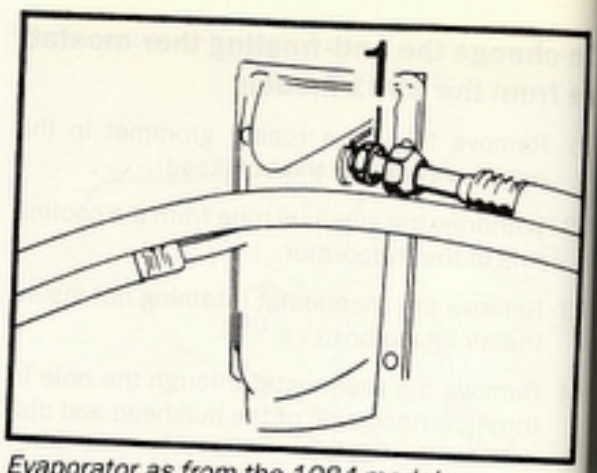
If the new location does not solve the frosting problem, fit a new anti-frosting thermostat.

Note: This location cannot be used on certain 1981 model cars, in which the end wall of the evaporator is covered with integral foam. The location recommended earlier should be used on these cars (see the Service Manual). In the event of frosting problems, fit a new anti-frosting thermostat.



Capillary tube location as from the 1984 models

To reduce the risk of frosting in the evaporator, the location of the capillary tube has been altered on the 1985 models. In addition, during the latter part of 1984, an evaporator from a new manufacturer (Sanden) has been installed in parallel with the Borletti evaporator.



Evaporator as from the 1984 models
Copper = Borletti
Aluminium = Sanden

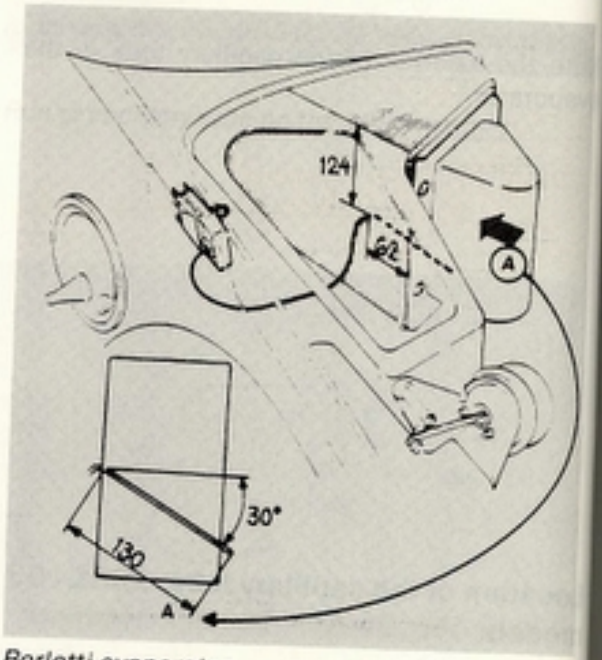
To identify the evaporator as from the 1984 models

Borletti	The flange nut at the connection to the evaporator is made of copper.
Sanden	The flange nut at the connection to the evaporator is made of aluminium (the entire evaporator is of aluminium).

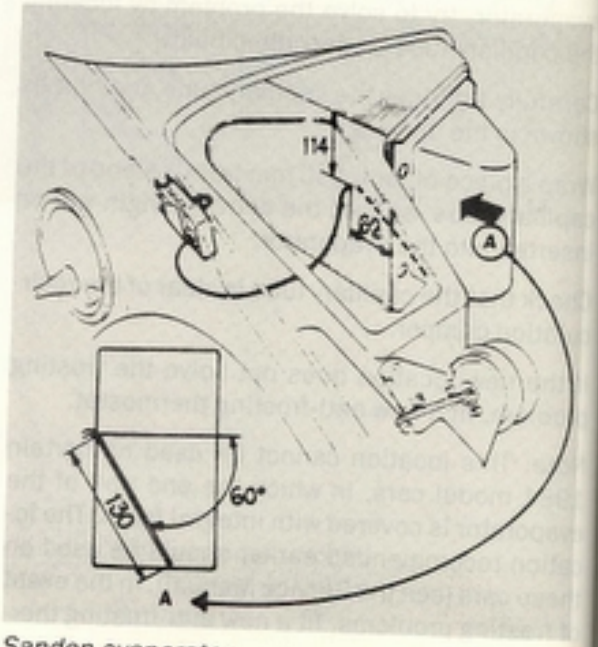
Note: Only the Borletti evaporator is available as a spare part.

On the 1984 models, the location of the capillary tube was the same on both evaporators. As from the 1985 model, the locations are different.

On 1984 models with frosting problems, the location of the capillary tube may be altered to the same location as on the 1985 model, as shown in the figure.

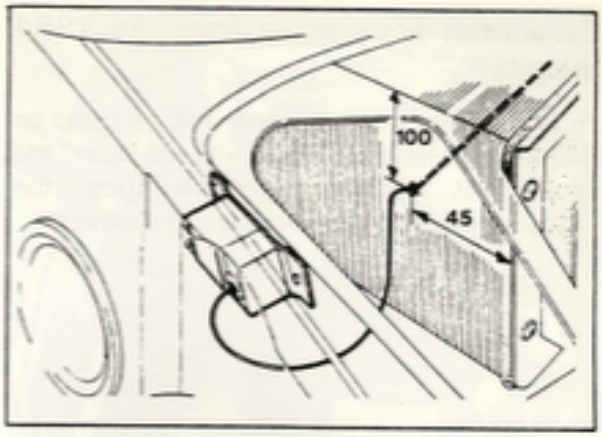


Borletti evaporator



Sanden evaporator

Capillary tube location, Clarion, as from the 1984 models



To change the evaporator
Cycling Clutch system as from the 1981 models

1 Remove the servo pump.

2 Discharge the refrigerant from the system (see the section on discharging and charging).

3 Disconnect the refrigerant hose from the outlet branch of the evaporator and the expansion valve. Use restraining tools.

4 Remove the four bolts retaining the evaporator and withdraw the evaporator.

Refit in the reverse order.

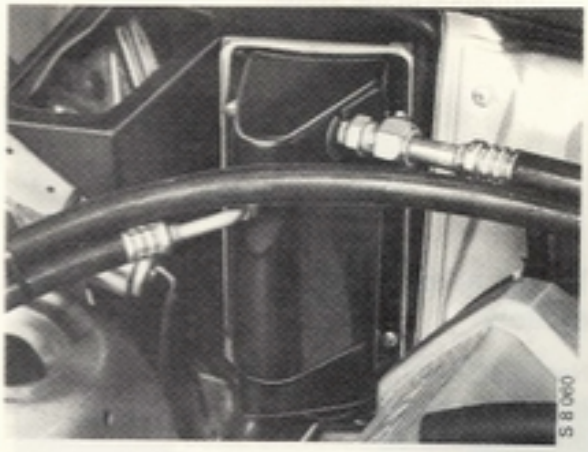
For particulars of the tightening torques, see the "Technical specifications".

Top up with refrigeration oil and lubricate the pipe couplings with refrigeration oil.

Top up the system with the refrigerant (see the section on discharging and charging).

Note
After opening the system, always plug the connections to exclude moisture. Don't remove the plugs until just before the connections are made.

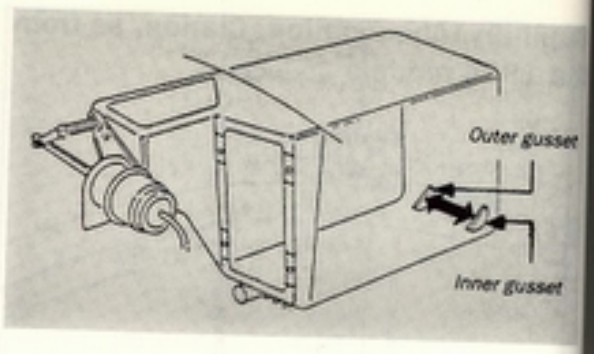
Evaporator up to and incl. the 1983 models



Evaporator as from the 1984 models

Evaporator housing as from the 1984 models

To ensure that the evaporator can be fitted so that leakage of drain water will not occur, the inner fillet has been removed from the evaporator housing as from the 1984 models.



To change the refrigerant hoses

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

1 Disconnect the negative (-) battery lead.

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

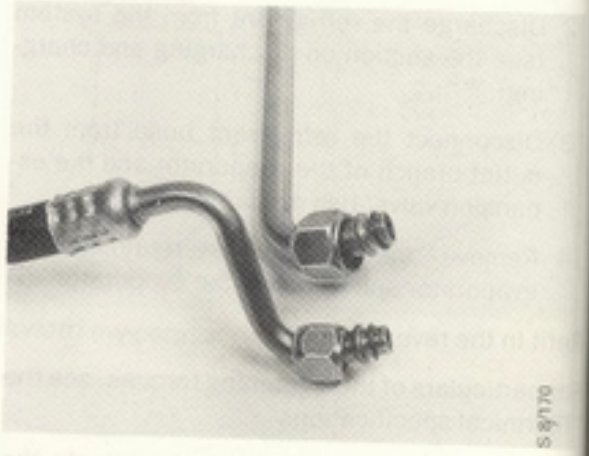
3 Change the defective hose.

4 Recharge, as necessary, with new refrigeration oil. Fit new 'O' rings that have been lubricated with new refrigeration oil.

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

5 Charge the system with refrigerant, in accordance with the instructions given elsewhere in this section.

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



To change the compressor, 1979-80 models

Note 1979 and 1980 model compressors are not interchangeable. But replacement of the compressor is carried out in the same manner.

1 Discharge the refrigerant from the system (see the section on discharging and charging). Relieve the load on the engine mounting by jacking up the power unit under the gearbox.

2 Disconnect the refrigerant hoses from the compressor pipes.

3 Remove the heat shield and compressor stay.

4 Remove the compressor pipes from the compressor (one socket-head cap screw).

5 Remove the drive belt.

6 Remove the engine mounting bolt.

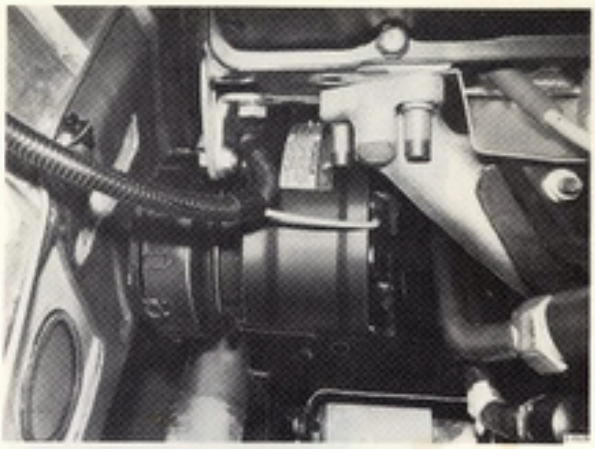
7 Remove the three engine mounting retaining bolts (the centre bolt need only be backed off). Jack up the engine as far as it will go.

8 Lift out the compressor with the engine mounting. Refit in the reverse order. Lubricate the pipes and connections with refrigeration oil.

For particulars of the tightening torques, see the "Technical specifications".

Topping up with oil need only be carried out if a new compressor has been fitted.

If the same compressor is fitted, top up only with the amount of oil necessary to replace any oil that has run out.

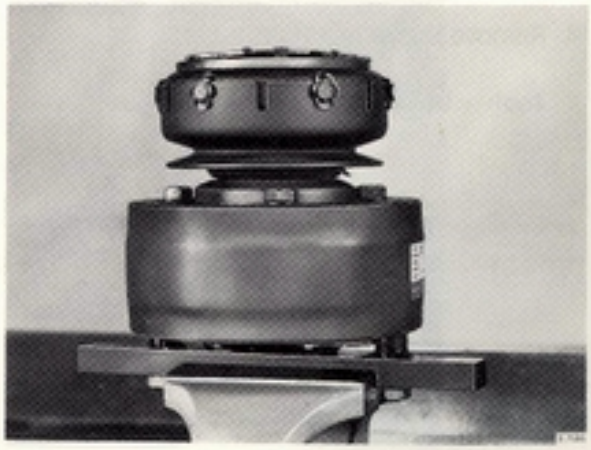


Heat shield and support stay removed

Replacing the magnetic clutch, 1979, 1980 models

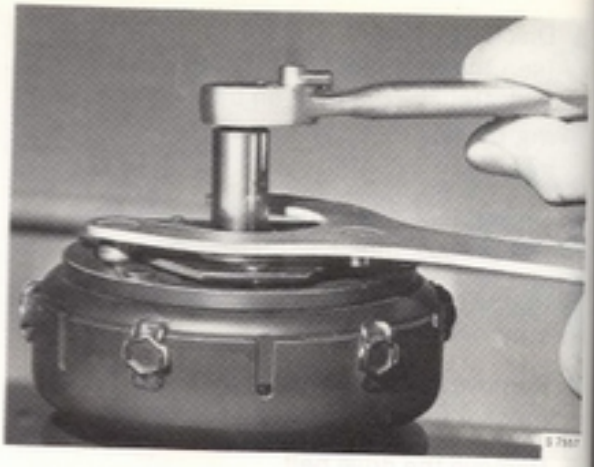
(Compressor removed)

1 Fit the compressor to holder 83 92 233 and mount in a vice.



2 Remove the retaining nut from the compressor shaft.

Tool: Sleeve 83 93 241
Hook wrench 83 93 266



3 Remove the compressor clutch retainer.

Tool: Puller 83 93 258
Hook wrench 83 93 266

4 Remove the rotor circlip.

Tool: Universal circlip pliers

5 Remove the rotor.

Tool: Puller 83 93 274
Guide 83 93 282

Installation

1 Position the rotor in the compressor so that the clutches electrical terminals are uppermost when the compressor is installed.

Note
The three guides on the rotor which should be fitted into the aperture in the compressor body.

2 Use drift 83 93 290 and a hammer to drive home the rotor until it sits flush against the compressor body.

3 Fit the circlip.

4 Fit the key and press the retainer onto the shaft as far as it will go. (Caution. Do not use a hammer to drive on the retainer as this can damage the compressor.)

5 Use tool 83 93 308 and bearing 83 93 316 to press the retainer onto the shaft.

Adjust the retainer so that the clearance between the retainer clutch ring and the rotor is 0.5 - 1 mm.

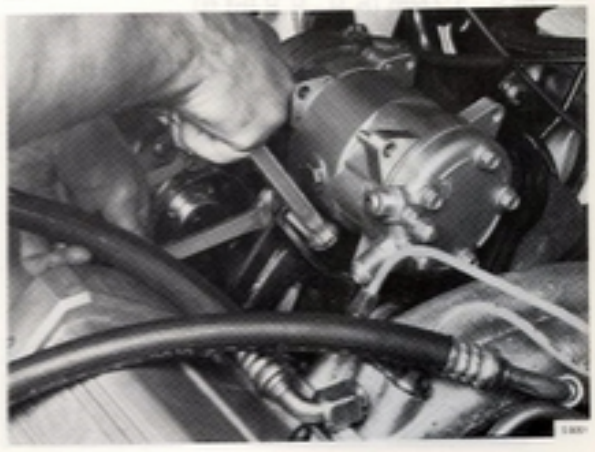
6 Fit the shaft nut and tighten it to a torque of 15 Nm (11.0 lbf ft). (The clutch clearance can be adjusted without removing the shaft nut.)

