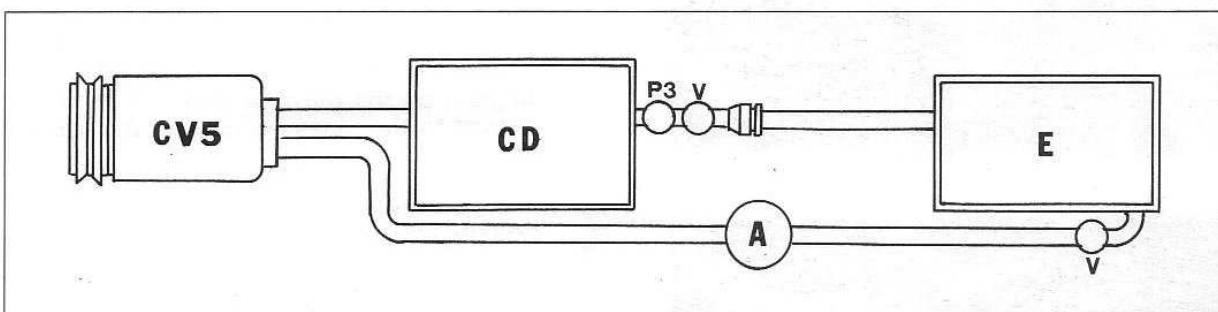
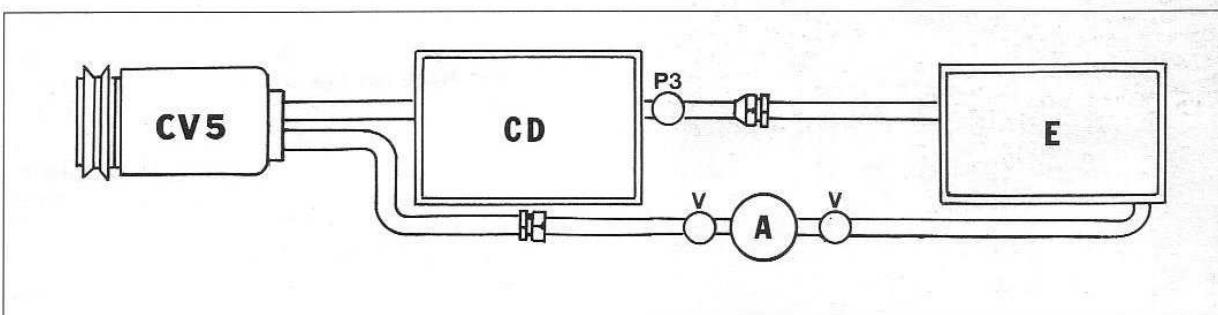


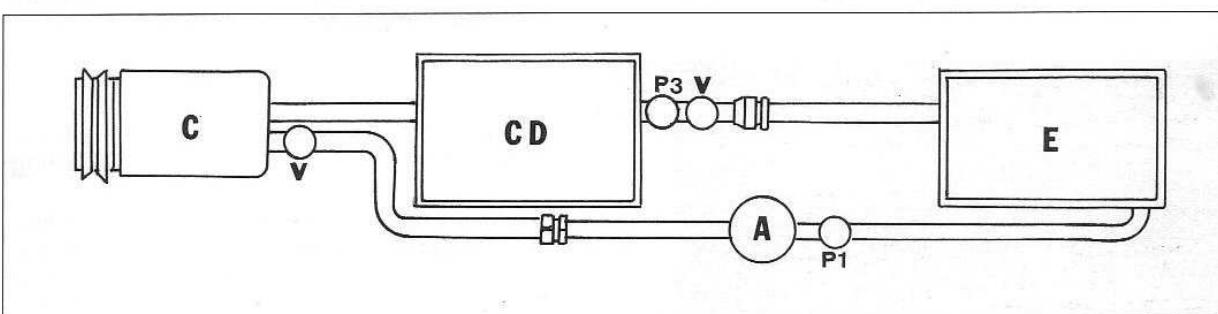
P2L037H01



P2L037H02



P2L037H03



P2L037H04

Diagram showing different air conditioning systems and component location

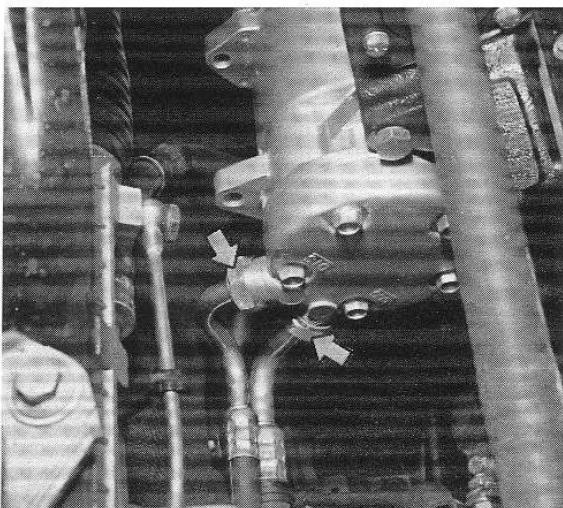
- | | |
|---------------------------------------|--|
| C. Compressor SD 709NBX307 | V. Needle valve for system charging and draining |
| CV5. Variable displacement compressor | P1. One-level pressure switch |
| CD. Condenser | P2. Three-level pressure switch |
| E. Evaporator | |
| A. Dehydrating accumulator | |

Auxiliary units

Automatic air conditioner

50.

Tempra



P2L038H01



SYSTEM DRAINING



Before carrying out any operation that could lead to loss of FREON 12, drain the air conditioning system.

Use gloves and goggles while draining the system in order to safeguard against the damaging contact of FREON 12 spray

To drain the system, use needle valve (see diagram on the previous page for location) welded to the pipes connecting the various system components



COMPRESSOR

Removing

After draining the air conditioning system, carry out the following operations in order:

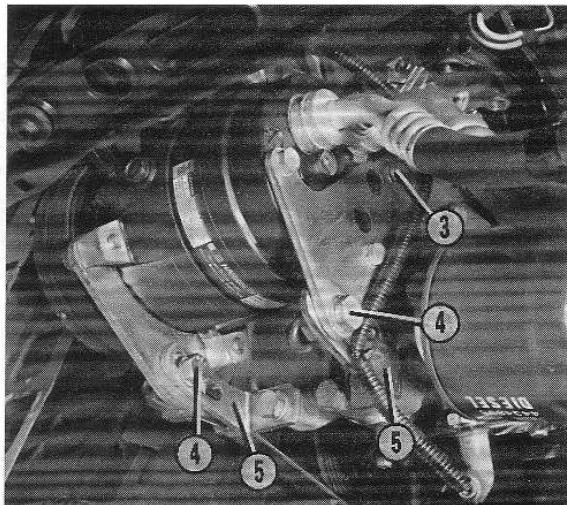
- for non-variable displacement compressors, back off the connections (arrowed in top diagram) of pipes connected to intake and delivery ducts;
- for V5 compressors (variable displacement), back off hexagonal socket screw (1) fastening split fitting (2) on the end of the pipes to the compressor;
- disconnect the electrical connection (bipolar for V5 compressors) from the terminals of electromagnetic coupling winding of the compressor pulley;



The location of the compressor and the brackets fastening it to the motor alters according to the version.

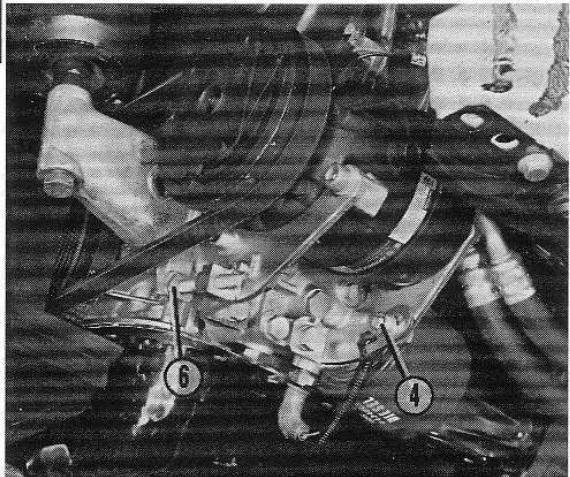
Compressor fastening to the engine is shown from different angles in the middle and top diagrams and the top diagram on the next page. The removal procedure is described in the following text (generally applicable to any other compressor fastened to another motor).

- slacken the screws (3) that fasten the top of the brackets applied to the compressor to the engine;
- slacken bolts (4) that fasten the bottom of the brackets applied to the compressor to those (5) fastened to the engine;



P2L038H03

- tighten screw (6) to bring the compressor closer to the motor;
- slip the belt off the compressor pulley;
- back off the screws and bolts (3 and 4) slackened previously and remove the compressor and brackets from its housing

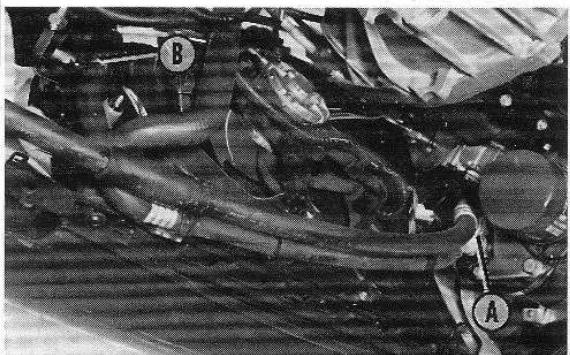


P2L039H01

Dismantling

The V5 compressor cannot be completely dismantled but only partly dismantled to remove parts 1 - 3 - 4 - 5 - 7 listed below and the regulation valve.

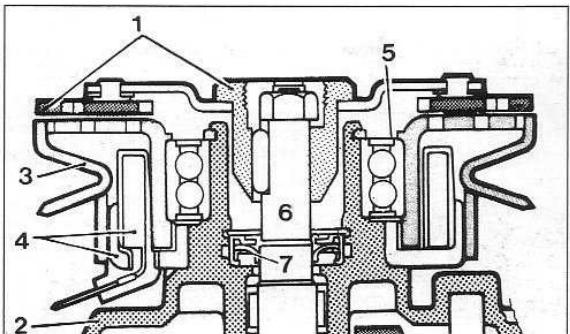
The operations necessary for checking and replacement of the above components are described and illustrated on pages 47 and onward



P2L039H02

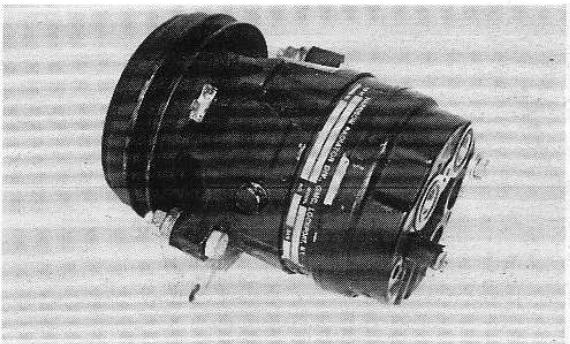
Section through pulley with electromagnetic coupling

1. Clutch plate
2. Compressor
3. Rotor unit with pulley
4. Solenoid
5. Ball bearing
6. Compressor shaft
7. Seal



P2L007H03

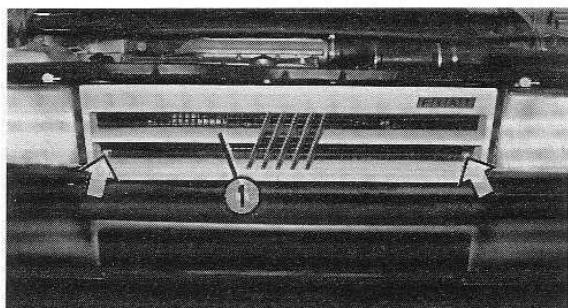
PIPING CONNECTED TO V5 COMPRESSOR



P2L039H03

To remove the two pipes connected by a single connection (A) at one end, after backing off the screw retaining the fitting to the compressor, back off fitting (B) that fastens a pipe to the condenser and the other fitting fastening the second pipe to the dehydrating accumulator.

50.

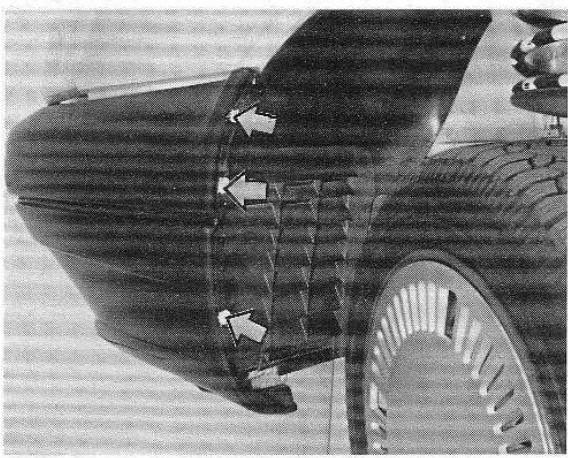


CONDENSER

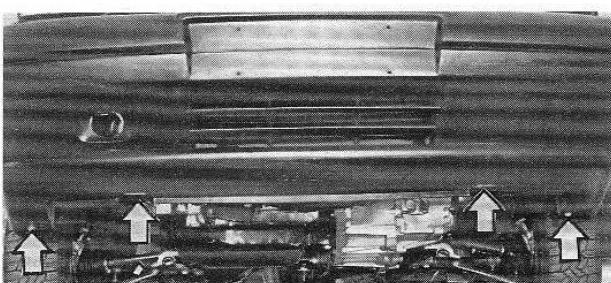
Removing

Carry out the following operations to remove the condenser:

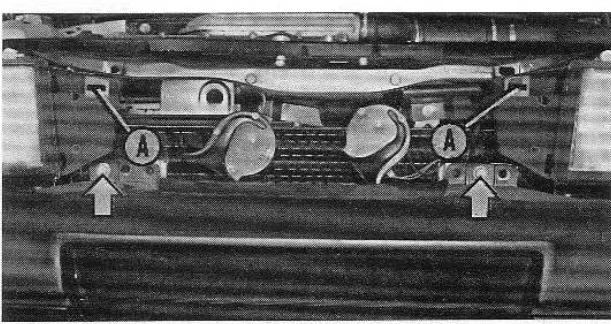
- back off the arrowed screws that fasten front radiator grille (1) to the bottom brackets (next to the headlamps) of the top crossbeam and remove the grille after releasing the top fasteners from the slots (indicated by the letter A in the fourth diagram);



- remove the arrowed clips that fasten the inner guards of the front wheel arches to the inner part of the end of the front bumper;

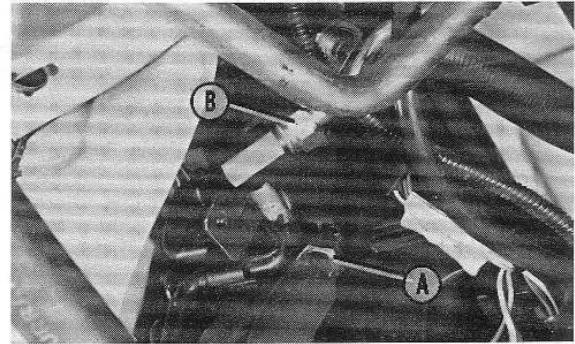


- back off the arrowed screws that retain the bottom of the front bumper to the body shell;

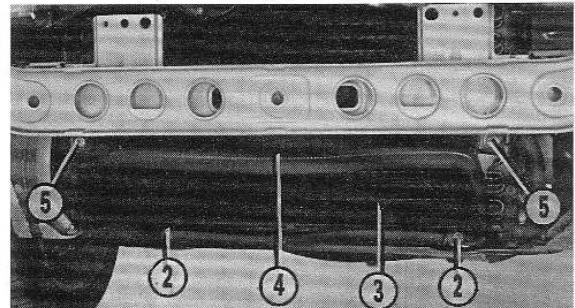


- back off the arrowed screws that fasten the top of the front bumper to the central front crossbeam;

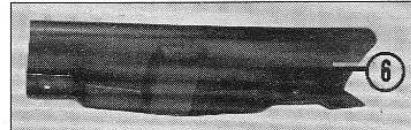
- remove the front bumpers and back off fittings (A and B) of the pipes connecting the condenser to the compressor and dehydrating accumulator respectively;



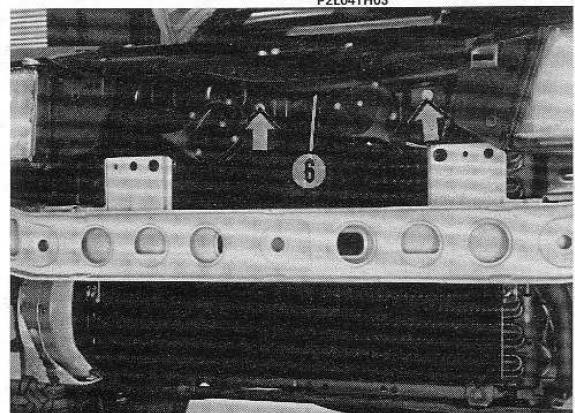
P2L041H01



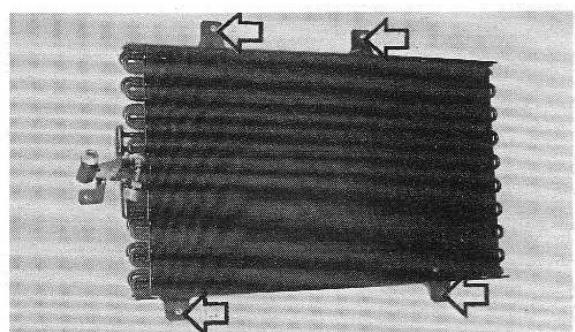
P2L041H02



P2L041H03



P2L041H04



P2L041H05

Refitting

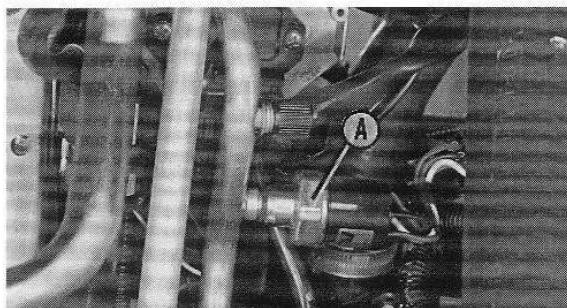
Carry out the removal operations in reverse order. Check that the finned surface is not clogged with dirt and that all fins are in good condition.

Straighten deformed fins with a pair of pliers or two screw drivers and remove the dirt carefully in order not to push the fins out of shape

Detail of condenser

The arrows indicate the points where the condenser is fastened to the top crossbeam and radiator

50.



P2L042H01

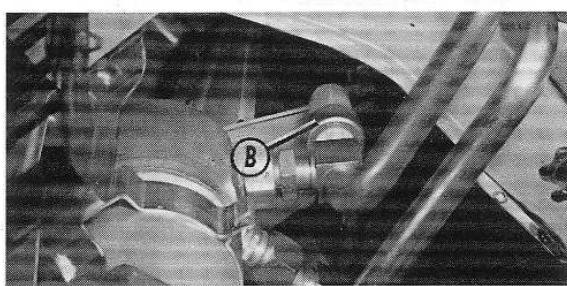


ONE AND THREE-LEVEL PRESSURE SWITCHES

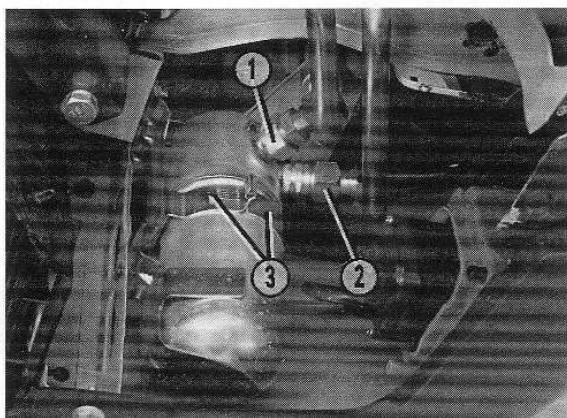
Removing

NOTE The air conditioning system need not be drained when removing one of the two pressure switches.

After disconnecting the electrical connections from the connection joined to the terminal leads of three-level pressure switch (A), or disconnecting one-level pressure switch (B), simply back off the part from the pipe to which it is fitted



P2L042H02



P2L042H03



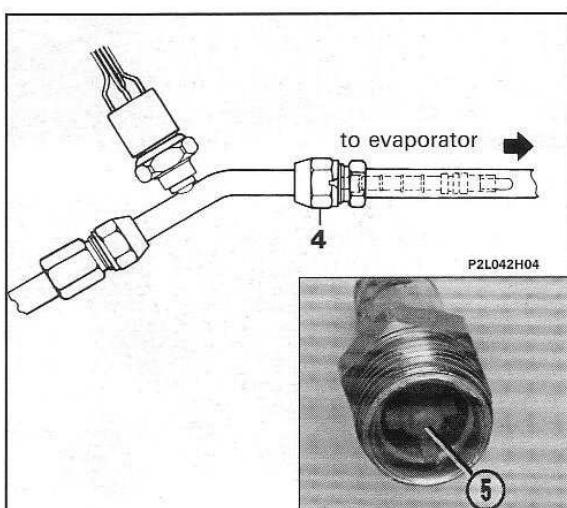
DEHYDRATING ACCUMULATOR

Removing

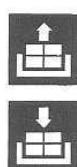
Back off fittings (1) and (2) from the piping connecting the dehydrating accumulator to the evaporator and piping connected to the compressor. After unscrewing the screw joining the two parts of clip (3), release the accumulator from its support bracket.

Refitting

After observing the specifications described on page 75, carry out removal operations in reverse order.



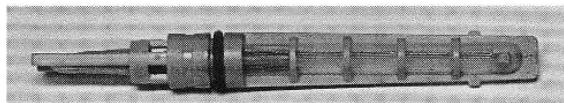
P2L042H04



EXPANSION VALVE

Working in the front of the engine bay, back off fitting (4) on the first section of piping connecting the condenser to the evaporator intake duct.

The second section of the piping contains expansion valve (5) which may be easily removed.



P2L042H06

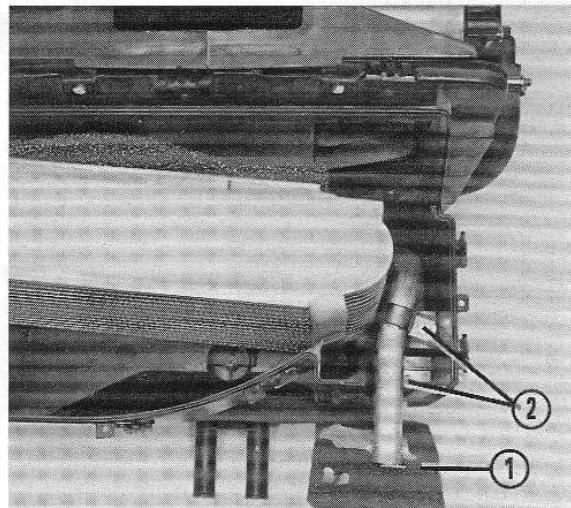
An arrow in relief on the valve surface indicates the correct direction for fitting the piping connected to the evaporator intake duct

EVAPORATOR



Removing

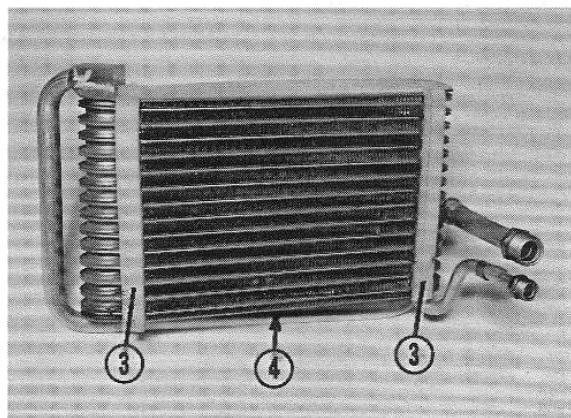
- Drain the air conditioning system;
- remove the heater-distributor unit (see operations described and illustrated on pages 20 onward);
- remove the top half of the conveyer of the above unit;
- remove screws (2) that fasten the brackets in the evaporator ducts to the bottom conveyer half;
- carefully pull seal (1) away from the front surface of the bottom conveyer half;
- remove the evaporator from the bottom conveyer half after releasing the input and output ducts from seal (1);



P2L043H01

Detail of evaporator (front view)

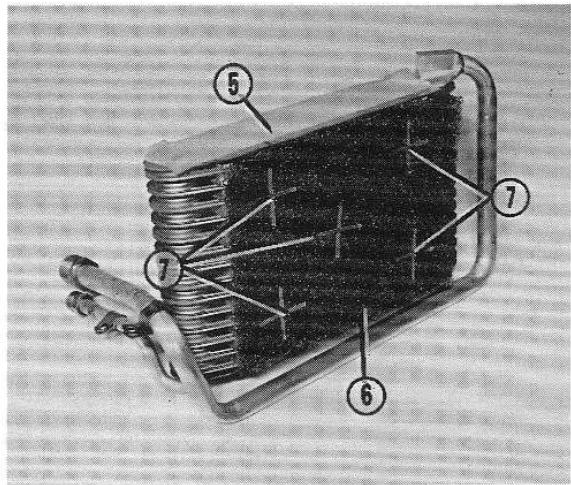
3. Polyurethane side seals
4. Polyurethane bottom seals



P2L043H02

Detail of evaporator (back view)

5. Polyurethane top seals
6. Anticondensate filter
7. Clip fastening filter (6) to the evaporator



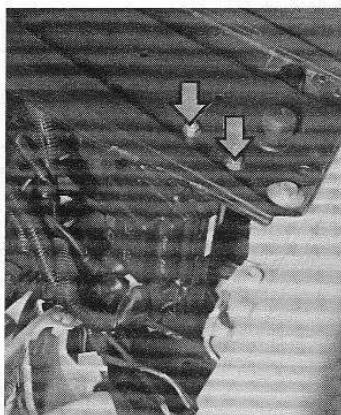
P2L043H03

Auxiliary units

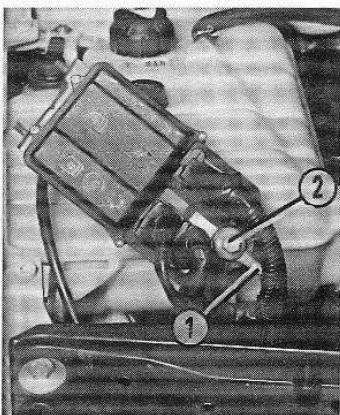
Automatic air conditioner

Tempra

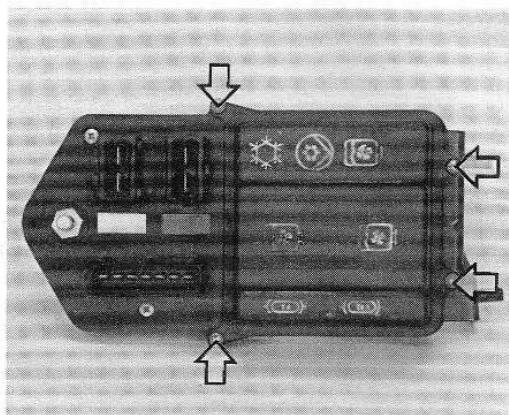
50.



Location of air conditioner control unit



Air conditioner control unit removed from housing

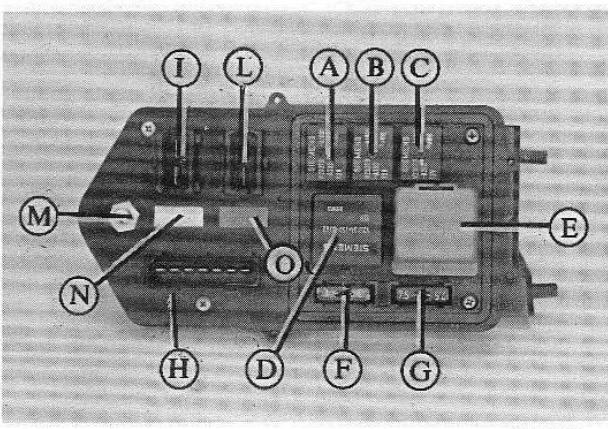


Detail of air conditioner control unit

To remove the control unit, back off the two nuts arrowed in the top diagram, disconnect the three connectors from their housings and release cable (1) from the single-pole terminal (2).

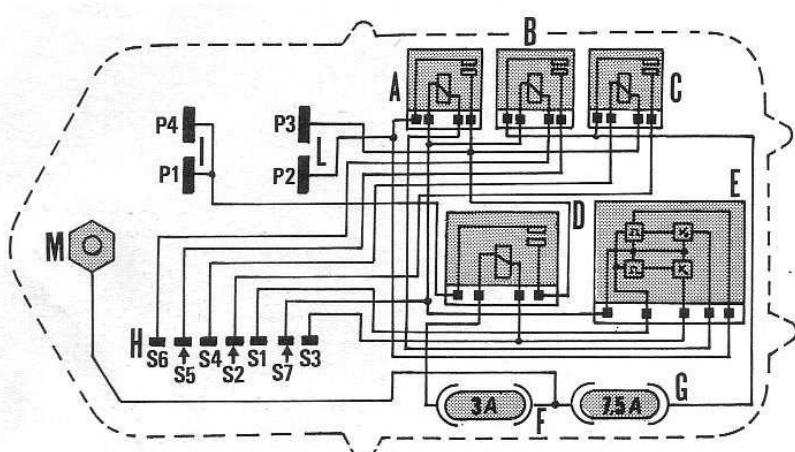
To remove the cover, back off the screws arrowed in the third diagram on the top.

