CONTENTS

HEATING AND VENTILATION SYSTEM (Non-Air Conditioned Cars)

Description 80.00.00

The car heating and ventilating system consists of selective ducting and a water-heated matrix through which fresh air can be forced, either by the passage of the car through the air or by twin, three-speed blower fans. The ducts channel air as required by the driver or passengers in front and rear compartments.

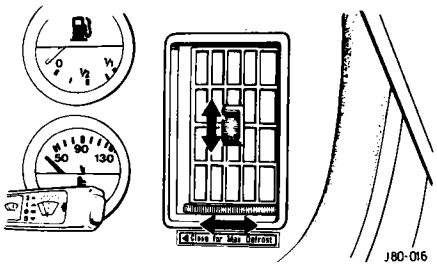


Fig. 1

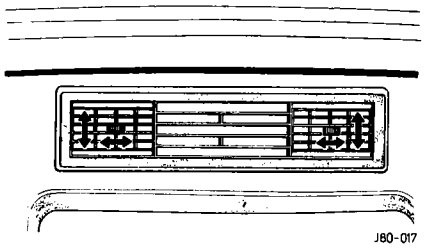


Fig. 2

Driver and Front Passenger Compartment (Fig. 1 and Fig. 2)

Face-level outlets (Fig. 1) at either end of the fascia may be opened or closed manually and adjusted for direction of delivery.
A face-level outlet (Fig. 2) is located in the centre of the fascia, the end sections of which can be adjusted for direction of delivery.
One outlet at each side of the centre console directs air into front footwells.

Windscreen

Non-adjustable vents, situated at the base of the windscreen, provide demisting and defrosting.

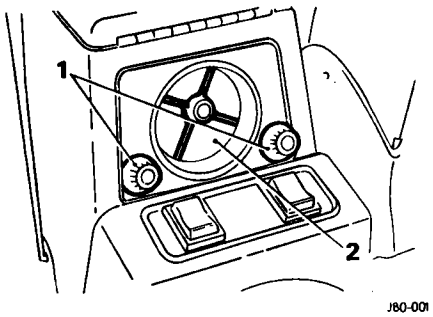


Fig. 3

Rear Passenger Compartment

Manually controlled louvred outlets (1, Fig. 3) direct air into each rear compartment footwell. A manually opened and closed directional outlet (2, Fig. 3) is located in the rear of the console.

Heater Controls (Fig. 4)

All heater controls are operated either by vacuum supplied by the engine or by mechanical linkage. With the engine switched off, a supply tank will provide sufficient vacuum for approximately six complete operations.

The control switches operate as follows:

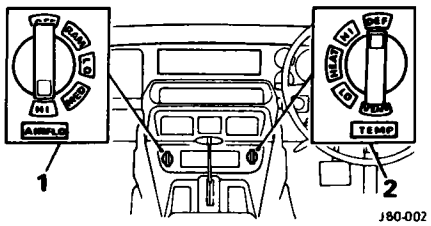


Fig. 4

Left-Hand Switch (Airflow symbol) (1, Fig. 4)

OFF

When the switch is set in this position the heating and ventilating system is inoperative.

RAM

When the switch is set in this position, air is forced into the car by its forward movement, then routed and heated as determined by the position of the right-hand switch, 'TEMP'.

LOW—MED—HIGH

When the switch is set to the 'HIGH' position, the blower fans rotate at a high speed to boost the air flow into the car. A resistor is switched into the blower fan circuit when the switch is moved to the 'MED' position therefore reducing the rotation speed of the fans. An additional resistor is switched in the fan circuit when the switch is moved to the 'LOW' position reducing the fan speed further.
The temperature of the air flow into the car is determined by the right hand 'TEMP' switch position.

Right-Hand Switch 'TEMP' (2, Fig. 4)

VENT

When the switch is set to this position, unheated fresh air is delivered from the face-level outlets across the fascia, at a delivery rate determined by the position of the left-hand switch. Individual outlets can be controlled as required. Movement of the knurled control knob beneath each of the side fascia outlets can be used to regulate airflow.
A small proportion of the airflow is bled to windscreen outlets for demisting.

LOW

When the switch is set to this position the hot water supply to the heater matrix is switched on and the centre fascia outlet is closed. A flap is positioned to deliver air at the minimum temperature. The airflow is distributed as follows:

a. Most of the air is delivered to the footwell outlets and the rear compartment.
b. A small proportion of the air is delivered to the fascia end outlets and to the windscreen.

DEF

When the switch is set to this position, air flow at maximum temperature is distributed 90% to windscreen and fascia end outlets and 10% to footwell and rear passenger compartment. The fascia end outlets may be aimed to defrost the side windows or closed to concentrate airflow at the windscreen.

Cold Weather

To obtain heating and demisting

a. Set the 'TEMP' control between 'LOW' and 'HIGH' to give the desired temperature, and allow a short period to elapse to permit the heater matrix to warm up.
b. Set the 'AIRFLOW' control to give the desired volume of air delivery.
c. Set the fascia end outlets as desired. For maximum demisting, close both outlets.
d. Set the rear compartment outlets as desired.

To obtain rapid demisting or defrosting

a. Set the 'TEMP' control to 'DEF' and allow a short period to elapse to permit the heater matrix to warm up.
b. Close the fascia end outlets, or direct them to defrost the side windows as required.
c. Set the 'Airflow' control to 'HIGH'.
d. Close the rear compartment outlets.

Hot Weather

To obtain fresh air ventilation

a. Set the 'TEMP' control to 'VENT'.
b. Set the 'Airflow' control to give desired volume of air delivery.
c. Set the fascia end and centre outlets as desired.
d. Set the rear compartment outlets as desired.

To obtain rapid demisting

a. Set the 'TEMP' control to 'LOW'.
b. Set the 'Airflow' control to 'HIGH'.
c. Close the fascia end outlets, or direct the air flow to the side windows if desired.
d. Close the rear compartment outlets.

The air delivered to the fascia and windscreen although warm, is always cooler than the air delivered to the footwell. The volume of air to the windscreen may be increased by closing both fascia end outlets.

HIGH

The temperature of the air delivered is progressively increased to a maximum as the switch is rotated to 'HIGH'. Airflow from the fascia end and windscreen outlets is always cooler than that delivered to the footwell.

HEATER CONTROLS

Remove and refit **80.10.02**

Removing

Disconnect the battery earth lead.
Remove the centre console as detailed in operation 76.25.01.
Remove two bolts, two nuts and associated shakeproof washers (1, Fig. 5) securing mounting plate to heater unit.
Remove three screws (2, Fig. 5) securing vacuum switches to mounting plate.
Note positions of vacuum pipes and disconnect from switches.
Remove circlips and locking rings (3, Fig. 5).
Remove mounting plate from studs.
Note position of cables and pipes on vacuum switch, and micro-switches before disconnecting.
To change micro-switch(es), remove secure screws and nuts as necessary.

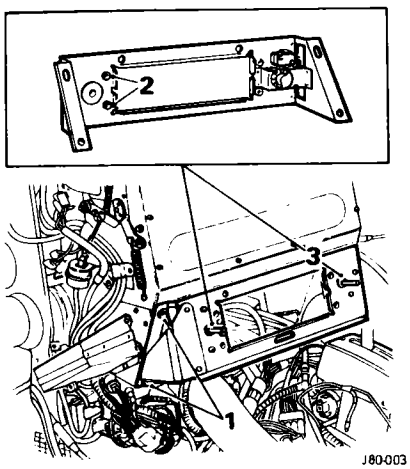


Fig. 5

NOTE: Ensure replacement switches are of correct pattern.

To change vacuum switch remove two screws securing mounting bracket.

Refitting

Refit mounting plate to studs.
Refit circlips and locking rings.
Reconnect the vacuum pipes to their correct positions on switches, and refit the three screws securing the vacuum switches to mounting plate.
Secure mounting plate to heater unit with the fixing nuts and bolts.
Refit the centre console.
Reconnect the battery.

HEATER TEMPERATURE CONTROL CABLE ASSEMBLY

Remove and refit **80.10.05**

Removing

Disconnect the battery earth lead.
Remove the centre console as detailed in operation 76.25.01.
Remove right-hand dash liner as detailed in operation 76.25.02.
Remove nut and setscrew (1, Fig. 6) securing radio/heater controls mounting panel to heater unit R.H. side.
Remove four drive screws (2, Fig. 6) securing R.H. footwell outlet duct.
Remove three drive screws (3, Fig. 6) securing R.H. footwell and rear outlet assembly.

NOTE: One screw is located behind control mounting panel and will require use of a right-angle star-headed screwdriver.

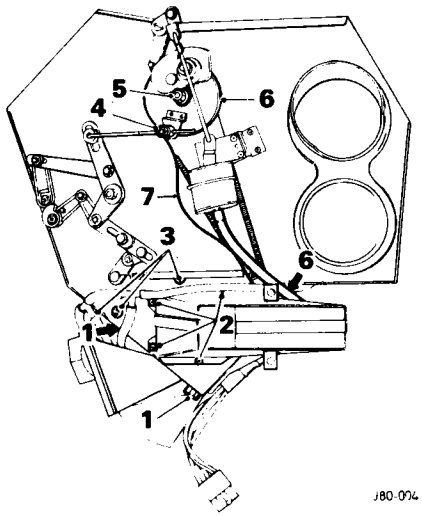


Fig. 6

Select 'VENT' position, loosen flap link operating rod locking nut (4, Fig. 6) on nylon wheel and cam assembly.
Remove nut and washer (5, Fig. 6) from the pivot of the nylon wheel and cam assembly.
Lift jockey pulleys against spring tension and remove main drive wheel (6, Fig. 6) from its fulcrum.
Ease radio/heater control panel and R.H. footwell outlet assembly away from heater unit.
Remove Bowden cable (7, Fig. 6) by releasing locking screw on driving bollard and removing nipples from main driving wheel.

continued

Refitting

Fit replacement cable to the pulley so that the cable is wound round the pulley 2½ times, i.e. when looking at the setscrew locking the pulley, three strands of wire should be seen.
Ensure that at least two strands pass below the locking washer, but do not tighten at this stage.
With temperature control knob in 10 o'clock position, and cable passing round jockey pulleys such that upper strand leaving bollard passes around forward pulley, stretch cable ends to fullest extent horizontally. Adjust cable until nipples are level with each other.
Tighten the locking screw, ensuring that the turns of cable are secured beneath the washer.
Fit nipples into main drive wheel, ensuring cable ends do not cross.
Refit radio/heater control panel and R.H. footwell outlet assembly to heater unit.
Holding the wire taut, refit the main driving wheel.

NOTE: It may be necessary to lift the jockey pulleys to accomplish this. The upper cooling flap driving lever must also be pushed upwards to allow the wheel to be located on its shaft.

Rotate the main driving wheel and the right-hand control knob so that when the control knob is at heat position (9 o'clock) the main driving wheel is at the position shown.
Tighten the locking screw on the driving pulley.
Reset flap operating mechanism as laid down in procedure for flap link adjustment in general section.
Refit and secure the right-hand footwell outlet duct.
Refit nut and screw securing radio/heater controls panel to heater unit.
Refit right-hand desk liner and the centre console.
Reconnect the battery.

HEATER WATER VALVE

Remove and refit **80.10.16**

Removing

Drain coolant from system, see operation 26.10.01.

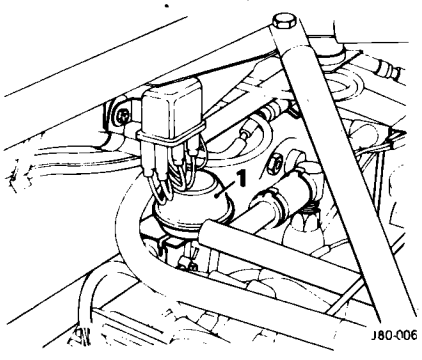


Fig. 7

NOTE: Conserve coolant if anti-freeze is in use.

Release hose clips and withdraw the hose from the unit.
Remove vacuum tube from connector and detach the unit (1, Fig. 7).

Refitting

Attach the unit and reconnect vacuum tube to the connector.
Refit hose and tighten the clip.
Refill the system with coolant.

NOTE: Water valves are sealed units and must be replaced if faulty.

AIR DIRECTION BOX REMOTE CONTROL

Remove and refit—Left- and Right-Hand **80.10.31**

Removing

Withdraw two screws and one shrouded nut securing the parcel shelf.
Remove the shelf.
Withdraw two screws (1, Fig. 8) securing the control handle assembly.
Unclip operating arm (2, Fig. 8) from the control handle assembly.

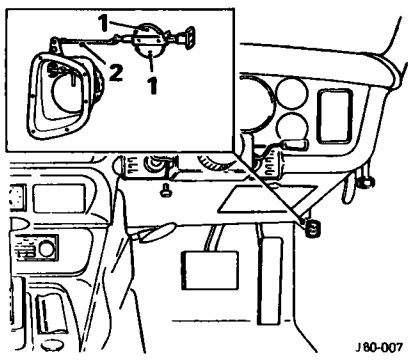


Fig. 8

Refitting

Reclip the operating arm to the control handle assembly.
Refit the two screws securing the control handle assembly.
Refit the shelf and secure with two screws and a shrouded nut.

AIR DIRECTION BOX

Remove and refit—Left- and Right-Hand **80.10.32**

Removing

Remove the air direction box remote control, see operation 80.10.31.
Remove the lower body side front trim pad, see operation 76.13.01.
Withdraw five screws (1, Fig. 9) securing the air direction box.
Remove the air direction box (2, Fig. 9).

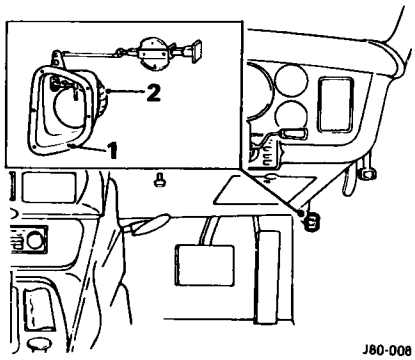


Fig. 9

Refitting

Refit the air direction box and secure with the five fixing screws.
Refit the lower body side front trim.

DEMISTER FLAP AND ACTUATOR ASSEMBLY

Remove and refit **80.10.37**

Removing

Remove the crash roll, see operation 76.46.04.
Remove two nuts (1, Fig. 10) securing the assembly to screen rail.
Disconnect the plastic ducting (2, Fig. 10) from assembly.
Disconnect vaccum tube (3, Fig. 10) from the actuator.
Lift assembly (4, Fig. 10) away from screen rail.

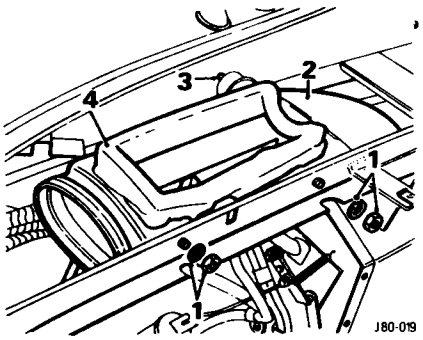


Fig. 10

Refitting

Locate assembly on to screen rail.
Reconnect vacuum tube and plastic ducting to the assembly.
Refit the two nuts to secure the assembly to the screen rail.
Refit the crash rail.

FLAP LINKAGE

Adjust **80.10.41**

In order to obtain correct adjustment of the heater mechanism the following procedure should be adopted.
Turn temperature control knob (1, Fig. 11) to vent.
Slacken locking screws, 'A', 'B' and 'C'.
Rotate lever 'R' (2, Fig. 11) into fully clockwise position and hold in place using firm finger pressure. Tighten locking screw 'A'.
Press lever operating flap 'N' (3, Fig. 11) to fully clockwise position using finger pressure and tighten.
Turn temperature control knob to defrost.
Using a screwdriver placed in slotted end of adjusting link (4, Fig. 11), apply pressure in order to push lever operating flap 'Q' into fully clockwise position. Tighten locking screw 'B'.
Check that detent loads at either ends of knob travel are acceptable. If not, some adjustment is possible by adjusting position of driving link pivot in lever 'R'. However, this should not normally be necessary.

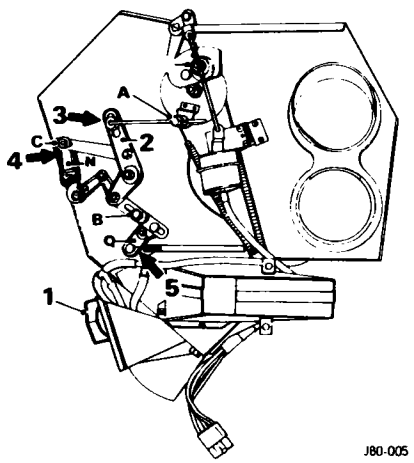


Fig. 11

The eccentric pivot on upper flap actuating cam is adjustable through about 180°.
This gives an adjustment of upper level temperature of 10°C in mid heat position.
Turning nut clockwise increases face-level temperature, turning it anti-clockwise reduces face-level temperature. With eccentric pivot in mid position and with R.H. knob in horizontal position, there should be a gap of about 6,35 mm (0.25 in) between flap and body of unit. This can only be checked with upper ducting removed.

DEMISTER DUCT OUTLETS

Remove and refit **80.15.02**

Removing

Insert blade of narrow thin tool between edge of demister outlet grille and surround (1, Fig. 12). Carefully lever apart. Grille and surround are retained in place by nylon friction bushes (2, Fig. 12).

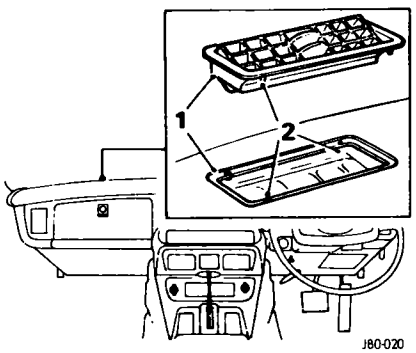


Fig. 12

Refitting

Place surround and grille in position and press firmly.

VENTILATOR (REAR)

Remove and refit **80.15.10**

Removing

Lift the console glovebox lid and remove two screws (1, Fig. 13) securing lid retaining bar.
Withdraw the three screws (2, Fig. 13) securing hinge plate to glovebox.
Withdraw three screws (3, Fig. 13) securing glovebox liner.
Insert hand under glovebox liner and grip bayonet locking ring (4, Fig. 13) of air vent assembly. Exert pressure on front of vent assembly and rotate anti-clockwise until locking ring releases.
Remove air vent assembly (5, Fig. 13).

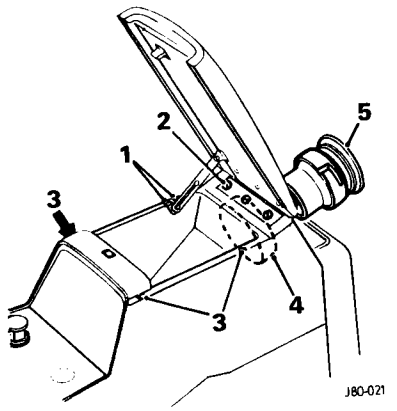


Fig. 13

Refitting

Refit the air vent assembly; secure by exerting pressure and rotating the locking ring until locked in position.
Fit the three screws to secure glovebox liner.
Fit the three screws securing the hinge plate to glovebox.
Lift the console glovebox lid and fit the two screws securing lid retaining bar.

VENTILATOR FASCIA OUTLETS

Remove and refit **Left 80.15.22**
Right 80.15.23

Removing

Before carrying out the above operation it will be necessary to remove the fascia as detailed in operation 76.46.01.
Disconnect the battery earth lead.
Unclip outlet at rear of fascia.
Withdraw outlet assembly (1, Fig. 14) from ducting and fascia.

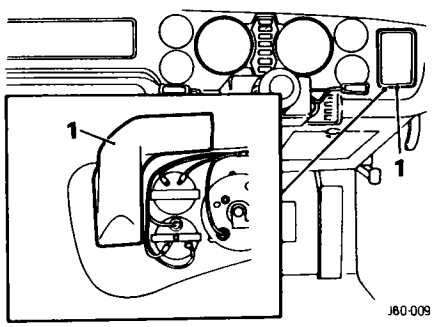


Fig. 14

Refitting

Insert the outlet assembly into ducting and fascia.
Reclip the outlet assembly.
Refit the fascia.
Reconnect the battery.

VENTILATOR FASCIA OUTLET (CENTRE)

Remove and refit **80.15.24**

Removing

Before carrying out the above operations it will be necessary to remove the fascia as detailed in operation 76.46.01.
Disconnect the battery earth lead.
Withdraw the four retaining screws and remove the outlet assembly.

Refitting

Refit the outlet assembly and secure with the four retaining screws.
Refit the fascia.
Reconnect the battery earth lead.

FRESH AIR INTAKE

NOTE: With air conditioning fitted but inoperative, fresh air will not be available at fascia adjustable outlets with fans switched ON.
Fascia outlets will only deliver air at the selected temperature.

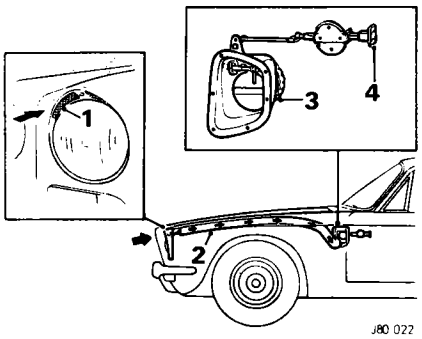


Fig. 15

An additional fresh air supply is available to driver and passenger. A grille located in the outer headlamp embellisher (1) admits air which is ducted via the wings (2) to outlets in the scuttle side panels (3) beneath the parcel tray. These outlets are controlled by a three-position lever marked 'PULL AIR' (4). The louvre outlets can be rotated to direct air as required.
Airflow will depend upon the speed at which the car is moving and position of selector level.

FRESH AIR INTAKE

Remove and refit Scuttle **80.15.29**

Removing

Insert screwdriver under edge of intake and carefully lever away from nylon friction bush. Take care not to damage the paintwork.
Disconnect windscreen washer capillary tube from washer jet.

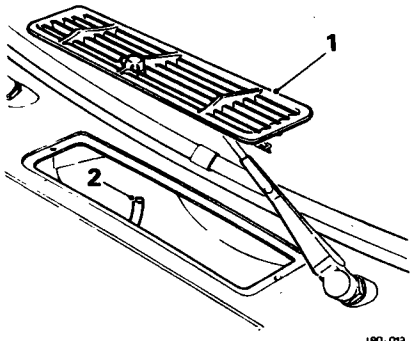


Fig. 16

Refitting

Reconnect the windscreen washer capillary tube from the washer jet and carefully replace the grille.

FRESH AIR INTAKE

Remove and refit **80.15.29**

Removing

Remove the headlamp as detailed in operation 86.40.02.
Withdraw screw (1, Fig. 17) retaining intake grille.
Clear grille of road dirt, insects etc.

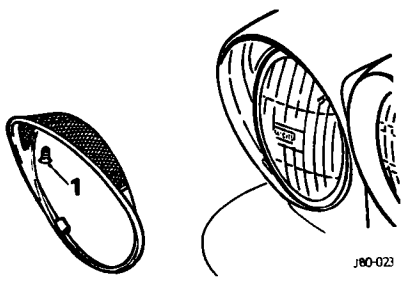


Fig. 17

Refitting

Refit headlamp embellisher and secure with retaining screw.

HEATER UNIT

Remove and refit **80.20.01**

Removing

Disconnect the battery.
Drain the coolant from system.

NOTE: Conserve the coolant if anti-freeze is in use.

Remove the fascia crash roll, and fascia.
Remove the driver's and passenger's dash casings.
Remove the glove compartment liner.
Remove the centre parcel shelf and centre console assembly.
Disconnect the coolant hoses at heater matrix bulkhead connectors in engine compartment.

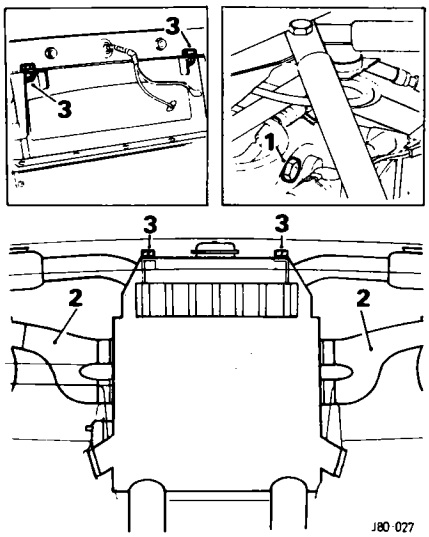


Fig. 18

NOTE: Retain the sponge collars from the stub pipes.

Remove the two nuts securing unit to the bulkhead (1, Fig. 18).
Locate the vacuum connectors and mark clearly before disconnecting.
Remove the flexible ducting from the heater unit (2, Fig. 18).
Disconnect the cable harness multi-pin connectors.
Remove the bolts securing the unit to the fascia rail. Ease the unit forward and lift from car (3, Fig. 18).

NOTE: Transmission selector should be in '1' position on automatic cars, or 4th, 2nd or Reverse gear on manual gearbox cars.
CAUTION: Great care must be exercised when lifting unit not to damage relay box. The unit must not be supported on these components.

Refitting

Offer unit up to mounting position and ease heater connectors through bulkhead apertures.

NOTE: Ensure sponge backing is in position.

Loosely fit retaining nuts, ensuring that pipes, speedometer cables and electrical harness are not trapped before tightening.
Refit the flexible ducting to the heater unit.
Reconnect the vacuum pipes as marked when dismantling.
Reconnect the electrical multi-pin connectors.
Ensure drain tubes from the unit are located through the grommets in side of transmisssion tunnel.
Refit the centre parcel tray.
Refit the glove compartment liner.
Refit the dash casings.
Refit the fascia and the fascia crash roll.
Reconnect the coolant hoses to the heater matrix bulkhead connectors in the engine compartment.

NOTE: Ensure sponge collars and metal washers are in place before connecting coolant hoses.

Refill with coolant.
Reconnect the battery earth lead.

HEATER MOTOR ASSEMBLY

Remove and refit
Right-Hand Unit 80.20.15

The blower fans are heavy duty motors with metal impellers attached. Speed variation is controlled by resistance units wired in series. Air flow control flaps are operated by a vacuum actuator mounted on the side of the inlet duct.

Removing

Disconnect the battery earth lead.
Remove the right-hand footwell trim pad, dash liner and console side pad as detailed in operation 76.46.11.
Remove the bulb failure unit from component panel.
Remove nuts securing component panel to blower assembly, and ease the panel clear.
Disconnect pliable trunking from the heater unit stub pipes.
Withdraw two screws securing fresh-air pull mounting bracket.
Remove two nuts retaining assembly from mounting posts.
Disconnect vacuum tube from actuator.
Disconnect electrical harness at snap connectors.
Ease fan motor assembly from car.

Refitting

Locate fan motor unit to its mounting positions.
Reconnect the electrical wiring harness.
Fit and tighten securing nuts.
Remove wedge holding the recirculation flap open.
Reconnect the pliable trunking to the stub pipes and the vacuum tube to the actuator.
Locate component panel to mounting studs and secure with securing nuts.
Refit the fresh-air pull mounting bracket.
Refit the bulb failure unit.
Refit the console side pad, dash liner and footwell trim pad.
Reconnect the battery earth lead.

NOTE: To refit assemblies successfully it is necessary to apply vacuum to the actuator, closing the top air flap. This simplifies insertion of the top flap and flange into its aperture and seal.

HEATER MOTOR ASSEMBLY

Remove and refit
Left-Hand Unit 80.20.15

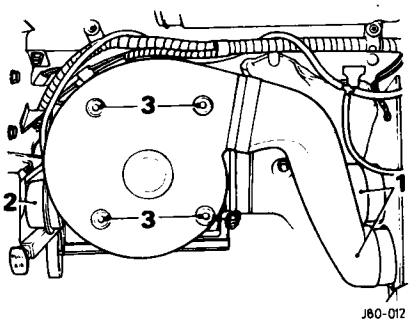


Fig. 19

Removing

Disconnect the battery earth lead.
Remove left-hand side footwell trim pad, dash liner, console trim pad, and glovebox as detailed in operation 76.46.11.
Remove nuts securing component panel to blower assembly, and ease the panel clear.
Disconnect the electrical feed to blower motor.
Disconnect the pliable trunking from the heater unit (1, Fig. 19), and the vacuum pipes from the actuator (2, Fig. 19).
Remove the motor assembly securing nuts and ease assembly from car (3, Fig. 19).

Refitting

Locate assembly to its mounting positions and secure with nuts.
Reconnect the pliable trunking and vacuum pipes.
Reconnect the electrical wiring harness.
Locate component panel to mounting studs and secure with the fixing nuts.
Refit the glovebox, dash liner, console trim pad, and footwell trim pad.
Reconnect the battery earth lead.

MOTOR RESISTANCE UNIT

Remove and refit
Left-Hand-Drive Cars 80.20.17

Removing

Disconnect the battery earth lead.
Remove the driver's side dash liner, and centre console side casing as detailed in operation 76.46.11.
Note position of cables at the resistance unit and disconnect (3, Fig. 20).
Withdraw the three retaining screws (1, Fig. 20) and remove resistance unit from the heater unit case (2, Fig. 10).

Refitting

Locate resistance unit into heater unit case and secure with the retaining screws.
Reconnect the electrical cables.
Refit the centre console side casing and dash liner.
Reconnect the battery earth lead.

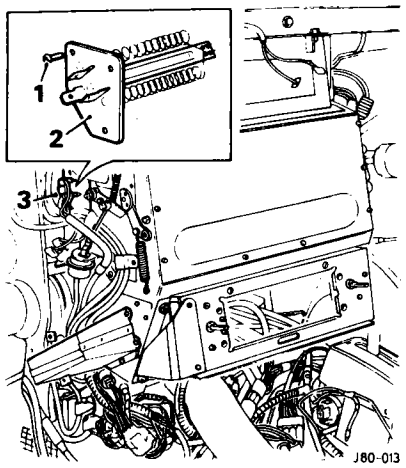


Fig. 20

MOTOR RESISTANCE UNIT

Remove and refit
Right-Hand-Drive Cars 80.20.17

Removing

Disconnect battery.
Remove glove compartment liner.
Note position of cables at the resistance unit and disconnect.
Withdraw the three retaining screws; and remove the resistance unit from the heater unit case.

Refitting

Locate resistance unit into heater unit case, and secure with the retaining screws.
Reconnect the electrical cables.
Refit the glove compartment liner.
Reconnect the battery.

continued

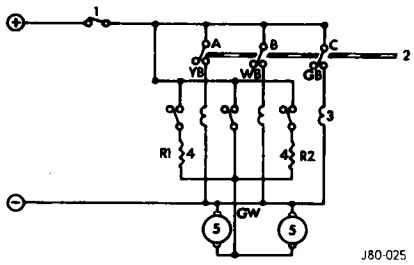


Fig. 21

KEY TO WIRING DIAGRAM

1. Ignition switch
2. Cam operated switches
3. Relays—motor speed
4. Resistors—motor speed
5. Fan motors

MOTOR RELAYS

Remove and refit **80.20.19**

Removing

Disconnect the battery earth lead.
Remove the left-hand centre console side casing.
Withdraw the retaining screws and remove the footwell air outlet duct.
Note and mark the position of cables at the connectors on relay box, and remove the cables (1, Fig. 22).
Remove the nuts and washers securing the relay box, and remove relay box (2, Fig. 22).

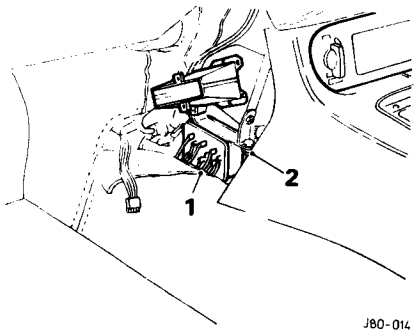


Fig. 22

Refitting

Fit and secure relay box with the retaining nuts and washers.

NOTE: Ensure earth strap tag is replaced under relay box securing unit.

Reconnect the electrical cables.
Refit the footwell air outlet duct, and left-hand centre console side casing.
Reconnect the battery.

BLOWER ASSEMBLY

Overhaul **80.20.20**

Dismantling

Remove blower motor assembly as detailed in operation 80.25.13/14.
Pull down air recirculation flap for access to flap box securing screw, and remove screw.
Remove screws securing flap box at top of motor housing (1, Fig. 23).
Disconnect motor electrical connections (2, Fig. 23)
Remove the flap box.

NOTE: It is recommended at this stage that the positions of various components are marked either with paint or a scriber. This will facilitate reassembly.
One cable Lucar has a raised projection which matches the aperture in the motor casing. This ensures that the connections are replaced correctly and the rotation of the motor is not altered.
Remove the bolts securing the motor mounting bracket to fan housing (3, Fig. 23).
Remove the motor and fan assembly from the fan housing.
Remove the mounting bracket from the motor.
Using the appropriate Allen key, remove the impeller fan from the spindle.

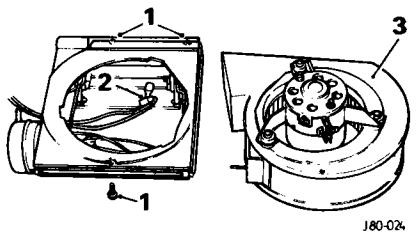


Fig. 23

Reassembling

Refit fan to the motor and secure to spindle.
Refit mounting bracket to motor.
Locate fan and mounting assembly into the fan housing
Fit and tighten bolts securing the assembly to fan housing.
Place flap box assembly to fan housing and reconnect electrical connections.
Fit and tighten screws securing the flap box to the housing.
Raise the recirculation flap, fit and tighten the remaining screw.
Refit the blower motor assembly.
Reconnect the battery.

HEATER MATRIX

Remove and refit **80.20.29**

Removing

Remove the heater unit as detailed in operation 80.20.01.
Using scriber or a thin brush and white paint mark the positions of all control rods, knobs and cams.
Disconnect tensioning springs from the heater matrix control flap operating arms.
Disconnect the operating rods.
Remove the two clips securing the inlet and outlet pipes to the heater unit case.
Withdraw six screws securing matrix cover-plate.
Withdraw one screw securing the cam and operating arm to footwell outlet flap shaft and remove arm.
Withdraw the heater matrix from side of heater unit with a steady straight pull. Care must be taken not to damage the inlet and outlet pipes.

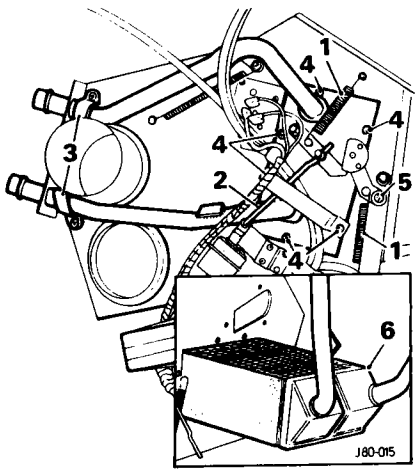


Fig. 24

Refitting

NOTE: Ensure that the sponge shock-absorbing pads are refitted correctly when replacing the matrix.
Refit the matrix into heater unit, taking care not to damage the inlet and outlet pipes.
Secure the cam and operating arm to footwell outlet flap shaft with the retaining screw.
Refit the matrix cover-plate and secure with the fixing screws.
Secure the inlet and outlet pipes to the heater unit with clips.
Reconnect the operating rods.
Reconnect the tensioning springs to the heater matrix control flap operating arms.
Refit the heater unit.

DEFROST AND DEMIST SYSTEM

Test **80.30.01**

Purpose

To ensure that the heating system is functioning correctly in the 'defrost' mode, and that adequate airflow is maintained in the heat mode to ensure that the windscreen remains mist-free.

Method

a. Set L.H. control to fan speed 'High'.

b. Set R.H. control to 'Defrost'.

c. Close end of dash outlets.

d. Start engine and run for seven minutes at 1500 rev/min.

e. During the running period measure the airflow from each screen outlet using checking ducts and velometer. Ensure that the centre dash outlet is closed and that it seals satisfactorily. The velocity from the screen outlets should be:

7,62 m/s (1500 ft/min) (minimum)

f. Also during the running period turn the R.H. control to 'Heat' and open end of dash outlets. Using the screen outlet and end of dash checking ducts measure the resulting air velocity. These should be:

Minimum velocity			
Screen		End of dash	
2,29 m/s	450 ft/min.	3,30 m/s	650 ft/min

g. At the end of seven minutes running at 1500 rev/min check that the water temperature gauge indicates 'Normal'. Using mercury in glass thermometers also check that the following minimum screen outlet temperatures are achieved.

Plenum Inlet		*Screen Outlet (minimum)*	
°C	°F	°C	°F
10	50	54	129.2
12	53.6	55	131
14	57.2	55.5	131.9
16	60.8	56.5	133.7
18	64.4	57	134.6
20	68	58	136.4
22	71.6	58.5	137.3
24	72.5	59.5	139.1

HEATER UNIT

Test **80.30.05**

1. Warm up and heat pick-up on vent and water valve operation.
   Turn the R.H. knob to 'Vent' and the L.H. knob to 'High'.
   Start the engine and warm up, run at 1000 rev/min. In this condition the inlet flaps should be open and the centre outlet flap open.
   With a thermometer placed in the air stream issuing from the centre vent, ensure that as the engine reaches normal operating temperatures, the air temperature does not rise above 5°C higher than it was in the engine cold state.

2. **Defrost mode**
   Turn the R.H. knob to 'Defrost'.
   The centre vent should close as should the upper mixing flap. The airflow to the footwell will be cut off apart from a small bleed.
   At this point the defrost schedule can be operated if so desired. This will also check that the upper mixing flap is operating.

3. **Fan speeds**
   Check that high, medium and low speeds can be obtained by rotating the L.H. knob.

4. **Temperature range**
   By rotating the R.H. knob ensure that the air temperature changes between hot and ambient over the heating range.

5. **Ram and off**
   On the road check that air flows from the vent when the L.H. knob is in the 'Ram' position, but is cut off in the 'Off' position.

Equipment required: 16 mm (⅝ in) bore hose at least 1,6 m (5 ft) long.
Water supply controlled by tap.
One 2 gallon or 10 litre capacity container.
Stop watch.

NOTE: All tests must be completed with the engine cold, i.e. with the thermostats closed. Should the engine temperature rise sufficiently to open the thermostats, the engine must be stopped and allowed to cool before the tests are continued.

1. Drain coolant; conserve for refill.
2. Disconnect hose from heater matrix outlet stub pipe (this hose connects to water pump intake). Plug open end of hose.
3. Connect 16 mm (⅝ in) bore hose to heater stub pipe and place other end in 10 litre or 2 gallon container.
4. Refill cooling system with water, leaving hose from supply tap in header tank.
5. Start engine, run at 1000 rev/min with 'defrost' selected on heater control. Adjust water supply to keep header tank filled.
6. When water from heater matrix is free from air, measure time required to fill the 10 litre or 2 gallon container. Stop engine. If the time to fill a 1 gallon container is more than 1 min. 11 secs, or for a 10 litre container more than 1 min. 18 secs, heater matrix is obstructed and must be cleared as detailed below.
7. Disconnect hose pipe from heater matrix output stub pipe, unplug car hose and refit to stub pipe.
8. Add one pint of Ferroclene to header tank, top-up system with water and replace both filler caps.
9. Start engine and run at 1000 rev/min for 15 minutes.
10. Stop engine and drain.
    Continue flushing system for at least 30 minutes to remove all traces of Ferroclene which would otherwise cause internal corrosion.
11. Repeat operations 2 to 6 above. If necessary, repeat operations 7 to 10.
12. Refill, using coolant conserved in operation 1 above.

HEATING AND VENTILATING VACUUM SYSTEM

Description

The vacuum is supplied from the vacuum reservoir located in the engine compartment on the driver's side of the vehicle, adjacent to the brake servo.
Vacuum actuators operate the blower and centre flap ventilators, the flap in the screen vent, the rods connected to the upper cooling flap and the lower heater flap.
When the system is switched to 'VENT' the actuator on the right hand side of the heater unit operates to fully open the upper cooling flap. When 'LO' is selected a vacuum switch releases the holding vacuum and the flap actuating lever drops onto an operating cam. When 'VENT' is re-selected vacuum is re-applied and the flap re-opens.
The left hand actuator is operative in all positions except when in the defrost mode. In the positions the actuator is operative the lower heating flap is free to be controlled by a cam and peg on the right hand side of the heater unit.
The water valve is closed as vacuum is applied and no water flows through the heater matrix. When heat is selected (either high or low) the vacuum feed is removed from the water valve which opens to allow water to flow through the heater matrix.

VACUUM SYSTEM

Function

Air Flo Control: OFF
Temp Control: VENT

1. The vacuum switches on both controls are all on and will conduct vacuum.
2. The centre flap is opened as vacuum is applied.
3. The demist flaps are closed as vacuum is applied.
4. The blower motor casing air intake flaps are closed as vacuum is applied and no air transfer from the exterior to the interior of the vehicle can take place.
5. The right hand side vacuum actuator is operative. This operates to open the upper cooling flap.
6. The left hand side vacuum actuator is operative. The lower heating flap in this mode is controlled by a cam and peg on the right hand side of the heater unit. These operate the flap in all positions except defrost.
7. The water valve is closed as vacuum is applied and water will not circulate through the heater matrix.

Air Flo Control: RAM, LO, MED or HI
Temp Control: VENT

The vacuum switches on the right hand control are all 'On' and conducting vacuum to the relevant units.
The units are:

1. The flaps in the screen vents.
2. The vaccum actuators on both sides of heater unit are operative.
3. The water valve is closed as vacuum is applied and water will not circulate through the heater matrix.
4. The centre flap is opened as vacuum is applied.

The vacuum switch on the left hand control is 'Off' and not conducting vacuum. The actuators on the blower motor casing are relaxed. The spring tension therefore opens the flaps to allow ambient air to the interior of the vehicle.

Air Flo Control: RAM, LO, MED or HI
Temp Control: LO—HI

1. The vacuum switch on the left hand control is 'Off' and not conducting vacuum. The actuators on the blower motor casing are relaxed. The spring tension therefore opens the flaps to allow ambient air to the interior of the vehicle.
2. The vacuum switches on the right hand are 'Off'.
3. Vacuum will be removed from the centre flap and the flap will close.
4. Vacuum will be removed from the right hand side actuator and the upper cooling flap will close to a position where the nylon disc and cam will take over the closing operation. The nylon disc is fitted with an additional abutment rod and lever that holds the upper cooling flap cam follower firmly against the cam profile.
5. The vacuum applied to the water valve has been removed therefore the valve opens to allow water to circulate the heater matrix.