Compressor, as from the 1981 models

(Also Clarion)

1 Drain the system of refrigerant (see "Discharging and Charging the system").

2 Loosen the adjusting link and remove the V-belt.



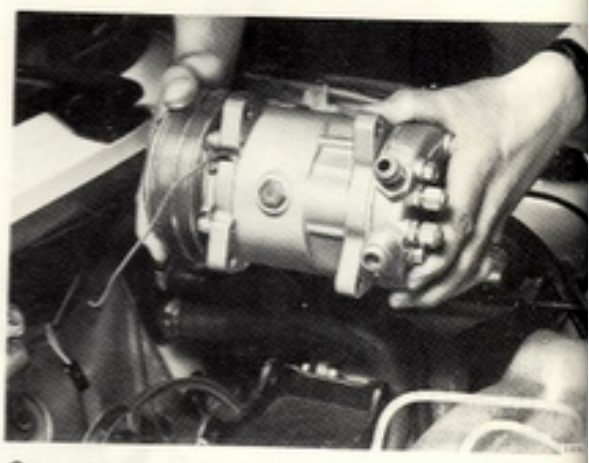
3 Remove the high-pressure and low-pressure hoses from the compressor.
(Blank off the connections)

4 Up to and including 1983 models:
Disconnect the cables from the pressure switch.

5 Remove the four bolts retaining the compressor and lift out the compressor.

Refit in the reverse order.

Lubricate the pipe connections with refrigeration oil. For particulars of tightening torques, see the "Technical specifications".



Compressor up to the 1983 models

Filling with refrigeration oil

1 Drain the compressor oil into a suitable vessel. Measure the volume of oil drained.
If a new compressor is to be fitted, drain the oil from the compressor.

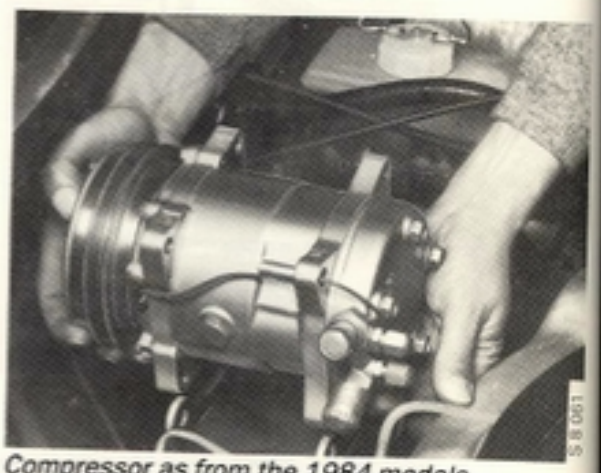
Sankyo compressor:

2 Add 0.3 dl of oil to the measured volume of oil. Pour this quantity of oil into the repaired compressor or the new compressor.

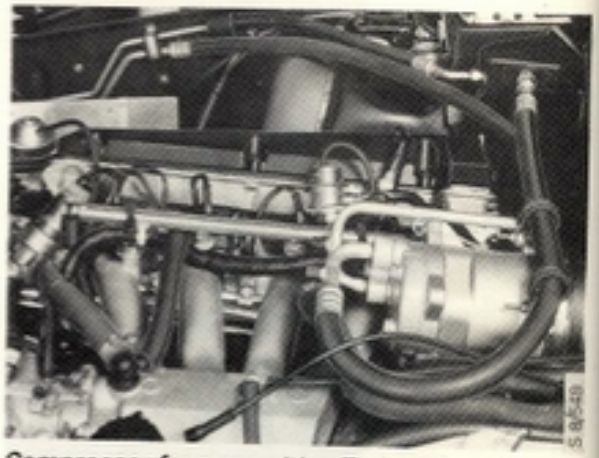
Clarion compressor:
Fill the compressor with the same quantity of oil as that drained out.

Check that the O-ring of the oil plug is undamaged.

Lubricate the O-ring with refrigeration oil and fit the oil drain plug. Tighten to a torque of 8 - 12 Nm (5.9 - 8.8 lbf ft).



Compressor as from the 1984 models



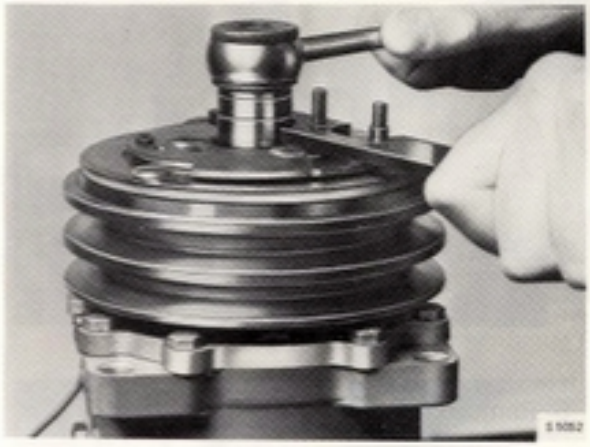
Compressor for a car with a Turbo 16 engine and all cars as from the 1986 models (not single-carburettor for ME).

To replace the magnetic clutch, 1981 models
(Compressor removed)

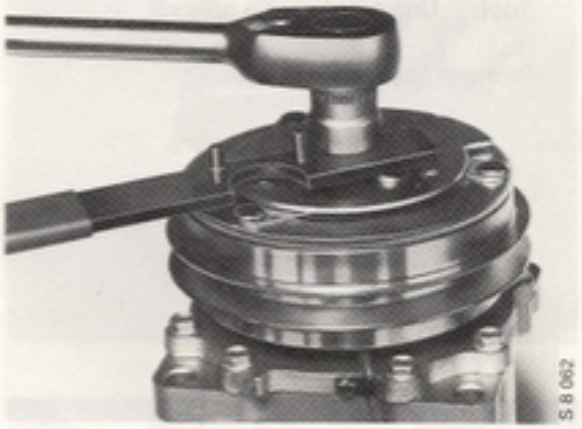
1 Mount the compressor in a vice.

2 Remove the retaining nut from the compressor shaft.

Tool: 3/4 in socket (19 mm)
Special tool 83 93 373

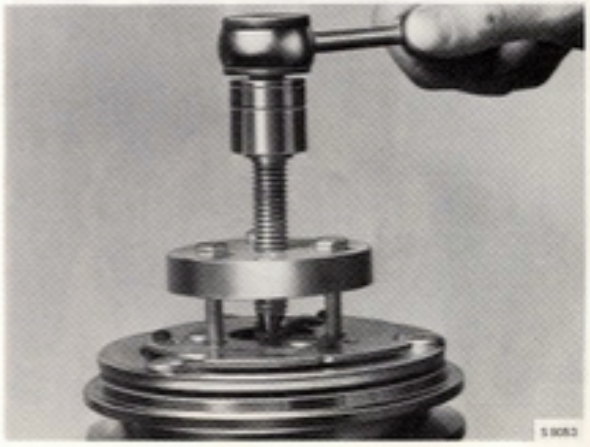


As from 1984 models, the compressor is equipped with a single-groove pulley.

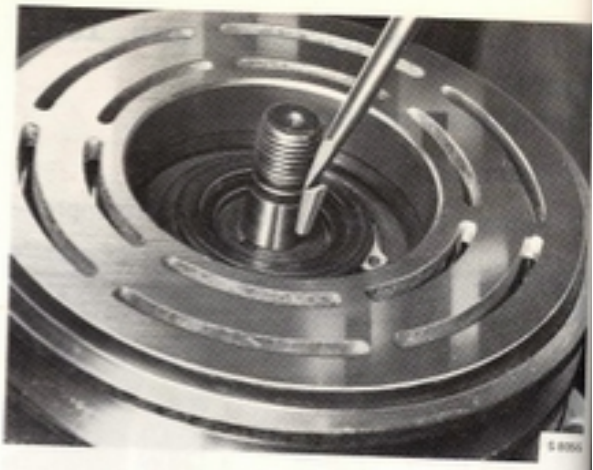


3 Remove the compressor clutch retainer.

Tool: 3/4 in socket (19 mm)
Pulley 83 93 381



4 Remove the key from the shaft.

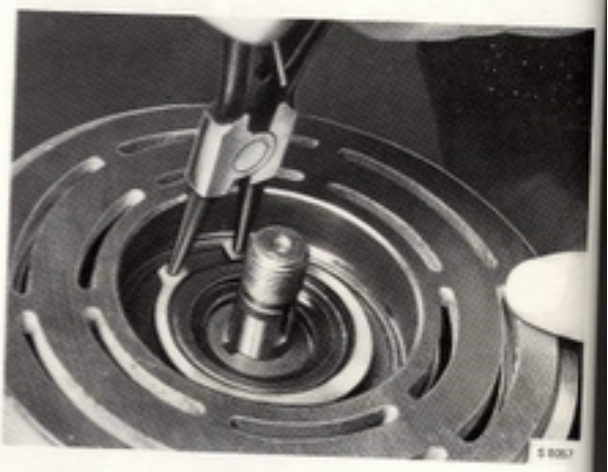


5 Remove the bearing circlip.

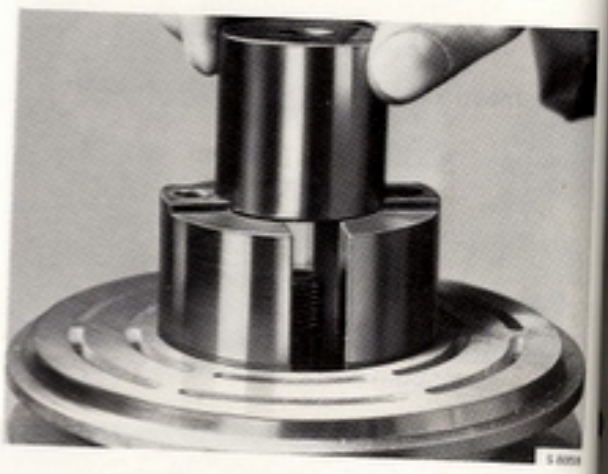
Tool: Universal circlip pliers.

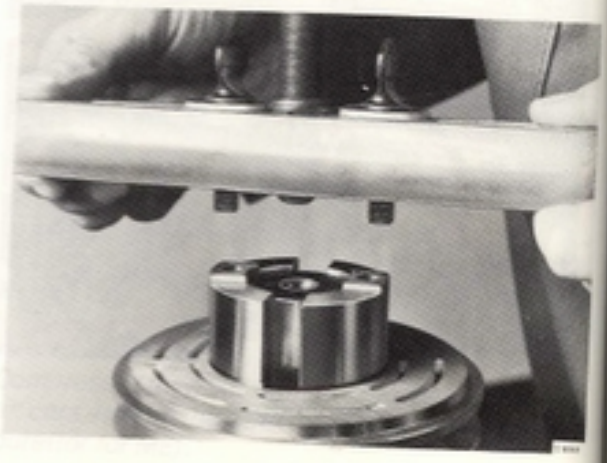
Remove the rotor circlip.

Tool: Universal circlip pliers.



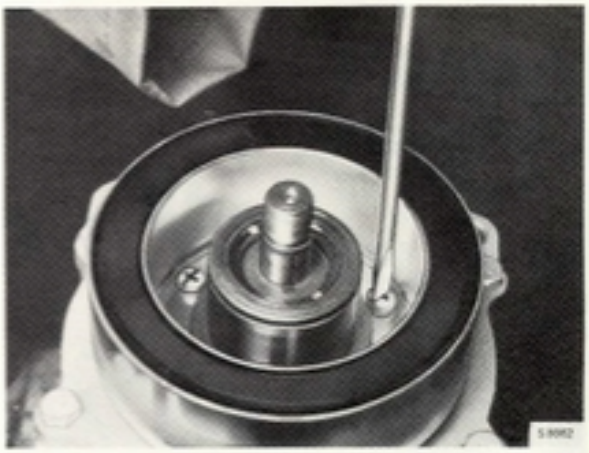
6 Place pulley 83 93 399 in position.



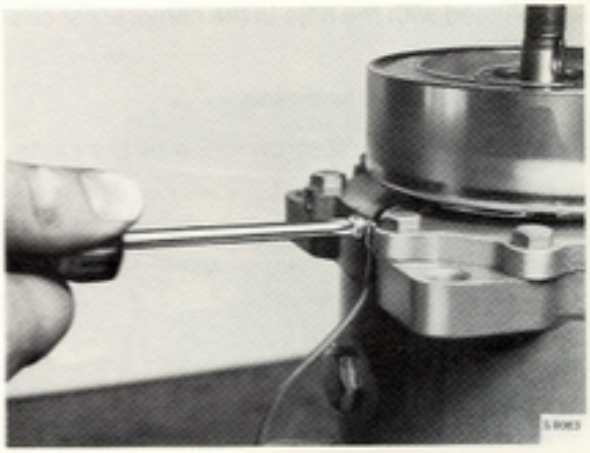


7 Remove the rotor.

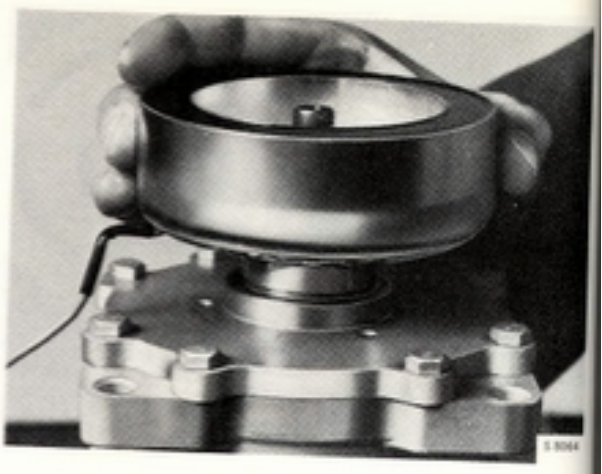
8 Remove the screws holding the coil onto the compressor.



9 Remove the screw and clip retaining the cable.

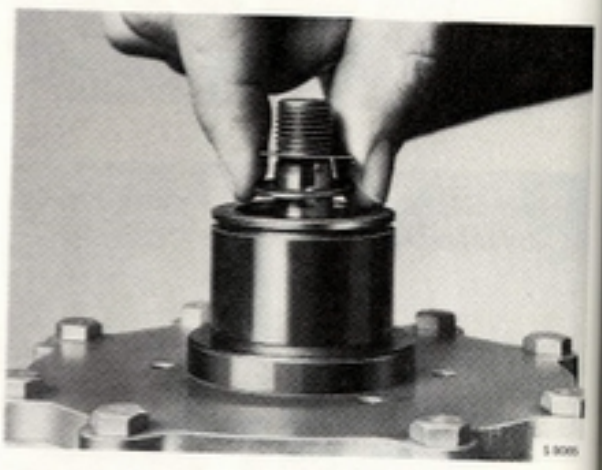


10 Remove the coil.



To refit

1 Shims for adjusting clutch clearance. Refit the same number of shims as were removed.

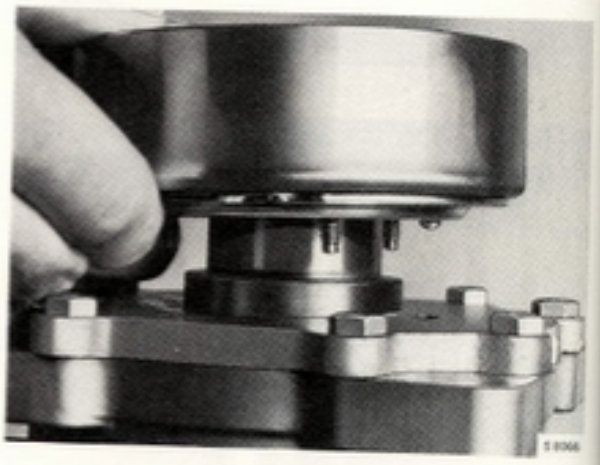


2 Fit the coil.

Note: Make sure that the dowel in the coil is aligned with the hole in the compressor casing.