AIR CONDITIONER CONTROL UNIT FOR VERSIONS WITH 1756 ENGINES - 1581 SPI - 1995



Detail of control unit without cover

- A. Supplementary 20 A relay for engaging 1st speed (low) of fan for cooling radiator and condenser
- B. 20A relay for activation of compressor pulley electromagnetic coupling
- C. Supplementary 20A relay for activation of compressor pulley electromagnetic coupling
- D. 50A relay for 2nd speed (top) of radiator and condenser cooling fan
- E. Delay for 2nd speed of radiator and condenser cooling fan

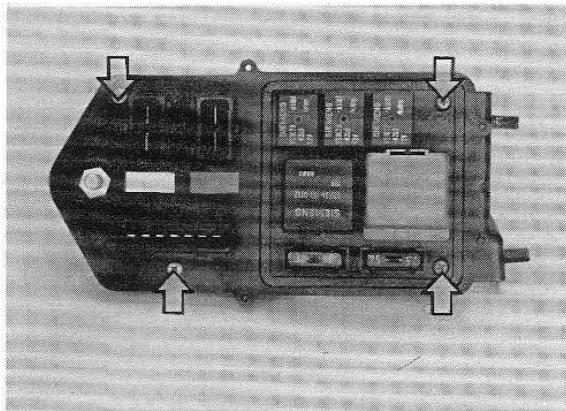


- F. 3A fuse
- G. 7.5A fuse
- H. Housing for 7-way connector
- I. Housing for 2-way connector
- L. Housing for 2-way connector
- M. Single-pole terminal for current socket
- N. White rectangle
- O. Red rectangle

Wiring diagram showing connections inside control unit

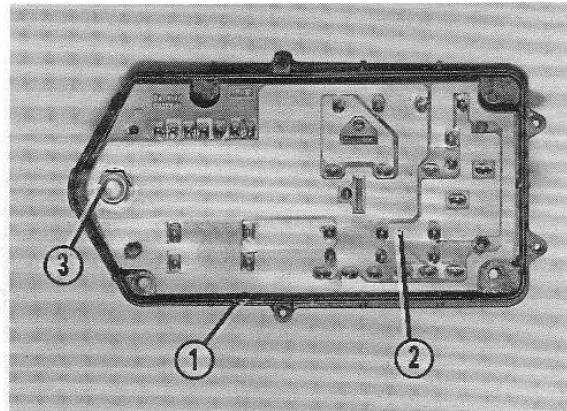
The above components are identified by letters

P2L044H05



P2L045H01
Detail of air conditioner control unit without cover

The arrows indicate the screws joining the two parts of the control unit base

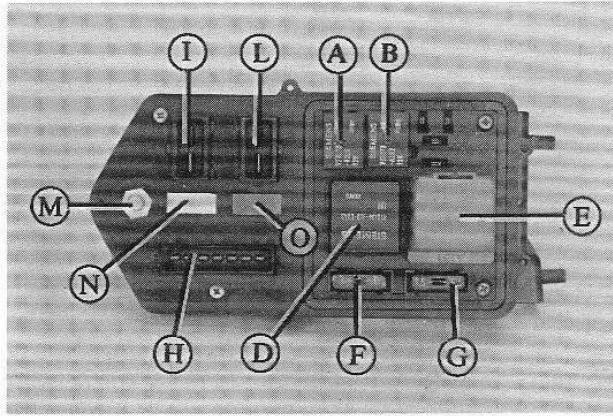


P2L045H02
Detail of the top part of the air conditioner control unit base with its printed circuit

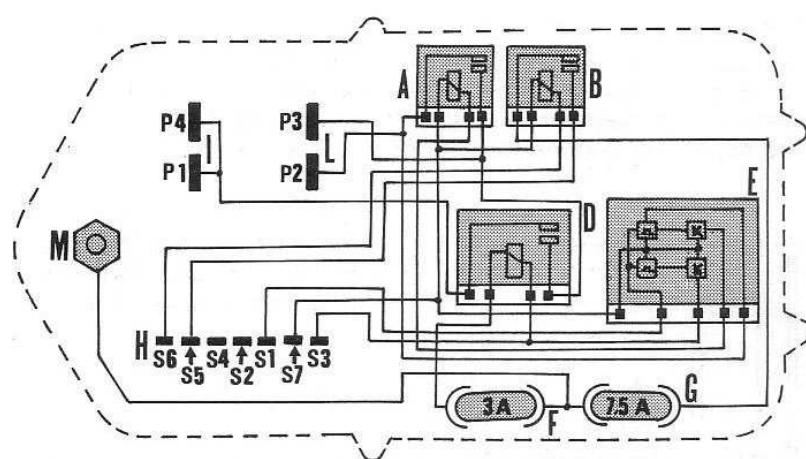
1. Top part of base
2. Printed circuit
3. Nut joining the two parts (1 and 2)

AIR CONDITIONER CONTROL UNIT FOR VERSIONS WITH 1372 ENGINES - 1581 - 1930 Diesel - 2000

- A. Supplementary 20A relay for 1st speed (low) of radiator and condenser fan
- B. 20A relay for activation of compressor pulley electromagnetic coupling
- D. 50A relay for 2nd speed (top) of radiator and condenser fan
- E. Delay for 2nd speed of radiator and condenser fan
- F. 3A fuse
- G. 7.5A fuse
- H. Housing for 7-way connector
- I. Housing for 2-way connector
- L. Housing for 2-way connector
- M. Single-pole terminal for current socket
- N. White rectangle
- O. Red rectangle



P2L045H03
Detail of control unit without cover

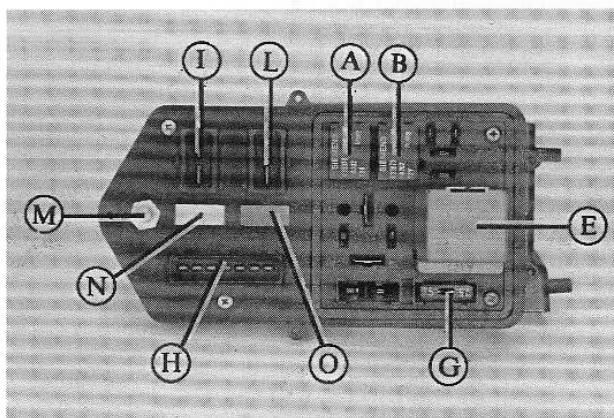


Wiring diagram of internal control unit connections

The above components are identified by letters

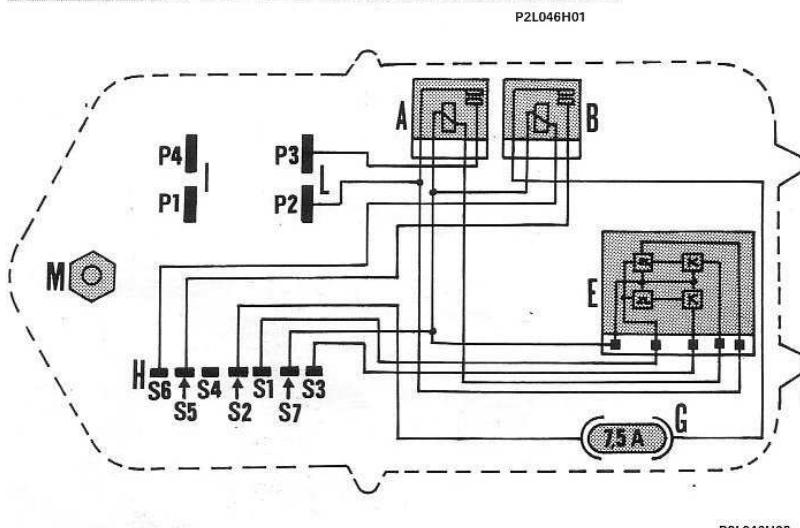
50.

AIR CONDITIONER CONTROL UNIT FOR VERSIONS WITH 1929 Turbo Diesel ENGINES



Detail of control unit without cover

- A. Supplementary 20 A relay for 1st speed (low) of radiator and condenser cooling fan
- B. 20A relay for compressor pulley electromagnetic coupling activation
- E. Delay device for 2nd speed of radiator and condenser cooling fan



- G. 7.5 A fuse
- H. Housing for 7-way connector
- I. Housing for white 2-way connector
- L. Housing for red 2-way connector
- M. Single-pole terminal for current socket
- N. White rectangle
- O. Red rectangle

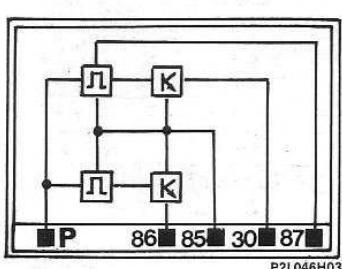
Wiring diagram of internal control unit connections

The above components are identified by letters

NOTE The relationship between the relays and fuses of the three control units shown in the last three pages and the same parts shown in the wiring diagrams in section 55 is as follows:

relays A - B - C - D - E and fuses F - G correspond in order to B - D - E - C - A - G - F in the diagrams in section 55

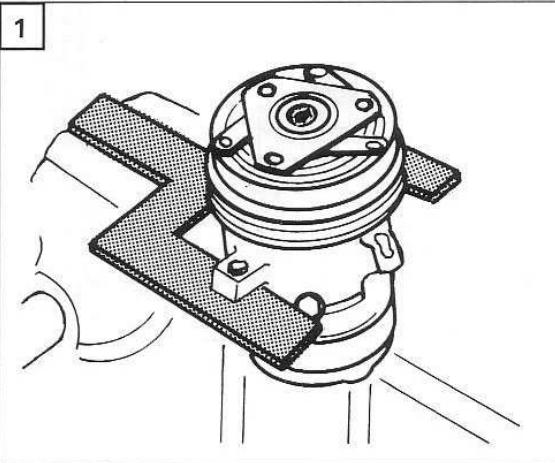
During normal operation of the air conditioner, the electronic circuit of the delay device is deactivated. During town driving and traffic jams when the air hardly moves past the car, the pressure of the FREON 12 inside the sealed circuit reaches the setting of the three-level switch. The switch in turn activates relay A (B in diagrams in section 55) via blades P and 30 of the above device. This brings the radiator and condenser cooling fan into operation at its first speed.



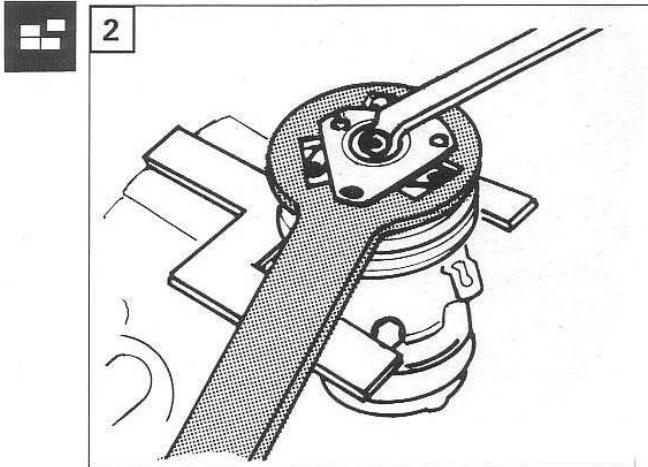
After 8-12 seconds, the above device activates relay D (C on wiring diagrams in section 55) via tag terminal 86. This supplies the above fan directly so that it runs at top speed.

Wiring diagram of delay device

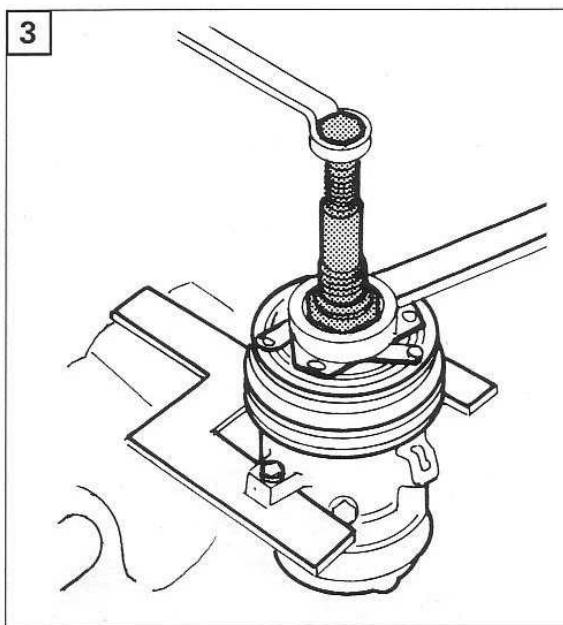
Proceed as follows to replace the parts of the V5 compressor mentioned on page 39:



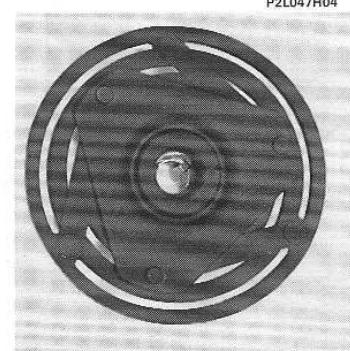
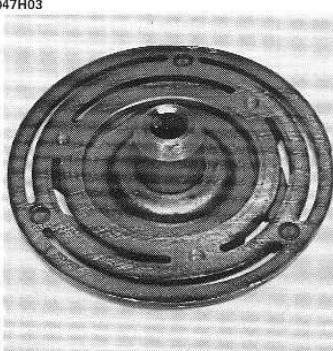
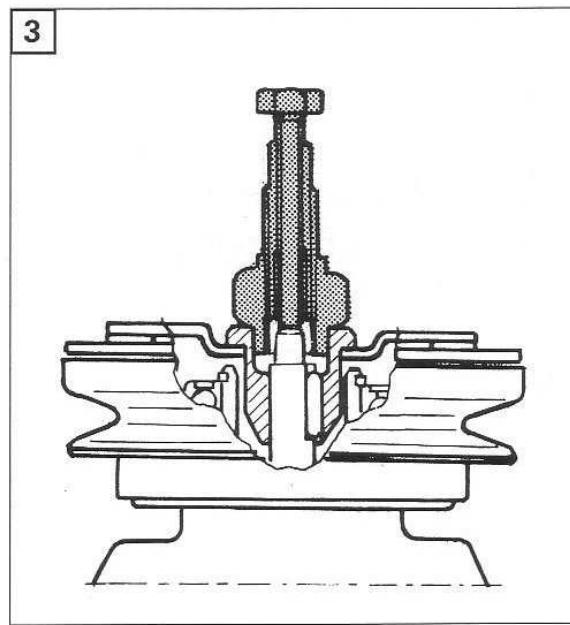
P2L047H01
Position stand 1877506000 (shown by shaded area) in the clamp and fit the compressor to this with two bolts.



P2L047H02
Using tool 1877507000 (shaded), keep the clutch plate still and back off the nut that holds it to the compressor shaft.

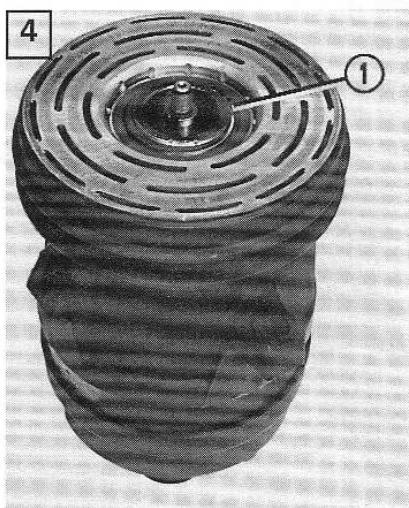


P2L047H03
Tighten extractor 1877508000 (shaded) on the clutch plate hub and remove from the compressor shaft.

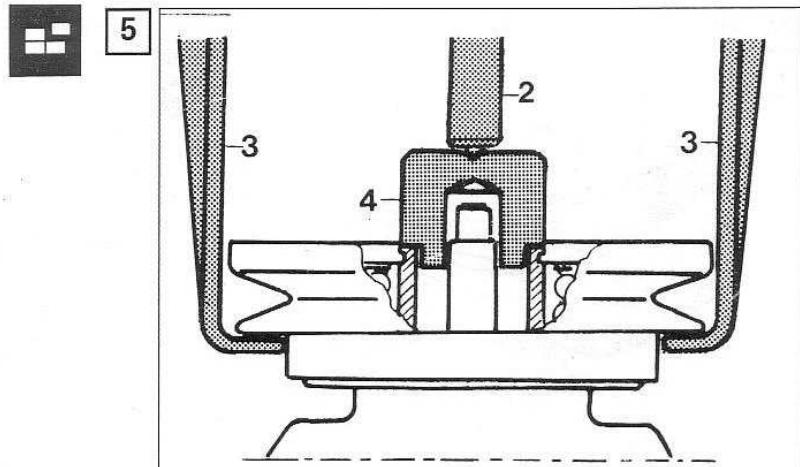


Detail of clutch plate (front and rear view)

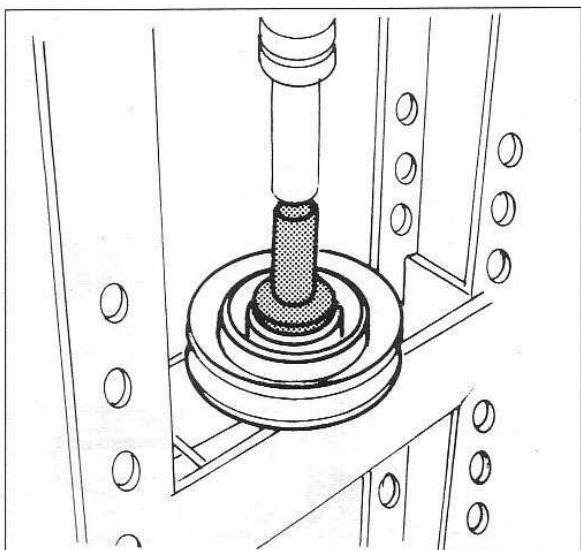
50.



P2L048H01



P2L048H02



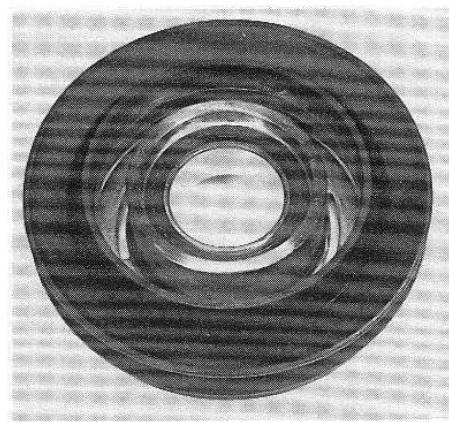
P2L048H03

6

After removing the key from its housing on the compressor shaft, remove the pulley assembly retaining ring (1) using round-ended pliers.

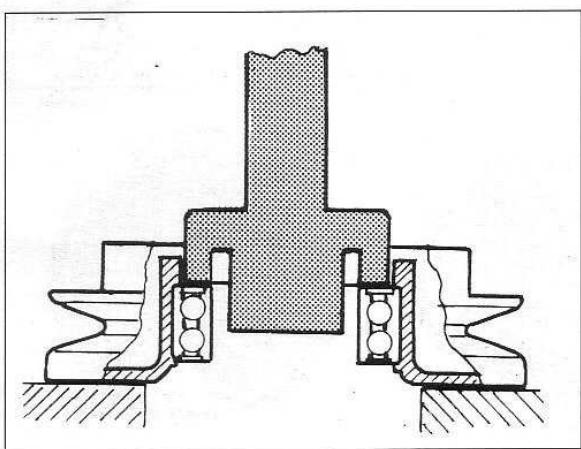
Using bridge 1840005004 (2), brackets 1840005303 (3), clamp 1840005400 and part 1877509000 (4), remove pulley assembly from the front compressor support (see figure 5).

Using press and driver 1875016000 (shaded in the illustrations alongside), release the bearing from the pulley assembly.

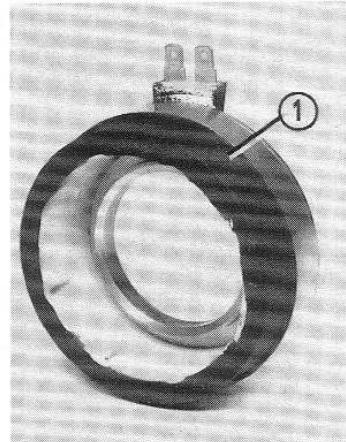
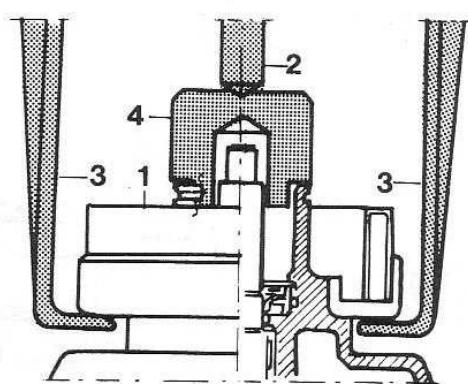
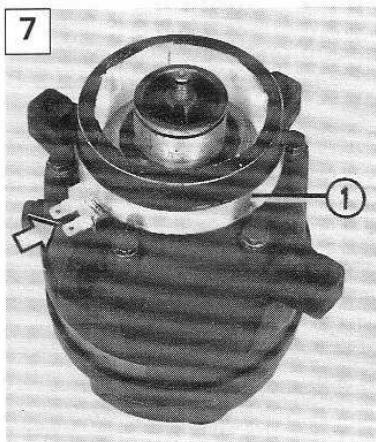


P2L048H05

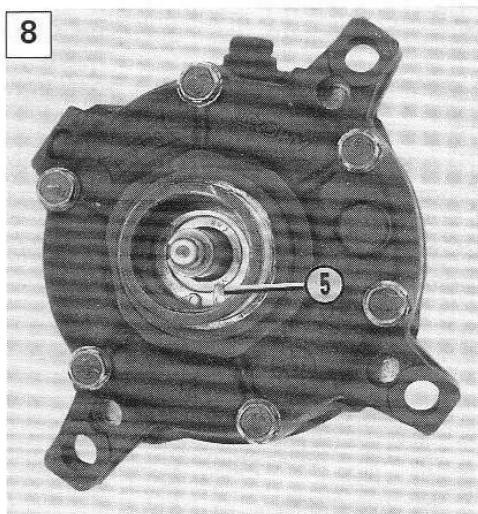
**View of bottom side of pulley assembly
(point to be struck with driver to remove bearing)**



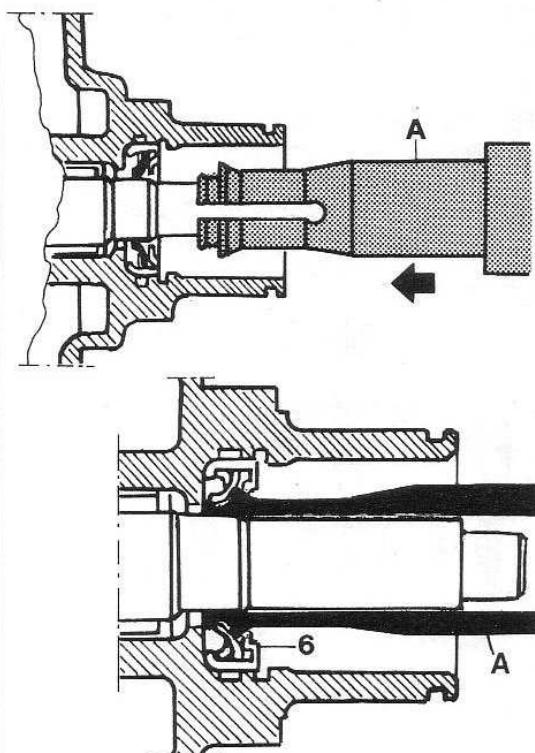
P2L048H04



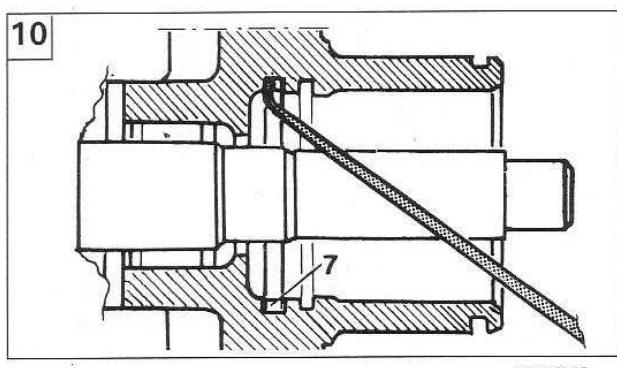
On the front compressor support mark the position of the contacts (arrowed) and the terminals of winding (1) of electromagnetic coupling. Then, use bridge 1840005004 (2), brackets 1840005303 (3), clamp 1840005400 and part 187509000 (4) release winding (1) from the front compressor support



9



Remove the seal retaining ring (5) using round-ended pliers.



Use tool 1877512000 (shaded), remove sealing ring (7) from the front compressor support.

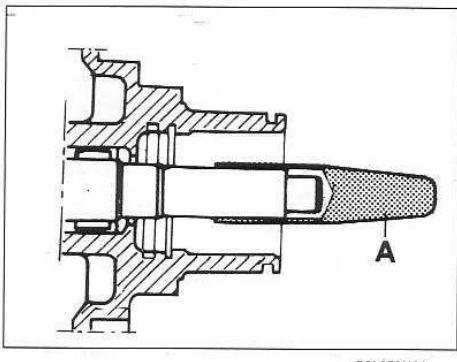
Insert tool 1877513000 (A) into the compressor shaft and push in the arrowed direction until the end takes up the position shown in the bottom diagram.

Then withdraw tool (A) from the compressor shaft to remove seal (6) from its housing.

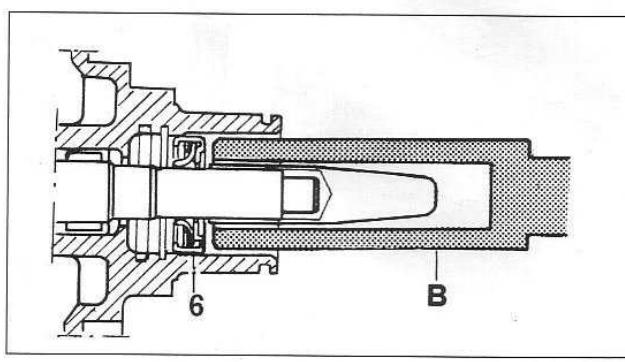
50.

Carry out the following operations to fit the new parts:

- submerge the sealing ring (7) in antifreeze fluid, then position in its housing on the front compressor support using tool 1877512000 (see illustrations to operation 10 on the previous page);



P2L050H01



P2L050H02

- fit sleeve 1877513000 (A) to the compressor shaft;
- submerge the new seal (6) in antifreeze fluid, then fit onto the above sleeve and press into its housing on the front support of the compressor using tool 1877513000 (B).

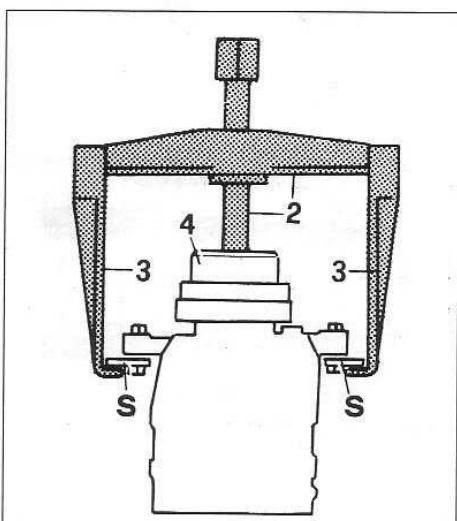
The tool must be fitted onto the compressor shaft as shown in the second diagram, i.e. in the reverse position to that shown for operation 9.

After fitting the new seal in its housing using round-nosed pliers, replace the retaining ring (9, operation 8) in its housing on the front compressor support.

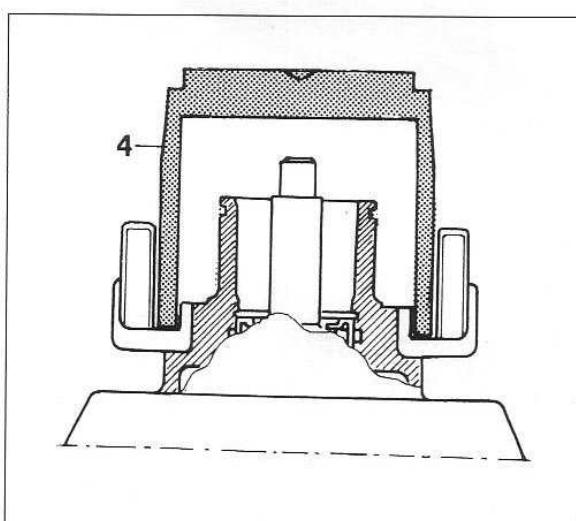
NOTE The compressor shaft and the inner part of its front support including the two seal housings must be perfectly clean.

Before fitting the new seal, check that it is not scratched or damaged and that no dirt or fabric threads are present on its surface that could affect the seal.

The flat side of the retaining ring must face the seal.

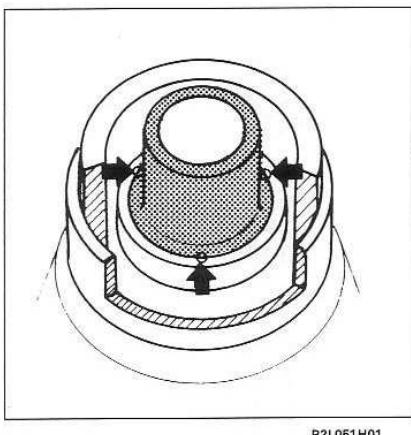


P2L050H03



P2L050H04

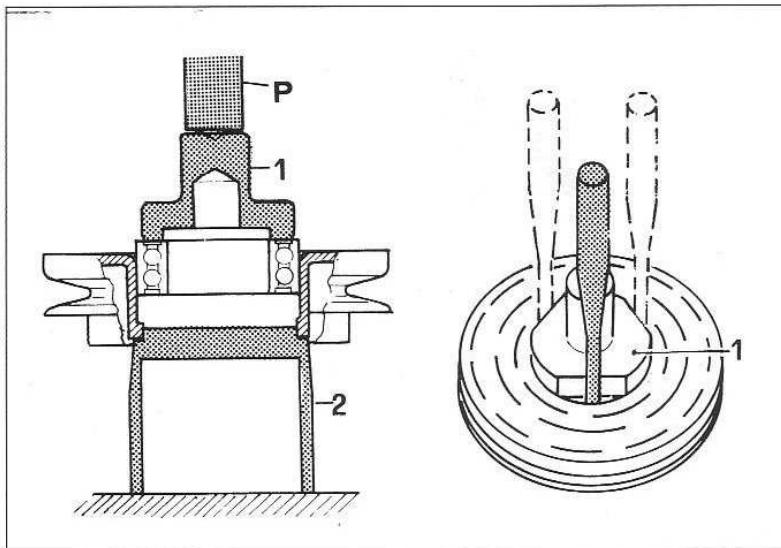
- file off the notches on the outer part of the front compressor support. Then fit the new electromagnetic coupling winding using bridge 1840005004 (2), bracket 1840005303 (3), clamp 1840005400 and part 1877511000 (4), noting the previously marked contact positions. The above brackets must be fastened to support (S) where the compressor is fastened (as shown in the left-hand diagram).



P2L051H01

After the winding is located in its housing, make three notches on the front compressor support (shaded) about 120° apart (see arrows) using a 3 mm diameter driver in order to keep it stable.

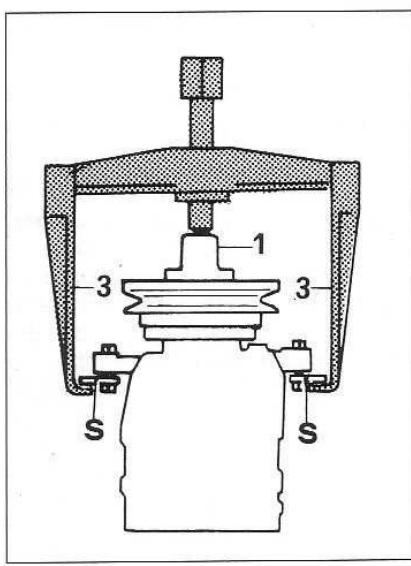
The notches must measure about half the side of the point of the driver and not more than 0.35 mm in depth.



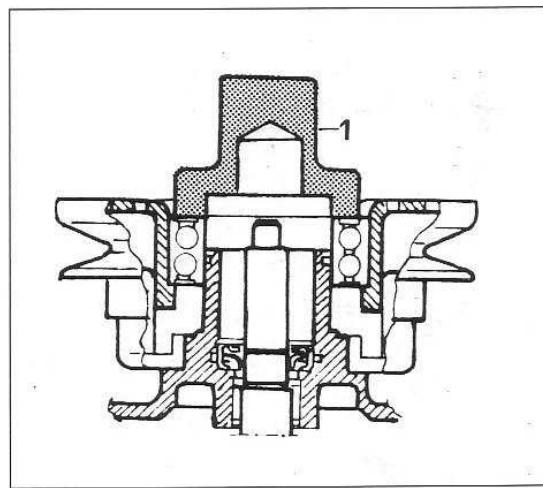
P2L051H02

File off the bearing retaining stakes on the inner surface of the pulley assembly. Then use press (including master cylinder P) and parts 1877510000 (1) and 1877511000 (2) to press fit the new bearing in the pulley assembly.

After press-fitting the bearing fully into its housing on the pulley, use a 5 mm diameter steel driver to make three stakes by inserting it alternately between the three millings on part 1877510000 and bearing housing (see right-hand figure). The notch must be close to but not in contact with the outer bearing race to prevent the race become deformed.



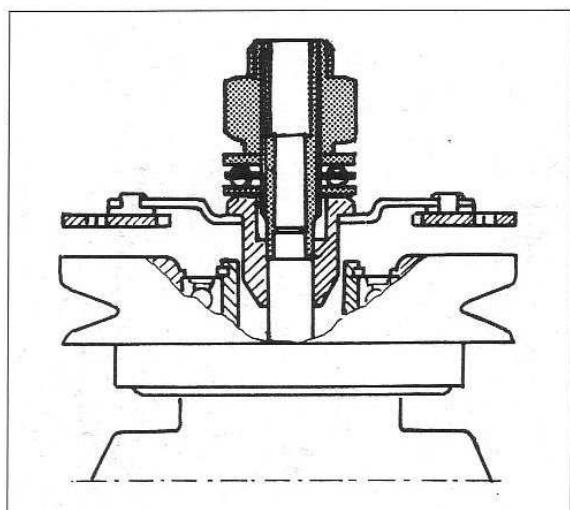
P2L051H03



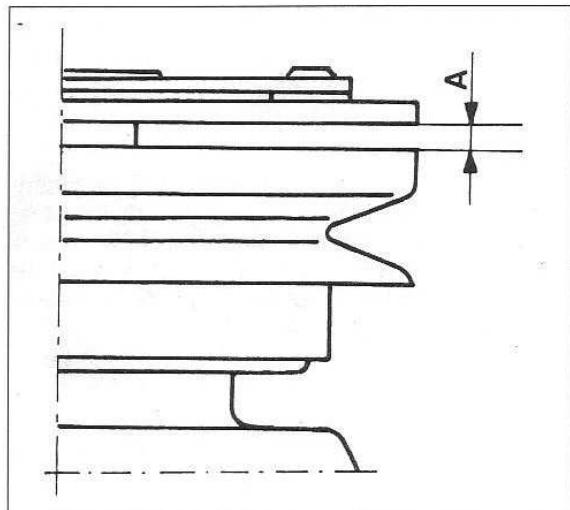
P2L051H04

Use the bridge and brackets mentioned on the previous page together with part 1877510000 (1) to fit the pulley assembly onto the front compressor support. Brackets (3) must be fastened to support (S) where the compressor is fastened (see left-hand diagram).

