Specialized ECU Repair

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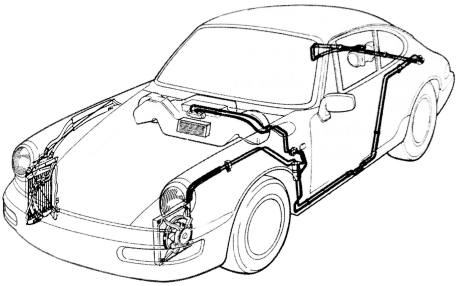
PORSCHE 964 / 993 HVAC TROUBLESHOOTING GUIDE & TESTING PROCEDURE

Problems with the Porsche Climate Control Unit (CCU) for the 964 and 993 models can sometimes be misdiagnosed since it forms part of a complex system. Many of these parts are known for their weaknesses and failures.



This guide was designed to help separate which issues in the HVAC system pertain to the CCU and which are related to the car itself, such as the Servo Motors, Sensors, Fans and Compressor clutch.

Other HVAC components like the hoses, dryer and pressure switch should be checked by a Certified Mechanic in HVAC systems.

If a Porsche System Tester (PST2/PIWIS) scanner is available, use it to scan fault codes and diagnose the system. (Some early 964 CCUs do not have diagnostics capabilities, unless they have been updated by us.) If you have another scanner brand, check it to see if you can read fault codes and perform activations.

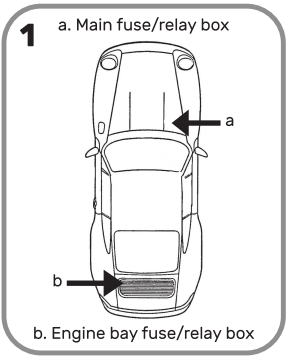
IMPORTANT NOTES ABOUT THESE TESTS:

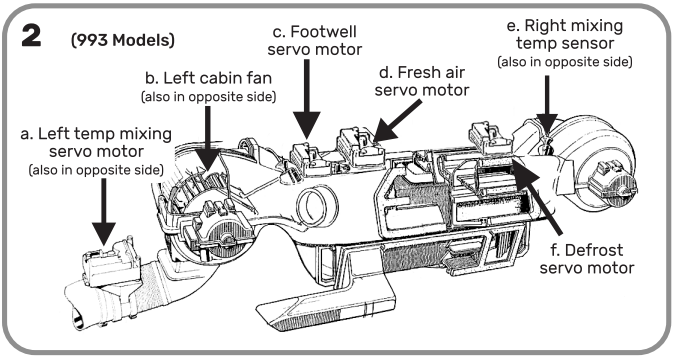
- We recommend that you do these tests in a covered but well ventilated area.
- You may need to keep a battery charger connected to the vehicle to prevent it from going flat during some of these tests.
- If you notice any slow movement from a Servo Motor, this is a sign that the motor is going bad and will need replacing or repair.
- If during the “Manual Tests” you feel as if the flaps are not directing 100% of the air in the correct direction, your Servo Motors will need to be manually adjusted.
- While you do the “Scanner Tests” in the “Input Signals” section, the Servo Motors, Fans and Compressor Clutch will not actually work. These are tests to confirm that the signals coming out of the CCU are actually working.
- It is not possible to see “Live Data” from the CCU except for the Sensor temperature readings.

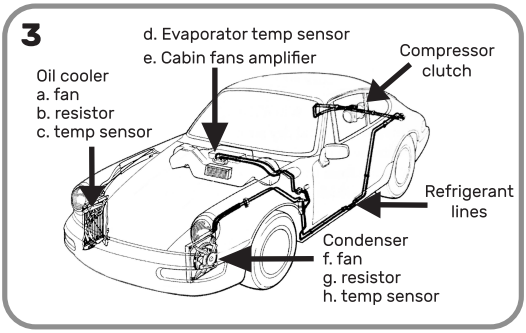
COMPONENTS MONITORED AND CONTROLLED BY THE CLIMATE CONTROL UNIT:

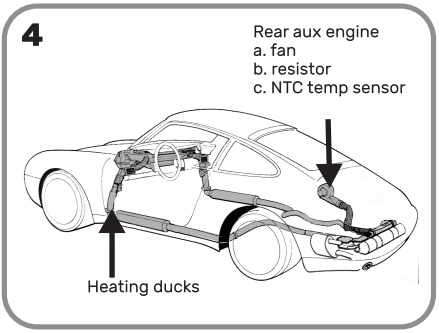
SENSORS (total of 7)	FAN BLOWERS (total of 6)	SERVOS MOTORS / FLAPS (total of 7)
• Cabin temp sensor inside CCU	• Rear aux engine fan (4a)	• Left temp mixing servo motor (2b)
• Left temp mixing sensor (2a)	• Left cabin fan (2b)	• Right temp mixing servo motor (2e)
• Right temp mixing sensor (2e)	• Right cabin fan (2b)	• Defroster servo motor (2f)
• Evaporator temp sensor (3d)	• Oil cooler fan (3a)	• Footwell servo motor (2c)
• Rear NTC temp sensor (4c)	• Condenser fan (3f)	• Fresh air servo motor (2d)
• Oil temp sensor (3c)	• Small CCU rear fan	• Recirculation servo motor (2f)
• Outside temp sensor (993 only)		• Switch-over servo motor

FUSES (total of 7)	RELAYS (total of 4)	RESISTORS / AMPLIFIER (total of 4)
• Rear aux engine fan fuse (1b)	• Rear aux engine fan relay (1b)	• Rear aux engine fan resistor (4b)
• Compressor fuse (1b)	• Compressor clutch relay (1b)	• Condenser fan resistor (3g)
• Oil cooler fan fuse (1a)	• Oil cooler fan relay (1a)	• Oil cooler fan resistor (3b)
• Condenser fan fuse (1a)	• Condenser fan relay (1a)	• Left & right cabin fans amplifier (3e)
• Left & Right cabin fans fuse (1a)		
• Climate control unit fuses (1a)		









PROBLEM	TESTING SOLUTION PROCEDURE
BATTERY DRAINS - 964/993	□ The rear aux engine fan normally runs for up to 15-20 minutes if NTC sensor detects high temperature to cool off the engine, therefore a weak battery may die. □ Check condenser fan resistor (Page 8, L) □ Check rear aux engine fan resistor (Page 8, K) □ Check oil cooler fan resistor (Page 8, M)
RIGHT AND/OR LEFT CABIN FANS RUNNING ALL THE TIME WHEN IGNITION KEY IS OFF - 964	□ This was designed to work this way in the 964 □ Check the cabin fans final stage amplifier (Page 5, B)
ALWAYS BLOWS COLD AIR 964/993	□ Check both right and left temp mixing servo motors (Page 7, J) □ Check both right and left temp mixing sensors □ Check condenser fan relay (Page 8, L) □ Check condenser fan resistor (Page 8, L)
ALWAYS BLOWS HOT AIR - 964	□ Check refrigerant pressure levels □ Check if evaporator is frozen over □ Check if the evaporator temp sensor is faulty □ Check condenser fan fuse (Page 8, L) □ Check condenser fan relay (Page 8, L) □ Check condenser fan resistor (Page 8, L) □ Check compressor clutch (Page 6, F) □ Check compressor fuse (Page 6, F) □ Check compressor relay (Page 6, F) □ Check compressor pressure switch
NO A/C COMPRESSOR ACTIVATION - 964/993	□ Check refrigerant pressure levels □ Check compressor clutch (Page 6, F) □ Check compressor fuse (Page 6, F) □ Check compressor relay (Page 6, F) □ Check wiring to compressor □ Check if evaporator is frozen over □ Check the evaporator temp sensor □ Check compressor pressure switch
NO FAN SPEED KNOB CONTROL WHEN THE CAR IS RUNNING 964/993	□ Check the fan final stage amplifier (Page 5, B) □ Check the left & right cabin fans fuse (Page 5, B) □ Rear aux engine fan failure will disable front fans (Page 8, K)
NO TEMPERATURE KNOB CONTROL - 964	□ Check both right and left temp mixing servo motors (Page 7, J) □ Check both right and left temp mixing sensors □ Check if evaporator is frozen over □ Check if the evaporator temp sensor is faulty