Tighten the three screws.

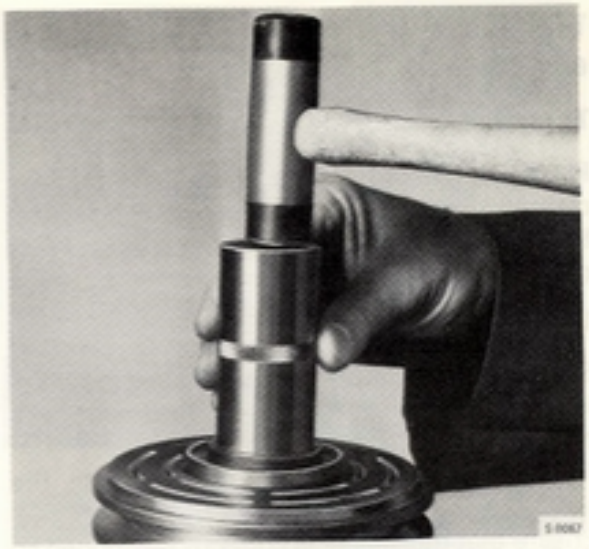
3 Refit the clip and screw retaining the cable.



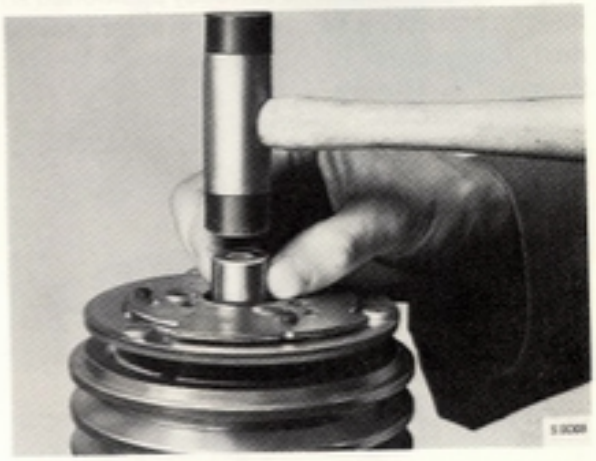
4 Position the rotor in the compressor. Position the driver and spacer 83 93 407 (set) in the rotor.

Ensure that the spacer is correctly positioned so that the pressure is exerted on the inner bearing race.
Use a hammer to drive home the rotor until it sits flush against the compressor.

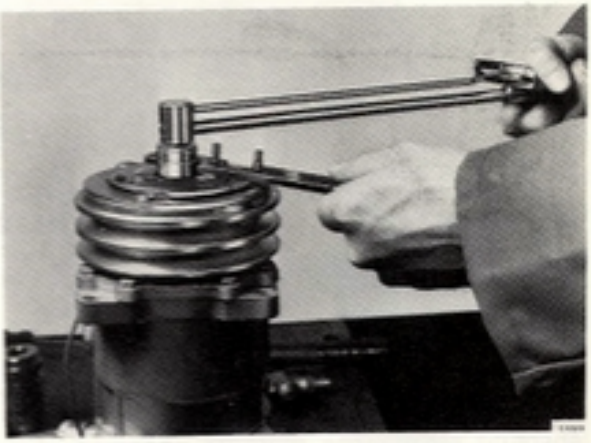
5 Fit the circlip for the bearing and the circlip for the rotor. Fit the key.



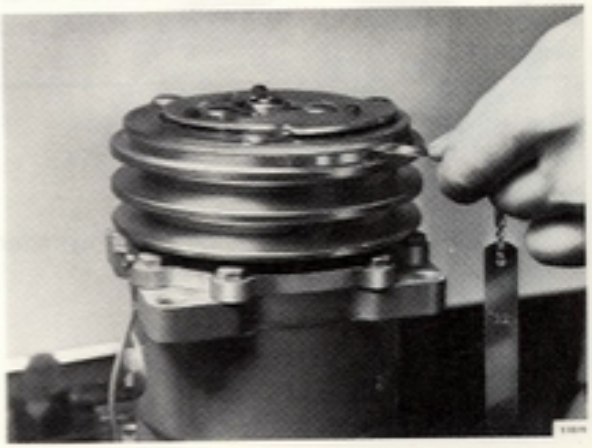
6 Place the compressor clutch retainer on the shaft.
Place adaptor 83 93 415 in position.
Use a hammer to drive home the retainer so that it sits flush against the shoulder (shims) of the shaft.



7 Refit the retaining nut and tighten to a torque of 25-30 lbf ft (34-42 Nm; 3.4 - 4.2 kgm).



Check the clearance between the retainer and the rotor. The clearance should be 0.16 - 0.31 in (0.40 - 0.80 mm).
If the clearance is not correct, remove the retainer and alter the number of shims.



To change the rotor bearing (Sankyo compressor)

To remove

Place the rotor on a sleeve. The inner diameter = clearance for the outer bearing race. Place driver 8393407 in position without the spacer. Press out the bearings.

To refit

Stand the rotor on its hub. Centralize the bearings. The bearings should be positioned with their sealing sides away from each other.
Place driver 8393407 in position with the spacer.
Ensure that the spacer is correctly positioned so that the pressure is exerted on the outer bearing race.
Press in the bearings.

To remove and refit the cylinder head and valve housing

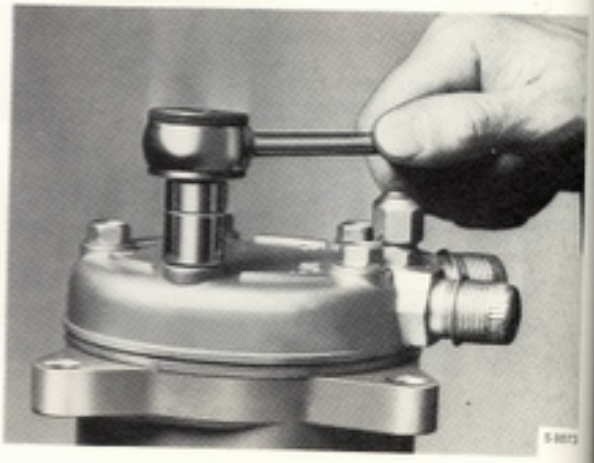
To remove

Note
Absolute cleanliness must be observed when working on the cylinder head, valve housing and service valve.

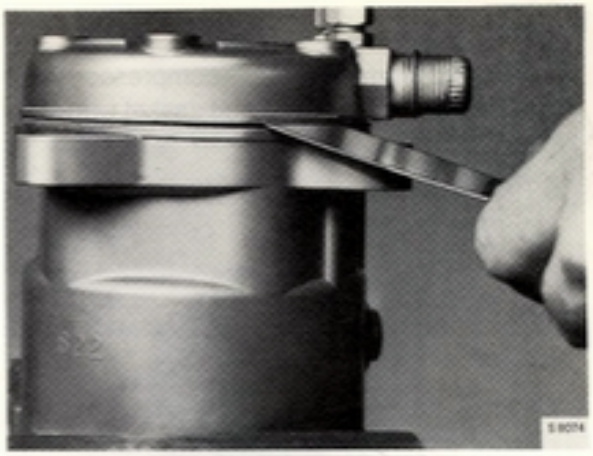
1 Mount the compressor in a vice.

Remove the 5 bolts holding the cylinder head onto the compressor.

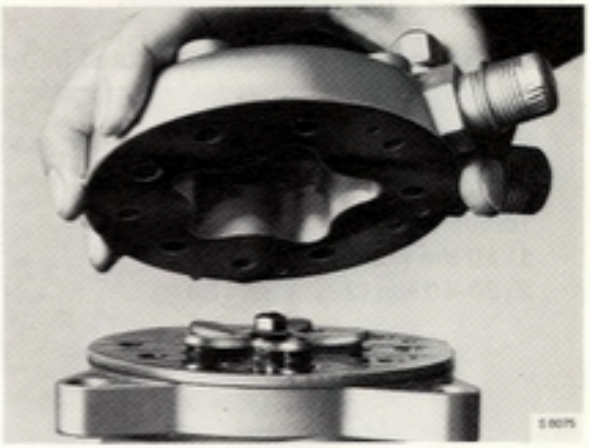
Tool: 1/2 in socket (13 mm)



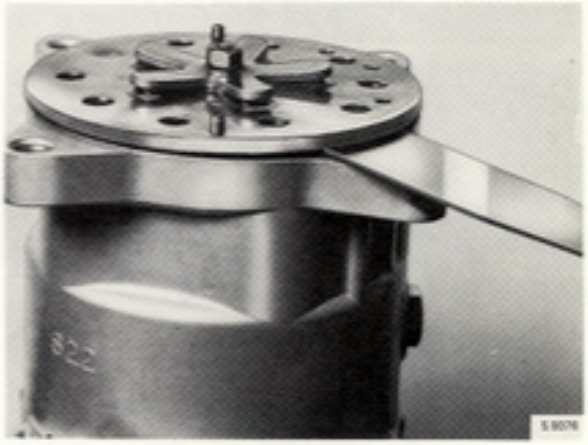
2 Carefully detach the cylinder head from the valve housing using a gasket scraper.



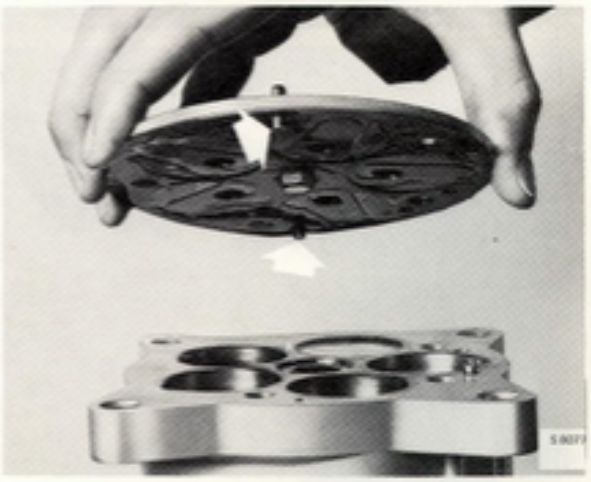
Note
The mating surfaces must be kept completely unmarked.



3 Carefully detach the valve housing from the compressor using a gasket scraper.



4 Remove the old gaskets, clean the mating surfaces and blow clean with R12 gas if required.



To refit

1 Oil the mating surfaces, compressor valve housing, cylinder head and gasket with refrigerant oil.

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

3 Fit the valve housing on the compressor.

Note! The dowels should be located in the holes in the compressor.

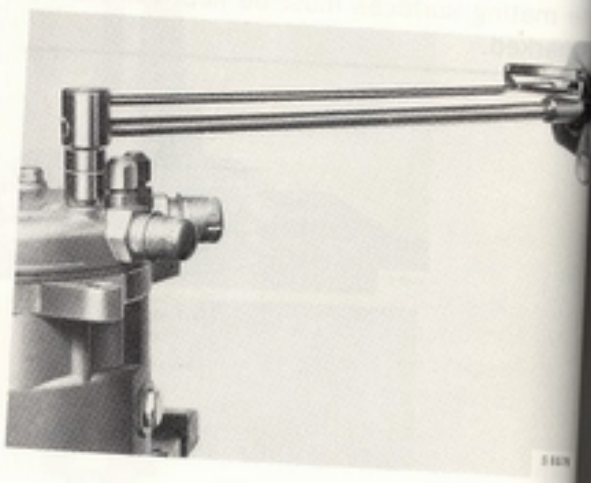
4 Fit the gasket between the valve housing and the cylinder head.

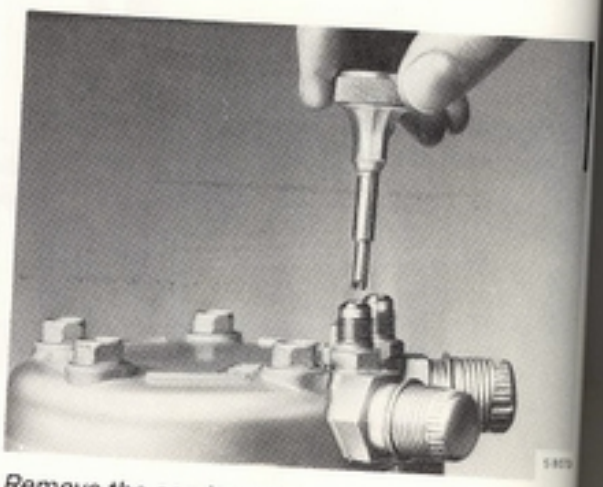
5 Refit the cylinder head.

Note! The dowels should be located in the holes in the cylinder head.

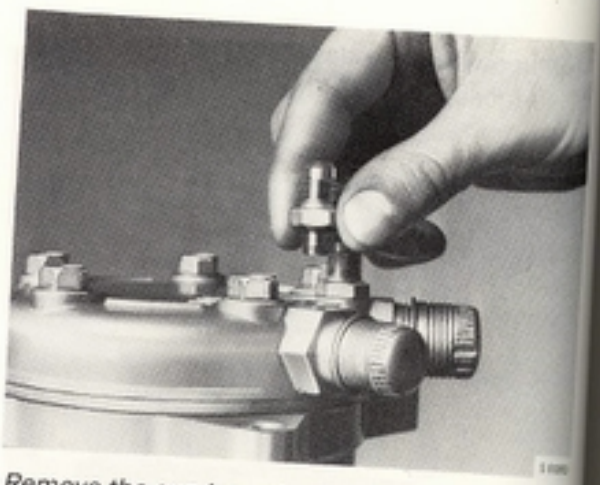
Refit the 5 bolts holding the cylinder head onto the compressor.

Torque tighten in 2 steps
1) 10 Nm (7.4 lbf ft)
2) 30-40 Nm (22.1 - 29.4 lbf ft)





Remove the service valve



Remove the service valve assembly

To change the electromagnetic clutch

(Compressor removed from the car)

Mount the compressor in a vice.

To dismantle

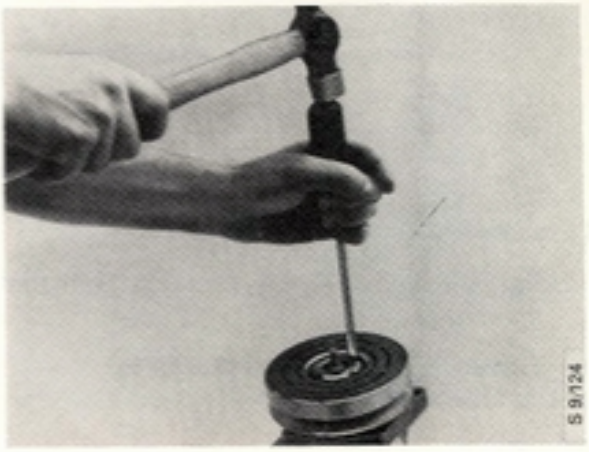
1 Undo and remove the centre nut on the crankshaft.