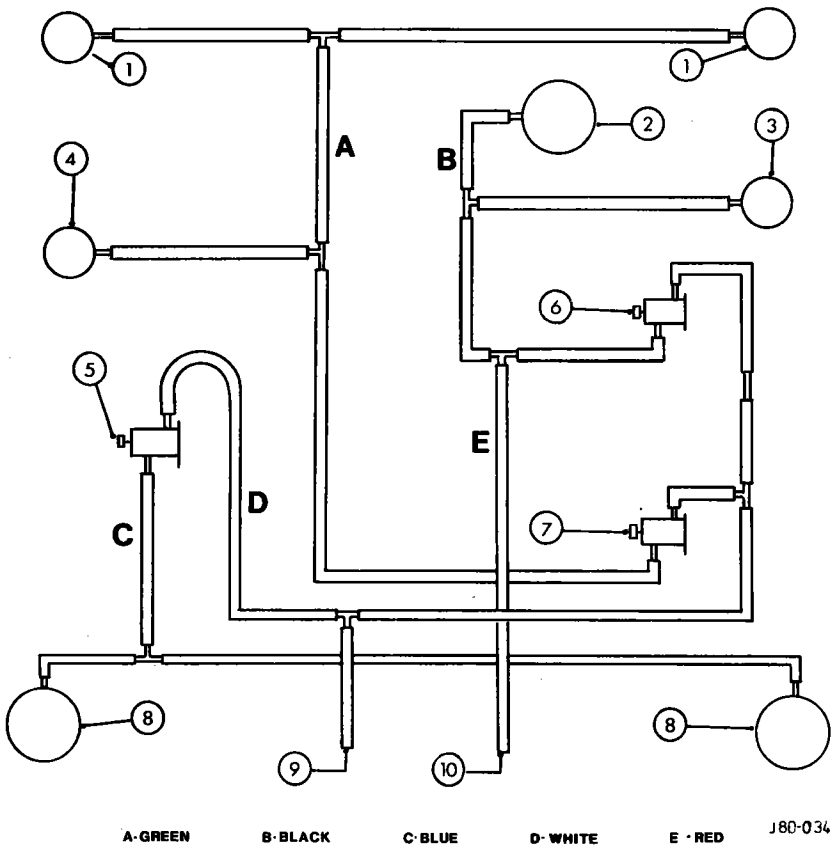
Air Flo Control: RAM, LO, MED or HI
Temp Control: DEF

1. In the 'DEF' mode vacuum is not applied to any of the actuators.
2. The centre flap is closed.
3. The vacuum actuator on the right hand side is inoperative and the upper cooling flap is closed.
4. The vacuum applied to the water valve has been removed therefore the valve opens to allow water to circulate the heater matrix.
5. The demist flaps to the screen are opened.
6. The vacuum actuator on the left hand side is inoperative and the lever attached to the lower heater flap is pushed upwards closing the flap. This overrides the action of the cam and peg on the right hand side of the lower heating pivot.

KEY TO VACUUM SYSTEM DIAGRAM

1. Demist flap actuator
2. Centre flap actuator
3. Actuator on the right hand side of heater unit
4. Actuator on the left hand side of heater unit
5. Switch on 'AIR FLO' control
6. Front switch on 'TEMP' control
7. Rear switch on 'TEMP' control
8. Blower flap actuator
9. To vacuum tank
10. To water valve actuator

HEATING AND VENTILATING VACUUM SYSTEM



CONTENTS

CONTENTS

WARNING: EXTREME CARE SHOULD BE EXERCISED IN HANDLING THE REFRIGERANT. LIQUID REFRIGERANT AT ATMOSPHERIC PERSSURE BOILS AT −29°C (−20°F). SERIOUS DAMAGE OR BLINDNESS MAY OCCUR IF REFRIGERANT IS ALLOWED TO CONTACT THE EYES.
Goggles and gloves must be worn while working with Refrigerant.

FIRST AID: If refrigerant should contact the eyes or skin, splash the eyes or affected area with cold water for several minutes. Do not rub. As soon as possible thereafter, obtain treatment from a doctor or eye specialist.

TORQUE LEVELS FOR THE AIR CONDITIONING HOSE CONNECTIONS

Item	Nm	Kgf.m	lbf.ft
1 Compressor/Condenser (Compressor End)	40.67 to 47.45	4.15 to 4.84	30 to 35
2 Condenser/Compressor (Condenser End)	28.47 to 36.30	2.90 to 3.73	21 to 27
3 Condenser/Receiver Drier (Condenser End)	20.34 to 27.12	2.10 to 2.76	15 to 20
4 Receiver Drier/Condenser (Receiver Drier End)	40.67 to 47.45	4.15 to 4.84	30 to 35
5 Receiver Drier/Evaporator (Receiver Drier End)	40.67 to 47.45	4.15 to 4.84	30 to 35
6 Evaporator/Receiver Drier (Evaporator End)	14.91 to 16.72	1.52 to 1.80	11 to 13
7 Expansion Valve/Evaporator (Expansion Valve End)	20.34 to 27.12	2.10 to 2.76	15 to 20
8 Evaporator/Compressor (Evaporator End)	28.47 to 36.60	2.90 to 3.73	21 to 27
9 Compressor/Evaporator (Compressor End)	40.67 to 47.45	4.15 to 4.84	30 to 35

SPECIAL TOOLS AND EQUIPMENT FOR SERVICING AIR CONDITIONING SYSTEM ON JAGUAR SERIES III

1 Pektron test unit
1 Charging station
1 Leak detector
1 Temperature test box
1 Compressor service tool kit
1 Setting jig for temperature differential control, 18G1363
1 Voltmeter
1 Ohmmeter

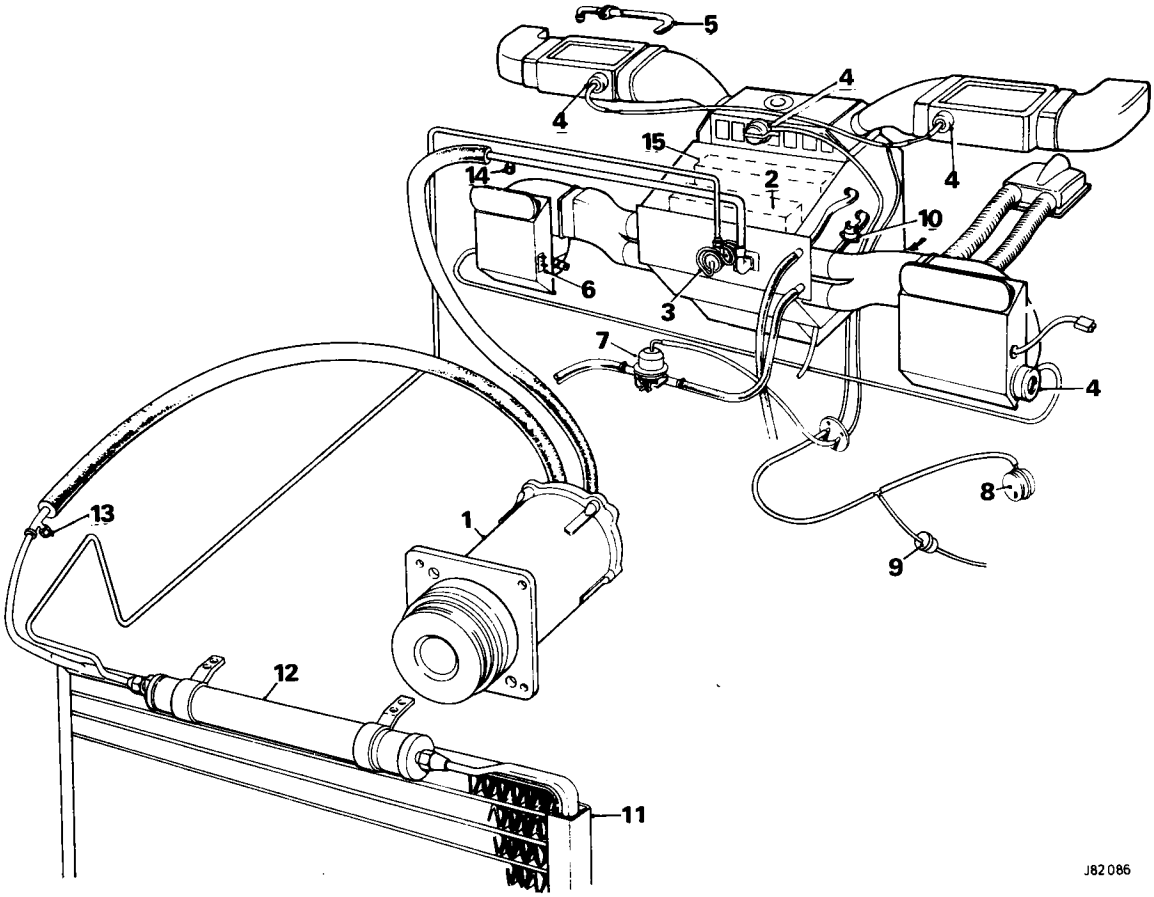


Fig 1

KEY TO COMPONENTS (Fig. 1)

1. Compressor
2. Evaporator
3. Expansion valve
4. Vacuum valve
5. In-car sensor
6. Ambient temperature sensor
7. Water control valve
8. Vacuum reservoir
9. Non-return valve
10. Water valve temperature switch
11. Condenser
12. Receiver-drier
13. High pressure schrader valve
14. Low pressure schrader valve
15. Heater matrix

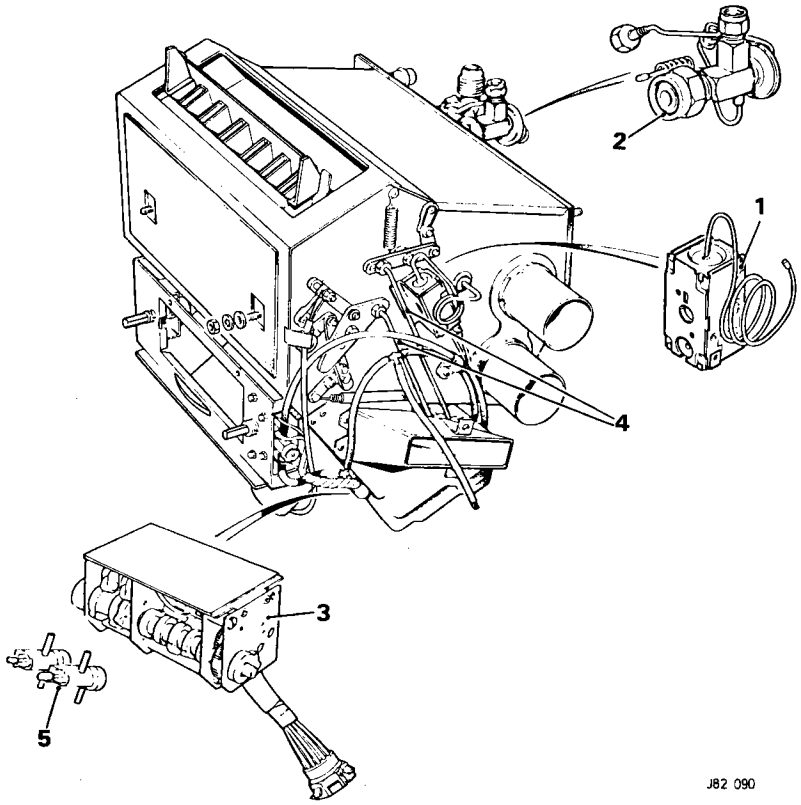


Fig 2

KEY TO COMPONENTS (Fig. 2)

1. Ranco thermostat
2. Expansion valve
3. Servo control unit
4. Control rod
5. Vacuum valve

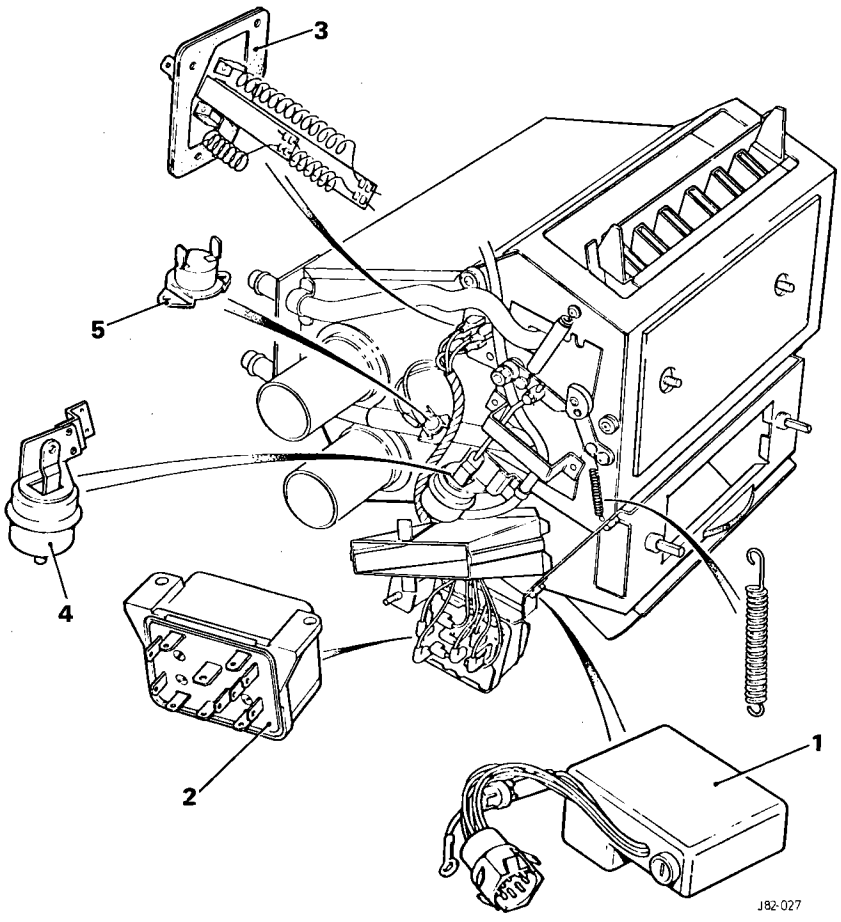


Fig 3

KEY TO COMPONENTS (Fig. 3)

1. Amplifier
2. Relays
3. Fan speed resistance
4. Vacuum actuator motor
5. Water thermostat

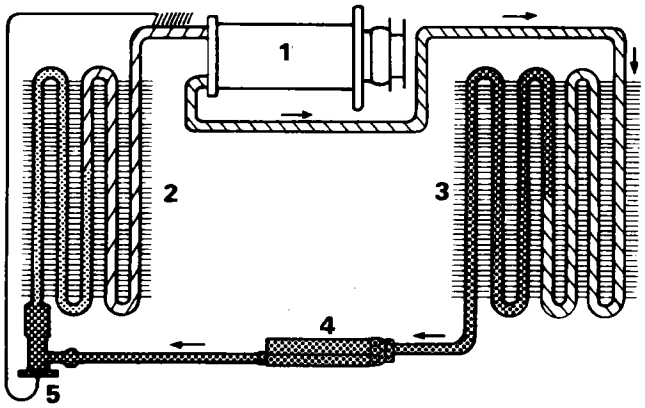


Fig 4

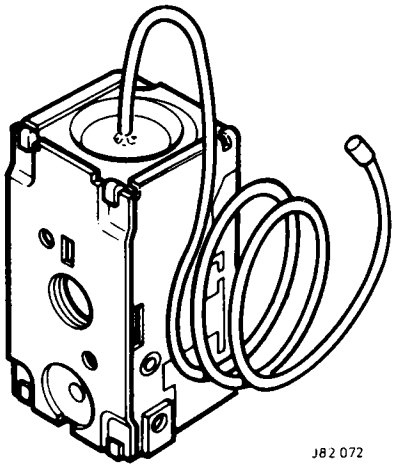


Fig 5

The switch breaks the electric feed to the compressor magnetic clutch winding and the refrigeration cycle ceases. When the evaporator matrix temperature rises above 2°C (33.8°F) the thermostat switch closes and the refrigeration cycle re-starts.

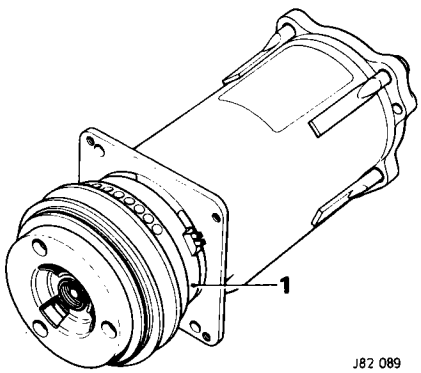


Fig 6

The magnetic clutch coil is mounted on the end of the compressor (1, Fig. 6) and the electrical connections are made to the coil terminals. The clutch permits the compressor to be engaged or disengaged as required for the air conditioning operation. When current passes through the clutch coil, the armature clutch plate assembly, keyed to the compressor shaft, is drawn rearwards against the belt driven pulley that is free wheeling upon the same shaft. This locks pulley and armature plate together to drive the compressor. When current ceases to flow, springs in the armature plate draw the clutch face from the pulley. The compressor comes to rest and the pulley continues to free wheel.

REFRIGERATION CYCLE

Description 82.00.00

A belt-driven compressor (1, Fig. 4) draws in superheated refrigerant vapour at low pressure and compresses it.

The pressure forces the refrigerant round the refrigeration system.

The pressurized refrigerant is forced into a condenser (3, Fig. 4) located in front of the engine cooling radiator. The condenser is a matrix of tubes surrounded by fins. The refrigerant vapour travelling inside the tubes gives up its heat to the air-flow through the condenser. With the heat removed the vapour condenses to a cool liquid. The dimensions of the condenser determine that further heat transference occurs and the liquid becomes sub-cooled. Complete condensation has occurred.

The sub-cooled refrigerant still under pressure is forced into a receiver/drier (4, Fig. 4). The receiver/drier has several functions. It is a reservoir for the liquid; a filter to remove any particles which would contaminate the liquid; and it contains a quantity of molecular sieve desiccant to soak up any moisture in the liquid. Moisture would impair the efficiency of the refrigerant and cause damage at a later stage. The clean 'dry' liquid now passes into an expansion valve (5, Fig. 4) located at the inlet to the air conditioning unit. The liquid refrigerant is metered by the expansion valve so that the correct quantity is allowed to an evaporator matrix (2, Fig. 4) located in the air-conditioning unit. The metering orifice of the expansion valve is protected by a gauze filter located in the inlet union. The size of the metering orifice is controlled by the temperature sensed by a capillary at the evaporator outlet. If the temperature of the outlet pipe falls, the expansion valve closes to cut down the flow of refrigerant to the evaporator. As the temperature of the outlet rises, a further quantity of refrigerant, metered by the expansion valve, enters the evaporator. The evaporator is a low pressure area so the refrigerant suddenly expands and the temperature drops. When the temperature falls below 0,6°C (33°F) it boils (i.e. vaporizes) and as any liquid requires a large amount of heat to change to vapour, the temperature of the evaporator matrix falls. Heat is taken from the air passing through the matrix on its way into the car.

Heat transfer continues until the vapour becomes low pressure super-heated vapour. The cycle recommences as the compressor draws in the super-heated low pressure vapour.

NOTE: Moisture from the cooled air passing over the fins of the evaporator condenses. The water is drained from the bottom of the evaporator by rubber tubes, and may form a pool of water under the vehicle when standing. This is normal and does not indicate a malfunction.

COMPONENT DESCRIPTION

RANCO THERMOSTAT

Ice formation on the evaporator fins due to moisture in the air is possible. Icing would damage the evaporator, so a thermostatic device to prevent this is fitted.

The Ranco thermostat (Fig. 5) is a temperature-operated switch which is normally closed in all functions and modes. It opens only when the temperature sensor capillary probe inserted in the evaporator matrix falls below 2°C (33.8°F).

It is important that the end of the capillary tube is inserted 10 cm and is in contact with the evaporator finning.

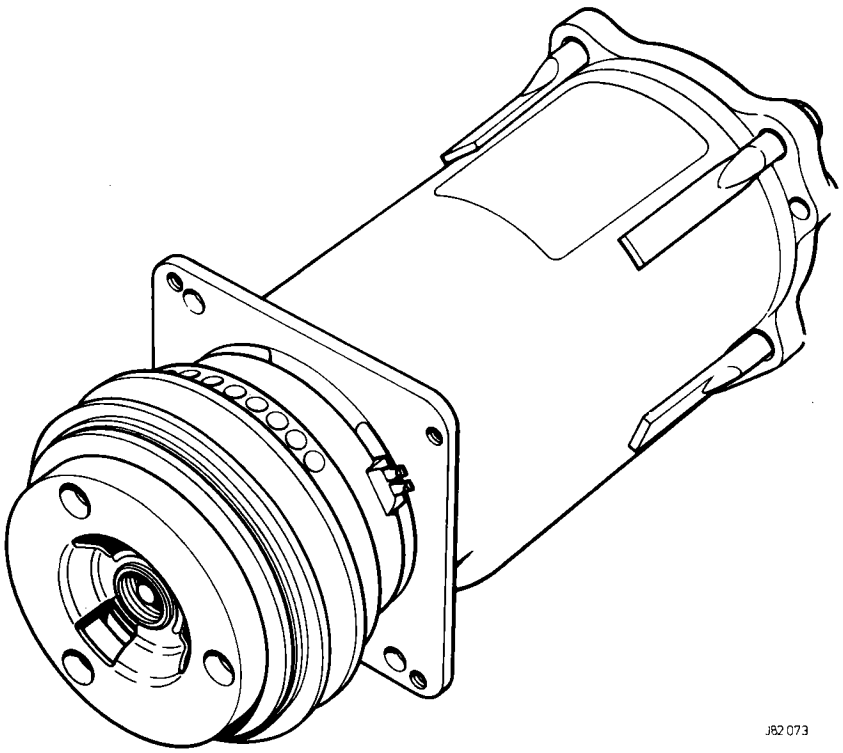


Fig 7

COMPRESSOR

The compressor (Fig. 7) is a six-cylinder, reciprocating piston type of special design in which three sets of double acting pistons are actuated by a swash plate on the compressor shaft so that the pistons move back and forth in the cylinders as the shaft is rotated. There are in effect three independent cylinders at each end of the compressor and reed valves are provided for each cylinder at both ends of the compressor. Internal 'cross-over' passages for suction and discharge are provided within the compressor so that the high and low service fittings on the rear end of the compressor control refrigerant flow to and from all the cylinders. A gear type oil pump located in the rear head provides for compressor lubrication.

CONDENSER

The condenser (Fig. 8) consists of a refrigerant coil mounted in a series of thin cooling fins to provide a maximum of heat transfer in a minimum amount of space. It is usually mounted directly in front of the car radiator so that it receives the full flow of RAM AIR. Ram air is the air flow induced by the forward motion of the car and the suction of the cooling fan.

The condenser receives heat laden high pressure refrigerant vapour from the compressor.

The refrigerant enters the inlet at the top of the condenser as a high pressure very hot vapour and as this hot vapour passes down through the condenser coils, heat will follow its natural tendency and move from the hot refrigerant vapour into the cooler ram air as it flows across the condenser coils and fins.

When the refrigerant vapour reaches the temperature and pressure that will induce a change of state a large quantity of heat will be transferred to the outside air and the refrigerant will change from a high pressure HOT VAPOUR to a high pressure WARM LIQUID.

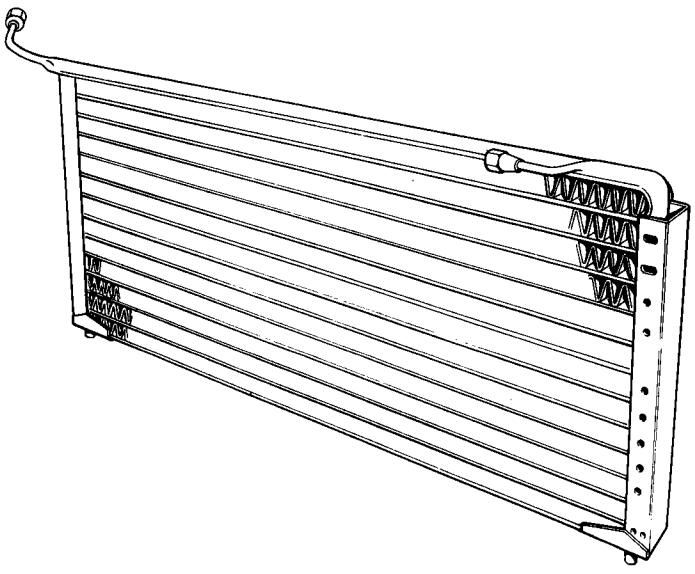


Fig 8

SIGHT GLASS

The sight glass located on the output side of the receiver-drier through which the refrigerant flows is used to indicate the condition of the refrigerant charge. A clear sight glass (Fig 9) normally indicates the system has a correct charge of refrigerant. It may also indicate the system has a complete lack of refrigerant, this will be accompanied by a lack of any cooling action by the evaporator. Also the system may be overcharged, this must be verified with test gauge readings.

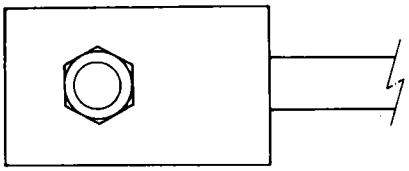


Fig 9

Foam or a constant stream of bubbles (Fig. 10) indicates the system does not contain sufficient refrigerant. Occasional bubbles when the system is first started is normal.

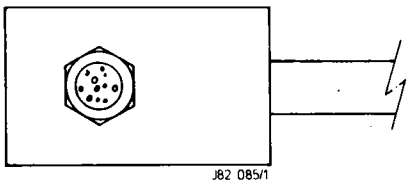


Fig 10

Foam or a heavy stream of bubbles (Fig. 11) indicates the refrigerant is very low.

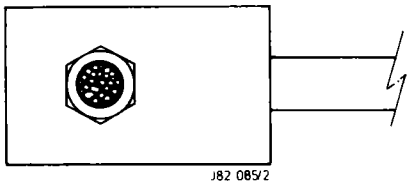


Fig 11

Oil streaks on the sight glass (Fig. 12) indicates a complete lack of refrigerant.

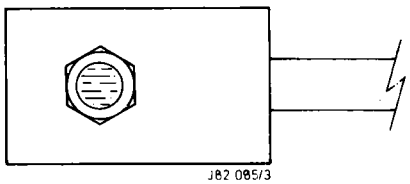


Fig 12

A cloudy sight glass (Fig. 13) indicates that the desiccant contained in the receiver-drier has broken down and is being circulated through the system.

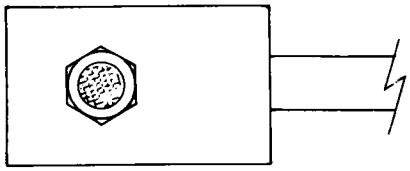


Fig 13

RECEIVER-DRIER

The receiver-drier (Fig 14) is a storage tank which receives the high pressure warm refrigerant liquid from the condenser through an inlet line and delivers the refrigerant to the thermostatic expansion valve through the outlet line. The receiver-drier has two separate functions:

Acts as a storage tank for liquid refrigerant since the amount of refrigerant required by the evaporator varies widely under the different operating conditions.

Contains a filter and desiccant to remove and retain foreign particles and moisture from the refrigerant which would be harmful to the system if allowed to circulate with the refrigerant.

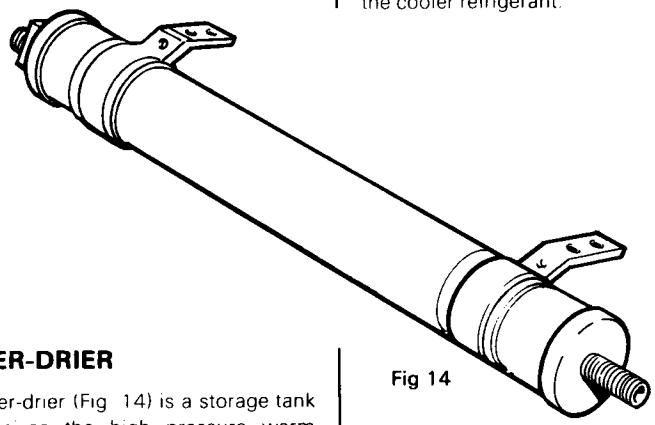


Fig 14

EVAPORATOR

The evaporator (Fig. 15) consists of a refrigerant coil mounted in a series of thin fins to provide a maximum amount of heat transfer in a mimimum amount of space. It is usually mounted in a housing under the cowl where warm air from the passenger compartment is blown across the coils and fins.

The evaporator receives refrigerant from the thermostatic expansion valve as a low pressure cold atomized liquid. As this cold liquid refrigerant passes through the evaporator coils, heat will follow its natural tendency and move from the warm air into the cooler refrigerant.

When the liquid refrigerant reaches a temperature and pressure that will induce a change of state, a large quantity of heat will move from the air into the refrigerant and the refrigerant will change from a low pressure COLD ATOMIZED LIQUID to a low pressure COLD VAPOUR.

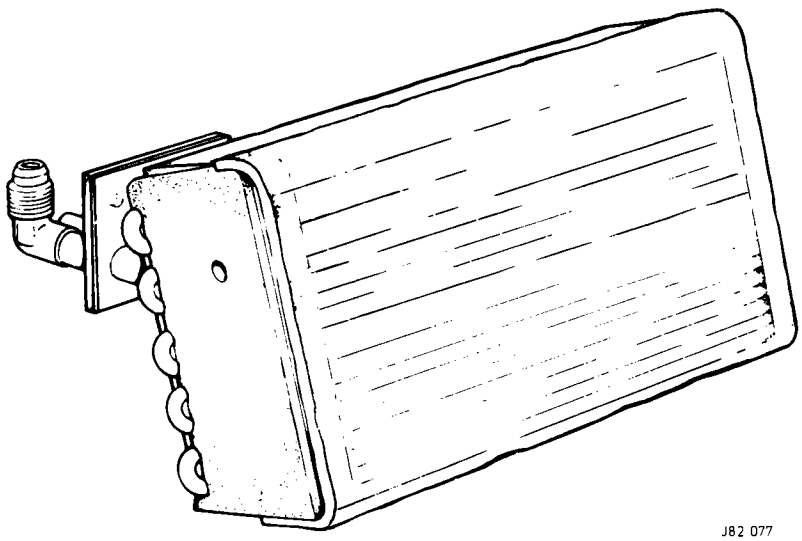


Fig 15

EXPANSION VALVE

The expansion valve (Fig. 16) is the dividing point between the high and low pressure sides of the system, and automatically meters the high pressure, high temperature liquid refrigerant through a small orifice, controlled by a metering valve, into the low presure, cold temperature side of the evaporator matrix. The refrigerant must be controlled to obtain the maximum cooling while assuring complete evaporation of the liquid refrigerant within the evaporator. To do this, the valve senses the outlet pipe temperature, the inlet pipe pressure, and increases or decreases the flow of refrigerant liquid to maintain the outlet temperature constant.

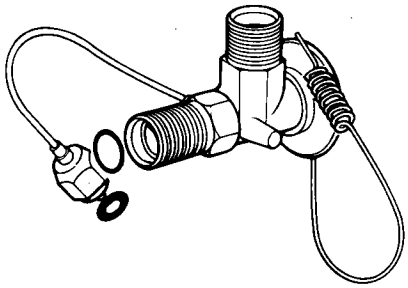


Fig 16 J82 078

The thermostatic expansion valve continually meters the exact amount of refrigerant required to supply some liquid refrigerant throughout the evaporator coil while ensuring that all of the refrigerant will be vapourized at the evaporator outlet. The refrigerant vapour then returns to the low (suction) side of the compressor.

AMPLIFIER

Automatic control is achieved by comparing car interior temperature and the temperature selected. This comparison provides an error signal to the air conditioning control unit, demanding an increase or decrease in car interior temperature. When the selected temperature is reached, the control unit will maintain it.

The error signal is detected across a Wheatstone Bridge circuit; two arms of which are fixed resistors, one arm contains the in-car thermistor and the fourth arm the temperature selection potentiometer. An error signal will be detected if car interior temperature is above or below that set on the temperature selection potentiometer. This signal is fed into the amplifier, (Fig. 17) amplified, and via relays, switches the servo motor to run clockwise or anti-clockwise. The position of the servo motor cam shaft directly determines the heating or cooling effect of the air conditioning system. Full heating and full cooling, are at opposite extremes of camshaft travel.

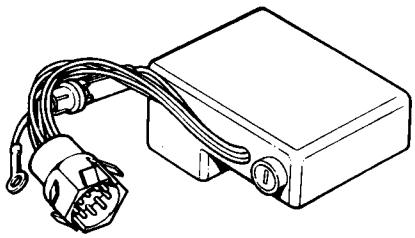


Fig 17 J82 079

The ambient thermistor in the Wheatstone Bridge circuit modifies the effect of the in-car thermistor. The result is a slightly colder interior temperature on hot days, and vice versa. A potentiometer driven by the servo motor is connected into the bridge circuit, modifying dynamic response. This provides control system damping, preventing excessive fluctuations in discharge air temperature.

4. Fresh/Recirculated Air — To improve performance the camshaft selects recirculated air on maximum cooling. Fresh air is selected for all other requirements.
5. Water Valve — On maximum cold, the camshaft controls a second vacuum switch to switch off the water valve controlling flow through the heater block.
6. Water Thermostat — A thermostat is fitted to prevent the system operating until engine water is hot enough to produce warm air. When on cooling mode the camshaft overrides this switch, and allows the system to operate immediately.
7. Evaporator thermostat — A thermostat is fitted to prevent icing of the evaporator. Under conditions where icing would be impossible and maximum cooling performance is required, the thermostat is overriden by the camshaft.

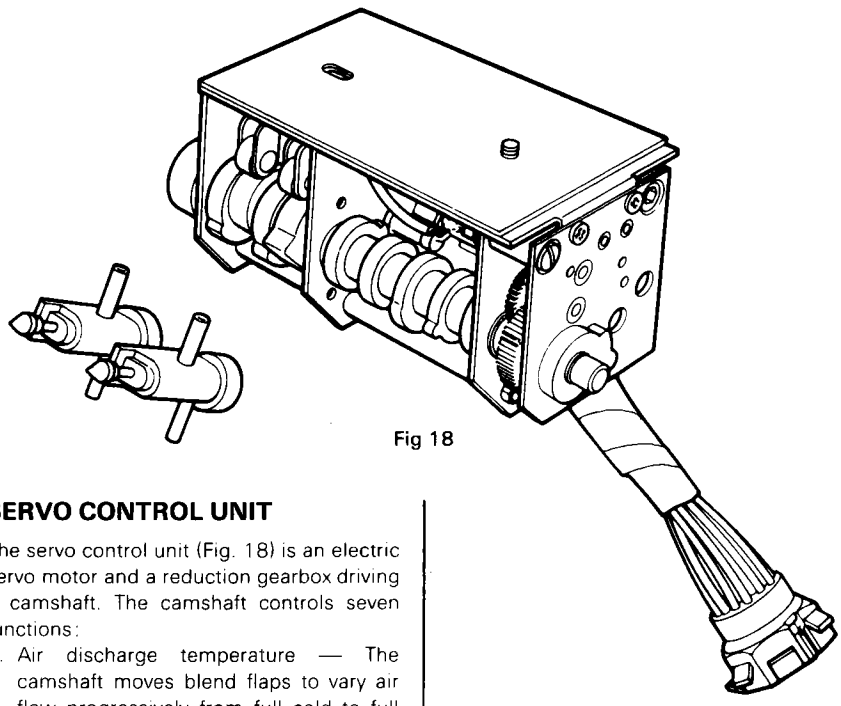


Fig 18 J82 080

SERVO CONTROL UNIT

The servo control unit (Fig. 18) is an electric servo motor and a reduction gearbox driving a camshaft. The camshaft controls seven functions:

1. Air discharge temperature — The camshaft moves blend flaps to vary air flow progressively from full cold to full heat. The cams are set to provide cooler air at head level, than to foot level, when the unit is in the low-medium heating mode. This prevents stuffiness at head level.
2. Fan speeds — The camshaft alters fan speed progressively to increase air flow at full cold or full heat positions. Four fan speeds are available on cooling, three on heating. On low heating or cooling the camshaft selects a low fan speed, preventing noise and excessive air movement.
3. Mode — The camshaft controls a vacuum switch so that the distribution of air in the car is automatically controlled by a vacuum operated flap. Cold air is distributed from the face level vents, and hot air is distributed mainly from foot level vents with a bleed of air from screen vents.

MANUAL CONTROLS

Temperature Selector

The left hand control (1, Fig. 19) is the potentiometer to select the temperature from 18°C (65°F) to 29°C (85°F) that is to be maintained automatically in the car.

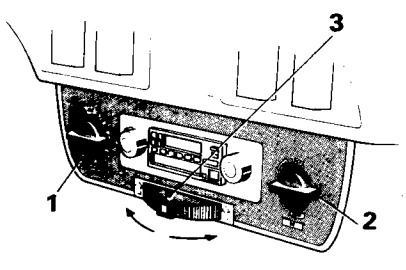


Fig 19 J82 093

MODE SWITCH

The right hand switch (2, Fig. 19) has five positions. When the switch is in the 'Off' position, the system is off and the fresh air intakes are closed. The 'Auto' position operates the system automatically. The high and low positions operate the fan high or low speed independently from that selected by the automatic control. The defrost position directs 90% of the air flow to the screen, closing the lower heater flap and opening the bleed flap to the screen outlets. At the same time, an additional resistor is switched into the Wheatstone Bridge circuit to ensure that the servo motor camshaft runs to full heat position.

Air Distribution Temperature Control

The thumbwheel (3, Fig. 19) can be used to alter the temperature of the air being distributed through the face level vents. It is most effective when the main controls are set at Auto and 75, and the system has been allowed to stabilise. To increase the temperature of the air being delivered through the vents, move the thumbwheel to the right; this will open the upper heater flap, allowing the increased air temperature to the face level vents. To decrease the air temperature, move the thumbwheel to the left; the upper flap will close and the air temperature to the vents will be lower.

METHOD OF TEMPERATURE VARIATION

Full Cooling

All air passes through the evaporator matrix in which the air is cooled and dehumidified. After leaving the evaporator, four blend flaps control the degree of heat added by the heater matrix. On maximum cooling, the cooler flaps are fully open and the heater flaps are fully closed. Cold air only flows into the car (Fig. 20). A larger area of the cooling matrix is exposed to the upper flap than is exposed to the lower outlets, and most of the cooling output is directed out through the centre face level grille.

A vacuum switch on the camshaft is closed so that the water valve closes to prevent hot water flowing to the heater matrix.

The water temperature thermostat is overridden in the cooling mode. (Water temperature thermostat prevents the fans operating before water reaches 40°C.)

The evaporator thermostat (Ranco) is overridden by the camshaft cam in this mode as normally full cooling is only required when ambient conditions would prevent the evaporator from icing up, i.e. hot days.

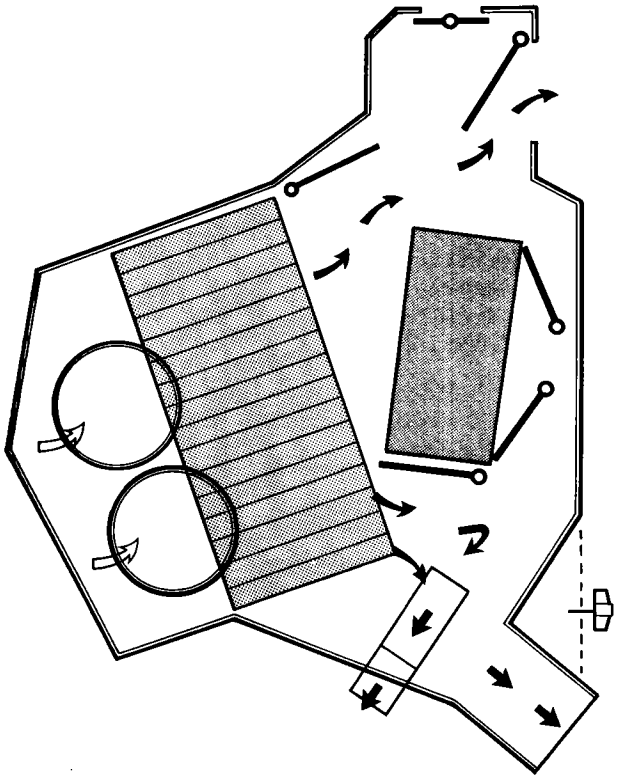


Fig 20 J82 081

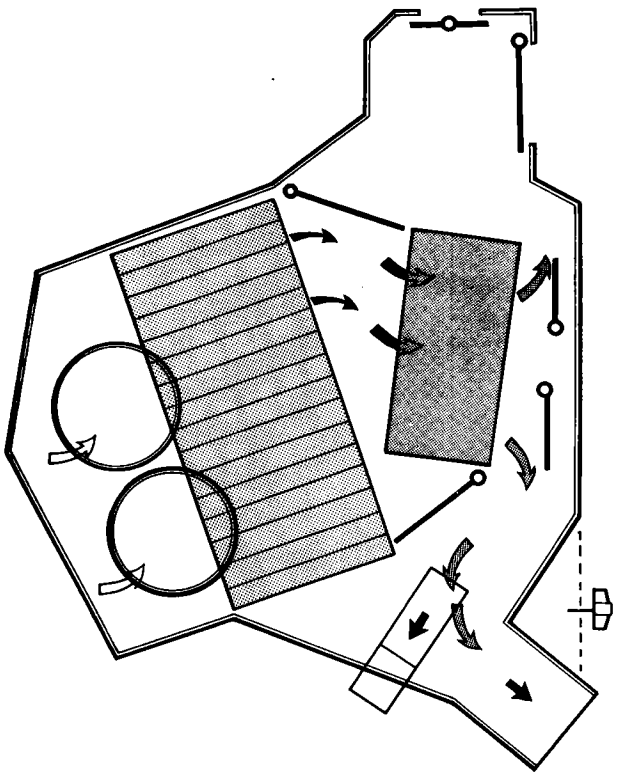


Fig 21 J82 082

Full Heating

When full heating is selected the camshaft moves to the full heat position. The camshaft mechanically operates the four flaps in the air conditioning unit so that the upper and lower cooling flaps are fully closed preventing cold air reaching the car interior direct. The heater flaps are fully open and the cool, de-humidified air blown through the evaporator now flows through the heater matrix and via the open heater flaps, to the screen rail end outlets and the front and rear footwells (Fig. 21).

The face level outlet is closed by the camshaft closing the vacuum switch so that no hot air is delivered from the centre face level output. 90% of all air passing through the unit now passes out of the front and rear footwell outlets.

NOTE: Screen outlets are only open in defrost mode, although a slight air bleed is permitted for defrost purposes.

Air Blend

The system automatically maintains any temperature selected, irrespective of external ambient conditions by blending hot and cold air to maintain the temperature selected. Both heating and cooling flaps are progressively positioned so that the correct blend is obtained.
The illustration (Fig. 22) shows possible positions the flaps could adopt to give correct in-car temperature. It can be seen that both heating and cooling flaps are in operation.

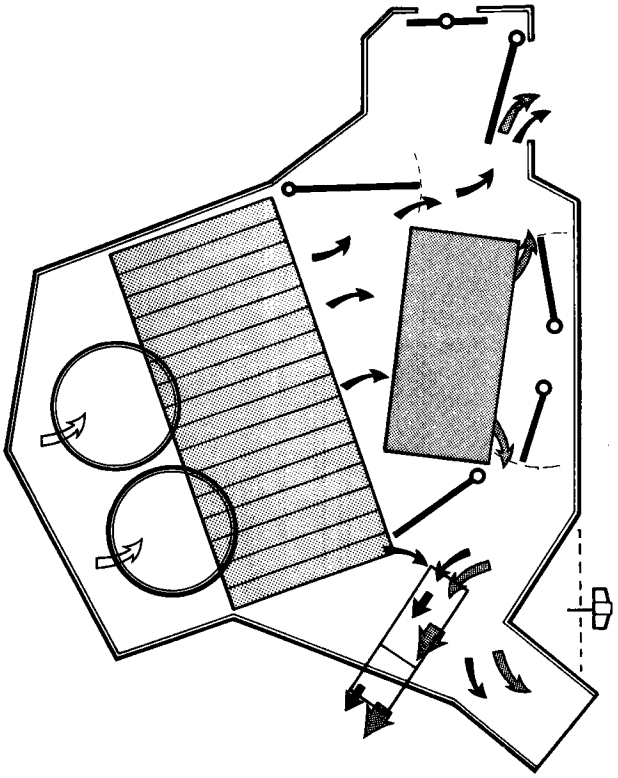


Fig 22 J82 083

Defrost

When defrost is selected the camshaft will travel to full heating. The vacuum switch on the right hand control will be closed to vacuum allowing the defrost flaps to open to pass air on to the windscreen. The left hand actuator will relax and allow the lower heating flap to close to direct 90% of all air through the unit to the windscreen (Fig. 23).