PROBLEM	TESTING SOLUTION PROCEDURE
RIGHT & LEFT CABIN FANS RUN INCONSISTENTLY WHEN CAR IS RUNNING 993	□ Check the cabin fan final stage amplifier (Page 5, B) □ Check the rear aux engine fan fuse (Page 8, K) □ Check the rear aux engine fan relay (Page 8, K) □ Check the rear aux engine fan resistor (Page 8, K)
HISSING SOUND OR AIR DOES NOT COME OUT FROM CABIN VENTS (CENTER VENTS / LEFT OR RIGHT VENTS)**- 993**	□ Check the left & right cabin fans fuse □ Check the cabin fan final stage amplifier (Page 5, B) □ Check defrost flap (Page 6, D) □ Check the recirculation flap (vacuum leak) (Page 6, E)
BIG SNOWFLAKE BUTTON DOES NOT OVERRIDE SYSTEM - 993	□ Check if evaporator is frozen over □ Check if the evaporator temp sensor is faulty □ See compressor activation notes before and also (Page 7, G)
DEFROST BUTTON DOES NOT OVERRIDE SYSTEM - 993	□ Check the defrost flap servo motor (Page 7, H)
NO MANUAL FLAP CONTROL FOR DEFROST OR FOOT-WELL SLIDER FLAPS 964	□ Check the defrost flap servo motor (Page 6, D) □ Check the footwell flap servo motor (Page 5, C)
AIR ONLY COMES OUT OF THE DEFROST VENTS - 964	□ Check the defrost flap servo (Page 6, D)
REAR AUX ENGINE FAN RUNNING ALL THE TIME WHEN IGNITION KEY IS OFF 993	□ This is normal for up to 15-20 minutes if rear NTC temp sensor detects high temperature to cool off the engine □ Check rear aux engine fan resistor (Page 8, K) □ Check the rear NTC temp sensor
OIL COOLER FAN RUNS AT HIGH SPEED ALL THE TIME WITH IGNITION KEY ON / CAR RUNNING (REGARDLESS OF THE OIL TEMPERATURE) **- 993**	□ Check oil cooler fan resistor (Page 8, M) □ Check oil cooler fan relay (Page 8, M) □ Check oil temp sensor (Page 8, M)
RIGHT OR LEFT VENTS BLOWING HOT OR COLD AIR ONLY WHEN CAR IS RUNNING - 964	□ Check both right and left temp mixing servos (Page 7, J)
NO CONDENSER FAN ACTIVATION 964/993	□ Check condenser fan fuse (Page 8, L) □ Check condenser fan relay (Page 8, L) □ Check condenser fan resistor (Page 8, L) □ Check refrigerant pressure levels
NO OIL COOLER FAN ACTIVATION AFTER WARM UP - 964/993	□ Check oil cooler fan fuse (Page 8, M) □ Check oil cooler fan relay (Page 8, M) □ Check oil cooler fan resistor (Page 8, M)
CLIMATE CONTROL UNIT DOES NOT WORK AT ALL - 964	□ Check the 2 climate control unit fuses in Main Fusebox (1A)

TEST PROCEDURES

CCU FAN (Behind the Control Unit):

A

MANUAL TEST	SCANNER TEST
Turn key to ON position, but do not start the car. The small fan that is mounted behind the Climate Control Unit should begin to run. **Fan working? ____** **Any abnormal noises from this fan?____**	In the "Actual Values" see that the temp changes when you blow hot air with your mouth into the front of the CCU temp sensor. **Low ____°C High____°C**

INTERIOR CABIN FANS:

B

MANUAL TEST	SCANNER TEST
Move the Fan Speed Knob from #0 to #4. You should feel flow of air from the Front Interior Fans increase from minimum to max. **Fans working? ____** Disconnect the CCU and, in the CCU harness, jump terminals K2 and G34 for Left cabin fan high speed through the final stage amplifier. **Left cabin fan high speed confirmed?____** Then jump terminals K2 with G31 for Right cabin fan high speed through the final stage amplifier. **Right cabin fan high speed confirmed?____**	In the "Input Signals" check that the "Blower potentiometer" moves from 0 to 4 by turning the knob manually. **Movement confirmed?____** In the "Drive Links" activate both front fans. (The front fans will only work at high speed during this test.) **Left fan worked?____** **Right fan worked? ____**

FOR THE REMAINDER OF THIS TEST KEEP THE FAN SPEED KNOB AT #3.*** FOOTWELL SERVO

C

SLOWLY move the Footwell slider from the left to the right and back. You should feel the flow of air from the footwell open and close. **Footwell servo working?____** Also, confirm by looking under the front luggage compartment, that the servo moves easily, and without resistance from one extreme side to the other. **Max CLOSE reached?____** **Max OPEN reached? ____**	In the "Input Signals" check that the "Footwell flap" moves from one side to the other by moving the slider manually. **Movement confirmed?____** In the "Drive Links" activate the servo motor to move from 0% to 100% and back. **Max Close ____% Max Open____%**

