Audi A8 1994 ➢

Air conditioner

Edition 11.1997

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi A8 1994 ➤

Air conditioner

Repair Group

01 - Self-diagnosis, Electrical check

87 - Air conditioning

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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Contents

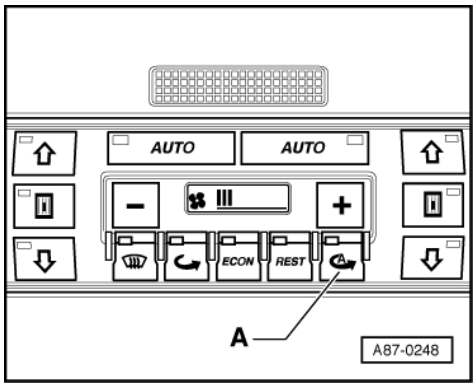
01 - Self-diagnosis, Electrical check

1 - Self-diagnosis of air conditioner

1.1 - Self-diagnosis of air conditioner

1.2 - Assignment of operating and display unit -E87

Vehicle feature	Part No. index for -E87	Explanation
Zexel compressor	up to and incl. "H"	Possible encoding for compressor with air conditioner compressor speed sender -G111
Nippondenso /Denso-compressor	from index "B" onwards	Possible encoding for compressor without air conditioner compressor speed sender -G111
TDI engine	from index "E" onwards	Possible encoding for TDI engine
Air quality sensor -G238	from index "J" onwards	Software adapted to air quality sensor -G238
Switch for heated rear window installed in -E87	from index "M" onwards	Modified version of dash panel centre section



Notes:

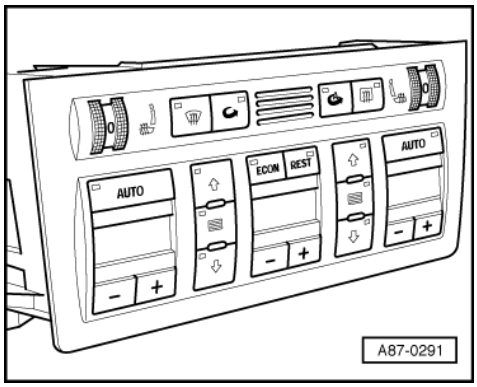
- Ensure that the assignment is correct when replacing an operating and display unit:

=> Parts List

- -> Different versions of the operating and display unit exist (e.g. for vehicles with air quality sensor and the button -A-).

- with and without radio/navigation system.

=> Parts List



- -> From model year 1999 onwards, different versions of the operating and display unit exist for vehicles with modified dash panel centre section (gradual introduction starting October 1998, e.g. index "M", "N", "P" or "Q").
  - with and without radio/navigation system (or radio with large control panel).
  - with and without switches for heated seats.

=> Parts List

1.3 - Technical data regarding self-diagnosis

Features

- The fault memory is designed as a non-volatile memory and is therefore not dependent on the power supply.
- Data is transferred between the control unit and fault reader V.A.G 1551 or vehicle system tester V.A.G 1552 in the "Rapid data transfer" mode.

1.4 - Functional description

The operating and display unit -E87 of the fully automatic air conditioner has a fault memory.

After analysing the information, the operating and display unit -E87 makes a distinction between 22 different faults => Fault table, Page 8 . It stores the faults until they are erased when the fault memory is interrogated.

1.5 - Fault detection

Faults occurring in the monitored sensors or components are stored in the fault memory together with an indication of the type of fault.

The first step in the fault-finding process is always to start self-diagnosis and interrogate the faults stored. The stored information can be interrogated using the following:

- Fault reader V.A.G 1551
- Vehicle system tester V.A.G 1552

The fault information displayed is used in conjunction with a fault table (containing information on possible causes of trouble) to perform pin-pointed repair measures.

Notes on fault indication:

- Data output is only possible if the ignition is switched on or if the engine is running at a speed lower than 3000 rpm. At higher engine speeds, data output is restricted or terminated (final control diagnosis, for example, can only be implemented at engine speeds of up to 3000 rpm; self-diagnosis is aborted on exceeding this speed).

- If a fault condition exists for longer than a pre-determined period, the fault is stored as being static. If the fault condition is then no longer detected for a pre-determined period, the fault is re-classified as being a sporadic fault. This process is constantly repeated. Sporadic faults are additionally identified as such by / SP on the right of the display.
- A sporadic fault is erased automatically if it no longer occurs for a pre-determined period.

The various self-diagnosis options are only possible in combination with the fault reader V.A.G 1551 or vehicle system tester V.A.G 1552, mode 1 "Rapid data transfer".

Self-diagnosis is not restricted to storage, interrogation, erasing and final control diagnosis. It also offers basic setting, control unit identification and encoding functions.

Mode -2- (Flash code output) is not provided for the air conditioner/heater electronics. Modes -3- (Self-test) and -4- (Workshop code) apply only to fault reader V.A.G 1551 and vehicle system tester V.A.G 1552 and are described in the appropriate operating instructions.

Notes:

- This Workshop Manual describes self-diagnosis with the fault reader V.A.G 1551.
- Self-diagnosis can also be carried out in the same way using the vehicle system tester V.A.G 1552. To be able to provide proof of faults in the event of subsequent enquiries, it is advisable to connect the fault reader V.A.G 1551 before erasing the fault memory and to print out the faults present (the V.A.G 1552 does not have a printer).
- Component fitting locations =>from page 120 onwards.
- Self-diagnosis can be carried out up to an engine speed of approx. 3000 rpm without restricting the regulating functions. If the ignition is switched off, self-diagnosis is restricted if carried out in auxiliary heater mode and during the "Rest" function.
- If a new operating and display unit -E87 has been installed but not encoded, the display of the -E87 flashes (after the ignition is switched on).

Available functions

Fault reader V.A.G 1551 or vehicle system tester V.A.G 1552		Ignition ON, engine not running	Engine idling	Page
Address words				
08	Air conditioner/heater electronics	yes	yes	
00	Automatic test sequence	yes	yes	
Functions				
01	Interrogate control unit version	yes	yes	4
02	Interrogate fault memory	yes	yes	6
03	Final control diagnosis	yes	yes	26
04	Perform basic setting	yes	yes	37
05	Erase fault memory	yes	yes	38
06	End output	yes	yes	39
07	Encode control unit	yes	yes	39
08	Read measured value block	yes	yes	42

Note:

If, with the ignition switched off, the operating and display unit -E87 was switched on by pressing the "Rest" button or via the auxiliary heater, self-diagnosis is also possible with certain restrictions.

1.6 - Safety precautions

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive:

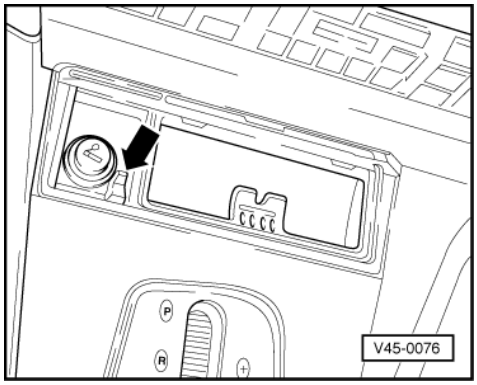
Attention:
- **Always attach testers and measuring instruments to back seat and have them operated from there by a second person.**
- **If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.**

1.7 - Connecting fault reader V.A.G 1551 and selecting air conditioner/heater electronics

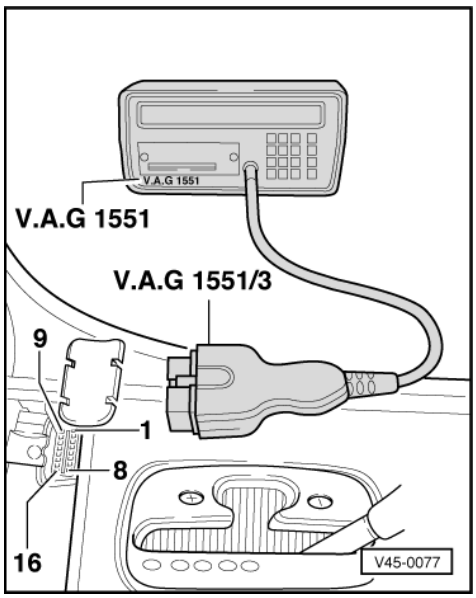
Test requirements:

- Vehicle supply voltage OK
- Fuses OK

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- -> Release ashtray from centre console by pressing small lever -arrow-.
- Pull ashtray out of centre console and remove diagnostic connector cover.



- -> With ignition switched off, connect fault reader V.A.G 1551 with wire V.A.G 1551/3.

-> Indicated on display:

```
V.A.G SELF-DIAGNOSIS     HELP
1 - Rapid data transfer 1)
2 - Flash code output1)
```

1) Displayed alternately

Note:

If the display remains blank, check the power supply and wiring in line with the current flow diagram.

Depending on desired function=>"Available functions" table, Page 3 :

- Switch on ignition.

or

- Start engine.
- Switch on printer by pressing PRINT key (indicator lamp in key lights up).
- Enter "1" for "Rapid data transfer".

-> Indicated on display:

```
Rapid data transfer     HELP
Enter address word XX
```

- Enter "08" for address word "Air conditioner/heater electronics".

-> Indicated on display:

```
Rapid data transfer     Q
08 - Air conditioner/heater electronics
```

- Confirm entry with Q key.

-> Indicated on display:

```
Rapid data transfer
Tester sending address word 08
```

- Wait until next display appears.

-> Fault reader V.A.G 1551 displays control unit identification (example).

```
4D0820043X D2 Fully auto. A/C     DXX
Code XXXXX     WSC XXXXX
```

Note:

The control unit identification can be printed out by pressing the PRINT key on the fault reader V.A.G 1551.

Control unit identification (example)

- 4D0 820 043 X	Part No.; Assignment => Parts List
- D2 Fully auto. A/C	Audi A8 control unit for fully automatic air conditioner
- DXX	Data level (software version) of control unit
- Code XXXXX:	Different codes=>Page 41
- WSC XXXXX:	Workshop code of V.A.G 1551 used for last encoding procedure

- Press ⇒key.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

Notes:

```
Rapid data transfer     HELP
No control unit response
```

-> Indicated on display:

- Press the HELP key for printout of possible causes of trouble.

```
Rapid data transfer     HELP
K-wire not switched to positive
```

Use the current flow diagram to check the wiring of the diagnostic connector =>Page 84 .

```
Rapid data transfer
No signal from control unit
```

```
Rapid data transfer
Fault in communication link
```

-> If this display appears at the beginning of or during the program, faults have occurred. Data can no longer be exchanged between the fault reader V.A.G 1551 and the operating and display unit -E87.

- Use the current flow diagram to check the wiring of the diagnostic connector =>Page 84 .
- After having rectified the possible fault causes, enter "08" for the address word "Air conditioner/heater electronics" => Page 5 .

2 - Interrogating fault memory

2.1 - Interrogating fault memory

- Connect fault reader V.A.G 1551 (V.A.G 1552) and enter address word "08" to select air conditioner/heater electronics.
(Connecting fault reader => Page 4 .)

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- Enter "02" for "Interrogate fault memory" function.

-> Indicated on display:

```
Rapid data transfer      Q
02 - Interrogate fault memory
```

- Confirm entry with Q key.

-> Indicated on display:

```
No faults detected
```

- Press ⇒key.

Notes:

- If no faults have been detected but complaints have been submitted regarding the air conditioner (e.g. the compressor is not functioning or does not function all of the time, unsatisfactory regulation of the system, the fresh-air blower speed cannot be controlled):
  - 1. Read measured value block (function 08) =>Page 42 .
  - 2. Perform final control diagnosis (function 03)=> Page 26 .
  - 3.Test cooling capacity of air conditioner => Page 185 .
- If no faults are detected by the operating and display unit -E87 and the temperature of the air discharged from the dash panel vents (left and right) cannot be adjusted or regulated, check the actuation of the pump/ valve unit valves => Electrical testing, Page 74 .

-> Indicated on display:

```
X faults detected
```

The stored faults are displayed and printed out consecutively, provided that printer is on.

Notes:

- If the printer is not on, press the ⇒ key to display the next fault.
- If fault(s) found:
  - 1. Eliminate fault.
  - 2. Interrogate fault memory (function 02).
  - 3. Erase fault memory (function 05).
  - 4. Check code (function 01)/encode control unit (function 07).
  - 5. Perform basic setting (function 04).
  - 6. Interrogate fault memory (function 02) and erase it if necessary (function 05).
  - 7. End output (function 06).

  Press ⇒key.

As with "No faults detected", the program returns to the start when the ⇒key is pressed.

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- End output (function 06) => Page 39 .
- Switch off ignition and unplug diagnostic connector.

2.2 - Notes on fault table

Notes:

- Below is a list of the faults which can be detected by the operating and display unit -E87 and displayed on the V.A.G 1551 and V.A.G 1552 when the fault memory is interrogated. The list is compiled according to the fault code.
- The content of the fault memory is retained until the fault memory is erased => Page 38 .
- The fault code is only printed out in "Rapid data transfer" mode if printer of V.A.G 1551 is switched on. Example: Fault code (5-digit) 01270.
- Sporadic faults are indicated by "/SP" on the display.
- As regards all sporadic faults, pay particular attention to possible loose contacts in the connectors.
- If components are indicated as being defective on reading out fault memory, additionally use the current flow diagram to check for short circuit and open circuit in wiring to components.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Check appropriate plug contacts before replacing the component.
- Additionally check the power supply and earth connections before replacing the operating and display unit -E87.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If the operating and display unit -E87 remains in operation when the ignition is switched off, check the wiring to the operating and display unit -E87 (connector E, contact 7) for a short to positive; refer to the supplementary current flow diagram in the case of vehicles with auxiliary heater:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Always perform basic setting (function 04) after replacing an air conditioner/heater component. Then read out the fault memory, eliminate any faults displayed and erase the fault memory (functions 02 and 05).
- If 22 °C (72 °F) is always displayed when the ignition is switched on and off regardless of the temperature set last, service the power supply (terminal 30) to the operating and display unit -E87 in line with the current flow diagram.
- The display is changed from °C (Celsius) to °F (Fahrenheit) and vice versa by pressing the "Temperature + left" (driver's side) while simultaneously holding down the "air recirculation" button.
- Testing the cooling capacity of the air conditioner =>Page 185 .
- If, in the case of vehicles with air conditioner compressor speed sender -G111, the compressor runs only briefly after the engine has been switched on and is then switched off again immediately afterwards, check the wiring between the air conditioner compressor speed sender -G111 and the operating and display unit -E87 for an open circuit:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If, in the case of vehicles with a Nippondenso/Denso compressor (without air conditioner compressor speed sender -G111), the compressor runs only briefly after the engine has been started and is then switched off immediately afterwards, check the code for the operating and display unit -E87 => Page 39 .
- If air quality sensors -G238 (with operating and display unit -E87 from part No. index "J" onwards are used, the fault location "Air quality sensor -G238" is added. The pressure switches -F73, -F23 and -F118 are no longer installed. The pressure switch -F129 is new; Functional description =>Page 102 .

- If the switch in the pressure switch -F129 is open between contacts 1 and 2, the operating and display unit -E87 interprets this as a fault in the refrigerant circuit. If the measured ambient temperature is lower than + 2 °C (or lower than - 5 °C in air recirculation mode), an open switch is not stored as a fault (at very low temperatures the pressure in the refrigerant circuit can drop below the switch pressure). The magnetic coupling is not activated at these temperatures. The switch is only stored as defective if it has opened at least twice within one driving period.
- If an open high-pressure switch -F129 was detected 30 times during one driving period (e.g. owing to a loose contact), the compressor is switched off ("ECON" mode). The compressor can be reactivated by pressing the "Compressor on" button or by switching the ignition off and on again. If this fault occurs during more than one driving period, the compressor cannot be switched on again until the fault memory has been erased.
- The following faults are no longer displayed in the case of operating and display units with part numbers from index "M" onwards:

- Speed information missing (can no longer be determined since compressor speed is no longer measured).

- Vehicle speed signal, implausible signal (the vehicle speed is transmitted from the dash panel insert via the "drive train

data bus").

- Ambient temperature sensor -G17 (the temperature measured by the -G17 is transmitted from the dash panel insert via

the drive train data bus).

- Potentiometer -G144 in control motor -V114 (the ACF flap and, therefore, the control motor are not used).

- ACF flap control motor -V114 (the ACF flap is not used).

- High-pressure switch for magnetic coupling -F118 (has been replaced by the pressure switch -F129).

- Air conditioning system magnetic coupling -N25 (since the sender -G111 is no longer fitted, faults at the magnetic coupling

can no longer be detected).

- The following faults are only displayed in the case of operating and display units with part numbers from index "M" onwards:

- Control unit incorrectly coded

- Basic setting not carried out

- Drive train data bus defective

- Engine control unit: No communication or Please interrogate fault memory

- Control unit in dash panel insert: No communication or Please interrogate fault memory

- If a fault is detected while basic setting is being performed on a control motor, -E87 units with part numbers from index "M" onwards set a substitute value for the stop limit which is not reached. In the fault memory, the "Adaption limit exceeded" fault is stored in the fault memory and the substitute value for this control motor is displayed in the measured value block (the actual value for the motor is not displayed).

2.3 - Fault table up to fault code 00800

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00000 No faults detected	The functions "Final control diagnosis 03" and "Read measured value block 08" must be performed if no faults are detected although complaints regarding the air conditioner/ heater electronics have been submitted.	
00529 2122 Speed information missing /SP 1)	- Open circuit between engine control unit, dash panel insert and -E87	- Use current flow diagram to locate and eliminate open circuit

	- Engine control unit and dash panel insert supply unusable engine speed signal	- Read measured value block =>Page 42 Check engine speed signal: => Electrical System; Repair Group 01

1) This fault is only detected during final control diagnosis (no engine speed signal detected, although compressor speed is supplied).

Note:

The "No speed info" fault is no longer provided in operating and display units with the part number 4D0 820 043 from index "M" onwards (it can no longer be determined since the compressor speed is no longer measured).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00532 2234 Supply voltage	- Voltage dips in vehicle electrical system to values below 9.5 V 2)	- Check alternator and voltage regulator: => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
Signal too small /SP	- Contact resistance along wiring to low-pressure switch -F73 (only vehicles with operating and display unit -E87 with part No. up to index "H")	- Use current flow diagram to locate and eliminate contact resistance: => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

2) If the vehicle voltage (at connector -E-, contact -11-) drops to a value lower than 9.5 V, the compressor is switched off for at least 25 seconds. It is not switched on again until the voltage exceeds 10.8 V.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00600 Potentiometer -G92 in control motor -V68 (for temperature flap)	- Short circuit or open circuit between -G92 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G92 in -V68 defective	- Replace control motor -V68
	- Flap out of position, control motor -V68 outside its adjustment range Continued ▼	- Install connecting element between flap and motor correctly

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00600		
Adaption limit exceeded 3)	- Temperature flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of temperature flap4) Check connecting element between flap and motor

	- Potentiometer -G92 in -V68 defective - Gears skipped in drive of -V68	- Replace control motor -V68

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00604 Potentiometer -G113 in control motor -V71 (for air flow flap)	- Short circuit or open circuit between -G113 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G113 in -V71 defective	- Replace control motor -V71
	- Flap out of position, control motor -V71 outside its adjustment range	- Install connecting element between flap and motor correctly

Continued ▾

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00604		
Adaption limit exceeded 3)	- Air flow flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of air flow flap4) Check connecting element between flap and motor
	- Potentiometer -G113 in -V71 defective - Gears skipped in drive of -V71	- Replace control motor -V71

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00625 Speed signal	- Loose contact along wiring between speedometer sender -G22, dash panel insert or another component also connected to this signal (e.g. radio or CCS control unit) and -E87	- Use current flow diagram to locate and eliminate loose contact
Implausible signal /SP	- Speedometer sender -G22 or dash panel insert supplies unusable signal, or one of other connected components destroys signal	- Check speed signal from sender -G22 and from dash panel insert (pay attention to all components connected to this signal wire): => Electrical System; Repair Group 01

Note:

The "Vehicle speed signal, implausible signal" fault is no longer provided for operating and display units with part numbers from index "M" onwards (the vehicle speed is transmitted from the dash panel insert via the drive train data bus).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00657 Centre vents control motor -V102	- Short circuit, open circuit in wiring or wiring fault between -V102 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
Blocked or without voltage /SP	- Centre vents flap sticking	- Check freedom of movement of centre vents flap
	- Control motor -V102 defective	- Check control motor -V102 => Final control diagnosis, Page 31
00710 Defrost flap control motor -V107	- Short circuit, open circuit in wiring or wiring fault between -V107 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
Blocked or without voltage /SP	- Defrost flap sticking	- Check freedom of movement of defrost flap
	- Control motor -V107 defective	- Check control motor -V107 => Final control diagnosis, Page 30

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00711 Left footwell flap control motor -V108	- Short circuit, open circuit in wiring or wiring fault between -V108 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
Blocked or without voltage /SP	- Left footwell flap sticking	- Check freedom of movement of left footwell flap
	- Control motor -V108 defective	- Check control motor -V108 => Final control diagnosis, Page 32
00712 Right footwell flap control motor -V109	- Short circuit, open circuit in wiring or wiring fault between -V109 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
Blocked or without voltage /SP	- Right footwell flap sticking	- Check freedom of movement of right footwell flap
	- Control motor -V109 defective	- Check control motor -V109 => Final control diagnosis, Page 32

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00713 Centre left vent control motor -V110	- Short circuit, open circuit in wiring or wiring fault between -V110 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
Blocked or without voltage /SP	- Centre left vent flap sticking	- Check freedom of movement of centre left vent flap
	- Control motor -V110 defective	- Check control motor -V110 => Final control diagnosis, Page 31
00714		

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Centre right vent control motor -V111 Blocked or without voltage /SP	- Short circuit, open circuit in wiring or wiring fault between -V111 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
	- Centre right vent flap sticking	- Check freedom of movement of centre right vent flap
	- Control motor -V111 defective	- Check control motor -V111 => Final control diagnosis, Page 31

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00715 Rear footwell vent control motor -V112 Blocked or without voltage /SP	- Short circuit, open circuit in wiring or wiring fault between -V112 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
	- Rear footwell vent flap sticking	- Check freedom of movement of rear footwell vent flap
	- Control motor -V112 defective	- Check control motor -V112 => Final control diagnosis, Page 33
00716 Air recirculation flap control motor -V113 Blocked or without voltage /SP	- Short circuit, open circuit in wiring or wiring fault between -V113 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
	- Air recirculation flap sticking	- Check freedom of movement of air recirculation flap
	- Control motor -V113 defective	- Check control motor -V113 => Final control diagnosis, Page 33

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00717 ACF flap control motor -V114 5) Blocked or without voltage /SP	- Short circuit, open circuit or fault along wiring to -E87	- Use current flow diagram to locate and eliminate short circuit/ wiring fault

5) This flap is not used. From model year 1998 onwards, an ACF filter is used which does not have its own flap.

Note:

The "ACF flap control motor -V114" fault is no longer provided for operating and display units with part numbers from index "M" onwards (the ACF flap is not used).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00722 Switch for centre left vent -F183	- Short circuit or open circuit between -F183 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Switch -F183 defective	- Check switch -F183 => Electrical testing, Page 73
00723		

Switch for centre right vent -F184	- Short circuit or open circuit between -F184 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Switch -F184 defective	- Check switch -F184 => Electrical testing, Page 73

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00727 Potentiometer -G135 in control motor -V107 (for defrost flap)	- Short circuit or open circuit between -G135 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G135 in -V107 defective	- Replace control motor -V107
	- Flap out of position, control motor -V107 outside its adjustment range	- Install connecting element between flap and motor correctly

Continued ▾

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00727		
Adaption limit exceeded 3)	- Defrost flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of defrost flap4) Check connecting element between flap and motor
	- Potentiometer -G135 in -V107 defective - Gears skipped in drive of -V107	- Replace control motor -V107

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00728 Potentiometer -G136 in control motor -V110 (for centre left vent)	- Short circuit or open circuit between -G136 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G136 in -V110 defective	- Replace control motor -V110
	- Flap out of position, control motor -V110 outside its adjustment range	- Install connecting element between flap and motor correctly

Continued ▾

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00728		

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Adaption limit exceeded 3)	- Centre left vent flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of centre left vent flap4) Check connecting element between flap and motor
	- Potentiometer -G136 in -V110 defective - Gears skipped in drive of -V110	- Replace control motor -V110

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00729 Potentiometer -G137 in control motor -V111 (for centre right vent)	- Short circuit or open circuit between -G137 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G137 in -V111 defective	- Replace control motor -V111
	- Flap out of position, control motor -V111 outside its adjustment range	- Install connecting element between flap and motor correctly
	Continued ▼	

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00729		
Adaption limit exceeded 3)	- Centre right vent sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of centre right vent4) Check connecting element between flap and motor
	- Potentiometer -G137 in -V111 defective - Gears skipped in drive of -V111	- Replace control motor -V111

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00730 Potentiometer -G138 in control motor -V102 (for centre vents)	- Short circuit or open circuit between -G138 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G138 in -V102 defective	- Replace control motor -V102
	- Flap out of position, control motor -V102 outside its adjustment range	- Install connecting element between flap and motor correctly

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	Continued ▼	

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00730		
Adaption limit exceeded 3)	- Centre vents sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of centre vents4) Check connecting element between flap and motor
	- Potentiometer -G138 in -V102 defective - Gears skipped in drive of -V102	- Replace control motor -V102

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00731 Potentiometer -G139 in control motor -V108 (for left footwell flap)	- Short circuit or open circuit between -G139 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G139 in -V108 defective	- Replace control motor -V108
	- Flap out of position, control motor -V108 outside its adjustment range Continued ▼	- Install connecting element between flap and motor correctly

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00731		
Adaption limit exceeded 3)	- Left footwell flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of left footwell flap4) Check connecting element between flap and motor
	- Potentiometer -G139 in -V108 defective - Gears skipped in drive of -V108	- Replace control motor -V108

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00732 Potentiometer -G140 in control motor -V109 (for right footwell flap)	- Short circuit or open circuit between -G140 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G140 in -V109 defective	- Replace control motor -V109
	- Flap out of position, control motor -V109 outside its adjustment range	- Install connecting element between flap and motor correctly
Adaption limit exceeded 3)	- Right footwell flap sticking	- Check freedom of movement of right footwell flap4)
	- Potentiometer -G140 in -V109 defective - Gears skipped in drive of -V109	- Replace control motor -V109

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00733 Potentiometer -G141 in control motor -V112 (for rear footwell vent)	- Short circuit or open circuit between -G141 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G141 in -V112 defective	- Replace control motor -V112
	- Flap out of position, control motor -V112 outside its adjustment range	- Install connecting element between flap and motor correctly
Adaption limit exceeded 3)	- Rear footwell flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of rear footwell flap4) Check connecting element between flap and motor
	- Potentiometer -G141 in -V112 defective - Gears skipped in drive of -V112	- Replace control motor -V112

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00734 Centre vent potentiometer -G142	- Short circuit or open circuit between -G142 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit.
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G142 defective	- Check potentiometer -G142 => Electrical testing, Page 73

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00735 Potentiometer -G143 in control motor -V113 (for air recirculation flap)	- Short circuit or open circuit between -G143 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Potentiometer -G143 in -V113 defective	- Replace control motor -V113
	- Flap out of position, control motor -V113 outside its adjustment range	- Install connecting element between flap and motor correctly
Adaption limit exceeded 3)	- Air recirculation flap sticking - Connecting element between flap and motor: incorrect version or clearance too great	- Check freedom of movement of air recirculation flap4) Check connecting element between flap and motor
	- Potentiometer -G143 in -V113 defective - Gears skipped in drive of -V113	- Replace control motor -V113

3) This fault can only be detected during basic setting.

4) Both limit stops must be reached.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00736 Potentiometer -G144 in control motor -V114 (for ACF flap) 5)	- Short circuit to -E87	- Use current flow diagram to locate and eliminate short circuit
Short to earth /SP Open circuit/short to positive /SP		

5) This flap is not used. From model year 1998 onwards, an ACF filter is used which does not have its own flap.

Note:

The "Potentiometer -G144 in control motor -V114" fault is no longer provided for operating and display units with part numbers from index "M" onwards (the ACF flap and, therefore, the control motor are not used).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00756 Left vent temperature sender -G150	- Short circuit or open circuit between -G150 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit
Short to earth /SP Open circuit/short to positive /SP	- Left vent temperature sender - -G150 defective	- Left vent temperature sender Checking -G150 =>Electrical testing, Page 72
00757 Right vent temperature sender -G151	- Short circuit or open circuit between -G151 and -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Short to earth /SP Open circuit/short to positive /SP	- Right vent temperature sender - -G151 defective	- Right vent temperature senderChecking -G151 =>Electrical testing, Page 72

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00779 3133 Ambient temperature sensor -G17	- Short circuit or open circuit between -G17 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Ambient temperature sensor -G17 defective	- Check ambient temperature sensor -G17 =>Electrical testing, Page 71
00785 3211 Dash panel temperature sensor -G56	- Short circuit or open circuit between -G56 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Dash panel temperature sensor - -G56 defective	- Check dash panel temperature sensor -G56 =>Electrical testing, Page 71

Notes:

- The "Ambient temperature sensor -G17" fault is no longer provided for operating and display units with part numbers from index "M" onwards (the temperature measured by the -G17 is transmitted from the dash panel insert via the drive train data bus).
- In the case of operating and display units -E87 with part numbers from index "M" onwards, the dash panel temperature sensor -G56 is installed in the -E87 and cannot be checked or replaced separately.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00787 3213 Fresh air intake duct temperature sensor -G89	- Short circuit or open circuit between -G89 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Short to earth /SP Open circuit/short to positive /SP	- Fresh air intake duct temperature sensor -G89 defective	- Check fresh air intake duct temperature sensor -G89 =>Electrical testing, Page 72

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00792 3224 Air conditioner pressure switch -F129	- Open circuit or loose contact between -F129 and -E87	- Use current flow diagram to locate and eliminate open circuit or loose contact
Short to positive /SP	- Actuation of radiator fan -V7 (speed 1) defective	- Check actuation of radiator fan -V7 (speed 1) =>Final control diagnosis, Page 81
	- Condenser or fan dirty	- Clean condenser and fan
	- Actuation of radiator fan -V7 (speed 2) by air conditioner pressure switch -F129 defective	- Check actuation of radiator fan -V7 (speed 2 via switch -F129) =>from Page 185 onwards
	- Air conditioner pressure switch - -F129 defective	- Check pressure switch -F129 =>from Page 185 onwards

	- Fault in refrigerant circuit (positive or negative pressure)	- Vehicle must be taken to specialist VW/Audi air conditioner workshop

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00796 3234 Temperature sensor blower -V42 (dash panel)	- Open circuit in power supply to - -V42 or along wiring between -V42 and -E87	- Use current flow diagram to locate and eliminate open circuit
Blocked or without voltage /SP	- Temperature sensor blower -V42 defective	- Replace temperature sensor blower -V42
00797 3241 Sunlight penetration photosensor -G107	- Short circuit or open circuit between -G107 and -E87	- Use current flow diagram to locate and eliminate short circuit/open circuit
Open circuit/short to earth /SP Short to positive /SP	- Sunlight penetration photosensor -G107 defective	- Check sunlight penetration photosensor -G107 =>Read measured value block, Page 60

Note:

In the case of operating and display units -E87 with part numbers from index "M" onwards, the temperature sensor blower -V42 is installed in the -E87 and cannot be checked or replaced separately.

2.4 - Fault table from fault code 00801 onwards

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00801 3311 High-pressure switch for magnetic coupling -F118	- Open circuit along wiring between -F118 and -E87	- Use current flow diagram to locate and eliminate open circuit
Open circuit/short to positive /SP	- Actuation of radiator fan -V7 (speed 1) defective	- Check actuation of radiator fan -V7 (speed 1) =>Final control diagnosis, Page 80
	- Condenser or fan dirty	- Clean condenser and fan
	- Actuation of radiator fan -V7 (speed 2) by high-pressure switch for air conditioner -F23 defective	- Check actuation of radiator fan -V7 (speed 2 via switch -F23) =>from Page 185 onwards

Continued ▾

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00801 3311		
	- High-pressure switch for air conditioner -F23 defective	- Check high-pressure switch for air conditioner -F23 =>from Page 185 onwards
	- High-pressure switch for magnetic coupling -F118 defective	- Check high-pressure switch for magnetic coupling -F118 =>from Page 185 onwards

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	- Fault in refrigerant circuit	- Vehicle must be taken to specialist VW/Audi air conditioner workshop

Note:

The "High-pressure switch for magnetic coupling -F118" fault is no longer provided for operating and display units with part numbers from index "M" onwards (it has been replaced by the pressure switch -F129).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01044 Control unit incorrectly coded	- Encoding of -E87 not performed according to specifications.	- Encode operating and display unit -E87 according to specifications =>Page 39
01087 Basic setting not carried out	- Fault during "Basic setting" function or ignition switched off and -E87 not able to conclude function Basic setting was not performed after replacement of -E87.	- Check coding of operating and display unit -E87 =>Page 37

Note:

The faults "Control unit incorrectly coded" and "Basic setting not carried out" are only stored by operating and display units with part numbers from index "M" onwards.

Note:

The "A/C magnetic coupling -N25" fault is no longer provided for operating and display units with part numbers from index "M" onwards (since the sender -G111 is no longer fitted, faults at the magnetic coupling can no longer be detected).

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01270 4121 A/C magnetic coupling -N25 6) Open circuit /SP	- Short circuit or open circuit between air conditioner compressor speed sender -G111 7) 8) and -E87	- Use current flow diagram to locate and eliminate open circuit Check air conditioner compressor speed sender -G111 =>Page 79
	- Open circuit between magnetic coupling relay -J44 and air conditioning system magnetic coupling -N25	- Use current flow diagram to locate and eliminate open circuit
	- Open circuit in power supply or along wiring between magnetic coupling relay -J44 and -E87	- Use current flow diagram to locate and eliminate open circuit
	- Magnetic coupling relay -J44 defective Continued ▼	- Replace magnetic coupling relay -J44

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01270 4121 A/C magnetic coupling -N256) Open circuit /SP	(Fault 01270 continued) - Air conditioning system magnetic coupling -N25 defective	- Service air conditioning system magnetic coupling -N25 =>Page 112
	- Fault in refrigerant circuit (sender -G111 is not generating any signal or compressor is blocked) 8)	- Vehicle must be taken to specialist VW/Audi air conditioner workshop

	- Ribbed belt tension too low Continued ▼	- Check belt tension: => Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

6) Faults at the magnetic coupling can only be detected in vehicles with sender -G111 (Zexel compressor).

7) The sender -G111 generates 4 pulses per compressor revolution.

8) The magnetic coupling is switched on for a few seconds after the engine has been started.

9) If the speed deviates by 30 % ... 60 %, the magnetic coupling of the -E87 is switched on again max. 9 times during a driving period (ignition OFF).

If the speed deviates by more than 60 %, the magnetic coupling remains switched off until the engine is started again.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
012704121 A/C magnetic coupling -N256) Speed deviation too large /SP 9)	(Fault 01270 continued)	
	- Operating and display unit for fully automatic air conditioner -E87 is incorrectly encoded (for "Zexel" instead of "Nippondenso" compressor) Continued ▼	- Check coding of operating and display unit -E87 => Page 39

6) Faults at the magnetic coupling can only be detected in vehicles with sender -G111 (Zexel compressor).

9) If the speed deviates by 30 % ... 60 %, the magnetic coupling of the -E87 is switched on again max. 9 times during a driving period (ignition OFF).

If the speed deviates by more than 60 %, the magnetic coupling remains switched off until the engine is started again.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01270 4121 A/C magnetic coupling -N256) Speed deviation too large /SP 9)	(Fault 01270 continued)	
	- Loose contact or contact resistance along wiring between -N25 and -J44 or along wiring between -G111 and -E87	- Use current flow diagram to check and repair open circuit => Electrical testing, Page 62
	- Air conditioning system magnetic coupling -N25 defective (slippage)	- Service air conditioning system magnetic coupling -N25 =>Page 112
	- Incorrect vibration dampers on crankshaft (diameter)	- Check vibration dampers => Parts List
	- Fault in refrigerant circuit (compressor sticking)	- Check freedom of movement of compressor Vehicle must be taken to specialist VW/Audi air conditioner workshop

	Continued ▼	

6) Faults at the magnetic coupling can only be detected in vehicles with sender -G111 (Zexel compressor).

9) If the speed deviates by 30 % ... 60 %, the magnetic coupling of the -E87 is switched on again max. 9 times during a driving period (ignition OFF).

If the speed deviates by more than 60 %, the magnetic coupling remains switched off until the engine is started again.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01270 4121 A/C magnetic coupling -N256) Mechanical fault /SP 10)	(Fault 01270 continued) - Pulley and clutch plate of air conditioning system magnetic coupling -N25 are stuck together	- Service magnetic coupling -N25 => Page 112
	- Short to positive along wiring between air conditioning system magnetic coupling -N25 and magnetic coupling relay -J44	- Use current flow diagram to locate and eliminate short circuit
	- Magnetic coupling relay -J44 defective	- Replace magnetic coupling relay -J44
	- Short to positive along wiring between -E87 and -J44	- Use current flow diagram to locate and eliminate short circuit

6) Faults at the magnetic coupling can only be detected in vehicles with sender -G111 (Zexel compressor).

10) The compressor always runs and cannot be switched off.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01271 3432 Temperature flap control motor -V68 Blocked or without voltage /SP	- Short circuit, open circuit in wiring or wiring fault between -V68 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
	- Temperature flap sticking	- Check freedom of movement of temperature flap
	- Temperature flap control motor - -V68 defective	- Check temperature flap control motor -V68 =>Final control diagnosis, Page 32
01273 4124 Fresh air blower -V2 Control difference /SP	- Short circuit or open circuit between fresh air blower -V2, fresh air blower control unit -J126 and/or -E87	- Use current flow diagram to locate and eliminate short circuit/ open circuit in wiring
	- Open circuit in power supply or earth connection to fresh air blower control unit -J126 Continued ▼	- Use current flow diagram to locate and eliminate open circuit

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01273 4124 Fresh air blower -V2 Control difference /SP	(Fault 01273 continued) - Fresh air blower control unit -J126 defective	- Check fresh air blower control unit -J126 =>Electrical testing, Page 74
	- Fresh air blower -V2 defective	- Replace fresh air blower -V2

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	- Solar cell isolation relay -J309 defective (depending on equipment level)	- Check solar cell isolation relay -J309: => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
01274 4131 Air flow flap control motor -V71 Blocked or without voltage /SP	- Short circuit, open circuit in wiring or wiring fault between -V71 and -E87	- Use current flow diagram to locate and eliminate short circuit, open circuit in wiring or wiring fault
	- Air flow flap sticking	- Check freedom of movement of air flow flap
	- Air flow flap control motor -V71 defective	- Check air flow flap control motor -V71 => Final control diagnosis, Page 30

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01312 Drive train data bus Defective	- Open circuit or short to earth/positive in data wire of bus system - Short circuit between data wires of bus system	- Use current flow diagram to locate and eliminate short (to earth, positive or between data wires) or open circuit in wiring in bus system
	- Data wires of bus system interchanged	- Use current flow diagram to check data wires of bus system.
	- Destruction of data telegram transmitted from control unit linked to bus system	- Check bus system =>Page 86 .
	- Control unit not designed for data bus linked to bus system.	- Check part numbers of all control units linked to bus system. => Parts List

Note:

The reception of data is displayed in the measured value block, Display group 012 =>Page 58 .

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01314 Engine control unit Please interrogate fault memory	- The engine control unit cannot output the required data due to a fault and delivers a fault message. - The engine control unit cannot output the required data due to a fault in an upstream component and delivers a fault message.	- Interrogate fault memory of engine control unit. Locate and eliminate causes of all faults stored in fault memory of engine control unit.
No communication /SP	- Open circuit along data wire between engine control unit and - -E87 Continued ▾	- Use current flow diagram to locate and eliminate open circuit or loose contact along data wire between engine control unit and -E87

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01314	(Fault 01314 continued)	

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
No communication /SP	- Fault affecting data output in engine control unit or in component linked to it.	- Interrogate fault memory of engine control unit.
	- Engine control unit not transmitting data telegram. - -E87 cannot read data telegram transmitted from engine control unit.	- Check bus system =>Page 86 .
	- Engine control unit not designed for data bus linked to bus system.	- Check part number of engine control unit. => Parts List
	- Open circuit in power supply to engine control unit with ignition on	- Interrogate and erase fault memories of all control units linked to bus system

Note:

The reception of data is displayed in the measured value block, Display group 012 =>Page 58 .

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01317 Control unit in dash panel insert Please interrogate fault memory	- The dash panel insert cannot output the required data due to a fault and delivers a fault message - The dash panel insert cannot output the required data due to a fault in an upstream component and delivers a fault message	- Interrogate fault memory of dash panel insert Locate and eliminate causes of all faults stored in fault memory of dash panel insert
No communication /SP	- Open circuit along data wire between dash panel insert and -E87 Continued ▼	- Use current flow diagram to locate and eliminate open circuit or loose contact along data wire between dash panel insert and -E87

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01317	(Fault 01317 continued)	
No communication /SP	- Fault affecting data output in dash panel insert or in component linked to it	- Interrogate fault memory of dash panel insert
	- Dash panel insert not transmitting data telegram - -E87 cannot read data telegram transmitted from dash panel insert	- Check bus system =>Page 86 .
	- Dash panel insert not designed for data bus linked to bus system.	- Check part number of dash panel insert. => Parts List
	- Open circuit in power supply to dash panel insert with ignition on	- Interrogate and erase fault memories of all control units linked to bus system

Note:

The reception of data is displayed in the measured value block, Display group 012 =>Page 58 .

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01592		

Air quality sensor -G238	- Short circuit, open circuit in wiring or fault in connector pin assignment between -G238 and -E87	- Use current flow diagram to locate and eliminate short (to earth or positive), open circuit or fault in connector pin assignment between-G238 and -E87
Electrical fault in current circuit /SP	- Air quality sensor -G238 defective	- Replace air quality sensor -G238
Defective	- Open circuit in power supply or earth connection to -G238	- Locate and eliminate open circuit in power supply or earth connection to -G238
	- Air quality sensor -G238 defective	- Replace air quality sensor -G238

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- Fitting locations of actuated components =>from Page 144 onwards.
- Final control diagnosis can be repeated several times if necessary.
- Control element malfunctions are stored in the fault memory.
- Checking the "idling speed regulation" function => Page 34 .
- During final control diagnosis, the vehicle must not be moved and the engine speed must be lower than 3000 rpm.
- During final control diagnosis, regulation is deactivated and all segments are actuated in the displays of the -E87.

Starting final control diagnosis

- Connect fault reader V.A.G 1551 (V.A.G 1552) and enter address word "08" to select air conditioner/heater electronics.
  (Connecting fault reader => Page 4 .)
- Start engine.
- Set "Auto" mode at operating and display unit -E87 (compressor begins to run).

- Switch on printer by pressing PRINT key (indicator lamp in key lights up).
- Interrogate fault memory => Page 6 .

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Enter "03" to select "Final control diagnosis" function.

-> Indicated on display:

```
Rapid data transfer     Q
03 -Final control diagnosis
```

- Confirm entry with Q key.

-> Indicated on display:

```
Final control diagnosis
Magnetic coupling -N25
```

- Press ⇒key to advance to next component. Functional description and sequence =>Table of control elements actuated, Page 27 .

-> Indicated on display:

```
Function unknown or cannot
be performed at present
```

- For operating and display units with part numbers up to index "K"

-> or

```
END
```

- For operating and display units with part numbers from index "M" onwards

Final control diagnosis is finished.

Notes:

- Final control diagnosis can be terminated by pressing the C key.
- If final control diagnosis has been terminated or is finished, interrogate the fault memory => Page 47 .
- If "Function unknown or cannot be performed at present" is displayed when final control diagnosis is started, this may be due to one of the following reasons:
  - The engine speed is lower than 300 rpm or higher than 3000 rpm.
  - A compressor shut-off condition exists which does not permit the magnetic coupling to be switched on.
  - The vehicle is in motion and its speed is higher than 5 km/h (3 mph).
  - The temperature measured by the temperature sensors in the passenger compartment is higher than 40° C (in the case of operating and display units with part numbers from index "M" onwards). Allow the vehicle to cool down or start final control diagnosis again (the heated windscreen will then no longer be activated).

Control elements actuated

Indicated on display	Specified function	Fault remedy
Heated windscreen -Z2	- Heated windscreen control unit - -J505 is activated for approx. 10 sec. Control unit -J505 switches on heated windscreen -Z2 if vehicle voltage is higher than 12.70 V.	- Read measured value block, display group 019, =>Page 65 Use current flow diagram to check power supply and earth connection to -J505. Use current flow diagram to check cabling between -E87 and -J505.

Notes:

- The "heated windscreen" control element is only displayed in the case of operating and display units -E87 with part numbers from index "M" onwards.
- During final control diagnosis, actuation of the heated windscreen by the -E87 only occurs at passenger compartment temperatures up to 40° C. If the temperature is higher, "Function unknown or cannot be performed at present" is displayed on the fault reader.
- The activation function of control unit -J505 can be tested, for example, with multimeter V.A.G 1715. Connect the current probe over the positive wire from control unit -J505 to the heated windscreen -Z2 and select the "Current measurement by current probe" function on the multimeter. The reading changes from approx. 0 A to greater than 7A.
- In the case of vehicles from model year 1999 onwards with modified dash panel centre section, the heated windscreen is gradually to be made available as an optional extra.
- Functional description of heated windscreen =>Read measured value block, Display group 019, Page 91 .

Indicated on display	Specified function	Fault remedy
A/C magnetic coupling -N25	- Magnetic coupling is activated/deactivated every 3 seconds, compressor is driven when magnetic coupling is activated	- Use current flow diagram to check power supply for magnetic coupling -N25 (via relay -J44) Service magnetic coupling -N25 => Page 152

▪ "Compressor shut-off" output (connector D, contact 3) is actuated at same time 1)	Output of operating and display unit -E87 is switched from 0 V to 12 V every 2 seconds; checking => Page 36	

1) Only check the "Compressor shut-off" output if complaints have been submitted.

Notes:

- The engine control unit uses the "air conditioner compressor shut-off" signal to compensate the brief increase in engine power required when the compressor is switched on. The compressor can also be switched off by the engine control unit via this output (input) =>Read measured value block, Display group 001, Page 47 or:

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 24

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23

- Check the output, e.g. by switching the compressor on and off using the "ECON" button while the measured value block of the engine control unit is being read out with the engine running:

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 01

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 01

Indicated on display	Specified function	Fault remedy
Fresh air blower -V2	- Fresh air blower -V2 runs ▪ Apply each fresh air blower voltage for 2 seconds: ▪ 0 V, 3 V, 6 V, 9 V, 12 V, 15 V, 0 V etc.	- Check freedom of movement of fresh air blower - Use current flow diagram to check earth connection for fresh air blower control unit -J126 Check fresh air blower control unit -J126 => Page 152

Indicated on display	Specified function	Fault remedy
Left heat regulation valve -N175	- Left heat regulation valve -N175 is activated/deactivated every 2 seconds	- Use current flow diagram to check for open circuit or short to earth along wiring between left heat regulation valve -N175 and operating and display unit -E87 Use current flow diagram to check power supply for left heat regulation valve -N175 Check function of left heat regulation valve -N175 => Page 152

Notes:

- The air flow flap is opened by the control motor -V71, the centre vents flap opened by the control motor -V102, the air recirculation flap closed by the control motor -V113, and the fresh air blower -V2 actuated with 5 V all at the same time.
- If the air temperature cannot be regulated, check the power supply to the valve and the connection from the valve to the operating and display unit -E87.

Indicated on display	Specified function	Fault remedy
Right heat regulation valve-N176	- Right heat regulation valve -N176 is activated/de-activated every 2 seconds	- Use current flow diagram to check for open circuit or short to earth along wiring between right heat regulation valve -N176 and operating and display unit -E87 - Use current flow diagram to check power supply for right heat regulation valve -N176 Check function of right heat regulation valve -N176 => Page 152

Notes:

- The air flow flap is opened by the control motor -V71, the centre vents flap opened by the control motor -V102, the air recirculation flap closed by the control motor -V113, and the fresh air blower -V2 actuated with 5 V all at the same time.
- If the air temperature cannot be regulated, check the power supply to the valve and the connection from the valve to the operating and display unit -E87.

Indicated on display	Specified function	Fault remedy
Coolant circulation pump -V50	- Coolant circulation pump -V50 is activated/deactivated every 2 seconds	- Use current flow diagram to check for open circuit or short to earth along wiring between coolant circulation pump -V50 and operating and display unit -E87 Use current flow diagram to check power supply for coolant circulation pump -V50 Check function of coolant circulation pump -V50 => Page 152
CAUTION: Fan is switched on	Info display ATTENTION: The next time the ⇒key is pressed, the radiator fan -V7 is switched on. Keep hands away from the area of the fan.	

Indicated on display	Specified function	Fault remedy
Radiator fan -V7	- Radiator fan -V7 is activated/deactivated every 5 seconds	- Use current flow diagram to check for open circuit or short to positive along wiring between operating and display unit -E87 and radiator fan relay -J26 Check actuation of radiator fan -V7 by radiator fan relay -J26: => Electrical System; Repair Group 01 152

Notes:

- The radiator fan -V7 is switched to speed 2 by the radiator fan 2nd speed relay -J101:
  - with closed radiator fan thermo-switch -F54
  - with closed high-pressure switch for air conditioner -F23
- The radiator fan is switched to speed 3 by the radiator fan 3rd speed relay -J135 (vehicles with 8-cyl. engine only):

- with closed dash panel insert switch

=> Electrical System; Repair Group 01

Indicated on display	Specified function	Fault remedy
Temperature sensor blower -V42 - Check function of blower -V42, e.g. using smoke (hold smoke source in front of intake opening in dash panel centre section)	- Blower -V42 for temperature sensor in dash panel is activated/deactivated every 5 seconds (smoke is drawn in by blower)	- Use current flow diagram to check for open circuit or short to earth along wiring between blower -V42 and operating and display unit -E87 - Use current flow diagram to check power supply for blower -V42 Check intake opening and intake hose for blockage =>Page 152

Note:

In the case of operating and display units -E87 with part numbers from index "M" onwards, the temperature sensor blower -V42 is installed in the -E87 and cannot be checked or replaced separately.

Indicated on display	Specified function	Fault remedy
Air flow flap control motor -V71	- Control motor -V71 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from "centre" dash panel vent changes	- Check freedom of movement of air flow flap - Use current flow diagram to check for open circuit or interchanged wiring between control motor -V71 and operating and display unit -E87 Check air flow flap control motor -V71 => Page 152

Notes:

- When the control motor -V71 is actuated, the temperature flap is moved to the "warm" position (opened) by the control motor -V68, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.
- The air flow flap control motor -V71 is actuated after the temperature sensor blower -V42 in the case of operating and display units with part numbers up to index "K". From index "M" onwards, the air flow flap control motor -V71 is actuated after the rear footwell vent control motor -V112.

Indicated on display	Specified function	Fault remedy
Defrost flap control motor -V107	- Control motor -V107 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from vents to windscreen changes	- Check freedom of movement of defrost flap - Use current flow diagram to check for open circuit or interchanged wiring between defrost flap control motor -V107 and operating and display unit -E87 Check defrost flap control motor -V107 => Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Centre left vent control motor -V110	- Control motor -V110 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from centre left vent changes	- Check freedom of movement of centre left vent flap - Use current flow diagram to check for open circuit or interchanged wiring between centre left vent control motor -V110 and operating and display unit -E87 Check centre left vent control motor -V110 => Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Centre right vent control motor -V111	- Control motor -V111 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from centre right vent changes	- Check freedom of movement of centre right vent flap - Use current flow diagram to check for open circuit or interchanged wiring between centre right vent control motor -V111 and operating and display unit -E87 Check centre right vent control motor -V111 => Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Centre vents control motor -V102	- Control motor -V102 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from centre dash panel vent changes	- Check freedom of movement of centre vents flap - Use current flow diagram to check for open circuit or interchanged wiring between centre vents control motor -V102 and operating and display unit -E87 Centre vents control motor -V102=> Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Temperature flap control motor -V68	- Control motor -V68 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from centre dash panel vent changes	- Check freedom of movement of temperature flap - Use current flow diagram to check for open circuit or interchanged wiring between temperature flap control motor -V68 and operating and display unit -E87 Temperature flap control motor -V68 => Page 152

Note:

The air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh-air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Left footwell flap control motor -V108	- Control motor -V108 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from left footwell vents changes	- Check freedom of movement of left footwell flap - Use current flow diagram to check for open circuit or interchanged wiring between left footwell flap control motor -V108 and operating and display unit -E87 Check left footwell flap control motor -V108 => Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Right footwell flap control motor -V109	- Control motor -V109 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from right footwell vents changes	- Check freedom of movement of right footwell flap - Use current flow diagram to check for open circuit or interchanged wiring between right footwell flap control motor -V109 and operating and display unit -E87 Check right footwell flap control motor -V109=>Page 152

Note:

The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

Indicated on display	Specified function	Fault remedy
Rear footwell vent control motor -V112	- Control motor -V112 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from rear footwell vent changes	- Check freedom of movement of rear footwell vent flap - Use current flow diagram to check for open circuit or interchanged wiring between rear footwell vent control motor -V112 and operating and display unit -E87 Check rear footwell vent control motor -V112=>Page 152
ACF flap control motor -V1141)	- Press ⇒ key to advance	

1) The ACF flap control motor -V114 is not used.

Notes:

- The temperature flap is moved to the "cold" position (closed) by the control motor -V68, the air flow flap is opened by the control motor -V71, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.
- The control element "ACF flap control motor -V114" is no longer actuated in the case of operating and display units with part numbers from index "M" onwards.

Indicated on display	Specified function	Fault remedy
Air flow flap control motor -V71	- Control motor -V71 moves from stop to stop ▪ Fresh air blower runs ▪ Air output from "centre" dash panel vent changes	- Check freedom of movement of air flow flap - Use current flow diagram to check for open circuit or interchanged wiring between control motor -V71 and operating and display unit -E87 Check air flow flap control motor -V71 => Page 152

Notes:

- When the control motor -V71 is actuated, the temperature flap is moved to the "warm" position (opened) by the control motor -V68, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.
- The air flow flap control motor -V71 is actuated after the temperature sensor blower -V42 in the case of operating and display units with part numbers up to index "K". From index "M" onwards, the air flow flap control motor -V71 is actuated after the rear footwell vent control motor -V112.

Indicated on display	Specified function	Fault remedy
Air recirculation flap control motor -V113	- Air recirculation flap moves from stop to stop ▪ Fresh air blower runs ▪ Air output changes	- Check freedom of movement of air recirculation flap - Use current flow diagram to check for open circuit or interchanged wiring between air recirculation flap control motor -V113 and operating and display unit -E87 Check air recirculation flap control motor -V113 => Page 152

Notes:

- The temperature flap is moved to the "warm" position (opened) by the control motor -V68, all other flaps are closed, and the fresh air blower -V2 is actuated with 5 V all at the same time.

- In model year 1994/95, operating and display units were installed in which the temperature flap is not moved to the "warm" position (different software).
- To check the functioning of the temperature flap in these vehicles, e.g. repeat final control diagnosis and unplug the connector from the control motor -V112 when the rear footwell vent flap is open.

Indicated on display	Specified function	Fault remedy
Segment test	- All segments of the operating and display unit -E87 are activated/deactivated every 3 seconds	- Check bulbs of operating and display unit -E87 Replace operating and display unit -E87 => Page 152
Ambient temperature indicator -G106 (in auto-check system)	- Ambient temperature indicator -G106 (in auto-check system) counts upwards from -40 °C or °F (approx. - 3 seconds per step) 1)	- Use current flow diagram to check for open circuit or short circuit along wiring and at connections between auto-check system and operating and display unit -E87 Use current flow diagram to check for open circuit in positive and earth connection for ambient temperature indicator -G106 Check auto-check system: => Electrical System; Repair Group 01 152

1) In the case of vehicles with automatic gearbox, the ambient temperature is only displayed when Drive is engaged

=> Owner's Manual

Note:

The ambient temperature indicator -G106 is no longer actuated in the case of operating and display units with part numbers from index "M" onwards. In the case of vehicles with an -E87 from index "M" onwards, the ambient temperature is calculated by the dash panel insert and data is transferred via a bus system.

Indicated on display	Specified function	Fault remedy
Idling speed regulation	- Output of operating and display unit -E87 is switched from 0 V to 12 V every 5 seconds; checking => Page 34	
End	- End of final control diagnosis	

Note:

In the case of operating and display units with part numbers from index "M" onwards, completion of the final control diagnosis is indicated when the last component is actuated ("END" is displayed on the fault reader).

Starting final control diagnosis for "idling speed regulation"

Notes:

- In the case of vehicles with TDI engine, encoding the operating and display unit -E87 for the TDI engine affects the "idling speed regulation" signal issued by the operating and display unit -E87.
- In "ECON" mode and at temperatures higher than 15 °C, no "idling speed regulation" signal is issued if the operating and display unit -E87 is encoded for the TDI engine.

- Switch off ignition.

- Remove engine control unit and connect appropriate test box to connector for engine control unit (engine control unit must not be connected to test box):

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 01; Self-diagnosis Self-diagnosis

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23; Servicing diesel direct-injection system Servicing diesel direct-injection system

Note:

Assignment of connectors to engine control unit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Switch on ignition.
- Connect fault reader V.A.G 1551 (V.A.G 1552) and enter address word "08" to select air conditioner/heater electronics.
  (Connecting fault reader => Page 4 .)

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Switch on printer by pressing PRINT key (indicator lamp in key lights up).
- Enter "03" to select the "Final control diagnosis" function.

-> Indicated on display:

```
Rapid data transfer     Q
03 -Final control diagnosis
```

- Confirm entry with Q key.

-> Indicated on display:

```
Function unknown or cannot
be performed at present
```

- Press ⇒key.
- Enter "03" again.

-> Indicated on display:

```
Rapid data transfer     Q
03 -Final control diagnosis
```

- Confirm entry with Q key.

Note:

Entering the "Final control diagnosis" function again stops the magnetic coupling -N25 from being actuated =>Read measured value block, Display group 001 => Page 47 .

- Connect voltage tester V.A.G 1527 B between earth and input to be tested (to engine control unit) on test box.
- Press ⇒-key repeatedly until "idling speed regulation" appears on display.

Indicated on display	Specified function	Fault remedy
Idling speed regulation 1)	- Output of operating and display unit -E87 (connector D, contact 4) is switched from 0 V to 12 V every 5 seconds (LED in V.A.G 1527 B flashes)	- Use current flow diagram to check wiring and connections between operating and display unit -E87 and engine control unit 2) Replace operating and display unit -E87 => Page 152

1) Causes the idling speed to increase or the pilot control value in the engine control unit to change.

2) Check with engine control unit installed:

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 24; Checking additional signals Checking additional signals

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23

Starting final control diagnosis for "compressor shut-off"

- Switch off ignition.
- Connect fault reader V.A.G 1551 (V.A.G 1552) (connecting fault reader => Page 4).
- Start engine.
- Enter address word "01" to select engine control unit.
- Interrogate fault memory. Fault memory should not contain any faults.
- Switch off ignition.
- Remove engine control unit and connect appropriate test box to connector for engine control unit and to engine control unit:

=> Appropriate Injection and Ignition System Workshop Manual, ; Repair Group 01

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23

Note:

Assignment of connectors to engine control unit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Start engine.
- Enter address word "08" to select air conditioner/heater electronics.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Switch on printer by pressing PRINT key (indicator lamp in key lights up).
- Enter "03" to select "Final control diagnosis" function.

-> Indicated on display:

```
Rapid data transfer     Q
03 -Final control diagnosis
```

- Confirm entry with Q key.
- Connect voltage tester V.A.G 1527 B between earth and input to be tested (to engine control unit) on test box.

Indicated on display	Specified function	Fault remedy
A/C magnetic coupling -N25	- Magnetic coupling is activated/deactivated every 3 seconds.	

Indicated on display	Specified function	Fault remedy
▪ "Compressor shut-off" output (connector D, contact 3) is actuated at same time 1)	- Output of operating and display unit -E87 (connector D, contact 3) is switched from 0 V to 12 V every 2 seconds (LED in V.A.G 1527 B flashes).	- Use current flow diagram to check cabling between -E87 and engine control unit. Replace operating and display unit -E87 => Page 152

1) Only check the "Compressor shut-off" output if complaints have been submitted.

Notes:

- The engine control unit uses the "air conditioner compressor shut-off" signal to compensate the brief increase in engine power required when the compressor is switched on. The compressor can also be switched off by the engine control unit via this output (input) =>Read measured value block, Display group 001, Page 47 or:

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 24

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23

- Check the output, e.g. by switching the compressor on and off using the "ECON" button while the measured value block of the engine control unit is being read out with the engine running:

=> Appropriate Injection and Ignition System Workshop Manual; Repair Group 01

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 01

4 - Basic setting

4.1 - Basic setting

Requirements:

- Code checked and, if necessary, corrected => Page 39 .
- Fault memory interrogated => Page 38 .
- Engine still idling after fault memory interrogation.
- Air conditioner ON ("Auto" mode).

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- Enter "04" to select the "Start basic setting" function.

-> Indicated on display:

```
Rapid data transfer      Q
04 - Start basic setting
```

- Confirm entry with Q key.

-> Indicated on display:

```
Start basic setting      Q
Enter display group number XXX
```


- Enter "001" (or "000") for "display group number 001" (or "000") and confirm with Q key.

Note:

The display group number "001" is not accepted by some operating and display units -E87 from index "M" onwards. The display group number "000" must be entered for these control units.

The air conditioner control motors are moved to their limit stops and the end position is stored in the operating and display unit -E87 (resistance value of the potentiometers installed in the control motors).

-> Indicated on display:

```
Basic setting     0
50
```

The system now counts down from 50 (seconds) to 0 (seconds).

-> Indicated on display:

```
Basic setting     0
0
```

Basic setting is finished when 0 is shown in the display zone.

- Press ⇒key.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Interrogate fault memory => Page 6 .

Note:

If a fault is detected while basic setting is being performed on a control motor, -E87 units with part numbers from index "M" onwards set a substitute value for the stop limit which is not reached. The "Adaption limit exceeded" fault is stored in the fault memory and the substitute value for this control motor is displayed in the measured value block.

5 - Erasing fault memory, ending output

5.1 - Erasing fault memory, ending output

Requirement:

- Fault memory interrogated.

Erasing fault memory

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Enter "05" for "Erase fault memory" function.

-> Indicated on display:

```
Rapid data transfer      Q
05 -Erase fault memory
```

- Confirm entry with Q key.

-> Indicated on display:

```
Rapid data transfer
Fault memory erased
```

- Press ⇒key.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

Notes:

-> Indicated on display:

```
Attention:
Fault memory not interrogated
```

- Sequence of operations not precisely observed.

- Interrogate fault memory.
- Eliminate any faults.

- The fault memory is not erased if between interrogating and erasing the fault memory, for example, the ignition was switched off or the engine speed exceeded 3000 rpm.

Ending output

Note:

The fault memory has been interrogated and erased, basic setting has been performed, and the coding has been checked.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Press keys 0 and 6 for "End output" function.

-> Indicated on display:

```
Rapid data transfer     Q
06 - End output
```

- Confirm entry with Q key.

-> Indicated on display:

```
Rapid data transfer     HELP
Enter address word XX
```

- Switch off ignition and unplug diagnostic connector.

6 - Encoding operating and display unit-E87-

6.1 - Encoding operating and display unit-E87-

Note:

Basic setting must be performed whenever encoding is carried out

=> Page 37 .

- Connect fault reader V.A.G 1551 (V.A.G 1552) and enter address word "08" to select air conditioner/heater electronics.
  (Connecting fault reader => Page 4 .)

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- Enter "07" for "Encode control unit" function.

-> Indicated on display:

```
Rapid data transfer      Q
07 - Encode control unit
```

- Confirm entry with Q key.

-> Indicated on display:

```
Encode control unit      Q
Enter code number XXXXX     0 - 32000
```


- Enter control unit code for part number index of operating and display unit -E87 as specified in code table => Page 42 .

Assignment of operating and display unit -E87

Vehicle feature	Part No. index for -E87	Explanation
Zexel compressor	up to and incl. "H"	Possible encoding for compressor with air conditioner compressor speed sender -G111
Nippondenso /Denso-compressor	from index "B" onwards	Possible encoding for compressor without air conditioner compressor speed sender -G111
TDI engine	from index "E" onwards	Possible encoding for TDI engine
Air quality sensor -G238	from index "J" onwards	Software adapted to air quality sensor -G238
Switch for heated rear window installed in -E87	from index "M" onwards	Modified version of dash panel centre section

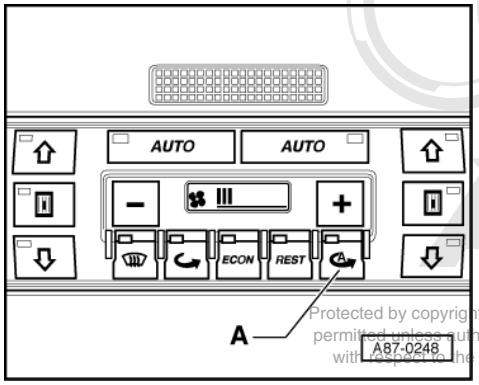
Notes:

- Precise assignment of operating and display unit -E87:

=> Parts List

- If a new operating and display unit -E87 is installed but not encoded, the display of the operating and display unit -E87 flashes (after the ignition is switched on).
- All invalid codes are suppressed by the operating and display unit -E87.
- A new operating and display unit -E87 with part numbers up to index "K" is encoded for the 6-cyl. engine (USA). This code can only be overwritten by a valid code. Otherwise, the code "6-cyl.-engine (USA)" is retained.

- A new operating and display unit -E87 with part numbers from index "M" onwards is encoded with "00001". This code can only be overwritten by a valid code. Otherwise, the code is retained and "Control unit incorrectly coded" is displayed in the fault memory.



- -> Vehicles with air quality sensor -G238 can be identified by the "automatic air recirculation" button -A- in place of the "Off" button.
- In the case of vehicles with petrol engine, the "idling speed regulation" signal serves as additional information for the engine control unit. It is sent as soon as increased cooling or heating power is required for regulating the passenger compartment temperature.
- In the case of vehicles with TDI engine, encoding the operating and display unit -E87 for the TDI engine affects the "idling speed regulation" signal issued by the operating and display unit -E87.
- In the case of vehicles with TDI engine, the engine control unit uses this signal to determine whether the additional petrol-driven heating system (auxiliary or additional heater) is to be switched on at low ambient temperatures:

=> Appropriate Diesel Direct-Injection and Glow Plug System Workshop Manual; Repair Group 23

- In "ECON" mode and at temperatures higher than 15 °C, no "idling speed regulation" signal is issued if the operating and display unit -E87 is encoded for the TDI engine.
- The operating and display units -E87 up to part number index "H" are available in different versions for "Rest of World", "USA" and "Japan".

=> Parts List

- The main coding differences between the operating and display units -E87 from part number index "J" onwards for "Rest of World", "USA" and "Japan" are as follows:
  USA = Temperature displayed in °F in preference to °C, slightly different temperature settings.
  Japan = The "manually activated air recirculation mode" function is not reset when the ignition is switched off.

6.2 - Code table up to part No. index "H"

Code				Significance
00				Fillers, no assignment
	0			Zexel compressor
	1			Nippondenso and Denso compressor (only possible from index "B" onwards)
		6		6-cylinder engine
		8		8-cylinder engine
			0	LHD with petrol engine
			1	RHD with petrol engine
			2	USA petrol engine
			3	LHD with TDI engine
			4	RHD with TDI engine

Code		Significance
	5	USA TDI engine

Example codes

00060	6-cyl. LHD petrol engine with Zexel compressor
00160	6-cyl. LHD petrol engine with Zexel compressor

6.3 - Code table from part No. index "J" onwards

Code			Significance
00			Fillers, no assignment1)
	0		Rest of World (RoW), except USA and Japan
	1		USA
	2		Japan
		6	6-cylinder engine
		8	8-cylinder engine 12-cylinder engine
			0 LHD with petrol engine
			1 RHD with petrol engine
			3 LHD with TDI engine
			4 RHD with TDI engine

1) If the control unit is encoded with "01" instead of "00", deactivation of the compressor in air recirculation mode occurs at approx. + 2 °C and not at approx. - 5 °C.