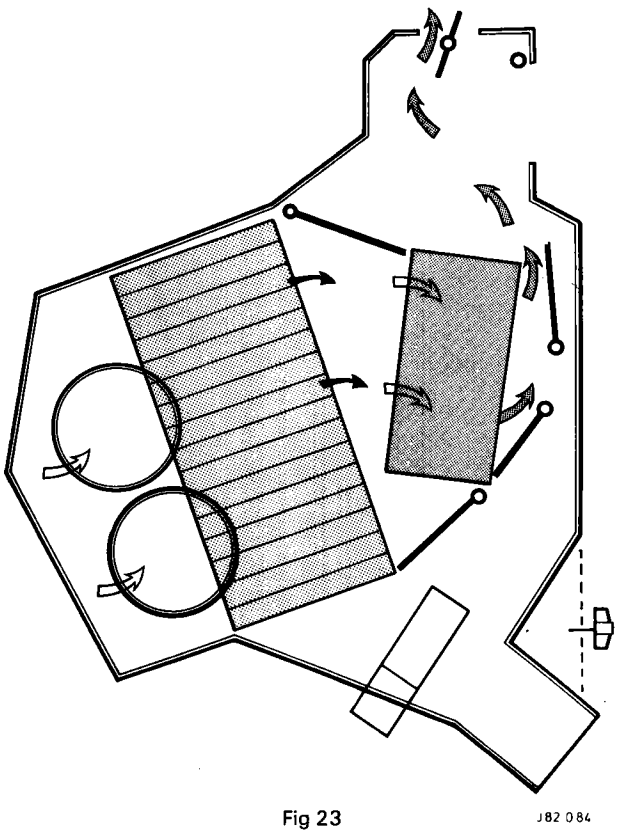


Fig 23 J82 084

GENERAL SECTION

This section contains safety precautions, general information, good practice and standards that must be followed when working upon the air conditioning system. A fault-finding and rectification section is included

Safety precautions

The air conditioning equipment is manufactured for use only with Refrigerant 12 (dichlorodifluoromethane) and extreme care must be taken NEVER to use a methyl-chloride refrigerant

The chemical reaction between methyl-chloride and the aluminium parts of the compressor will result in the formation of products which burn spontaneously on exposure to air, or decompose with violence in the presence of moisture. The suitable refrigerant is supplied under the following trade names

Freon 12, Arcton 12; Isceon 12

or any refrigerant to specification 12.

Goggles and gloves must be worn while working with the refrigerant.

WARNING: EXTREME CARE SHOULD BE EXERCISED IN HANDLING THE REFRIGERANT. LIQUID REFRIGERANT AT ATMOSPHERIC PRESSURE BOILS AT −29°C (−20°F). SERIOUS DAMAGE OR BLINDNESS MAY OCCUR IF REFRIGERANT IS ALLOWED TO CONTACT THE EYES.

FIRST AID: If refrigerant should contact the eyes or skin, splash the eyes or affected area with cold water for several minutes. Do not rub. As soon as possible thereafter, obtain treatment from a doctor or eye specialist.

Good practice

1. The protective sealing plugs must remain in position on all replacement components and hoses until immediately before assembly.
2. Any part arriving for assembly without sealing plugs in position must be returned to the supplier as defective.
3. It is essential that a second backing spanner is always used when tightening all joints. This minimises distortion and strain on components or connecting pipes
4. Components must not be lifted by connecting pipes, hoses or capillary tubes
5. Care must be taken not to damage fins on condenser or evaporator matrices. Any damage must be rectified by the use of fin combs
6. Before assembly of tube and hose joints, use a small amount of clean new refrigerant oil on the sealing seat.
7. Refrigerant oil for any purpose must be kept very clean and capped at all times. This will prevent the oil absorbing moisture.
8. Before assembly the condition of joints and flares must be examined Dirt and even minor damage can cause leaks at the high pressure encountered in the system.
9. Dirty end fittings can only be cleaned using a cloth wetted with alcohol.
10. After removing sealing plugs and immediately before assembly, visually check the bore of pipes and components Where ANY dirt or moisture is discovered, the part must be rejected
11. All components must be allowed to reach room temperature before sealing plugs are removed. This prevents condensation should the component be cold initially
12. Before finally tightening the hose connections ensure that the hose lies in the correct position, is not kinked or twisted, and will not be trapped by subsequent operations, e.g. closing bonnet, refitting bonnet.
13. Check that the hose is correctly fitted in clips or strapped to the sub-frame members
14. The Frigidaire compressor must be stored horizontally and sump down. It must not be rotated before fitting and charging Do not remove the shipping plate until immediately before assembly Always use new 'O' ring seals beneath union housing plate, and in those pipe joints which incorporate them.
15. Components or hoses removed must be sealed immediately after removal.
16. After a system has been opened the receiver/drier must be renewed.

Before commencing checks, run the engine until normal running temperature is reached This ensures that sufficient vacuum is available for tests. For cooling tests the engine must be running for the compressor clutch to operate.

SPECIAL TOOLS AND EQUIPMENT FOR SERVICING AIR CONDITIONING SYSTEM ON JAGUAR SERIES III

1 Pektron test unit
1 Charging station
1 Leak detector
1 Temperature test box
1 Compressor service tool kit
1 Setting jig for temperature differential control, 18G1363.
1 Voltmeter
1 Ohmmeter

The Pektron Climatic Control tester (Fig. 24) is recommended for testing the air conditioning electrical system.

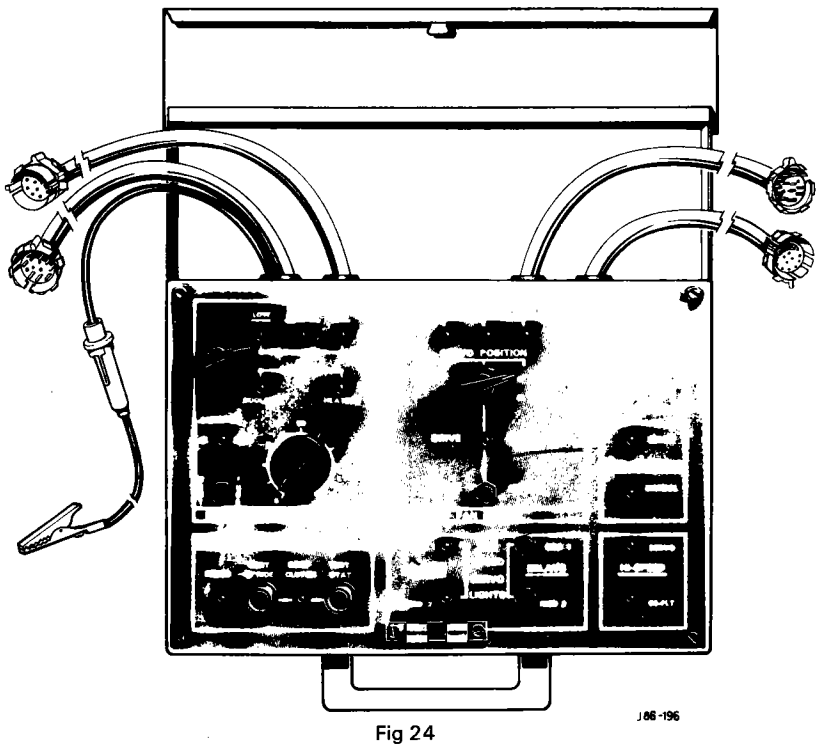


Fig 24

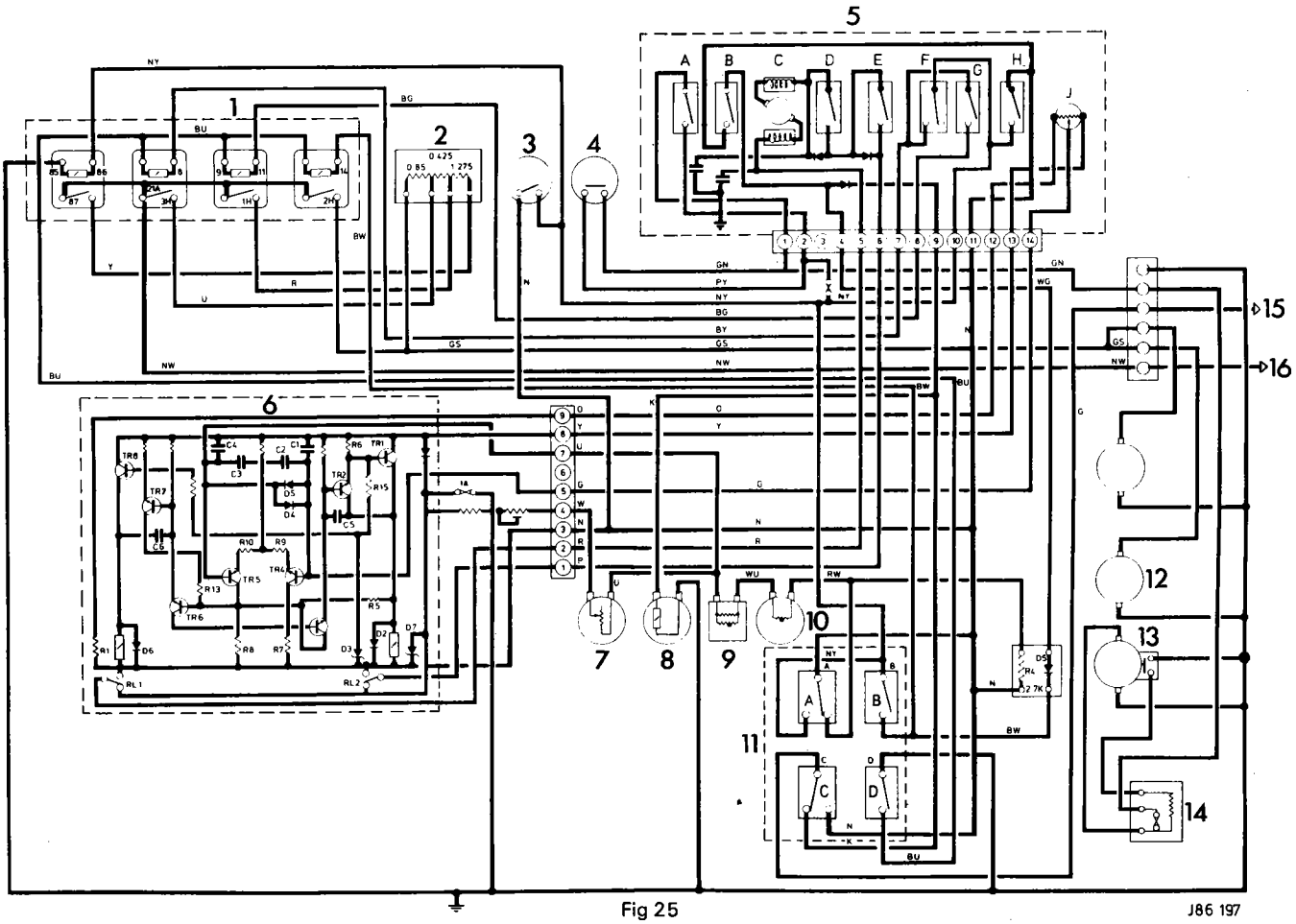


Fig 25 J86 197

KEY TO DIAGRAM

1. Blower motor relay
2. Blower motor resistor
3. Water temperature transmitter
4. Thermostat
5. Servo
6. Amplifier
7. Temperature selector
8. Vacuum valve
9. Ambient sensor
10. In-car sensor
11. Mode control switch
12. Blower motors
13. Compressor clutch
14. Thermal fuse
15. To fuse
16. To fuse

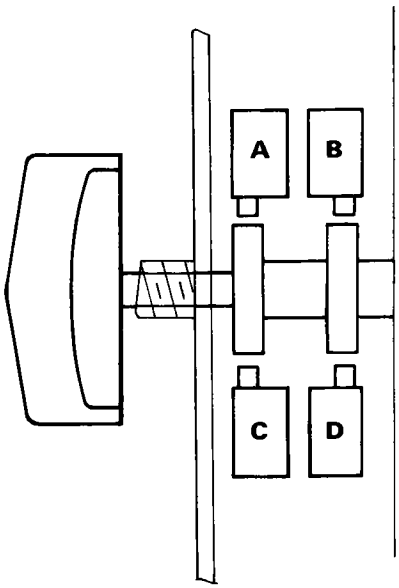
KEY TO SERVO UNIT (5, Fig. 25)

A Thermo override
B Recirc & Highspeed
C Servo motor
D Cool limit switch
E Heat limit switch
F Med 1 switch
G Med 2 switch
H Temperature bypass switch
J Feedback potentiometer

Mode switch functions (11, Fig. 25)

	Micro switch	Off	Lo	Auto	Hi	Def
A	Defrost	NC	NC	NC	NC	NO
B	High Speed	NO	NC	NO	NC	NC
C	On/Off	NO	NC	NC	NC	NC
D	Low Speed	NO	NO	NC	NC	NC

NC = Normally Closed
NO = Normally Open



MODE CONTROL J86-195
Fig 26

KEY TO MODE CONTROL

A Defrost micro switch
B High speed micro switch
C Low speed micro switch
D On/off micro switch

AIR CONDITIONING SERVO UNIT

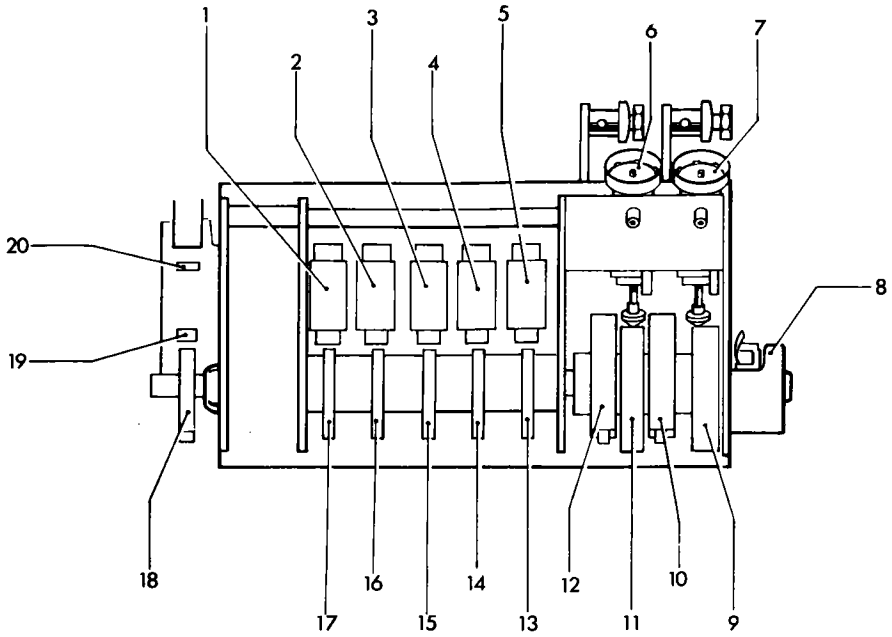


Fig 27

KEY TO SERVO UNIT

1. Full cooling micro switch
2. Full heating micro switch
3. Med 1 micro switch
4. Med 2 micro switch
5. Temperature override micro switch
6. Water valve vacuum switch
7. Centre flap vacuum switch
8. Feedback potentiometer
9. Cam S9
10. Cam S8
11. Cam S7
12. Cam S6
13. Cam S5
14. Cam S4
15. Cam S3
16. Cam S2
17. Cam S1
18. Cam S10
19. Ranco override micro switch
20. Recirculate Hi Speed switch

Test Procedure

Allow coolant temperature to stabilize to ambient by not running the engine for at least two hours, and open all of the vehicle windows for this period.

Set the car mode control to off, and the temperature selector to approximately the ambient temperature in the vehicle. Ensure that the ignition is switched off, then disconnect the plug at the servo control unit. Insert the tester 15 way socket into the servo input and join the harness socket to the tester 15 way plug.

Disconnect the plug and socket at the amplifier. Insert the tester 12 way socket into the amplifier input, and join the harness to the tester 12 way plug. Connect the tester earth lead to a good earth on the vehicle. Carry out the following operations and note the effects.

ACTION	EFFECT	WHEN INCORRECT
A Switch on Car Ignition	'VAC SOLENOID MANUAL' will illuminate. No other lights 'ON'	Check Ignition Supply. Fuse, etc. Ensure that A/C Mode Control is 'OFF'. Check Wiring to Vacuum Solenoid
B Start the Car Engine and switch car mode Control to LOW. Then switch SERVO POSITION to HEAT and press the DRIVE CONTROL until the DRIVE INDICATOR goes out. (Note: It only comes ON when DRIVE CONTROL is Pressed)	1 The Fan Speed $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ lights should be ON for Servo Position	If the DRIVE INDICATOR did not light, switch SERVO POSITION to COOL and press the DRIVE CONTROL. When this also does not light the DRIVE INDICATOR check the SERVO motor and servo components and wiring
	2 The vehicle cooling fans should be OFF	Ensure that the engine is not yet warmed up, then disconnect the water temperature switch in the car, and if fans continue to run suspect wiring and the Micro Switch Water Temp. override in the Servo Control Unit (5, Fig. 27).
	3 The VAC SOLENOID MANUAL lights should go out.	Check Switch C in mode control unit (Fig. 26) and wiring

ACTION	EFFECT	WHEN INCORRECT
C. Run the car engine fast to warm up the cooling water to working temperature	1. The fans will start to run at low rate and the SERVO MED 1 light will operate (FAN SPEED SERVO LIGHT) The majority of air will be directed through the floor vents	Check water temperature switch Check low speed relay Check blower resistors R1 & 2 Check fans Check wiring.
	2. The compressor clutch will operate as indicated by RANCO COMP. CLUTCH light	(A) Check 10A fuse, which if faulty will be indicated by the RANCO FUSED light being ON (B) Check Ranco thermostat by shorting out at the component terminals and monitoring the COMP clutch light.
D. Switch the SERVO POSITION to COOL and press DRIVE CONTROL until '$\frac{3}{4}$' light goes out then release.	MED 1 FAN SPEED SERVO light goes out.	Check MED 1 micro switch (3, Fig. 27) and wiring to SERVO Control Unit
E. Press DRIVE CONTROL until '$\frac{1}{2}$' light goes out then release.	The air emission is evenly distributed between face level and floor vents	Check adjustment of blend flaps, or vacuum system
F. Press DRIVE CONTROL until '$\frac{1}{4}$' light goes out then release.	MED 1 FAN SPEED SERVO light is 'ON'.	Check MED 1 micro switch (3, Fig. 27) and wiring to SERVO Control Unit.
G. Press DRIVE CONTROL until DRIVE INDICATOR goes out, then release.	HIGH SPEED SERVO light ON.	Check Hi-SPEED/RECIRC micro switch and wiring to SERVO Control Unit.
	COMP. CLUTCH light stays on when TEST O'RIDE switch is pressed.	Check ranco override micro switch (19, Fig. 27) and wiring to SERVO Control Unit.
	MED 2 FAN SPEED SERVO light is 'ON'	Check MED 2 Micro Switch (4, Fig. 27) and wiring to Servo Control Unit.
	VAC -SOLENOID SERVO light 'ON'.	Check Diode D3 in Servo control Unit harness
H. Switch car mode control to AUTO. Drive servo to '$_1$' position by selecting DRIVE CONTROL unit '$\frac{1}{4}$' and '$\frac{1}{2}$' lights are 'ON'.	This has given the cooling compressor the protection of its freezing sensing thermostat.	----------
J. Press MED 1 switch (FAN SPEED SERVO lights).	Car Fan Speed increases.	Check Main Relay Check Resistor R3 Check Wiring
K. Keeping MED 1 pressed, operate MED 2 (FAN SPEED SERVO light).	Car Fan Speed increases further.	Check Main Relay Check Resistor R2 Check Wiring.
L. Release MED 1 and MED 2 switches. Select HI on car mode control	Car fan speed increases to maximum.	Check High Speed Micro Switch at mode control Check Main Relay Check Wiring.
	Ensure D5-FLT does not light	Check Diode D5 in mode control harness Check Wiring.
M. Select AUTO on car mode control.	To reduce fan speed to low rate.	----------

	ACTION	EFFECT	WHEN INCORRECT
N	Press TEST on AMPLIFIER fuse	AMPLIFIER Fuse light should be 'ON' Feed to amplifier good	Check feed to amplifier
P	Switch to AMPLIFIER on sensing Switching System (Tester) Rotate control 0-100 fully clockwise then fully anti-clockwise alternately.	Towards the '100' point HEATING light should come ON, then towards the 'O' point COOLING light should come ON.	Check Wiring Replace Amplifier
O	Ensure that the car temperature setting control is at approximately the ambient temperature Switch to SENSOR on Sensing Switching System (Tester) Monitor LOW, DATUM, and HI lights and adjust rotary control 0-100 until only DATUM is illuminated.	If it is not possible to 'balance' the DATUM light, then the ambient temperature may be incorrectly set on the vehicle temperature selector, or out of its range, or there is a fault in the sensors, wiring or Temperature Control If OK proceed to Item R	Check sensors and wiring Check Micro Switch overriding sensing circuit in the mode control, and wiring Check temperature SELECTOR and wiring
R	Increase or decrease the car TEMPERATURE SELECTOR by 5°F from its set point, whichever is convenient	If increased the HI light will come ON in addition to the DATUM.	Check TEMPERATURE SELECTOR and wiring.
S	Adjust the rotary 0-100 control to cancel the HI or LOW light obtained in Item R Return the TEMPERATURE SELECTOR to its original point	If decreased to its original point the LOW light will come ON in addition to the DATUM If increased to its original point the HI light will come ON in addition to the DATUM	Check TEMPERATURE SELECTOR and wiring
T	Adjust the rotary 0-100 control to cancel the HI or LOW light obtained in Item S. Switch the mode control from AUTO to DEF.	The HI light operates in addition to the DATUM	Check Micro Switch override sensing circuit at mode control and resistance unit in mode control harness
U	Select the OFF on the Mode control. Switch off the vehicle engine and ignition circuit	All tester indicators are OFF	Check vehicle ignition switch Check relays and wiring.
V	Remove tester connectors and return the vehicle wiring and plugs and sockets to standard.	The complete system can now be tested following any corrective action taken as a result of the checks	Identify the problem area, and after carrying out the preliminary procedure of tester connection, repeat only the relevant parts of the schedule

Familiarity with the tester should be easily acquired, and then the Operator will find the flexibility of control offered by having access to test each sub-assembly will lead to quick identification of faults, and a system knowledge which allows him to extend this scope of the scheduled checks.

'IN-CAR' FAULT FINDING CHART

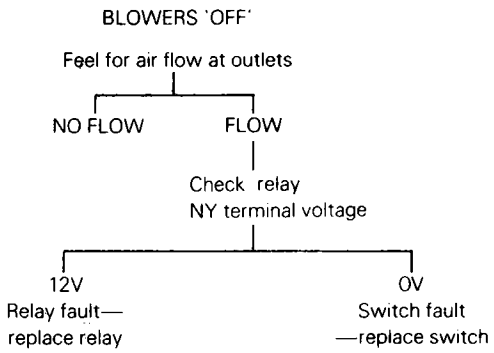
Equipment required

1. Voltmeter capable of covering 0 to 13 volts d.c.
2. Continuity tester.
3. Ohmmeter capable of covering 0 to 20K ohms.
4. Vacuum gauges (not essential) to check vacuum level.

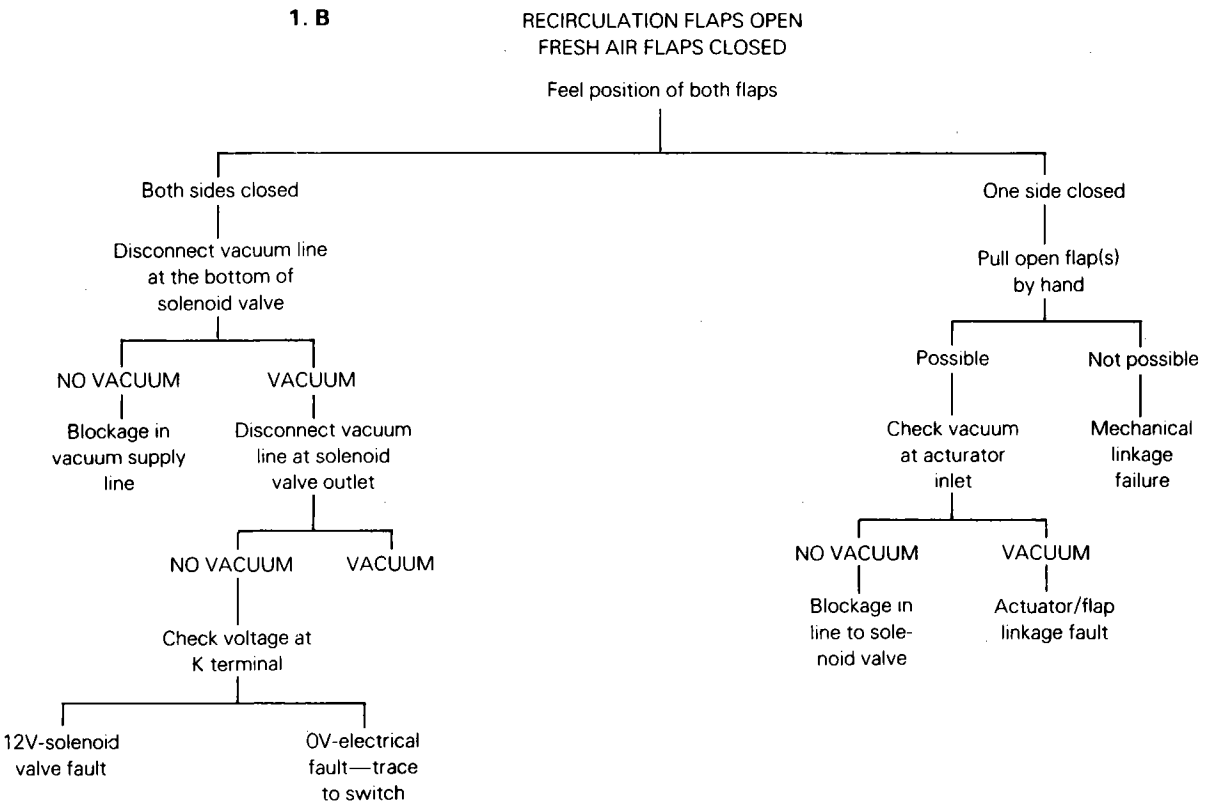
The battery should be disconnected whenever an electrical unit is being removed or refitted.

TEST 1 **R.H. OFF** **L.H. 75°**

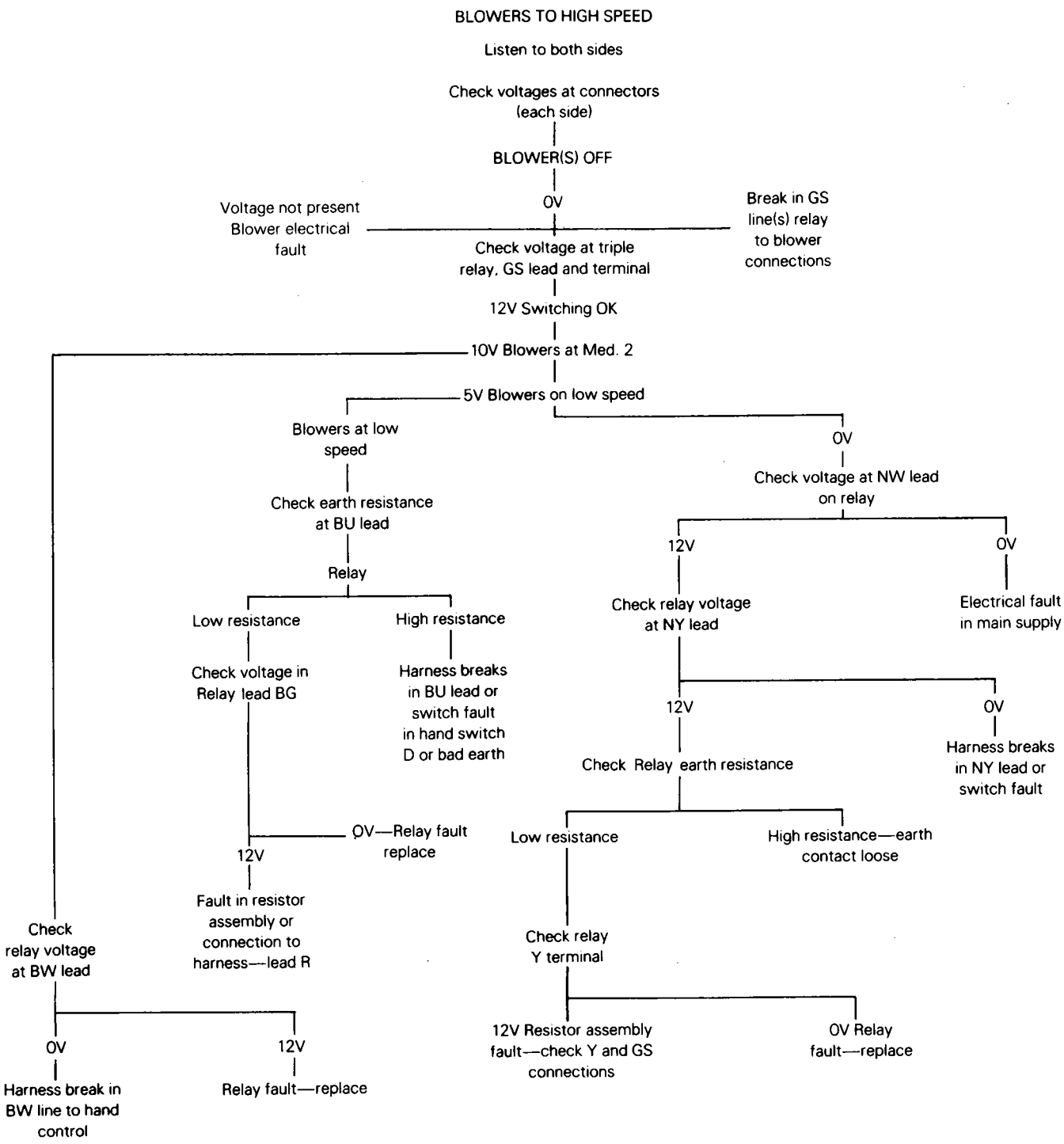
1. A



1. B



TEST 2 R.H. 'DEFROST' L.H. 75°



2B HOT AIR TO SCREEN

Feel outlets both sides
(Close side face-level vents)

- COLD AIR FOOT-LEVEL OR COLD AIR SCREEN → Mechanical linkage/ flap fault see Test 6
- COLD AIR FOOT-LEVEL COLD AIR SCREEN → Servo has not traversed— see Test 5 Or water valve failure— see Test 6
- NO AIR TO SCREEN (AIR TO FOOT-LEVEL ONE/BOTH SIDES) → Check vacuum at 'T' piece under crash padding (green line)
  - NO VACUUM → Actuator/mechanical flap fault
  - VACUUM → Vacuum switch C fault or hand control

R.H. AUTO—HI **L.H. HEATING MODE (HIGHER THAN AMBIENT)**

TEST 3

3A BLOWER SPEED HIGH

Listen to blowers

BLOWERS OFF

Water temperature switch faulty or harness break in N and NY lines

3B SCREEN FLAPS CLOSE AIR TO FOOT-LEVEL

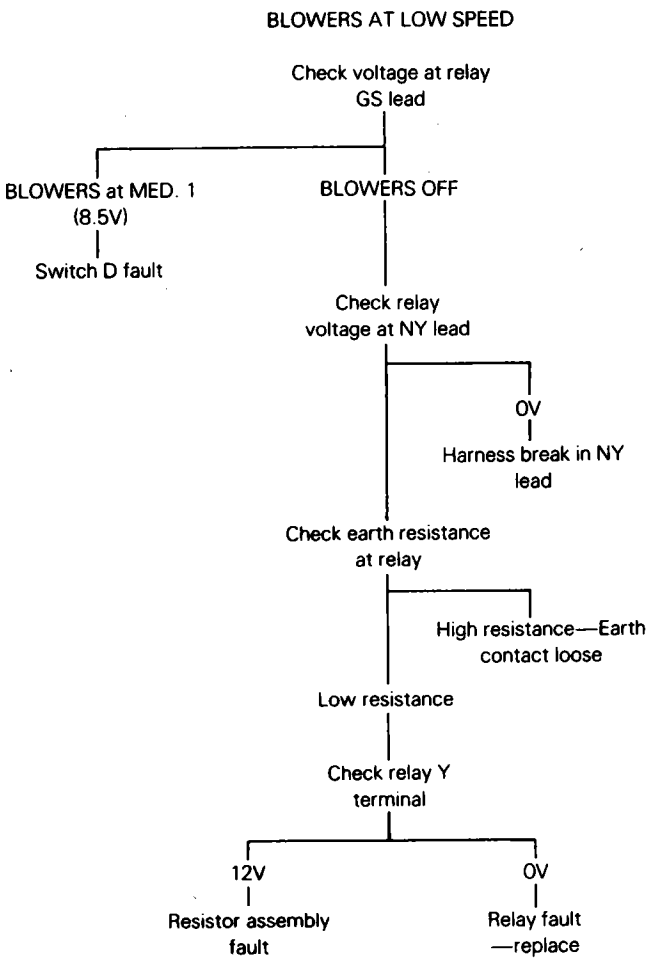
Feel for air flow at screen outlets

HIGH FLOW AT SCREEN OR COLD AIR AT FOOT-LEVEL

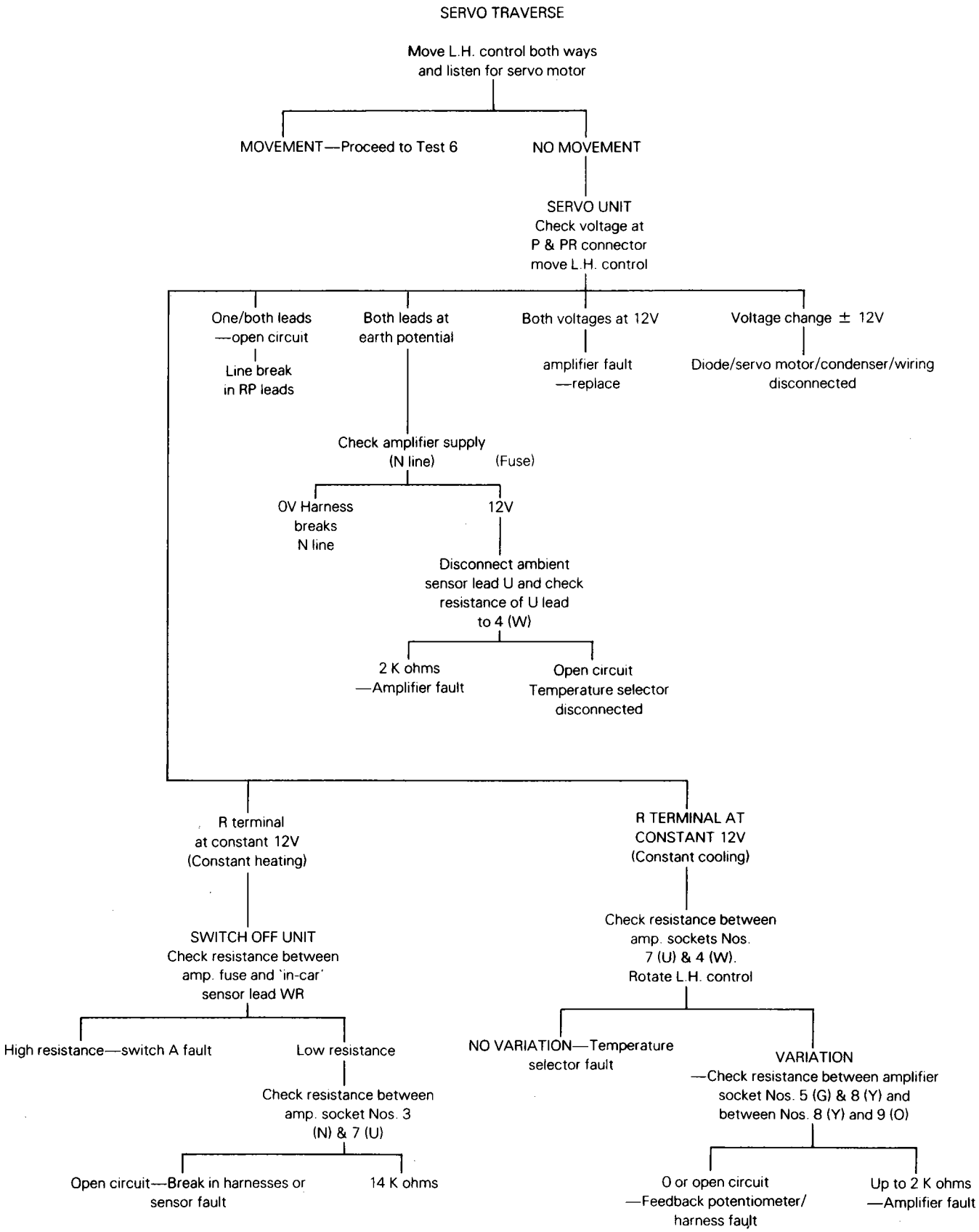
Check vacuum at 'T' piece (green) below crash padding

- NO VACUUM → Faulty vacuum switch C or line blockage
- VACUUM → Actuator fault or flap mechanical failure

TEST 4 R.H. AUTO—LOW L.H. 85°



TEST 5 AMPLIFIER/SERVO RESPONSE



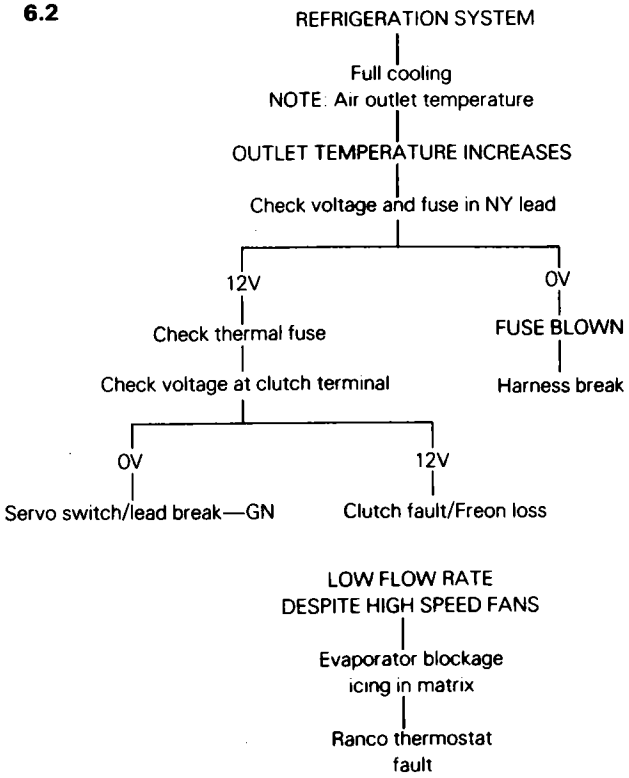
6.1 AUTOMATIC FUNCTIONS

LIMITED COOLING/HEATING

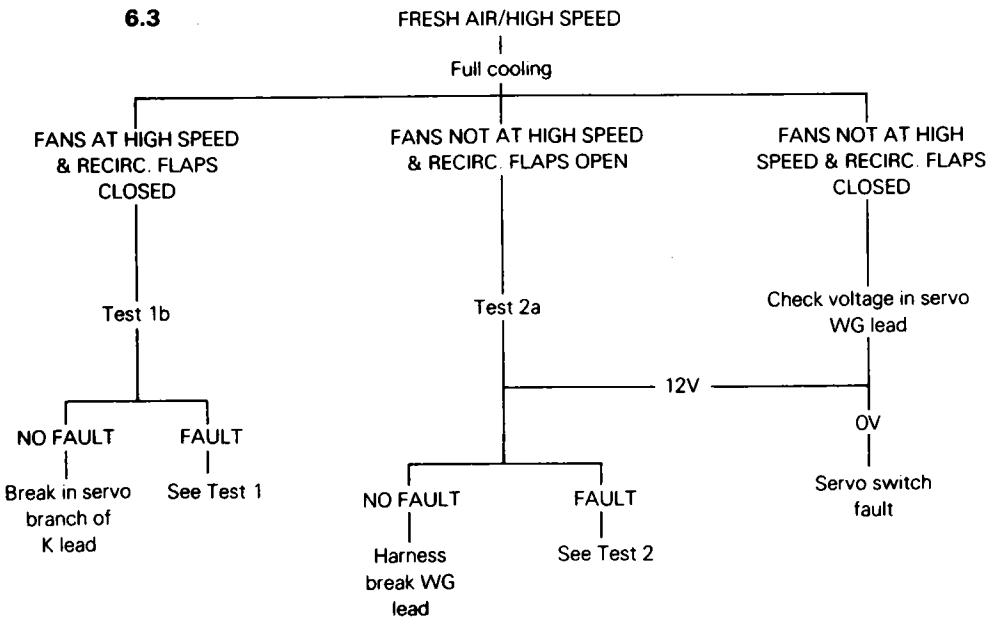
SERVO WILL NOT TRAVERSE

Could be damaged—check Test 5

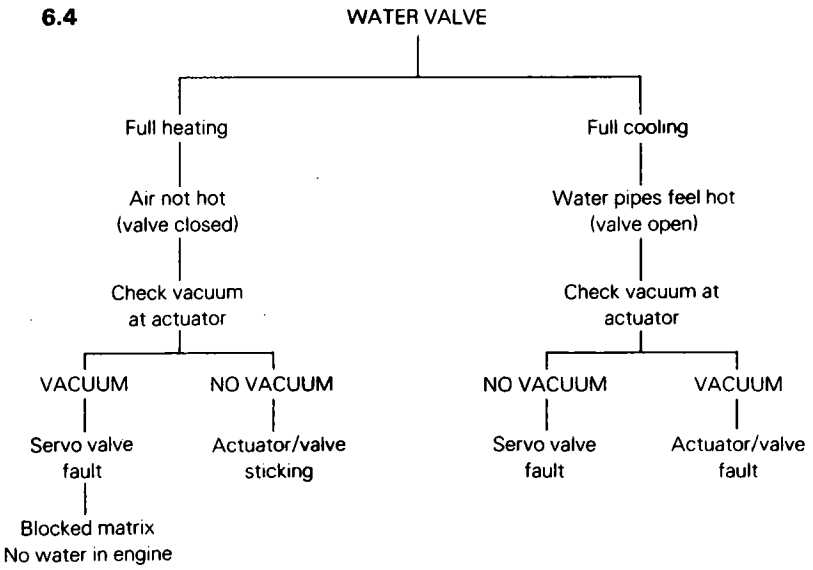
6.2



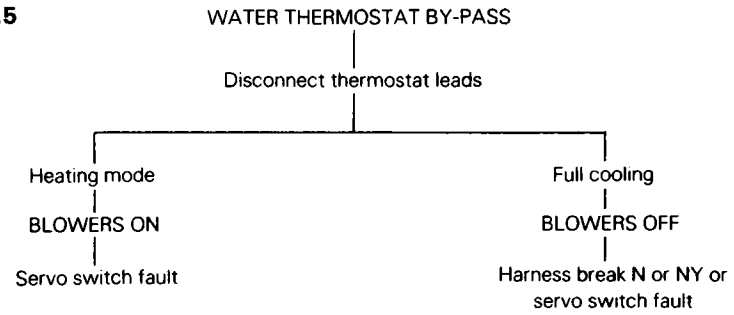
6.3



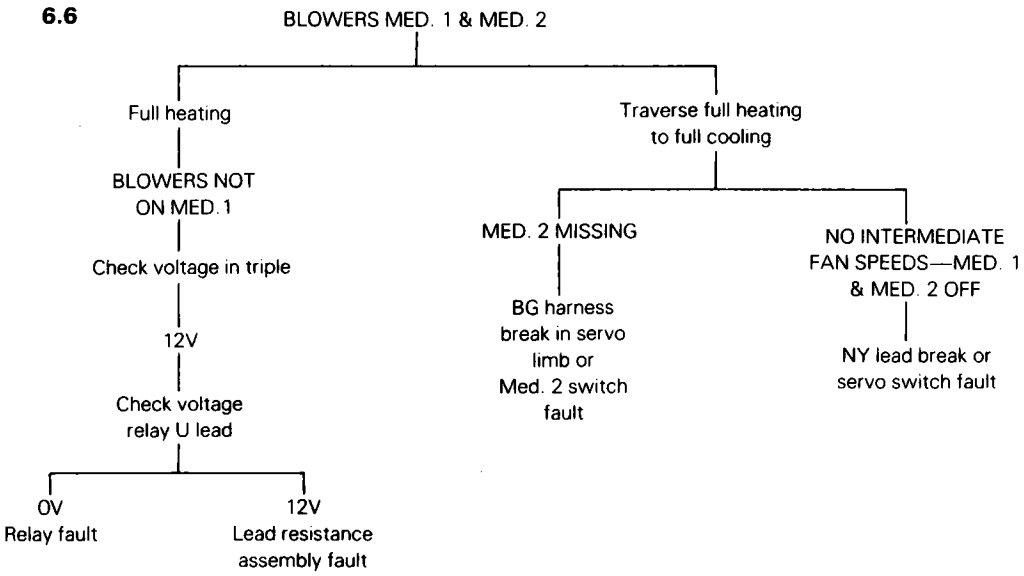
6.4


WATER VALVE
Full heating
Air not hot (valve closed)
Check vacuum at actuator
VACUUM
Servo valve fault
Blocked matrix
No water in engine
NO VACUUM
Actuator/valve sticking
Full cooling
Water pipes feel hot (valve open)
Check vacuum at actuator
NO VACUUM
Servo valve fault
VACUUM
Actuator/valve fault