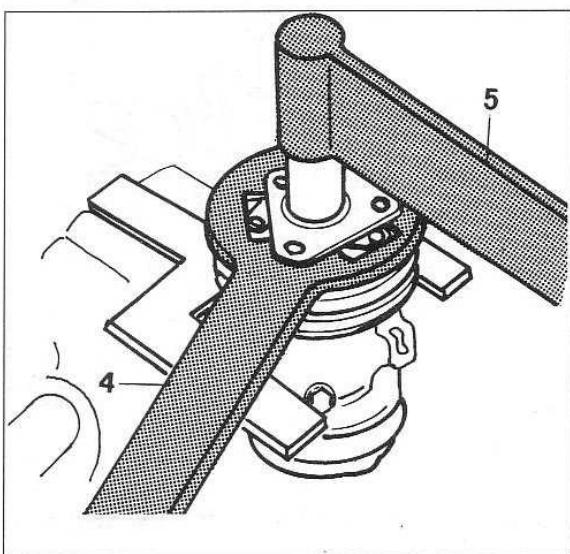
50.



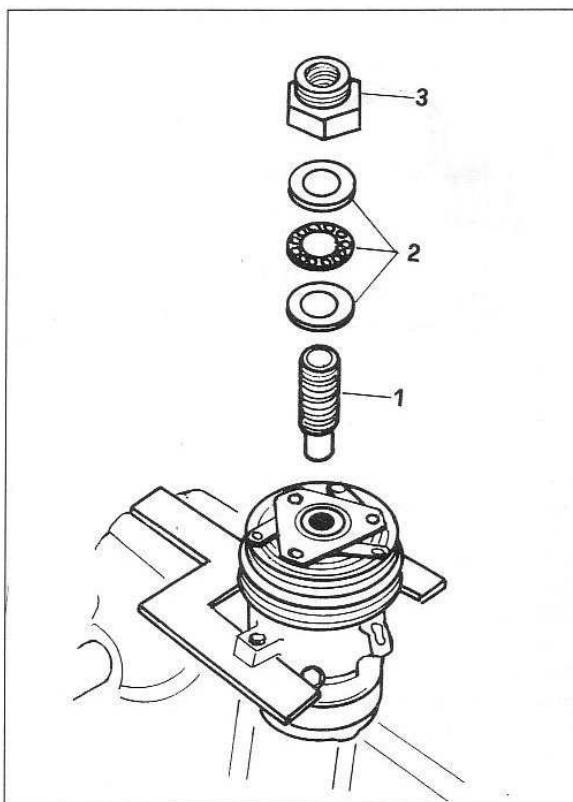
P2L052H01



P2L052H02



P2L052H03



P2L052H04

Use round-nosed pliers to replace the pulley assembly retaining ring in its housing on the front compressor support (see illustration to operation 4 on page 48).

Fit the key in the clutch plate hub groove and fit the clutch plate onto the compressor shaft. Then apply parts (1-2-3 top right diagram), making up tool 1877508000, to the shaft and clutch plate as shown in the shaded area of the top, left-hand diagram. To do this, tighten part (1) onto the compressor shaft, fit three rings (2) onto this (to make up a ball bearing) and then tighten nut (3), noting that the outer thread must face upward. Tighten the nut until there is a gap of 0.38 - 0.64 mm between the bottom surface of the clutch plate and the top of the pulley assembly (A, second diagram alongside), which can be measured using depth gauge 1895113000

Then use tool 177507000 (4) to keep the clutch plate in place as you tighten clutch plate hub retaining nut to a torque of 11 - 12 Nm using a torque wrench (5).

NOTES Before carrying out the operations described on the previous pages, ensure that the clutch plate and pulley assembly linings are completely clean.

After the last operation described on the previous page, turn the compressor pulley by hand to check that it does not rub against the clutch plate.

Detail of compressor on car

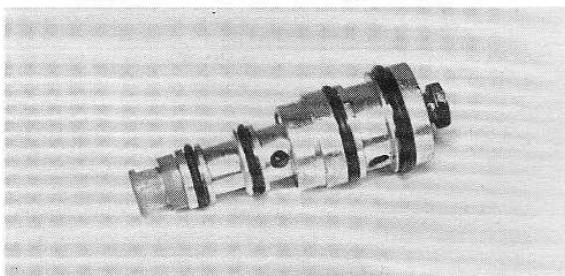
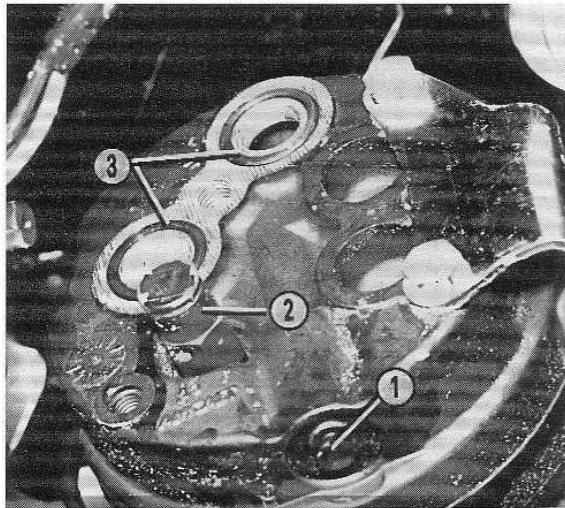
1. Compressor control valve
2. High pressure vent valve
3. Sealing rings on intake and exhaust ports

The compressor control valve is the only part that can be replaced without removing the compressor from the car.

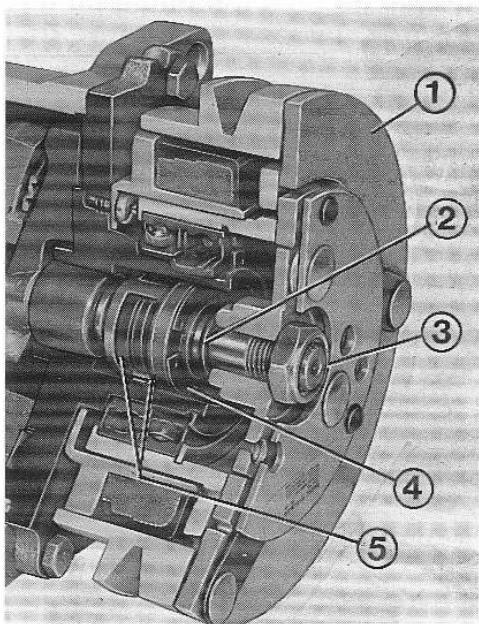
To replace, after draining the system, remove the valve retaining ring from the valve and remove the valve from the compressor.

Before fitting the new valve (shown in the diagram alongside), lubricate the sealing rings with antifreeze fluid.

Detail of compressor control valve



50.



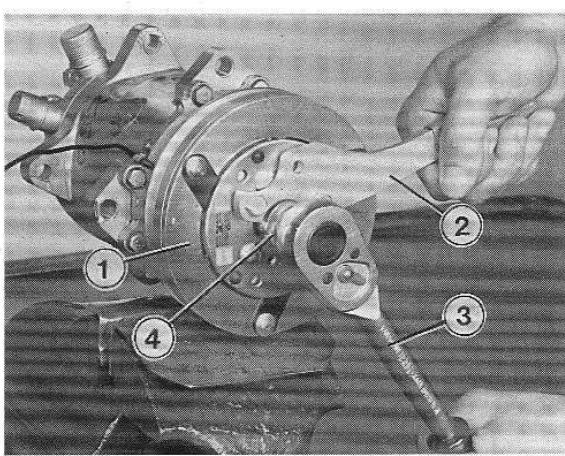
COMPRESSOR SD 709NBX 307

REPLACING SEAL ON ROTOR PULLEY SIDE

Disassembly

Longitudinal section through rotor pulley side compressor

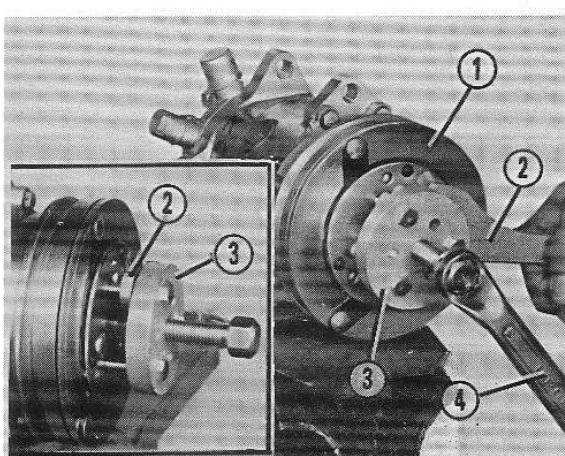
1. Clutch plate
2. Shims
3. Nut retaining plate (1)
4. Retaining ring
5. Seal assembly



Use wrench 32409 to keep the clutch plate (1) still and back off the nut retaining it to the compressor shaft.

Dismantling clutch plate retaining nut

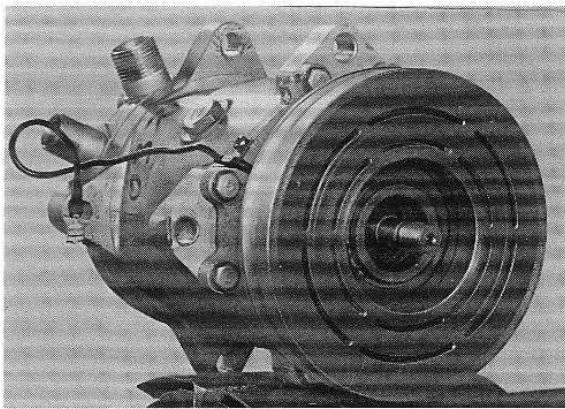
1. Clutch plate
2. Wrench 32409 for clutch plate retainer
3. Ratchet wrench
4. Bush for nut



Use wrench 32409 and extractor 32416 to release the clutch plate (1) from the compressor shaft.

Removing clutch plate

1. Clutch plate
2. Wrench 32409 for retaining clutch plate
3. Extractor 32416 for clutch plate
4. Hand key



P2L055H01

Detail of compressor without clutch plate

Remove the clutch plate fastening key from the compressor shaft.

Use tool 32047 to remove the retaining ring (4 top diagram, page 54) from the seal unit housing.

Remove the housing using tool 32405 and withdraw the seals using tool 32425.

Remove the O-ring from the housing, taking care not to scratch the inner mating surfaces.

Assembly

Thoroughly clean the area where the new seals are to be fitted.

Fit the new sealing ring, making sure it fits exactly into the groove.

Fit coupler 32426 to the compressor shaft and carry out disassembly operations in reverse order to fit the seal unit, housing and retaining ring.

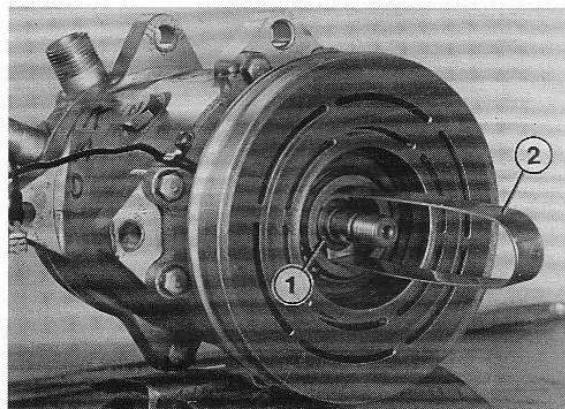
The seal unit and housing must be lubricated with clean SUNISO 5GS before fitting.

Before fitting the clutch plate, check that the rotor pulley turns freely and also check that the tab fits properly into its housing on the shaft.

NOTE Do not touch the surfaces of the graphite ring included in the new seal unit.

Fitting new seal unit using coupler 32426 and tool 32425

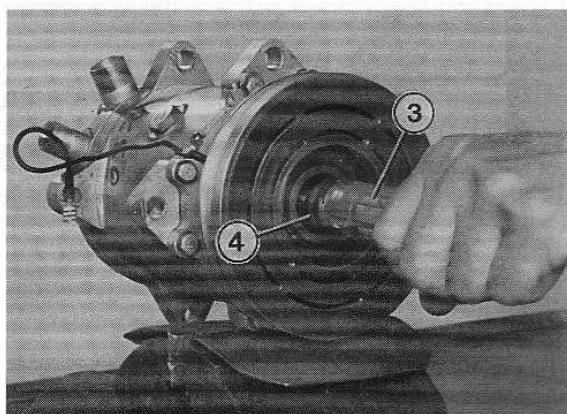
4. Seal unit
5. Coupler 32426



P2L055H02

Removing seal assembly housing using tool 32405

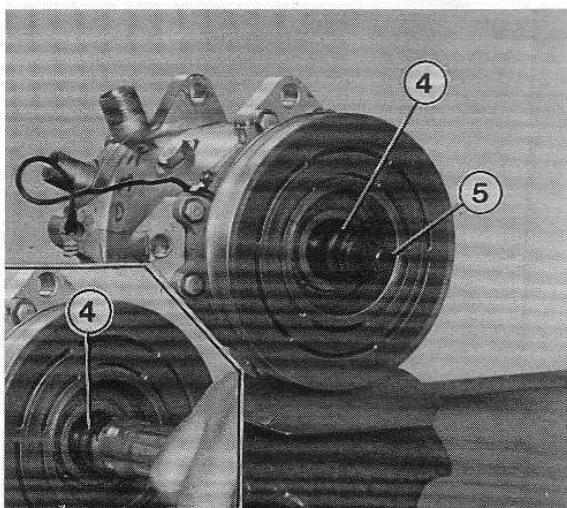
1. Seal assembly housing
2. Tool 32405



P2L055H03

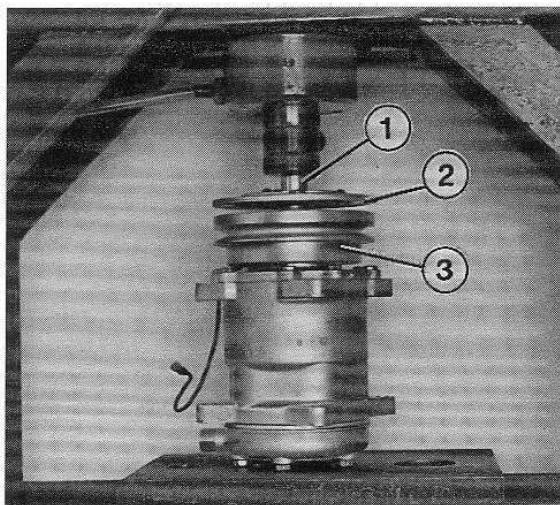
Removing seal assembly using tool 32425

3. Extractor 32425 - 4. Seal assembly unit



P2L055H04

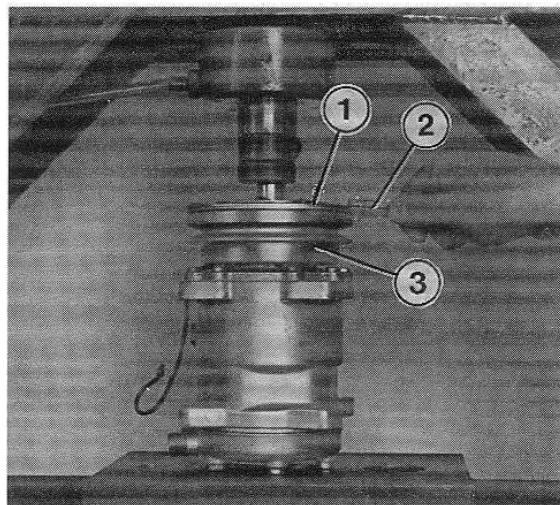
50.



P2L056H01

Fitting new clutch plate using a press

1. Tool 32436 for press-fitting clutch plate
2. Clutch plate
3. Rotor pulley



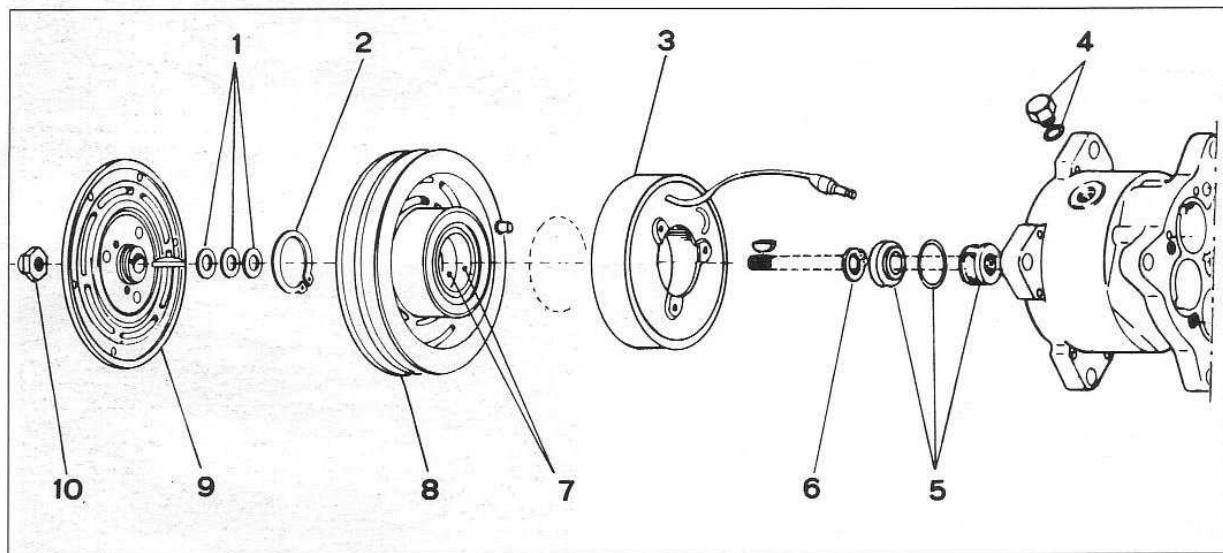
P2L056H02

Positioning clutch plate on shaft

1. Clutch plate
2. Shim
3. Rotor pulley

Fit clutch plate using a press (as shown), leaving a gap of 0.4 - 0.7 mm between the plate and the rotor pulley (measure using feeler gauge).

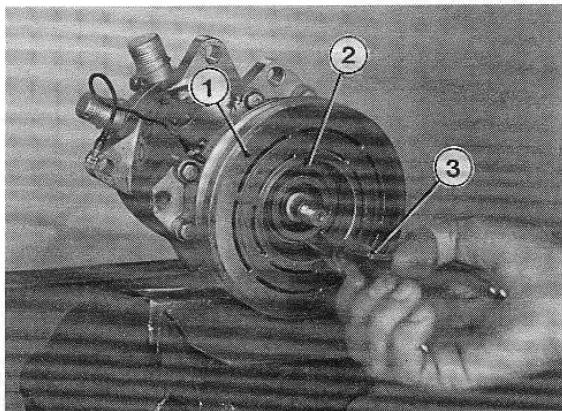
Lastly, tighten self-locking nut that fastens the clutch plate to the compressor shaft and tighten to a torque of 3.4 - 4.2 daNm.



P2L056H03

Components of rotor pulley side compressor

- | | |
|---------------------------|-------------------------------|
| 1. Shims | 6. Retaining ring |
| 2. Retaining ring | 7. Bearings for pulley (8) |
| 3. Solenoid | 8. Rotor pulley with bearings |
| 4. Plug with sealing ring | 9. Clutch plate |
| 5. Seal unit | 10. Plate retaining nut (9) |



P2L057H01

Disassembling rotor pulley retaining ring

1. Rotor pulley
2. Pulley retaining ring (1)
3. Round-nosed pliers

REPLACING BEARINGS FOR ROTOR PULLEY

Disassembly

Remove the clutch plate (as shown on page 51).

Using round-nosed pliers and tool 32407, remove rotor pulley bearing retaining rings. Release the rotor pulley from the compressor using extractor 32418 (see top, right diagram).

Removing-refitting ball bearings from/into rotor pulley using driver 32435

- | | |
|------------------|-----------------|
| 1. Driver 32435 | 3. Rotor pulley |
| 2. Ball bearings | |

Use the press to release the ball bearings from the pulley.

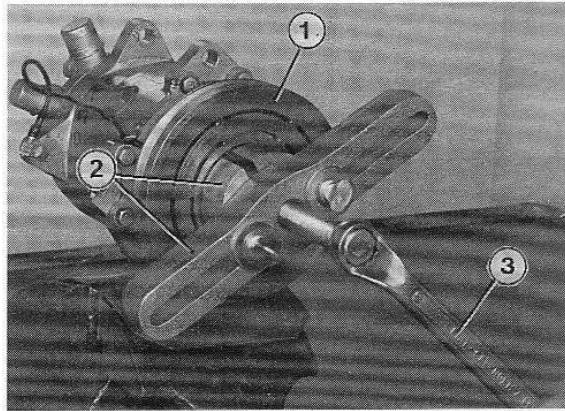
Assembly

After fitting the bearings and retaining ring in the rotor pulley, fit the rotor to the compressor.

Fit the inner retaining ring and fit the clutch plate to the compressor shaft, leaving the specified gap to the rotor pulley (see instructions and diagrams on the previous page). Lastly, tighten the self-locking nut fastening the clutch plate to the compressor shaft.

Press-fitting the pulley after replacing the bearings

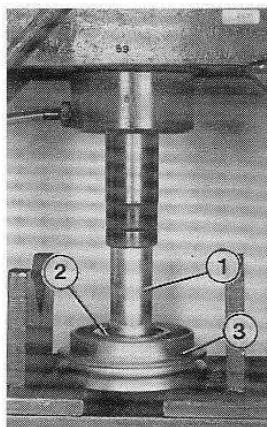
1. Driver 32435
2. Rotor pulley
3. Solenoid



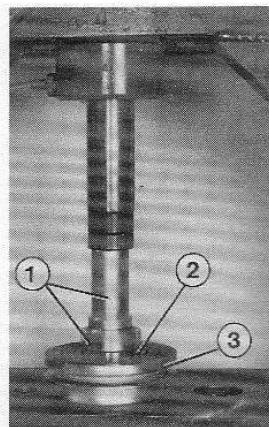
P2L057H02

Removing rotor pulley using tool 32418

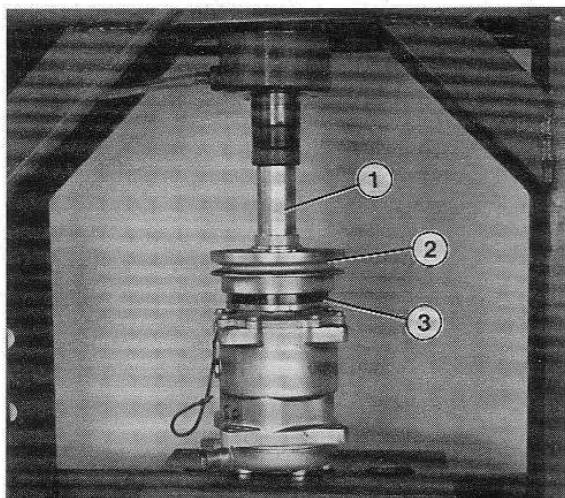
1. Rotor pulley
2. Extractor unit 32418
3. Hand key for extractor (2)



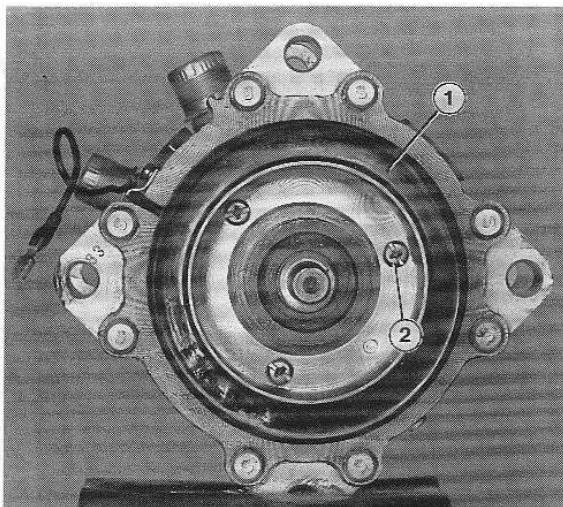
P2L057H03



P2L057H04



P2L057H05



P2L058H01

REPLACING THE SOLENOID

Disassembly

Remove the clutch plate and rotor pulley as described and illustrated on the previous pages.

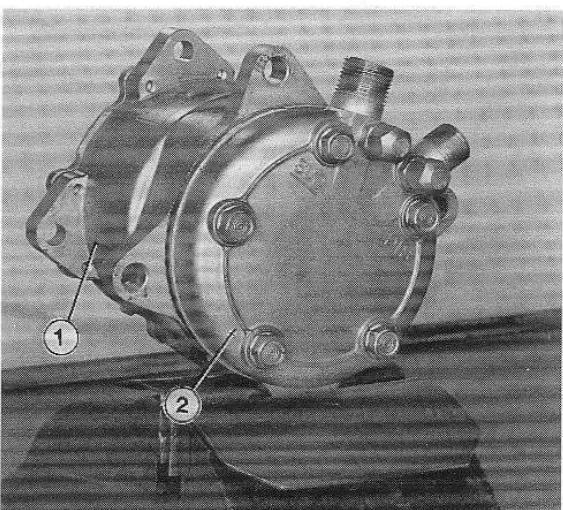
Back off screws (2) retaining the solenoid (1) to the front compressor plate.

Assembly

Carry out disassembly operations described and illustrated on the previous pages in reverse order.

View of compressor front without rotor pulley

1. Solenoid
2. Screws retaining the solenoid to the compressor body



P2L058H02

REPLACING THE VALVE PLATE AND CYLINDER HEAD SEALS

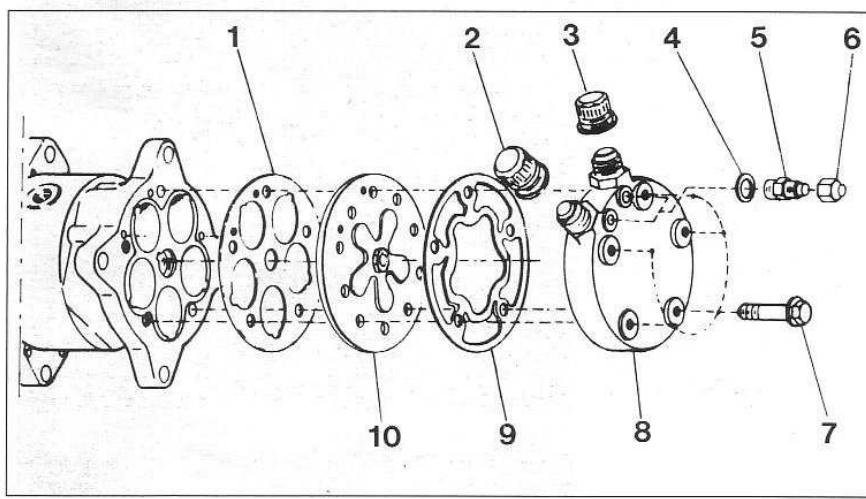
Disassembly

Back off the screws retaining the cylinder head and valve plate to the compressor case and remove valves very carefully.

View of compressor from cylinder head side

1. Compressor case
2. Cylinder head

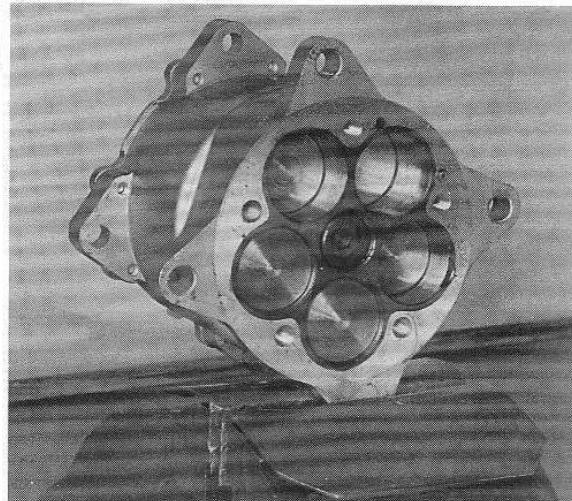
Parts of valve plate side compressor



P2L058H03

Assembly

Before fitting the valve plate and cylinder head with gaskets to the compressor body, thoroughly clean the sealing surfaces without scratching or chipping. Check that there are no material residues in the cylinder liners. Use clean SUNISO 5GS oil (or equivalent) to lubricate areas of the compressor case, valve plate and cylinder head in contact with gaskets.

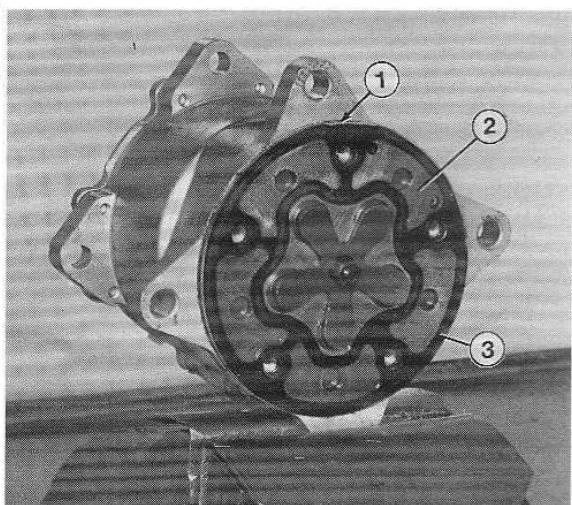


P2L059H01

Compressor case without valve plate



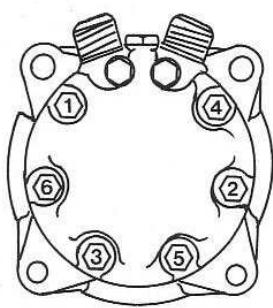
Position the new gasket (1) on the compressor case and then fit the following in order: valve plate (2), new gasket (3) and cylinder head. Fasten the unit using screws that must be tightened to a torque of 2.9- 3.3 daNm (3 - 3.4 kgm) following the order below.



