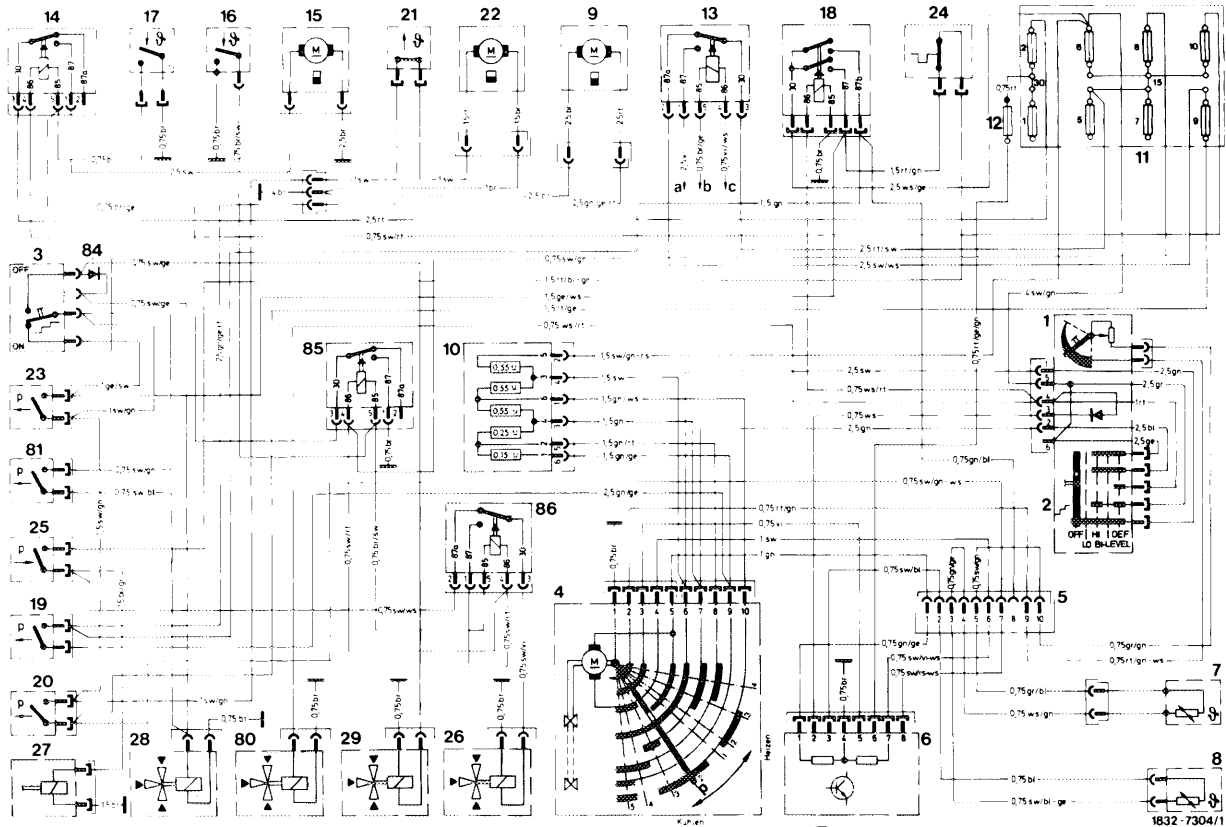


Electric wiring diagram, ignition off, regulating valve in position "parking" (standard)

- 1 Temperature dial
- 2 Pushbutton switch
- 3 "ON/OFF" switch refrigerant compressor
- 4 Regulating valve
- 5 10-point plug connection for tester
- 6 Amplifier
- 7 In-car temperature sensor
- 8 Ambient temperature sensor
- 9 Blower
- 10 Pre-resistance for blower
- 11 Main fuse box
 - Fuse 2 : 16 amps
 - Fuse 6 : 16 amps
 - Fuse 9 : 8 amps
 - Fuse 10 : 8 amps
- 12 Additional fuse for amplifier (2 amps)
- 13 Relay air conditioning system
- 14 Relay auxiliary fan
- 15 Auxiliary fan
- 16 Temperature switch 100 °C (212 °F) in thermostat housing for auxiliary fan
- 17 Temperature switch 62 °C (142 °F) in receiver dehydrator for auxiliary fan
- 18 Double contact relay
- 19 Vacuum switch (main switch, closes with vacuum higher than 175 mbar or 0.18 atu)
- 20 Vacuum switch (refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu)
- 21 Temperature switch for heating water pump (22) 16 °C (61 °F) ON, 26 °C (79 °F) OFF
- 22 Heating water pump
- 23 Vacuum switch (for refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)
- 24 ETR-switch 2 °C (36 °F)
- 25 Pressure switch refrigerant compressor ON 2.6 bar gauge pressure (2.6 atu) OFF 2.0 bar gauge pressure (2.0 atu)
- 26 Switchover valve for maintaining constant speed
- 27 Electromagnetic clutch for refrigerant compressor
- 28 Switchover valve for vacuum element of legroom flaps
- 29 Switchover valve for vacuum element of fresh air-recirculating air changeover switch
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)
- 84 Diode

