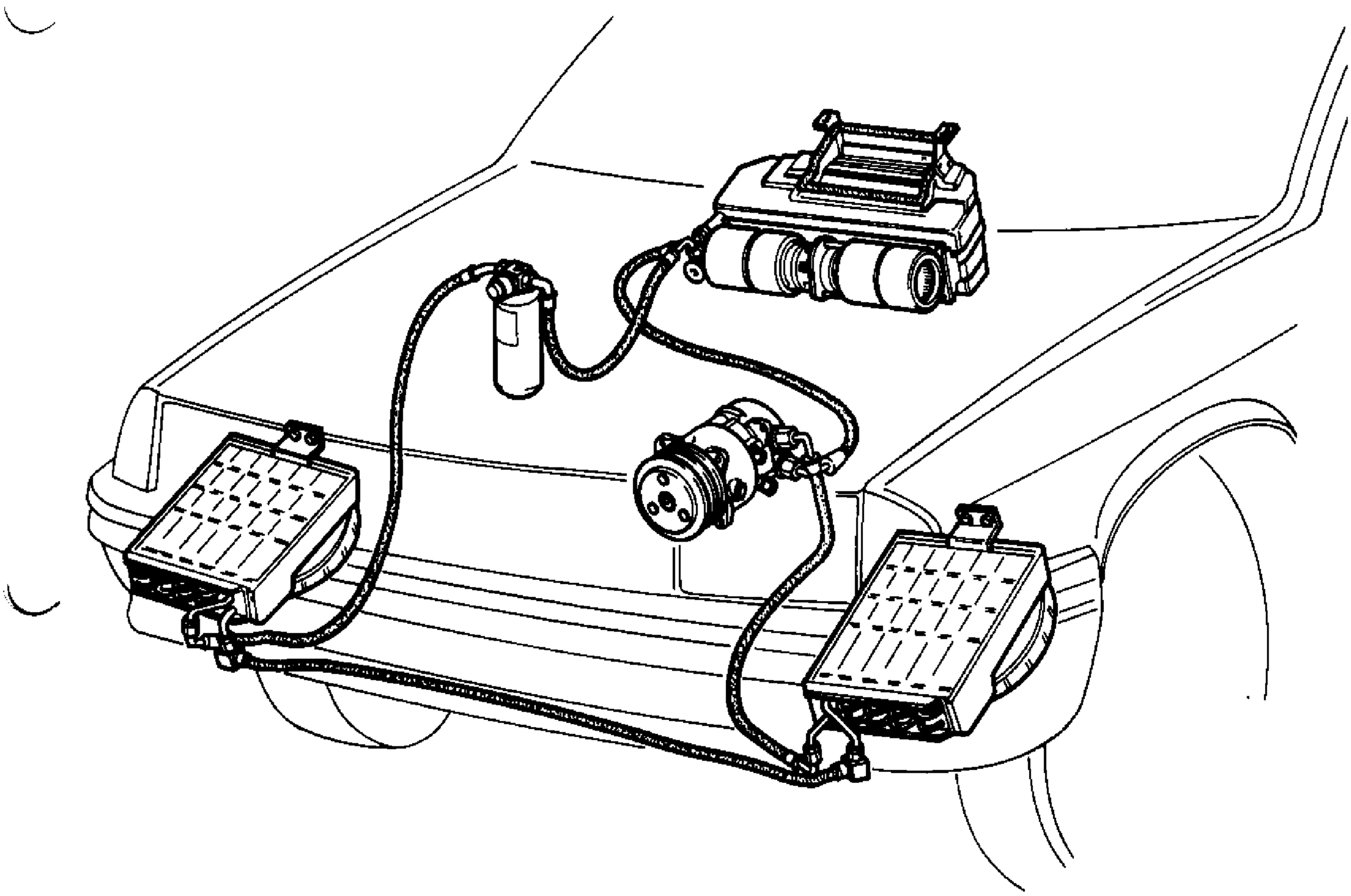
INSTALLATION INSTRUCTIONS

Alfa 33

Alfa 33 MANUAL SUPPLEMENT

air conditioner



DIREZIONE ASSISTENZA TECNICA

Alfa Romeo

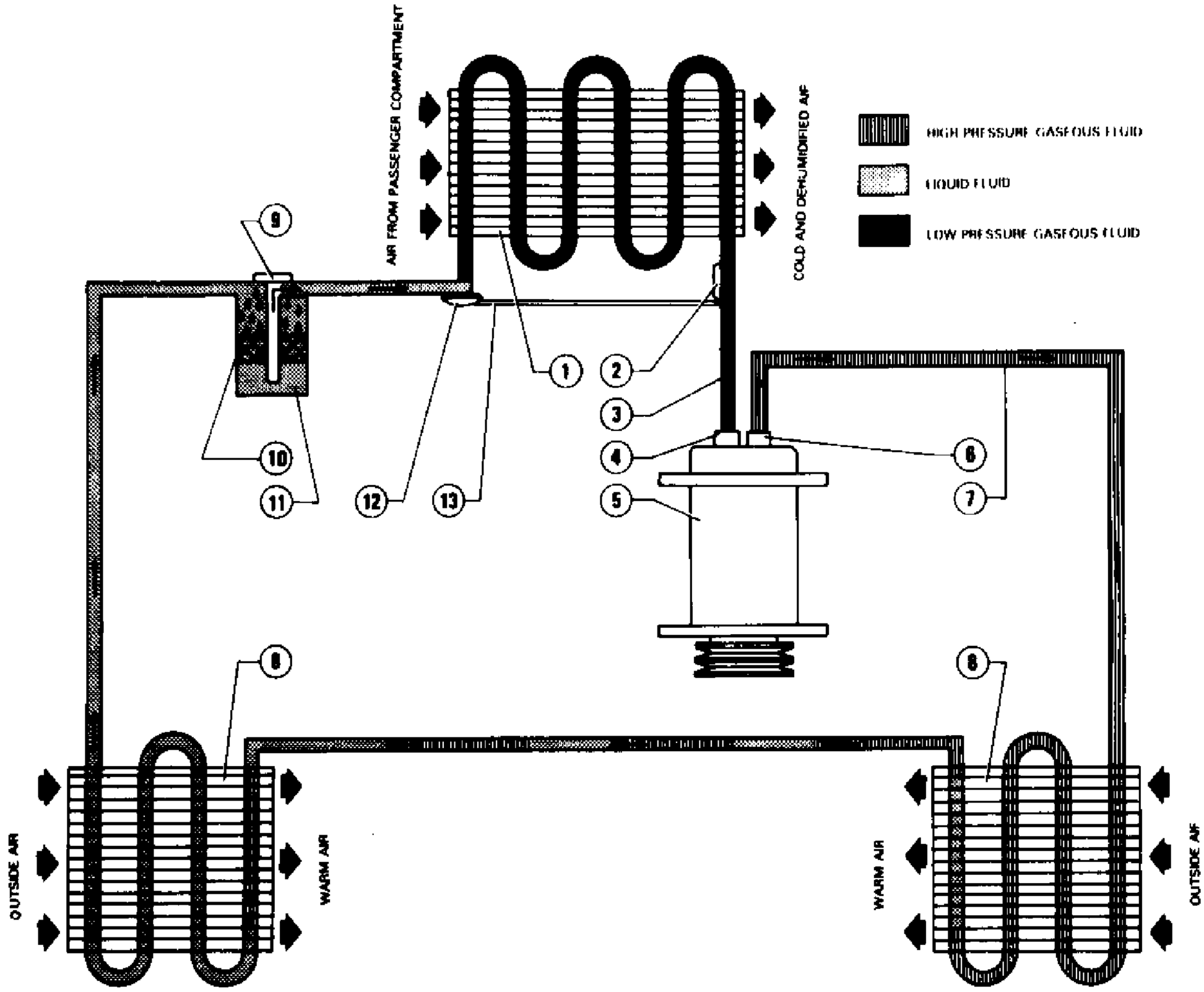
PA3335000000AC

November 1984

AIR CONDITIONER Alfa 33

CONTENTS

DESCRIPTION



1 Cooler
2 Thermostatic sensor
3 Intake piping
4 Intake union
5 Compressor
6 Delivery union
7 Delivery piping
8 Condenser
9 Indicator glass
10 Drier
11 Tank
12 Expansion valve
13 Capillary tube

The air conditioning system serves to dehumidify and cool down the air present in the passenger compartment.

- It operates just as per the cycle of a refrigerator; the cycle is realized by the freon 12 (R12) fluid which exploits its status changes (from liquid into gas and viceversa) in order to give, or obtain, a remarkable quantity of neat.
- The Freon 12 has been chosen in relation to its characteristics: in fact, it is non poisonous, uninflamable, unexplosive, and anticorrosive for metals, and odourless.
- During functioning, two pressure levels are established in the system; these two levels are maintained, from one side by compressor (5), and from the other, by expansion valve (12), at cooler (1) inlet.
- The frigorific fluid comes out of compressor (5), as a gas having high temperature and pressure (80 to 100 °C [176 to 212 °F]), and 10 to 18 bar (145 to 261 p.s.i.). It enters condenser (8), is cooled down thank to electric fans and dynamic air, and goes out as a liquid, at a temperature of 40 to 50 °C approx (104 to 122 °F). It passes through drier filter (10), which has the purpose of filtering and, mainly, absorbing the possible humidity which, when freezing, could clog the expansion valve, thus reducing the frigorific cycle efficacy.
- The expansion valve (12), located at cooler inlet, atomizes the fluid, thus reducing its pressure and, consequently, also the temperature before cooler (1) inlet, where it vaporizes, thus dissipating heat from the air in the passenger compartment which is forced on the exchanger vanes by a centrifugal fan. Furthermore, the air, in contact with the cold sidewalls of cooler, looses a high percentage of humidity, thus generating condensate, which is collected and drained outside vehicle through draining hoses. The gaseous fluid then, cames out from cooler and is sucked by compressor. After this, the cycle restarts.
- The system correct functioning is controlled by a Trinary pressure gauge, located in correspondence with drier filter.

  The pressu re gauge executes the following:

  - Disengages the compressor electromagnetic coupling in the event of pressure drop, due to leaks in the system (i. e., operates as min. pressure gauge).
  - Disengages the compressor electromagnetic coupling in the event of abnormal pressure increase, due to incorrect functioning of a system component (i. e., operates as max pressure gauge).
  - Operates the electric fan of right condenser, when pressure to the drier filter reaches 15 to 17 bar (217.5 to 246.5 p.s.i.) (the electric fan stops when this pressure is reduced by 3 to 4 bar (43.5 to 48 p.s.i.).

  However, the electric fan of left condenser is always operating during compressor functioning.
- During engine start-up, a relay provides to prevent the compressor electromagnetic coupling fan being engaged, thus preventing forcing the starter.
- A special device permits the engine idle r.p.m. to be increased when compressor is operating.
  This device is controlled by a solenoid valve which picks up the vacuum signal from the servobrake system instead of the intake manifold.
  The greatest vacuum of the servobrake system (transmitted to the ingnition distributor) increases the engine advance and, consequently, the idle r.p.m.
- The system is controlled by two devices, located on the central console.
  - A three-setting switch, permits the fan unit to operate at three different speeds.
  - A thermostat permits the cooler unit temperature to be regulated, so as to keep the passenger compartment in the required conditions.
- The compressor can be operated only when the electric fan motor is connected.

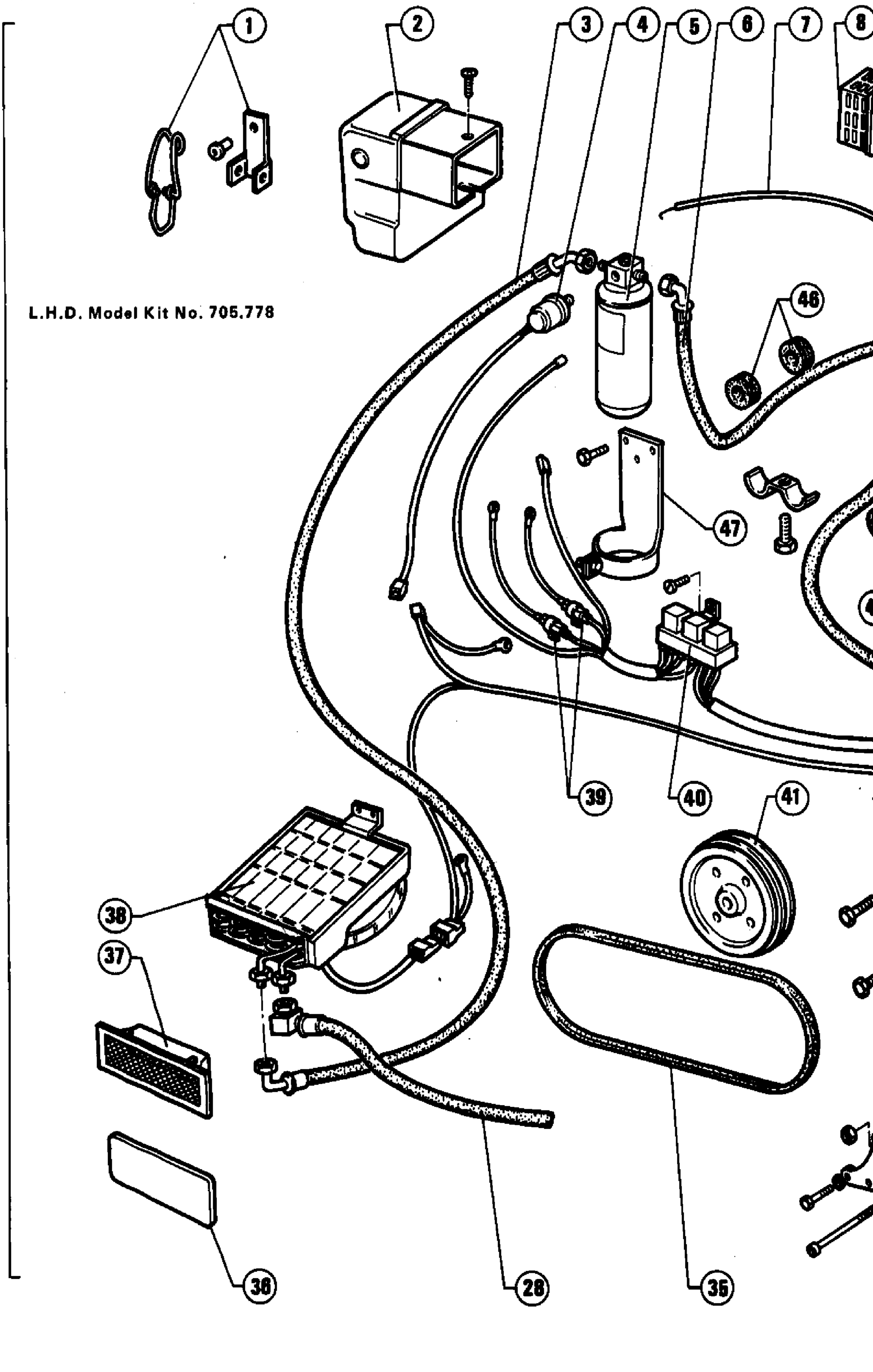
INSTALLATION OF THE AIR CONDITIONING SYSTEM

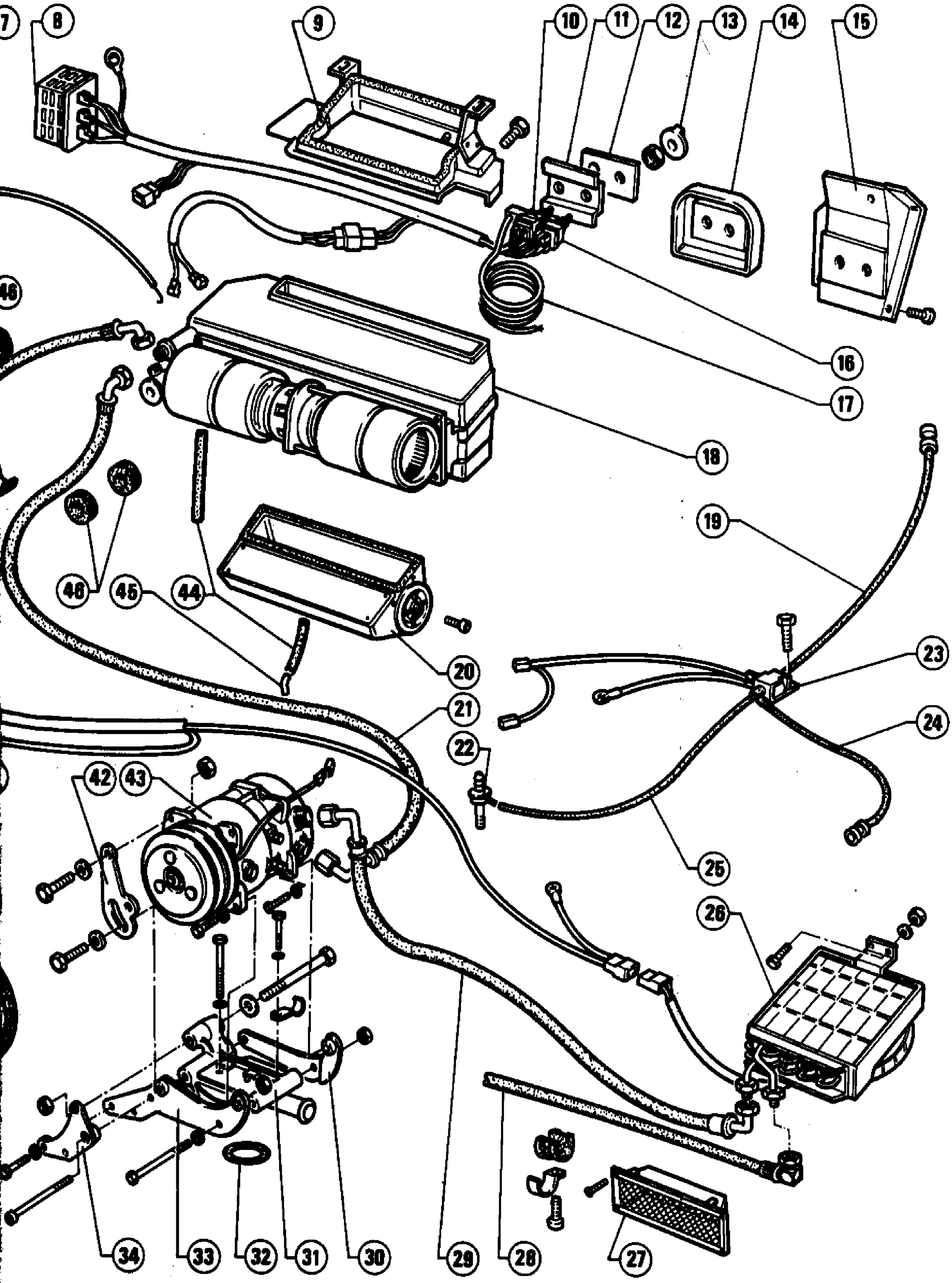
The following kits are available:
Air conditioner for Alfa 33 1.5:

L.H.D. **705.778**
R.H.D. **705.779**

1 Air filter clip
2 Air union
3 Hose connecting right condenser to drying filter
4 Trinary pressure gauge
5 Drying filter
6 Hose connecting drying filter to cooler
7 Outside air lid control cable
8 Resistor
9 Cooler cover
10 Thermostat
11 Bracket
12 Air conditioner controls cover
13 Ball grip
14 Controls support (only for models without clock on lower cover)
15 Controls support (only for the Alfa 33 4 x 4 model)
16 Three-setting switch
17 Thermostat probe
18 Cooler
19 Hose connecting solenoid valve to vacuum intake on servobrake
20 Air flow-to floor regulator
21 Hose connecting cooler to compressor
22 Single-acting valve with side intake
23 3-way solenoid valve for the fast idle r.p.m. device
24 Hose connecting solenoid valve to ingnition distributor pneumatic advance regulator
25 Hose connecting solenoid valve to servobrake single-acting valve
26 Left condenser
27 Left air duct
28 Hose connecting condensers
29 Hose connecting compressor to left condenser
30 Rear bracket
31 Union
32 O-ring
33 Front bracket
34 Bracket securing alternator
35 Compressor drive belt
36 Template for cutting bumper
37 Right air duct
38 Right condenser
39 Fuses
40 Relay
41 Crankshaft pulley
42 Compressor belt tightener bracket
43 Compressor with electric pulley
44 Condensate draining hose
45 Union for condensate draining hose
46 Piping guide ring
47 Drying filter support

L.H.D. Model Kit No. 705.778

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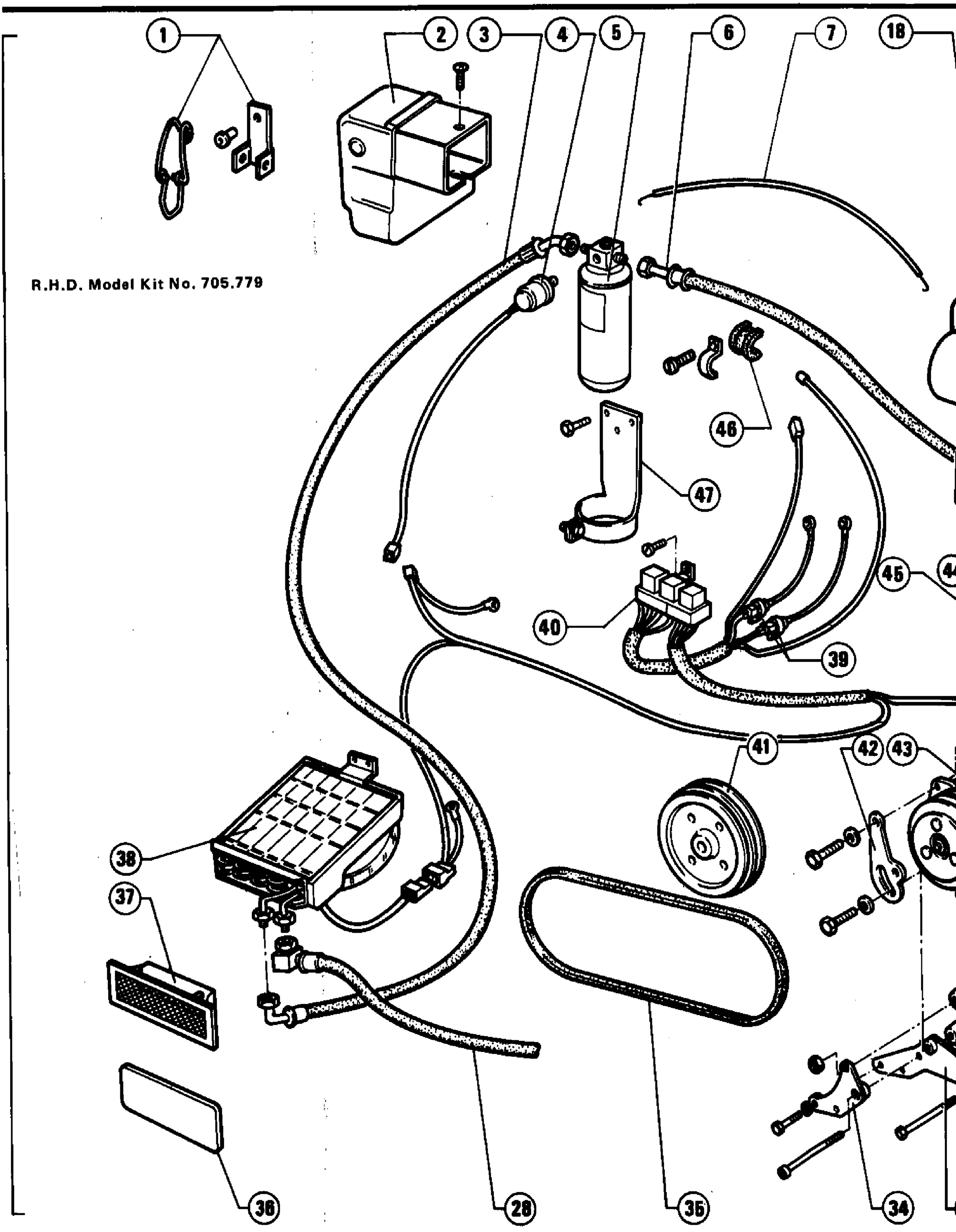
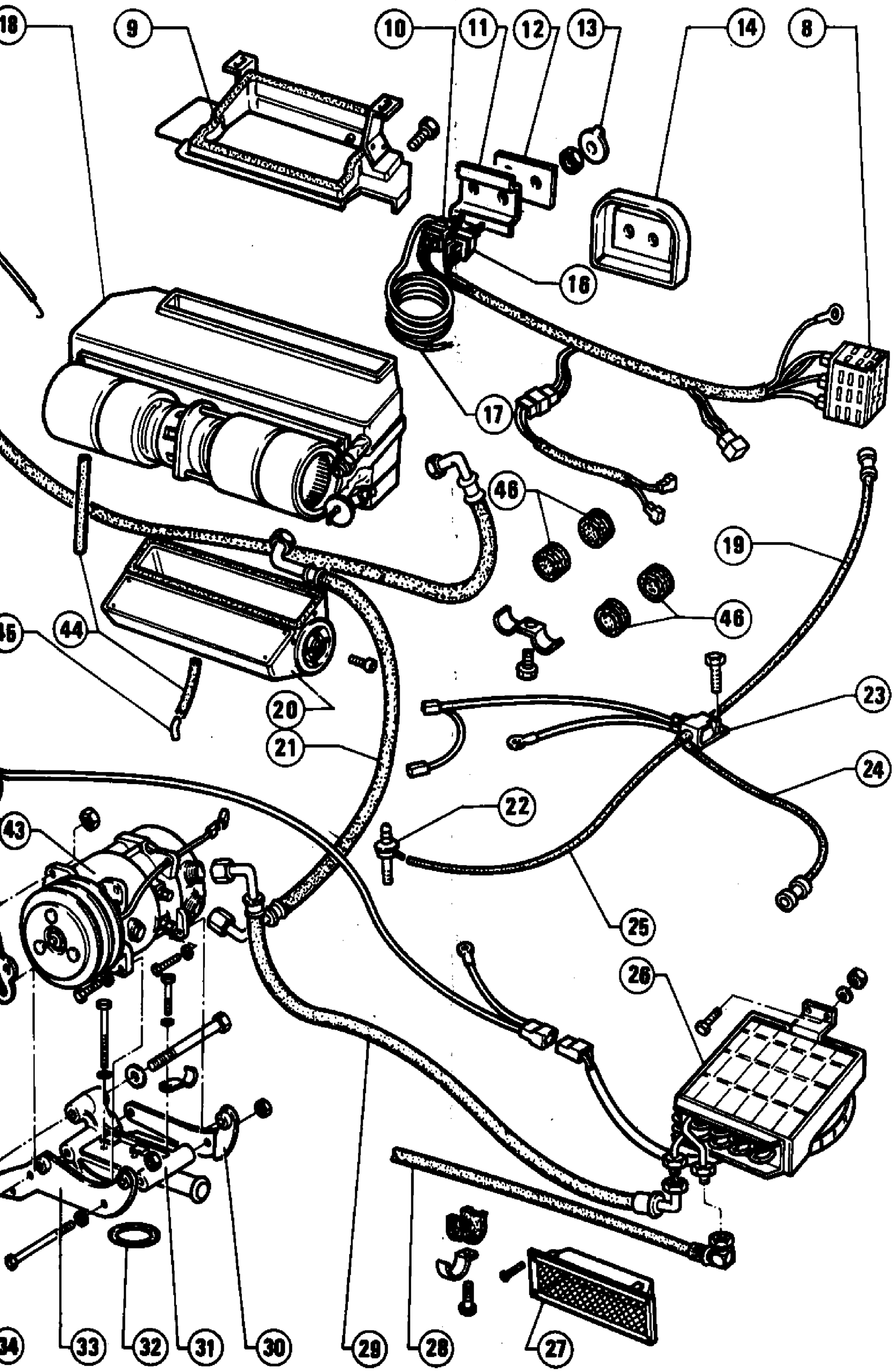
R.H.D. Model Kit No. 705.779