Tool: Holder 83 93 655.

2 Remove the hub and shoe assembly.

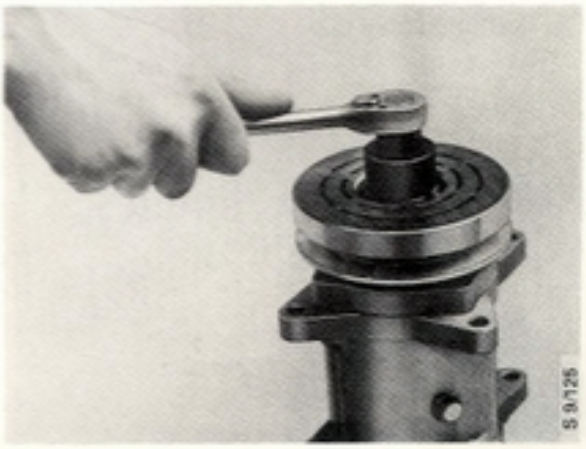
Tool: Puller 83 93 662.
Note! that the shims may remain inside the hub assembly.

3 Use a screwdriver to bend down the tabs on the bearing washer.



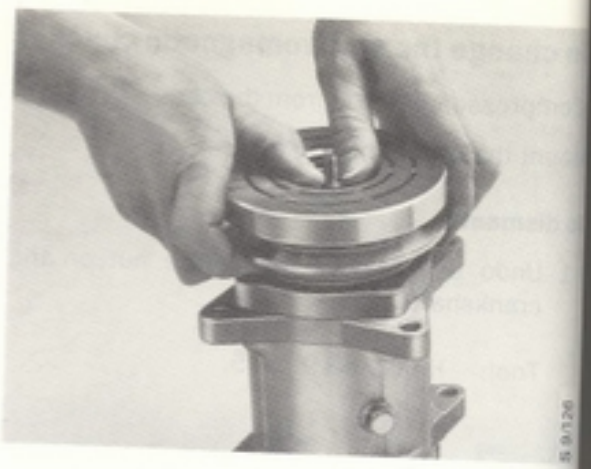
4 Remove the bearing nut.

Tool: Socket 83 93 670.



5 Remove the pulley assembly by hand.

Note! Do not use any tools.



6 Remove the screw and clip retaining the cable.

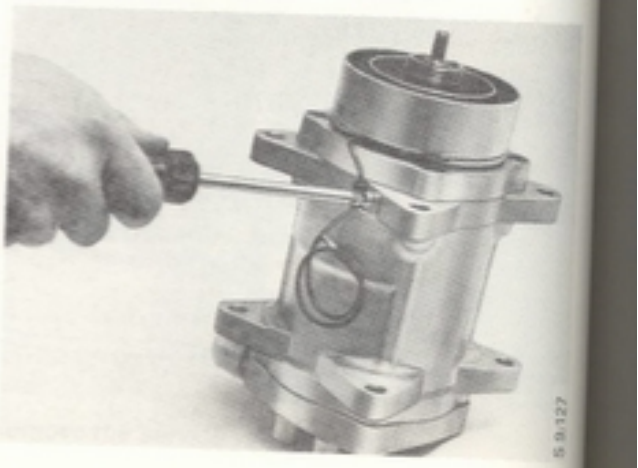
7 Remove the screws retaining the coil in the compressor.

To reassemble

1 Refit the field assembly, securing it with the six screws.

Tightening torque: 4 Nm (2.9 lbf ft)

2 Refit the cable clip.



3 Place the felt washer on the crankshaft.

Tool: Sleeve 83 93 704

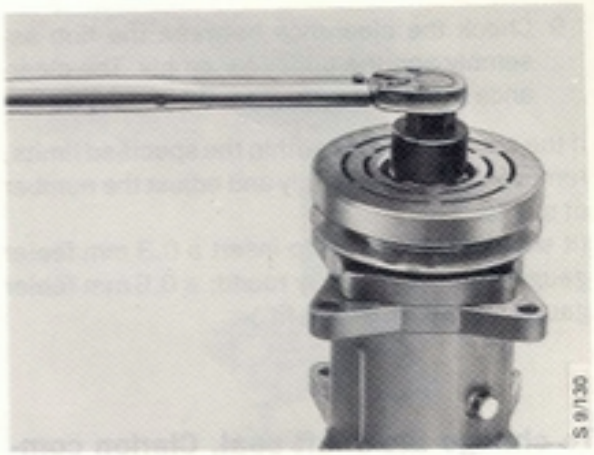
4 Fit the pulley assembly by hand.

Note. Do not use any tools.

5 Fit the tab washer and bearing nut.

Tightening torque: 30 Nm (22.1 lbf ft)

Tool: Socket 83 93 670.



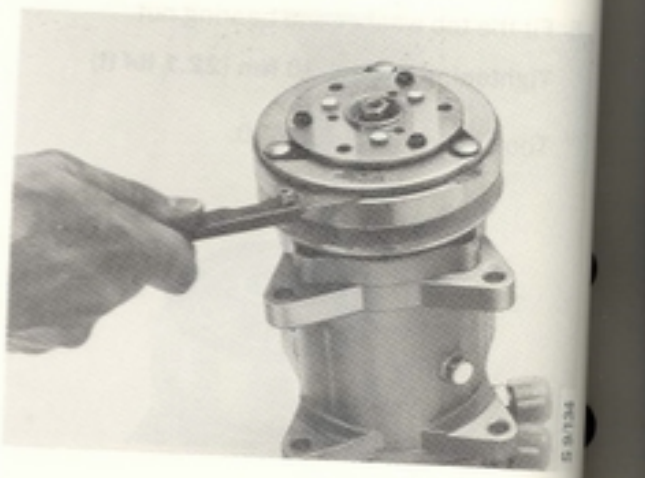
6 Bend up the tabs on the washer and lock them in the nut.

7 Clean the crankshaft and hub assembly. Make sure that the key is fitted properly in the keyway in the shaft.
Refit the same number of shims.

8 Refit the centre nut and tighten it to a torque of 15 Nm (11.0 lbf ft).

9 Check the clearance between the hub assembly and the pulley assembly. The clearance should be between 0.30 and 0.70 mm.

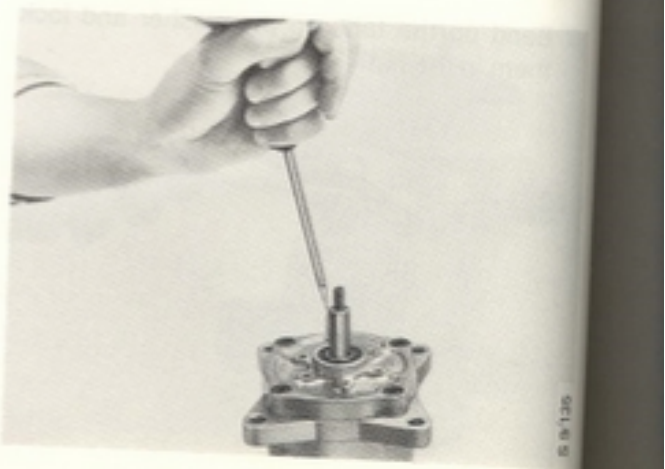
If the clearance is not within the specified limits, remove the hub assembly and adjust the number of shims.
(It should be possible to insert a 0.3 mm feeler gauge freely all the way round; a 0.6 mm feeler gauge should be a tight fit.)



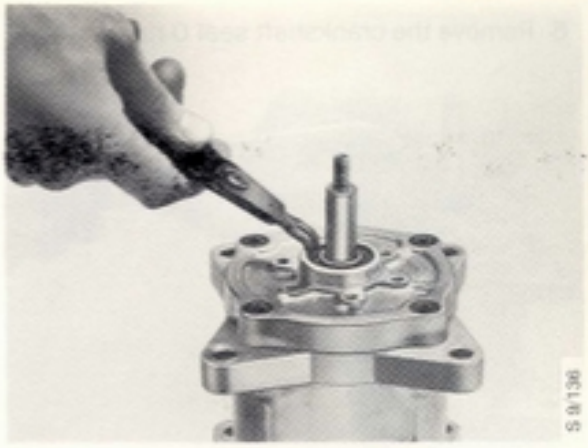
To change the shaft seal, Clarion compressor

1 Do not remove the crankshaft seal unless there is a gas leak or the cylinder head has been removed. When removing the seal, take care not to scratch it or damage it.

2 Use a screwdriver to remove the key from the keyway in the crankshaft.

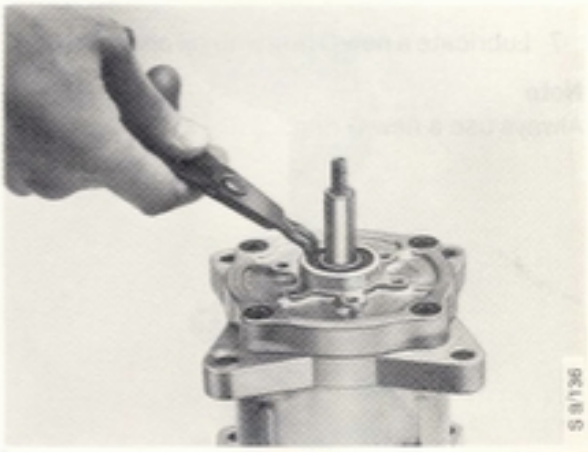


3 Remove the circlip retaining the seal.

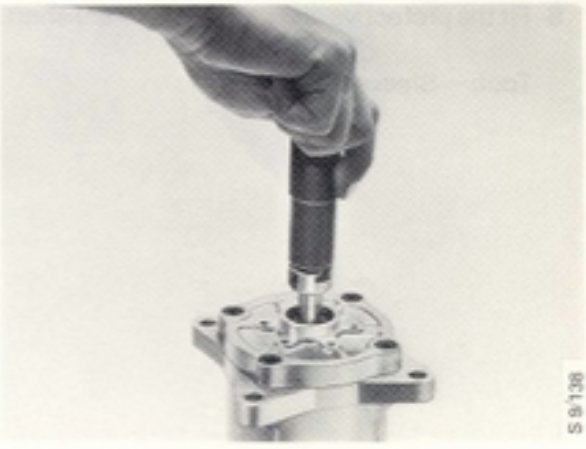


4 Remove the seal.

Tool: Pliers 83 93 696

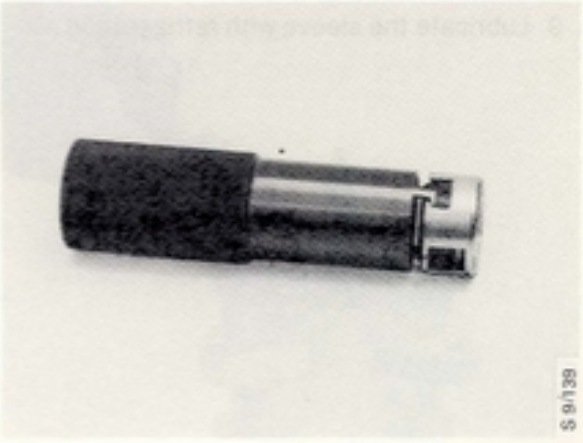


5 Remove the crankshaft seal by engaging the special key in the slots in the seal (see illustration) and then turning it clockwise.



Note
Since two types of crankshaft seal are used, check the seal from above to determine which of the two special keys (2-lug or 3-lug) should be used.

Tool: 83 93 688 (2-lug)
83 93 738 (3-lug)



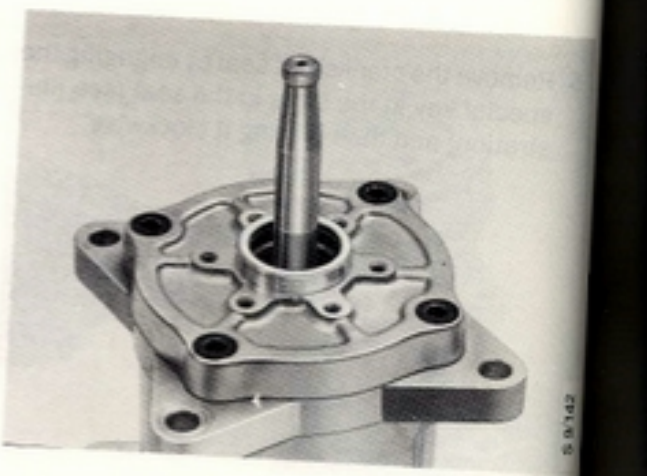
6 Remove the crankshaft seal O ring.

7 Lubricate a new O ring with oil and then fit it.

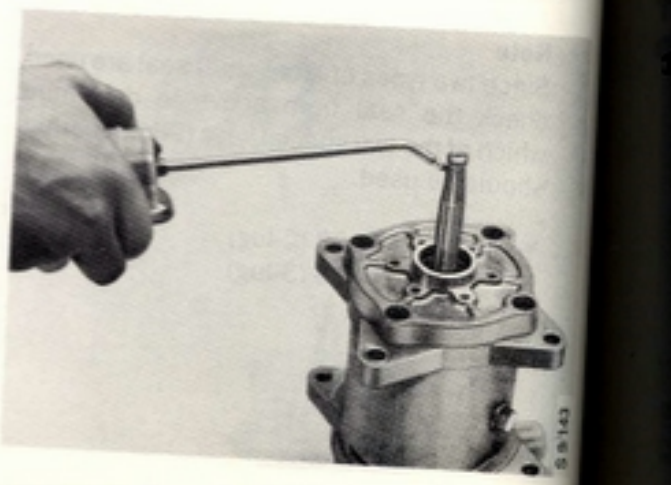
Note
Always use a new O ring.

8 Fit the protective sleeve onto the crankshaft.

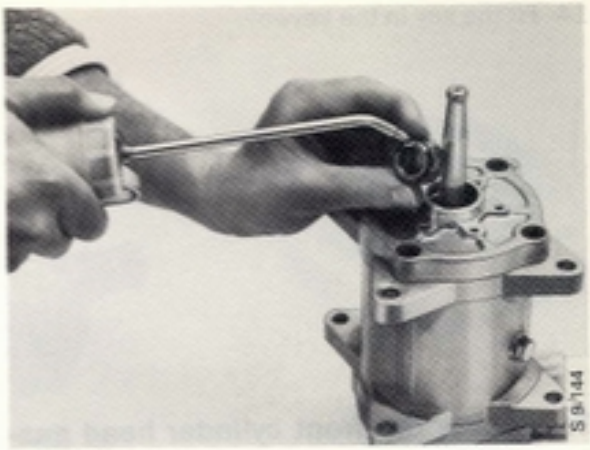
Tool: Sleeve 83 93 712



9 Lubricate the sleeve with refrigeration oil.

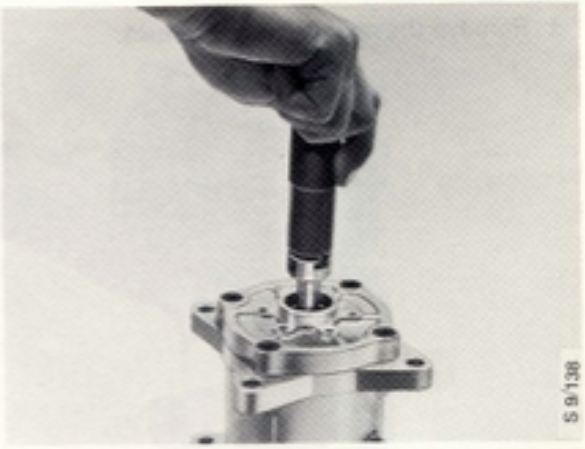


10 Lubricate the crankshaft seal with refrigeration oil.



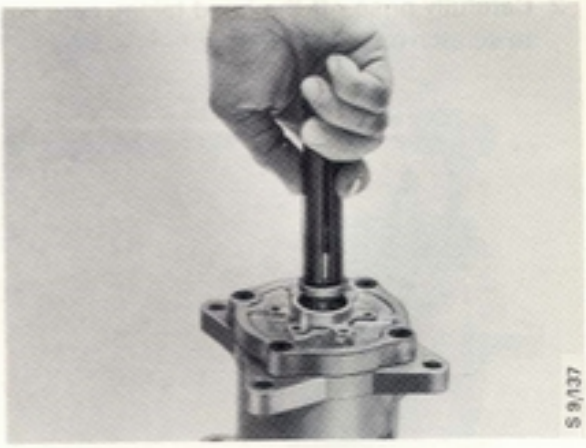
11 Slide the crankshaft seal onto the sleeve and then fit it by turning the special key anti-clockwise.