- a Cable connector starter terminal 50
- b Starter lockout and back-up lamp switch
- c Ignition starter switch terminal 50

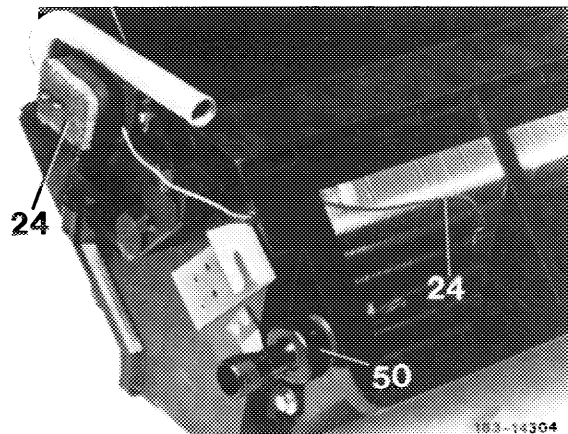


Electric wiring diagram, ignition off, regulating valve in position "parking" (USA)

- | | |
|---|--|
| <p>1 Temperature dial</p> <p>2 Pushbutton switch</p> <p>3 "ON/OFF" switch refrigerant compressor</p> <p>4 Regulating valve</p> <p>5 10-point plug connection for tester</p> <p>6 Amplifier</p> <p>7 In-car temperature sensor</p> <p>8 Ambient temperature sensor</p> <p>9 Blower</p> <p>10 Pre-resistance for blower</p> <p>11 Main fuse box
Fuse 2 : 16 amps
Fuse 6 : 16 amps
Fuse 8 : 8 amps
Fuse 9 : 8 amps
Fuse 10 : 8 amps</p> <p>12 Additional fuse for amplifier (2 amps)</p> <p>13 Relay air conditioning system</p> <p>14 Relay auxiliary fan</p> <p>15 Auxiliary fan</p> <p>16 Temperature switch 100 °C (212 °F) in thermostat housing for auxiliary fan</p> <p>17 Temperature switch 62 °C (142 °F) in receiver dehydrator for auxiliary fan</p> <p>18 Double contact relay</p> <p>19 Vacuum switch (main switch, closes with vacuum higher than 175 mbar or 0.18 atu)</p> | <p>20 Vacuum switch (refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu)</p> <p>21 Temperature switch for heating water pump (22) 16 °C (61 °F) ON, 26 °C (79 °F) OFF</p> <p>22 Heating water pump</p> <p>23 Vacuum switch (for refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)</p> <p>24 ETR-switch 2 °C (36 °F)</p> <p>25 Pressure switch refrigerant compressor
ON 2.6 bar gauge pressure (2.6 atu)
OFF 2.0 bar gauge pressure (2.0 atu)</p> <p>26 Switchover valve for maintaining constant speed</p> <p>27 Electromagnetic clutch for refrigerant compressor</p> <p>28 Switchover valve for vacuum element of legroom flaps</p> <p>29 Switchover valve for vacuum element of fresh air-recirculating air changeover switch</p> <p>80 Switchover valve "BI-LEVEL" (at "DEF")</p> <p>81 Vacuum switch (closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)</p> <p>84 Diode</p> <p>85 Relay declutching</p> <p>86 Relay ignition switchover</p> <p>a Cable connector starter terminal 50</p> <p>b Starter lockout and back-up lamp switch</p> <p>c Ignition starter switch terminal 50</p> |
|---|--|

d) ETR-switch (evaporator temperature regulator)

The ETR-switch (24) is attached at the right on air conditioner unit. The capillary of the switch is between ribs of evaporator. The switch interrupts the current flow to refrigerant compressor clutch as soon as the rib temperature is below 2 °C (36 °F). This will prevent any icing up of evaporator.