D

MANUAL TEST	SCANNER TEST
SLOWLY move the Defrost Slider from the left to the right and back. You should feel the flow of air at the windshield open and close. **Defroster servo working? ____** Also, confirm by looking under the front luggage compartment, that the servo moves easily, and without resistance from one extreme side to the other. **Max CLOSE reached?____** **Max OPEN reached? ____**	In the "Input Signals" check that the "Defroster flap" moves from one side to the other by moving the slider manually. **Movement confirmed? ____** In the "Drive Links" activate the servo motor to move from 0% to 100% and back. **Max Close ____% Max Open____%**

RECIRCULATION FLAP

E

MANUAL TEST	SCANNER TEST
Press the Recirculation button. The flap should close and you should feel an increase of airflow inside the cabin of the car. **Increase airflow confirmed? ____**	In the "Input Signals" close and open this "Recirculation switch" by pressing the button manually. **Closed confirmed?____** **Open confirmed?____** In the "Drive Links" activate this "Air circ. flap". **Closed confirmed?____** **Open confirmed?____**

A/C COMPRESSOR CLUTCH: LOCATED IN THE ENGINE BAY OF THE CAR.
IT'S RELAY ARE ALSO LOCATED HERE.

F

MANUAL TEST	SCANNER TEST
Remove relay (Pos 3) and jump terminals 30 and 87 to hear and see the compressor clutch engage. **Clutch activation confirmed?____** Start the car. Then press the Small Snowflake button "shortcut". The A/C Compressor clutch and Recirculation flap should engage at the same time and you should feel the cold air coming into the cabin. **Cold air confirmed?____** **Increase airflow confirmed? ____**	In the "Input Signals" close and open this "A/C switch" by pressing the button manually. **Closed confirmed?____** **Open confirmed?____** In the "Drive Links" do the "A/C test". **Test completed successfully?____**

BIG SNOWFLAKE, A/C COMPRESSOR CLUTCH SHORTCUT (993 ONLY)

G

MANUAL TEST	SCANNER TEST
Press the Big Snowflake button "shortcut". The A/C Compressor clutch and Recirculation flap will engage. The Defroster and Footwell flaps will close if they were open. The temp setting will be set to the coldest temp and the blower speed to #4. **Cold air confirmed? ____** **Increased airflow confirmed? ____** **Max fan speed confirmed? ____**	In the "Input Signals" close and open this "Max A/C switch" by pressing the button manually. **Closed confirmed? ____** **Open confirmed? ____**

DEFROST SHORTCUT

H

MANUAL TEST	SCANNER TEST
Press the Defrost button "shortcut". The Defroster flap will open and the cabin fan speed will be set to #4. The temp setting will go to almost full hot. (This shortcut feature can sometimes activate the A/C compressor depending on the outside temperature). **Defroster servo working? ____** **Max fan speed confirmed? ____** **Hot air confirmed? ____**	In the "Input Signals" close and open this "Defrost switch" by pressing the button manually. **Closed confirmed?____** **Open confirmed?____**

FRESH AIR SERVO:

I

MANUAL TEST	SCANNER TEST
Slowly move the Temperature Knob from coldest to hottest. Confirm by looking under the front luggage compartment, that the servo moves easily, and without resistance from one extreme side to the other. **Max CLOSE reached?____** **Max OPEN reached? ____**	In the "Drive Links" activate this servo motor to move from 0% to 100% and back. **Max Close ____% Max Open____%**

TEMPERATURE MIXING SERVOS (LEFT AND RIGHT):

J

MANUAL TEST	SCANNER TEST
Slowly move the Temperature Knob from coldest to hottest. Confirm by looking under the front luggage compartment, that the servo moves easily, and without resistance from one extreme side to the other. **Left Servo Max CLOSE reached?____** **Left Servo Max OPEN reached? ____** **Right Servo Max CLOSE reached?____** **Right Servo Max OPEN reached? ____**	In the "Drive Links" activate this "Left and Right mixing flap" to move from 0% to 100% and back. **Left flap Max Close ___% Max Open___%** **Right flap Max Close ___% Max Open___%**

REAR AUXILIARY ENGINE FAN: LOCATED IN THE ENGINE BAY OF THE CAR. IT'S RELAY AND FUSE ARE ALSO LOCATED HERE.