Example codes

00060	RoW 6-cyl. LHD with petrol engine
00063	RoW 6-cyl. LHD with TDI engine

7 - Reading measured value block

7.1 - Reading measured value block

Notes:

- 19 measured value blocks each with 4 measured values are provided for operating and display units with part numbers up to index "K".
- 22 measured value blocks each with 4 measured values are provided for operating and display units with part numbers from index "M" onwards.
- The currently valid actual/specified value or the value programmed and stored at the last basic setting session is displayed for the limit stops of the individual control motors.
- A compressor without air conditioner compressor speed sensor -G111 was gradually introduced from model year 1996 onwards (starting with vehicles with 8-cyl. engine). Manufacturer: "Nippondenso" or "Denso".
- If the air quality sensor -G238 is installed (operating and display unit -E87 with part number from index "J" onwards), display zone 4 of the measured value block in display group 001 indicates why the air conditioner is operating in air recirculation mode or why it continues to operate in fresh air mode although air recirculation is requested by the air quality sensor.

Requirements:

- Fault memory interrogated => Page 38 .
- Engine still idling after fault memory interrogation.
- Air conditioner ON

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- Switch on printer by pressing PRINT key (indicator lamp in key lights up).
- Enter "08" for "Read measured value block" function.

-> Indicated on display:

```
Rapid data transfer       Q
08 - Read measured value block
```

- Confirm entry with Q key.

-> Indicated on display:

```
Read measured value block     Q
Enter display group number XXX
```

- Enter display group number=>List of available display group numbers, Page 43 .

-> Indicated on display:

```
Read measured value block X
     1     2     3     4
```

The measured value block shows 4 display zones.

Note:

Proceed as follows to switch to a different display group:

Display group	V.A.G 1551	V.A.G 1552
Up	Press key 3	Press ↑ key
Down	Press key 1	Press ↓ key
Skip	Press C key	Press C key

Notes:

- If the printer is switched on, the current display is printed out on the record slip.
- The position of the flaps can be changed by pressing the control buttons on the operating and display unit -E87.
- A second mechanic will be required if the readings are to be taken when the vehicle is moving.
- Follow the safety precautions => Page 4 .

- If readings match specifications, press ⇒key.

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

List of available display group numbers

Display group number	Display zone	Designation	Explanatory notes on Page
001	1	Current compressor shut-off conditions	47
	2	Voltage for magnetic coupling -N25	

Display group number	Display zone	Designation	Explanatory notes on Page
	3	Voltage at terminal "15" (volt)	
	4	Up to part No. index "H": Display zone not used From part No. index "J" onwards: Air recirculation requested by air quality sensor -G238	51
002	1 ... 4	Defrost flap control motor -V107	53
003	1 ... 4	Centre left vent control motor -V110	53
004	1 ... 4	Centre right vent control motor -V111	54
005	1 ... 4	Centre vents control motor -V102	54
006	1 ... 4	Temperature flap control motor -V68	55
007	1 ... 4	Left footwell flap control motor -V108	55
008	1 ... 4	Right footwell flap control motor -V109	56
009	1 ... 4	Rear footwell vent control motor -V112	56
010	1 ... 4	Air flow flap control motor -V71	57

Display group number	Display zone	Designation	Explanatory notes on Page
011	1 ... 4	Air recirculation flap control motor -V113	57
012	For operating and display units with part numbers up to index "K"		58
	1 ... 4	Not used	
	For operating and display units with part numbers from index "M" onwards		58
	1	Information from engine control unit on bus system	
	2	Information from control unit in dash panel insert via bus system	
	3	Display zone not used	
	4	Display zone not used	

Display group number	Display zone	Designation	Explanatory notes on Page
013	1	Centre left vent switch -F183	58
	2	Centre right vent switch -F184	
	3	Centre vent potentiometer -G142	
	4	For operating and display units with part numbers up to index "K" Calculated ambient temperature (for ambient temperature indicator -G106)	
		For operating and display units with part numbers from index "M" onwards Display zone not used	

Display group number	Display zone	Designation	Explanatory notes on Page
014	1	For operating and display units with part numbers up to index "K" Ambient temperature sensor -G17	59
		For operating and display units with part numbers from index "M" onwards Ambient temperature transmitted from dash panel insert	

Display group number	Display zone	Designation	Explanatory notes on Page
	2	Fresh air intake duct temperature sensor -G89	
	3	Left vent temperature sender -G150	
	4	Right vent temperature sender -G151	
015	1	Dash panel temperature sensor -G56	60
	2	For operating and display units with part numbers up to index "K" Calculated coolant temperature	
		For operating and display units with part numbers from index "M" onwards Coolant temperature transmitted from dash panel insert	
	3 and 4	Sunlight penetration photosensor -G107 (sunlight penetration from left and right)	

Display group number	Display zone	Designation	Explanatory notes on Page
016	1 and 2	Voltage at fresh air blower -V2	61
	3	For operating and display units with part numbers up to index "K" Voltage at terminal "58d" (downstream of lighting regulator -E20) (volt)	
		For operating and display units with part numbers from index "M" onwards Voltage value for terminal "58d" transmitted from dash panel insert (via bus system).	
	4	For operating and display units with part numbers up to index "K" Side lights, terminal "58"	
		For operating and display units with part numbers from index "M" onwards Voltage value for terminal "58s" transmitted from dash panel insert.	

Display group number	Display zone	Designation	Explanatory notes on Page
017	1	Engine speed	62
	2	For operating and display units with part numbers up to index "K" Compressor speed	
		For operating and display units with part numbers from index "M" onwards Vehicle speed	
	3	For operating and display units with part numbers up to index "K" Vehicle speed	
		For operating and display units with part numbers from index "M" onwards Voltage at terminal 58 (side lights)	
	4	Auxiliary heater	

Display group number	Display zone	Designation	Explanatory notes on Page
018	1	For operating and display units with part numbers up to index "K" Kick-down switch for air conditioner	64

Display group number	Display zone	Designation	Explanatory notes on Page
		For operating and display units with part numbers from index "M" onwards Actuation of heated rear window	
	2	For operating and display units with part numbers up to index "K" Coolant temperature switch "too hot"	
		For operating and display units with part numbers from index "M" onwards Compressor deactivated because coolant temperature too "high"	
	3	Air conditioner compressor shut-off	
	4	High-pressure switch for magnetic coupling -F118 Air conditioner pressure switch -F129	

Display group number	Display zone	Designation	Explanatory notes on Page
019	1	Left heat regulation valve -N175	65
	2	Right heat regulation valve -N176	
	3	Coolant circulation pump -V50	
	4	For operating and display units with part numbers up to index "K" Display zone not used	
		For operating and display units with part numbers from index "M" onwards Actuation of heated windscreen	

Note:

The display groups "020" to "022" are only provided for operating and display units with part numbers from index "M" onwards.

Display group number	Display zone	Designation	Explanatory notes on Page
020	1 ... 4	Last four compressor shut-off conditions which were active for longer than 20 sec.	67
021	1	Idling-speed increase	67
	2	Actuation of radiator fan, speed 1	
	3	Actuation of radiator fan, speed 2	
	4	Windscreen washer switch	
022	1	Assignment of ignition key	68
	2	Signal for "ignition OFF time" (standing time)	
	3	Display zone not used	
	4	Display zone not used	

7.2 - Measured value blocks up to display group 009

Display group 001:

Current compressor shut-off conditions, voltage for magnetic coupling -N25, voltage at terminal "15" and request for air recirculation mode by air quality sensor -G238

Notes:

- If one of the compressor shut-off conditions 1, 8, 11 or 12 exists, the magnetic coupling -N25 cannot be actuated during final control diagnosis (=>Page 26).
- If more than one compressor shut-off condition exists at the same time (display zone 1), the shut-off conditions are displayed either alternately or only the shut-off condition which has been assigned the highest priority by the operating and display unit -E87 is displayed.
- In the case of vehicles with air quality sensor -G238 the compressor may, depending on the pollutant content of the surrounding atmosphere, be switched on during the "automatic air recirculation" function at ambient temperatures up to approx. - 5 °C (compared to + 2°C with the other modes).
- The compressor shut-off conditions Code "2" and "4" are no longer provided for operating and display units with part numbers from index "M" onwards.
- In the case of operating and display units with part numbers from index "M" onwards, the last four compressor shut-off conditions which were active for longer than 20 sec. are displayed in display group 020.

Display zone	Code	Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	0	Compressor ON No compressor shut-off condition detected	- If compressor is not switched on, perform final control diagnosis => Page 69 onwards
	1	Compressor OFF ▪ Operating and display unit -E87 with part number up to index "H": High-pressure switch for magnetic coupling -F118 open	- Remedy => Fault table, Page 69 onwards
Continued		▪ Operating and display unit -E87 with part number from index "J" onwards: Pressure switch -F129 (between contacts 1 and 2) open	- Pressure in refrigerant circuit too high (constriction or radiator fan -V7 not running) - Pressure in refrigerant circuit too low (refrigerant circuit empty) - Open circuit or loose contact along wiring between - -F129 and -E87 Remedy => Fault table, Page 69 onwards

Display zone	Code	Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	2	Compressor OFF	

Display zone		Significance	Cause of trouble/remedy
		a) No compressor speed signal detected	- Open circuit or short to earth/positive between air conditioner compressor speed sender - G111 and connector D, contact 3 to operating and display -E87 1) - Magnetic coupling -N25 defective Service magnetic coupling -N25 => Page 79
	Continued t	b) Belt slip 1x greater than 60% or 10x greater than 30% but less than 60%	- Open circuit or loose contact between air conditioner compressor speed sender -G111 and connector D, contact 3 to operating and display -E87 1) - Belt tension not OK - Compressor not running smoothly

1) Each time the operating and display unit -E87 is started, the air conditioner compressor is switched on and then switched off again after a short time because no speed signals are detected.

Note:

The compressor shut-off condition Code "2" is no longer provided for operating and display units with part numbers from index "M" onwards.

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	2	Compressor OFF c) Operating and display unit -E87 incorrectly coded	- Operating and display unit -E87 encoded for Zexel compressor instead of Nippondenso/Denso compressor Check code of operating and display unit -E87 => Page 39
Continued t	3	Compressor OFF ▪ Operating and display unit -E87 with part number up to index "H": Low-pressure switch for air conditioner -F73 open1) ▪ Operating and display unit -E87 with part number from index "J" onwards: Not provided => Compressor shut-off condition Code "1", Page 47	- Test cooling capacity => Page 69 onwards

1) This code is displayed in auxiliary heater mode and during the "Rest" function (voltage at terminal "75" lower than 9.5 V).

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	4	Compressor OFF (for 12 s)	

		Kick-down	- Automatic gearbox control unit -J217 has switched input to earth - Air conditioner kick-down switch -F46 closed (depending on equipment level) => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder => Appropriate Automatic Gearbox Repair Manual; Repair Group 01 - Short to earth along wiring between control unit -J217/ kick-down switch -F46 and connector C, contact 19 to operating and display unit -E87

Note:

The compressor shut-off condition Code "4" is no longer provided for operating and display units with part numbers from index "M" onwards.

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	5	Compressor OFF	
		a) Engine speed lower than 300 rpm	
Continued		b) No engine speed detected	- Open circuit between dash panel insert, engine control unit and connector D, contact 1 to operating and display unit -E87 (-E87 with part number up to index "K") - Engine control unit and/or dash panel insert not transmitting speed signal Check engine speed signal in the case of -E87 with part number up to index "K" => Electrical System; Repair Group 90 Check bus system in the case of -E87 with part number from index "M" onwards

Note:

In the case of operating and display units with part numbers from index "M" onwards, the engine speed is transmitted via the bus system in the data telegram from the engine control unit; see also compressor shut-off condition Code "15".

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	6	Compressor OFF Compressor switched off via "ECON" button of operating and display unit -E87	- Switch on compressor
	7	Compressor OFF Air conditioner switched off via "OFF" button of operating and display unit -E87	- Switch on air conditioner
	8	Compressor OFF	
Continued		Measured ambient temperature lower than 5 °C (- 5 °C in the case of operating and display unit -E87 with part number from index "J" onwards and air recirculation mode)	- Ambient temperature lower than 5 °C (- 5 °C) Move vehicle into heated area for testing - Ambient temperature sensor -G17 or fresh air intake duct temperature sensor -G89 supplies incorrect values Check ambient temperature sensor -G17 and fresh air intake duct temperature sensor -G89 => Display group 014, Page 59

Note:

If, in the case of vehicles with air quality sensor -G238, the compressor is not switched on in air recirculation mode at temperatures between + 2 °C and - 5 °C, check the code for the operating and display unit -E87 (poss. "01XXX" instead of "00XXX").

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	9	Display zone not used	
	10	Supply voltage at magnetic coupling -N25 lower than 9.5 V	- => Display zone 2 and Fault table, Page 8 Use current flow diagram to check power supply for magnetic coupling -N25 (via relay -J44)
Continued	11	Compressor OFF Engine temperature too high	- Engine temperature determined by dash panel insert is too high Check in the case of -E87 with part number up to index "K" => Electrical System; Repair Group 90 Check bus system in the case of -E87 with part number from index "M" onwards - Short to earth along wiring between dash panel insert and connector D, contact 5 to operating and display unit -E87

Note:

In the case of operating and display units with part numbers from index "M" onwards, the engine temperature is transmitted in the data telegram from the dash panel insert via the bus system.

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	12	Compressor OFF Air conditioner compressor shut-off	- Engine control unit has switched off air conditioner compressor => Display group 018, Page 26
Continued	13	Compressor OFF Compressor ON delay (approx. 10 seconds) at engine speeds higher than 6000 rpm	No significance for Service Department

Display zone		Significance	Cause of trouble/remedy
	Code	Compressor shut-off conditions	
1	14	Compressor OFF ▪ Operating and display unit -E87 with part number up to index "H": High-pressure switch -F118 has switched 30 times during current driving period ▪ Operating and display unit -E87 with part number from index "J" onwards: Pressure switch -F129 has switched 30 times during current driving period	 - Loose contact along wiring between high-pressure switch -F118/-F129 and operating and display unit -E87 - Fault at switch -F118/-F129 or in refrigerant circuit - => Fault table, Page 79
	15	Compressor OFF	

Display zone		Significance	Cause of trouble/remedy
		Fault in bus system	- => Fault table, Page 8

Note:

In the case of operating and display units with part numbers from index "M" onwards, various items of information are transmitted in a data telegram from the engine control unit and dash panel insert via the bus system. If a fault exists in the bus system, the -E87 must not switch on the compressor.

Display zone	Significance	Explanatory notes
2	Supply voltage at magnetic coupling -N25 (volt), connector E, contact 11	- Higher than 9.5 V with magnetic coupling -N25 switched on => Display zone 1, Code 10 and Fault table, Page 8
3	Voltage at terminal 15 (volt)	Connector E, contact 6 to operating and display unit -E87
4	▪ Operating and display unit -E87 with part number up to index "H": Display zone not used	

Note on display zone 2:

If a voltage between 4 and 6 V is displayed => Display zone 1, Code 3 and Electrical testing => from Page 69 onwards.

Note on display zone 3:

If the readout with the engine running is lower than 12 V, check the positive and earth connection to the operating and display unit -E87:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Display zone		Significance	Explanatory notes
4	Code	Air recirculation mode	
		▪ Operating and display unit -E87 with part number from index "J" onwards:	
	00	No request for air recirculation mode	- System in fresh air mode
	10	Request for air recirculation mode from air quality sensor -G238	- Request is met - System in air recirculation mode
	11	Request for air recirculation mode from air quality sensor -G238	- Request is not met because "automatic air recirculation" function is disabled (indicator lamp in "Automatic air recirculation" button not lit) - System in fresh air mode
Continued	12	Request for air recirculation mode from air quality sensor -G238	- Request is not met because compressor is switched off (e.g. via ECON button) and more than 15 seconds have already elapsed since start of request - Request is not met because compressor is switched off - (=>Display zone 1) - System in fresh air mode

Display zone		Significance	Explanatory notes
4	Code	Air recirculation mode	
Continued	13	Request for air recirculation mode from air quality sensor -G238	- Request is not met because air conditioner is in "Defrost" mode (indicator lamp in "DEF" button lit). - System in fresh air mode

Notes:

- "0" may also be displayed instead of "00" if there is no request for air recirculation mode.
- To counteract the risk of the windows misting up, the "automatic air recirculation" function is limited to 15 seconds when the compressor is switched off.
- If there is a fault at the air quality sensor -G238, "automatic air recirculation" mode is not possible.
- To enable windows to demist as quickly as possible, the air recirculation mode is not possible in Defrost mode.
- The purpose of the air quality sensor is to keep short-term peak concentrations of pollutants in the ambient air out of the passenger compartment. This is done by the operating and display unit -E87 switching the system from fresh air to air recirculation mode on receipt of a request from the air quality sensor -G238.
- If the ambient air pollution remains relatively high over a lengthy period of time, the sensor's teach-in program begins to adapt it to the changing environmental conditions, so an ongoing request for air recirculation mode in an atmosphere of consistent ambient air pollution generally lasts less than 12 minutes. If a number of pollution peaks occur in short succession, the air conditioner may also operate longer in air recirculation mode.

- If, in the case of vehicles with air quality sensor -G238, the compressor is not switched on in air recirculation mode at temperatures between + 2 °C and - 5 °C, check the code for the operating and display unit -E87 (poss. "01XXX" instead of "00XXX").

Display zone		Significance	Explanatory notes
	Code	Air recirculation mode	
4	20	Air recirculation mode	- Air conditioner has been switched to air recirculation mode via "Manual air recirculation" button (indicator lamp in "Manual air recirculation" button is lit)
	30	Air recirculation mode	- After windscreen has been cleaned by windscreen wash and wipe system, air conditioner switches to air recirculation mode for approx. 10 s (to prevent smell of cleaning agent entering passenger compartment)
Continued	40	Air recirculation mode	- Air conditioner switches to air recirculation mode so as to attain required temperature in passenger compartment as quickly as possible at high ambient temperature (increased cooling power) - Air recirculation mode is maintained until desired and actual temperatures in passenger compartment have become assimilated to within specified temperature difference

Display zone		Significance	Explanatory notes
	Code	Air recirculation mode	
4	50	Air conditioner OFF, flaps at "air recirculation" position	- Air conditioner has been switched off via "minus" button for fresh air blower speed on operating and display unit -E87
	60	Partial air recirculation mode	- Air conditioner switches from air recirculation mode to fresh air mode; fresh air flap is opened before air recirculation flap is closed

Notes:

- The "partial air recirculation" function was introduced to enhance comfort. When the air conditioner is switched over, the running noise of the fresh air blower changes. The modified sequence (the flaps are actuated in succession instead of simultaneously) means the transition is smoother.
- The air conditioner may remain in "partial air recirculation" mode for a lengthy period of time (for example to provide an effective level of cooling at high ambient temperatures without having to run the system continuously in air recirculation mode).

Display group 002: Defrost flap control motor -V107

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G135 (in control motor -V107)	▪ Readout greater than 15 and less than 235 ▪ Max. permissible deviation of 3 units from specified feedback value (only in range greater than 65, but less than 185)
2	Specified feedback value for potentiometer -G135 (calculated by -E87)	▪ Display range 15 ... 235
3	Value for -G135 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (defrost flap closed)	▪ Readout greater than 15 and less than 65
4	Value for -G135 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (defrost flap open, directs air to windscreen)	▪ Readout greater than 185 and less than 235

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.
- If a fault is detected while basic setting is being performed on a control motor, -E87 units with part numbers from index "M" onwards set a substitute value for the stop limit which is not reached. In the fault memory, the "Adaption limit exceeded" fault is stored in the fault memory and the substitute value for this control motor is displayed in the measured value block (the actual value for the motor is not displayed).

Display group 003: Centre left vent control motor -V110

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G136 (in control motor -V110)	▪ Readout greater than 65 and less than 235 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 115, but less than 185)
2	Specified feedback value for potentiometer -G136 (calculated by -E87)	▪ Display range 65 ... 235
3	Value for -G136 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (centre left vent flap closed)	▪ Readout greater than 65 and less than 115
4	Value for -G136 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (centre left vent flap open)	▪ Readout greater than 185 and less than 235

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .

- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 004: Centre right vent control motor -V111

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G137 (in control motor -V111)	▪ Readout greater than 15 and less than 195 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 65, but less than 145)
2	Specified feedback value for potentiometer -G137 (calculated by -E87)	▪ Display range 15 ... 195
3	Value for -G137 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (centre right vent flap closed)	▪ Readout greater than 15 and less than 65
4	Value for -G137 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (centre right vent flap open)	▪ Readout greater than 145 and less than 195

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 005: Centre vents control motor -V102

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G138 (in control motor -V102)	▪ Readout greater than 55 and less than 235 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 105, but less than 185)
2	Specified feedback value for potentiometer -G138 (calculated by -E87)	▪ Display range 55 ... 235
3	Value for -G138 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (flap for cold air to centre dash panel vent closed)	▪ Readout greater than 55 and less than 105
4	Value for -G138 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (flap for cold air to centre dash panel vent open)	▪ Readout greater than 185 and less than 235

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- This control motor can also be influenced by turning the handwheels at the "centre" dash panel vent.
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 006: Temperature flap control motor -V68

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G92 (in control motor -V68)	▪ Readout greater than 20 and less than 185 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 75, but less than 135)
2	Specified feedback value for potentiometer -G92 (calculated by -E87)	▪ Display range 20 ... 185

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- This control motor can also be influenced by turning the handwheel for potentiometer -G142 (at the "centre" dash panel vent). Since the upper stop limit is program-controlled, it may not be possible to reach this stop limit by means of manual actuation.
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display zone	Significance	Explanatory notes
3	Value for -G92 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (temperature flap to centre dash panel vent closed)	▪ Readout greater than 20 and less than 75
4	Value for -G92 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (temperature flap to centre dash panel vent open)	▪ Readout greater than 135 and less than 185

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- This control motor can also be influenced by turning the handwheel for potentiometer -G142 (at the "centre" dash panel vent). Since the upper stop limit is program-controlled, it may not be possible to reach this stop limit by means of manual actuation.

Display group 007: Left footwell flap control motor -V108

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G139 (in control motor -V108)	▪ Readout greater than 15 and less than 190 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 65, but less than 140)
2	Specified feedback value for potentiometer -G139 (calculated by -E87)	▪ Display range 15 ... 190
3	Value for -G139 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (left footwell flap closed)	▪ Readout greater than 15 and less than 65
4	Value for -G139 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (left footwell flap open)	▪ Readout greater than 140 and less than 190

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 008: Right footwell flap control motor -V109

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G140 (in control motor -V109)	▪ Readout greater than 60 and less than 245 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 110, but less than 195)
2	Specified feedback value for potentiometer -G140 (calculated by -E87)	▪ Display range 60 ... 245
3	Value for -G140 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (right footwell flap closed)	▪ Readout greater than 60 and less than 110
4	Value for -G140 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (right footwell flap open)	▪ Readout greater than 195 and less than 245

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 009: Rear footwell vent control motor -V112

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G141 (in control motor -V112)	▪ Readout greater than 60 and less than 245 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 110, but less than 195)
2	Specified feedback value for potentiometer -G141 (calculated by -E87)	▪ Display range 60 ... 245
3	Value for -G141 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (rear footwell vent flap closed)	▪ Readout greater than 60 and less than 110
4	Value for -G141 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (rear footwell vent flap open)	▪ Readout greater than 195 and less than 245

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .

- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- This control motor can be actuated by, for example, pressing the "Def" button on the -E87.

- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

7.3 - Measured value blocks from display group 010 onwards

Display group 010: Air flow flap control motor -V71

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G113 (in control motor -V71)	▪ Readout greater than 50 and less than 215 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 100, but less than 165)
2	Specified feedback value for potentiometer -G113 (calculated by -E87)	▪ Display range 50 ... 215
3	Value for -G113 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (air flow/fresh air flap closed)	▪ Readout greater than 50 and less than 100
4	Value for -G113 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (air flow/fresh air flap open)	▪ Readout greater than 165 and less than 215

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .

- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 011: Air recirculation flap control motor -V113

Display zone	Significance	Explanatory notes
1	Actual feedback value for potentiometer -G143 (in control motor -V113)	▪ Readout greater than 15 and less than 215 ▪ Maximum permissible deviation of 3 units from specified feedback value (in range greater than 65, but less than 165)
2	Specified feedback value for potentiometer -G143 (calculated by -E87)	▪ Display range 15 ... 215
3	Value for -G143 obtained during "basic setting" and stored in -E87, with control motor at "lower stop limit" position (air recirculation flap open)	▪ Readout greater than 15 and less than 65
4	Value for -G143 obtained during "basic setting" and stored in -E87, with control motor at "upper stop limit" position (air recirculation flap closed)	▪ Readout greater than 165 and less than 215

Notes:

- If the deviation between the specified and actual feedback value is greater than 3 units, check whether the notes have been observed =>Page 42 .
- If the readouts in display zone 3 or 4 are outside the permissible range =>Fault table, Page 8 .
- If the feedback value in display zone 1 is less than 5 (short circuit) or greater than 250 (open circuit),perform electrical testing => from Page 69 onwards.

Display group 012:

For operating and display units with part numbers up to index "K"

Display zone	Significance	Explanatory notes
1 ... 4	Not used	▪ Ignore readout

Note:

The display group 012 was intended for the ACF flap control motor -V114. This control motor is, however, not used.

Display group 012: Information on bus system

For operating and display units with part numbers from index "M" onwards

Display zone	Significance	Explanatory notes
1	Information from engine control unit Display: Motor 0 = Information not received Motor 1 = Information received	▪ If "0" is displayed, check bus system ▪ => Page 86
2	Information from control unit in dash panel insert Display: Instr. 0 = Information not received Instr. 1 = Information received	
3	Display zone not used	
4	Display zone not used	

Note:

"0" in display zone 1 or 2 indicates that no information is being received. Interrogate the fault memory =>Page 6 .

Display group 013:

Centre left vent switch -F183, centre right vent switch -F184, centre vent potentiometer -G142 and calculated ambient temperature for ambient temperature indicator -G106

Display zone	Significance	Explanatory notes
1	Centre left dash panel vent Readout 0 = Vent closed Readout 1 = Vent at centre position Readout 2 = Vent open	▪ Centre left vent switch -F183
2	Centre right dash panel vent Readout 0 = Vent closed Readout 1 = Vent at centre position Readout 2 = Vent open	▪ Centre right vent switch -F184

Display zone	Significance	Explanatory notes
3	Rotary actuator for potentiometer in centre dash panel vent Stop limit "cold" = More than 5 units	▪ Centre vent potentiometer -G142

Display zone	Significance	Explanatory notes
	Stop limit "warm" = Less than 250 units	
4	For operating and display units with part numbers up to index "K" Calculated ambient temperature for ambient temperature indicator -G106 in °C	▪ For auto-check system
	For operating and display units with part numbers from index "M" onwards Display zone not used	

Notes on display zone 3:

- If the readout in display zone 3 is outside the permissible range =>Fault table, Page 69 onwards.
- In the vehicle, the stop limit for the potentiometer -G142 is approx. 80 for "cold" and approx. 180 for "warm".

Notes on display zone 4:

- In the case of operating and display units with part numbers up to index "K", the basis for the readout in display zone 4 is the lower of the two measured ambient temperatures => Display group 014. The value remains stored up to 4 hours after the ignition has been switched off.
- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the ambient temperature is calculated by the dash panel insert. Data is exchanged between the control units via a bus system.

Display group 014:

Ambient temperature sensor -G17, ambient temperature from dash panel insert, values measured by fresh air intake duct temperature sensor -G89, left vent temperature sender -G150, and right vent temperature sender G151

Display zone	Significance	Explanatory notes
1	For operating and display units with part numbers up to index "K" Value measured by ambient temperature sensor -G17 in °C	▪ Checking=> Electrical testing, Page 71
	For operating and display units with part numbers from index "M" onwards Current ambient temperature transmitted from dash panel insert in °C	▪ Checking => Electrical System; Repair Group 01
2	Value measured by fresh air intake duct temperature sensor -G89 in °C	▪ Checking=> Electrical testing, Page 72
3	Value measured by left vent temperature sender -G150 in °C	▪ Checking=> Electrical testing, Page 72
4	Value measured by right vent temperature sender -G151 in °C	▪ Checking=> Electrical testing, Page 72

Notes:

- The value measured by a defective temperature sensor or sender is suppressed by the operating and display unit -E87 and an internally calculated value is used by the -E87 for further regulation (this value is also displayed).
- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the value measured by the ambient temperature sensor -G17 is evaluated by the dash panel insert. The measured value is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.
- The ambient temperature (stored low temperature value) displayed by the driver information system may differ from the temperature value (current measured value) displayed in display zone 1.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

Display group 015:

Dash panel temperature sensor -G56, calculated coolant temperature or coolant temperature transmitted from dash panel insert, and sunlight penetration photosensor -G107

Display zone	Significance	Explanatory notes
1	For operating and display units with part numbers up to index "K" Value measured by dash panel temperature sensor -G56 in °C	▪ Checking=> Electrical testing, Page 71 ; test step 1.6
	For operating and display units with part numbers from index "M" onwards Value measured by dash panel temperature sensor -G56 in °C	▪ Installed in operating and display unit, cannot be replaced separately.
2	For operating and display units with part numbers up to index "K" Calculated coolant temperature in °C	
	For operating and display units with part numbers from index "M" onwards Coolant temperature transmitted from dash panel insert in °C	▪ Checking => Electrical System; Repair Group 01

Note:

The value measured by a defective temperature sensor is suppressed by the operating and display unit -E87 and an internally calculated value is used by the -E87 for further regulation (this value is also displayed).

Notes on display zone 2:

- The coolant temperature is calculated by operating and display units -E87 with part numbers up to index "K" taking various input signals into consideration (engine speed, engine running time, calculated ambient temperature, vehicle stop period, etc.).
- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the coolant temperature is calculated by the dash panel insert. The calculated value is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

Display zone	Significance	Explanatory notes
3	Value measured by sunlight penetration photosensor -G107 in % (sunlight penetration from left)	▪ 0 ... 100 %, depending on intensity of sunlight
4	Value measured by sunlight penetration photosensor -G107 in % (sunlight penetration from right)	▪ 0 ... 100 %, depending on intensity of sunlight

Notes on display zone 3 and 4:

The readout for the sunlight penetration photosensor -G107 can be varied by shining a suitable lamp onto the sensor.

Display group 016:

Voltage at fresh air blower -V2, voltage at terminal 58d, terminal 58s and terminal 58 (side lights)

Display zone	Significance	Explanatory notes
1	Specified voltage at fresh air blower -V2 (calculated by operating and display unit -E87)	▪ 3.5 ... 12.5 V
2	Actual voltage at fresh air blower -V2	▪ 3,5 ... 12.5 V ▪ Deviation from specified voltage within vehicle voltage range: max. 0.5 V

Note on display zone 1 and 2:

During the "Read measured value block" function, it is not possible to switch off the fresh air blower -V2 by pressing the OFF button.

Display zone	Significance	Explanatory notes
3	For operating and display units with part numbers up to index "K" Voltage for illuminating display elements of operating and display unit -E87	▪ Approx. battery voltage with side lights OFF ▪ Approx. 2.0 ... 12.5 V with side lights ON ▪ Voltage at connector C, contact 14 to -E87 from terminal 58d, depending on position of lighting and instrument regulator -E20
	For operating and display units with part numbers from index "M" onwards Voltage at terminal 58d transmitted from dash panel insert, in % relative to maximum permissible voltage (data transmitted via bus system).	▪ 0 ... 10 % with side lights OFF ▪ 10 ... 100 % with side lights ON ▪ Checking => Electrical System; Repair Group 01
4	For operating and display units with part numbers up to index "K" Readout 0 = Side lights (terminal 58) OFF Readout 1 = Side lights (terminal 58) ON	▪ Voltage at connector E, contact 2 to ▪ -E87 less than 2 V ▪ Voltage at connector E, contact 2 to ▪ -E87 greater than 2 V
	For operating and display units with part numbers from index "M" onwards Voltage at terminal 58s transmitted from dash panel insert, in % relative to maximum permissible voltage.	▪ 0 ... 100 % ▪ Voltage at connector C, contact 14 to -E87, depending on position of lighting and instrument regulator -E20

Notes on display zone 3 and 4:

Operating and display units with part numbers up to index "K"

- Depending on the configuration of the operating and display unit -E87, an approximate battery voltage is displayed for the period after the side lights are switched off until the ignition is switched off (the voltage value is stored).
- If complaints are submitted, the value for operating and display units with part numbers up to index "K" should be checked using the test box owing to the different configuration.

Operating and display units with part numbers from index "M" onwards

- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the voltage for the display lighting (terminal 58d) is calculated by the dash panel insert. The calculated value is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot

provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .
- The percentage transmitted from the dash panel insert depends on the position of the lighting and instrument regulator -E20 and on the light intensity measured by the photosensor in the dash panel insert.
- The voltage of terminal 58s is transmitted from the dash panel insert via an additional wiring connection and not via the bus system.

Display group 017:

Engine speed, compressor speed, vehicle speed and auxiliary heater

Display zone	Significance	Explanatory notes
1	For operating and display units with part numbers up to index "K" Engine speed in rpm	
	For operating and display units with part numbers from index "M" onwards Engine speed in rpm	▪ Checking => Appropriate Ignition and Injection System Repair Manual; Repair Group 01

Notes on display zone 1:

- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the engine speed is calculated by the engine control unit. The calculated value is transmitted to the -E87 via the bus system. If, owing to a component fault, the engine control unit cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.
- The reception of information expected from the engine control unit is displayed in the measured value block, Display group 012=>Page 58 .

Display zone	Significance	Explanatory notes
2	For operating and display units with part numbers up to index "K" Compressor speed in rpm	
	For operating and display units with part numbers from index "M" onwards Readout 0 = With stationary vehicle. Readout X = Current vehicle speed in km/h Vehicle speed is transmitted from dash panel insert via bus system.	▪ Checking => Electrical System; Repair Group 01

Notes on display zone 2:

Operating and display units with part numbers up to index "K"

- Compressor speed with 0% belt slip = Transmission ratio 1.28 x Engine speed (6-cyl. engine).
- Compressor speed with 0% belt slip = Transmission ratio 1.38 x Engine speed (8-cyl. engine).
- The air conditioner compressor speed sender -G111 generates 4 pulses per compressor revolution.
- Vehicles with Nippondenso/Denso compressor do not have an air conditioner compressor speed sender -G111. The readout can be ignored for these vehicles.

Operating and display units with part numbers from index "M" onwards

- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the vehicle speed is calculated by the dash panel insert. The calculated value is transmitted to the -E87 via the

bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .
- If during self-diagnosis the vehicle is moved at more than 1 km/h, this speed is displayed.

Display zone	Significance	Explanatory notes
3	For operating and display units with part numbers up to index "K" Readout 0 = No vehicle speed signal detected since switching on ignition Readout 1 = At least one speed signal detected by speedometer -G21 since switching on ignition	
	For operating and display units with part numbers from index "M" onwards Readout 0 = Side lights (terminal 58) OFF Readout 1 = Side lights (terminal 58) ON	▪ Checking => Electrical System; Repair Group 01

Notes on display zone 3:

Operating and display units with part numbers up to index "K"

- If during self-diagnosis the vehicle is moved at more than 1 km/h, this speed is displayed.

Operating and display units with part numbers from index "M" onwards

- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the voltage for the display lighting (terminal 58d) is calculated by the dash panel insert. The calculated value is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

Display zone	Significance		Explanatory notes
4	Readout 0 =	Auxiliary heater mode OFF	▪ Voltage at connector E, contact 7 to ▪ -E87 less than 5 V
	Readout 1 =	Auxiliary heater mode ON	▪ Voltage at connector E, contact 7 to ▪ -E87 greater than 5 V

Notes on display zone 4:

- In auxiliary heater mode (operating and display unit -E87 is switched on), self-diagnosis of the air conditioner is also possible with the ignition switched off.
- If theoperating and display unit -E87 remains in operation after the ignition is switched off or "1" is displayed when the auxiliary heater is switched off, locate and eliminate the short to positive:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Display group 018:

Kick-down switch, actuation of heated rear window, coolant temperature switch, air conditioner compressor shut-off and high-pressure switch -F118

Display zone	Significance	Explanatory notes
1	For operating and display units with part numbers up to index "K"	
	Readout 0 = Kick-down switch open	▪ Voltage at connector C, contact 19 to -E87 greater than 5 V
	Readout 1 = Kick-down switch closed	▪ Voltage at connector C, contact 19 to -E87 less than 5 V
	For operating and display units with part numbers from index "M" onwards	
	Readout 0 = Actuation of heated rear window OFF	
	Readout 1 = Actuation of heated rear window ON	▪ Voltage at connector F, contact 1 (from -E87 to -Z1), approx. battery voltage

Notes on display zone 1:

Operating and display units with part numbers up to index "K"

- When the kick-down switch is closed, the magnetic coupling -N25 is deactivated for 12 seconds.
- Depending on the vehicle configuration, the kick-down switch is either installed in the automatic gearbox control unit -J217 or exists as a separate component -F46.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Operating and display units with part numbers from index "M" onwards

- Electrical test on heated rear window => Page 89

Display zone	Significance	Explanatory notes
2	For operating and display units with part numbers up to index "K"	
	Readout 0 = Coolant temperature switch "too hot" open	▪ Voltage at connector D, contact 5 to ▪ -E87 greater than 5 V
	Readout 1 = Coolant temperature switch closed	▪ Voltage at connector D, contact 5 to ▪ -E87 less than 5 V => Display group 001, Display zone 1, Page 47
	For operating and display units with part numbers from index "M" onwards	
	Readout 0 = Coolant temperature transmitted from dash panel insert is lower than 118° C (and, therefore, OK)	▪ Coolant temperature is transmitted from dash panel insert via bus system.
	Readout 1 = Coolant temperature transmitted from dash panel insert is higher than 118° C (compressor must be switched off)	- => Display group 001, Display zone 1, Page 47

Notes on display zone 2:

Operating and display units with part numbers up to index "K"

- Check the coolant temperature and dash panel insert with -E87 up to index "K":

=> Electrical System; Repair Group 90

Operating and display units with part numbers from index "M" onwards

- In the case of vehicles with an operating and display unit with part number from index "M" onwards, the coolant temperature is calculated by the dash panel insert. The calculated value is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The compressor is switched off by the -E87 as soon as the coolant temperature exceeds 118° C. The compressor is not switched on again until the coolant temperature drops below 113° C.
- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

Display zone	Significance	Explanatory notes
3	Readout 0 = Compressor shut-off output open	▪ Voltage at connector D, contact 3 to ▪ -E87 less than 5 V
	Readout 1 = Compressor shut-off output closed	▪ Voltage at connector D, contact 3 to ▪ -E87 greater than 5 V

Notes on display zone 3:

- The output is closed (voltage greater than 5 V) when the magnetic coupling -N25 is switched on.
- If, with the magnetic coupling switched on, the voltage drops below 5 V (engine control unit switches input to earth), the magnetic coupling is switched off by the operating and display unit -E87 =>Display group 001, Display zone 1, Page 47 .

Display zone	Significance	Explanatory notes
4	▪ Operating and display unit -E87 with part number up to index "H":	
	Readout 0 = High-pressure switch for magnetic coupling -F118 closed	▪ Voltage at connector D, contact 10 to -E87 less than 2 V
	Readout 1 = High-pressure switch for magnetic coupling -F118 open	▪ Voltage at connector D, contact 10 to -E87 greater than 2 V
	▪ Operating and display unit -E87 with part number from ▪ index "J" onwards:	
	Readout 0 = Air conditioner pressure switch -F129 closed	▪ Voltage at connector D, contact 10 to -E87 less than 2 V
	Readout 1 = Air conditioner pressure switch -F129 open	▪ Voltage at connector D, contact 10 to -E87 greater than 2 V

Note on display zone 4:

The compressor is switched off if the switch is open =>Display group 001, Display zone 1, Page 47 .

Display group 019:

Left heat regulation valve -N175 and right heat regulation valve -N176, coolant circulation pump -V50 and actuation of heated windscreen

Display zone	Significance	Explanatory notes
1	Readout 1 = Left heat regulation valve -N175 open (heating)	▪ Voltage at connector E, contact 3 to ▪ -E87, approx. battery voltage

Display zone	Significance	Explanatory notes
	Readout 0 = Left heat regulation valve -N175 closed (cooling)	▪ Voltage at connector E, contact 3 to ▪ -E87 less than 2 V
2	Readout 1 = Right heat regulation valve -N176 open (heating)	▪ Voltage at connector E, contact 4 to ▪ -E87, approx. battery voltage
	Readout 0 = Right heat regulation valve -N176 closed (cooling)	▪ Voltage at connector E, contact 4 to ▪ -E87 less than 2 V
3	Readout 0 = Coolant circulation pump -V50 OFF	▪ Voltage at connector E, contact 8 to ▪ -E87, approx. battery voltage
	Readout 1 = Coolant circulation pump -V50 ON	▪ Voltage at connector E, contact 8 to ▪ -E87 less than 2 V

Notes:

- The coolant circulation pump -V50 is switched off if the temperature preselection for the driver's and front passenger's side is set to "LO".
- If the air temperature cannot be regulated, check the power supply to the heat regulation valves and the connection to the operating and display unit -E87.

Display zone	Significance	Explanatory notes
4	For operating and display units with part numbers up to index "K" Display zone not used	
	For operating and display units with part numbers from index "M" onwards	
	Readout 00 = (or 0) Actuation of heated windscreen OFF Heated windscreen OFF	▪ Switch in -E87 open Voltage at connector D, contact 11 to -E87 not interrogated
	Readout 10 = Actuation of heated windscreen ON Heated windscreen OFF	▪ Switch in -E87 closed ▪ Switch at output of -J505 to -E87 open Voltage at connector D, contact 11 to -E87 less than 5 V
	Readout 11 = Actuation of heated windscreen ON Heated windscreen ON	▪ Switch in -E87 closed ▪ Switch at output of -J505 to -E87 closed Voltage at connector D, contact 11 to -E87 greater than 5 V and less than 8 V

Notes:

- "0" or "00" is displayed if the vehicle does not have a heated windscreen or control unit -J505.
- The heated windscreen control unit -J505 switches approx. battery voltage to the output to the -E87 as long as the voltage at the -J505 is greater than 12.70 V and the control unit is not too hot.

- If the windscreen heating is to be switched on, the operating and display unit -E87 actuates a transistor which reduces the voltage at connector D, contact 11 by 50%. The control unit -J505 switches on the heated windscreen.
- If the voltage (vehicle voltage at -J505) falls below 12.70 V while the windscreen is being heated or if the control unit -J505 becomes too hot, a switch in the -J505 opens and the voltage at the output to the -E87 falls below 5V. At the same time the heated windscreen is switched off by the -J505.
- Functional description of heated windscreen => Page 91

Display group 020: Last four compressor shut-off conditions

Display zone	Significance	Explanatory notes
1	Fourth last compressor shut-off condition	▪ Breakdown of conditions=>Page 47 Display group 001, Display zone 1
2	Third last compressor shut-off condition	
3	Second last compressor shut-off condition	
4	Last compressor shut-off condition	

Notes:

- The display group "020" is only provided for operating and display units with part numbers from index "M" onwards.
- Only compressor shut-off conditions which were active for longer than 20 seconds are stored.
- At the beginning of production (until approx. February 1999, software version "D12"), operating and display units with part numbers from index "M" onwards were installed in which no compressor shut-off conditions were stored. With these units, "0" is always displayed in display zones 1 to 3, and "0" or a currently active shut-off condition is displayed in display zone 4.

Display group 021:

Idling-speed increase, actuation of radiator fan and operation of windscreen washer system

Note:

The display group "021" is only provided for operating and display units with part numbers from index "M" onwards.

Display zone	Significance	Explanatory notes
1	Readout 0 = Idling speed regulation OFF	▪ Voltage at connector A, contact 2 to ▪ -E87 less than 2 V
	Readout 1 = Idling speed regulation ON	▪ Voltage at connector A, contact 2 to ▪ -E87 greater than 2 V

Notes on display zone 1:

- Check the idling speed regulation function (idling-speed increase) => Page 34 Starting final control diagnosis for "idling speed regulation".
- A prerequisite for the activation of idling speed regulation is the absence of any compressor shut-off condition preventing actuation of the magnetic coupling (e.g. pressure switch -F129 open, engine not running or "Econ" mode selected).
- In the case of vehicles with TDI engine, encoding the operating and display unit -E87 for the TDI engine affects the "idling speed regulation" signal issued by the operating and display unit -E87. This signal tells the engine control unit that the additional heating system is to be switched on.

=> Auxiliary/Additional Heater; Repair Group 01

- In "ECON" mode and at temperatures higher than 15 °C, no "idling speed regulation" signal is issued if the operating and display unit -E87 is encoded for the TDI engine.

Display zone	Significance	Explanatory notes
2	Readout 0 = Actuation of radiator fan relay (speed 1) OFF	▪ Voltage at connector D, contact 7 to ▪ -E87 greater than 5 V (fan OFF)
	Readout 1 = Actuation of radiator fan relay (speed 1) ON	▪ Voltage at connector D, contact 7 to ▪ -E87 less than 5 V (fan ON)

Note on display zone 2:

The radiator fan is switched to speed 1 by the -E87 provided that no compressor shut-off condition exists which prevents the magnetic coupling from being switched on (e.g. engine not running or "Econ" mode selected).

Display zone	Significance	Explanatory notes
3	Readout 0 = Actuation of radiator fan relay (speed 2) OFF	▪ Voltage at connector D, contact 8 to ▪ -E87 greater than 5 V (fan OFF)
	Readout 1 = Actuation of radiator fan relay (speed 2) ON	▪ Voltage at connector D, contact 8 to ▪ -E87 less than 5 V (fan ON)
4	Readout 0 = Windscreen washer switch not actuated	▪ Voltage at connector D, contact 6 to ▪ -E87 less than 5 V
	Readout 1 = Windscreen washer switch actuated	▪ Voltage at connector D, contact 6 to ▪ -E87 greater than 5 V

Note on display zone 3:

In the case of vehicles with pressure switch -F129, the radiator fan is actuated directly via the switch. Actuation of speed 2 via the -E87 is intended for vehicles with high-pressure sender -G65 (this will not be the case in the Audi A8 until a later date).

Note on display zone 4:

When the windscreen washer switch is actuated, the air conditioner is switched to air recirculation mode for a predefined time => Display group 001, Display zone 4

Display group 022:

Assignment of ignition key and signal for "ignition OFF time"

Note:

The display group "022" is only provided for operating and display units with part numbers from index "M" onwards.

Display zone	Significance	Explanatory notes
1	Readout 0 = Ignition switched on using key for which there is no assignment in dash panel insert No information received from dash panel insert	▪ Check ignition key adaption => Electrical System; Repair Group 90
	Readout 1 = (2, 3 or 4) Ignition switched on using key set to position 1 (2, 3 or 4) in dash panel insert	▪ Up to 4 keys can be assigned.

Notes on display zone 1:

- When the ignition is switched on, the -E87 starts with the setting which was valid when the ignition was last switched off using the key concerned (temperature, air distribution, fresh air blower speed).

- The assignment of the ignition key is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

Display zone	Significance	Explanatory notes
2	Signal for "ignition OFF time" (standing time)	- Duration of period between last ignition OFF and ignition ON - Readout 00:00 h and 03:59 h
3	Display zone not used	
4	Display zone not used	

Notes on display zone 2:

- If no "ignition OFF time" signal is detected by the -E87 when the ignition is switched on (the signal is sent from the dash panel insert), the -E87 assumes that the standing time is longer than 4 hours, and the engine temperature is assumed to be the same as the ambient temperature.
- The standing time is transmitted to the -E87 via the bus system. If, owing to a component fault, the dash panel insert cannot provide the information requested, a fault message requesting readout of the fault memory is sent with the data telegram.

=> Electrical System; Repair Group 01

- The reception of information expected from the dash panel insert is displayed in the measured value block, Display group 012 =>Page 58 .

8 - Electrical testing

8.1 - Electrical testing

8.2 - Wiring and component test with test box V.A.G 1598/19

Special tools, testers and other items required

- Test box V.A.G 1598/19
- Portable multimeter V.A.G 1526 or V.A.G 1526 A
- Voltage tester V.A.G 1527 B
- Adapter set V.A.G 1594 A
- Temperature sensor with suitable tester

Note:

In the case of vehicles with solar roof, a jumper must be attached between socket 9 E and 14 A in test steps 3.1 ... 3.4 and 4.4 ... 4.6. The solar cell isolation relay -J309 is then actuated and terminal "30" connected to the fresh air blower -V2:

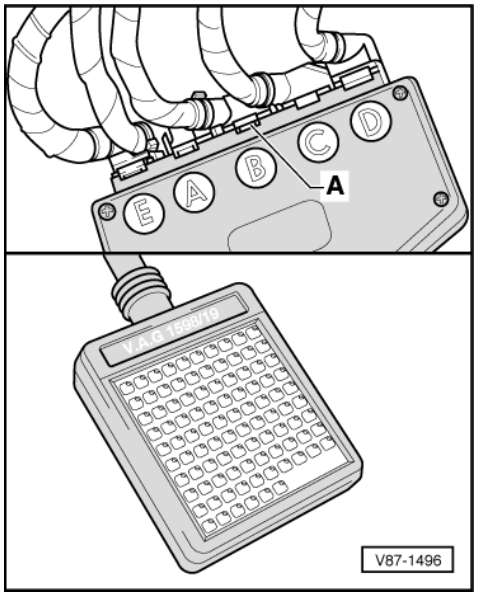
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Test requirement:

- All fuses OK:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Switch on ignition.
- Open bottom left and right dash panel vents.
- Set air distribution to "bottom dash panel vents" by pressing buttons on operating and display unit -E87.
- Switch off ignition.
- Remove side trim of centre console on front passenger's side:



=> General Body Repairs, Interior; Repair Group 70

- Remove radio.
- -> Push back catches -A- and unplug connectors from operating and display unit -E87.
- Connect test box V.A.G 1598/19 to wiring harness of operating and display unit -E87.

Note:

The contact numbers of the connector coincide with the socket numbers of the test box.

Overview of electrical tests on operating and display unit -E87-

Test step	Component tested	Page
1	- Power supply, earth, lighting - Temperature sensors/senders -G17, -G56, -G89, -G150, -G151	71
2	- Centre vent potentiometer and left/right centre vent switches -G142, -F183, -F184	73
3	- Fresh air blower -V2 and fresh air blower control unit -J126	74
4	- Coolant circulation pump and left/right heat regulation valves -V50, -N175, N176	74
5	- Control motors in plenum chamber and associated potentiometers -V71/-G113, -V113/-G143, -V114/-G144	76
6	- Air conditioner control motors and associated potentiometers -V68/-G92, -V102/-G138, -V107/-G137, -V108/-G139; -V109/-G140, -V110/-G136, -V111/-G137, -V112/-G141	77
7	- Air conditioner compressor speed sender -G111 - System-actuated switches -F73, -F118, -F129	79
8	- Magnetic coupling relay -J44 - Actuation of radiator fan -V7 (speed 1)	80
9	- Signal from automatic intermittent wash/wipe relay -J31 - Signal from heated windscreen control unit -J505	81

8.3 - Electrical test up to test step 5

Test step 1

(Power supply, earth, lighting, temperature sensors/senders):

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1.1	5 E + 9 E	Power supply at terminal 30 of -E87	▪ Ignition OFF	- Approx. battery voltage	- Use current flow diagram to service power supply at terminal 30 and earth connection to -E87
1.2	6 E + 9 E	Power supply at terminal 15 of -E87	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply at terminal 15 and earth connection to -E87
1.3	2 E + 9 E	Power supply at terminal 58 of -E87	▪ Side lights ON ▪ Side lights OFF	- Approx. battery voltage - 0 V	- Use current flow diagram to service power supply at terminal 58 and earth connection to -E87

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1.41)	14 C + 9 E	Power supply at terminal 58d of -E87	▪ Side lights ON	- Depends on brightness set for instrument illumination	- Use current flow diagram to service power supply at terminal 58d and earth connection to -E87
1.51)	11 C + 12 E	Ambient temperature sensor -G17	- Measure temperature at sensor fitting location	- Depends on temperature at sensor/ sender fitting location	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance
1.61)	20 C + 12 E	Dash panel temperature sensor -G56	▪ Temperature sensor blower -V42 OK => Final control diagnosis, Page 30 Measure temperature at sensor fitting location	=> Table, Page 72	- Replace temperature sensor/sender

1) Test step only required for vehicles with operating and display units with part numbers up to index "K"

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1.7	5 B + 16 B	Fresh air intake duct temperature sensor -G89	- Measure temperature at sensor fitting location	- Depends on temperature at sensor/ sender fitting location => Table, Page 72	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance
1.8	13 A + 16 B	Left vent temperature sender -G150	- Measure temperature at sensor fitting location		- Replace temperature sensor/sender
1.9	11 A + 16 B	Right vent temperature sender -G151	- Measure temperature at sensor fitting location		

Temperature-dependent resistance values of sensors/senders:

Temperature measured at sensor/sender fitting location °C	Resistance value of sensor -G56 and senders -G150 and -G151 kω	Resistance value of sensors -G17 and -G89 kω
- 40	100.7	34.7
- 30	52.7	18.1
- 20	28.7	9.95
-10	16.2	5.59
0	9.40	3.28
5	7.27	2.54
10	5.66	1.99
15	4.45	1.57
20	3.50	1.25
25	2.79	1.00
30	2.23	0.80

Temperature measured at sensor/sender fitting location °C	Resistance value of sensor -G56 and senders -G150 and -G151 kω	Resistance value of sensors -G17 and -G89 kω
35	1.80	0.65
40	1.45	0.53
50	0.97	0.36
60	0.67	0.25
70	0.47	-
80	0.33	-

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1.10 2)	11 E + 10 E	Power supply at terminal 30 of -E87	▪ Ignition OFF	- Approx. battery voltage	- Use current flow diagram to service power supply at terminal 30 and earth connection to -E87

1.112)	14 C + 9 E	Power supply at terminal 58s of -E87	▪ Ignition ON ▪ Side lights ON	- 0 ... 12 V (depends on brightness set for instrument illumination)	- Use current flow diagram to service power supply from terminal 58s to -E87
1.122)	14 C + 9 E	Power supply at terminal 58s of -E87	▪ Ignition ON ▪ Side lights OFF	- Less than 2 V	- Use current flow diagram to eliminate short circuit along wiring to -E87

2) Test step only required for vehicles with operating and display units with part numbers from index "M" onwards.

Test step 2

(Centre vent potentiometer -G142, centre left vent switch -F183 and centre right vent switch -F184):

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**
2.1	8 C + 15 C	Centre vent potentiometer -G142	- Turn handwheel from stop to stop	- At "warm" stop limit position: greater than - 0.1 kω 1) - At "cold" stop limit position: less than 7.5 kω1)	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance along wiring to -E87 Replace dash panel vent
2.2	15 C + 12 E	Centre vent potentiometer -G142	- Turn handwheel from stop to stop	- At "cold" stop limit position: greater than - 0.1 kω 1) - At "warm" stop limit position: less than 7.5 kω1)	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance along wiring to -E87 Replace dash panel vent

1) The resistance value must change continuously as the handwheel is turned.

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**
2.3	12 C + 12 E	Centre left vent switch -F183	- Turn handwheel from stop to stop	- Vent open: less than 1.5 kω - Vent closed: greater than 0.1 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance along wiring to -E87 Replace dash panel vent
2.4	7 C + 12 E	Centre right vent switch -F184	- Turn handwheel from stop to stop	- Vent open: less than 1.5 kω - Vent closed: greater than 0.1 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance along wiring to -E87 Replace dash panel vent

Test step 3:

Fresh air blower -V2 and fresh air blower control unit -J126

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =) - Vehicles with solar roof: Attach jumper between socket 9 E and 14 A					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
3.1	4 B + 9 E	Control unit -J126	▪ Ignition ON	- Voltage less than 5 V - Fresh air blower does not run	- Use current flow diagram to eliminate short to positive along wiring between -J126 and -E87 Replace control unit -J126
3.2	12 B + 9 E	Power supply for fresh air blower -V2	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply
3.3	11 B + 9 E	Power supply for control unit -J126 (via fresh air blower -V2)	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply

Connect voltage tester V.A.G 1527 B - Vehicles with solar roof: Attach jumper between socket 9 E and 14 A					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
3.4	4 B + 12 B	Control unit -J126	- Ignition ON	- LED in voltage tester lights up	- Eliminate open circuit along wiring between -F126 and -E87 Replace control unit -J126
				- Fresh air blower runs	- Check freedom of movement of fresh air blower -V2 Replace control unit -J126

Test step 4

(Coolant circulation pump -V50, left heat regulation valve -N175 and right heat regulation valve -N176):

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
4.1	8 E + 9 E	Power supply for coolant circulation pump -V50 and wiring to -E87	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply to -E87 (via -V50) Replace pump/valve unit

4.2	3 E + 9 E	Power supply for left heat regulation valve -N175 and wiring to -E87	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply to -E87 (via -N175) Replace pump/valve unit

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
4.3	4 E + 9 E	Power supply for right heat regulation valve -N176 and wiring to -E87	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to service power supply to -E87 (via -N176) Replace pump/valve unit

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)
Connect voltage tester V.A.G 1527 B between socket 4 B and 12 B (fresh air blower -V2 runs)
- Vehicles with solar roof: Attach jumper between socket 9 E and 14 A

Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
4.4	8 E + 9 E	Functional description of coolant circulation pump -V50	▪ Ignition ON ▪ Engine warm	- Coolant pump runs - Temperature of air from vents increases - Current input less than 2.5 A	- Use current flow diagram to check for interchanged cabling Replace pump/valve unit

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)
Attach jumper between socket 8 E and 10 E (coolant circulation pump -V50 runs)
Connect voltage tester V.A.G 1527 B between socket 4 B and 12 B (fresh air blower -V2 runs, heated air from vents on driver's and front passenger's side) 1)
- Vehicles with solar roof: Attach jumper between socket 9 E and 14 A

Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
4.5	3 E + 9 E	Functional description of left heat regulation valve -N175	▪ Ignition ON ▪ Engine warm	- Temperature of air from left vents drops 2) - Current input less than 3.5 A	- Use current flow diagram to check valve -N175 for interchanged cabling Replace pump/valve unit

1) Both heat regulation valves are open, both heat exchangers become warm (the discharge direction of the air depends on the air conditioner setting prior to removal of the operating display unit -E87).

2) Coolant in heat exchanger is cooled, heat regulation valve is closed.

Note:

If complaints regarding inadequate heating capacity have been submitted but no faults could be detected during this test or when the air conditioner heating capacity was tested => Page 189 , use the current flow diagram to check whether the cabling of the coolant pump -V50 and left heat regulation valve -N175 / right heat regulation valve -N176 has been interchanged.

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)
Attach jumper between socket 8 E and 10 E (coolant circulation pump -V50 runs)
Connect voltage tester V.A.G 1527 B between socket 4 B and 12 B (fresh air blower -V2 runs, heated air from vents on driver's and front passenger's side) 1)
- Vehicles with solar roof: Attach jumper between socket 14 A and 9 E

Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
4.6	4 E + 9 E	Functional description of right heat regulation valve -N176	▪ Ignition ON ▪ Engine warm	- Temperature of air from right vents drops 2) - Current input less than 3.5 A	- Use current flow diagram to check valve -N176 for interchanged cabling Replace pump/valve unit

1) Both heat regulation valves are open, both heat exchangers become warm (the discharge direction of the air depends on the air conditioner setting prior to removal of the operating display unit -E87).

2) Coolant in heat exchanger is cooled, heat regulation valve is closed.

Note:

If complaints regarding inadequate heating capacity have been submitted but no faults could be detected during this test or when the air conditioner heating capacity was tested => Page 189 , use the current flow diagram to check whether the cabling of the coolant pump -V50 and left heat regulation valve -N175 / right heat regulation valve -N176 has been interchanged.

Test step 5

(Air conditioner control motors and associated potentiometers: control motors in engine compartment):

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
5.1	16 B + 3 A/12 A	Potentiometer (in control motor) -G113 (-V71) -G143 (-V113)		- Depends on position of control motor: greater than 0.1 kωand less than 7.5 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
5.2	7 B + 3 A/12 A	Potentiometer (in control motor) -G113 (-V71) -G143 (-V113)		- Depends on position of control motor: greater than 0.1 kωand less than 7.5 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

Notes on test step 5.1 and 5.2:

- The resistance value of the potentiometers in the control motors (specification: 4.5 ... 7.5 kωbetween contact 1 and 3) can only be measured directly at the control motor (parallel connection).
- The resistance value of the potentiometers in the control motors (between contacts 1 and 2 as well as 2 and 3) depends on the position of the control motor.The resistance value should only be measured with the control motor installed. The upper specification is not attained in test steps 5.1 and 5.2. (In order to attain the upper specification, all of the connectors would have to be disconnected from the other control motors during the measurement - parallel connection.)
- If the fault "Potentiometer short to earth" or "Open circuit/short to positive" is detected by the -E87, check all potentiometers (test steps 5 and 6).

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (200 ω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
5.3	8 A + 16 A	Air flow flap control motor -V71		- 40 ... 140 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
5.4	17 A + 18 A	Air recirculation flap control motor -V113		- 40 ... 140 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

8.4 - Electrical test from test step 6 onwards

Test step 6

(Air conditioner control motors and associated potentiometers: control motors in passenger compartment):

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6.1 1)	16 B + 2 A/ 4 A/ 5 A/ 6 A/ 7 A/ 10 A/ 2 B/ 10 B	Potentiometer (in control motor) -G136 (-V110) -G138 (-V102) -G92 (-V68) -G139 (-V108) -G140 (-V109) -G135 (-V107) -G141 (-V112) -G137 (-V111)		- Depends on position of control motor: greater than 0.1 kωand less than 7.5 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

1) Notes => Page 77 .

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6.2	7 B + 2 A/ 4 A/ 5 A/ 6 A/ 7 A/ 10 A/ 2 B/ 10 B	Potentiometer (in control motor) -G136 (-V110) -G138 (-V102) -G92 (-V68) -G139 (-V108) -G140 (-V109) -G135 (-V107) -G141 (-V112) -G137 (-V111)		- Depends on position of control motor: greater than 0.1 kωand less than 7.5 kω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

Notes on test step 6.1 and 6.2:

- The resistance value of the potentiometers in the control motors (specification: 4.5 ... 7.5 kωbetween contact 1 and 3) can only be measured directly at the control motor (parallel connection).
- The resistance value of the potentiometers in the control motors (between contacts 1 and 2 as well as 2 and 3) depends on the position of the control motor.The resistance value should only be measured with the

control motor installed. The upper specification is not attained in test steps 6.1 and 6.2. (In order to attain the upper specification, all of the connectors would have to be disconnected from the other control motors during the measurement - parallel connection.)

- If the fault "Potentiometer short to earth" or "Open circuit/short to positive" is detected by the -E87, check all potentiometers (test steps 5 and 6).

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (200 ω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6.3	1 A + 9 A	Temperature flap control motor -V68		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
6.4	19 B + 20 B	Centre vents control motor -V102		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (200 ω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6.5	23 A + 24 A	Defrost flap control motor -V107		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
6.6	19 A + 20 A	Left footwell flap control motor -V108		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
6.7	21 A + 22 A	Right footwell flap control motor -V109		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (200 ω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6.8	21 B + 22 B	Centre left vent control motor -V110		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
6.9	1 B + 9 B	Centre right vent control motor -V111		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor
6.10	17 B + 18 B	Rear footwell vent control motor -V112		- 90... 180 ω	- Use current flow diagram to eliminate short circuit, open circuit or contact resistance Replace control motor

Test step 7

(Air conditioner compressor speed sender -G111 -, only vehicles with Zexel compressor, high-pressure switch for magnetic coupling -F118, low-pressure switch for air conditioner -F73 and air conditioner pressure switch -F129):

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (20 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
7.1	2 D + 12 E	Air conditioner compressor speed sender -G111		- 0,8 ... 1.5 kω	- Use current flow diagram to eliminate open circuit, contact resistance or short circuit Sender -G111 defective. Vehicle must be taken to specialist VW/Audi air conditioner workshop
7.2	2 D + 9 E	Air conditioner compressor speed sender -G111		- Greater than 2 kω	- Use current flow diagram to eliminate short circuit Sender -G111 defective. Vehicle must be taken to specialist VW/Audi air conditioner workshop

Note:

Vehicles with Nippondenso/Denso compressor do not have an air conditioner compressor speed sender -G111; test steps 7.1 ... 7.4 are not necessary for these vehicles.

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
7.3	2 D + 12 E	Air conditioner compressor speed sender -G111	▪ Engine running ▪ Compressor not running	- Less than 1 V	- Use current flow diagram to eliminate short circuit
Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (2 V font=symbol charset=fontspecific code=64 descr='[ap]') Attach jumper between socket 22 C and 9 E (air conditioning system magnetic coupling ON)					
7.4	2 D + 12 E	Air conditioner compressor speed sender -G111	▪ Engine running ▪ Compressor running	- Greater than - 0.05 V (depends on engine speed)	- Sender -G111 defective. Vehicle must be taken to specialist VW/Audi air conditioner workshop

Note:

Vehicles with Nippondenso/Denso compressor do not have an air conditioner compressor speed sender -G111; test steps 7.1 ... 7.4 are not necessary for these vehicles.

Switch on measuring range of portable multimeter V.A.G 1526: Resistance measurement (2 kω)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained

7.5	10 D + 12 E	Vehicles with -E87 up to part number index "H": High-pressure switch for magnetic coupling -F118 Vehicles with -E87 from part number index "J" onwards: Air conditioner pressure switch -F129		- Less than 0.1 kω	- Use current flow diagram to eliminate open circuit, contact resistance or short circuit 1) Replace high-pressure switch -F118 - Replace air conditioner pressure switch -F129

1) If Code 1 "Pressure switch -F118/-F129 open" is displayed as the compressor shut-off condition in measured value block 1:

- use current flow diagram to check for loose contact along wiring to -F118/-F129.

- check actuation of radiator fan -V7 (speed 1) (=>Final control diagnosis, Page 29).

- check actuation of radiator fan -V7 (speed 2):

- between contact 1 and 2 of high-pressure switch for magnetic coupling -F118 (=>Page 101).

-between contact 3 and 4 of air conditioner pressure switch -F129 (=>Page 102);

- If no fault can be detected, the vehicle must be taken to a specialist VW/Audi air conditioner workshop.

Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
7.6	9 E + 11 E	Only vehicles with -E87 up to part number index "H": Low-pressure switch for air conditioner -F73	▪ Ignition ON	Approx. battery voltage	- Use current flow diagram to eliminate open circuit in power supply Low-pressure switch -F73 defective or refrigerant circuit empty (checking =>from Page 185 onwards)

Note:

The low-pressure switch -F73 is not used in vehicles with the air conditioner pressure switch -F129. The contact in the connector to the operating and display unit is no longer used.

Test step 8

(Magnetic coupling relay -J44, actuation of radiator fan -V7):

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)					
Test step	V.A.G 1598/19 socket	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained

8.1 1)	9 E + 11 E	Magnetic coupling relay -J44	▪ Engine running	- Less than 1 A - Compressor is driven	- Use current flow diagram to eliminate open circuit or short to positive along wiring between -N25, -J44 and -E87 Check low-pressure switch -F73 => Test step 7.6 Replace relay -J44 Service magnetic coupling -N25 => Page 112

1) Test step only required for vehicles with operating and display units with part numbers up to index "K"

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**
8.2	7 D + 9 E	Actuation of radiator fan -V7 (speed 1)	▪ Engine running	- Less than 1 A - Fan runs at speed 1	- Use current flow diagram to eliminate open circuit or short to positive along wiring between -J44 and -E87 Check actuation of radiator fan -V7: => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Switch on measuring range of portable multimeter V.A.G 1526: Current measurement (20 A =)					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**
8.3 2)	9 E + 22 C	Magnetic coupling relay -J44	▪ Engine running	- Less than 1 A - Compressor is driven	- Use current flow diagram to eliminate open circuit or short to positive along wiring between -N25, -J44 and -E87 Replace relay -J44 Service magnetic coupling -N25 => Page 112

2) Test step only required for vehicles with operating and display units with part numbers from index "M" onwards.