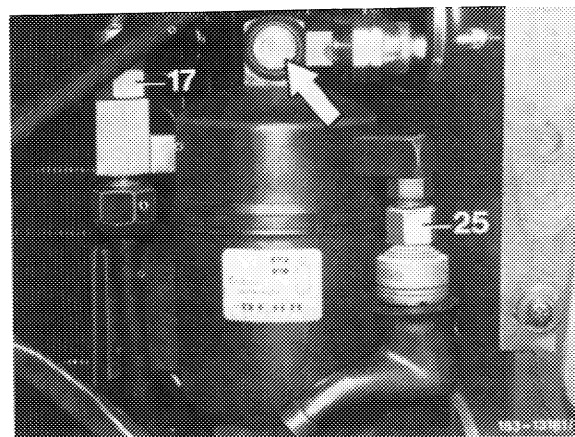


Layout of ETR-switch and air jet nozzle

- 24 ETR-switch with capillary
- 50 Air jet nozzle

e) Pressure switch for refrigerant compressor

This switch (25) is located at receiver dehydrator of refrigerant circuit. When the refrigerant is not yet completely lost (high pressure too low) the pressure switch will switch off the electromagnetic clutch and thereby prevent damage to refrigerant compressor.

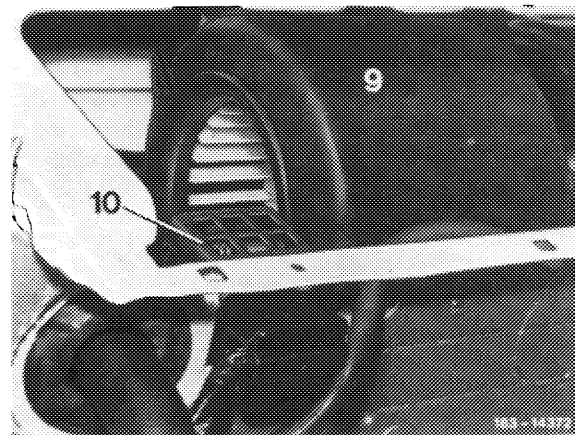


Layout of pressure switch in receiver dehydrator

- 25 Pressure switch

f) Resistor group for blower

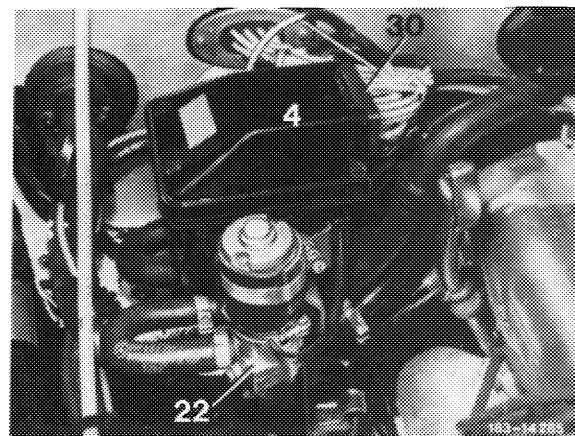
The resistor group (10) has 5 resistors with ohmic values of different size (refer to wiring diagram). The group is installed in air duct (water tank) in front of blower.