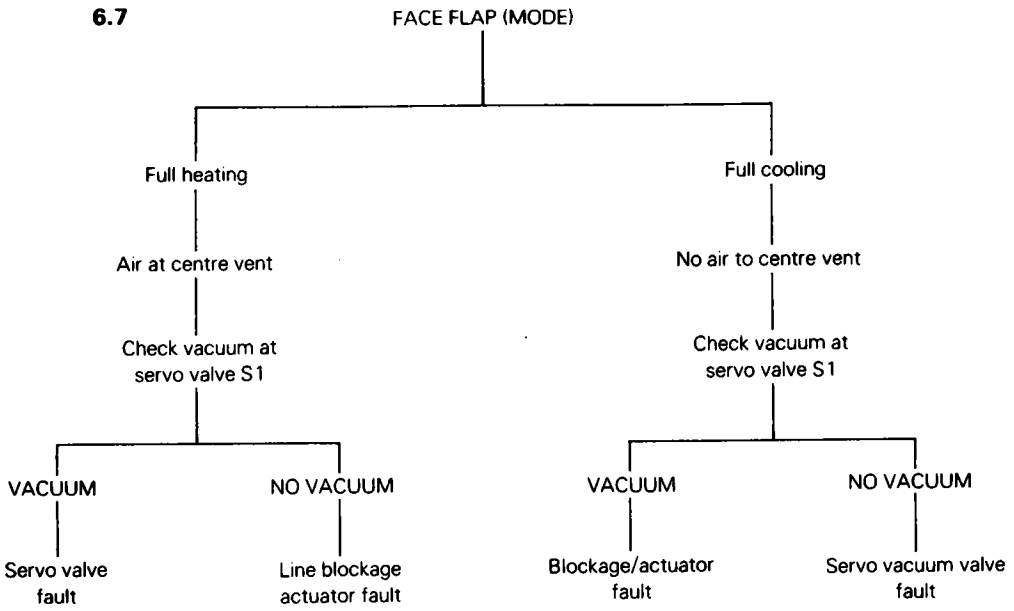
6.5


WATER THERMOSTAT BY-PASS
Disconnect thermostat leads
Heating mode
BLOWERS ON
Servo switch fault
Full cooling
BLOWERS OFF
Harness break N or NY or servo switch fault

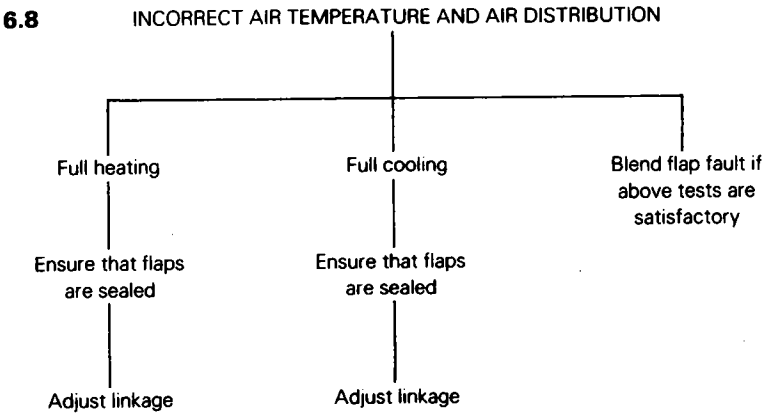
6.6


BLOWERS MED. 1 & MED. 2
Full heating
BLOWERS NOT ON MED. 1
Check voltage in triple
12V
Check voltage relay U lead
0V
Relay fault
12V
Lead resistance assembly fault
Traverse full heating to full cooling
MED. 2 MISSING
BG harness break in servo limb or Med. 2 switch fault
NO INTERMEDIATE FAN SPEEDS—MED. 1 & MED. 2 OFF
NY lead break or servo switch fault

6.7


FACE FLAP (MODE)
Full heating
Air at centre vent
Check vacuum at servo valve S1
VACUUM
Servo valve fault
NO VACUUM
Line blockage actuator fault
Full cooling
No air to centre vent
Check vacuum at servo valve S1
VACUUM
Blockage/actuator fault
NO VACUUM
Servo vacuum valve fault

6.8


INCORRECT AIR TEMPERATURE AND AIR DISTRIBUTION
Full heating
Ensure that flaps are sealed
Adjust linkage
Full cooling
Ensure that flaps are sealed
Adjust linkage
Blend flap fault if above tests are satisfactory

CHARGING AND TESTING EQUIPMENT

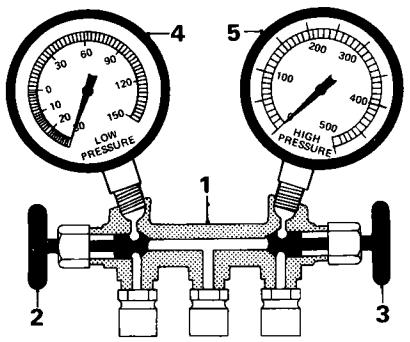


Fig 28

The charging and testing equipment consists of a charging manifold (1, Fig. 28) fitted with two stop valves (2 & 3, Fig. 28). One compound gauge (4, Fig. 28) reading both vacuum and pressure, and it is connected to the suction side of the system. The other gauge is a high pressure gauge (5, Fig. 28) and is connected to the delivery side of the system.

WARNING: FOR SAFETY REASONS, THE ACCURACY OF BOTH GAUGES MUST BE CHECKED AT FREQUENT INTERVALS.

Gauge Manifold

The manifold is designed to control refrigerant flow. As shown in the following illustration, when the manifold test set is connected into the system, pressure is registered on both gauges at all times. During all tests, both the low and high side hand valves are in the closed position (turned inward until the valve is seated). Refrigerant will flow around the valve stem to the respective gauges and register the system low side pressure on the low side gauge, and the system high side pressure on the high side gauge. The hand valves isolate the low and high side from the central portion of the manifold.

Low Side Gauge

This gauge (4, Fig. 28) has a dial reading from 0 to 150 psi (pressure scale) in a clockwise direction, and from 0 to 30 inches of Mercury (vacuum scale) in a counter-clockwise direction. This low side gauge is called a Compound Gauge and has a dual purpose, to register both Pressure and Vacuum. This gauge is used to measure evaporator outlet pressure.

High Side Gauge

This gauge (5, Fig. 28) has a dial reading from 0 to 500 psi in a clockwise direction. The high side gauge is a Pressure gauge only.

A test hose connected to the fitting directly under the low side gauge is used to connect the low side of the test manifold into the low side of the system, and a similar connection is found on the high side.

Two hose connectors must be fitted with depressors to operate the schrader valves on the high and low pressure sides of the system.

CAUTION: Do not open the high side hand valve while the air conditioning system is in operation. Under no circumstances should this be done. If the high side hand valve should be opened while the system is operating, high pressure refrigerant will be forced through the high side gauge and to the refrigerant can if it is attached. This high pressure can rupture the can or possibly burst the fitting at the safety can valve, resulting in much damage (including physical injury).

With the engine switched off, remove the protective caps from the schrader valves. Ensure both high and low side hand valves are in the closed position. Connect the high pressure gauge hose to the high pressure schrader valve (1, Fig. 29) and connect the low pressure or compound valve hose to the low pressure schrader valve (2, Fig. 29).

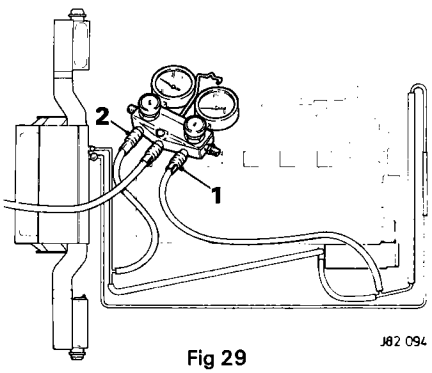


Fig 29

PURGING TEST HOSES

Using System Refrigerant

Be sure high and low side hoses are properly connected to service valves (all hose connections tight).

Now, purge the high side test hose by opening the hand valve on the high side gauge for 3 - 5 seconds. This allows the system's refrigerant to force air through the test hoses and out of the centre service hose. Immediately close the high side gauge hand valve.

Purge the low side test hose in the same manner, using the hand valve of the low side gauge. Close hand valve after 3 - 5 seconds.

Stabilizing the System

The manifold gauge set is attached to the system, and the test hoses purged of air. You must now operate the system for a few minutes to stabilize all pressures and temperatures throughout the system in order to obtain accurate test gauge readings. Stabilize the system as follows:

Place all test hoses, gauge set and other equipment away from all engine moving parts. Also keep hoses from touching hot manifolds. Start the engine and adjust engine speed to fast idle.

Turn air conditioner controls to maximum cooling. Set blower fan on high speed.

Open doors and/or windows (to quickly eliminate interior heat).

Operate system under these conditions for 5 to 10 minutes and the system will be stabilized and ready for test readings.

Test Conditions

1. Use a large fan to substitute for normal ram air flow through the condenser.
2. Car adjusted to normal fast idle speed.
3. All conditions equivalent to 30 mph

TORQUE LEVELS FOR THE AIR CONDITIONING HOSE CONNECTIONS

Item	Nm	Kgf/m	lbf/ft
1. Compressor/Condenser (Compressor End)	40,67 to 47,45	4,15 to 4,84	30 to 35
2. Condenser/Compressor (Condenser End)	28,47 to 36,30	2,90 to 3,73	21 to 27
3. Condenser/Receiver Drier (Condenser End)	20,34 to 27,12	2,10 to 2,76	15 to 20
4 Receiver Drier/Condenser (Receiver Drier End)	40,67 to 47,45	4,15 to 4,84	30 to 35
5 Receiver Drier/Evaporator (Receiver Drier End)	40,67 to 47,45	4,15 to 4,84	30 to 35
6 Evaporator/Receiver Drier (Evaporator End)	14,91 to 17,62	1,52 to 1,80	11 to 13
7 Expansion Valve/Evaporator (Expansion Valve End)	20,34 to 27,12	2,10 to 2,76	15 to 20
8 Evaporator/Compressor (Evaporator End)	28,47 to 36,60	2,90 to 3,73	21 to 27
9 Compressor/Evaporator (Compressor End)	40,67 to 47,45	4,15 to 4,84	30 to 35

PRESSURE — TEMPERATURE RELATIONSHIP

NOTE: Pressures shown are under exact conditions (see Test Conditions below) and are not necessarily true for every car checked.

Ambient Temperature is given as the temperature of the air surrounding the condenser and is taken 2 inches in front of the condenser

Ambient Temperature °F	High Pressure Gauge Reading
60	95-115
65	105-125
70	115-135
75	130-150
80	150-170
85	165-185
90	175-195
95	185-205
100	210-230
105	230-250
110	250-270
115	265-285
120	280-310

Low Pressure Gauge Reading	Evaporator Temperature °F
10	2
12	6
14	10
16	14
18	18
20	20
22	22
24	24
26	27
28	29
30	32
35	36
40	42
45	48
50	53
55	58
60	62
65	66
70	70

Normal operating ranges shown by dotted line boxes.

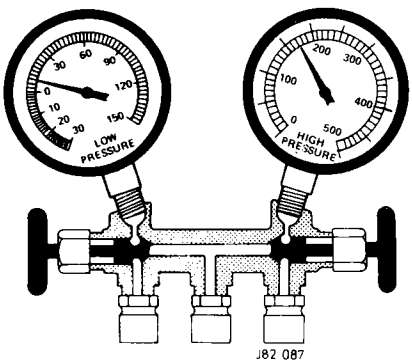


Fig 30

Complaint

Little or no cooling

Condition

1. Low side gauge reading too low. Should be 15 - 30 psi
2. High side gauge reading too low. Should be 185 - 205 psi at ambient temperature of 95°F.
3. Stream of bubbles evident in sight glass.
4. Discharge air from evaporator only slightly cool

Diagnosis

System low on refrigerant. May be caused by small leak.

Correction

1. Leak test system
2. Discharge refrigerant from system if necessary to replace units or lines.
3. Repair leaks
4. Check compressor oil level. System may have lost oil due to leakage
5. Evacuate system using vacuum pump.
6. Charge system with NEW Refrigerant.
7. Operate system and check performance.

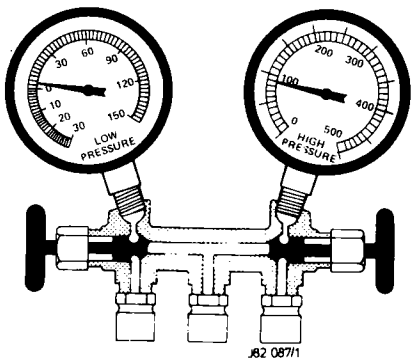


Fig 31

Complaint

Cooling is not adequate

Condition

1. Low side gauge reading is very low. Should be 15 - 30 psi.
2. High side gauge reading very low. Should be 185 - 205 psi at ambient temperature of 95°F.
3. No liquid and no bubbles evident in sight glass
4. Discharge air from evaporator is warm.

Diagnosis

System excessively low of refrigerant. Serious leak indicated

Correction

1. Leak test system.

NOTE: Add partial refrigerant charge before leak testing to ensure a leak test indication.

Leak test compressor seal area very carefully

2. Discharge refrigerant from system.
3. Repair leaks.
4. Check compressor oil level. System may have lost oil due to leakage.
5. Evacuate system using vacuum pump.
6. Charge system with NEW Refrigerant.
7. Operate system and check performance

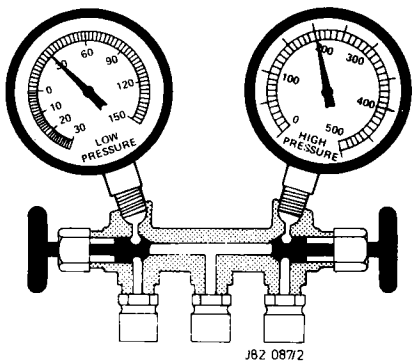


Fig 32

Complaint

Cooling is not adequate.

Condition

1. Low side gauge reading is constant and does not drop. Pressure should drop until compressor cycles (thermostat control).
2. High side gauge reading slightly high (or slightly lower especially if large fan used to substitute ram air): High side guage reading should be 185 - 205 psi at ambient temperature of 95°F.
3. Sight glass free of bubbles or only shows occasional bubble.
4. Discharge air from evaporator only slightly cool.

Diagnosis

Non condensables present in system. Air or moisture present instead of full refrigerant charge

Correction

1. Leak test system.

Leak test compressor seal area very carefully.

2. Discharge refrigerant from system.
3. Repair leaks as located.
4. Replace receiver-drier. Drier probably saturated with moisture.
5. Check compressor oil level.
6. Evacuate system using vacuum pump.
7. Charge system with NEW Refrigerant 12.
8. Operate system and check performance.

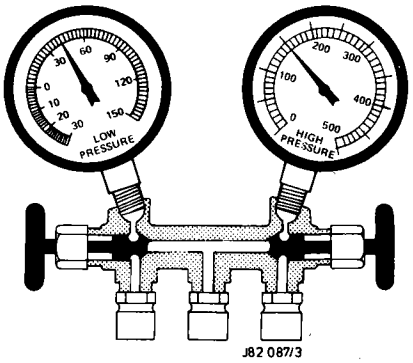


Fig 33

Complaint

Cooling is not adequate.

Condition

1. Low side gauge reading too high. Should be 15 - 30 psi.
2. High side gauge reading too low. Should be 185 - 205 psi at temperature of 95°F.
3. Sight glass free of bubbles (system is fully charged).
4. Discharge air from evaporator not sufficiently cool.

Diagnosis

Internal leak in compressor.

Correction

1. Discharge the system and replace compressor and receiver-drier.
2. Evacuate the system using a vacuum pump.
3. Charge the system with new refrigerant.
4. Operate system and check performance.

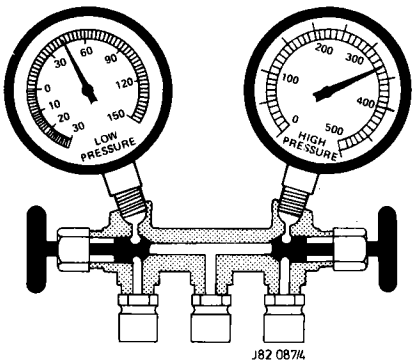


Fig 34

Complaint

Little or no coolant. Engine overheating may also be noted.

Condition

1. Low side gauge reading excessively high. Should be 15 - 30 psi.
2. High side gauge reading excessively high. Should be 185 - 205 psi at 95°F.
3. Bubbles may appear occasionally in sight glass. Liquid line very hot.
4. Discharge air from evaporator is warm.

Diagnosis

Improper condenser operation with lack of cooling caused by too high a high side pressure. System may have either normal or overcharge of refrigerant.

Correction

1. Check for loose or worn driver belts causing excessive compressor head pressures.
2. Inspect condenser for clogged air passages, bug screen, or other obstructions preventing air flow through condenser.
3. Inspect condenser mounting for proper radiator clearance.
4. Inspect clutch type fan for proper operation.
5. Inspect radiator pressure cap for correct type and proper operation.

After making the above checks:
Operate system and check performance.

If condition not corrected:

1. Inspect system for overcharge of refrigerant and correct as follows:
   (a) Discharge refrigerant until stream of bubbles appears in sight glass and both high and low gauge readings drop below normal.
   (b) Add new Refrigerant 12 until bubbles disappear and pressures are normal, then add $\frac{1}{4}$ - $\frac{1}{2}$ lb of additional refrigerant.
2. Operate system and check performance.

If gauge readings still too high:

1. Discharge system.
2. Remove and inspect condenser for oil clogging. Clean and flush condenser to ensure free passage of refrigerant or replace condenser.
3. Replace receiver-drier.
4. Evacuate system using vacuum pump
5. Charge system with NEW Refrigerant 12.
6. Operate system and check pertormance.

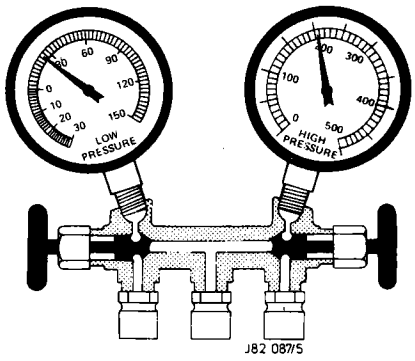


Fig 35

Complaint

Cooling is not adequate during hot part of day.

NOTE: Cooling may be satisfactory during early morning or late evening hours but is not adequate during hot part of the day.

Condition

1. Low side gauge reading (15 - 30 psi) but may drop into vacuum during testing.
2. High side gauge reading normal (205 psi at 95°F) but will drop when low side gauge reading drops into vacuum.
3. Sight glass may show tiny bubbles.
4. Discharge air from evaporator is sharp and cold but becomes warm when low side gauge reading drops into a vacuum.

Diagnosis

Excessive moisture in system. Desiccant agent saturated with moisture which is released during high ambient temperatures. Moisture collects and freezes in expansion valve and stops refrigerant flow.

Correction

1. Discharge refrigerant from system.
2. Replace receiver-drier.
3. Evacuate system with vacuum pump.
4. Charge system with NEW Refrigerant 12.
5. Operate system and check performance.

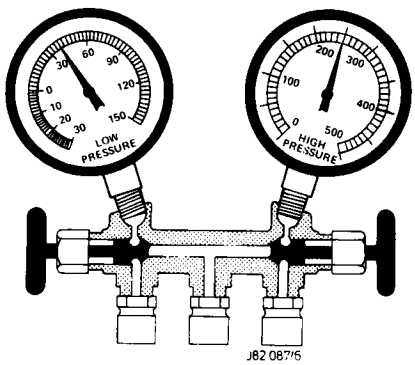


Fig 36

Complaint

Little or no cooling.

Condition

1. Low side gauge reading too high. Should be 15 - 30 psi.
2. High side gauge reading too high. Should be 185 - 205 psi at ambient temperature of 95°F.
3. Occasional bubbles in sight glass.
4. Discharge air from evaporator is not cool.

Diagnosis

Air in system. Refrigerant contaminated by non-condensables (air and/or moisture).

Correction

1. Discharge refrigerant from system.
2. Replace receiver-drier which may be saturated with moisture.
3. Evacuate system using vacuum pump.
4. Charge system with NEW Refrigerant.
5. Operate system and check performance.

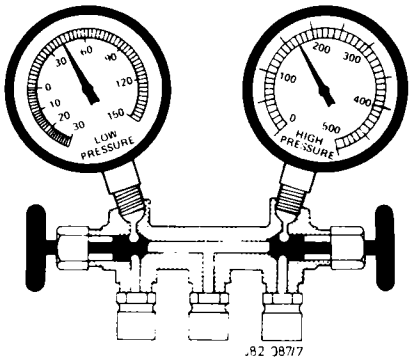


Fig 37

Complaint

Little or no cooling

Condition

1. Low side gauge reading too high. Should be 15 - 30 psi.
2. High side gauge reading normal or slightly low. Should be 185 - 205 psi at an ambient temperature of 95°F.
3. Discharge air from evaporator warm.
4. Suction hose and evaporator show heavy sweating.

Diagnosis

Expansion valve allowing excessive flow of refrigerant through evaporator causing flooding of evaporator coils.

Testing

Check for expansion valve stuck open of incorrect mounting or temperature sensing bulb as follows.

(a) Set air conditioner for maximum cooling and operate the system.
(b) Spray liquid Refrigerant 12 on head of valve or capillary bulb, not low side gauge reading. Low side gauge should drop into a vacuum.
(c) If low side vacuum reading obtained, warm expansion valve diaphragm chamber with hand, then repeat test (step 'b').

Correction

1. If expansion valve test indicates valve operation is satisfactory, proceed as follows.
   (a) Clean contact surface of evaporator outlet pipe and temperature sensing bulb, clamp bulb securely in contact with pipe.
   (b) Operate system and check performance.
2. If expansion valve test indicates valve is defective, proceed as follows:
   (a) Discharge system.
   (b) Replace expansion valve.
   (c) Evacuate system using vacuum pump.
   (d) Charge system with NEW Refrigerant.
   (e) Operate system and check performance.

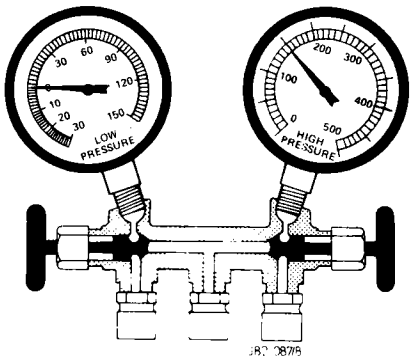


Fig 38

Complaint

Cooling is not adequate.

Condition

1. Low side gauge reading too low (0 psi or a vacuum). Should be 15 - 30 psi.
2. High side gauge reading too low. Should be 185 - 205 psi at ambient temperature of 95°F.
3. Discharge air from evaporator only slightly cool.
4. Expansion valve inlet may show heavy sweating or frost.

Diagnosis

Expansion valve restricting refrigerant flow due to clogged screen, stuck valve, or temperature sensing bulb having lost its charge.

Testing

1. If expansion valve inlet is cool to touch, proceed as follows.
   (a) Set air conditioner for maximum cooling and operate the system.
   (b) Spray liquid Refrigerant 12 on head of valve of capillary bulb, note low side gauge reading. Low side gauge should drop into a vacuum.
   (c) If low side vacuum reading obtained, warm expansion valve diaphragm chamber with hand, then repeat test (step 'b').
   (d) If expansion valve test indicates valve operation is satisfactory, clean contact surface of evaporator outlet pipe and temperature sensing bulb, clamp bulb securely in contact with pipe. Proceed with correction procedure (below).
2. If expansion valve inlet shows sweating or frost proceed as follows:
   (a) Discharge system.
   (b) Disconnect inlet at expansion valve, remove and inspect filter.
   (c) Clean and replace filter, reconnect inlet line.
   (d) Proceed with correction, procedure (below).
3. If expansion valve test (step '1' preceding) indicates valve is defective, proceed as follows.
   (a) Discharge system.
   (b) Replace expansion valve, then proceed with correction procedure.

Correction

1. After cleaning expansion valve screen, or replacing expansion valve if necessary, and properly mounting temperature sensing bulb on evaporator outlet pipe, proceed as follows.
   (a) Evacuate system using vacuum pump.
   (b) Charge system with NEW Refrigerant 12.
   (c) Operate system and check performance.

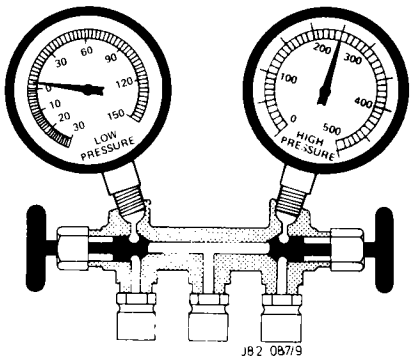


Fig 39

Complaint

Cooling is not adequate.

Condition

1. Low side gauge reading too low. Should be 15 - 30 psi.
2. High side gauge reading will build excessively high. Should be 185 - 205 psi at an ambient temperature of 95°F.

NOTE: An overcharged system, or a Condenser or receiver-drier that is too small, will cause high side gauge reading to be normal or excessively high.

3. Discharge air from evaporator only slightly cool.
4. Liquid line cool to the touch, line or receiver-drier may show heavy sweating or frost.

Diagnosis

Restriction in receiver-drier or liquid line with compressor removing refrigerant from evaporator faster than it can enter resulting in a 'starved' evaporator.

Correction

1. Discharge system.
2. Remove and replace receiver-drier, liquid lines, or other defective parts.
3. Evacuate system using vacuum pump.
4. Charge system with NEW Refrigerant 12.
5. Operate system and check performance.

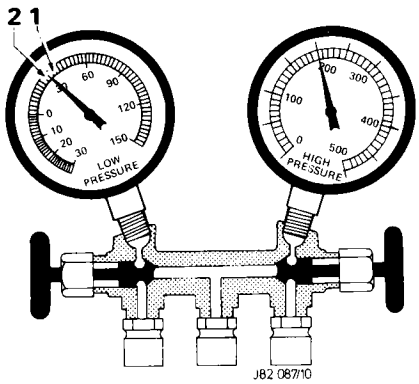


Fig 40

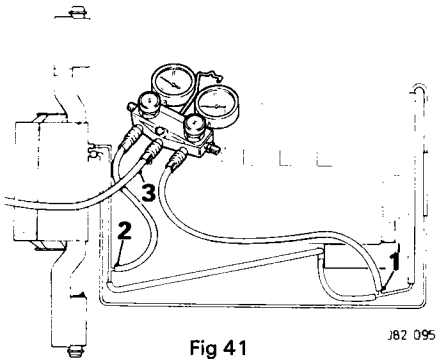


Fig 41

Complaint

Compressor cycles (cuts in and out) too rapidly. Compressor cycles on 34 psi (1, Fig. 40) Compressor cycles off 28 psi (2, Fig. 40)

Condition

1. Low side pressure cycle too high with insufficient range between OFF and ON. Cycle should be:
   Cycle 'Off' — 12 - 15 psi.
   Cycle 'On' — 36 - 39 psi.
   Cycle Range — 24 - 28 psi.
2. High side gauge reading Normal (200 psi). Should be 185 - 205 psi at ambient temperature of 95°F

Diagnosis

Ranco thermostat faulty.

Correction

1. Stop car engine, turn air conditioning off and disconnect the battery.
2. Remove and discard old thermostatic switch, install new switch of same type
3. When installing new thermostatic switch, make certain that capillary tube installed in same position and to same depth in evaporator core as old switch tube

CAUTION: Do not kink or bend capillary tube too sharply — tube is gas filled.

Operate system and check performance of new thermostatic switch.

AIR CONDITIONING SYSTEM

Depressurise

Observe all safety precautions and do not smoke while carrying out the following procedure.
With the engine switched off, remove the protective caps from the schrader valves.
Connect the manifold gauge set with the red hose to the high pressure side (1, Fig. 41) and the blue hose to the low pressure side (2, Fig. 41)
Place the free end of the centre hose (3, Fig. 41) into a suitable container. Slowly open the high or low side manifold hand valve and adjust the valve for a smooth refrigerant flow. Watch for any signs of escaping oil and adjust the hand valve so that no oil escapes. If oil is lost during the discharge, the compressor oil level will have to be checked and topped up.
As the discharge rate slows down, open the other manifold hand valve. Refrigerant will now flow from the high and low pressure sides of the system. Constantly adjust the hand valves to ensure that oil does not flow.
When a zero reading is shown on both the high and the low pressure gauges the system is discharged. Close both hand valves.

Evacuate

Once a system has been opened for repairs, or is found low of refrigerant, it must be fully evacuated with a vacuum pump to remove all traces of moisture before a new refrigerant charge is added.
Moisture may collect and freeze in the expansion valve which will block the refrigerant flow and stop the cooling action.
Moisture will also react with Refrigerant 12 and cause corrosion of the small passages and orifices in the system.
The desiccant in the receiver-drier can absorb only a limited amount of moisture before it becomes saturated, therefore it is important to prevent moisture entering the system, and to remove any moisture which may have entered the system through a leak or an open connection.
Unwanted air and moisture are removed from the system by a vacuum pump. A vacuum pump is the only piece of equipment designed to lower the pressure sufficiently so that the moisture boiling temperature is reduced to a point where the water will vaporise and then can be evacuated from the system.
The compressor cannot be used as a vacuum pump because the refrigeration oil circulates with the refrigerant The compressor depends to a large extent on the refrigerant distributing oil for lubrication and damage to the compressor may result due to lack of refrigerant which carries the oil for lubrication.
After the system has been fully discharged, and with the test gauge set still connected, attach the centre hose of the manifold gauge set, to the inlet fitting of the vacuum pump
Open the low and high side manifold hand valves to their maximum positions.
Open the discharge valve on the vacuum pump or remove the dust cap on the discharge outlet whichever is appropriate.
Turn the vacuum pipe on, note the low side gauge to make certain that a vacuum is being created in the system by the vacuum pump.
From the time the lowest vacuum is attained, continue to operate the vacuum pump for a few minutes to be sure complete evacuation has been performed.
Close both gauge hand valves, turn off the vacuum pump, note the low side gauge reading. The gauge needle should remain stationary at the point where the pump was turned off. Should the gauge needle return towards zero a leak exists in the air conditioning system.
If a leak exists charge the system with R12 refrigerant, locate the leak with a leak detector, discharge the refrigerant from the system. Repair the leak and repeat the evacuation procedure.
If the gauge needle remains stationary and vacuum is maintained for 3 to 5 minutes, close both the high and low manfold hand valves, and disconnect the hose from the vacuum pump
The air conditioning system is now ready for charging.

Flushing

If contamination of the expansion valve and associated pipeworks occurs it is essential that the whole of the air conditioning is fully flushed out using Freon 12, or other suitable charging gas.
Discharge the system.
Disconnect the inlet (low pressure) and the outlet (high pressure) pipes from the compressor.
Fit a suitable blanking plate over the end of the high pressure pipe and retain the plate with a suitable G clamp, also remove the schrader valve from the charging connection on the high pressure pipe.
Place the low pressure pipe into a suitable metal container and cover.
Disconnect the high pressure pipe from the expansion valve and carefully remove the conical filter, then reconnect the pipe on the expansion valve.
Carefully remove the thermal bulb coil attached to the evaporator outlet pipe and allow the thermal bulb to remain in the ambient air.
This will prevent the expansion valve closing when refrigerant is flushed through it.
Connect a suitable hose, from the liquid connection of a recommended refrigerant canister, to the charging connection on the high pressure pipe.
Open the canister (the pressure in the canister should be approximately 4.22 kgf/cm² (60 lbf/in²)) and allow the refrigerant to flush through the air conditioning system for approximately 30 seconds, or until a steady liquid flow is observed from the low pressure pipe.
Turn the refrigerant canister off and remove the connections.

IMPORTANT: On re-assembling the system. Fit a new receiver-drier.

Check the compressor oil level.
Thoroughly clean and refit the expansion valve filter
Refit the thermal bulb on to the evaporator outlet pipe
Refit the schrader valve into the high pressure pipe
Refit all the pipe connections and recharge the system

Charge

Charging the air conditioning system is the process of adding a specific quantity of refrigerant to the circuit. Before attempting the charging operation the system **must** have been evacuated and, if necessary, flushed through immediately beforehand. No delay between evacuation and charging procedures is permissible. The equipment should be fitted with a means of accurately weighing the refrigerant during the charging process. Great care must be taken to charge correctly, as undercharging will result in very inefficient operation, and overcharging will result in very high pressures and possible damage to components.

Evacuate the system with hoses (1 & 2, Fig. 42) connected as shown.
Connect the centre hose of the charging manifold (3, Fig. 42) to a supply of refrigerant. The supply available must be at least 3,3 kg (7 2 lb) weight.
Open the refrigerant supply valve.
Purge the centre hose by momentarily cracking the connection at the manifold block: retighten the connector.
Record the weight of refrigerant supply source. Open both valves on the charging manifold and allow the refrigerant source pressure to fill the vacuum in the system.
Between 0,23 kg and 0,45 kg ($\frac{1}{2}$ lb to 1 lb) weight will enter the system.
Record the quantity.

NOTE: The quantity drawn in will vary with ambient temperature.

Close the high pressure side valve on the manifold block.
Ensure that all is clear and start the vehicle engine. Run the engine at 1500 rev/min.
Set the air conditioning system blower speed control to **'Fast'.**

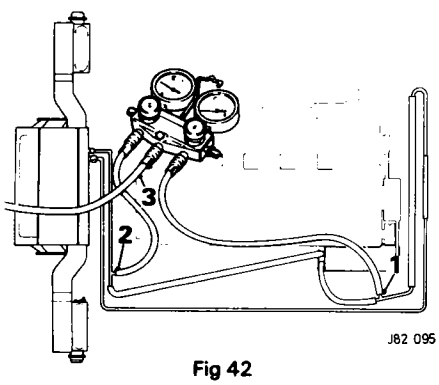


Fig 42

NOTE: This engages the compression clutch to start system circulation, and runs the blower motors at fast speed to heat the evaporator coil. Vapour will be turned to liquid in the condenser and stored in the receiver-drier.

Control the flow of refrigerant with the suction side valve on the charging manifold, and allow a total weight of 1,13 kg ± 0,028 kg (2$\frac{1}{2}$ lb ± 2 oz) refrigerant to enter system.
Close the suction side valve.

NOTE: Alternatively, observe the sight glass on receiver-drier until the sight glass clears, and no bubbles or foam are visible.

Re-open the suction valve for 2 to 5 minutes (2 minutes if the ambient temperature is low, 5 minutes if high).
This will allow an additional 0,11 kg ($\frac{1}{4}$ lb) of refrigerant to enter the system.
Run the system for 5 minutes, observing the sight glass.
If foaming is very slight, switch off the engine.

NOTE: It is normal for there to be slight foaming if the ambient air temperature is 21°C (70°F) or below.

Close the refrigerant supply valve, disconnect the hose
Quickly disconnect the hoses from the schrader valves
Fit protective sealing caps.
Switch on the engine and check the function of the air conditioning system
Switch off the engine flush the engine compartment and interior of the vehicle with shop compressed air line
Conduct a leak test on the installation.

SUPERHEAT SWITCH AND THERMAL FUSE

Description

The superheat switch and a thermal fuse are included in the clutch circuit to provide a compressor protection system. This guards against low refrigerant charge and blockages causing extreme superheated inlet gas conditions and resulting compressor damage.

KEY TO DIAGRAM (Fig. 43)
1. To compressor clutch
2. Superheat switch
3. Thermal fuse
4. + Feed cable

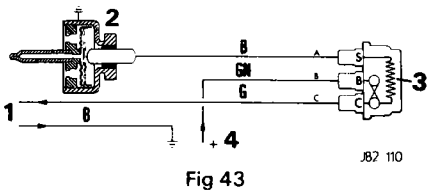


Fig 43

The superheat switch is located in the rear of the compressor in contact with the suction side gas, whose pressure drops and temperature rises with low refrigerant charge (ie Freon leak). This condition closes the superheat switch contacts.
The thermal fuse is a sealed unit containing a heater and meltable fuse. The superheat switch brings in the heater which melts the fuse and disconnects the compressor clutch and heater. The compressor stops and damage from insufficient lubrication will be avoided.

CAUTION: After a thermal fuse melt, establish and rectify the cause before replacing the thermal fuse unit complete.

Thermal fuse melt:
Temperature: 157 to 182°C (315 to 360°F)
Time: 2 minutes — 14V system voltage
5.5 minutes — 11,5V system voltage
Heater resistance, cold: 8 to 10 ohms.

Air Conditioning Superheat Switch

Testing

If the refrigerant level is satisfactory and there is not a blockage in the air conditioning system but the thermal fuse persists in melting.
Carry out the following checks.

Test Procedure 'A' — for use with a cold engine and at ambient temperatures below 30°C (86°F).

Connect a test lamp in series with the superheat switch (Fig. 44).

NOTE: With the test lamp connected in the circuit it will prevent the thermal fuse from operating as a safety device therefore care should be taken when carrying out the test.

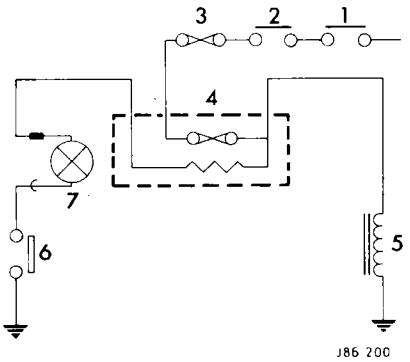


Fig 44

KEY TO DIAGRAM (Fig. 44)
1. Air conditioning switch
2. Ambient switch
3. Compressor clutch fuse
4. Thermal fuse
5. Compressor clutch coil
6. Superheat switch
7. Test lamp

With the ignition and air conditioning switched on.
Ensure a serviceable thermal fuse is fitted.
Evacuate the air conditioning system and then close the taps.
The test lamp should not light. If the test lamp does light then follow test procedure 'B'.
With the lamp not illuminated start and run the engine at about 2000 rpm. After a few minutes the lamp should light. As soon as the test lamp lights, open the taps to allow refrigerant to charge into the system. As the air conditioning system becomes charged the lamp should go out.
If the above lamp functions do not occur, replace the superheat switch.
After checking remove the test lamp from the circuit and reconnect the superheat switch lead onto the terminal.
Operate and check the system.

Test Procedure B — for use with a hot engine or at ambient temperatures above 30°C (86°F).

Connect the test lamp in series with the superheat switch.
Switch the ignition and air conditioning on.
Ensure a serviceable thermal fuse is fitted.
Evacuate the air conditioning system and then close the taps.
The test lamp should light. (If the lamp does not light carry on checks as in Procedure 'A').
With the test lamp illuminated open the taps and allow refrigerant to charge the system.
As the system becomes charged the test lamp should go out.
If the lamp functions do not occur, then replace the superheat switch.
After checking remove the test lamp and reconnect the superheat switch lead onto the terminal.
Operate and check the system.

SUPERHEAT SWITCH

Renew

Discharge system.
Disconnect harness connector from superheat switch.
Remove suction (low pressure) and out-put (high pressure) hoses.
Remove superheat switch retaining circlip and remove switch by pulling out of the compressor housing.
Remove the superheat switch 'O' ring located in the compressor housing.
Lightly lubricate the new 'O' ring seal and fit into compressor housing.
Locate the replacement superheat switch into the compressor housing and gently push switch into housing until seated.
Fit new circlip and secure.
Connect the suction (low pressure) and out put (high pressure) hoses to the compressor. Evacuate and recharge system and check system for leaks using suitable leak detection equipment.

COMPRESSOR

Remove and Refit

WARNING: BEFORE COMMENCING WORK, REFER TO THE GENERAL SECTION. DO NOT OPERATE THE COMPRESSOR UNTIL THE SYSTEM IS CORRECTLY CHARGED.

NOTE: Ensure that clean, dry male and female caps are to hand.