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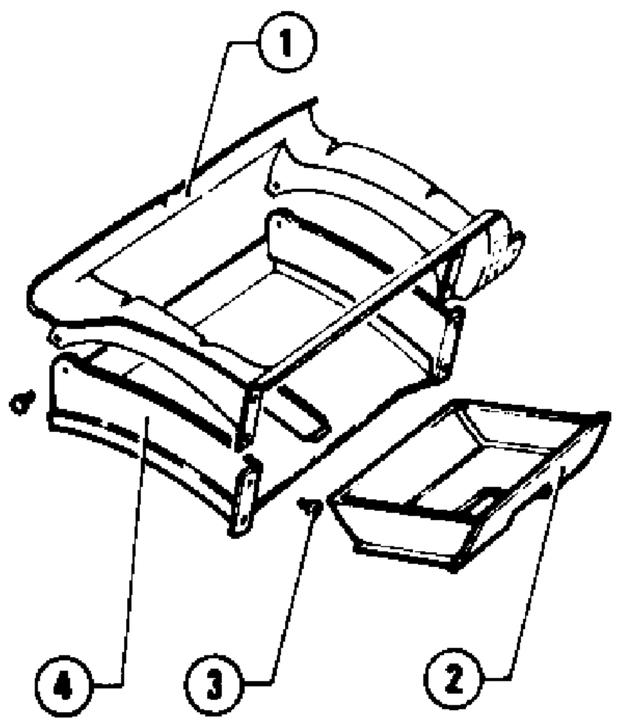
OPERATIONS INSIDE THE VEHICLE

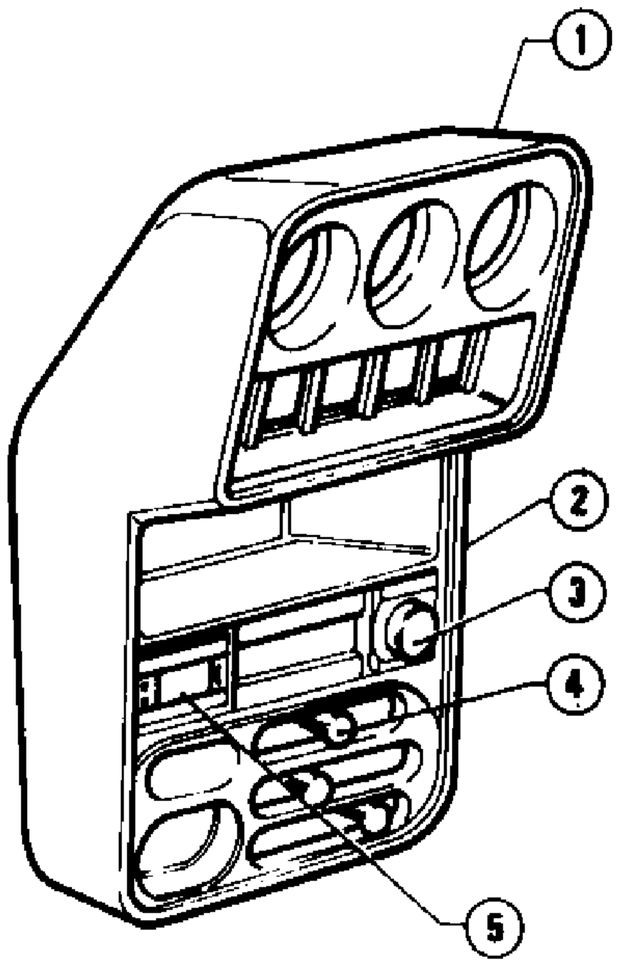
PRELIMINARY DISASSEMBLIES

1. Set vehicle on a lift, engage the parking brake and detach battery terminals.
2. Withdraw object holder (2), and remove object holder casing (4) removing, by drilling, the four rivets (3) securing dashboard (1).



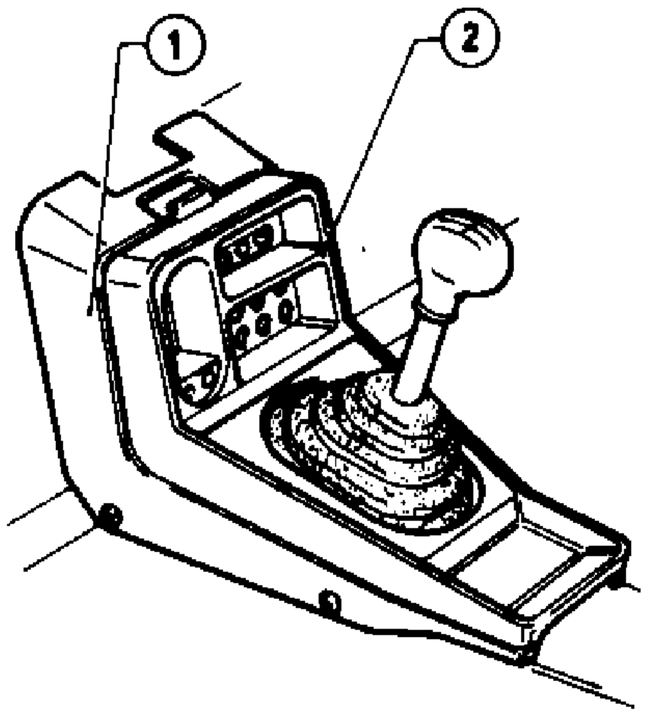
1 Dashboard
2 Object holder
3 Rivet
4 Object holder casing

3. Remove lower cover from central console
(1) Withdraw ball grips (4) from the air ventilation control assembly.
(2) Detach cover (2), disconnect the wirings, and remove cover.



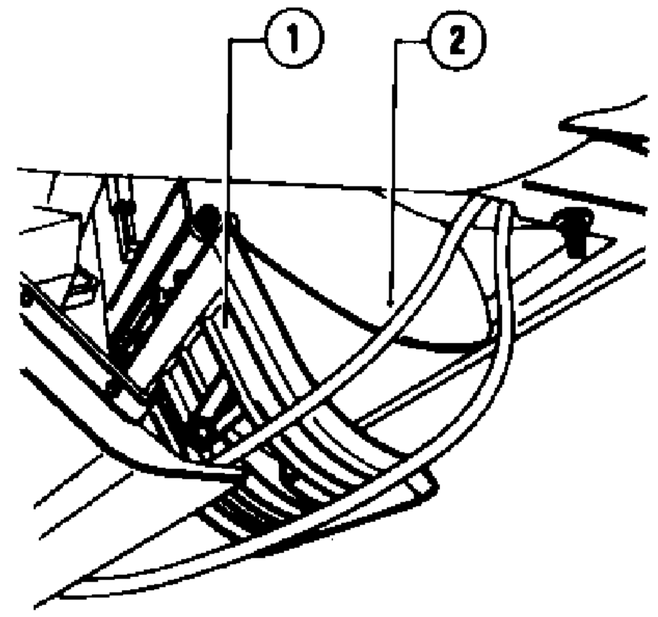
1 Central console
2 Lower cover
3 Cigar lighter
4 Ball grip
5 Clock

4. Withdraw instrument holder (2) from console (1) and detach the related wiring.



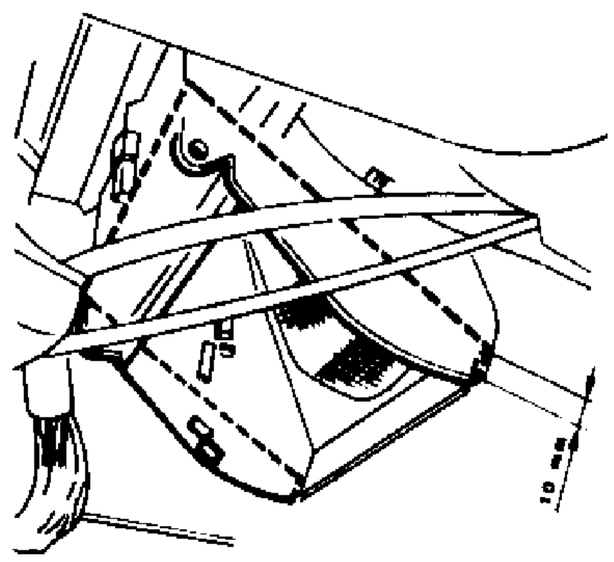
1 Speed gear console
2 Instrument holder

5. Remove lid (1) and the related lever from fairing (2).

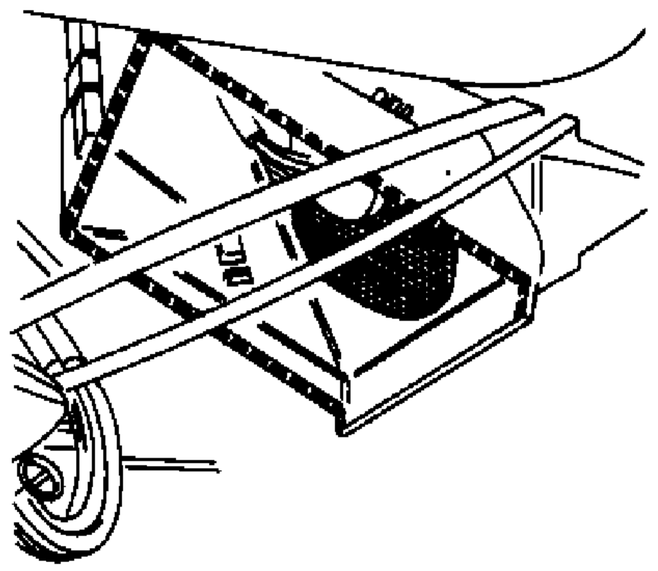


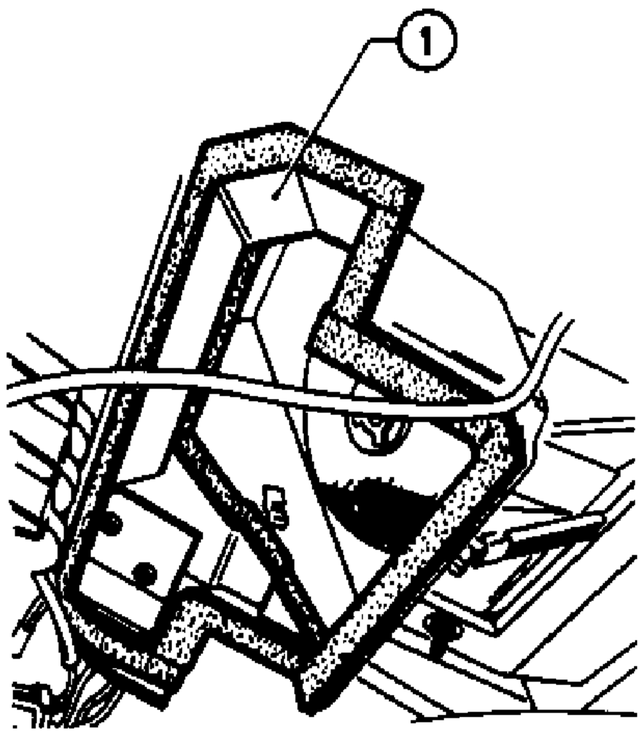
1 Lid of the air flow to floor regulator
2 Air ventilation unit fairing.

6. Trace a line, as shown in the figure, on the fairing of the air ventilation unit.



7. Cut along the traced line and remove the fairing lower part.

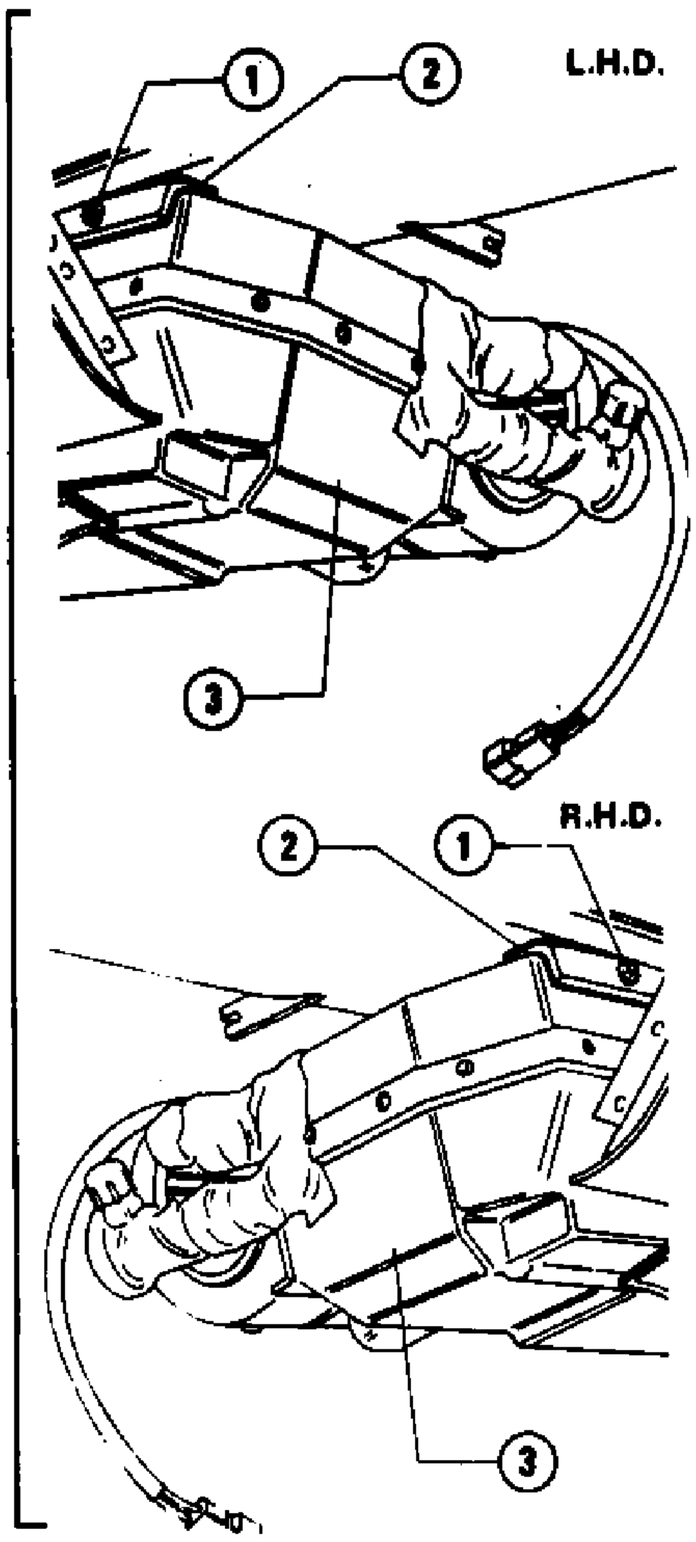




1 Cooler unit cover

(3) Before inserting cover (2) permanently, connect the wiring to electric fan; position cooler unit (3) and secure it to cover (2) with self-threading screws (1), by screwing them through the central console opening.

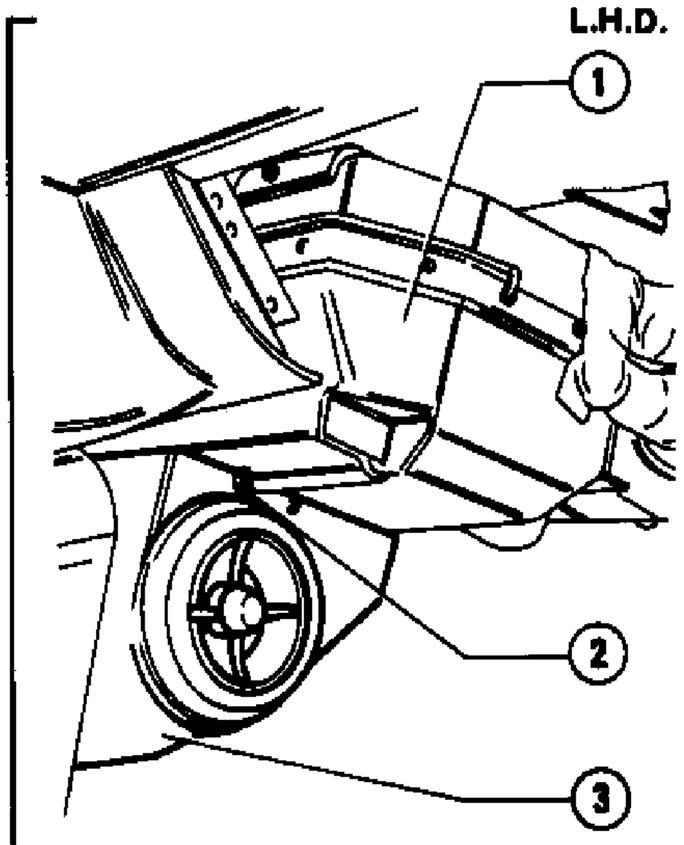
Before securing the cooler unit to cover, verify that the object holder casing is correctly positioned without interfering with the cooler unit.

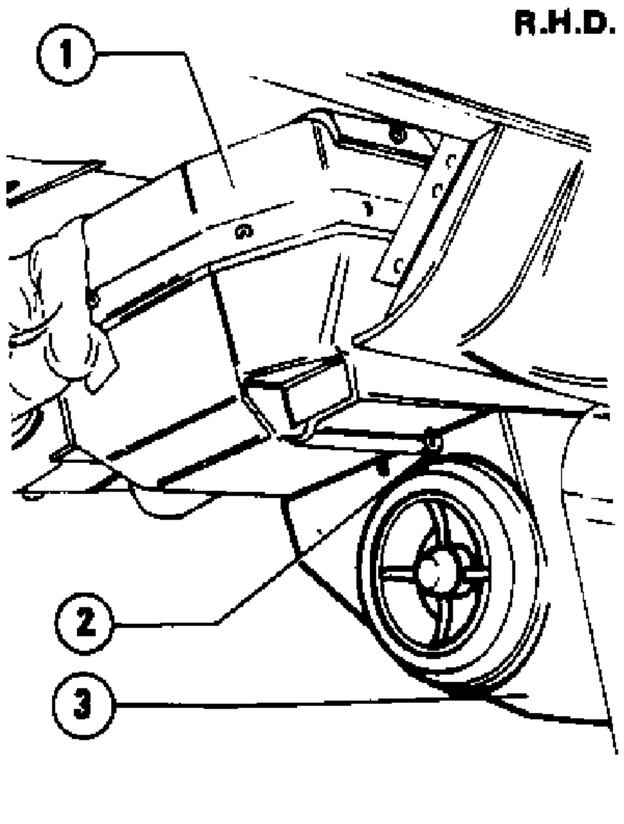


1 Self-threading screw
2 Cooler unit cover
3 Cooler unit

(4) Position cover on the fairing of the air ventilation unit and tighten permanently the two nuts securing the cooler unit cover to body.

5. Position the air flow regulator (3) and secure it to cooler unit (1) by means of self-threading screw (2).





1 Cooler unit
2 Self-threading screw
3 Air flow to floor regulator

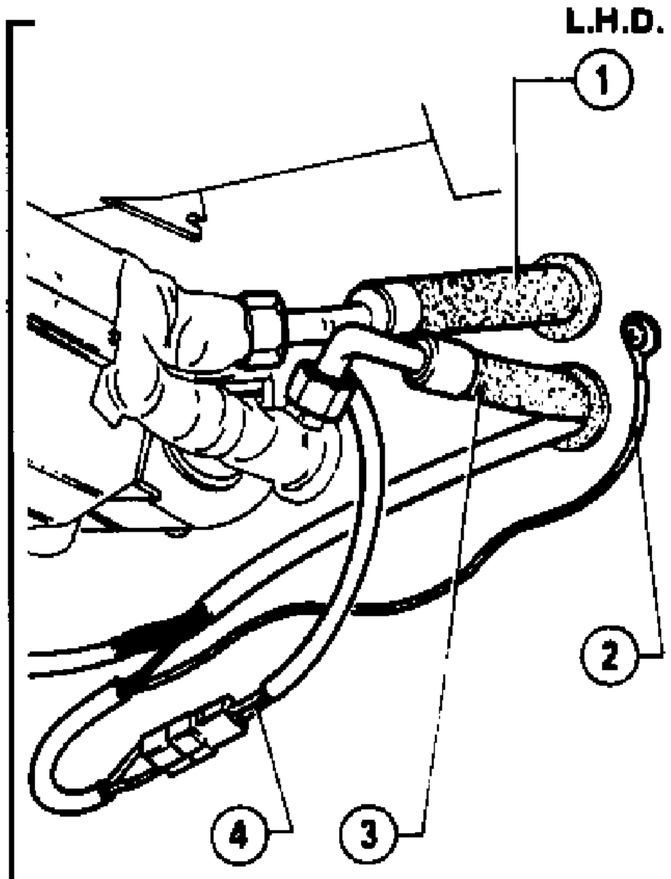
6. Connect the cooler unit, the piping and the electric wiring following the procedure below:

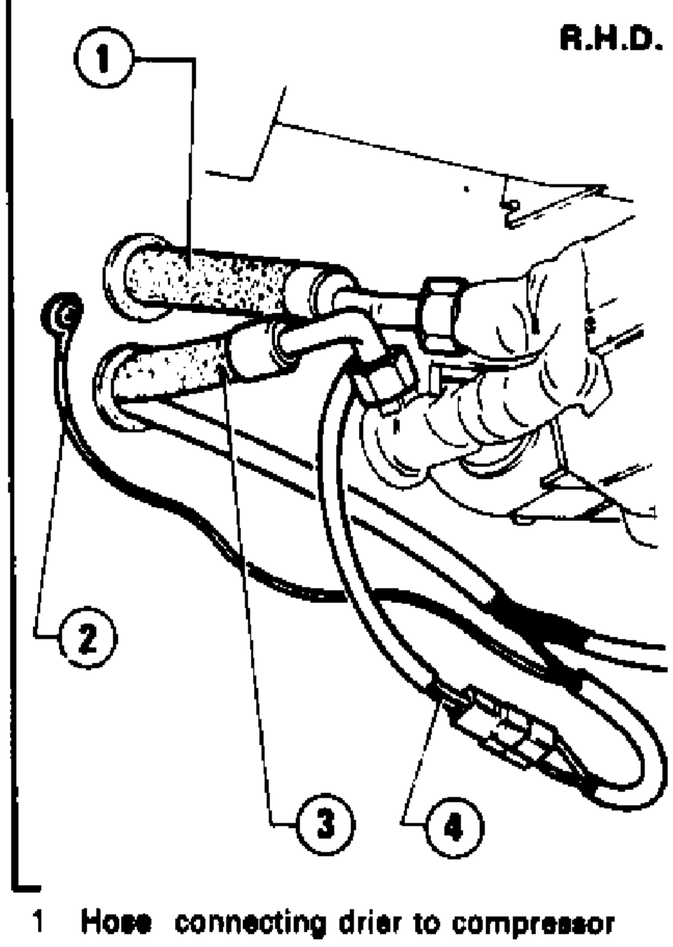
(1) **Lubricate** with antifreeze oil and connect the unions of the following piping to the cooler unit.