P2L059H02

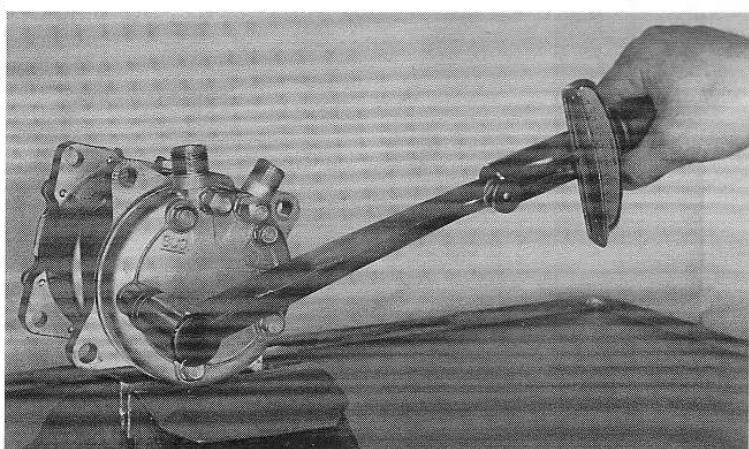
Fitting gaskets and valve plate

1. Gasket between compressor case and valve plate
2. Valve plate
3. Gasket between valve plate and cylinder head



P2L059H04

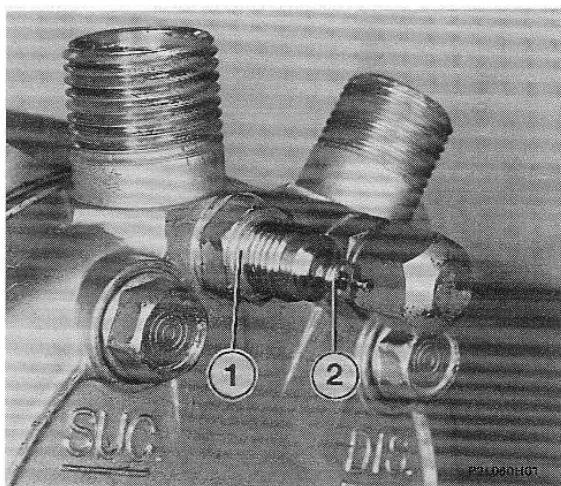
Tightening order of bolts retaining cylinder head to engine block



P2L059H03

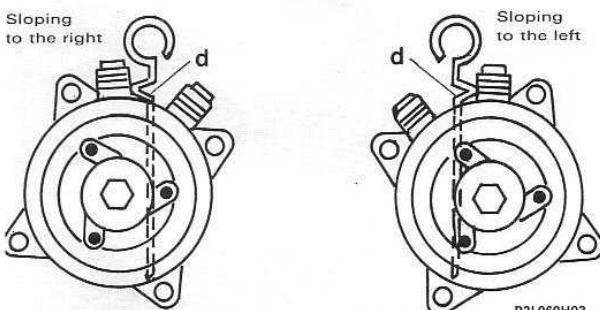
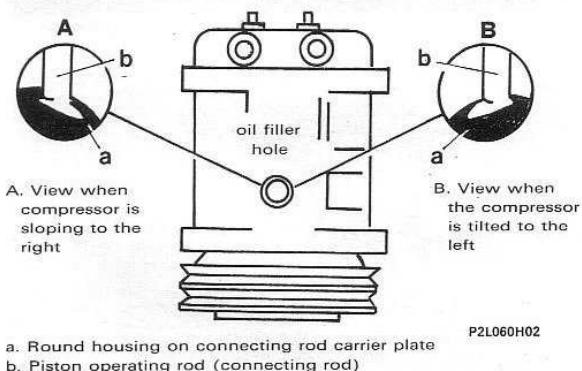
Torque tightening screws retaining cylinder head to engine block using torque wrench

50.



REPLACING SERVICE NEEDLE VALVE

If the service needle valve is not working properly, before replacing check that the fault is not due to a bad seal at the washer between the valve case and the cylinder head.



Slope angle	Number of notches	Slope angle	Number of notches
0°	2 - 4	40°	7 - 9
10°	4 - 5	50°	9 - 10
20°	5 - 6	60°	10 - 12
30°	6 - 7	90°	12 - 13

NOTE The special tools shown and described for overhaul of the SD 709 compressor is not supplied by FIAT.

If necessary, apply to the company MURRAY EUROPA Via Volta 20090 Cusago(MI) or its area representatives.

Detail of needle valve partly unscrewed from the case

1. Case for needle valve
2. Needle valve

CHECKING OIL LEVEL

Proceed as follows to check the oil:

- run the compressor for 10 minutes with the engine idling;
- drain coolant from the system and then from the compressor, taking care not to lose any oil;
- position level gauge 32448 on the flat surfaces of the front fastening dowels and read the slope angle after centring the air bubble;
- back off the oil filler plug and turn the compressor clutch plate until the inner part is positioned as shown in the diagram.

When the compressor is sloping to the right, position the piston operating rod at the beginning of its travel towards the back of the compressor. If the compressor slopes to the left, position the rod at the beginning of its travel towards the pulley.

- insert oil dipstick 32447 in the hole up to the top, bent part (d). This must be positioned according to the compressor slope as shown in the diagram;
- remove dipstick 32447 from the compressor and count the number of notches wet with oil;

The table shows oil levels for compressor inclinations.

If the level is lower (than indicated), top up until oil level reaches average level given in the table.

The plug must be tightened to a torque of 1.1 - 1.2 daNm (1.1 - 1.2 kgm).

Do not exceed this torque to stop leakage but unscrew the plug and replace the sealing ring.

FAULT DIAGNOSIS FOR AUTOMATIC AIR CONDITIONER

The system may display three different types of fault as follows:

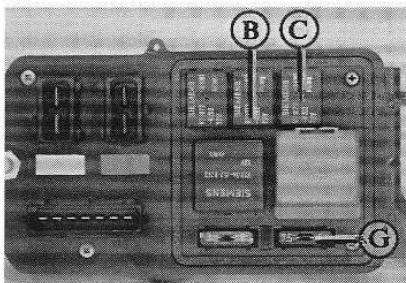
- mechanical (noise)
- electrical (inefficient cables or parts)
- functional, which may derive from the previous two or depend on system components.

MECHANICAL FAULTS		
Defect	Possible cause	Remedial operations
Compressor noise	Compressor pulley not properly aligned with the pulley fitted to the crankshaft	[A]
	Compressor drive belt not working properly (slack, too taut) or worn	[B]
	Compressor knock due to excessive charge of FREON 12 or uncondensed gas in the circuit	[C]
	Slacken screws and bolts fastening the compressor to the power unit	[D]
	Pulley with noisy electromagnetic coupling	[E]
	Compressor knock due to internal play or noise due to tendency to seize	[F]
Compressor noise under the facia	Noise due to passenger compartment fan motor brushes	[G]

- [A] Check installation and fastening of the two pulleys
- [B] Belt should bend by 1 cm under a load of 9.8-14.7 daN (10-15 kg). With a new belt, run the engine for a few minutes at varying speeds before final adjustment.
- [C] Drain, dry and recharge the system.
- [D] Check and tighten screws and bolts.
- [E] If the noise persists after checking the clutch plate nut is tightened to the correct torque, remove the compressor and replace the faulty part (compressor, retaining ring, pulley, clutch plate).
- [F] Drain the system and replace the compressor.
- [G] Replace the fan.

50.

ELECTRICAL FAULTS		
Defect	Possible cause	Remedial operations
Pulley with faulty electromagnetic coupling	Fuse or relay not working properly Electromagnetic coupling winding broken Three-level pressure switch not working properly One-level pressure switch not working properly Electromagnetic coupling winding voltage less than normal System pressure less than 1.65 bar or drain ed Electronic control unit inefficient	[A]
Sliding of pulley with electromagnetic coupling	Electromagnetic coupling coil short-circuited Electromagnetic coupling winding supply voltage less than normal	[B] page 67
Abnormal operation of radiator and condenser cooling fan	Fuse inefficient Relay inefficient Fan motor winding broken or short-circuited Three-level pressure switch inefficient Two-level heat switch inefficient	[C] page 68
Abnormal operation of passenger compartment fan	Fuse inefficient Fan motor with windings broken or short-circuited Electronic speed regulator inefficient Electronic control unit inefficient	[D] page 73



[A]

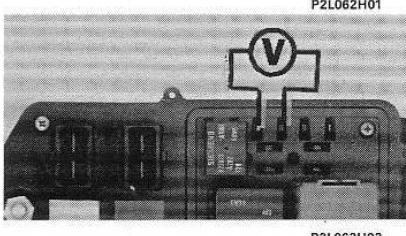
Check condition of removable 7.5 A fuse (G) for air conditioner control unit.

For versions with 1756 - 1581 SPI - 1995 engines, disconnect relay (C), while for other engines disconnect relay (B) from the air conditioner control unit.

Connect a 12V - 5W test bulb (L) or multimeter (voltmeter V) between the housings on the base where tag terminals 85 and 86 of the above relay were connected

After turning the ignition key to MAR, press air conditioner AUTO key.

If the test bulb comes on or a 12V reading is obtained, carry out the operation sequence marked A8 and described on page 66.

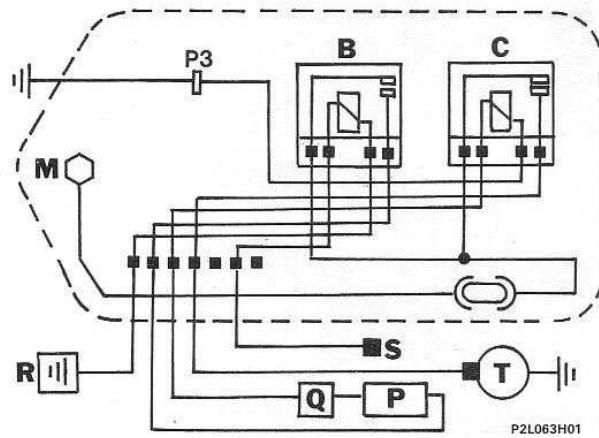


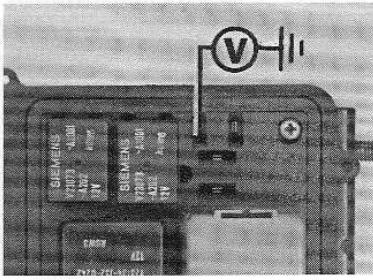
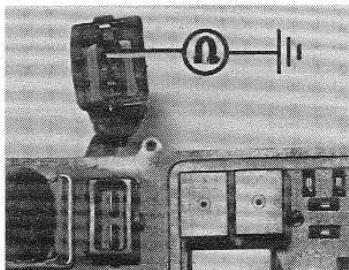
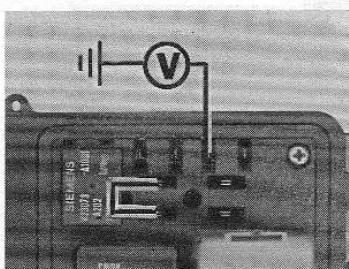
If the bulb stays off or a nil voltage reading is obtained, according to the engine version and therefore the air conditioner control unit, carry out the operations shown on this and the following pages.

VERSIONS WITH 1756 - 1581 SPI - 1995 ENGINES

Diagram showing internal and external connections of the air conditioner control unit for activating the compressor pulley electromagnetic coupling

- B. 20A relay
- C. Supplementary 20A relay
- M. Single-pole terminal for current socket
- P. Three-level pressure switch
- Q. One-level pressure switch (not on all versions)
- R. Air conditioner engagement control
- S. Fused positive (except starting)
- T. Compressor
- U. Earth connection



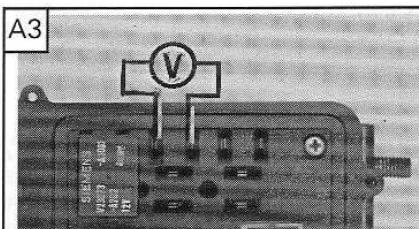
CHECK OPERATIONS	RESULT	REPAIR OPERATIONS	
 P2L063H02	Connect a voltmeter or test bulb (12V - 5W) between earth and the housing on the base of the control unit where tag terminal 85 of above relay (C) was fitted.	Voltage 12 V Bulb on	Carry out the sequence of operations coded A1
		Voltage nil Bulb off	Carry out the sequence of operations coded A2
A1	Disconnect the red connector from the air conditioner control unit and connect an ohmmeter between terminal P3 and earth. If voltage reading is nil, replace the above control unit because the internal printed circuit has failed. Otherwise (resistance infinite) check the earth connection and the condition of the cable leading to terminal P3.	 P2L063H03	
A2	Leave the connections described previously (between terminal 85 and earth) and disconnect relay B. Connect housings where tag terminals 30 and 87 of relay B were fitted using a bridge. If voltage reading is 12V or the bulb comes on, carry out the sequence of operations coded A3. If the value is nil or the bulb stays off, carry out the sequence of operations coded A4.	 P2L063H04	

Auxiliary units

Automatic air conditioner

Tempra

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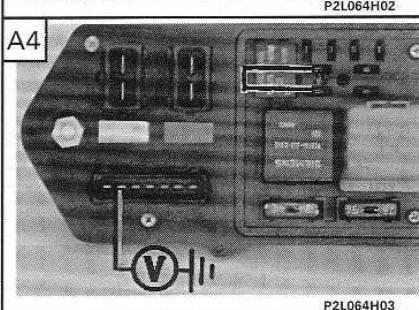


Connect a voltmeter or test bulb between the housings on the base where tag terminals 85 and 86 of relay B were connected. Turn the ignition key to MAR and turn on the air conditioner by pressing AUTO.

If voltage reading is 12V or the bulb comes on, replace relay B because it is defective.

If the reading is nil or the bulb stays off, disconnect 7-way connector (from the air conditioner control unit) and connect a voltmeter or test bulb to terminals S6 and S7.

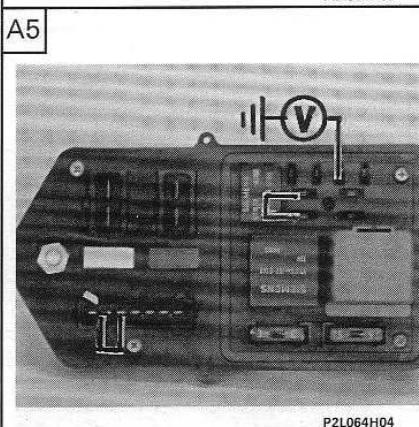
If voltage reading is 12V or the bulb comes on, replace the control unit because its internal printed circuit is broken. Otherwise, check the connection and condition of the cables leading to the two above terminals. If undamaged, replace the air conditioner control unit because it is defective.



Leave the connection (bridge) between the housings on the base where tag terminals 30 and 87 of relay B were connected and disconnect the 7-way connector.

Connect a voltmeter or bulb between tag terminal S5 of the connector housing (7-way) and earth.

If the voltage reading is 12V or the bulb comes on, carry out the operation sequence coded A5. If reading is nil or the bulb stays off, replace the air conditioner control unit because its internal printed circuit is broken.



Connect a voltmeter or test bulb (12V - 5W) between earth and the housing on the base where tag terminal 85 of relay C was connected.

Bridge the two tag terminals S5 and S4 of the 7-way connector housing.

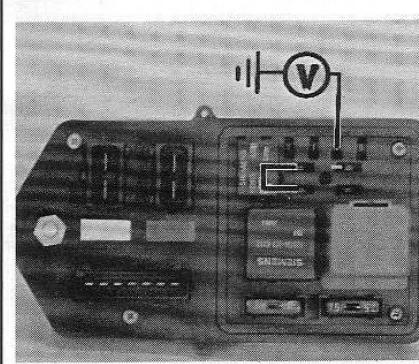
If voltage reading is nil or the bulb stays off, replace the air conditioner control unit because its internal printed circuit is broken.

If reading is 12V or the bulb comes on, carry out the following operations in order:

- leave the voltmeter or bulb connected between the earth and terminal 85 and remove the bridge between the two tag terminals S5 and S4;
- connect the 7-way connector to its housing on the control unit base;
- disconnect the electrical connection to which the three-level pressure-switch cables lead and bridge the Green and Dark Blue cables.

If the bulb comes on or a reading of 12V is obtained, connect the device to the air conditioning system and check its efficiency. If the pressure of FREON 12 inside the system is greater than 2.35 bar, replace the three-level switch.

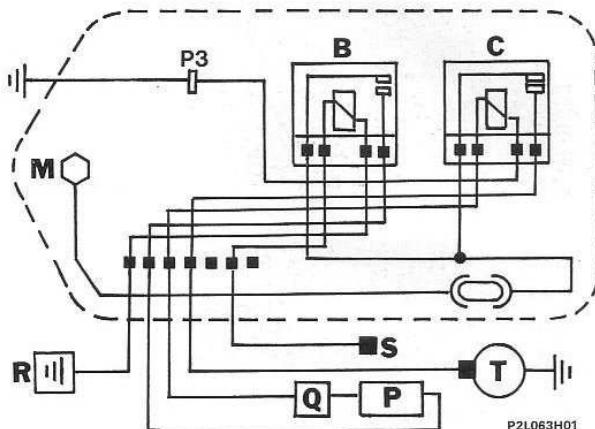
Otherwise, (bulb off or voltage nil) short-circuit the one-level pressure switch (if present). If the same situation persists, check the condition and continuity of the cables leading to the two tag terminals S4 and S5. If the bulb comes on or the voltage is 12V, replace the one-level pressure switch.

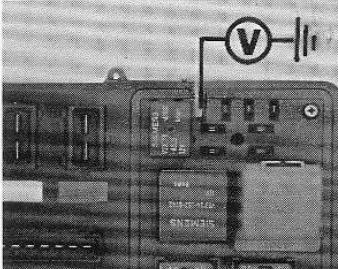
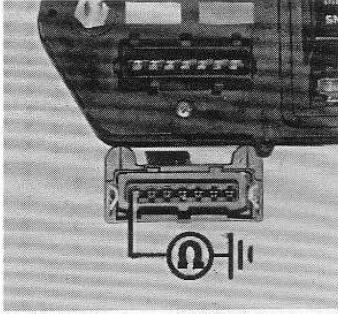
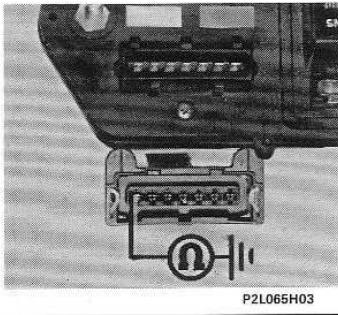


ALL VERSIONS EXCEPT THOSE WITH THE ENGINES MENTIONED ON PAGE 63

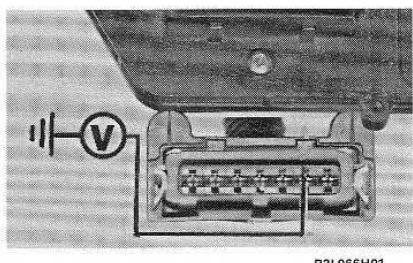
Diagram showing internal and external connections of the air conditioner control unit for activating the compressor pulley electromagnetic coupling

- B. 20A relay
- M. Single-pole terminal for current socket
- P. Three-level pressure switch
- Q. One-level pressure switch (not present on all versions)
- R. Air conditioner control
- S. Fused positive (except starting)
- T. Compressor
- U. Earth connections



CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 P2L065H02	Connect a voltmeter or test bulb (12V - 5W) between earth and the housing on the control unit base where tag terminal 85 of relay (B) was connected.	Voltage 12 V Bulb on Carry out the operation sequence coded A6.
		Voltage nil Bulb off Carry out the operation sequence coded A7.
A6	<p>Disconnect the 7-way connector from the air conditioner control unit and connect an ohmmeter between terminal S6 and earth. If resistance reading is nil when the ignition key is turned to MAR and the AUTO key of the air conditioner is pressed, replace the control unit because its internal printed circuit is broken. Otherwise (infinite resistance), check connection and condition of the cable leading to terminal S6. If unbroken, replace the air conditioner control unit.</p>	
A7	<p>Disconnect the 7-way connector from the control unit and connect a voltmeter or test bulb (12V - 5W) between terminals S6 and S7. If voltage reading is 12V or the bulb comes on, replace the above control unit because its internal printed circuit is broken. If reading is nil or the bulb stays off, check connection and condition of the cables leading to the two terminals (see operations on next page).</p>	
	 P2L065H03	
	 P2L065H03	

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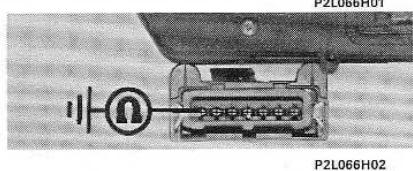


Disconnect the 7-way connector from the air conditioner control unit and connect a voltmeter or test bulb (12V - 5W) between terminal S7 and earth.

If the bulb stays off or voltage reading is nil, check connection and continuity of cable leading to the above terminal.

If the bulb comes on or voltage reading is 12V, carry out the following operations:

- connect an ohmmeter between terminal S6 of the above connector and earth;
- disconnect the electrical connection from the one to which the terminal cables of the three-level pressure switch lead and bridge the Green and Dark Blue cables.



If resistance reading is nil with the ignition key turned to MAR and the air conditioner on, connect a tester to the air conditioner and check its efficiency. If the pressure of FREON 12 inside the system is more than 2.35 bar, replace the three-level pressure switch.

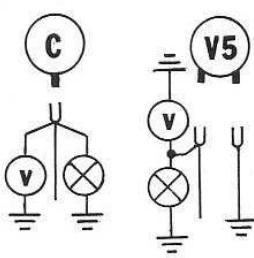
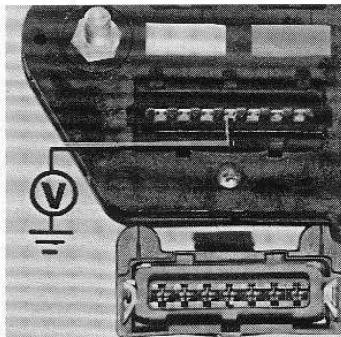
If resistance reading is infinity, short-circuit the one-level pressure switch (if present). If the same condition persists, check the condition and connection of cables leading to terminal S6. Otherwise (resistance 0Ω), replace the one-level pressure switch.

If the cables leading to terminal S6 are undamaged, replace the air conditioner control unit.

NOTE Apart from the last operation referring to cables connected to terminal S6, the previous operations do not refer to the 2000 engine.

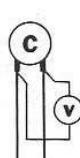
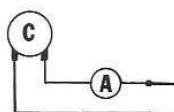
A8 If, after carrying out the operation described at the bottom of page 62, the bulb comes on or voltage reading is 12V, carry out the following operations:

CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 Connect the test bulb or a voltmeter between the housing on the base where blade 30 of relay C or B was connected and earth.	Bulb off Voltage nil	Replace the air conditioner control unit because its internal printed circuit is broken.
	Bulb on Voltage 12V	Carry out the following tests.
 Bridge the housings where tag terminals 30 and 87 of relay C or B were connected.	Compressor electromagnetic coupling activated	Replace relay B or C.
	Compressor electromagnetic coupling stays deactivated	Carry out the following tests.

CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 <p>P2L067H01</p> <p>C. Rotary compressor V5. Variable displacement compressor</p>	Bulb on Voltage 12V	Drain the air conditioning system and replace the winding of the compressor pulley electromagnetic coupling.
	Bulb off Voltage nil	Carry out the following tests
 <p>P2L067H02</p> <p>Disconnect the 7-way connector from the air conditioner control unit and connect a voltmeter or test bulb between tag terminal S2 (for versions listed on page 63) or S5 (for other versions) of the above connector connection housing and earth.</p>	Voltage nil Bulb off	Replace the air conditioner control unit because its internal circuit is broken.
	Voltage 12V Bulb on	Replace the positive cable connecting the compressor to the control unit (*).

(*) For versions with variable displacement compressors, before replacing the above cable check the connection and condition of the earth connection cable.

For versions with 2000 engines, before replacing the above cable, check that the air conditioning system and the three-level pressure switch are efficient.

CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 <p>P2L067H03</p> <p>Connect a voltmeter to the tag terminals of the compressor pulley electromagnetic coupling winding.</p>	Voltage 12V	Carry out the following tests.
	Voltage less than 12V	Check the battery voltage and check the electromagnetic coupling supply circuit.
 <p>P2L067H04</p> <p>Connect an ammeter in line with the compressor pulley electromagnetic coupling winding.</p>	Current 0 A	Replace the winding because it is broken.
	Current more than 4.2 A (for V5 compressors) or 3 A (for SD 709 compressors)	Replace the winding because some coils are short-circuited.

Auxiliary units

Automatic air conditioner

Tempra

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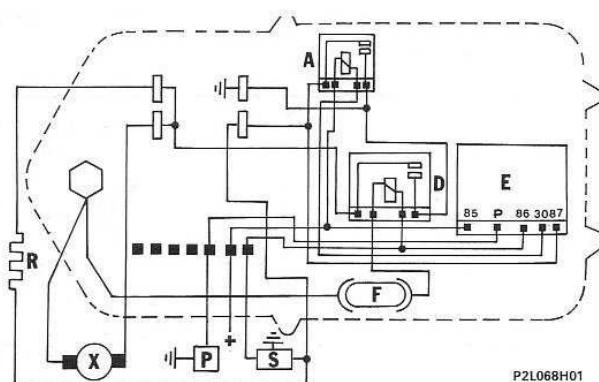
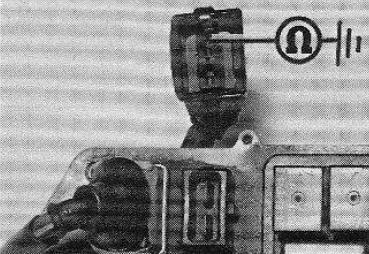
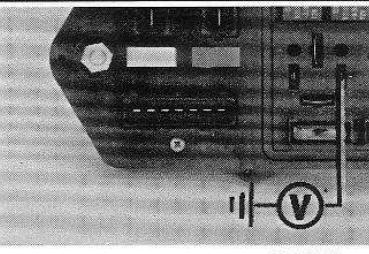
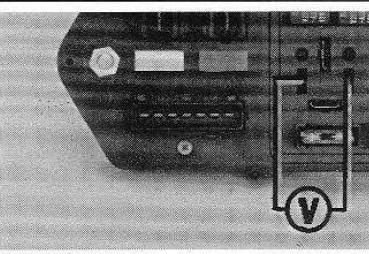
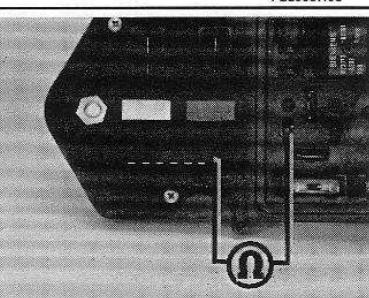
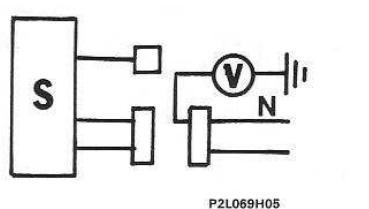


Diagram showing internal and external connections of the air conditioner control unit connected to the radiator and condenser cooling fan (applicable to all versions apart from those with diesel engines)

- A. Supplementary 20A relay for 1st fan speed (X)
- D. 50A relay for 2nd fan speed (X)
- E. Delay device for fan 2nd speed engagement (X)
- F. 3A fuse
- P. Three-level pressure switch
- R. Resistor
- S. Two-level heat switch

X. Radiator and condenser cooling fan

C	<p>P2L068H02</p>	<p>Disconnect relay D from the air conditioner control unit. Bridge the terminals on the base where tag terminals 30 and 87 of relay D were connected. If fan (X) does not work, carry out the operation sequence coded C1. Otherwise, carry out the sequence of operations coded C2.</p>															
C1	<p>P2L068H03</p>	<p>Disconnect the electrical connection to the fan cables (X) and connect a voltmeter in its place. If the voltage reading is 12V, replace the fan. If reading is nil, carry out the following operations:</p>															
	<p>P2L068H04</p>	<table border="1"> <thead> <tr> <th>CHECK OPERATIONS</th><th>RESULT</th><th>REPAIR OPERATIONS</th></tr> </thead> <tbody> <tr> <td> <p>P2L068H04</p> </td><td> Connect a voltmeter or test bulb between the terminal of the light blue lead and earth. </td><td> Voltage 12V Bulb on Carry out the following test. </td></tr> <tr> <td></td><td> Voltage nil Bulb off </td><td> Check the efficiency of the 30A fuse (162 on the wiring diagrams) and the condition of the cable section connecting the connector block to the fan. </td></tr> <tr> <td> <p>P2L068H04</p> </td><td> Disconnect the white two-way connector from the air conditioner control unit and connect an ohmmeter between the earth and tag terminal P1 on the base housing. </td><td> Resistance nil Replace the Black Blue cable connecting the control unit to the fan. </td></tr> <tr> <td></td><td> Resistance infinity </td><td> Carry out the following test. </td></tr> </tbody> </table>	CHECK OPERATIONS	RESULT	REPAIR OPERATIONS	<p>P2L068H04</p>	Connect a voltmeter or test bulb between the terminal of the light blue lead and earth.	Voltage 12V Bulb on Carry out the following test.		Voltage nil Bulb off	Check the efficiency of the 30A fuse (162 on the wiring diagrams) and the condition of the cable section connecting the connector block to the fan.	<p>P2L068H04</p>	Disconnect the white two-way connector from the air conditioner control unit and connect an ohmmeter between the earth and tag terminal P1 on the base housing.	Resistance nil Replace the Black Blue cable connecting the control unit to the fan.		Resistance infinity	Carry out the following test.
CHECK OPERATIONS	RESULT	REPAIR OPERATIONS															
<p>P2L068H04</p>	Connect a voltmeter or test bulb between the terminal of the light blue lead and earth.	Voltage 12V Bulb on Carry out the following test.															
	Voltage nil Bulb off	Check the efficiency of the 30A fuse (162 on the wiring diagrams) and the condition of the cable section connecting the connector block to the fan.															
<p>P2L068H04</p>	Disconnect the white two-way connector from the air conditioner control unit and connect an ohmmeter between the earth and tag terminal P1 on the base housing.	Resistance nil Replace the Black Blue cable connecting the control unit to the fan.															
	Resistance infinity	Carry out the following test.															