Tool: 83 93 688 (2-lug)
83 93 738 (3-lug)

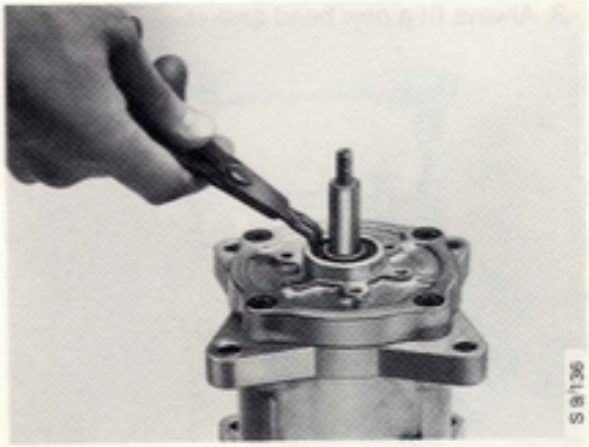


12 Fit the sealing ring.

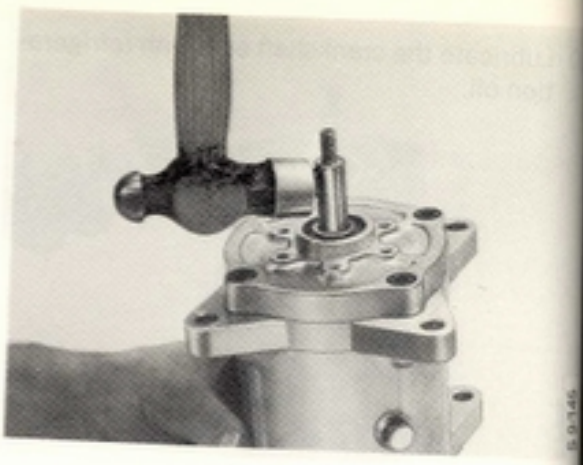
Tool: Pliers 83 93 696



13 Fit the circlip in the groove using circlip pliers.

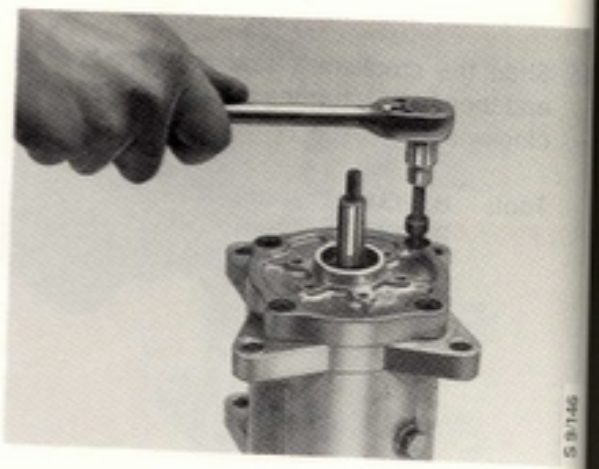


14 Fit the key in the keyway.

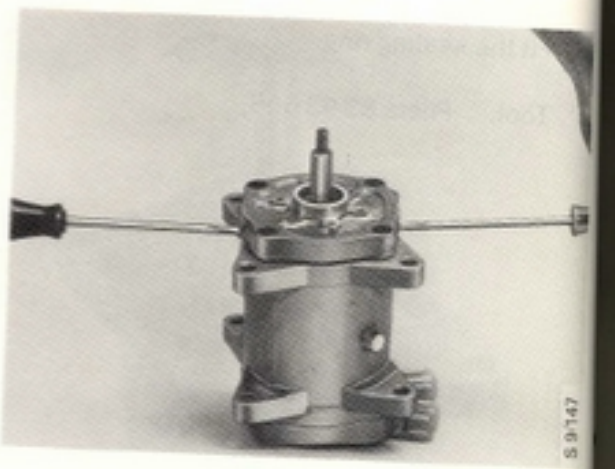


To change the front cylinder head gasket, Clarion compressor

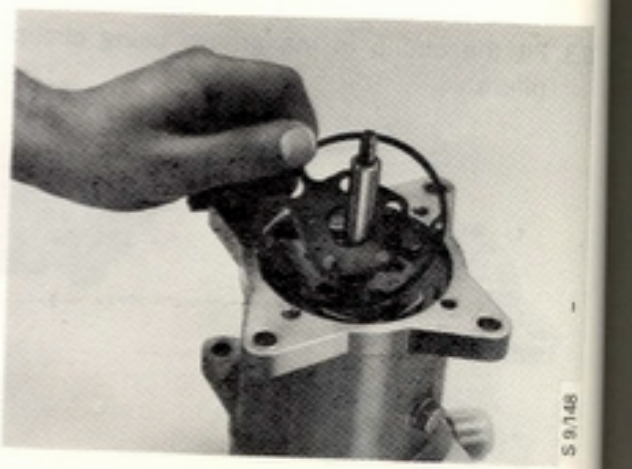
1 Remove the cylinder head screws.



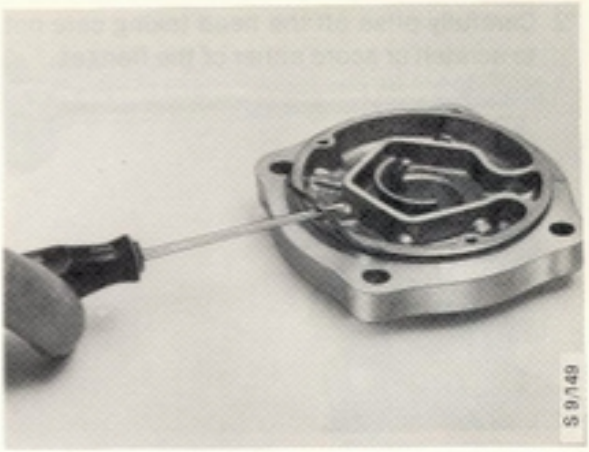
2 Carefully prise off the head taking care not to scratch or score either of the flanges.

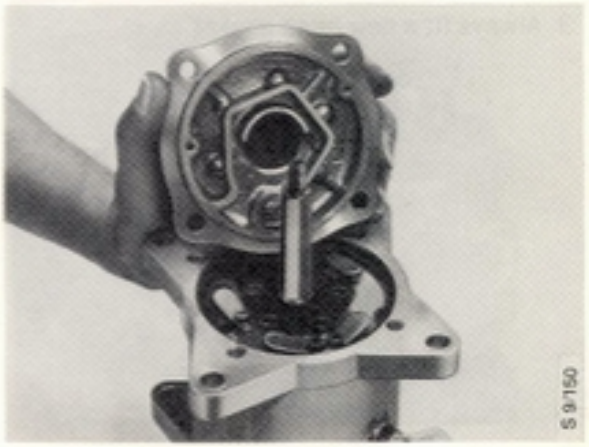


3 Always fit a new head gasket.



4 Lubricate the new O-ring with refrigeration oil.
Align the dowels when fitting the cylinder head.

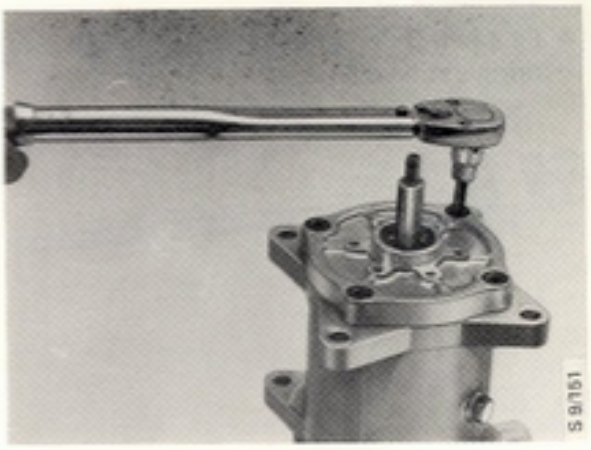

S 9/149


S 9/150

5 Fit the cylinder head.

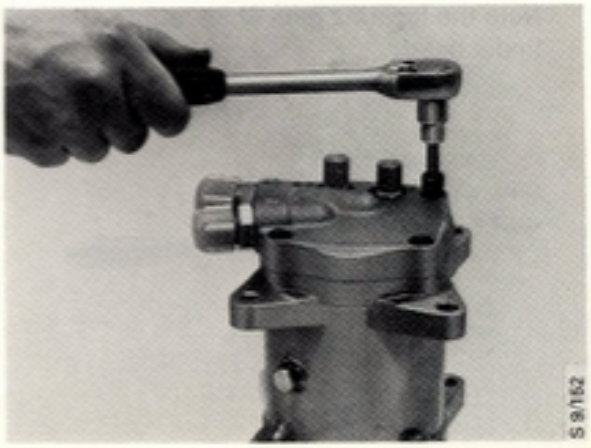
6 Tighten the cylinder head bolts.
Tightening torque: 15 Nm 11.0 lbf ft)

Note
If both cylinder heads have been removed, always tighten the front head to the specified torque before tightening the rear head.

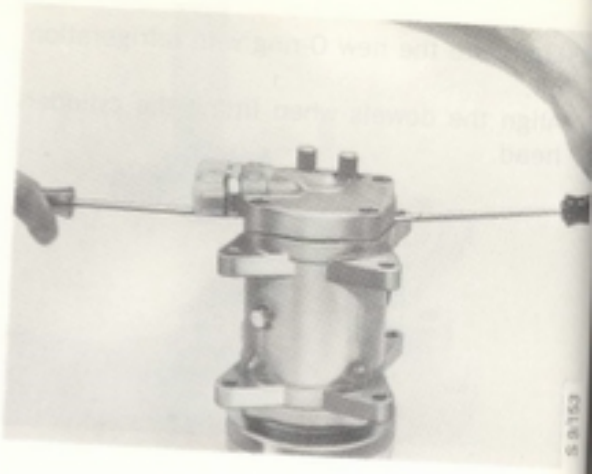

S 9/151

To change the rear cylinder head gasket, Clarion compressor

1 Remove the cylinder head screws.

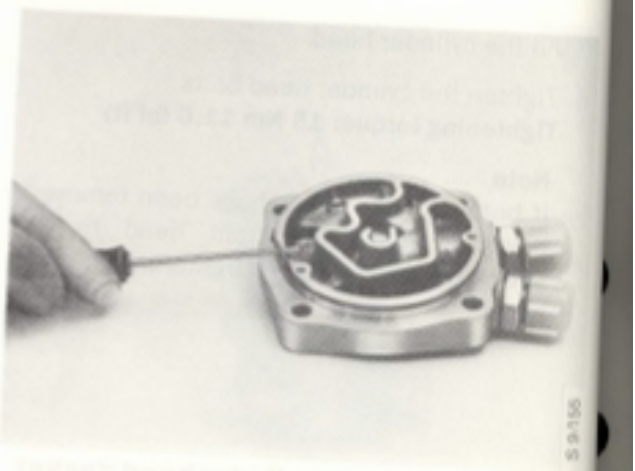

S 9/152

2 Carefully prise off the head taking care not to scratch or score either of the flanges.



3 Always fit a new head gasket.

4 Fit a new O ring after first lubricating it with refrigeration oil.

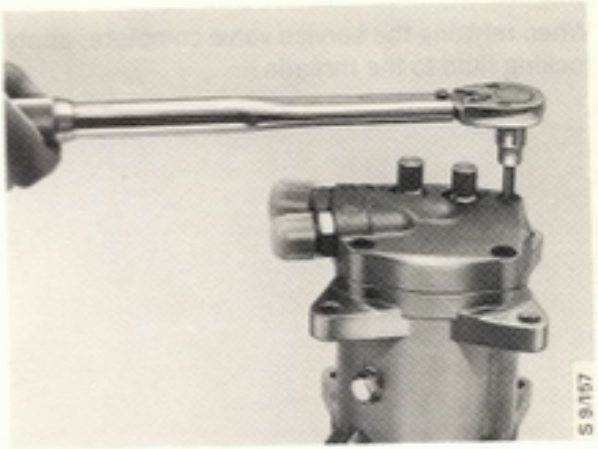


Note the locating pins when refitting the cylinder head.

Tighten the cylinder head screws evenly (symmetrically) in sequence.

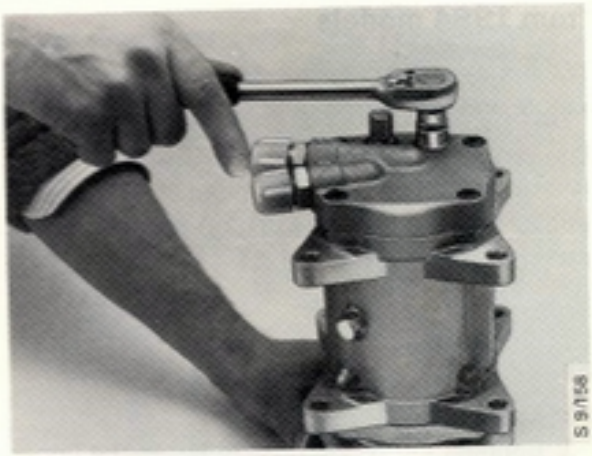
Tightening torque: 15 Nm (11.0 lbf ft)

Note
If both cylinder heads have been removed, always tighten the front head to the specified torque before tightening the rear head.

