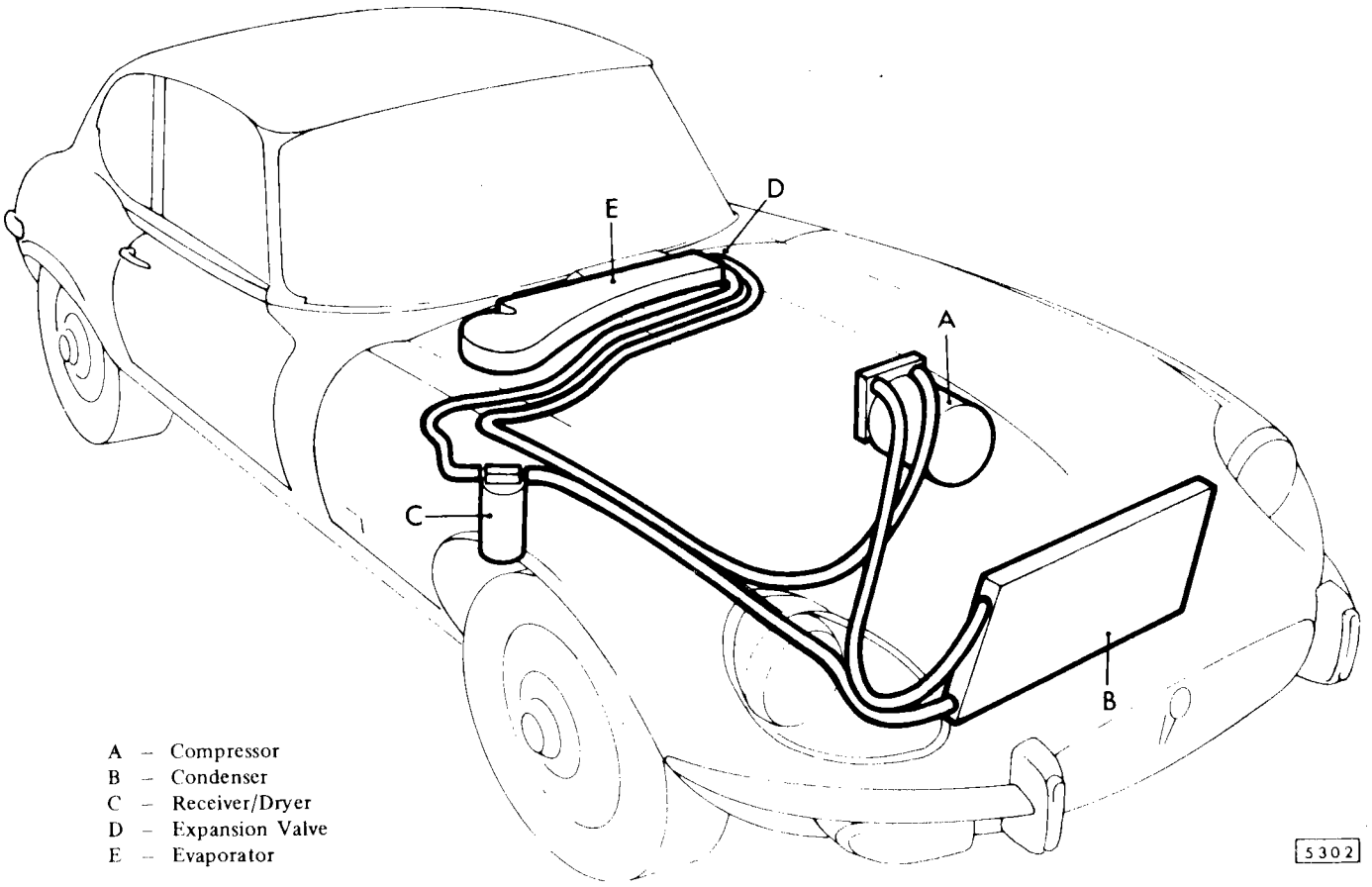
## CONTENTS




A – Compressor
B – Condenser
C – Receiver/Dryer
D – Expansion Valve
E – Evaporator

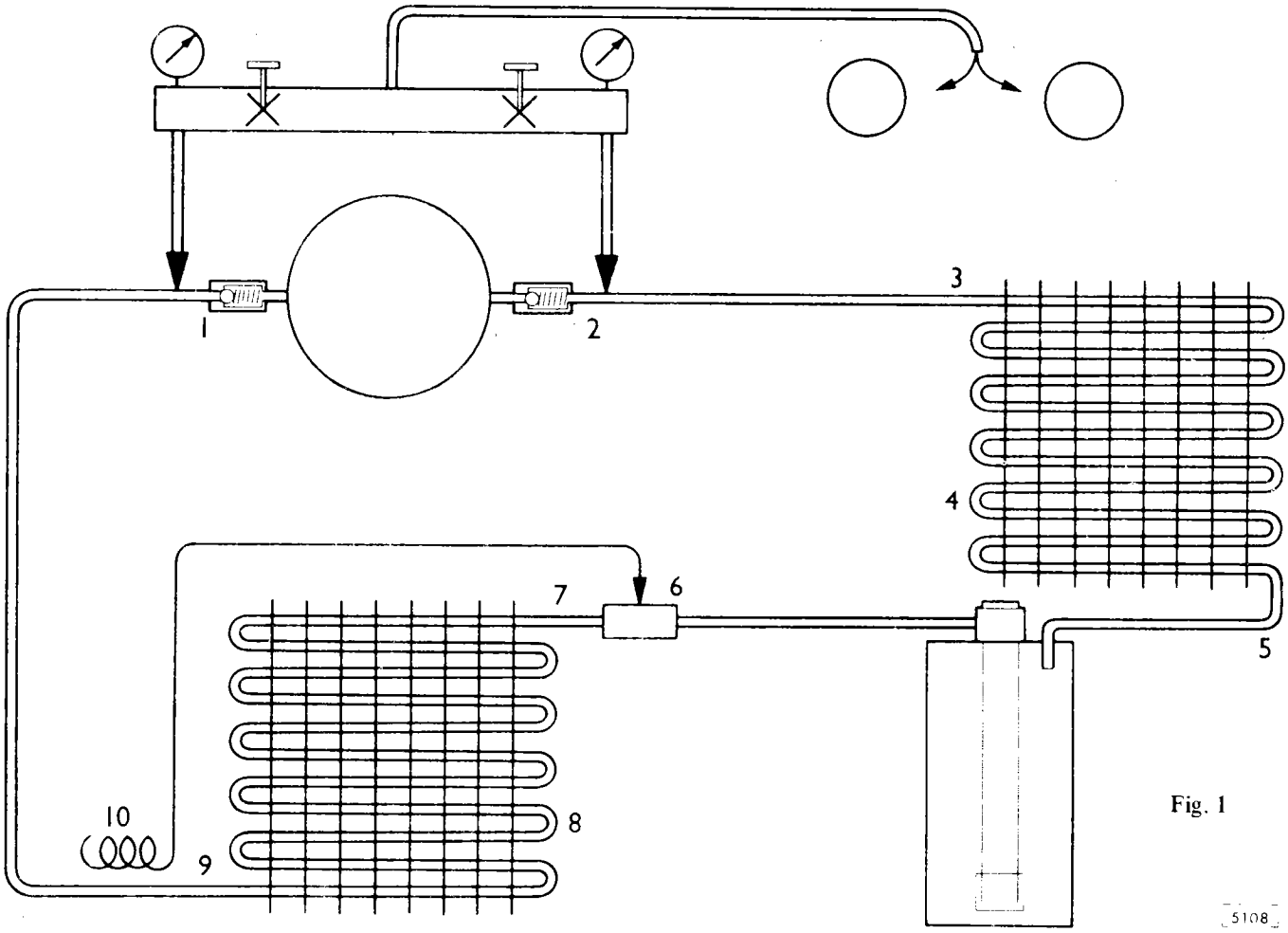



Fig. 1

## AIR CONDITIONING SYSTEM

### System description 82.00.00

The Jaguar air conditioning refrigeration system is comprised of the following components; a compressor, a magnetic clutch, a condenser, a combined receiver/drier, an evaporator coil with attached expansion valve, a blower fan, a thermostat and interconnecting hoses. It is fitted with two electric relays, one supplying current while the ignition is switched on, and the other by-passing the engine cooling system radiator thermostat. The cooling fans therefore run continually while the air conditioning system is switched on.

The refrigeration cycle is best described with reference to figures 1 and 2. The refrigerant used is to specification R.12 (refrigerant 12) which is a halogenated hydrocarbon (dichlorodifluoromethane).

The heart of the automobile refrigerant system is the compressor. Its purpose is two fold; to raise the pressure of the refrigerant vapour and correspondingly raise its temperature.

The suction side of the compressor, point 1, pulls in superheated refrigerant vapour. The compression cycle occurs between points 1 and 2 of figure 1, work being done on the vapour to raise its pressure and add heat. The fact that heat is added is shown by point 2 on figure 2 being to the right of point 1. The pressure difference is given by the vertical axis of figure 2. The high pressure, high temperature vapour is delivered to a fin and tube

construction condenser located in front of the engine coolant radiator where heat flow takes place from the high temperature vapour to the surrounding air. As the refrigerant passes through the condenser, heat transfer and a reduction in temperature takes place, the gas giving up its latent heat and condensing to a cooi liquid. However, the length of the condenser is selected so that further heat loss takes place, sub-cooling the refrigerant liquid to ensure complete condensation. In figure 2 these conditions are shown between points 3 and 5. At point 3 condensation commences, passes through a wet vapour state, and is complete at point 4. The sub-cooling is shown taking place between points 4 and 5.

The high pressure liquid now passes to the receiver/drier, a reservoir for the liquid content of the system. The receiver/drier incorporates a filter and a limited capacity dehydrating element to remove traces of moisture from the refrigerant.

From the receiver/drier, liquid refrigerant passes to the expansion valve and evaporator unit point 6 of figure 1.

The expansion valve is the dividing point in the system, a step change from a high pressure area into a low through a small metering orifice. The metering orifice is protected by a gauze filter in the inlet union of the expansion valve. The orifice size is controlled by the temperature at the outlet from the evaporator unit and by the inlet pressure to the expansion valve. A quantity of liquid refrigerant passes the expansion valve orifice and expands suddenly as it enters the low pressure area. As the liquid passes through the coils of the evaporator unit heat transfer takes place from the car interior air to the liquid causing it to boil.

The length of the evaporator coil is so chosen that the liquid refrigerant has completely vapourised at approximately three quarters through, the remaining length serving to absorb more heat and super-heat the vapour. This ensures that no liquid refrigerant reaches the compressor, and that as much heat as possible is absorbed from the car interior. The temperature sensing capillary of the expansion valve is fitted at the outlet of the evaporator. The capillary senses the outlet gas temperature and sets the expansion valve to meter the supply of cold liquid to the input of the evaporator.

For example, should the outlet pipe temperature fall, the expansion valve closes, cutting off the flow of liquid refrigerant until the temperature rises to the preset level. The super-heated vapour is then drawn to the suction side of the compressor, point 1 of figure 1, and the cycle continues.

Moisture from air passing over the matrix of the evaporator unit condenses on to the cool fins and drains from the evaporator via three rubber tubes. Use of the air conditioning system can therefore result in a pool of water beneath the vehicle after parking. This is completely normal and does not indicate malfunction of the system.

It can be seen that ice formation is possible upon the fins of the evaporator unit. Anti-icing of the coil, and control of the vehicle interior temperature is provided by the thermostat. The capillary senses the temperature of the evaporator coil and, via a switch, de-energises the compressor clutch when the temperature falls to the preset level. This stops the flow of refrigerant and allows the coil to heat up until the thermostat switch re-closes. The compressor clutch then engages to re-start the cycle.