Test step 9

(Signal for wash/wipe system, connection to heated windscreen control unit -J505):

Connect voltage tester V.A.G 1527 B					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**

Connect voltage tester V.A.G 1527 B					
9.1 3)	9 E + 6 D	Signal from automatic intermittent wash/wipe relay -J31	▪ Ignition ON - Actuate windscreen wash/wipe switch	- LED in voltage tester does not light up - LED in voltage tester lights up	- Use current flow diagram to eliminate short circuit - Use current flow diagram to eliminate open circuit along wiring

3) Test step only required for vehicles with air quality sensor -G238

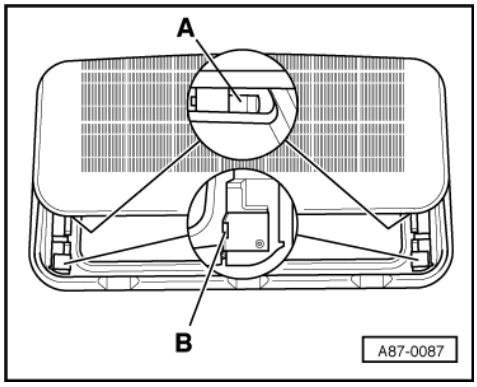
Switch on measuring range of portable multimeter V.A.G 1526: Voltage measurement (20 V =)					
Test step	**V.A.G 1598/19 socket**	**Testing of**	**▪ Test conditions - Additional work**	**Specification**	**Remedies if specification not attained**
9.2 4)	9 E + 6 D	Signal from heated windscreen control unit -J505	▪ Ignition ON	- Approx. battery voltage	- Use current flow diagram to eliminate open circuit or short to earth along wiring Use current flow diagram to check power supply to control unit -J505.

4) Test step only required for vehicles with heated windscreen -Z2.

Note:

Functional description of heated windscreen => Page 91

8.5 - Functional description of solar roof



- -> Solar operation is only possible if the sun roof is closed or raised (the solar energy converted into electrical energy by the solar roof is transferred to the vehicle electrics via contacts -A- (at the front edge of the sun roof) and -B- (in the frame of the sun roof)).
- Solar operation is not possible if the ignition is switched on, if the auxiliary heater/auxiliary ventilation mode is in operation or if the "residual heat" function is active (the operating and display unit -E87 actuates the isolation relay -J309 which switches the power supply for the fresh air blower -V2 from the solar cells -C20 to terminal "30").

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

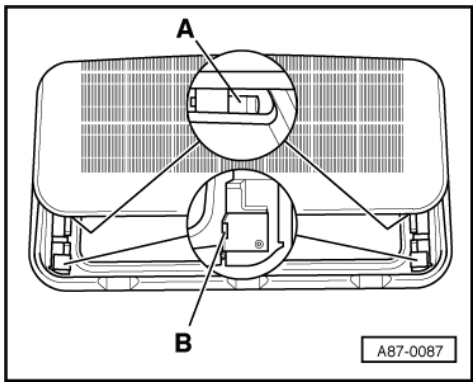
- The energy yielded by the solar cells -C20 is converted in the solar operation control unit -J355 (installed between the sun roof headliner and solar roof) (e.g. from 6.5 V and 2.5 A to 3.5 V and 4.6 A).

- The electrical energy yielded by the solar roof is calculated using the following formula:

  Solar radiation
  x Solar cell surface area on sun roof
  x Efficiency of solar cells -C20
  x Efficiency of control unit -J355

Example:	
Solar radiation	500 W/m2
Solar cell surface area on sun roof	x 0.21 m2
Efficiency of solar cells -C20	x 0.13
Efficiency of control unit -J355	x 0.9
Yielded electrical energy	= 12 W

Note:



- -> Contacts -A- and -B- (on the sun roof and sun roof frame) used to transfer the generated electrical energy must be clean and free of any lubricating grease.
- If necessary, a thin coating of contact grease may be applied to contacts -A- and -B- (electrically conductive protective and lubricating agents are commercially available from electronics traders).

Checking functioning of solar roof

Special tools, testers and other items required

- 12 V test lamp (max. 5 W)

Test condition

- Sun roof closed.

- Park vehicle in sunlight

Notes:

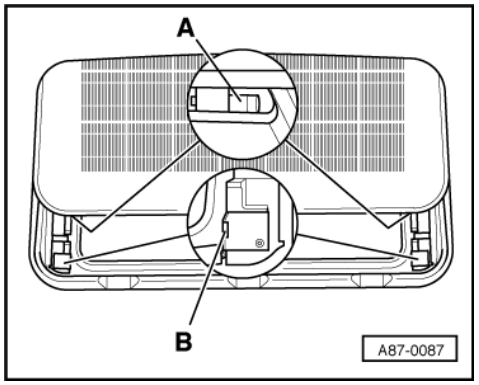
- In unfavourable weather conditions, the solar roof can be illuminated using e.g. two commercially available 500 W halogen lamps. The lamps must be located at a distance of 500 mm from the sun roof.
- When the solar roof is illuminated using halogen lamps, electrical energy of only approx. 1.5 W is yielded (the fresh air blower -V2 rotates, but the air flow is virtually undetectable).

- Adjust air distribution of air conditioner to "dash panel vents".
- Open "centre" dash panel vents (close all other vents).
- Switch off ignition (operating and display unit -E87 goes dark).

- Air should be flowing from "centre" dash panel vents (if necessary, check by moistening surface of your hand and holding it in front of vent).

If fresh air blower -V2 is not functioning:

- Open sun roof approx. 10 cm.



- -> Connect 12 V test lamp (max. 5 W) between two contacts -A- of sun roof.
  - Test lamp should flicker or light up (depending on intensity of solar radiation).

If test lamp flickers or lights up, solar roof is functioning OK.

- Check cabling to fresh air blower -V2 (via isolating relay -J309):

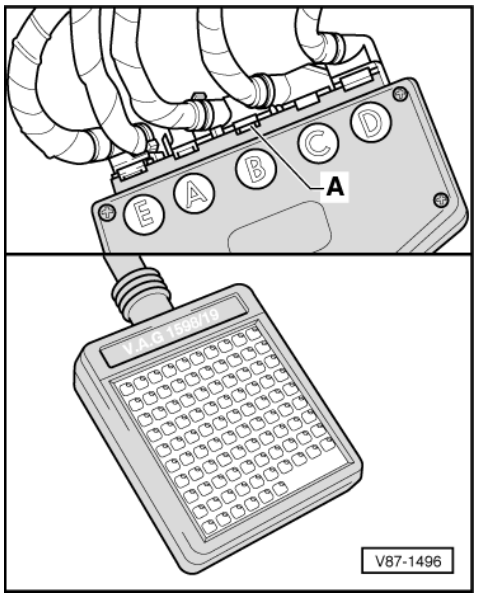
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

8.6 - Checking wiring of diagnostic connector

Special tools, testers and other items required

- Test box V.A.G 1598/19
- Portable multimeter V.A.G 1526 or V.A.G 1526 A
- Adapter set V.A.G 1594 A

Notes:



- Switch off the ignition before checking the wiring.

- The diagnostic connector is located under the front ashtray insert in the centre console. The wiring junction for the diagnostic wire (K-wire) is configured as a welding spot in the wiring harness:

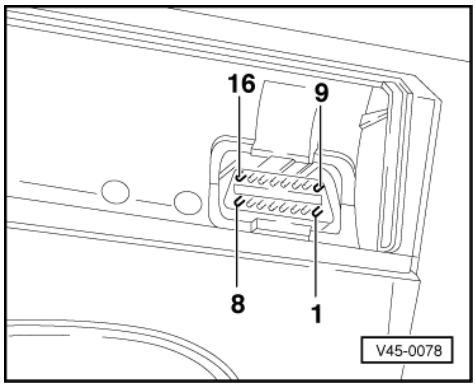
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Wire colours for all vehicle systems connected to diagnostic connector (contact 7) via wiring junction:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- -> Plug connector -C- of operating and display unit -E87 into patchboard -C- of test box V.A.G 1598/19 =>from Page 69 onwards.

Contact assignment of diagnostic connector



4 - -> Earth connection for V.A.G 1551/1552
7 - K-wire (data wire between fault reader and various vehicle systems with self-diagnosis)
16 - Power supply for V.A.G 1551/1552

Notes:

- The diagnostic connector wiring is routed to the various control units via a welding spot in the wiring harness:

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- The diagnostic wire is connected to contact 24 of connector -C- of the operating and display unit -E87.
-

```
Rapid data transfer
Fault in communication link
```

-> If this display appears at the beginning of or during self-diagnosis:
- Disconnect the connections to the control units for the other vehicle systems with self-diagnosis in sequence.
- Enter the address word "08" again each time the connection to a vehicle system has been disconnected.
- If the control unit identification is then displayed, replace the last control unit to be disconnected from the diagnostic wire.

9 - Checking bus system

9.1 - Checking bus system

9.2 - Functional description of bus system

Bus:

"Bus" is the term used to describe a data transfer and distribution system.

CAN:

The Controller Area Network is a two-wire bus system. The wires are referred to as bus wires. Data is transferred serially to the connected control units by way of the bus wires.

The control units communicate via the bus system, i.e. they exchange data by means of the bus system.

Notes:

- The operating and display unit -E87 with part number 4D0 820 043 from index "M" onwards is configured for the bus system.
- "CAN bus" is the term used to describe a data transfer and distribution system.
- In the bus system, the data is transmitted via the data wires "CAN-H" and "CAN-L" simultaneously (two-wire bus system). These wires are twisted together and screened against the other wires in order to minimise interference from other systems.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Various control units are connected to the bus system depending on the vehicle equipment level.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- The wires between the control units along which data is transmitted are referred to as signal wires.
- The data is transferred via these data lines serially (i.e. in sequence) to the connected control units. The data cannot be checked by workshop means.
- Data is transmitted and received by the various control units at regular intervals in the form of telegrams. The interval between two telegrams transmitted by a control unit depends on the priority rating of the data transmitted and is between 0.01 and 0.2 s.

- A fault is stored in the fault memory if a connected control unit does not receive any information within a specified time or if the data telegrams received cannot be evaluated.
- The reception of data is displayed in the measured value block, Display group 012 =>Page 58 .
- If a control unit cannot provide the data requested (or only a certain item of information) due to a component fault, transmission of the data telegram is accompanied by a fault message requesting readout of the fault memory in this control unit.

Example:

The ambient temperature sensor -G17 is not connected. The dash panel insert cannot, therefore, transmit the value measured by this sensor in its data telegram.

The dash panel insert stores this fault and inserts a fault message in its data telegram in place of the measured value.

The operating and display unit -E87 detects the fault message when it evaluates the telegram and stores the information "Dash panel insert, please interrogate fault memory" in the fault memory.

9.3 - Checking bus system if "Drive train data bus defective" fault occurs

Notes:

- If the connector is unplugged from a control unit connected to the bus system and the ignition is then switched on, a fault may be entered in the other control units connected to the bus system. The same applies if the power supply is interrupted, for example, by removing a fuse.
- The current flow diagram can be used to determine how many control units are connected to the bus system.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Connect fault reader V.A.G 1551 (V.A.G 1552) => Workshop Manual, Page 01-7.
- Switch on ignition.

-> Indicated on display:

```
Rapid data transfer     HELP
Enter address word XX
```

- Press 0 key twice for "Automatic test sequence" function and confirm entry with Q key.

- Use "Automatic test sequence" function to check all control units for "Drive train data bus defective" fault.

The fault is only displayed by the operating and display unit -E87 of the air conditioner:

- Check for open circuit and resistance along data wires to -E87.

  Resistance: max. 1.5 ohms

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Note:

Pay particular attention to possible loose contacts in wires and connectors.

If no fault can be found, the fault is located in the -E87.

This fault is displayed in another control unit:

- Check for open circuits, resistance, and mutual short circuits, and shorts to earth/positive in the data wires and screening between the various control units connected to the bus system.

  Resistance: max. 1.5 ohms

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Notes:

- Pay particular attention to possible loose contacts in wires and connectors.
- If this fault is not displayed for all connected control units, the cause of the trouble may be an open circuit at a connection point in the wiring.

If no fault can be detected and this fault is displayed at all control units connected to the bus system, there is a fault in one of the connected control units.

- Disconnect all control units (except dash panel insert and engine control unit) from bus system.
- Erase fault memory of dash panel insert.

=> Electrical System; Repair Group 01

- Interrogate fault memory of dash panel insert.

=> Electrical System; Repair Group 01

If the "Drive train data bus defective" fault is then no longer displayed, the fault is located in one of the disconnected control units.

- Reconnect various control units in sequence.
- Interrogate fault memory after connecting each control unit.
- Replace control unit for which "Drive train data bus defective" fault is displayed again.

If the "Drive train data bus defective" fault continues to be displayed, there is a fault in the dash panel insert or in the engine control unit.

- Disconnect engine control unit and connect operating and display unit -E87.
- Interrogate fault memory of dash panel insert again.

Note:

Disconnecting the engine control unit and connecting the operating and display unit -E87 allows the defective control unit to be determined.

9.4 - Checking bus system if "No communication" fault occurs

Notes:

- If the connector is unplugged from a control unit connected to the bus system and the ignition is then switched on, a fault may be entered in the other control units connected to the bus system. The same applies if the power supply is interrupted, for example, by removing a fuse.
- The "No communication" fault may be displayed by the operating and display unit -E87 for the connection between the dash panel insert and engine control unit.

- Connect fault reader V.A.G 1551 (V.A.G 1552) => Workshop Manual, Page 01-7.
- Switch on ignition.

-> Indicated on display:

```
Rapid data transfer     HELP
Enter address word XX
```

- Press 0 key twice for "Automatic test sequence" function and confirm entry with Q key.
- Use "Automatic test sequence" function to check all control units for "No communication" fault.

The fault is only displayed by the operating and display unit -E87 of the air conditioner:

- Check for open circuit and resistance along data wires to -E87.

  Resistance: max. 1.5 ohms

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Notes:

- Pay particular attention to possible loose contacts in wires and connectors.
- If this fault is displayed simultaneously for the connection to the engine control unit and to the dash panel insert, the fault is located along the wiring to the -E87 or in the -E87.

If no fault can be found along the wiring, the fault is located in the -E87.

This fault is displayed in another control unit:

- Interrogate fault memory of control unit with which -E87 cannot exchange data.
- If different fault or additional faults are stored in control unit with which other control units cannot exchange data, eliminate these faults before checking bus wiring system.

- Check part number together with associated index of control unit with which no communication is possible.

=> Parts List

Notes:

- If there is a fault in a control unit, problems may be encountered when data is exchanged with other control units although the fault does not directly affect the bus system.
- A number of control units are only configured for communication in the bus system from a certain part number onwards.
- An open circuit in the power supply or in the earth connection to a control unit connected to the bus system may cause this fault to be stored.

- Check for open circuits or resistance in the data wires and screening between the various control units connected to the bus system.

  Resistance: max. 1.5 ohms

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Check for open circuits and resistance in the power supply to the various control units connected to the bus system.

Notes:

- Pay particular attention to possible loose contacts in wires and connectors.
- This fault is only displayed for the control units which expect to receive a certain telegram from a different control unit and, consequently, cannot evaluate or do not detect this telegram.

The fault is also stored if the fault cannot be detected but is displayed at a different control unit.

- The control unit with which the other control units cannot communicate should be replaced first.

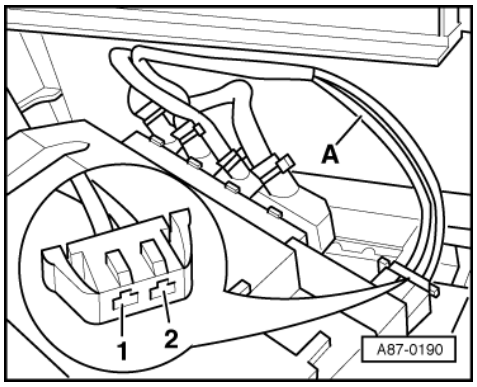
10 - Electrical test on heated rear window

10.1 - Electrical test on heated rear window

Measuring instruments and testers required

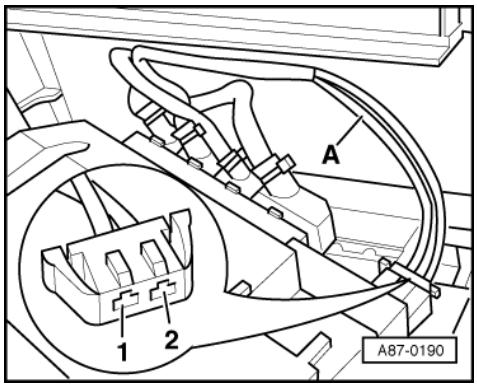
- Multimeter V.A.G 1715 (with current probe)
- Adapter set V.A.G 1594

Test requirements



All fuses OK as per current flow diagram

- Switch off ignition.
- Remove operating and display unit -E87 (=> Page 152).
- -> Unplug connector -F- from operating and display unit -E87.
- Switch on ignition.
- Measure voltage between contact 1 and 2 (specification: approx. battery voltage).
- Switch off ignition.
- Plug connector -F- into -E87.



- -> Guide wire -A- to connector -E- through current probe of V.A.G 1715.

Note:

All connectors must be plugged in at the -E87.

- Select "Current measurement by current probe" function at V.A.G 1715.
- Start engine.
- Switch on heated rear window at -E87 (indicator lamp in button lights up).

Display on V.A.G 1715 changes from approx. 0 A to less than 25 A.

After approx. 10 minutes, the display changes from less than 25 A to approx. 0 A (indicator lamp in button goes out).

Notes:

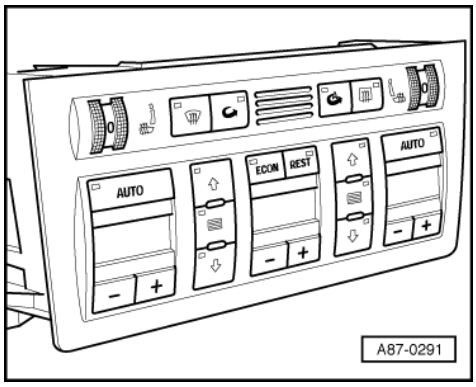
- Stray current on the current probe may cause a low current reading when the heated rear window is switched off.

- At ambient temperatures above 0° C, the -E87 switches off the heated rear window automatically after approx. 12 minutes.
- In the case of operating and display units with part numbers from index "B", "C", "F" and "G" and software version "D55" onwards, the heated rear window remains switched on at ambient temperatures less than 0° C until the ignition is switched off (it can be switched off manually at any time). If the temperature during a driving period increases to above 0°C, the heated rear window is switched off when the operating time stored in the -E87 (approx. 12 minutes) has elapsed. Gradual conversion (standard feature as of 08.97).

11 - Heated windscreen

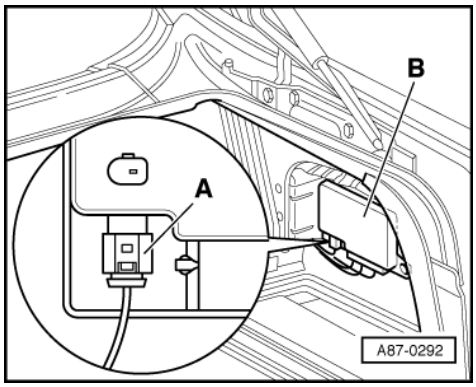
11.1 - Heated windscreen

11.2 - Functional description of heated windscreen



- -> The heated windscreen control unit -J505 is actuated by the operating and display unit -E87 (=>Read measured value block, Display group 019, Page 65):

- After every engine cold-start if the ambient temperature is less than + 5°C and "Auto" mode is set on the operating and display unit -E87. The temperature at the -E87 must be set so that the air conditioner is in heating mode, and neither of the two vent temperature senders (-G150, -G151) should measure more than + 35°C. The heating period lasts up to 4 minutes, depending on the ambient temperature.
- When "Defrost" mode is selected on the -E87 if the ambient temperature is less than + 5° C. The heating period lasts between 2 and 4 minutes, depending on the ambient temperature. The indicator lamp in the "Defrost" button flashes while the heated windscreen is switched on. The heated windscreen is only actuated when the engine is running.



- -> The heated windscreen control unit -J505 -B- switches on the windscreen heating if the following conditions are met.

- The operating and display unit -E87 activates the -J505.
- The voltage at the control unit -J505 is greater than 12.70 V.
- The control unit -J505 is not overheated.

- The electrical resistance of the metal foil in the heated windscreen -Z2 is approx. 2 ohms. To enable the heated windscreen to attain the maximum possible heating power of approx. 1000 W (Watts), a voltage greater than the vehicle electrical system voltage is required. The heated windscreen control unit -J505 converts the vehicle voltage into a variable voltage which, depending on the vehicle voltage, is between 25 and 48 V.
- To prevent the vehicle electrical system from being overloaded, the -J505 regulates the heating power of the heated windscreen. At a vehicle voltage of 12.70 V the heating power is approx. 200 W, and it is regulated steplessly up to 1000 W at 13.10 V. To prevent the vehicle voltage from collapsing when the heated wind-

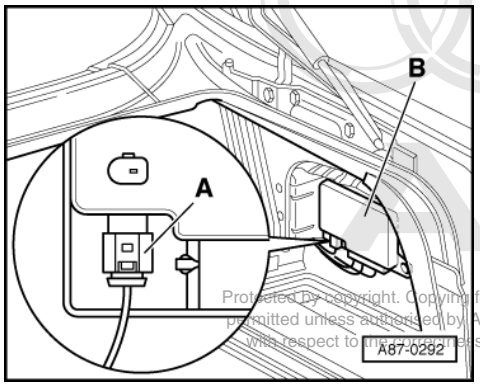
screen is switched on, the -J505 permits the specified power output to rise by a maximum of 200 W per second.

- During activation of the heated windscreen the voltage at the fresh air blower -V2 is limited by the operating and display unit -E87 (to approx. 4V in "Auto" mode and to approx. 7V in "Defrost" mode).

11.3 - Disabling heated windscreen

Notes:

- If a crack develops in the windscreen as a result of some external impact such as a stone chip, the heated windscreen is disabled to prevent the crack from growing.



- The operating and display unit -E87 does not activate the heated windscreen control unit -J505 in "Econ" mode.
- -> So as not to restrict the functioning of the air conditioner, the heated windscreen control unit -J505 must be disabled until a damaged heated windscreen -Z2 is replaced. To do so, unplug connector -A- from the control unit -B-.

87 - Air conditioning

1 - Safety measures when working on vehicles with air conditioner and for handling refrigerant

1.1 - Safety measures when working on vehicles with air conditioner and for handling refrigerant

The assemblies and the piping of the air conditioning system are filled with the following refrigerant::

1,1,1,2 tetrafluoroethane (CF3-CH2F or CH2F-CF3)

This refrigerant is currently marketed in Germany as R134a, H-FKW 134a, SUVA 134a and KLEA 134a (trade names may vary in other countries).

Safety measures

The following safety measures are to be taken in Germany for this refrigerant (additional regulations may apply in other countries).

The refrigerant circuit is to be drained first, should repair work require the refrigerant circuit to be opened (=> Page 93). In doing so, the utmost care is to be taken to avoid contact with liquid refrigerant or refrigerant vapours. Should refrigerant nevertheless escape, be sure not to inhale the resultant refrigerant/air mixture.

Extraction systems are therefore to be switched on and use made of both rubber gloves and protective goggles.

Explanation:

Intensive exposure to refrigerant on unprotected parts of the body will result in frostbite.

Attention:
Keep an eye bath to hand.
Should liquid refrigerant come into contact with the eyes, rinse eyes thoroughly in water for approx. 15 minutes.
Then apply eye drops and consult a doctor immediately even if no pain is felt.
Always inform doctor of the type of refrigerant involved.

Should refrigerant come into contact with other parts of the body despite compliance with all the pertinent safety measures, these are similarly to be rinsed thoroughly in cold water without delay for at least 15 minutes.

Although refrigerant does not represent a fire hazard, smoking, welding, soldering and brazing are not permitted in areas exposed to refrigerant.

Explanation:

The high temperature of a naked flame or hot objects causes decomposition of refrigerant gas. Inhalation of the resultant toxic decomposition products leads to dry coughing and nausea.

Draining refrigerant circuit

Refrigerant is never to be allowed to escape into the atmosphere, but rather it is to be extracted from the refrigerant circuit using an extractor or service station. The refrigerant removed is then either to be re-processed on site or returned to the manufacturer for proper disposal (different or additional regulations may apply in other countries). Vehicles are therefore to be sent to a specialist VW/Audi air conditioner workshop, which will have the necessary equipment.

Explanation:

Should it escape into the earth's atmosphere, refrigerant R134a will have a detrimental effect in terms of global warming.

Notes:

- Refrigerant R134a has far less of a greenhouse effect than R12.
- Refrigerant R134a does not affect the earth's ozone layer (R134a is an H-FC with no chlorine atoms). Depletion of the ozone layer in the upper atmosphere is however only brought about by the splitting of carbon-chlorine bonds (as is the case, for example, with refrigerant R12).

When the air conditioner has been drained, disconnect the power supply to the air conditioning system magnetic coupling -N25 (e.g. unplug the connector from the air conditioner low-pressure switch -F73 or from the air conditioner pressure switch -F129).

Explanation:

Interruption of the power supply prevents inadvertent switch-on of the compressor with an empty refrigerant circuit.

Working on refrigerant circuit

Work on refrigerant circuit is only to be carried out in well ventilated areas where there are no inspection pits, shafts or cellar entrances within a radius of 5 metres. Extraction systems are to be switched on.

Explanation:

The refrigerant emerging is not only colourless and odourless, but also heavier than air and thus displaces oxygen. Should refrigerant gas nevertheless escape, this can result in animperceptible danger of asphyxiation in poorly ventilated areas and inspection pits.

Note:

The mixture of gas and air which forms when refrigerant gas escapes must not be inhaled. Use is to be made of suitable workshop extractors.

Welding, brazing and soldering are not permitted on sections of the air conditioner when filled. This likewise applies to vehicle welding and soldering work if there is a danger of air conditioner components becoming warm.

Explanation:

Exposure to heat creates considerable pressure in the system, which could cause it to burst.

Remedy:

Drain refrigerant circuit (=>Page 93).

Note:

Damaged or leaking parts of the air conditioner are never to be repaired by welding or soldering them; they are always to be replaced.

When servicing the air conditioner, all open components and pipe connections must be immediately re-sealed.

Explanation:

Moisture will penetrate the air conditioner components if they are left open for a lengthy period. If this is the case, system parts will have to be replaced before the air conditioner can be re-filled.

Painting work on vehicles with air conditioner

When performing paintwork repairs, object temperatures of 80 °C are not to be exceeded in drying booths or their pre-heating areas.

Explanation:

Exposure to heat creates considerable pressure in the system, which could cause it to burst.

2 - Notes on general repairs

2.1 - Notes on general repairs

The refrigerant circuit of the air conditioner is only to be drained and opened if this is required by the pertinent safety measures (=> Page 93).

The air conditioner refrigerant circuit is not to be opened when performing all other standard vehicle repair operations.

Service work which can be performed on the heater and air conditioner without opening the refrigerant circuit is described in this Workshop Manual on => Page 96 onwards.

Note:

The connections for the switches mentioned in this Workshop Manual have a valve. This valve closes automatically when the switches are removed. These switches can thus be replaced in any Audi/VW workshop without draining the refrigerant circuit.

Air conditioner servicing work which involves draining the refrigerant circuit and can thus not be carried out in every VW/Audi workshop, is described on => Page 190 onwards (vehicle is to be sent to specialist VW/Audi air conditioner workshop for drainage of the refrigerant circuit).

2.2 - Contact corrosion

Contact corrosion can occur if use is made of unsuitable connecting elements (bolts, nuts, washers...).

For this reason, only connecting elements with a special surface coating are fitted. These elements can be recognised by their greenish colour.

Moreover, rubber components, plastic components and adhesives are made of non-conductive material.

Always fit new components in cases of doubt about re-use.

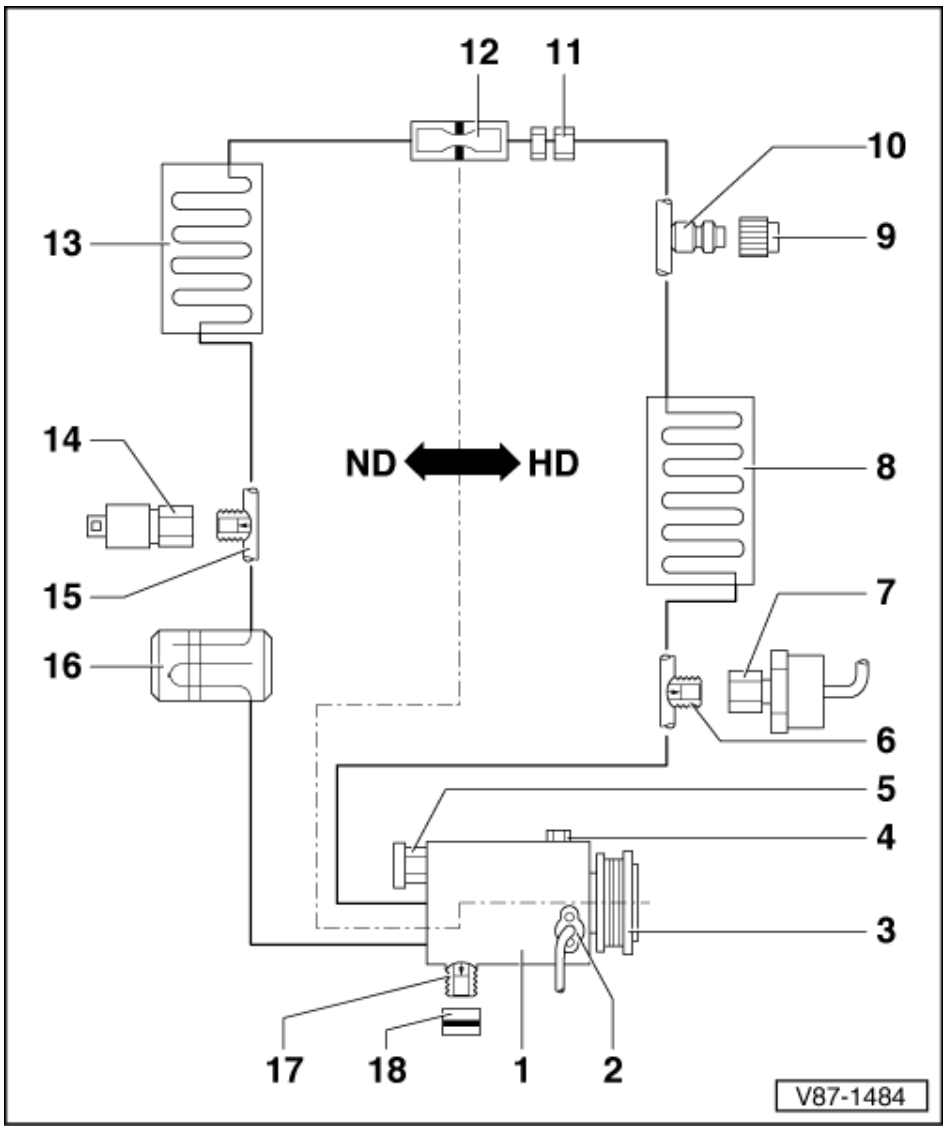
Attention:
- **Only use genuine Audi A8 parts.**
- **Accessories must have been released by Audi AG.**
- **Damage caused by contact corrosion is not covered by warranty.**

3 - Servicing work on refrigerant circuit

3.1 - Servicing work on refrigerant circuit

Notes:

- Servicing work on refrigerant circuit => Page 190 onwards.
- All parts/operations marked 1)can be serviced and replaced/performed in any VW/Audi workshop (work not involving refrigerant circuit).
- All parts of the refrigerant circuit not marked 1)as well as all refrigerant hoses and pipes can only be serviced/ replaced in a specialist VW/Audi air conditioner workshop.
- A "Denso" compressor was gradually introduced in model year 1996 (starting with vehicles with 8-cyl. engine). This compressor does not have the air conditioner compressor speed sender -G111. If the compressor is not running smoothly, the magnetic coupling is switched off by means of an overheating cut-out in the magnetic coil of the magnetic coupling.
- The compressor manufacturer "Nippondenso" has changed its name to "Denso".



HD = High-pressure end

ND = Low-pressure end

1 Compressor

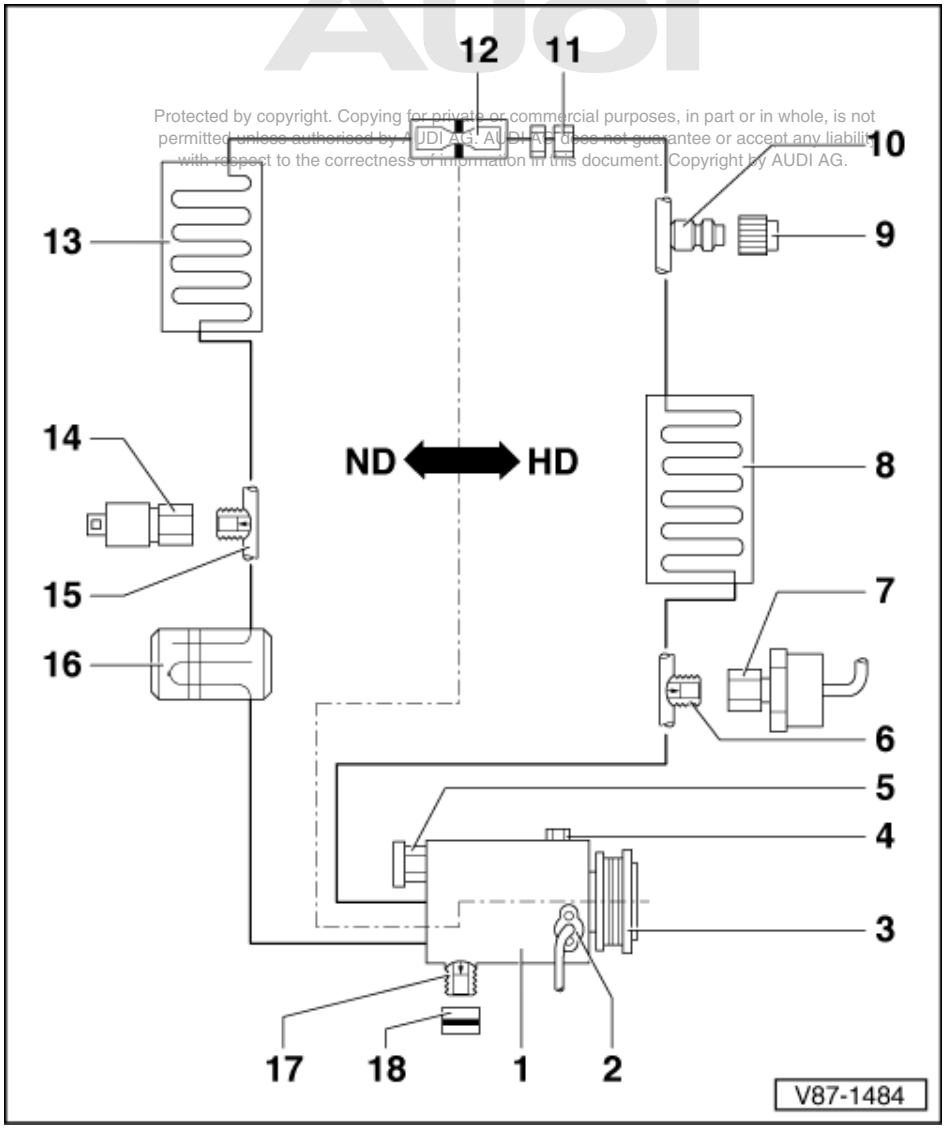
- Detaching and reattaching compressor from/to bracket:
- 6-cyl. petrol engines => Page 106
- 6-cyl. TDI engines => Page 109
- 8-cyl. engines => Page 109
- 12-cyl. engine => Page 111
- Removing and installing ribbed belt

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

- Ribbed belt assignment:

=> Parts List

- On installing refrigerant pipes and corresponding holder, make sure there is adequate distance between belt, holder and pulley



2 Air conditioner compressor speed sender -G111

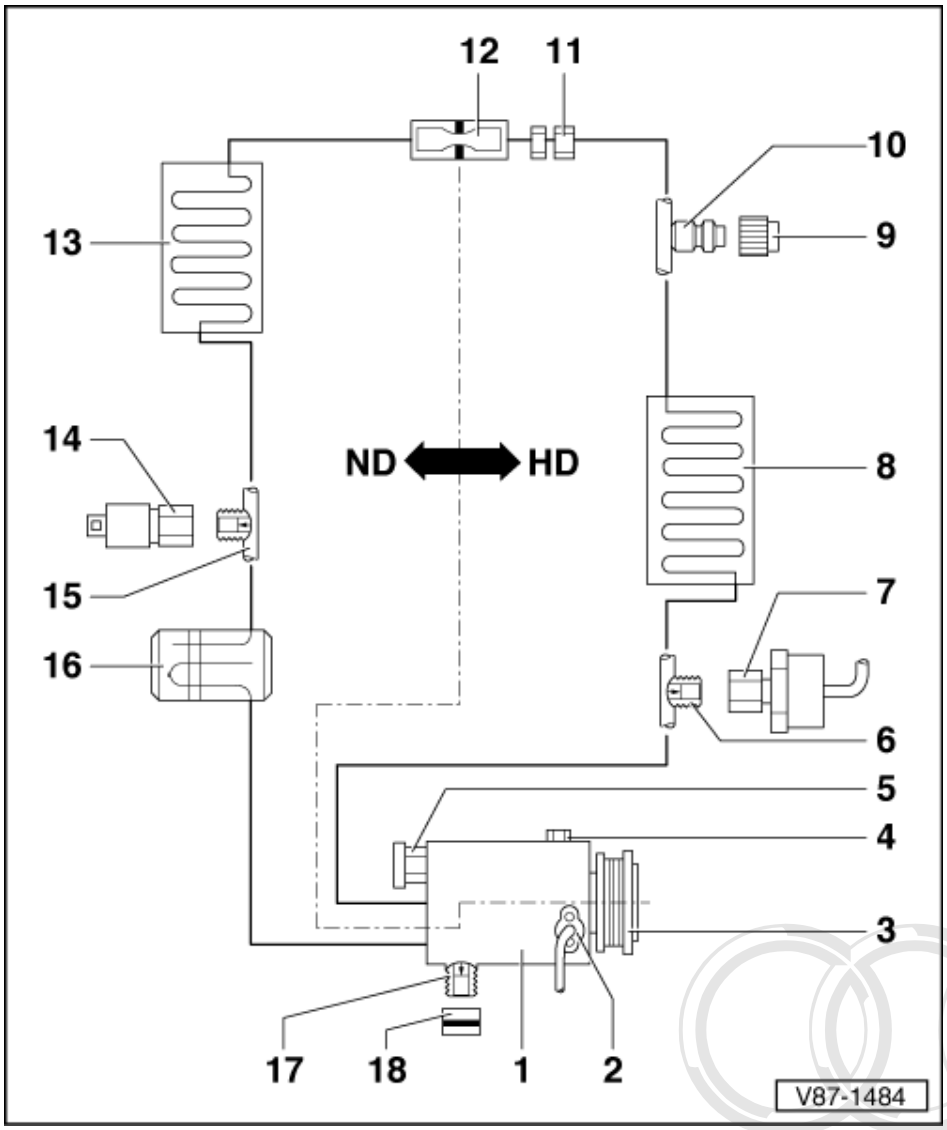
- Not installed if Denso compressor fitted

3 Air conditioning system magnetic coupling -N25 1)

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Servicing=>from Page 112 onwards

4 Oil drain plug
5 Pressure relief valve
6 Connection with valve
7 High-pressure switch for air conditioner -F23 and for magnetic coupling -F118 1)
- Vehicles with -E87 up to part number index "H"
- Functional description, removing and installing => Page 101

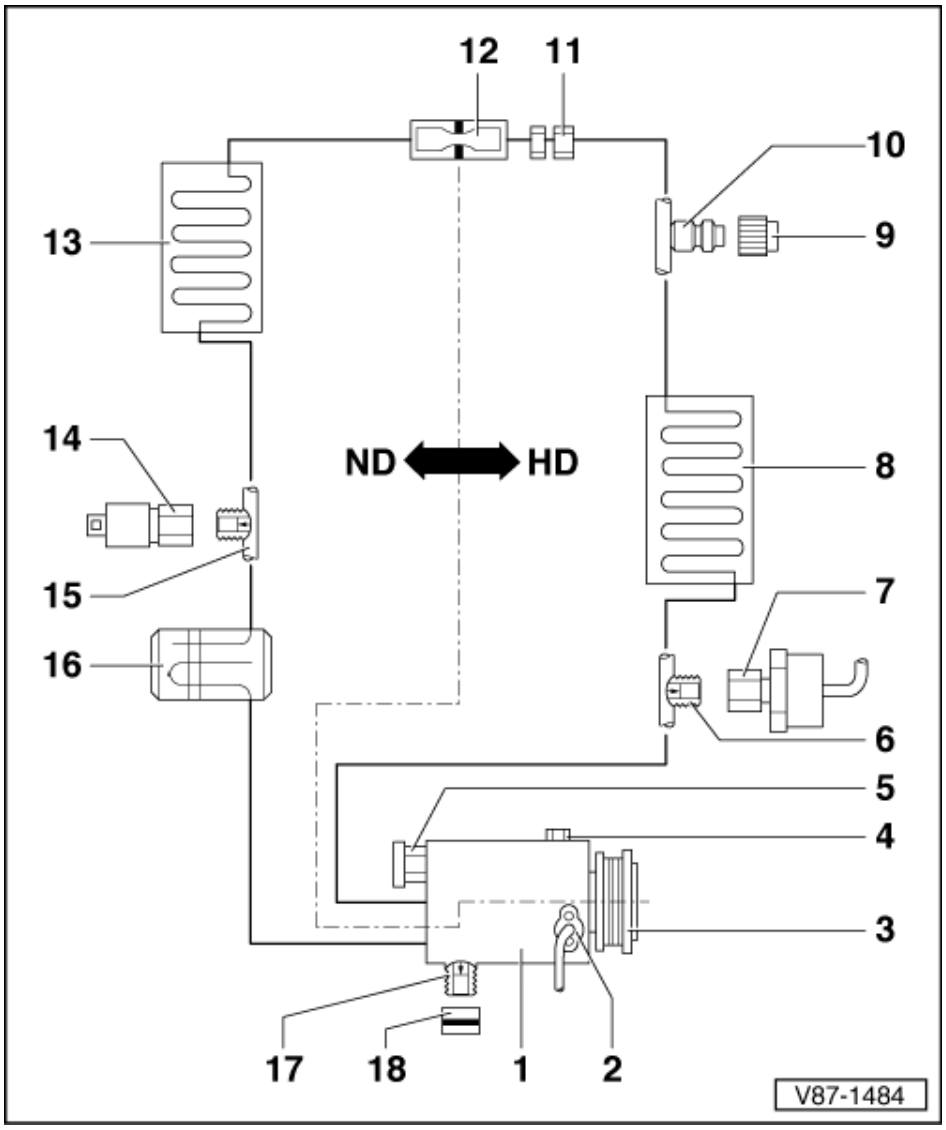


7 - Air conditioner pressure switch -F129
- Vehicles with -E87 from part number index "J" onwards
- Functional description, removing and installing => Page 102

8 Condenser
9 Cap
- With seal
- Always to be screwed on

10 Service connection
- For measurement, drainage and filling at specialist VW/Audi air conditioner workshops

11 Union in refrigerant pipe
12 Restrictor



13 Evaporator

14 Low-pressure switch for air conditioner -F73 1)

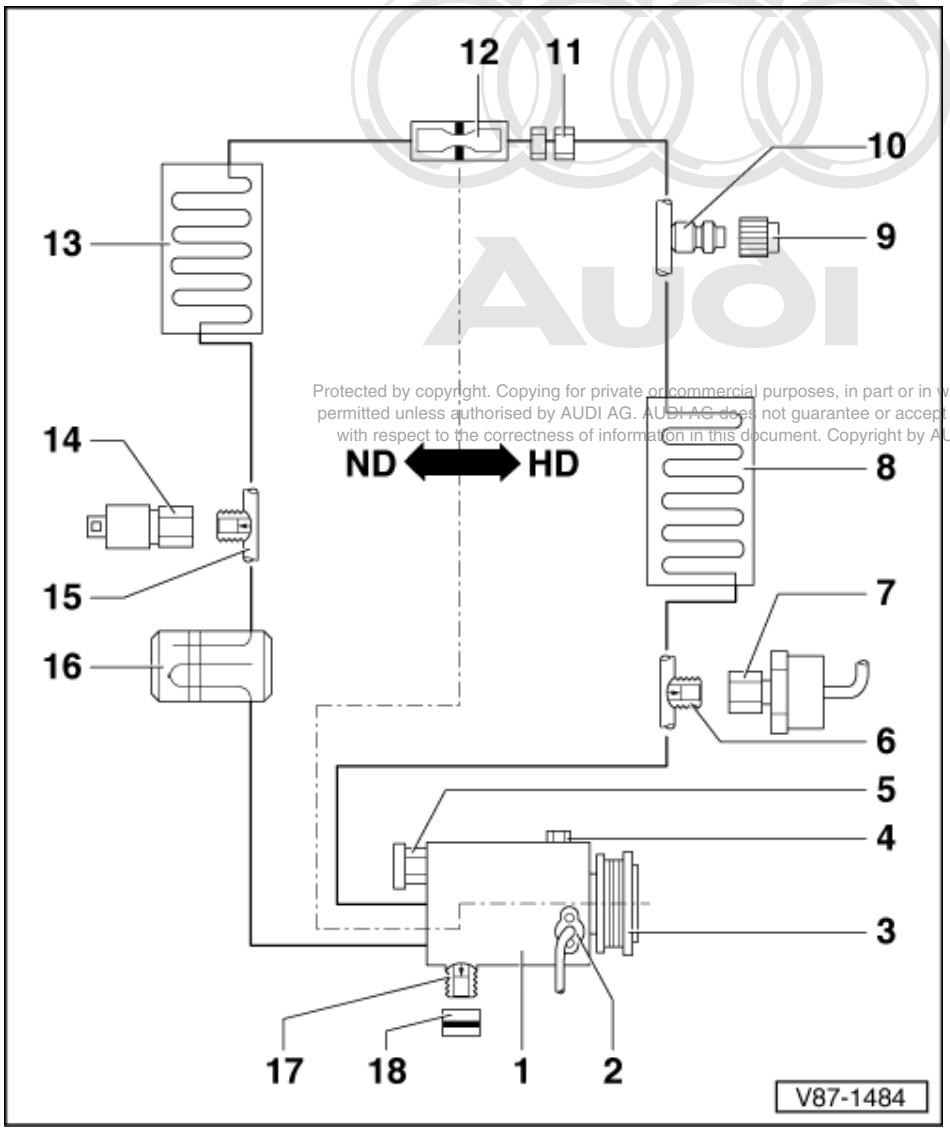
- Only vehicles with -E87 up to part number index "H"
- Not required if air conditioner pressure switch -F129 is used
- Functional description, removing and installing => Page 104

15 Connection with valve

- Vehicles without low-pressure switch for air conditioner -F73: Cap with seal must be screwed onto connection for this switch

Note:

Following the decision to no longer install the low-pressure switch -F73, approx. 300 vehicles were built in October/November 1997 without this connection.



16 Reservoir

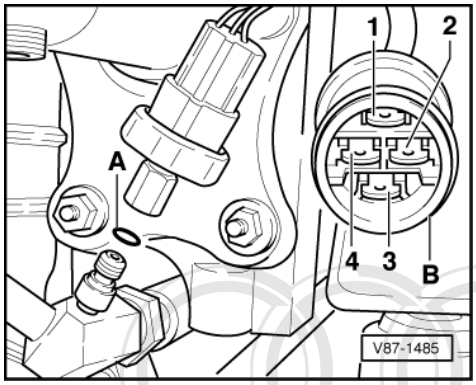
17 Connection with valve

- Zexel compressor only

18 Cap

- With seal
- Always to be screwed on

3.2 - High-pressure switch for air conditioner -F23 and for magnetic coupling -F118



- -> The high-pressure switch for air conditioner -F23 switches the radiator fan -V7 to speed 2 via contact -1- and -2-.

High-pressure switch -F23	Switching pressure (in bar)	Function
Closes at	14.3 ... 17.3 bar	Fan ON
Opens at	10.9 ... 15.3 bar	Fan OFF

Pressure difference between switching points 2.0 ... 3.4 bar

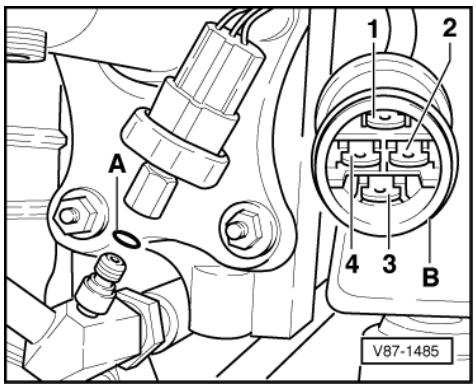
- The high-pressure switch for magnetic coupling -F118 switches off the compressor via contact -3- and -4- (via the operating and display unit -E87) if positive pressure exists in the refrigerant circuit.

High-pressure switch -F118	Switching pressure (in bar)	Function
Opens at	28.2 ... 31.0 bar	Compressor OFF
Closes at	11.5 ... 15.0 bar	Compressor ON

Removing

- Remove front bumper:

=> General Body Repairs, Exterior; Repair Group 63



- -> Unplug connector -B-.
- Screw out switch; refrigerant circuit remains closed (valve).

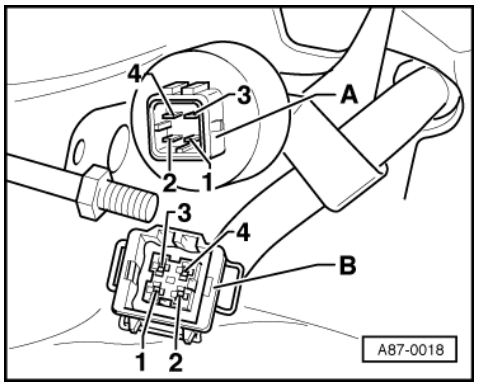
Installing

- Replace O-ring -A- => Page 105 .

- Tighten switch to 5 Nm.

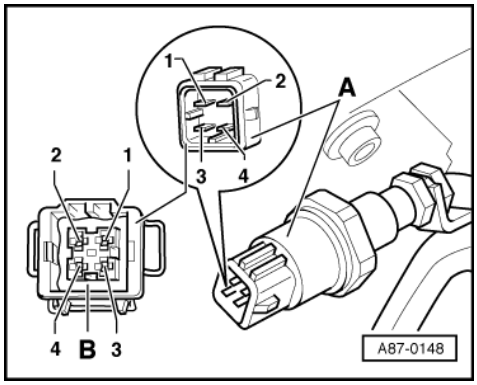
Notes:

- To test the cooling capacity, connect the removed switch to the wiring harness.



- -> Different versions are installed (with and without cabling).

3.3 - Air conditioner pressure switch -F129



- -> The low-pressure/high-pressure switch (between contacts -1- and -2-) switches off the compressor (via the operating and display unit -E87) if positive or negative pressure exists in the refrigerant circuit.

Switch	Switching pressure (in bar)	Function
Low-pressure switch, contacts 1 and 2		
Opens below	1.2 bar	Compressor OFF
Closes above	1.8 bar	Compressor ON
High-pressure switch, contacts 1 and 2		
Opens above	30 bar	Compressor OFF
Closes below	14.5 bar	Compressor ON

- The high-pressure switch (switch between contacts 3 and 4) switches the radiator fan -V7 to speed 2.

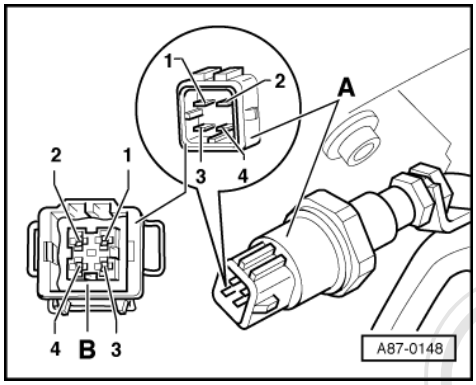
Switch	Switching pressure (in bar)	Function
High-pressure switch, contacts 3 and 4		
Closes at	16.0 bar	Fan ON
Opens at	12.5 bar	Fan OFF

Checking operation

- Start engine.

- Switch on compressor (set "Auto" mode at operating and display unit).

If compressor is driven:



- -> Unplug connector -B-.
  - Compressor stops running (low-pressure switch open)
- Remove switch -A- and plug in connector.
  - Compressor is not switched on (low-pressure switch open)

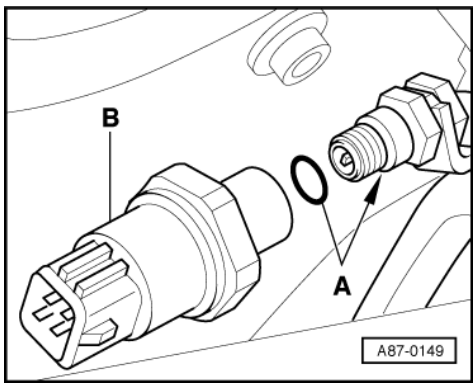
If compressor is not driven:

- Unplug connector -B- and jumper contacts 1 and 2 in connector.
  - Compressor is switched on

Notes:

- If the compressor is switched on when the contacts are jumpered, either the pressure in the refrigerant circuit is too low (refrigerant circuit empty) or the switch is defective.
- The pressure in the refrigerant circuit can only be checked at a specialist VW/Audi air conditioner workshop.
- If the compressor is not switched on and the switch -F129 is displayed in the measured value block as the compressor shut-off condition, locate and eliminate the open circuit along the wiring between the switch -F129 and the operating and display unit -E87 =>Page 79 .

Removing

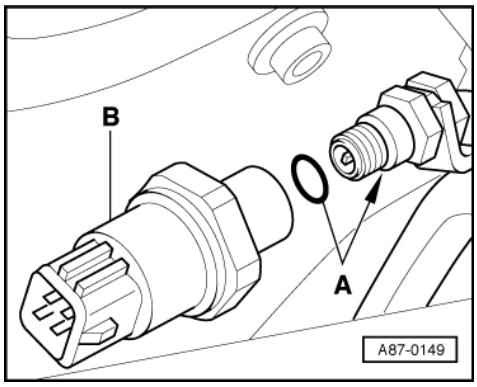


- Remove front bumper:

=> General Body Repairs, Exterior; Repair Group 63

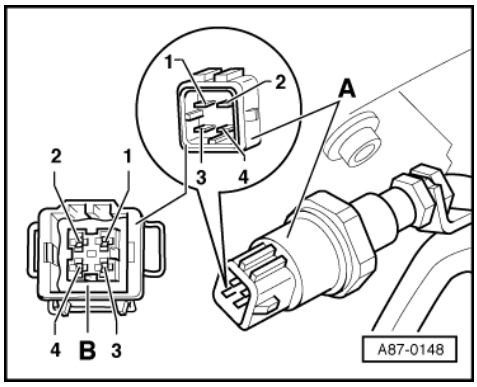
- Unplug connector.
- -> Screw out switch -B- ; refrigerant circuit remains closed (valve).

Installing



- -> Replace O-ring -A- => Page 105 .
- Tighten switch to 5 Nm.

Note:



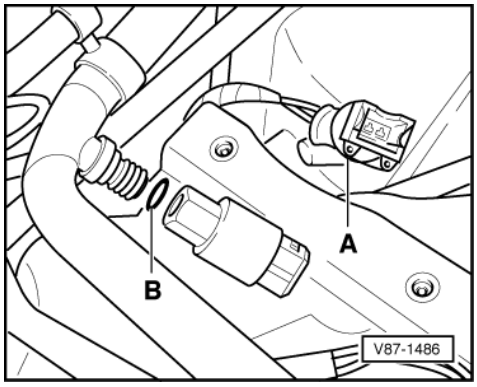
-> To test the cooling capacity, remove the switch and jumper contacts -1- and -2- of the connector -B-.

3.4 - Low-pressure switch for air conditioner -F73

- The low-pressure switch switches off the compressor if negative pressure exists in the refrigerant circuit.

Low-pressure switch -F73	Switching pressure (in bar)	Function
Opens at	1.45 ... 1.60 bar	Compressor OFF
Closes at	2.9 ... 3.4 bar	Compressor ON

Removing



- -> Unplug connector -A-.
- Screw out switch; refrigerant circuit remains closed (valve).

Installing

- Replace O-ring -B- => Page 105 .
- Tighten switch to 5 Nm.

Notes:

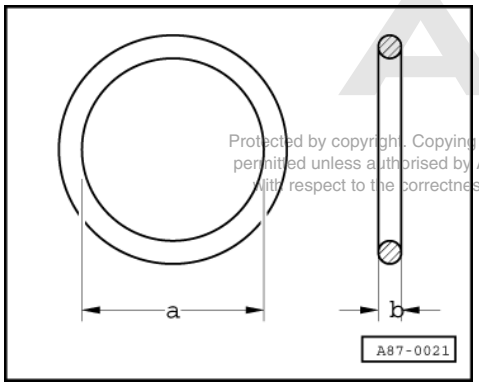
- To test the cooling capacity, remove the switch and jumper the contacts in connector -A-.
- Vehicles without switch -F73: The connection must be sealed off with a cap with seal.

3.5 - O-rings for refrigerant circuit

- Only to be used once; always replace.
- Moisten with refrigerant oil before fitting.
- Pay attention to correct positioning on pipe/in groove.
- Ensure cleanliness when working.

Notes:

- Only O-rings resistant to the refrigerant R134a and the associated refrigerant oil may be fitted. These O-rings are colour-coded to prevent incorrect use (currently "red", "purple" or "violet"):



=> Parts List

- In addition to the colour-coded O-rings, use is also made at the factory of black O-rings for certain connections.
- -> Dimensions-a- and -b- differ depending on the fitting location of the O-ring:

=> Parts List

4 - Detaching and reattaching compressor from/to bracket, removing and installing compressor bracket

4.1 - Detaching and reattaching compressor from/to bracket, removing and installing compressor bracket

Notes:

- The compressor bracket can be removed and installed without opening the refrigerant pipes.
- Do not drain the refrigerant circuit; do not detach the refrigerant hoses and pipes from the compressor.
- After detaching the compressor, secure it to the longitudinal member (e.g. using a length of wire). Never leave the compressor hanging from the refrigerant pipes.

- Before removing the compressor, mark the running direction of the ribbed belt with chalk or a felt-tip pen. Running a used belt in the opposite direction could destroy it.

4.2 - 6-cylinder petrol engines

Removing and installing compressor bracket

Notes:

- Different ribbed belts are used for the Zexel and Denso compressors. Assignment:

=> Parts List

- To protect the O-rings against heat radiating from the exhaust manifold, heat insulation matting must be fitted at the refrigerant pipes. Part number:

=> Parts List

- Pay attention to notes => Page 105 .
- Remove noise insulation:

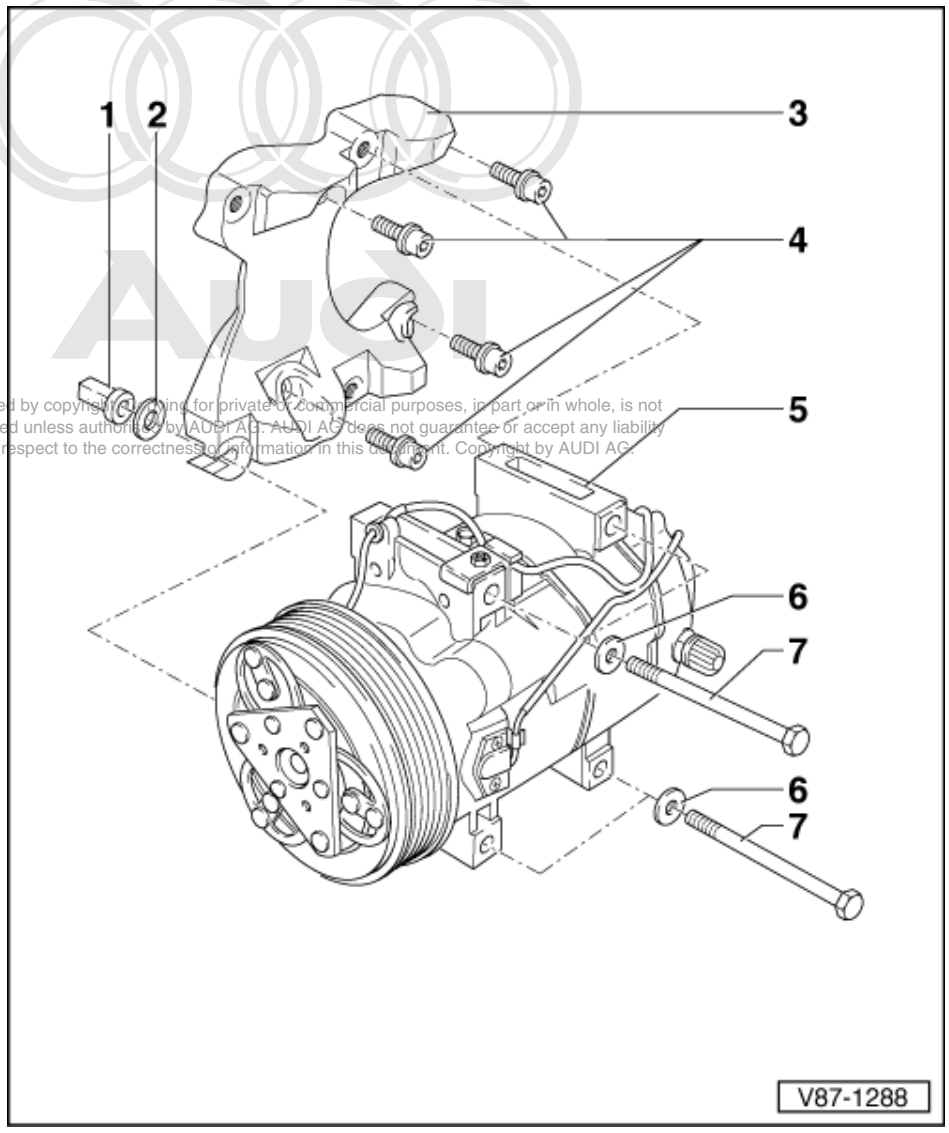
=> General Body Repairs, Exterior; Repair Group 50

- Remove oil filter. Protect sealing surfaces against damage:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 17

- Slacken off ribbed belt:

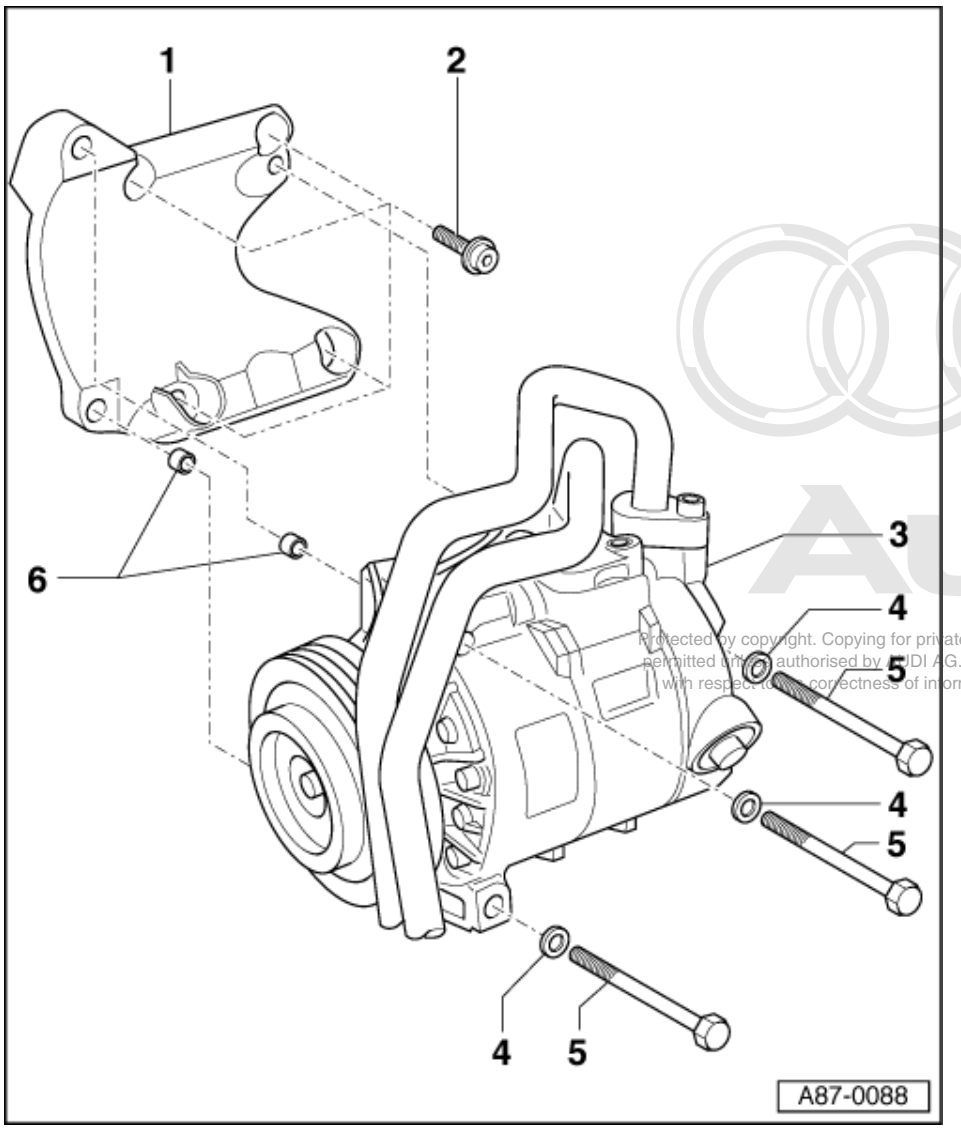
=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13



Zexel compressor

1 Nut
2 Washer
3 Compressor bracket
4 Hexagon socket-head bolt - 25 Nm
- With washer

5 Compressor with magnetic coupling
6 Washer
7 Hexagon bolt - 25 Nm



Denso compressor

1 Compressor bracket
2 Hexagon socket-head bolt - 25 Nm
- With washer

3 Compressor with magnetic coupling
4 Washer
5 Bolt - 25 Nm
6 Centring sleeve

Note:

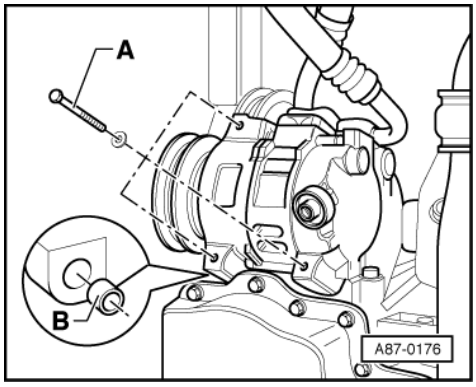
Detaching refrigerant pipes from compressor=>Page 206 .

4.3 - 6-cylinder TDI engines

Removing

- Slacken off ribbed belt:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13



- -> Screw out bolts -A-.

Installing

- When installing compressor, make sure that both centring sleeves -B- are fitted correctly.
- Tighten bolts -A- to 20 Nm.

Note:

Detaching refrigerant pipes from compressor => Page 206 .