- Hose (1) (1/2"), on cooler outlet union.
- Hose (3) (5/16"), on cooler inlet union.

(2) Connect the movable connector of cables (4) for the cooler electric fan supply.

(3) Secure the electric fan ground cable (2) to body and fit the connection by scratching paint in the fixing point.



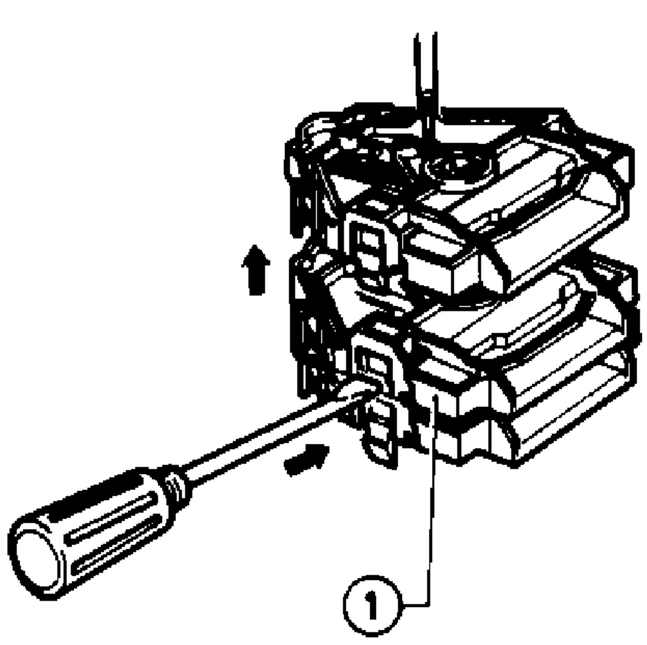


1 Hose connecting drier to compressor
2 Electric fan ground cable
3 Hose connecting drying filter to cooler
4 Electric fan supply cables

8. Remove the dynamic air lid control cable.

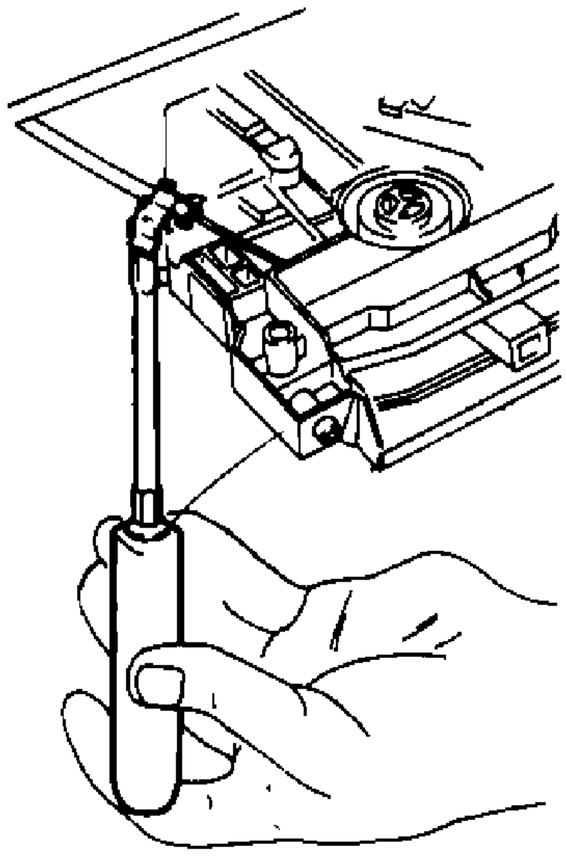
(1) Unscrew the four screws securing the air ventilation controls assembly to central console. Remove the controls assembly.

(2) Separate the components of the air ventilation controls assembly.

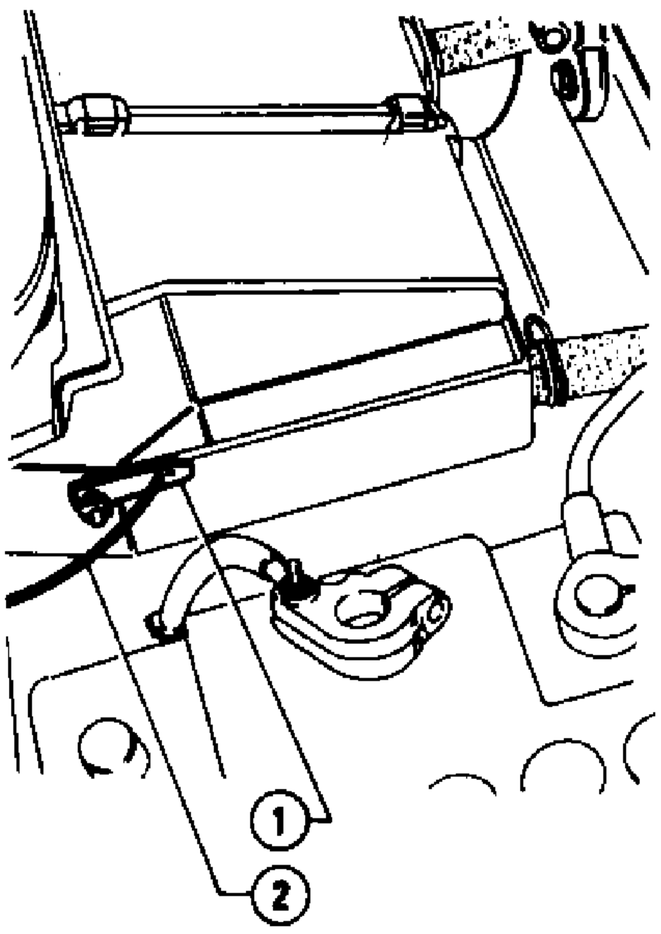


1 Air ventilation controls assembly

(3) Detach the cable from the dynamic air lid control component, by releasing the sheath clamp



(4) Operating from the engine compartment, withdraw cable (2) and detach it from lever (1).



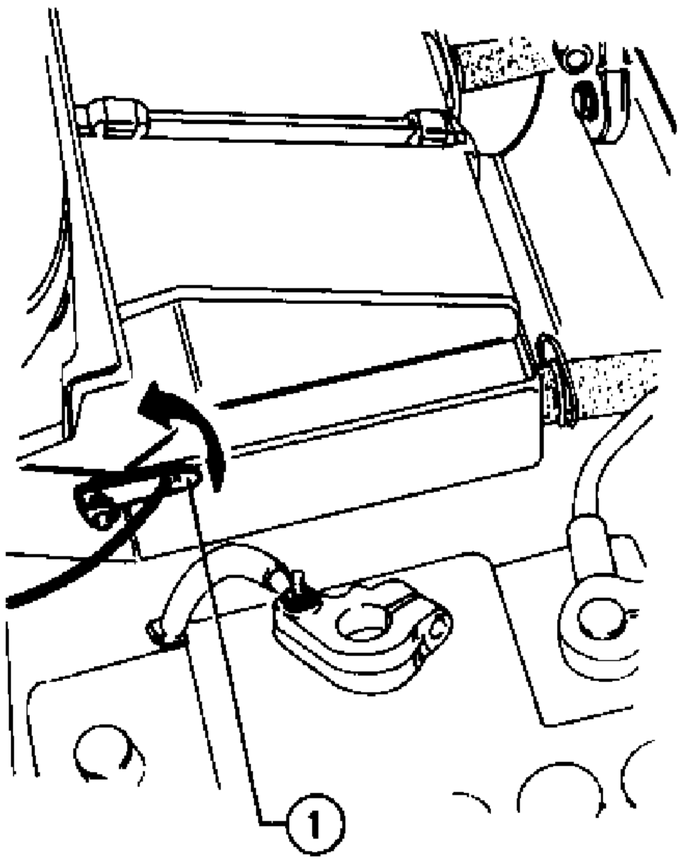
1 Lever
2 Dynamic air lid control cable

ASSEMBLY

1. Reconnect the dynamic air lid control cable by reversing the order of what described in "Preliminary Disassembly" step 8.

2. Adjust the movement of the dynamic air lid.

(1) Move lever (1) towards arrow direction (dynamic air lid closed) and set the related lever, on the air ventilation controls assembly, in the corresponding position.



1 Dynamic air lid control lever

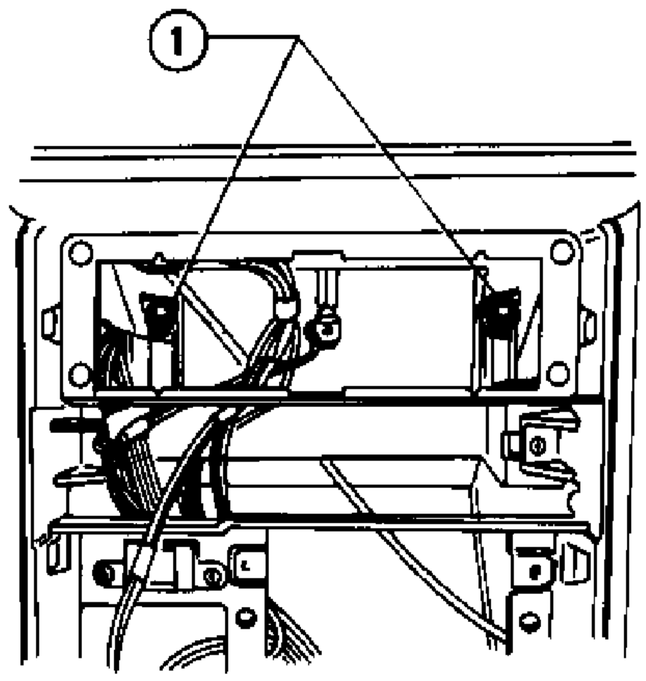
(2) Secure the sheath of lid control cable, by securing the related clamp to the air ventilation controls assembly.

(3) Verify that lid moves freely, without sticking or seizing.

3. Arrange the piping and the connecting wiring between passenger compartment and engine compartment (refer to: Operations inside the Engine Compartment - Assembly - step 7).

4. Mount the cooler unit and the related cover, following the procedure below.

(1) Unscrew the two nuts (1) securing fairing of the air ventilation unit to body.



1 Nuts

(2) Fit cooler cover (1) on the lower part of the air ventilation unit fairing and verify that it is correctly positioned on both air ventilation unit and studs, then temporarily insert the two nuts.

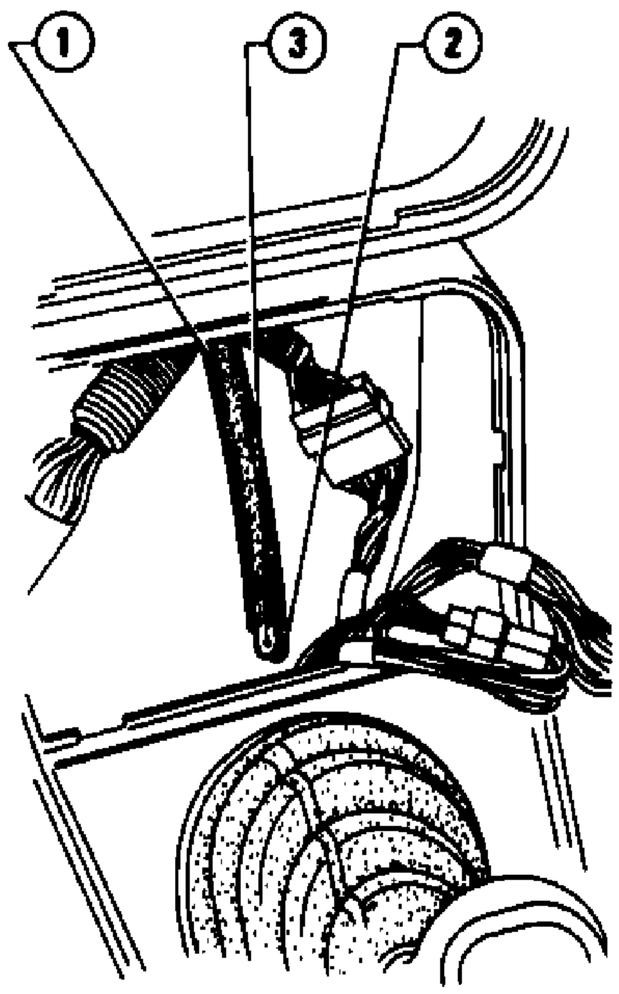
(4) Cover both unions and expansion valve with anti-condensate sealing compound.

7. Mount the condensate draining hoses.

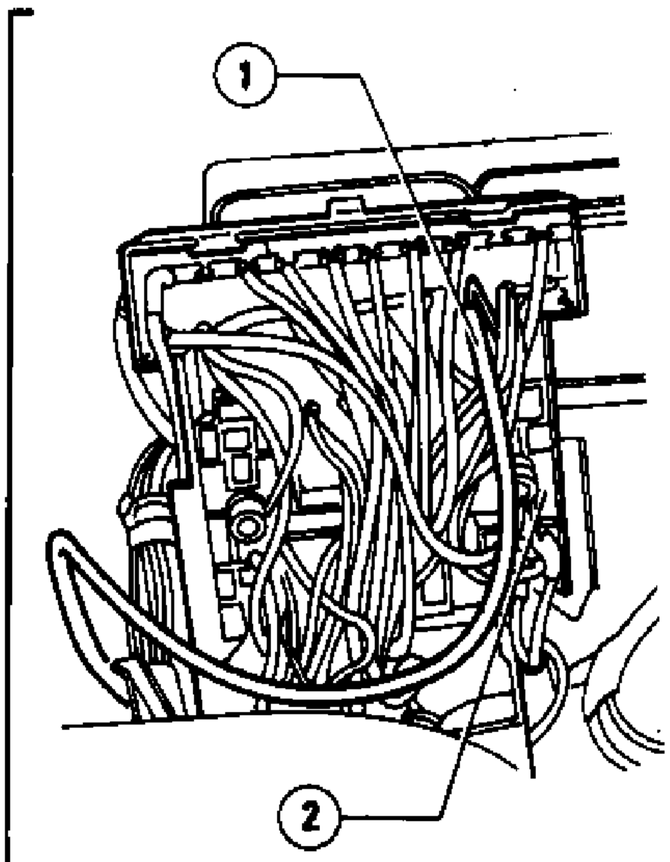
(1) Drill a hole (2) (14 mm dia (0.55 in)) on the tunnel, underneath the cooler unit.

CAUTION
Before drilling the hole, cut the floor carpet so as to prevent damaging it.

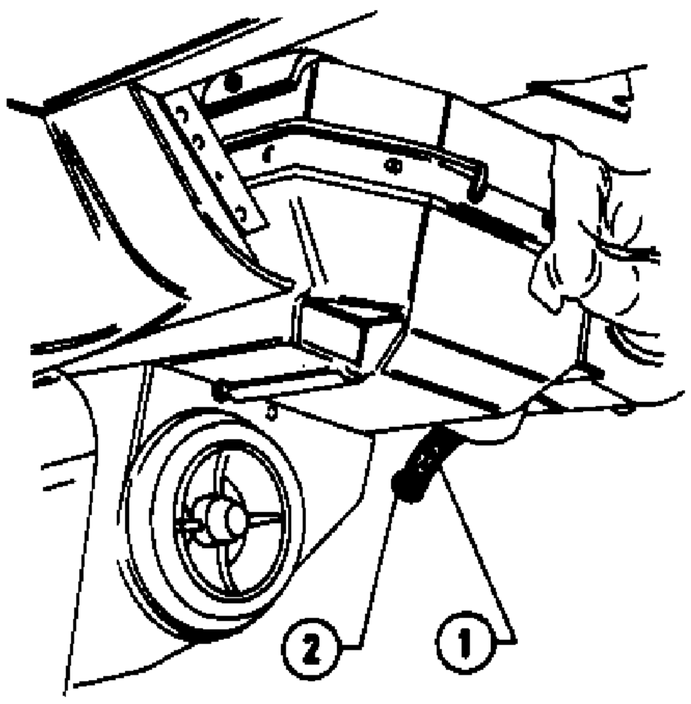
(2) Insert the free end of the upper condensate draining hose (1) into hole (2).



1 Lower condensate draining hose
2 Hole
3 Plastic union



1 Connector for condenser electric fan supply cable
2 Fusebox



1 Upper condensate draining hose
2 Hole

8. Arrange the system electric wiring and attach connector (1) (pink cable) in position 8 on the fusebox. (Refer to: Electric and Pneumatic System Diagram).

9. Install switch and thermostat.

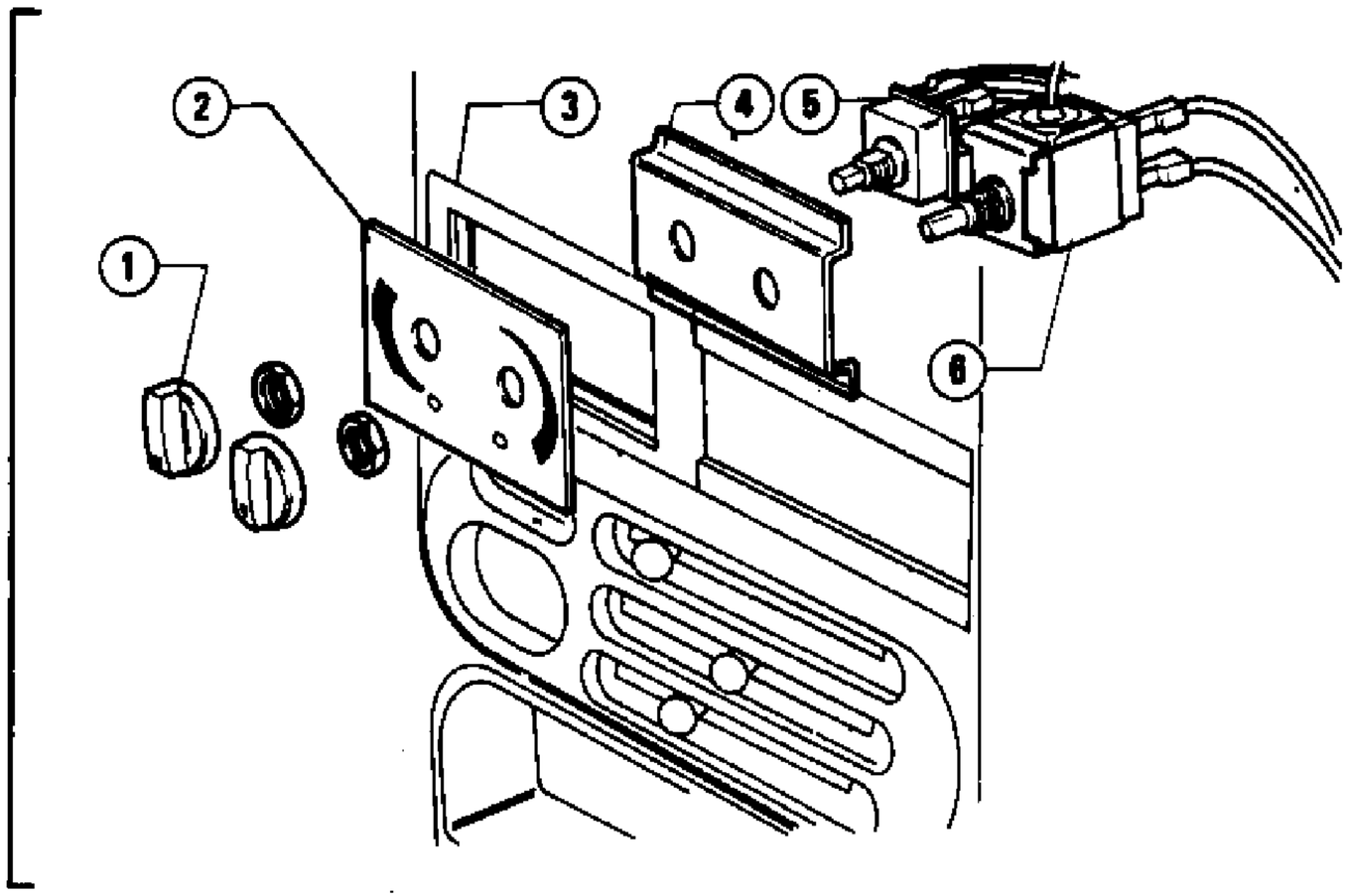
(1) Rotate the controls of both switch and thermostat counterclockwise, so that they correspond to position " ◯ " of cover.

(2a) For the models without clock on lower cover:

- Verify proper connection of wiring.
- Install switch (5) and thermostat (6) with related bracket (4) and cover (2), on lower cover (3), securing switch them the related nuts.

(3) Drill a hole (2) (10 mm dia (0.39 in)) on tunnel, in correspondence with the instrument holder of speed gear console.

CAUTION
Take care not to damage the electric wirings.

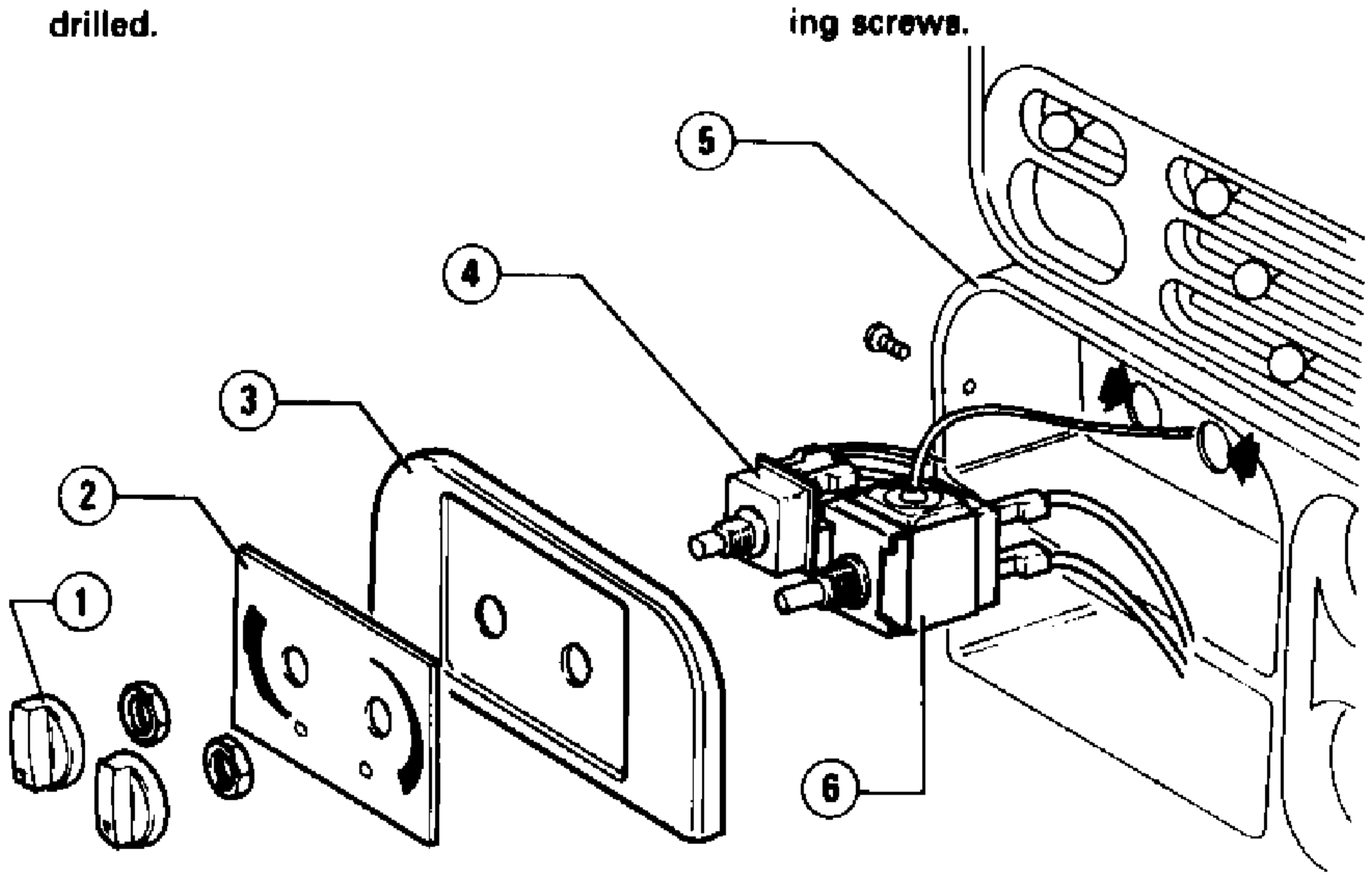


1 Knob
2 Cover
3 Lower cover
4 Bracket
5 3-setting switch
6 Thermostat

(4) Fit union (3) of the lower condensate draining hose (1) into hole (2).