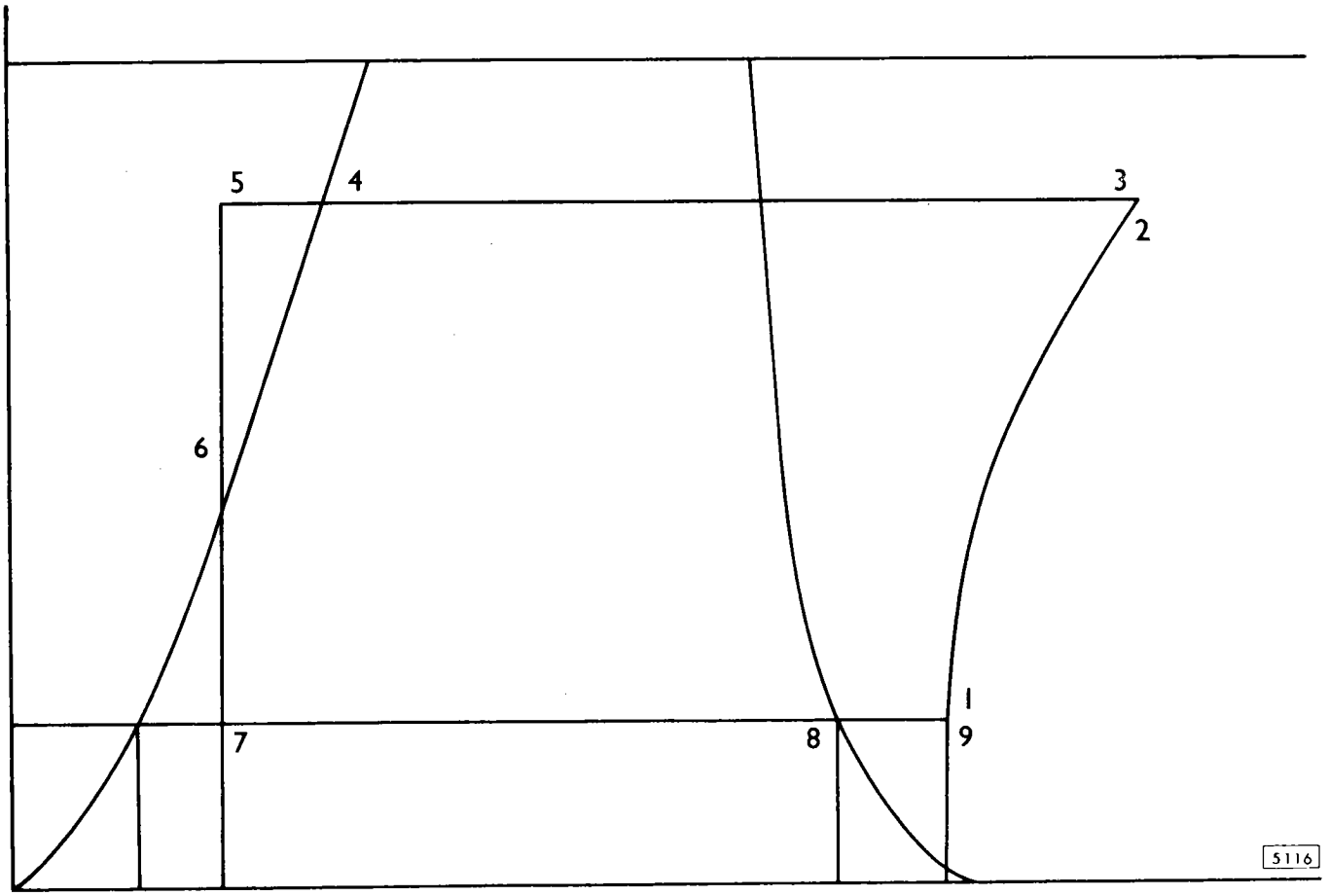



**Figure 2.**

### Component description

### Compressor

The compressor utilizes three double acting pistons disposed axially around the compressor drive shaft. The pistons are actuated by a swash plate pressed on to the shaft. A magnetic clutch is used to drive the compressor shaft. 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.

### Condenser

The condenser is a copper tube and aluminium fin heat transfer unit fitted forward of the engine coolant radiator. The condenser transfers heat from the refrigerant flowing through it to the airstream drawn through it by the engine cooling fans.

### Receiver/Drier

The receiver/drier is a cylindrical tank that serves as a reservoir for the refrigerant. The liquid refrigerant is fed in at the top, and is drawn out, via a screen and filter, through a tube extending to the bottom. The outlet tube has a sight glass fitted through which it can be determined by observing the refrigerant condition, whether there is adequate refrigerant in the system. A cloth sac filled with moisture absorbing granules is located inside the tank. This retains any traces of moisture that may be present in the refrigerant.

### Expansion Valve

The expansion valve controls the flow of refrigerant through the evaporator coil to achieve optimum cooling efficiency. To do this, the valve senses the outlet pipe temperature and inlet pipe pressure and increases or decreases the flow of refrigerant liquid to maintain the outlet temperature constant.

### Evaporator

The evaporator is a tube and fin heat exchanger into which the liquid refrigerant is metered. The air content of the vehicle, when forced over the fins by the recirculating blower fan, gives up its heat to boil the refrigerant.

## GENERAL SECTION 82.00.00

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 methylchloride refrigerant.

The chemical reaction between methylchloride 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
ARCTON12
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.

## FAULT FINDING CHART

Procedures to resolve the causes given are included in the following section.

| CAUSE | | SYMPTOM: Unusually low reading of compound gauge | SYMPTOM: Unusually high reading of compound gauge | SYMPTOM: Unusually low reading of high pressure gauge | SYMPTOM: Unusually high reading of high pressure gauge |
|---|---|---|---|---|---|
| Air or non condensable gases in system | (m) | | | | X |
| Unusually hot running engine | (l) | | | | X |
| Insufficient air over condenser | (k) | | | | X |
| Restriction in high pressure side | (j) | | | | X |
| Loose capillary tube connection at evaporator coil outlet | (i) | | X | | |
| Very high heat load | (h) | | X | | X |
| Excessive refrigerant charge | (g) | | X | | X |
| Evaporator coil blocked with ice | (f) | X | | X | |
| Defective expansion valve | (e) | X | X | X | |
| Low capillary charge in expansion valve | (d) | X | | X | |
| Partial restriction in expansion valve | (c) | X | | X | |
| Very light heat load | (b) | X | | X | |
| Low refrigerant charge | (a) | X | | X | |

## FAULT FINDING AND RECTIFICATION

Carry out preliminary tests – 82.30.16, before continuing with relevant check.

### Low refrigerant charge

1. Run engine at 1000 – 1200 r.p.m.
2. Switch on air conditioning system to high delivery setting.
3. Set thermostat control to mid range position.
4. Fit charging manifold as described in 82.30.06, first ensuring both charging manifold valves closed.
5. With the following ambient air temperatures, the corresponding delivery pressure gauge readings should be as given.

| Ambient Temp. | Pressure gauge kg/cm² | lb/sq.in. |
|---|---|---|
| 16°C (60°F) | 7,03 – **10,54** | 100 – 150 |
| 27°C (80°F) | 9,84 – 13,36 | 140 – 190 |
| 38°C (100°F) | **12,65** – 15,8 | 180 – 225 |
| 43.5°C (110°F) | 15,1 – 17,56 | 215 – 250 |

**NOTE**: The higher pressure gauge readings for each temperature reading would only occur if very little air is flowing over condenser.
Readings will decrease as the vehicle cools down from extended air conditioning system use.

#### Check

Check receiver/drier sight glass for excessive foaming.
Check expansion valve for intermittent hissing.

#### Correction

Test for leaks – 82.30.09, and rectify as necessary.

**IMPORTANT**: The system **MUST** be depressurised before any brazing repair is attempted.

Recharge the system – 82.30.08 on completion of repair.

### Very light heat load

#### Check

Low outside ambient.
Evaporator blower intake for obstruction.
Outlet louvres for obstruction.
Remove blower motor assembly and check fan for damage.
Evaporator coils for ice formation.

#### Correction

Clear or remove any obstruction.
Renew or repair fan blades.
If ice formation present, set thermostat control to higher position.

### Partial restriction of expansion valve

#### Check

Reach up beside evaporator unit and feel expansion valve and connecting hoses.
If a restriction is present ice can form on the valve body and on the pipe from valve to matrix.
If the valve is functioning correctly, the intake hose will feel warm.

#### Correction

Remove valve – 82.25.01. Clean filter in inlet connection. If this filter is not obstructed fit replacement valve.

### Low capillary charge in expansion valve

#### Check

Follow procedure to remove evaporator unit, operations 1 to 21 – 82.25.20.
Remove three self tapping screws securing expansion valve cover.
Remove filler pads.
Observe suction side pressure gauge, and enclose capillary sensing coil in the hand. The unusual heat should cause the expansion valve to flood and show sudden rise in suction side pressure. If the pressure does not rise, it can be assumed that capillary charge is weak.

#### Correction

Replace expansion valve – 82.25.01.

### Defective expansion valve

#### Check

Carry out checks as for partial restriction of expansion valve.

#### Correction

As for partial restriction of expansion valve.

### Evaporator coil blocked with ice

#### Check

Thermostat sensor not in contact with fins of evaporator.
Thermostat setting.
Expansion valve.

#### Correction

Reposition sensor to touch fins.
Reposition thermostat to lower level.
Renew expansion valve.

## GENERAL INFORMATION

Torque levels to be used when tightening all connections are as follows:

| | | Torque loading | | |
|---|---|---|---|---|
| | | kg.m | ft.lb. | |
| 1. | Compressor/Condenser | 4,15 to 4,84 | 30 to 35 | |
| 2. | Condenser/Compressor | 2,90 to 3,73 | 21 to 27 | |
| 3. | Condenser/Receiver/Drier | 2,10 to 2,76 | 15 to 20 | |
| 4. | Receiver/Drier/Condenser | 1,52 to 1,80 | 11 to 13 | (Aluminium tank) |
| | | 4,15 to 4,84 | 30 to 35 | (Steel tank) |
| 5. | Receiver/Drier/Evaporator | 1,52 to 1,80 | 11 to 13 | (Aluminium tank) |
| | | 4,15 to 4,84 | 30 to 35 | (Steel tank) |
| 6. | Evaporator/Receiver/Drier | 1,52 to 1,80 | 11 to 13 | |
| 7. | Expansion valve/Evaporator | 2,10 to 2,76 | 15 to 20 | |
| 8. | Evaporator/Compressor | 2,90 to 3,73 | 21 to 27 | |
| 9. | Compressor/Evaporator | 4,15 to 4,84 | 30 to 35 | |

## GOOD PRACTICE

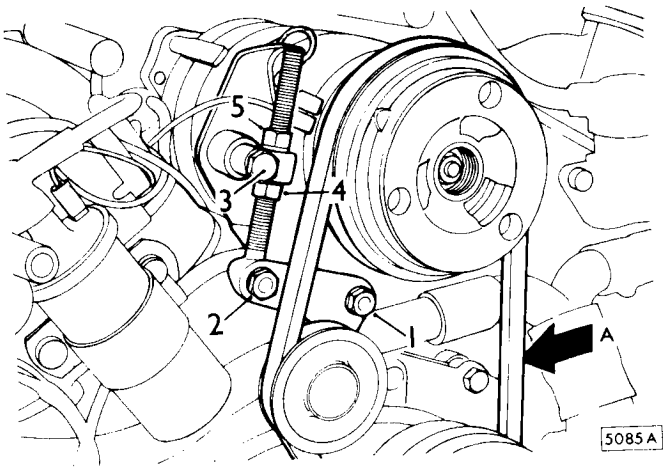
1. The protective sealing plugs must remain in position on all replacement components and hoses until immediately before assembly.
2. Any part arriving for assembly without sealing plugs in position must be returned to the supplier as defective.
3. It is essential that a second backing spanner is always 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 pressures encountered in the system.
9. Dirty end fittings can only be cleaned using a clean 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 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 battery.
13. Check hose is correctly fitted in clips or strapped to subframe 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.
15. Components or hoses removed must be sealed immediately after removal.
16. AFTER A SYSTEM HAS BEEN OPENED TWICE THE RECEIVER/DRIER MUST BE RENEWED.

**NOTE**: To improve engine accessibility it is advantageous to place both front wheels on blocks of wood and disconnect the bonnet stay; this allows bonnet to hinge further forward. The blocks should be approximately 30,5 cm (12 in.) long, 25,4 cm (10 in.) wide and 15 cm (6 in.) high. Ensure bonnet is adequately supported after disconnecting stay.

## COMPRESSOR DRIVE BELT

**Adjust** 82.10.01

**CAUTION**: It is extemely important that the drive belt tension is **exactly** as stated. Excessive slack or tension will lead to premature failure either of the belt, the idler pulley or of the compressor pulley ball bearing races. The drive belt is specifically designed for this application and must not be used elsewhere.