Disconnect the battery earth lead.
Depressurize the system.
On NAS vehicles, remove the air pump
Note the position of the hoses.
Remove the clamping plate securing the high and low pressure hoses (1, Fig 45).
Displace the hoses (2, Fig. 45). Fit blanking caps to the hoses and the compressor.
Remove the superheat switch cable connector (3, Fig. 45).
Slacken the compressor front and rear pivot bolts (4, Fig. 45).
Slacken the adjusting link locking and adjusting nuts.
Remove the bolts securing the adjusting link and remove the link.
Displace the drive belt. Disconnect the clutch cable connector (5, Fig. 45).
Remove the nuts securing the cruise control actuator and displace the actuator unit.
Remove the compressor pivot bolts and displace the compressor.
Manoeuvre the compressor from the engine compartment, keeping it horizontal and the sump down.
If a new compressor is being fitted, remove the mounting brackets from the old compressor and fit to new unit.
On refitting, ensure that new 'O' sealing rings are fitted.
Ensure the compressor drive belt is adjusted to the correct tension.
Correct tension as follows:
A load of 2,9 kg (6.4 lb) must give a total belt deflection of 4,32 mm (0.17 in) when applied at mid-point of the belt.
Recharge the air conditioning system.

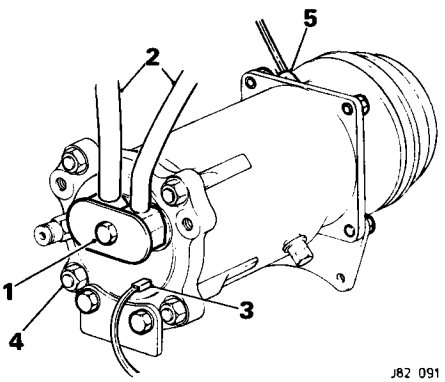


Fig 45

CAUTION: After recharging, cycle the clutch in and out 10 times by selecting OFF-LOW, AUTO-OFF on the mode selector switch with the engine running. This ensures that the pulley face and the clutch plate are correctly bedded-in before a high demand is made upon them.

Check the system for correct operation.
Check the cruise control for correct operation

COMPRESSOR OIL — CHECKING PROCEDURE

The following procedure should be adopted when checking the amount of oil in a compressor prior to its being fitted to a car:

1. Remove drain plug from compressor sump and drain oil into container having capacity of at least 285 cc (10 fl oz).
2. Remove pressure plate across inlet and outlet ports at rear of compressor: more oil may flow from sump plug hole.
3. With pressure plate still removed, set compressor on its rear end so that inlet and outlet ports are over container; slowly rotate drive plate through several revolutions both clockwise and anti-clockwise. Oil may flow from ports.
4. Measure quantity of oil drained out; make this up to 199 cc (7 fl oz) and re-fill compressor with this amount of 525 viscosity refrigerant oil.

If the compressor is not to be fitted immediately, it is important that the pressure plate be refitted over the ports and secured there, to prevent ingress of foreign matter.
Should it be suspected that the compressor oil level is low, on a car in service, the checking procedure detailed should be followed after the car engine has been run for at least 10 - 15 minutes with the air conditioning system switched on; this will cause the refrigerant oil to be returned to the compressor sump.
Should a new receiver-drier bottle, condenser or evaporator be fitted, without the car engine being run as above, immediately before dismantling, the following quantities of 525 viscosity refrigerant oil must be added to the system:
(a) For a new receiver-drier bottle — add 28 cc (1 fl oz).
(b) For a new condenser — add 85 cc (3 fl oz).
(c) For a new evaporator — add 85 cc (3 fl oz).

Additional oil is not needed after renewal of hose assemblies.
Oil may be added to the system either directly into the compressor or into the compressor charging port.

Compressor Servicing Procedure

To enable the servicing of the air conditioning compressor the following components are now available The following servicing procedures should be adopted in the event of a malfunction of the compressor which involves any of the parts listed, as opposed to the replacement of the compressor unit

Part Description

Pulley Bearing
Superheat Switch
Pressure Relief Valve
'O' Ring Suction Discharge Port
$\frac{1}{4}$ Pint 525 Viscosity Oil
Clutch Driver Assembly
Shaft Nut
Woodruff Key
Coil and Housing Clutch
Pulley Bearing Assembly
Retainer Ring Kit
Body of Compressor less Clutch, Pulley and Coil Housing Assembly
Shaft Kit for Seal
Bearing Retaining Ring

The specialist tool kit required to service the compressor unit in conjunction with the following procedures are available from KENT MOORE.

Tool Kit	**10500**
Hub Holding Tool	**10418**
Thin Walled Socket	**10416**

Tool Kit Contents

Pulley Extractor Kit
Pulley Bearing Remover and Installer Kit
Seal Assembly Remover and Installer
Hub Drive Plate Remover Kit
Hub and Drive Plate Assembly Installer
'O' Ring Remover
'O' Ring Installer
Snap Ring Installer
Ceramic Seal Remover and Installer, and Shaft
Seal Protector
Hub Holding Tool
Thin Walled Socket

When Servicing the compressor, remove only the necessary components that preliminary diagnosis indicates are in need of service.

Seven service operations may be performed on the GM 6 cylinder compressor.

(i) Replacement of compressor assembly.
(ii) Replacement of clutch drive and pulley assembly.
(iii) Replacement of pulley bearing.
(iv) Replacement of clutch coil and housing assembly.
(v) Replacement of shaft seal.
(vi) Replacement of superheat switch.
(vii) Replacement of compressor cylinder and shaft assembly (less clutch drive, coil housing and pulley).

General Instructions During Servicing Operations

(i) Discharge system prior to removal of compressor unit.
(ii) During removal, maintain the compressor positioned so that the sump is downward Do not rotate compressor shaft
(iii) If the compressor is being replaced due to a component failure within the main body of the compressor, the clutch coil housing and clutch plate drive and hub assembly must be removed from the original compressor unit and fitted to the replacement unit. This also applies when fitting a replacement compressor body.
(iv) If the original compressor is being reinstalled following servicing, replace with the right quantity of 525 viscosity oil.
(v) Discard 'O' rings from suction and discharge ports of compressor and replace and with new 'O' rings.
(vi) Install compressor and adjust drive belt tension to service manual specifications
(vii) Lubricate 'O' rings with refrigerant oil and attach suction and discharge hose connections and retaining plate to compressor torque to 2,764 - 3,455 kgfm (20 - 25 ft lbs)

Replacement of Clutch Drive Plate and Hub Pulley, Clutch Coil and Housing Assemblies.

Discharge the system.
Remove the compressor from the engine.
Using suitable mounting jig or vice, secure compressor.
Holding the hub of the clutch drive plate with the hub holding tool Using the thin walled $\frac{9}{16}$ in socket remove the shaft nut. Refer to Fig. 46.

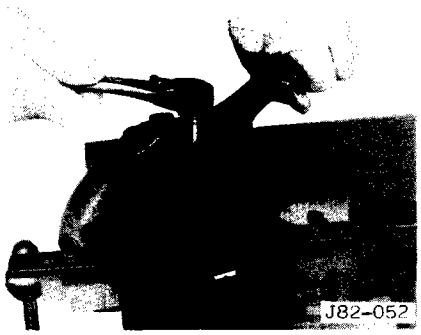


Fig 46

Screw the threaded hub puller to the hub. Hold the body of the hub puller with a suitable spanner, tighten centre screw of hub pulley (Fig. 47), until drive plate, hub and woodruff key can be removed (Fig. 48).

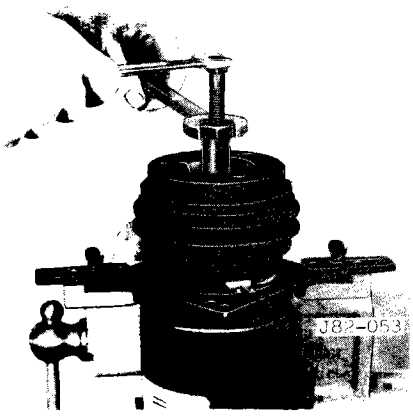


Fig 47

Fig 48

Using suitable circlip pliers remove the bearing to head retainer ring (Fig. 49)

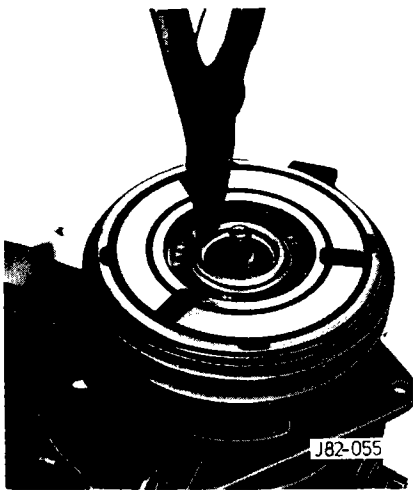


Fig 49

Fig 50

Remove the absorbent felt sleeve retainer ring to enable the location of the pulley extraction tool.
Using the pulley extraction tool locate the puller pilot on hub of front head and remove the pulley assembly (Fig. 50).

NOTE: The next operation details removal of pulley bearing. DO NOT remove the pulley bearing unless it is to be replaced. Removal may cause the bearing to be damaged.

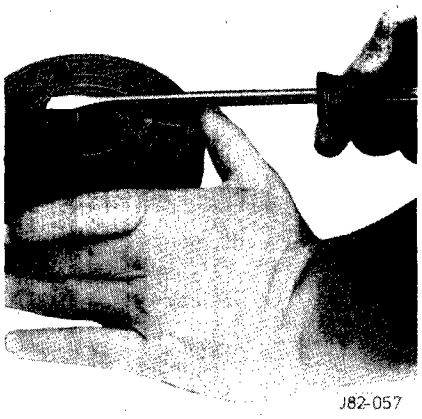


Fig 51

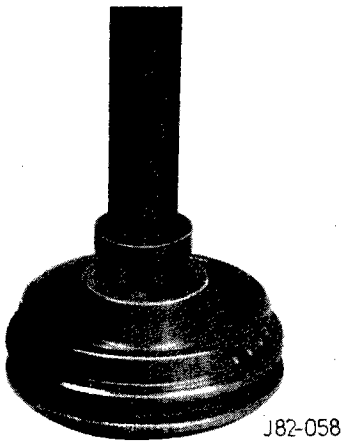


Fig 52

Remove bearing to pulley retaining ring with small screwdriver (Fig. 51). Drive out the bearing using bearing remover and handle (Fig. 52).

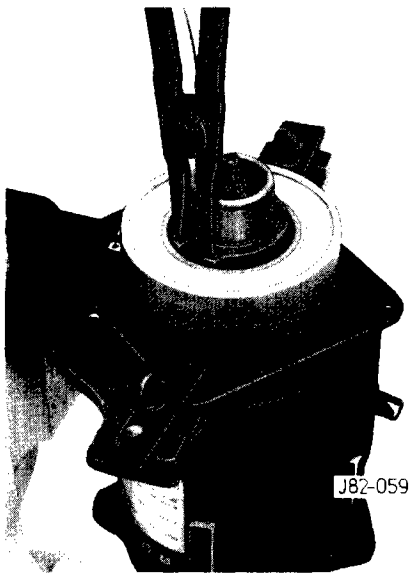


Fig 53

Mark position of the coil and housing assembly in relationship to the shell of the compressor. Remove the coil housing retainer ring using suitable circlip pliers (Fig. 53) and lift off the coil and housing assembly (Fig. 54).
Examine coil for loose or distorted terminals and cracked insulation. Check that the current consumption is 3.2 Amps at 12 volts. The resistance should be 3.75 Ohms at room temperature.

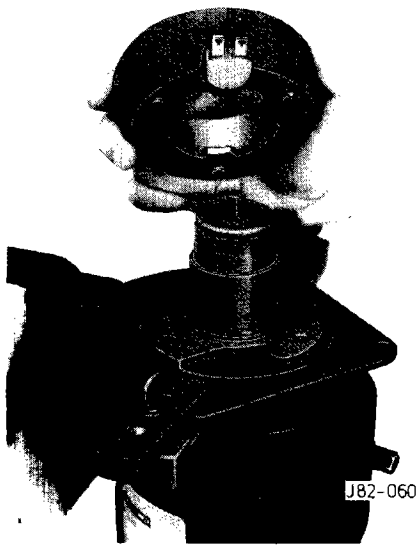


Fig 54

Reassemble coil and housing assembly by reversing the dismantling procedure. Be sure coil and housing assembly markings line up

NOTE: If the pulley assembly is going to be reused, clean the friction surface with suitable solvent cleaner.

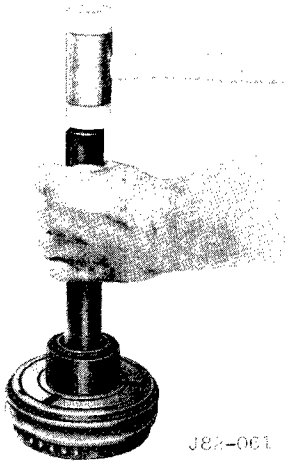


Fig 55

Drive the new bearing into the pulley assembly with the bearing installer and handle. The bearing installer will ride on the outer race of the bearing (Fig. 55).

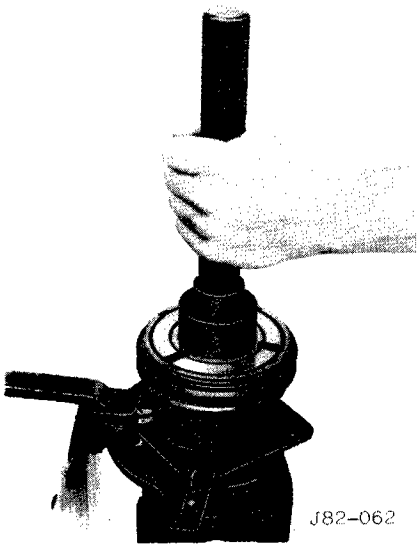


Fig 56

Lock the bearing in position with the bearing to pulley retainer ring.
Press or tap the pulley assembly into the hub of front head using installer tool and handle (Fig. 56).
Check the pulley for binding or roughness, and that the pulley rotates freely.
Using suitable circlip pliers lock pulley assembly in position with bearing to head retainer ring (flat side of retainer ring should face towards pulley).
Install square drive woodruff key in the key way of the clutch drive hub.
Wipe frictional surface of clutch plate and pulley clean Using a suitable solvent.
Place clutch plate and hub assembly on shaft, aligning shaft key way with key in hub (refer to Fig 48 dismantling procedure).

NOTE: The woodruff key is made with a slight curvature to help hold it in the plate hub during assembly.

IMPORTANT: To avoid damage to the compressor, undue force should not be applied to the hub or shaft. This could misplace axial plate on shaft, resulting in damage to the compressor.

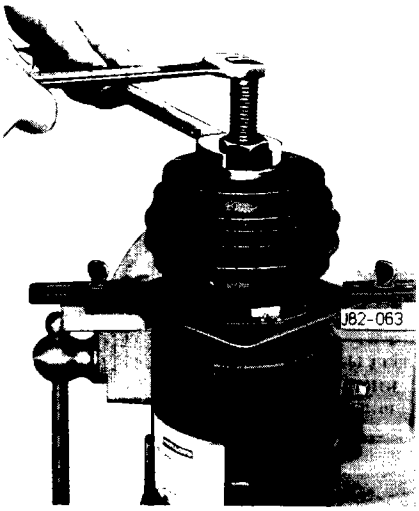


Fig 57

Place spacer on hub. Thread clutch plate and hub assembly installer tool onto end of the shaft (Fig. 57).

Hold the head of the bolt and turn tool body several revolutions to press hub partially on shaft. Remove clutch plate and hub assembly installer and spacer.

Check alignment of woodruff key with key way in shaft. If alignment is correct, replace installer tool and continue to press hub into shaft until there is approximately 2,38 mm ($\frac{3}{32}$ in) air gap between the frictional surfaces of pulley and clutch plate. Remove installer tool and spacer.

Install a new shaft lock nut with the small diameter boss of the nut against the hub using a thin wall $\frac{9}{16}$ in socket. Hold clutch with holding tool and tighten nut to 2,07 kg/fm (15 ft/lbs), using a 3,455 kg/fm (25 ft/lbs) torque wrench. The air gap between the frictional surfaces of pulley and clutch plate should now be approximately 0,56 mm to 1,45 mm (0.022 in to 0.057 in).

Shaft Seal Leak Detection

A compressor shaft seal should not be changed because of an oil line on the underside of the bonnet. The seal is designed to seep some oil for lubrication purposes. Only change a shaft seal when a leak is detected by the following procedures.

Ensure there is refrigerant is in the system.

Turn off the engine.

Blow off compressor clutch area with compressed air. Blow out clutch vent holes to completely remove any freon and oil deposits.

Allow car to stand for 5 minutes, without operating compressor.

Rotate the compressor clutch drive plate by hand until one of the vent holes is at the lower side of drive plate. Using leak detector, sense through vent hole at lower side of drive plate only.

Some compression shaft seal leaks may be the result of misplacement of the axial plate on the compressor shaft. The mispositioning of the axial plate may be caused by improper procedures used during pulley and driven plate removal, undue force collisions, or dropping the compressor.

Replacement of Shaft Seal

Remove clutch driven plate and hub assembly as previously described.

Remove compressor absorbent felt retaining ring and felt sleeve.

Fig 58

Thoroughly clean the area inside the compressor neck surrounding the shaft, the exposed portion of the seat and the shaft itself of any dirt or foreign material. This is absolutely necessary to prevent any such material from getting into the compressor.

Remove the seal seat retaining circlip (Fig. 58) using suitable circlip pliers.

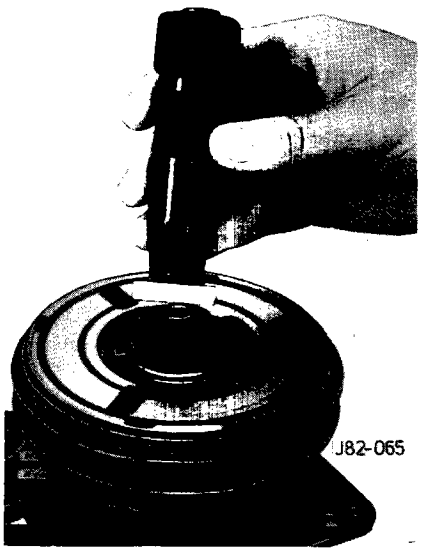


Fig 59

Remove the ceramic seal seat using the seal seat remover and installer tool (Fig. 59). Position tool into seal seat recess, grasp flange of shaft seal seat and pull straight out.

Fig 60

Using the seal remover and installer tool grip the seal by inserting the tool into the seal recess. Turning clockwise. Withdraw the tool and seal (Fig. 60).

Fig. 61

Remove the seal seat 'O' ring (Fig. 61) using the 'O' ring remover tool.

Recheck the inside of the compressor neck and the shaft. Be sure these areas are perfectly clean and free of burrs before installing new parts.

Coat shaft and 'O' ring with clean compressor 525 viscosity oil.

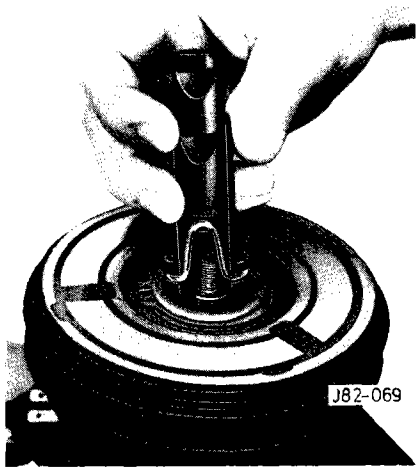


Fig 62

Place 'O' ring on 'O' ring installer (Fig. 62) and insert tool and 'O' ring into seal recess. Release 'O' ring by sliding down tool hook, and remove tool.
(Fig. 63) illustrates the tool being removed following 'O' ring installations.

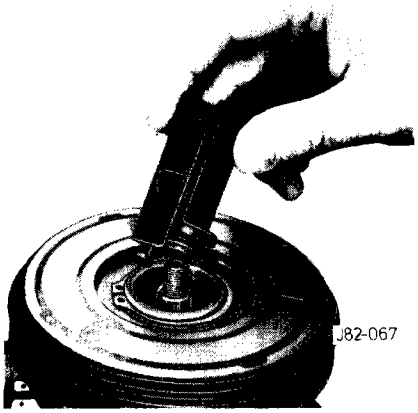


Fig 63

Place the seal protective sleeve over the compressor shaft and fit new shaft seal. Gently twisting the tool clockwise to engage the seal housing flats onto the compressor shaft. Withdraw the tool by pressing downwards and twisting the tool anti-clockwise.
Coat the seal face of the new ceramic seal seat with clean 525 viscosity oil. Mount the seal seat on to the remover and installer tool and carefully guide the seal into the compressor neck gently twisting it into the 'O' ring seal.
Disengage and remove tool, and compressor shaft protective sleeve.
Install new circlip with the flat side against seal seat, and press home.
Install the new absorbent sleeve by rolling the material into the cylinder, overlapping the ends and slipping it into the compressor neck with the overlap at the top of the compressor. Using a small screwdriver or similar tool carefully spread the sleeve so that in its final position, the ends butt together at the top vertical centre line.
Install the new absorbent sleeve retainer so that its flange face will be against the front end of the sleeve, press and tap with a mallet setting the retaining ring and absorbent sleeve until the outer edge of the sleeve retainer is recessed approximately 0.8 mm ($\frac{1}{32}$ in) from the face of the compressor neck.
Lightly lubricate absorbent felt sleeve with 525 viscosity oil.
Refit clutch drive plate and hub assembly
Check compressor oil level.
Refit compressor to vehicle, and connect the suction (low pressure) and discharge (high pressure) hoses using new 'O' ring seals.
Prior to fitment of compressor drive belt rotate the compressor drive plate clockwise several revolutions to prime lubrication pump.
Evacuate and recharge system.

NOTE: During charge procedure check compressor seals for leaks using suitable leak detection equipment.

Leak Test

A high proportion of all air conditioning work will consist of locating and repairing leaks. Many leaks will be located at points of connections and are caused by vibration. They may only require the retightening of a connection or clamp. Occasionally a hose will rub on a structural part of the vehicle and create a leak, or a hose will deteriorate and require a replacement. Any time the system requires more than $\frac{1}{2}$ lb of refrigerant after a period of operation, a leak is indicated which must be located and rectified.
The 'Robinair Robbitek 30001 Leak Detector' is designed for speedy detection of leaks. The leak detector is small and portable, and is battery operated. This instrument will indicate leaks electronically by sounding an alarm signal. Provision is made to plug in an earphone, which is useful in a noisy workshop; and it has the recommended sensitivity of 0,45 kg (1 lb) in 32 years.

FLAP LINKAGE

Adjust Air

Service Tools: 18G 1363, Setting Jig (Fig. 64)

Remove the console right hand panel and underscuttle trim panels to gain access to the air conditioning unit flap linkages. Note: On LH drive cars it is necessary to remove the glovebox compartment.
Remove the footwell outlet vent from the air conditioning unit.
Switch on the ignition, position the right hand control knob to 'DEF'. When the servo has reached its full heat position, switch off the ignition and disconnect the battery.
Disconnect the linkage rods (1, Fig. 66) from the servo lever connections.
Set the link bolt adjuster (2, Fig. 66) in its mid position.
Gently pull the wire link (3, Fig. 66) to detach it from the grommet in link (4, Fig. 66)

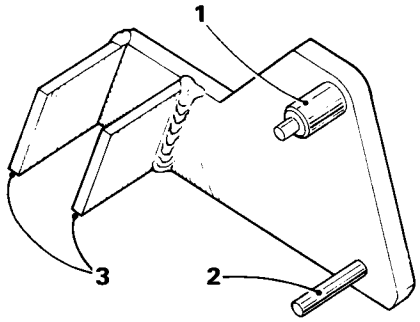


Fig 64 J82 104

Move the thumbwheel (Fig. 65), located in the radio console panel, fully to the right.
Using the jig setting tool 18G 1363, locate peg (1, Fig. 64) into the hole (7, Fig. 66) on the linkage protection bracket, and peg (2, Fig. 64) in the hole in linkage (4, Fig. 66), from which link (3, Fig. 66) was removed.
The parallel end guides on the setting jig tool (3, Fig. 64), should locate over the linkage assembly (8, Fig. 66) so that the linkage is in a straight line. If linkage (8, Fig. 66) is not in line adjust the distribution temperature control cable (9, Fig. 66), until the linkage is straight. Tighten the cable clamp (6, Fig. 66).
With the jig setting tool in position adjust the linkage (10, Fig. 66) until post (11, Fig. 66) is at the top of the slot.
Remove the jig setting tool.
Position the setbolt adjuster (12, Fig. 66) at its furthest point away from fulcrum (13, Fig 66). Refit the link rod (3, Fig. 66) to linkage (4, Fig. 66).
Reconnect the servo linkage rods (1, Fig. 66) to the servo motor levers, ensure that the servo lever cam followers locate against the servo cams.
Reconnect the battery and switch on the ignition. Motor the system to the full cooling position.
Switch off the ignition.
Check that the linkage (14, Fig. 66) abuts against the snail cam (15, Fig. 66).
The lower heat flap should now be fully sealed; check by manually pushing the snail cam, no movement should be evident.

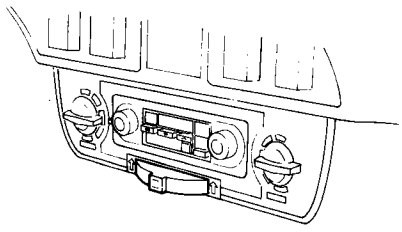


Fig 65 J82 105

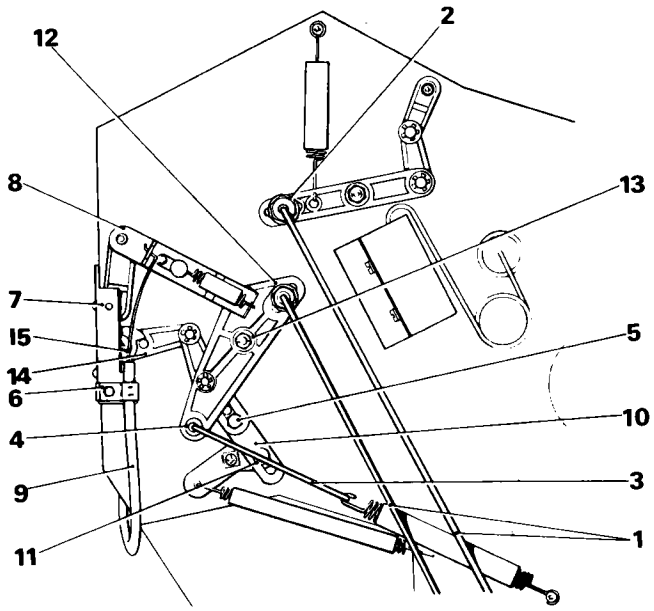


Fig 66 J82 070

If there is movement, switch on the ignition and motor the system to its full heat position, switch off the ignition. Slacken the set bolt adjuster (12, Fig. 66) and move it slightly towards the fulcrum point (13, Fig 66) Reset the servo lever linkage rods (1, Fig 66) so that the servo lever cam followers locate against the servo cam.

Switch on the ignition and motor the system to its full cooling position (AUTO 65). Check that linkage (14, Fig. 66) abuts against the snail cam (15, Fig. 66). Check manually by pressing the snail cam, if movement is evident, repeat the procedure in the previous paragraph.

If no movement is evident, then the lower heat flap is sealing correctly and the flap linkages and distribution temperature control are correctly set.

Ensure that all linkages and adjustments are secure.

Refit the footwell outlet vent, the underscuttle trim panels and console right hand side panel.

CONDENSER UNIT AND RECEIVER-DRIER

Renew

Before commencing this operation, ensure that suitable clean, dry sealing plugs and caps are to hand

Disconnect the battery earth lead.

Depressurise the air conditioning system.

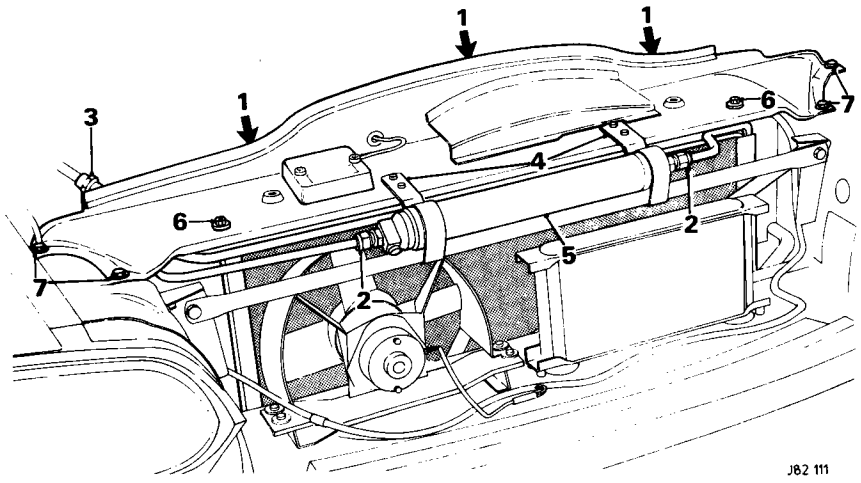
Remove the nuts and washers securing the fan cowl to the radiator (1, Fig. 67) top rail and pull the fan cowl clear of the mounting studs.

Disconnect the pipes from the receiver-drier (2, Fig. 67) and the pipe from the compressor to the condenser (3, Fig. 67). Fit blanking plugs to all the disconnected pipes to avoid contamination.

Remove the nuts and washers securing receiver-drier (4, Fig. 67).

Remove the receiver-drier (5, Fig. 67).

Note the connections and disconnect the cable harness to the ignition amplifier.



J82 111

Fig 67

Remove the nuts and washers securing the condenser mounting bracket to the radiator top rail (6, Fig. 67).

Remove the four bolts and washers securing the radiator top rail to the wing valances (7, Fig. 67).

Ease the top rail clear of the condenser and lift the condenser clear of the car.

On refitting, reverse the above operations and fit a new receiver-drier.

NOTE: If the system is opened, even for a short time, the receiver-drier must be renewed. Do not remove the protective sealing caps from the new unit until it has been fitted and is ready for the pipes to be connected.

AMBIENT TEMPERATURE SENSOR

Renew

Disconnect the battery earth lead.

Remove the right hand underscuttle casing.

Remove the component panel securing screws and displace the component panel.

Note the position of the electrical connections and disconnect the cables from the sensor.

Remove the two screws securing the sensor and remove the sensor.

IN CAR TEMPERATURE SENSOR

Renew

Disconnect the battery earth lead.

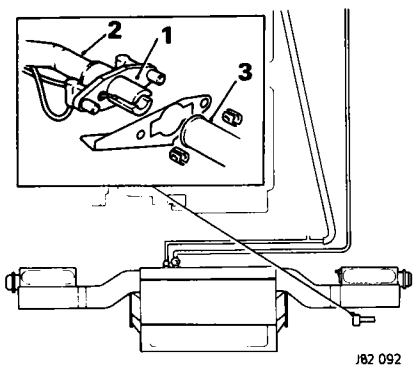
Remove the screws securing the passengers underscuttle casing and remove the casing.

Remove the screws securing the glove box liner and the glove box latch. Remove the latch and carefully withdraw the liner.

Carefully manoeuvre the elbow hose from the sensor outlet.

Disconnect and remove the sensor assembly (1, Fig. 68) from the air pick-up tube (2, Fig. 68).

Remove the sensor assembly from the elbow hose (3, Fig. 68).



J82 092

Fig 68

TEMPERATURE SELECTOR

Renew

MODE SELECTOR

Renew

Disconnect the battery earth lead.

Carefully prise off the switch knobs from the temperature and fan controls.

Unscrew the fasteners from behind the control knobs and detach the control panel.

Disconnect the optical fibre elements, remove the control panel and the radio escutcheon assemblies.

Remove the right and left hand side pads.

Unscrew the gear selector control knob.

Remove the screws securing the switch panel to the centre console, ease the switch panel from the centre console, note the position of the wiring connectors, disconnect the connectors and remove the switch panel.

Remove the screws securing the front and rear ends of the console.

Displace the stop lamp bulb failure sensor and remove the console assembly.

Remove the bolts and washers securing the stays to the transmission tunnel (1, Fig. 69).

Ease the stays aside to give access to the switch panel.

Remove the nuts and washers securing the switch panel to the left hand of the unit (2, Fig. 69).

Remove the screws securing the switch cover to the switch panel (3, Fig. 69). Note the position and disconnect the vacuum pipes.

Remove the nut and washer securing the switch cover to unit at lower right hand side.

Release the harness and remove the switch cover.

Remove the nut and washer securing the switch panel at the upper right hand side of the panel (5, Fig. 69).

Ease the panel clear of the mounting studs, remove the two screws securing the temperature selector (4, Fig. 69), note the position of the cable connections, disconnect the cables at the connections (6, Fig. 69) and remove the selector.

Note the position of and disconnect the cables from the mode selector micro-switches (1, Fig. 70).

Note the position of the micro-switches, remove the two screws and nuts securing the switches (2, Fig. 70).

Remove the switches and retain the distance pieces.

Remove the screws securing the vacuum switch mounting bracket (3, Fig. 70) and remove the vacuum switch assembly.

Remove the circlip securing the cam assembly and remove the cam assembly.

NOTE: Care must be taken to ensure that correct replacement parts are used, and that the items are replaced in the correct position.

When refitting the cams, ensure that the vacuum switch operating rod is pressed back to allow the camshaft into position.

THERMOSTAT

Renew

Disconnect the battery earth lead.

Remove the right hand underscuttle casing and the right hand side casing.

On left hand drive cars remove the glove box liner.

Remove the nut securing the thermostat to the bracket (1, Fig. 71).

Note the position of and disconnect the cables from the lucar connectors (2, Fig. 71).

Carefully remove the thermostat by withdrawing the capillary tube from the air conditioning unit (3, Fig. 71).

NOTE: Ensure the replacement thermostat capillary tube is formed to the exact dimensions of the unserviceable unit, ensuring that the capillary tube makes contact with the evaporator matrix.

BLOWER MOTOR RESISTANCE UNIT

Renew

Disconnect the battery earth lead.

On right hand drive cars, remove the left hand underscuttle casing and the glove box liner.

On left hand drive cars, remove the left hand underscuttle casing and the left hand side casing.

Note the position of and disconnect the cables from the resistance unit lucar connectors (1, Fig. 72).

Remove the screw securing the vacuum hose clip, move the hose to one side (2, Fig. 72).

Remove the screws securing the resistance unit and withdraw the unit from the air conditioning unit case (3, Fig. 72).

On refitting, ensure the cable connectors are secure and connected correctly.

WATER VALVE TEMPERATURE SWITCH

Renew

Disconnect the battery earth lead.

Remove the left hand underscuttle casing and the console side casing.

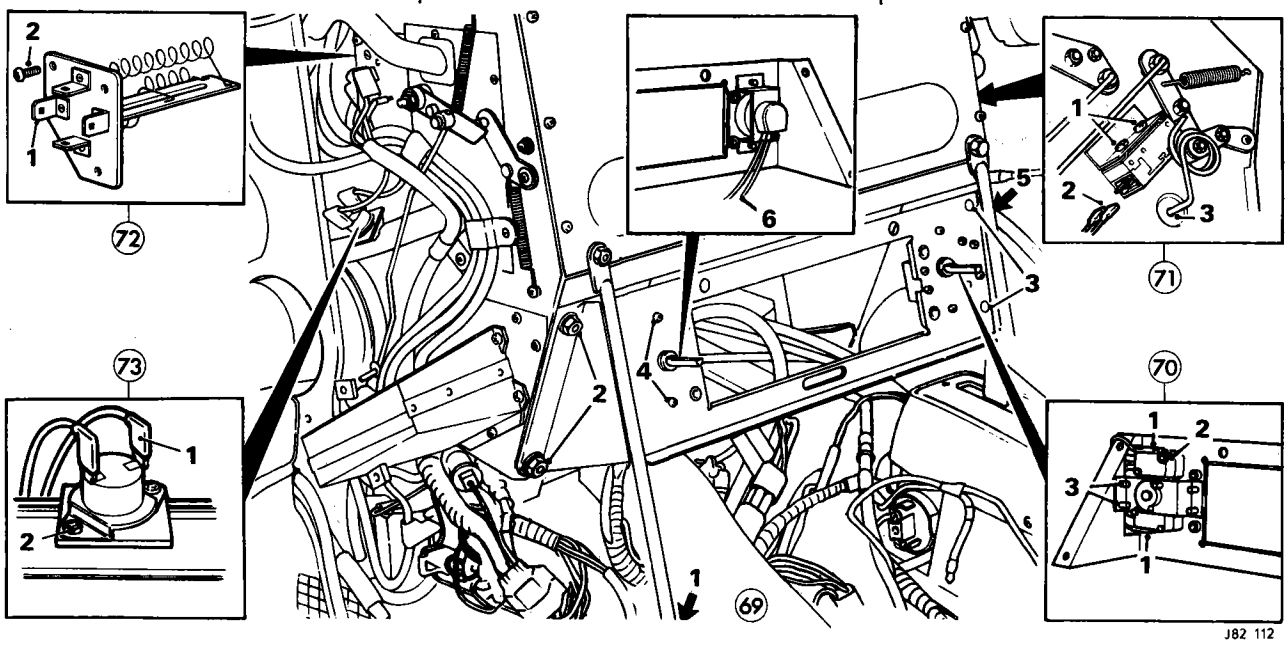
On right hand drive cars remove the glove box liner.

Disconnect the cables at the lucar connectors on the switch (1, Fig. 73).

Withdraw the securing screws and remove the switch (2, Fig. 73).

On refitting, ensure the connectors are clean and tight.

Figs 69 — 73



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BLOWER MOTOR RELAY

Renew

Disconnect the battery earth lead.
Remove the left hand console side casing.
Remove the screws securing the footwell air outlet duct and remove the duct
Note the position of the cable connectors.
Disconnect the block connector, the lucars and the main feed cable from the relay (1, Fig. 74).
Remove the nuts securing the relay and remove the relay (2, Fig. 74).
On fitting replacement relay, ensure the cables are secure and connected correctly.

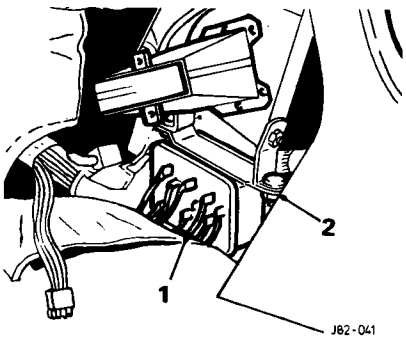


Fig 74

WATER VALVE

Renew

Remove the engine coolant filter and header tank caps, then open the radiator drain tap.
Allow the coolant to drain from the system.
Slacken the securing clip on the water valve to cylinder head hose and disconnect the water valve from the hose (1, Fig. 75).
Disconnect the vacuum hose from the water valve (2, Fig. 75).
Reposition the valve for access to the water valve to heater hose clip (3, Fig. 75).
Slacken the clip and remove the water valve.

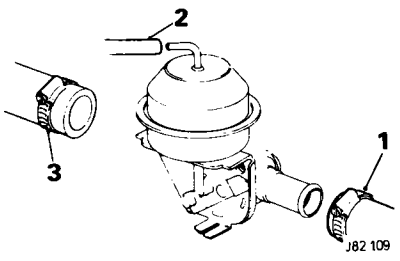


Fig 75

On refitting, ensure the cooling system is refilled with coolant to the correct specification

THERMAL FUSE

Renew

Disconnect the cable block connector from the thermal fuse (1, Fig. 76) assembly located to the front of the right hand wing valance.
Remove the nut and screw securing the thermal fuse (2, Fig. 76)
Remove the thermal fuse.

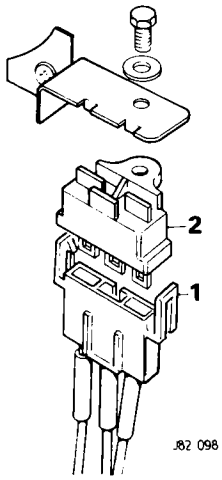


Fig 76

EXPANSION VALVE

Renew

Depressurize the air conditioning system.
Partially drain the engine coolant.
Disconnect the hose unions (1, Fig. 77) and seal with clean blanking caps.
Release the clip securing the water valve to the cylinder head hose, disconnect the water valve from the hose, and move the water valve clear of the expansion valve.
Remove the padding from the capillary tube (2, Fig. 77).
Disconnect the capillary tube at the union (3, Fig. 77).
Release the valve by unscrewing the union nut (4, Fig. 77)

NOTE: To avoid straining the joint or the pipe, ensure the valve is held firmly as the union is unscrewed.

Slacken the two screws securing the capillary tube clear of the clamp.
Remove the valve assembly carefully, manoeuvering the capillary tube clear of the clamp.
On fitting replacement unit, ensure new 'O' rings are fitted, the cooling system is refilled, and the air conditioning system is recharged.

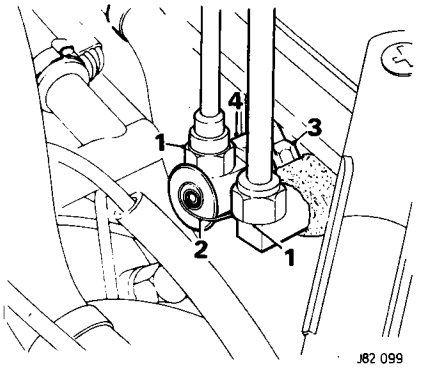


Fig 77

BLOWER ASSEMBLY

Remove and refit RH Unit

The blower fans are heavy duty motors with impellors attached. Speed is varied by controlled switching of resistances in series with the motors. The right hand unit has the ambient temperature sensor mounted in the inlet duct. Air flow control flaps are operated by a vacuum actuator situated in the side of the inlet duct.

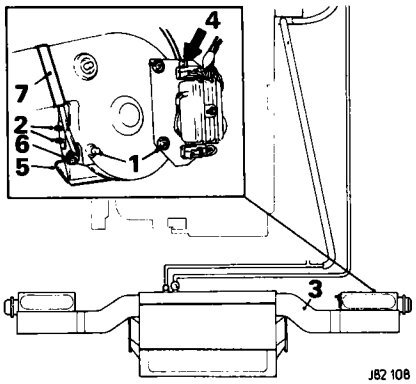


Fig 78

Disconnect the battery earth lead.
Remove the right hand underscuttle casing and right hand console casing.
On left hand drive cars, remove the glove box liner.
Remove the nuts securing the component panel to the blower (1, Fig. 78) assembly, secure the component panel clear for access to the blower assembly mounting bolts.
Disconnect the ambient temperature sensor leads at the lucar connectors (2, Fig. 78).
Disconnect the pliable trunking from the stub pipes on the side of the air conditioning unit (3, Fig. 78).
Disconnect the blower motor harness block connector.
Disconnect the vacuum pipe from the flap operating servo on blower assembly (4, Fig. 78).
Open the recirculation flap and fit a wedge to retain it in the open position (5, Fig. 78).
Remove the bolts securing blower assembly to mounting brackets (6, Fig. 78).
Ease the blower assembly from its location.
Remove the tape securing the ducting to the assembly (7, Fig. 78).