(2b) For the models with clock on lower cover.

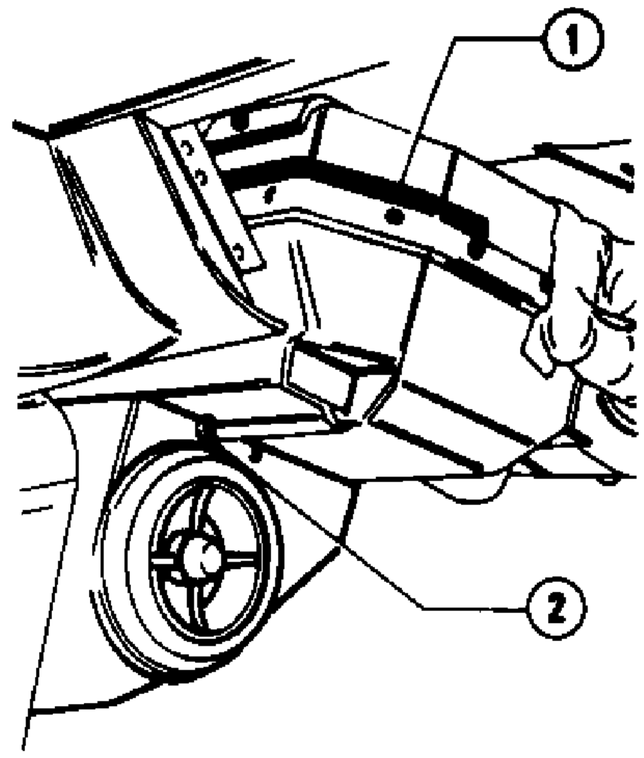
- Disconnect wiring from switch and thermostat.
- Drill instrument holder (5) in the rear compartment, in the area shown by the arrow, then insert the controls wiring in the holes just drilled.
- Install switch (4), thermostat (6) and cover (2) on support (3), secure them with the two related nuts.
- Connect the switch and thermostat wiring.
- Secure support (3) to instrument holder (6) by means of self-threading screws.



1 Knob
2 Cover
3 Controls support
4 3-setting switch
5 Instrument holder
6 Thermostat

(3) Insert the knob and verify the correct functioning of the two controls and that they correspond with the symbols present on cover.

(4) Insert thermostat probe (1) into the suitable seat on cooler unit (2).

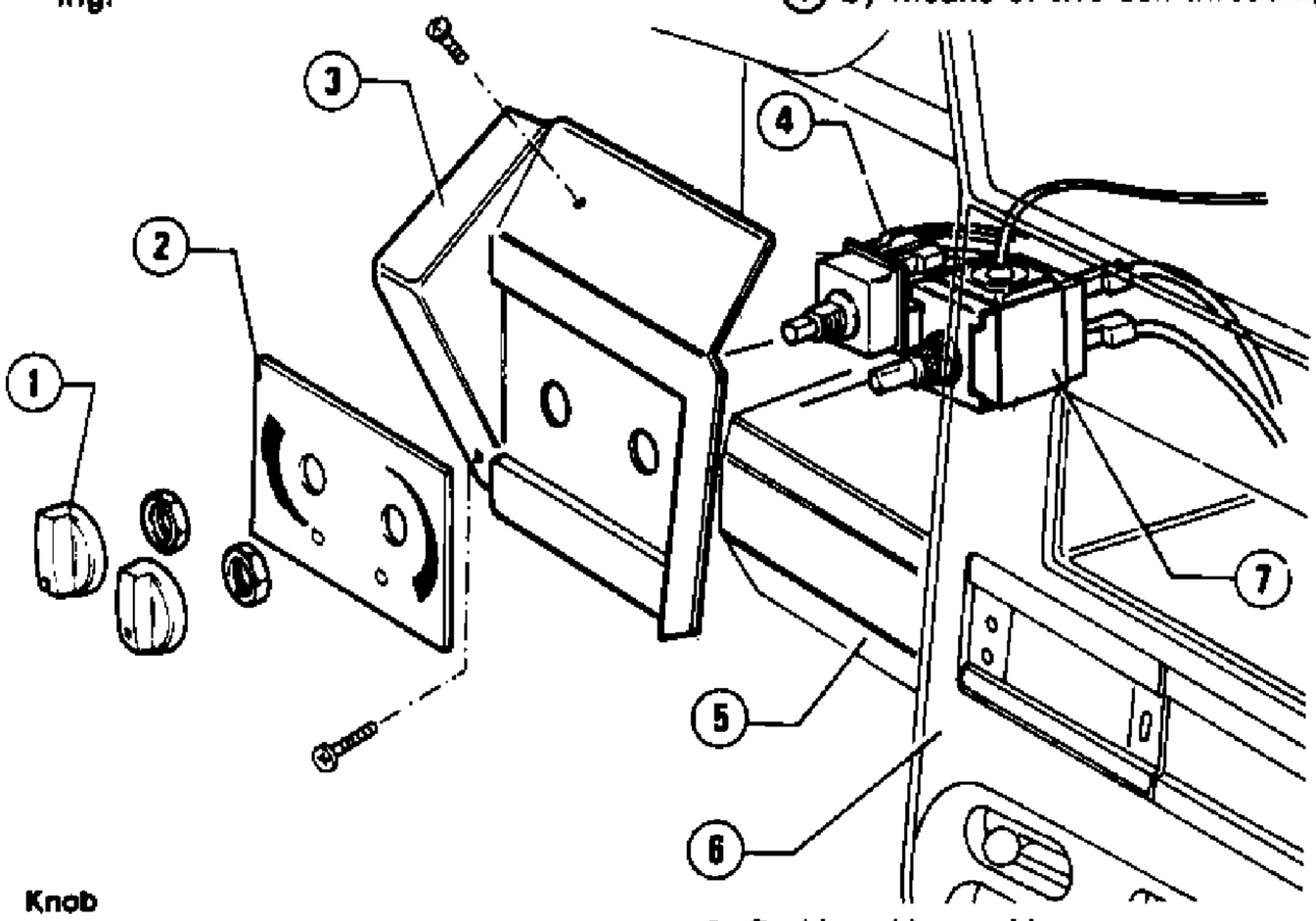


1 Thermostat probe
2 Cooler unit

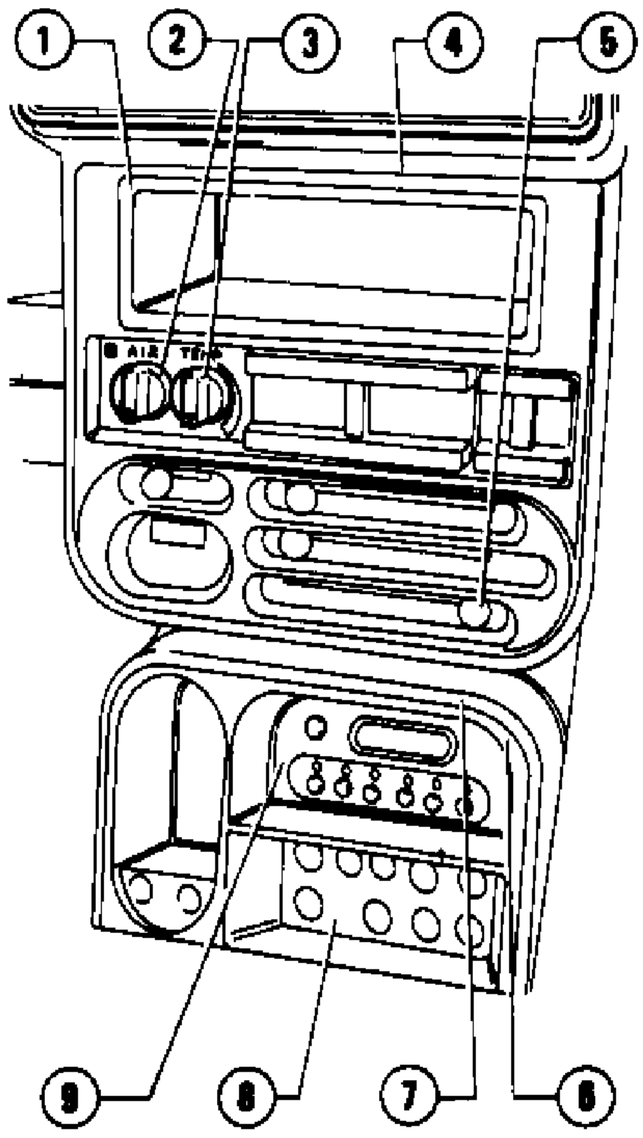
10. Install lower cover (1) and instrument holder (6), by reversing the order of removal.

(2c) For model Alfa 33 4x4

- Disconnect the wiring from switch and thermostat.
- Drill the lower part of dashboard (5) between the radio compartment and the steering column fairing; then insert the controls wiring.
- Fit switch (4), thermostat (7) and cover (2) on support (3), and secure them with the two related nuts.
- Connect the wiring of both thermostat and switch.
- Secure support (3) to dashboard (5) by means of two self-threading

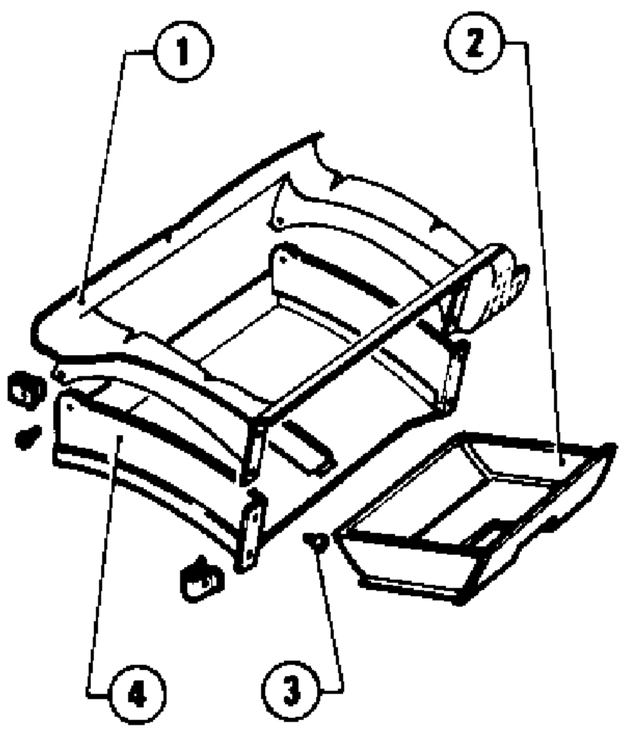


1 Knob
2 Cover
3 Controls support
4 3-setting switch
5 Dashboard lower side
6 Lower Cover
7 Thermostat



1 Lower cover
2 3-setting switch
3 Thermostat
4 Central console
5 Knob
6 Instrument holder
7 Speed gear console
8 Trip computer
9 ALFA ROMEO Control

11. Refit the object holder into its original seat (4) in the object holder, securing it with self-threading screws (3) and clips supplied in the kit; then insert the object holder.



1 Dashboard
2 Object holder
3 Self-threading screw
4 Object holder seat

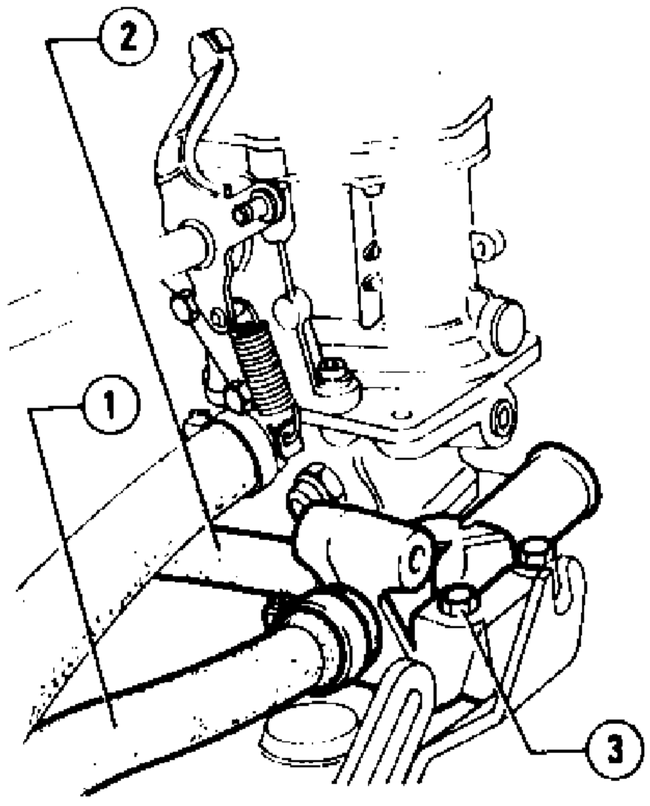
OPERATIONS IN THE ENGINE COMPARTMENT

PRELIMINARY DISASSEMBLIES

WARNING:
Proceed with care when working on a hot engine to avoid being burned.

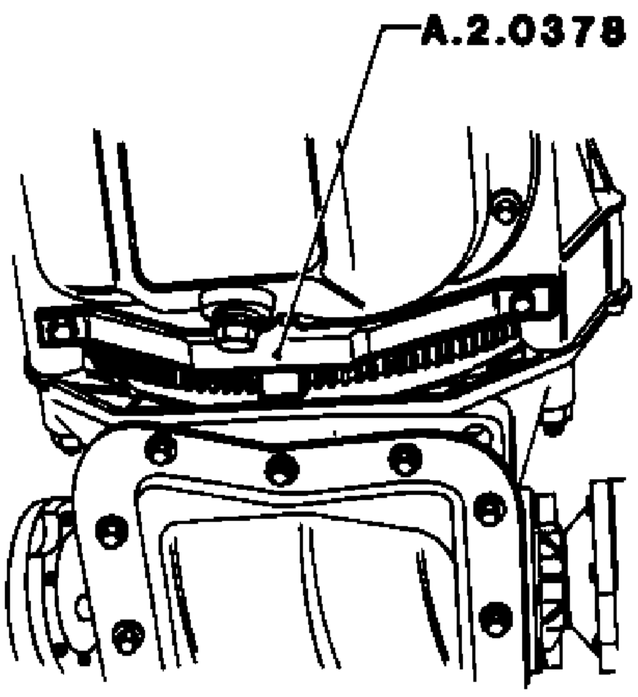
1. Remove bonnet (refer to Group 56 - Bonnet - Removal and Installation).
2. Remove battery.
3. Disassemble the air filter complete with filter body (refer to: Group 04 - Air Filter - Removal).
4. Remove coolant radiatore (refer to: Group 07 - Radiator - Removal and Installation).
5. Remove front bumper (refer to: Group 75 - Front Bumber - Removal and Installation).
6. Remove alternator (refer to Group 01 - Engine Disassembly - Engine Main Mechanical Unit - step 4).
Remove also the left front bracket supporting alternator.

7. Remove union.
(1) Disconnect hoses (1) and (2) from union (3).
(2) Unscrew the screws securing union (3) to engine block, then remove union.



1 Liquid - to thermostat delivery hose
2 Liquid - from heater return hose
3 Union

8. Remove crankshaft pulley.
(1) Raise vehicle on lift, unscrew the three screws securing flywheel cover, and remove it.
(2) Fit tool **A.2.0378** on engine block.



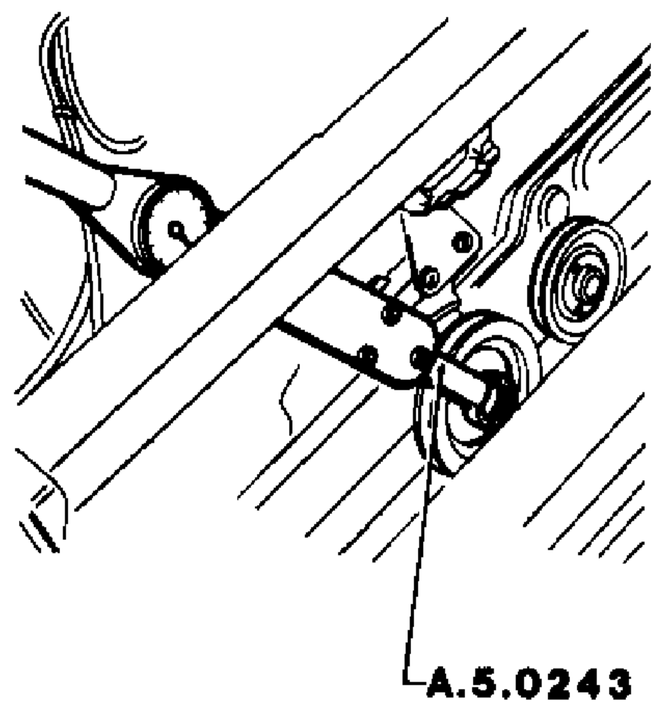
(3) By means of tool **A.5.0243**, unscrew the nut securing crankshaft pulley; remove pulley and related washer.

REASSEMBLY

1. **Specific engine pulley.**

(1) Fit the specific pulley with original washer and nut; then tighten the nut to the prescribed torque using a torque spanner fitted with extension **A.5.0243**.

(T): **Tightening torque**
Nut securing crankshaft pulley
- **with torque spanner directly applied on nut**
  118 to 144 N·m
  (12 to 14.7 kg·m
  86.8 to 106.3 ft·lb)
- **with extension A.5.0243 and torque spanner (with 300 mm (11.8 in) arm)**
  83.3 to 101.6 N·m
  (8.5 to 10.3 kg·m
  61.5 to 74.5 ft·lb)



(2) Remove tool **A.2.0378** and install flywheel cover.

2. **Suitable union.**
(1) Carefully remove any traces of the old sealant from the union connection surface.

CAUTION:
Take care not to drop particles of the old sealant into the cooling system hole on the engine block.

(2) Connect hose (2) to union (3) and tighten the related clamp.

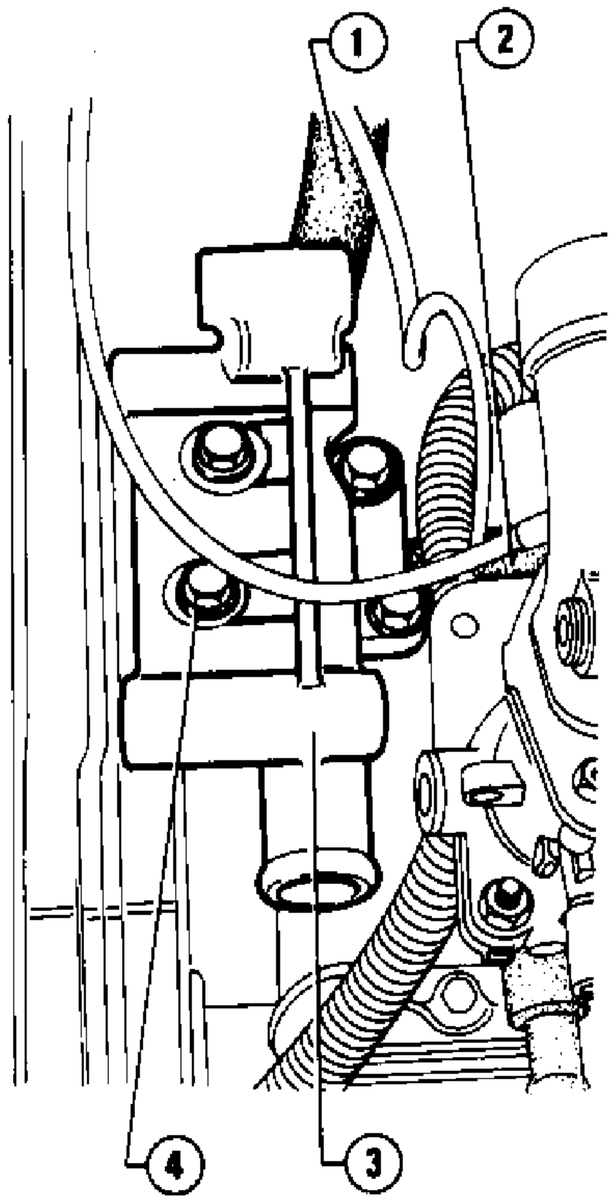
(3) Reduce length of sleeve (1) between union and thermostat, **to 10 mm (0.39 in)**; then, connect sleeve to union, and tighten the related clamp.
(4) Install union (3) with the related O-ring interposed, on the engine block.

It is advisable to smear the union supporting surface and related securing screws threads with gasket silicone.

CAUTION:
Position the O-ring correctly into its seat.

---

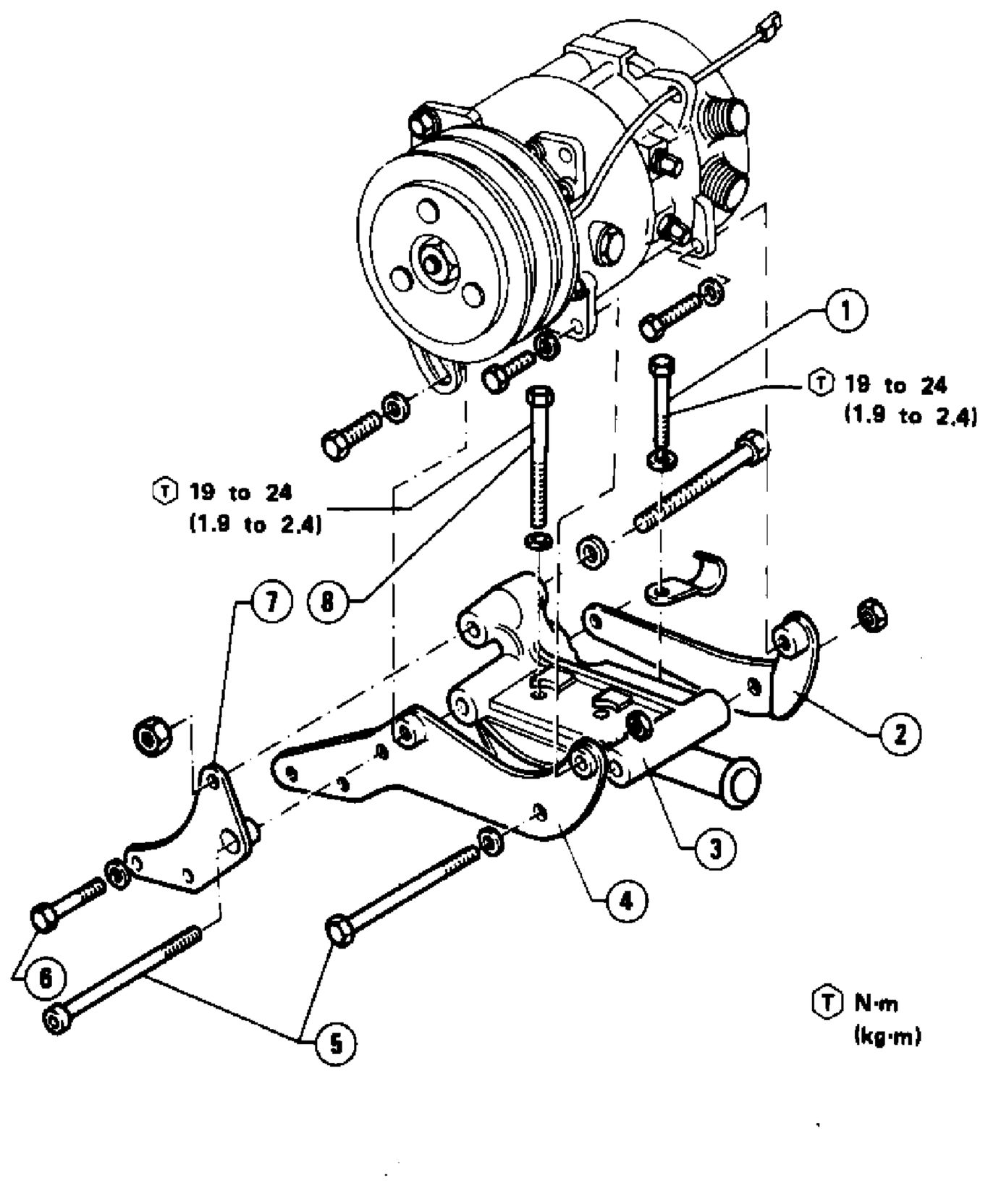
(5) Secure union (3) without tightening the related screws (4) taking into account that one of the screws secures the support bracket of the electric cables.