- 9 Blower
- 10 Pre-resistor for blower

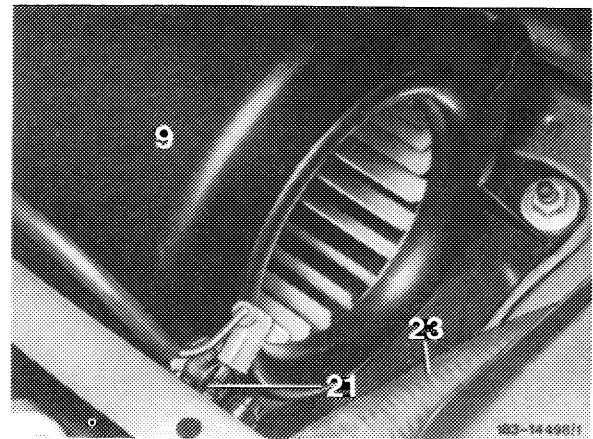
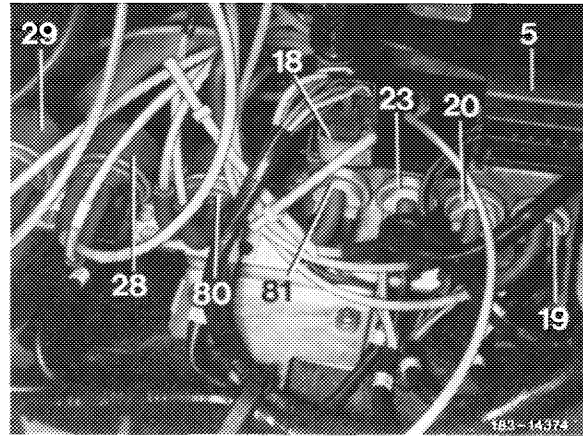
g) Heating water pump

The heating water pump (22) is located adjacent to regulating valve (4) and serves for maintaining a uniform heating water flow through heat exchanger also at low engine speeds. The heating water pump (22) will be energized only if the vacuum solenoid switch (20) is closed. In position "OFF" or at an ambient temperature above 26 °C (79 °F) the heating water pump is switched off by the temperature switch (21).



- 4 Regulating valve
- 22 Heating water pump
- 30 Vacuum lines

- 5 10-point plug connection for tester
- 18 Double contact relay
- 19 Vacuum switch (main switch, green)
- 20 Vacuum switch (refrigerant compressor, yellow)
- 23 Vacuum switch for refrigerant compressor (only at "BI-LEVEL")
- 28 Switchover valve legroom flap
- 29 Switchover valve fresh air flap
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (at "BI-LEVEL" only)



21 Temperature switch for heating water pump

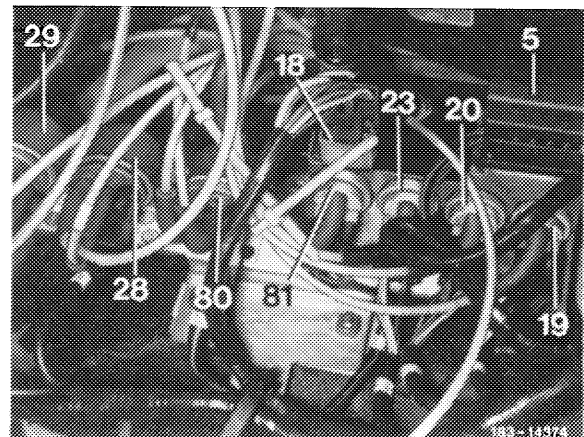
h) Double contact relay

During "DEF" mode and in the event of a malfunction of vacuum supply, the double contact relay (18) will bridge the main switch (19) and thereby permit defrosting of windows as well as heating as an emergency operation.

i) Vacuum-actuated "BI-LEVEL" switch

During "BI-LEVEL" mode this switch (23) will short the circuit if the "ON/OFF" switch of the refrigerant compressor is in "OFF" position. As a result, the refrigerant compressor will always run along in these modes to dehumidify the air except when it is switched off via temperature switch.

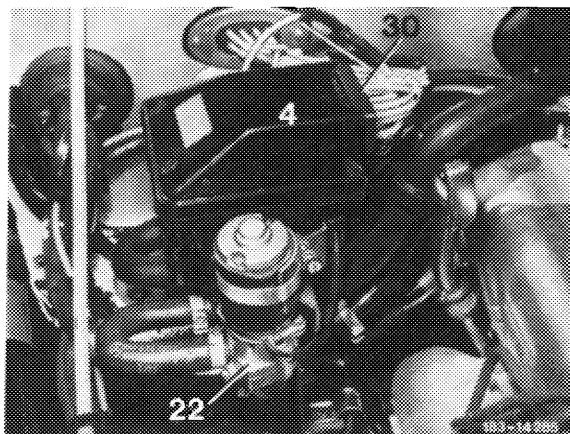
- 5 10-point plug connection for tester
- 18 Double contact relay
- 19 Vacuum switch (main switch, green)
- 20 Vacuum switch (refrigerant compressor, yellow)
- 23 Vacuum switch for refrigerant compressor (only at "BI-LEVEL")
- 28 Switchover valve legroom flap
- 29 Switchover valve fresh air flap
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (at "BI-LEVEL" only)



j) Vacuum lines

For the entire vacuum system the vacuum lines (30) are designed in such a manner (color-coded or hose lines vulcanized into couplings) that mistakes are hardly possible.