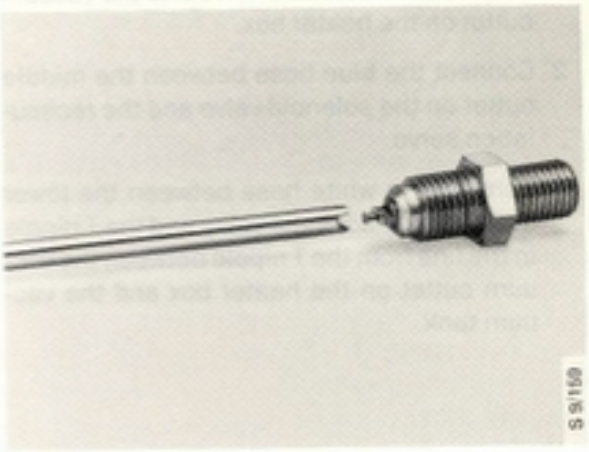

S 9/157

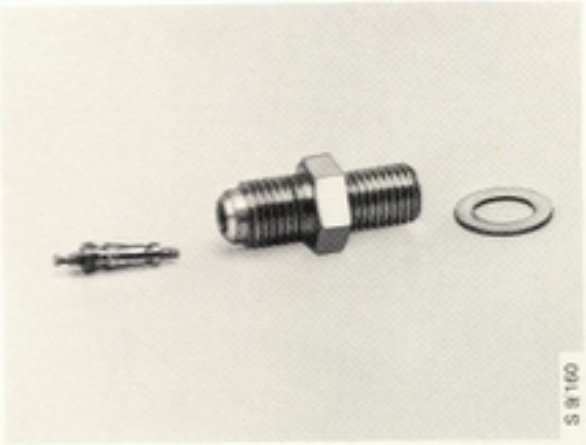
To change the service valve, Clarion compressor

Remove the service valve complete.

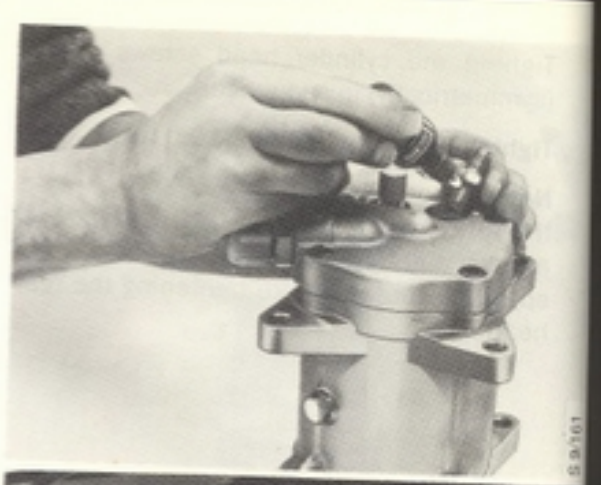

S 9/158

Removing the valve.


S 9/159


S 9/160

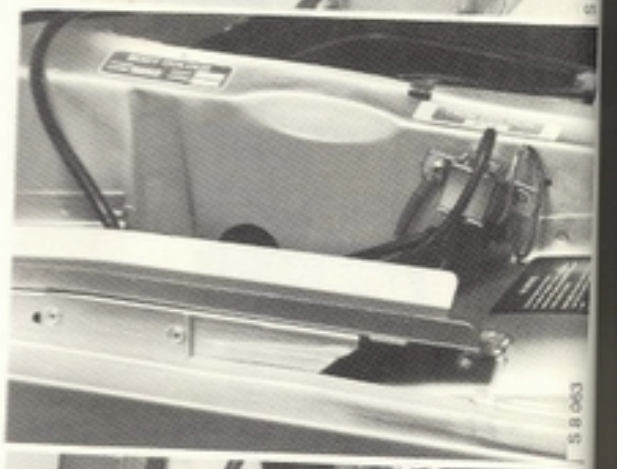
When refitting the service valve complete, apply locking fluid to the threads.



Manually controlled air recirculation as from 1984 models

The system comprises a solenoid valve, a 3-way nipple and vacuum hoses.

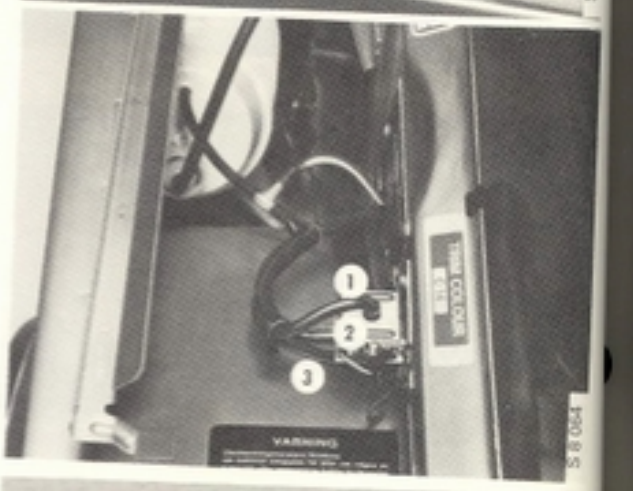
The solenoid valve is located on the inner wheel housing panel on the right- hand side of the car and is operated by a switch on the instrument panel.

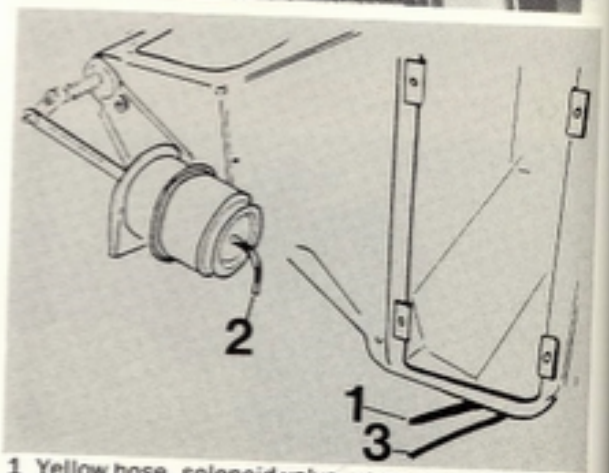


1 Connect the yellow hose between the upper outlet on the solenoid valve and the vacuum outlet on the heater box.

2 Connect the blue hose between the middle outlet on the solenoid valve and the recirculation servo.

3 Connect the white hose between the lower outlet on the solenoid valve and the T nipple in the line from the T nipple between the vacuum outlet on the heater box and the vacuum tank.





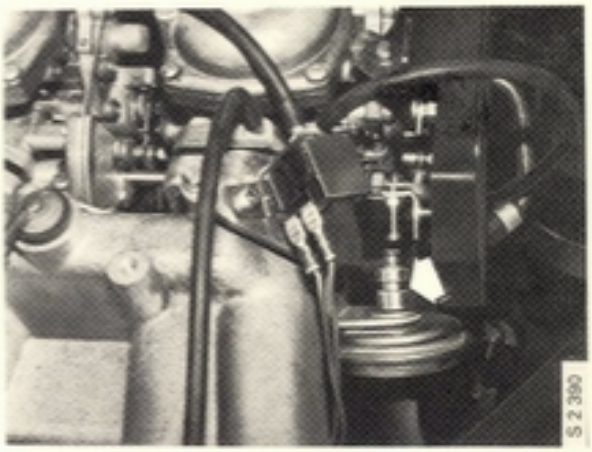
1 Yellow hose, solenoid valve -vacuum connection in the evaporator housing
2 Blue hose, solenoid valve -recirculation servo
3 White hose, T adapter - vacuum connection in the evaporator housing

Fast-idling device

A device for increasing the engine idling speed is connected in parallel with the circuit to the compressor's magnetic clutch in order to keep the engine idling speed at the correct level when the compressor is in operation.

Carburettor engines

The device consists of a solenoid valve which acts on the throttle butterfly. When the compressor cuts in, the solenoid acts on the butterfly, preventing it from returning fully to the idling stop, thereby maintaining a correct idling speed. The device may be adjusted.



To check and adjust

1 Run the engine up to normal operating temperature.

2 Connect a tachometer.

3 Check that an idling speed of 850 ± 50 r/min is obtained.

4 Switch on the AC system.

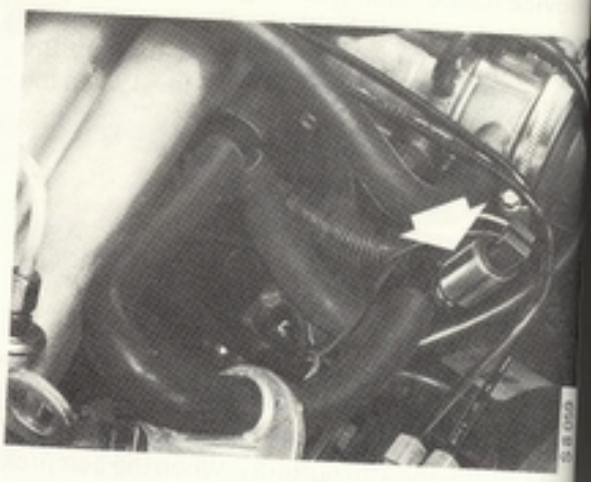
5 Rev up the engine and then release the throttle.

6 Check that the idling speed returns to 850 ± 50r/min.

7 Adjustment can be made, if necessary, on the solenoid adjustment screw. Recheck the setting by repeating the above procedure.

Fuel-injection engines up to and including the 1983 models

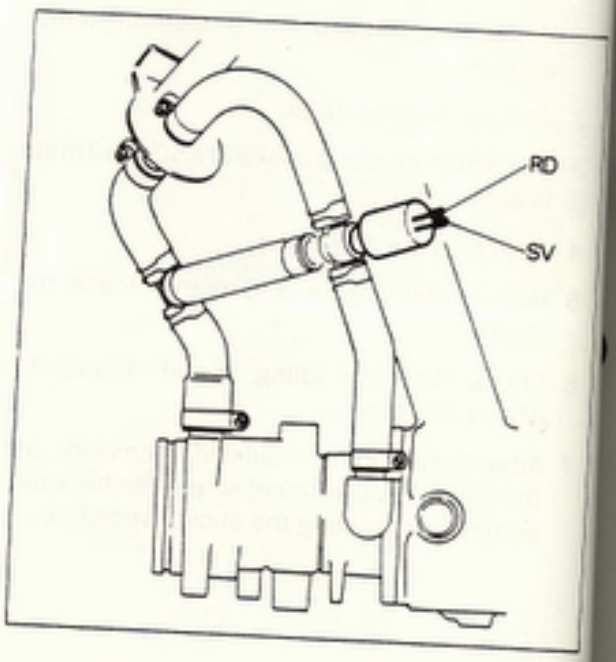
The device consists of a solenoid valve which boosts the supply of air to the inlet manifold. When the compressor cuts in, the specially calibrated valve opens to maintain a correct idling speed. The valve is not adjustable.



Fuel injection engines as from the 1984 models

(not applicable to the Turbo 16 for the U.S.A.)

The solenoid valve has been moved to the other side of the make-up air valve. When the valve is actuated, it is subjected to the higher pressure prevailing upstream of the butterfly valve, and will then open more easily.



Time delay relay for idling speed compensation (only U.S.A.), 1986 models

A new AC relay with a built-in time delay will be fitted. This means that, 0.6 seconds before the compressor is switched in, the engine speed will be increased to compensate for the increased load. See circuit diagram under "Electrical system".

Delayed cutting-in of the AC on starting (only U.S.A.), 1986 models

On all cars with B201 and B202 engines and with AC, operation of the AC unit will be delayed by 10 seconds to reduce the load on the engine if the unit should be switched in at the instant of starting. See circuit diagram under "Electrical system".

The electrical system

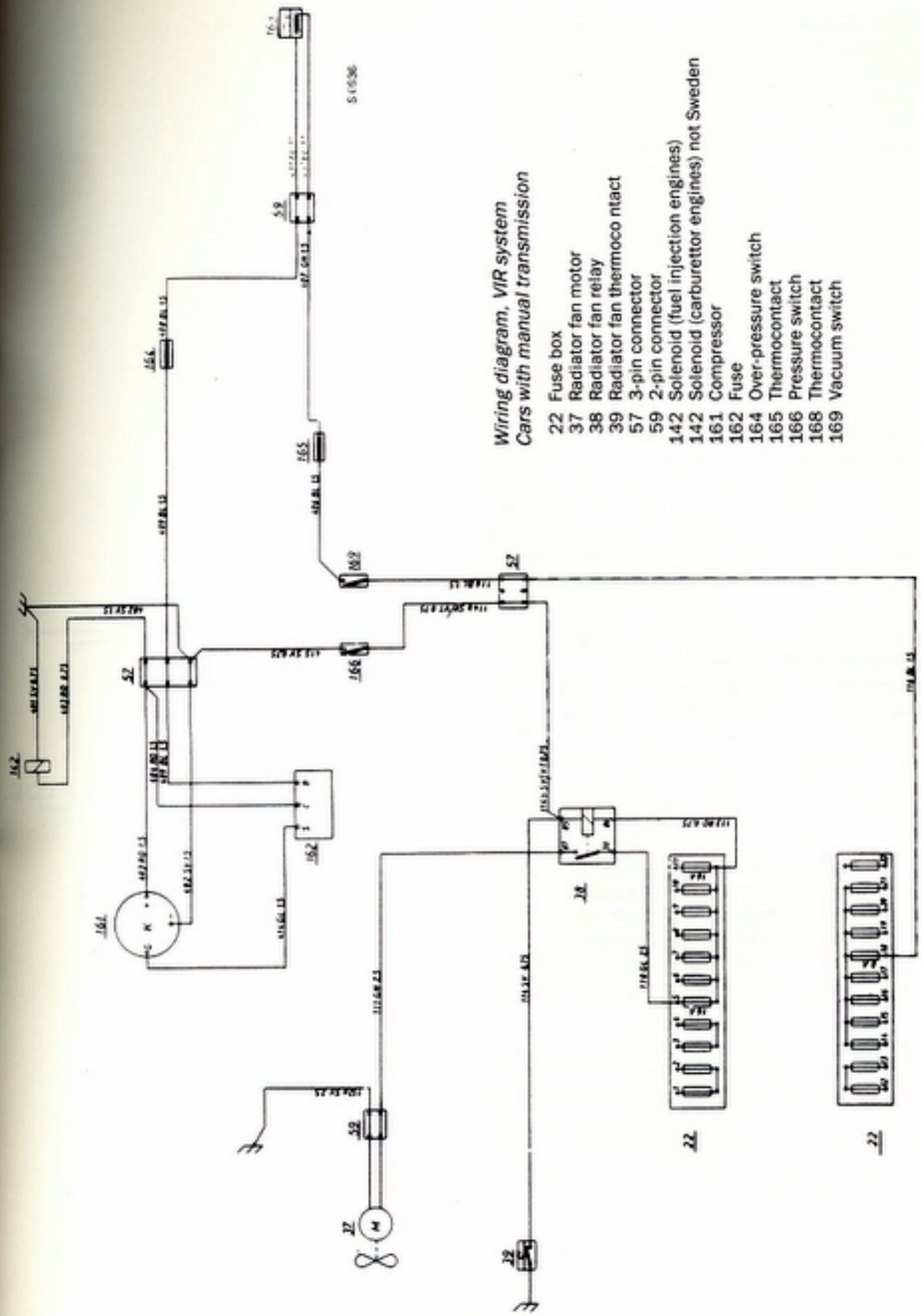
VIR system

The magnetic clutch of the compressor is supplied from fuse 18 in the electrical distribution box. The circuit includes one normally-open and three normally-closed contacts and a fuse. On cars with automatic transmission, the same circuit also contains a time-delay relay with normally-closed contacts. If the air distribution control is set to AC max., AC fresh or defroster, a vacuum switch (169) will close the circuit. A temperature switch (165) which senses the incoming air temperature will open the circuit if the air temperature is below about +3°C. A time relay (167) (only fitted in cars with automatic transmission), which is activated by throttle switch (137), breaks the circuit for about 16 seconds when the throttle opening is excessive. In other words, the compressor is isolated to avoid loss of power during acceleration. A thermocontact (168) which senses the tem perature of the coolant is connected across the circuit and is primarily intended to ensure that the engine receives adequate cooling. If the temperature goes above 230°F (115°C), the thermocontact will break the circuit to the compressor's magnetic clutch.