1 Sleeve
2 Liquid from heater return hose
3 Union
4 Screw securing union to engine block

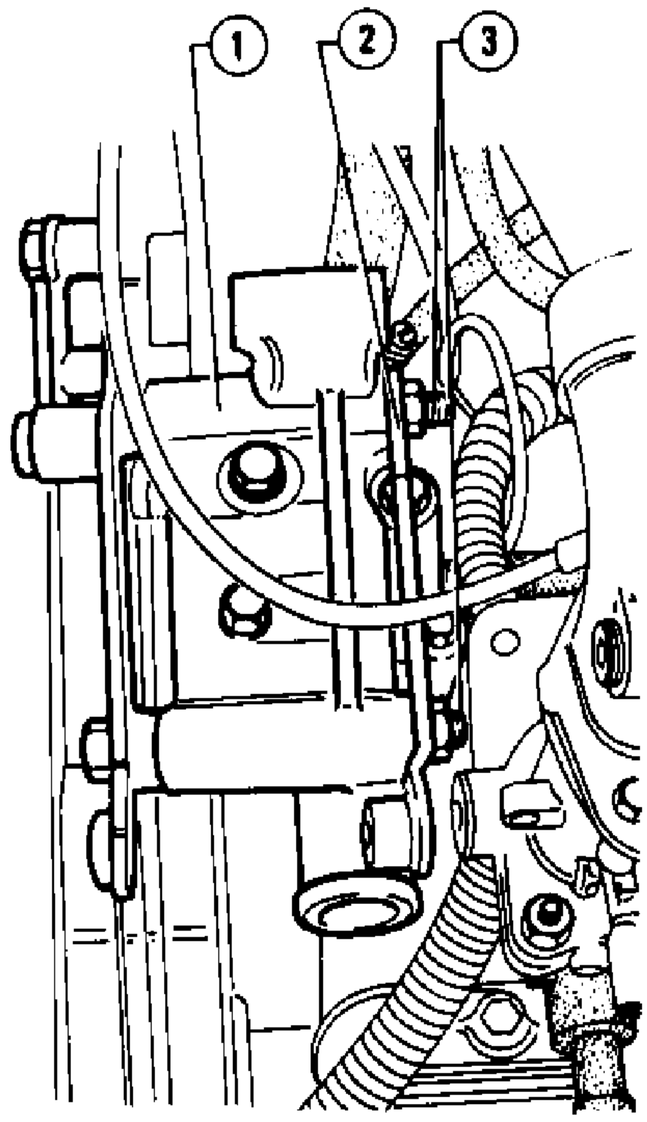
3. Brackets of the air conditioning system compressor.
(1) Place brackets (2) and (4) on union (3), and bracket (7) on engine block; secure the brackets with the related screws (5) and (6), without tightening them.
(2) Tighten screws (5) so as to align the brackets; then tighten screws (6).
(3) Tighten the two front screws (8) to the prescribed torque, unscrew screws (5) and remove bracket (2) to gain access to the two rear screws (1); then tighten also these to the prescribed torque.

(T): **Tightening torque**
Screws securing union to engine block
19 to 24 N·m
(1.9 to 2.4 kg·m)



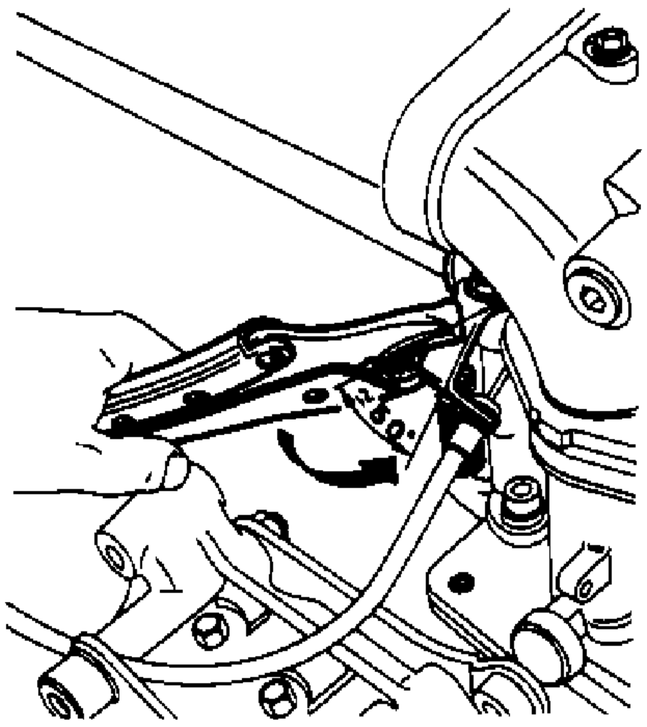
1 Rear screw securing union to engine block
2 Rear bracket
3 Union
4 Front bracket
5 Screws securing brackets to union
6 Screw securing bracket supporting alternator on engine block
7 Bracket supporting alternator
8 Front screw securing union to engine block

(4) Install rear bracket (2) and tighten the two screws (3) securing union (1).



1 Union
2 Rear bracket
3 Screws securing brackets to union

(5) By means of pliers, tilt the choke cable sheath support bracket left side downwards (50° approx), so that sheath does not interfere with the compressor to be installed.



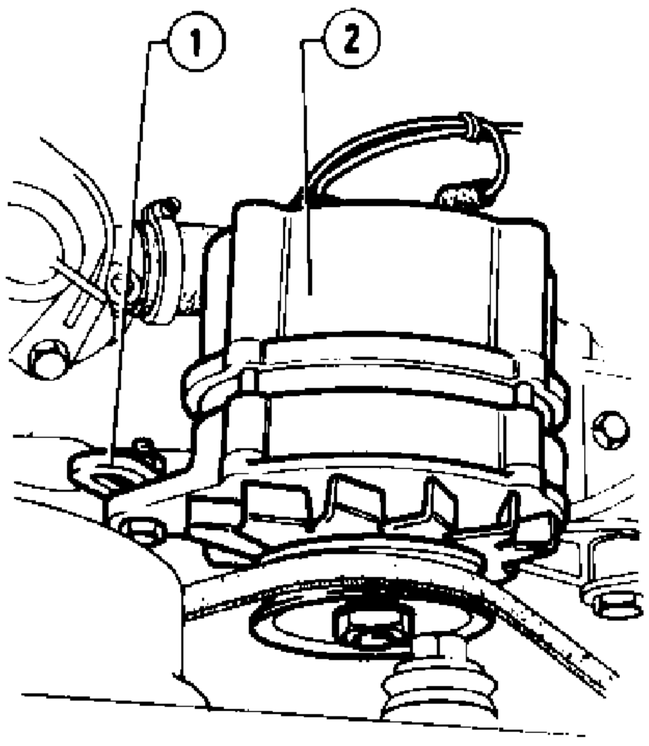
4. Alternator.

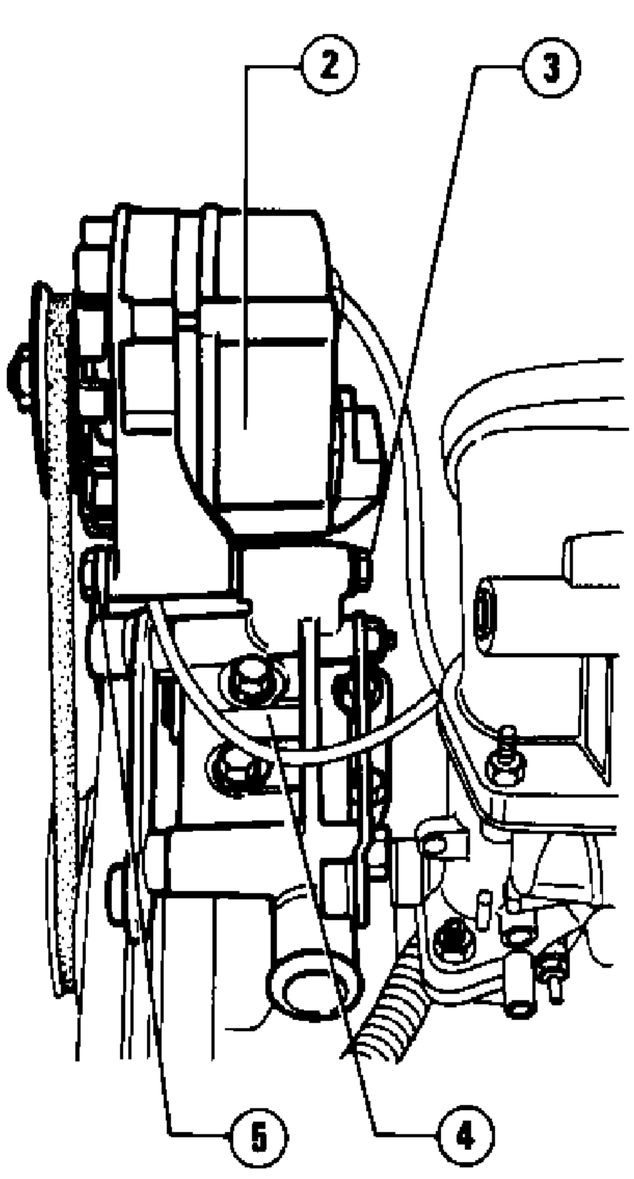
(1) Place alternator (2) on union (4) and on the related bracket (5), secure it on left side with bolt (3).

The screw head must be from the alternator rear side, and the stem must not protrude out of nut (after tightening).

(2) Secure the alternator right side to belt tightener bracket (1).

(3) Install the original drive belt of alternator, then carry out tensioning; tighten the securing bolts of alternator.





1 Belt tightener bracket
2 Alternator
3 Bolt
4 Union
5 Bracket

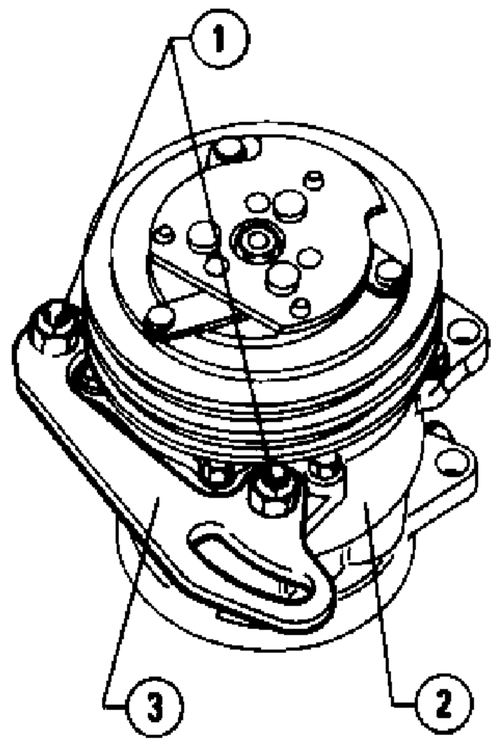
(4) Reconnect the alternator to the supply and warning lamp cables.

5. Radiator.

Reinstall coolant radiator on vehicle, and reconnect sleeves and wiring (refer to Group 07: Radiator - Removal and Installation).

6. Compressor.

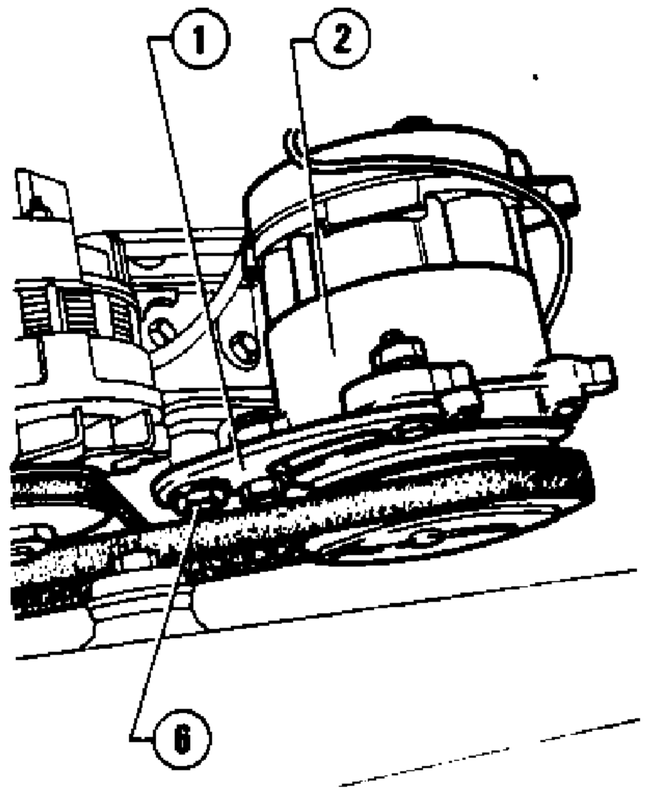
(1) Operating at bench, install belt tightener bracket (3) on compressor (2), on the opposite side with respect to Freon unions; then tighten securing bolts (1).

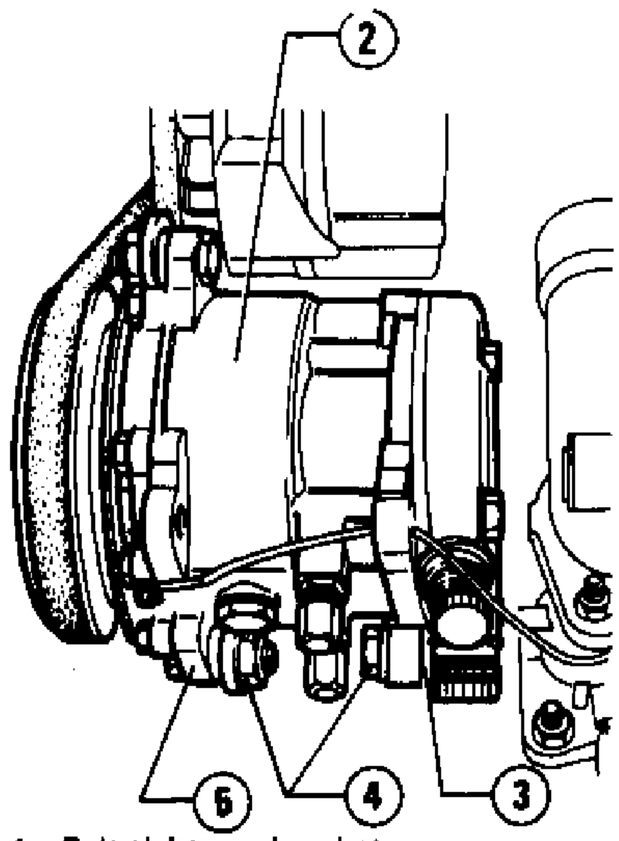


1 Bolts
2 Air conditioner compressor
3 Belt tightener bracket

(2) Position compressor (2) on brackets (3) and (5); secure it with bolts (4), without tightening these.

(3) Tighten screw (6) securing belt tightener bracket (1) to bracket (5).





1 Belt tightener bracket
2 Compressor
3 Rear bracket
4 Bolts
5 Front bracket
6 Screw

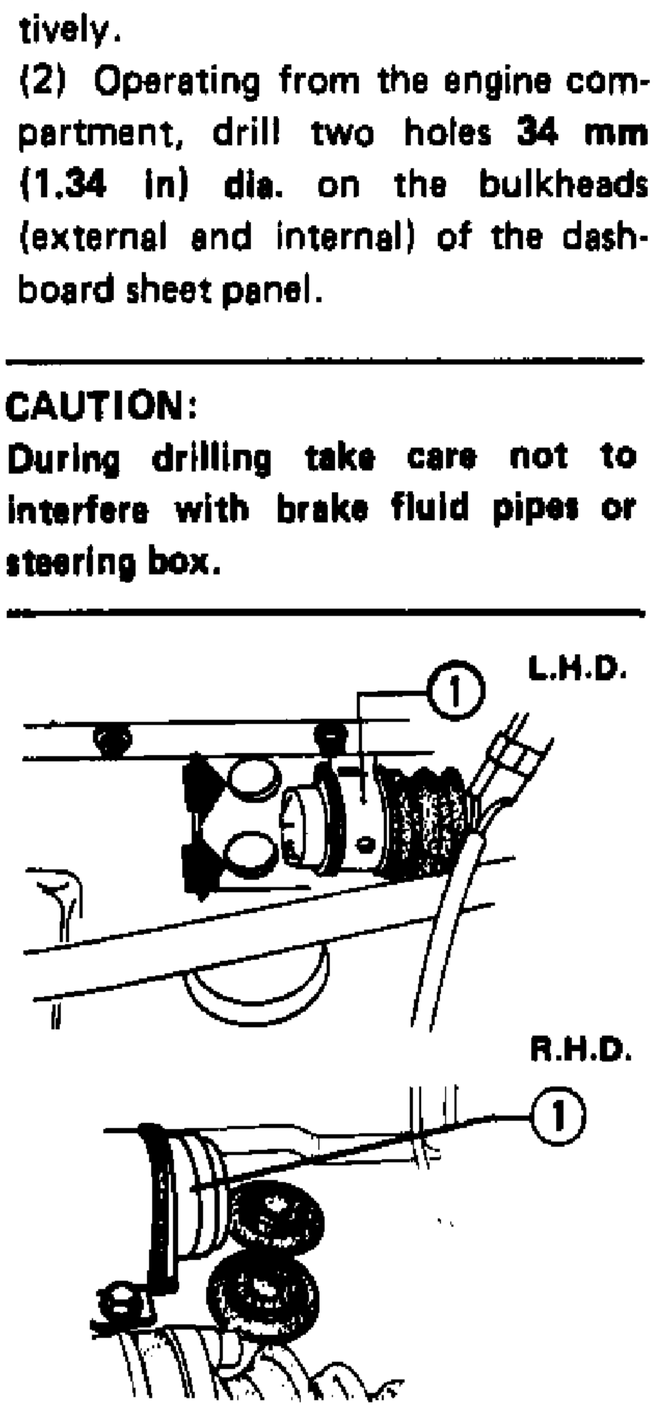
(4) Fit the compressor drive belt, move compressor upwards and put belt under tension; then tighten the securing bolts and nuts.

7. How to pass hoses and wirings on the dashboard sheet panel.

(1) Lift the right side carpet inside the passenger compartment for the L.H.D. models and the left side carpet for the R.H.D. models respectively.

(2) Operating from the engine compartment, drill two holes **34 mm (1.34 in) dia.** on the bulkheads (external and internal) of the dashboard sheet panel.

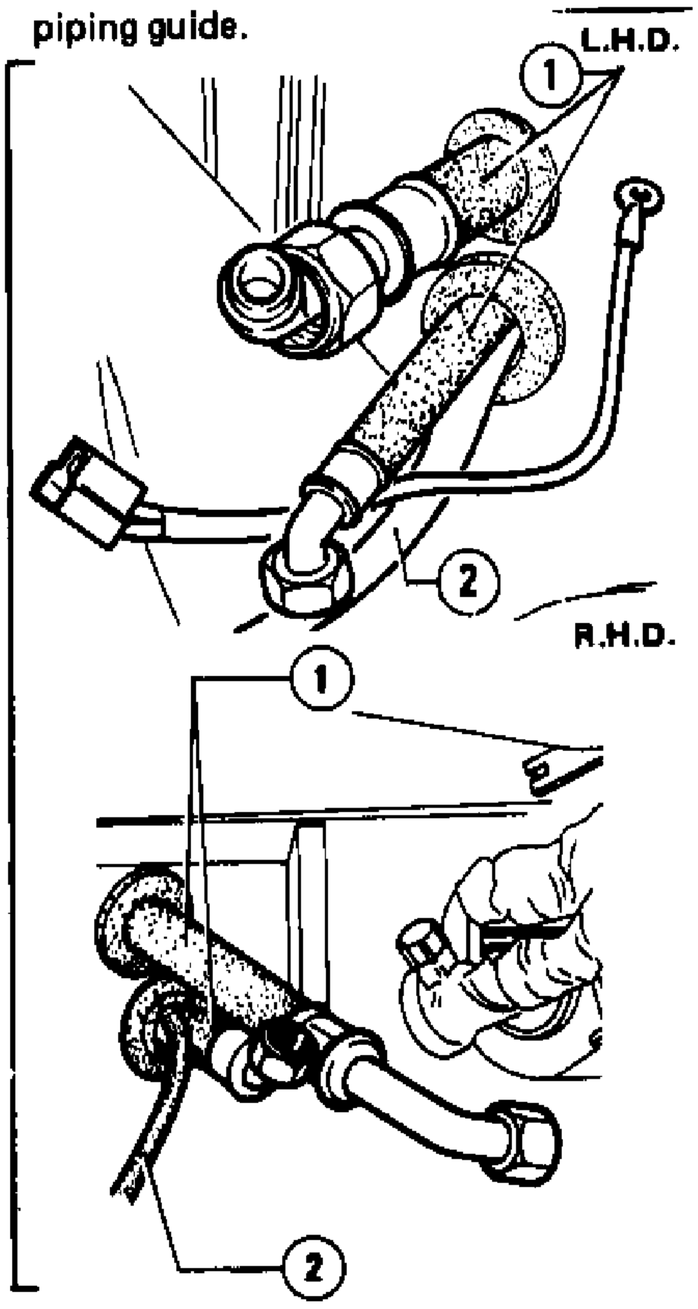
CAUTION:
During drilling take care not to interfere with brake fluid pipes or steering box.



1 Steering box

(3) Fit the piping guide rubber ring on each hole.

(4) Insert electric cables 2 of the air conditioning system into the piping lower guide, then the two hoses 1 for the delivery (5/16") and return (1/2") of cooler fluid, positioning the smaller the lower piping guide.



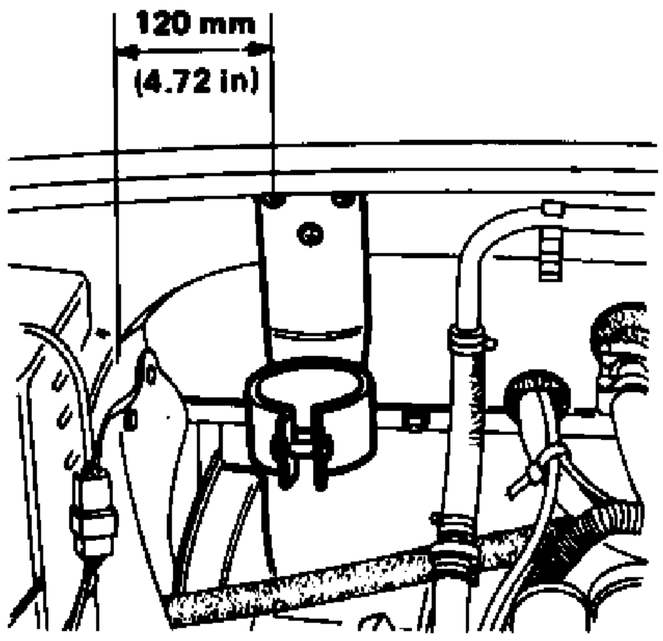
1 Fluid delivery and return hoses
2 Electric cables

8. Drying filter and Trinary pressure gauge.

(1) Position the filter support bracket on the scuttle front cross member, complying with the dimension shown in the figure, and mark the securing holes positions.

(2) Drill three holes **(3.5 mm dia (0.14 in))** on the cross member, in correspondence with the previous marks.

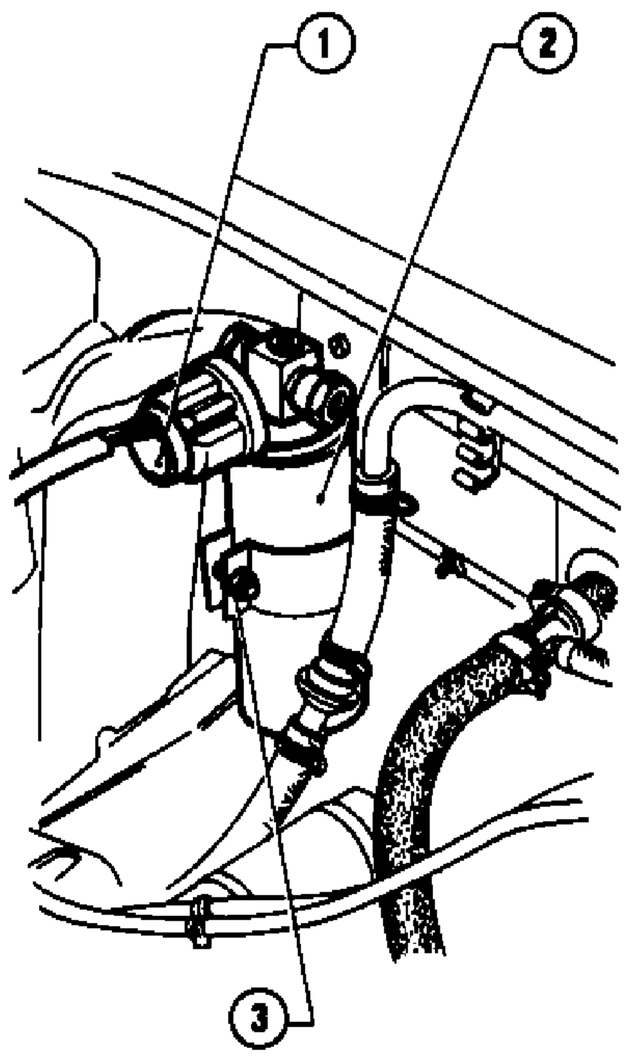
(3) Secure the filter support bracket, using three self-threading screws.