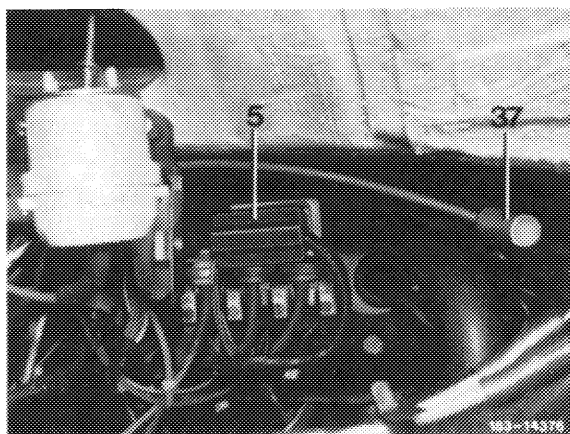
- 4 Regulating valve
- 22 Heating water pump
- 30 Vacuum lines



k) Connection for tester

For connection of tester to system a 10-point plug connection (5) is located underneath instrument panel at the right. The electrical connection and the vacuum connection are accessible upon removal of glove box.

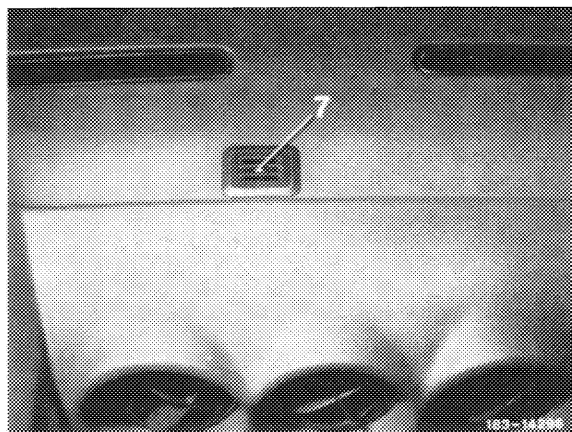
- 5 10-point plug connection for tester
- 37 Vacuum connection for tester



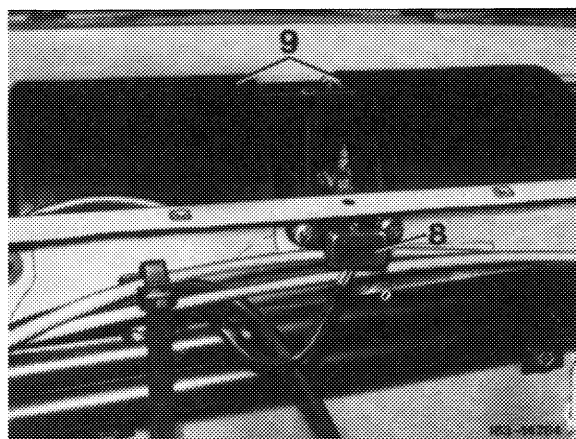
G. Temperature control

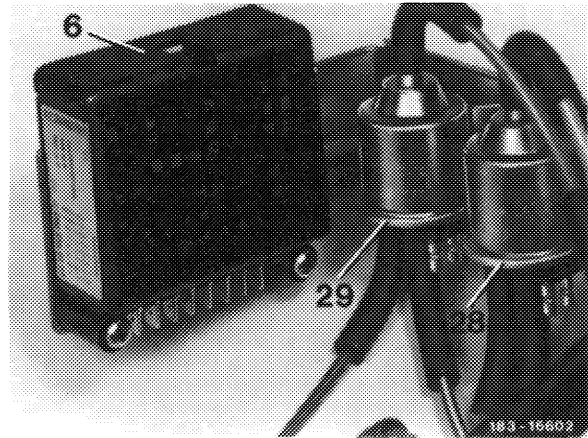
The in-car temperature sensor (7) and the ambient temperature sensor (8) are temperature-sensitive resistors (thermistors) and are connected in series with potentiometer of temperature dial (1) and feedback potentiometer in regulating valve (4). This resistor chain is compared with a fixed resistor in amplifier (6). Any deviations result in a difference in potential which, amplified by amplifier (6), drives the servomotor in regulating valve.