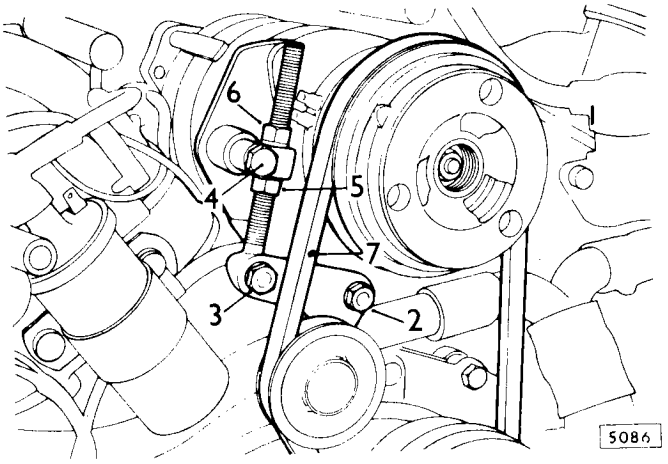

1. Slacken setscrew at angle of idler pulley arm.
2. Slacken locknut and bolt at adjustment bolt boss.
3. Slacken setscrew at adjustment sleeve.
4. Slacken locknut beneath adjustment sleeve.
5. Use locknut above adjustment sleeve to set belt tension as follows:–
   A load of 2,1 kg (4.6 lb) applied at point A, in the direction shown, shall deflect the belt 3,2 mm (0.125 in.)
6. Retighten setscrews and nuts loosened at operations 1, 2, and 3.
7. Tighten locknut beneath adjustment sleeve.

## COMPRESSOR DRIVE BELT

**Remove and refit** 82.10.02

**CAUTION**: The drive belt is specifically designed for this application and must not be used elsewhere.

**Removing**




1. Remove alternator drive belts – 86.10.03.
2. Slacken setscrew at angle of idler pulley arm.
3. Slacken locknut and bolt at adjustment bolt boss.
4. Slacken setscrew at adjustment sleeve.
5. Slacken locknut beneath adjustment sleeve and wind down.
6. Screw top locknut up adjustment bolt sufficiently far to free drive belt.
7. Remove belt and manoeuvre clear.

**Refitting**

**NOTE**: It is possible that some early vehicles will have the adjustment sleeve rotated through 180 degrees. This is not critical, but means that the adjustment bolt is not operating with the best possible advantage. While fitting the replacement belt, therefore, ensure sleeve is fitted as shown in diagram.

8. Manoeuvre replacement belt into position.
9. Set drive belt tension, operations 5, 6 and 7 of – 82.10.01.
10. Refit alternator drive belts.

**Excessive refrigerant charge**

**Check**

Observe charging manifold gauge readings. If both suction and discharge pressure readings are unusually high for the prevailing ambient this indicates the possibility of the system being overfilled. Ensure centre hose of charging manifold pointing in safe direction, and **slowly** open pressure side valve to bleed off some refrigerant.
If the gauge pressures fall, this confirms excessive refrigerant charge.

**Correction**

Continue to **slowly** bleed off refrigerant until both gauge readings are approximately normal.

**IMPORTANT**: Keep close watch on receiver/drier sight glass during this operation. Any bubbles appearing will indicate that too much refrigerant has been removed.

**Very high heat load**

**Check**

Very hot or very humid day.
Vehicle heater is switched off.
All windows and doors are closed.

**Correction**

Ensure heater is switched off and that all air vents, windows, and doors are closed.

**Loose capillary tube connection at evaporator coil outlet**

**Check**

Observe suction side of compressor connector union housing for severe frosting or icing.
Note: A slight degree of frosting is normal.

**Correction**

If icing is heavy, check that expansion valve capillary coil is in correct contact and clamped to evaporator outlet pipe. Tighten clip as necessary. Do not overtighten to damage capillary coil.
Replace expansion valve – 82.25.01.

**Restrictions in high pressure side**

**Check**

For restriction in condenser, receiver/drier, and hoses connecting these units. Any restriction or partial blockage will create a drop in temperature at the point of restriction. This temperature drop will be obvious to the touch, and in some cases frost or sweating may occur at that point.

**Correction**

Replace component or hose affected.

**Insufficient air over condenser**

**Check**

That the condenser matrix is not damaged or obstructed.
Vehicle radiator matrix is not damaged.
Cooling fans run continually while air conditioning system is on.
Direction of rotation of fans.

**Correction**

Blow out matrices with compressed air. Use hose if necessary to soften caked mud.
Dress deformed finning.
Check wiring to fan and replace fan if wiring correct.

**Unusually hot running engine**

**Check**

Engine cooling system as detailed in Group 26.
Ensure radiator blind (if fitted) is not in operation.

**Air or non-condensable gas in system**

**Check**

If all other methods fail to reduce head pressure to a satisfactory level, check for air in the system.
Pour cold water over condenser to accelerate condensing action.
If there is excessive refrigerant in system the pressure will momentarily fall.
Air in the system will not condense. The pressure will therefore remain high.

**Correction**

Sweep (purge) the system – 82.30.07.
Change receiver/drier unit.

## COMPRESSOR OIL LEVEL

**Check** **82.10.14**

There is no way to check oil level while the compressor is installed but the level should not change throughout normal service. However, owing to the fact that oil is normally in suspension and comes to rest whenever the system is shut down, that oil within a component removed is lost to the total quantity.
In order to compensate for this loss, a specific quantity of oil is to be added for each component replaced; the quantity relating to each component will be given in the relevant procedure. If oil has been lost from the system owing to accident damage depressurisation or incorrect depressurisation procedure, the compressor must be removed from the installation to check oil level – 82.10.20.

## COMPRESSOR

**Remove and refit** **82.10.20**

**WARNING**: Before commencing work on this operation, refer to general section 82.10.00. Do not turn the compressor over until the system is correctly charged.

**NOTE**: Ensure that suitable clean, dry male and female sealing plugs are to hand.

**Removing**

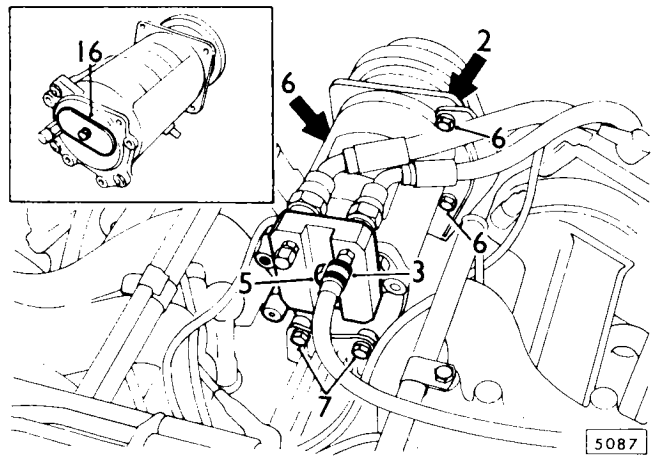
1. Disconnect battery – 86.15.19.
2. Pull electrical connector from compressor clutch coil.
3. Depressurise air conditioning system 82.30.05.
4. Remove compressor drive belt – 82.10.02.
5. Remove one setscrew and spring washer securing valve and union assembly housing to rear of compressor.

   **IMMEDIATELY** seal all connection orifices using clean dry plugs. Recover 'O' ring seals.
6. Remove three setscrews. Plain and spring washers securing front flange to mounting.
7. Remove two setscrews and spring washers securing back flange to mounting.
8. **Keeping compressor horizontal and sump down**, lift from car.
9. Drain oil from compressor sump into a suitable container and accurately measure quantity.

   **CAUTION**: If the oil shows any sign of contamination with solids or water, the system must be swept (82.30.07) and the receiver/drier replaced (82.17.01) on completion of this operation.

10. Drain oil, if any, from replacement compressor.

    **NOTE**: Transfer parts, as necessary, from replaced compressor to new, by following compressor manufacturer's instructions.



11. If oil present, refill replacement compressor with an equal quantity of new clean refrigerant oil to that removed in operation 9.
If oil not present, refill replacement compressor with an equal quantity of new clean refrigerant oil to that removed in operation 9 PLUS 29 g. (1 oz.).

**NOTE**: This allows for the fact that more oil is retained within a freshly drained unit than in one that has never been filled.

**Refitting**

12. Place replacement compressor in position, sump downwards.
13. Loosely secure back flange to mounting using two setscrews and spring washers.
14. Loosely secure front flange to mounting using three setscrews, plain and spring washers. Fit earth connection at top right hand setscrew.
15. Tighten all five mounting setscrews.
16. Remove shipping plate from rear of replacement compressor and fit, after removing sealing plugs, to replaced compressor.

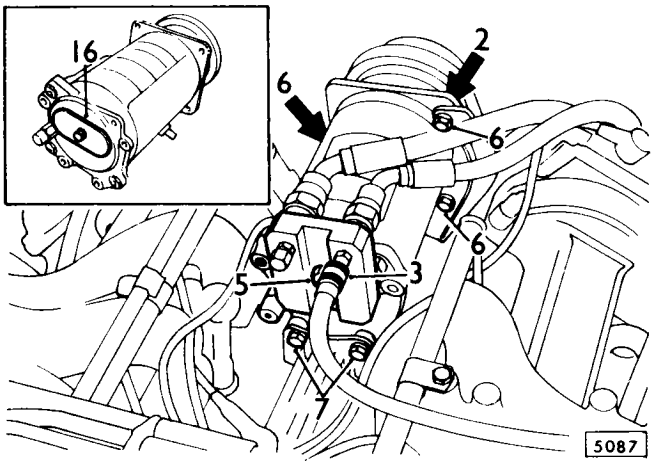
**NOTE**: Use 'O' ring seals removed in operation 5 beneath shipping plate.

17. Remove sealing plugs from valve and union housing assembly and secure to rear of replacement compressor using one setscrew and spring washer. Torque 4,5 kg.m to 11,3 kg.m (10 lb.ft to 25 lb.ft.).

**NOTE**: Ensure replacement 'O' ring seals are not displaced.

18. Refit compressor drive belt.
19. Refit electrical connector to clutch coil.
20. Reconnect battery
21. Charge air conditioning system subject to the condition of oil removed in operation 9 – 82.30.08.

**CAUTION**: After charging, cycle clutch in and out 10 times with blower fan set to low. This ensures that faces of pulley and clutch plate are correctly bedded in before a high demand is made upon them.



## CONDENSER

### Remove and refit 82.15.07

**WARNING**: Before commencing work on this operation, refer to general section 82.00.00.

**NOTE**: Ensure that suitable clean, dry male and female sealing plugs are to hand.

#### Removing

1. Disconnect battery – 86.15.19.
2. Depressurise air conditioning system – 82.30.05.
3. **Using two spanners**, release the upper union on condenser matrix.

   **IMMEDIATELY** seal each connector using clean dry plugs.

4. **Using two spanners**, release the lower union on condenser matrix.

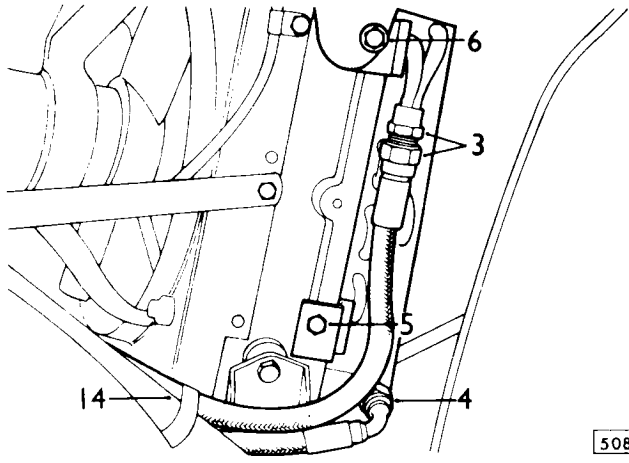
   **IMMEDIATELY** seal each connector using clean dry plugs.

5. Remove two setscrews and spring washers securing bottom of condenser matrix.
6. Support core, and remove two setscrews, large plain washers and spring washers securing top of condenser matrix.
7. Lift condenser matrix from vehicle.

#### Refitting

**CAUTION**: The replacement condenser **MUST** have sealing plugs fitted. If not, the unit must be rejected and another used. The setscrews used to secure the condenser **MUST NOT EXCEED** the stated length. Longer screws will irreparably damage the radiator core.