AIR CONDITIONING UNIT

Remove and refit

Removing

Disconnect the battery earth lead.
Withdraw the steering wheel and the adjuster assembly from the upper steering column.
Remove the left and right hand underscuttle casing.
Remove the instrument panel module and carefully remove switch panel.
Withdraw the air conditioning knobs from the air conditioning selector switches, remove the radio, remove the screws securing the facia and the console to the air conditioning unit.
Remove the glove box liner.
Slacken the nuts securing the top rear portion of the facia to the bulkhead, remove the bolts securing the sides of the facia to the bulkhead, remove the nut securing the main light switch, displace the switch and carefully remove the facia from the car.
Disconnect the air conditioning hoses at the bulkhead connectors to the expansion valve on the engine compartment (1, Fig. 79).
Disconnect the coolant hoses at the heater bulkhead connectors in the engine compartment.
Remove the nuts securing the air conditioning unit to the bulkhead (2, Fig. 79).
Unclip the main harness from the securing clips on the screen rail (3, Fig. 79).
Remove the bolts securing the demist duct support rail to the body mounting points and remove the support rail (4, Fig. 79)
Disconnect the pliable ducting between the air conditioning unit and the blower motors from the stub pipes (5, Fig. 79).
Remove the rear compartment ducts (6, Fig. 79)
Remove the nuts and bolts securing the unit support stays (7, Fig. 79); recover the stays.
Remove the automatic gearbox selector quadrant cover.
Remove the bolts securing the upper steering column to the mounting bracket; remove the spacers and the packing washers (8, Fig. 79).
Remove the bolts securing the earth leads and the support stays to the steering column mounting bracket. Retain the washers (9, Fig. 79).
Remove the bolt securing the mounting bracket to the screen rail (10, Fig. 79) and retain the bracket.

NOTE: To facilitate refitting, it is advised that the position of all the electrical multi-pin connectors are noted and marked. The position and the routes of all the vacuum pipes noted and marked.

Disconnect the blower motor flap vacuum pipes at the 'T' piece (11, Fig. 79), and the demister duct vacuum pipe at the servo (12, Fig. 79).
Disconnect the main panel harness electrical connectors and remove the harness from the securing clips.
Remove the nuts securing the air conditioning switch panel to the air conditioning unit (13, Fig. 79) and remove the screws securing the mode switch cover, retain the switch cover (14, Fig. 79)
Disconnect the mode switch vacuum pipes and the mode switch electrical connectors.
Disconnect the earth cable and the motor harness multi-pin at the air conditioning main harness.
Disconnect the remaining block connectors including the multi-pin connector of the windscreen wiper motor harness at the bulkhead.
Disconnect the ambient and in car sensors.
Ease the drain tubes clear of the grommets in the transmission tunnel, ease the main panel harness clear of the unit and ease the demist duct vane securing studs from the screen rail.
Retain the demist duct assembly.
Remove the screw securing the air conditioning unit to the top rail (15, Fig. 79).
Manoeuvre the unit from its location taking great care to prevent damage to the unit or to the surrounding components.
With the unit on a workbench, remove the face level vent, the brackets and the demist duct assembly from the unit.
Refit by reversing the above procedure noting that the receiver-drier must be replaced.

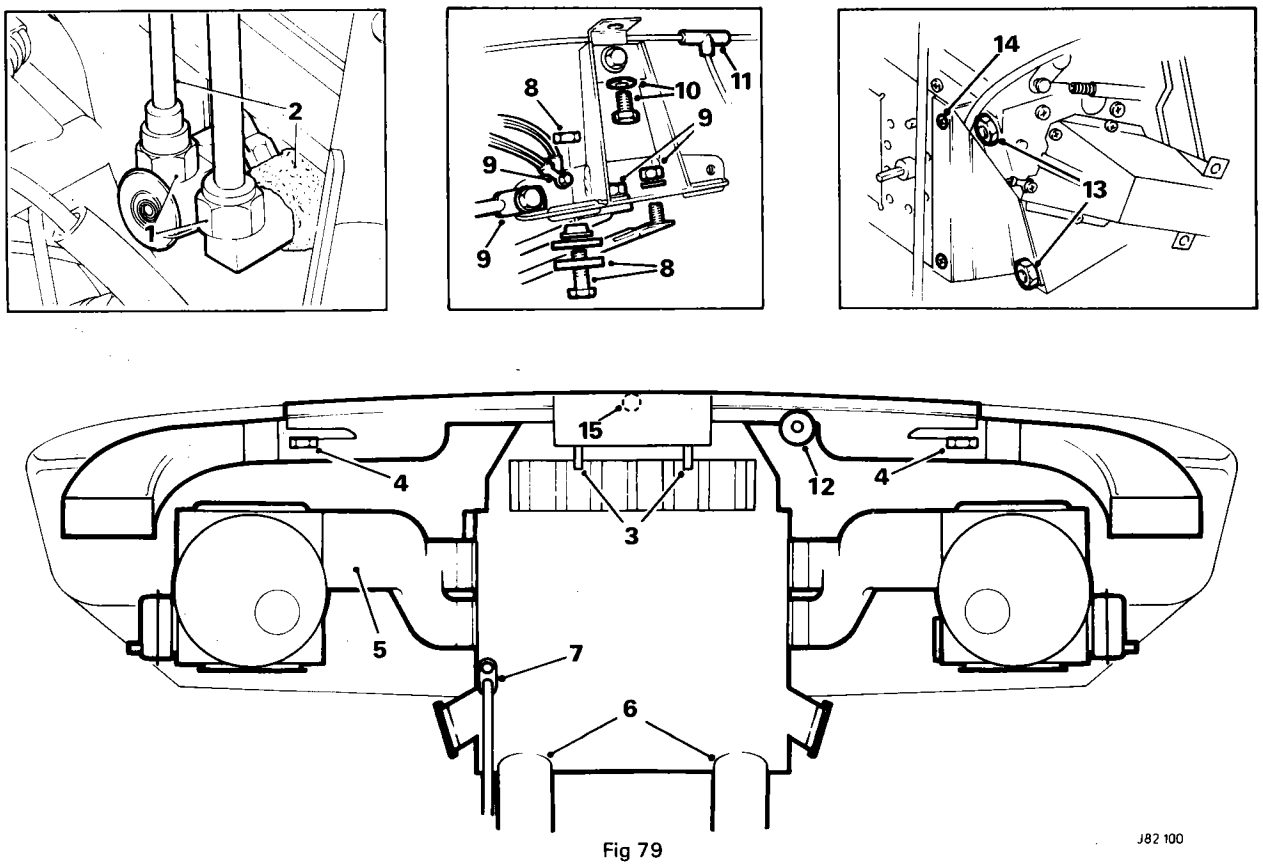


Fig 79

J82 100

BLOWER ASSEMBLY

Remove and refit LH Unit

Removing

Disconnect the battery earth lead.
Remove the left hand underscuttle casing and the left hand console casing
On right hand drive cars, remove the glove box liner.
Remove the nuts securing the compartment panel (1, Fig. 80) to the blower motor assembly, ease the panel clear and secure for access to blower assembly (2, Fig. 80).
Disconnect the pliable ducting from the stub pipes at the side of the air conditioning unit (3, Fig. 80)
Disconnect the blower motor harness at the block connector
Disconnect the vacuum pipe from the flap operating servo on the blower assembly (4, Fig. 80).
Open the recirculation flap in the base of the blower assembly and hold open with a suitable wedge (5, Fig. 80).
Remove the bolts securing the blower assembly to the mounting brackets, and ease the blower assembly from its location (6, Fig. 80)
Remove the tape securing the ducting to the assembly and remove the ducting (7, Fig. 80)

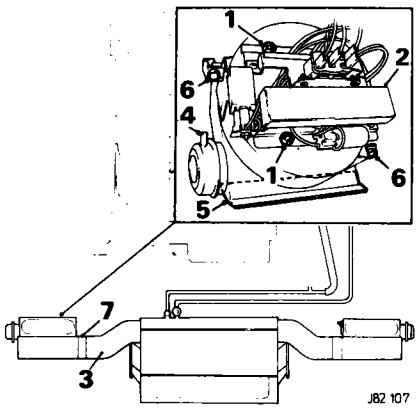


Fig 80

VENTILATORS

Remove and refit — Centre
Right hand
Left hand

Removing

For the centre and passengers side veneer panels, open the glove box for access. By using a suitable long thin-bladed instrument, carefully release the veneer panel, retaining clips, and remove the appropriate panel
Withdraw the appropriate ventilator

HEATER MATRIX

Renew

With the air conditioning unit removed and located on a workbench, the heater matrix can be removed.

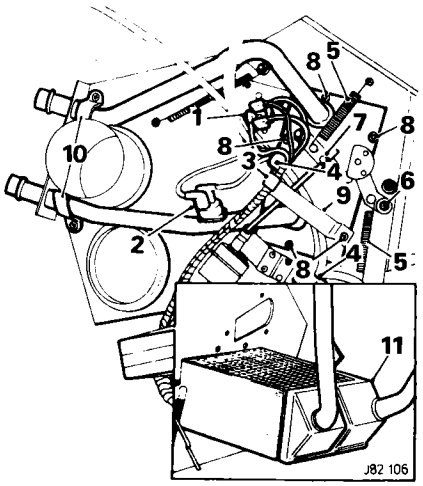


Fig 81

IMPORTANT: It is recommended that the positions of all the operating rods are marked with a scriber, or a similar methods.

Note and disconnect all the cables from the blower motor resistance unit (1, Fig. 81) and the water valve temperature switch (2, Fig. 81)
Remove the screws securing the cable harness clip and the bracket (3, Fig. 81)
Remove the screws securing the vacuum pipe clips (4, Fig. 81)
Disengage the return springs from the operating levers (5, Fig. 81), remove the screw securing the lower flap operating lever to flap hinge (6, Fig. 81) and remove the lever
Slacken the screw securing the operating rod from the vacuum servo to the flap operating lever on the matrix cover (7, Fig. 81) and release the lever from the rod.
Remove the screws securing the matrix cover plate to the unit (8, Fig. 81).
Remove the screws securing the heater matrix pipes retaining bracket to unit and remove the bracket (9, Fig. 81)
Remove the pipe clips (10, Fig. 81)
With a straight pull, ease the matrix clear of the unit (11, Fig. 81)
Remove the sleeve from the top pipe, the cover plate and the water valve temperature switch from the lower pipe

EVAPORATOR

Renew

With the air conditioning unit removed from the car and placed on a workbench.
Remove the screws securing the heater matrix pipe retaining bracket to the unit and remove the bracket
Remove the screws securing the back plate to the unit, ease the rubber pad from the back plate (1, Fig. 82), remove the screws securing the expansion valve mounting plate to the back plate (2, Fig. 82), and ease the back plate (3, Fig. 82) over the expansion valve

NOTE: Take care to prevent damage to the capillary tube.

Remove the thermostat (4, Fig. 82) by disconnecting the cables and removing the fixing nut. Carefully ease the thermostat capillary tube from the air conditioning unit.
Ease the evaporator clear of the air conditioning unit (5, Fig. 82).

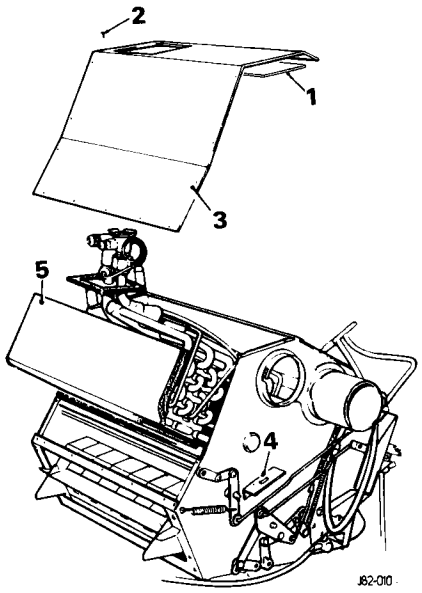


Fig 82

SERVO AND CONTROL UNIT

Remove and refit

Disconnect the battery earth lead.
Remove the RH console side casing.
Remove the RH footwell vent by withdrawing the four securing screws (1, Fig. 83).

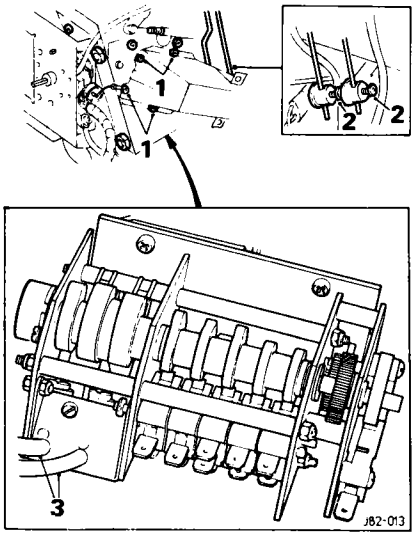


Fig 83

Disconnect the two flap operating rods from the cam followers, marking the rods to facilitate correct refitting (2, Fig. 83).
Mark the vacuum tubes for identification before disconnecting them from the vacuum switches (3, Fig. 83).
Disconnect the cable harness at the multi-pin plug and socket.
Remove the servo unit chrome dome nut and ease the servo clear of the unit.
Refit by reversing the above procedure.

SERVO AND CONTROL UNIT ASSEMBLY

Overhaul

CAUTION: No attempt must be made to dismantle the servo motor from the gearbox. 12 volts must never be applied direct to the motor connections. The motor will over-run the limit switches and could strip the gear assembly. Do not attempt to dismantle the camshaft assembly.
The servo and control unit must not be serviced under warranty.

Dismantling

To remove the Ranco thermostat and recirculation over-ride micro-switches, withdraw the two securing screws and take the switch from the end plate (1, Fig. 84).
The other micro-switches can now be removed by easing the friction washers from the ends of the micro-switch locating rods (2, Fig. 84). Push the rods through the micro-switch pack (3, Fig. 84) and ease the micro-switches from the assembly (4, Fig. 84).

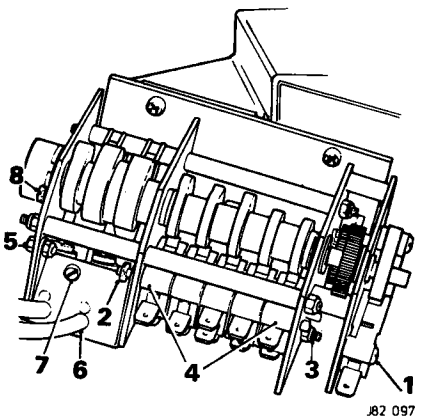


Fig 84

The vacuum switches can be removed by removing the two nuts and screws retaining the vacuum switch mounting bracket (5, Fig. 84). Pull the bracket from the assembly (6, Fig. 84). Remove the nut and screw clamping mounting plates together. Remove the plates to free the switches (7, Fig. 84).
The feedback potentiometer is removed by withdrawing the two securing screws (8, Fig. 84). Note the position of cables and unsolder.

Reassembling

Re-solder the cables to the potentiometer and secure with the two fixing screws.
Reposition the vacuum switches to the clamping plates. Fit the bracket to the assembly.
Secure with the nuts and screws.
Ease the micro-switch pack into the assembly.
Push the locating rods through the micro-switch pack and ease the friction washers onto the end of the rods.
Refit the Ranco thermostat and recirculation over-ride micro-switch with the two securing screws.

VACUUM SOLENOID

Renew

Remove the left hand console side pad (1, Fig. 85).
Remove the screws securing the footwell outlet vent to air conditioning unit and remove the vent.
Remove the nut securing the earth leads to the mounting bolt (2, Fig. 85).
Remove the nut and bolt securing the vacuum solenoid (3, Fig. 85).
Disconnect the vacuum pipes and electrical cables from the solenoid (4, Fig. 85).
Remove the vaccum solenoid.

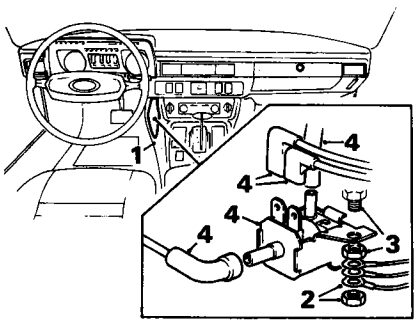


Fig 85

AMPLIFIER UNIT

Renew

Disconnect the battery.
Remove the left-hand console side panel.
Remove the screws securing the footwell vent to the air-conditioning unit and remove the duct (1, Fig. 86).
Remove the nut securing the blower motor relay to the mounting bracket on the air conditioning unit (2, Fig. 86).
Displace the vacuum solenoid from its location and swing aside (3, Fig. 86).
Disconnect the amplifier cable harness multi-pin plug and socket (4, Fig. 86).
Displace the amplifier from the spring clip under the unit and move the harness aside.
Remove the nylon strap securing the harnesses and remove the amplifier (5, Fig. 86).

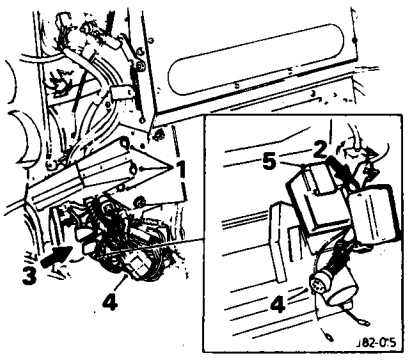


Fig 86

BLOWER ASSEMBLY

LH
Overhaul RH

NOTE: The blower assembly must not be dismantled under warranty.

Dismantling

Remove the three self tapping screws from the air intake casing (1, Fig. 87).
Part the air inlet casing (2, Fig. 87) from the motor assembly (3, Fig. 87) and disconnect electrical connections at the lucar connectors (4, Fig. 87).

NOTE: It is recommended at this stage that the positions of the various components are marked either with paint or a scriber. This will facilitate reassembly.

One cable Lucar has a raised projection which matches the aperture in the motor casing. This ensures that the connections are replaced correctly and that the rotation of the motor is not altered.
Remove the bolts securing the motor mounting bracket to the fan housing (5, Fig. 87).
Remove the motor and fan assembly from the fan housing.
Remove the mounting bracket from the motor.
Using the appropriate Allen key, remove the impeller fan from the spindle.

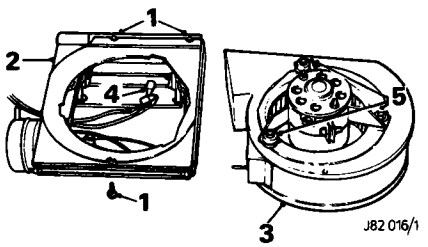


Fig 87

Reassembling

Refit the fan to the motor and secure it to the spindle.
Refit the mounting bracket to the motor.
Locate the fan and mounting assembly into the fan-housing.
Fit and tighten the bolts securing the assembly to the fan housing.
Place the flap box assembly to the fan housing and reconnect the electrical connections.
Fit and tighten the screws securing the flap box to the housing.
Raise the recirculation flap, fit and tighten the remaining screw.
Refit the blower motor assembly.
Reconnect the battery.

CHARGING VALVE CORE

Renew

A possible reason for very slow charging is a bent or damage schrader valve depressor. Do not attempt to straighten. The valve core must be replaced.
If excessive leakage is detected from the schrader valve cores at the rear of the compressor, use a soap solution to ensure that the valve core itself is at fault. If the valve core is leaking replace it by following this procedure
Ensure replacement clean dry valve core is to hand before commencing operation.
Depressurize the system.
Remove the valve core using a schrader removing tool

NOTE: Do not overtighten when refitting, then charge the system.

AIR CONDITIONING

Test operation

NOTE: During the following tests windows should be closed and footwell fresh air vents shut 'off'.

Warm the engine up and check operation of thermostatic cut-out and low speed over-ride. RH control to 'auto'.
With the engine cold, turn the LH knob to 'full heat'. Start the engine and run at 1000 rpm. If, after any previous running the camshaft has turned to the cold position, the servo will operate for a few seconds and then shut down. As the water temperature reaches 40°C the system will start up, the centre outlet will close if not already closed, and the fans will slip up to speed 2. This can be checked by turning the RH knob to low, when a drop in speed should be noticed.

Sequence of operation check. RH control to 'auto'

With the engine warm, turn the LH knob to 65° . Operate the cigar lighter or other heat source and hold the heated unit about 1 in below the sensor inlet hole, which is situated below the centre parcel shelf. The unit should then go through the following sequence in approximately 20 seconds.
Blower speeds will drop to low.
Temperatures will decrease, the upper temperature dropping more quickly than the footwell temperature.
After approximately ten seconds the centre outlet flap will open.
Approximately one second after this the fan speeds will shift up to a medium 1.
A further one second later the fan speed will shift up to medium 2.
Another one second later the fan speeds will shift to maximum, at the same time the fresh air vents will close and the recirculating flaps will open. The rush of air into the air boxes will be felt along the bottom edge of the lower trim panels. Turn the RH knob to 'LOW' which should cause the fan speeds to drop. Return RH knob to auto setting
On some cars in which the servo action is fairly fast the separation of the fan speeds may not be discernible

Aspiration and intermediate position check

Remove the heat source from the sensor. Within ten seconds, depending upon ambient conditions, the unit should shift off recirculation and the blowers will drop to one of the intermediate speeds. This test can be carried out on the road since thermistor aspiration will be better and hence the test will be performed more quickly. In certain high ambient conditions the system will be reluctant to come off recirculation, in which case the intermediate modes can be checked by inching the servo through these positions. This is done by turning the LH knob slightly clockwise until the servo motor is heard to operate, and then returning it to a lower position to stop the servo motor at the desired position.

Defrost and fan vibration check

Turn the RH knob to defrost. The centre outlet flap should close and the screen outlets open. Air to the footwells should be cut off leaving air to the upper ducts only. The fans should shift to maximum speed and hot air should issue from the upper ducts. Fan vibration is best assessed under these conditions. Tests in accordance with the defrost schedule can be carried out at this point if desired

Outlet vent valve check

Check that air can be cut off from the outer face-level vents by rotating the wheels beneath the outlets

Settled mid-range and High speed over-ride check

Set the RH knob to 'Auto'. Set the LH knob to 75° and wait for the unit to settle. The fans should now be on low speed. Turn the RH knob to 'HIGH'. Maximum fan speeds should now be engaged.

DEFROST AND DEMIST TESTS

Purpose

To ascertain that the heating/air conditioning system is functioning correctly in the 'Defrost' mode, and that adequate airflow is maintained in the heat mode to ensure that the windscreen remains mist-free.

Method

Set the LH control to '85°C'.
Set the RH control to 'Defrost'.
Close the end of dash outlets.
Start the engine and run it for seven minutes at 1500 rpm.
During the running period measure the air-flow from each screen outlet using checking ducts and velometer. Ensure that the centre dash outlet is closed and that it seals satisfactorily. The velocity from the screen outlets should be 1550 ft/min.
Also during the running period turn the RH control to 'HIGH' and open the end of the dash outlets. Using the screen outlet and end of dash checking ducts measure the resulting air velocity. This should be:

Minimum velocity (ft/min)	
Screen	End of dash
500	850

At the end of seven minutes running at 1500 rpm check that the water temperature gauge indicates 'Normal'. Using mercury in glass thermometers check that the following minimum screen outlet temperatures are achieved.

Plenum inlet		Screen outlet (minimum)	
°C	°F	°C	°F
10	50	54	129.2
12	53.6	55	131
14	57.2	55.5	131.9
16	60.8	56.5	133.7
18	64.4	57	134.6
20	68	58	136.4
22	71.6	58.5	137.3
24	75.2	59.5	139.1

Conclusions

If the above minimum requirements are met, then it can be assumed that:
(a) The thermostats are opening correctly.
(b) The water valve is opening fully.
(c) The flaps and linkages are correctly adjusted for the heating mode.
(d) The fans give adequate airflow at maximum speed.
If the above criteria are not met, the causes may be related to:

Thermostats

The water temperature guage will not achieve 'Normal' position within seven minutes and the air outlet temperature remains low. The thermostat(s) must be removed and checked for sticking open.

Water valve

The temperature gauge reads 'Normal' but the air outlet temperature remains low. Check that the vacuum-operated water valve is subjectd to at least 21.6 cmHg (8.5 inHg) of vacuum. If the valve is under adequate vacuum, change the valve. However, if the vacuum is low, check that the vacuum is being supplied to the whole system, that the water valve vacuum actuator is operational and that the water valve vacuum switch is operational. (See that the supply from the switch to valve is not pinched or trapped).

Flaps and linkages

Inadequate flap sealing will result in low air velocity at the screen outlets. Check that the centre facia flap closes fully on 'Defrost' and that only a small air bleed to the footwells occurs. These leaks can be detected by hand and may be rectified by adjusting the linkage. Excessive air-flow from the screen outlets in heat mode may be caused by the demist control flap sticking open.

Blowers

If following flap inspection the air flow is still low, investigations should be carried out into the blower assemblies. Check that full voltage is being received on maximum speed and that the units are correctly wired for rotation. If all is correct the only remaining procedure is to change the fan assembly.

NOTE: The engine must be running for this check.

Check that the compressor drive belt is correctly adjusted and is not slipping at higher engine speeds, at idle speed, or on sudden acceleration of the engine, with the compressor clutch speed.
Observe the sight glass on the receiver-drier and check for frothing or bubbles with engine running at 1000 rpm.
Slowly increase engine speed and repeat check at 1800 rpm.

NOTE: It is normal for there to be slight foaming if ambient air temperature is below 21°C (70°F).

Check for frosting on the connector union housing; the region around the suction part is normally cold, and slight frosting is permissible.
Check by feel along pipe lines for sudden temperature changes that would indicated blockage at that point.
Place a thermometer in the air outlet louvres.
Run the vehicle on the road and note the drop in temperature with air conditioning system switch on or off.
Ensure that the condenser matrix is free of mud, road dirt, leaves or insects that would prevent free air-flow. If necessary, clear the matrix.
If the foregoing checks are not met satisfactorily, refer to rectification and fault-finding procedures

System check

The following check must be carried out to ensure that the system is basically functional. These checks may also be used to ensure satisfactory operation after any rectification has been done. If the system proves unsatisfactory in any way, refer to fault finding.
Check that blower fans are giving an air flow expected in relation to control switch position.
Check that air delivered is equal at both outlets.
Check that compressor clutch is operating correctly, engaging and releasing immediately control switch is set to an 'on' position.

NOTE: the engine must be running and the thermostat control set fully cool.

Check that the radiator cooling fan starts operating when the compressor clutch engages

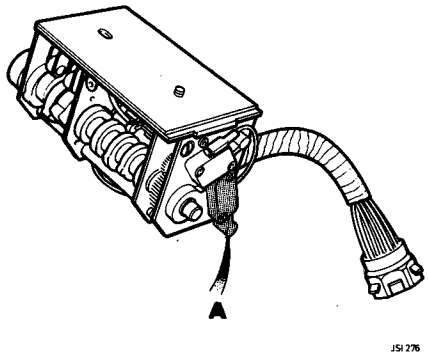


Fig. 88

Compressor thermal fuse

If problems are being encountered with the persistent failure of the air conditioning compressor thermal fuse and the normal test procedures cannot identify any obvious fault, then the following procedure should be carried out.

Step 1

Ensure that the valves of the charge station equipment are fully closed and connect them to the vehicle high and low pressure connections.

CAUTION: Observe all safety precautions as detailed in the Service Manual.

Run the engine at normal operating temperature, and select AUTO, 75°C; and allow the system to stabilise to ensure that the unit is neither on full cooling nor full heating mode. Adjust the engine speed to 1000 rev/min and note the readings on the gauges.
The readings should be as follows:
The High Pressure gauge should indicate a pressure of between 10,5 and 15,8 kgf/cm^2 (150 to 225 lbf/in^2).
The Low Pressure gauge should indicate a pressure not lower than 2,67 kgf/cm^2 (38 lbf/in^2) when the compressor clutch engages, and not lower than 1,27 kgf/cm^2 (18 lbf/in^2) when the compressor clutch disengages.

NOTE: Where higher ambient temperatures are encountered the high pressure readings may be greater than the above.

Ambient temperature is given as the temperature of the air surrounding the condensor and is taken 50,8 mm (2 in) in front of the condensor. Normal Ambient Temperature for the U.K. market is assumed to be between 5°C and 25°C (41°F to 77°F).
If the above is satisfactory proceed to Step 2.
If the low pressure reading drops below 1,27 kgf/cm^2 (18 lbf/in^2) with the clutch still engaged, then the expansion valve is faulty.

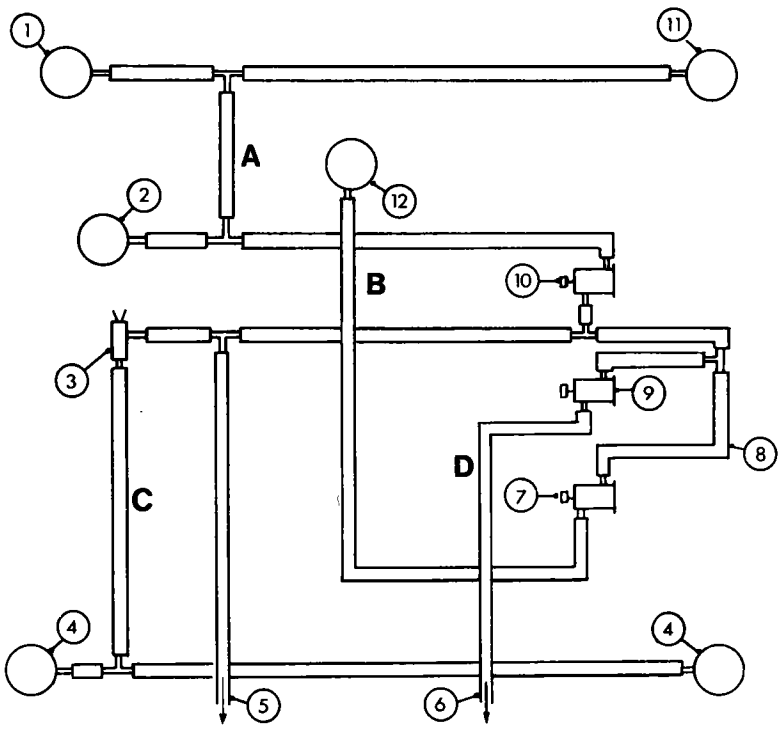
Step 2

Increase the engine speed to 3 000 rev/min and note the reading on the low pressure gauge. The reading should be approximately 0,70 kgf/cm^2 (10 lbf/in^2), at or just prior to, the disengagement of the compressor clutch. If the clutch fails to disengage and the pressure continues to drop to 0,35 kgf/cm^2 (5 lbf/in^2) or below, then the expansion valve is faulty.
If the pressure remains at 0,70 kgf/cm^2 (10 lbf/in^2) and the clutch cycle is correct, select low fan speed. Should the low pressure start to drop, carry out the modification detailed in Step 3.

Step 3

1. Disconnect the battery.
2. Remove the centre console right hand side trim panel to gain access to the air conditioning/heater unit.
3. Remove the plastic retaining plug from the black plastic cover surrounding the servo motor unit.
4. Carefully move aside the shield to gain access to the Ranco override micro switch, (A, Fig. 88).
5. Disconnect the green/brown (GN) lead and insulate.
6. Reverse procedure 1 to 4.

AIR CONDITIONING VACUUM SYSTEM



KEY TO VACUUM SYSTEM DIAGRAM

1. Demist flap actuator (LH)
2. Lower heater flap actuator
3. Vacuum controlled solenoid
4. Blower case flap actuator
5. To vacuum supply
6. To water valve
7. Face level vacuum switch
8. Vacuum switches on servo unit
9. Water valve actuator
10. Screen vent actuator (for defrost only) on RH switch
11. Demist flap actuator (LH)
12. Face level front grille

VACUUM SYSTEM

Description

Off

When the system is in the off position, the engine is running and vacuum is available there is no heating or cooling effect from the system, but the following functions have however taken place.

1. The vacuum solenoid is energised so that air input flaps are closed to ambient air intake, i.e. it is in the recirculation mode.
2. The blower motors are switched off.
3. The compressor clutch is disconnected so that refrigeration does not take place.
4. Vacuum allows hot water to flow to the heater matrix, demist/defrost flaps open, the front face level grille flap closes and there is no output to the front or rear footwells.

Maximum cooling (Auto)

1. The centre face level flap opens by camshaft opening the vacuum switch.
2. Vacuum is applied to the water valve closing the valve thus preventing the flow of water to the heater matrix.
3. High speed recirculation switch is operated by the camshaft. A voltage is fed to the solenoid operated vacuum switch which applies vacuum to the fan motor flaps. The flaps move into a recirculating mode.
4. As the right hand control is at auto then vacuum will be applied to the screen flaps to keep them closed.

Maximum heating (Auto)

1. The camshaft now at full heating will close the vacuum switch to the centre flap which will relax to the closed position.
2. The camshaft will also have closed the vacuum switch controlling the water valve. The water valve opens to allow water to flow to the heater matrix.
3. The electrical supply to the solenoid vacuum switch is broken closing the vacuum switch. This action removes the vacuum supply to the blower motor casing flaps allowing ambient air to enter the car.
4. The screen flaps are kept closed and the lower heater flap is allowed to stay open by applying vacuum to their respective actuators.

Defrost

1. The camshaft will also have closed the vacuum switch controlling the water valve. The water valve opens to allow water to flow to the heater matrix.
2. No vacuum to the centre flap allowing the flap to close.
3. No vacuum to the screen vents allowing them to open, no vacuum to lower heater flap actuator closing the lower flap to allow 90% of air to the screen.
4. The electrical supply to the solenoid vacuum switch is broken closing the vacuum switch. This action removes the vacuum supply to the blower motor casing flaps allowing ambient air to enter the car.

NOTE: In the defrost position no vacuum is supplied to any actuator.

AIR CONDITIONING SYSTEM MARK III

Description. 82.00.00

Electronic Control Module:

The control module can be described as a computer at the heart of which is a digital micro processor. It receives data signals from driver operated switches, then by comparing this data with data received from various temperature sensors and feedback sensing devices, it calculates the output voltages needed to operate the blower motors, flap servo motors, compressor and vacuum solenoids to achieve the temperature requirement selected for the vehicle.

Although the control module cannot be repaired in service, a set of test pins are provided for testing the various circuits by the use of the Jaguar Diagnostic System. The control module will be irreparably damaged should any of the test pins be momentarily shorted together.

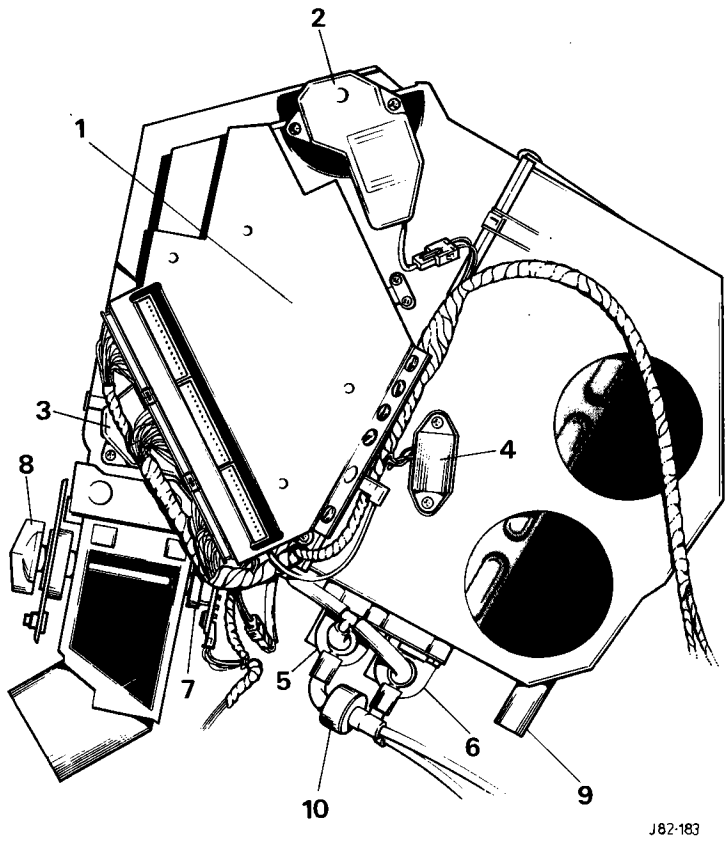


Fig. 2

Fig 1 Air con unit LH side

1 Upper feedback potentiometer
2 Lower feedback potentiometer
3 Water temperature switch
4 Recirculation vacuum solenoid
5 Water valve vacuum solenoid
6 Differential temperature control
7 Temperature demand control
8 Temperature demand potentiometer
9 Condensate drain tube
10 Recirculation solenoid vacuum restrictor

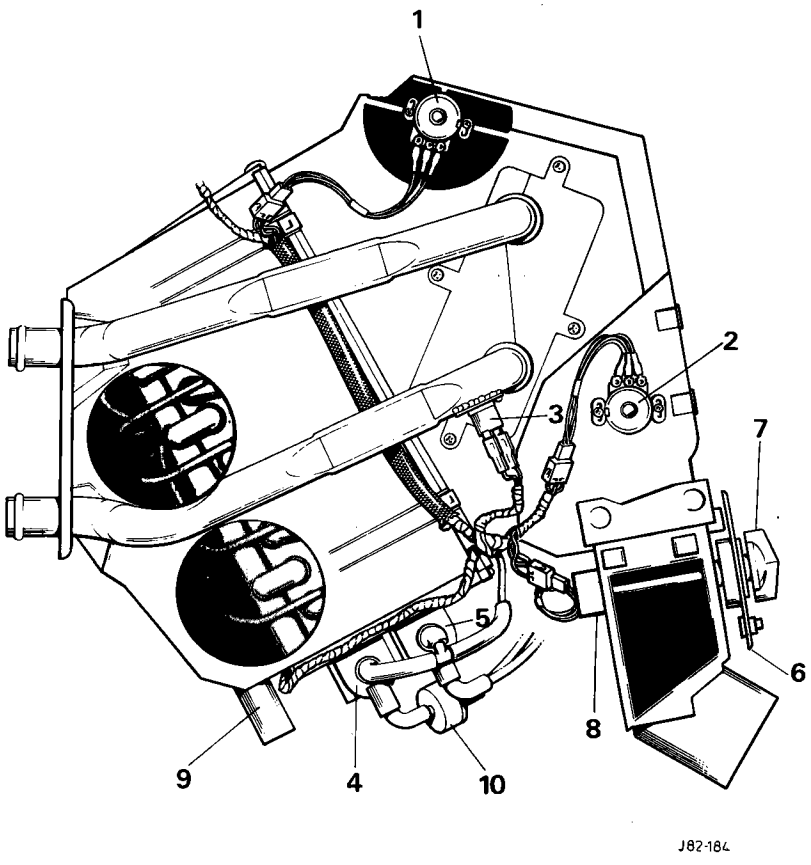


Fig. 1

Fig 2 Air con unit RH side

1 Control module
2 Upper servo
3 Lower servo
4 Evaporator sensor
5 Centre vent vacuum solenoid
6 Defrost vacuum solenoid
7 Mode switch
8 Mode control
9 Condensate drain tube
10 Centre vent solenoid vacuum restrictor

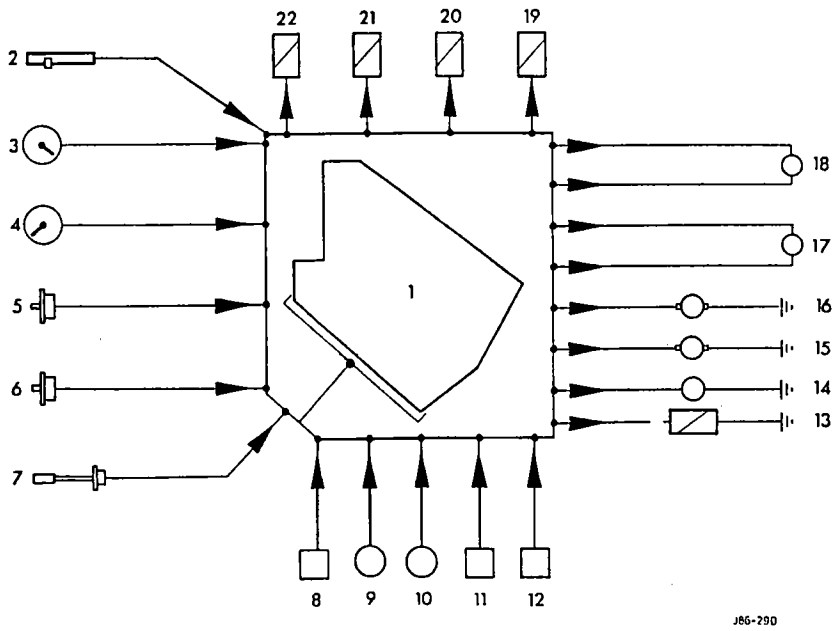


Fig. 1

Key to illustration:

1 Control Module
2 Differential temperature control
3 Temperature control switch
4 Mode control switch
5 Ambient temperature sensor
6 In-car temperature sensor
7 Evaporator temperature sensor
8 Coolant temperature switch
9 Flap feedback potentiometer
10 Flap feedback potentiometer
11 Blower motor feedback
12 Blower motor feedback
13 High speed relay
14 Compressor clutch
15 Blower motor
16 Blower motor
17 Servo motor
18 Servo motor
19 Defrost vacuum solenoid
20 Recirculation flaps solenoid
21 Centre vent solenoid
22 Water valve vacuum solenoid

Temperature Distribution System

The air conditioning unit case consists of three parts, the rear of which carries the evaporator, the front is then split in two to enable the rotary flaps to be inserted.

The method used to achieve the required air temperature is known as a series parallel system. All the air into the unit passes through the evaporator, then depending on the position of the flaps either passes through the heater matrix to be heated, or bypasses the heater matrix completely, or a combination of both to achieve the air temperature required. The system employs two flaps that are driven to the required position (determined by the control system) by two servo motors and gear box assemblies. The motor can rotate in either direction depending on the direction of the current flow through the motor. Full cooling is achieved by the air passing through the evaporator only and bypassing the heater matrix.

The flap position is monitored by 2K2 ohm feedback potentiometers (Fig. 2) which supply voltage signals to the control module indicating the flap positions.