(4) Mount drying filter (2) on the related bracket, and secure it by tightening bolt (3).

(5) Tighten pressure gauge (1) union on drying filter (2).

CAUTION:
This operation must be carried out rapidly in order to prevent humidity from entering the drier since this could decrease its efficacy.



1 Trinary pressure gauge
2 Drying filter
3 Bolt

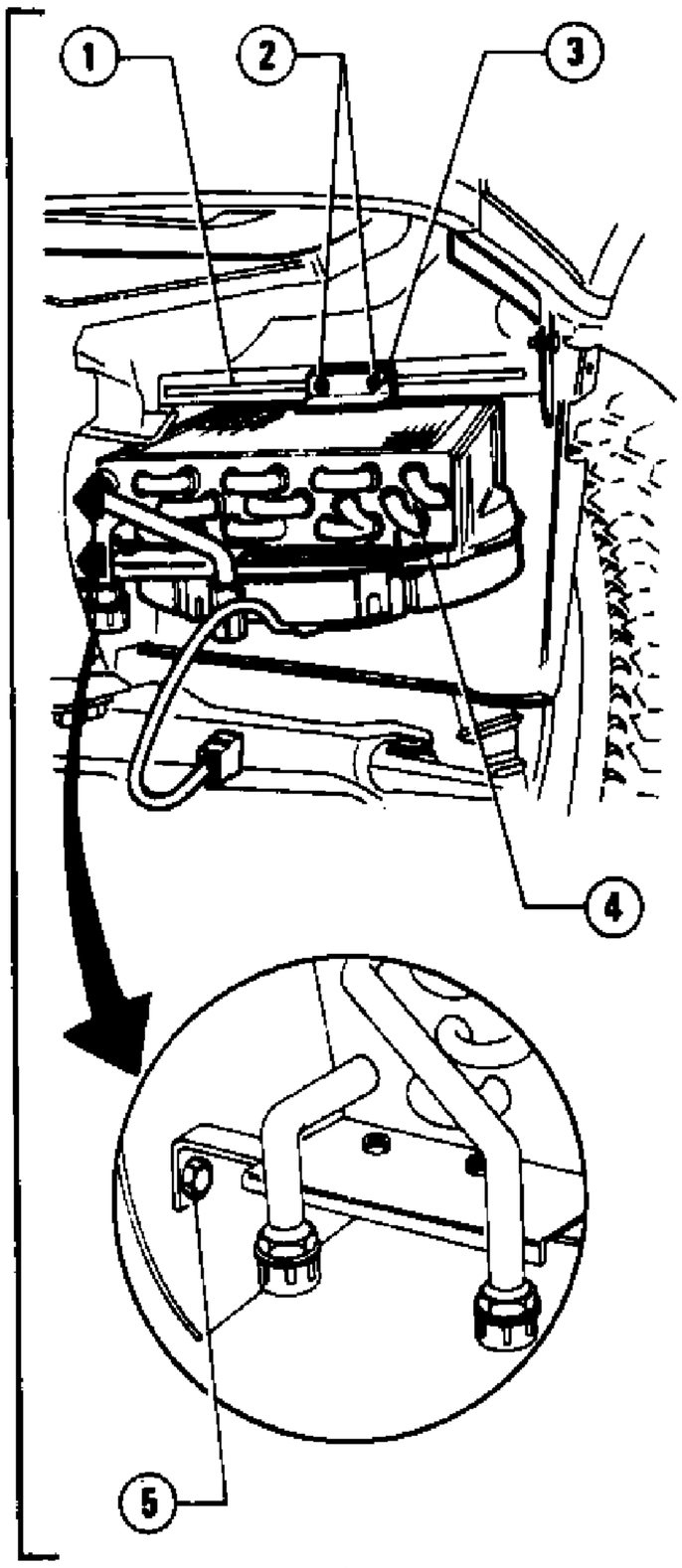
9. Condensers.

(1) Raise vehicle on lift, position condenser (4), complete with electric fan, and secure it by means of self-threading screw (5).

If necessary, in order to fit the condenser, bend the sheet panel edge towards the vehicle centre line as shown in the figure.

(2) Support condenser and drill two holes on cross member (1) in correspondence with the holes of bracket (3). Remove apron to make operation easier.

(3) Secure bracket (3) to cross member (1), using two bolts (2) with related washers; operate in the same way for the other condenser.



1 Fender cross member
2 Bolts
3 Condenser bracket
4 Condenser with electric fan
5 Self-threading screw

10. Condenser piping.

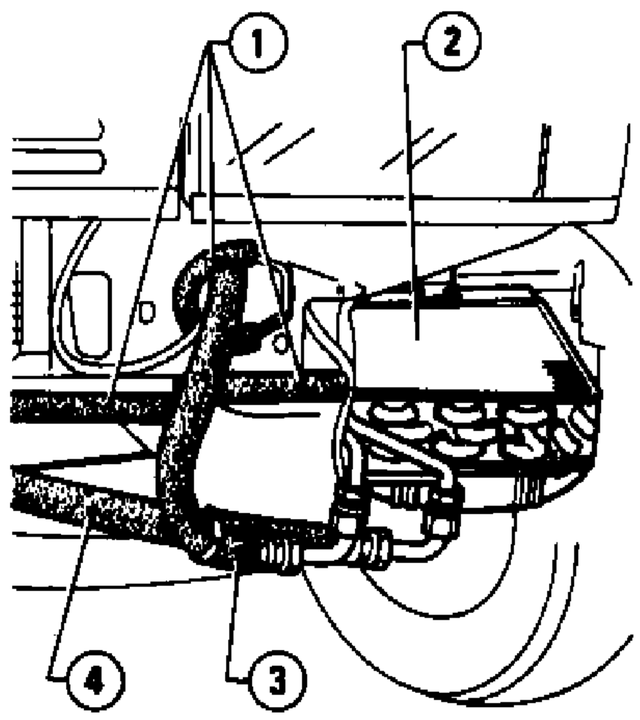
(1) Place hoses (3) and (5) between engine compartment and condensers, arranging them under front headlights, taking care not to bend them excessively.

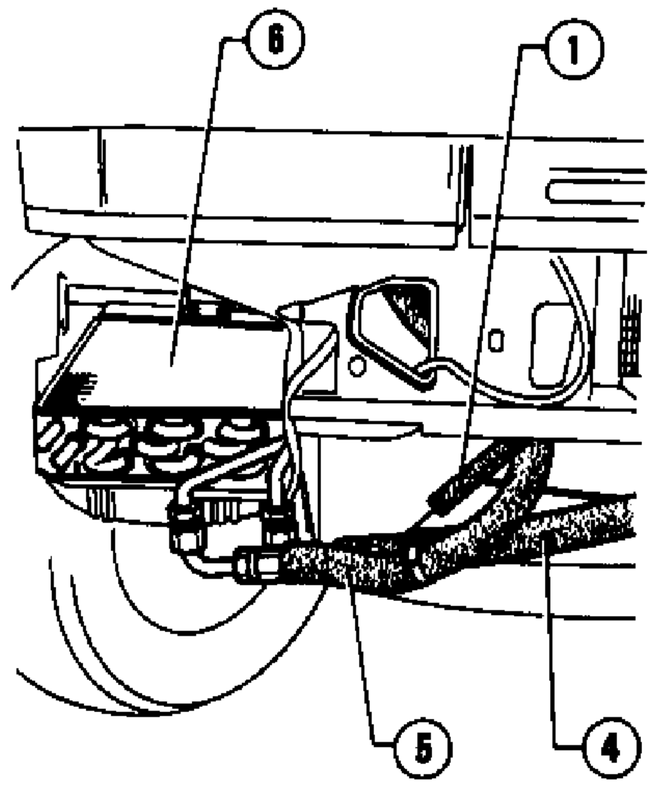
(2) Secure the appropriate rubber protection (1) on the sheet metal panel, included also the internal part not visible in the figure, so as to prevent hoses from coming in contact with the sheet metal panel.

(3) Lubricate with antifreeze oil, and connect the unions of the following piping.

- Hose (3) (13/32"), on inlet union of left condenser (2).
- Hose (4) (13/32"), on inlet/outlet unions of condensers.
- Hose (5) (5/16") on outlet union of right condenser (6).

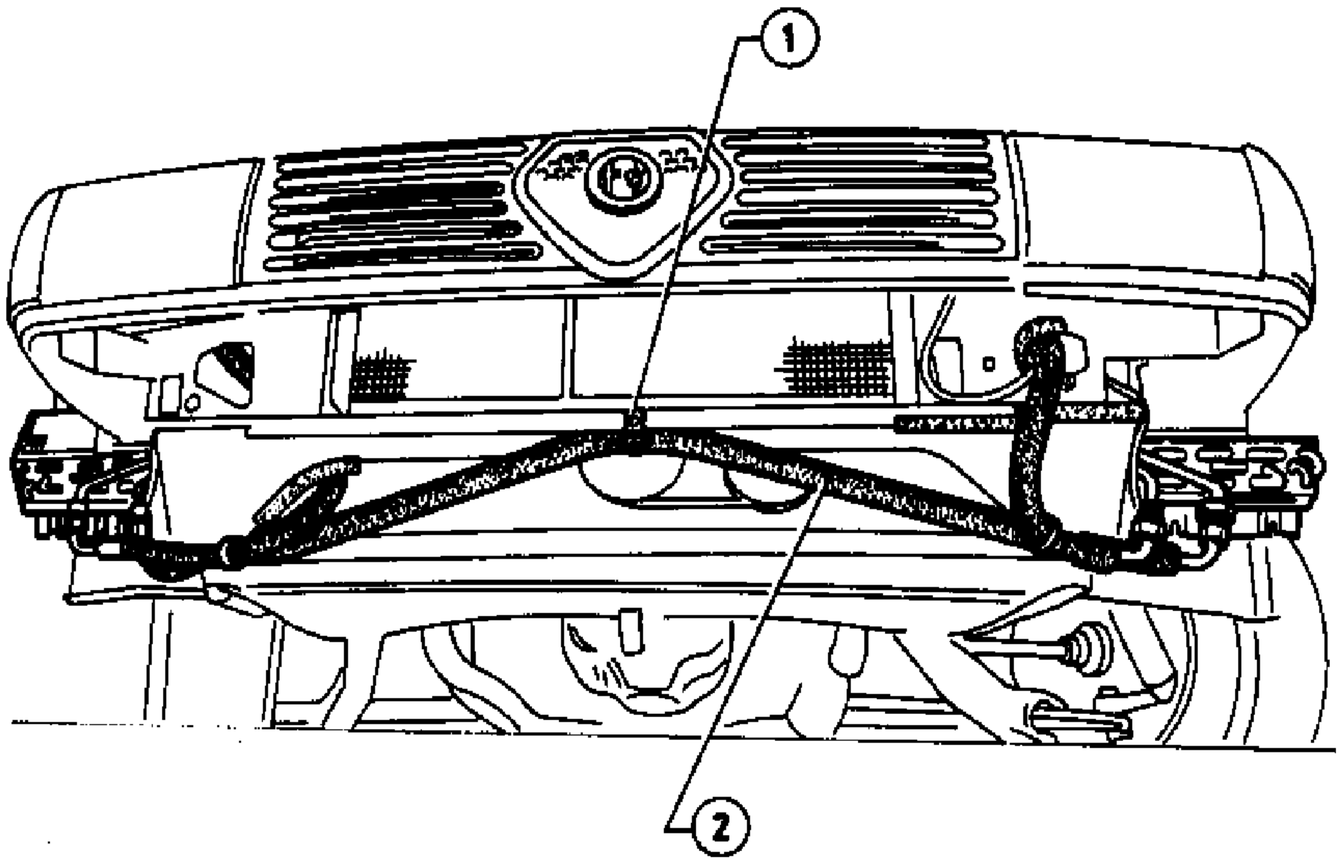
CAUTION:
When tightening unions, apply a bucking wrench on them, to prevent damaging the condenser inlet/outlet piping.





1 Rubber protection
2 Left condenser
3 Hose connecting compressor to left condenser
4 Hose connecting condensers
5 Hose connecting right condenser to drying filter
6 Right condenser

(4) By means of clamps (1), secure hose (2) connecting condenser to body.



1 Clamp
2 Hose connecting condensers

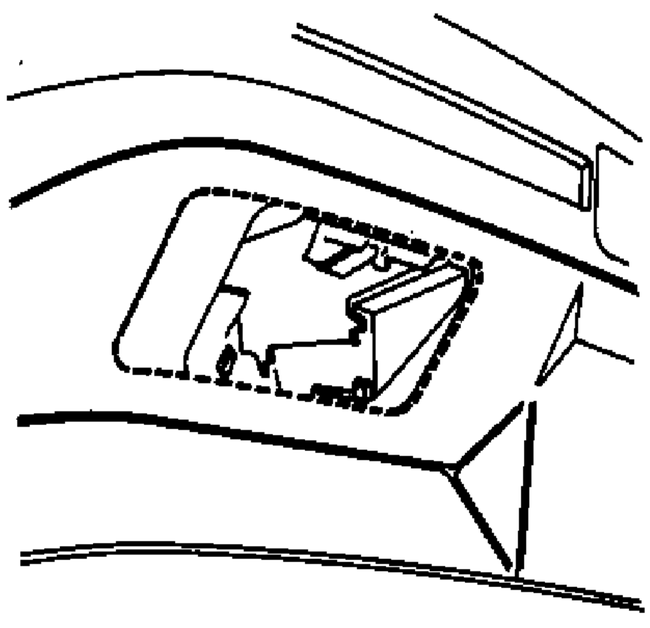
11. Wiring.

Arrange the air conditioner wiring and attach the connectors for condenser electric fan.

12. Preparation of the front bumper at bench.

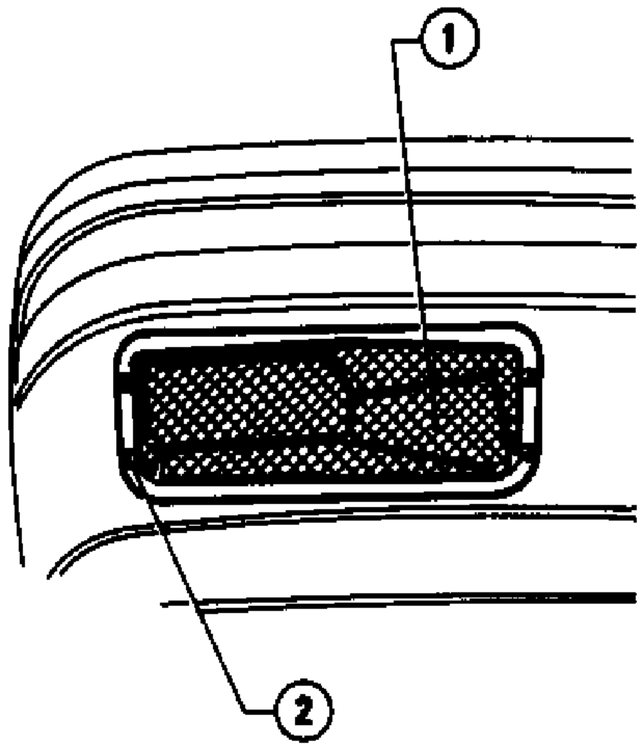
(1) Remove the two foglight seat covers from front bumper.

(2) By means of a template (supplied in the kit), mark the bumper area to be removed in correspondence with the foglight seats (refer to figure).



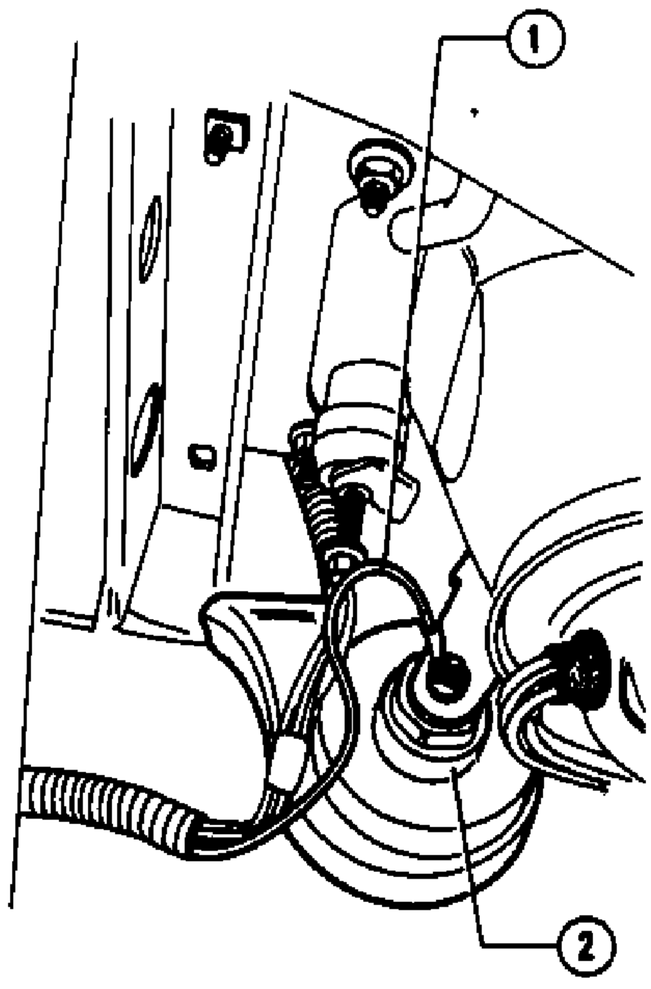
(3) By means of a suitable hacksaw, perform a cut a few millimetres inside the line marked on both sides of bumper.

(4) Mount air ducts (1) securing them to the bumper with screws (2).



1 Right air duct
2 Self-threading screw

13. Modified front bumper (Refer to Group 75 - Front Bumper - Removal and Installation); taking care to connect the terminals of ground cables (1) on the studs securing horns (2).

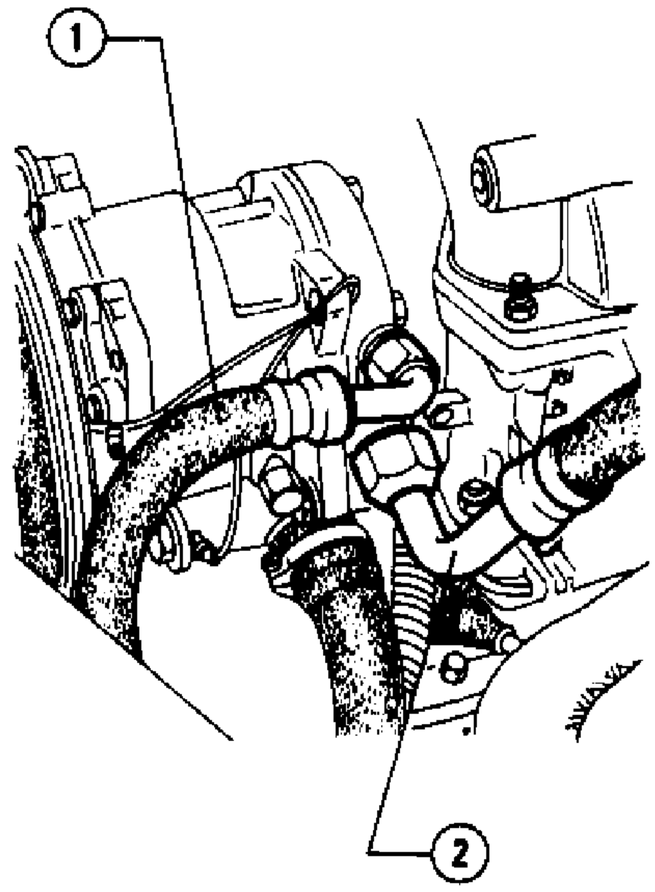


1 Ground cable for condenser electric fan
2 Horn

14. Completion of the installation of system piping.

(1) Lubricate with antifreeze oil and connect the unions of the following piping:

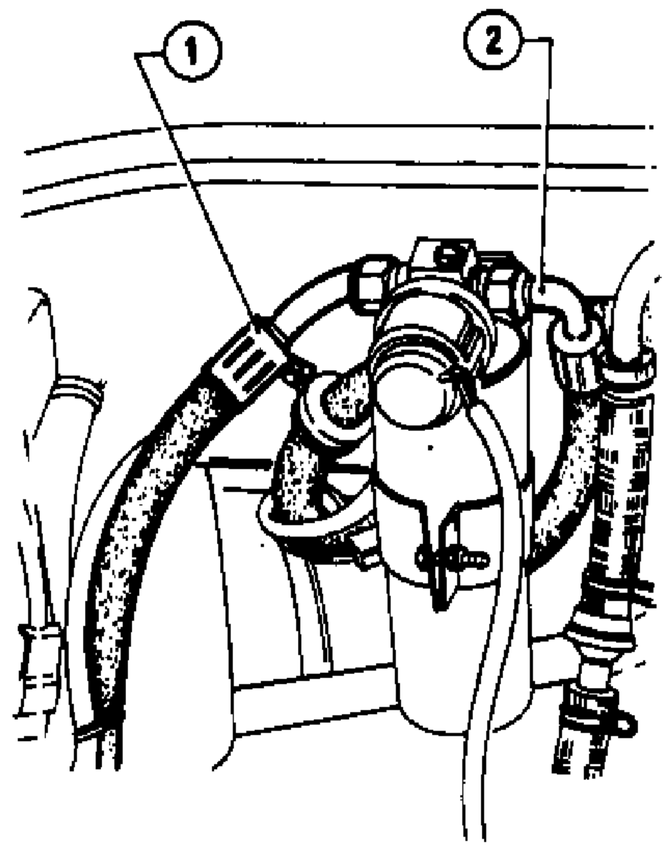
- Hose (2) (1/2") on compressor inlet union.
- Hose (1) (13/32") on compressor outlet union.



1 Hose connecting compressor to left condenser
2 Hose connecting cooler to compressor

- Hose (1) (5/16") on drying filter inlet union.
- Hose (2) (5/16") on drying filter outlet union.

CAUTION:
The piping connection on drying filter must be carried out very rapidly; in fact, if drying filter internal components come in contact with the air, the component efficacy it reduced.

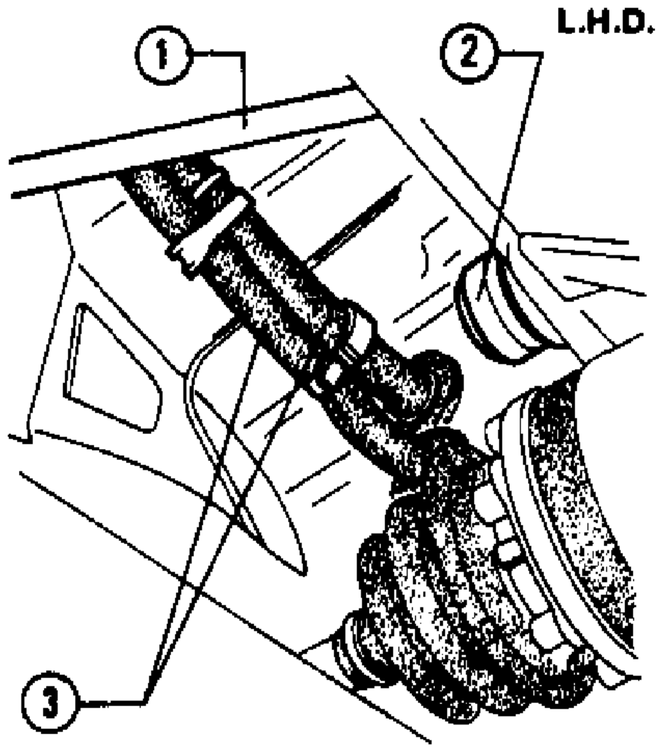


1 Hose connecting right condenser to drying filter
2 Hose connecting drying filter to cooler

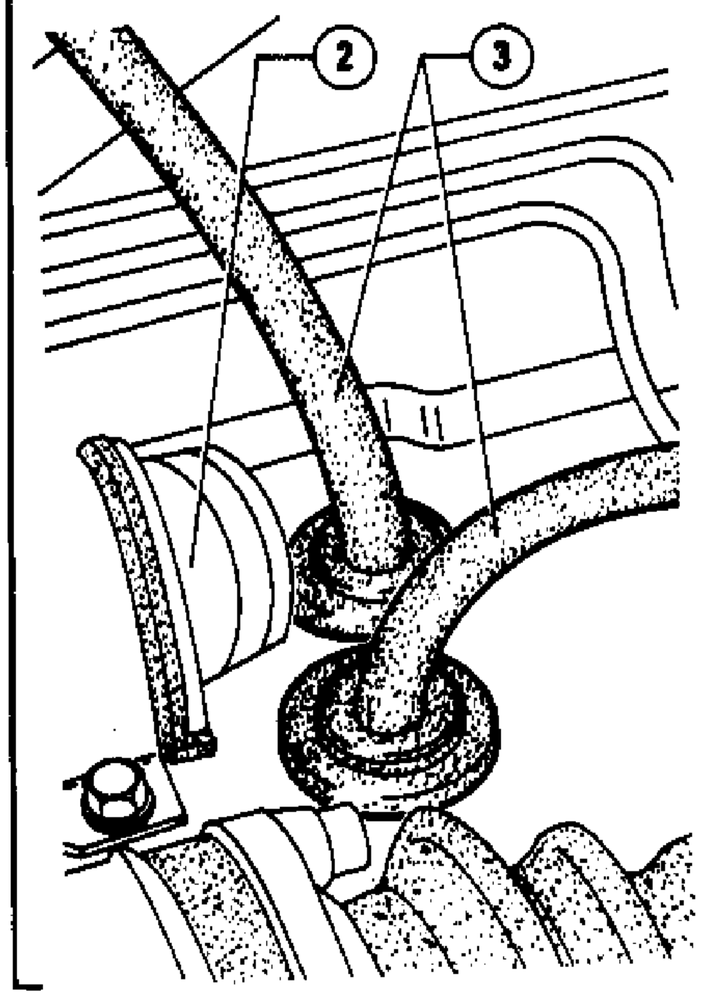
(2) Secure the system piping to body, by means of the suitable clamps contained in the kit.