- 7 In-car temperature sensor

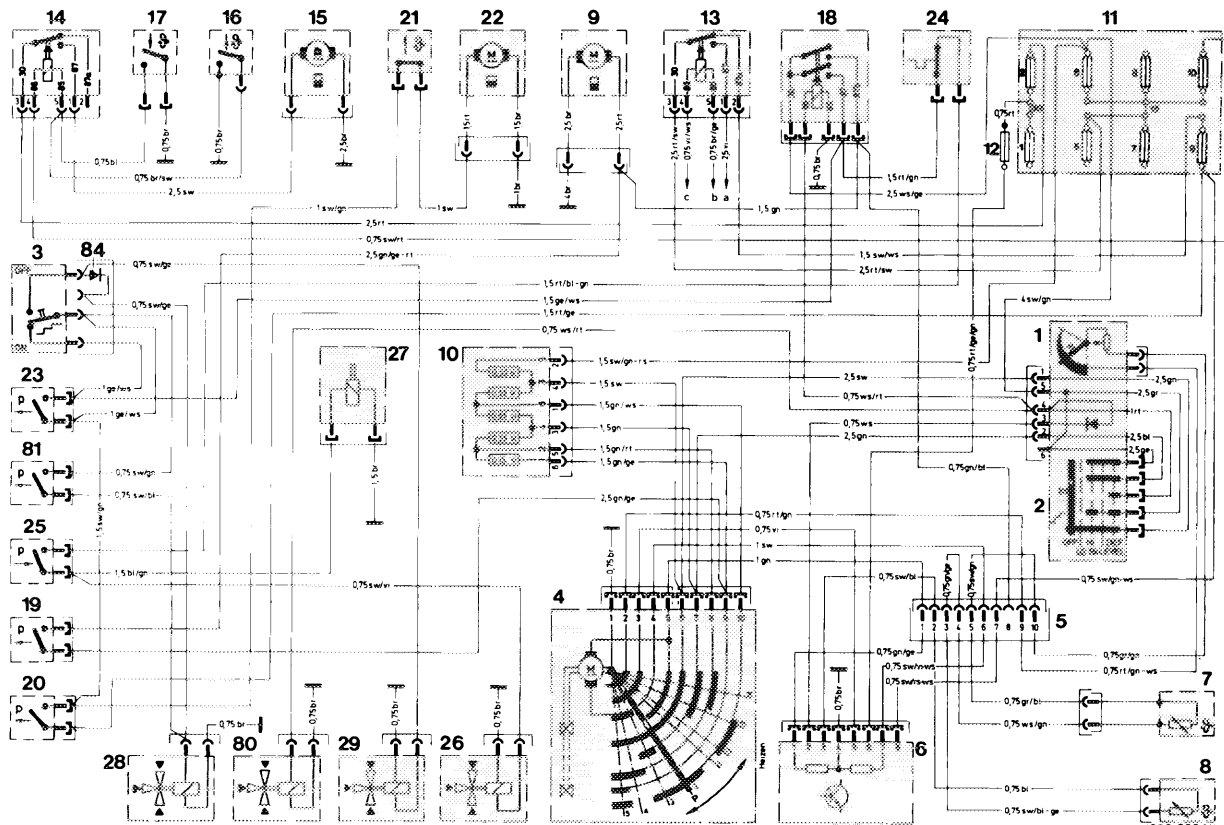


- 8 Ambient temperature sensor
- 9 Blower





The regulating valve will then keep changing its position until the resistor chain is again in balance under influence of feedback potentiometer. At this moment, the potential difference = 0. The amplifier is not transmitting any more voltage to servomotor in regulating valve.



Electric wiring diagram (ignition off, regulating valve in position "parking", (standard))