8. Measure 15 g. (½ oz.) of clean new refrigerant oil, remove plug and pour oil into lower connection of condenser. Replace plug. Rotate condenser to disperse oil.
9. Using two 15,8 mm (.625 in.) long setscrews, two large plain washers, and two spring washers, loosely secure top brackets of condenser beneath cowl.
10. Using two 12,7 mm (.5 in.) long setscrews and two spring washers, loosely secure bottom brackets to radiator.
11. Tighten four setscrews securing condenser.
12. Using two spanners fit lower connector to condenser **immediately** after removing sealing plugs. Securely tighten to torque given in 82.00.00 at angle shown. Ensure hose not kinked or twisted.
13. Using two spanners, fit upper connector to condenser **immediately** after removing sealing plugs. Securely tighten to torque given in 82.00.00. Ensure hose not kinked or twisted.
14. Settle lie of hoses **INSIDE** frame tube.
15. Reconnect battery.
16. Charge air conditioning system – 82.30.08.



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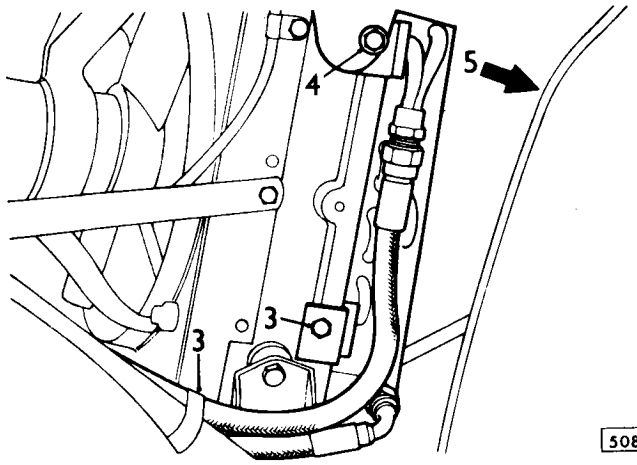
### Cleaning matrix

The condenser matrix is mounted in a position that receives maximum flow of air while the vehicle is moving. In addition, while the air conditioning system is in operation, the radiator cooling fans run continuously.
It is therefore advisable to check at regular intervals to ensure that the matrix is not obstructed by an accumulation of insects and other debris. A procedure for cleaning the matrix is given, and if followed whenever necessary will ensure that the air conditioning system and the engine coolant radiator operate at top efficiency.

1. Place front wheels of vehicle on wood blocks. 30,5 cm (12 in.) long, 25,4 cm (10 in.) wide and 15 cm (6 in.) high and disconnect bonnet stay.
2. Place rubber mat or link mat across inside of bonnet to prevent damage to matrix.
3. Remove two setscrews and spring washers from bottom brackets of matrix. Remove hose strapping.
4. Support matrix and remove two setscrews, large plain washers and spring washers from top brackets of matrix.
5. Lay matrix forward into bonnet, supporting and padding as necessary to avoid straining or twisting hoses.
6. Using a shop airline directed from the back surface towards the front, remove all debris. Use hose to disperse caked mud.

   **CAUTION**: The setscrews **MUST** be replaced in the position from which they were removed.

7. Using two 15,8 mm (.625 in.) long setscrews, two large plain washers, and two spring washers, loosely secure top brackets of condenser beneath air intake deflector cowl.
8. Using two 12,7 mm (.5 in.) long setscrews and two spring washers, loosely secure bottom brackets to radiator.
9. Tighten four setscrews securing condenser. Torque 1,0 kg.m (7.0 lb.ft.).
10. Remove all mats and padding used.
11. Ensure hoses lie **INSIDE** frame tube. Refit strapping.
12. Refit bonnet stay.



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## LIQUID RECEIVER/DRIER

**Remove and refit** **82.17.01**

**WARNING**: Before commencing work on this operation, refer to general section **82.00.00.**

**CAUTION**: If the replacement receiver/drier is not fitted with sealing plugs, or is left open for longer than 5 minutes, it **MUST NOT** be used. Return to supplier as defective.

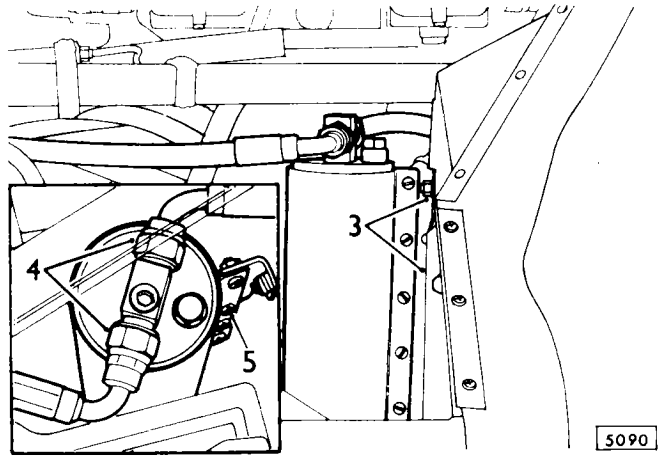
**NOTE**: Ensure that suitable clean, dry male and female sealing plugs are to hand.

**Removing**

1. Disconnect and remove battery – 86.15.01.
2. Depressurise air conditioning system – 82.30.05.
3. Remove two setscrews, plain and spring washers securing receiver/drier carrier bracket to right hand mudshield.
4. Remove hose connectors from head of receiver/drier. **Immediately** seal all connections using clean dry plugs.
5. Remove four screws and nuts closing carrier.
6. Remove receiver/drier from carrier.

**Refitting**

7. Position new filter/drier in carrier, tank top level with top of carrier and angled as shown. Secure carrier and bracket with four screws and nuts.
8. Measure 15 g. (½ oz.) of clean new refrigerant oil, remove plug and pour oil into inlet connector.
9. Remove plug from inlet hose, and make connection. Torque to level given in general – **82.00.04.**
10. Remove plug from outlet connector and outlet hose, and make connection. Torque to level given in general – **82.00.04.**
11. Secure bracket to right-hand mudshield using two setscrews, plain and spring washers. Torque level is given in general – **82.00.04.**
12. Ensure hoses are not kinked or twisted.
13. Charge air conditioning system – 82.30.08.
14. Refit and connect battery.




## CONTROLS **82.20.00**

The air conditioning system is controlled by the driver through two knobs on the evaporator unit front case. The right hand control is a four position switch. This is used to engage the air conditioning system and set the three speeds of the recirculating blower unit in the evaporator. The left hand control adjusts a thermostatically controlled, variable switch.

The thermostatic probe is positioned within the evaporator matrix, and senses the temperature at this point. The switch breaks the supply of the compressor clutch current when the temperature falls to the desired level, thus stopping the refrigerating cycle. Current is restored to the clutch, when the evaporator coil temperature has risen a set amount, so re-starting the cycle.

Rotating the control clockwise lowers the temperature at which the thermostat operates.

## CONTROL SWITCH

**Remove and refit** 82.20.07

**Removing**

1. Remove evaporator front case – 82.25.18.
2. Remove knob from control switch.
3. Remove two countersunk head screws from escutcheon plate.
4. Remove one countersunk head screw securing top of switch bracket.
5. Pull off electrical connectors and note terminals.
6. Remove two screws securing switch mounting bracket to switch.

**Refitting**

7. Fit mounting bracket to replacement switch and retain with two special screws.
8. Make electrical connections to switch.
9. Place switch in position and loosely secure with two countersunk head screws through escutcheon plate.
10. Fit countersunk head screw through top of front cover to locate switch bracket.
11. Tighten all three screws.
12. Fit knob.
13. Fit evaporator front case.

## AIR CONDITIONING SYSTEM RELAYS

When the air conditioning system is installed, two additional relays are used. They operate as follows:–
Air Conditioning Relay is fitted upon the left hand mudshield. It supplies current to the control switch while the ignition is on (position II). This powers the compressor clutch via the thermostatic control. The relay coil current is broken while the starter motor is operating, ensuring that the engine does not have to start while loaded by the compressor.

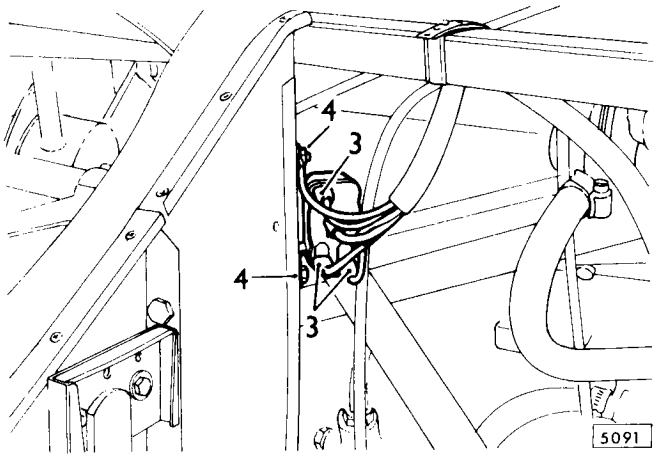
Radiator Cooling Fan Thermostat Relay is mounted on the left hand side on top of the radiator. It provides a short circuit path across the cooling fan thermostat when the air conditioning system is switched on. The cooling fans therefore run continually while the air conditioning is operating.

## MAIN RELAY (AIR CONDITIONING)

**Remove and refit** 82.20.08

**Removing**

1. Disconnect battery – 85.15.19.
2. Release servo brake fluid reservoir bracket from mudshield and suspend reservoir, up-right beneath heater.
3. Note connections on relay, then release connectors.
4. Remove two setscrews and plain nuts securing relay. Recover earth cable from upper screw and spring washer from lower.



**Refitting**

5. Fit connectors to relay.
6. Secure relay in position using setscrew and nut at top. Fit earth cable beneath nut.
7. Fit setscrew, spring washer and nut to secure bottom of relay.
8. Refit servo brake fluid reservoir bracket to mudshield.
9. Reconnect battery.

## RADIATOR COOLING FAN THERMOSTAT RELAY

**Remove and refit**

**Removing**

1. Follow procedure given in 26.25.31.

**Refitting**

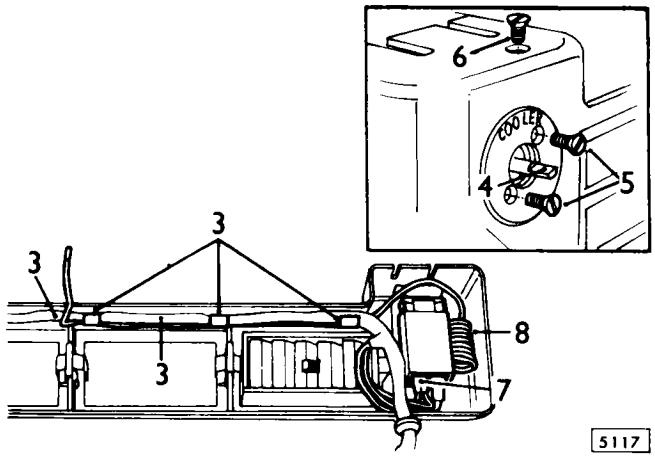
Follow procedure given in 26.25.31.

## THERMOSTAT

**Remove and refit** **82.20.18**

**Removing**

1. Remove evaporator front case – 82.25.18.
2. Remove knob from thermostat.
3. Pull cable harness from clips that also control thermostat capillary.
4. Remove knob from thermostat control.
5. Remove two countersunk head screws from escutcheon plate.
6. Remove one countersunk head screw securing top of thermostat bracket.
7. Pull off electrical connectors and note terminals.
8. Do not disturb lie of thermostat capillary. This can be used as a pattern to assist in forming replacement.
9. Remove two special screws securing mounting bracket to thermostat.