4.4 - 8-cylinder engines

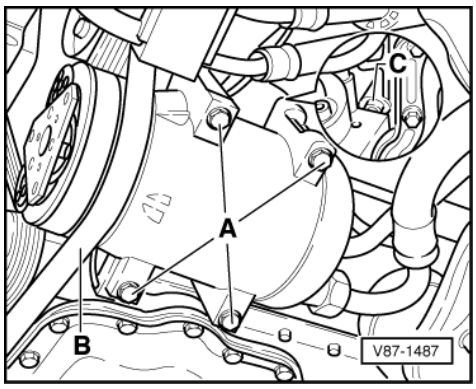
Detaching and reattaching compressor from/to bracket

- Pay attention to notes => Page 105 .
- Remove noise insulation:

=> General Body Repairs, Exterior; Repair Group 50

Zexel compressor

Removing



- -> Slacken off ribbed belt -B-:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

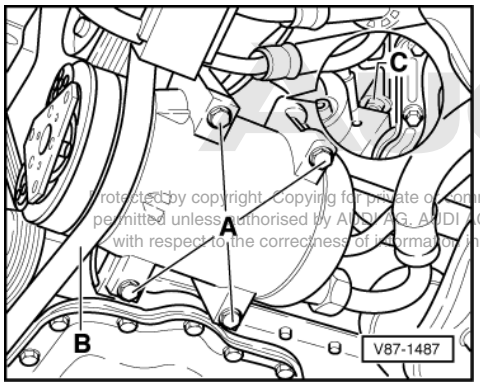
- Remove bracket for compressor and power steering pump:

=> Running Gear, Front-wheel Drive and Four-wheel Drive; Repair Group 42

Note:

The bracket for the air conditioner compressor and power steering pump can be removed and installed without opening the refrigerant circuit.

Installing



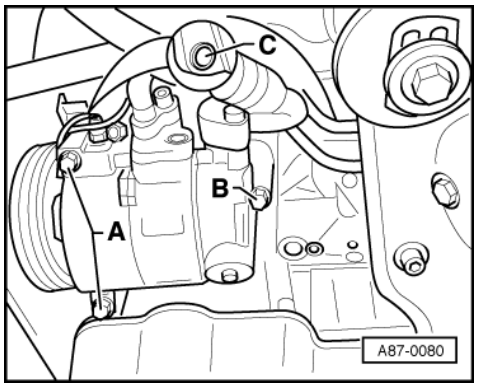
- -> When installing compressor, make sure that centring sleeves -C- are fitted correctly.
- Tighten bolts -A- to 20 Nm.
- Make sure that cabling to air conditioner compressor speed sender -G111 and to air conditioning system magnetic coupling -N25 is installed correctly.

Denso compressor

Removing

- Slacken off ribbed belt:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13



- -> Screw out bolts -A- and -B-.

Installing

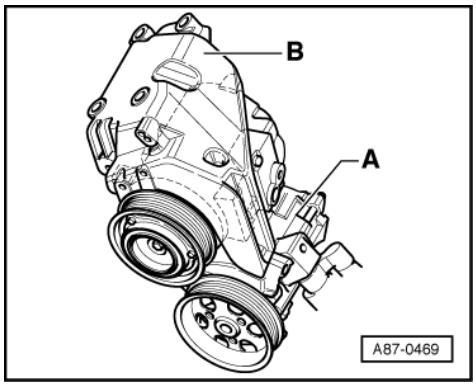
- When installing compressor, make sure that centring sleeves -C- are fitted correctly.
- Tighten bolts -A- and -B- to 25 Nm.

Note:

Detaching refrigerant pipes from compressor => Page 206 .

4.5 - 12-cylinder engine

Detaching and reattaching compressor from/to bracket



- Pay attention to notes => Page 105 .
- Remove noise insulation:

=> General Body Repairs, Exterior; Repair Group 50

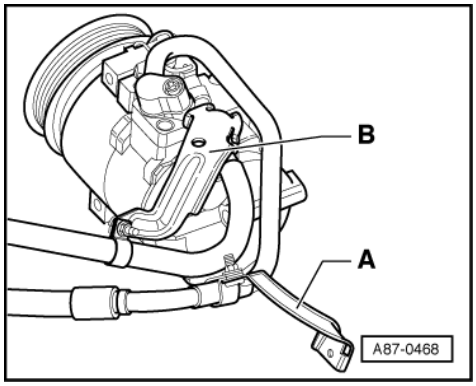
- Slacken off ribbed belt:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

- -> Remove power steering pump -A-:

=> Running Gear, Front-wheel Drive and Four-wheel Drive; Repair Group 42

Note:



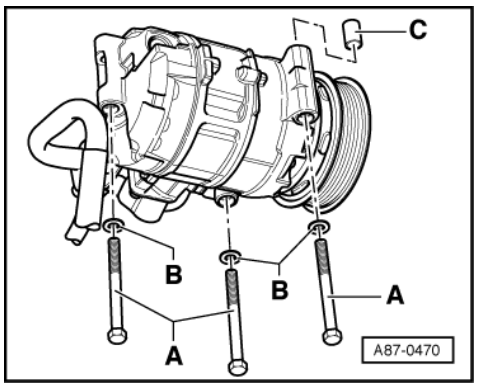
The bracket for the air conditioner compressor -B- and power steering pump -A- can be removed and installed without opening the refrigerant circuit.

Removing

- -> Remove bracket -A-.

Note:

Bracket -B- and the bolts at the refrigerant pipe connections must not be loosened or removed.



- -> Screw out bolts -A-.

Installing

- When installing compressor, make sure that centring sleeves -C- are fitted correctly.
- Install washers -B- between compressor and bolts.
- Tighten bolts -A- to 25 Nm.

Note:

Detaching refrigerant pipes from compressor => Page 206 .

5 - Servicing magnetic coupling -N25

5.1 - Servicing magnetic coupling -N25

Notes:

- The magnetic coupling can be serviced without the refrigerant circuit being opened.
- Before removing the compressor, mark the running direction of the ribbed belt with chalk or a felt-tip pen. Running a used belt in the opposite direction could destroy it.

- Remove noise insulation:

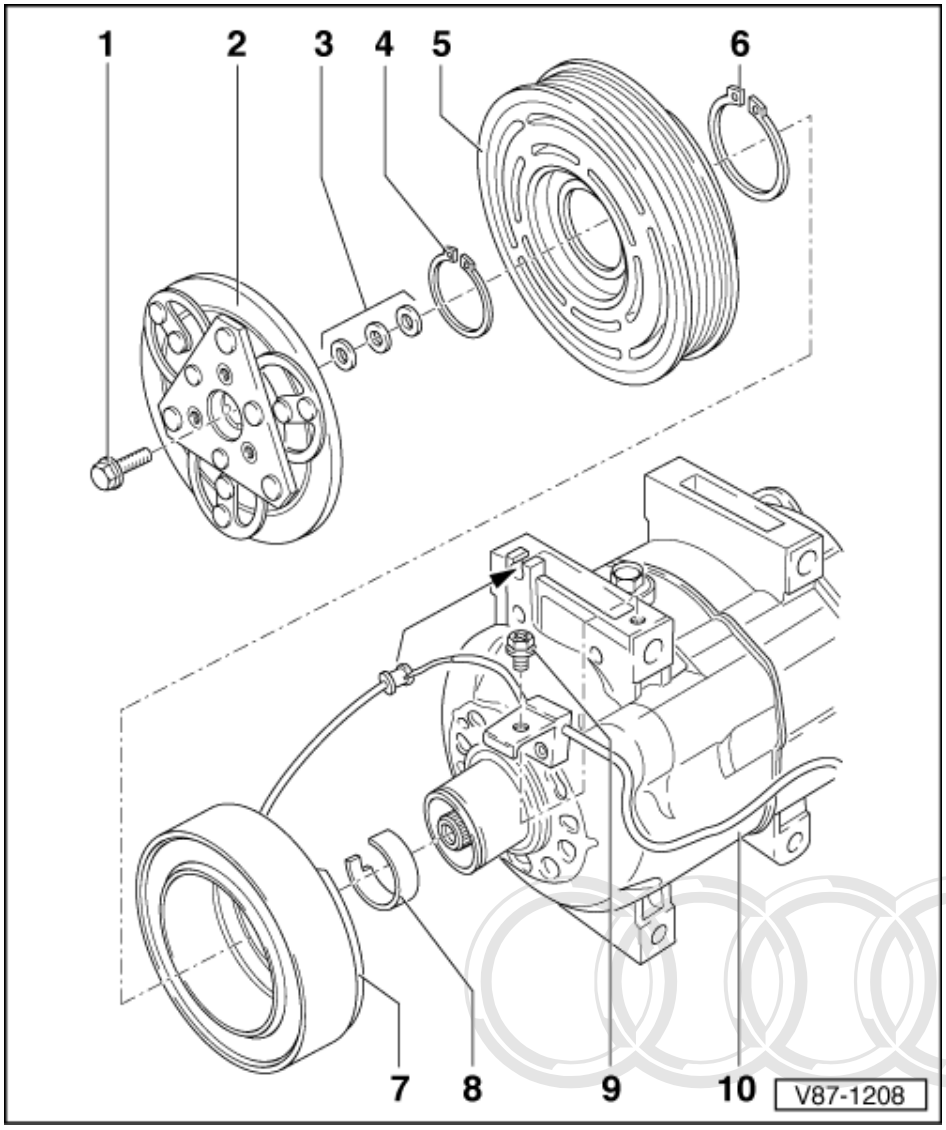
=> General Body Repairs, Exterior; Repair Group 50

- Remove ribbed belt:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

- Detach compressor from bracket (8-cyl. engine only) => from Page 105 onwards.

5.2 - Zexel compressor

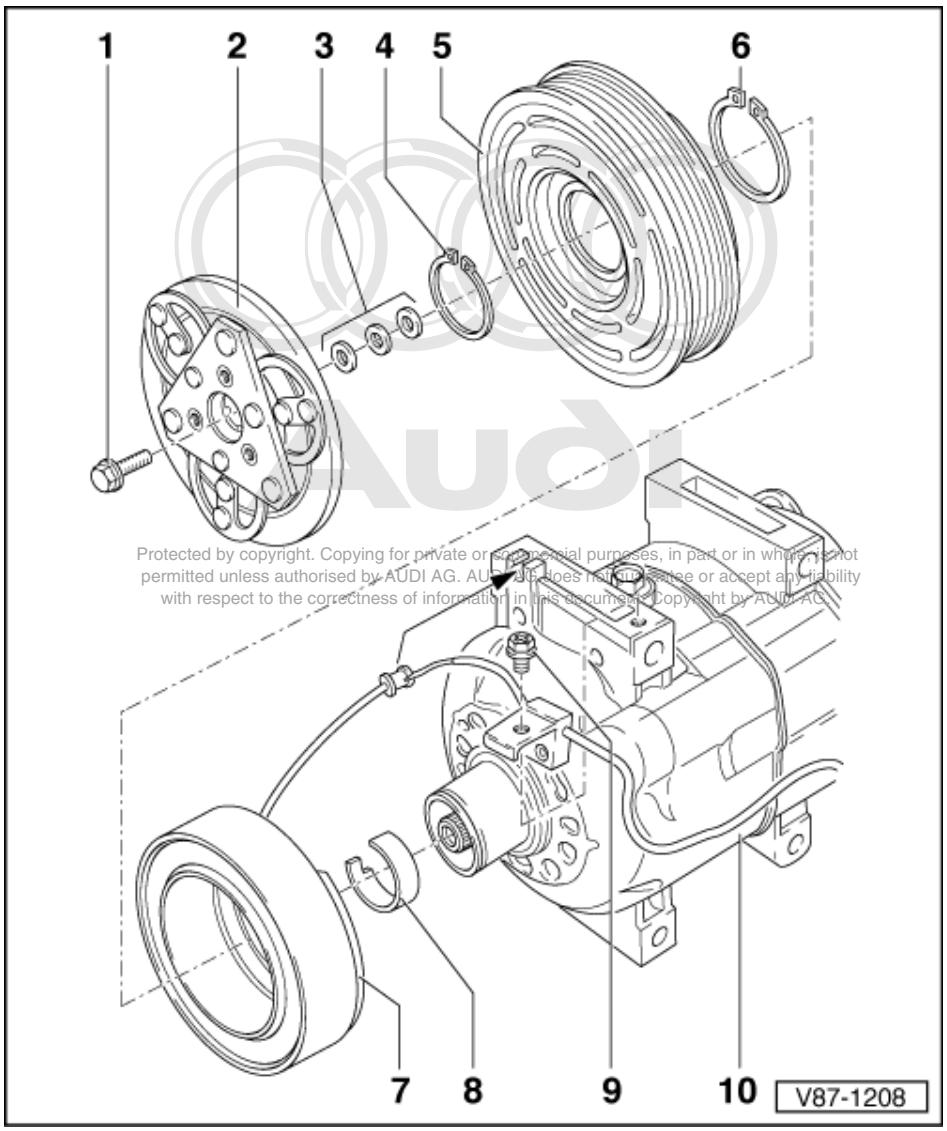


1 Bolt - 15 Nm
- Slackening and tightening => Fig. 1

2 Clutch plate
- Pulling off => Fig. 2

3 Spacer
- For adjusting gap
- Checking gap => Fig. 6

4 Circlip
- Replace
- Ensure correct positioning (flat side facing compressor)
- Ensure correct positioning in groove



5 Pulley

- Pulling off => Fig. 3
- Installing => Fig. 4

6 Circlip

- Replace
- Ensure correct positioning (flat side facing compressor)
- Ensure correct positioning in groove

7 Magnetic coil

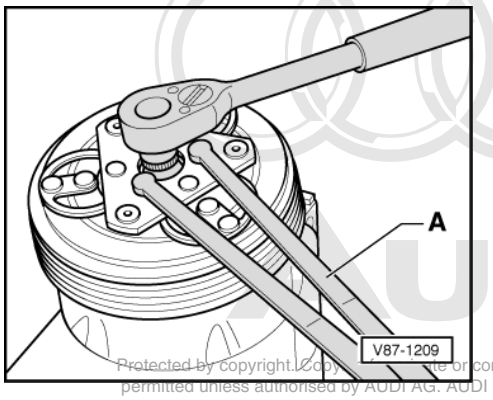
- Installing => Fig. 5

8 Felt ring

- Replace

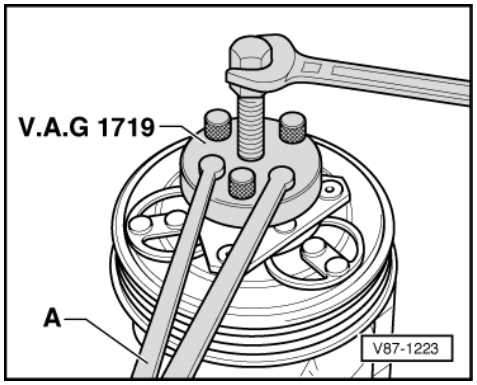
9 Bolt

10 Compressor



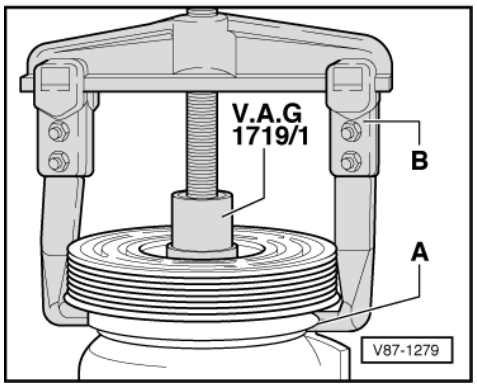
-> Fig.1 Slackening and tightening hexagon bolt

- Counterhold with commercially available 2-hole pin wrench -A- (pin ø 4 mm).
- Tighten bolt to 15 Nm.



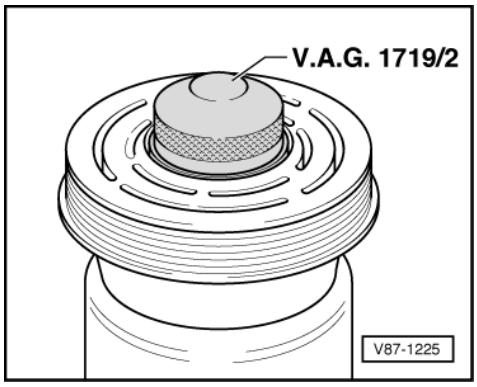
-> Fig.2 Pulling off clutch plate

- Counterhold with commercially available 2-hole pin wrench -A-.



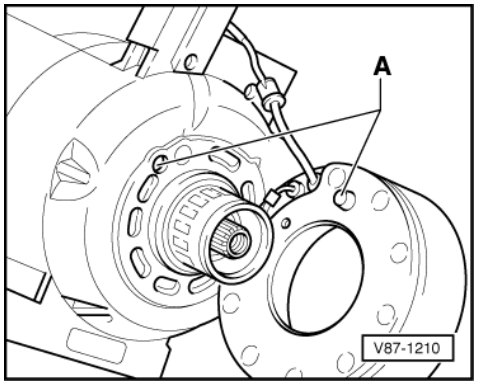
-> Fig.3 Pulling off pulley

- Remove felt ring.
- Position two-arm puller -B- against shoulder -A- to prevent damage to pulley.



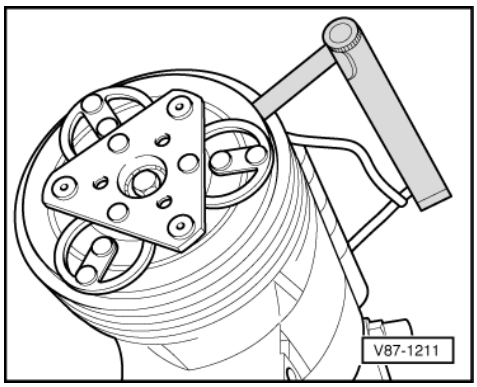
-> Fig.4 Installing pulley

- Clean contact surface.
- Fit pulley using special tool V.A.G 1719/2 and a plastic-headed hammer.



-> Fig.5 Installing magnetic coil

- Insert lug -A- into recess.



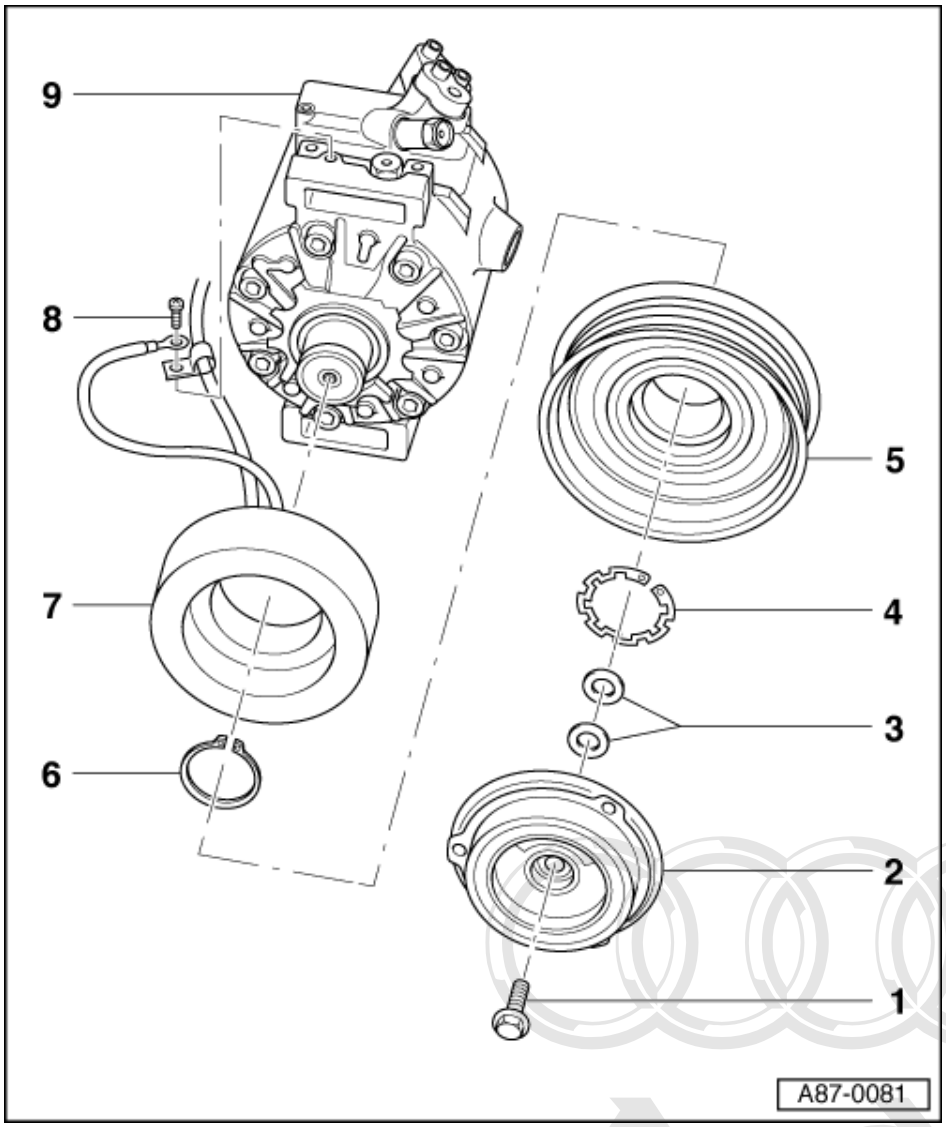
-> Fig.6 Checking gap

- Check gap between pulley and clutch plate:
  - Gap = 0.3 ... 0.6 mm

Note:

The gap must be within the specified tolerance around the entire circumference.

5.3 - Denso compressor



1 Bolt - 15 Nm
- Slackening and tightening => Fig. 1

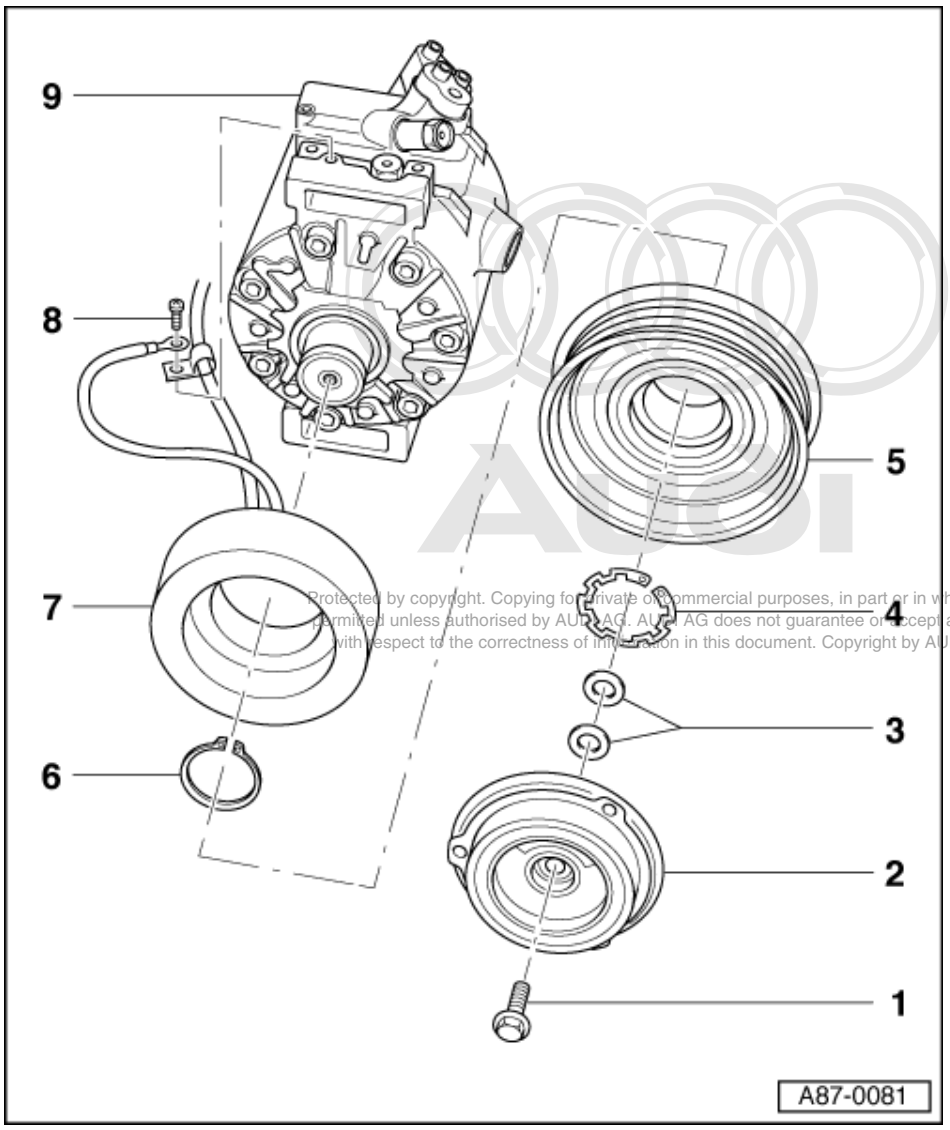
2 Clutch plate
- Pulling off => Fig. 2

3 Spacer
- For adjusting gap
- Checking and adjusting gap => Fig. 4

4 Circlip
- Replace
- Ensure correct positioning (flat side facing compressor)
- Ensure correct positioning in groove

5 Pulley

- Pull off seized pulley, e.g. using two and three-arm puller; take care not to damage pulley



6 Circlip

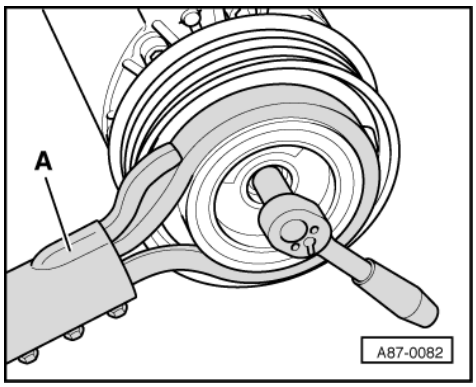
- Replace
- Ensure correct positioning (flat side facing compressor)
- Ensure correct positioning in groove

7 Magnetic coil

- With integrated overheating cut-out. Cut-out deactivates magnetic coil as soon as magnetic coupling overheats (e.g. if compressor is not running smoothly)
- Previously used protective diode -J201 is also integrated (reduces voltage peaks which may occur on deactivating magnetic coupling)
- Installing => Fig. 3

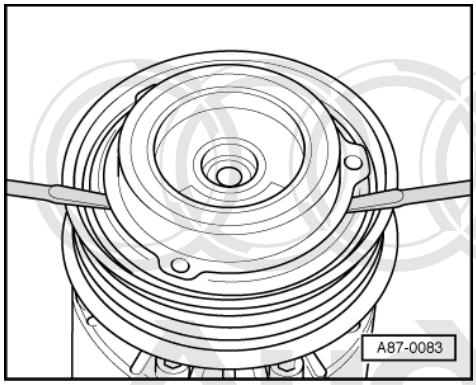
8 Bolt

9 Compressor



-> Fig.1 Slackening and tightening hexagon bolt

- Counterhold clutch plate using commercially available strap wrench -A- with fabric strap.
- Tighten bolt to 15 Nm.

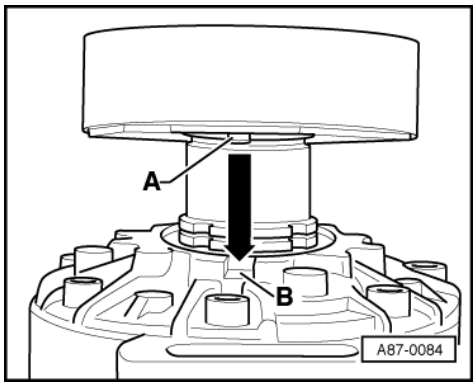


-> Fig.2 Pulling off clutch plate

- Carefully lever off clutch plate using two screwdrivers.

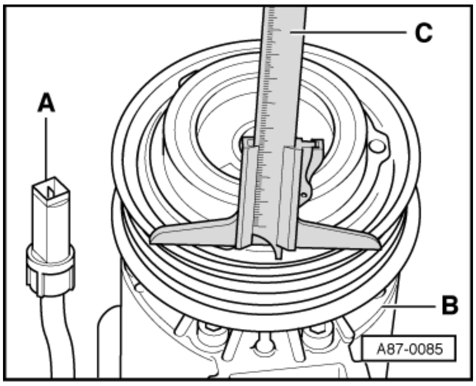
Note:

If clutch plate is seized, pull off using two or three-arm puller.



-> Fig.3 Installing magnetic coil

- Insert lug -A- into recess -B-.



-> Fig.4 Checking and adjusting gap

- Measure gap "1" between pulley and clutch plate at 3 points using depth gauge -C-.
- Apply voltage of 12 V to magnetic coil.

  A - Positive at single connector
  B - Earth at compressor housing

- Measure gap "2" between pulley and clutch plate at 3 points using depth gauge -C-.
- Gap size: difference between gap "1" and "2".
  - Specification: 0.4 ... 0.6 mm

Notes:

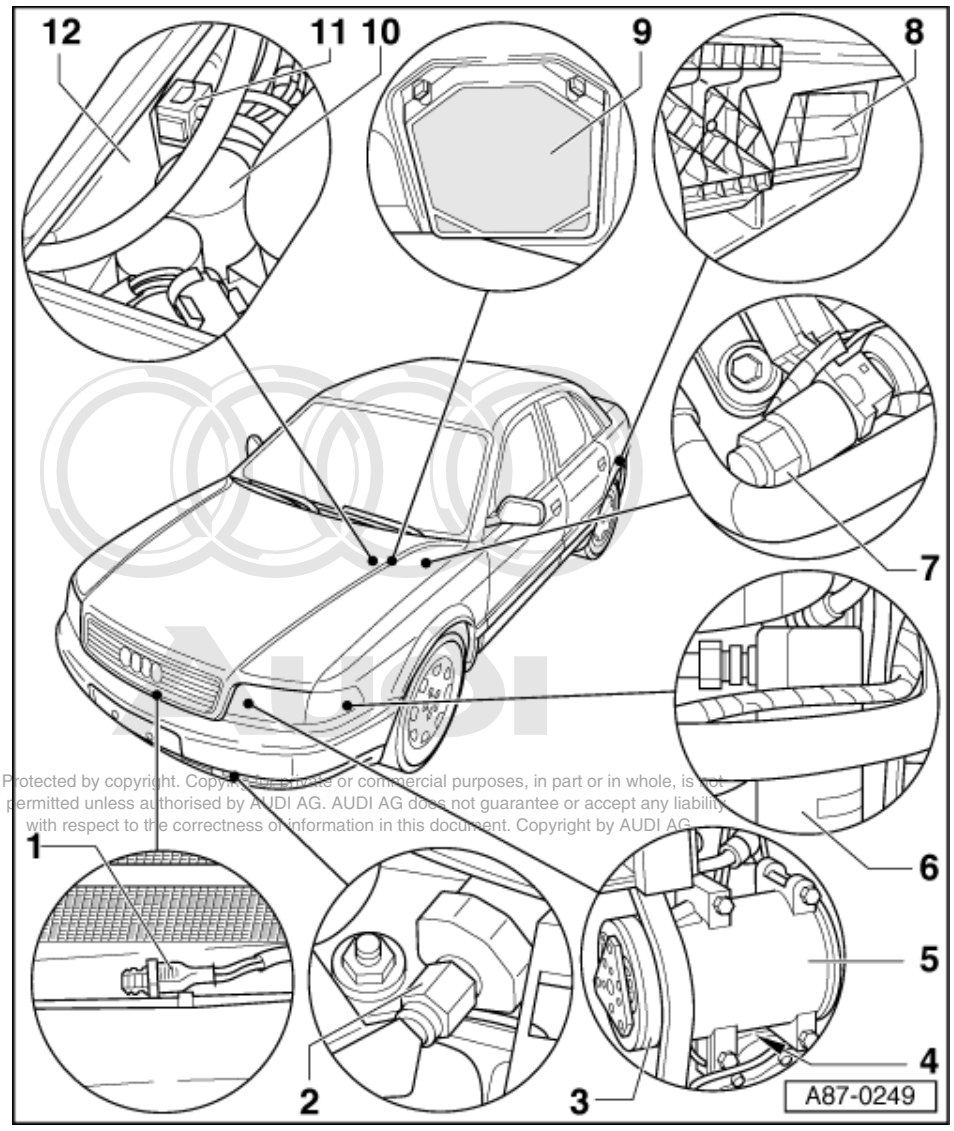
- The gap must be within the specified tolerance around the entire circumference.
- The gap size can also be measured without removing the compressor.
- If the gap size is outside the specified tolerance range, remove the clutch plate and adjust the gap size by removing or inserting spacers.

6 - Components used to control and regulate air conditioner (in engine compartment)

6.1 - Components used to control and regulate air conditioner (in engine compartment)

Notes:

- Servicing work on refrigerant circuit => Page 190 .
- Perform the following work on completion of repair operations: Interrogate fault memory => Page 37
- Testing cooling capacity => Page 185 .
- Electrical test on all components marked 1) => from Page 70 onwards.
- All components marked 2) are actuated in final control diagnosis => Page 26 .



1 Ambient temperature sensor -G17 1)

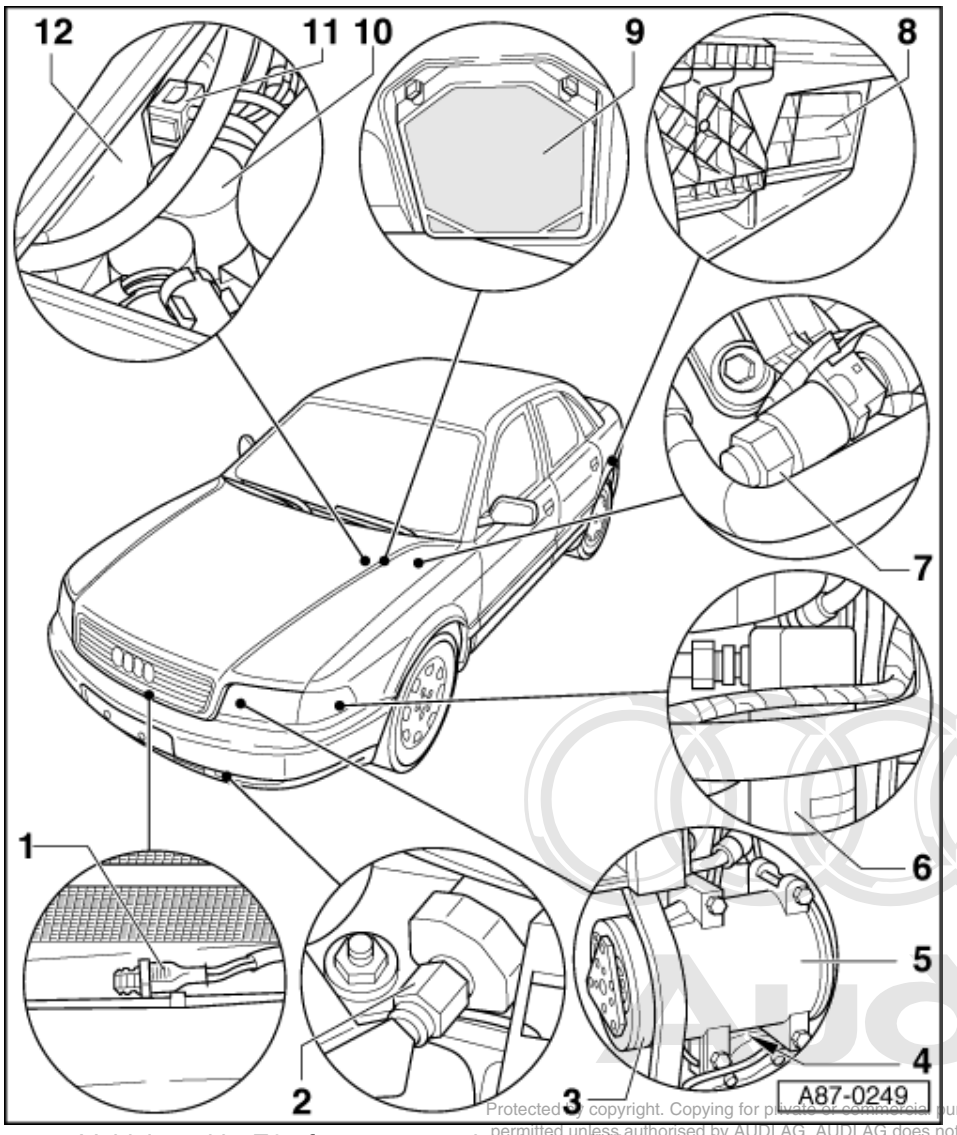
- ◆ Removing:
- \- Remove bumper:

=> General Body Repairs; Repair Group 63

- \- Unplug connector from temperature sensor and unclip from mount in air duct
- ◆ Resistance values =>Page 72

2 Pressure switch

- ◆ Vehicles with -E87 up to part number index "H":
  High-pressure switch for air conditioner -F23 and for magnetic coupling -F118 1)
- ◆ Functional description, removing and installing => Page 101



- Vehicles with -E87 from part number index "J" onwards: Air conditioner pressure switch -F1291)
- Functional description, removing and installing => Page 102

3 Air conditioning system magnetic coupling -N25 2)

- Servicing=>from Page 112 onwards

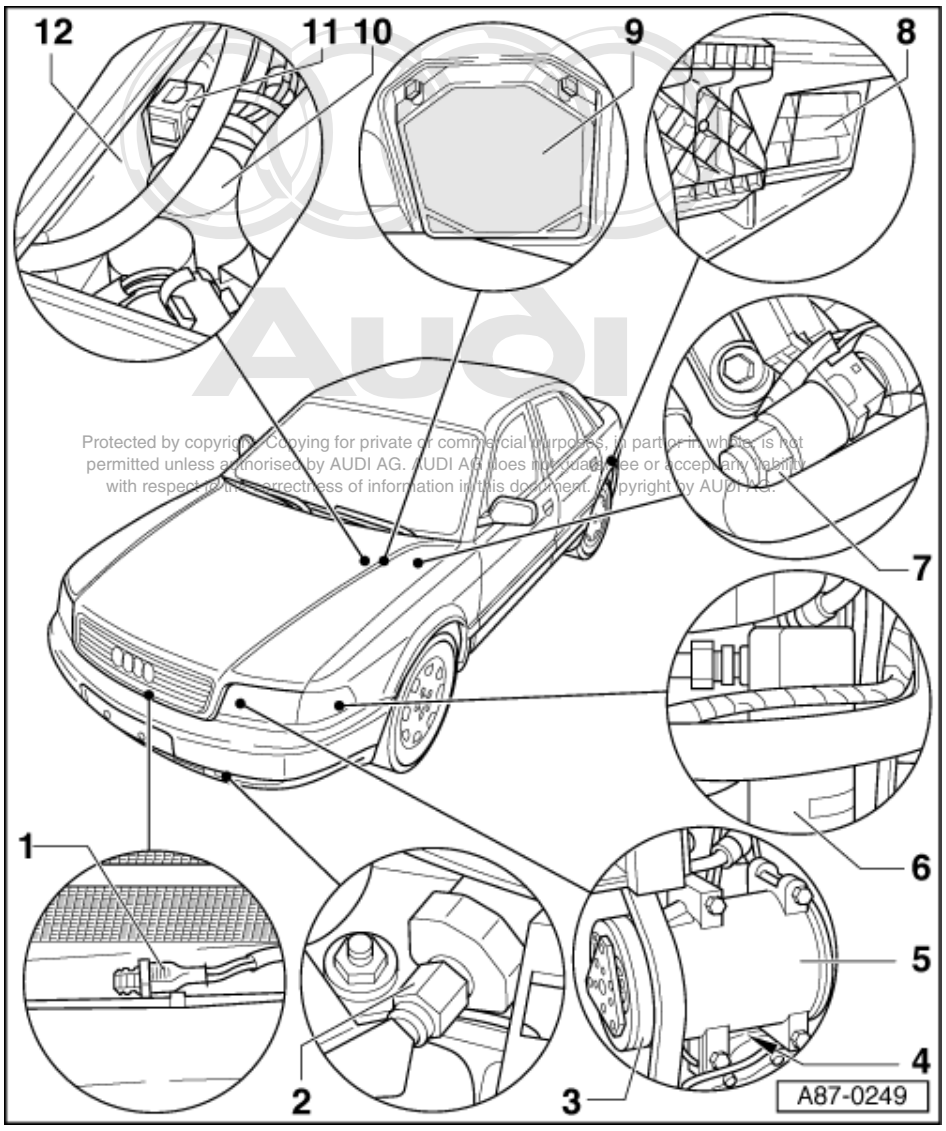
4 Air conditioner compressor speed sender -G111

- Not installed if Denso compressor fitted

5 Compressor

- Detaching and reattaching compressor from/to bracket; removing and installing compressor bracket => from Page 105 onwards
- Removing and installing ribbed belt:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13

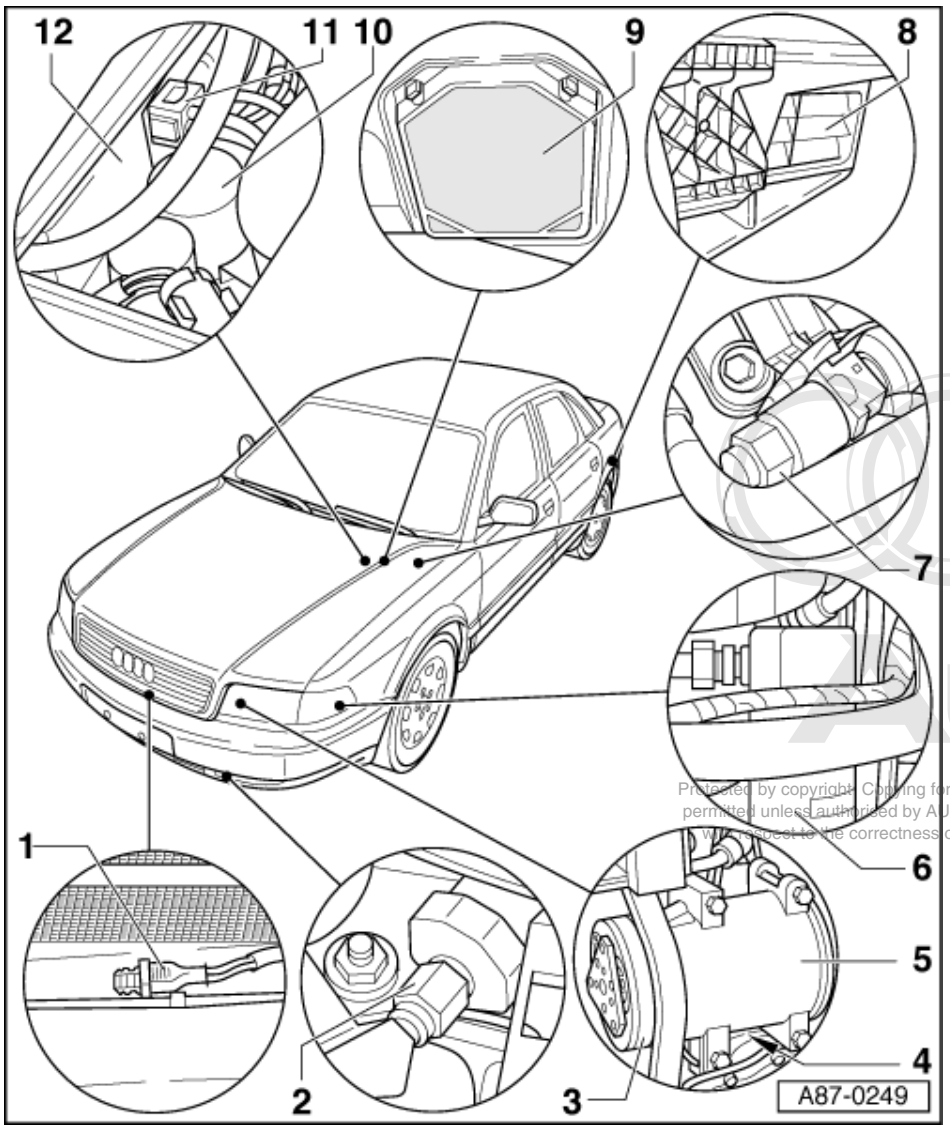


6 Reservoir

- Only to be removed after draining refrigerant circuit; vehicle must be taken to specialist VW/Audi air conditioner workshop
- Removing and installing => Page 201

7 Low-pressure switch for air conditioner -F731)

- Only vehicles with -E87 up to part number index "H"
- Functional description, removing and installing => Page 104
- Not required if air conditioner pressure switch -F129 is used
- Vehicles without low-pressure switch for air conditioner -F73: Cap with seal must be screwed onto connection for this switch

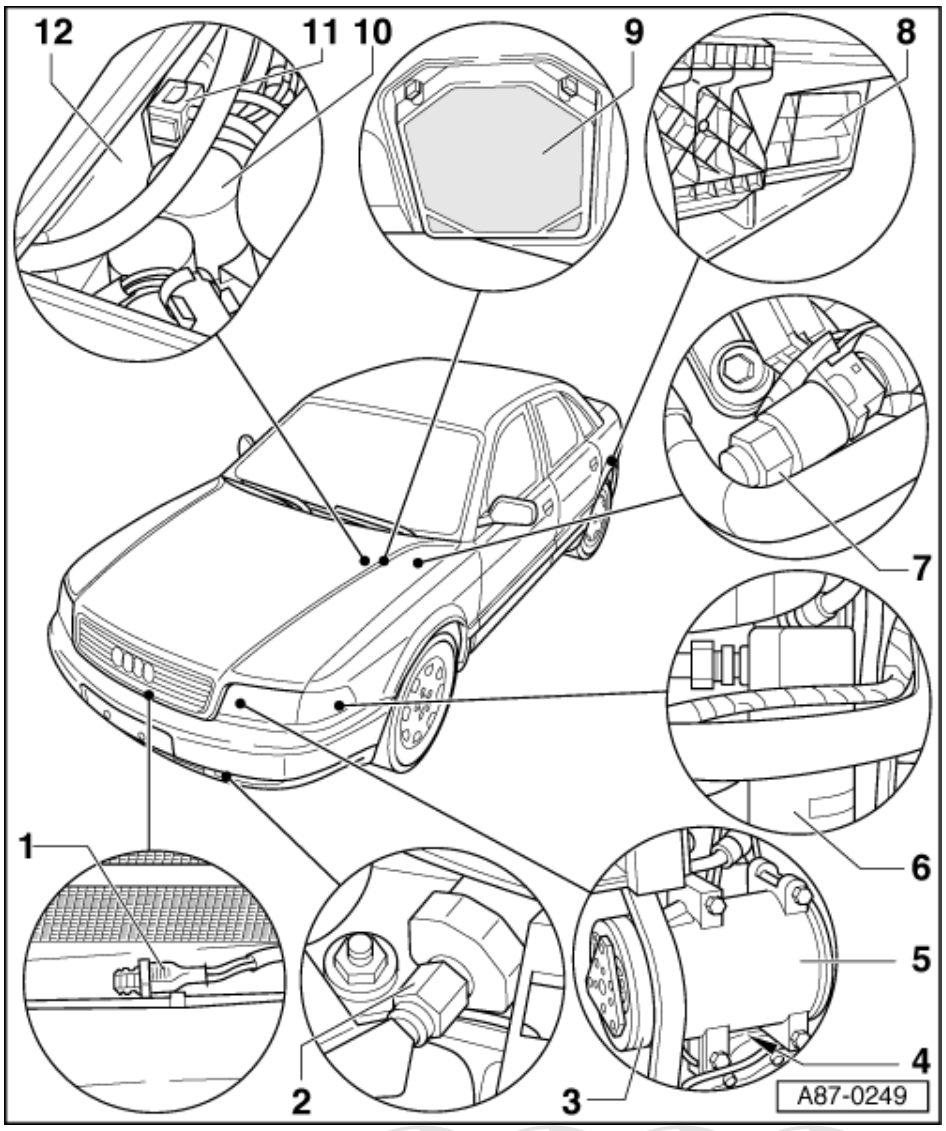


8 Forced air extraction

- Sealing lips in vent opening must move freely and close by themselves
- To ensure that ventilation of passenger compartment functions correctly, air ducts must not be obstructed by lining of luggage compartment (up to rear shelf)

9 Dust and pollen filter

- Removing and installing=>Page 138
- Additional filter element with activated charcoal fitted in vehicles with air quality sensor -G238=>Page 138



10 Pump/valve unit 2)

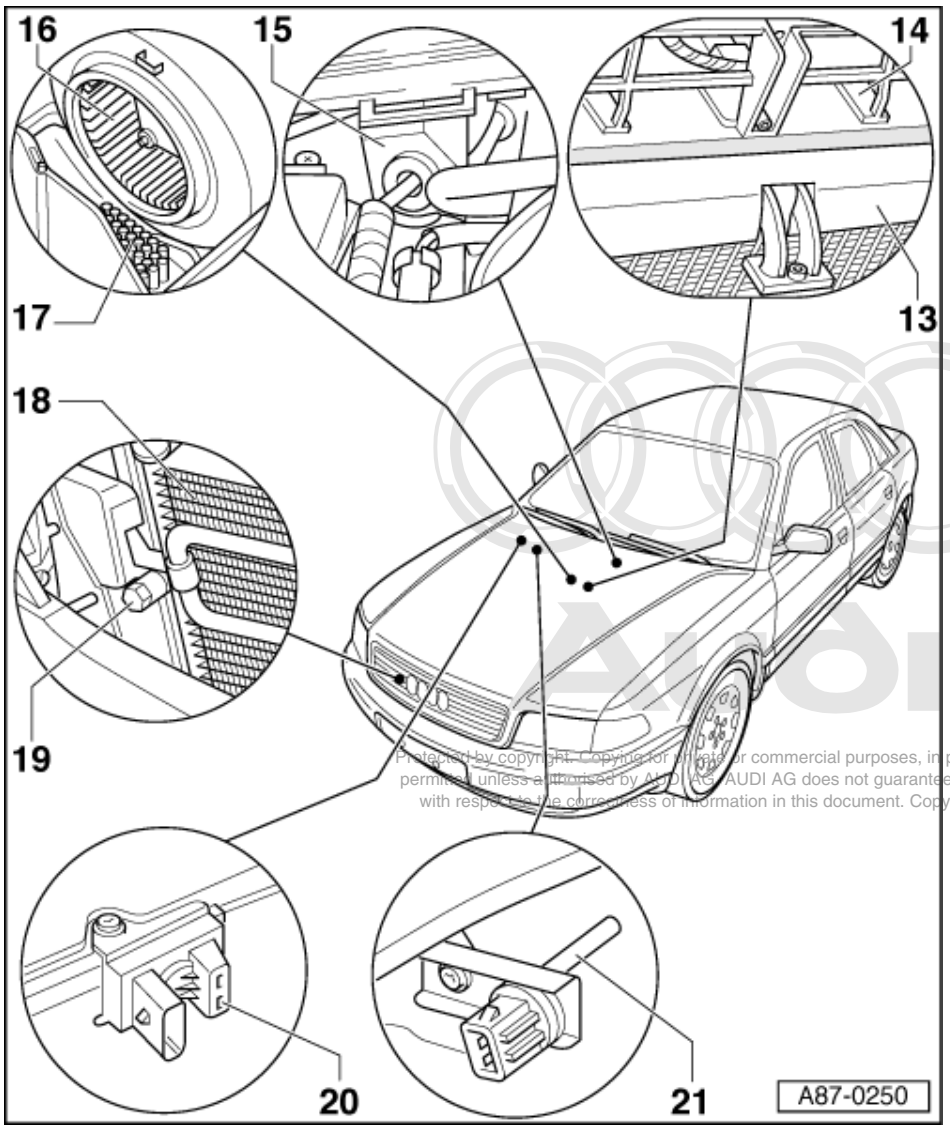
- Consists of heat regulation valves -N175 and -N176 and coolant circulation pump -V50
- Checking function => Page 74
- Removing and installing=>Page 135
- Replacing => Page 137

11 Fresh air intake duct temperature sensor -G89 1)

- Fitting location shown in vehicles without air quality sensor
- Removing and installing=>Page 132

12 Air flow flap control motor -V71 2)

- With air flow flap control motor potentiometer -G113
- Removing and installing=>Page 128



13 Evaporator

- Only to be removed after draining refrigerant circuit; vehicle must be taken to specialist VW/Audi air conditioner workshop
- Removing and installing
  => Page 207

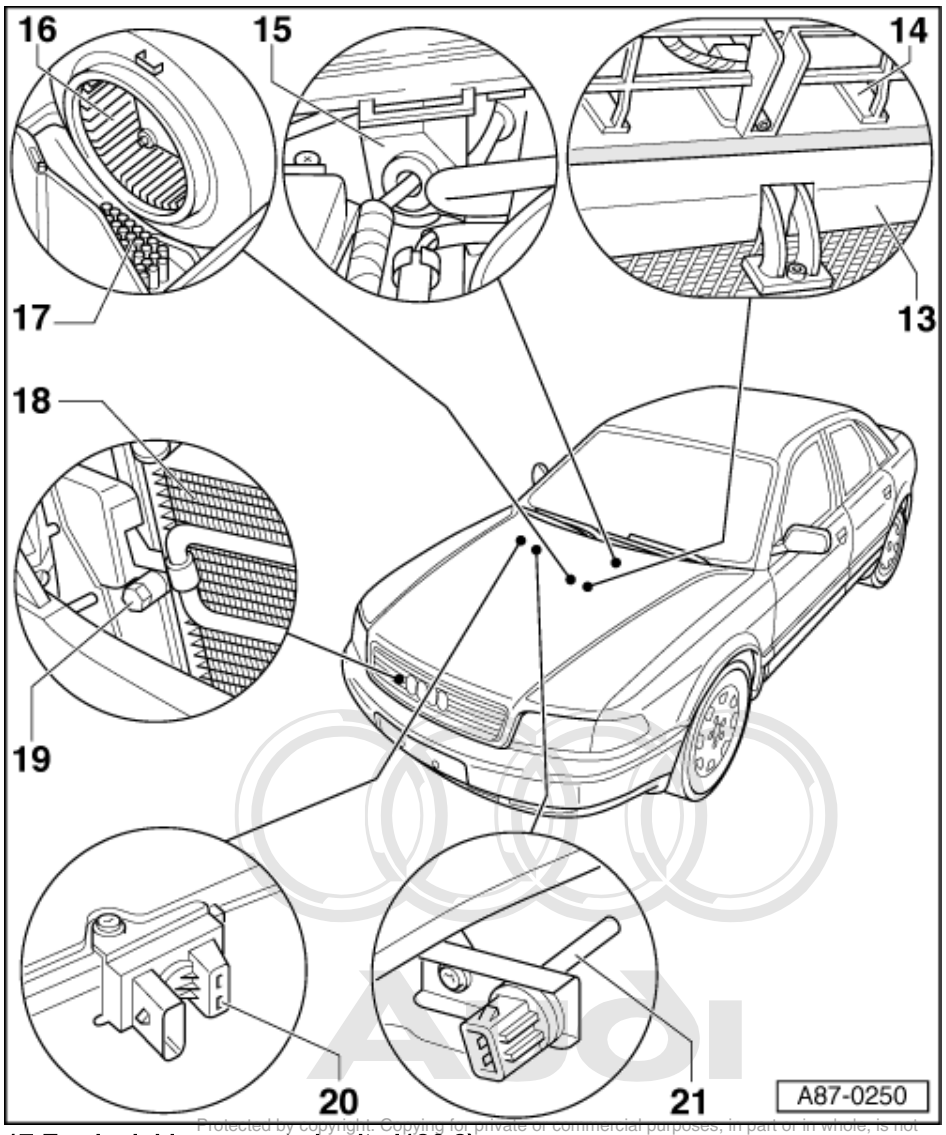
14 Opening for air recirculation mode

15 Air recirculation flap control motor -V113 2)

- With air recirculation flap control motor potentiometer -G143
- Removing and installing=>Page 132

16 Fresh air blower -V2 2)

- Removing and installing=>Page 131



17 Fresh air blower control unit -J126 2)

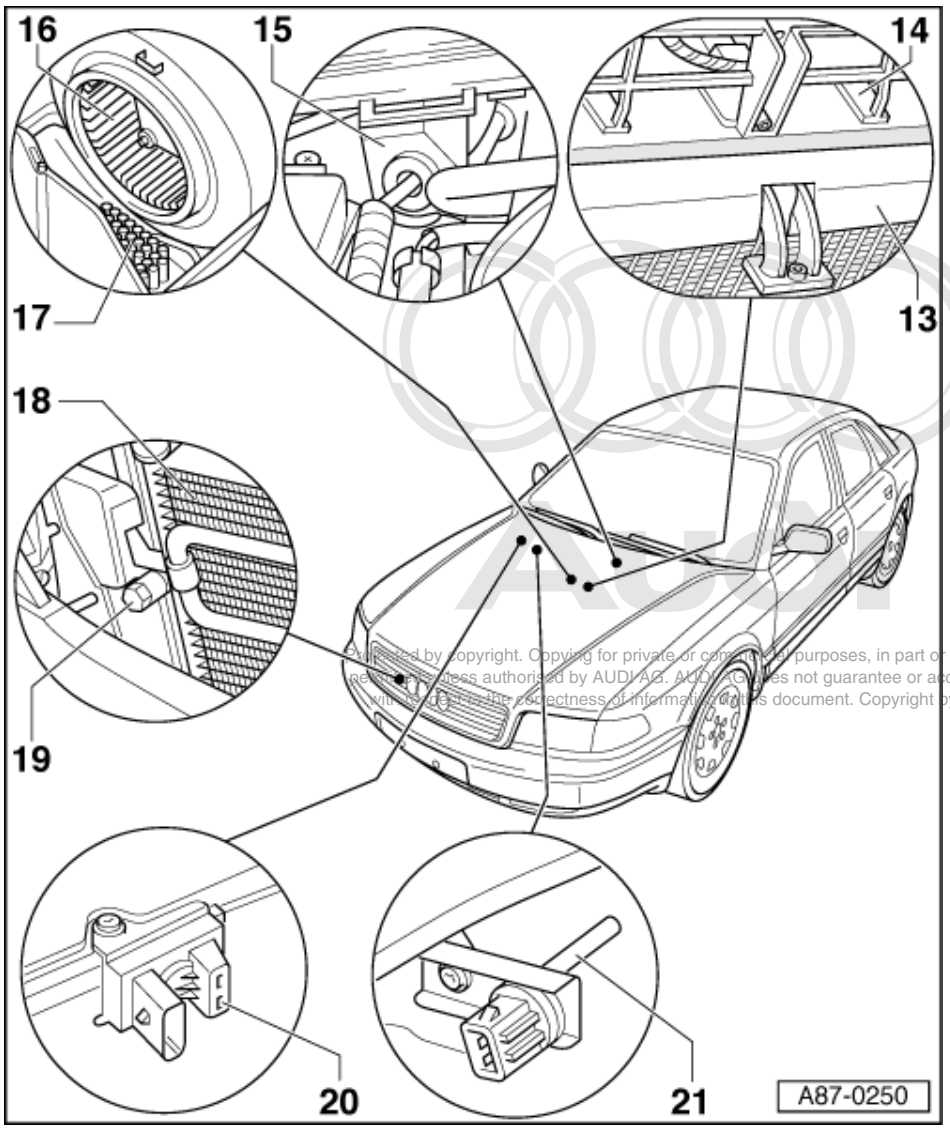
- Removing and installing=>Page 134

18 Condenser

- Only to be removed after draining refrigerant circuit; vehicle must be taken to specialist VW/Audi air conditioner workshop
- Removing and installing
  => Page 204

19 Service connection

- For measurement, drainage and filling at specialist VW/Audi air conditioner workshops
- Cap with seal; always screw on



20 Air quality sensor -G238

- Gradual introduction in model year 1998
- Only vehicles with operating and display units -E87 from part number index "J" onwards
- Functional description => Page 139
- Testing => Page 140
- Removing and installing=>Page 144

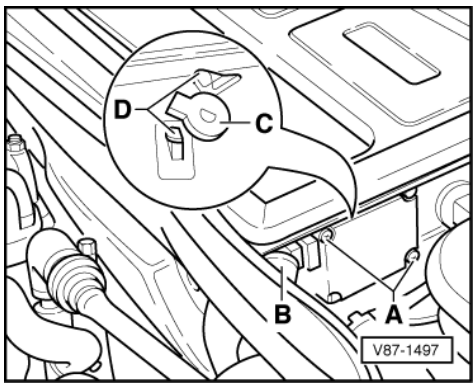
21 Fresh air intake duct temperature sensor -G89 1)

- Fitting location shown in vehicles with air quality sensor
- Removing and installing=>Page 132

6.2 - Removing and installing air flow flap control motor -V71 with potentiometer -G113

Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.

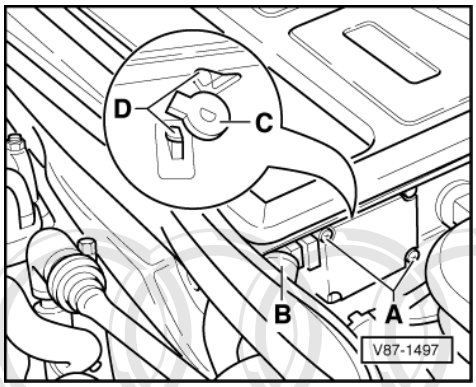


- If a control motor emits cracking or rattling noises at regular intervals (approx. every 7 min.), refer to the notes on page 162 (Removing and installing centre vents control motors).

Removing

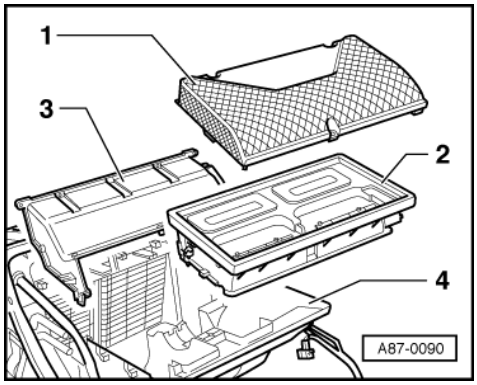
- Remove plenum chamber cover.
- Remove cover panel.
- -> Screw out bolts -A-.
- Remove control motor.

Installing



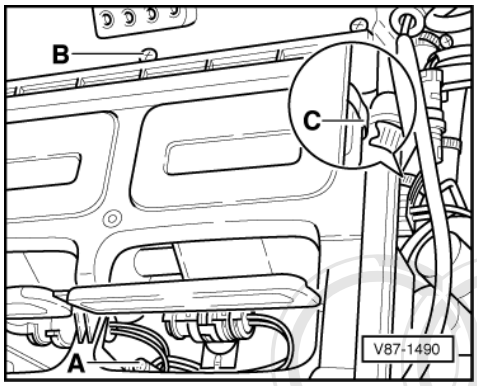
- -> Before installing control motor, check mounting of air flow flap.
  - Lug -C- must be between stops -D-
- Install control motor.
- If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.
- Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.
- Hand-tighten securing bolts -A- (8 Ncm).
- After installing cover panel, check that grommet -B- is fitted correctly.
- Perform self-diagnosis => Page 1.

6.3 - Removing and installing intake housing with air flow flap



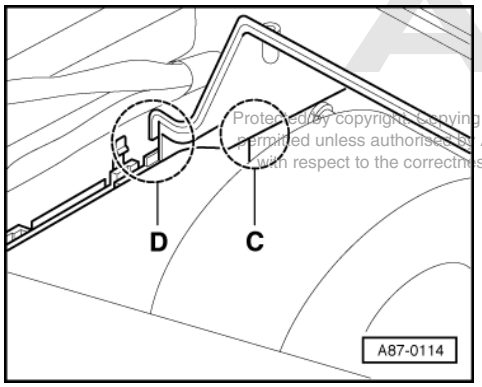
Removing

- Remove plenum chamber cover.
- -> Remove grille -1- covering air flow flaps.
- Switch off ignition.



- -> Screw out bolts -A- and -B-.
- Lever off securing clip -C-.
- Remove intake housing (-2- in Fig. A 87-0090).

Installing

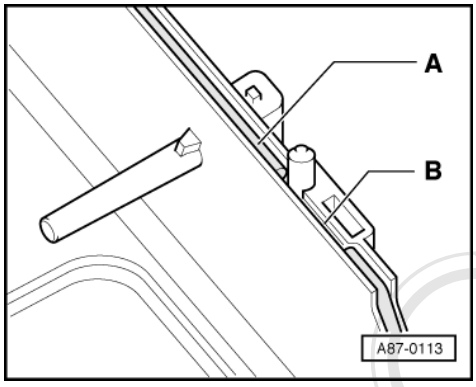


Install in reverse order, paying attention to the following:

- -> Before fitting intake housing, carefully seal housing joints at -C- and -D- with silicone adhesive sealing compound (black) D 176 001 A3.
- Interrogate fault memory => Page 38 .

- Perform functional test on system.

Notes:



- -> If complaints regarding humidity (condensation on windscreen, odours) are submitted, a sponge-rubber sealing cord (ø 3 mm -A-) must be fitted up to -B- in addition to the described sealing measures. No sealing cord should be fitted at -B- where the groove is narrower.
- Use sponge-rubber sealing cord (soft type with ø 3 mm, commercially available).

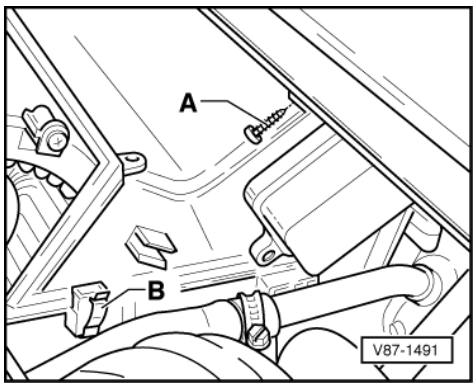
6.4 - Removing and installing fresh air blower -V2

Removing

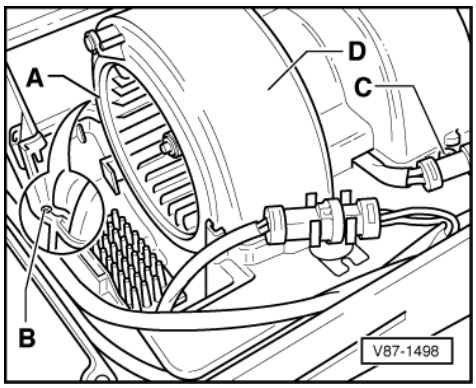
- Remove plenum chamber cover.
- Remove windscreen wipers and cowl panel trim.

=> Electrical System; Repair Group 92

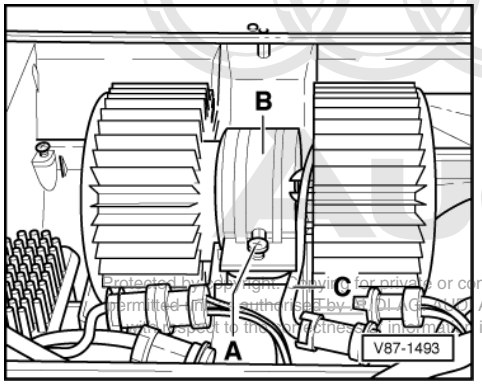
- Remove intake housing with air flow flap =>Page 130 .



- -> Screw out bolts -A-.
- Lever off clips -B- and detach cover with air recirculation flap from air conditioner unit.



- -> Remove both air duct rings -A-.
- Screw out bolts -B- and -C- .
- Remove air duct -D-.



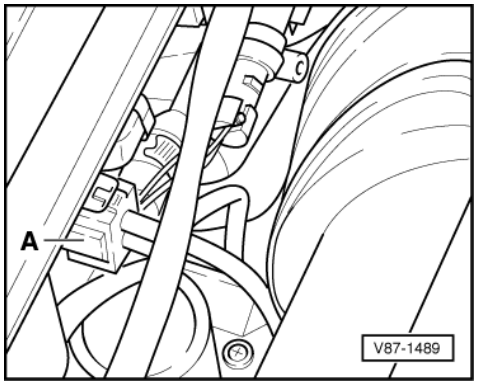
- -> Screw out bolts -A- and remove retainer -B-.
- Remove fresh air blower -V2.

Installing

Install in reverse order, paying attention to the following:

- When installing, make sure that wiring is fitted correctly -C-.

6.5 - Removing and installing fresh air intake duct temperature sensor -G89



- Remove plenum chamber cover.
- -> Rotate temperature sensor -A- by approx. 90° and remove.

Note:

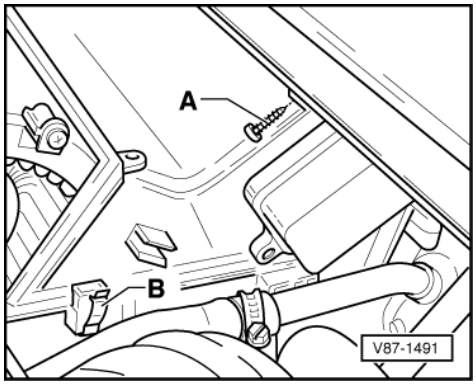
The illustration shows the fitting location in a vehicle without air quality sensor.

6.6 - Removing and installing air recirculation flap control motor -V113

Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.