K

MANUAL TEST	SCANNER TEST
Remove relay (Pos 5) and jump terminals 30c and 87c for low fan speed through resistor. **Low speed confirmed?____** Jump terminals 30 and 87 for high fan speed. **High speed confirmed?____**	In the "Drive Links" activate this "Rear blower" low speed Stage 1. **Stage 1 confirmed? ____** Activate the high speed Stage 2 of this fan. **Stage 2 confirmed? ____**

CONDENSER FAN: LOCATED IN THE DRIVER'S SIDE FRONT FENDER. ITS RELAY AND FUSE ARE IN THE FRONT FUSE BOX.

L

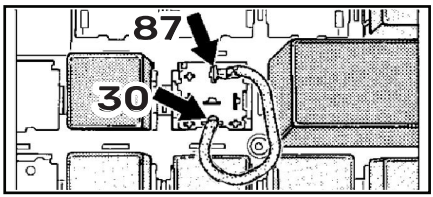
MANUAL TEST	SCANNER TEST
Remove relay (R14) and jump terminals 30c and 87c for low fan speed through resistor. **Low speed confirmed?____** Jump terminals 30 and 87 for high fan speed. **High speed confirmed?____**	In the "Drive Links" activate the "Condenser fan" low speed Stage 1; **Stage 1 confirmed? ____** (The high speed Stage 2 of this fan cannot be accessed or controlled by the scanner, nor by the Climate Control Unit.)

OIL COOLER FAN: LOCATED IN THE PASSENGER'S SIDE FRONT FENDER. ITS RELAY AND FUSE ARE IN THE FRONT FUSE BOX

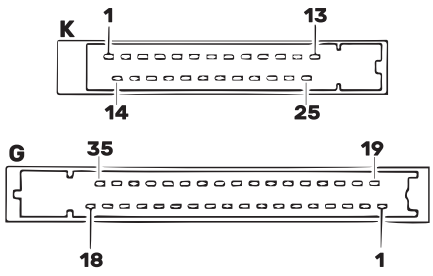
M

MANUAL TEST	SCANNER TEST
Remove relay (R04) and jump terminals 30c and 87c for low fan speed Stage 1 through resistor. **Low speed confirmed?____** Jump terminals 30 and 87 for high fan speed; **High speed confirmed?____**	In the "Drive Links" activate the "Oil cooler fan" low speed Stage 1. **Stage 1 confirmed? ____** Activate the high speed Stage 2 of this fan. **Stage 2 confirmed? ____**

When you need to test a circuit that goes through a relay, use a short piece of insulated wire to jump terminals 30 and 87, or 30c and 87c. This feeds 12v to power up the part of the car that you are diagnosing.



CLIMATE CONTROL UNIT CONNECTOR PIN OUT



CHECKING REFRIGERATING CAPACITY

Testing Conditions

- Park car where it is not subjected to sunshine.
- Clean the condenser.
- Close sun roof, doors and windows.
- Turn temperature control switch to "max cold" final position (blue dot on scale).
- Slide defrost lever and footwell lever against the right stops (opened).
- Switch on blower to speed 4.
- Open all dashboard air outlets.
-Measure ambient temperature (outside of car).

Testing

1 - Insert a thermometer (as recommended in the workshop manual) in the center nozzle outlet.

2 - Start and run engine at speed of 2,000 rpm.

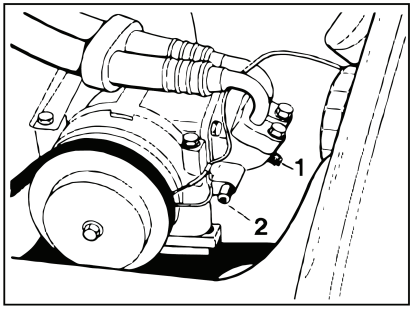
3- Switch on air conditioner.

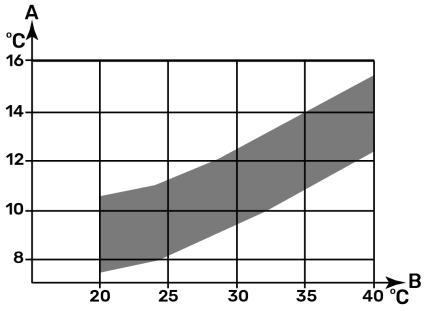
4 - Read the values for temperature on the center nozzle as well as high and low pressure with the compressor running two minutes.