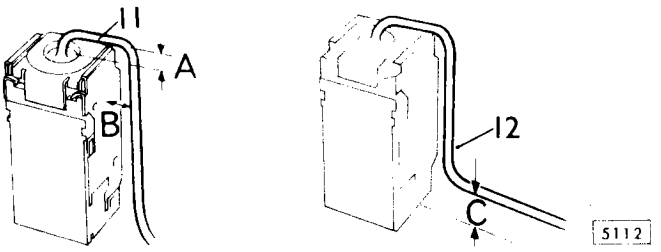


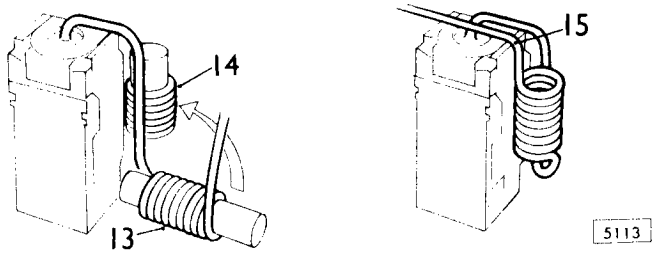
**Refitting**

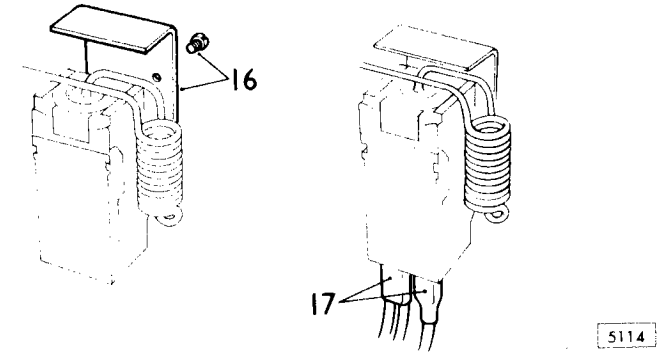
10. The thermostat capillary must be pre-formed before assembly into the front cover.

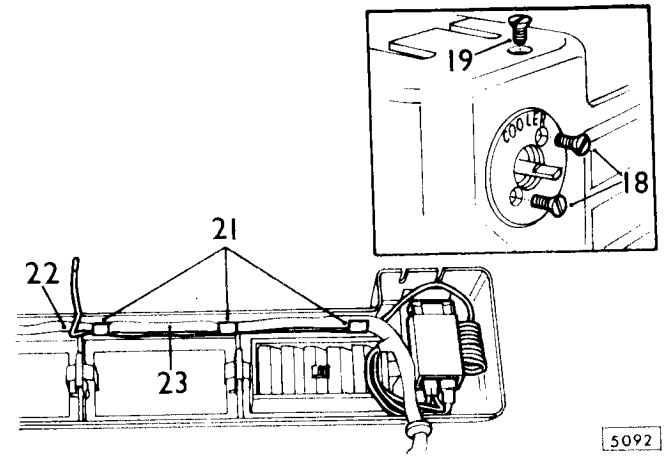
    **CAUTION**: The capillary tube must be carefully bent in any direction only once. It must not, under any circumstances, be kinked or worked back and fore.

11. Bend capillary over to right hand side of thermostat. Dimensions A and B 7,93 mm (.31 in.).
12. Form second bend. Dimension C 7,93 mm (.31 in.).
13. Commencing at a point 12,7 mm (0.5 in.) along horizontal length of capillary, carefully wind 8½ full close turns upon a length of 9,52 mm (.375 in.) wooden dowel. The greatest care must be taken not to kink the tube during this operation.
14. With dowel still in place carefully move coil through 90 degrees to lie alongside thermostat.
15. Remove dowel, and carefully bend capillary across top of thermostat.
16. Fit thermostat bracket and secure with two special screws.
17. Make electrical connections to thermostat.
18. Place switch in position and loosely secure with two countersunk head screws through escutcheon plate.
19. Fit countersunk head screw through top of front cover to locate switch bracket.
20. Tighten all three screws.
21. Bend capillary to lay in three right hand clips and to pass beneath harness.
22. Immediately past third clip bend capillary away from front cover at 90 degrees.
23. Press harness into right hand three clips to retain capillary.
24. Fit knob.
25. Test offer front case to evaporator unit and ensure capillary sensing end passes into evaporator core and is in contact with core. If necessary, put slight set, in capillary to ensure contact.
26. Fit evaporator front case.



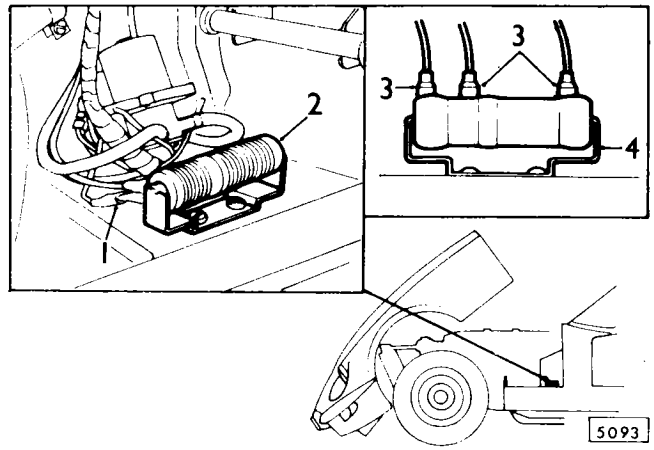



## BLOWER MOTOR RESISTANCE UNIT

The resistance unit consists of high dissipation, wirewound resistances switched in series to control blower motor speed.

**Remove and refit** 82.20.26




**Removing**

1. Pull electrical connectors from resistance. Note cable locations.
2. Remove resistance from clip.

**Refitting**

3. Fit electrical connectors to replacement resistor.
4. Fit unit into clips.

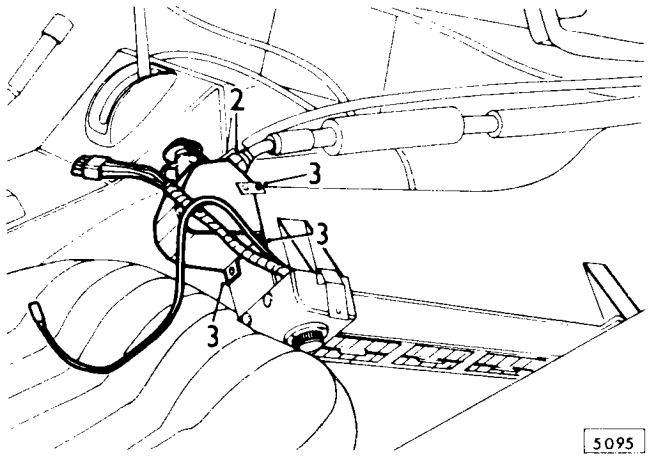
**CAUTION**: The connectors must be fitted as removed. Incorrect installation will over-load the unit, give incorrect speeds, and lead to premature failure.

## EXPANSION VALVE

**Remove and refit** 82.25.01

**WARNING**: Before commencing work on this operation, refer to general section **82.00.04.**

**NOTE**: Ensure that suitable clean, dry male and female sealing plugs are to hand.

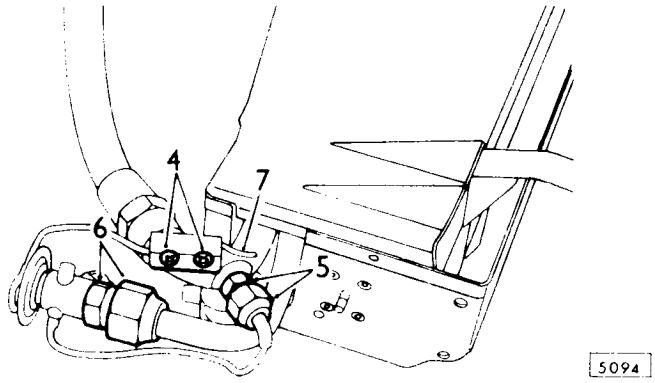



**Removing**

1. Remove evaporator unit assembly, operations 1 to 21 - 82.25.20.
2. Release inlet hose connection to expansion valve. **IMMEDIATELY** plug both connections.
3. Remove three small self tapping screws securing expansion valve cover. Remove filler pads. Loosen insulating material.
4. Remove two self tapping screws from outlet temperature sensing coil clip.
5. Restrain boss nut and release pressure balancing pipe union (if fitted).
6. Restrain expansion valve body and release pipe union nut. Draw valve clear.

**IMMEDIATELY** plug evaporator inlet pipe.

**Refitting**




7. Locate outlet temperature sensing coil in clip and fit screws.
8. Remove sealing plugs and fit expansion valve to evaporator.
9. Set angle of expansion valve and finger tighten pipe union nut.
10. Fit pressure balancing pipe union (if fitted). Restrain boss nut and tighten.
11. Restrain expansion valve body and tighten pipe union nut. Torque 2,1 to 2,8 kg.m (15 to 20 lb.ft.).
12. Remove sealing plugs and fit inlet hose to expansion valve. Torque to level given in general 82.10.00 Wrap insulation around inlet and outlet hose connections.
13. Fit expansion valve cover over filler pads and secure with three small self tapping screws.
14. Refit evaporator unit assembly, operations 25 to 34.

## BLOWER ASSEMBLY

**Remove and refit** 82.25.13

**Removing**

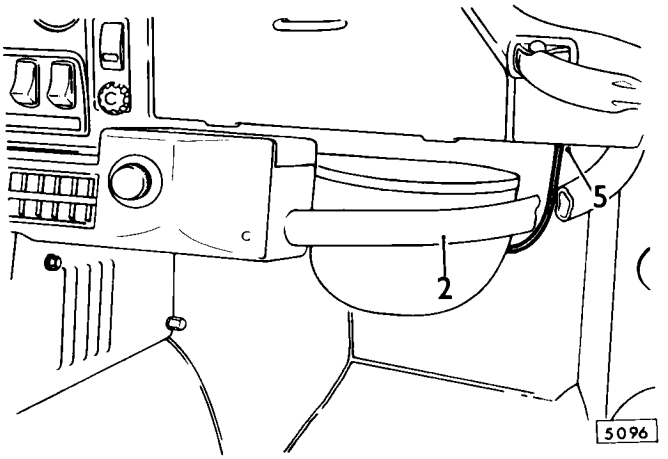
1. Disconnect battery – 86.15.19.
2. Remove right hand parcel tray – 76.67.05.
3. Remove one screw securing dash liner.
4. Manoeuvre dash liner clear.
5. Remove screw securing blower earth cable.
6. In right hand footwell, reach up behind evaporator blower fan duct and pull cable down from clips.
7. Separate blower motor cable connector.
8. Remove two self tapping screws securing blower intake cowl.

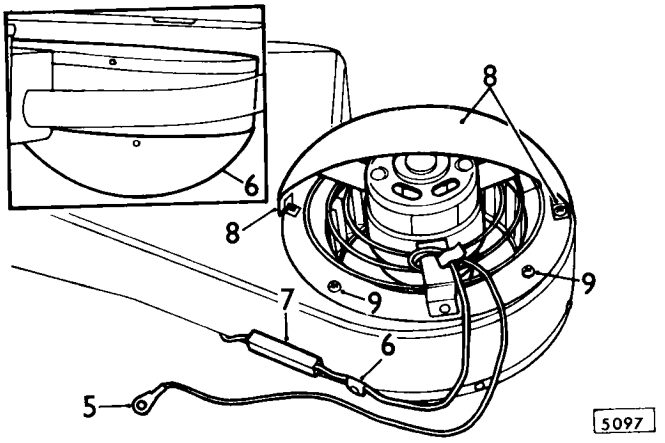
**NOTE:** Pull cowl out towards front seats to disengage clip.

9. Support blower assembly while removing four setscrews securing blower assembly in bottom case.

**Refitting**

10. Reverse operations 1 to 9 inclusive.




## LOUVRE ASSEMBLY

**Remove and refit** 82.25.16

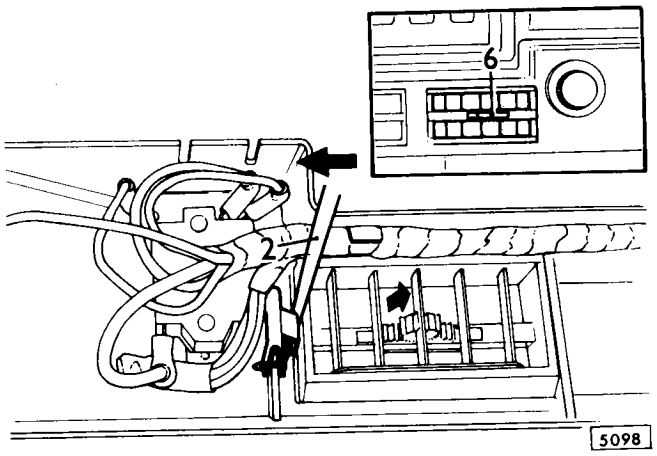
**Removing**

1. Remove evaporator front case – 82.25.18.
2. Insert knife blade beneath clip at one end of louvre assembly to one side of pivot.
3. Gently lever away from louvre assembly, at the same time pressing upwards from beneath.
4. Remove louvre assembly towards interior of front case.