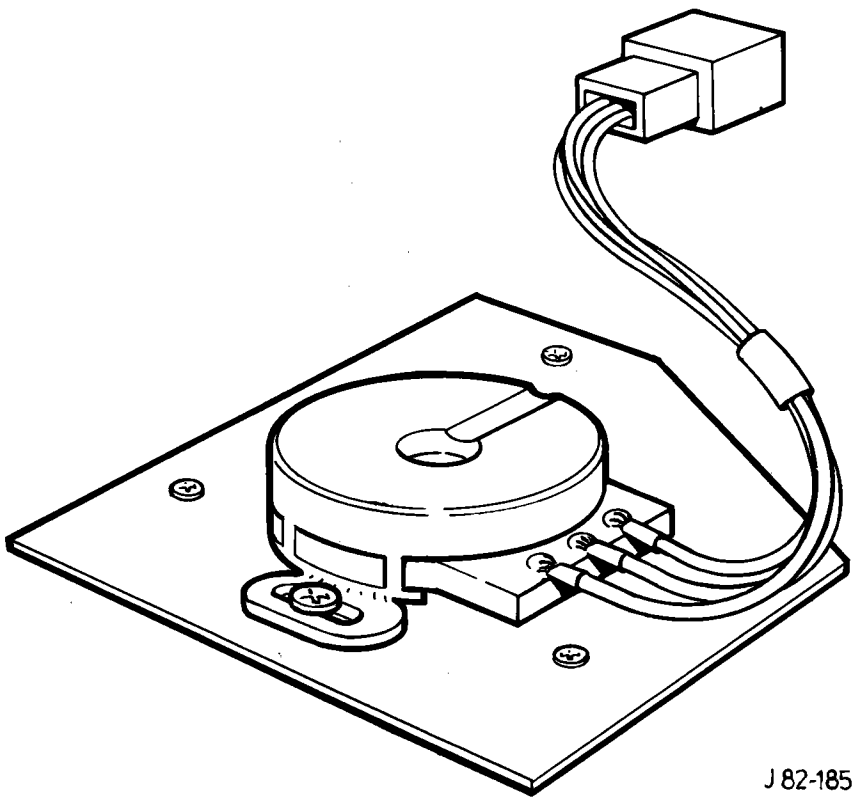


Fig. 2

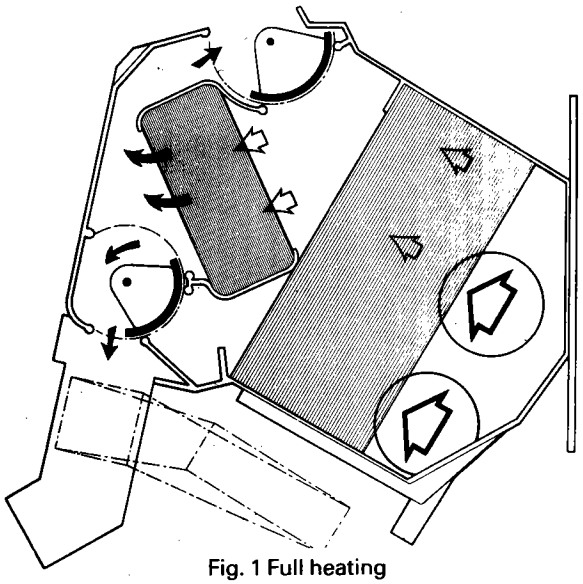


Fig. 1 Full heating

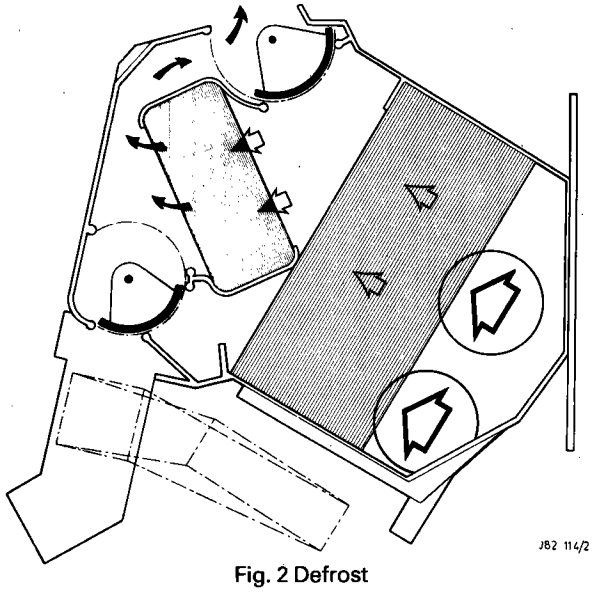


Fig. 2 Defrost

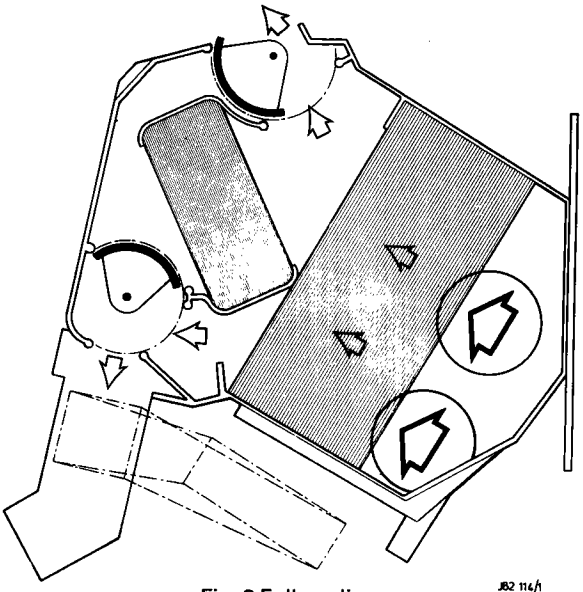


Fig. 3 Full cooling

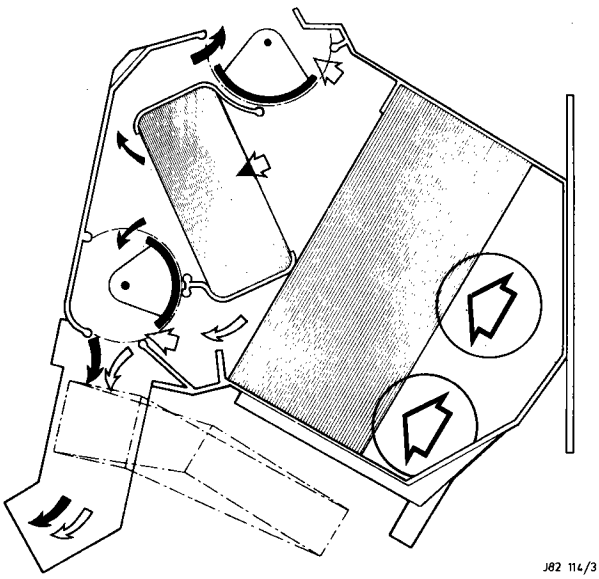


Fig. 4 Air blend

Temperature Selector:

The temperature requirement of the vehicle is selected by the setting of a 2K2 ohm potentiometer which is coupled to the temperature control switch (B fig. 5). 5 volts is supplied to the potentiometer from pin 43 of the control module. The output voltage is from zero to 2.885 volts which represents a range of temperatures from 10° to 29°C (66° to 84°F). The rotation of the potentiometer is restricted internally to 180° travel.

Incorporated in the switch is the facility to override the automatic function. This enables the temperature to be manually selected and is achieved by pulling out the control knob.

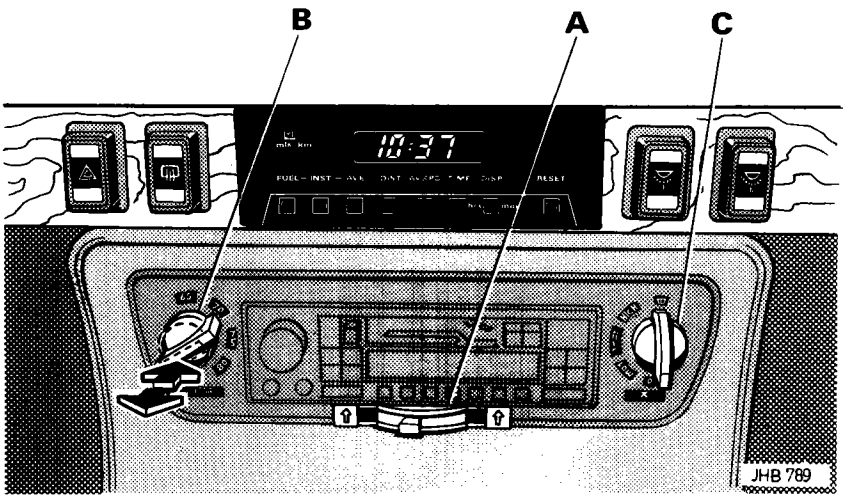


Fig. 5

Engaging the manual mode enables the operator to select the desired air temperature entering vehicle. This is maintained regardless of ambient temperature.

Temperature Differential Control

The temperature differential control (A fig. 1) is used to control the temperature of air being distributed by the face level vents. With the control fully right the air delivered to the fascia will be slightly cooler than that to the footwell. Moving the control to the left the air will reduce the temperature to the fascia and at its full left postioin it will be at its coolest.
A 10 K ohm slide potentiometer used for this purpose is coupled to the thumbwheel
Its supply voltage is from pin 7 and the signal voltage is then fed to pin 28 of the control module

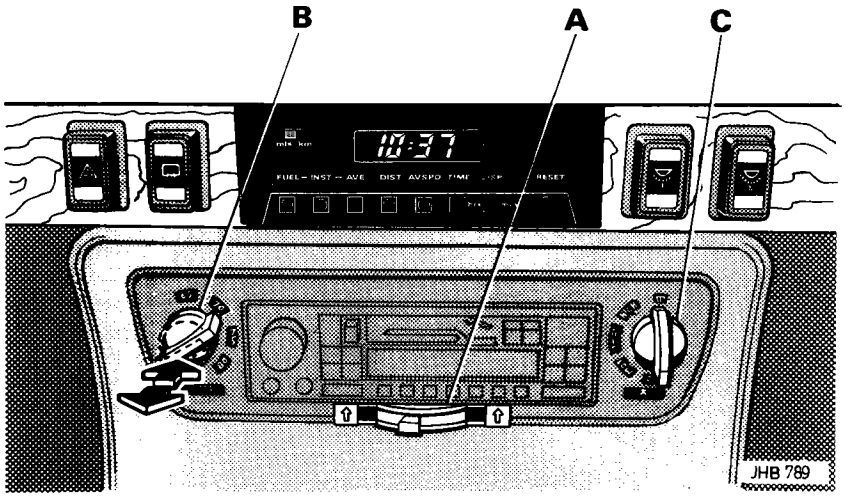


Fig. 1

Temperature Sensors:

There are three temperature sensors fitted into the system, an ambient temperature sensor, an in-car temperature sensor and an evaporator temperature sensor. All three sensors are electrically identical, but the evaporator temperature sensor (Fig. 2) is physically different and is not interchangeable with the other two. An input of 5 volts is supplied to the sensors from pin 43 of the control module.
The temperature sensing voltage from the sensor is then fed back into the control module. At 0°C (32°F) the sensing voltage should be 2.732 volts and with a temperature rise or fall of 1°C (1.8°F) the sensing voltage should rise or fall by 0.01 volts, for example if the temperature should rise to 5°C (41°F) from zero, the voltage will rise by 0.05 volts to 2.782 volts. The sensor is a semi-conductor device similar to a zenor diode in as much as it allows current to flow in reverse bias. The current flow through the device varies with temperature and is very accurate over a wide range.
The sensor assembly has a built in potentiometer which is preset and should not be adjusted.

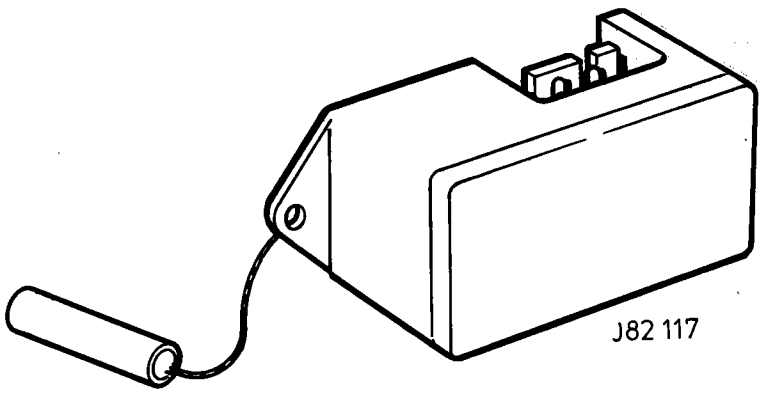


Fig. 2

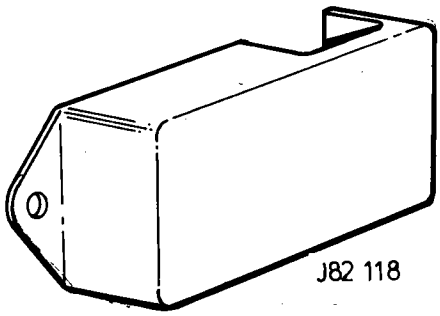


Fig. 3

Key to diagram:

1 Resistor
2 Semi conductor
3 Potentiometer
4 Pin 43 control module
5 Sensing voltage Pin 43 ambient Pin 4 in car, Pin 5 evap. sensors
6 Earth Pin

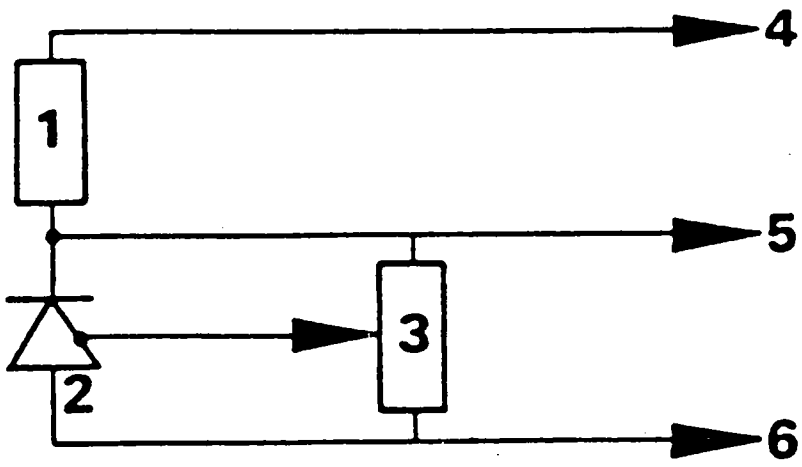
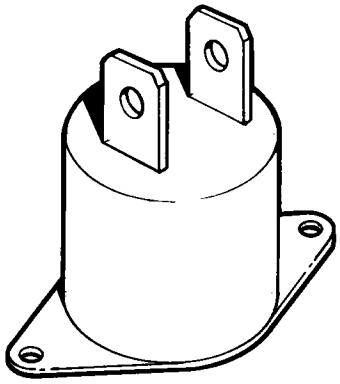


Fig. 4

J86 295

Coolant Temperature Switch:

A water temperature switch (fig. 1) is fitted to the lower side of the heater inlet pipe. Its contacts are open at temperatures below 40°C, this prevents the fans from operating until relatively hot coolant is flowing from the engine.



J82119

Fig. 1

Fan Speed Switch:

This control switch (C fig. 2) provides inputs to the control module giving information regarding the air required from the blower motors by the operator.

The switch has five positions: OFF, LOW, NORMAL, HIGH AND DEFROST.

In the OFF position the system is not operational, but a signal from the switch is sent to the control module to ensure the flaps in the fan motor assemblies are closed preventing outside air from entering the system. In the LOW, NORMAL and HIGH positions, information regarding the range of fan speed is received by the control module from the control switch, temperature selector and the various sensors. Should a low fan speed be selected the control module will maintain the speed of the fan motor within a range of low speeds depending on the temperature requirement of the vehicle. There are no distinct steps between the fan speeds.

The fan speeds are electronically controlled, and by selecting LOW, NORMAL or HIGH a level of speed in the range selected is received dependent of the operator requirements.

When DEFROST is selected the fans are electronically controlled to operate at maximum speed, the screen vents open, maximum heating is obtained and the lower level flaps fully close (this operation can take up to a maximum of 30 seconds).

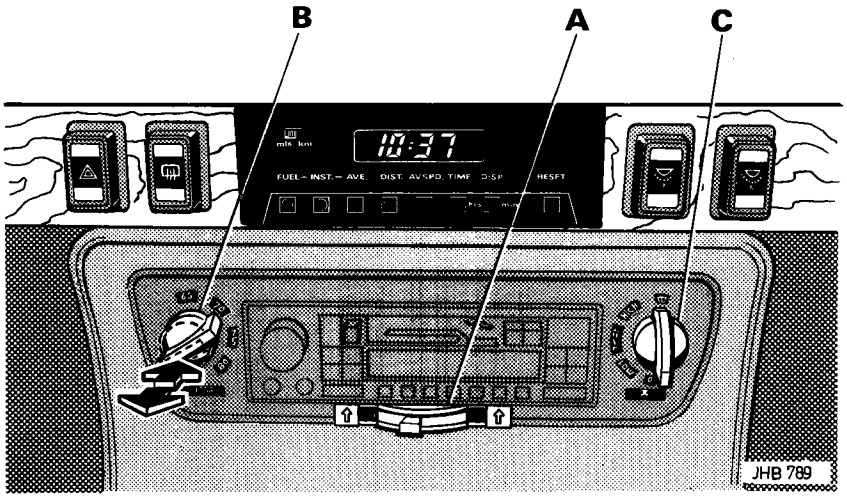


Fig. 2

Key to diagram

1 Pin 13 control module
2 Pin 14 control module
3 Pin 15 control module
4 Pin 27 control module
5 Pin 1 control module
6 Pin 12 control module
7 Pin 44 control module
8 Pin 9 control module

Switch positions:

A OFF
B LOW
C AUTO
D HIGH
E DEFROST

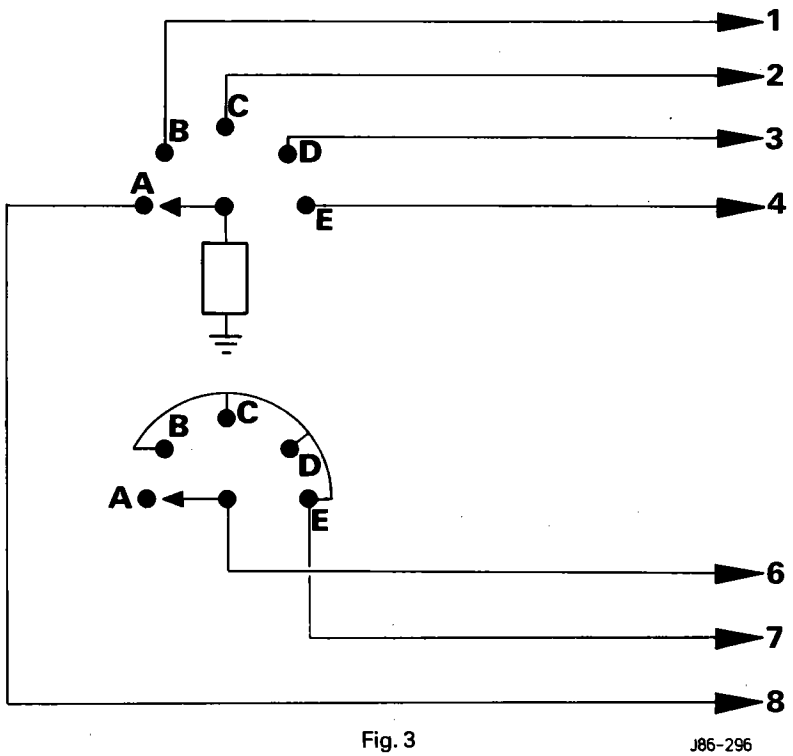


Fig. 3

J86-296

Fan Speed Drive Control:

Mounted in the outlet of the blower motor units are heatsink assemblies each of which consist of an interference suppressor diode (11 fig. 1) a feedback diode (8 fig. 1) and a power transistor (9 fig. 1).
The unit is supplied with positive battery voltage via an ignition controlled fuse. With the fan motor running at high speed the relay (12 fig. 1) is energised with a voltage from pin 16 of the control module thus closing the relay contacts. The negative circuit is therfore completed via the relay contacts.
On all the other fan speeds the negative circuit for the fan motor is via the power transistor and the control module.
The feedback diode (8 fig. 1) enables the control module to sense the voltage at the negative terminal of the fan motor and so calculate the speed of the blower motor.

Vacuum System:

The components operated by the vacuum solenoids (Fig. 2) are:

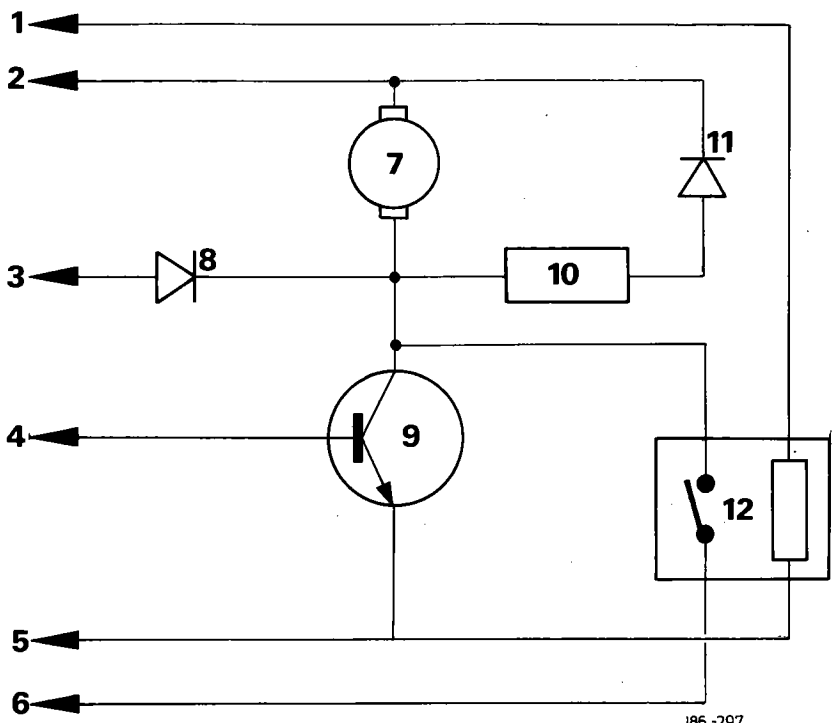
1 Defrost/Demist flaps which are held closed by vacuum. Identified by a green supply tube.

2 Recirculation/Fresh air flaps which are held closed by vacuum. Identified by a blue supply tube.

3 Centre vent which is opened by vacuum. Identified by a black supply tube vacuum tube.

4 Water valve which is closed by vacuum. Identified by a red supply tube.

The vacuum supply to the recirculate/fresh air flaps and the centre vent have built in restrictors so that the operation of these flaps is slowed down to avoid the risk of the system hunting due to the rapid change caused by fast operation time. The recirculation flaps can take up to 30 seconds to change state. The vacuum supply for the system is from the engine manifold via a reservoir and a non-return valve.

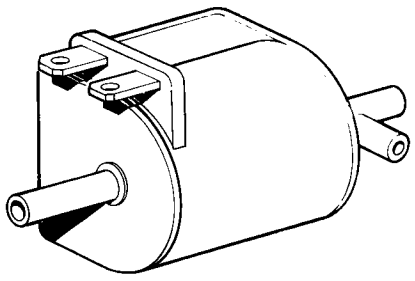


J86 -297

Fig. 1

Key to diagram:

1 Pin 16 control module
2 + Battery supply
3 Pin 22 or 33 control module
4 Pin 31 or 32 control module
5 Pin 45 control module
6 Earth
7 Fan motor
8 Feedback diode
9 Power transistor
10 Resistor
11 Protection diode
12 High speed relay

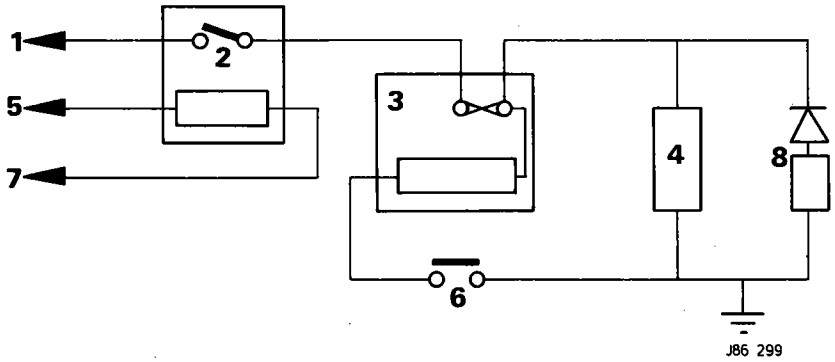


J62 115

Fig. 2

Key to diagram:

1 Positive battery supply
2 Clutch relay
3 Thermal time fuse
4 Compressor clutch
5 Pin 20 control module
6 Super heat switch
7 Negative pin control module
8 Protection diode and resistor



Compressor Clutch Control:

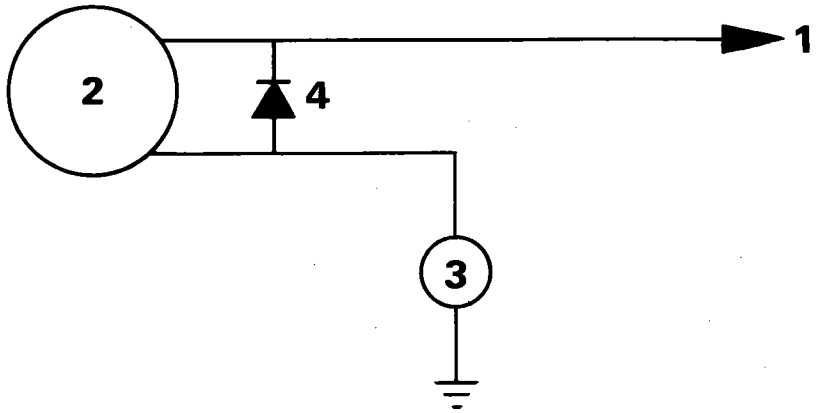
The output from pin 20 of the control module is used to energise the compressor clutch relay (2 fig. 1) which will result in the relay contacts closing allowing battery voltage to the clutch, which on early vehicles is via a thermal fuse (3 fig. 1).
The control module has protection circuits built in to protect the micro-processor from damage in case of incorrect connections which may be made to the compressor clutch relay.

Superheat Switch and Thermal Fuse

On early vehicles a superheat switch is included in the compressor clutch circuit to provide a compressor protection system. The superheat switch and thermal fuse guards against a low refrigerant charge or blockages causing extreme superheated refrigerant vapour conditions resulting in compressor damage. The thermal fuse is a sealed unit containing a heater and a meltable fuse. The superheat switch is located in the rear of the compressor in contact with the suction side refrigerant vapour. With a low refirgerant charge or a blockage the pressure drops and the temperature rises. This condition closes the superheat switch contacts which completes the thermal fuse heater circuit, melts the fuse, disconnects the battery supply to the compressor clutch winding and the thermal fuse heater. The compressor ceases to operate and damage from insufficient lubrication will be avoided.
The thermal fuse melts at 157 to 182°C.
Time taken 2 minutes – 14V system voltage.
5.5 minutes – 11.5V system voltage.
The heater resistance, cold 8 to 10 ohms.
CAUTION: After a thermal fuse melt, establish and rectify the cause before replacing the thermal fuse unit complete.

High Side Low Pressure Switch (HSLP)

On later vehicles the thermal fuse and superheat switch has been replaced by a high side low pressure switch (HSLP).
The HSLP switch is designed to monitor pressure drop on the high pressure side of the refrigerant cycle. At a low pressure condition of 25 lbf/in^2 + or – 5 lbf/in^2, the HLSP switch contacts open thus breaking the earth circuit of the compressor clutch coil, resulting in the compressor clutch disengaging.
Where a fault is present in the refrigerant system e.g. low refrigerant, restriction, etc. the HSLP switch contacts will remain open until the fault has been rectified. Following rectification and recharging the refrigerating system, the HSLP switch contacts will close thus completing the clutch coil earth circuit.



J 86-510

1 Clutch Relay
2 Compressor Clutch
3 HSLP Switch
4 Protection Diode

Fig. 1

Fault Finding

WARNING: THE MICROPROCESSOR IS AN EXTREMELY SENSITIVE AND EXPENSIVE UNIT, AND SHOULD ONLY BE TESTED USING A DIGITAL TYPE MULTI-METER WITH NO LESS THAN A 3.5 DIGIT DISPLAY, AND A RESISTANCE OF NO LESS THAN 2 MEGS OHMS ANY OTHER FORM OF MULTI-METER WILL IRREVERSIBLY DAMAGE THE MICROPROCESSOR.

The control pins are mounted very close together, therefore, there is a high risk of shorting two pins together when using a test probe.

Two pins shorted together even momentarily, will cause irreparable damage to the control module.

To avoid shorting two pins together an insulated sleeve or shroud must be fitted over the probe so that it overlaps the end of the probe by approximately 3 mm (9.125 ins). The insulation stripped from a piece of cable will provide suitable sleeve.

Always allow time for servos to come to rest.

Automatic check will require setting all sensors to known condition, i.e. in workshop are at 24°C (75°F) for at least 30 minutes.

Sensor inputs will relate to ambient temperature, i.e. at 24°C (75°F), sensor voltage readings will be 2.97V (10mV × 1°C (33.8°F).

System Off
Power Supply On

	Pin No	Voltage
Ignition in	1	11 - 14V
Recirc Input	9	2 - 6V
Grounds	2	0 - 40mV
	6	0 - 40mV
	10	0 - 40mV
	38	0 - 40mV
	45	0 - 40mV
From On/Off Switch	44	0 - 12mV
To On/Off Switch	12	10 - 13.3V
Set in Manual by shorting pin	19	To Ground

	Pin No	Voltage
Select Low On Mode Switch Maximum Temperature Demand		
Low Input	13	150 – 350mV
Clutch Output (Evap Sensor below 2.720V)	20	0.6 – 11.4V
Medium Input	14	3 – 5V
High Input	15	3 – 5V
Defrost	27	3 – 5V
From On/Off Switch	44	10.3 – 13.3V
Output	43	4.73 – 5.2V
Recirc output	3	0 – 200mV
High Speed Relay	16	0 – 200mV
Water Valve Vacuum Solenoid	17	0 – 200mV
Centre Vent Vacuum Solenoid	18	0 – 200mV
Select Norm (Med or Auto) On mode Switch		
Low Input	13	3 – 5V
Medium Input	14	150 – 350mV
High Input	15	3 – 5V
Defrost Input	27	3 – 5V
Select High On Mode Switch Maximum Temperature Demand Ensure Servos Are Stationary		
Low Input	13	3 – 5V
Medium Input	14	3 – 5V
High Input	15	150 – 350mV
Defrost Input	27	3 – 5V
Select Defrost		
Low Input	13	3 – 5V
Medium Input	14	3 – 5V
High Input	15	3 – 5V
Defrost Input	27	150 – 350mV
Temperature & Diff Potentionmeter Ranges		
Temperature Demand (Maximum)	35	2.665 – 3.105V
Temperature Demand (Minimum)	35	0 – 200mV
Diff Demand (Maximum)	28	4.750 – 5.250V
Diff Demand (Minimum)	28	0 – 200mV
Set Temperature Demand to Mid Range	35	1.43 – 1.45V
Select Norm		
Recirc output	9	3 – 5V
Servo Drive Lower Flap	37	4V
Servo Drive Lower Flap	41	4V
Servo Drive Upper Flap	40	4V
Servo Drive Upper Flap	42	4V
Recirc output	3	0 – 500mV
Reference voltage	7	2.875 – 2.895V
Defrost Output	11	0 – 500mV
High Speed Relays	16	0 – 500mV
Lower Feedback Potentiometer	29	0.60 – 0.90V
Upper Feedback Potentiometer	30	1.15 – 1.45V
Coolant Temperature Input	21	260 – 460mV
Defrost Output	11	0 – 500mV
Clutch Output (Evaporator above 2.745V)	20	10.3 – 13.3
RH Blower Feedback	33	10 – 13V
LH Blower Feedback	22	10 – 13V
RH Blower Control	32	0 – 0.5V
LH Blower Control	31	0 – 0.5V
Water Valve Solenoid	17	0 – 500mV
Centre Vent Solenoid	18	0 – 500mV

	Pin No	Voltage
Select Low On Mode Switch		
Maximum Temperature Demand		
Set Diff to Mid Range	28	2.45 – 2.55V
Servos Stopped	37	0 – 40mV
	40	0 – 40mV
	41	0 – 40mV
	42	0 – 40mV
Lower Feedback	29	0 – 0.2V
Upper Feedback	30	0 – 0.2V
Set Temperature to Mid Position	35	1 .43 – 1.45V
Servos Stopped	37	4V
	40	4V
	41	4V
	42	4V
Lower Feedback	29	0.57 – 0.87V
Upper Feedback	30	0.60 – 0.9V
Set Temperature to Maximum	35	2.665 – 3.105V
Lower Feedback	29	0.979 – 1.279V
Upper Feedback	30	1.518 – 1.818V
Set Diff to Maximum	28	4.750 – 5.20V
Lower Feedback	29	0.979 – 1.279V
Upper Feedback	30	1.340 – 1.640V
Blower Test		
Set Diff to Minimum	28	0 – 200mV
Set Temperature to Minimum	35	0 – 200mV

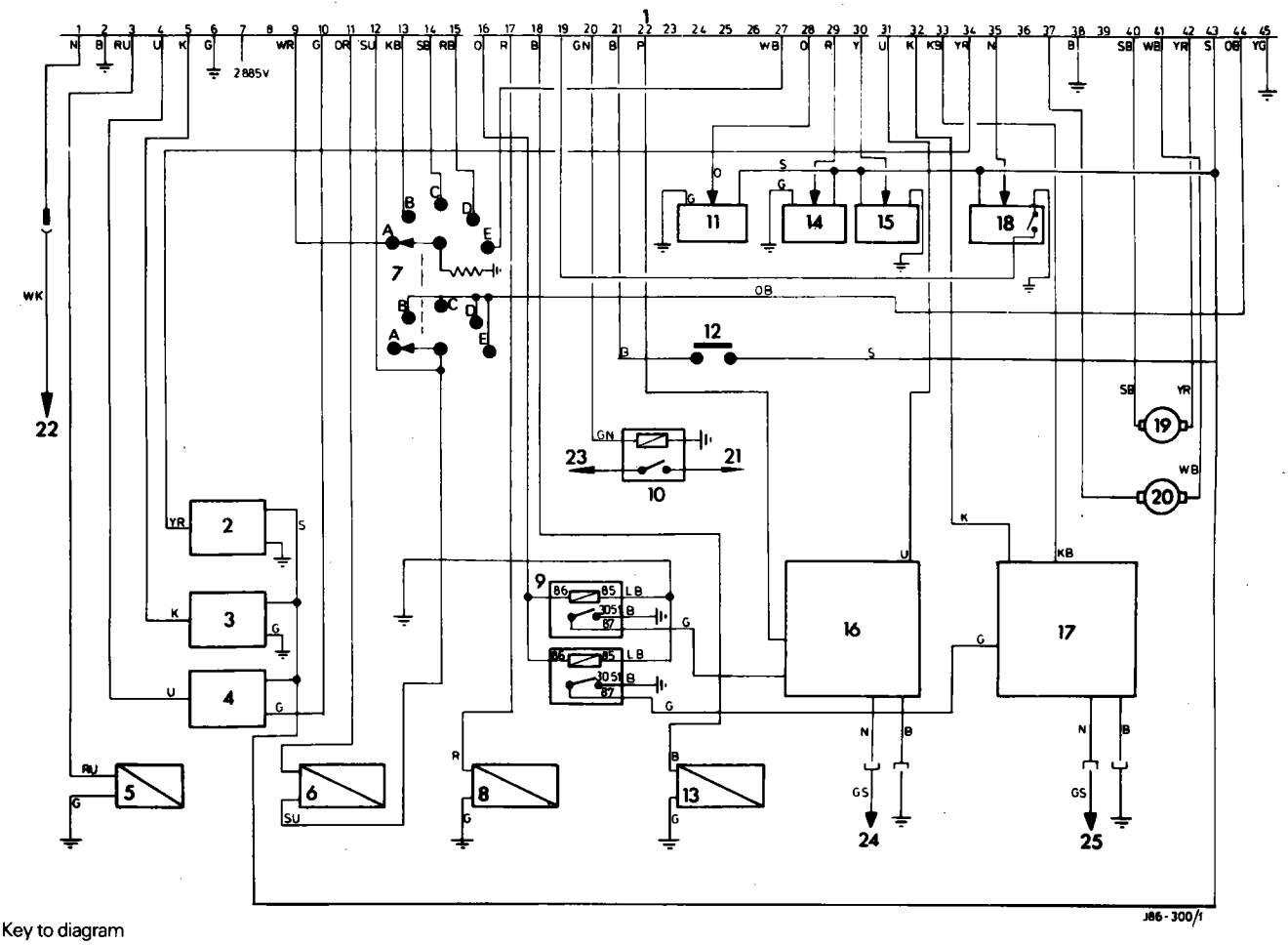
Note: After setting allow servos to come to rest.
Typical voltage figures are in the brackets.

Mode Switch Position	RH Control Pin No 32	LH Control Pin No 31	RH Feedback Pin No 33	LH Feedback Pin No 22
Low	1 – 2V (1.77V)	1 – 2V (1.7V)	4 – 6V (5.8V)	4 –6V (5.63V)
Med	2 – 3V (2.28V)	2 – 3V (2.27V)	3 – 5V (3.7V)	3 – 5V (3.4V)
High	1 – 2V (1.17V)	1 – 2V (1.19V)	1 – 2V (1.22V)	1 – 2V (1.27V)

Set Temperature to Mid Point			Pin No 28	Voltage 1.43 – 1.45V
Mode Switch Position	RH Control Pin No 32	LH Control Pin No 31	RH Feedback Pin No 33	LH Feedback Pin No 22
Low	1 – 2V (1.24V)	1 – 2V (1.27V)	6.5 – 9V (8.7V)	6.5 – 9V (8.7V)
Med	1 – 2V (1.4V)	1 – 2V (1.41V)	6.9 – 9V (7.5V)	6.5 – 9V (7.5V)
High	2 – 3V (2.2V)	2 – 3V (2.2V)	3 – 5V (4.1V)	3 – 5V (4.0V)

Set Temperature to Maximum			Pin No 28	Voltage 2.88 – 3.10V
Mode Switch Position	RH Control Pin No 32	LH Control Pin No 31	RH Feedback Pin No 33	LH Feedback Pin No 22
Low	1 – 2V (1.67V)	1 – 2V (1.63V)	6.5 – 9V (6.25V)	6.5 – 9V (6.1V)
Med	2 – 3V (2.17V)	2 – 3V (2.1V)	3 – 5V (4.25V)	3 – 5V (4.2V)
High	2 – 3V (2.3V)	2 – 3V (2.3V)	3 – 5V (3.7V)	3 – 5V (3.5V)

	Pin No	Voltage
Open The Water Temperature Switch Leads		
Set Temperature to Mid Point	35	1.43 – 1.45V
RH Control	32	0 – 0.5V
LH Control	31	0 – 0.5V
Short the Water Temperature Switch Leads		
Select Low On Mode Switch		
Clutch Output	20	9.3 – 12.3V
RH Control	32	1 – 2V
LH Control	31	1 – 2V
Set Diff to Minimum	28	0 – 200mV
Set Temperature to Minimum	35	0 – 200mV
Recirc Output	3	9.3 – 12.3V
High Speed Relays	16	0 – 200mV
Water Valve Solenoid	17	9.3 – 12.3
Centre Vent Solenoid	18	9.3 – 12.3
Defrost output	35	0 – 500mV
Select Defrost On Mode Switch	27	150 – 350mV
High Speed Relays	16	9.3 – 12.3V
Lower Feedback	29	2.709 – 3.100V
Upper Feedback	30	1.714 – 2.014V
Select Off On Mode Switch	44	0 – 1V
Recirc Output	3	9.3 – 12.3V



Key to diagram

1 Control module
2 Ambient temperature sensor
3 Evaporator temperature sensor
4 In car temperature sensor
5 Recrculation vacuum solenoid
6 Defrost vacuum solenoid
7 Mode control switch
8 Water valve vacuum solenoid
9 High speed relays
10 Compressor clutch relay
11 Differential control
12 Coolent temperature switch
13 Centre vent vacuum solenoid
14 Lower servo feedback potentiometer
15 Upper servo feedback potentiometer
16 LH blower motor assembly
17 RH blower motor assembly
18 Temperature and auto/manual control
19 Upper servo
20 Lower servo
21 To compressor clutch relay
22 To fuse No 11
23 V12 in line fuse 3.6 fuse 16
24 Fuse 5 RH steering. Fuse 10 LH steering
25 Fuse 10 RH steering. Fuse 5 LH steering

AMBIENT TEMPERATURE SENSOR

Renew **82.20.02**

Disconnect the battery earth lead.
Remove the right hand side dash liner.
Disconnect the sensor block connector.
Remove the screws securing the sensor to the blower motor assembly.
Remove the sensor.
Remove and discard the sensor gasket.
Fitting a new sensor is the reversal of the removal procedure ensuring a new gasket is fitted.

IN-CAR TEMPERATURE SENSOR

Renew **82.20.03**

Disconnect the battery earth lead.
Remove the fascia crash roll.
Displace the sensor assembly from the crash roll.
Remove the tape securing the cable harness (2, Fig. 2).
Disconnect the multi-plug connector (1, Fig. 2).
Remove the screws securing the sensor and remove the sensor (3, Fig. 2).
Fitting a new sensor is the reversal of removal procedure.

TEMPERATURE CONTROL SWITCH

Renew **82.20.10**

Disconnect the battery earth lead.
Remove both console side casings.
Remove the radio.
Remove the centre console to the air con unit securing screws.
Remove the upper veneer panel securing screws and displace the panel for access.
Remove the upper console to the fascia securing screws.
Remove the rear console switch panel securing screws and displace the panel for access.
Note and disconnect the switch multi-plug connectors and place the panel aside.
Remove the console to tunnel rear securing screws.
Remove the console surround panel securing screws and carefully raise the panel for access.
Note and disconnect window, sun-roof and window lock switch connectors.
Remove the surround panel.
Carefully displace the console assembly rearwards.
Press in the temperature module securing "rocol" rivet centres and remove the rivets.
Remove the module to temperature differential control assembly securing screw.
Carefully displace the module sideways and disconnect from air con unit location.
Disconnect the switch multi-plug connector.
Remove the temperature module assembly.
Press in switch securing "rocol" rivet centres and remove rivets.
Remove the switch.
Fitting a new temperature control switch is the reversal of removal procedure.