Values must be located in the shaded area of the following diagrams (read values in the diagrams according to the ambient temperature).

4.1 - Temperature on center nozzle.

Connect service tester on the air conditioner.





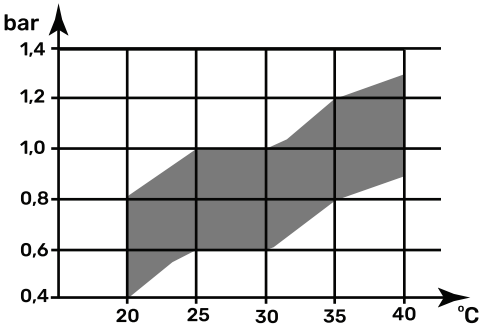
1 - High pressure

2 - Low pressure

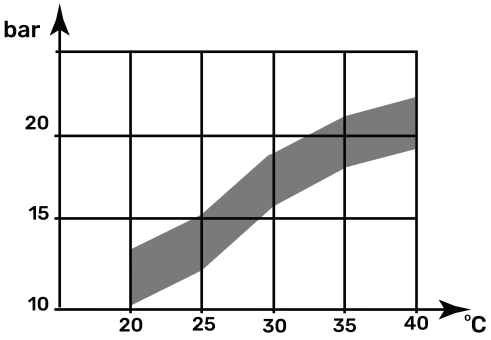
A - Center nozzle temperature

B - Ambient temperature

4.2 Low Pressure



4.3 High Pressure



Check the following if specified values are not reached.

1 - The temperature mixing flaps must be completely closed (warm air necks or sills must not be warm). Adjust if necessary.

2 - The condenser fan must switch to second speed with a refrigerant high pressure of approx. 19 bar (270 psi).

Note:

Displayed

Fault does not exist, this could mean:

- Fault does not exist at time of testing (loose contact)

  Remedy: Path checked by visual inspection

- Conditions, with which the fault had occurred, are not given (e.g. ignition not turned on, AC button

  not pressed)

Signal unplausible:

- The control unit cannot recognize whether there is a short, break or seizure of an electric motor.

Temperature Sensor Values

Left and Right Mixing Chambers

at:	0°C (32° F)	30.6 - 34.7 kΩ
	25°C (77° F)	9.5 - 10.5 kΩ
	50°C (122°F)	3.4 - 3.8 kΩ

Evaporator

at:	0°C (32° F)	8.8 - 9.2 kΩ
	25°C (77° F)	2.6 - 2.9 kΩ

Rear Fan

at:	0°C (32° F)	28.8 - 36.4 kΩ
	25°C (77° F)	9.0 - 11.0 kΩ
	50°C (122°F)	3.1 - 4.0 kΩ

Oil Cooler

at:	60°C (140° F)	3.6 - 4.0 kΩ
	85°C (185° F)	1.4 - 1.6 kΩ
	100°C (212° F)	0.9 - 1.0 kΩ

Criteria for canceling the diagnostic operation

1. Vehicle speed > 0 mph
2. RH mixing chamber temperature > 80°C
3. LH mixing chamber temperature > 80°C
4. Rear fan temperature > 95°C
5. Oil temperature > 105°C

Criteria for starting the diagnostic operation

1. Vehicle speed = 0 mph
2. RH mixing chamber temperature < 80°C
3. LH mixing chamber temperature < 80°C
4. Rear fan temperature < 95°C
5. Oil temperature < 105°C

FAULT, FAULT CODE	POSSIBLE CAUSES, ELIMINATION, REMARKS
TEST POINT 1	
Power supply	**to heater/ air conditioner regulator** K1 - term. 31 K2 - term. 30 G29 - term. X G35 - term. 15 G17 - term. 58 b (light) check
TEST POINT 2	
Inside temperature sensor Fault Code 8 _ 11	Replace heater/ air conditioner regulator.
TEST POINT 3	
Left mixing chamber temperature sensor Fault Code 8_12	Measure resistance between G 18 and G 23. Check both electric leads against ground.
TEST POINT 4	
Right mixing chamber temperature sensor Fault Code 8_13	Measure resistance between G 18 and G 24. Check both electric leads against ground.
TEST POINT 5	
Evaporator temperature sensor Fault Code 8_14	Measure resistance between G 18 and G 22. Check both electric leads against ground.
TEST POINT 6	
Rear fan temperature sensor Fault Code 8_15	Measure resistance between G 10 and G 18. Check both electric leads against ground. Note that the electric leads run via two plugs (T 5 and T 30).