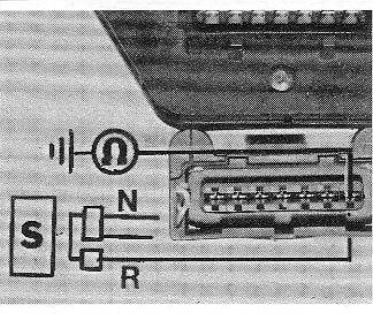
CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 <p>P2L069H01</p> <p>Disconnect the two-way red connector from the control unit and connect an ohmmeter between terminal P3 and earth.</p>	Resistance nil	Replace the air conditioner control unit because its printed circuit is broken.
	Resistance infinity	Check the connection and condition of the cable leading to terminal P3.
 <p>P2L069H02</p> <p>Connect a voltmeter or test bulb between the housing on the control unit base where tag terminal 85 of relay D was inserted and earth.</p>	Voltage 12V Bulb on	Carry out the following test
	Voltage nil Bulb off	Check the efficiency of the 3A fuse (F) and if found to be working replace the control unit.
 <p>P2L069H03</p> <p>Connect a voltmeter or test bulb between the housings on the control unit base where tag terminals 85 and 86 of relay D were connected.</p>	Voltage 12V Bulb on	Replace relay D
	Voltage nil Bulb off	Carry out the following test
 <p>P2L069H04</p> <p>Disconnect the seven-way connector from the control unit and connect an ohmmeter between tag terminal S3 of the base housing and base terminal where tag terminal 86 of relay D is connected.</p>	Resistance nil	Carry out the following test
	Resistance infinity	Replace the control unit because its printed circuit is broken
 <p>P2L069H05</p> <p>Disconnect the electrical connection of the two-level heat switch terminal cables (S) (on the radiator) and connect an ohmmeter between the black cable of the cable connector and earth.</p>	Resistance nil	Carry out the following test
	Resistance infinity	Replace the Black lead that connects the two-level heat switch to earth

Auxiliary units

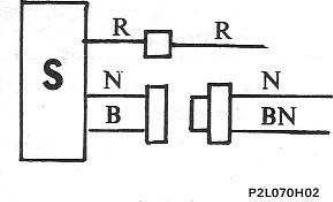
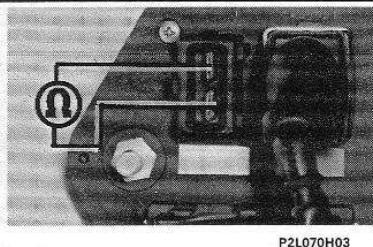
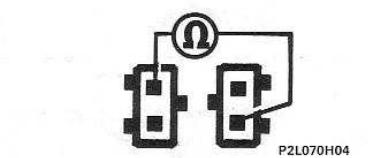
Automatic air conditioner

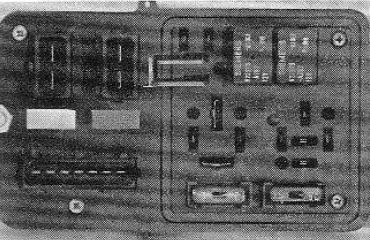
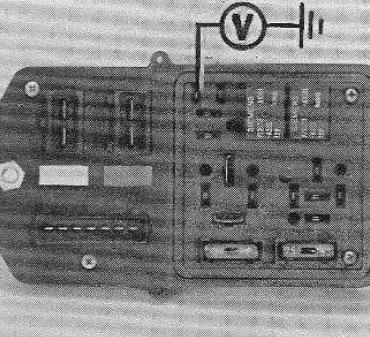
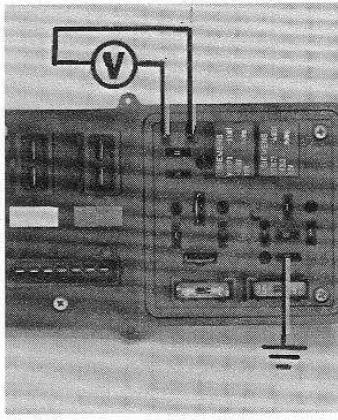
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CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 <p>P2L070H01</p> <p>Join the Red and Black cables of the wiring connectors to which the terminal leads of the heat switch were connected and connect an ohmmeter between terminal S3 of the 7-way connector (above) and earth</p>	Resistance nil	Replace the two-level heat switch
	Resistance infinity	Replace the red cable that leads to terminal S3 of the 7-way connector

If the fan is not working at low speed but only at high speed, proceed as follows:

 <p>P2L070H02</p> <p>Disconnect the connection of the two-level heat switch terminal leads (on radiator) and join the wiring connector cables. Turn the ignition key to MAR</p>	Fan works Fan does not work	Replace the two-level heat switch Carry out the following tests
 <p>P2L070H03</p> <p>Disconnect the white two-way connector from the air conditioner control unit and connect an ohmmeter between the two tag terminals P1 and P4 on the base housing</p>	Resistance nil Resistance infinity	Carry out the following tests Replace the control unit because its printed circuit is broken
 <p>P2L070H04</p> <p>Disconnect the red connector from the control unit and connect an ohmmeter between terminals P2 and P4 of the two coloured connectors.</p>	Resistance of 0.23Ω Resistance less than 0.2Ω Resistance infinity	Replace broken section(s) of cable connecting the resistor to the two-level heat switch Replace the resistor because it is inefficient Replace the resistor after checking the condition of the leads connecting it to the control unit (terminals P2 and P4)
 <p>P2L070H05</p>		

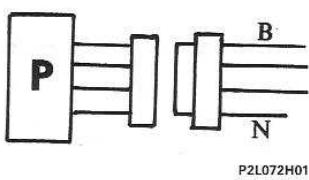
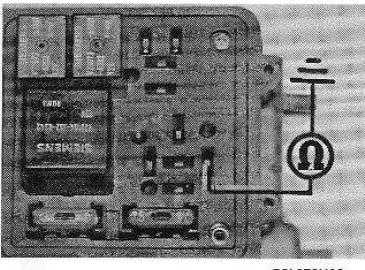
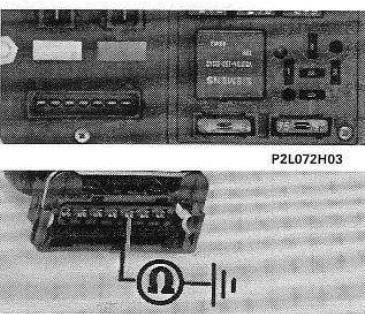
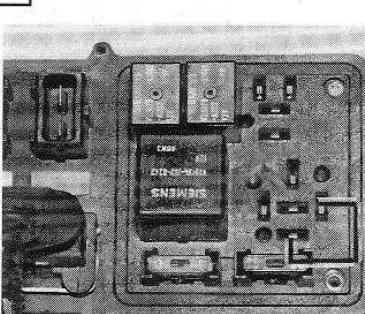
CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
 P2L071H01	<p>Disconnect relay A from the air conditioner control unit.</p> <p>Bridge the seats on the base where tag terminals 30 and 87 of relay A were connected.</p>	<p>Fan works</p> <p>Carry out the operation sequence coded C3.</p> <p>Fan does not work</p> <p>Carry out the operation sequence coded C4.</p>
C3  P2L071H02	<p>Remove the bridge and connect a voltmeter or a test bulb (12V - 5W) between the seat on the base where tag terminal 85 of relay A was connected and earth.</p>	<p>Voltage 12V Bulb on</p> <p>Carry out the following test</p> <p>Voltage nil Bulb off</p> <p>Check whether the pulley electromagnetic coupling is activated. If so, replace the control unit because its printed circuit is broken. If not, carry out the operations described previously for the coupling.</p>
 P2L071H03	<p>Connect the voltmeter or test bulb between the seats on the control unit base where tag terminals 85 and 86 of relay A were connected.</p> <p>Disconnect the delay device (E) from the control unit and earth the seat on the base where tag terminal 30 of the above device was connected.</p>	<p>Voltage 12V Bulb on</p> <p>If the delay device works (see operations C5), replace relay A</p> <p>Voltage nil Bulb off</p> <p>Replace the air conditioner control unit because its printed circuit is broken</p>
C4  P2L071H04	<p>Disconnect the red two-way connector and connect an ohmmeter between tag terminal P2 and the seat for connection of tag terminal 30 of relay A on the base.</p>	<p>Resistance nil</p> <p>Check the efficiency of the resistor and cables connecting it to the control unit</p> <p>Resistance infinity</p> <p>Replace the control unit because its printed circuit is broken</p>

Auxiliary units

Automatic air conditioner

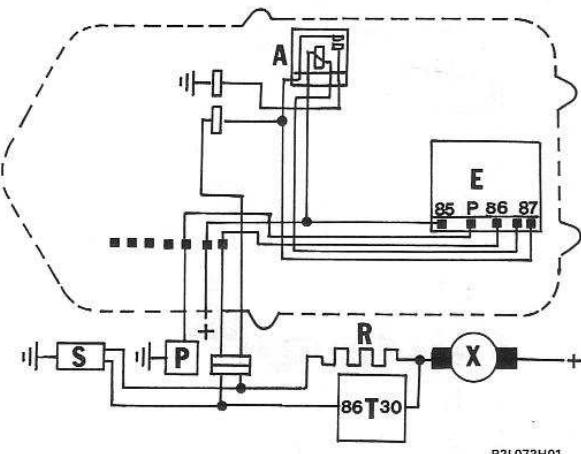
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CHECK OPERATIONS	RESULT	REPAIR OPERATIONS
C5 	Fan works	Replace the three-way pressure switch.
	Fan does not work	Carry out the following test.
	Resistance nil	Carry out the operations coded C6.
	Resistance infinity	Carry out the following tests.
	Resistance nil	Replace the control unit because its printed circuit is broken.
	Resistance infinity	Replace the broken lead(s) connecting the three-level pressure switch to earth and to the control unit.
C6 	Fan works	Replace the delay device. If the fan still does not work properly, replace the control unit.
	Fan does not work	Replace the control unit

Internal and external connection diagram of air conditioner control unit for radiator and condenser cooling fan. Applies to versions with 1929 Turbo Diesel engines or Diesel

- A. 20A relay for 1st fan speed (X)
- E. Delay device for 2nd fan speed (X)
- P. Three-level pressure switch
- R. Resistor
- S. Two-level heat switch
- T. 50A relay for 2nd fan speed (X)
- X. Radiator and condenser cooling fan

**D**

Carry out the following operations in order:
Check efficiency of 30A fuse (230 in wiring diagram of section 55) fitted to line that supplies passenger compartment fan directly.

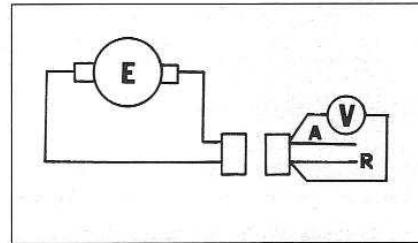
Disconnect the connector of the fan base supply leads and connect a voltmeter to these.

Turn the ignition key to MAR.

Press the AUTO key and the AIR key several times in order to select top fan speed.

If voltage reading is 12V, replace the fan.

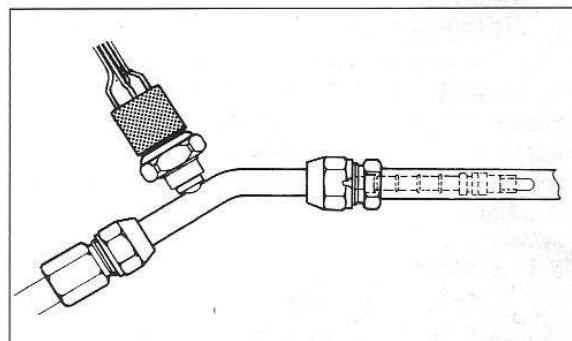
If voltage reading is nil, check the condition of the various cable sections that supply the fan. If no defects are found, replace the electronic regulator after checking supply, i.e. that connected cables are not broken.



FUNCTIONAL FAULTS

In order to establish the causes that gave rise to the faults and therefore the appropriate remedies, carry out the following operations:

- park the car in a well-ventilated area of the workshop (if not possible, choose the part least polluted by exhaust gas and vapour in general);



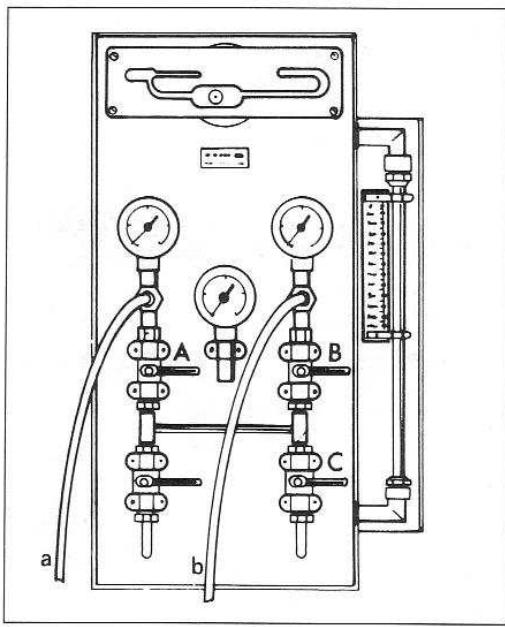
- only for the version with 1929 Turbo Diesel engine, back off the three-level pressure switch (shaded) from the first section of the piping that connects the condenser to the evaporator. Tighten a three-way connection in its place.

This fitting must have a female fitting of 7/16" 20 UNF-2B; a male fitting with needle valve type BRIDGEPORT size 7/16" 20 UNF-2A and a male fitting with needle valve size 1/4" SAE;

- tighten the three-level pressure switch to the above BRIDGEPORT type needle valve;

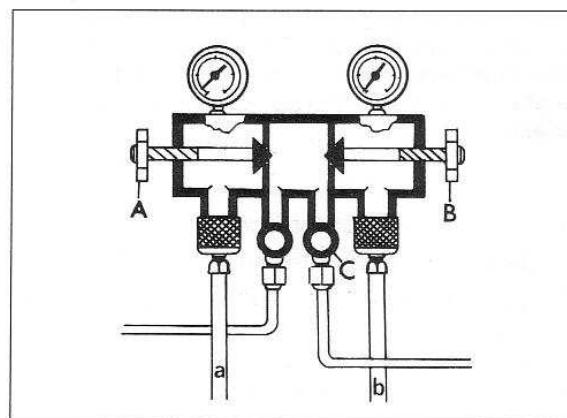
- before connecting the device for testing system vacuum and charge, check that all cocks are closed;

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P2L074H01

CEAST equipment



P2L074H02

Carlo EISNER equipment

- open the low (A) and high (B) pressure cocks and quickly open the metering cylinder cut-off cock (C) in order to expel the air in the two hoses (a and b);
- close the cocks A - B - C;

- connect the low pressure side hose (a) to one of the needle valves welded onto the pipes connecting the dehydrating accumulator to the compressor or evaporator;
- connect the high pressure side hose (b) to the needle valve fitted to the three-way fitting or the valve welded onto the first section of pipe connecting the condenser to the evaporator next to the three-way pressure switch;
- take readings from the equipment high and low pressure vacuum gauges.

PRESSURE READINGS	CAUSE OF MALFUNCTION	REMEDIAL OPERATIONS
A reading between 0 - 0.7 bar	System drained (or almost) due to leakage	Add 400 grams of FREON 12 to the system, find leaks using a leak tester and repair.
A reading between 0.7 - 1.65 bar	System partly drained due to leakage	Find leaks using a leak tester and repair (*)
A reading more than 2.5 bar	When the air conditioner is switched on, the compressor pulley electromagnetic coupling does not work	After checking the compressor pulley electromagnetic coupling circuit, replace the three-level pressure switch

(*) Before repairing, note that the pressure reading shown refers to an outdoor temperature of more than 10° C

With an outdoor temperature of more than 10°C, start up the car engine and run at 1000 rpm. Press the AUTO key to start the air conditioner and operate the passenger compartment fan at the highest possible speed by pressing the AIR and TEMP keys. Set the minimum possible temperature on the display (LO).

SYSTEMS WITH VARIABLE DISPLACEMENT COMPRESSOR

After activating the air conditioning system as described, two situations may arise as follows:

1. The compressor pulley electromagnetic coupling comes on and then goes off;
2. The pulley electromagnetic coupling stays on all the time.

In the first case, disconnect the electrical connection of the radiator and condenser cooling fan supply lead and let the compressor pulley go off due to the effect of the 3-level pressure switch.

When the above coupling is reactivated, if the compressor knocks and the vent valve (on the compressor) comes on during the test, the system contains too much fluid.

If the compressor begins to work again without excessive noise, carry out the same operations described for the second case above.

If the excessive coolant temperature warning light comes on during the test or the pressure gauge connected to the high pressure side of the system shows a reading of more than 26.5 bar, quickly restore the supply to the above fan (radiator and condenser)

If the system is found to contain too much fluid, carry out the following operations:

- restore supply to the radiator and condenser cooling fan;
- leave engine idling with the air conditioner on (passenger compartment fan at max. speed and minimum temperature setting);
- after 5 minutes, stop the engine and drain the air conditioning system;
- disconnect the compressor and the dehydrating accumulator and drain the fluid from both parts;
- add 85.2 cm³ (3 oz) of SUNISO 5GS antifreeze (or equivalent) to the compressor and reconnect the two parts of the system;
- dry and load the system.

In the other two situations described previously, proceed as follows:

While the engine and air conditioner are running, check the pressure reading on the two pressure gauges on the equipment connected to the system.

DIFFERENCE BETWEEN PRESSURE READINGS	CHECKS AND REMEDIES
Less than 0.69 bar	<p>Drain the air conditioning system. Disconnect the compressor control valve and check the condition of its sealing rings. If damaged, replace. If undamaged, replace the entire control valve. Once the valve has been fitted to the compressor, dry and charge the system.</p>
More than 0.69 bar	Check that the blender flap is fully down.

In the first case, if the problem persists after replacing the sealing rings or control valve, replace the compressor.

In the second case, if the blender flap is in the proper position and cooling is still poor, carry out the operations described on the following page.

Auxiliary units

Automatic air conditioner

Tempra

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Feel the first section of the pipe connecting the condenser to the evaporator, just before the expansion pipe.

If the pipe is cold, there is a restriction in the high pressure circuit. The restriction point can easily be found by looking to see where condensation forms.

Once the defective part has been identified, drain the system before repairing or replacing.

If the piping is hot when felt, check for leaks

After mending the leaks or, if no leaks are found, draining the system, remove the expansion pipe from the piping and examine. According to its external condition, proceed as follows:

CONDITION OF EXPANSION PIPE	OPERATIONS TO BE CARRIED OUT
Completely blocked	Replace the expansion pipe before drying and charging the system.
Almost blocked	Replace the compressor and the expansion pipe. Then dry and charge the system
Clean or almost clean (a slight coating of metal shavings is normal)	Clean the expansion pipe and refit in dehydrating pipe before drying and charging the system.

In the third case, if system works inefficiently after cleaning the expansion pipe (poor cooling), start up car engine and run at 1500 rpm.

Operate the air conditioner by carrying out the following operations:

- close the car doors and windows;
- press the AUTO key and the key under the ECON that turn on the air conditioner and activate air circulation inside the passenger compartment;
- press the left hand side of the TEMP key several times until the word LO appears on the display.

After running the air conditioner for 10 minutes, check the pressure reading on the low pressure side pressure gauge.

According to the pressure reading, proceed as follows:

PRESSURE READINGS	OPERATIONS TO BE CARRIED OUT
Greater than 2.41 bar	Drain the system, replace the compressor control valve, dry the system and recharge.
Less than 2 bar	Carry out the operations described previously. Note that the evaporator may freeze and the air flow may be reduced as a result.

The normal reading should be between 2 and 2.4 bars when the system is working properly.
If the system does not work properly after replacing the control valve, replace the compressor.

SYSTEMS WITH SD-709NBX 307 COMPRESSOR

After activating the air conditioner as described previously, two situations may arise as follows:

1. the compressor pulley electromagnetic coupling does not come on;
2. the compressor pulley electromagnetic coupling goes on and off.

In the first case, connect the coupling supply lead to the battery positive pole using a fused test cable.

If the coupling is not activated, replace the solenoid after checking the earth connection. Otherwise, i.e. if the coupling comes on, disconnect the test cable and check the pressure reading for the dehydrating accumulator (low pressure side pressure gauge reading).

If the pressure exceeds 3.45 bar, short-circuit the pressure switch (fitted to the piping connecting the evaporator to the accumulator) and check whether the coupling is activated. If so, replace the pressure switch because it is defective. If not, check the coupling supply circuit because it is broken.

If the pressure (low side) is less than 3.45 bar, take a pressure reading off the high pressure side pressure gauge.

If the pressure is less than 3.45 bar, leakage is occurring. Locate the leaks using a leak detector. Mend them before drying and charging the system.

If the pressure exceeds 3.45 bar, drain the system and check whether the high pressure circuit (compressor-evaporator) or expansion valve are partly blocked.

In the second case, feel the temperature of the first section of the pipe connecting the condenser to the evaporator (i.e. high pressure section of the circuit before the expansion valve (pipe);

If the pipe is cold, it is partly blocked or restricted. In this case, drain the pipe before drying and charging the system.

If the piping is warm all over, measure the temperature of the evaporator input and output (see also operations on the next page).

If these ducts are at the same temperature, or the output is colder than the input, check pressure (low side) at which compressor pulley electromagnetic coupling comes on.

The setting pressures of the pressure switch that acts as a switch for the electromagnetic coupling supply circuit are as follows:

- circuit closes: 2.826 - 3.516 bar (compressor working);
- circuit closes: 1.38 - 1.93 bar (compressor stopped).

Three different situations may arise as follows:

1. Compressor works continually and pressure (low side) stays within specified limits.
2. Compressor works cyclically within above pressure limits.
3. Compressor comes on at over 3.516 bar or goes off at a pressure less than 1.38 bar.

In the third case, replace the one-level pressure switch fitted to the piping connecting the evaporator to the dehydrating accumulator.

In the first case, disconnect the supply cables of the evaporator fan and check the pressure at which the compressor comes on.

If the compressor goes off at a pressure less than 1.38 bar, replace the above pressure switch. If it goes off at 1.38 - 1.93 bar or pressure does not go down, insert thermometer probes in the central and side outlets.

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Do the same when the second situation arises.

Environmental temperature	21 °C	27 °C	32 °C	38 °C	43 °C
Air temperature at outlets	4°-7 °C		6°-8 °C		7°-10 °C

If the ratio between the temperature of the air emerging from the outlets and the environmental temperature is given in the table, the system is efficient. If not, i.e. the temperature of the air emerging from the outlets is greater than or equal to the highest temperature given in the table, check the compressor cycles.

Two conditions may arise as follows:

- compressor always on;
- compressor goes on and off cyclically or stays off for long periods.

In the first case, drain the system and check to see if the expansion pipe is missing. If so, fit a new part in the second section of the pipe connecting the condenser to the evaporator. Then dry and charge the system.

If the expansion pipe is fitted correctly in the piping and is perfectly clean, the system is overloaded. Dry and recharge the system.

If the system is still not working properly after recharging, replace the dehydrating accumulator because the dehydrating element is saturated.

To replace, see the instructions on the next page.

In the second case, drain the system and check that the expansion valve (pipe) is not blocked. If so, replace before drying and draining the system.

If the evaporator input duct is colder than the outlet duct after the operation described at the bottom of the previous page, check for leaks.

If leaks are found, locate by means of a leak tester. Mend before drying and charging the system.

If no leaks are found, add 500 g of coolant FREON 12 (R 12) and check compressor on/off cycles.

If the cycles exceed 8 per minute, drain the system and check whether the expansion valve is blocked. Mend the system before drying and charging.

If the number of cycles is 8 or less, measure the temperature in the evaporator input and outlet ducts.

If the input temperature is greater than or equal to the output temperature, add 500 g of coolant R 12. If the input temperature is lower than the output temperature, add 500 g of R 12 and measure the temperature in the two ducts again.

If the temperature in the input duct is greater than or equal to that of the output duct, add 500 g of coolant R 12.

If the temperature in the input duct is lower than that in the output duct, drain the system and check whether the expansion valve is blocked. Adjust the system before drying and charging

CHECKING OPERATION AND LIST OF OPERATIONS FOR REPLACING AIR CONDITIONING SYSTEM COMPONENTS

Condenser

During operation, the temperature normally varies between 48 and 94° C while the pressure is between 13.35 and 26.50 bar.

If the temperature is high downstream of the condenser during operation and the compressor goes off due to the action of the three-level pressure switch, the condensation level is low. In this case, proceed as follows:

1. Check whether the three-level pressure switch is efficient (see next section for instructions) If not, replace.
2. If the pressure switch is efficient, check that the condenser is not blocked externally. If so, remove all the impurities and straighten the fins if bent so that the cooling air flows freely round the condenser.

3. If the condenser is not blocked externally, check for leaks or partial internal blocks. If leaks are found, replace the part. If partly blocked, try to blow free with nitrogen.

Three-level pressure switch

To check pressure switch efficiency, connect the device for checking, drying and charging the system as described on page 73.

Check the pressure reading on the pressure gauge connected to the high pressure side of the device. If the pressure reading exceeds 2.15 bar, run the engine and the air conditioner and check the pressures when the condenser and radiator cooling fan starts and stops.

Then disconnect the electrical connection of the fan supply cables and read the two pressures when the compressor pulley electromagnetic coupling goes off and on.

If the pressure increases to more than 26.5 bar without the electromagnetic coupling becoming activated, stop the engine immediately.

The three-level pressure switch must be replaced if it allows the electromagnetic coupling to be activated at a pressure of less than 1.65 bar when the engine is off, or if the condenser and radiator cooling fan comes on at a pressure other than 14.5 - 16.5 bar and goes off at a pressure other than 11.5 - 13.5 bar, or the electromagnetic coupling is deactivated at a pressure of more than 23.5 - 26.5 bar.

Pay close attention during the above operation because if the three-level switch is not working properly and the engine is not turned off straight away, the pressure may build up in the circuit (to more than 26.5 bar) to cause the pipe to burst.

Dehydrating accumulator

The accumulator needs to be replaced only when the expansion pipe is blocked or the evaporator is defective because corroded on the inside or when the accumulator itself is leaking.

The accumulator does not need replacing if deformed for any reason (car crash), provided no leakage occurs.

After removing the accumulator, plug the two pipes immediately.

After removing the accumulator, measure the amount of antifreeze it contains.

Add the same amount of clean antifreeze plus 60 cm³ to the new accumulator before fitting to the car.

Lubricate the two O-rings at the fittings connected to the system with clean antifreeze.

Compressor

New compressors are supplied with a specific amount of antifreeze (see page 89).

When a compressor is disconnected from the car, the antifreeze it contains must be replaced as follows:

- back off the bleed plug;
- drain the fluid out of the compressor into a clean container of known weight;
- weigh the fluid taken from the compressor;
- replace the same amount of clean fluid into the compressor;
- screw in the plug and tighten to a torque of 14 - 19 Nm.

If the compressor is replaced, the new part must be completely drained of fluid and filled with exactly the amount of fluid that the old compressor contained.

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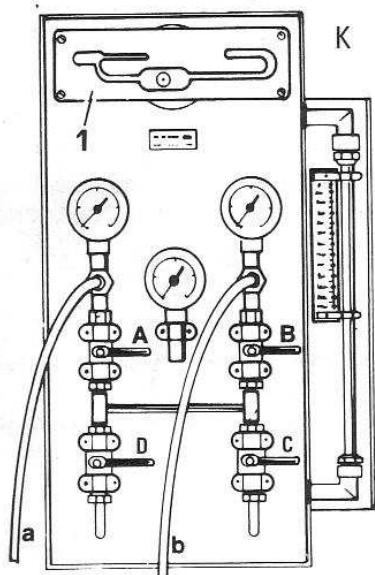
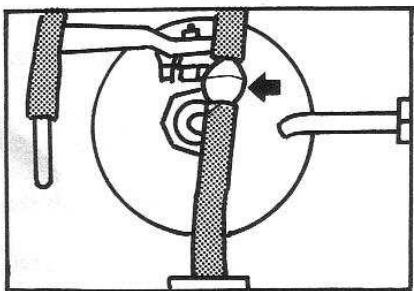
OPERATING DEVICE FOR DRAINING AND CHARGING AIR CONDITIONER

CEAST PORTABLE DEVICE

Equipment preparation

Carry out the following operations:

- connect the device far away from any heat source;
- working at the rear of the device, remove the two rubber plugs from the pump intake and outlet ducts (keep for reuse if the device is moved);
- connect the free end of the rubber pipe to the pump intake fitting and apply the oil trap to the outlet;
- if traces of mercury are noted in the glass phial of the porous filter (arrowed), position the device upright so that the mercury particles return to the GRAEDE vacuum meter;
- connect the supply cable of the motor that drives the vacuum pump to a single-phase current socket at 220 V;
- close the low and high pressure side cocks (A-B);
- close the FREON 12 input cock and the metering cylinder drain cock (located at the side and on the inside in the top part of the device);
- open the metering cylinder cut-out cock (C) and vacuum pump cut-out cock (D);
- turn on the vacuum pump with the switch.

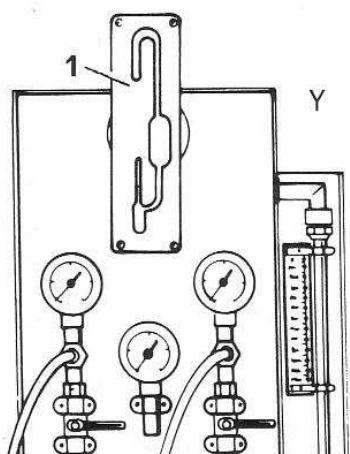


Emptying the metering cylinder

Operate the vacuum pump for 20 minutes to dry the metering cylinder thoroughly; check the vacuum or, more precisely, the residual pressure metering cylinder using a GAEDE vacuum gauge (1) as follows:

- position the vacuum gauge horizontally with the central mercury container at the bottom (see illustration K);
- turn the instrument clockwise until it is vertical (as illustrated in diagram Y alongside);
- read the vacuum (residual pressure) which is determined by the level reached by the mercury in the small graduated bulb;
- restore the vacuum gauge to a horizontal position so that the pump can also empty the instrument.

Once a good vacuum has been achieved, less than 0.66 mbar (0.5 mmhg) close the cocks to cut out the metering cylinder (C) and cut out the vacuum pump (D).



Filling the metering cylinder

Proceed as follows to fill the metering cylinder:

- connect the charging hose to a cannister of FREON 12;
- connect the free end of the hose to the FREON 12 input cock (on the left hand side of the device) without tightening;
- slightly open the cannister wheel to expel the air in the hose and then tighten the fitting;

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- open the FREON 12 input cock and the cannister wheel so that the FREON 12 can enter the metering cylinder at a given pressure;
- slightly open the drain cock (located inside the device under the metering cylinder). This allows the metering cylinder to fill gradually because it maintains a lower pressure level than in the cannister;
- check the fluid level on the dipstick located on the side of the device;

When charging, do not exceed «0» on the graduated scale when this is upright so that the FREON 12 volume can change according to the environmental temperature.

To make it easier to fill the metering cylinder, the cannister must be fixed to a wall in upturned position and with its outlet at a height not less than that of the device input cock.

CARLO EISNER PORTABLE DEVICE

Preparing the device

Proceed as follows:

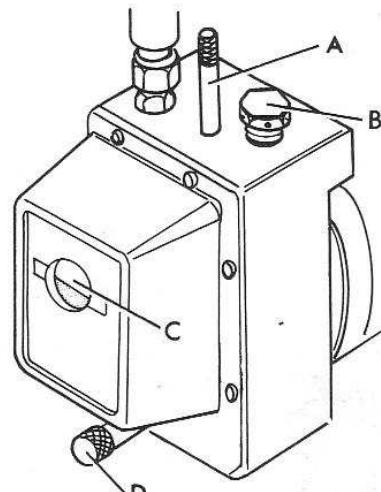
- connect the device far away from any heat source;
- check that the vacuum pump is filled with the required amount of clean fluid (check though port C);
- if the fluid is not topped up or dirty, change it;
- connect the electronic vacuum sensor to the vacuum pump intake pipe;
- calibrate the electronic vacuum gauge.

NOTE *The last two operations and the next operation must be carried out only if an electronic vacuum gauge and device with a proper socket are available.*

Detail of vacuum pump

- A. Ballast control
B. Oil filler plug
D. Oil drain plug

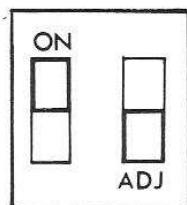
- C. Port for checking oil level and cleanliness



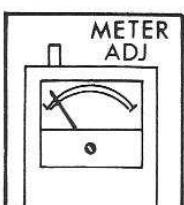
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Calibrating A-14 electronic vacuum gauge

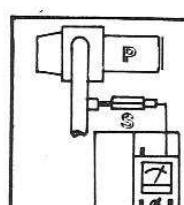
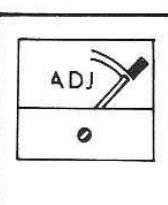
Proceed as follows to calibrate:



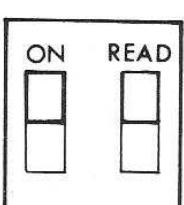
1. position-left-hand key to ON and right-hand key to ADJ



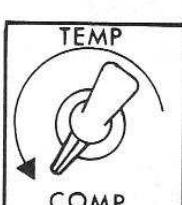
- 2-3. Turn knob (marked METER ADJ) until the meter dial moves to the ADJ line.



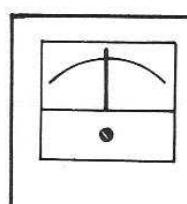
4. Connect the vacuum gauge cable to the sensor (S) on the pump intake pipe (P)



5. Position key on READ

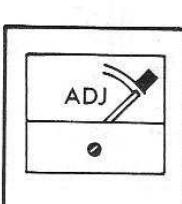
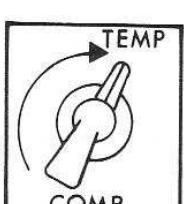


6. Turn the knob fully anticlockwise



7. The meter needle will show a reading on the scale

- 8-9. Turn the knob clockwise until the instrument needle moves to the ADJ line



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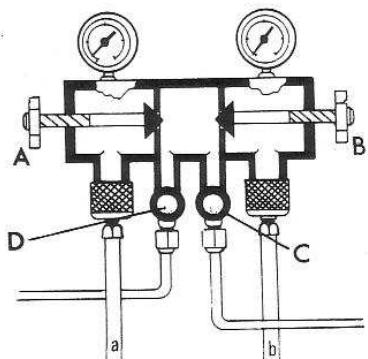
Auxiliary units

Automatic air conditioner

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Tempra

- Pressure gauge unit
 A. Low pressure cock
 B. High pressure cock
 C. Metering cylinder cut-out cock
 D. Vacuum pump cut-out cock
 a-b. Hoses



Cocks closed A-B-E Cocks open C-D

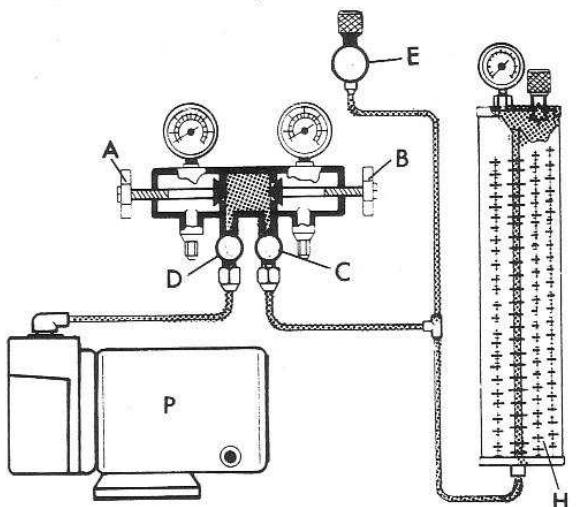


Diagram showing metering cylinder vacuum system

- E. Charging cock
 H. Metering cylinder

P. Vacuum pump

Connect the device supply cable to a 220 V current socket.
 Close the low pressure side cock (A), high pressure cock (B) and metering cylinder load cock (E) (not on some versions).