**Refitting**

**NOTE:** The louvre assemblies are handed and only close fully in one direction. In order to distribute air flow to the best advantage they must be fitted as follows.

5. Operate louvre slide button to fully close louvres.
6. Fit louvre into rear of front case such that slide button is away from the centre line of front case.
7. Locate one pivot in a spring clip.
8. Align pivot at other end with hole in spring clip and press down into engagement.
9. Check for free movement. Left hand louvre has limited travel, but others should rotate through 360 degrees.
10. Refit evaporator front case.



## LOUVRE ASSEMBLY CLIP

**Remove and refit** 82.25.17

### Removing

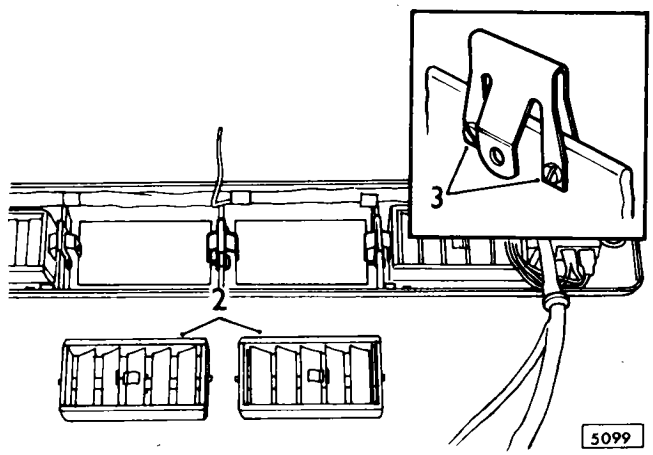
1. Remove evaporator front case – 82.25.18.
2. Remove louvre assembly on either side of damaged clip – 82.25.23.

   **NOTE**: If clip is at one end, one louvre assembly only need be removed.

3. Slacken two self tapping screws securing clip.

### Refitting

4. Fit new clip in position and lightly secure with two self tapping screws.
5. Set position of clip so that a dimension of 13,5 mm (.53 in.) exists between front face of case and centre of pivot hole on both sides of clip.
6. Fully tighten screws.
7. Refit louvre assemblies.
8. Refit evaporator front case.




## EVAPORATOR UNIT FRONT CASE

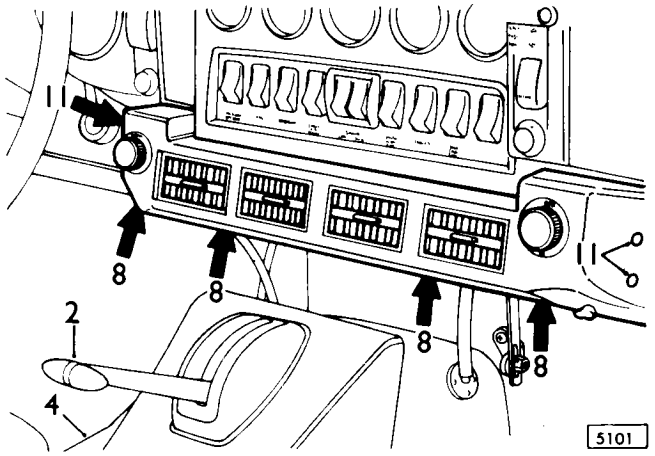
**Remove and refit** in situ 82.25.18

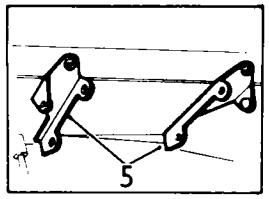
### Removing

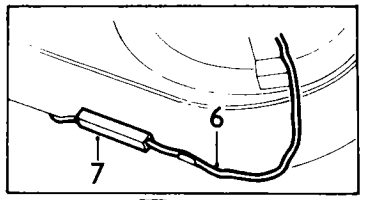
1. Disconnect battery – 86.15.19.
2. Engage 2nd gear (standard car) or 'L' (automatic transmission).
3. Chock wheels.
4. Set handbrake fully off.
5. Remove radio mounting brackets – 86.50.02.
6. In right hand footwell, reach up behind evaporator blower fan duct and pull cable down from clips.
7. Separate blower motor cable connector.
8. Remove four countersunk head screws beneath front case.
9. Release two knurled finger nuts securing instrument panel and hinge down.
10. Release white, sleeved, cable from fuse station 7 at right hand side.
11. Draw front case straight away from evaporator unit assembly until thermostat sensor is clear of core.
12. Disconnect multipin connector at left hand side.
13. Draw blower cable through grommet at right hand side.

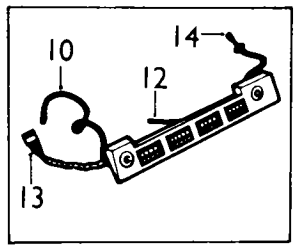
### Refitting

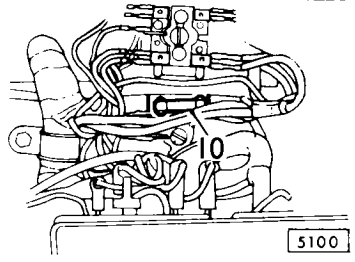
Reverse operations 1 to 13 inclusive.



## EVAPORATOR UNIT ASSEMBLY

**Remove and refit** 82.25.20

**WARNING:** Before commencing work on this operation refer to general section 82.10.00.

**NOTE:** Ensure that suitable clean dry male and female blanking plugs are to hand.

**Removing**

1. Disconnect battery – 86.15.19.
2. Depressurise air conditioning system – 82.30.05.

**NOTE:** It is only necessary to depressurise the system if it is intended to disconnect hoses.

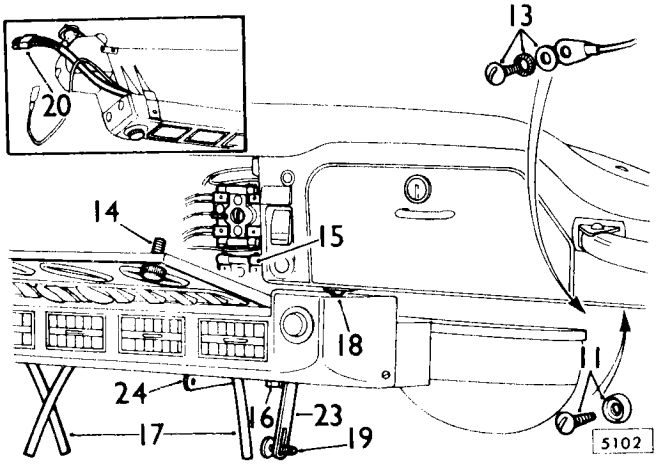
3. Engage 2nd gear (standard car) or 'L' (automatic transmission).
4. Chock wheels.
5. Set handbrake fully off.
6. Slide seats fully to rear.
7. Remove radio panel and radio (if fitted) – 86.50.04 – 86.50.03.
8. Protect gear shift or transmission selector with suitable piece of felt.
9. Remove left hand parcel tray – 76.67.04.
10. Remove right hand parcel tray – 76.67.05.
11. Remove one self tapping screw and cup washer securing under dash liner at right hand side.
12. Manoeuvre dash liner clear.
13. Remove one self tapping screw, plain and shakeproof washer securing blower earthing cable.
14. Release two knurled finger nuts securing instrument panel and hinge down.
15. Remove sleeved white cable from fuse number 7, right hand side.
16. Beneath right hand side of evaporator unit assembly loosen set screw at top of steady stay.
17. Pull three condensate drain tubes from underside of unit.
18. Release two self tapping screws securing evaporator unit assembly.
19. Press evaporator unit inwards far enough to release front brackets from flange. Simultaneously release steady stay from radio panel stud.
20. Pull evaporator unit out into car and release multipin connector at left hand side. Draw sleeved white lead from behind instrument panel.
21. Lower unit to rest in right hand side footwell.
22. Using two spanners, release inlet and outlet hose connections.

**IMMEDIATELY** plug all connectors.

23. Remove steady stay.
24. Remove radio mouting bracket.

**Refitting**

25. Fit radio mounting bracket.
26. If replacement evaporator unit assembly drawn from stores, measure 15 g (½ oz.) of clean, new refrigerant oil, remove plug from outlet connector and pour oil into core.
27. Remove plug from outlet hose and fit to connector.
28. Settle lay of hose and tighten connector to torque given in **82.00.04;** using two spanners.
29. Remove plugs from inlet hose and connector and make connection.
30. Settle lay of hose and tighten connector to torque given in **82.00.04;** using two spanners.
31. Loosely fit steady stay using one setscrew and plain washer.
32. Complete reassembly by reversing operations 3 to 20.
33. Connect battery.
34. Charge air conditioning system – 82.30.08.



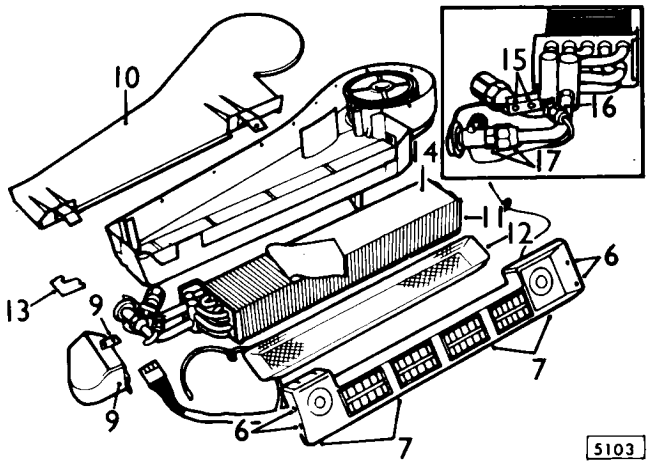
## EVAPORATOR MATRIX

**Remove and refit** 82.25.22

**WARNING**: Before commencing work on this operation, refer to general section 82.00.00.

**Removing**

1. Disconnect battery – 86.15.19.
2. Depressurise air conditioning system – 82.30.05.
3. Remove evaporator unit assembly – 82.25.20.
4. Remove radio mounting brackets.
5. Slacken self tapping screws at blower cable clips and release cable connector.
6. Remove two plastic locating pins at either side of front case by carefully levering with a knife blade.
7. Remove four countersunk head self tapping screws along bottom of front case.
8. Draw front case straight away from evaporator unit assembly until thermostat sensor is clear of core.
9. Remove three small self tapping screws securing expansion valve cover.
10. Remove thirteen small self tapping screws securing top cover. Recover two clips.
11. Carefully lift evaporator matrix from bottom case.
12. Recover front grill screen.
13. Recover rubber seal at inlet and outlet pipes.
14. Recover sealing sheet along top of evaporator matrix.
15. Remove two self tapping screws from outlet temperature sensing coil clip.
16. Restrain boss nut and release pressure balancing pipe union (if fitted).
17. Restrain expansion valve body and release pipe union nut. Draw valve clear.
18. Blank off expansion valve.




**Refitting**

**NOTE**: Ensure blanking plugs removed immediately before making connections.

19. Locate outlet temperature sensing coil in clip and fit screws.
20. Set angle of expansion valve.
21. Finger tighten expansion valve to pipe union nut.
22. Fit pressure balancing pipe union (if fitted). Restrain boss nut and tighten.
23. Restrain expansion valve body and tighten pipe union nut. Wrap insulation around inlet and outlet pipe connections.
24. Locate small pad at bottom of inlet and outlet pipe headers.
25. Fit sealing sheet.
26. Fit front grill screen.
27. Offer front case to evaporator coil to matrix, ensure hole in front grill locates with thermostat sensor.
28. Use a sharpened piece of 4,76 mm (.187 in.) **wooden dowel** and part evaporator core fins to give interference hole for thermostat sensor.
29. Carefully lower evaporator matrix into bottom case ensuring flanges locate correctly.

**NOTE**: Before fitting matrix to bottom case, carefully check to ensure case is watertight, and all sealing compound in good condition.

30. Fit rubber seal at inlet and outlet pipes.
31. Place top cover in position and secure with thirteen small self tapping screws. Fit cable clips where shown and do not tighten these screws. Seal joint with suitable, non-hardening sealing compound.
32. Fit front cover and secure with four countersunk head screws.

    **NOTE**: Ensure thermostat sensor fits straight into evaporator core, and blower motor cable passes through grommet hole in top cover.