FAULT, FAULT CODE	POSSIBLE CAUSES, ELIMINATION, REMARKS
TEST POINT 7	
Oil cooler temp. sensor Fault Code 8_21	Measure resistance between G 12 and G18. Check both electric leads against ground. Note that the electric leads run via plug T 34.
TEST POINT 8	
Defrost flap motor Fault Code 8_22	1. Check voltage between G 18 (negative) and G 26 (positive). Display: 0.2 - 5 volts depending on position of motor. 2. Check voltage between G 13 (positive) and G 18 (negative). Display: approx. 5 volts. Replace heater/ air conditioner regulator if there is no voltage. 3. Pull off plug on drive motor. 4. Check pin 4 and pin 5 electric leads for breaks, short against ground and against battery voltage.
TEST POINT 9	
Footwell flap motor Fault Code 8_23	1. Check voltage between G 18 (negative) and G 27 (positive). Display: 0.2 - 5 volts. Points 2 through 4 - see Test Point 8.
TEST POINT 10	
Fresh air flap motor Fault Code 8_24	1. Check voltage between G 18 (negative) and G 20 (positive). Display: 0.2 - 5 volts. Points 2 through 4 - see Test Point 8.
TEST POINT 11	
Left mixing flap motor Fault Code 8_31	1. Check voltage between G 18 (negative) and G 25 (positive). Display: 0.2 - 5 volts. Points 2 through 4 - see Test Point 8.

FAULT, FAULT CODE	POSSIBLE CAUSES, ELIMINATION, REMARKS
TEST POINT 12	
Right mixing flap motor Fault Code 8_32	1. Check voltage between G 18 (negative) and G 8 (positive). Display: 0.2 - 5 volts. Points 2 through 4 - see Test Point 8.
TEST POINT 13	
Left heater blower motor Fault Code 8_33	1. Check whether final stage is screwed tight on the aluminum cooling panel. 2. Check whether motor is seized mechanically.
TEST POINT 14	
Right heater blower motor Fault Code 8_34	See Test Point 13.
TEST POINT 15	
Condenser blower motor Fault Code 8_41	1. Check voltage on terminals 30 and 30 C. 2. Check whether motor is seized mechanically; e.g. bridge terminals 30 and 87. 3. Check leads from relay to motor for breaks and ground shorts. 4. Check leads from motor to heater/ air conditioner regulator G 7 for breaks.
TEST POINT 16	
Oil cooler blower motor Fault Code 8_42	Points 1 through 3 - see Test Point 15. 4. Check leads from motor to heater/ air conditioner regulator G 9 for breaks.

FAULT, FAULT CODE	POSSIBLE CAUSES, ELIMINATION, REMARKS
TEST POINT 17	
Rear blower motor speed 1 Fault Code 8_43/46	Points 1 through 3 - See Test Point 15. 4. Check electric leads from motor to heater/ air conditioner regulator G 19 for breaks. 5. Check electric leads from motor to relay term. 87 or to ballast resistor for short against battery voltage.
TEST POINT 18	
Rear blower motor speed 2 Fault Code 8_44/47	1. Check voltage on terminals 30 and 30 C. 2. Check whether motor is seized mechanically, e.g. bridge terminals 30 and 87. 3. Check electric leads from relay term. 87 to motor for breaks and ground short. 4. Check electric leads from motor to heater/ air conditioner regulator G 19 for breaks.
TEST POINT 19	
Inside sensor blower motor Fault Code 8_45	1. Check voltage on plug receptacle. Display: approx. 12 volts. 2. Check whether motor is seized mechanically.

Note on Test Item 17/18

The turbo is fitted with 2 rear blowers. Fault Codes 43 and 44 refer to the right-hand blower, 46 and 47 refer to the left-hand blower.

Since both the 911 Carrera 2/4 and the 911 turbo are fitted with the same heating/ air conditioning blower, a separate jumper is fitted to the 911 Carrera 2/4 (also refer to page 87-27). For this reason, both fault codes, i.e. 43 and 46 or 44 and 47, respectively, are displayed at the same time whenever a fault in the rear blower is detected on the 911 Carrera 2/4.

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