- If a control motor emits cracking or rattling noises at regular intervals (approx. every 7 min.), refer to the notes on page 162 (Removing and installing centre vents control motors).

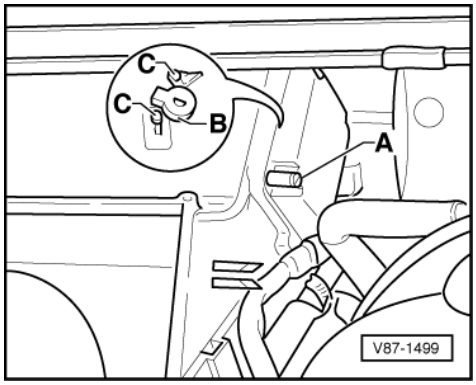


Removing

- Remove plenum chamber cover.
- Remove windscreen wipers and cowl panel trim:

=> Electrical System; Repair Group 92

- -> Screw out bolts -A-.

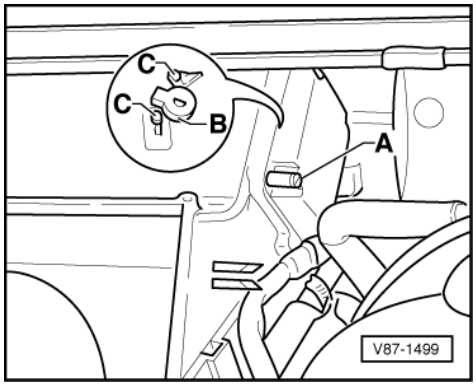


- Lever off clips -B- and detach cover with air recirculation flap from air conditioner unit.
- Remove cover panel.
- -> Screw out bolts -A- and remove control motor.

Installing

Install in reverse order, paying attention to the following:

- Before installing control motor, check mounting of air recirculation flap.

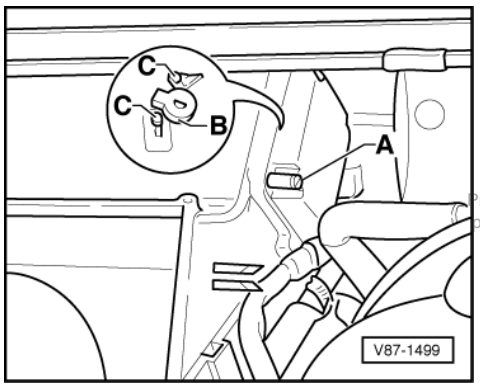


- -> Lug -B- must be between stops -C-

Install control motor.

If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.

Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.

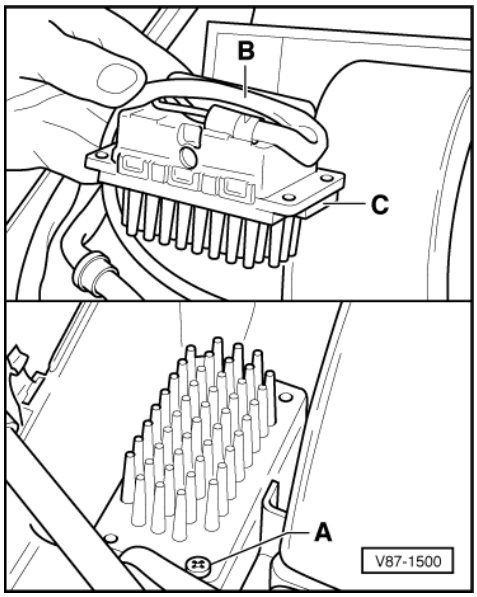


- -> Hand-tighten securing bolts -A- (8 Ncm).
- After installing cover panel, check that grommet is fitted correctly.
- Interrogate fault memory => Page 37 .

6.7 - Removing and installing fresh air blower control unit -J126

Removing

- Remove plenum chamber cover.
- Remove intake housing with air flow flap =>Page 130 .



- -> Screw out bolts -A-.

Attention:
The heat sink may be hot.

Installing

Install in reverse order, paying attention to the following:

- Install wiring -B- to control unit -J126 as shown in illustration.
- Before installing, remove foam seal -C- from replacement control unit.

6.8 - Removing and installing pump/valve unit

Notes:

- From January 2001, a modified pump/valve unit is to be gradually introduced (different motor for coolant circulation pump -V50). With this version, the vehicle wiring harness is connected directly to the pump.
- If the pump/valve unit is to be replaced in a vehicle produced before the introduction of the new unit, a wiring adapter must be used to enable the modified unit to be installed.

=> Parts List

Special tools, testers and other items required

- Drip tray V.A.G 1306
- Commercially available compressed-air gun

Removing

- Switch off ignition.
- Remove brake servo.

=> Running Gear, Front-wheel Drive and Four-wheel Drive; Repair Group 47

Notes:

- If complaints regarding insufficient heating capacity were submitted, carry out the following checks before removing the pump/valve unit:

- Check attachment to coolant circuit.
- Check electrical connection to pump for interchanged cabling (+ and -).

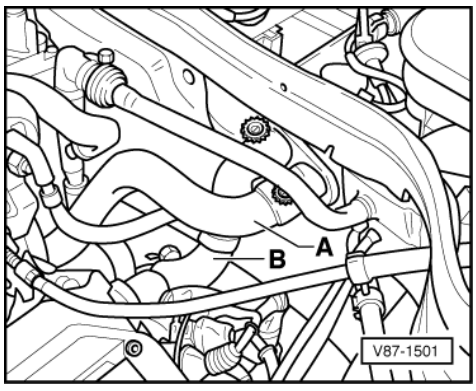
- If the coolant circulation valve -V50 causes noises, check whether the cooling system has been fully bled before removing the pump/valve unit (air in the coolant circuit can causes noises):

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- RHD vehicles: Remove the coupling station from the electronics box in the plenum chamber.

- Unscrew cap of coolant expansion tank.
- Place drip tray V.A.G 1306 below engine.
- Drain coolant circuit:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

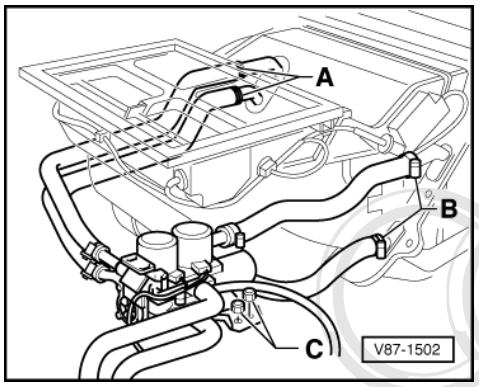


- -> Mark positions of coolant hoses -A- (supply to pump/valve unit) and -B- (return to engine).
- Remove coolant hoses -A- and -B- from engine to pump/valve unit.

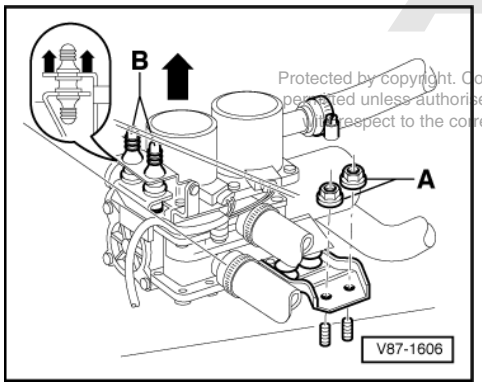
Note:

The illustration shows the hose positions in the 8-cylinder engine.

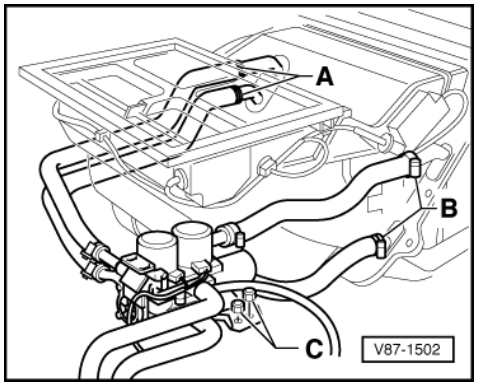
- Remove intake housing with air flow flap =>Page 130 .
- Hold coolant hose -A- in container.
- Attach compressed-air gun to coolant hose -B- and carefully blow coolant out of pump/valve unit.
- Unplug connectors to pump/valve unit.
- Remove reinforcing panel (plenum chamber) =>Page 138 .



- -> Mark coolant hoses -A- and -B-.
- Detach coolant hoses from coolant pipes to heat exchangers.
- Unscrew nuts -C-.



- -> Detach pump/valve unit from rubber mounts -B-.

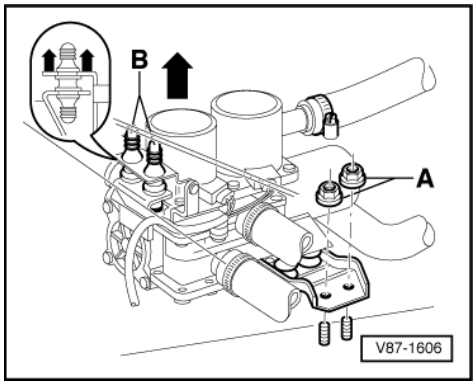


- -> Pull pump/valve unit to right until both clamps on coolant hoses -A- (at pump/valve unit) can be accessed.
- Mark coolant hoses -A-.

- Remove pump/valve unit.

Installing

Install in reverse order, paying attention to the following:



- -> Tighten nuts -A- to 10 Nm.
- Connect coolant hoses correctly to heat exchanger:
  - Lower hose = Coolant supply
  - Upper hose = Coolant return
- Connect coolant hoses correctly to engine. Pay attention to markings.

Notes:

- The coolant circulation pump -V50 of the pump/valve unit should not be operated until the coolant circuit has been bled.
- The pump/valve unit will be destroyed if it runs dry.

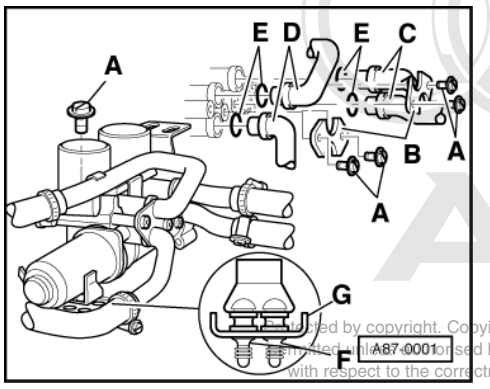
- Do not connect double connector to pump/valve unit until cooling circuit has been bled:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- After installation, check whether grommet between engine compartment and plenum chamber is fitted correctly.

Replacing pump/valve unit

- Remove pump/valve unit =>Page 135 .



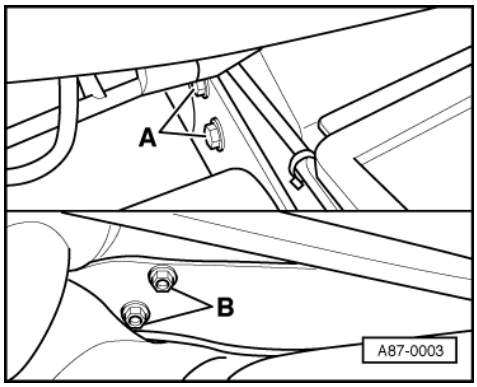
- -> Screw out bolts -A-.
- Detach holder -B-.
- Remove coolant pipes:
  - Pipes -C- to heat exchanger on front passenger's side
  - Pipes -D- to heat exchanger on driver's side

Notes:

- Replace the O-rings -E-.
- Insert the rubber mount -F- into the pump/valve unit and into the holder -G- as shown in the illustration.

6.9 - Removing and installing reinforcing panel (plenum chamber)

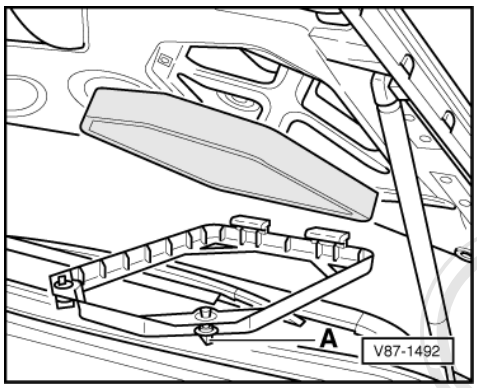
- Remove intake hose (from air filter to engine).
- Detach insulating mat from front panel of plenum chamber.



- -> Screw out bolts -A- and nuts -B-.
- Remove reinforcing panel.

6.10 - Removing and installing dust and pollen filter

A dust and pollen filter is fitted under the bonnet on right and left-hand side.



- -> Press in 2 quick-release fasteners -A- of retaining frame slightly and turn them by approx. 90°.
- Remove dust and pollen filter.

Notes:

- Replacement interval for dust and pollen filter:

=> Maintenance

6.11 - Dust and pollen filter with activated charcoal filter insert

Vehicles with the air quality sensor -G238 (=> Page 139) are also fitted with a dust and pollen filter with additional activated charcoal filter insert.
The activated charcoal filter acts as a dust and pollen filter, but can also filter gaseous pollutants such as ozone, benzene, nitrogen dioxide etc. out of the air flow.

The function of the activated charcoal is to absorb the gaseous impurities in the air flow until the fresh air flap is closed and the air conditioner is operating in air recirculation mode. The switch from fresh air to air recirculation mode is made by the operating and display unit as soon as the air quality sensor detects gaseous impurities in the ambient air (the "automatic air recirculation mode" function must be selected). The activated charcoal layer in the dust and pollen filter works differently on the various pollutants in the air:

- Some pollutants are bound permanently into the activated charcoal layer.

- Others are converted into harmless compounds, as in a catalytic converter.

- For the rest the activated charcoal acts as a condenser. As the pollution level increases, pollutants are absorbed until a certain degree of saturation is reached. If the pollutant level falls, the activated charcoal layer continuously discharges the absorbed particles.

Since the activated charcoal layer adsorbs a proportion of the pollutant particles permanently, it may be advisable to change the dust and pollen filter earlier than specified under the following operating conditions:

- When the vehicle is being run in areas with heavy air pollution.

- When the vehicle is being run with the "automatic air recirculation" function mainly disabled.

- In vehicles without air quality sensor, and thus without the "automatic air recirculation" function.

In the case of vehicles with air quality sensor, the air conditioner should always be operated with the "automatic air recirculation" function. If, however, this function is to be deactivated, the following points must be taken into consideration:

- The activated charcoal layer in the dust and pollen filter is saturated after a certain period of time.

- A saturated filter can no longer absorb pollutants, and will allow them to pass unhindered.

The key function of a dust and pollen filter and of the air quality sensor is to keep peaks in pollution level out of the passenger compartment. The following points must, however, be taken into consideration:

- If a vehicle is being driven in an area with relatively clean ambient air (with only a small amount of gaseous pollutants in

the air), the fresh air mode is switched to air recirculation mode sooner than it would in an area with a high pollution level

(e.g. industrial area).

- The switchover from fresh air mode to air recirculation mode is performed regardless of the basic pollution level whenever

the pollution level increases (e.g. when the vehicle is driven through a cloud of exhaust soot from a diesel-powered truck).

The activated charcoal filter can be fitted in any vehicle (including vehicles without air quality sensor). However, the same restrictions then apply to those vehicles as when the air conditioner is operated with the "automatic air recirculation" function disabled.

6.12 - Functioning of air quality sensor -G238

The air quality sensor detects pollutants in the ambient air (usually petrol and/or diesel fumes) and causes the operating and display unit -E87 to switch the air conditioner to air recirculation mode.
The operating and display unit determines the type and severity of the air pollution using the signal from the sensor. Depending on the ambient temperature and severity of the air pollution, the operating and display unit changes the operating mode as follows:

- Ambient temperature higher than approx. + 2°C: The air recirculation mode is actuated even with only a slight increase in pollution concentration.

- Ambient temperature between approx. + 2°C and approx. - 5°C: The air recirculation mode is only actuated if there is

a relatively high increase in pollution concentration (the compressor is switched on at the same time).

- Ambient temperature lower than approx. - 5°C: The air recirculation mode is only actuated if there is a relatively high

increase in pollution concentration and only for approx. 15 seconds (the compressor is not switched on). If the pollution

concentration drops, the air conditioner is switched back to fresh air mode.

The "automatic air recirculation" function can be switched off at any time. If the function is active, the compressor is switched on following a request for "automatic air recirculation" even at ambient temperatures lower than + 2 °C. The compressor cannot, however, be operated at temperatures lower than approx. - 5 ° C.
In the case of vehicles with "automatic air recirculation", the compressor can also be switched on down to temperatures of approx. - 5 °C if the air recirculation mode is switched on manually (via the air recirculation button).
The sensor has a self-teaching function (it adapts its sensitivity to the ambient pollution) to ensure that the air conditioner does not run continuously in air recirculation mode in areas which have a constantly high level of air pollution.
If the ambient air pollution remains relatively high over a lengthy period of time, the sensor's teach-in program begins to adapt it to the changing environmental conditions, so an ongoing request for air recirculation mode in an atmosphere of consistent ambient air pollution generally lasts less than 12 minutes. If a number of pollution peaks occur in short succession, the air conditioner may also operate longer in air recirculation mode.

A certain time is required for the air conditioner flaps to be adjusted. A dust and pollen filter with an activated charcoal layer is installed so that, if the pollution level should increase suddenly (e.g. if the vehicle is driven through a cloud of diesel exhaust fumes), no gaseous pollutants can be drawn into the passenger compartment with the fresh air before the fresh air flap is closed. A pollutant-saturated filter is no longer able to perform its function, and must be replaced =>Page 138 .
In order to prevent the air recirculation/fresh air flap from switching too frequently, the flap is not actuated immediately if there is only a slight increase in ambient pollution (the sensor does not send a request to the -E87). The filtration effect of the activated charcoal element in the dust and pollen filter is sufficient to cope with the pollution level =>Page 138 .
In order to prevent the air recirculation/fresh air flap from switching too frequently, a request for "automatic air recirculation" from the sensor is retained for at least 25 seconds (minimum retention time), even if the pollution concentration in the air drops by such a degree that air recirculation mode would no longer be necessary.
If the compressor is switched off (e.g. in "ECON" mode), the maximum operating time for the "automatic air recirculation" mode is limited to approx. 15 seconds by the -E87 to prevent the windows from misting.
To make sure that misted windows are demisted as quickly as possible, the -E87 does not permit air recirculation in the "Defrost" mode.
After the ignition is switched on, the air quality sensor -G238 needs approx. 30 seconds before it is ready for operation (warm-up time). During this time the sensor does not send any request for "automatic air recirculation" to the -E87.
The air quality sensor -G238 is a highly sensitive electronic component which may be destroyed if brought into direct contact with solvents, fuel or certain chemical compounds. You should therefore not fit sensors which have come into contact with such substances.

6.13 - Testing air quality sensor -G238

Special tools, testers and other items required

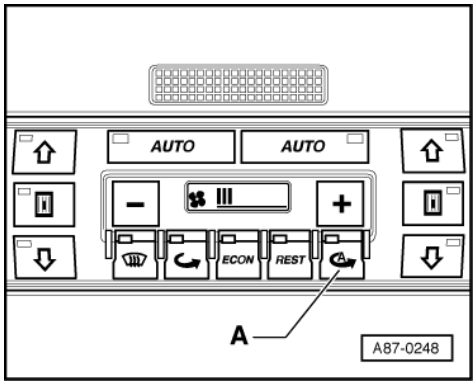
- Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/3
- Test gas D 007 855 A2

Test requirements:

- The vehicle is parked in an area of clean ambient air (not in the vicinity of running engines, extraction system exhaust outlets, etc.).
- The engine compartment and plenum chamber are clean (not soiled with oil or fuel).
- The engine compartment and plenum chamber have not been sprayed with cleaning agents or preservatives containing solvents.
- Fault memory interrogated => Page 38 .

- Remove plenum chamber cover.
- Switch on ignition.

- Set "Auto" mode at operating and display unit -E87.
- Start engine (compressor is driven).



- -> Press "automatic air recirculation" button (LED in button -A- lights up).
- Wait 30 seconds (warm-up time for air quality sensor).

-> Indicated on display:

```
Rapid data transfer      HELP
Select function XX
```

- Enter "08" for "Read measured value block" function.

-> Indicated on display:

```
Rapid data transfer       Q
08 - Read measured value block
```

- Confirm entry with Q key.

-> Indicated on display:

```
Read measured value block      Q
Enter display group number XXX
```

- Enter display group number "001" =>List of available display group numbers, Page 43 .

- Confirm entry with Q key.

-> Indicated on display:

```
Read measured value block 1
     1     2     3     4
```

Chart of possible readouts in display zones 1 ... 3 =>from Page 47 onwards.

- ->

```
Read measured value block 1
     0     12.5 V     12.5 V     00
```

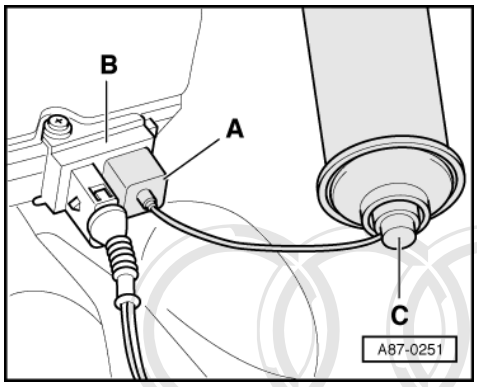
Read off display in display zone 4.

Note:

The operating status of the fresh air/air recirculation flap is displayed in display zone 4. Chart of possible readouts =>Page 51 .

- Specification: 00
  (no request for air recirculation mode, air conditioner in fresh air mode)

or



- Specification: 60
  ("partial air recirculation mode", fresh air and air recirculation flaps open)

-> Place spray head -A- of test gas canister over air inlet of air quality sensor -B-.
Press spray head -C- of test gas canister for 1 second.

Notes:

- The test gas canister is filled with pure oxygen with a certain nitrogen oxide content.
- The sensor will also respond if cigarette smoke or the gas from a lighter is applied.

- ->

```
Read measured value block 1
     0     12.5 V     12.5 V     10
```

Read off display in display zone 4.

- Specification: 10
  (request for "automatic air recirculation mode" exists, request is met, air conditioner switches to air recirculation mode)
- Wait for short time (approx. 1 minute, depending on amount of test gas sprayed onto sensor).
- ->

```
Read measured value block 1
     0     12.5 V     12.5 V     00
```

Read off display in display zone 4.

- Specification: 00
  (no request for air recirculation mode, air conditioner in fresh air mode)

or

- Specification: 60 (partial air recirculation mode)

Note:

In order to prevent the air recirculation/fresh air flap from switching too frequently, a request for "automatic air recirculation" from the sensor is retained for at least 25 seconds (minimum retention time), even if the pollution concentration in the air drops again by such a degree that air recirculation mode would no longer be necessary.

- Actuate switch for windscreen wash/wipe system until windscreen washer pump -V5 has pumped fluid for approx. 2 seconds.
- ->

```
Read measured value block 1
     0     12.5 V     12.5 V     30
```

Read off display in display zone 4.
- Specification: 30
  (request for "air recirculation mode" exists owing to windscreen wash system, air conditioner switches to air recirculation mode for approx. 10 seconds)

- Wait for short time.
- ->

```
Read measured value block 1
     0     12.5 V     12.5 V     00
```

Read off display in display zone 4.
- Specification: 00
  (no request for air recirculation mode, air conditioner in fresh air mode)

or

- Specification: 60 (partial air recirculation mode)

Notes:

- Depending on the composition of the window cleaning fluid, the sensor may detect impurity in the air and request "automatic air recirculation".
- If the fresh air mode is not switched over to the air recirculation mode when the switch for the windscreen wash/wipe system is actuated, use the current flow diagram to check the wiring from the operating and display unit -E87 to the automatic intermittent wash/wipe relay -J31.

- Press ⇒key.

-> Indicated on display:

```
Rapid data transfer     HELP
Select function XX
```

- Press keys 0 and 6 for "End output" function.

-> Indicated on display:

```
Rapid data transfer     Q
06 - End output
```

- Confirm entry with Q key.

-> Indicated on display:

```
Rapid data transfer     HELP
Enter address word XX
```


- Switch off ignition and unplug diagnostic connector.

Note:

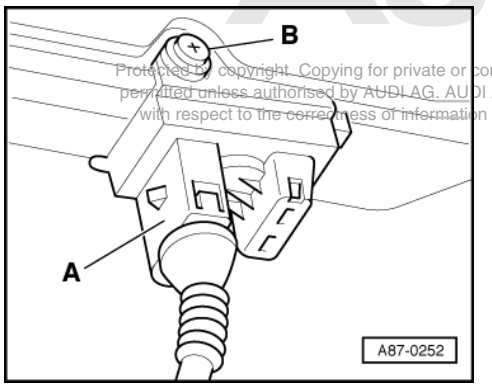
If this test shows that the air quality sensor is functioning OK, but a customer complaint has been submitted:

- Check the dust and pollen filter for clogging.
- Connect the fault reader and select the "08 Read measured value block" function.
- Since the readings are taken when the vehicle is moving, a second mechanic is required.
- Follow the safety precautions => Page 4 .
- Enter the display group number "001".
- First drive the vehicle to an area of relatively clean ambient air (system operating in fresh air mode).
- Then drive the vehicle to an area of polluted ambient air (such as an uphill road with heavy goods vehicle traffic).
- Read off display in display zone 4. When the vehicle is driven through a cloud of diesel exhaust fumes, the display must change from "00" or "60" to "10".
- Refer also to the descriptions given on Page 139 .

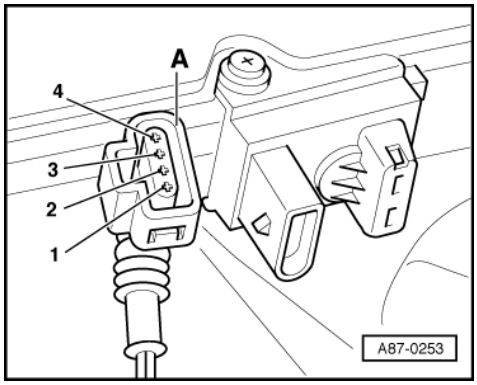
6.14 - Removing and installing air quality sensor -G238

Notes:

- The air quality sensor -G238 is a highly sensitive electronic component which may be destroyed if brought into direct contact with solvents, fuel or certain chemical compounds.
- Do not install sensors which have been kept in toolboxes, for example.
- Do not place a removed sensor anywhere where it may come into contact with solvents, fuel or certain chemical compounds (in liquid or vapour form).



- Remove plenum chamber cover.
- -> Unplug connector -A- from sensor.
- Screw out bolt -B- and detach sensor.



-> Contact assignment in connector -A-

1 - Positive (terminal "15")
2 - Negative (terminal "31")
3 - Signal wire to operating and display unit -E87 (square-wave signal cannot be measured)
4 - Not used

7 - Components used to control and regulate air conditioner (in passenger compartment)

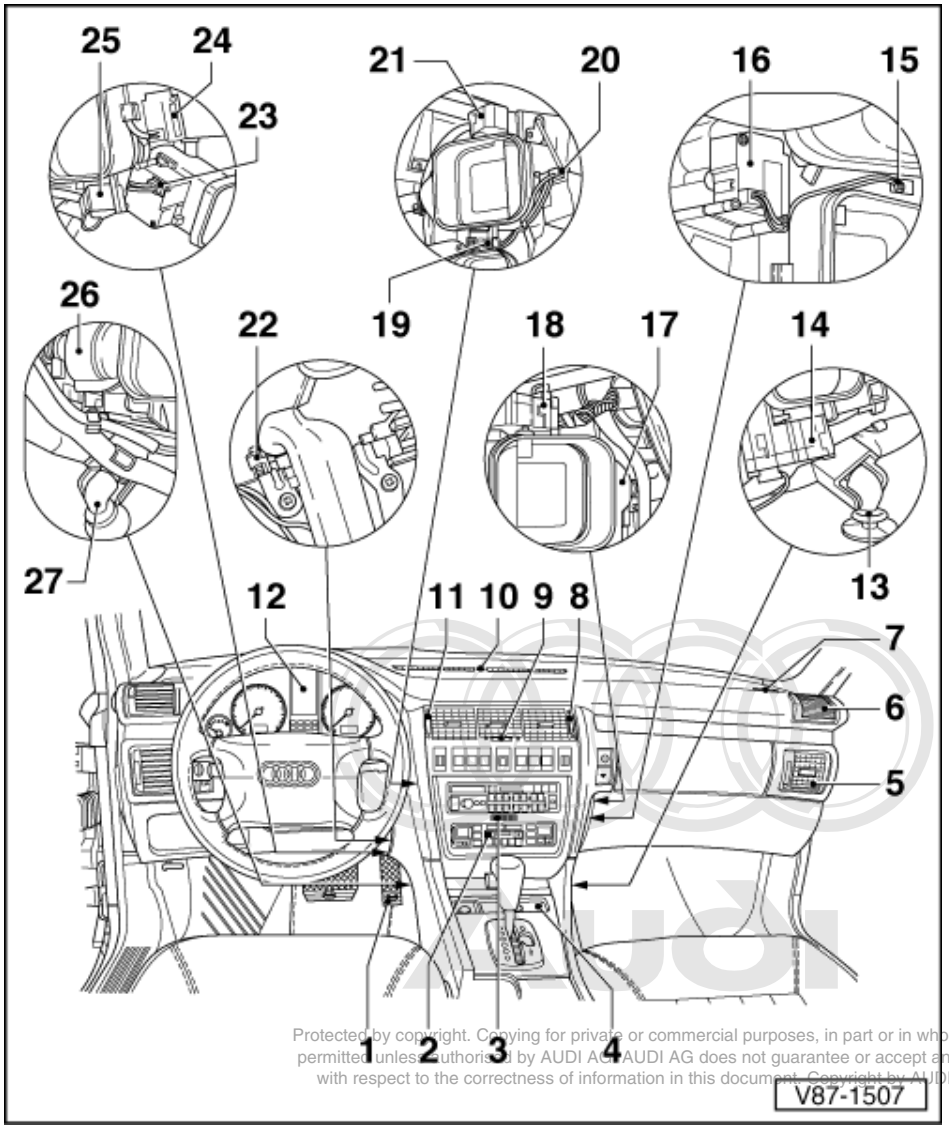
7.1 - Components used to control and regulate air conditioner (in passenger compartment)

Notes:

- Servicing work on refrigerant circuit => Page 190 .
- Perform the following work on completion of repair operations:
  Interrogate fault memory => Page 37
- Testing cooling capacity => Page 185 .
- Electrical test on all components marked 1) => from Page 70 onwards.

- All components marked 2) are actuated in final control diagnosis
  => Page 26 .
- The windscreen (defroster) vents can only be replaced after the dash panel has been removed (separate the dash panel from the dash panel cross member).

=> General Body Repairs, Interior; Repair Group 70



1 Air conditioner kick-down switch -F46

- Not installed in all vehicles
- Kick-down deactivation without kick-down switch -F46 via engine control unit or automatic gearbox control unit
- No longer fitted in vehicles with operating and display units -E87 with part numbers from index "M" onwards

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

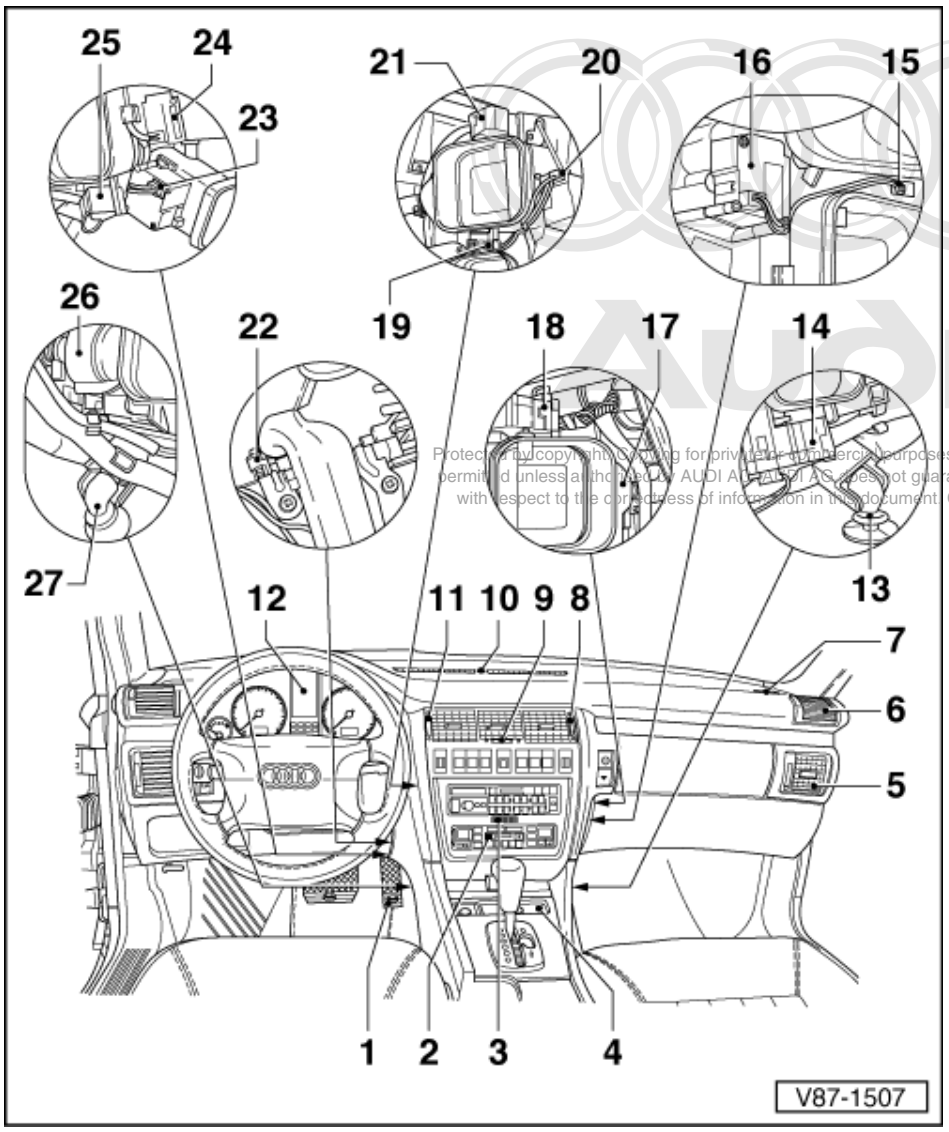
2 Operating and display unit -E87

- Assignment => Page 152

=> Parts List

- Removing and installing=>Page 152
- Checking code and encoding
  => Page 39

- Replacing bulbs=> Page 157



3 Fresh air intake duct temperature sensor -G56 1)

- Removing and installing
  => Page 168
- Fitted in -E87 in vehicles with operating and display units -E87 with part numbers from index "M" onwards

4 Diagnostic connector

5 Dash panel vent

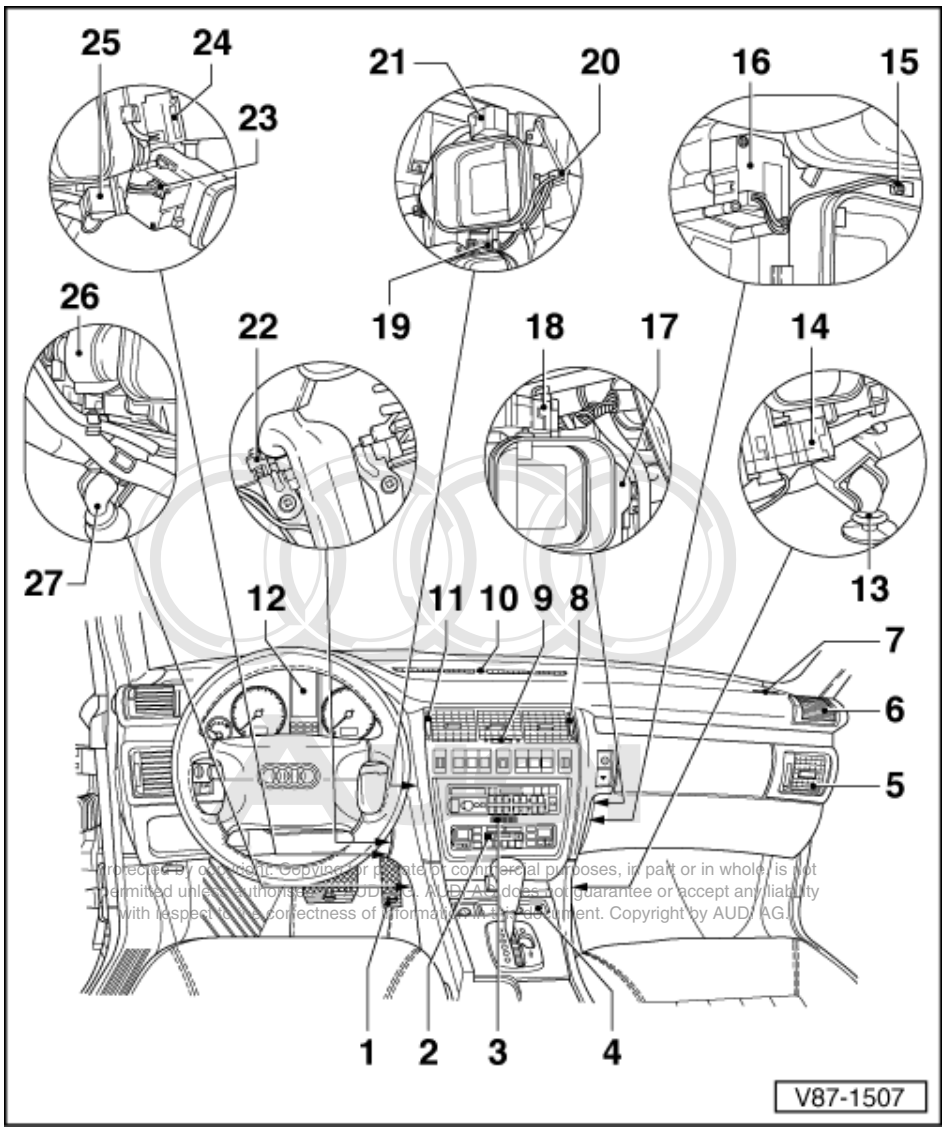
- Bottom left and right
- Removing and installing
  => Page 159

6 Dash panel vent

- Top left and right
- Removing and installing
  => Page 158

7 Defroster vent

- For left and right side window
- Removing and installing
  => Page 158



8 Centre right vent switch -F184 1)

- Removing and installing vent
  => Page 157

9 Potentiometer in centre dash panel vent -G142 1)

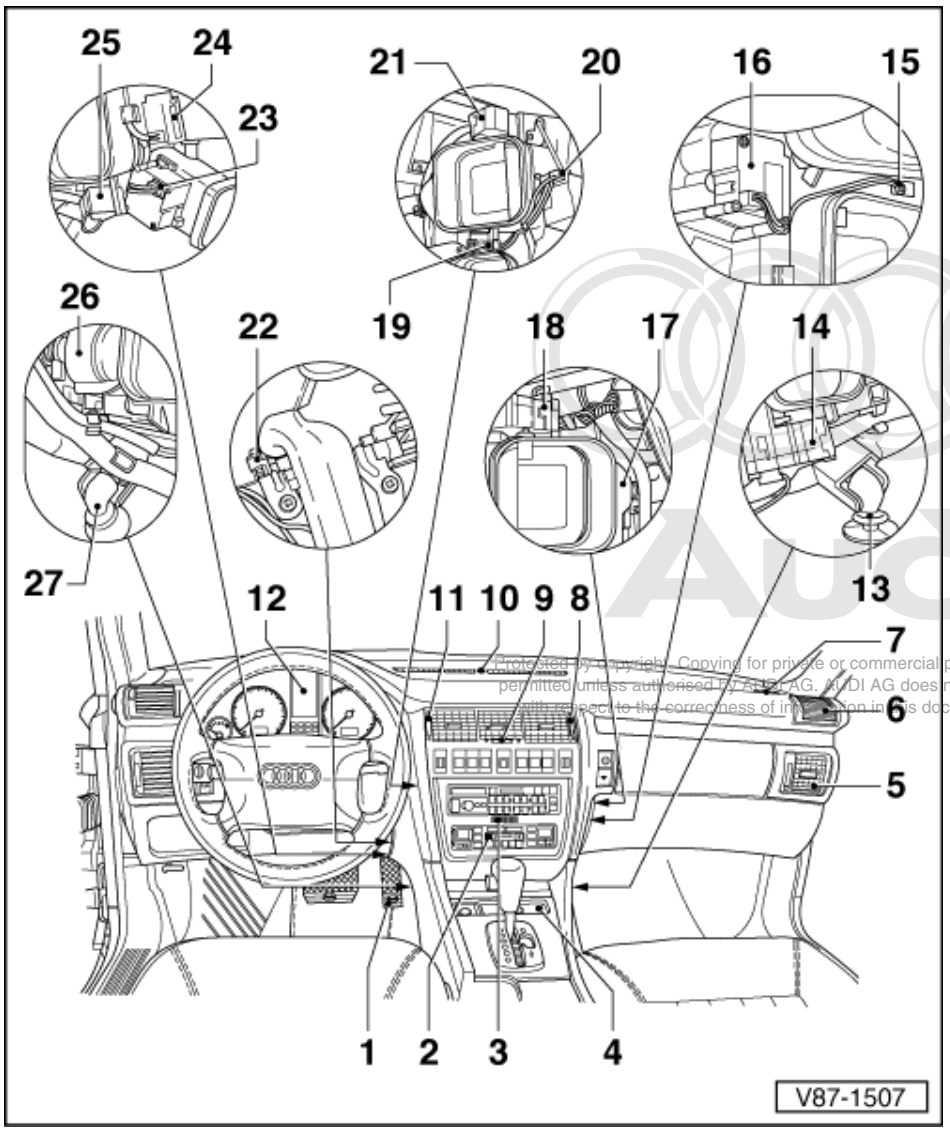
- Removing and installing vent
  => Page 157

10 Sunlight penetration photosensor -G107 1)

- Removing and installing
  => Page 168

11 Centre left vent switch -F184 1)

- Removing and installing vent
  => Page 157

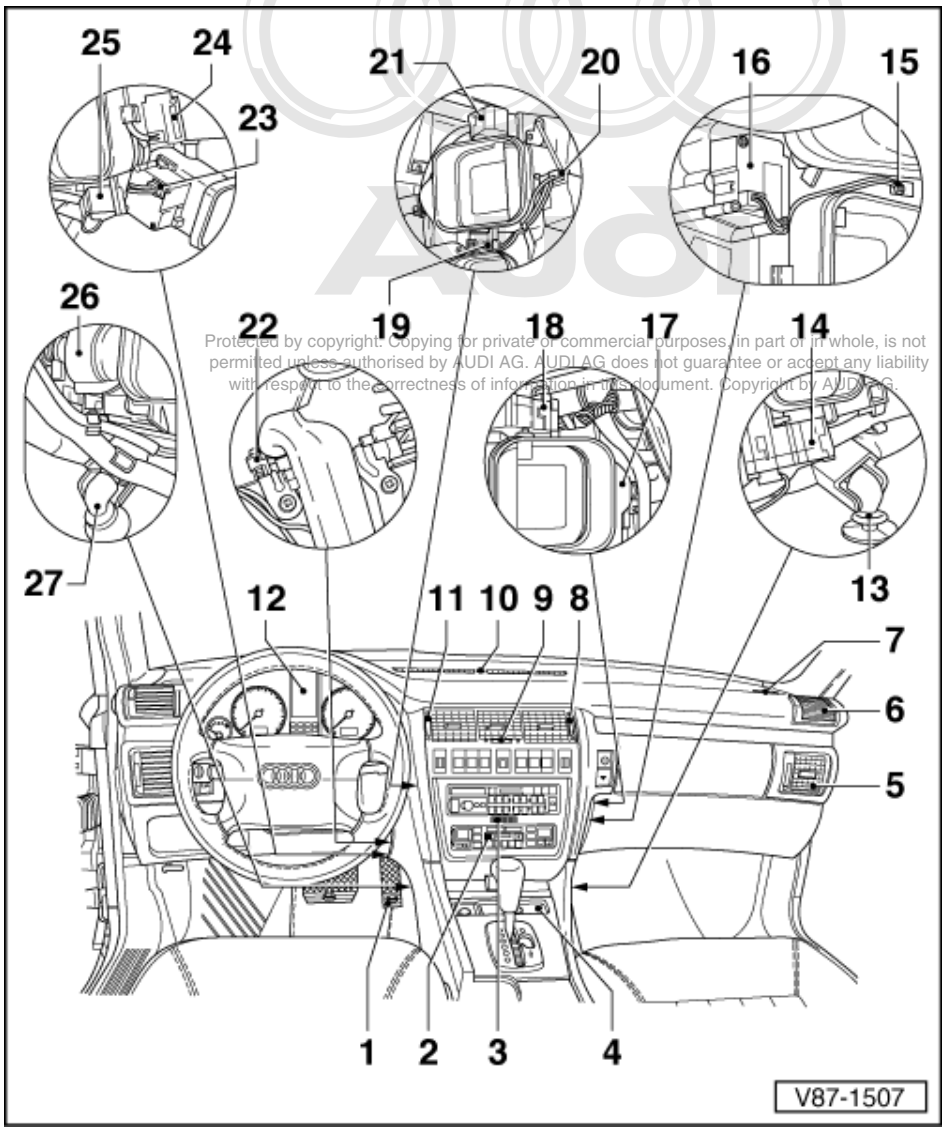


12 Auto-check system

- With ambient temperature indicator -G1062)
- Ambient temperature delivered by operating and display unit -E87 is only indicated on vehicles with automatic gearbox when Drive is engaged
- If temperature indicator is defective, check measured values from temperature sensors=>Page 72
- In vehicles with operating and display unit -E87 with part number from index "M" onwards, displayed temperature is calculated directly in dash panel insert.

13 Condensation drainage hose with valve

- Front passenger's side
- Checking, removing and installing => Page 160



14 Right footwell flap control motor -V109 2)

- With potentiometer -G140
- Removing and installing => Page 167

15 Right vent temperature sender -G151 1)

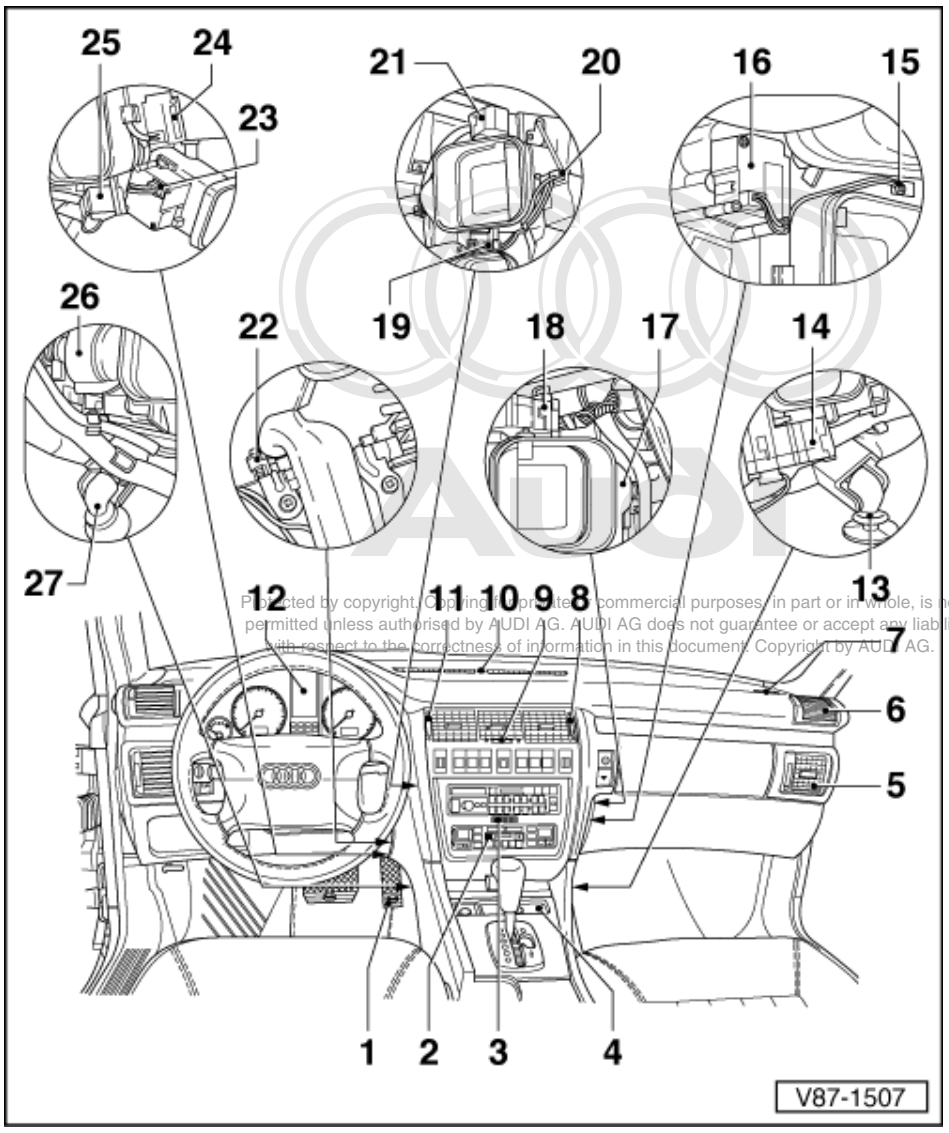
- Testing => Page 71
- Removing and installing => Page 169

16 Temperature flap control motor -V68 2)

- With potentiometer -G92
- Removing and installing => Page 167

17 Heat exchanger for heater

- Right
- Removing and installing => Page 171



18 Centre right vent control motor -V111 2)

- With potentiometer -G137
- Removing and installing => Page 163

19 Left vent temperature sender -G150 1)

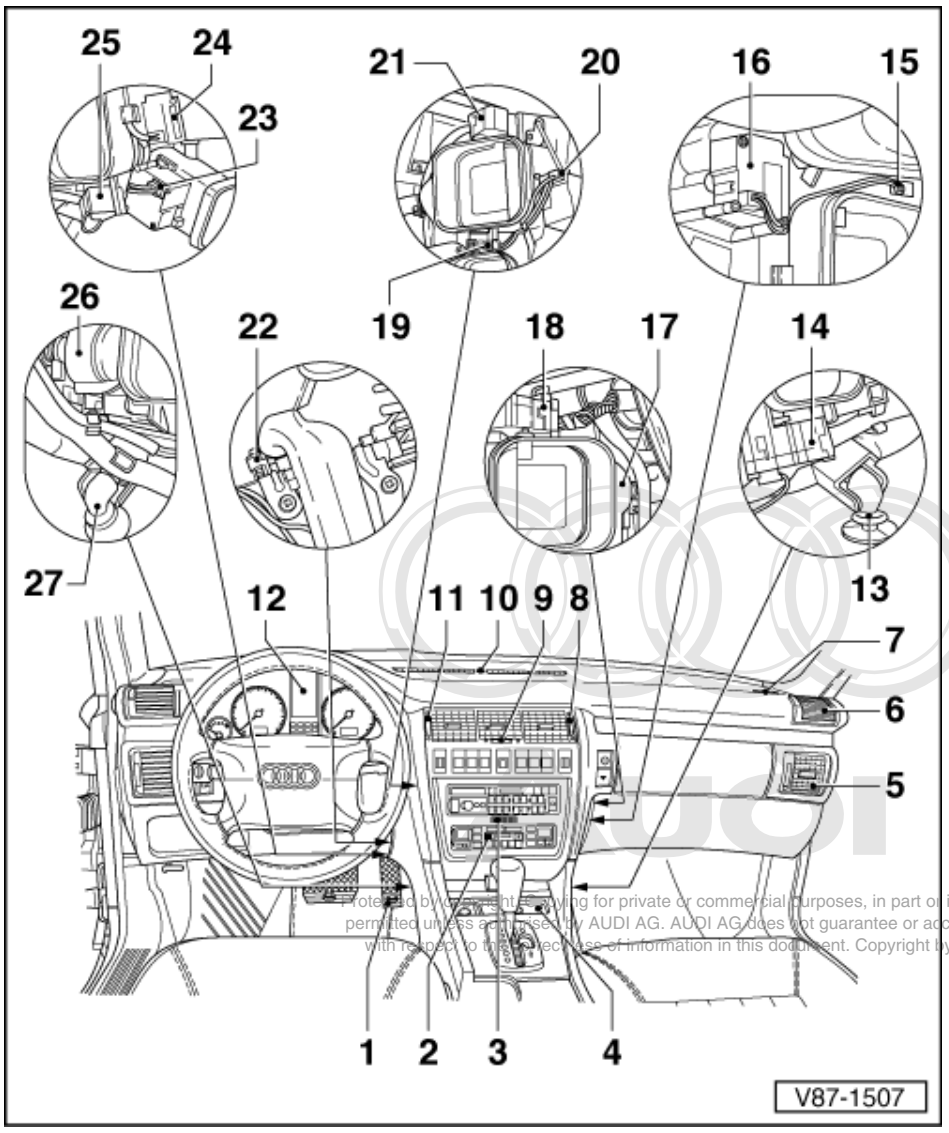
- Testing => Page 71
- Removing and installing => Page 169

20 Defrost flap control motor -V107 2)

- With potentiometer -G135
- Removing and installing => Page 164

21 Centre left vent control motor -V110 2)

- With potentiometer -G136
- Removing and installing => Page 163



22 Temperature sensor blower -V42 2)

- Removing and installing
  => Page 169
- Fitted in -E87 in vehicles with operating and display units -E87 with part numbers from index "M" onwards

23 Rear footwell vent control motor -V112 2)

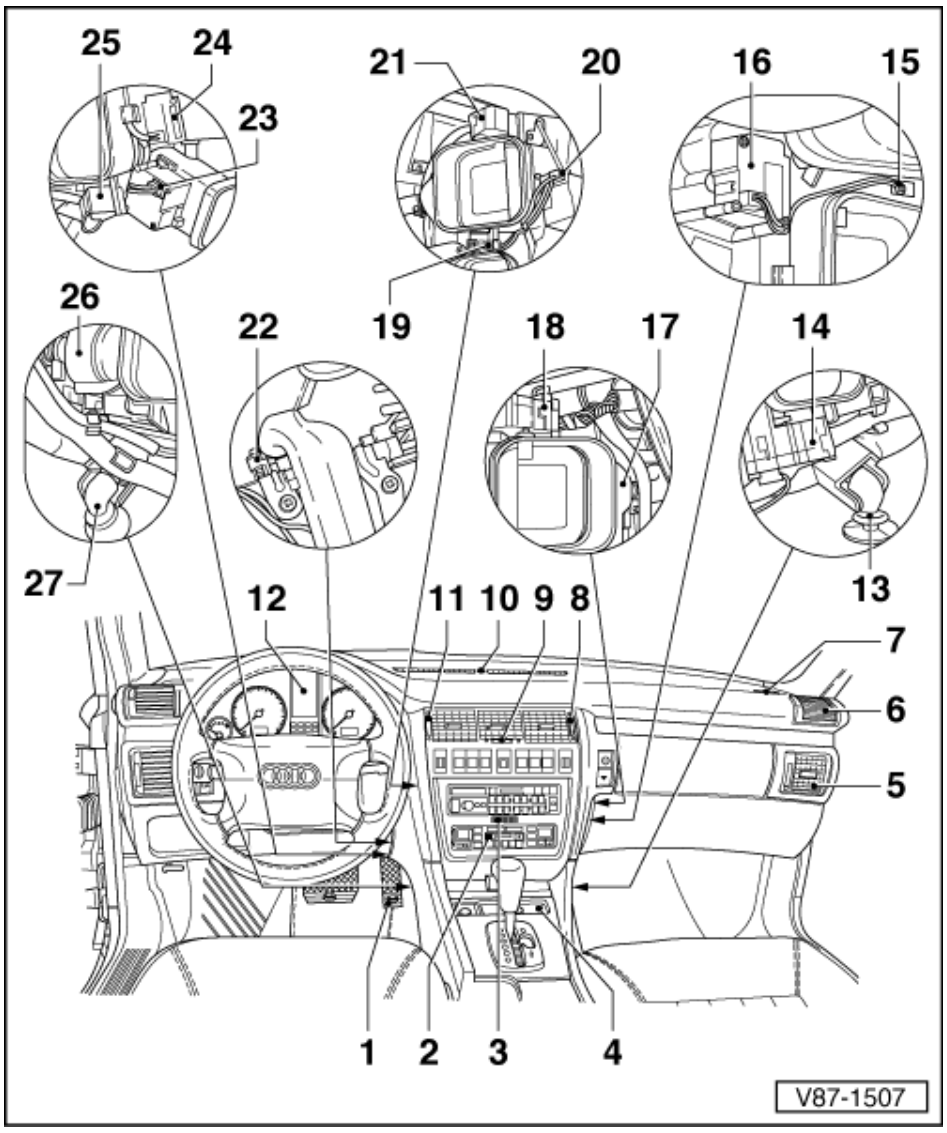
- With potentiometer -G141
- Removing and installing
  => Page 166

24 Centre vents control motor -V102 2)

- With potentiometer -G138
- Removing and installing
  => Page 164

25 Left footwell flap control motor -V108 2)

- With potentiometer -G139
- Removing and installing
  => Page 166



26 Heat exchanger for heater

- Left
- Removing and installing
  => Page 177

27 Condensation drainage hose with valve

- Driver's side
- Checking, removing and installing
  => Page 160

7.2 - Removing and installing operating and display unit -E87

Notes:

- Before removing the -E87, interrogate the fault memory => Page 6 .
- Ensure that the assignment is correct when replacing an operating and display unit =>Page 153 and

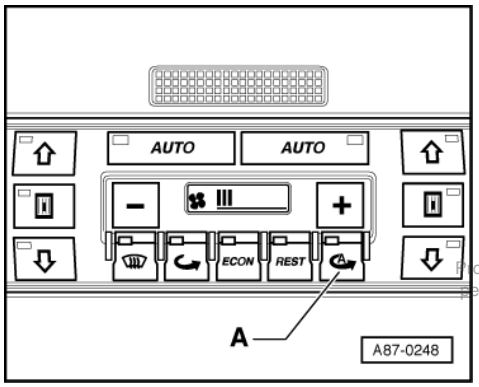
=> Parts List

- After replacing the -E87, always:
  - check and correct the code =>Page 6 .

-> Code for operating and display units up to part number index "H" differs from that for units from index "J" onwards => Page 42 .

- If a newly installed operating and display unit -E87 flashes when the ignition is switched on, encode the -E87 =>Page 39 .
- If 22 °C (71°F) is always displayed when the ignition is switched on regardless of the temperature set last, service the power supply to the -E87 (terminal 30) in line with the current flow diagram.

- In the case of operating and display units up to index "K", the display on the -E87 (and the ambient temperature display in the dash panel insert) can be switched from °C to °F and vice versa by pressing the button "Temperature + left" (driver's side) with the "air recirculation" button depressed. The unit of measurement used in the display (°C or °F) in the case of an -E87 from index "M" onwards is determined by the setting made at the control unit in the dash panel insert (and transmitted to the -E87 via the data bus system).
- The -E87 can be activated a certain time after the ignition has been switched off (up to approx. 30 minutes) by pressing the "Rest" button (the operating time depends on the charge condition of the battery - maximum time approx. 10 minutes).
- If the -E87 remains in operation after the ignition has been switched off, use the current flow diagram to check for short to positive along the wiring to connector E, contact 7 (connection for auxiliary heater mode).
- In vehicles with operating and display unit -E87 without "OFF" button, the air conditioner can be switched off using the "minus" button for fresh air blower speed.



- In the case of vehicles with air quality sensor -G238 the compressor may, depending on the pollutant content of the surrounding atmosphere and the "manual air recirculation mode", be switched on during the "automatic air recirculation" function at ambient temperatures up to approx. - 5 °C (compared to + 2°C with the other modes).
- -> Vehicles with air quality sensor -G238 can be identified by the button -A- for "automatic air recirculation" (in place of the "Off" button) on the operating and display unit -E87.
- In the case of operating and display units from index "M" onwards, the display and controls are illuminated by LEDs (the LEDs cannot be replaced).
- In the case of incorrect measurements by the temperature sensor -G56, check the intake grille in the trim panel (it must not be obstructed).

Assignment of operating and display unit -E87

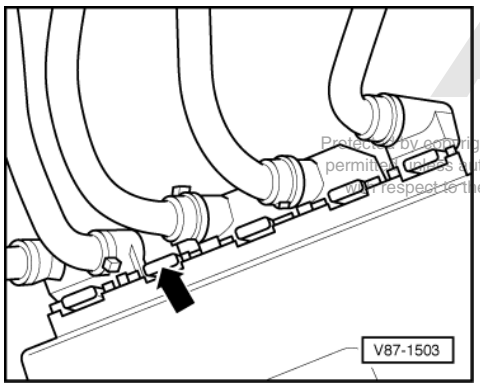
Vehicle feature	Part No. index for -E87	Explanation
Zexel compressor	up to and incl. "H"	Possible encoding for compressor with air conditioner compressor speed sender -G111
Nippondenso /Denso-compressor	from index "B" onwards	Possible encoding for compressor without air conditioner compressor speed sender -G111
TDI engine	from index "E" onwards	Possible encoding for TDI engine

Air quality sensor -G238	from index "J" onwards	Software adapted to air quality sensor -G238
Switch for heated rear window installed in -E87	from index "M" onwards	Modified version of dash panel centre section

Operating and display units with part numbers up to index "K"

Notes:

- Different versions exist for RoW, USA and Japan vehicles (up to part number index "H").
- Different versions exist for vehicles with and without navigation system.

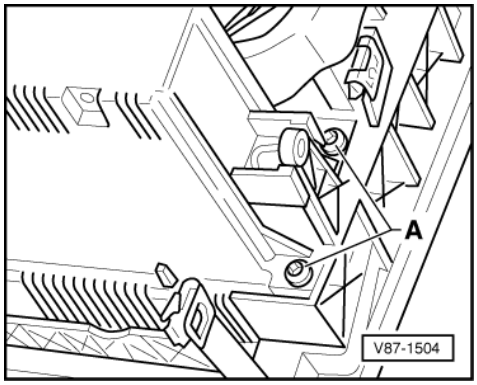


- Removing

- Remove dash panel centre section:

=> General Body Repairs, Interior; Repair Group 70

- -> Push back connector catch -arrow- and unplug connector.



- -> Screw out 4 bolts -A-.

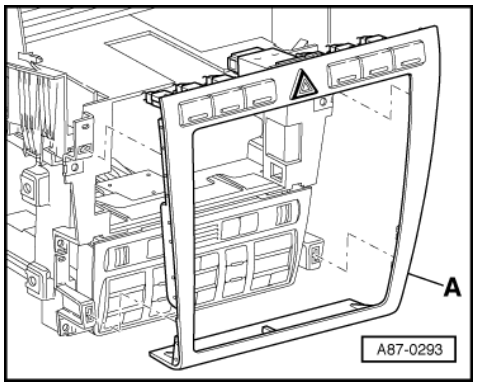
Note:

If the operating and display unit -E87 cannot be pulled out of the dash panel centre section, detach the cover (wood trim panel) from the dash panel centre section.

- Installing

Install in reverse order.

Operating and display units with part numbers from index "M" onwards



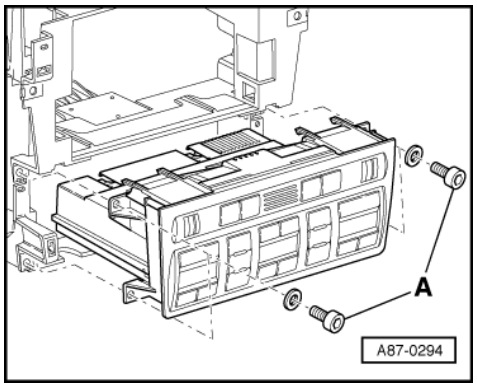
- Removing

- Remove centre dash panel vent => Page 157 .
- -> Remove trim panel -A- for dash panel centre section.

=> General Body Repairs, Interior; Repair Group 70

- Remove radio or radio/navigation system.

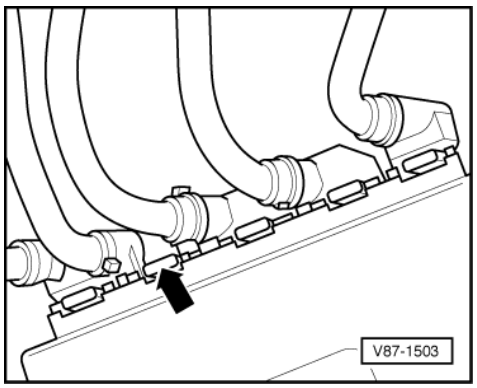
=> Radio, Telephone, Navigation; Repair Group 91



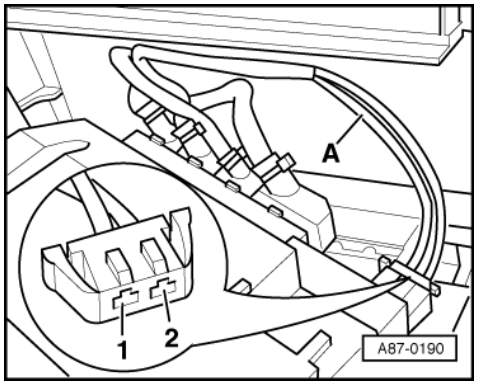
Notes:

- Different versions of the trim panel -A- and operating and display unit exist for vehicles with radio and with radio/navigation system (or radio with large control panel).
- Different versions of the operating and display unit exist for vehicles with and without heated seats.

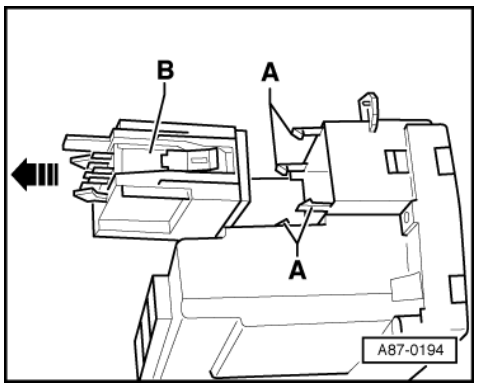
- -> Screw out 4 bolts -A-.



- -> Push back connector catch -arrow- and unplug connector.



- -> Release and unplug connector for heated rear window.



- -> Remove switches for heated seats. To do so, push back retainer tabs -A- and pull switches -B- backwards out of operating and display unit -E87.

Notes:

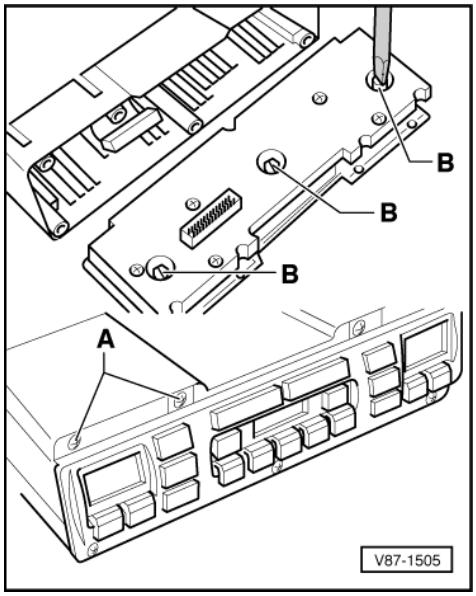
- In the case of operating and display units from index "M" onwards, the display and controls are illuminated by LEDs (the LEDs cannot be replaced).
- Replacement -E87 units are available in various versions (depending on the vehicle's equipment level, e.g. with and without opening for the heated seat switches).

=> Parts List

- Installing

Install in reverse order.

7.3 - Replacing bulbs of operating and display unit -E87

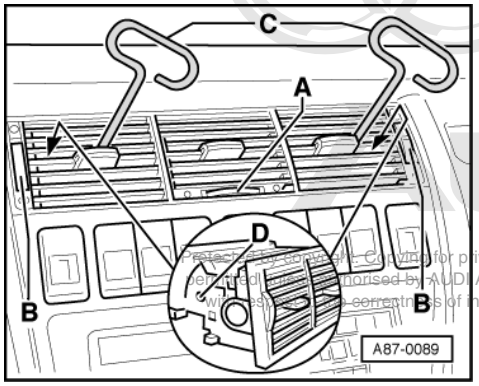


Note:

The bulbs can only be replaced in operating and display units with part numbers up to index "K".