- | | |
|---|--|
| 1 Temperature dial | 20 Vacuum switch (refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu) |
| 2 Pushbutton switch | 21 Temperature switch for heating water pump (22)
16 °C (61 °F) ON, 26 °C (79 °F) OFF |
| 3 "ON/OFF" switch refrigerant compressor | 22 Heating water pump |
| 4 Regulating valve | 23 Vacuum switch (for refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only) |
| 5 10-point plug connection for tester | 24 ETR-switch 2 °C (36 °F) |
| 6 Amplifier | 25 Pressure switch refrigerant compressor
ON 2.6 bar gauge pressure (2.6 atu)
OFF 2.0 bar gauge pressure (2.0 atu) |
| 7 In-car temperature sensor | 26 Switchover valve for maintaining constant speed |
| 8 Ambient temperature sensor | 27 Electromagnetic clutch for refrigerant compressor |
| 9 Blower | 28 Switchover valve for vacuum element of legroom flaps |
| 10 Pre-resistance for blower | 29 Switchover valve for vacuum element of fresh air-recirculating air changeover switch |
| 11 Main fuse box
Fuse 2 : 16 amps
Fuse 6 : 16 amps
Fuse 9 : 8 amps
Fuse 10 : 8 amps | 80 Switchover valve "BI-LEVEL" (at "DEF") |
| 12 Additional fuse for amplifier (2 amps) | 81 Vacuum switch (closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only) |
| 13 Relay air conditioning system | 84 Diode |
| 14 Relay auxiliary fan | |
| 15 Auxiliary fan | |
| 16 Temperature switch 100 °C (212 °F) in thermostat housing for auxiliary fan | |
| 17 Temperature switch 62 °C (142 °F) in receiver dehydrator for auxiliary fan | |
| 18 Double contact relay | |
| 19 Vacuum switch (main switch, closes with vacuum higher than 175 mbar or 0.18 atu) | |
| | a Cable connector starter terminal 50 |
| | b Starter lockout and back-up lamp switch |
| | c Ignition starter switch terminal 50 |

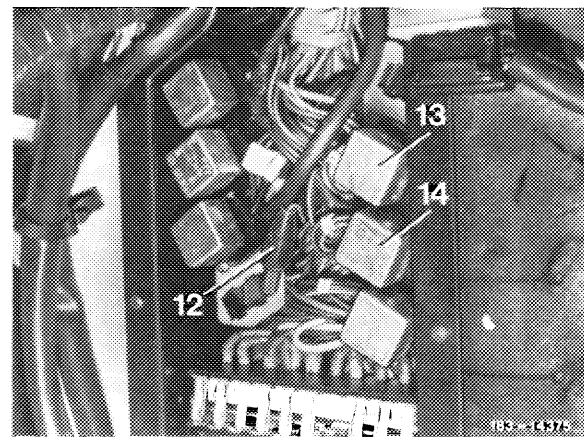
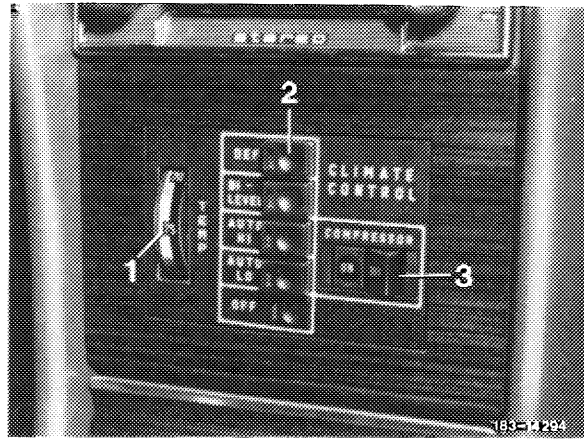
Example:

If the temperature dial (1) is set higher for a few degrees, the resistance of the potentiometer increases and thereby that of the entire resistor chain. A comparison with the fixed resistance results in a difference in potential which, upon amplification, drives the servomotor. The regulating valve will run in direction of "heating" until the chain and the fixed resistor are again in balance. The vehicle will heat up, the in-car temperature sensor will then become a few degrees warmer, its resistance will drop. Another difference in potential in amplifier will result, this time a negative one. In amplified condition it will drive the servomotor in regulating valve in reverse until the system is again in balance and the preset temperature is attained.

When the ignition is switched off, the regulating valve moves into a parking position. The amplifier receives a direct electrical signal from battery (fuse 12). The amplifier will then make sure that the regulating valve moves into parking position (blower stage 2 – cooling). When the specified setting is attained, the valve will automatically switch off.