33. Fit four plastic locating pins.
34. Connect blower motor cable and pass cable beneath clips.
35. Tighten clip screws.
36. Measure 15 g (½ oz.) of clean new refrigerant oil, remove plug from outlet connector and pour oil into core. Refit plug and position evaporator to ensure oil flows into core.
37. Fit evaporator unit assembly.
38. Refit radio mountings, radio (if fitted) and radio panel.
39. Connect battery.
40. Charge air conditioning system – 82.30.08.

## HOSES

**Remove and refit** **82.25.26**

**WARNING**: Before commencing work on this operation, refer to general section 82.00.00.

**NOTE**: Ensure that suitable clean dry male and female sealing plugs are to hand.

1. Before attempting to remove any hoses, the air conditioning system MUST be depressurised – 82.30.05.
2. Hoses used as replacements must have sealing plugs fitted at each end. The plugs must not be removed until immediately before the connection is made.
3. In several cases it is advantageous to remove a component before attempting to remove hoses. This makes the correct reconnection procedure much easier.
4. In all cases two spanners must be used in opposition to avoid straining the component at hose connections.
5. If the suction hose between the evaporator and the compressor is to be changed, the hose may be cut at the outlet plate in right hand pedal board to facilitate removal. When replacing this hose it is advisable to test lay it in position and ensure that it is correct end for end. Check condition of grommet at pedal board and replace if necessary. Fit the hose by feeding the evaporator end along its run from the front of the engine to the pedal board, then through the pedal board and on to the evaporator. The large pieces of insulation material must be stripped from the defective hose, and replaced, positioned identically, on the new.
6. In all cases, settle the lay of a hose to ensure it is not kinked or trapped before torque tightening the end connections and locating clips or strapping.
7. If either of the hoses to condenser are to be changed, ensure, after refitting that both lay **INSIDE** the frame tube.

## BLOWER ASSEMBLY

### Overhaul 82.25.30

#### Dismantling

1. Using long slim Allen headed screwdriver, release blower fan locking screw.
2. Pull fan from motor shaft.
3. Release motor cables from clip.
4. Slacken clamp nut and bolt, and withdraw motor.

#### Assembling

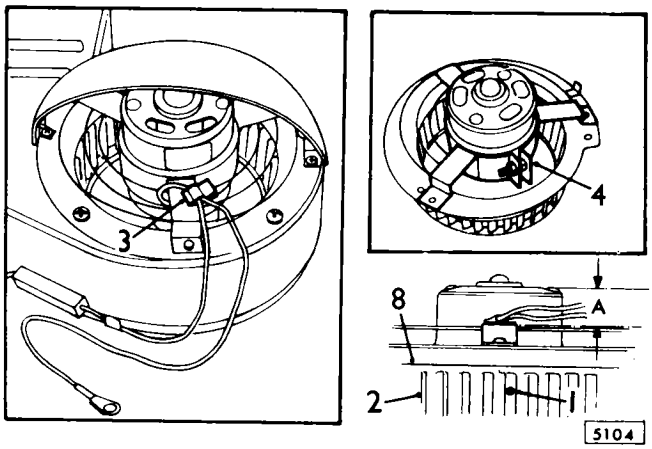
5. Fit motor into clamp and loosely secure.

   **NOTE**: Position cable outlet hole adjacent to clip on limb of clamp ring.

6. Position motor to obtain a dimension 'A' of 30,16 mm (.812 in.) between bracket and top face of motor casing. Tighten clamp nut and bolt.
7. Fit both cables through clip.
8. Place fan on motor spindle and position so that bottom outside rim of fan is level with top of mounting ring flare.

   **NOTE**: Some degree of run out is permissible, but the fan must not touch the flare at any point.

9. Tighten locking screw using a long slim Allen headed screwdriver.



## CHARGING AND TESTING EQUIPMENT

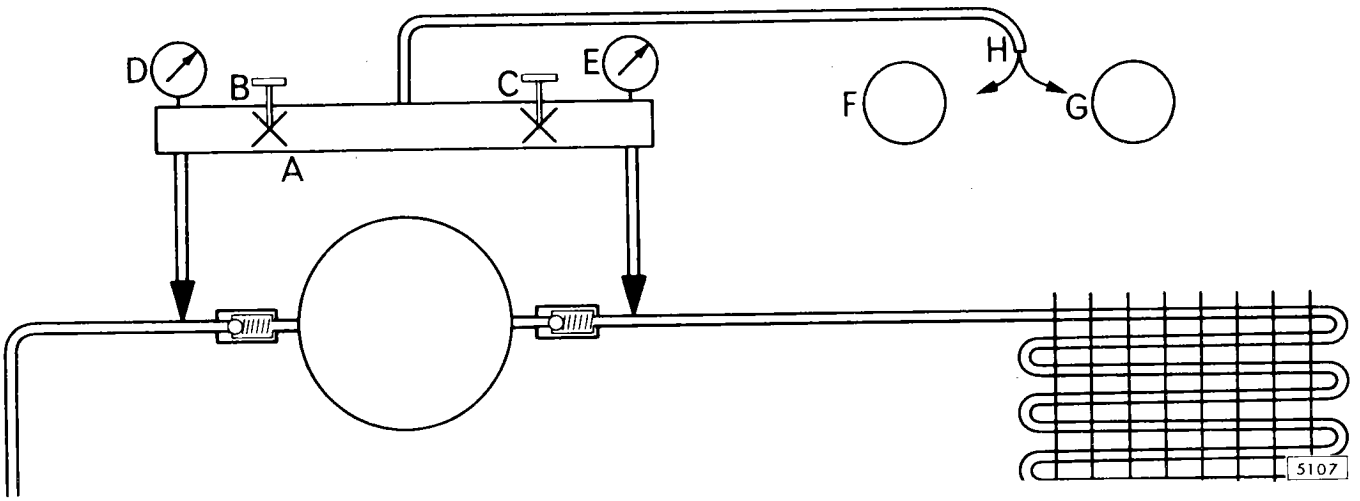
**WARNING:** Before commencing work on this operation, refer to general – 82.00.00.

**Fit and remove** **82.30.01**

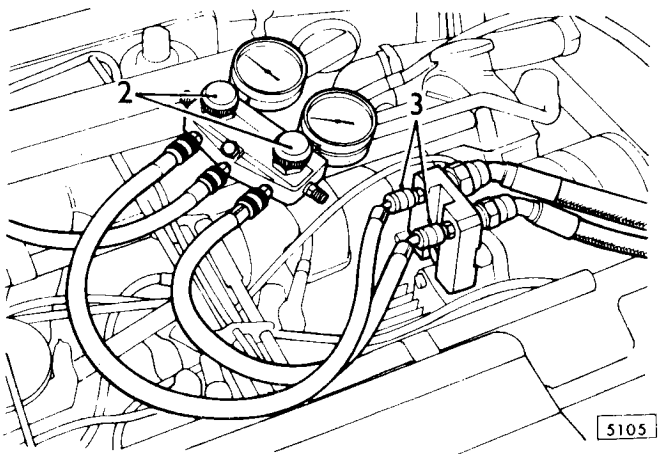
The charging and testing equipment consists of a charging manifold A fitted with two stop valves B and C and two pressure gauges D and E, a vacuum pump F, and a supply of refrigerant gas, G.
One gauge is a compound type, reading both vacuum and positive pressure, and is connected to the suction side of the union housing; the other is a high pressure gauge and is connected to the delivery side.

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

The stop valves enable either suction or delivery hoses, or both, to be connected to the centre port of the manifold. The centre hose H can be connected either to a vacuum pump or to a supply of refrigerant. Two hose connectors to union housing must be fitted with depressers to operate the Schrader valve. The equipment should be fitted with a means of accurately weighing the refrigerant container during the charging process.




1. To fit the charging manifold to the air conditioning system, remove the protective sealing caps over the union housing Schrader valves.
2. Ensure both manifold stop valves are fully closed (screwed in).
3. **Quickly** fit hose connectors to correct Schrader valves. The gauges will display system pressures on suction and delivery sides.
4. To remove the equipment from the vehicle, **quickly** unscrew each connector in turn. This ensures that the Schrader valves are held open for the shortest possible time.
   **Refit the valve sealing caps.**



## AIR CONDITION SYSTEM

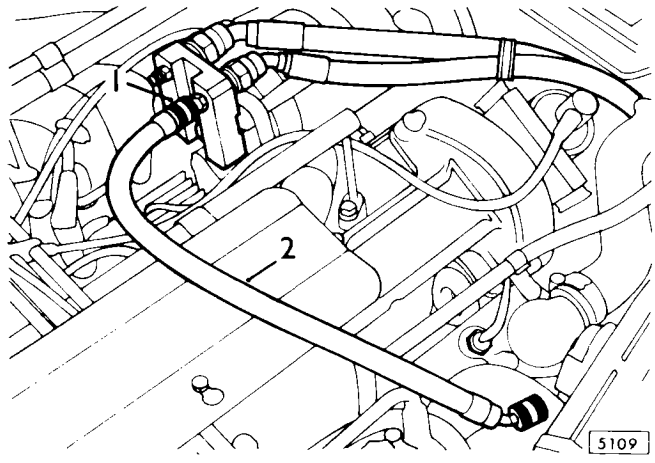
**WARNING:** Before commencing work on this operation refer to general 82.00.00.

### Depressurise 82.30.05

Depressurising the system means that the system is vented until the refrigerant remaining is at atmospheric pressure. The system is then resealed to prevent air contaminating the components.
This procedure **MUST** be carried out before any connection is released.
It is very important that the method used is **EXACTLY** as described. Too rapid venting entrains the compressor lubricating oil and necessitates refilling to the correct level. See 82.10.20.

**WARNING: NO SMOKING. POINT THE VENT HOSE IN A SAFE DIRECTION**

1. Remove protective cap over the union housing discharge Schrader valve.
2. Using a piece of hose approximately 91 cm (36 in.) long, fitted with a suitable connector, vent the system by **SLOWLY** screwing the hose connector on to the discharge side of the union housing.
3. If oil is seen escaping or if the vented gas becomes dense and white, **IMMEDIATELY** slow the flow rate by unscrewing the hose.
4. As the flow rate falls, the hose connector can be screwed further on to the union.
5. When no further gas escapes, and the hose connector is fully home **IMMEDIATELY** unscrew it as quickly as possible.
6. Refit protective sealing cap.

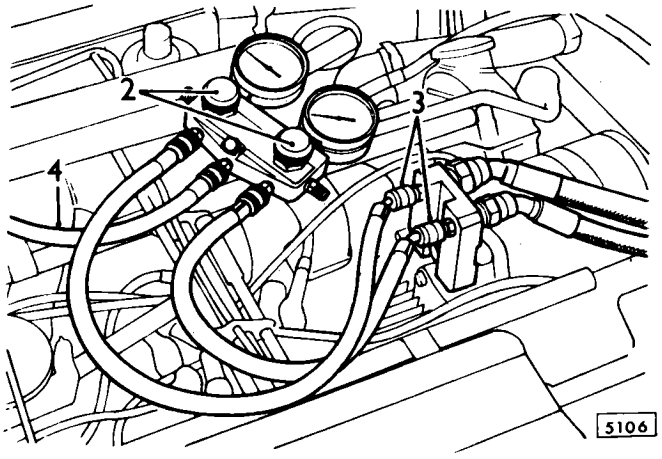


## AIR CONDITIONING SYSTEM

### Evacuate 82.30.06

The system is evacuated by removing all residual gas or air after depressurisation and/or repair using a vacuum pump.
Evacuation must be carried out before charging, as the ability of the system to hold a high vacuum is a measure of its tightness; the vacuum also assists in drawing in the charge of refrigerant.
The evacuation process serves to boil off any moisture in the system if ambient temperature is high enough. In conditions of low ambient temperature the purging method of system cleansing must be used before charging.
**Any** sign of a rapid fall in vacuum indicates a serious leak. This must be found and rectified **IMMEDIATELY**, as air is being drawn in through the leak.
Follow the procedure given under leak test – 82.30.09 before proceeding. The procedure given here refers to the evacuation of an old system. The method for a new system is similar, but **no** decrease in vacuum is permitted.