Open the metering cylinder cut-off cock (C) and vacuum pump cock (D).
 Turn the ballast control rod anticlockwise through two or three turns and turn on the vacuum pump by means of the switch on the supply lead or close to the pump.

The metering cylinder pressure gauge will indicate 0.

After running the vacuum pump for two minutes, tighten the ballast control rod fully (clockwise).

Emptying metering cylinder

Run the vacuum pump for about 15 minutes in order to dry the metering cylinder completely. Check the vacuum or, more accurately, the residual pressure in the metering cylinder, using an electronic vacuum gauge with its keys set to ON and READ.

If an electronic vacuum meter is not available, after 10 minutes close the metering cylinder cock (C) and check that the needle of the pressure gauge on the metering cylinder is immobile (before beginning of scale).

Once vacuum is down to below 0.66 mbar (0.5 mmHg) or if the needle of the pressure gauge has stayed still for a further five minutes of pump operation (with cock C open), close cocks (C and D) to cut off metering cylinder and pump before disconnecting the pump.

Cocks closed A-B-C-D Cocks open E-F

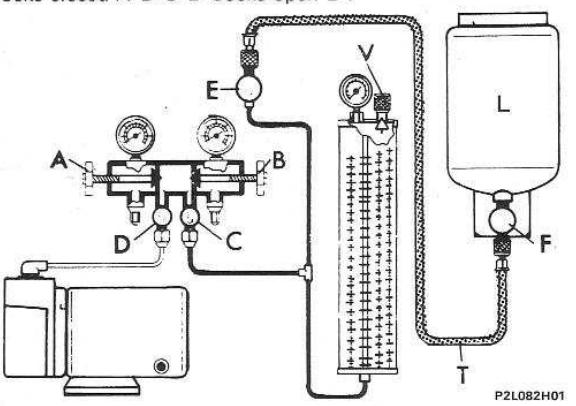


Diagram showing metering cylinder filling system

- E. Charging cock
 F. Cannister cock
 L. Charging cannister

V. Bleed valve

Filling metering cylinder

Proceed as follows to fill the metering cylinder:

- connect a hose to a cannister of FREON 12;
- connect the free end of the hose to the charging cock (E) without tightening, or otherwise to a cock on the piping connecting the pressure gauge to the metering cylinder;
- slightly open the cannister wheel to expel the air in the hose and then tighten fitting to cock (E) or the valve;
- open the charging cock (E) (if it exists) and the cannister wheel;

- to facilitate charging and to obtain gradual metering cylinder filling, because cylinder pressure is less than in the canister, bleed FREON 12 from the needle valve (bleed) located on the top of the metering cylinder;
- check the fluid level on the front column of the metering cylinder;
- turn the clear graduated cylinder so that the scales corresponding to used coolant (R 12) face to the front;
- choose the scale that shows a pressure reading corresponding to the reading on the pressure gauge fitted to the metering cylinder on the top above the maximum level. Superimpose on the level gauge (column) and take the reading.

Do not exceed the line indicating maximum level on the graduated scale on the clear cylinder when filling, i.e. do not fill to the top to permit volume changes due to environmental temperature.

To facilitate metering cylinder filling, the cannister must be fixed to a wall in upturned position.

After filling the metering cylinder, close the cannister wheel and the charging cock (E) (if present). Then undo the fittings at the ends of the charging hose.

INSTRUCTIONS FOR DRYING AND CHARGING THE AIR CONDITIONING SYSTEM

Drying

This operation is carried out with the aim of removing any uncondensed gas and as much of the humidity in the air conditioning system as possible.

Dry the air conditioning system before charging and after restoring to original operating conditions, i.e. after:

- eliminating any coolant leaks;
- replacing any components as necessary.

Use the appropriate device to dry the air conditioning system. This must be connected as follows:

- the low pressure hose (a) of the device must be connected to one of the two needle valves welded to the pipes connected to the dehydrating accumulator;
- the high pressure hose (b) of the device must be connected to the needle valve of the three-way connection, which must be fitted in place of the three-level pressure switch or the valve welded nearby on the piping connecting the condenser to the evaporator.

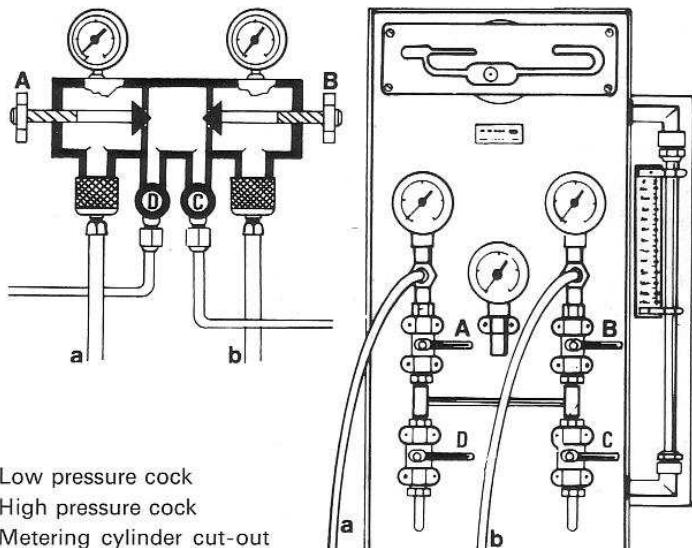
After making these connections, proceed as follows:

- check that the metering cylinder cut-off (C) is properly closed;
- start the vacuum pump and then open the low pressure cock (A), high pressure cock (B) and vacuum pump cut-out cock (D).

After these operations, if the air conditioning system does not leak, the pressure gauge needle will indicate a reading less than zero.

After 5 minutes, close the low and high pressure cocks (A) and (B) and the vacuum pump cut-out cock (D) and wait for a further 5 minutes. If the reading on the pressure gauge falls during this time, there must be leaks in the system.

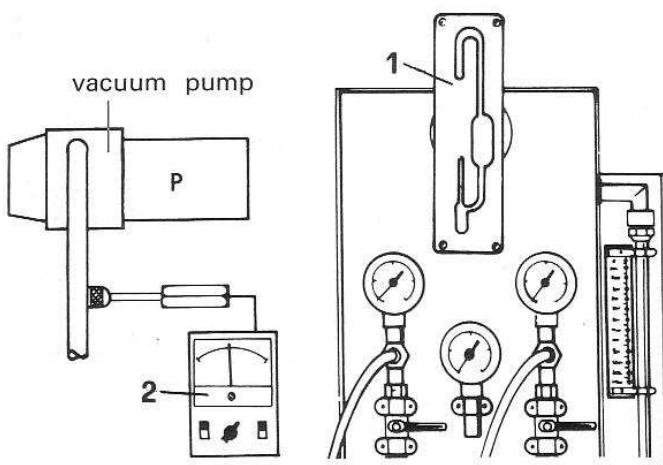
If the leaks do not disappear when the fittings are tightened, add 300 g FREON 12 to the system by opening high pressure (A), low pressure (B) and metering cylinder cut-out (C) cocks and find the leak or leaks with a leak tester before eliminating. Repeat the above operations and if no further leaks are found, start the vacuum pump again.



- A. Low pressure cock
- B. High pressure cock
- C. Metering cylinder cut-out cock
- D. Vacuum pump cut-out cock
- a. Low pressure hose
- b. High pressure hose

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For the GAEDE vacuum gauge, the values in the table refer to the mercury level when the instrument is horizontal.

Instruments that offer a precise indication of system sealing condition are the GAEDE pressure gauge (1) (CEAST device), electronic vacuum gauge A-14 (2) or vacuum gauges (for EISNER equipment). Observe their instructions.

NOTE *The electronic vacuum gauge must be calibrated prior to use.*

The following conditions should normally be set up:

Vacuum pump operation time	about 10'	about 45'	
Degrees of vacuum	mbar mmHg	≤2.67 ≤2	≤0.8 ≤0.6

When vacuum has dropped to less than 0.667 mbar (0.5 mmHg), which is the value necessary for beginning to charge the system, first close cock D and then turn off the pump.

NOTE *When an electronic vacuum gauge is not available, the pump must be turned off (provided the circuit is well sealed) after not less than half an hour.*

The following conditions may be present during drying:

1. Limited time available.
2. The vacuum pump is no longer completely efficient.
3. Air conditioning system has lacked sufficient coolant for a long time due to leaks.
4. Some components of the air conditioning system have been replaced (pipes, condenser, etc.).

In these cases, after connecting the equipment hoses to the system needle valve, proceed as follows:

- run the vacuum pump for about 15 minutes and check that the vacuum is at least 2.67 mbar (2 mmHg);
- add 500 g. of FREON 12 to the system and run the car engine;
- press the AUTO key and set display to LO (maximum cooling)
- accelerate the engine to at least 1500 rpm and maintain for 10 minutes;
- drain all the coolant out of the system by slackening the fitting of the hose connected to the needle valve on the three-way fitting or the needle valve welded to the first section of the pipe connecting the condenser to the evaporator;
- repeat the operations described previously;
- turn the vacuum pump again for 30 minutes before finally charging the system.

In cases 3 and 4, before draining the cooling from the system, check for leaks using an electronic leak tester and eliminate. Before running the vacuum pump for the specified 30 minutes, replace the accumulator.

NOTES *Before turning off the vacuum pump, always close the pump cut-off cock to prevent the system under vacuum from taking up vapour containing humidity and impurities from the pump. While building up the vacuum, the GAEDE vacuum meter must be kept upright. Slightly lubricate the air conditioner hose fitting threads and O-rings using only SUNISO 5GS antifreeze (or equivalent) - as used to lubricate the compressor. Never use grease, ordinary oil or sealants. Even the smallest particle of foreign material could cause severe damage to the system if it entered the circuit.*

Charging

After drying the air conditioning system, fill (charge) with FREON 12 coolant.

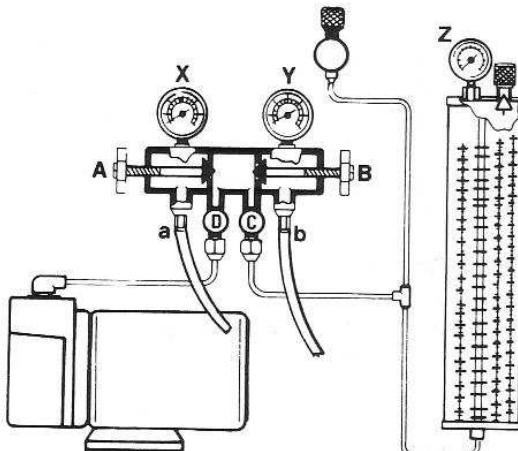
The amount of FREON 12 to be added to the system is specified in the table on page 89.

Proceed as follows to charge the system:

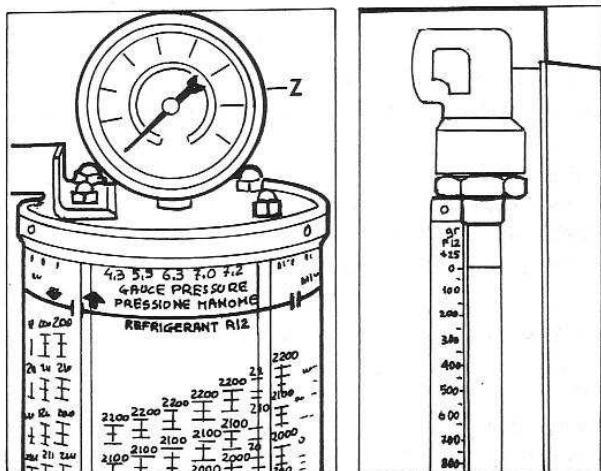
- do not change the connections of the two hoses (a and b) and check that the low and high pressure cocks (A and B) and metering cylinder cut-off and vacuum pump cocks (C and D) are closed;
- for the CEAST device, zero the graduated stick to the coolant level;
- for the Carlo EISNER device, display the level of the coolant in the column on which the scale corresponding to coolant R12 is to be superimposed (by turning the clear graduated cylinder) and pressure indicated by pressure gauge Z;
- slowly open both high pressure cock (B) and metering cylinder cut-off cock (C) and check that the FREON 12 enters the system gradually.

Two situations may arise after this operation, as follows:

- all the coolant necessary for this system is decanted into the system by the metering cylinder;
- only part of the amount of coolant required is decanted into the system by the metering cylinder because the pressures between the metering cylinder and the system, read off pressure gauges (Y and Z), are level.



P2L085H01

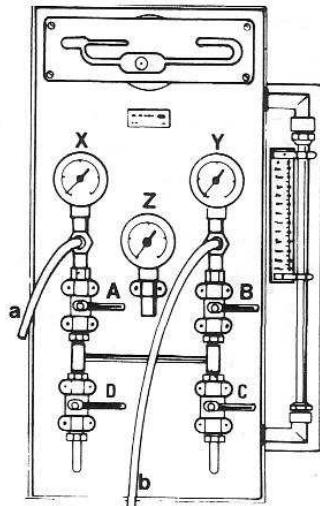


P2L085H02

Close the high pressure (B) and metering cylinder cut-off (C) cocks.

When the second situation arises, proceed as follows to finish filling the system with coolant:

- connect the green and dark blue terminal leads of the three-level pressure switch and run the car engine;
- press the AUTO key and set the display to LO (corresponding to maximum cooling);
- press the right side of the AIR key until all 8 bars come on on the lower display, which corresponds to maximum passenger compartment fan speed;
- accelerate the engine to 1500 rpm;
- open the low pressure cock (A);
- slowly open the metering cylinder cut-off cock (C) so that FREON 12 enters through the compressor intake.



P2L085H03

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Carry out this operation carefully to prevent the coolant flow from striking and damaging the compressor valves. Check that the pressure reading on the low pressure side gauge (X) is 1 - 2 bars (about 1 - 2 kg/cm²) less than the pressure read off the metering cylinder pressure gauge (Z).

Proceed as follows once the system is loaded:

- close the low pressure side cock (A) and metering cylinder cut-off cock (C);
- cut off the connection between the two green and blue terminal leads on the three-way pressure switch located near the condenser;
- leave the car engine idling and with the air conditioner on. After about 2 minutes, take pressure readings at high pressure Y and low pressure X sides. Then measure the temperature of the air emerging from the outlets inside the passenger compartment using a thermometer.

The system is efficient if the difference between the temperature of the air emerging from the outlets and outside air temperature falls within the following values:

Ambient temperature	21°C	27°C	32°C	38°C	43°C
Temperature of air emerging from the outlets	4° - 7°C	6° - 8°C	7° - 10°C		

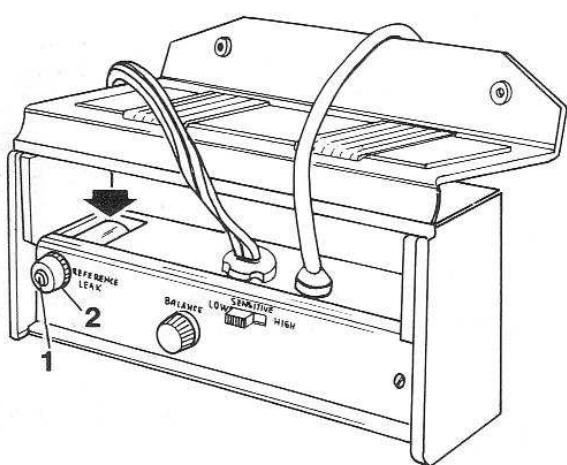
Lastly, carry out the following operations:

- unscrew the hoses of the tester from the system and three-way valve needle valves;
- unscrew the three-way fitting from the pipes and tighten the three-level pressure switch in its place after releasing from the fitting;
- blow compressed air into and around the compressor to remove any traces of coolant spilt during charging. This is necessary to prevent spillage from affecting the reading on the electronic leak tester, which must be used to make a final, precise check prior to testing the car on the road.

GENERAL ELECTRIC H ELECTRONIC LEAK TESTER 10

Use

Before using the leak tester for the first time, unscrew screw (1) from plug (2) of the bottle on the control panel (Reference leak) and wait about 15 minutes for the reference leak to stabilise. The bottle plug screw is used only during delivery of the leak tester and must not be reused.



P2L086H01

Check that the reference leak bottle contains a certain amount of coolant R 11; the liquid level can be checked through a special port (arrowed).

The bottle is filled with enough coolant R 11 to last about 1 year.

Fit the supply cable plug in a 220 V socket and the leak tester will warm up immediately.

Do not try to operate the leak tester at a voltage other than the one recommended (220V) because it would be irreparably damaged.

Check that sufficient air flows around the probe. Hold upright with the point facing down and observe the little ball inside. If the air flow is sufficient, the ball will lift and float above the felt of the filter in the tip.

The height of the ball in the probe is not important. We are only interested to see whether it lifts or not. If the ball does not lift, before assuming that the device is broken, dip the point of the probe gently to ensure that it is not merely stuck.

If the ball still does not lift, send the instrument to the Manufacturer for checking.

Move the key on the sensitivity switch to "HIGH" or "LOW". The low setting is used to detect leaks of a certain size and when the instrument is new whereas the high setting is used for small leaks.

After using the leak tester for a time, the response of the sensitive element falls and the switch must be set to the high position to detect any size leak.

To check this condition, move the sensitivity switch to "LOW" and then turn the balance knob until the bulb just stops flashing. See whether the light flashes when the probe is held near to the reference leak.

If not, i.e. the bulb does not flash or the flash rate tends to fall off when the probe is held continually close to the reference leak, move the sensitivity switch to the "HIGH" setting and adjust the balance again.

To adjust the balance, turn the balance knob until the probe neon bulb, which must be held away from the reference leak, just stops flashing.

If properly adjusted, the light will flash and continue to flash while the probe is held close to the reference leak. When the probe is moved away, the flashing should fall off and then stop.

On some types of leak tester the flashing may not stop when the sensitivity switch is set to "HIGH". This does not indicate a fault but excessive sensitivity. In this case, the switch must be set to "LOW" until the sensitive element has settled.

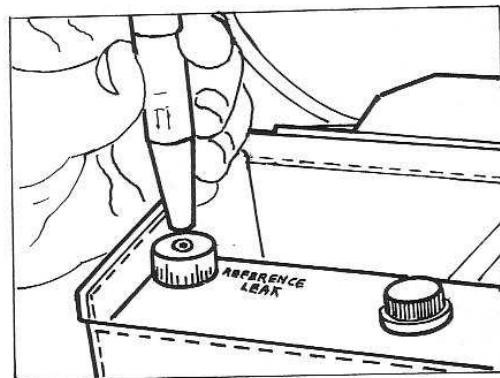
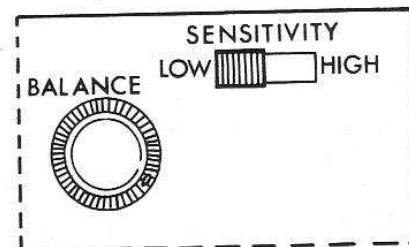
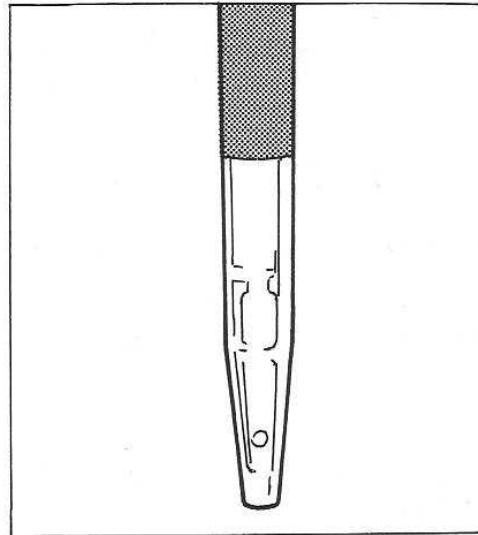
The reference leak may be used frequently, whenever it is necessary to ensure efficient leak tester operation and as a reference standard to measure the size of the leak.

When the probe is brought close to the reference leak (as shown in the bottom diagram), the response is more or less the same as obtained with a 14.2 g/hour FREON 12 leakage.

A leak that causes the same flashing rate produced by the reference leak is the same size as the reference.

Hold the probe as close as possible to the point to be checked and move at a speed of about 2.5 cm/sec over the system pipes and joints where a leak is suspected.

When the probe detects a coolant leak, the flashing rate speeds up continually as the probe moves closer to the leak point.



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NOTE To extend the life of the sensitive element, never put the probe in a current of coolant gas and never take up cigarette smoke in the probe.

The probe neon lamp does not flash at a steady rate in a very polluted environment. It is therefore impossible to check the leak. Ventilate the test area to reduce this likelihood.

An unsteady flash rate may also be caused by voltage changes in the mains supply. Use a voltage stabiliser to prevent this.

TIF MOD HDL 5500 BATTERY-OPERATED ELECTRONIC LEAK TESTER

Use

This instrument is ready for use because it is calibrated automatically.

Turn the switch from OFF to ON. The instrument produces a series of beeps. Remove the probe, equipped with a micropump, from its housing and search for leaks by moving it slowly (about 2 cm/sec) over the system section under investigation.

The beeps increase in frequency near a leak until they merge to produce a continuous sound.

Immediately after, the instrument zeros automatically and is ready for another reading.

The instrument always provides an exact measurement of the gas leak in polluted environments or when the leaks are large.

Leak detection may be more difficult in ventilated areas. The test area should therefore be protected by screens.

When large leaks hide the presence of smaller ones, locate and eliminate the large ones first before moving on to the small ones.

If the leaks are not easy to locate, isolate the probable leak point with material and then search for the leak again after a few minutes.

AIR CONDITIONING SYSTEM SPECIFICATIONS

CALIBRATING PRESSURE SWITCHES

Part	Level	Cable colours	Settings (in bar)	Circuit condition	Function
Three-level pressure switch	1°	Green Blue	2.65 ± 0.35 (2.3 - 3)	Closed	Compressor pulley coupling activated
			2.5 ± 0.25 (2.25 - 2.75)	Open	Compressor pulley coupling deactivated
	2°	White Black	15.5 ± 1 (14.5 - 16.5)	Closed	Condenser fan - radiator operating
			11.5 ± 1 (10.5 - 12.5) differential 4 ± 1	Open	Condenser fan - radiator deactivated
	3°	Green Blue	25 ± 1.5 (23.5 - 26.5)	Open	Compressor pulley coupling deactivated
			21 ± 1.5 (19.5 - 22.5) differential 4 ± 1	Closed	Compressor pulley coupling activated
One-level pressure switch	1°		2.826 - 3.516	Closed	Compressor pulley coupling activated
			1.38 - 1.93	Open	Compressor pulley coupling deactivated

SPECIFICATIONS OF ROTARY COMPRESSOR

Make and type	SANKYO SD - 709 NBX 307
Cylinder diameter	29.3 mm
Stroke	32.8 mm
Design capacity	154.9 cm ³ each revolution
Number of cylinders	7
Amount of SUNISO 5GS fluid, or equivalent	135 cm ³
Electromagnetic coupling operating voltage	12V
Minimum electromagnetic coupling engagement voltage	7.5V
Electromagnetic coupling power uptake	48W

SPECIFICATIONS OF VARIABLE DISPLACEMENT COMPRESSOR

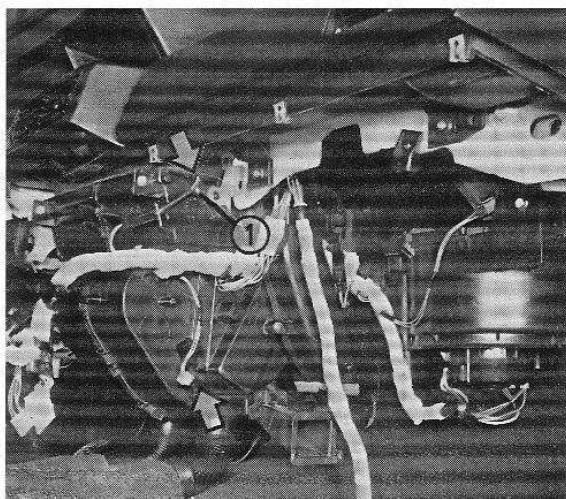
Make and type	HARRISON V5
Cylinder diameter	36.9 mm
Stroke	28.4 mm
Design capacity	from 3 to 151 cm ³ per revolution
Number of cylinders	5
Amount of SUNISO 5GS fluid, or equivalent	236 cm ³ (8 oz)
Pressure safety valve (vent)	set to 30.3 bar
Electromagnetic coupling operating voltage	12V
Electromagnetic coupling current uptake	4.2A
Amount of FREON 12 to charge the system	0.850-0.950 kg

SETTING HEAT SWITCHES CONTROLLING RADIATOR AND CONDENSER COOLING FAN

Make and type	A	B
	VEBE 2-level	VEBE or ELTH 2-level
1st level contact closure	92 °C ± 2 °C (90°-94 °C)	88 °C ± 2 °C (86°-90 °C)
1st level contact opening	87 °C ± 2 °C (85°-89 °C)	83 °C ± 2 °C (81°-85 °C)
2nd level contact closure	97 °C ± 2 °C (95°-99 °C)	92 °C ± 2 °C (90°-94 °C)
2nd level contact opening	92 °C ± 2 °C (90°-94 °C)	87 °C ± 2 °C (85°-89 °C)

- A. Heat switch for petrol versions
 B. Heat switch for diesel versions

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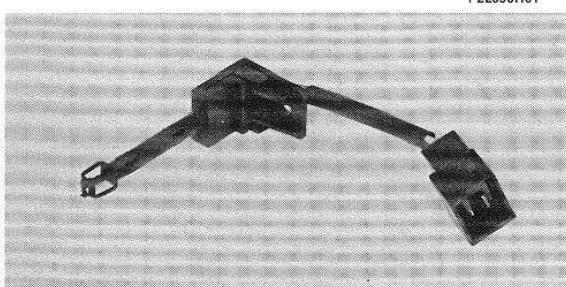


BLENDED AIR TEMPERATURE SENSORS

Removing

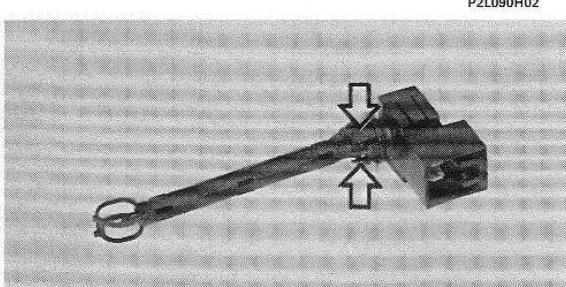
- Remove the front trim (see operations on page 13 onwards)

To remove the top sensor, release from heater-distributor unit after unscrewing screw (1) and disconnecting the supply cable connection.



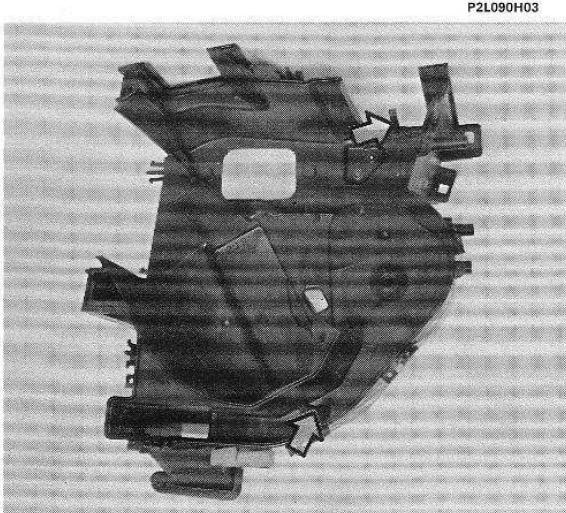
Detail of right side of heater - distributor unit

The two sensors are arrowed



Detail of top blended air temperature sensor

The bottom sensor can easily be removed from the heater - distributor unit after undoing the arrowed clips.

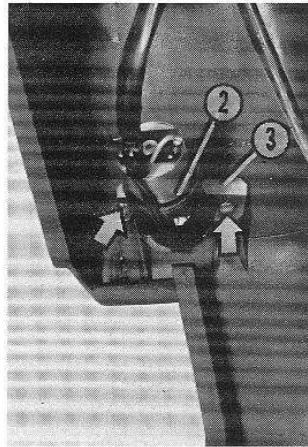


Detail of inside of right heater - distributor unit half

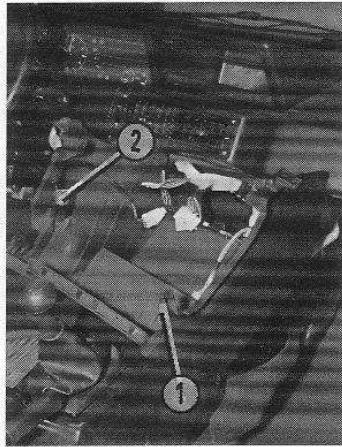
The two blended air temperature sensors are arrowed

PASSENGER COMPARTMENT AIR TEMPERATURE SENSOR**Removing**

- Remove the bottom left guard under the instrument facia (see operations on page 13);
- remove the glove compartment trim from the bottom right-hand side of the instrument facia (see operations on page 13);
- remove the electronic control unit from the central part of the front trim that acts as a central console (see operations on page 15);
- back off the arrowed screws in the middle and bottom diagrams on page 16 that secure the front trim (1) to the heater unit, facia and bracket fastened to the floor pan;
- remove front trim (1) from its seat;
- back off the screws arrowed in the first diagram on the top that retain bracket (3) (fixed to sensor 2) to trim (1)
- disconnect the electrical connection of the sensor terminal cables



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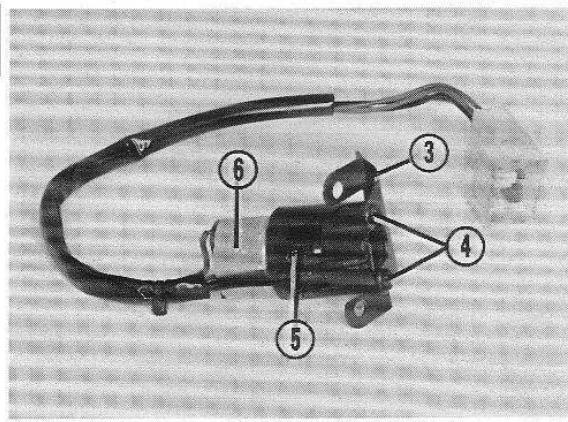
P2L091H02

Refitting

Carry out the removal operations in reverse order

Passenger compartment air temperature sensor

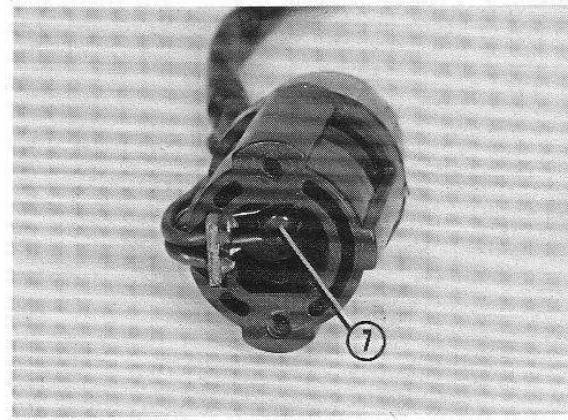
3. Sensor retaining bracket
4. Screws retaining bracket (3) to the sensor unit
5. Fan
6. Fan motor



P2L091H03

Front view of sensor

7. Sensitive element



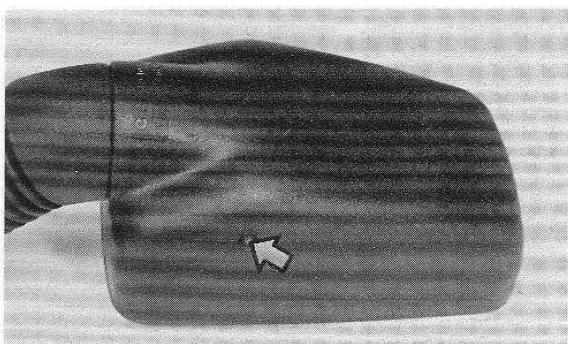
P2L091H04

Auxiliary units

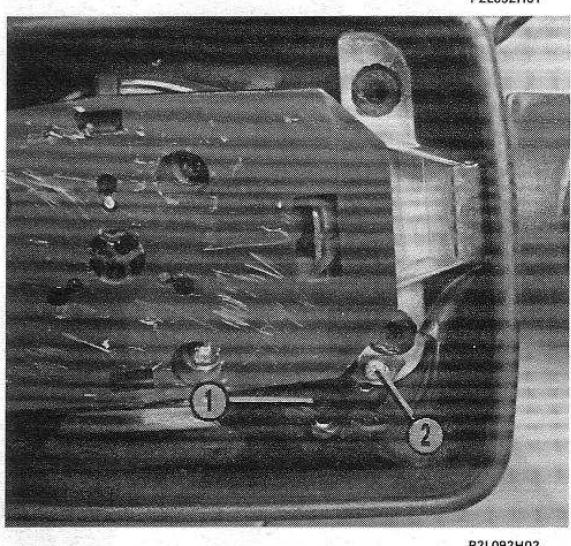
Automatic systems

50.