- Remove operating and display unit -E87 =>Page 152 .
- -> Screw out bolts -A-.
- Carefully lever off display and control panel.
- Rotate bulb -B- by 90° and remove.

7.4 - Removing and installing centre dash panel vents

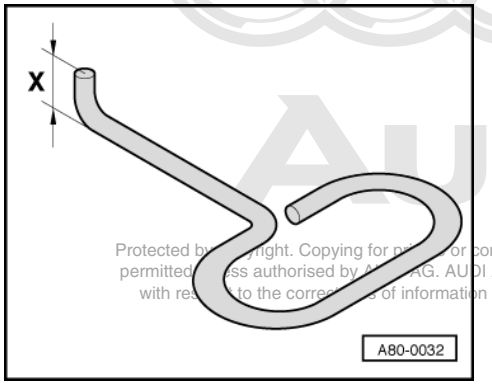


- -> Insert tool -C- into holes in dash panel vents -D-.
- Pull dash panel vents evenly out of dash panel centre section.

Note:

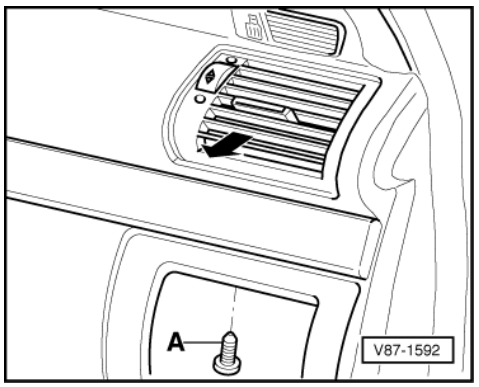
Do not hook the tools -C- onto the fins of the dash panel vents (the fins could break).

Making tool for removing dash panel vents



- -> Bend ø 3 mm wire into shape shown.
  - Dimension x = 6 mm

7.5 - Removing and installing top left/top right dash panel vents

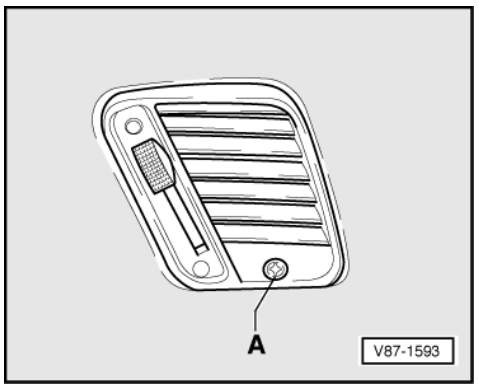


- Remove bottom left and bottom right dash panel vents =>Page 159 .
- -> Screw out bolt -A-.
- Pull dash panel vents out of dash panel using tools.

Note:

Making tool =>Page 158 .

7.6 - Removing and installing left/right side window defroster vents



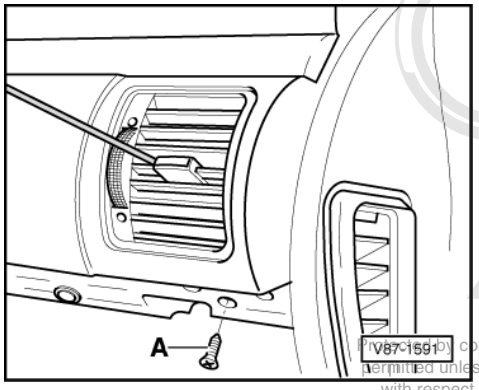
- -> Screw out bolt -A-.

Note:

If the bolt -A- is not fitted, the defroster vent is clipped into the dash panel.

- Pull defroster vent out of dash panel.

7.7 - Removing and installing bottom left/bottom right dash panel vents



- Remove glove box and driver's storage compartment:

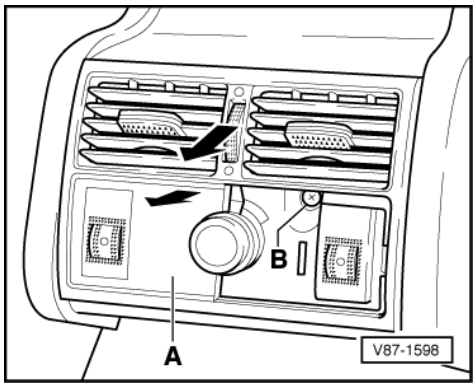
=> General Body Repairs, Interior; Repair Group 70

- -> Screw out bolt -A-.
- Pull dash panel vents out of dash panel using tools.

Note:

Making tool =>Page 158 .

7.8 - Removing and installing rear centre footwell vents



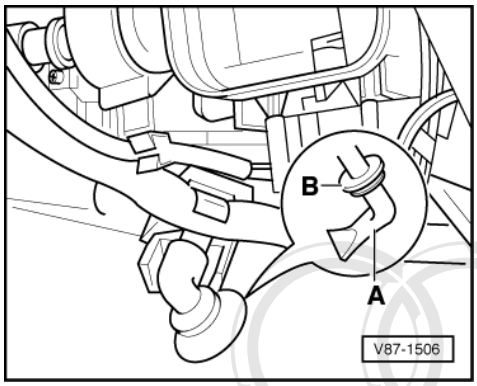
- -> Carefully lever trim panel -A- off centre console.
- Screw out bolts -B-.
- Remove rear centre footwell vents.

7.9 - Checking, removing and installing condensation drainage hose with valve

Checking

- Remove side trim of centre console on driver's and front passenger's side:

=> General Body Repairs, Interior; Repair Group 70



- -> It must be possible to attach condensation drainage hose -A- to connection on air conditioner without the drainage hose being subjected to mechanical stress.
- Cross-section of condensation hose must not be constricted by insulating mat.

- Re-work insulating mat if necessary.

- When installed, condensation drainage valve must not rest against heat dissipation panel.

- With valve removed, check whether there is adequate clearance between centre tunnel floor panel and heat dissipation panel.

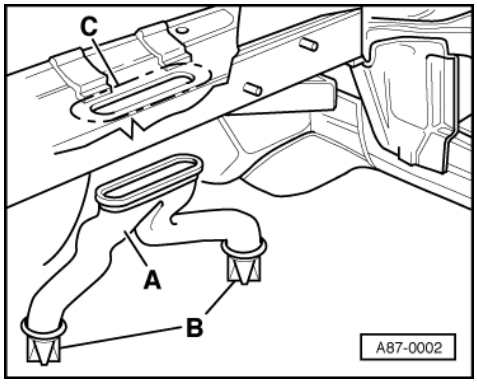
- Condensation drainage valve must not be gummed up with wax or underseal and must close properly.

- Condensation drainage hose must be securely fitted to condensation drainage connection on air conditioner.

- If necessary, use hose clamp to secure condensation drainage hose.

- In the event of moisture in passenger compartment:

- Use length of wire to check for dirt in condensation drainage ducts of air conditioner, e.g. with condensation drainage hose removed. Clean drainage ducts if necessary.

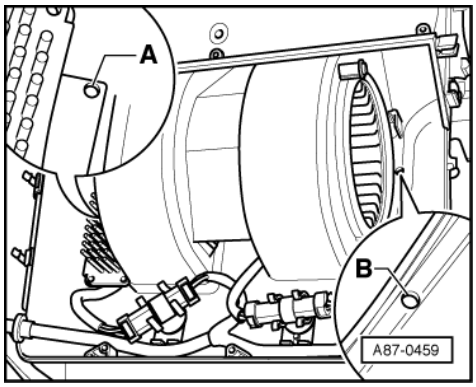


- -> Check for dirt in drainage hose -A-, associated valve -B- and section under air conditioner unit -C-.
- If necessary, remove coupling station from electronics box in plenum chamber.

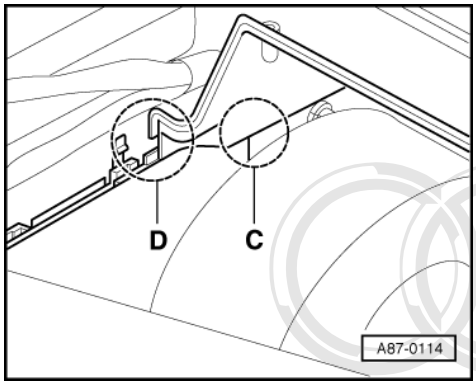
Note:

The illustration shows the valve and drainage hose with the surrounding assemblies removed.

- If no faults can be detected:



- Check forced air extraction of passenger compartment (via luggage compartment) => Page 124 .
- Check seal on intake housing => Page 131 .
- Remove grille covering air flow flaps and intake housing =>Page 130 .
- -> Check both drainage holes -A- and -B- in air conditioner unit for dirt (drainage holes have different diameters depending on model year, illustration shows version installed from model year 1999 onwards).



- -> Check areas -C- and -D- for indications of water penetration. If necessary, seal these areas =>Page 130

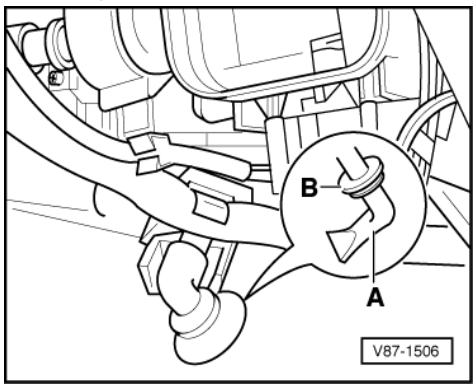
Removing

- Remove side trim of centre console on driver's and front passenger's side:

=> General Body Repairs, Interior; Repair Group 70

- Detach condensation drainage hose from air conditioner unit.
- Pull condensation drainage hose out of centre tunnel.

Installing



- -> Push condensation drainage valve -A- through centre tunnel floor panel.
- Engage rib -B- completely in centre tunnel panel.

7.10 - Removing and installing centre vents control motors (-V102, -V110 and -V111)

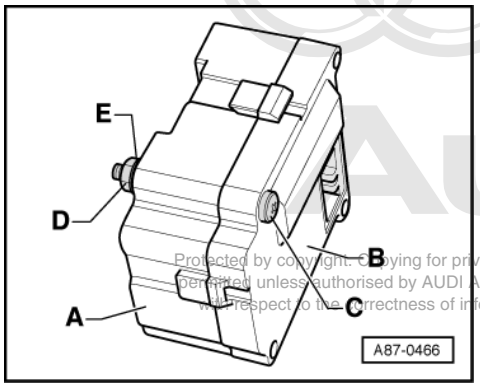
Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.
- Replace the control motor if it emits cracking or rattling noises at regular intervals (approx. every 7 min.).

- These noises are emitted from the control motor gearing when the control motor is actuated by the -E87.
- The control motor is actuated to hold the flap/motor securely at a stop limit.

- To determine which control motor is causing the noises, the various control motors must be connected in sequence (using the test box V.A.G 1598 and wires from the adapter set V.A.G 1594A) to the 12 V vehicle voltage (positive socket "E5" and negative socket "E9") until each control motor has reached a stop limit. The control motor is moved to the other stop limit by swapping over positive and negative. Connecting the test box sockets to the various control motors => Page 74 Electrical test, test step 6.3 to 6.10 and

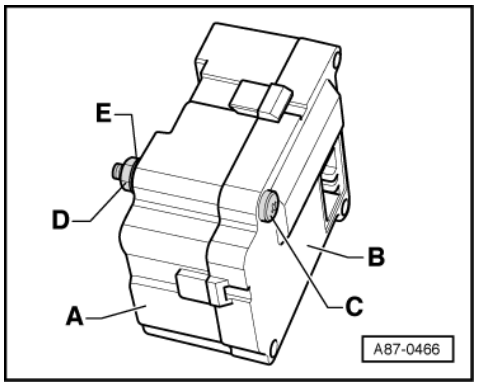
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- -> All replacement control motors will eventually only be available with the additional bolt -C- on the housing.

=> Parts List

- The bolt is intended to prevent the cover -B- from lifting off and the drive shaft in housing -A- from slipping.
- Depending on the fitting location of the control motor on the air conditioner unit, it may be necessary to remove the bolt -C- (the above-described function of the bolt -C- is then performed by the bolt which secures the control motor to the air conditioner unit).



- -> Depending on the fitting location of the control motor on the air conditioner, it may be necessary to shorten the web for the third mounting point on the air conditioner unit so that the control motor can be securely fitted

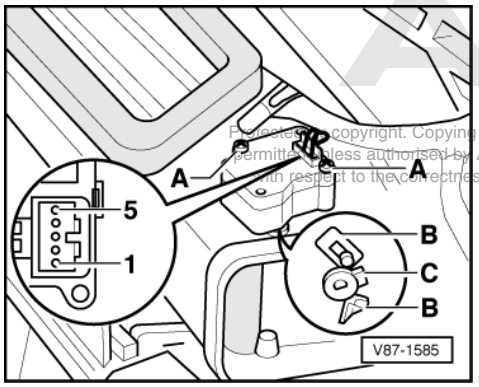
without the bolt -C- or nut -D- making contact with the air conditioner unit (the control motor is not bolted at this point).
- If a replacement control motor is supplied, the bolt -C- (M3 x 30) can be retrofitted with an appropriate shim -E- and nut -D-.

Left control motor -V110/right control motor -V111

Removing

- Remove dash panel:

=> General Body Repairs, Interior; Repair Group 70



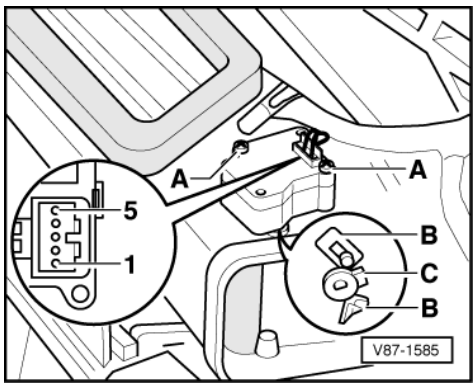
- -> Screw out bolts -A-.
- Remove control motor.

Note:

The illustration shows the control motor -V111.

Installing

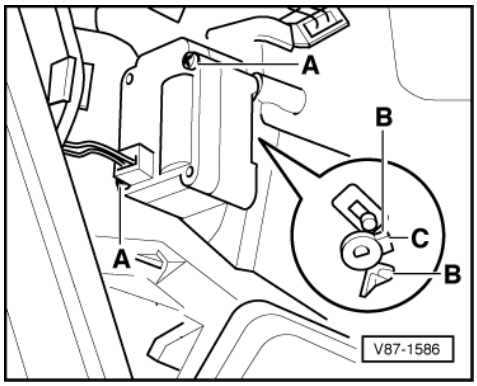
- Before installing control motor, check mounting of flap.
  - Lug -C- must be between stops -B-
- Install control motor.
- If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.



- Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.
- -> Hand-tighten securing bolts -A- (4 Ncm).
- Interrogate fault memory => Page 37 .

Control motor -V102

Removing



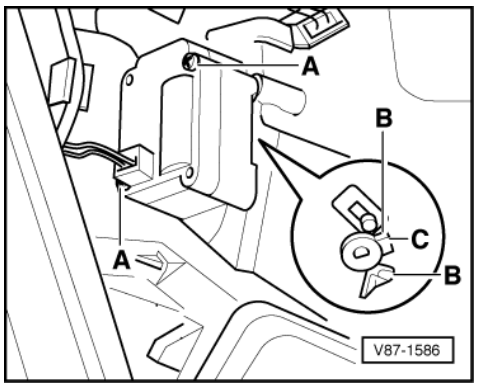
- Remove driver's storage compartment and side trim of centre console:

=> General Body Repairs, Interior; Repair Group 70

- -> Screw out bolts -A-.
- Remove control motor from air conditioner unit.

Installing

- Before installing control motor, check mounting of flap.



- -> Lug -C- must be between stops -B-

Install control motor.
If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.
Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.
Hand-tighten securing bolts -A- (4 Ncm).
Interrogate fault memory => Page 37 .

7.11 - Removing and installing defrost flap control motor -V107

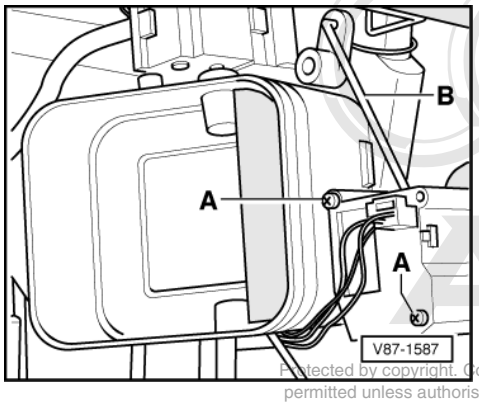
Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.
- If a control motor emits cracking or rattling noises at regular intervals (approx. every 7 min.), refer to the notes on page 162 (Removing and installing centre vents control motors).

- The control motor may have an additional bolt securing the cover to the housing. Refer to the notes on Page 162 (Removing and installing centre vents control motors).

Removing

- Remove driver's storage compartment and side trim of centre console:



=> General Body Repairs, Interior; Repair Group 70

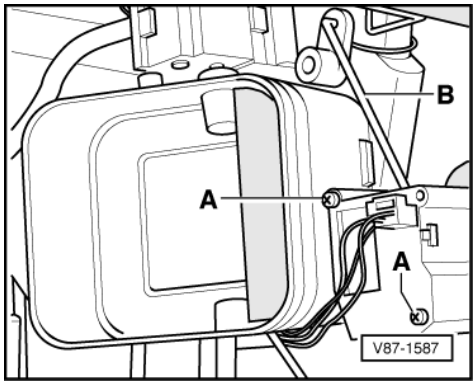
- Remove footwell vents.
- -> Screw out bolts -A-.
- Remove control motor.

Note:

The linkage -B- with lever remains attached to the air conditioner unit.

Installing

- Before installing control motor, check mounting of flap.
- Install control motor.
- If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.
- Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.



- -> Hand-tighten securing bolts -A- (4 Ncm).
- Interrogate fault memory => Page 37 .

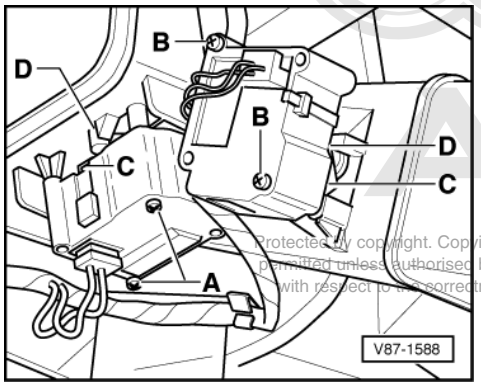
7.12 - Removing and installing left footwell flap control motor -V108 and rear footwell vent control motor -V112

Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.
- If a control motor emits cracking or rattling noises at regular intervals (approx. every 7 min.), refer to the notes on page 162 (Removing and installing centre vents control motors).
- The control motor may have an additional bolt securing the cover to the housing. Refer to the notes on Page 162 (Removing and installing centre vents control motors).

Removing

- Remove driver's storage compartment and side trim of centre console:

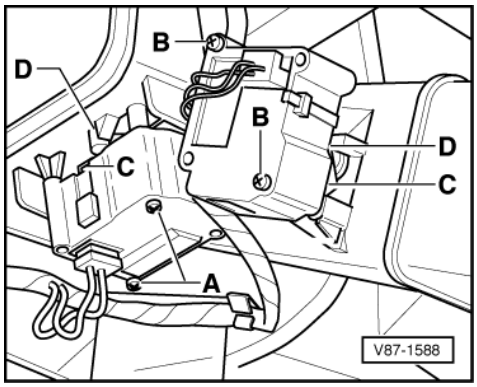


=> General Body Repairs, Interior; Repair Group 70

- -> Screw out bolts -A- for control motor -V108.
- Screw out bolts -B- for control motor -V112.
- Remove control motor.

Installing

- Install control motor.
- If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.
- Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.



- -> Hand-tighten securing bolts -A- and -B- (4 Ncm).

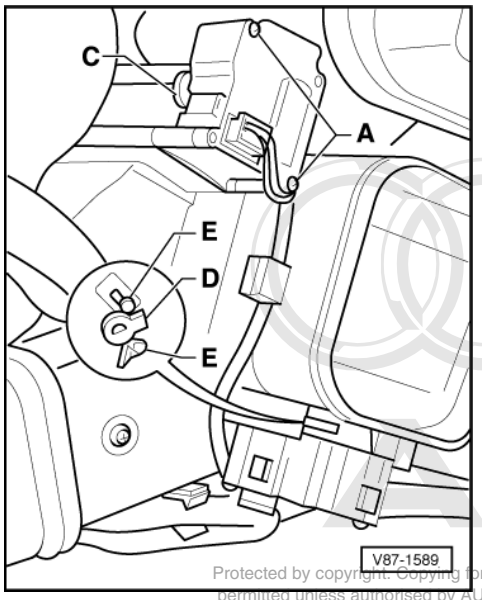
- Interrogate fault memory => Page 37 .

7.13 - Removing and installing temperature flap control motor -V68 and right footwell flap control motor -V109

Notes:

- When removing, mark the motor/flap connecting element (this will prevent it from being mixed up with the connecting elements of other control motors).
- If the "Adaption limit exceeded" fault occurs, check the motor/flap connecting element. There must not be any clearance between the control motor shaft and the connecting element.
- If a control motor emits cracking or rattling noises at regular intervals (approx. every 7 min.), refer to the notes on page 162 (Removing and installing centre vents control motors).
- The control motor may have an additional bolt securing the cover to the housing. Refer to the notes on Page 162 (Removing and installing centre vents control motors).

Removing



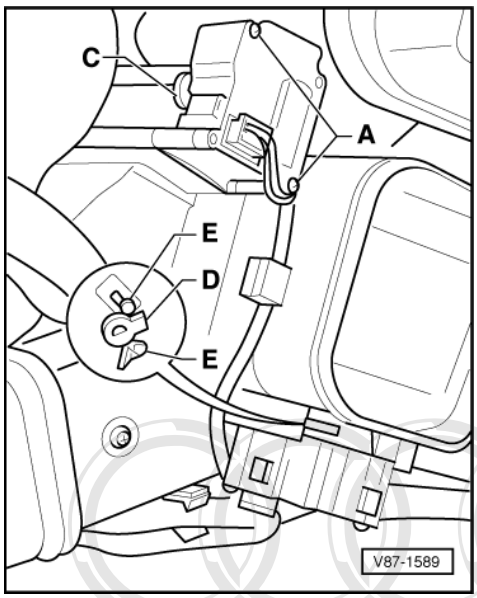
- Remove glove box and side trim of centre console:

=> General Body Repairs, Interior; Repair Group 70

- Remove footwell vent.
- -> Screw out bolts -A- for control motor -V68.
- Screw out bolts -B- for control motor -V109.
- Remove control motor.

Installing

- Before installing control motor, check mounting of flap.



- -> Lug -D- of control motor -V109 must be between stops -E-

Install control motor.

Check that actuating arm -C- is correctly fitted to control motor -V68.

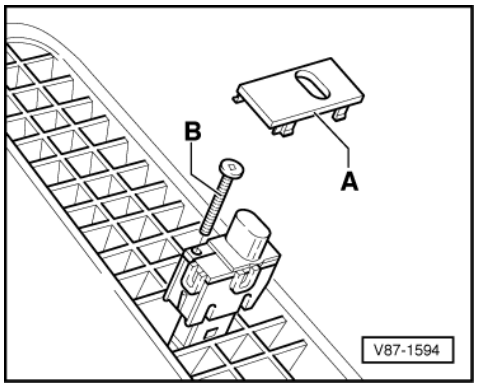
If the position of the shaft prevents the motor from being installed, use the test lead from V.A.G 1594 A to connect contact 4 and 5 of the control motor to a 12 V battery via a 5 A fuse.

Allow the control motor to turn until it has reached a position which will permit installation. The direction of rotation can be reversed by swapping positive and negative.

Hand-tighten securing bolts -A- and -B- (4 Ncm).

Interrogate fault memory => Page 37.

7.14 - Removing and installing sunlight penetration photosensor -G107

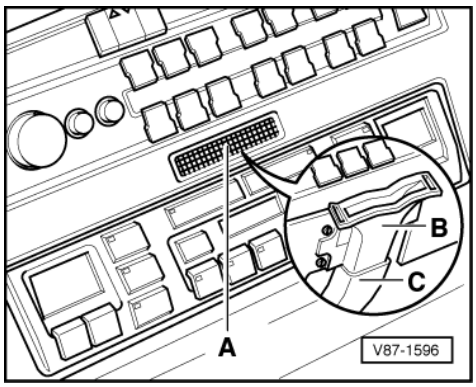


- -> Carefully lever cover -A- out of windscreen defroster vent.
- Screw out bolt -B-.
- Remove sunlight penetration photosensor from windscreen defroster vent.

7.15 - Removing and installing dash panel temperature sensor -G56

- Remove dash panel centre section:

=> General Body Repairs, Interior; Repair Group 70



Notes:

- -> The intake housing -A- of the temperature sensor must not be obstructed.
- The temperature sensor -B- is permanently connected to the switch mount. Both components must be replaced together as a single component.
- In the case of incorrect measurements, check the blower -V42 and the associated intake housing -C-.

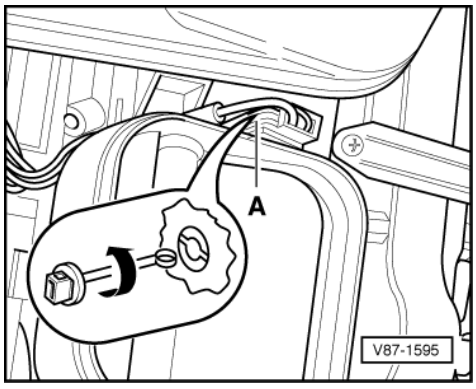
7.16 - Removing and installing vent temperature senders

Left vent temperature sender -G150/right vent temperature sender -G151

- Remove glove box, driver's storage compartment and side trim of centre console:

=> General Body Repairs, Interior; Repair Group 70

- Remove footwell vents on driver's and front passenger's side.



- -> Rotate vent temperature sender -A- approx. 90°.

Note:

The illustration shows the right vent temperature sender -G151.

- Pull out vent temperature sender.

7.17 - Removing and installing dash panel temperature sensor blower -V42

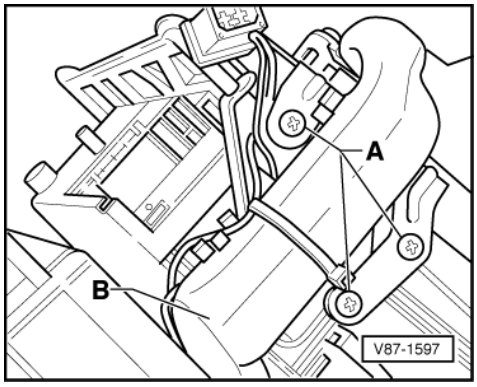
Notes:

- The blower -V42 can only be replaced as a separate component in vehicles with an -E87 up to index "K".

- The blower -V42 is only integrated in the -E87 in vehicles with an -E87 from index "M" onwards. This blower cannot be replaced as a separate component.

- Remove driver's storage compartment and side trim of centre console:

=> General Body Repairs, Interior; Repair Group 70



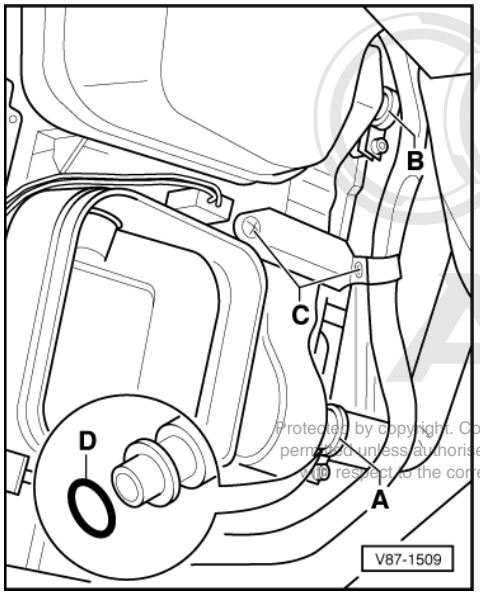
- -> Screw out bolts -A-.
- Detach suction hose -B-.
- Remove temperature sensor blower.

Notes:

- Checking function =>Final control diagnosis, Page 30 .
- Check the suction hose -B-. It must not be obstructed and must be fitted securely to the hose connection leading to the temperature sensor.

8 - Removing and installing heat exchangers for air conditioner unit

8.1 - Removing and installing heat exchangers for air conditioner unit

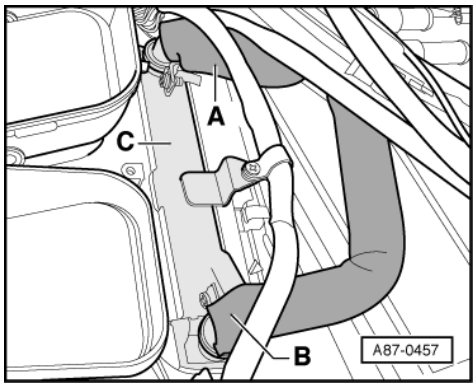


Notes:

- From November 2000, a modified air conditioner unit is to be gradually introduced. This air conditioner unit has modified heat exchangers (version "2") and modified coolant pipes leading to the heat exchangers. The modified heat exchangers are different in size which has meant that the mount in the air conditioner unit also had to be changed.

- The air conditioner unit with the version "2" heat exchangers can be identified from the outside by the coolant pipes leading to the heat exchangers:

- -> The coolant pipes for version "1" are connected at the front of the heat exchanger.



- -> The coolant pipes -A- and -B- for version "2" are connected at the side of the heat exchanger -C-.

Special tools, testers and other items required

- Hose clamps 3093/3094
- Drip tray V.A.G 1306
- Commercially available compressed-air gun

8.2 - Removing and installing right heat exchanger (front passenger's side)

Note:

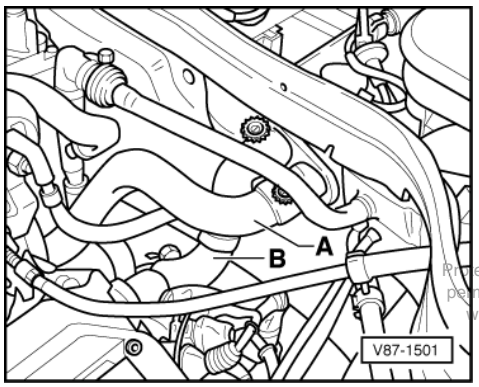
The following sequence must be followed in the case of RHD vehicles: Remove left heat exchanger first.

- Switch off ignition.
- Remove windscreen wipers and cowl panel trim:

=> Electrical System; Repair Group 92

- Unscrew cap of coolant expansion tank.
- Place drip tray V.A.G 1306 below engine.
- Drain coolant circuit:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19



- -> Mark positions of coolant hoses -A- and -B-.
- Detach coolant hoses -A- (supply to pump/valve unit) and -B- (return to engine).

Note:

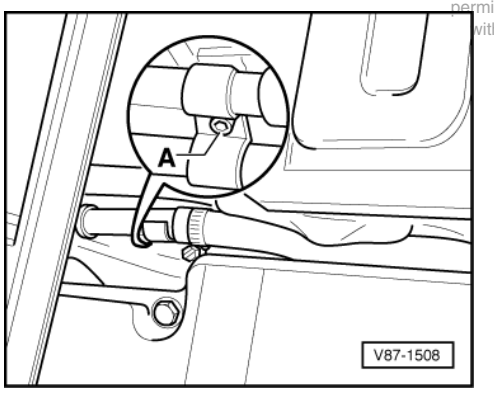
The illustration shows the hose positions in the 8-cylinder petrol engine.

- Hold coolant hose -A- in container.
- Attach compressed-air gun to coolant hose -B- and carefully blow coolant out of pump/valve unit and heat exchangers.

Note:

To ensure that the coolant is blown out of both heat exchangers, clamp off the upper coolant hose to each of the two heat exchangers alternately.

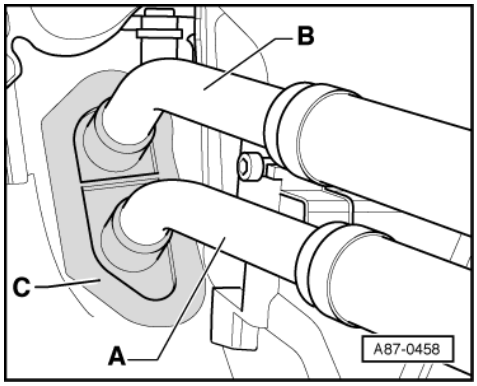
- Unplug connectors to pump/valve unit.
- Remove reinforcing panel (plenum chamber) =>Page 138 .



- -> Slacken off bolt -A- securing coolant pipe holder (in plenum chamber) by approx. 2 turns.
- Remove coolant pipe holder.
- Remove glove box and side trim of centre console:

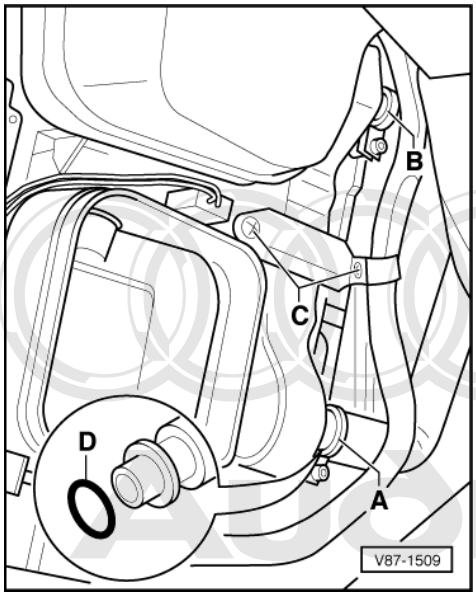
=> General Body Repairs, Interior; Repair Group 70

- Remove footwell vent.
- Cover carpet under heat exchanger with impermeable plastic sheeting and absorbent paper.



- -> Moisten contact surface between both coolant pipes -A- / -B- and grommet -C- slightly with silicone lubricant (this will ensure that pipes can be moved without position of grommet changing).

Removing heat exchanger (version "1")



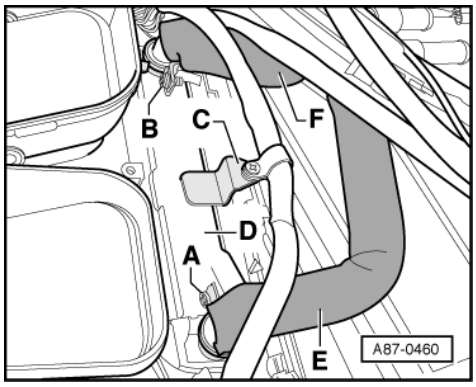
- -> Remove clamps -A- and -B-.
- Push both coolant pipes towards plenum chamber.

Note:

Since the grommet for the coolant pipes has been moistened slightly with silicone lubricant, the pipes can be moved without the grommet being pushed out of the air conditioner unit.

- Screw out bolts -C-.
- Remove retainer.
- Pull out heat exchanger.

Removing heat exchanger (version "2")



- -> Remove clamps -A- and -B-.
- Remove both coolant pipes from heat exchanger.
- Push both coolant pipes towards plenum chamber.

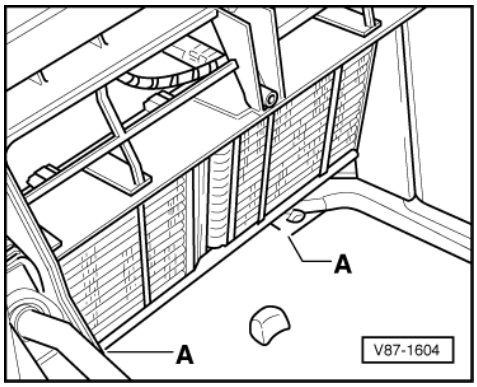
Note:

Since the grommet for the coolant pipes has been moistened slightly with silicone lubricant, the pipes can be moved without the grommet being pushed out of the air conditioner unit.

- Screw out bolts -C-.
- Detach holder.
- Pull out heat exchanger -D-.

Installing heat exchanger (version "1")

Install in reverse order, paying attention to the following:



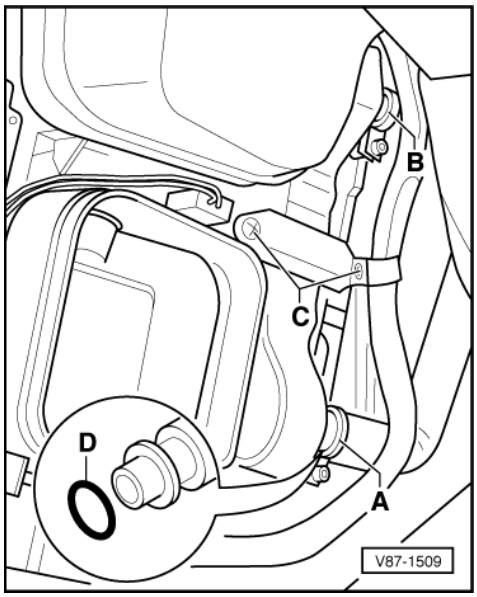
- -> Before installing heat exchanger, check openings -A- of condensation drainage duct for dirt. Clean if necessary.

Notes:

- The condensation drainage valve must not be gummed up with wax or underseal and must close properly.
- The illustration shows the drainage openings with the heat exchangers installed.

Cleaning:

- Heat exchangers removed:
  Reach through opening for heat exchangers and clean condensation drainage ducts, e.g. using a length of wire.
- Heat exchangers installed:
  Clean condensation drainage ducts from outside (with condensation drainage hose detached), e.g. using a length of wire.



- -> Secure all connections with standard hose clamps:

=> Parts List

- Gaskets and sealing rings -D- must always be replaced.
- Moisten sealing ring -D- slightly with coolant.

- Before installing glove box, check cooling system for leaks:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- Before installing glove box and plenum chamber cover, check position of coolant pipe grommet in hole in plenum chamber.

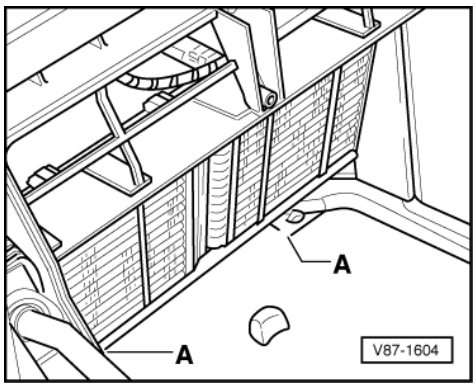
Notes:

- The coolant circulation pump -V50 of the pump/valve unit should not be operated until the coolant circuit has been bled.
- The pump/valve unit will be destroyed if it runs dry.

- Do not connect double connector to pump/valve unit until cooling circuit has been bled:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

Installing heat exchanger (version "2")



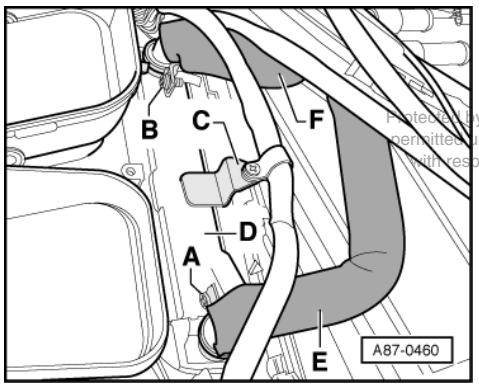
- -> Before installing heat exchanger, check openings -A- of condensation drainage duct for dirt. Clean if necessary.

Notes:

- The condensation drainage valve must not be gummed up with wax or underseal and must close properly.
- The illustration shows the drainage openings with the heat exchangers installed.

Cleaning:

- Heat exchangers removed:
  Insert an illuminated angled mirror into opening for heat exchanger and check both drainage openings. If necessary, clean condensation drainage ducts, e.g. using a length of wire.



- Heat exchangers installed:
  Clean condensation drainage ducts from outside (with condensation drainage hose detached), e.g. using a length of wire.

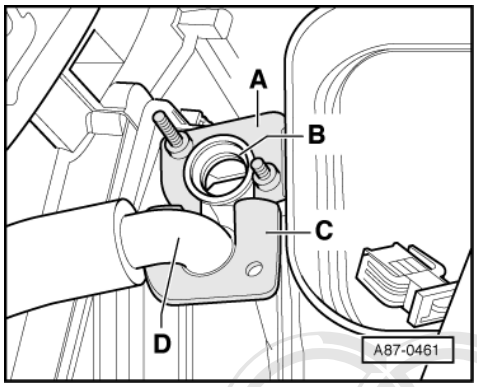
Install in reverse order, paying attention to the following:

- -> Secure all connections with standard hose clamps or with retainers approved for these connections:

=> Parts List

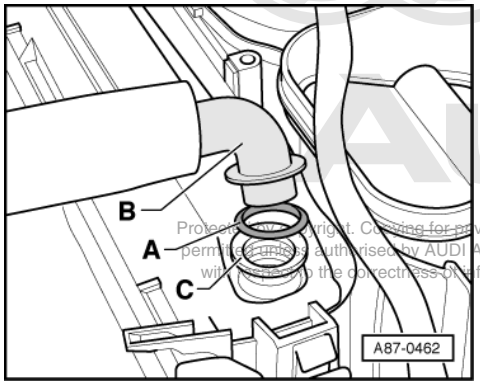
Notes:

- The clamps -A- and -B- may be difficult to attach with the air conditioner unit installed.



- -> The retainers -A- and -C- must be used to ensure that the heat exchangers can be replaced by the Service Department with the air conditioner unit installed.

=> Parts List

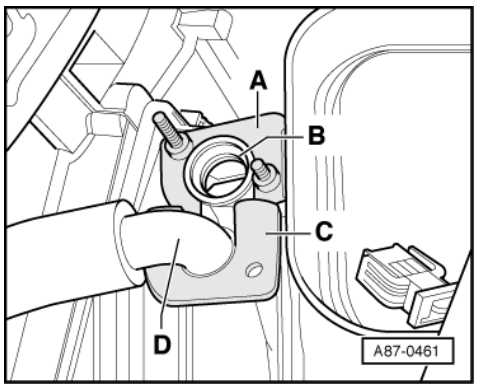


- -> Check both coolant pipes -B- and connections at heat exchanger -C- for damage and dirt.

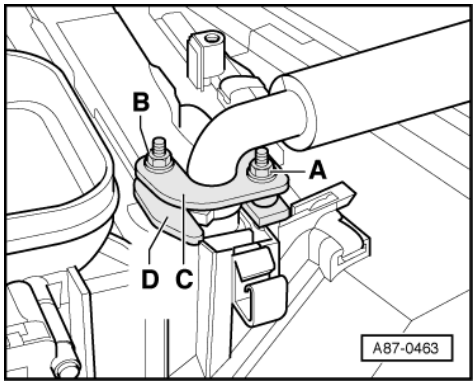
Note:

Sealing rings must always be replaced.

- Moisten sealing ring -A- slightly with coolant and attach it to coolant pipe -B-.



- -> Attach retainer -A- (with studs) to connection at heat exchanger -B- as shown in illustration.
- Attach retainer -C- (with holes) to coolant pipe -D- as shown in illustration.
- Insert coolant pipe -D- (with sealing ring) into connection of heat exchanger -B-.



- -> Secure coolant pipe in heat exchanger with retainers -C- and -D-.
- Tighten both hexagon nuts -A- and -B- alternately and evenly (tightening torque 3 Nm).

Notes:

- The retainers -C- and -D- must be fitted as shown in the illustration (pay attention to the external shape).
- When tightening the hexagon nuts, make sure that the retainers do not tilt.
- After securing the coolant pipes, check the position of the retainers. They must not rest against other components.

- Install second coolant pipe in the same way.
- Before installing glove box, check cooling system for leaks:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- Before installing glove box and plenum chamber cover, check position of coolant pipe grommet in hole in plenum chamber.

Notes:

- The coolant circulation pump -V50 of the pump/valve unit should not be operated until the coolant circuit has been bled.
- The pump/valve unit will be destroyed if it runs dry.

- Do not connect double connector to pump/valve unit until cooling circuit has been bled:

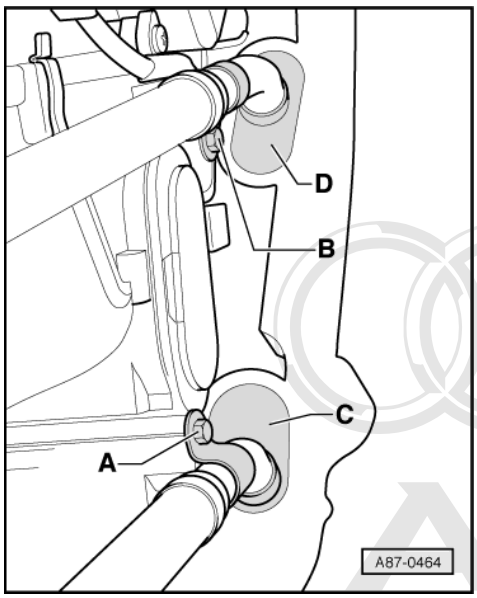
=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

8.3 - Removing and installing left heat exchanger (driver's side)

- Remove windscreen wipers and cowl panel trim:

=> Electrical System; Repair Group 92

- Remove right heat exchanger (front passenger's side) => Page 171 .



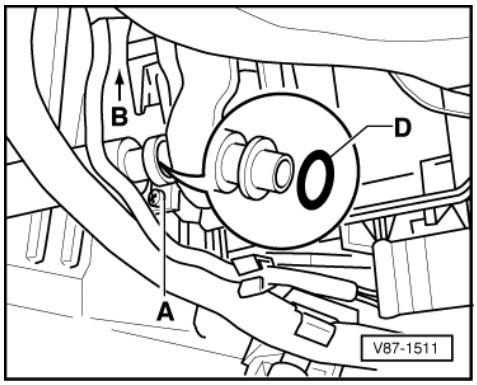
Note:

The following sequence must be followed in the case of RHD vehicles: First remove left heat exchanger as well as coupling station from electronics box in plenum chamber.

- Remove driver's storage compartment and side trim of centre console:

=> General Body Repairs, Interior; Repair Group 70

- -> Slacken off bolts -A- and -B- on coolant pipe clamps by approx. 2 turns.
- Moisten contact surface between both coolant pipes and both grommets -C- and -D- slightly with silicone lubricant (this will ensure that pipes can be moved without position of grommets changing).
- Remove footwell vent.



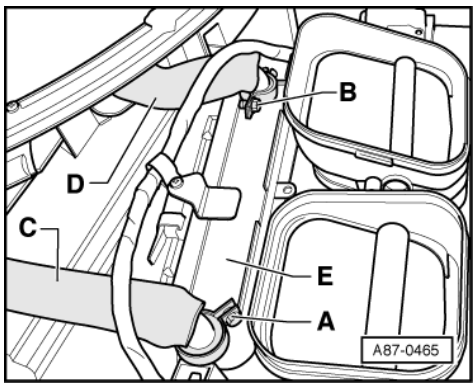
- Cover carpet under heat exchanger with impermeable plastic sheeting and absorbent paper.

Removing heat exchanger (version "1")

- -> Remove clamp -A- and -B-.
- Push both coolant pipes towards plenum chamber.

Note:

Since the grommet for the coolant pipes has been moistened slightly with silicone lubricant, the pipes can be moved without the grommet being pushed out of the air conditioner unit.

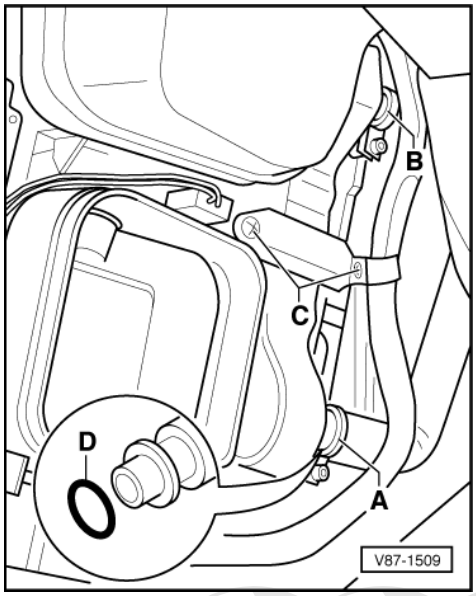


- Remove heat exchanger by pushing out towards front passenger's side (through air conditioner unit).

Removing heat exchanger (version "2")

- -> Remove clamp -A- and -B-.
- Detach coolant pipes -C- and -D- from heat exchanger -E-.
- Remove heat exchanger -E- by pushing out towards front passenger's side (through air conditioner unit).

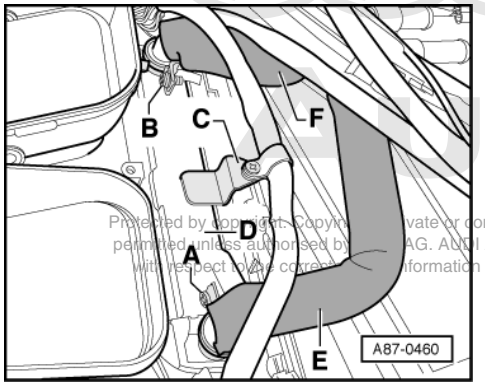
Installing heat exchanger (version "1")



Install in reverse order, paying attention to the following:

- -> Gaskets and sealing rings -D- must always be replaced.
- Push heat exchanger from front passenger's side through air conditioner unit.
- Other working steps required for installation => Page 174 .

Installing heat exchanger (version "2")

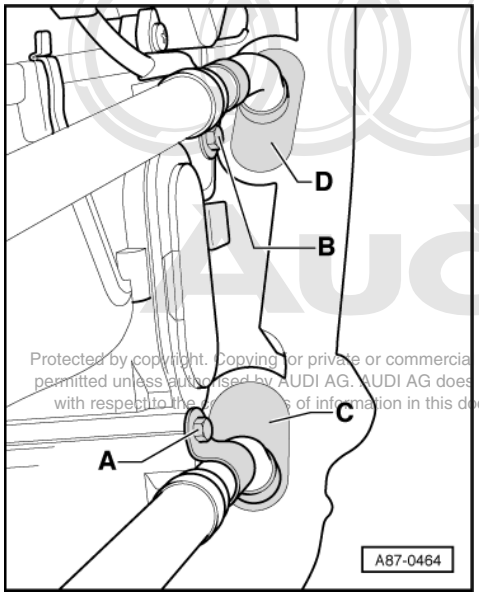


Install in reverse order, paying attention to the following:

- Push heat exchanger from front passenger's side through air conditioner unit.

Notes:

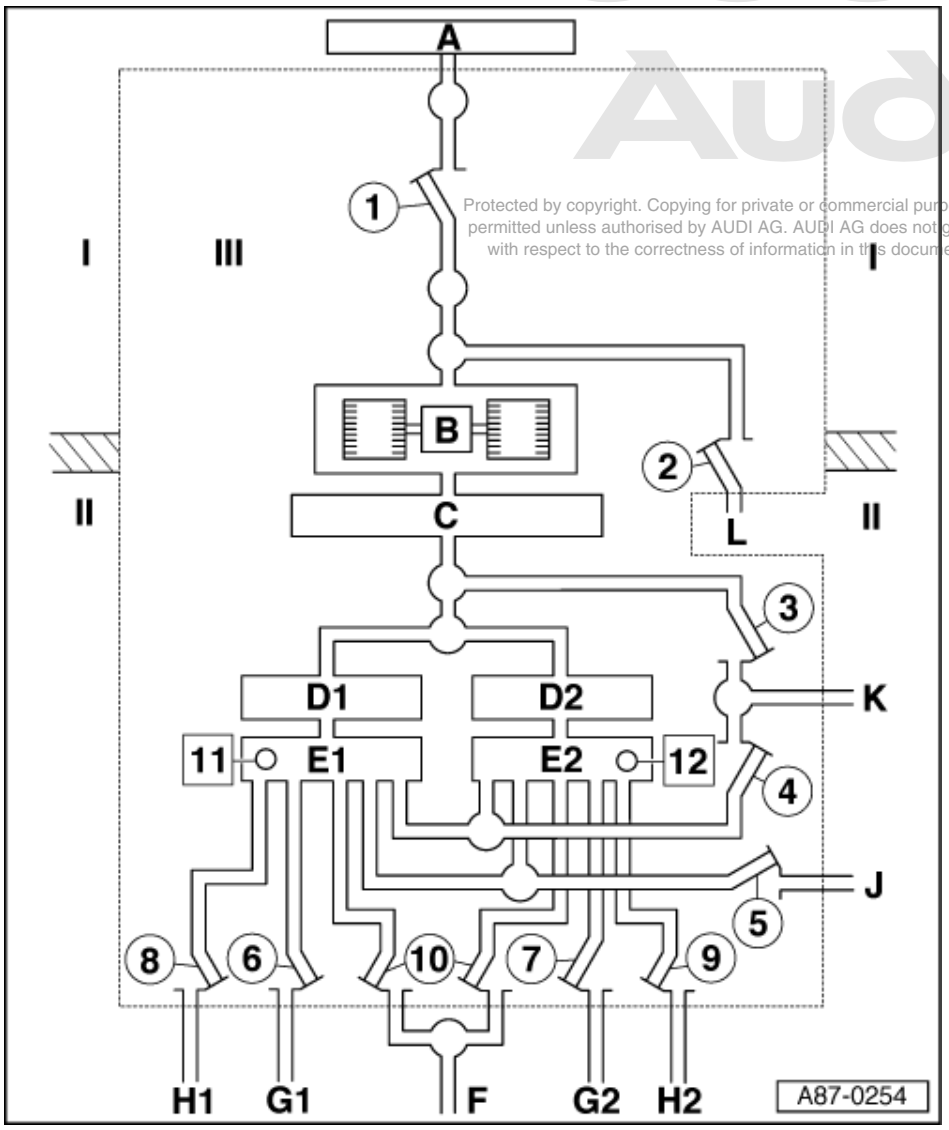
- Sealing rings must always be replaced.
- -> To ensure that the heat exchanger does not slip back into the air conditioner unit, it is advisable to insert the front passenger's side heat exchanger into the air conditioner unit and to secure it using the holder and bolt -C-.



- -> Before installing glove box and plenum chamber cover, check position of coolant pipe grommets -C- and -D- in holes in plenum chamber.
- Other working steps required for installation => Page 175 .

9 - Air distribution diagram

9.1 - Air distribution diagram



Note:

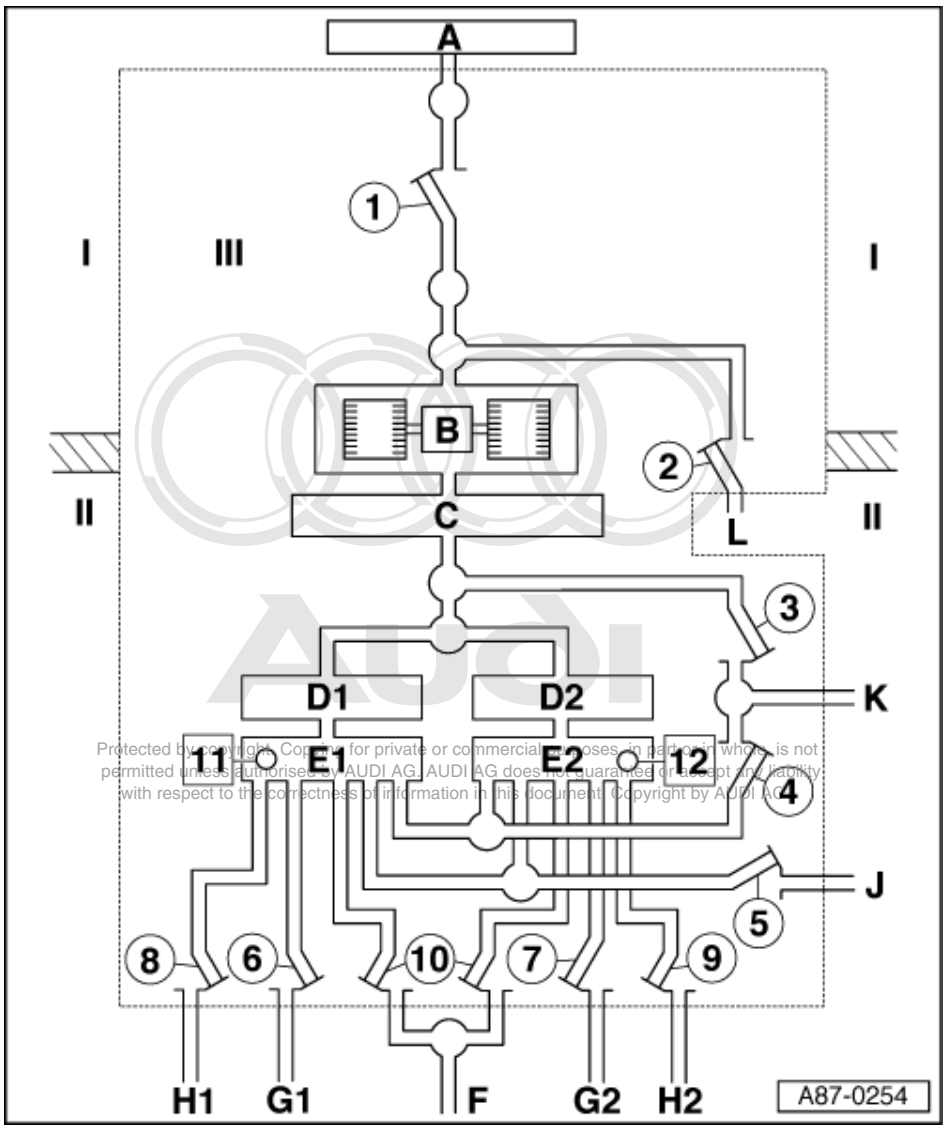
Component fitting locations => from Page 120 onwards.

I - Engine compartment (plenum chamber)
II - Passenger compartment
III - Air conditioner unit
A - Dust and pollen filter

- Installed in bonnet

B - Fresh air blower -V2
C - Evaporator
D1 - Left heat exchanger

- For heater



D2 - Right heat exchanger

- For heater

E1 - Left mixing box

- Driver's side

E2 - Right mixing box

- Front passenger's side

F - Air duct to rear centre footwell vent

G1 - To left footwell vents

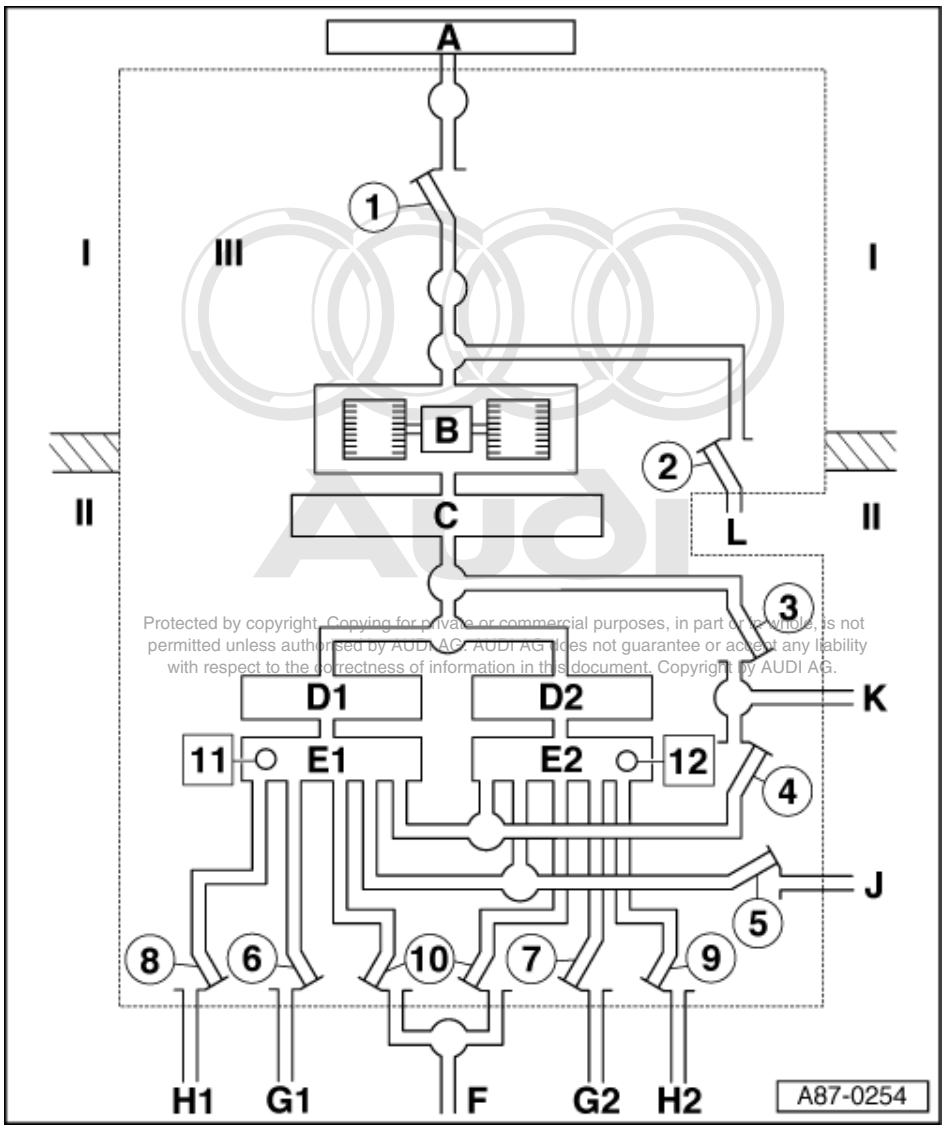
- Driver's side and rear

G2 - To right footwell vents

- Front passenger's side and rear

H1 - To left dash panel vent and B-pillar vent

- Driver's side



H2 - To right dash panel vent and B-pillar vent

- Front passenger's side

J - To defroster vents

K - To centre dash panel vent

L - Air intake duct

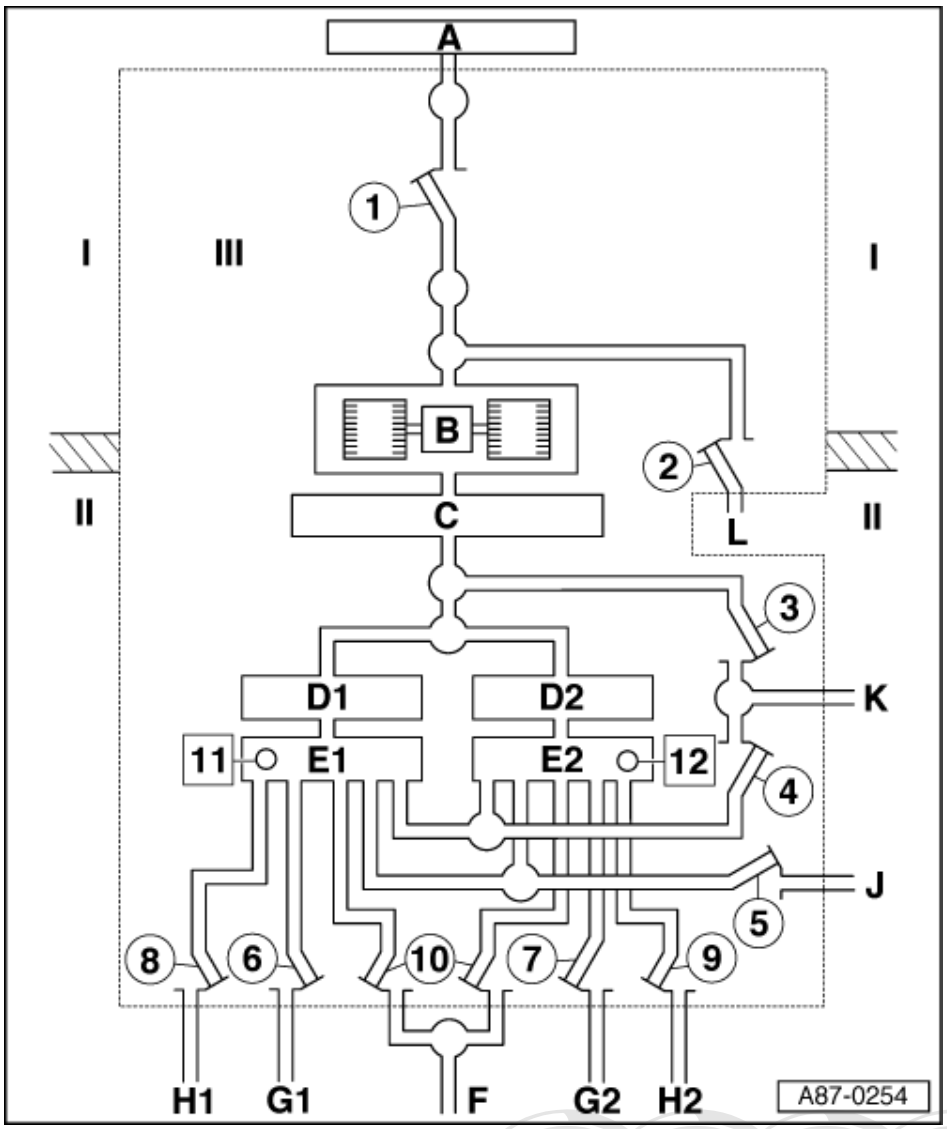
- For air recirculation mode

1 Air flow flap control motor -V71

- Flap closes completely in air recirculation and ACF mode and partially at high speeds (program-controlled)

2 Air recirculation flap control motor -V113

- Flap opens in air recirculation and partial air recirculation mode

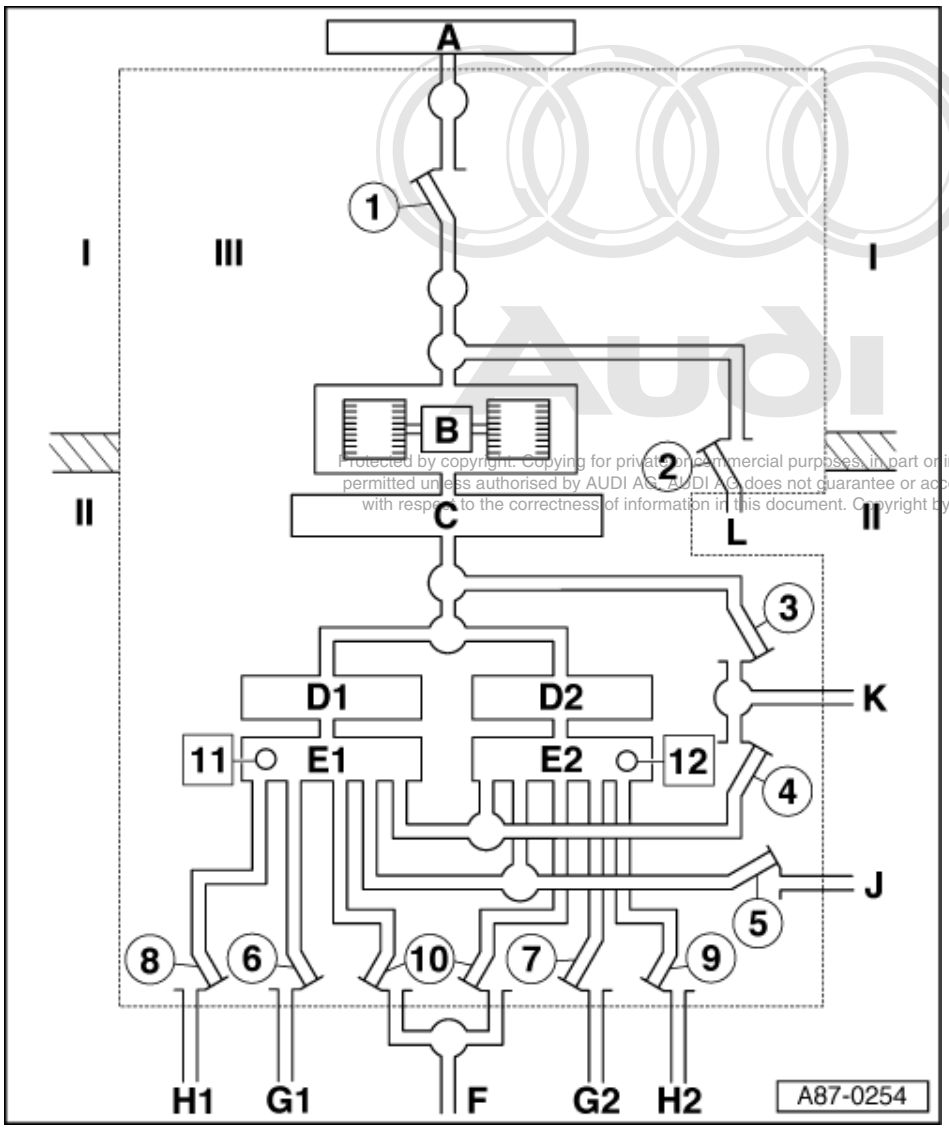


3 Centre vents control motor -V102

- Flap can be opened or closed by adjusting centre vent potentiometer -G142 (program-dependent)
- If flap is open, "cold air" is mixed with air flowing out of centre dash panel vent

4 Temperature flap control motor -V68

- Flap can be opened or closed by adjusting centre vent potentiometer -G142 (program-dependent)
- If flap is closed, only "cold air" is discharged from centre dash panel vent => - 3 -



5 Defrost flap control motor -V107
6 Left footwell flap control motor -V108
7 Right footwell flap control motor -V109
8 Centre left vent control motor -V110
9 Centre right vent control motor -V111
10 Rear footwell vent control motor -V112
11 Left vent temperature sender -G150
12 Right vent temperature sender -G151

10 - Testing cooling capacity of air conditioner

10.1 - Testing cooling capacity of air conditioner

Special tools, testers and other items required

- Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/3

- Minitester V.A.G 1362

Test requirements:

- Radiator and condenser clean (clean if necessary).
- Ribbed belt for compressor drive OK and properly tensioned.
- All air ducts, covers and seals OK and properly fitted.
- Air flow through dust and pollen filter not impaired by dirt.
- Vehicle not exposed to sunlight.
- Engine warm.
- Code checked and, if necessary, corrected => Page 39 .
- Basic setting performed => Page 37 .