An over-pressure cut-out (164), activated by the pressure in the high-pressure side of the system, breaks the circuit if the pressure exceeds 350 lb/in² (25 kg/cm²) for any reason. A temperature-sensitive switch in the compressor closes if the temperature in the compressor becomes excessive. This switch loads a fuse (162) in the magnetic clutch circuit which blows, breaking the circuit. Blown fuses must be replaced.

A device (142) which increases the idling speed of the engine is connected in parallel with the magnetic clutch circuit. On fuel injection engines this consists of a solenoid which boosts the supply of air to the inlet manifold and, on carburettor engines, a solenoid which activates the throttle.

An over-pressure switch (166) which senses the pressure in the high-pressure side of the system is connected in parallel with the ordinary cooling system's thermocontact (39) for the radiator fan motor. When the pressure in the system reaches a predetermined level the contact closes and the radiator fan is started.


Wiring diagram, VIR system
Cars with manual transmission
22 Fuse box
37 Radiator fan motor
38 Radiator fan relay
39 Radiator fan thermoco ntact
57 3-pin connector
59 2-pin connector
142 Solenoid (fuel injection engines)
142 Solenoid (carburettor engines) not Sweden
161 Compressor
162 Fuse
164 Over-pressure switch
165 Thermocontact
166 Pressure switch
168 Thermocontact
169 Vacuum switch

The electrical system

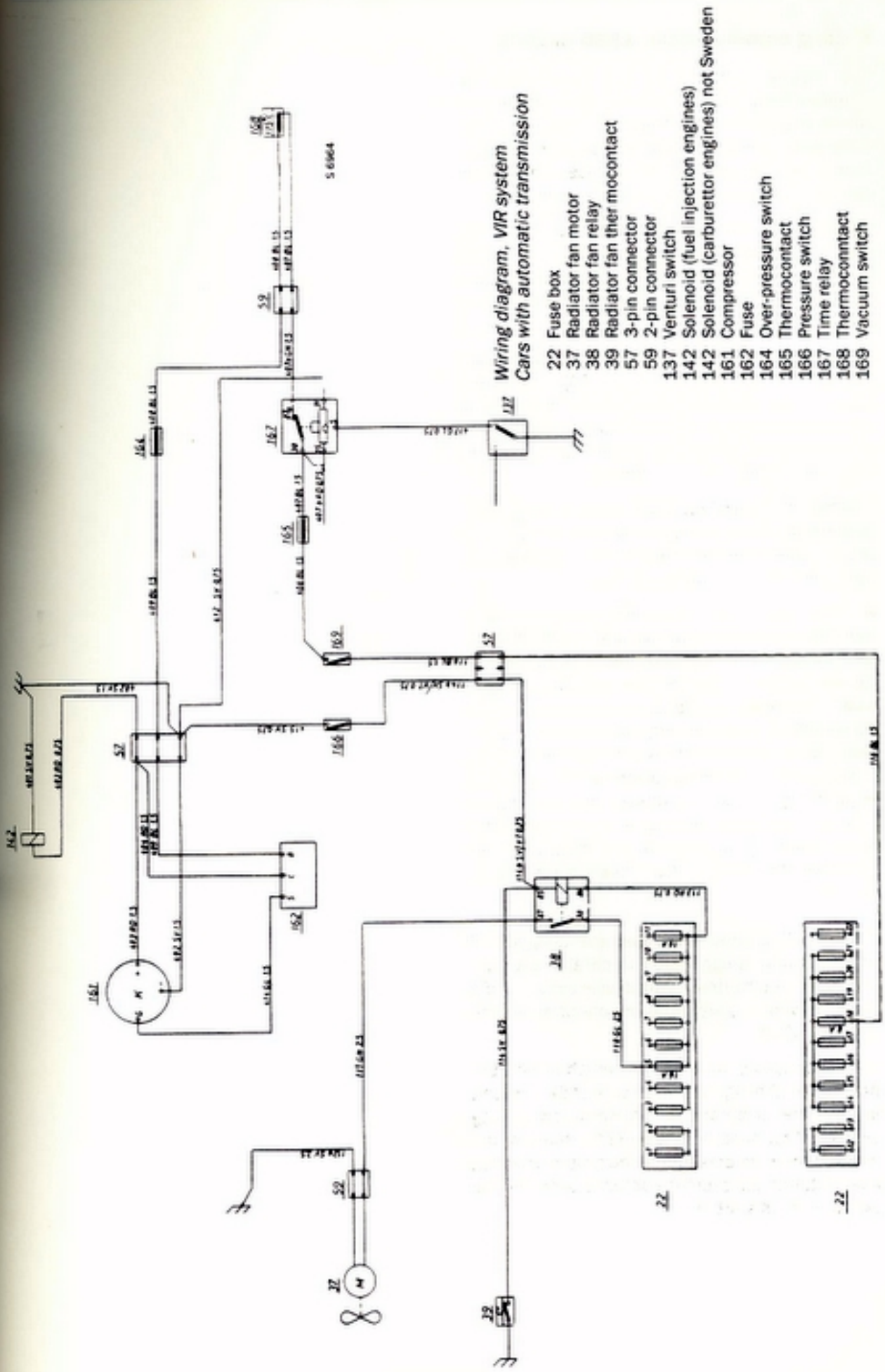
VIR system

The magnetic clutch of the compressor is supplied from fuse 18 in the electrical distribution box. The circuit includes one normally-open and three normally-closed contacts and a fuse. On cars with automatic transmission, the same circuit also contains a time-delay relay with normally-closed contacts. If the air distribution control is set to AC max., AC fresh or defroster, a vacuum switch (169) will close the circuit. A temperature switch (165) which senses the incoming air temperature will open the circuit if the air temperature is below about +3°C. A time relay (167) (only fitted in cars with automatic transmission), which is activated by throttle switch (137), breaks the circuit for about 16 seconds when the throttle opening is excessive. In other words, the compressor is isolated to avoid loss of power during acceleration. A thermocontact (168) which senses the tem perature of the coolant is connected across the circuit and is primarily intended to ensure that the engine receives adequate cooling. If the temperature goes above 230°F (115°C), the thermocontact will break the circuit to the compressor's magnetic clutch.

An over-pressure cut-out (164), activated by the pressure in the high-pressure side of the system, breaks the circuit if the pressure exceeds 350 lb/in² (25 kg/cm²) for any reason. A temperature-sensitive switch in the compressor closes if the temperature in the compressor becomes excessive. This switch loads a fuse (162) in the magnetic clutch circuit which blows, breaking the circuit. Blown fuses must be replaced.

A device (142) which increases the idling speed of the engine is connected in parallel with the magnetic clutch circuit. On fuel injection engines this consists of a solenoid which boosts the supply of air to the inlet manifold and, on carburettor engines, a solenoid which activates the throttle.

An over-pressure switch (166) which senses the pressure in the high-pressure side of the system is connected in parallel with the ordinary cooling system's thermocontact (39) for the radiator fan motor. When the pressure in the system reaches a predetermined level the contact closes and the radiator fan is started.


Wiring diagram, VIR system
Cars with automatic transmission
22 Fuse box
37 Radiator fan motor
38 Radiator fan relay
39 Radiator fan ther mocontact
57 3-pin connector
59 2-pin connector
137 Venturi switch
142 Solenoid (fuel injection engines)
142 Solenoid (carburettor engines) not Sweden
161 Compressor
162 Fuse
164 Over-pressure switch
165 Thermocontact
166 Pressure switch
167 Time relay
168 Thermoconntact
169 Vacuum switch

Cycling clutch system, 1980 models

The magnetic clutch of the compressor is supplied from fuse 18 (16A) in the electrical distribution box. The circuit includes one normally-open and two normally-closed contacts. The circuit is earthed across a pressure-sensing switch on the high-pressure side of the compressor.

When the air distribution control is set to AC max., AC fresh or defroster, a vacuum switch (169) will close the circuit. At the same time, the AC relay (155) will close, thus starting the extra radiator fan (37).

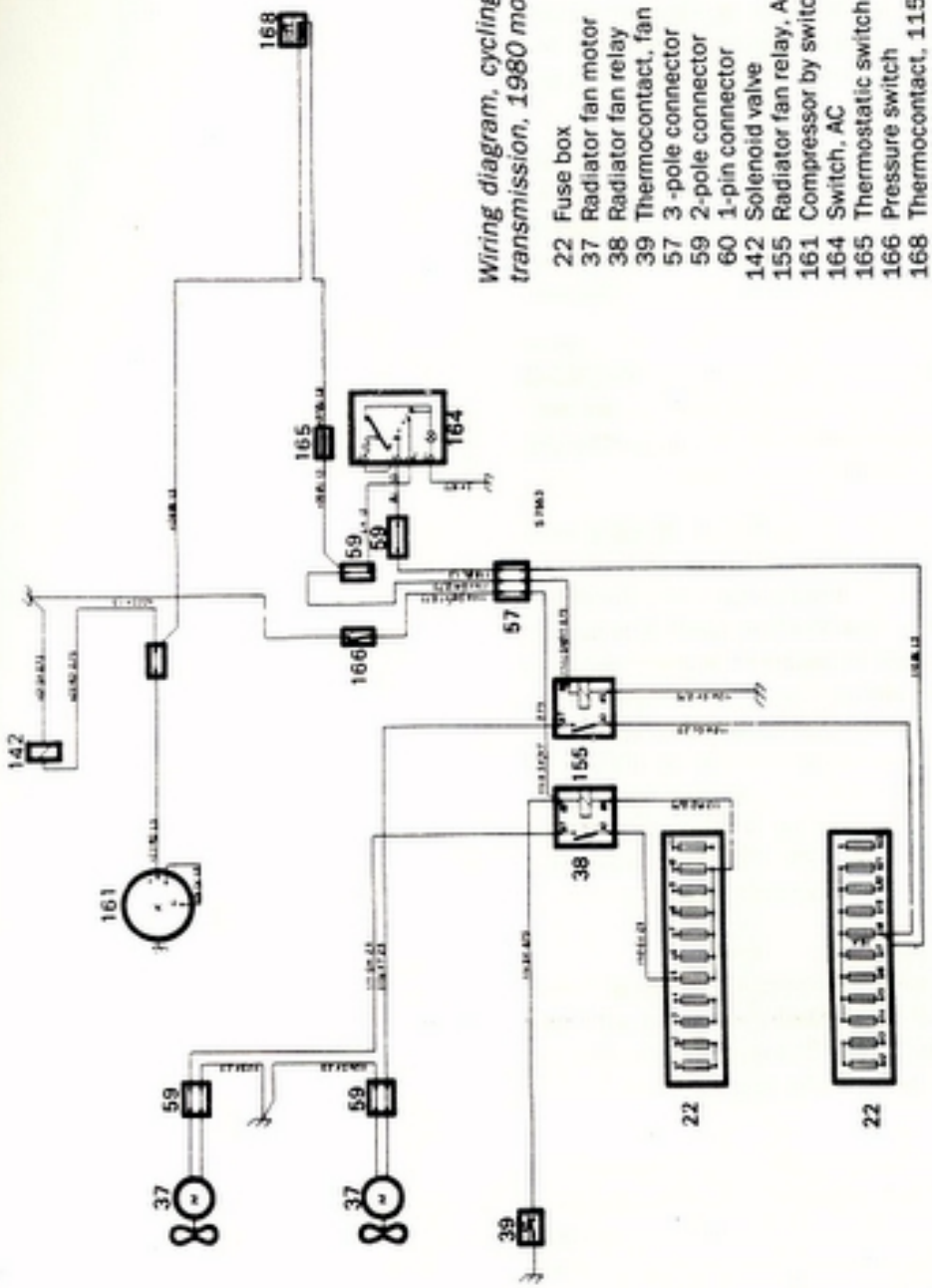
In the case of an AC installed as an accessory (not U.S.A., Canada), a switch (164) is fitted instead of the vacuum switch (169). The switch (164) is mounted in the facia and enables the AC to be started and stopped, regardless of the setting of the air distribution control.

The thermostat switch (165) which is integrated into the anti-frost thermostat senses the temperature at the evaporator outlet and regulates the operation of the compressor clutch.

A time relay (167) (only fitted in cars with automatic transmission), which is activated by throttle switch (137), breaks the circuit for about 20 seconds when the throttle opening is excessive. In other words, it isolates the compressor to avoid loss of power during acceleration. A thermocontact (168) which senses the temperature of the coolant is connected across the circuit and is primarily intended to ensure that the engine receives adequate cooling. If the temperature goes above 115°C (230°F), the thermocontact will break the circuit to the compressor's magnetic clutch.

A device (142) which increases the idling speed of the engine is connected in parallel with the magnetic clutch circuit. This device consists of a solenoid which boosts the supply of air to the inlet manifold.

An over-pressure switch (166), which senses the pressure in the high-pressure side of the system, is connected in parallel with the ordinary cooling system's thermocontact (39) for the radiator fan motor. When the pressure in the system reaches a predetermined level the contact closes and the radiator fan is started.



Wiring diagram, cycling clutch system, manual transmission, 1980 models

22 Fuse box
37 Radiator fan motor
38 Radiator fan relay
39 Thermocontact, fan
57 3-pole connector
59 2-pole connector
60 1-pin connector
142 Solenoid valve
155 Radiator fan relay, AC
161 Compressor by switch compressor
164 Switch, AC
165 Thermostatic switch
166 Pressure switch
168 Thermocontact, 115°C

Cycling clutch system, 1980 models

The magnetic clutch of the compressor is supplied from fuse 18 (16A) in the electrical distribution box. The circuit includes one normally-open and two normally-closed contacts. The circuit is earthed across a pressure-sensing switch on the high-pressure side of the compressor.

When the air distribution control is set to AC max., AC fresh or defroster, a vacuum switch (169) will close the circuit. At the same time, the AC relay (155) will close, thus starting the extra radiator fan (37).