Tempra



**EXTERNAL AIR TEMPERATURE
SENSOR**



Detail of left door mirror unit

The arrow indicates the outside air temperature sensor

**Detail of left door mirror without reflecting
glass strip**

1. Sensor
2. Screws retaining sensor to unit

RESISTANCE OF SENSORS WITH TEMPERATURE

TEMPERATURE	RESISTANCE SENSOR A.E.	RESISTANCE SENSOR A.I.	RESISTANCE SENSOR A.M.S.	RESISTANCE SENSOR A.M.I.
-30 °C	* 185 kΩ	—	* 176960 Ω	* 176960 Ω
-25 °C	* 135 kΩ	—	* 130410 Ω	* 130410 Ω
-20 °C	* 100 kΩ	21199 Ω	* 97072 Ω	* 97072 Ω
-15 °C	* 75 kΩ	15982 Ω	* 72951 Ω	* 72951 Ω
-10 °C	55 kΩ	12154 Ω	55326 Ω	55326 Ω
-5 °C	42.5 kΩ	9318 Ω	42326 Ω	42326 Ω
0 °C	32.65 kΩ	7200 Ω	32650 Ω	32650 Ω
+5 °C	25 kΩ	5604 Ω	25391 Ω	25391 Ω
+10 °C	20 kΩ	4393 Ω	19899 Ω	19899 Ω
+15 °C	16 kΩ	3467 Ω	15711 Ω	15711 Ω
+20 °C	12.5 kΩ	2753 Ω	12492 Ω	12492 Ω
+25 °C	10 kΩ	2200 Ω	10000 Ω	10000 Ω
+30 °C	8 kΩ	1768 Ω	8057 Ω	8057 Ω
+40 °C	5 kΩ	1161 Ω	5326 Ω	5326 Ω
+50 °C	3.60 kΩ	778 Ω	3602 Ω	3602 Ω
	tolerance 2% *3%	tolerance 5%	tolerance 2% *3%	tolerance 2% *3%

A.E. Outside air
A.I. Passenger compartment air

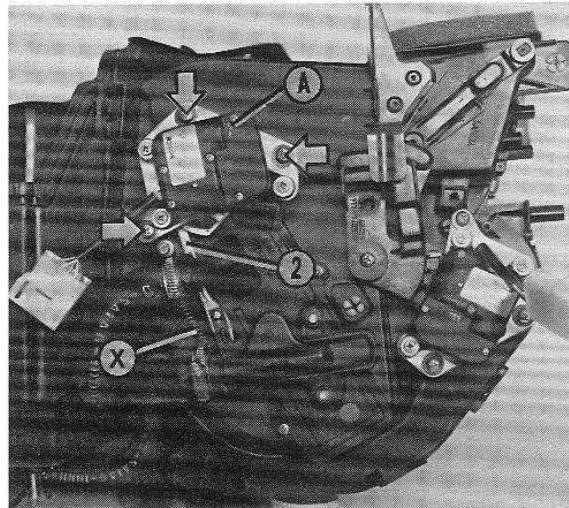
A.M.S. Top blended air
A.M.I. Bottom blended air

BLENDER FLAP AND COCK CONTROL ACTUATOR

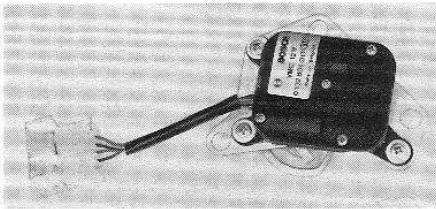


Removing

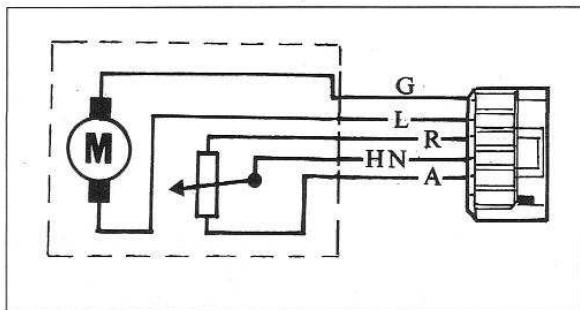
- Release spring (X) retaining link (2);
- back off the arrowed screws that retain the plate with the electric actuator (A) to the left side of the distributor-heater unit;
- release link (2) from plate (3) fitted on the inside of the actuator shaft;
- disconnect the actuator supply cable connection.



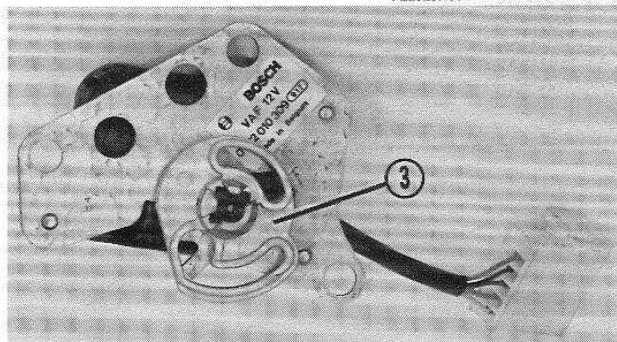
P2L017H02



P2L028H01



Actuator wiring diagram



P2L093H01

Detail of electric actuator controlling the blender flap and heater input cock

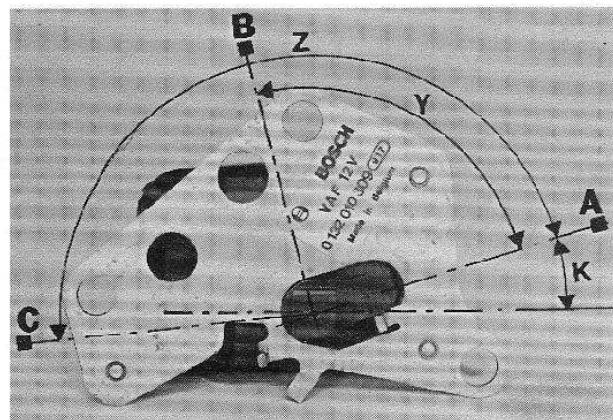
Diagram showing position of lever on new actuator shaft corresponding to cock closure

- A. Position corresponding to cock closed
- B. Position corresponding to cock open and blender flap closed
- C. Position corresponding to cock open and blender flap fully open

$$K = 15^\circ \pm 30'$$

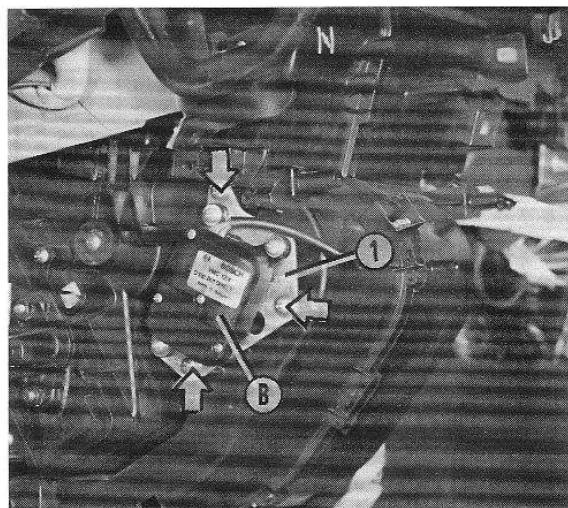
$$Y = 85^\circ$$

$$Z = 170^\circ - 175^\circ$$



P2L093H02

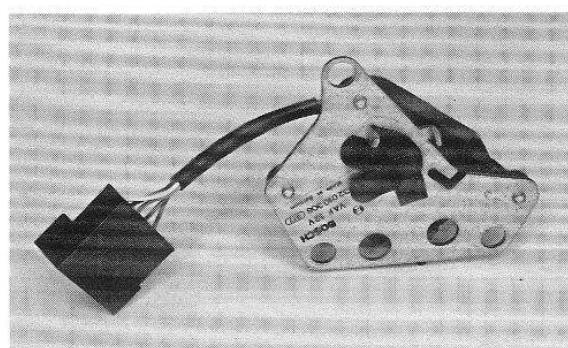
50.



**TOP AND BOTTOM
DISTRIBUTION FLAP
CONTROL
ACTUATOR**

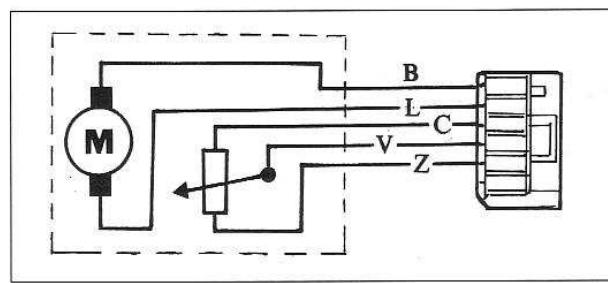
Removing

- Back off the arrowed screws that retain plate (1) with actuator (B) to the left side wall of the heater- distributor unit;
- disconnect the electrical connection of the actuator terminal leads.



P2L094H02

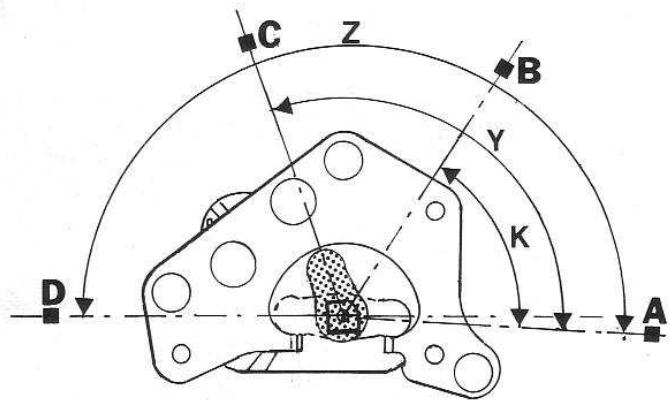
Detail of electric actuator



P2L094H03

Actuator wiring diagram

Diagram showing positions of lever on actuator shaft corresponding to the different air distribution patterns



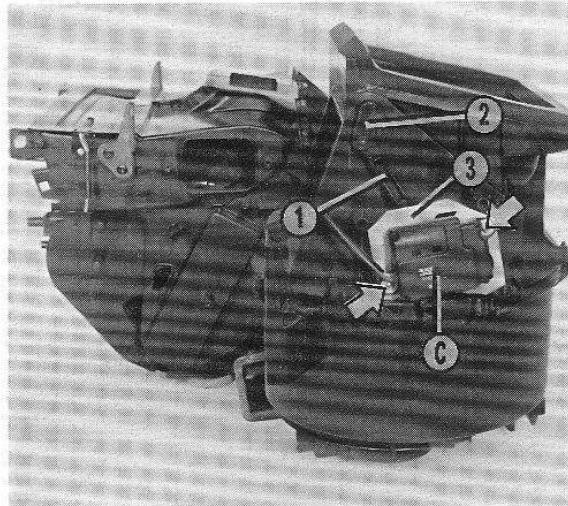
P2L094H04

- A. Position where air conveyed to front, central and side air outlets
- B. Position where air conveyed to footwells and front, central and side outlets
- C. Position where air conveyed to the footwells
- D. Position where air conveyed to the windscreens diffusers
- K. Angle between position A and position B = 60°
- Y. Angle between position A and position C = $113^\circ \pm 1^\circ$
- Z. Angle between position A and position D = $183^\circ - 185^\circ$

AIR INTAKE FLAP
ELECTRIC ACTUATOR

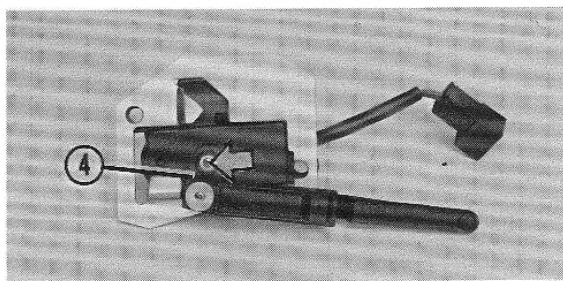
Removing

- Remove the heater - distributor unit;
- release the top link (1) from air intake flap lever (2);
- back off the arrowed screws fastening plate (3) and actuator (C) to the heater - distributor unit;



P2L095H01

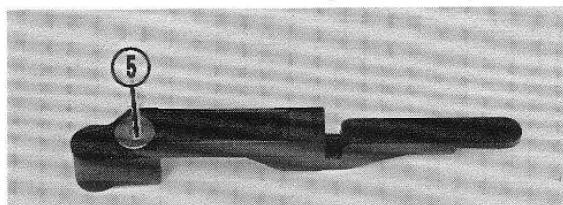
- back off the arrowed screw that fastens lever (4) to the actuator.



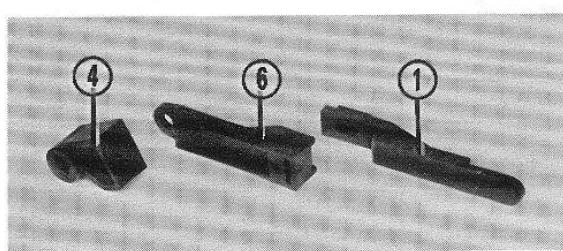
P2L095H02

Detail of levers and air intake flap control links

1. Top link
4. Lever
5. Screw joining lever (4) to bottom link (6)
6. Bottom link

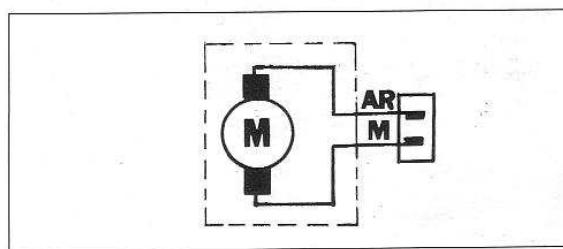


P2L095H03

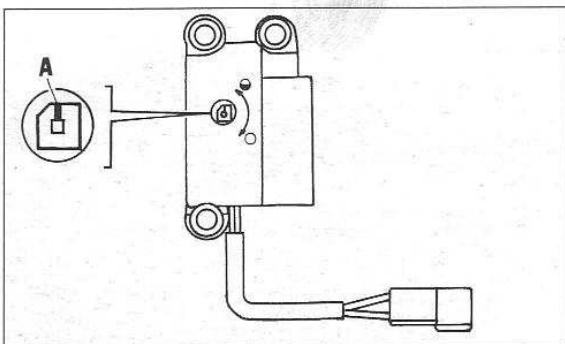


P2L095H04

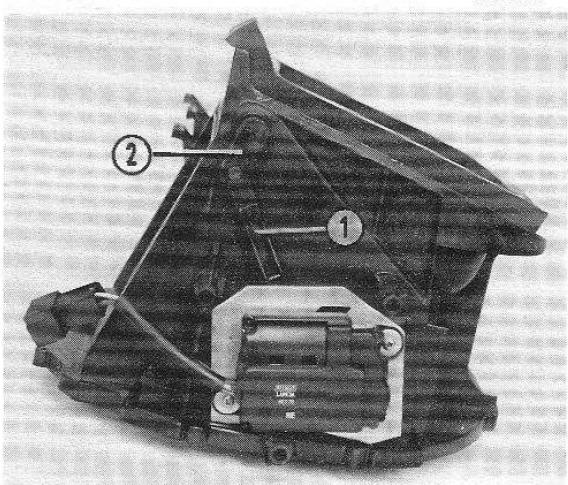
Actuator wiring diagram



P2L095H05



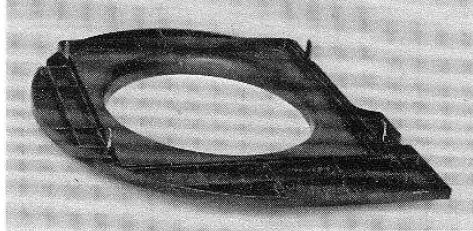
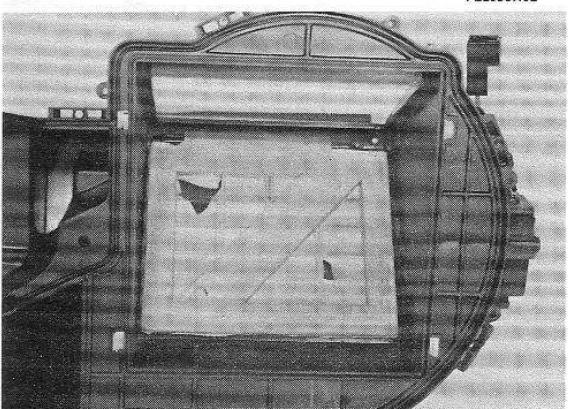
The actuator is supplied with the reference notch (A) in the position illustrated



AIR INTAKE FLAP

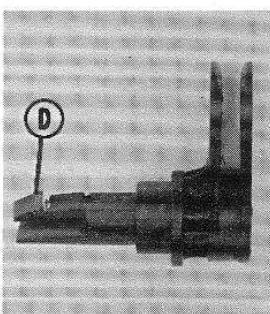
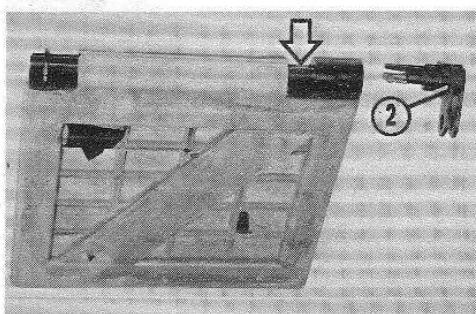
Removing

- Remove the heater-distributor unit;
- remove the top part of the conveyer from the unit;
- disconnect link (1) from lever (2) and remove from the flap pin by pushing tooth (D, bottom diagram) through the opening indicated by the arrow;
- remove the air intake flap from the inside of the conveyer half

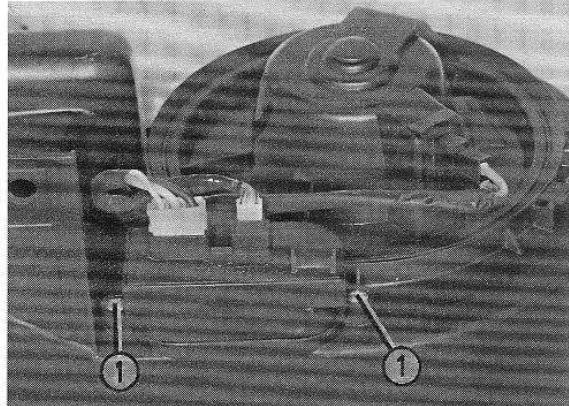


Detail of diaphragm conveying air to the fan

Detail of bottom of top conveyer half



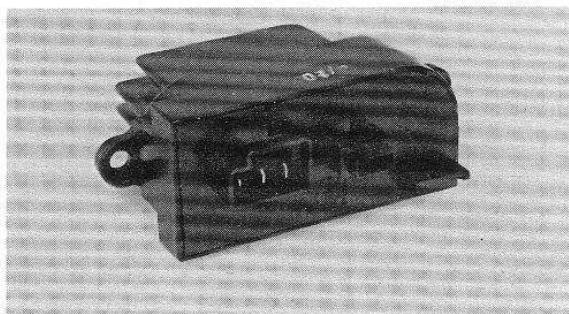
Detail of air intake flap and operating lever

PASSENGER COMPARTMENT FAN ELECTRONIC SPEED VARIATOR WITH BUILT-IN TEMPERATURE SENSOR

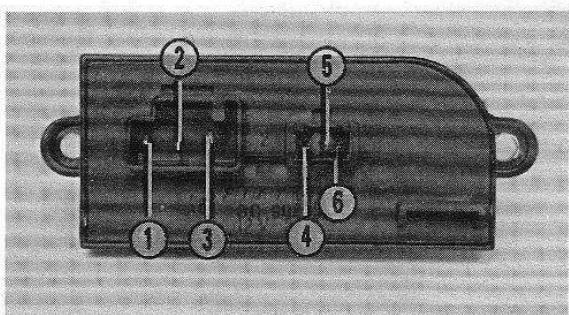
P2L097H01

Removing

Working from the part under the right side of the instrument facia, unscrew screws (1) retaining the electronic speed variator to the bottom part of the heater-distributor unit conveyer.



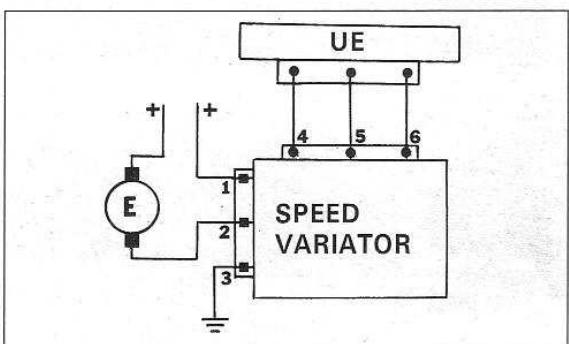
P2L097H02

Detail of speed variator

P2L097H03

Detail of connection site for the two connectors on the electronic speed variator**Diagram showing connection of electronic speed variator**

UE. Air conditioner electronic control unit
E. Fan



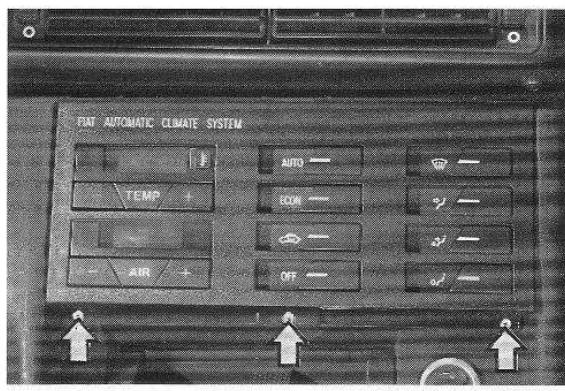
P2L097H04

Auxiliary units

Automatic systems

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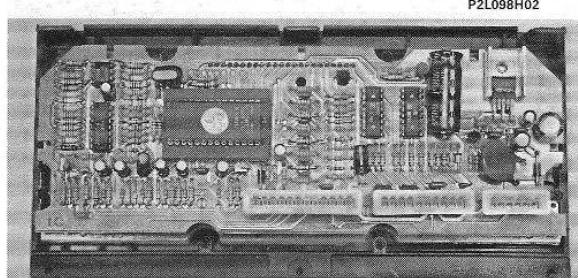
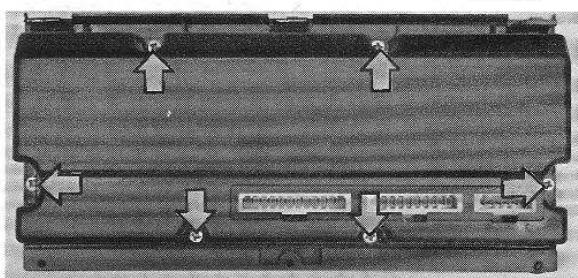
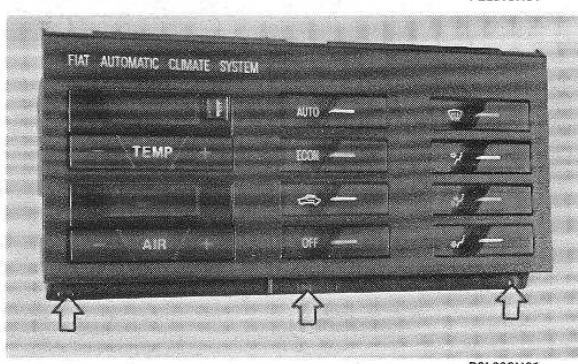
Tempra



SYSTEM ELECTRONIC CONTROL UNIT

Removing

- Open the flap giving access to the ashtray and cigar lighter
- Unscrew the arrowed screw that holds the back of the system electronic control unit to the front trim that acts as the central console;
- Undo the clips on top of the control unit (see arrows in the second diagram on page 15) and remove from its housing
- disconnect the three connectors from the bottom of the electronic unit.

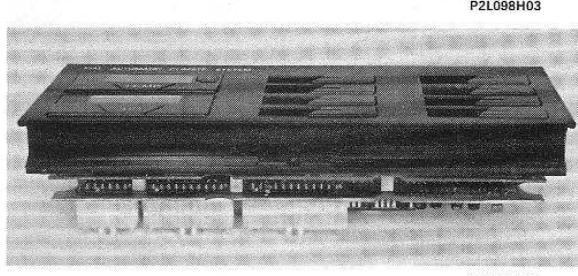


Detail of front panel with electronic control unit keys

The bottom fastening points are arrowed

Detail of front part of the electronic control unit

The arrows indicate the location of the screw fastening the cover to the base.

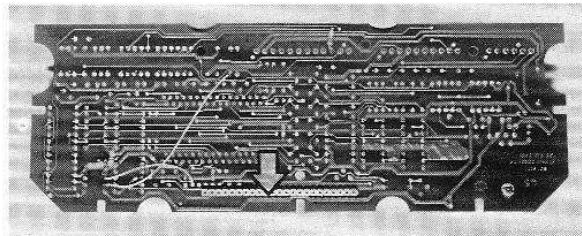


Detail of rear of the control unit without cover

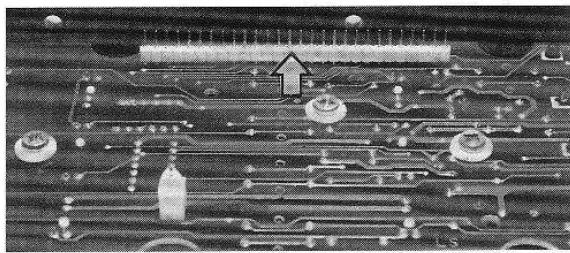
Detail of electronic control unit without back cover

Detail of external plate with printed circuit

The arrow indicates the connection site of needles on the underlying plate



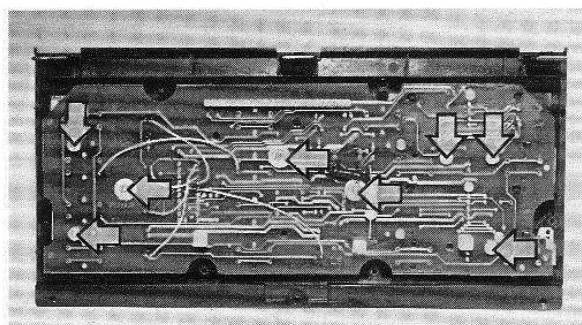
P2L099H01

Detail of needles to which the outer plate is fitted

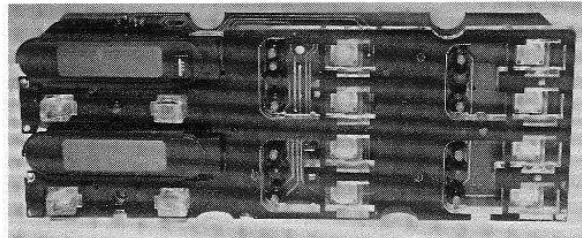
P2L099H02

Detail of control unit without outer plate

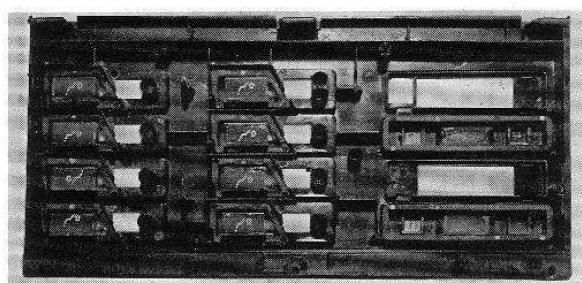
The arrows indicate the screws retaining the bottom plate with the printed circuit to the support with keys



P2L099H03

Detail of front part of bottom plate without panel

P2L099H04

Detail of inner part of panel with keys

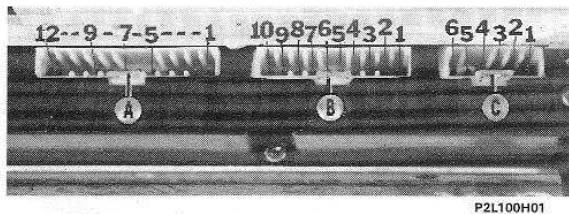
P2L099H05

Auxiliary units

Automatic systems

Tempra

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Numbering of needles in connector sites on the back of the electronic control unit

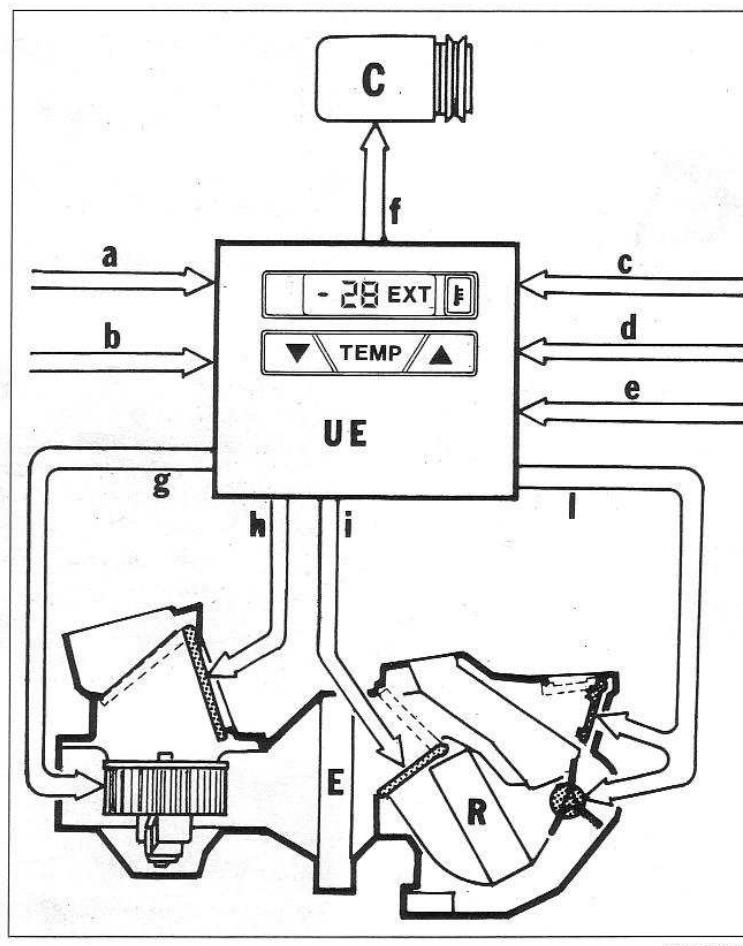


Diagram of information relayed to the electronic control unit and the components involved:

- a. Outside air temperature
- b. Passenger compartment air temperature.
- c. Temperature of blended air around top distribution flap.
- d. Temperature of blended air around bottom distribution flap.
- e. Speedometer signal.
- f. To compressor.
- g. To fan.
- h. To air intake flap.
- i. To blender flap.
- l. To top and bottom distribution flaps.
- C. Compressor.
- E. Evaporator.
- R. Heater.
- UE. Electronic control unit.

AUTOMATIC AIR CONDITIONER OR HEATER

The operation of each of the two systems (heater or air conditioner) is controlled by an electronic control unit. On the basis of certain parameters (speed and temperature) received and display settings (temperature), it acts electrically on certain parts to alter their position or operation.