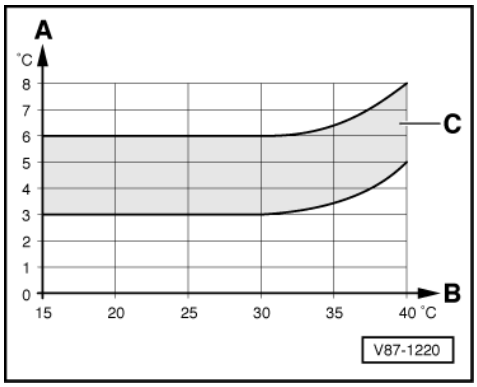
- Fault memory interrogated => Page 38 .
- Settings on operating and display unit -E87:
  - "Auto" mode for driver's and front passenger's side.
  - Temperature preset to "LO" for driver's and front passenger's side.
  - "ECON" button not switched on (compressor ON).
- Functions with engine running:
  - Compressor is driven (magnetic coupling is switched on).
  - Radiator fan -V7 is running (at least at speed 1).
  - Fresh air blower -V2 is running at maximum speed.
  - Air flow flap closes and air recirculation flap opens (approx. 1 minute after vehicle is started).
  - Coolant circulation pump -V50 is not running.

  - Heat regulation valves -N175 and -N176 are closed (coolant hoses and pipes to heating system heat exchangers cool down).

Notes:

- If one of these test requirements is not met, interrogate the fault memory => Page 26 .
- Test heating capacity of air conditioner and check functioning of pump/valve unit =>Page 189 .

Testing



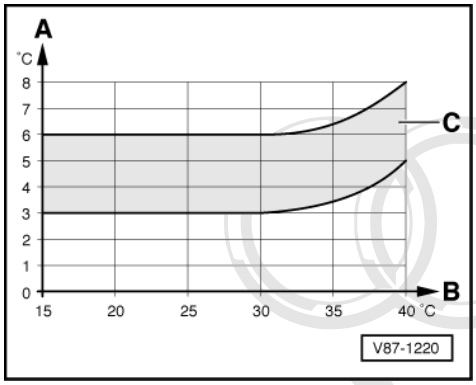
A - -> Air temperature from "centre" dash panel vents
B - Ambient temperature
C - Permissible tolerance range

Depending on the ambient temperature, the temperature of the air from the "centre" dash panel vents must be within the specified tolerance range after 5 minutes.

- Close bonnet.
- Measure ambient temperature.
- Close doors, windows and sun roof.

- Close "right" and "left" dash panel vents.
- Close B-pillar vents.
- Switch on ignition.
- Open "centre" dash panel vents.
- Set handwheel for temperature-adjustable centre vent to "warm".
- Set "Auto" mode for driver's and front passenger's side.
- Preset temperature to "LO" for driver's and front passenger's side.

- Start engine (start of time measurement).
- Set engine speed to 2000 rpm.



- Measure temperature of air flowing out of "centre" dash panel vents, e.g. using minitester V.A.G 1362.
- -> Compare measured values to values in graph.

Notes:

- If the required values are not attained => Page 187 (Measures to be taken if actual value deviates from specified value).
- It is advisable to use two separate thermometers for this measurement.
- The temperature of the air in the mixing boxes of the air conditioner unit (downstream of the heat exchanger) can be measured in the measured value block using the V.A.G 1551 while the cooling capacity is being tested =>Display group 014, Page 59 .
- If the air conditioner is functioning correctly, the coolant pipe on the low-pressure side (thick pipe) will cool down.
- If cooled air is discharged from the temperature-adjustable centre vent when set to "cold" and non-cooled air when set to "warm", check the heat regulation valves -N175 and -N176.
- If the cooling capacity on the front passenger's side is still adequate but the specified values for the driver's side are no longer attained, this is an indication that there is a coolant leak (layers in evaporator).

Measures to be taken if actual value deviates from specified value

▪ Compressor shut off during cooling capacity test?

↓ yes

- Continue test =>Page 188 .

↓ no

- Clamp off both coolant hoses from engine to pump/valve unit using hose clamps 3093/3094.

↓

- Repeat cooling capacity test =>Page 185 .

↓

▪ Is required cooling capacity attained?

↓ yes

- Detach hose clamps 3093/3094 from both coolant hoses.

↓

- Check actuation of heat regulation valves -N175, -N176 and coolant circulation pump -V50 => Page 189 .

↓

Continued t

↓ no

- Vehicle must be taken to specialist VW/Audi air conditioner workshop (fault in refrigerant circuit).

▪ Is actuation of heat regulation valves and coolant circulation pump OK?

↓ yes

- Connect test box V.A.G 1598/19 to wiring harness of operating and display unit -E87 =>Page 69 .

↓

- Perform electrical test on valves -N175, -N176 and pump -V50 =>Page 74 .

↓

▪ Are valves -N175, -N176 and pump -V50 functioning OK?

↓ yes

Replace operating and display unit -E87 =>Page 152 .

↓

- Repeat cooling capacity test =>Page 185 .

↓ no

Replace pump/valve unit =>Page 137 .

↓

- Repeat cooling capacity test =>Page 185 .

↓ no

- Eliminate cause of fault =>Electrical testing,Page 74 and

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

↓

- Repeat cooling capacity test =>Page 185 .

Continuation of test - Compressor was switched off during cooling capacity test

- Interrogate fault memory => Page 47 .

Repeat cooling capacity test and observe display zone 1 on display of V.A.G. 1551

▪ Is required cooling capacity attained (compressor was not switched off)?

↓ yes

End

↓ no

▪ Is following code displayed as compressor shut-off condition in display zone 1?

↓ Code 1

▪ High-pressure switch -F118/-F23 and/or high-pressure switch in pressure switch -F129 open
Continue test =>Page 188 .

↓ Code 3

▪ Low-pressure switch -F73 open
Continue test =>Page 189 .

↓ Other code

- Further codes =>from Page 47 onwards

Continuation of test - Compressor shut-off condition Code "1"

▪ Was radiator fan -V7 switched to speed 2 during test?

↓ yes

- Replace high-pressure switch -F118/-F23 and/or pressure switch -F129.
Repeat cooling capacity test.

↓

▪ Is required cooling capacity attained (compressor was not switched off)?

↓ yes

End

↓ no

- Reinstall old switch -F118/-F23 and/or -F129.

↓ no

- Unplug connector of high-pressure switch -F118/-F23 and jumper contacts "1" and "2" => Page 102 .

↓

▪ Is radiator fan running at speed 2?:

↓ yes

- Replace high-pressure switch -F118/-F23.

↓ no

- Use current flow diagram to service actuation of radiator fan -V7.

Continuation of test - Compressor shut-off condition Code "1"

- Vehicle must be taken to specialist VW/Audi air conditioner workshop (fault in refrigerant circuit).

Continuation of test - Compressor shut-off condition Code "3"

- Unplug connector of low-pressure switch -F73 and jumper contacts => Page 185 .

▪ Is required cooling capacity attained?

↓ yes

- Replace switch -F73.
- Repeat cooling capacity test.

↓

▪ Is required cooling capacity attained?

↓ yes

End - Reinstall old switch -F73. Vehicle must be taken to specialist VW/Audi air conditioner workshop (fault in refrigerant circuit).

↓ no

▪ Was compressor switched off again?

↓ yes

- Check wiring to operating and display unit -E87 via switch -F73.

↓

Repeat cooling capacity test.

↓ no

- Vehicle must be taken to specialist VW/Audi air conditioner workshop (fault in refrigerant circuit).

↓ no

11 - Testing heating capacity of air conditioner and checking functioning of pump/valve unit

11.1 - Testing heating capacity of air conditioner and checking functioning of pump/valve unit

This test checks the functioning of the pump/valve unit (heat regulation valves -N175/-N176 and coolant circulation pump -V50).

◆ If the temperatures obtained are lower than the specification (insufficient heating capacity):

- Check functioning of heat regulation valves -N175/-N176 and coolant circulation pump -V50 => Electrical testing,Page 74 .

If no fault is found:

- Check whether coolant hoses (from engine and from heat exchanger for heater to pump/valve unit) have been interchanged => Page 135 and

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- Check whether electrical contacts of pump -V50 have been interchanged (running direction).

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Special tools, testers and other items required

◆ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/3

Test requirements:

• Coolant circuit bled properly:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- All air ducts, covers and seals OK and properly fitted.
- Air flow through dust and pollen filter not impaired by dirt.
- Engine warm.
- Code checked and, if necessary, corrected => Page 39 .
- Vehicle not exposed to sunlight.
- Basic setting performed => Page 37 .
- Fault memory interrogated => Page 38 .

Testing

- Close bonnet.
- Switch on ignition.
- Close doors, windows and sun roof.
- Start engine and let it run for a few minutes with maximum cooling capacity (compressor ON, temperature preset to "LO" for left and right-hand side).
- Switch off ignition.
- Press "Rest" button on operating and display unit -E87 (-E87 is switched on, pump -V50 does not run, valves -N175 and -N176 are closed).

Note:

The operating time for the "Rest" function is limited to approx. 10 minutes by the operating and display unit -E87.

- Read measured value block, display group 014, =>Page 59 .
- Check display in display zone 3 and 4.

  - Specification:
    Ambient temperature plus max. 15°C

  Set temperature preselection for driver's side to "HI" at operating and display unit -E87.
  Check display in display zone 3 (temperature increases).
  - Specification: approx. engine temperature
    (pump -V50 running, valve -N175 open)

  Check display in display zone 4 (temperature remains virtually constant).
  - Temperature increase less than 10 °C
    (valve -N176 closed)

  Set temperature preselection for front passenger's side to "HI" at operating and display unit -E87.
  Check display in display zone 4 (temperature increases).

  - Specification: approx. engine temperature
    (pump -V50 running, valve -N175 and -N176 open)

  Set temperature preselection for driver's and front passenger's side to "LO" at operating and display unit -E87.
  Check display in display zone 3 and 4.
  - Specification: Temperature drops to ambient temperature (plus max. 15 °C) within 5 minutes
    (pump -V50 running, valves -N175 and -N176 closed)

12 - Servicing work on refrigerant circuit

12.1 - Servicing work on refrigerant circuit

Notes:

- The replacement compressor contains the correct amount of the refrigerant oil required for the refrigerant circuit:

=> Air conditioner - with refrigerant R134a; Capacities; Approved refrigerant oils

- Testing cooling capacityn => Page 185 .
- The refrigerant in the refrigerant circuit should never be topped up (drain, evacuate and refill the circuit).
- The specified diameters for the O-rings and the tightening torques also apply to refrigerant pipe/hose unions between the individual components.

- Only O-rings approved for refrigerant R134a should be used:

=> Air conditioner - with refrigerant R134a; Components of refrigerant circuit

- The O-rings for Zexel compressors are not colour-coded (for air conditioner compressor speed sender - G111, oil drain plug and pressure relief valve); they are supplied as a set:

=> Parts List

- Different refrigerant oils are specified for Zexel and Denso compressors:

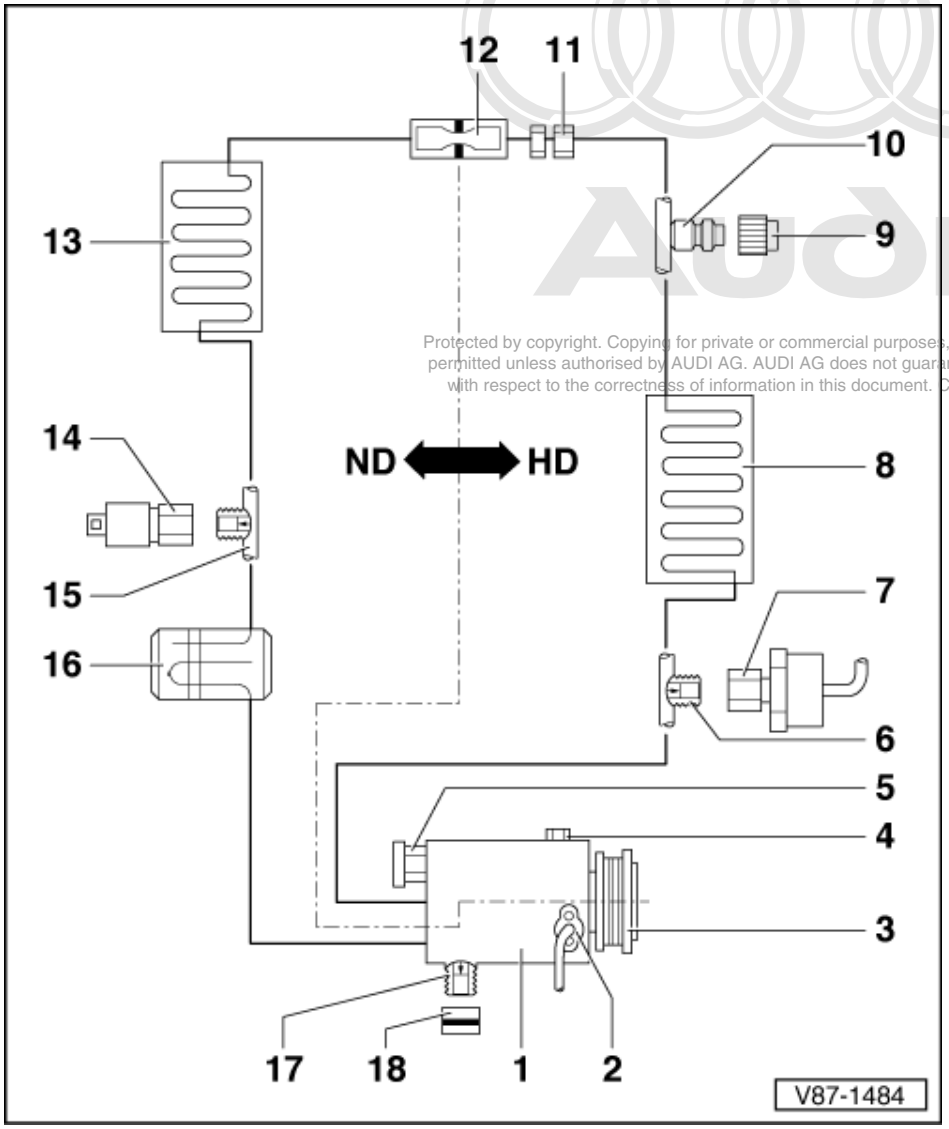
=> Air conditioner - with refrigerant R134a; Capacities; Approved refrigerant oils

- Checking pressures in refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- All other service and testing work not described in this Workshop Manual.

=> Air conditioner - with refrigerant R134a



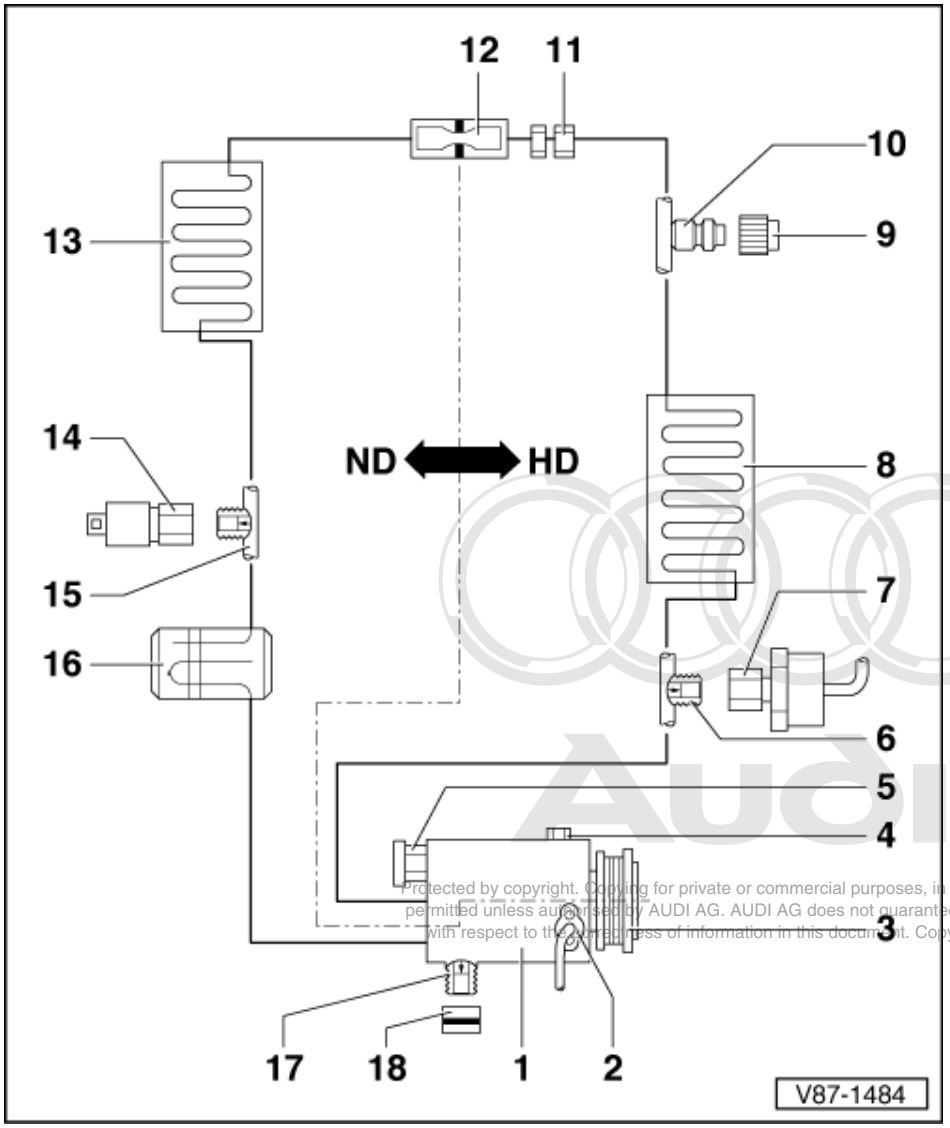
HD = High-pressure end

ND = Low-pressure end

1 Compressor

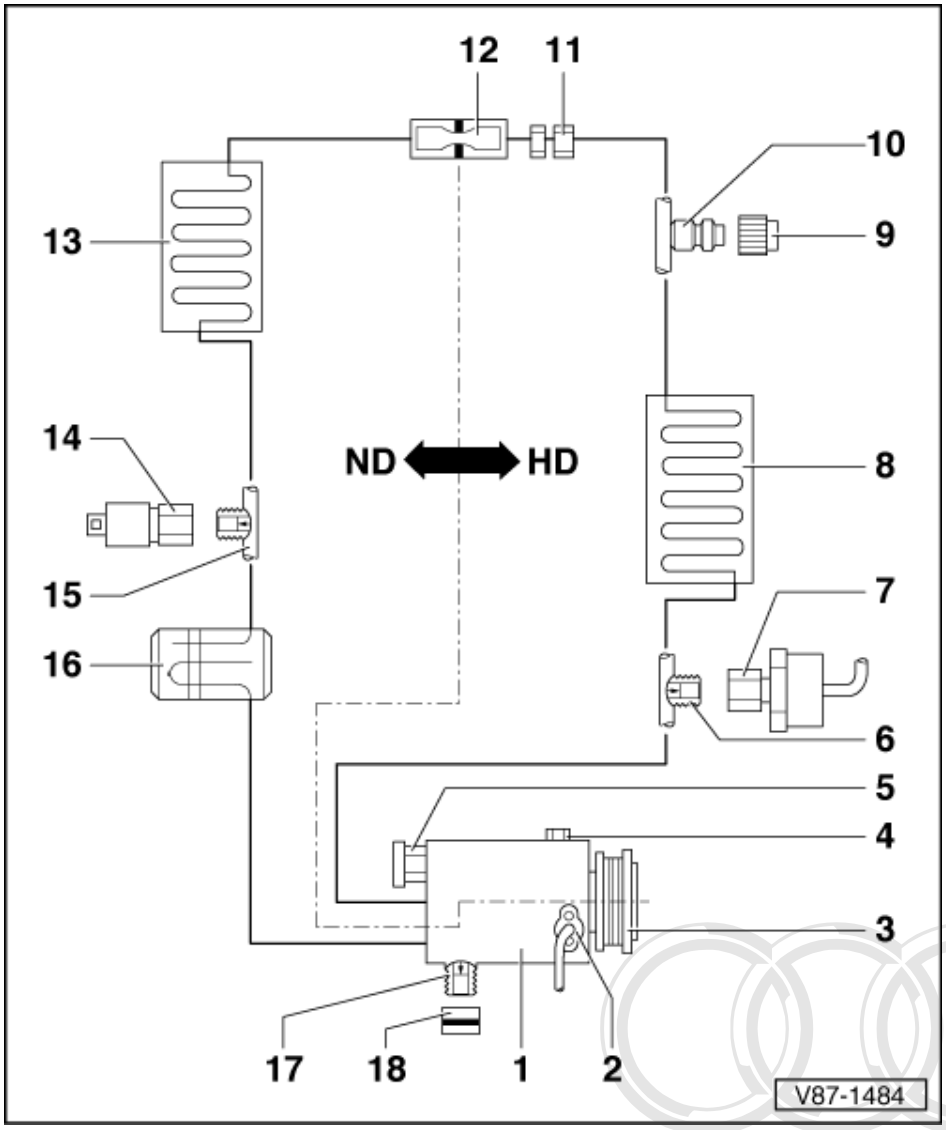
- O-ring for Zexel compressor:
  for low-pressure connection:
  17.2 mm/1.8 mm
  for high-pressure connection:
  14.0 mm/1.8 mm
- Tightening torque for Zexel compressor:
  Low-pressure connection: 40 Nm
  High-pressure connection: 30 Nm
- Detaching and reattaching refrigerant pipe from/to Denso compressor => Page 206
- Removing V-belt and ribbed belt

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 13



- After fitting new compressor or pouring in fresh refrigerant oil (e.g. after blowing out refrigerant circuit), crank compressor 10 times by hand following installation and prior to initial start-up so as to prevent compressor damage
- To protect O-rings against heat radiating from exhaust manifold, heat insulation matting must be fitted at refrigerant pipes. Part number:

=> Parts List

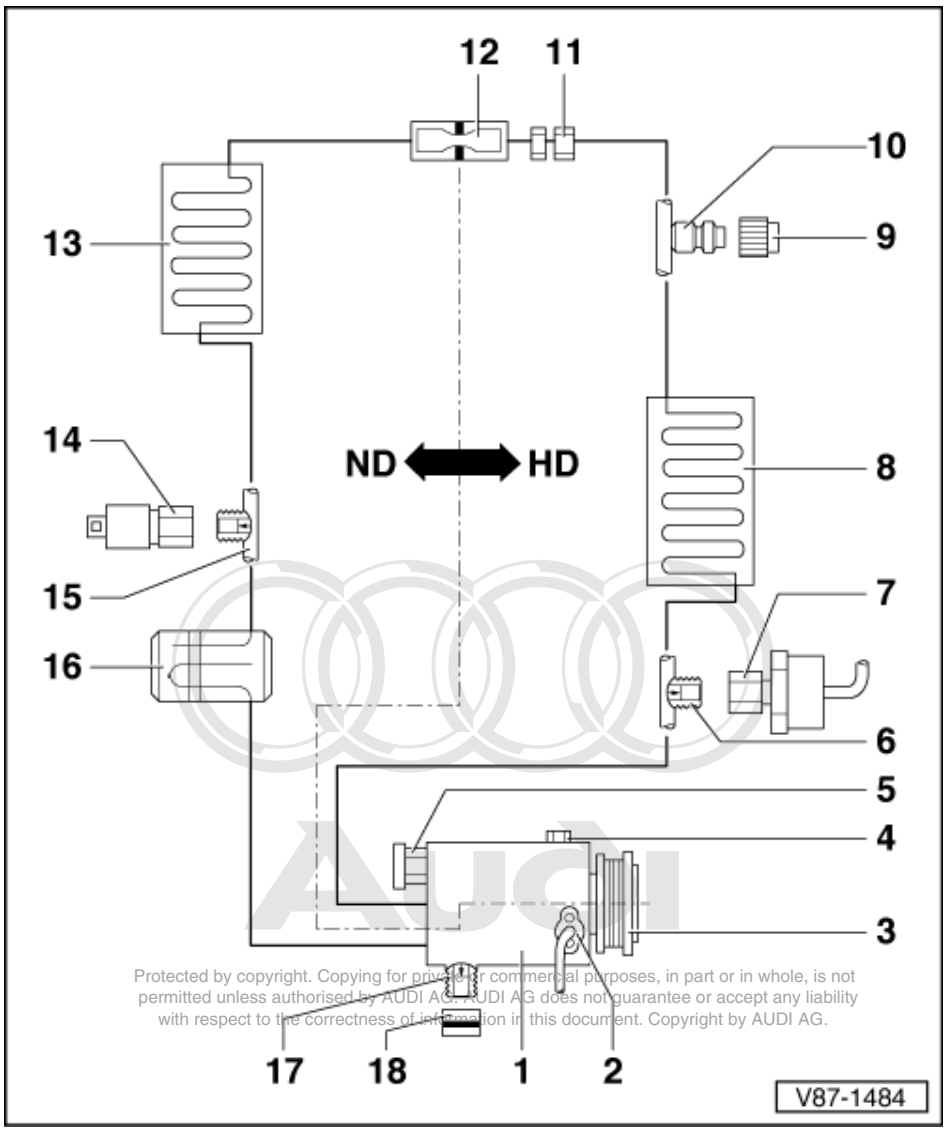


2 Air conditioner compressor speed sender -G111

- Not installed with Denso compressor
- O-ring: 15.5 mm; 1.5 mm
- Removing and installing
  => Page 206
- Must not be unscrewed unless refrigerant circuit is empty
- Can only be replaced after removing compressor

3 Air conditioning system magnetic coupling -N25

- Servicing:
  Zexel compressor => Page 117

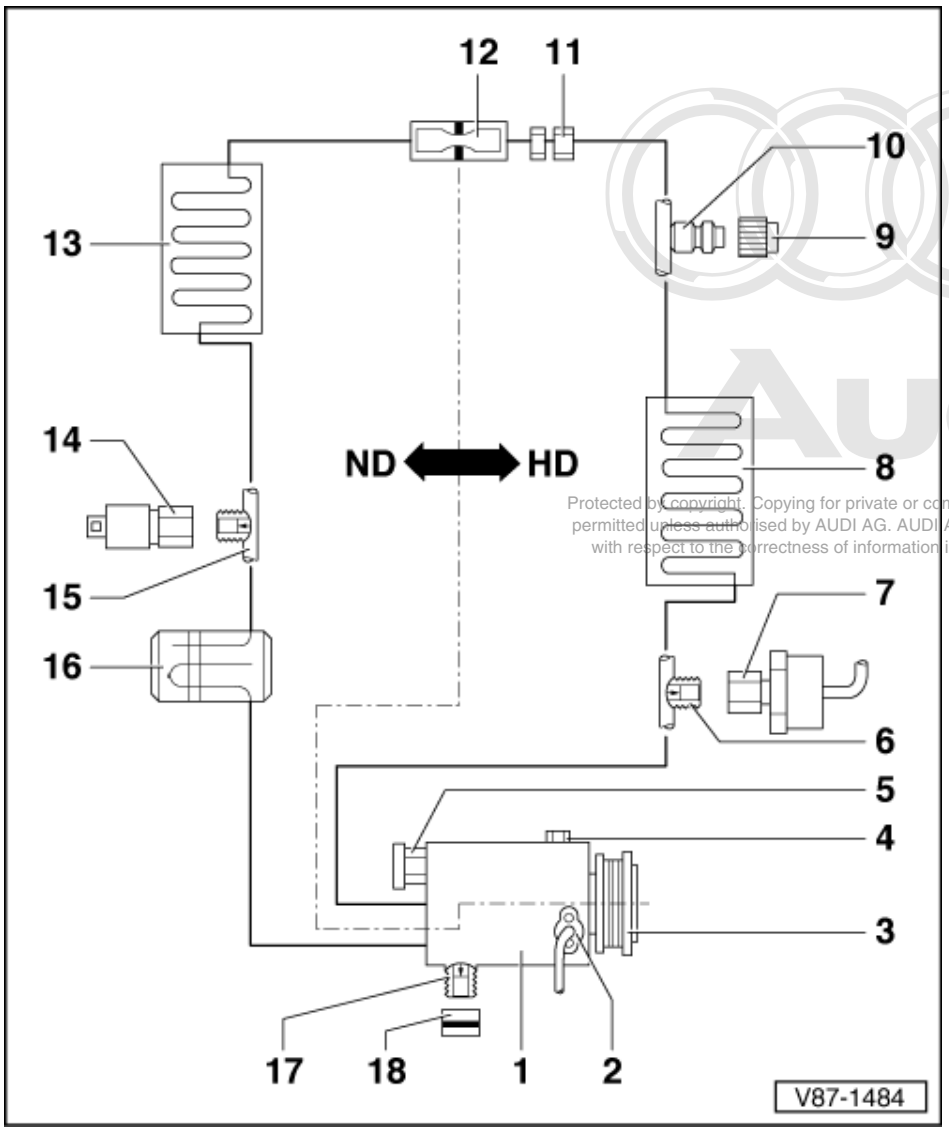


4 Oil drain plug

- With Denso compressor, sealing ring is installed instead of O-ring
- Always replace

=> Parts List

- O-ring for Zexel compressor:
  7.8 mm/1.9 mm
- Tightening torque:
  Zexel compressor: 10 Nm
- Tightening torque:
  Denso compressor: 30 Nm
- To drain refrigerant oil; should only be unscrewed if compressor has been removed.
  Turn compressor via clutch plate of magnetic coupling to accelerate discharge of refrigerant oil



5 Pressure relief valve, 10 Nm

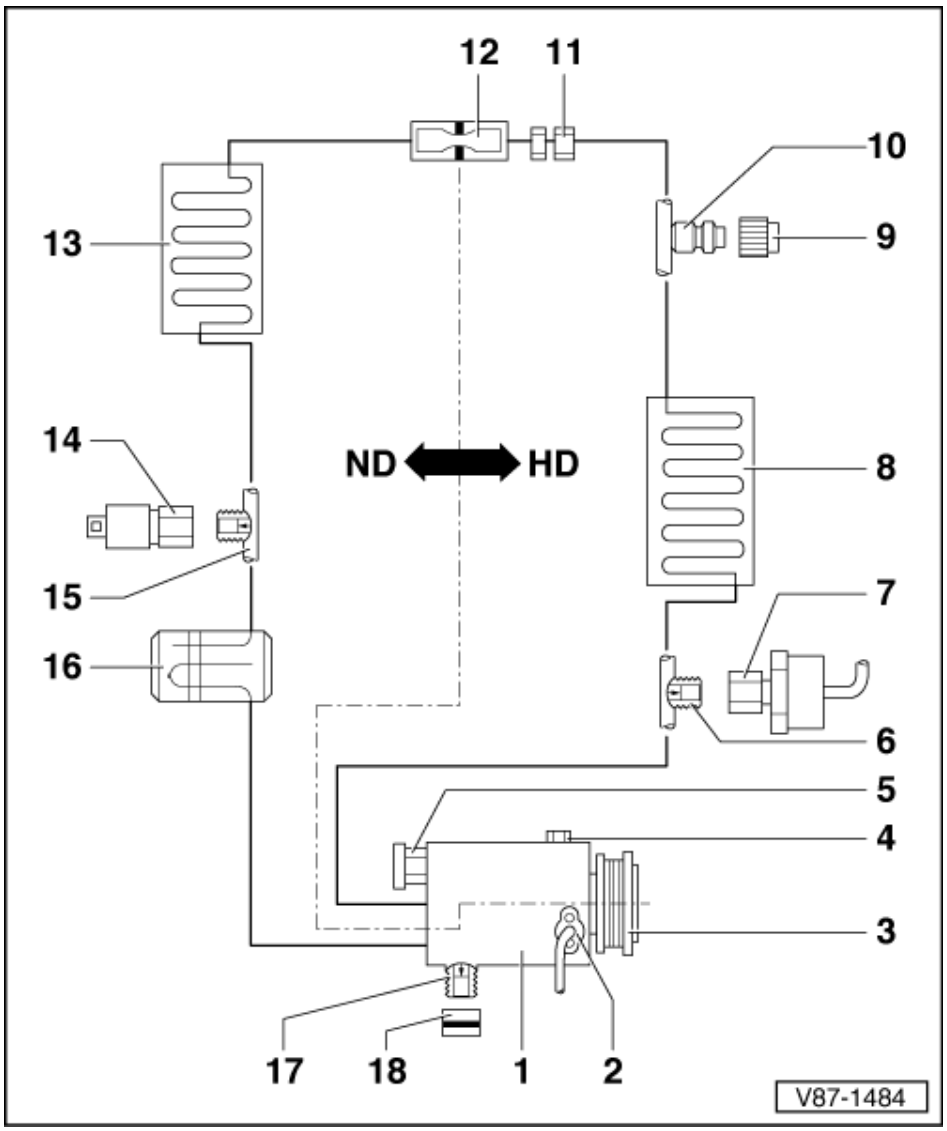
- O-ring:
  8.8 mm/1.9 mm
- Tighten to 10 Nm
- Connection without valve; should only be unscrewed after refrigerant circuit has been emptied

6 Connection with valve

- For high-pressure switch for air conditioner -F73 and high-pressure switch for magnetic coupling F-118

7 Pressure switch

- Vehicles with -E87 up to part number index "H":
  High-pressure switch for air conditioner -F23 and for magnetic coupling -F118
- Vehicles with -E87 from part number index "J" onwards:
  Air conditioner pressure switch -F129



8 Condenser

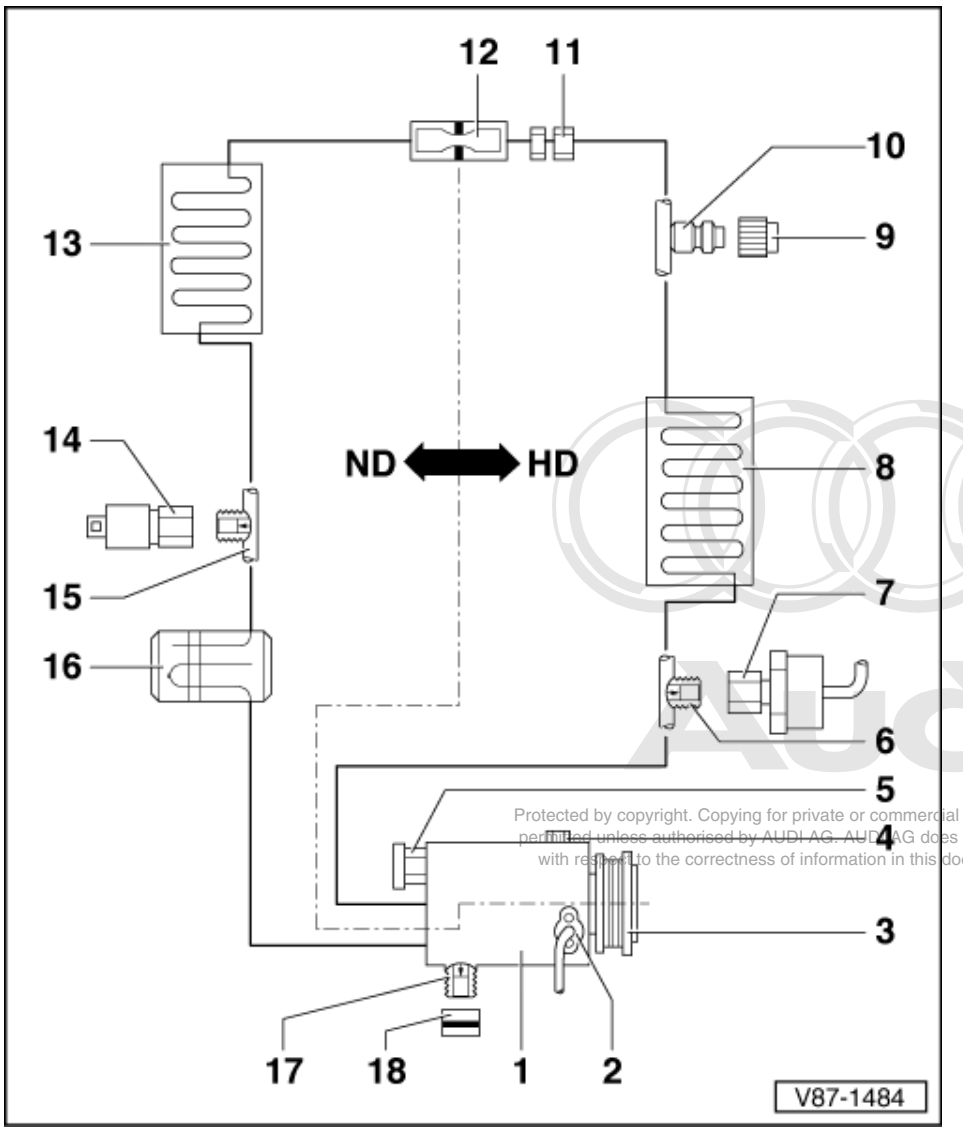
- O-ring:
  Inlet: 14.0 mm/1.8 mm
  Outlet: 10.8 mm/1.8 mm
- Tightening torque:
  Inlet: 30 Nm
  Outlet: 15 Nm
- Removing and installing
  => Page 204

9 Cap

- With seal
- Always to be screwed on

10 Service connection

- For service station for measuring pressure and draining/filling refrigerant circuit



11 Union in refrigerant pipe

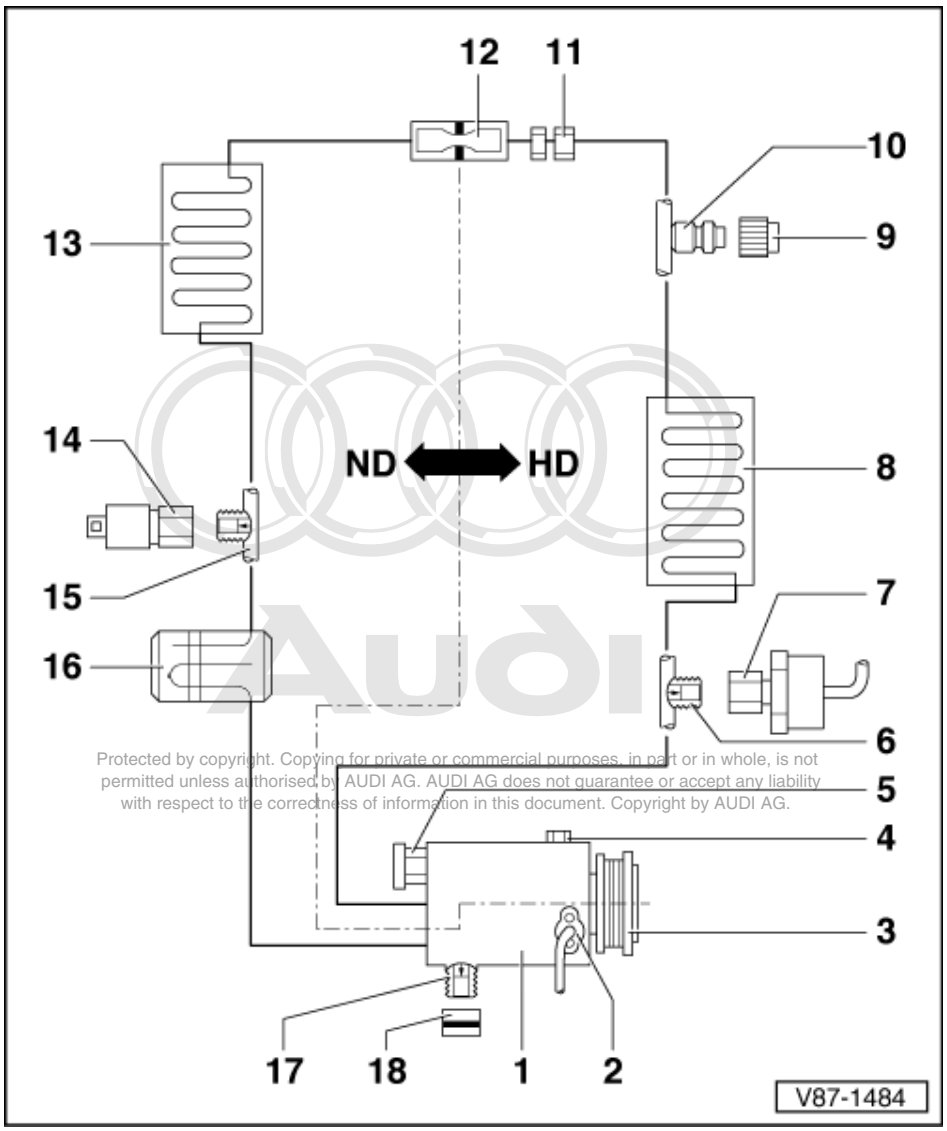
- O-ring:
  10.8 mm/1.8 mm
- Tightening torque: 15 Nm

12 Restrictor

- Replace O-ring
- Removing and installing
  => Page 205
- Before installing, lubricate O-ring slightly with refrigerant oil

13 Evaporator

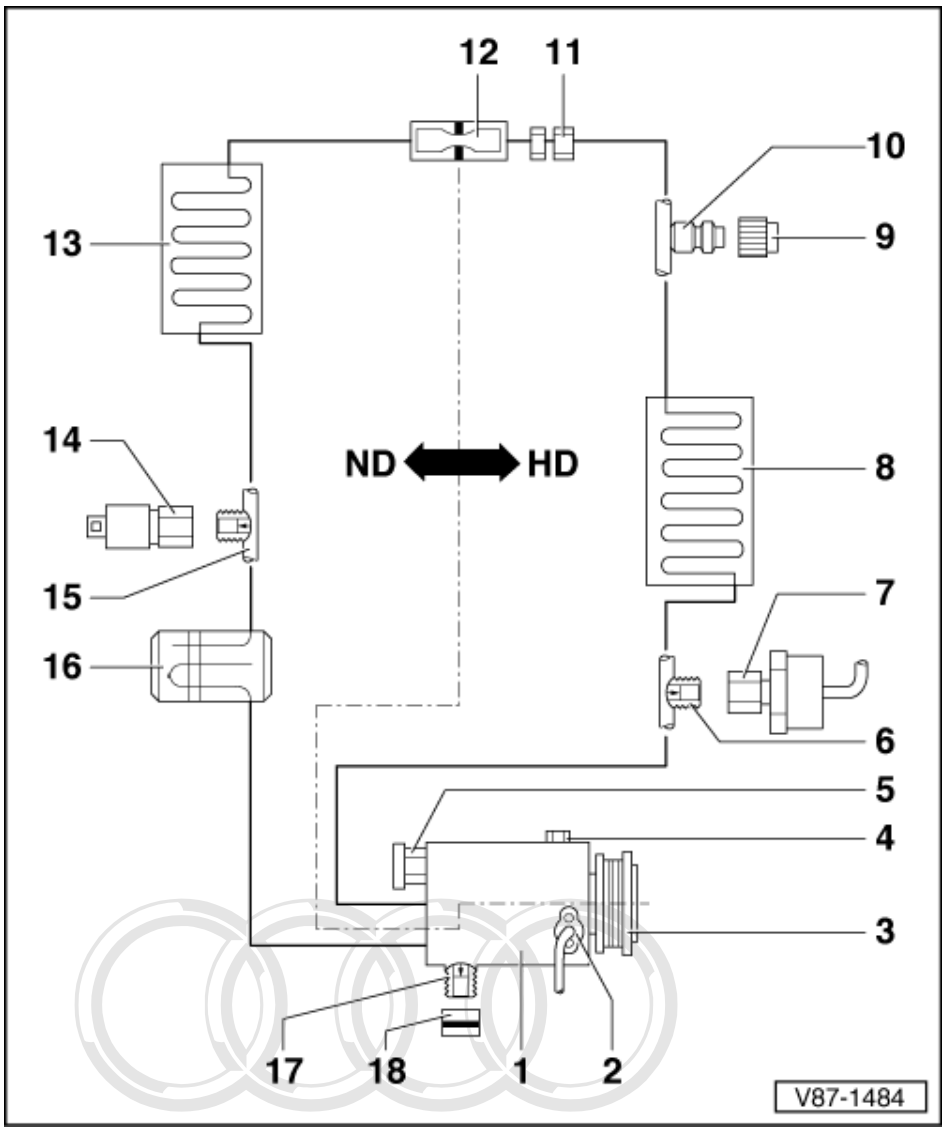
- O-ring at connection to air conditioner unit:
  Inlet: 10.8 mm/1.8 mm
  Outlet: 17.2 mm/1.8 mm
- Tightening torque of bolt at connection to air conditioner unit: 25 Nm



- O-ring between evaporator and connecting pipes in air conditioner unit => Page 207
- Tightening torque of bolts between evaporator and connecting pipes in air conditioner unit: 5 Nm
- Removing and installing
  => Page 207

14 Low-pressure switch for air conditioner -F73

- Only vehicles with -E87 up to part number index "H"
- Not required if air conditioner pressure switch -F129 is used
- Vehicles without low-pressure switch for air conditioner -F73: Cap with seal must be screwed onto connection - 15 - for this switch



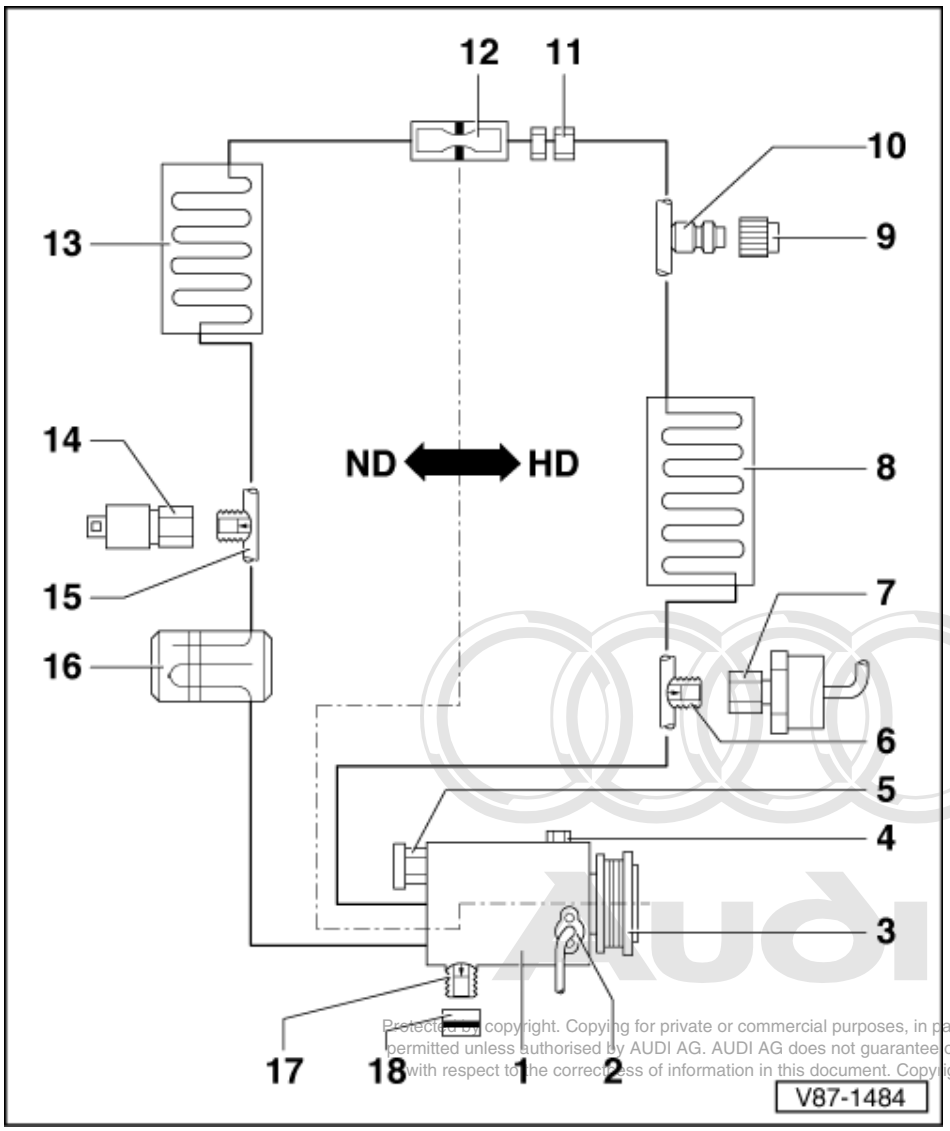
15 Connection with valve

- For low-pressure switch for air conditioner -F73
- For service station or pressure gauge set for measurement and drainage
- For measurement, use valve adapter V.A.G 1785/10 or adapter set V.A.G 1786 (with filler hose)

=> Air conditioner - with refrigerant R134a; connect service station to measure and check

Notes:

- Following the decision to no longer install the low-pressure switch -F73, approx. 300 vehicles were built in October/November 1997 without this connection.
- In the case of these vehicles, it is not possible to measure the pressure on the low-pressure side; replace the refrigerant pipe if necessary.

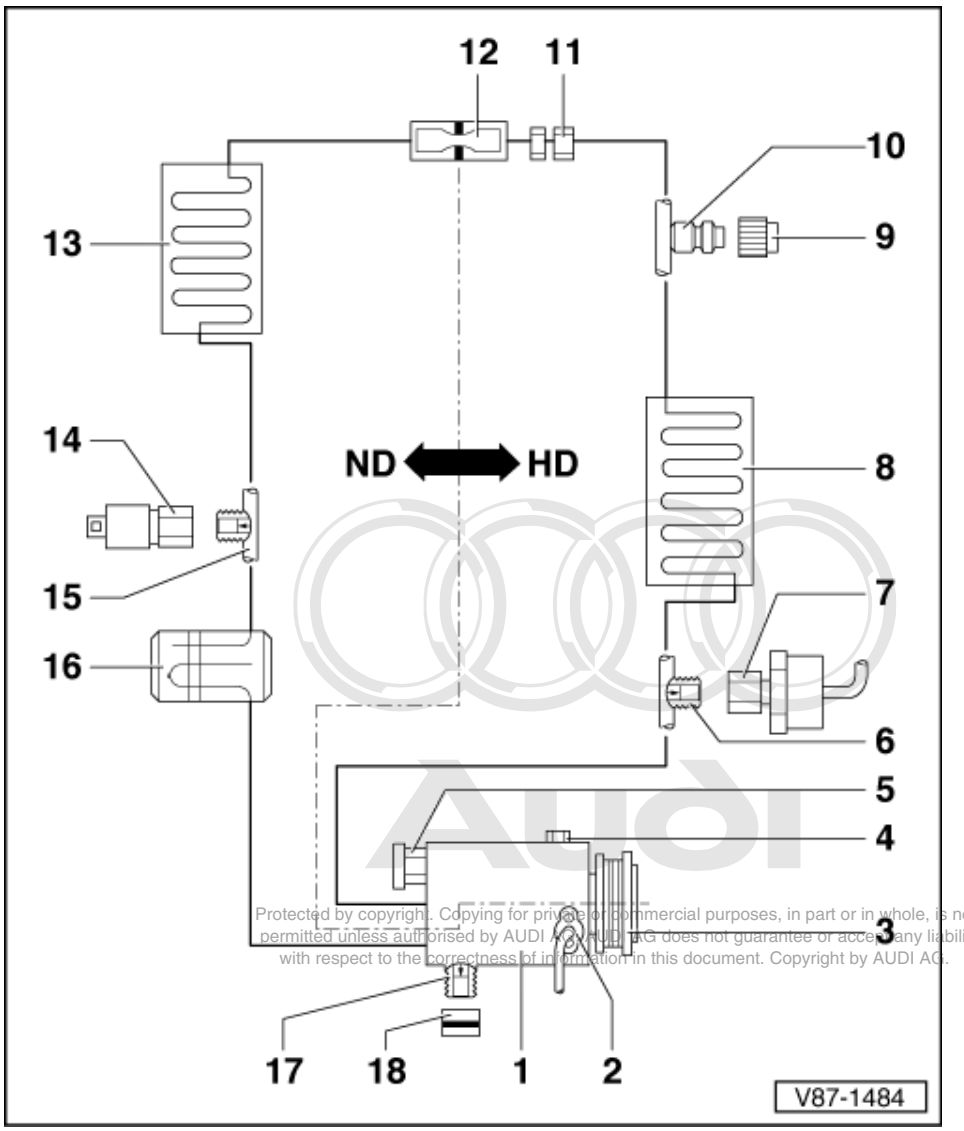


16 Reservoir

- O-ring:
  Inlet: 17.2 mm; 1.8 mm
  Outlet: 17.2 mm; 1.8 mm
- Tightening torque:
  Inlet: 40 Nm
  Outlet: 40 Nm
- Removing and installing
  => Page 201

17 Connection with valve

- Zexel compressor only
- For service station for measuring pressure and draining/filling refrigerant circuit



- Use valve adapter V.A.G 1785/10, O-ring (8.9 mm/1.8 mm), adapter V.A.G 1786/2 and filler hose

=> Air conditioner - with refrigerant R134a; connect service station to measure and check

- Vehicles without this connection: Measure pressures on low-pressure side via connection with valve - 15 -

18 Cap

- With seal
- Always to be screwed on

12.2 - Removing and installing reservoir

Removing

- Remove front bumper:

=> General Body Repairs, Exterior; Repair Group 63

- Remove left headlight:

=> Electrical System; Repair Group 94

- Unplug connector from ABS hydraulic unit.
- Drain refrigerant circuit:

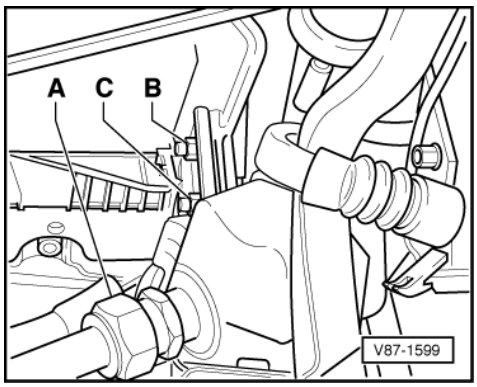
=> Air conditioner - with refrigerant R134a

Notes:

- Seal the open pipe connections.
- Keep the reservoir closed as long as possible; only remove the caps immediately prior to installation (the reservoir contains a desiccant bag which soon becomes saturated with moisture and thus unusable if the reservoir is left open).
- The way in which the refrigerant pipes are connected differs depending on the engine version:

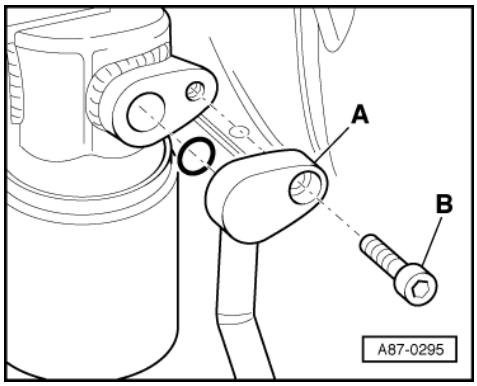
=> Parts List

Vehicles with 6 or 8-cyl. engine



- -> Detach refrigerant pipes -A-.
- Slacken off hexagon nut -B-.
- Unscrew hexagon nut -C-.

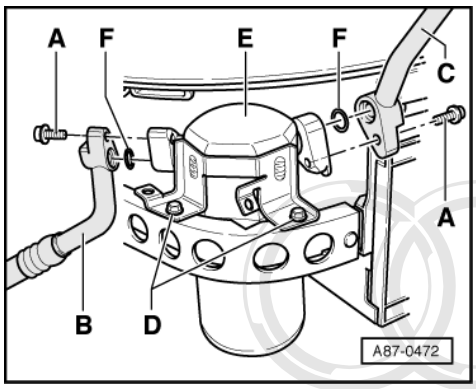
Note:



-> From model year 1999 onwards, a reservoir is gradually being introduced for which the refrigerant pipe -A- is secured to the reservoir using a block connection. Bolt -B- of this reservoir version is tightened to 25 Nm.

- Pull reservoir forwards and disengage.

Vehicles with 12-cyl. engine



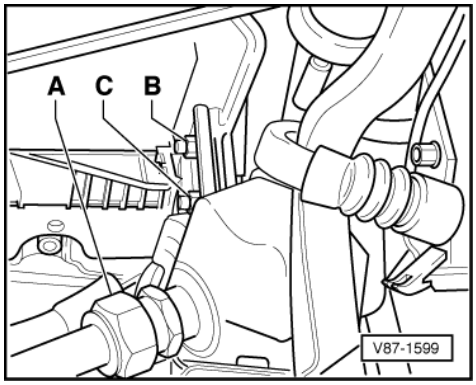
- -> Screw out bolts -A-and detach refrigerant pipes -B- and -C-.
- Screw out bolts -D-.
- Detach reservoir -E-.

Installing

Install in reverse order, paying attention to the following:

Before installing reservoir:

=> Air conditioner - with refrigerant R134a; Replacing components of refrigerant circuit



- Replace O-rings -F- (16.7 mm/1.8 mm; illustration shows position in 12-cyl. engine).
- Secure refrigerant pipes to reservoir with bolts -A- (block connections) (tightening torque 25 Nm).
- -> Secure refrigerant pipe to reservoir with union nuts -A- (tightening torque 40 Nm). Secure reservoir with oil filter strap to prevent it from rotating.

Notes:

- When removed, the reservoir contains refrigerant oil which must be returned to the refrigerant circuit (when the new reservoir has been fitted).
- The oil quantity is adjusted according to the nature of the complaint.
  - If, for example, the reservoir has been damaged in an accident (no loss of refrigerant, no penetration of moisture or dirt into the refrigerant circuit), the air conditioner can be serviced by weighing the old and new reservoir without the need for extensive repair work. Pour the refrigerant oil into the new reservoir until it weighs the same as the reservoir which has been removed.
  - If an indeterminate amount of refrigerant oil has escaped or dirt and moisture have penetrated the refrigerant circuit, the refrigerant circuit must be cleaned using compressed air and nitrogen.

=> Air conditioner - with refrigerant R134a; Replacing components of refrigerant circuit

12.3 - Removing and installing condenser

Removing

- Remove front bumper:

=> General Body Repairs, Exterior; Repair Group 63

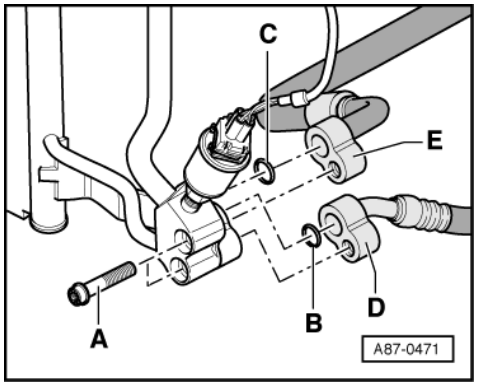
- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- Detach oil cooler and move to one side.

Vehicles with 6 and 8-cyl. engine

- Detach refrigerant pipes by slackening off union nuts.



Vehicles with 12-cyl. engine

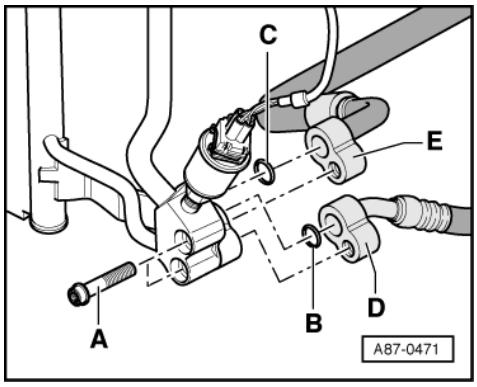
- -> Screw out bolts -A-and detach refrigerant pipes -B- and -C-.

Installing

- Before installing condenser:

=> Air conditioner - with refrigerant R134a; Replacing components of refrigerant circuit

Vehicles with 12-cyl. engine



- -> Replace O-rings -B- (10.8 mm/1.8 mm) and -C- (14.0 mm/1.8 mm); illustration shows position in 12-cyl. engine.
- Secure refrigerant pipes to reservoir with bolts -A- (block connections) (tightening torque 20 Nm).

Vehicles with 6 and 8-cyl. engine

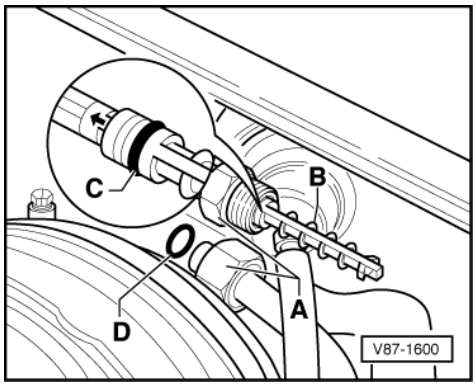
- Secure refrigerant pipe to condenser with union nuts (tightening torques for refrigerant pipes and O-rings =>- 196).

12.4 - Removing and installing restrictor

Removing

- Remove plenum chamber cover.
- Drain refrigerant circuit:

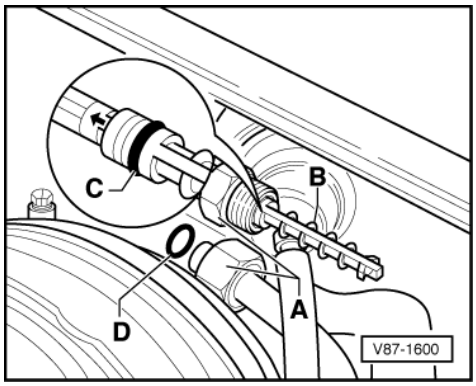
=> Air conditioner - with refrigerant R134a



- -> Disconnect refrigerant pipe at union -A-.
- Use pointed-nose pliers to pull restrictor -B- out of refrigerant pipe.

Installing

- Pay attention to colour of restrictor when replacing. Only insert restrictor of same colour (white or yellow) (different versions).
- Install restrictor -B- at correct position (with arrow on restrictor pointing towards evaporator).
  - Restrictor must be positioned without play in refrigerant pipe
- Check that O-ring -C- is fitted correctly in groove.



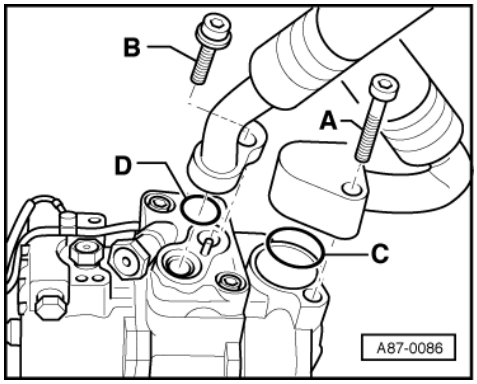
- -> Replace O-ring -D-.
- Tighten union -A- to 25 Nm.

12.5 - Detaching and reattaching refrigerant pipes from/to Nippondenso compressor

Removing

- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a



- -> Screw out bolts -A- and -B-.

Installing

- Replace O-rings -C- (23.8 mm/2.4 mm) and -D- (11.1 mm/1.8 mm).
- Tighten bolts -A- and -B- to 25 Nm.

Notes:

- The illustration shows the hose positions in the 8-cylinder engine.
- The O-rings from the caps of replacement compressor connections must not be used.
- In the case of vehicles with 12-cyl. engine, the compressor must be detached from the bracket first => from Page 105 onwards.

12.6 - Removing and installing air conditioner compressor speed sender -G111

Note:

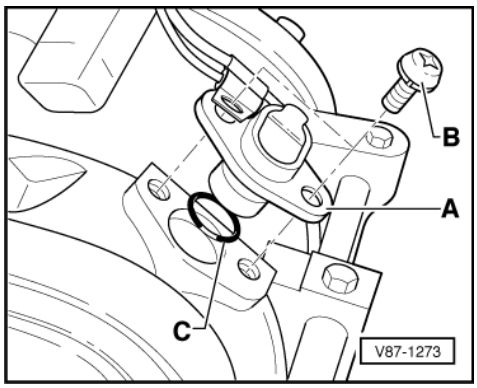
The air conditioner compressor speed sender -G111 is only fitted in vehicles with the Zexel compressor.

Removing

- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- 8-cylinder engine: Detach compressor from bracket => Page 109 .
- Unplug connector.



- -> Screw out bolts -B-.
- Pull sender -A- out of compressor.

Installing

- With sender removed, visually inspect lugs at impulse wheel (4x at periphery).
- Replace O-ring -C-.
- Screw out bolts -B- (5 Nm).

12.7 - Removing and installing compressor

Removing

- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- Detach compressor from bracket => Page 105 onwards.
- Remove compressor bracket => from Page 105 onwards.
- Detach refrigerant pipes from compressor.

Installing

Before installing compressor:

=> Air conditioner - with refrigerant R134a; Replacing components of refrigerant circuit

- Tightening torques and O-rings =>from Page 192 onwards.

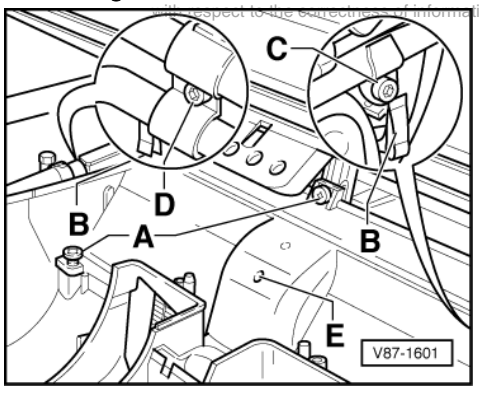
- After fitting new compressor or pouring in fresh refrigerant oil (e.g. after blowing out refrigerant circuit), crank compressor 10 times by hand following installation and prior to initial start-up so as to prevent compressor damage.
- Before initial start-up of compressor:
  - Start engine with compressor switched off ("OFF" mode) and wait until idling speed has stabilised.
  - Then switch on compressor and let it run at idling speed for at least 10 minutes.

12.8 - Removing and installing evaporator

Notes:

- From November 2000, a modified air conditioner unit is to be gradually introduced. This air conditioner unit has a modified evaporator (version "2") and modified refrigerant pipes to the evaporator. The modified evaporator is different in size which has meant that the mount in the air conditioner unit also had to be changed.
- The air conditioner unit with the version "2" evaporator can be identified from the outside by the coolant pipes leading to the heating system heat exchangers => Page 170 .
- Until January 2001, the version "2" air conditioner units will be supplied with an evaporator with a bonded foam seal. From January 2001 onwards, the seal on the evaporator will gradually be changed over to an all-round rubber seal.