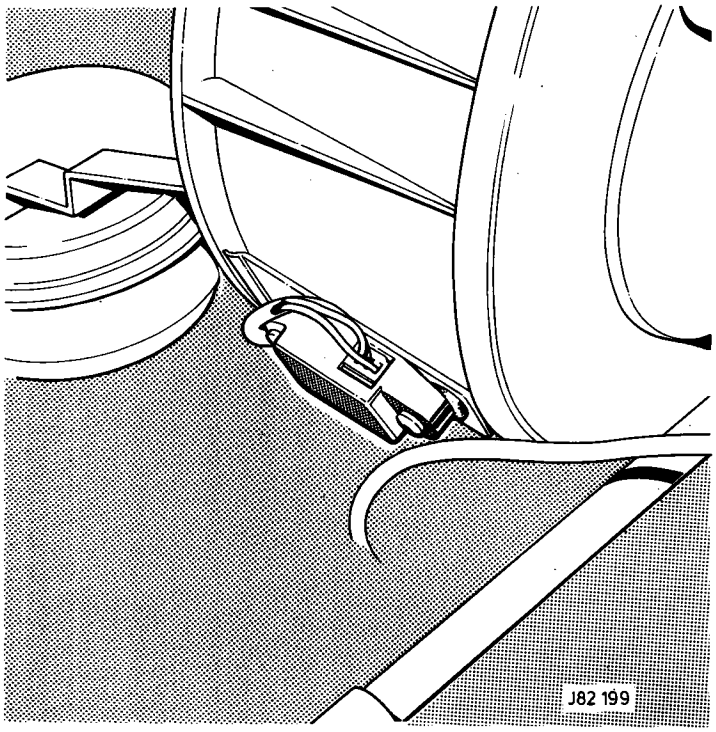


Fig. 1

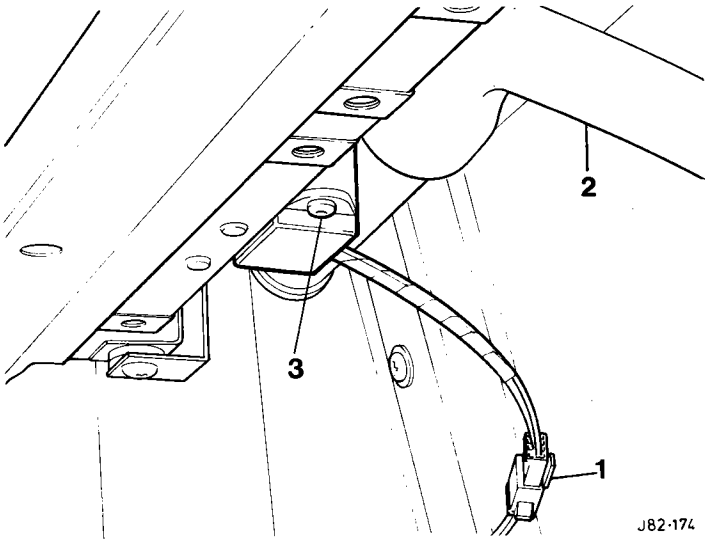


Fig.2

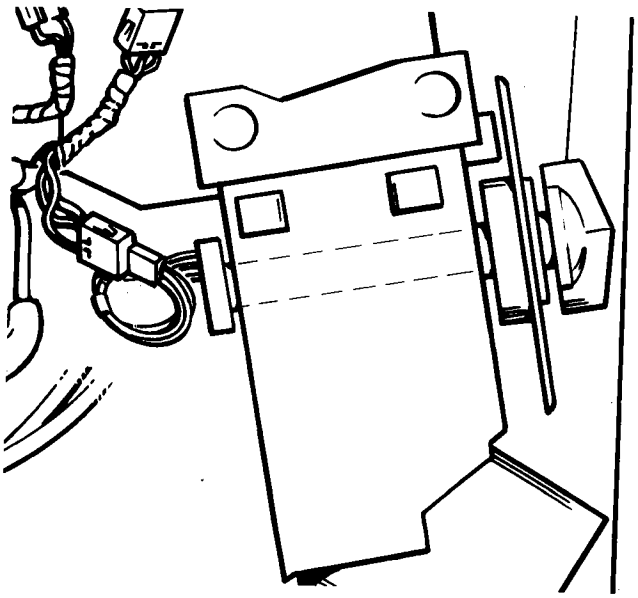


Fig. 3

AIR FLOW CONTROL SWITCH

Renew **82.20.11**

Disconnect the battery earth lead.
Remove both console side casings.
Remove the radio.
Remove the centre console to the air con unit securing screws.
Remove the upper veneer panel securing screws and displace the panel for access.
Remove the upper console to the fascia securing screws.
Remove the rear console switch panel securing screws and displace the panel for access.
Note and disconnect the switch multi-plug connectors and place the panel aside.
Remove the console to tunnel rear securing screws.
Remove the console surround panel securing screws and carefully raise the panel for access.
Note and disconnect window, sun-roof and window lock switch connectors.
Remove the surround panel.
Carefully displace the console assembly rearwards.
Press in the air flow switch module securing "rocol" rivet centres and remove the rivets.
Carefully displace the module sideways and disconnect from air con unit location.
Disconnect the switch multi-plug connector.
Remove the air flow switch module assembly.
Remove the outlet to module securing screws and remove the outlet.
Undo the switch securing nut.
Withdraw the switch and shaft assembly.
Remove the nut.
Fitting a new air flow mode control switch is the reversal of removal procedure.

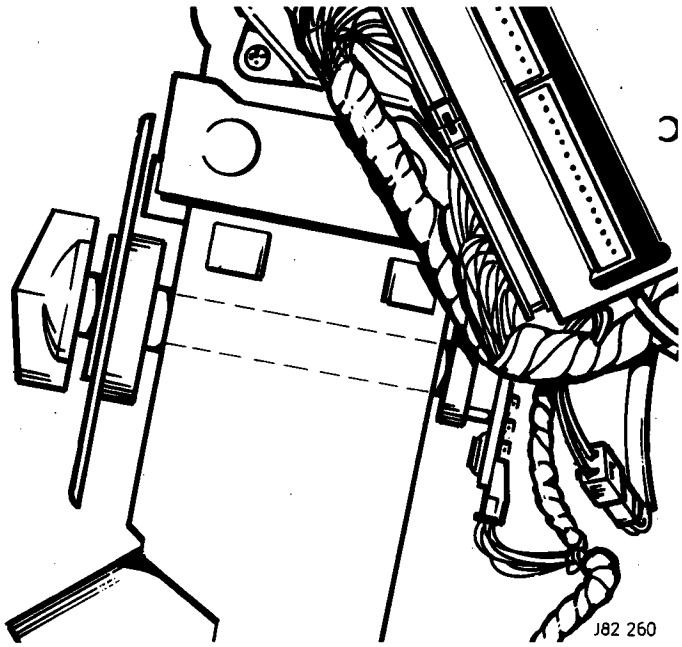


Fig 1.

FASCIA VENTILATOR CENTRE FLAP SERVO

Renew **82.20.41**

Disconnect the battery earth lead.
Remove the fascia board operation 76.46.01.
Disconnect the green servo vaccum hose.
Slacken the servo to connecting rod lock bolt.
Remove the screws securing the servo.
Remove the servo.
Fitting a new servo is the reversal of the removal procedure.

DEMISTER FLAP SERVO

Renew **82.20.42**

Disconnect the battery earth lead.
Remove the fascia board operation 76.46.01.
Disconnect the black servo vacuum hose.
Slacken the servo to connecting rod lock bolt.
Remove the screws securing the servo.
Remove the servo.
Fitting a new servo is the reversal of the removal procedure.

FACE LEVEL TEMPERATURE DIFFERENTIAL CONTROL POTENTIOMETER

Renew **82.20.57**

Disconnect the battery earth lead.
Remove both console side casings.
Remove the temperature control switch.
Press in the temperature module securing "rocol" rivet centres and remove the rivets.
Remove the module to differential assembly securing screws and carefully displace the module sideways.
Disconnect the temperature switch multi-plug connector and remove the temperature switch module assembly.
Disconnect the potentiometer block connector.
Displace the rubber boot from the opticell and disconnect the air con control illumination fibres from the opticell, displace from the rubber boot.
Remove the right hand screw securing the differential control assembly.
Displace the air con control panel through the console and remove the assembly from the vehicle.
Remove the control assembly from control panel.
Remove the lower control panel securing screws nd remove the panel.
lemove the screws securing the potentiometer.
ut and remove the rachet strap securing the able harness.
Remove the potentiometer assembly.
Fitting of a new potentiometer is the reversal of removal procedure.

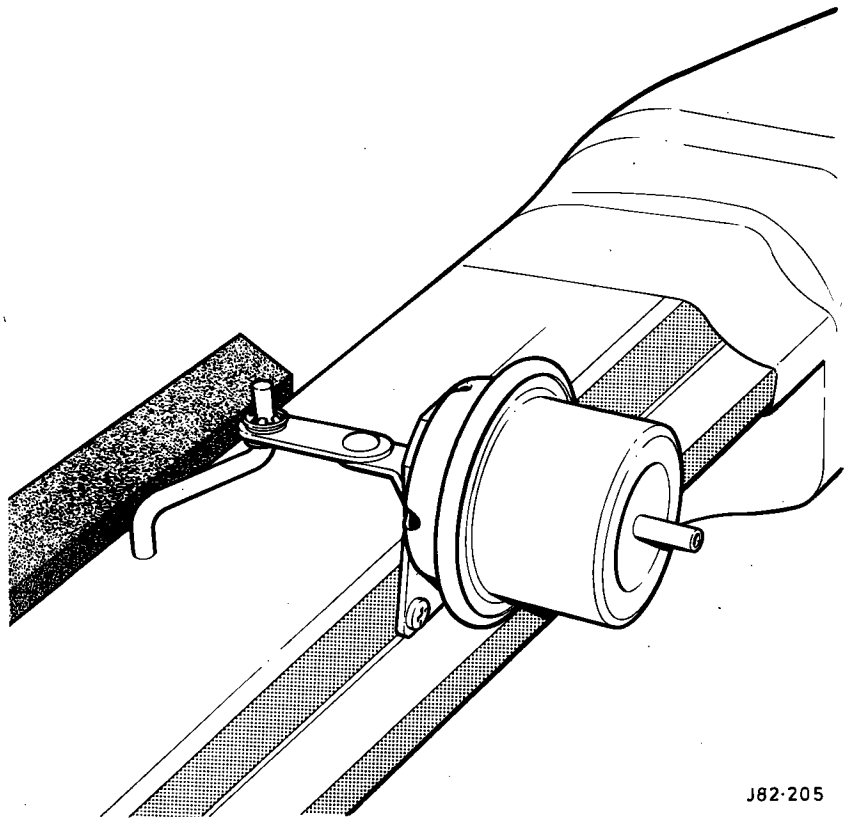


Fig 1.

Fig. 2

BLOWER MOTOR HIGH SPEED RELAY
(Passenger side)

Renew **82.20.58**

Disconnect the battery earth lead.
Remove the passenger side dash liner.
Remove the glove box.
Disconnect the vacuum hose from the blower motor assembly.
Fit a dummy hose hose to the vacuum servo and apply vacuum to open the lower flap.
Seal off the vacuum.
Disconnect the lower flap connecting rod clips and disconnect the rods from the lower flap.
Open flap for access.
Using a suitable tool remove the relay from the blower assembly.
Fitting a new relay is the reversal of the removal procedure.

BLOWER MOTOR HIGH SPEED RELAY
(Drivers side)

Renew **82.20.59**

Disconnect the battery earth lead.
Remove the drivers side dash liner.
Disconnect the vacuum hose from the blower motor assembly.
Fit a dummy hose hose to the vacuum servo and apply vacuum to open the lower flap.
Seal off the vacuum.
Disconnect the lower flap connecting rod clips and disconnect the rods from the lower flap.
Open flap for access.
Using a suitable tool remove the relay from the blower assembly.
Fitting a new relay is the reversal of the removal procedure.

LOWER SERVO FEEDBACK POTENTIOMETER

Renew **82.20.60**

Disconnect the battery earth lead.
Remove the left hand console side casing.
Remove the passenger side dash liner.
Disconnect the potentiometer block connector.
Remove the screws securing the potentiometer assembly.
Remove the potentiometer assembly.
Fitting a new potentiometer is the reversal of the removal procedure.

UPPER SERVO FEEDBACK POTENTIOMETER

Renew **82.20.61**

Disconnect the battery earth lead.
Remove glove box assembly.
Disconnect the potentiometer block connector.
Remove the screws securing the potentiometer assembly.
Remove the potentiometer assembly.
Fitting a new potentiometer is the reversal of the removal procedure.

UPPER FLAP MOTOR GEARBOX ASSEMBLY

Renew **82.20.62**

Disconnect the battery earth lead.
Remove the right hand dash liner and console side casing.
Remove the electronic control module.
Remove the warning lamp cluster lens cover (1, Fig. 2).
Turn the rev counter to disengage from locating pegs and displace from the fascia for access.
Remove the screws securing the flap motor assembly (2, Fig. 2).
Disconnect the cable harness block connector and remove the motor/gearbox assembly.
Fitting a new motor/gearbox assembly is the reversal of removal procedure.

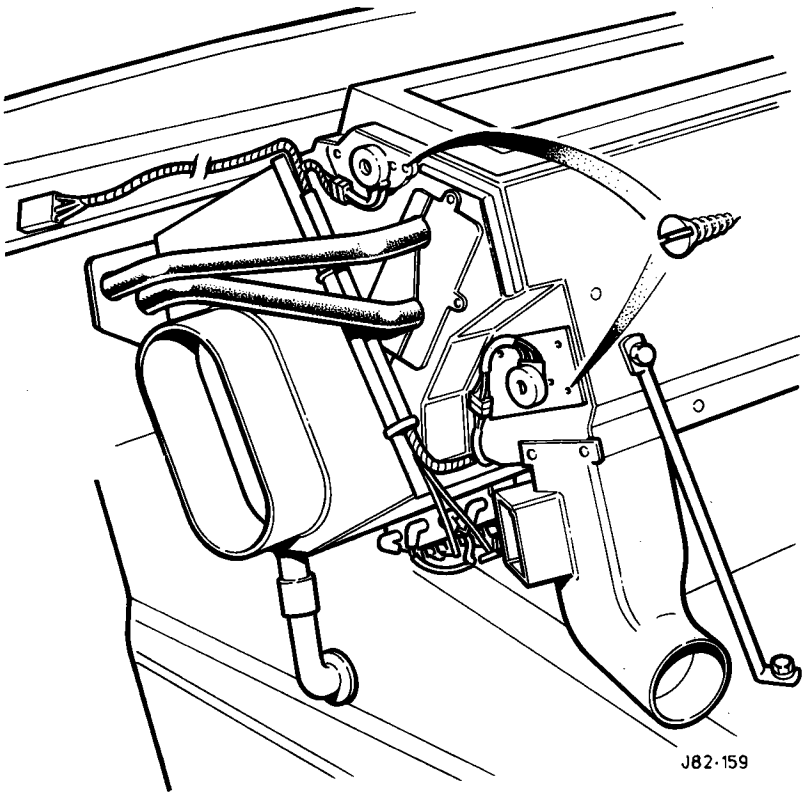


Fig 1.

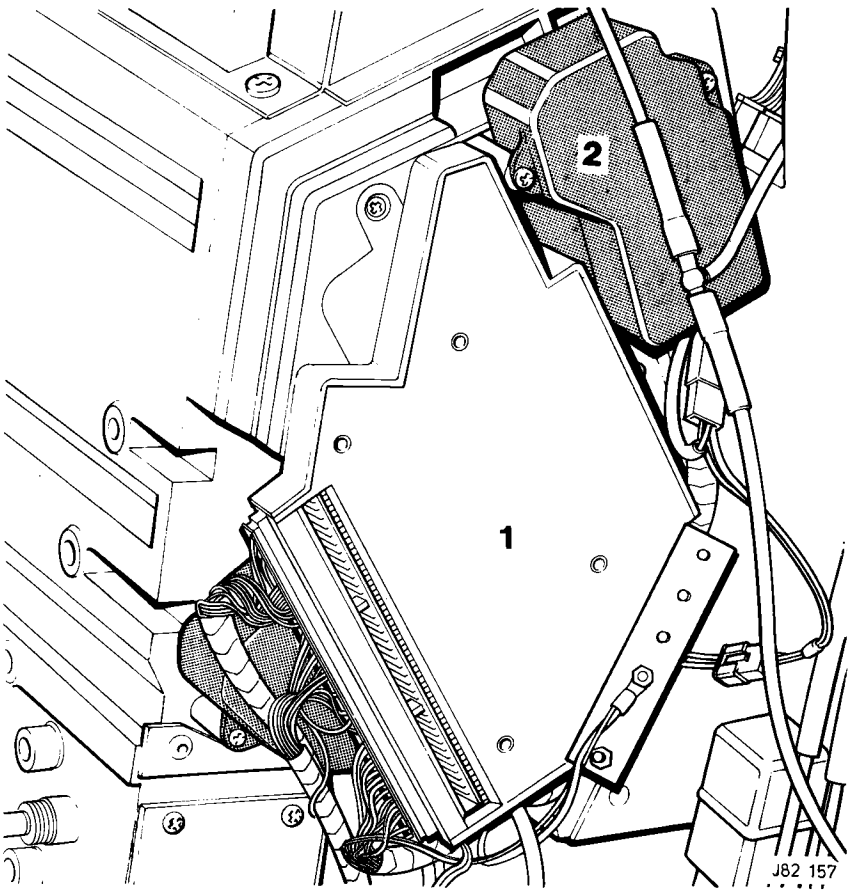


Fig. 2

LOWER FLAP MOTOR ASSEMBLY

Renew **82.20.63**

Disconnect the battery earth lead.
Remove the right hand side dash liner.
Remove the console side casing.
Remove the electronic control module 82.20.65 (1, Fig. 1).
Disconnect the motor block connector.
Remove the screws securing the motor assembly and remove the assembly (2, Fig. 2).
Fitting a new motor assembly is the reversal of the removal procedure.

EVAPORATOR TEMPERATURE SENSOR

Renew **82.20.64**

Disconnect the battery earth lead.
Remove the right hand side dash liner.
Remove the console side casing.
Disconnect the sensor block connector.
Remove the screws securing the sensor to the air con unit.
Displace the 'P' clip.
Withdraw and remove the sensor from the air con unit.
Fitting a new sensor is the reversal of the removal procedure.

ELECTRONIC CONTROL MODULE

Renew **82.20.65**

Disconnect the battery earth lead.
Remove the right hand dash liner.
Remove the console side casing.
Disconnect the earth wire from the control module.
Disconnect the three block connectors from the control module.
Remove the screws securing the module and remove the module from the air con unit (Fig. 2).
Fitting a new module is the reversal of the removal procedure.

CENTRE VENT VACUUM SOLENOID

Renew **82.20.66**

Disconnect the battery earth lead.
Remove the right hand console side casing.
Remove footwell duct securing screws.
Displace and remove the duct assembly.
Remove the bolts securing the solenoid bracket and displace the place for access.
Disconnect the white vacuum hose from 'T' piece.
Reposition the plate for access.
Note and disconnect the vacuum hoses from the solenoid.
Note and disconnect the solenoid feed wires.
Remove the solenoid from plate.

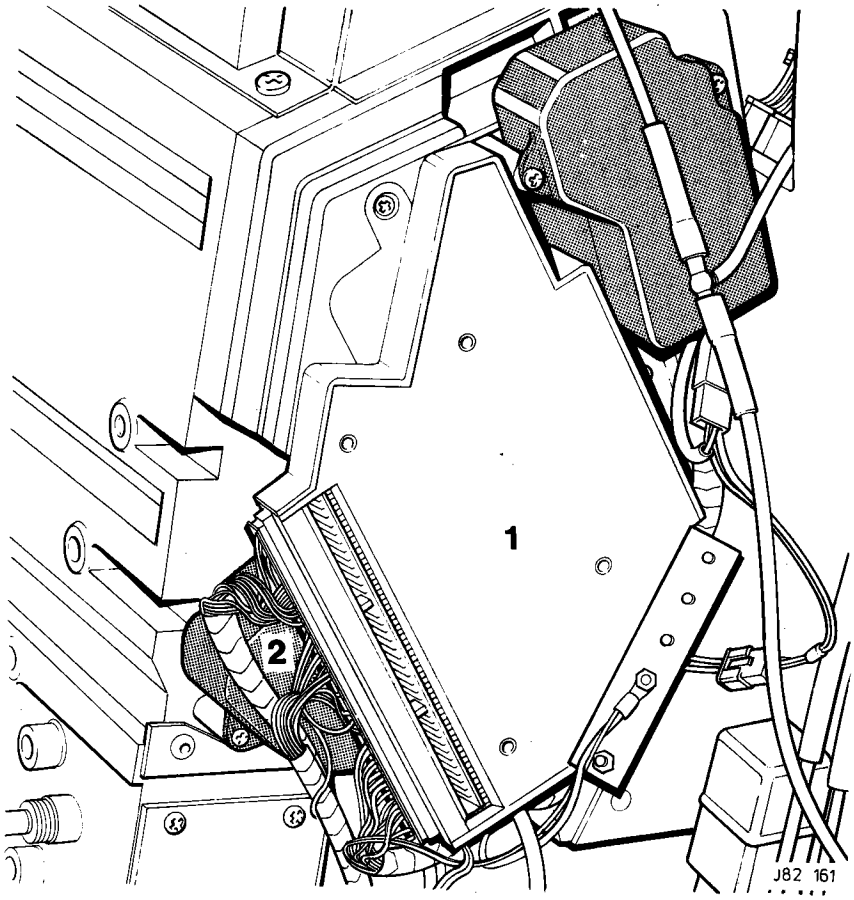


Fig 1.

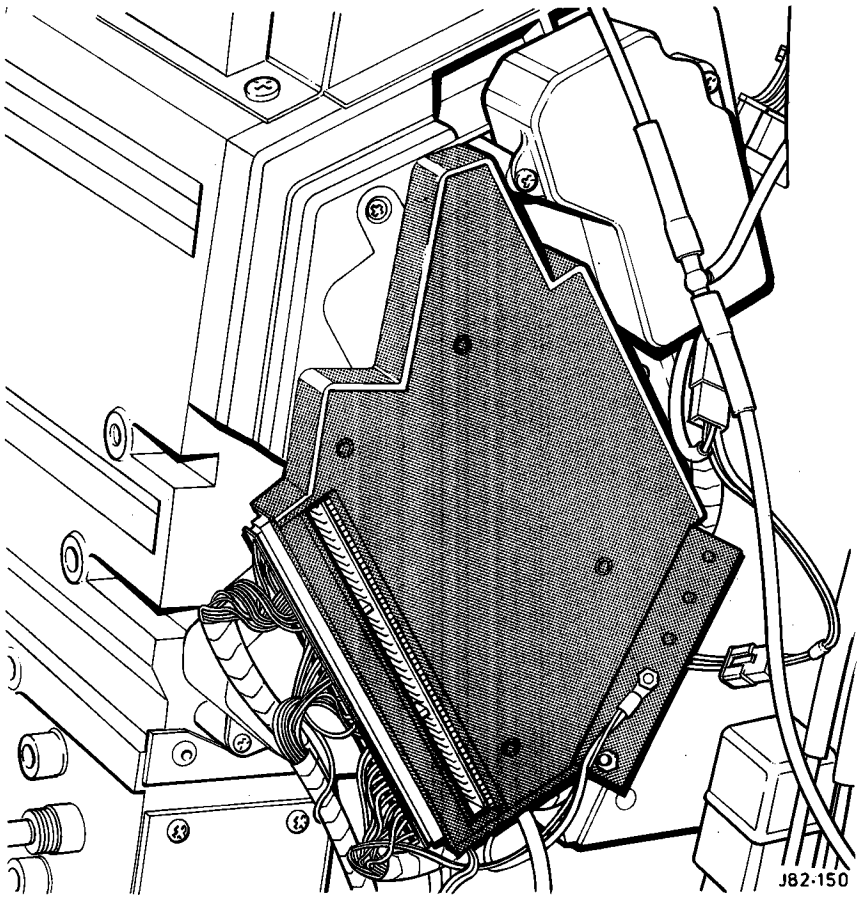


Fig. 2

RECIRCULATION VACUUM SOLENOID

Renew **82.20.67**

Disconnect the battery earth lead.
Remove the right hand console side casing.
Remove footwell duct securing screws.
Displace and remove the duct assembly.
Remove the bolts securing the solenoid bracket and reposition rearward from locating lugs for access.
Note and disconnect the vacuum hoses.
Disconnect the solenoid feed wires.
Remove the solenoid from mounting bracket.
Fitting a new solenoid is the reversal of the removal procedure.

DEFROST VACUUM SOLENOID

Renew **82.20.68**

Disconnect the battery earth lead.
Remove the left hand console side casing.
Remove the screws securing the footwell duct.
Displace and remove the footwell duct assembly.
Remove the bolts securing the solenoid bracket and displace bracket for access.
Disconnect the white vacuum hose from the 'T' piece.
Reposition the bracket for access.
Note and disconnect the vacuum hoses from the solenoid.
Note and disconnect the feed wires from the solenoid.
Remove the solenoid from the mounting plate.
Fitting a new solenoid is the reversal of the removal procedure.

WATER VALVE VACUUM SOLENOID

Renew **82.20.69**

Disconnect the battery earth lead.
Remove the left hand console side casing.
Remove the screws securing footwell duct.
Displace and remove the duct.
Remove the screws securing the solenoid mounting bracket and reposition the bracket rearward from the location lugs for access.
Note and disconnect the vacuum hoses.
Remove the solenoid from mounting bracket.
Fitting a new solenoid is the reversal of the removal procedure.

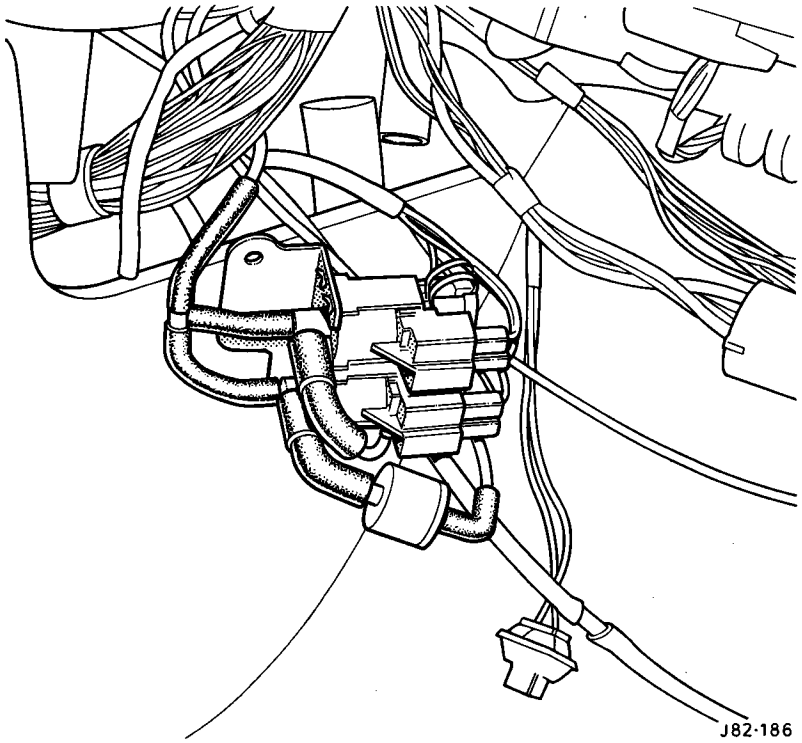


Fig 1.

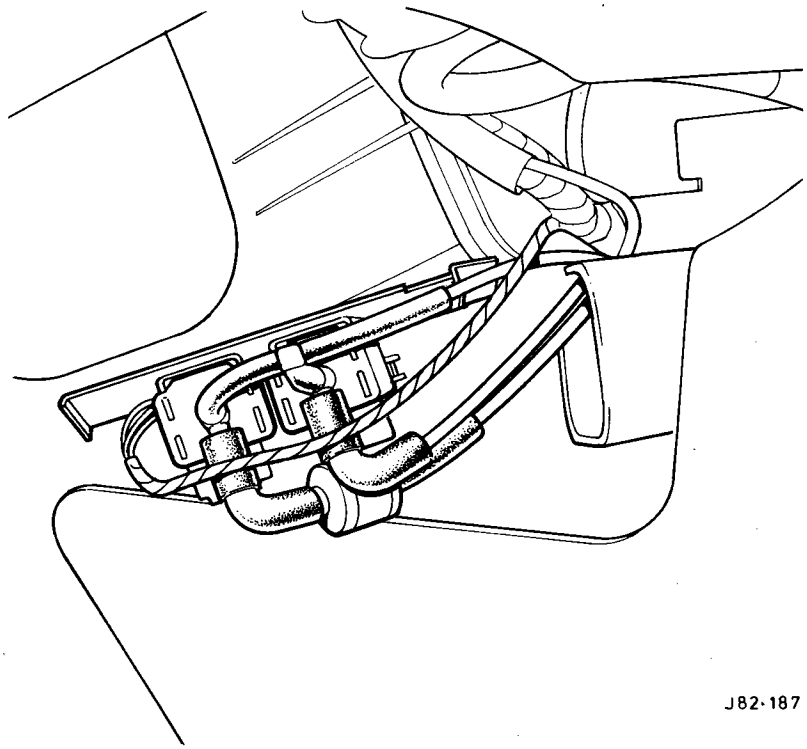


Fig. 2

WATER TEMPERATURE SWITCH

Renew **82.20.71**

Disconnect the battery earth lead.
Remove the left hand side console casing.
Remove the screws securing the footwell duct and remove the duct.
Note and disconnect the feed wires from the switch.
Displace and remove switch from water pipe (Fig. 1).
Fitting a new switch is the reversal of the removal procedure.

EXPANSION VALVE

Renew **82.25.01**

Depressurise the air conditioning system.
Undo the pipe to the expansion valve union nuts and disconnect the pipes.
Fit plugs to the expansion valve and to the pipes.
Reposition the pipes to one side.
Displace the heat protective material from capilliary tube.
Undo the capilliary tube union nut and carefully displace the tube aside.
Remove and discard 'O' rings.
Fit plugs to the unions.
Carefully displace the lower shield from the expansion valve location.
Remove the capilliary tube coil clamp screws and displace the clamp.
Undo the expansion valve union nut.
Displace and remove the expansion valve assembly (Fig. 2).
Fit plugs to the valve and pipe.
Remove and discard the heat protective material from the valve.
Fitting a new valve is the reversal of the removal procedure.
Ensure new 'O' rings to all unions connections are fitted.
Evacuate and recharge the system with R12 refrigerant.

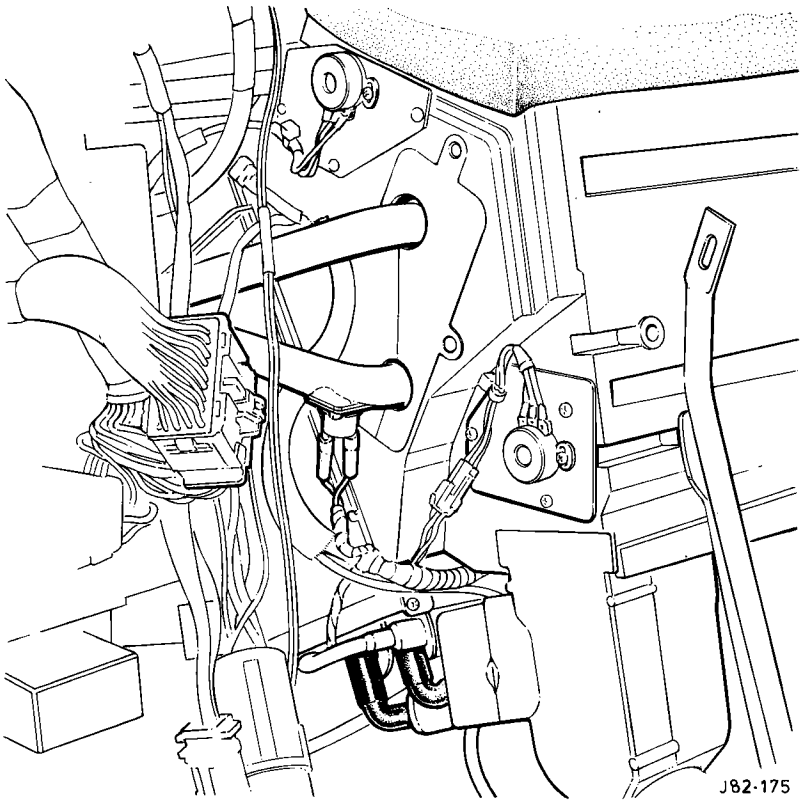


Fig 1.

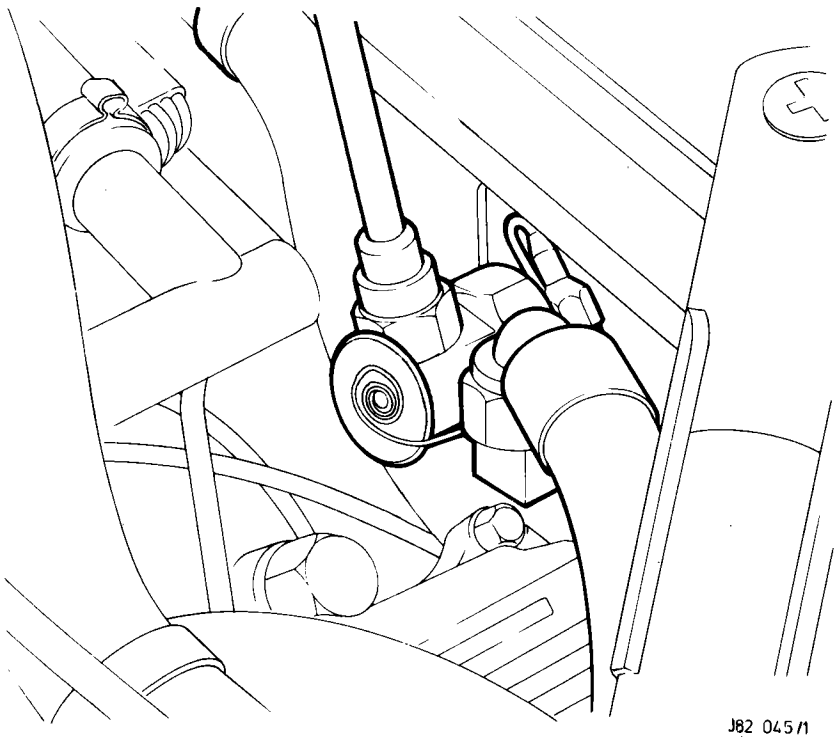


Fig. 2

HEATER MATRIX

Renew 82.25.10

Disconnect the battery earth lead.
Drain the engine coolant into a suitable container.
Remove both console side casings.
Remove both dash liners.
Remove the glove box assembly.
Remove the fascia crash roll.
Remove the feed and return pipes cover securing screws.
Remove the covers.
Displace the foam pad for access.
Undo the feed and return pipes securing bolts and displace the pipes from the matrix.
Displace and remove the gaskets.
Remove the screws securing the electronic control module and displace the module for access.
Remove tape from access panel.
Remove the screws securing the panel and remove the panel.
Displace and withdraw the heater matrix (Fig1).
Fitting a new heater matrix is the reversal of the removal procedure.

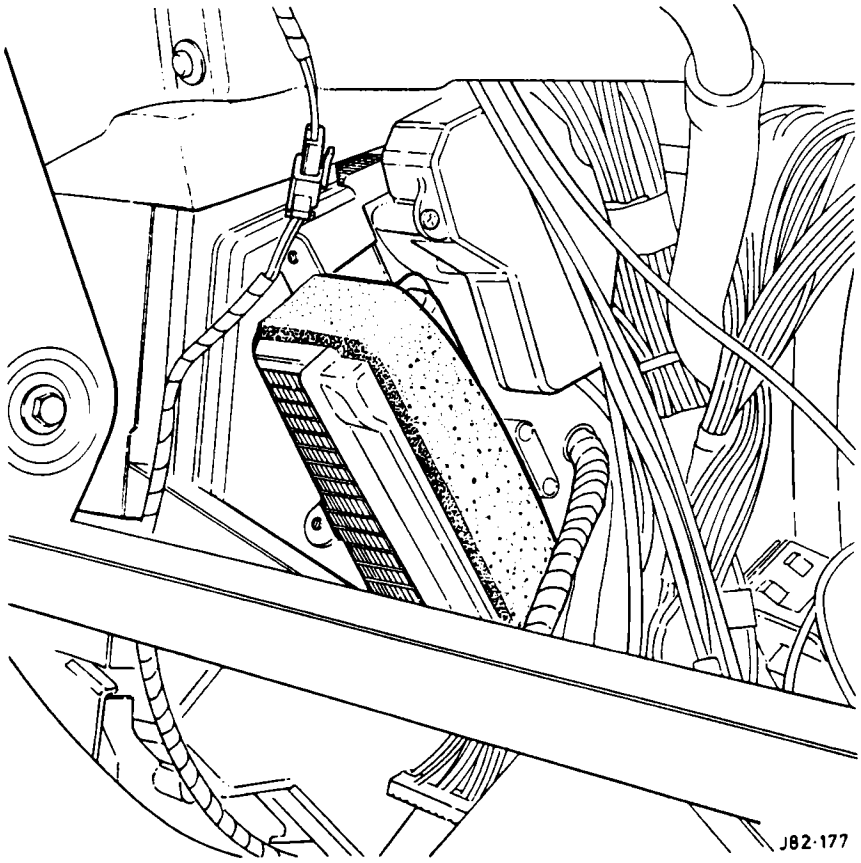


Fig 1

EVAPORATOR UNIT

Renew 82.25.20

Disconnect the battery earth lead.
Remove the console assembly.
Remove the fascia board.
Drain the engine coolant into a suitable container.
Depressurise the air conditioning system.
Remove the expansion valve.
Remove the air conditioning unit assembly.
Remove the heater pipe guide plate securing screws and remove the guide plate.
Remove the screws securing evaporator sensor and withdraw the sensor from evaporator.
Remove the screws securing the solenoid mounting plate and displace mounting plates from unit.
Remove harness to casing earth bolt and displace the harness.
Cut and remove harness to casing securing ratchet straps and displace the harness from casing.
Displace vacuum hose from casing.
Displace heat cladding from capilliary tube.
Undo expansion valve to unit union nut.
Undo capilliary tube union nut.
Remove the capilliary clamp screws.
Displace and remove the expansion valve assembly.
Remove and discard 'O' rings.
Fit plugs to expansion valve.
Displace and remove casing securing clips.
Split casing and remove evaporator from unit.
Remove expansion valve guide plate securing screws and remove plate.
Displace and remove plate from evaporator.
Fitting the new evaporator is the reversal of the removal procedure.
Refill the engine cooling system with coolant.
Recharge the air conditioning system.

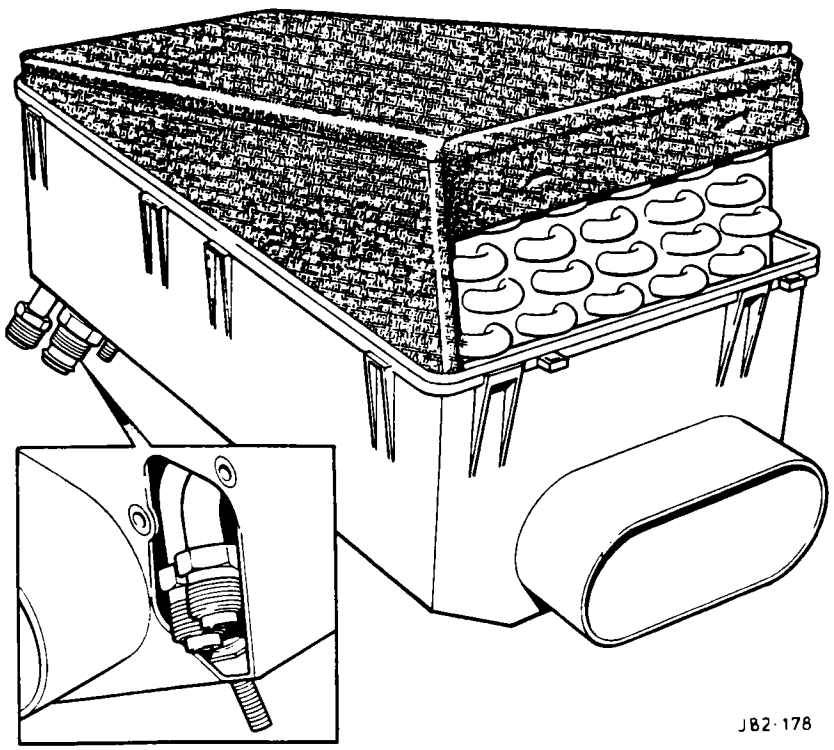
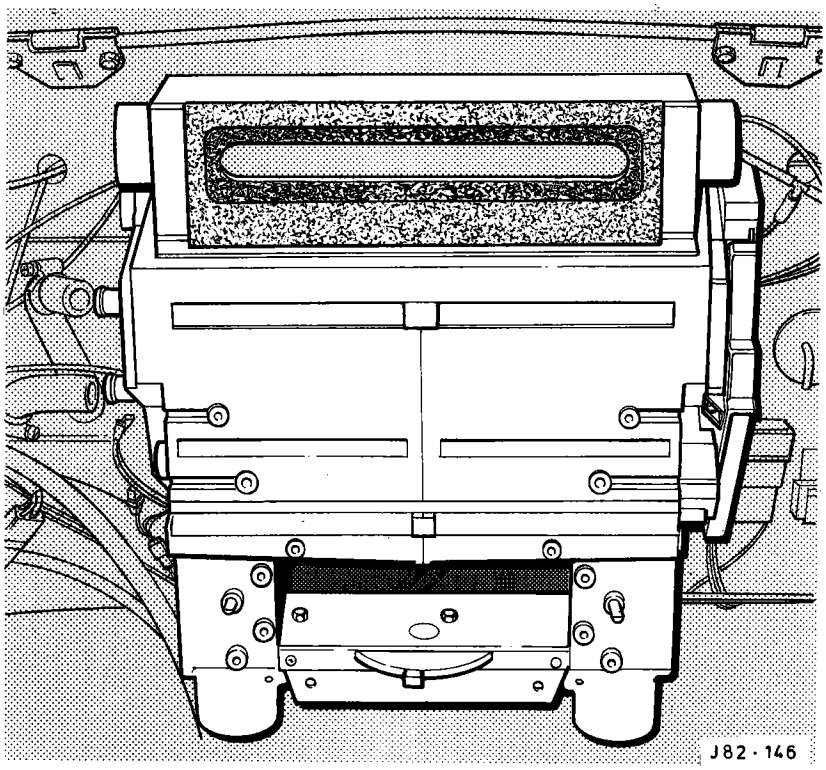


Fig 2

AIR CONDITIONING UNIT

Renew **82.25.21**

Disconnect the battery earth lead.
Drain the engine coolant into a suitable container.
Depressurise the air conditioning system.
Remove both console side casings.
Remove both dash liners.
Remove the glove box assembly.
Remove the fascia crash roll.
Remove the fascia.
Remove the air con unit to rear outlet air tubes.
Disconnect the trunking to volute outlet tubes and remove the tubes.
Slacken the feed and return coolant hose clips and disconnect the hoses from the heater matrix.
Undo the high and low refrigerant hose union nuts to the expansion valve, disconnect the hoses.
Remove and discard the 'O' ring seals.
Fit protective plugs to the hoses and expansion valve.
Remove the nuts securing the air con unit to the bulkhead.
Remove the spacers.
Remove the foam rings from the heater pipes.
Disconnect the condensate drain tubes.
Disconnect the right and left hand blower motor multi-plug connectors.
Note the position of and disconnect the vacuum hoses from the right and left hand side of the air con unit.
Disconnect the in-car sensor from grommet.
Disconnect the face level differential switch multi-plug connector.
Displace and remove the unit.
Displace and remove foam pads from the unit.
Fitting a new air conditioning unit is the reversal of the removal procedure.
Ensure new 'O' rings are fitted to all air conditioning hose connections.
Refill the engine coolant system.
Reconnect the battery.
Recharge the air conditioning system.



BLOWERS MOTOR (LEFT HAND)

Renew **82.25.13**

Disconnect the battery earth lead.
Remove the left hand dash liner and the console side casing.
Remove the glove box assembly.
Remove the nuts securing the component panel to the blower motor assembly.
Displace the earth strap from the inner stud.
Displace the fuse holder from the component panel.
Displace the component panel from the blower assembly.
Disconnect the pliable trunking from the volute outlet tubes.
Disconnect the aspirator tube from the trunking.
Disconnect the blower solenoid vacuum hose.
Open the lower flap and insert a suitable wedge to hold it open.
Remove the nuts and bolts securing the blower motor assembly.
Disconnect the multi-plug cable connector.
Displace and remove the blower motor assembly from the vehicle.
Fitting a new blower motor assembly is the reversal of the removal procedure.

BLOWER MOTOR (RIGHT HAND)

Renew **82.25.14**

Disconnect the battery earth lead.
Remove the right hand dash liner and the console side casing.
Remove the nuts securing the component panel to the blower motor assembly.
Displace relays for access.
Disconnect the pliable trunking from the volute outlet tubes.
Disconnect the blower solenoid vacuum hose.
Open the lower flap and insert a suitable wedge to hold it open.
Remove the nuts and bolts securing the blower motor assembly.
Displace the assembly, route trunking over the steering column.
Displace the component panel from the blower motor assembly.
Disconnect the multi-plug cable connector and remove the blower motor assembly from the vehicle.
Remove the tape securing the trunking to the blower assembly and remove the trunking.
Fitting a new blower motor assembly is the reversal of the removal procedure.