CAUTION:
Take the utmost care when securing the cooler delivery/return hoses in correspondence with the dashboard sheet panel, so as to prevent any interferences with the steering transmission levers.

L.H.D.

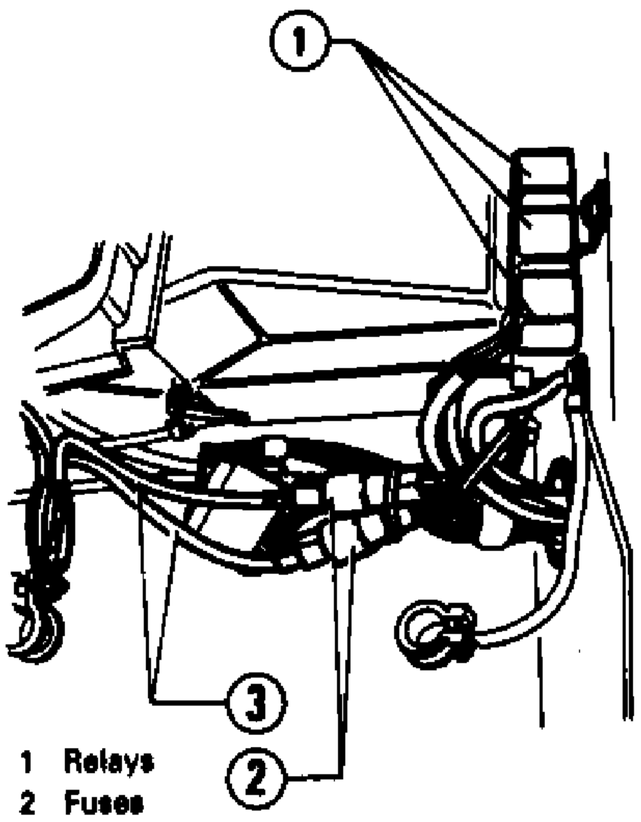


R.H.D.



1 Steering transmission levers
2 Steering box
3 Air conditioner hoses

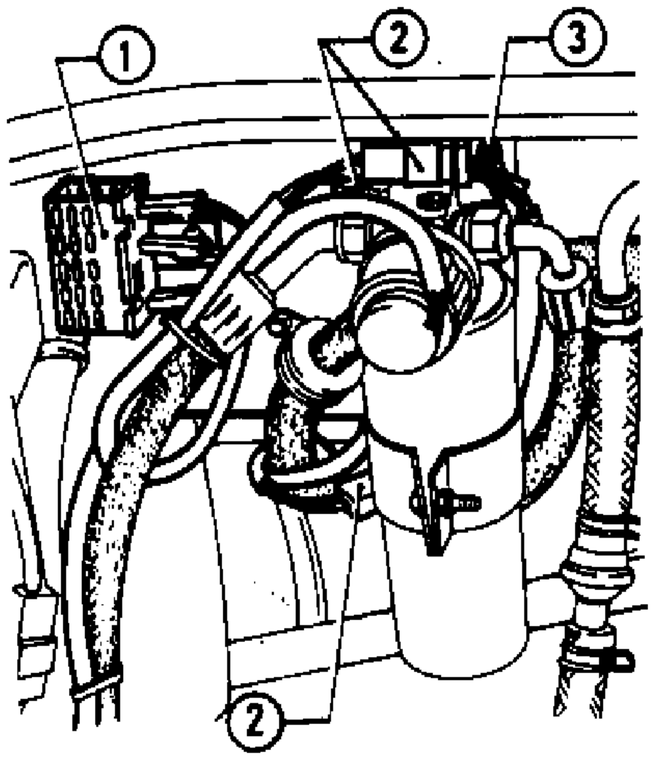
15. Completion of wiring.
(1) Secure the three relays (1) to body.
(2) Secure cables (3) to battery positive terminal.



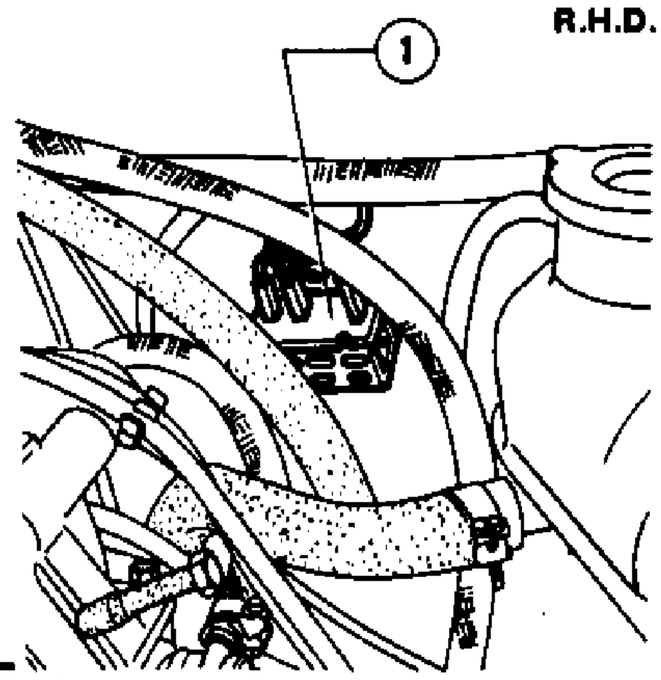
1 Relays
2 Fuses
3 Air conditioner supply cables

(3) Position resistor (1) as per figure, and secure it to body by means of a self-threading screw.
(4) Secure the Trinary pressure gauge ground cable (3) to body.
(5) Connect the cable connectors (2) related to relays, trinary pressure gauge and control system inside the passenger compartment.

L.H.D.

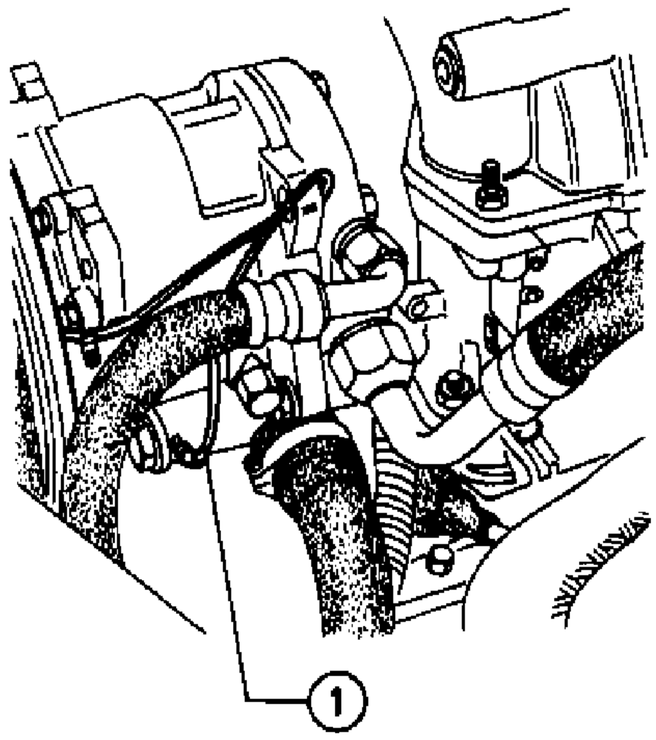


R.H.D.



1 Resistor
2 Connectors
3 Ground cable

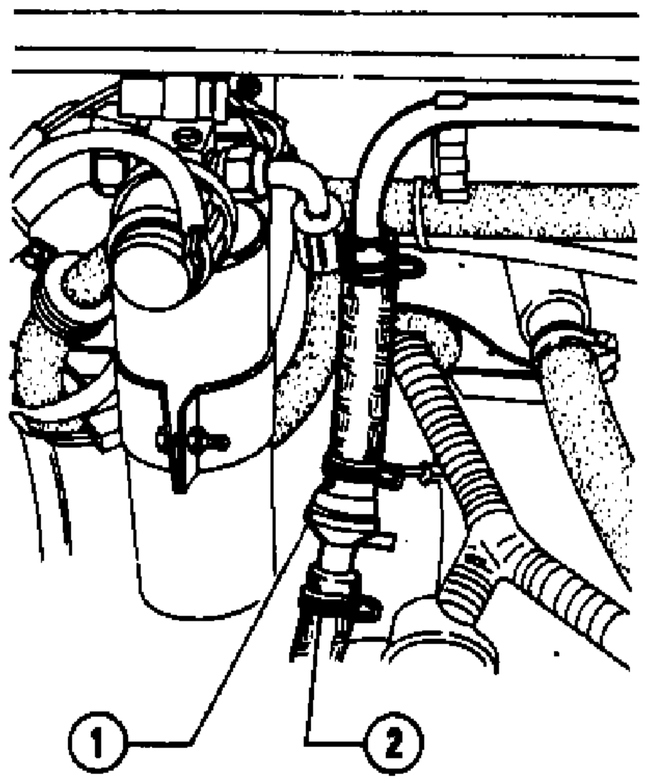
(6) Connect the movable connector of the electromagnetic coupling supply cable (1) of compressor.



1 Electromagnetic coupling supply cable

Secure wiring with suitable clamps.

16. Fast idle r.p.m. device.
(1) Replace the single-acting valve on hose (2), with a suitable valve (1), fitted with side intake.



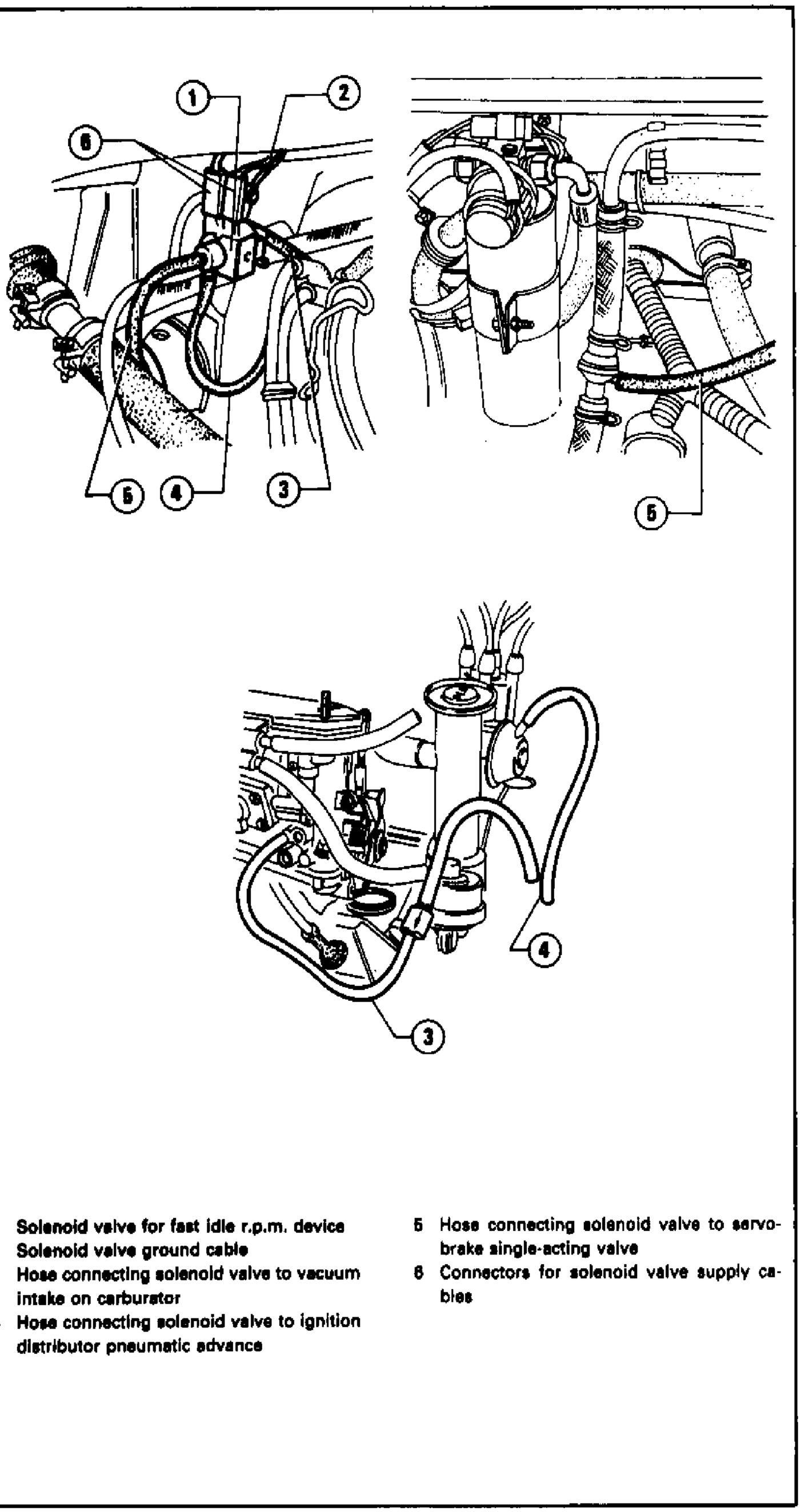
1 Single-acting valve with side intake
2 Servobrake vacuum intake hose

(2) Secure solenoid valve (1) on the sheet panel connection of the engine central support; then connect ground cable (2) to body by means of the solenoid valve securing screw.
(3) Disconnect the vacuum hose from pneumatic advance regulator of the ignition distributor.

(4) Connect the following hoses to the mentioned components.

- Hose (5), to single-acting valve on the servobrake vacuum intake hose.
- Hose (3), to the solenoid valve.
- Hose (4), to the ignition distributor pneumatic advance regulator.

(5) Position the cable connecting solenoid valve to electromagnetic coupling, inserting connectors (6).

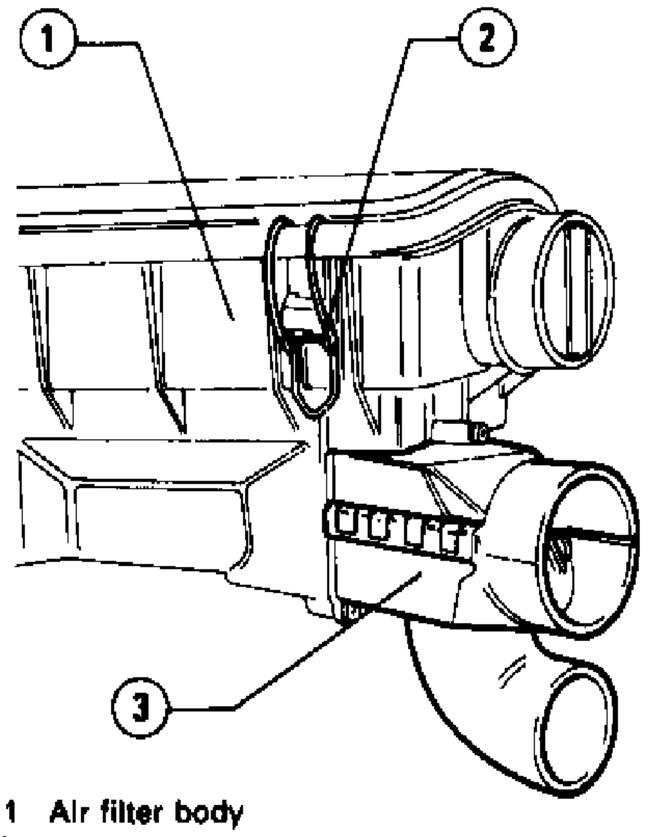


1 Solenoid valve for fast idle r.p.m. device
2 Solenoid valve ground cable
3 Hose connecting solenoid valve to vacuum intake on carburator
4 Hose connecting solenoid valve to ignition distributor pneumatic advance
5 Hose connecting solenoid valve to servobrake single-acting valve
6 Connectors for solenoid valve supply cables

17. Modification of air filter intake.

(1) Unscrew the screws securing air intake (3) to filter body (1); remove air intake.

(2) Remove clip (2).



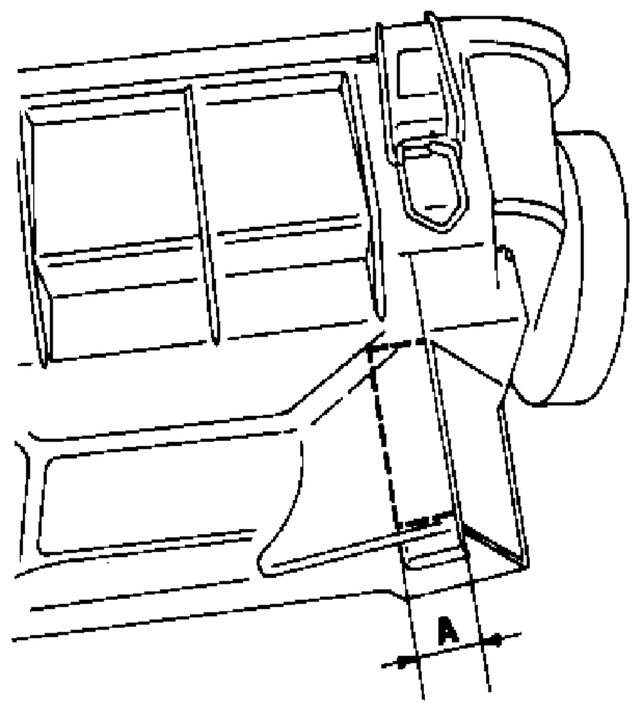
1 Air filter body
2 Clip
3 Air intake with thermostat

(3) Cut the end of the air filter intake, according to the dimension given in the figure.

A = 20 mm
for air filters Mod. FISPA 11.30.20

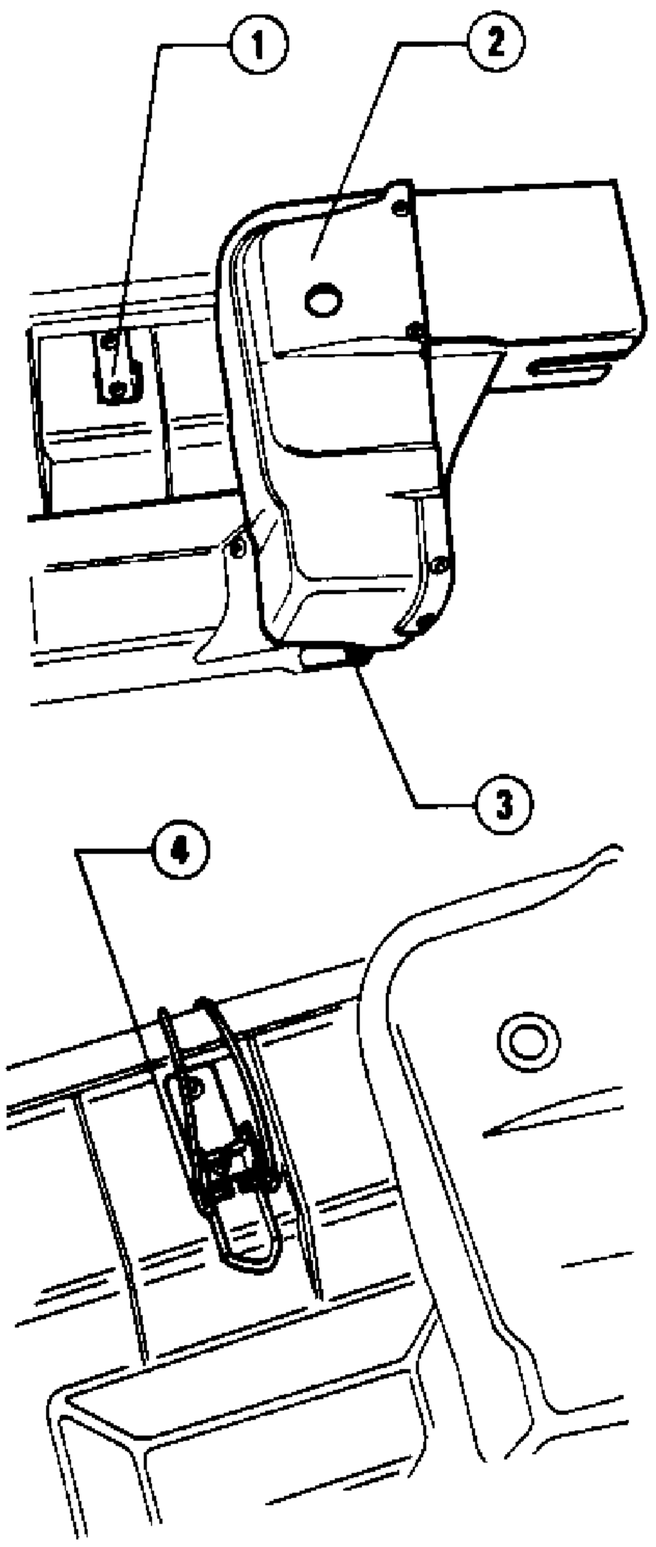
A = 30 mm
for all the other models

After cutting, verify that the air union, supplied in the kit, is completely inserted in the filter body inlet.



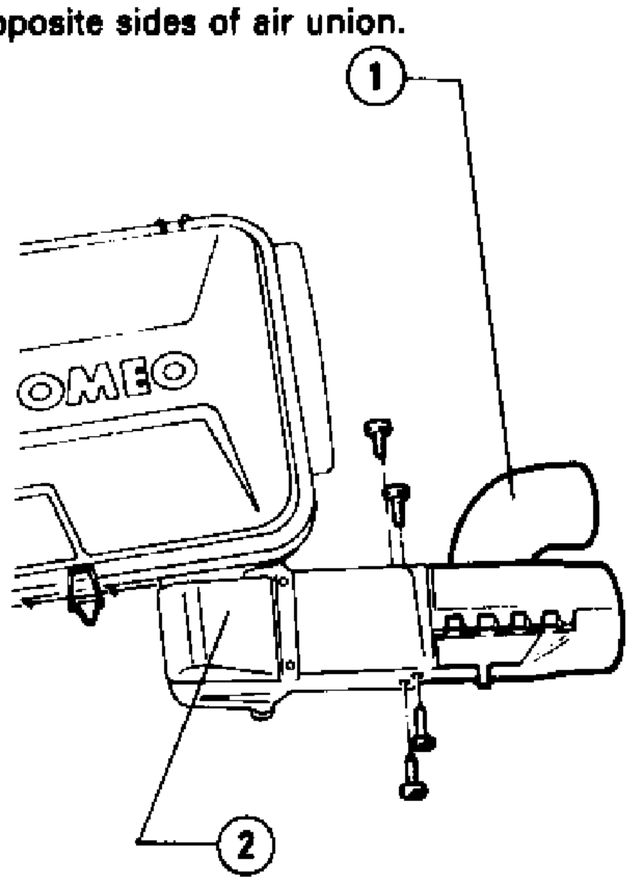
(4) Insert air union (2) on filter body, and secure it with self-threading screws (3).

(5) By means of rivets, secure bracket (1) in the position shown in the figure, and secure the clip (4) securing air filter cover.



1 Bracket
2 Air union
3 Self-threading screws
4 Clip

(6) Install the original air intake (1) on air union (2), securing it with four self-threading screws arranged on the two opposite sides of air union.