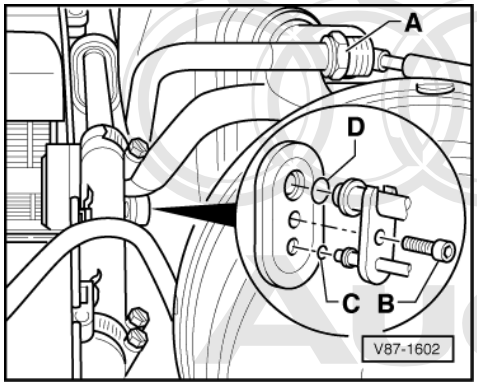
Removing



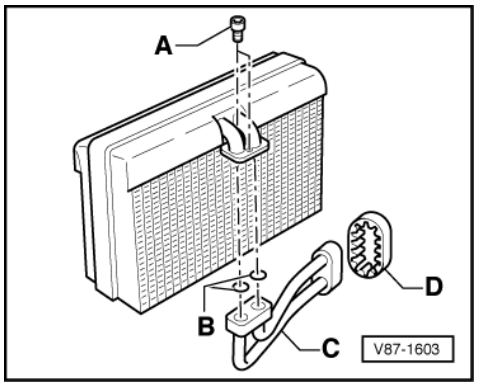
- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- Remove fresh air blower -V2 => Page 131 .
- Remove reinforcing panel (plenum chamber) =>Page 138 .
- -> Screw out bolts -A-.
- Lever off clips -B-.
- Remove coolant pipe holders -C- and -D-.



- Remove evaporator cover -E-.
- -> Disconnect refrigerant pipe at union -A-.
- Screw out bolt -B-.
- Detach refrigerant pipes from connecting pipe of evaporator.

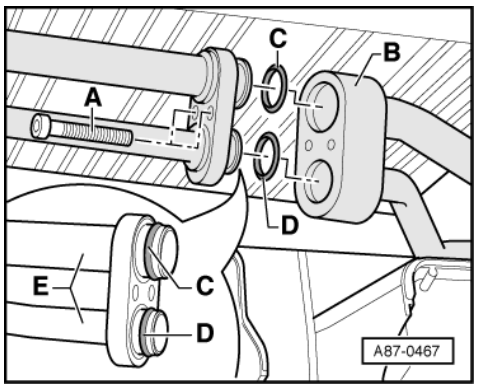


Note:

RHD vehicles: Remove the coupling station from the electronics box in the plenum chamber.

Removing evaporator (version "1")

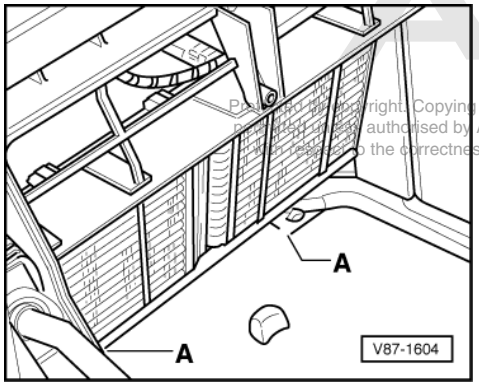
- -> Screw out bolts -A-.
- Remove connecting pipe -C-.
- Remove evaporator.



Removing evaporator (version "2")

- -> Screw out bolts -A-.
- Remove connecting pipe -B-.
- Remove evaporator.

Installing



Install in reverse order, paying attention to the following:

Before installing evaporator:

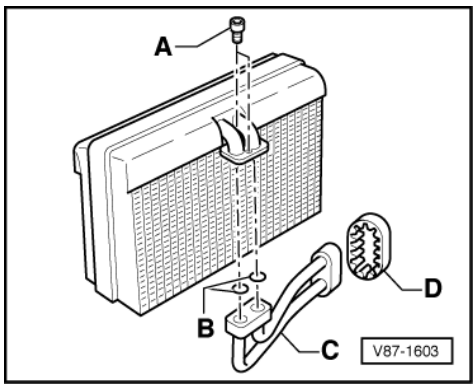
=> Air conditioner - with refrigerant R134a; Replacing components of refrigerant circuit

- -> Before installing evaporator, check openings -A- of condensation drainage duct for dirt. Clean if necessary.

Notes:

- The condensation drainage valve must not be gummed up with wax or underseal and must close properly.
- With version "1" air conditioner units, insulating matting is bonded into the bottom section of the air conditioner unit housing under the evaporator. Before installing the evaporator, check that this matting is bonded securely to the bottom section of the housing.
- The insulating matting is no longer fitted in version "2" air conditioner units.

Installing evaporator (version "1")

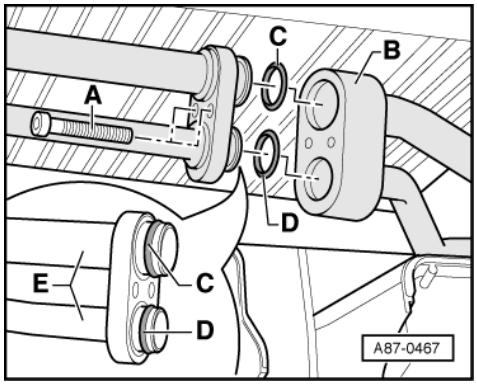


- -> Replace O-rings -B- between connecting pipes in air conditioner unit and pipes to evaporator.
  - Tightening torque of bolts -A-: 5 Nm
  - O-rings -B-
    Inlet:13.4 mm/2.4 mm
    Outlet: 13.4 mm/2.4 mm

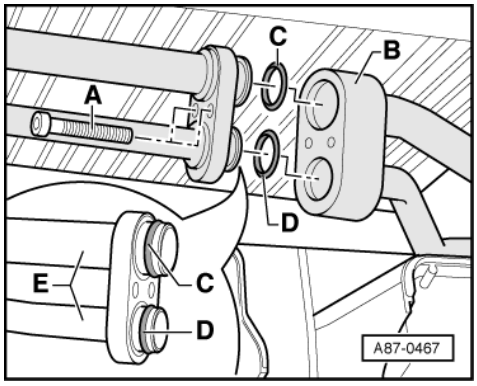
Note:

Make sure that the grommet -D- is fitted correctly to the evaporator connecting pipe -C-.

Installing evaporator (version "2")

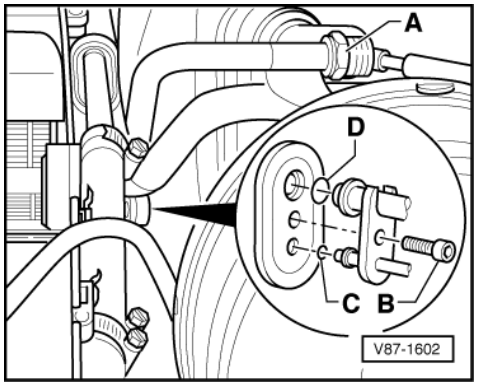


- -> Replace O-rings -C- and -D- between connecting pipe in air conditioner unit -B- and pipes to evaporator -E-.
  - Tightening torque of bolts -A-: 5 Nm
  - O-rings -C-
    Outlet: 13.4 mm/2.4 mm
  - O-rings -D-
    Inlet: 11.2 mm/2.4 mm



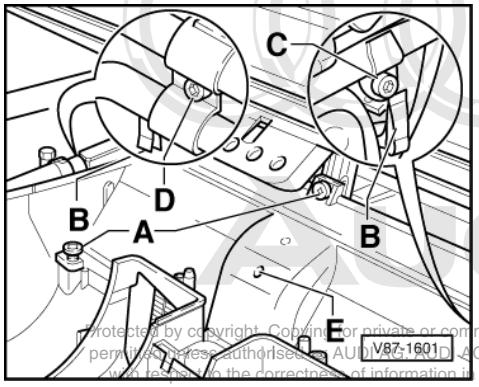
Notes:

- -> Make sure that the O-rings -C- and -D- are correctly fitted in the groove of the connecting pipes to the evaporator -E-.
- Make sure that the grommet to the air conditioner unit is correctly fitted to the evaporator connecting pipe -B- (see the illustration for version "1", V87-1603).



Installing evaporator (continued for version "1" and "2")

- -> Replace O-rings -C- and -D- between evaporator connecting pipe and refrigerant pipes.
  - Tightening torque of bolt -B-: 25 Nm
  - O-rings -C-
    Inlet: 10.8 mm/1.8 mm
  - O-rings -D-
    Outlet: 17.2 mm/1.8 mm



- -> In the case of vehicles with reinforcing panel (plenum chamber), it is very difficult to install the bolt -D- after the evaporator cover -E- has been fitted. Remedy:
  - Fit suitable washer to bolt -A-.
  - Screw in bolt approx. 2 turns before fitting evaporator cover.
  - Rework hole in refrigerant pipe holders -C- and -D- to form slot and apply anti-corrosion agent to machined areas (only applies to vehicles up to model year 1995; holders in vehicles produced after this model year have slot).

- Install holders as shown in illustration.

12.9 - Capacities

Refrigerant R134a and refrigerant oil capacities:

=> Air conditioner - with refrigerant R134a; Capacities

Notes:

- Always fill the refrigerant circuit up to the upper tolerance limit (some refrigerant remains in the filler hoses).
- The refrigerant circuit may only be filled with approved refrigerant oils:

=> Parts List

- Different refrigerant oils are specified for Zexel and Denso compressors:

=> Air conditioner - with refrigerant R134a; Capacities; Approved refrigerant oils

- Apart from the refrigerant oil G 052 154 A2, the refrigerant oil G 052 200 A2 included in the retrofit kit with part No. 4A0 298 107 can also be used for Zexel compressors .
- The refrigerant oil G 052 300 A2 required for Denso compressors is also included in the retrofit kit 4A0 298 107 A.
- Refrigerant oil from containers that have stood open for a lengthy period is unusable (PAG oil absorbs moisture).
- Further notes:

=> Air conditioner - with refrigerant R134a

12.10 - Removing and installing air conditioner unit

Special tools, testers and other items required

- Drip tray V.A.G 1306
- Commercially available compressed-air gun

Removing

- Drain refrigerant circuit:

=> Air conditioner - with refrigerant R134a

- Protect driver's and front passenger's seat with loose covers.
- Switch on ignition.
- Move electrically adjustable seats to their rearmost position.
- Press "Def" button on operating and display unit -E87.
  - Air duct from air conditioner unit to windscreen and flaps for dash panel vents are closed.
- Remove centre console:

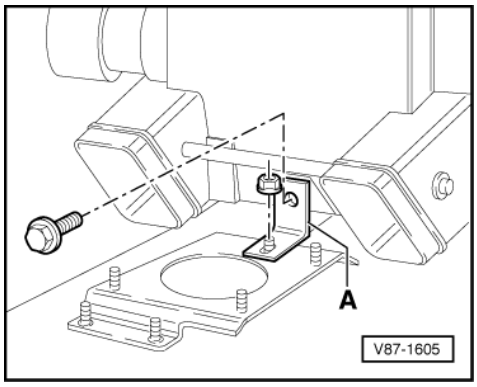
=> General Body Repairs, Interior; Repair Group 70

- Heed (if necessary obtain) radio code for vehicles with encoded radio.
- Disconnect battery earth strap with ignition switched off.
- Remove dash panel:

=> General Body Repairs, Interior; Repair Group 70

- Remove airbag control unit:

=> Electrical System; Repair Group 96



- -> Remove bracket -A-.
- Remove plenum chamber cover.
- Detach cover panel from coupling station of electronics box in plenum chamber.

Note:

RHD vehicles: Remove the coupling station from the electronics box in the plenum chamber.

- Remove intake housing with air flow flap =>Page 130 .
- Detach all air ducts to air conditioner unit.

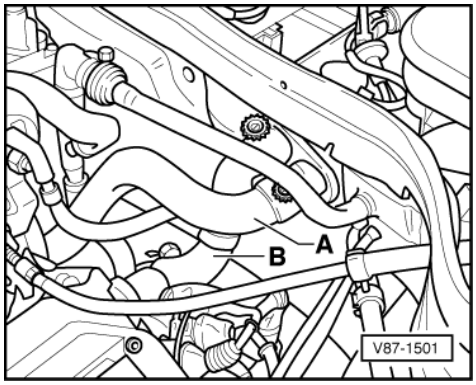
- Remove windscreen wipers and cowl panel trim:

=> Electrical System; Repair Group 92

- Remove reinforcing panel (plenum chamber) =>Page 138 .
- Unscrew cap of coolant expansion tank.
- Place drip tray V.A.G 1306 below engine.

- Drain coolant circuit:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

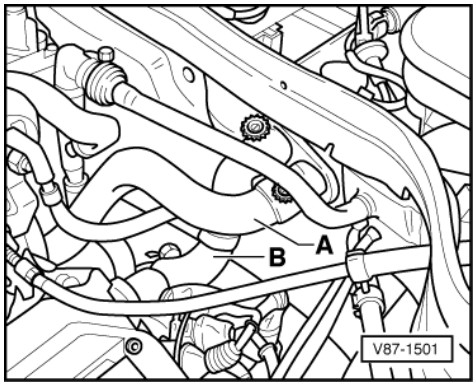


- -> Mark positions of coolant hoses -A- and -B-.
- Remove coolant hoses -A- and -B- between engine and pump/valve unit.

Note:

The illustration shows the hose positions in the 8-cylinder engine.

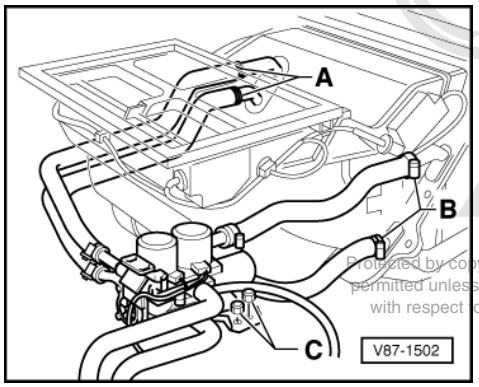
- Hold coolant hose -A- in container.



- -> Attach compressed-air gun to coolant hose -B- and carefully blow coolant out of pump/valve unit and heat exchangers.

Note:

To ensure that the coolant is blown out of both heat exchangers, clamp off the upper coolant hose to each of the two heat exchangers alternately.



- -> Mark coolant hoses -A- and -B-.
- Detach coolant hoses -A- (supply to pump/valve unit) and -B- (return to engine).
- Mark coolant hoses from pump/valve unit to heat exchangers and detach them from coolant pipes.

- Unplug connectors to air conditioner unit.

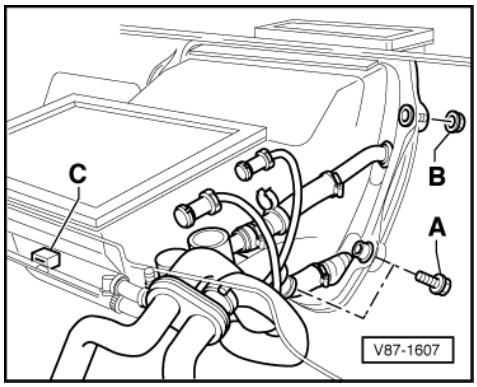
Note:

Pay attention to the earth wire at A-pillar.

- Detach condensation drainage hoses from air conditioner unit
  => Page 160 .
- Detach refrigerant pipes to evaporator => Removing and installing evaporator, Page 207 .

Note:

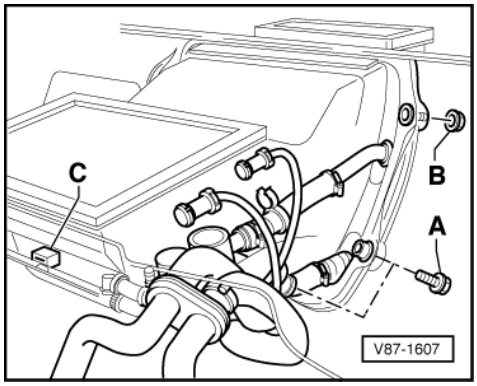
Seal the open pipe connections and the evaporator connections on the air conditioner unit.



- -> Screw out bolts -A- (in passenger compartment).
- Screw out nuts -B- (in passenger compartment).
- Remove air conditioner unit from inside passenger compartment.

Installing

Install in reverse order, paying attention to the following:

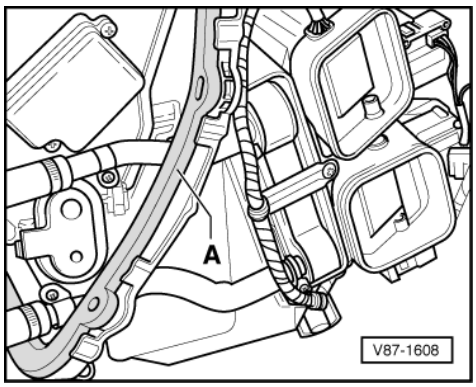


Notes:

- Replace gaskets and sealing rings.
- Secure all hose connections with standard hose clamps:

=> Parts List

- -> Check that damper element -C- is fitted correctly.
- Connect coolant hoses correctly to heat exchanger:
  - Lower hose = Coolant supply
  - Upper hose = Coolant return



- -> Replace gasket -A- between plenum chamber and air conditioner unit.

Note:

When inserting the air conditioner unit, make sure that the cables to the control motors (in the plenum chamber) are not trapped and that the gasket -A- is not damaged on the studs.

- Connect coolant hoses correctly to engine. Pay attention to markings.
- Before installing side trim, check cooling system for leaks:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

Notes:

- The coolant circulation pump -V50 of the pump/valve unit should not be operated until the coolant circuit has been bled.
- The pump/valve unit will be destroyed if it runs dry.

- Do not connect double connector to pump/valve unit until cooling circuit has been bled:

=> Appropriate Engine, Mechanics Workshop Manual; Repair Group 19

- After installation, check whether grommet between engine compartment and plenum chamber is fitted correctly.
- Check that condensation drainage hoses are fitted correctly => Page 160 .

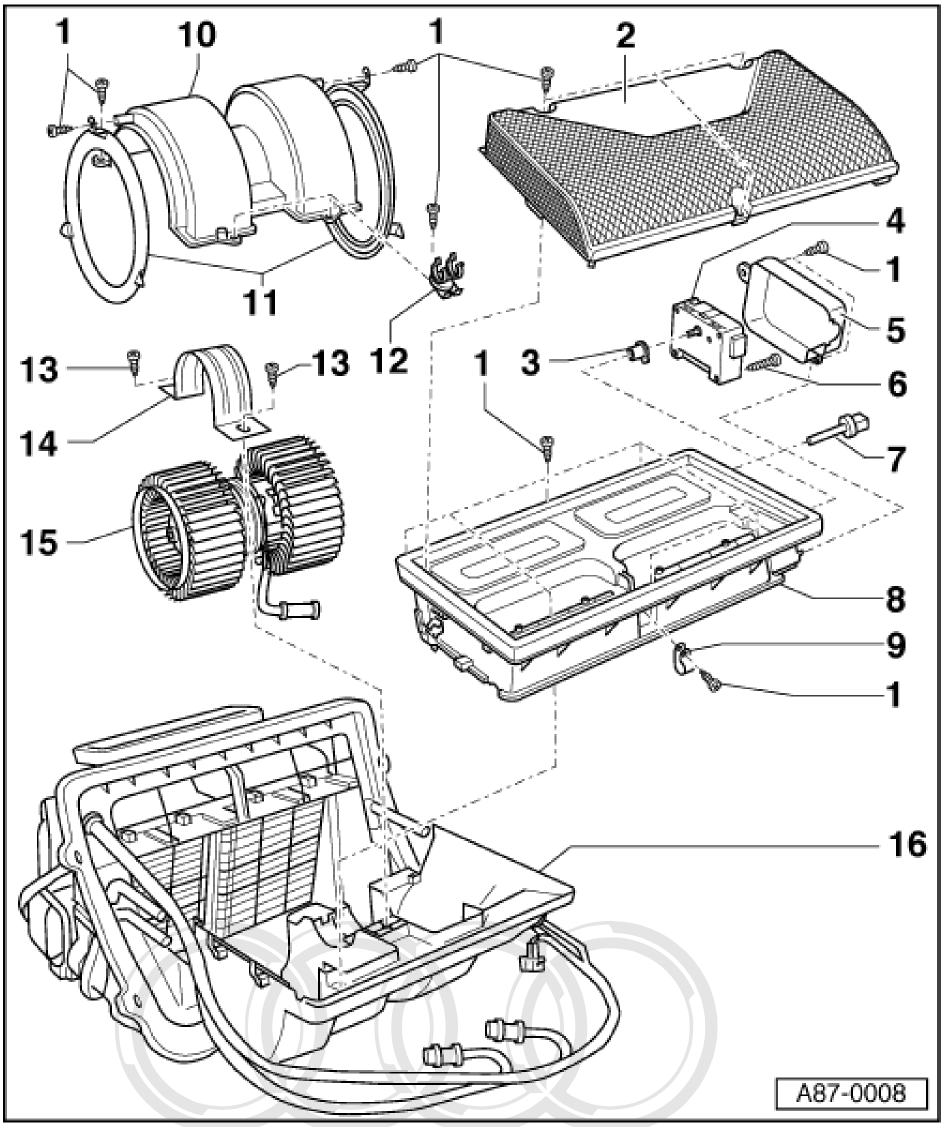
13 - Dismantling and assembling air conditioner unit

13.1 - Dismantling and assembling air conditioner unit

Notes:

- From November 2000, a modified air conditioner unit is to be gradually introduced (version "2"). Various components of the new air conditioner unit have been modified compared to version "1".
- Version "2" components which differ from the corresponding version "1" components are indicated on the following pages.
- The version "2" air conditioner unit can be identified from the outside by the coolant pipes leading to the heating system heat exchangers => Page 170 .
- When removing the air conditioner unit, mark the various control motors and the associated connecting elements between the flap and motor (this will prevent them from being mixed up with the connecting elements of other control motors).
- If connecting elements are mixed up, the control motors with the incorrect connecting elements will not reach their specified end position and, following basic setting, the "Adaption limit exceeded" fault will be displayed in the fault memory.

13.2 - Removing and installing cover grille, fresh air blower, evaporator and covers in plenum chamber



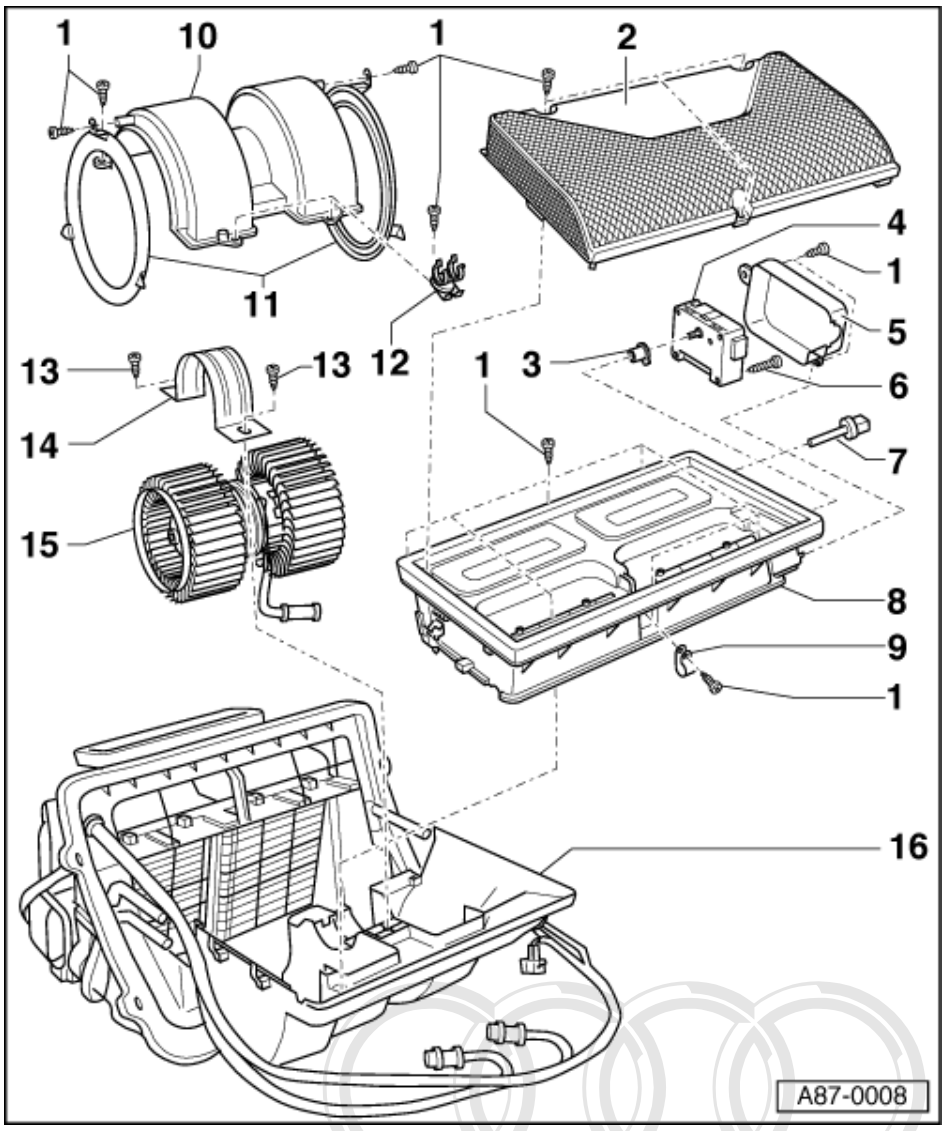
Notes:

- The air conditioner unit should only be removed if the refrigerant circuit has been drained; the vehicle must be taken to a specialist VW/Audi air conditioner workshop.
- Removing and installing air conditioner unit =>Page 212

1 Self-tapping oval-head bolt

2 Cover grille

3 Lever



4 Air flow flap control motor -V71

- With air flow flap control motor potentiometer -G113
- Removing and installing
  => Page 128

5 Cover

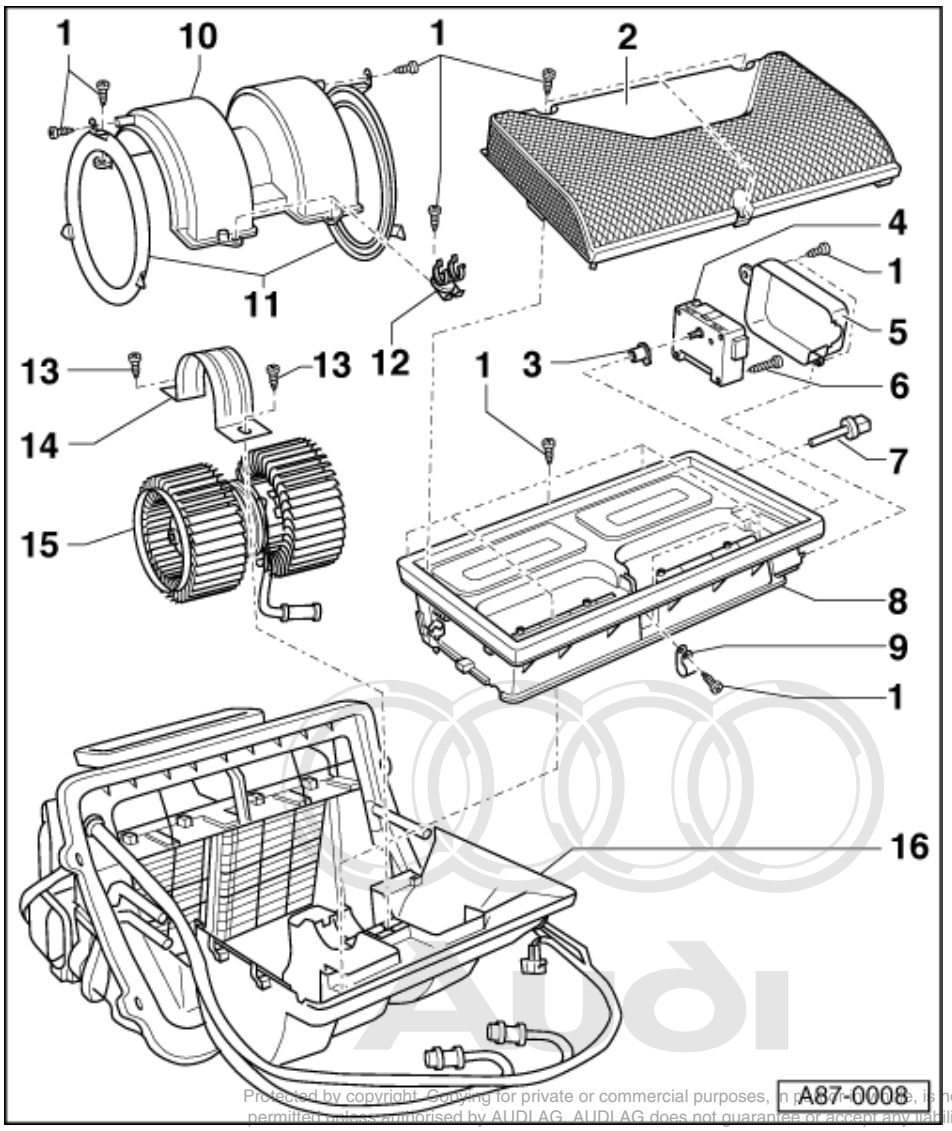
6 Bolt - 8 Ncm

7 Fresh air intake duct temperature sensor -G89

- Removing and installing
  => Page 132

8 Intake housing

- With air flow flaps and gasket
- Removing and installing
  => Page 130
- Dismantling and assembling => Fig. 2



9 Holder

- For wiring harness

10 Housing

- For fresh air blower -V2

11 Air duct ring

12 Holder

- For plug-in coupling

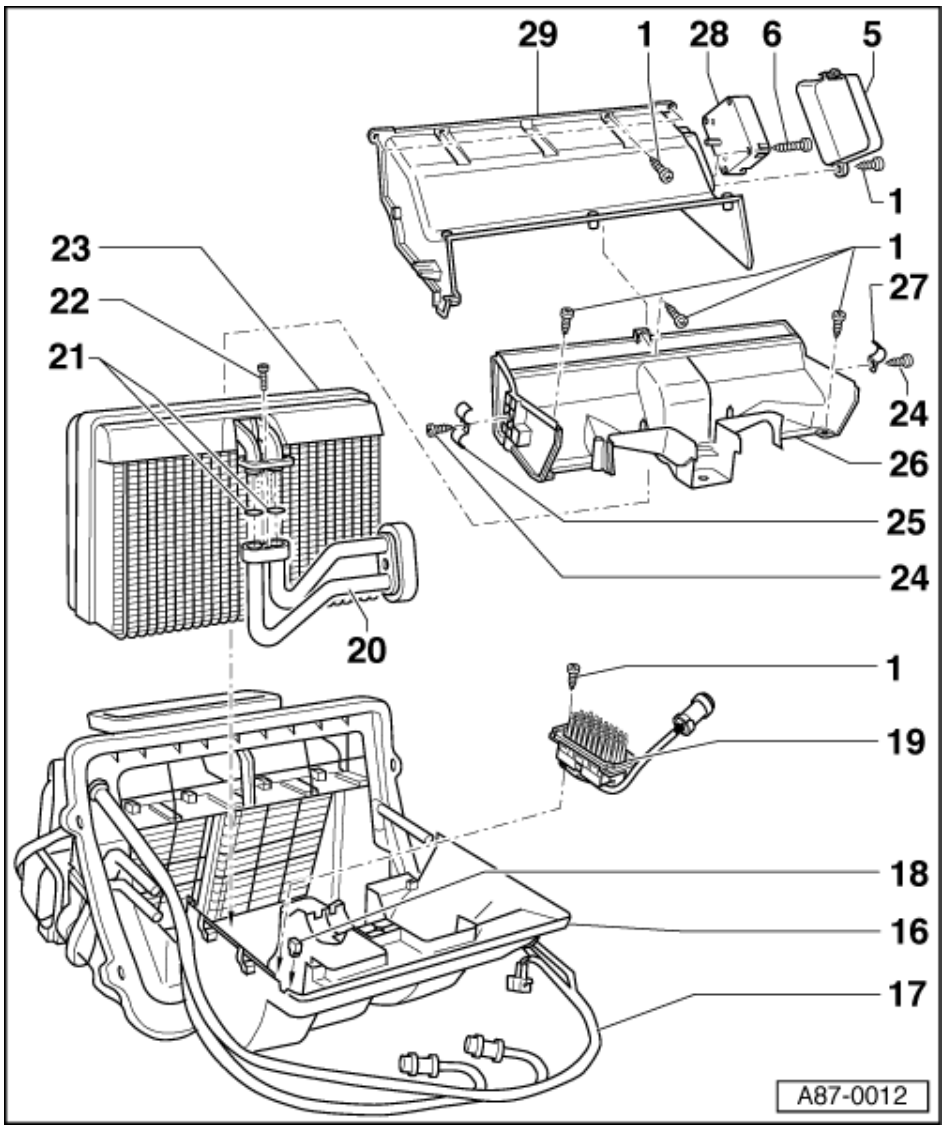
13 Self-tapping oval-head bolt

14 Holder

- For fresh air blower -V2

15 Fresh air blower -V2

- Removing and installing
  => Page 131



16 Bottom section of housing

- With air distributor housing
- Dismantling and assembling => Page 224
- Dismantling and assembling air distributor housing => Page 228
- Differences between version "1" and "2" of air conditioner unit

17 Wiring harness of air conditioner unit

- Electrical connections at air conditioner unit:

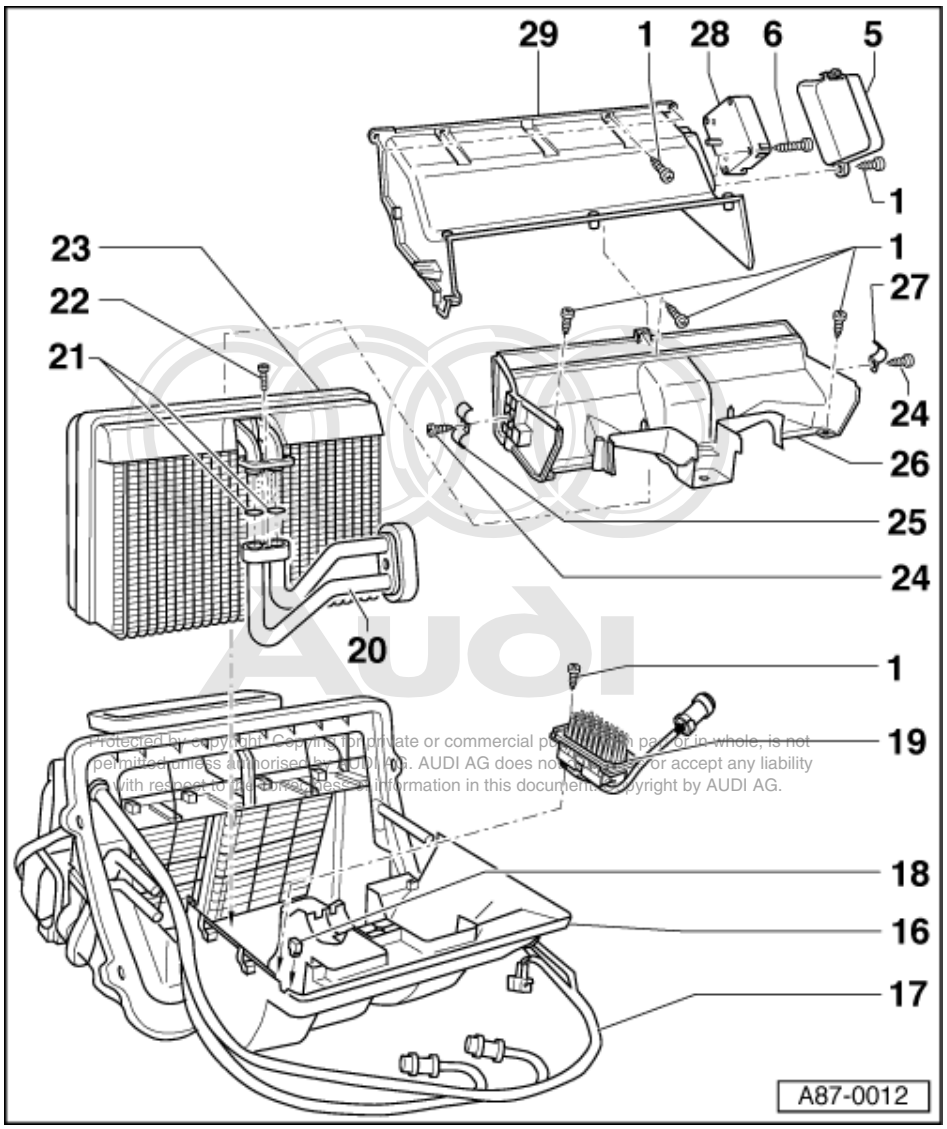
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

18 Filler piece

- 04.94 ä permanently attached to bottom section of housing

19 Fresh air blower control unit -J126

- Removing and installing
  => Page 134



20 Connecting pipe with grommet

- For evaporator
- Refrigerant pipe union between housing and connecting pipe for evaporator
- Differences between version "1" and "2" of air conditioner unit
- Grommet for sealing union at housing

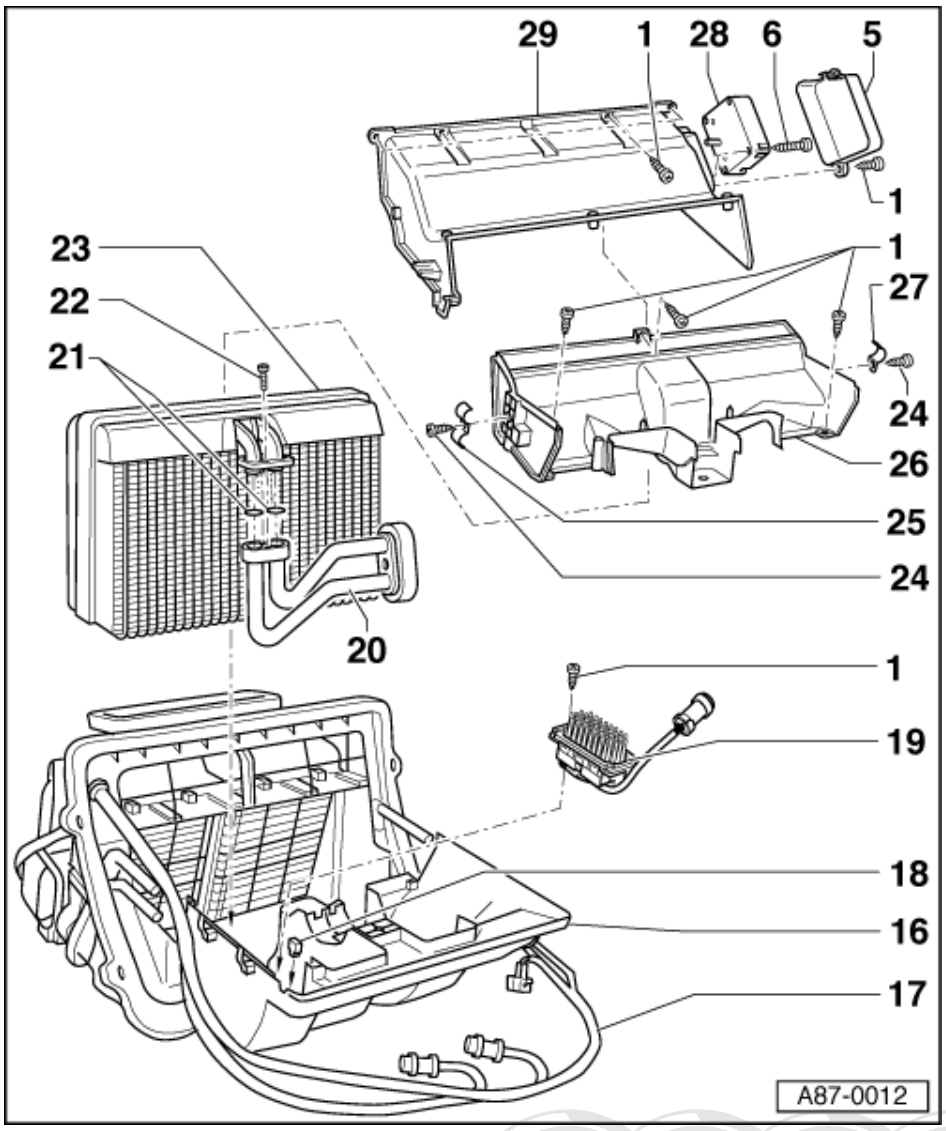
21 O-ring

- Replacing => Page 211
- Different sizes for version "1" and "2" of air conditioner unit

22 Bolt - 25 Nm

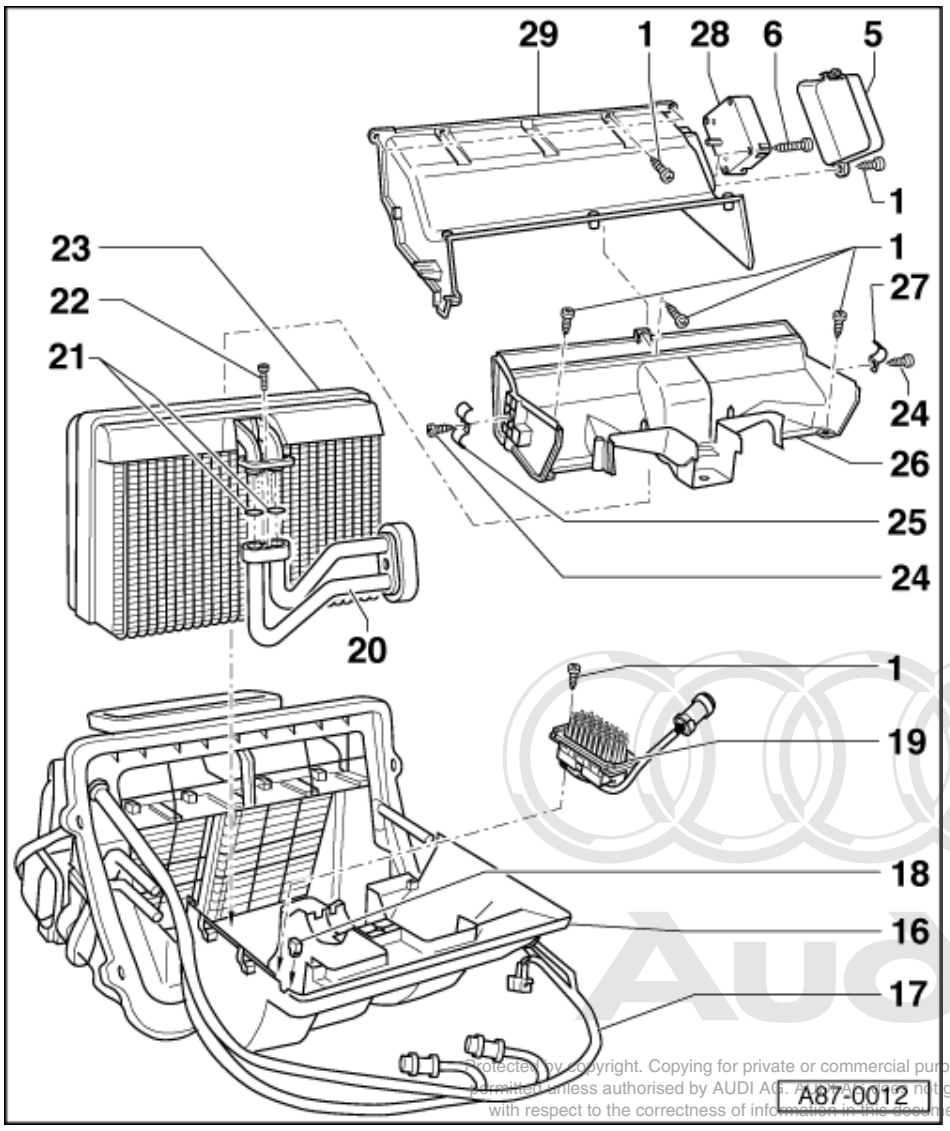
23 Evaporator

- Only to be removed after draining refrigerant circuit; vehicle must be taken to specialist VW/Audi air conditioner workshop



- Differences between version "1" and "2" of air conditioner unit => Page 207 .
- Until January 2001, the version "2" air conditioner units will be supplied with an evaporator with a bonded foam seal. From January 2001 onwards, the seal on the evaporator will gradually be changed over to an all-round rubber seal.
- Removing and installing
  => Page 207

24 Bolt



25 Pipe holder

- For coolant pipes for right heat exchanger
- Removing and installing
  => Page 211

26 Cover

- For evaporator

27 Pipe holder

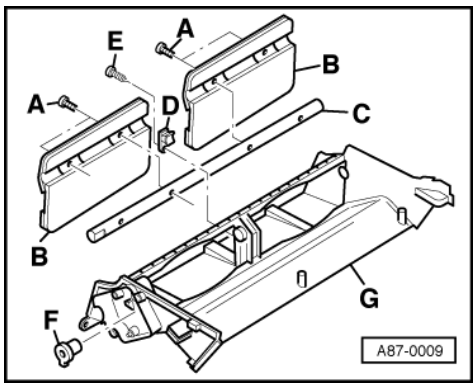
- For coolant pipes for left heat exchanger

28 Air recirculation flap control motor V113 -

- With air recirculation flap control motor potentiometer -G143
- Removing and installing
  => Page 132

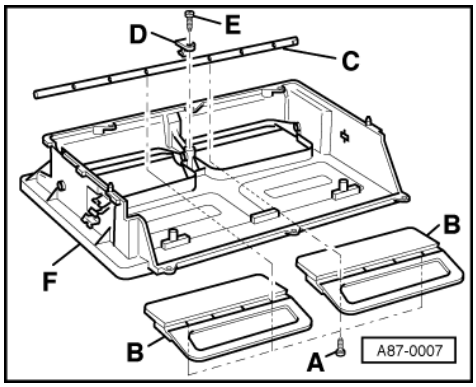
29 Cover

- With air recirculation flap
- Removing and installing
  => Page 132
- Dismantling and assembling => Fig. 1



-> Fig.1 Dismantling and assembling cover

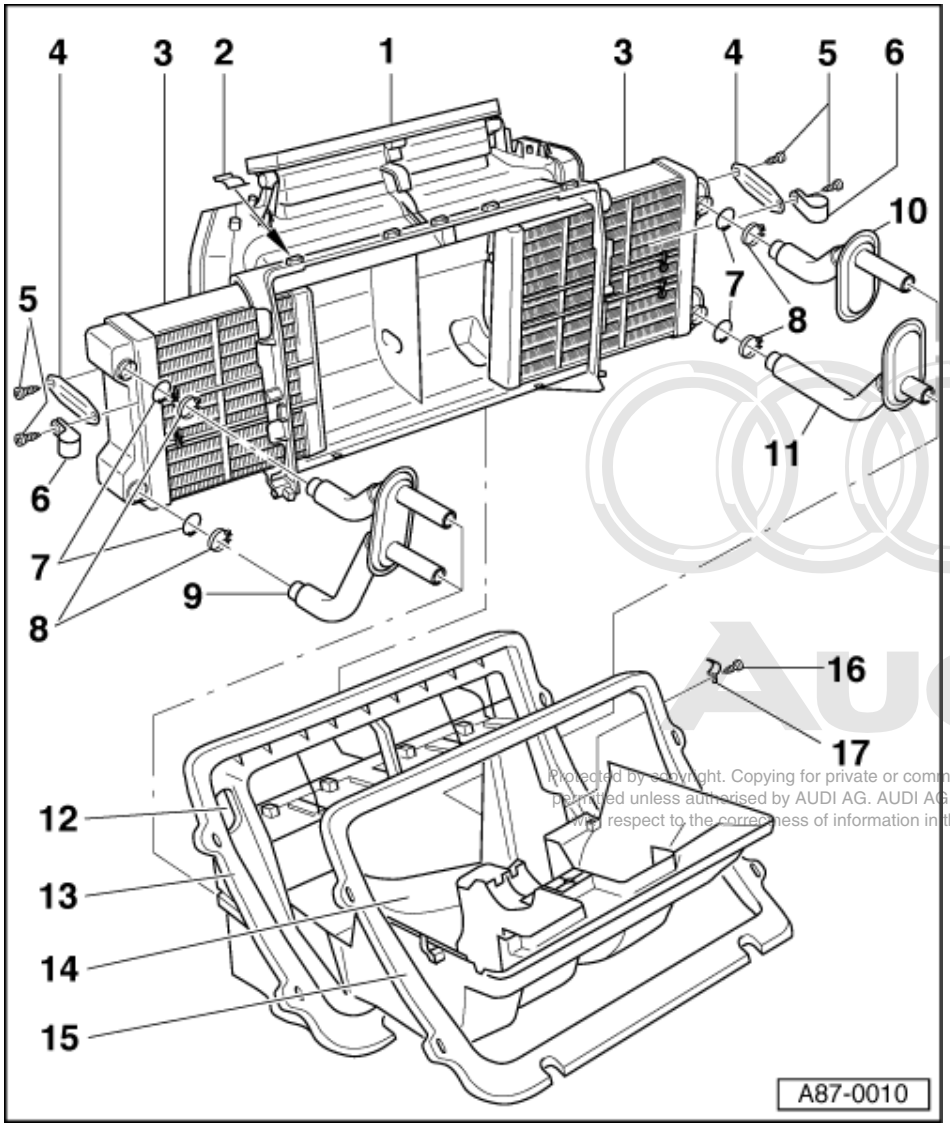
A - Bolt
B - Air recirculation flap
C - Shaft
D - Holder
E - Bolt
F - Connecting element
G - Cover



-> Fig.2 Dismantling and assembling intake housing

A - Bolt
B - Air flow flap
C - Shaft
D - Holder
E - Bolt
F - Intake housing with gasket (to seal against bonnet)

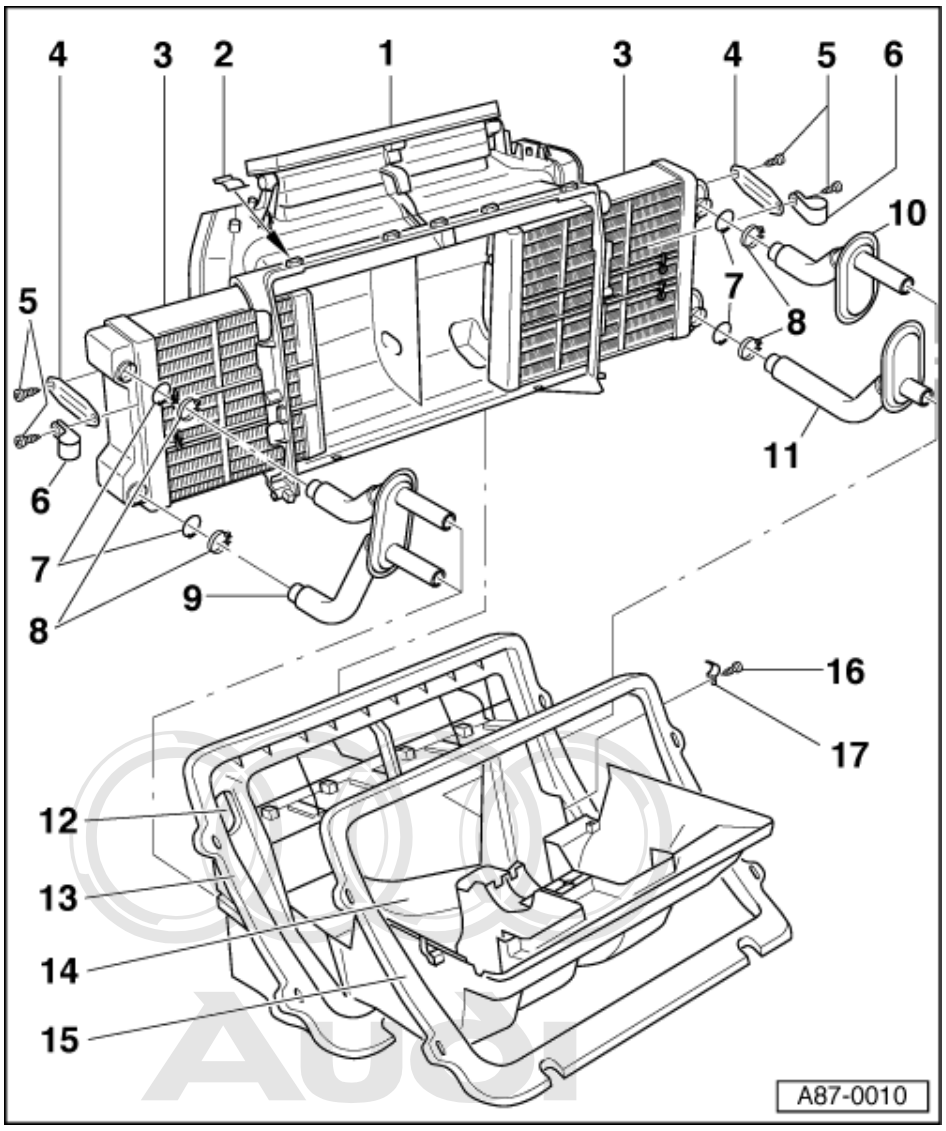
13.3 - Dismantling and assembling bottom section of housing and air distributor housing



1 **Air distributor housing**
- Dismantling and assembling => Page 228
- Differences between version "1" and "2" of air conditioner unit (other heat exchangers => Page 170).

2 **Clip**

3 **Heat exchanger**
- Removing and installing (right)
  => Page 170
- Removing and installing (left)
  => Page 177
- Differences between version "1" and "2" of air conditioner unit => Page 170 .



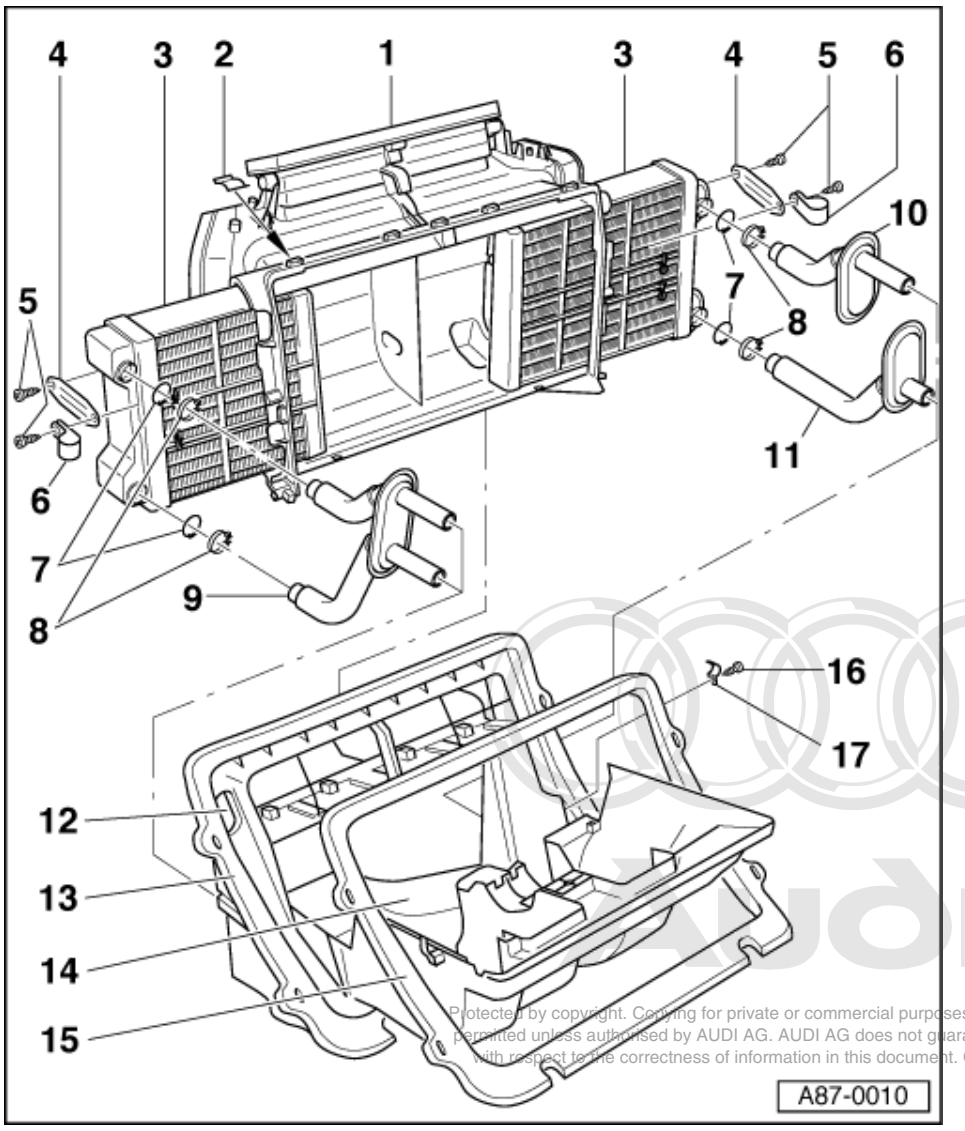
4 **Holder**
- Differences between version "1" and "2" of air conditioner unit (different heat exchangers => Page 170).

5 **Self-tapping oval-head bolt**

6 **Holder**
- For wiring harness

7 **O-ring**
- Replace

8 **Clamp**
- Replace
- Make sure that clamp is fitted correctly



9 Coolant pipe (right)

- With double grommet
- Differences between version "1" and "2" of air conditioner unit (different heat exchangers => Page 170).

10 Coolant pipe (top left)

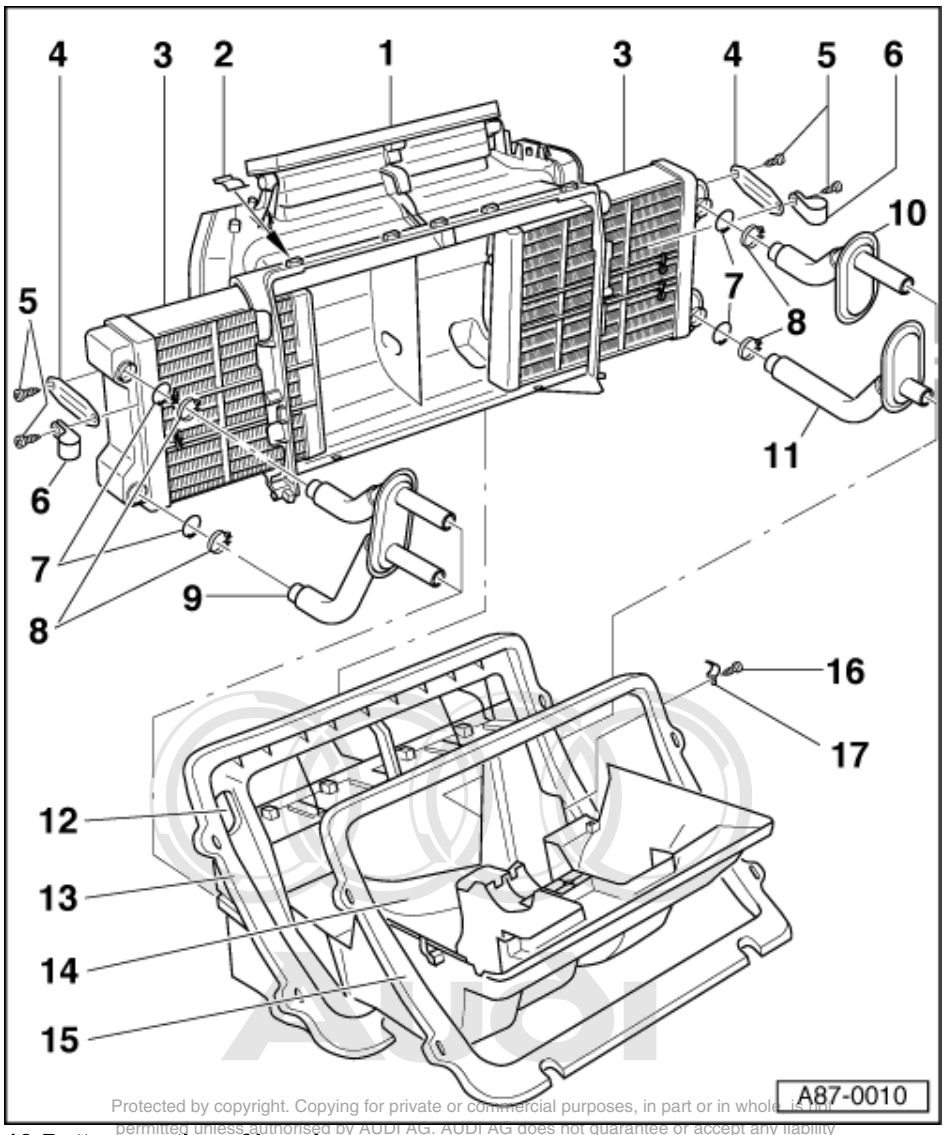
- With grommet
- Differences between version "1" and "2" of air conditioner unit (different heat exchangers => Page 170).

11 Coolant pipe (bottom left)

- With grommet
- Differences between version "1" and "2" of air conditioner unit (different heat exchangers => Page 170).

12 Opening

- For wiring harness



13 Bottom section of housing

- Differences between version "1" and "2" of air conditioner unit (different evaporator => Page 207).

14 Insulating matting

- Only fitted with version "1" air conditioner units
- Entire surface of matting bonded to bottom section of housing (check bonding).
- Not fitted for version "2" air conditioner units

15 Gasket

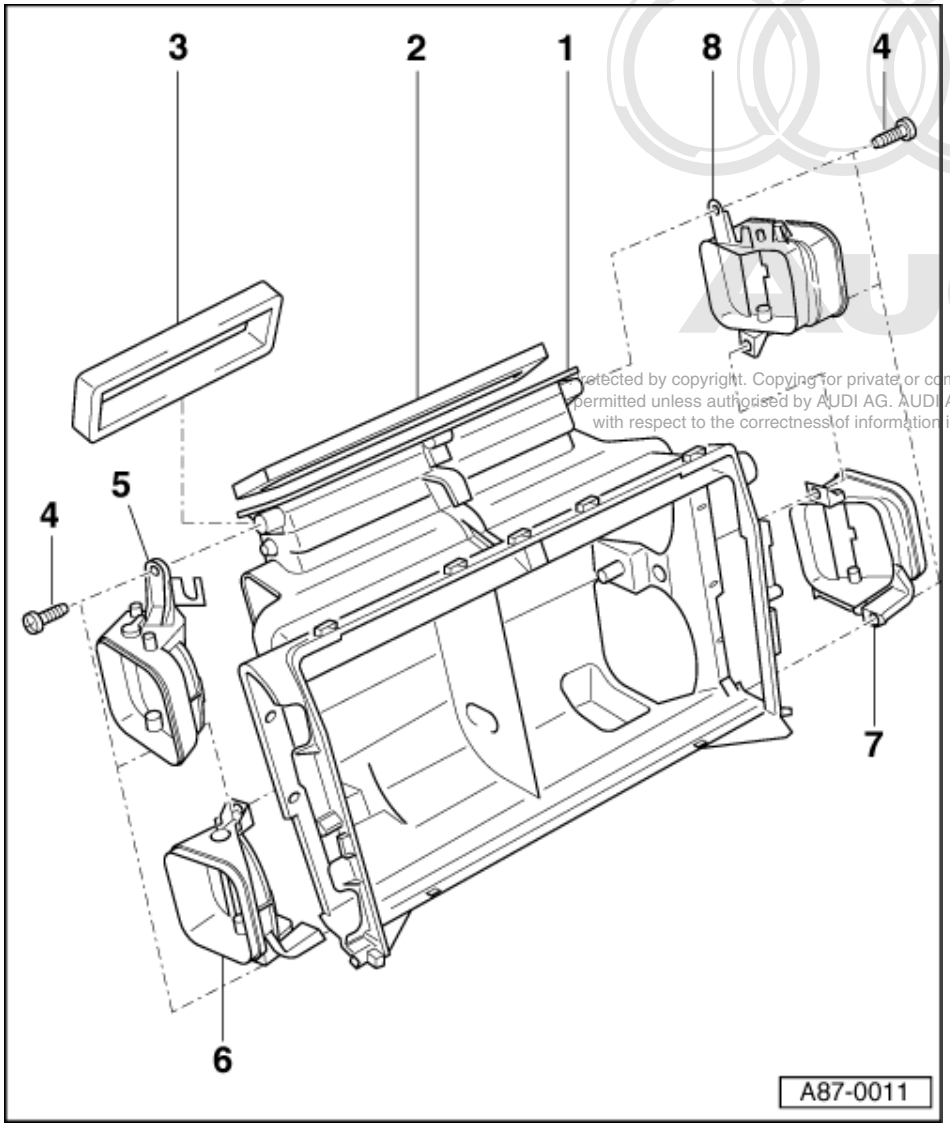
- Replace

16 Bolt

17 Pipe holder

- For coolant pipe (bottom left)

13.4 - Dismantling and assembling air distributor housing



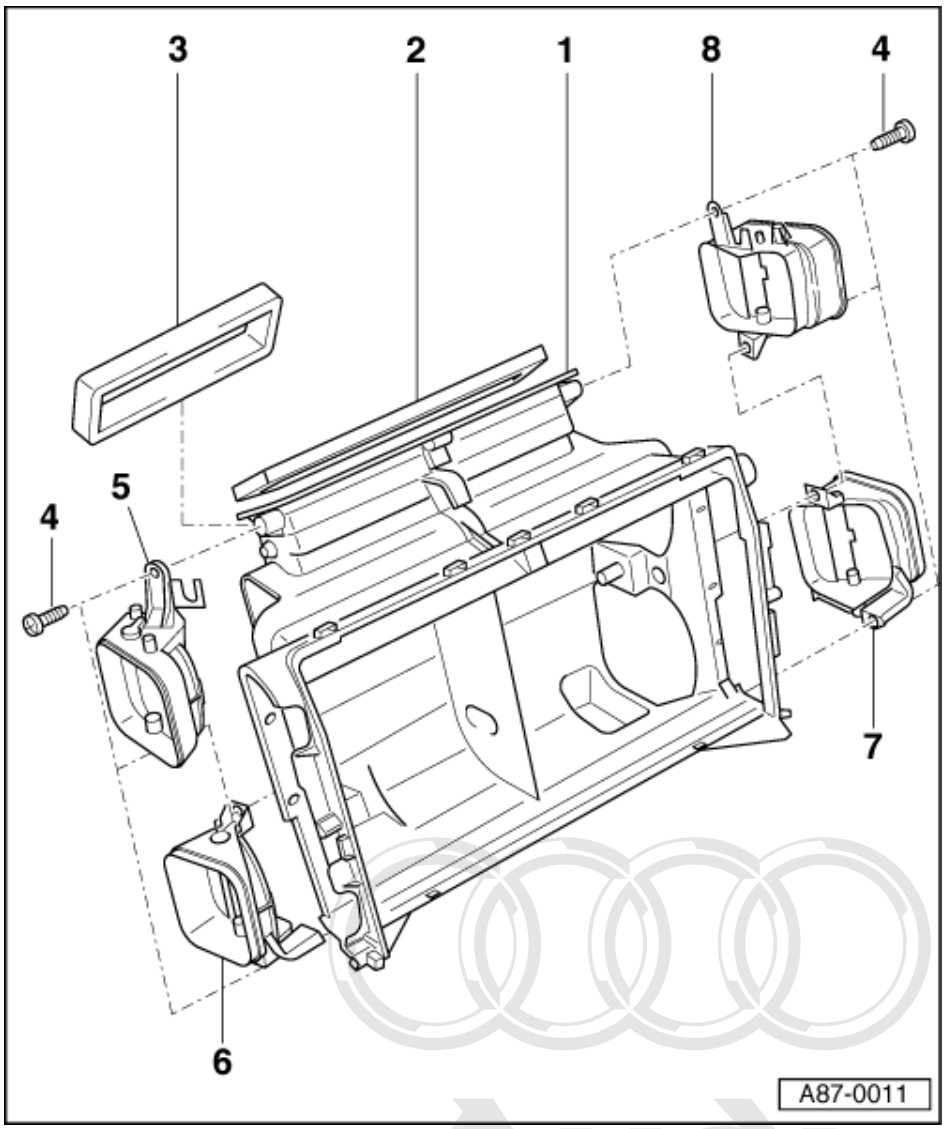
1 **Air distributor housing**
- Differences between version "1" and "2" of air conditioner unit (different heat exchangers => Page 170).

2 **Gasket**

3 **Gasket**

4 **Self-tapping oval-head bolt**

5 **Air duct**
- With cut-off flap to centre right vent
- Removing and installing control motor -V111 => Page 162



6 Air duct
- With cut-off flap to right footwell vent
- Removing and installing control motor -V109 => Page 167

7 Air duct
- With cut-off flap to left footwell vent
- Removing and installing control motor -V108 => Page 166

8 Air duct
- With cut-off flap to centre left vent
- Removing and installing control motor -V110 => Page 162