Layout of additional fuse for amplifier

- 12 Additional fuse (2 amps)
- 13 Relay air conditioning system (code number 4)
- 14 Relay auxiliary fan (code number 6)



H. Tester

Conventional tool

1 tester ATC 331

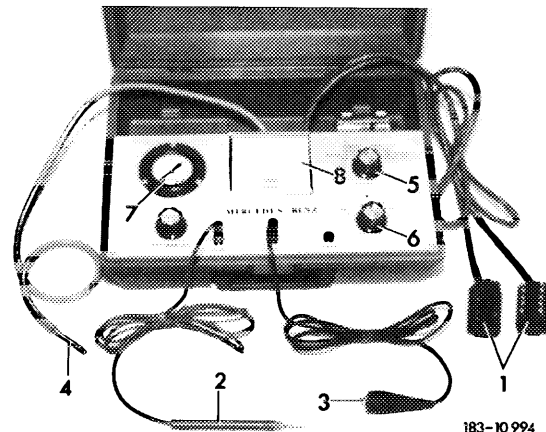
made by Deutsche Ranco GmbH
Postfach 1560
6832 Hockenheim

The tester is an auxiliary tool which puts artificial operating conditions into the automatic temperature control system for all its modes, from blower max. cooling to blower max. heating, without any regard to weather conditions.

When the tester is connected to the system, the ambient temperature sensor, the in-car temperature sensor and the temperature dial are bypassed by the tester. The bypass circuit takes the place of electrical signals as an input into the amplifier section to switch the system through its steps.

The vacuum measuring instrument (7) shows the vacuum in the system supplied to the main switch. The instrument shows when a flap changes its position by slight and fast descending and ascending (fluctuations) on vacuum readout.

- | | |
|-------------------------------|-------------------------------|
| 1 10-point-plug connection | 5 Voltmeter switch |
| 2 Volt or ohmmeter needle | 6 Mode switch |
| 3 Connection (vehicle ground) | 7 Vacuum measuring instrument |
| 4 Vacuum connection line | 8 Voltmeter |

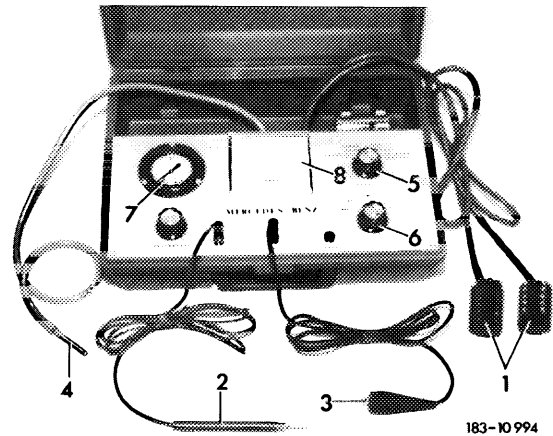


Voltmeter (8) shows changes of blower motor speeds and additionally checks the condition of the in-car and ambient temperature sensor, as well as temperature dial, amplifier and regulating valve.

A tester not used for testing should be in the "OFF" position; damage may result if the tester remains switched on.

Control knob – positions of tester

- | | |
|-------------------------------|-------------------------------|
| 1 10-point plug connection | 5 Voltmeter switch |
| 2 Volt or ohmmeter needle | 6 Mode switch |
| 3 Connection (vehicle ground) | 7 Vacuum measuring instrument |
| 4 Vacuum connection line | 8 Voltmeter |



The voltmeter switch (5) is a switch with six positions:

OFF position:

In this position no voltage can be read on measuring instrument. If it is not used, leave knob in its position and put back into this position in-between tests.

BLOWER VOLTS position:

In this position, the blower motor voltage is read directly on voltmeter.

AMBIENT SENSOR position:

In this position the voltage drop is measured via ambient temperature sensor.

TEMPERATURE CONTROL position:

In this position the voltage drop is measured via temperature dial.

IN-CAR SENSOR position:

In this position the voltage drop is measured via the in-car temperature sensor.

SERVO AMP position:

In this position the amplifier output voltage to regulating valve is indicated on voltmeter.

Mode switch (6) is a switch with 5 positions:

PARK position:

In this position the regulating valve moves to the position indicated as parking position, which occurs each time when the ignition is switched off.

Both park positions on tester are similar to each other. When the tester is in this position, the blower remains switched on because the "OFF" knob must be pushed to bleed the main switch.

A/C position/cooling position:

In this position the operating conditions of a hot day are fed into amplifier and the regulating valve is set to position max. "cooling".

MID position:

In this position the regulating valve is set to a low blower speed (not included in test program).

HEAT position:

In this position the operating conditions of a cold day are fed into amplifier and the regulating valve is set to max. "heating".