The illustration on the previous page gives a diagrammatic representation of information relayed to the electronic control unit and the different parts involved.

The four temperatures are supplied to the electronic control unit by four sensors, as follows:

- N.T.C. external air temperature extending from the surface of the left door mirror;
- self-ventilating N.T.C. passenger compartment air temperature sensor inside the facia under the control panel on the right hand side of the steering wheel;
- two blended air temperature sensors, N.T.C. type, fitted to the top and bottom of the right side of the heater-distributor unit.

The speedometer signal is supplied to the electronic control unit by a sensor fitted to the transmission.

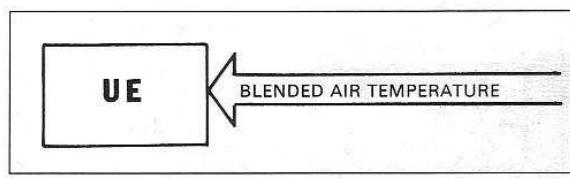
According to the air temperature and car speed values supplied by the above sensors and the required passenger compartment temperature set on the display, the electronic control unit:

- activates or deactivates the compressor pulley electromagnetic coupling;
- supplies the electric actuator (motor) that operates the air intake flap through two levers and two links so that this takes up one of its two positions;
- activates the electric actuator that operates the blender flap and cock located on the heater input duct via two levers, two links and a cam plate so that the flap takes up a certain position and the cock opens by a certain amount;
- activates the electric actuator that turns the bottom distribution flap directly and, via a toothed sector and two levers, turns the top distribution flap to make it take up given positions;
- operates the fan at a given speed.

Both the automatic systems may be activated under very different environmental conditions and the engine temperature difference may also be very great.

The electronic control unit can adopt the following strategies to provide maximum comfort as quickly as possible according to certain parameters:

When the ignition key is turned from STOP to MAR, the electronic control unit (VE) measures the blended air temperature.



P2L101H01

Auxiliary units

Automatic systems

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Tempra

READING	MEMORISED DATA TAKEN INTO CONSIDERATION
Blended air temperature less than 40 °C	External air temperature is memorised
Blended air temperature greater than 40 °C	The electronic unit considers the outdoor air temperature memorised previously before the engine stops (key turned to STOP)
Car speed less than 30 km/h	The outdoor temperature is updated only if less than memorised when the ignition key was set to MAR
Car speed more than 30 km/h for at least one minute	The outdoor air temperature replaces the temperature measured previously - whether greater or smaller

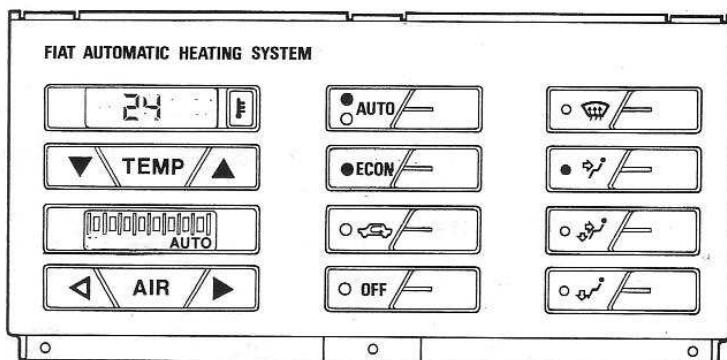
The second condition listed above is applied because the engine is still warm and the car must therefore have stopped only recently. Outdoor environmental conditions are therefore still the same as before stopping.

The third condition applies to prevent measurement of an artificial temperature increase due to a traffic jam or town driving.

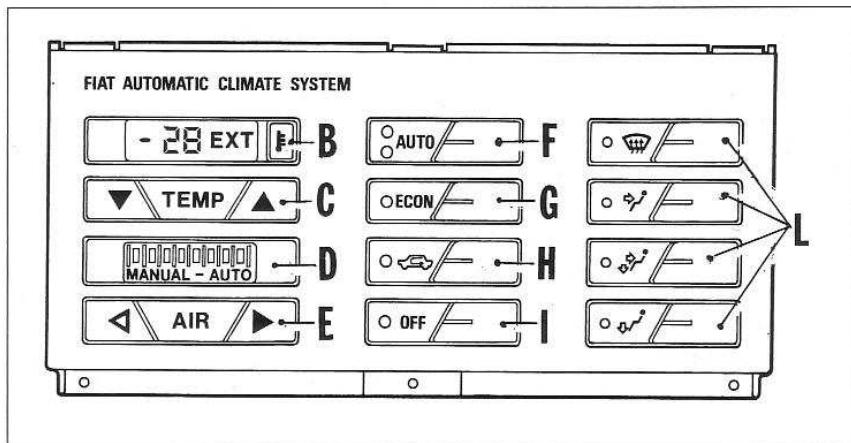
Every time the ignition key is turned from MAR to STOP, the settings previously selected by the automatic device and the user are memorised and become operational again when the ignition key is turned back to MAR.

When the battery is removed for any reason and the connection is re-established after a certain time lapse by turning the ignition key to MAR on the front control panel, the indications shown in the diagram below may appear:

- temperature setting on display 24 °C or 72 °F (according to the electronic unit version);
- ECON key on (led on);
- top led next to AUTO key on;
- led for fan speed and distribution pattern selected automatically.



P2L102H01



P2L103H01

Detail of automatic air conditioner front control panel

- | | |
|---|--|
| A. Temperature display. | F. Automatic device activation key. |
| B. Outdoor temperature display key. | G. Economy gauge activation key. |
| C. Selector key for setting required temperature. | H. Key for activating passenger compartment circulation. |
| D. Fan speed display. | I. System de-activation key. |
| E. Selector key for setting fan speed. | L. Key for selecting air distribution through the various outlets and diffusers. |

When key I is pressed (OFF), the following functions are obtained:

- adjacent led comes on;
- leds for all other keys go off;
- system goes off;
- distribution flaps locked in last position taken up;
- air intake flap turns up to prevent outside air from entering.

The pressure on any other key, except B, activates the required function (according to the key) and restores all the other operating conditions memorised by the electronic control unit before the system was turned off by pressing the I key (OFF).

The system may also be reset by pressing the I key again.

When the system is deactivated (OFF key on), the outdoor temperature may be displayed by pressing the B key.

When the G key (ECON) is pressed, present only on the air conditioner system, the following functions are obtained:

- adjacent led comes on;
 - bottom led relating to key F (AUTO) comes on;
 - compressor pulley electromagnetic coupling goes off and cannot be reactivated.
- automatic control of the air intake flap is excluded, ie. if the H key has not been pressed the flap is positioned upright to exclude passenger compartment air recycling (entry of outdoor air).

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The various functions listed for the G key (ECON) are memorised and stay in the system, even if the car engine is stopped and restarted. Control of the compressor and air intake flap position is returned to the system by pressing the G key.

When the F key (AUTO) is pressed, all the previous manual settings are cancelled and the air conditioner system operates automatically - i.e. the electronic unit operates the compressor and positions the different flaps to obtain maximum passenger compartment comfort on the basis of the temperature recorded and the temperature set on the display.

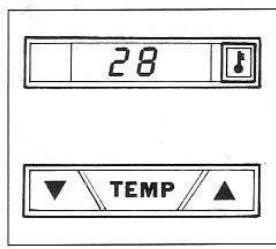
Automatic system operation is indicated by two leds next to key F (AUTO).

If one or more keys are pressed manually (different from those set by the automatic system), i.e. if a different distribution and/or a different fan speed and/or the ECON key is pressed, the bottom led next to the F key (AUTO) goes off to indicate partial automatic operation.

During automatic system operation, if the H key is pressed (symbol shows car passenger compartment), when the led comes on, i.e. when passenger compartment air recycling is activated, recycling is eliminated and outdoor air circulation restored. This is indicated by the above led going off.

If the H key is pressed when the led is off (outside air flow), the above led comes on and passenger compartment air recirculation is activated.

Note also that the two lighted leds next to the AUTO key indicate automatic system operation while the top led alone indicates semi-automatic operation.

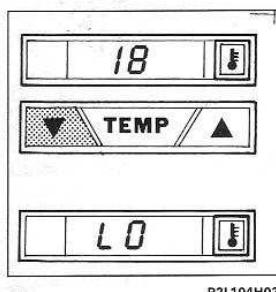


P2L104H01

The required passenger compartment temperature may be set by pressing the key shown alongside. It appears on the top display.

Each time one side of the key is pressed (for however long), the displayed temperature changes by only one unit.

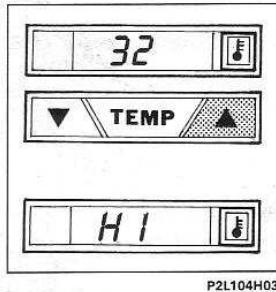
The temperature set on the display may be selected between a minimum of 18 °C and a maximum of 32 °C or between 64 °F and 89 °F for control units in degrees Fahrenheit.



P2L104H02

When the displayed temperature is 18° C (or 64° F) if the shaded part of the key is pressed, the code LO appears on the display.

In this case, the system takes up a fixed position designed to supply maximum cooling effect to the passenger compartment

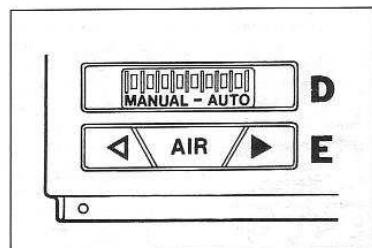


P2L104H03

When the displayed temperature is 32° C (or 89° F) if the shaded part of the key is pressed, the code HI appears on the display.

In this case, the system take up a fixed position designed to supply maximum heating effect in the passenger compartment.

Fan speed is controlled continually by the electronic control unit and changes are recorded on display D by gradual lighting of the 7 leds (in addition to the first which is always lit). Key E may be pressed to select required fan speed and cancel the previous speed setting (manual or automatic). If the previous fan speed was selected automatically, when selector E is pressed, the bottom led next to the AUTO key goes off and the wording MANUAL is lit.



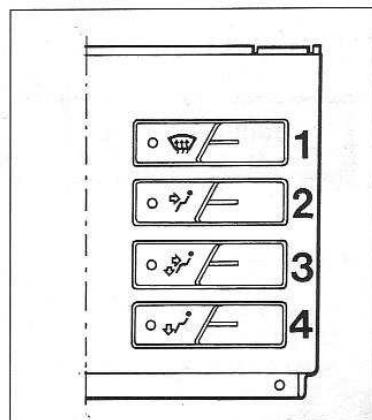
P2L105H01

Air distribution to the various outlets and diffusers is controlled continually by the automatic system which turns the two distribution flaps from the positions corresponding to key (1) to the positions corresponding to key (4). This selection is displayed by lighting of the led next to the corresponding key. During winter heating, the automatic system may make the two distribution flaps take up the position corresponding to key (1).

When one of the four keys is pressed manually, the distribution pattern selected manually or automatically may be altered. In the first case, if the fan speed or recycling air flow have not been changed, the bottom led next to the AUTO key goes off.

When the key pressed manually is pressed again, control of distribution flap position is restored to the automatic device

Air distribution to the various outlets and diffusers can easily be identified by observing the direction of arrow symbols on keys.

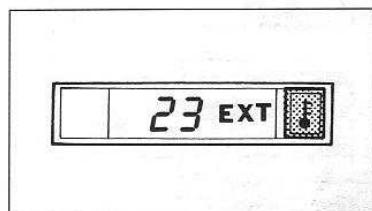


P2L105H02

When the shaded key on the right-hand side of the top display is pressed, the temperature of the air outside the passenger compartment appears.

This value is identified by the letters EXT (exterior) and remains visible for about 10 seconds. After this, the required passenger compartment temperature setting is displayed.

The range of passenger compartment temperatures that can appear on the display runs from -30° C to 50° C or from -22° to 122°F



P2L105H03

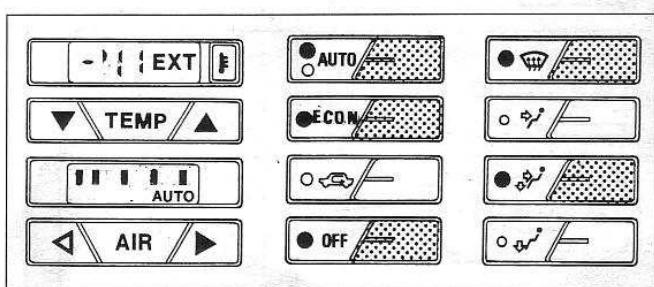
AUTOMATIC DIAGNOSIS

Carry out operations for the different stages in order

Stage 1

Turn the ignition key from STOP to MAR while holding the AUTO key down at the same time.

The indications shown alongside should appear on the two displays and the leds for the shaded keys should come on



P2L105H04

P2L105H05

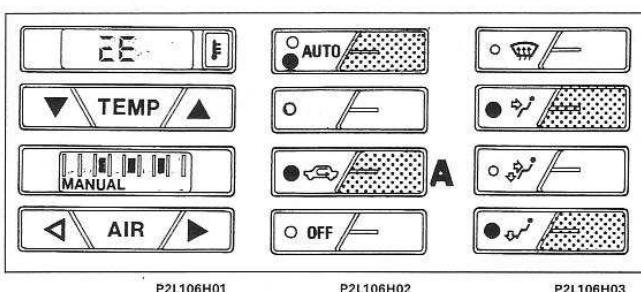
P2L105H06

Auxiliary units

Automatic systems

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Tempra



P2L106H01

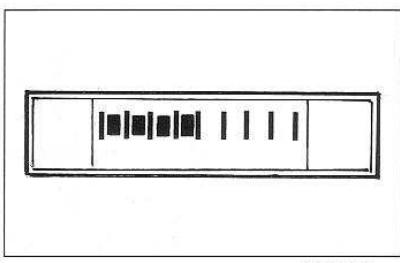
P2L106H02

P2L106H03

Press the key marked A.

The indications shown in the diagram alongside should appear on the two displays and the arrowed leds should come on.

When key A is pressed, the system returns to the condition shown in the diagram at the bottom of the previous page



P2L106H04

STAGE 2

1. Press the AUTO key

The indications shown alongside should appear on the bottom display (4 bars).

2. Press the different keys shown on the following table in order and check that the respective illustrated code appears on the top display for each one.
Also check that the led comes on for each key in the middle and right hand columns

KEY	CODE
▼ / TEMP	5
TEMP / ▲	6
◀ / AIR	1
AIR / ▶	2
● ECON /	4
● CAR /	3

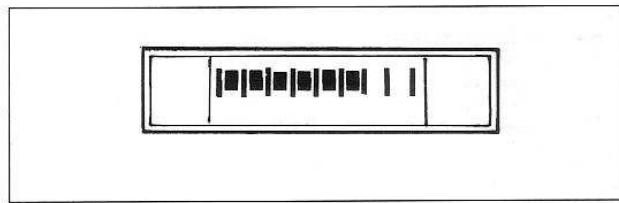
P2L106H05

KEY	CODE
○ OFF /	7
○ Wipers /	9
○ ⚡ /	6
○ ⚡ /	5
○ ⚡ /	8
● KEYS /	E

P2L106H12

STAGE 3

1. Press the AUTO key. The illustrations alongside should appear on the display (6 bars).

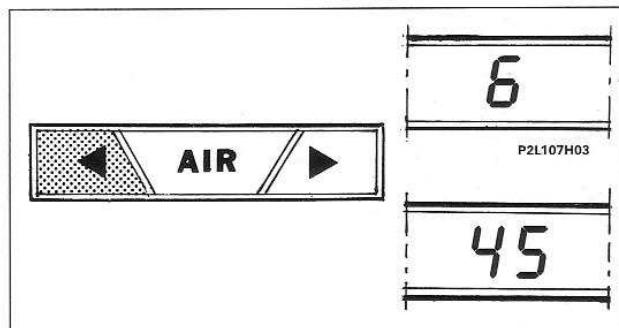


P2L107H01

2. Press the left hand side of the AIR key (shaded). The passenger compartment air temperature should appear on the top display.

If the value 06 appears - or just 6 (as shown), the sensor or its circuit are broken.

If the value 45 appears (as shown), the sensor or connected circuits are short-circuited.



P2L107H03

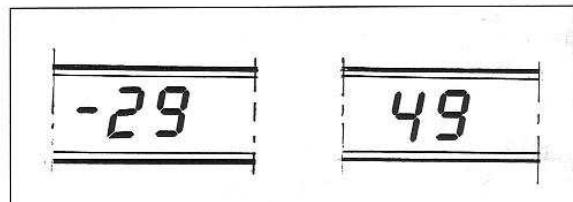


P2L107H04

3. Press the right hand side of the AIR key. The outdoor air temperature should appear on the top display.

If the value -29 appears (as shown), the sensor or its circuit are broken.

If the number 49 appears (as shown), the sensor or connected cables are short-circuited.



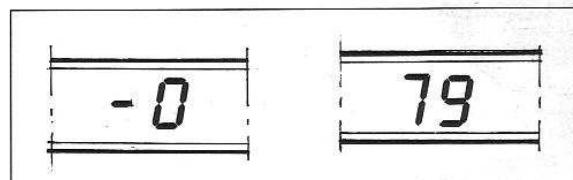
P2L107H05

P2L107H06

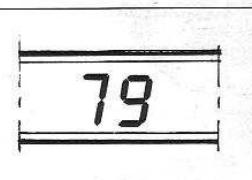
4. Press the left hand side and then the right hand side of the TEMP key.

The top display should show the blended air temperature in the top and bottom part of the heater-distributor unit respectively. If reading is -00 or -0 for one of the two sensors, the sensor or its circuit are broken.

If the value 79 is displayed, the sensor in question or its connected cables are short-circuited.



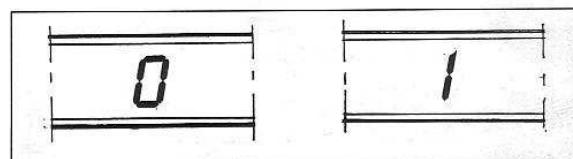
P2L107H07



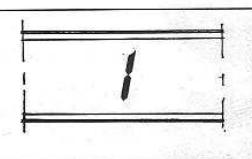
P2L107H08

5. Press the OFF key.

0 should appear on the display if the car is at a standstill, or 1 if the car is running at a speed of more than 30 Km/h.



P2L107H09



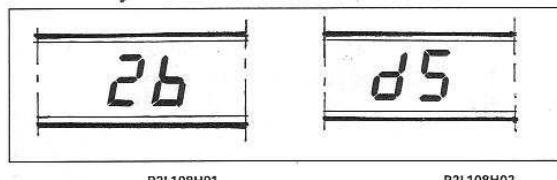
P2L107H10

Auxiliary units

Automatic systems

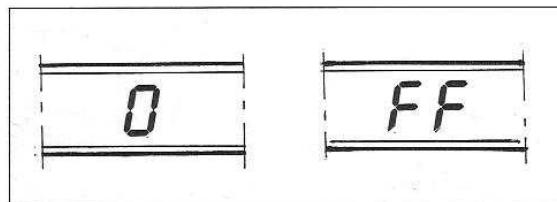
Tempra

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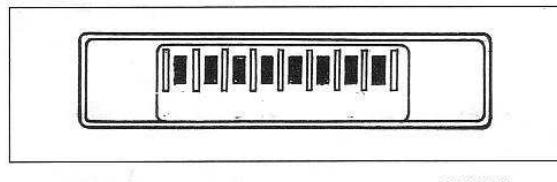
P2L108H01

P2L108H02

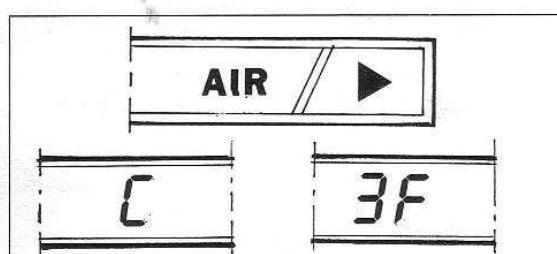


P2L107H09

P2L108H03

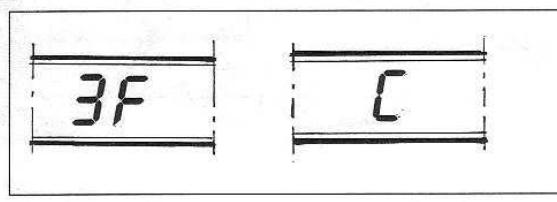


P2L108H04



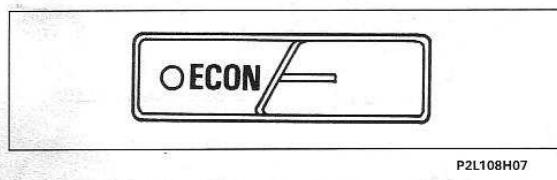
P2L108H05

P2L108H06



P2L108H06

P2L108H05



P2L108H07

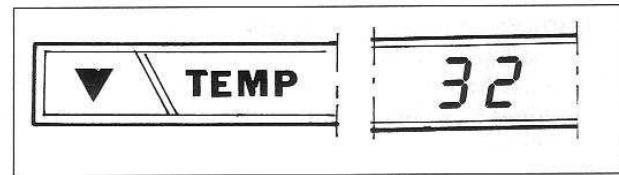
6. Press the key above the OFF key. A value between 2b and d5 should appear on the top display. This value represents the distribution flap position.

7. Press the ECON key. The top display should show the temperature of the passenger compartment fan electronic variator. If the code 0 appears on the top display, the sensor or its circuit are broken. If the code FF appears, the sensor or its connected cables are short-circuited.

STAGE 4

1. Press the AUTO key. The bottom display should show the indications shown alongside (8 bars).
2. Press the right hand side of the AIR key repeatedly (shown alongside). 26 codes should be displayed in order beginning with C up to 3F on the top display and fan speed should be heard to increase gradually.
3. Press the left hand side of the AIR key repeatedly. Each time the key is pressed, the top display should show one of 26 codes in order beginning with 3F up to C. Fan speed should be heard to decrease gradually.
4. When the ECON key shown alongside is pressed and repressed, the compressor pulley electromagnetic coupling should go on and off and the key led should go off.

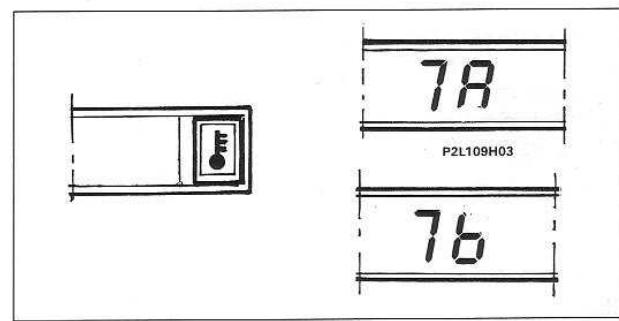
5. Press the left hand part (shown alongside) of the TEMP key. The display should show a set of codes up to 32.



P2L109H01

P2L109H02

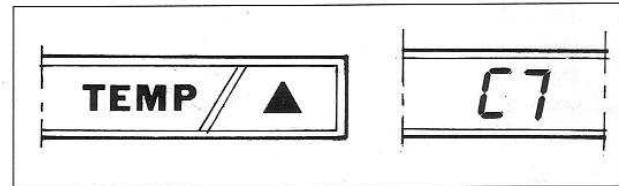
6. Press the shaded key. The display should show a sequence of codes up to 7a or 7b, corresponding to total opening of the cock on the heater input duct.



P2L106H11

P2L109H04

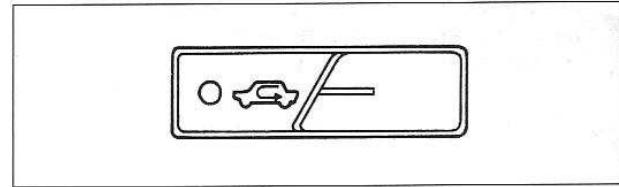
7. Press the right hand side (shown alongside) of the TEMP key. The display should show a series of codes up to C7.



P2L109H05

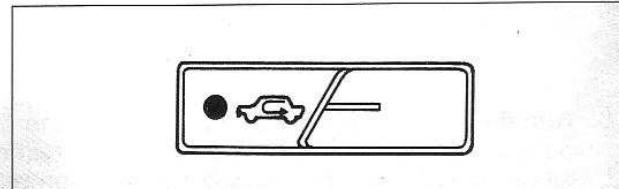
P2L109H06

8. When the key shown (alongside) is pressed, passenger compartment air recirculation should be activated and the key led should come on.



P2L109H07

9. Press the key shown (alongside) again. The key led should go off and outdoor air should be admitted.



P2L109H08

Auxiliary units

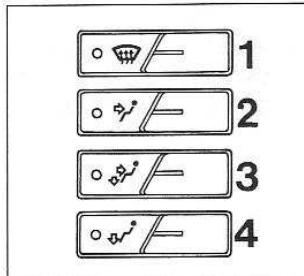
Automatic systems

Tempra

50.

10. Press keys 1-2-3-4 in order

A led should come on for each key and the top display should show a sequence of codes until the code relating to each individual key identifying a given distribution flap position remains permanently fixed.



P2L105H02

The various codes relating to the keys are given in the table:

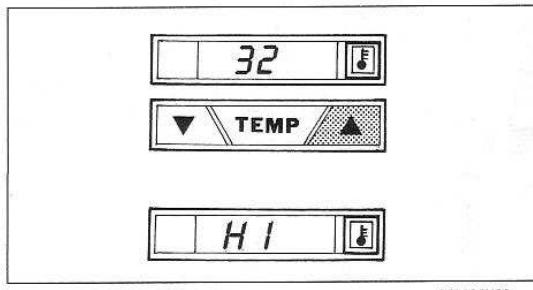
KEY	CODE
	5 P2L110H01
	26 P2L110H02

KEY	CODE
	62 P2L110H03
	94 P2L110H04

After this last automatic diagnosis operation, press the AUTO key to return to normal system operation.

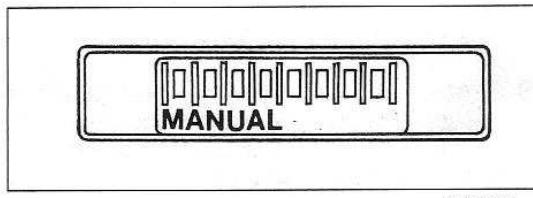
MEMORISING CONTROLS

1. Turn the ignition key to MAR.
2. Press the AUTO key.
3. Press the right hand side of the TEMP key several times (shaded) until the code HI appears on the top display.



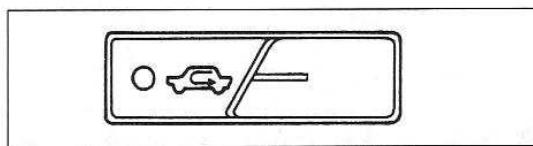
P2L104H03

4. Press the right hand side of the AIR key until the fan is running at top speed and 8 bars appear on the bottom display (as shown alongside).



P2L110H05

5. Press the key shown alongside and one of the keys from the right hand column other than those set by the automatic system.



P2L109H07

6. Turn the ignition key to STOP and then turn to MAR again after a few moments. The previously memorised settings should still be operational without any changes - i.e. temperature HI, maximum fan speed, recycled air and the same distribution pattern.

OPERATIONS TO BE CARRIED OUT ACCORDING TO AUTOMATIC DIAGNOSIS RESULTS

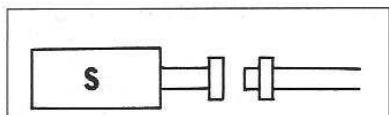
If one or more segments or one or more key LEDs stay off or individual key codes do not appear during the first and second stage of automatic diagnosis, replace the electronic control unit.

For the third stage of automatic diagnosis, follow the instructions in the following table.

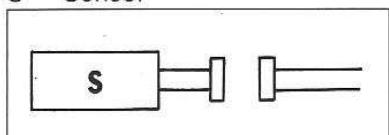
KEY	DATA DISPLAYED	OPERATIONS TO BE CARRIED OUT	DATA DISPLAYED	OPERATIONS TO BE CARRIED OUT
Left hand side of AIR key	Passenger compartment air temperature $\pm 1^{\circ}\text{C}$ from actual temperature	Replace the sensor. If the fault persists, replace the electronic unit		
	6	A	6	C
	45		45	Replace sensor
	45	B	6	Replace sensor
			45	D
Right hand side of AIR key	Outdoor temperature $\pm 1^{\circ}\text{C}$ different from actual temperature	Replace the sensor. If the defect persists, replace the electronic unit		
	-29	A	-29	C
	49		49	Replace sensor
	49	B	-29	Replace sensor
			49	D
Left hand side of TEMP key	Air temperature in the top of the heater-distributor unit $\pm 1^{\circ}\text{C}$ different from actual temperature	Replace the sensor and replace the electronic control unit if the defect persists		
	-0	A	-0	C
	79		79	Replace sensor
	79	B	-0	Replace sensor
			79	D
Right hand side of TEMP key	Air temperature in the bottom of the heater-distributor unit $\pm 1^{\circ}\text{C}$ different from actual temperature	Replace the sensor and if the defect persists, replace the electronic unit		
	-0	A	-0	C
	79		79	Replace sensor
	79	B	-0	Replace sensor
			79	D

50.

KEY	DATA DISPLAYED	OPERATIONS TO BE CARRIED OUT	DATA DISPLAYED	OPERATIONS TO BE CARRIED OUT
ECON key	Temperature of electronic speed variator $\pm 1^\circ \text{C}$ different from actual temperature	Replace the passenger compartment fan electronic speed variator		
	O	A	O	C
	FF		FF	E
		B	O	E
			FF	D



S = Sensor



S = Sensor

A. Disconnect the sensor terminal connection and bridge the two cables supplying the sensor.

B. Disconnect the sensor terminal electrical connection

C. Replace broken cable(s) connecting the sensor to the electronic unit and replace the unit if no breaks found.

D. Check and/or replace the positive lead connected accidentally to earth. If no defects are found, replace the electronic unit.

E. Replace the fan electronic speed variator.

Some defects may be found during the fourth stage of automatic diagnosis:

- fan does not work at all speeds;
- compressor does not come on;
- electric actuators do not work or function is restricted;
- electric actuators work perfectly but codes displayed are different from those set.

During the first two stages, check the fan and compressor supply circuits.

In the third stage, check the efficiency of the actuators. If they are working, replace the electronic unit after checking condition and insulation of the cables connecting the two parts.

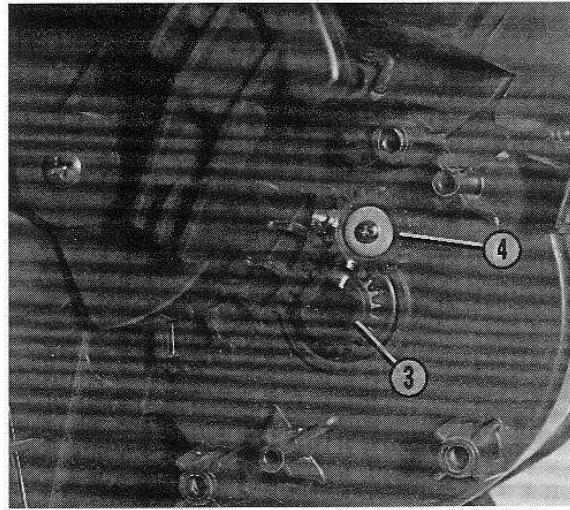
In the fourth case, if the number of codes displayed in sequence is the same as that displayed between the codes that appear, adjust the micrometer screws that alter position transducer position.

NOTE This last operation must be carried out only if the displayed codes differ by only one unit from the actual number. Replace the actuator in other cases.

HEATER-DISTRIBUTOR UNIT

The heater-distributor unit of the two automatic systems differs from the manual unit in the following respects:

- different toothed sector;
- the bottom distribution flap is not positioned directly by the toothed sector. The toothed sector is positioned via gear (4) by gear (3) which is an integral part of the above flap. The flap is positioned directly by an electric actuator;
- the bottom distribution flap is a different shape.



When the heater - distributor unit is reassembled, the white ridge on the toothed sector must be aligned with the ridge on the idling wheel (4). The second ridge on the idling wheel must be aligned with the ridge on the toothed wheel (3) which is an integral part of the bottom distribution flap