1. Remove both protective caps over union housing Schrader valves.
2. Ensure both manifold stop valves are fully closed (screwed in).
3. **Quickly** fit hose connectors to correct Schrader valves.
4. Fit centre hose of charging manifold to vacuum pump connection.
5. Fully open both valves of charging manifold.
6. Start vacuum pump.
7. Wait until a vacuum of 50.8 Torr (28 in Hg.) has been drawn, or when the maximum that can be achieved with the prevailing barometric conditions is obtained.
8. Close both valves on charging manifold.
9. Switch off vacuum pump and wait 20 minutes.
10. A very slight pressure rise may occur due to the slow evaporation of liquid refrigerant or moisture entrained in the compressor oil.
11. If the vacuum holds satisfactorily, switch on vacuum pump, open both charging manifold valves and allow the pump to pull on the system for a further 20 minutes.
12. Fully close both charging manifold valves.
13. Switch off vacuum pump.
14. Disconnect centre hose from vacuum pump connection.
    The air conditioning system is now ready for charging – 82.30.07.



## AIR CONDITIONING SYSTEM

**WARNING**: Before commencing work on this operation, refer to general – 82.00.00.

### Sweep (Purge) 82.30.07

The sweeping, or purging, operaion given below may be used in addition to, and following, evacuation as a method of removing the last traces of moisture if ambient temperature is low.
The operation must be carried out if the system has inadvertently been left open for longer than a few minutes on a humid day. The operation must also be carried out if moisture is suspected in the system following the diagnosis of a fault.
The receiver/drier **MUST** be replaced immediately after the purging operation, and before the final evacuation operation commences.

1. Evacuate system, operations 1 to 8 – 82.30.06.
2. Disconnect vacuum connection from pump and connect to refrigerant supply.
3. Open refrigerant supply valve.
4. To purge length of hose, slightly crack centre connector at charging manifold; retighten connection.
5. Slowly open the suction side valve on charging manifold and allow 0,23 kg. to 0,45 kg. (½ lb. to 1 lb.) of gas to enter system.
6. Close suction side valve on charging manifold.
7. Close refrigerant supply valve.
8. Leave for 10 minutes.
9. Disconnect hose from refrigerant supply.
10. Open both valves on charging manifold to allow refrigerant to escape slowly from system. IMMEDIATELY flow stops, reconnect hose to refrigerant supply.
11. Close suction side valve on charging manifold.
12. Loosen hose connection at suction side of charging manifold.
13. Open refrigerant supply valve slowly and allow gas to pass through entire system and escape at charging manifold for about 5 seconds.
14. Close refrigerant supply valve.
15. Close valve at pressure side of charging manifold.
16. Tighten suction side hose connection while gas still flows.
17. If system is being purged to remove excess moisture, change receiver/drier – 82.17.01 – before proceeding to evacuation and charging. If system is being purged owing to low ambient temperature, evacuate and charge immediately. Operations 4 to 14 – 82.30.06.

## AIR CONDITIONING SYSTEM

**WARNING**: Before commencing work on this operation, refer to general – 82.00.00.

### Charge 82.30.08

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, swept (purged) immediately beforehand. No delay between evacuation and charging procedures is permissible. Great care must be taken to charge correctly, as under charging will result in very inefficient operation, and over charging will result in very high pressures and possible damage to components.

1. Evacuate the system – 82.30.06.
2. Connect centre hose of charging manifold to supply of refrigerant. The supply available must be at least 3,3 kg. (7.2 lb.) weight.
3. Open refrigerant supply valve.
4. Purge centre hose by momentarily cracking connection at manifold block; retighten connector.
5. Record weight of refrigerant supply source.
6. Open both valves on charging manifold and allow refrigerant source pressure to fill vacuum in system.
7. Between 0,23 kg. and 0,45 kg. (½ lb. to 1 lb.) weight will enter the system.
   Record quantity.

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

8. Close pressure side valve on manifold block.
9. Ensure all clear and start vehicle engine. Run engine at 1500 r.p.m.
10. Set air conditioning system blower speed control to 'H'.

    **NOTE**: This engages compressor clutch to start system circulation, and runs blower motor at fast speed to heat evaporator coil. Vapour will be turned to liquid in the condenser and stored in the receiver drier.
11. Control flow of refrigerant with suction side valve on charging manifold, and allow a total weight (including operation 7) of 1,14 to 1,36 kg. (2½lb. to 3 lb.) refrigerant to enter system.
12. Close suction side valve.

    **NOTE**: Alternatively, observe sight glass on receiver/drier until sight glass clears, and no bubbles or foam are visible. Close suction valve.
    Re-open suction valve for 2 to 5 minutes (2 mins. if ambient temperature low, 5 minutes if high).
    This will allow an additional 0,11 kg. (¼ lb.) of refrigerant to enter the system.

13. Run system for 5 minutes, observing sight glass.
14. If foaming very slight, switch off engine.

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

15. Close refrigerant supply valve; disconnect hose.
16. **Quickly** disconnect hoses from Schrader valves on union block.
17. Fit protective sealing caps.
18. Switch on engine and check function of air conditioning system – 82.30.16.
19. Switch off engine; flush engine compartment and interior of vehicle with shop compressed air line.
20. Conduct a leak test on installation – 82.30.09.

## AIR CONDITIONING SYSTEM

### Leak test — 82.30.09

The system shall show no leaks when tested by a detector with high sensitivity ideally of 0,45 kg (1 lb.) in 32 years. Exceptions are the receiver/drier sight glass and uncapped Schrader valves, which must show no leakage when tested by a detector with sensitivity of 0,45 kg. (1 lb.) in 15 years.

Do not smoke while conducting the leak tests.

For safety reasons the discharge pressure gauge on the charging manifold must be checked at frequent intervals.

The testing area must be well ventilated, but free from draughts.

The system must be operated at high pressure before leak testing. As compressor discharge pressures are variable with ambient temperature the following procedure must be used.

### Pressurising

1. Remove Schrader valve protective sealing cap from discharge connector at union housing.
2. Ensure both valves on charging manifold closed.
3. **Quickly** screw pressure hose from charging manifold block on to union.
4. If necessary blank off condenser.
5. Set heater control to full hot, fast fan.
6. Set air conditioning controls to full cold, fast blower.
7. Start engine and allow discharge pressure to reach 15,76 bars. (225 lb/sq. in.). Under no circumstances allow the pressure to rise above 17,58 Bars (250 lb/sq. in.).

**CAUTION: Do not allow engine to overheat.**

8. When pressure reaches 15,76 Bars (225 lb/sq. in.), turn off engine.
9. Continue with Testing.

### Testing

1. All joints and fittings shall be free of excess oil to eliminate the possibility of false readings caused by refrigerant absorption in the oil. For this reason any joint tightened to eliminate leakage should be cleared with compressed air to remove refrigerant vapour.
2. Since refrigerant vapour is heavier than air, the detector probe must be moved in the area below the joint tested.

3. The detector probe must be held for at least 3 seconds closer than 6,4 m (.250 in.) to the joint tested.
4. The detector should be cleared with uncontaminated air before each usage.
5. False readings may occur if the detectors are used in atmospheres where solvents or volatile compounds containing halides (Fluorine, Bromine, Chlorine or Iodine) are present e.g. Trichlorethylene.

   Cigarette smoke and exhaust fumes may also cause false readings.

6. If the exact location of a leak is in doubt, liquid soap solution should be brushed on to the area and the position of the bubble observed.
7. The detector probe should be held at the air conditioning outlets with the system off and the fan turned on and off quickly to flow a small quantity of air. This procedure will find any leaks in the evaporator coil. The car body must be cleared of refrigerant before this test.

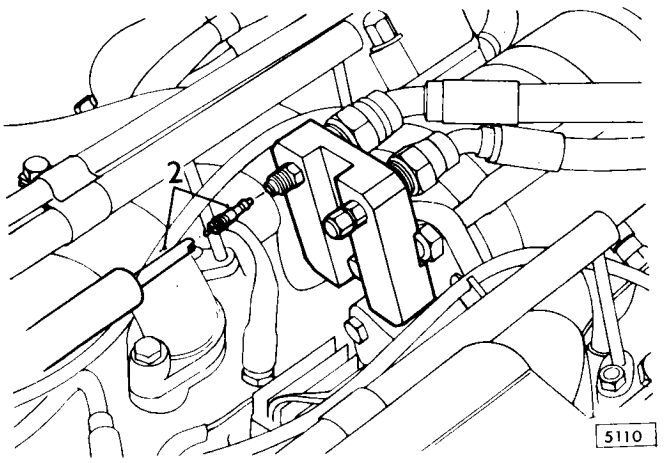
## CHARGING VALVE CORE

**WARNING**: Before commencing work on this operation, refer to general – 82.00.00.

**Remove and refit** **82.30.12**

A possible reason for very slow charging rates is a bent or damaged Schrader valve depresser. Do not attempt to straighten. The valve core must be replaced.

If excessive leakage is detected from the Schrader valve cores on the connector union housing 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. If the valve union is leaking refer to – 32.30.13.
Ensure replacement clean dry valve core is to hand before commencing operation.




**Remove**

1. Depressurise the system – 82.30.05.
2. Remove valve core using a Schrader removing tool.

**Refitting**

3. Insert new valve core into union and ensuring threads not crossed, screw home.

   **NOTE**: Do not overtighten.

4. Charge the system – 82.30.08.

## CONNECTOR UNION HOUSING

**WARNING**: Before commencing work on this operation, refer to general – 82.00.00

**Remove and refit** **82.30.13**

If leakage is detected between the Schrader valve union and the housing, or the threads are damaged in any way, the union housing must be replaced. Ensure a replacement housing and 'O' rings are to hand before commencing the operation.

**Removing**

1. Depressurise the system – 82.30.05.

   **NOTE**: Ensure suitable clean dry male and female sealing plugs are to hand.

2. Release suction and delivery hose connections from union housing; **IMMEDIATELY** seal hoses.

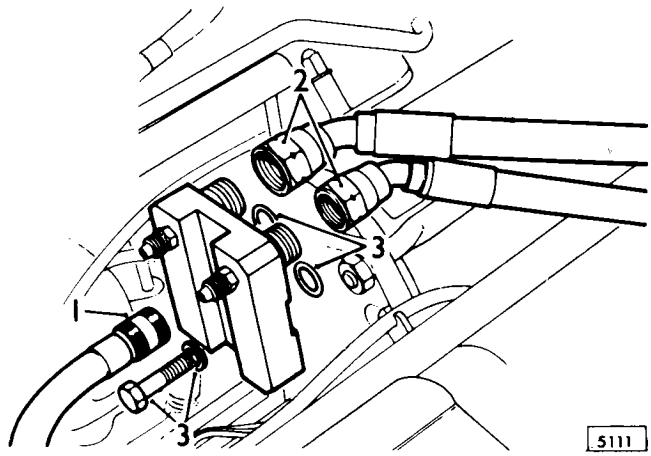
3. Remove one setscrew and spring washer securing housing to rear of compressor; remove 'O' ring seals.

**Refitting**

4. Fit new clean dry 'O' ring seals at rear of compressor.

   **CAUTION**: Ensure 'O' ring seal seating area clean, dry, flat and unmarked by scores or burrs.

5. Fit new housing and secure with one setscrew and spring washer. Torque 4,5 kg.m to 11,3 kg.m. (10 lb.ft. to 25 lb.ft.) Ensure 'O' ring seals are correctly positioned before fully tightening setscrew.
6. Remove sealing plugs from hoses and fit to union housing. Torque to level given in general – 82.00.00.
7. Charge system – 82.30.08.



## AIR CONDITIONING EQUIPMENT

### Preliminary tests 82.30.16

The following checks 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 – 82.00.00.

1. Check evaporator blower fan is giving air flow expected in relation to control switch position. Check speed resistor for signs of over heating.
2. 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.

3. Check both radiator cooling fans start operating when compressor clutch engages.

   **NOTE**: The engine must be running for this check.

4. 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 engaged.
5. Observe sight glass on receiver/drier and check for frothing or bubbles with engine running at 1000 r.p.m.
   Slowly increase engine speed and repeat check at 1800 r.p.m.

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

6. Check for frosting on connector union housing, the region around the suction port is normally cold, and slight frosting is permissible.
7. Check by feel along pipe lines for sudden temperature changes that would indicate blockage at that point.
8. Place a thermometer in the air outlet louvres. Run the vehicle on the road and note drop in temperature with air conditioning system switched on or off.
9. Ensure condenser matrix is free of mud, road dirt, leaves or insects that would prevent free air flow. If necessary clear the matrix following the cleaning procedure given under 82.15.07.
10. If the foregoing checks are not met satisfactorily, refer to rectification and fault finding procedures – 82.00.00.