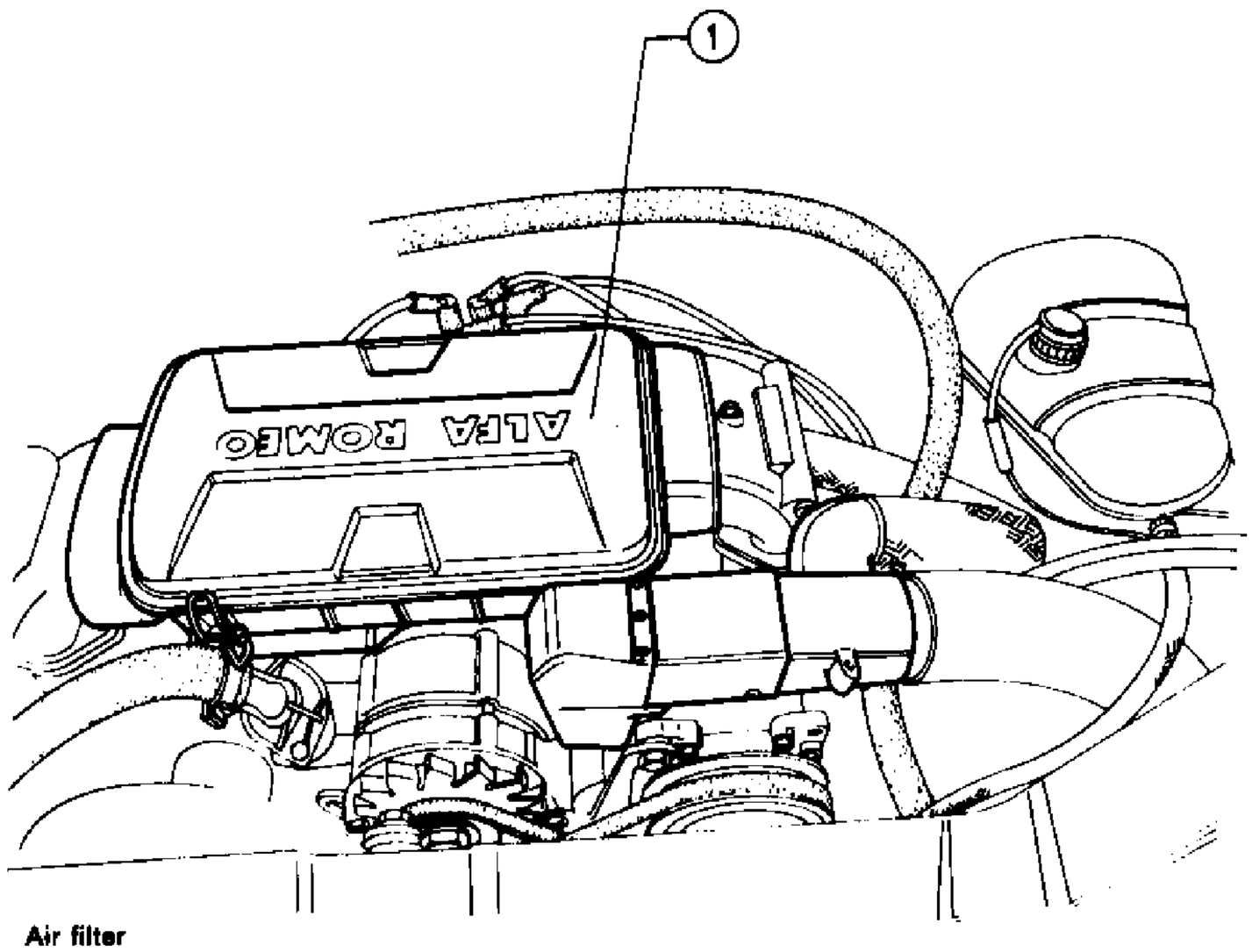


1 Air intake with thermostat
2 Air union

(7) Seal the joints between filter body, union and air intake with silicone.

18. Final operations.

- Place battery into the engine compartment, and reconnect terminals.
- Fill the engine cooling system with the quantity and quality of coolant prescribed (refer to Group 07 - Service Data and Specifications).
- Install the air filter (1) by reversing the order of removal.



1 Air filter

- Refill the air conditioning system (refer to - Fillings and Checks) and, if necessary, top-up the engine cooling system header tank with the prescribed liquid.
- Install bonnet (refer to: Group 56 - Bonnet - Removal and Installation).

FILLINGS AND CHECKS

To refill the air conditioning system fluid, use a suitable machine creating a vacuum.

1. Connect hoses (8) and (9) to the unions of cocks (4) and (10) respectively, on the vacuum machine.

2. Unscrew the caps on compressor (5) side, and connect the other end of hoses (8) and (9) to lower union (low pressure, union "D") and upper union (high pressure, union "S") respectively.

3. Switch on the vacuum machine and open the vacuum (11) and high pressure (10) cocks so that air is sucked from the air conditioning system.

4. After operating about **10'**, open and close the vacuum cock (11) a few times and check that the low pressure gauge indicator (2) does not oscillate during this operation. The possible oscillations, indicate that there are leaks in the system as a consequence, before continuing, verify that all unions have been tightened. If leaks are still present, insert **200 g (7.05 oz)** of Freon 12 into system and set in evidence the leak source by means of a zeroed Freon 11 electronic leak finder.

5. Before refilling, dewater the system by keeping it in a vacuum equal to:

0.05 to 0.08 kPa
(0.4 to 0.6 mmHg;
$7.1 \cdot 10^{-3}$ to $11.4 \cdot 10^{-3}$ p.s.i.)

to be read on the vacuometer, for a period of **30'**, then close the cocks (10) and (11) and switch off the vacuum machine.

6. Position the zero of the reference indicator (3) in correspondence with the level of Freon in the transparent column, then slowly open the low pressure cock (4) for a period of time necessary to fill the system with the specified quantity of Freon 12, to be read on the indicator scale (previously zeroed).

CAUTION:
Open the low pressure cock slowly to prevent water hammering in the system.

Air conditioning system refill:
Fluid:
RIVOIRA Freon 12
Quantity:
0.90 kg (1.87 lb)
Should the prescribed quantity of Freon not enter the system freely, start the engine and compressor, and let this last suck Freon.

7. Once the operation has been carried out, close the low pressure cock (4) and keep Freon compressor connected to the vacuum machine.
Start the engine, bring it to **1000 to 1200 r.p.m.** and activate the air conditioner; check for air bubbles, by looking through the Freon filter glass window. If air bubbles are present, the Freon must be let out, and the filling process repeated.

8. **10 minutes** after the air conditioner has been activated, check that the pressure read on the low pressure gauge (2) in the vacuum machine is **80 to 250 kPa (0.8 to 2.5 kg/cm²; 11.38 to 35.56 p.s.i.)** when the electromagnetic coupling of the Freon compressor disengages.

- Pressure below **80 kPa (0.8 kg/cm²; 11.38 p.s.i.)** could be caused by an insufficient quantity of Freon. Drain the Freon and repeat all operations, and repeating the vacuum procedure for **40'**.
- Pressure above **250 kPa (2.5 kg/cm²; 35.56 p.s.i.)** could be caused by too much Freon (noise in the compressor) or by a deficiency in the thermostat on the cooler (the thermostat does not activate the release of the compressor electromagnetic coupling).
  Should there be too much Freon, it is sufficient to let out the excess; if however, the thermostat is not working properly, verify that feeler is correctly inserted into the cooler unit.

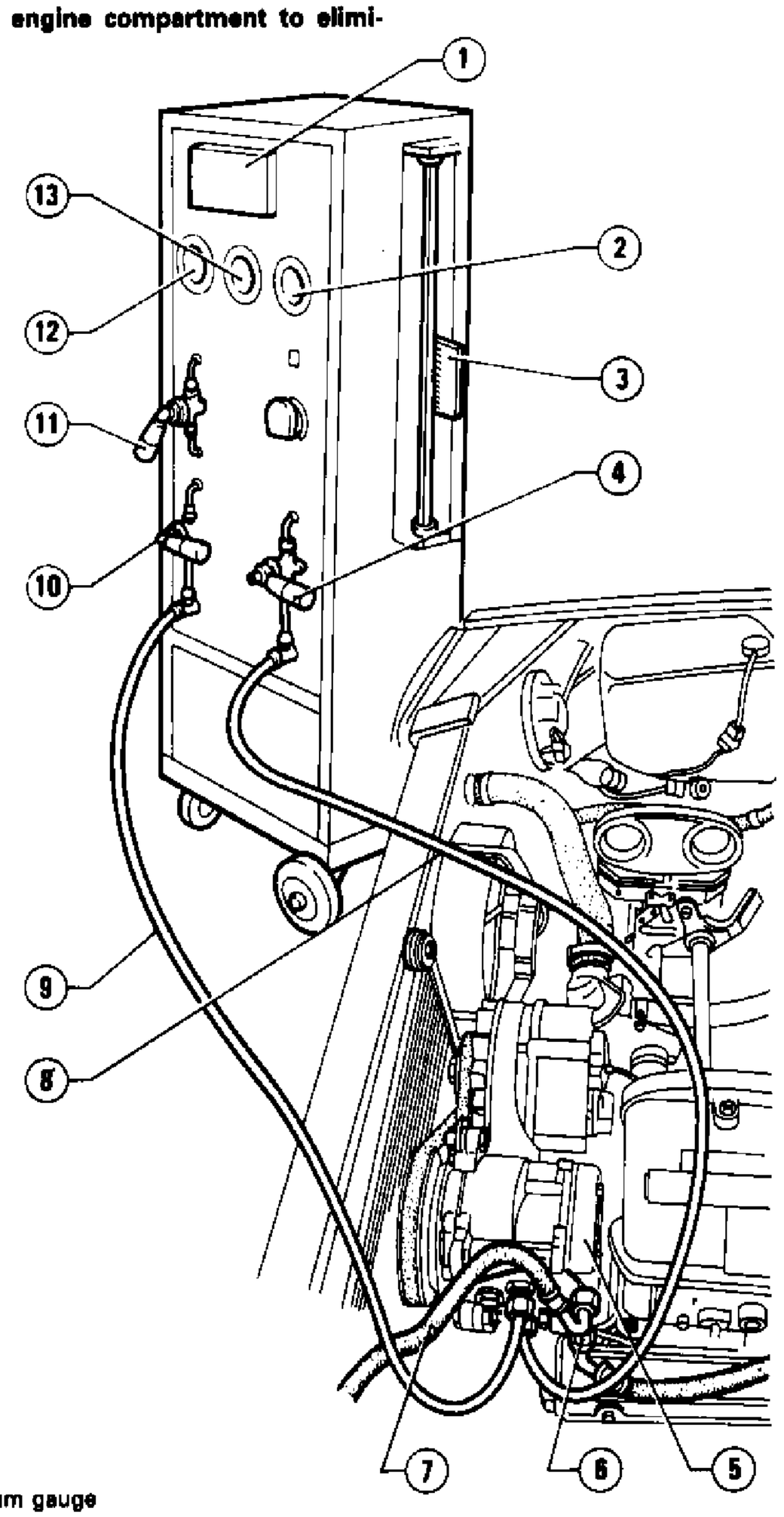
9. Disconnect hoses (8) and (9) from compressor (5), and retighten the suitable caps.

10. Using a zeroed electronic leak finder with Freon 11, check for Freon leaks from system unions.

Before checking with the leak finder, it is good practice to blow compressed air into the engine compartment to eliminate any traces of Freon that escaped during the needle valve removal.

11. If Freon is found on any the unions, tighten the union affected, then blow in air to remove any traces of Freon; then repeat the check with the leak finder.

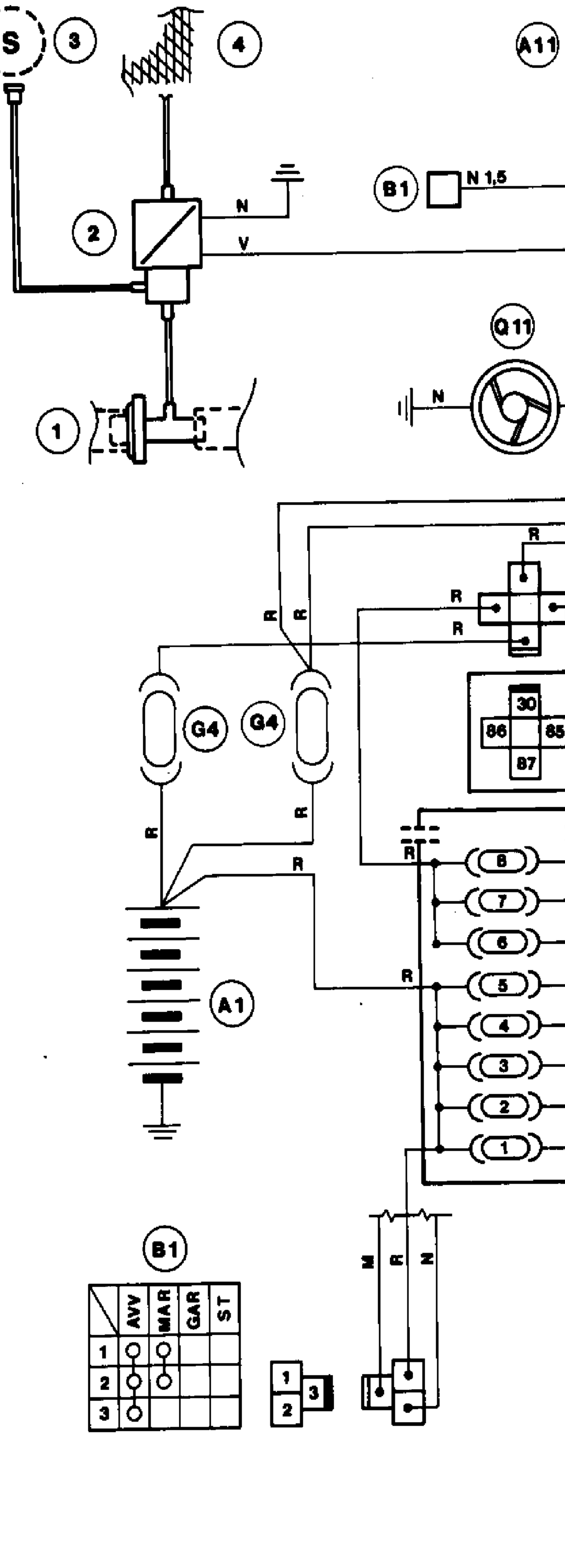
If leaks are still present, drain Freon from the system and detach the union, then verify that the O-ring is correctly positioned in the union. If not so, position it correctly, and repeat the system refilling operations.



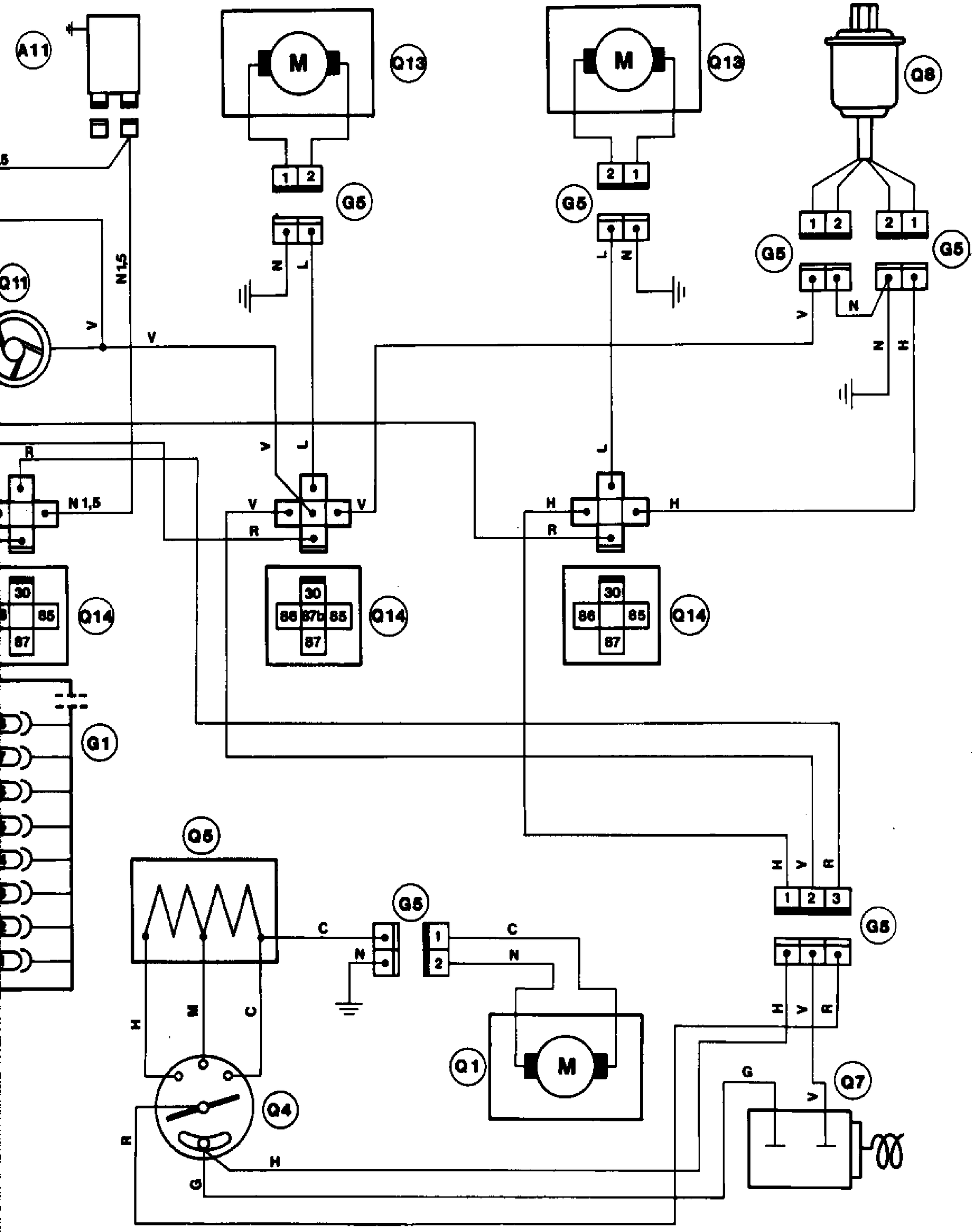
1 Vacuum gauge
2 Low pressure gauge
3 Fluid level reference index
4 Low pressure cock
5 Compressor
6 Hose connecting cooler to compressor
7 Hose connecting compressor to condenser
8 Low pressure hose
9 High pressure hose
10 High pressure cock
11 Vacuum cock
12 High pressure gauge
13 Measuring gauge

A1 Battery
A11 Starter
B1 Ignition switch
G1 Fuse box
G4 In-line fuse holder
G5 Multiple connector
Q1 Heater blower fan
Q4 Heater blower fan control
Q5 Heater blower fan speed adjustment resistance
Q7 Fluid thermostat
Q8 Trinary pressure switch
Q11 Compressor electromagnetic coupling
Q13 Condenser electric fan
Q14 Relay for condenser electric fans and compressor electromagnetic coupling

1 Servobrecke single-acting valve
2 3-way solenoid valve
3 Ignition distributor pneumatic regulator
4 Vacuum intake on carburetor



ELECTRIC AND PNEUMATIC SYSTEM DIAGRAM



SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

FLUIDS AND LUBRICANTS

Application	Type	Name	Q.ty kg (lb)
Air conditioning system refill	Freon	RIVOIRA Freon 12 std. n. 3681-69910	0.90 (1.98)
Threading of air conditioning system unions	Oil	SUN OIL COMPANY Suniso 46 std. n. 3631-69526	-

TIGHTENING TORQUES

Item \ Unit	N·m	kg·m	ft·lb
Nut securing crankshaft pulley	186 to 144	12 to 14.7	86.8 to 106.3
Screws securing union to engine block	19 to 24	1.9 to 2.4	13.7 to 17.3

TROUBLE DIAGNOSIS AND CORRECTIONS

Before beginning the trouble diagnosis operations, carry out the following operations:

1. Connect the high and low pressure service hoses of the vacuum machine to the related unions on compressor left side.
2. Start the engine, switch on air conditioner and let it operate **10 to 15 minutes,** until system reaches the steady condition.
3. Carry out the performance test (take note of the pressure values indicated on the vacuum machine gauges).

Prescribed values
Low pressure:
80 to 250 kPa
(0.8 to 2.5 kg/cm²)
High pressure:
1000 to 2000 kPa
(10 to 20 kg/cm²)

4. Take note of the pressure values indicated by the service gauges.

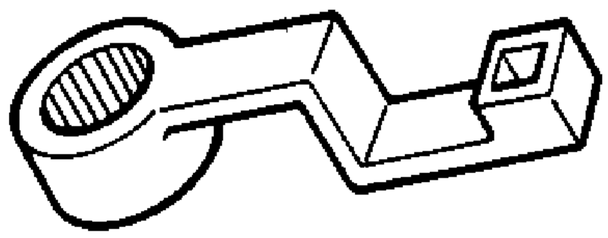
Trouble	Probable cause	Corrective action
System fails to operate	• System fuses faulty	Replace
	• Compressor drive belt loosened	Restore correct tensioning
	• The electromagnetic clutch coil is faulty or does not receive sufficient current or the ground contact is inefficient	Check clearance between front plate and pulley of electromagnetic clutch, or restore the contacts
	• Piping broken or unions insufficiently tightened	Replace piping, refill the system and check for leaks from unions
	• Control devices (electric fan switch, relay thermostat, Trinary pressure gauge) faulty	Replace the faulty components
	• Electric wirings interrupted or damaged	Restore electric continuity
	• Condenser electric fan does not operate	Check the Trinary pressure gauge and the electric fan motor
	• Compressor seized or with inefficient valves	Replace compressor
	• Expansion valve clogged or blocked in the open position	Replace expansion valve
	• Drier filter clogged	Replace drier filter
	• No fluid in the system	Identify the cause, execute the vacuum and refill the system
Insufficient cooling down	IF: DELIVERY PRESSURE LOW INTAKE PRESSURE LOW	
	• Frigorific fluid quantity, insufficient due to slight leaks	By means of the leak finder, identify the leak area and eliminate it. Carry out the vacuum and refill the system
	• Expansion valve blocked in the closed position	Replace expansion valve
	IF: DELIVERY PRESSURE HIGH INTAKE PRESSURE HIGH	
	• Condenser inefficient	
	– Radiator surface clogged	Remove front wheels aprons and by means of an air flow clean the finned surface of condensers

Trouble	Probable cause	Corrective action
Insufficient cooling down (cont.)	– Cooling electric fans faulty	Replace electric fans
	• Excessive frigorific fluid	Drain frigorific fluid until obtaining the pressure prescribed valves when the electromagnetic coupling is disengaged
	• Thermostat sensor in the cooler, out of seat	Remove thermostat sensor, clean the mating surfaces and position it correctly
	• Expansion valve inefficient (blocked in the open position)	Replace valve
	• Expansion valve sensor out of seat	Position correctly
	IF: DELIVERY PRESSURE NORMAL INTAKE PRESSURE NORMAL	
	• Humidity in the system	Drain frigorific fluid from system. Replace drier filter carry out the vacuum and refill the system
	IF: DELIVERY PRESSURE HIGH INTAKE PRESSURE NORMAL	
	• Air in the system	Drain frigorific fluid from system. Replace drier filter carry out the vacuum and refill the system
	IF: DELIVERY PRESSURE HIGH INTAKE PRESSURE LOW	
	• Throttling with temperature decrease after choke, and presence of water or ice (on drier filter or piping after condenser)	Disassemble the component concerned, replace it or eliminate the throttling
	• Filter clogged	Replace filter
	• Expansion valve blocked in the closed position	Replace expansion valve
	• The thermostatic sensor of expansion valve without gas (excessive water on cooler and on intake piping, since the expansion valve is kept open)	Replace expansion valve

Trouble	Probable cause	Corrective action
Insufficient cooling down (cont.)	IF: DELIVERY PRESSURE NORMAL INTAKE PRESSURE NORMAL - HIGH	
	• Thermostat faulty (the electromagnetic clutch of compressor becomes frequently engaged and disengaged)	Replace thermostat taking care not to squash the capillary tube and install it in the same position and depth of the previous one inside the cooler
The cooling down is discontinuous	• Switch of electric fan and/or trinary pressure gauge and/or thermostat and/or electric fan motor faulty	Replace the faulty components
	• Ground cable of electromagnetic clutch coil incorrectly adjusted or oxidized	Restore connection
	• Electromagnetic clutch of compressor slips	Replace the electromagnetic coupling clutch
	• Ice between cooler vanes	
	– Thermostat sensor disengaged by cooler	Position correctly
	– Expansion valve faulty (blocked in the open position)	Replace expansion valve
	• Ambient relative humidity too high	
	– Thermostat inefficient (intake pressure too low or too high)	Replace thermostat
	– Cooler clogged outside	Clean cooler by blowing air under pressure
System noisy	• Driving belt slackened or worn	Restore belt correct tensioning or replace, if necessary
	• Compressor oil level too low	Restore level
	• Electromagnetic clutch noisy and/or compressor noisy and/or bearings noisy	Replace the faulty component

Trouble	Probable cause	Corrective action
System noisy (cont.)	• Dashboard components mounted incorrectly	Check and restore correct installation
	• Electric fan motor too worn	Replace electric fan
	• Too frigorific fluid in the system with reverberations or vibrations in the delivery piping vibrations in the compressor, excessive values of both delivery and intake pressures, bubbles or accumulations in the indicator glass	Drain frigorific fluid until obtaining the pressure values prescribed
	• Insufficient quantity of frigorific fluid with squealing in the cooler housing in the vicinity of expansion valve	Check for leaks by means of a leak finder, carry out the vacuum and refill the system
	• Excessive humidity in the system with consequent noise of expansion valve and low pressure value	Drain frigorific fluid from system. Replace drier filter carry out vacuum and refill the system

SPECIAL SERVICE TOOLS

Number tool	Tool Name	Refer to page
A.2.0378	Tool for securing flywheel (on vehicle) 	80-12
A.5.0243	Wrench for tightening the driving shaft pulley (on vehicle) 	80-12