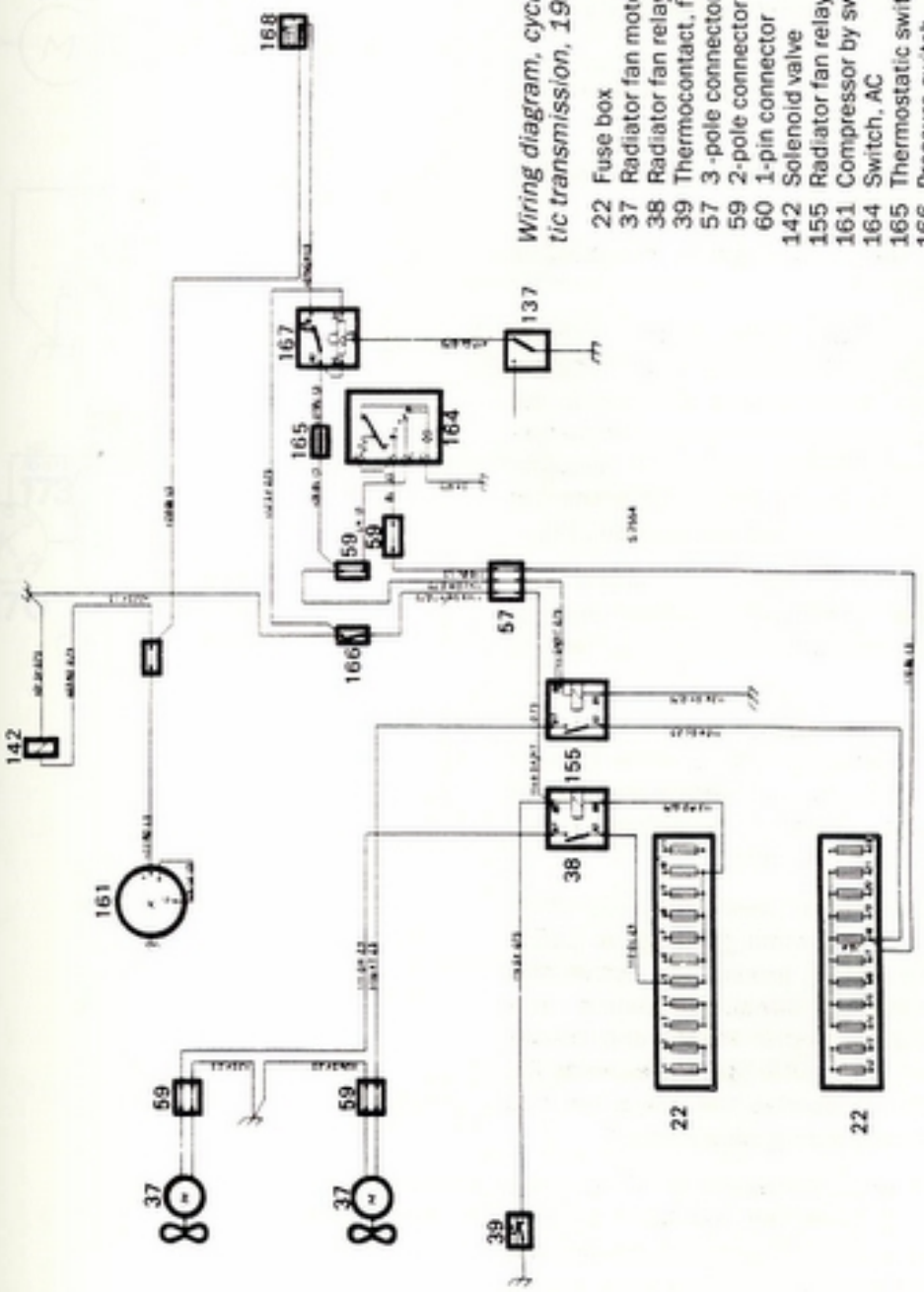
In the case of an AC installed as an accessory (not U.S.A., Canada), a switch (164) is fitted instead of the vacuum switch (169). The switch (164) is mounted in the facia and enables the AC to be started and stopped, regardless of the setting of the air distribution control.

The thermostat switch (165) which is integrated into the anti-frost thermostat senses the temperature at the evaporator outlet and regulates the operation of the compressor clutch.

A time relay (167) (only fitted in cars with automatic transmission), which is activated by throttle switch (137), breaks the circuit for about 20 seconds when the throttle opening is excessive. In other words, it isolates the compressor to avoid loss of power during acceleration. A thermocontact (168) which senses the temperature of the coolant is connected across the circuit and is primarily intended to ensure that the engine receives adequate cooling. If the temperature goes above 115°C (230°F), the thermocontact will break the circuit to the compressor's magnetic clutch.

A device (142) which increases the idling speed of the engine is connected in parallel with the magnetic clutch circuit. This device consists of a solenoid which boosts the supply of air to the inlet manifold.

An over-pressure switch (166), which senses the pressure in the high-pressure side of the system, is connected in parallel with the ordinary cooling system's thermocontact (39) for the radiator fan motor. When the pressure in the system reaches a predetermined level the contact closes and the radiator fan is started.



Wiring diagram, cycling clutch system, automatic transmission, 1980 models

22 Fuse box
37 Radiator fan motor
38 Radiator fan relay
39 Thermocontact, fan
57 3-pole connector
59 2-pole connector
60 1-pin connector
142 Solenoid valve
155 Radiator fan relay, AC
161 Compressor by switch compressor
164 Switch, AC
165 Thermostatic switch
166 Pressure switch
168 Thermocontact, 115°C

Cycling Clutch system, 1981-1983 models

The magnetic clutch of the compressor is supplied from fuse 18 (16A in the electrical distribution box. The circuit includes

- a manual switch (150), mounted in the facia
- an anti-frosting thermostat (171) mounted on the heater box in the interior
- a pressure switch (169) mounted on the dryer receiver
- a temperature switch (168) located in the upper radiator hose
- on IA cars, a microswitch (167) located on the intake manifold throttle housing.

The circuit is earthed through the mounting of the compressor.

When the switch (150) closes, current is fed to both the compressor's magnetic clutch and the fan relay (155) which closes and starts the auxiliary fan (172). Once the pressure in the system has reached 213 lb/in² (15 kg/cm²), the pressure switch (166) closes the circuit to the fan relay (156), which starts the radiator fan (37).

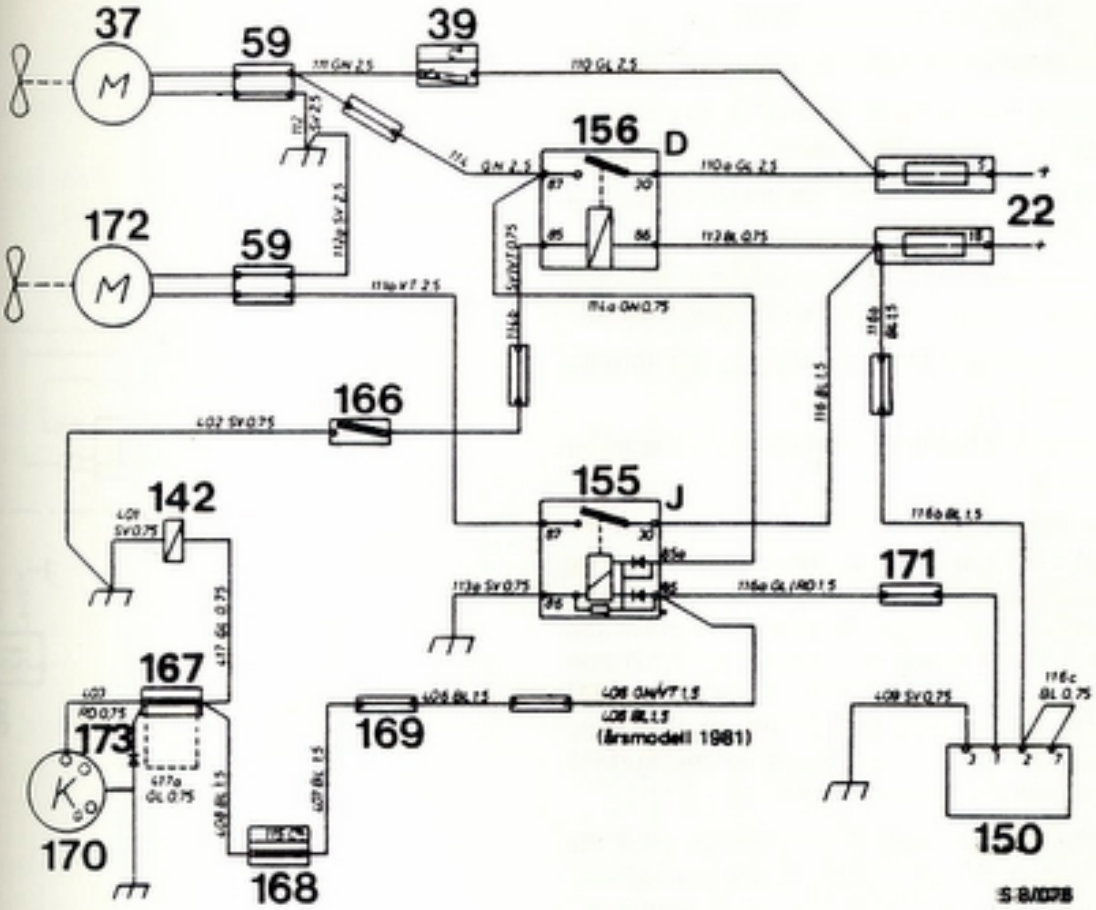
The anti-frost thermostat (171) opens and closes the circuit to the magnetic clutch depending on the temperature on the surface of the condenser.

The pressure switch (169) breaks the circuit if the pressure in the system drops below 40 lb/in² (2,8 kg/cm²), which occurs if there is insufficient refrigerant in the system or if the ambient temperature drops below 0°C (30°F).

The thermocontact (168) breaks the circuit if the temperature of the coolant goes above 115°C (240°F) for any reason, primarily to ensure that the engine receives adequate cooling. The microswitch (167) fitted in IA cars only breaks the circuit when the throttle opening exceeds 70. In other words, it isolates the compressor to avoid loss of power during acceleration.

A device (142) which increases the idling speed of the engine is connected in parallel with the magnetic clutch circuit. This device consists of a solenoid which boosts the supply of air to the inlet manifold.

Wiring diagrams 1984-, see group 3:2, Electrical system wiring diagrams.



Wiring diagram, cycling clutch system, 1981 - 1983 models.

22 Fuse box
37 Radiator fan motor
39 Thermostatic switch for radiator fan
59 Two-pin connector
142 Solenoid valve
150 AC switch
155 Fan relay for auxiliary fan motor
156 Fan relay, standard fan motor
166 Pressure switch for radiator fan
167 Throttle switch (cars with fuel injection and automatic transmission only)
168 Thermostatic switch, 115°C
169 Pressure switch
170 Compressor
171 Thermostatic switch (anti-frost device).
172 AC cooling fan
173 Diode, as from 1982 models

Electrical system, Clarion, 1984 models

The magnetic clutch of the compressor is supplied from fuse 25 (30A) in the electrical distribution box. The circuit includes

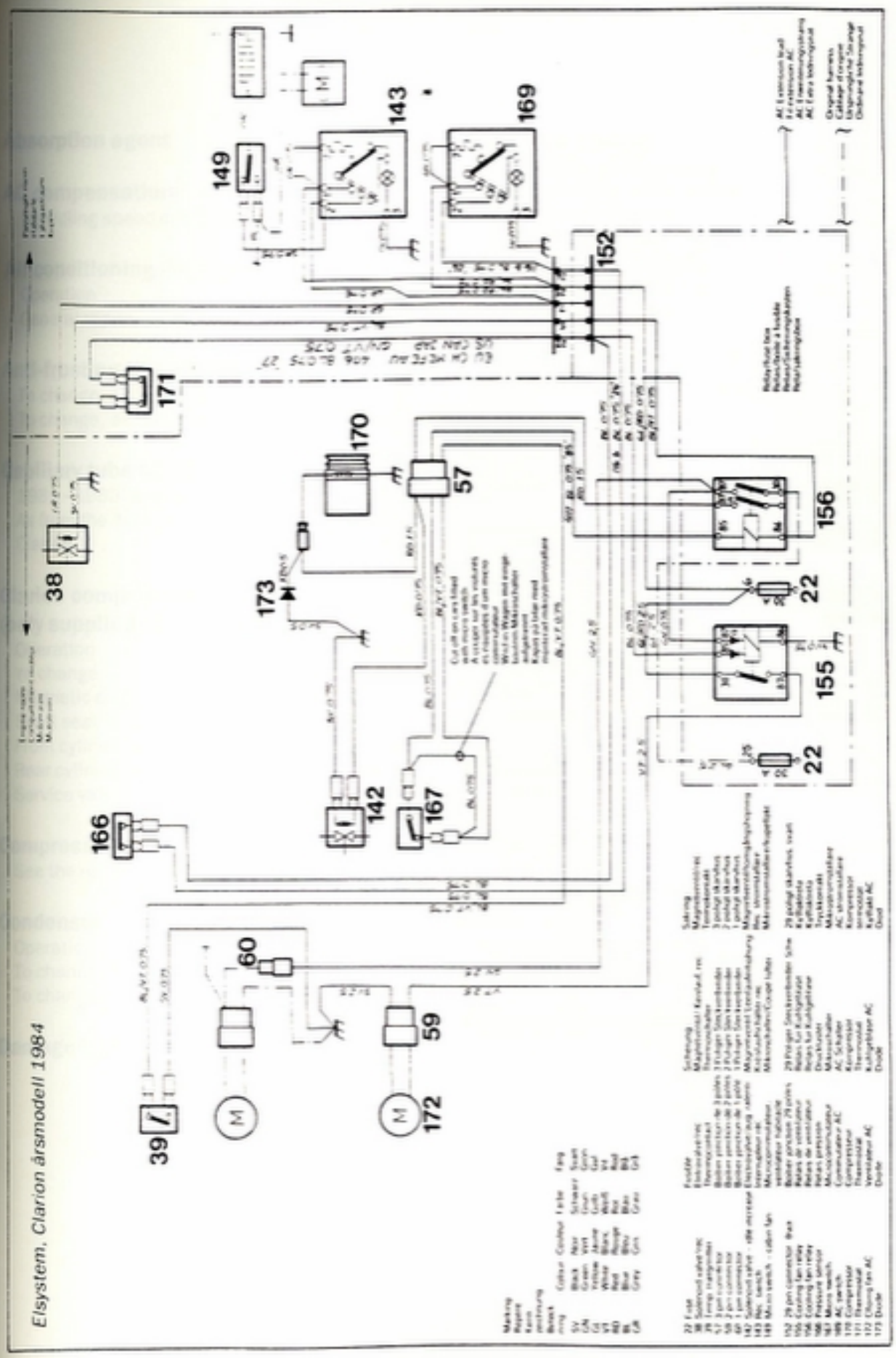
- a manual switch (169) mounted in the facia
- an anti-freeze thermostat (171) mounted on the heater box in the interior
- a pressure switch (166) mounted on the dryer receiver
- a temperature switch (39) located in the upper radiator hose, and on fuel injection engines
- a microswitch (167) located on the throttle housing.

The circuit is earthed through the compressor mounting.

When switch (169 closes, current flows to the radiator fan relay (156) which closes, energizing the electromagnetic clutch on the compressor, whereupon the radiator fan cuts in and the AC fan relay (155) is energized; the AC fan (172) now also cuts in. The anti-frost thermostat (171) makes and breaks the circuit to the electromagnetic clutch, according to the surface temperature of the evaporator fins.

Pressure switch (166) breaks the circuit if the pressure in the system falls below 2.1 kgf/cm^2, which will happen if there is an insufficient quantity of refrigerant in the system or if the temperature of the ambient air falls below 0.5°C (33°F). The thermostatic switch (39) breaks the circuit if the temperature of the coolant exceeds 115°C (239°F). This is mainly to ensure that adequate cooling of the engine is maintained. Microswitch (167) injection engines only breaks the circuit if the throttle butterfly opens through more than 70. This switches off the compressor to prevent power being lost on acceleration.

An idling speed adjustment device (142) is connected in parallel with the circuit to the electromagnetic clutch injection engines only. The device consists of a solenoid valve which boosts the supply of air to the inlet manifold. Air recirculation is selected manually by means of a switch (143) on the instrument panel. Current is supplied to the switch (169). Switch (143) energizes the solenoid valve (38), which is located on the right-hand wheel arch, and controls the recirculated air shutter.


Elsystem, Clarion årsmodell 1984
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