



Electrolux

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Customer Care - EMEA
Training and Operations Support
Technical Support

SERVICE MANUAL

HOBS

Module: Induction - Power Board

Leopard & Snow Leopard



1 PRECAUTION



Information "Warnings"

All work with open appliances must be done with the mains supply disconnected.

Work on electrical equipment should only be carried out by qualified personnel.

Before working on a device, check the efficiency of the system casing using appropriate equipment. As an example, refer to the indications described / illustrated in the portal Electrolux Learning Gateway (<http://electrolux.edvantage.net>).

After the work, carry out electrical safety tests and ensure that the all safety devices are working properly.

In the case of manipulation / replacement of the PCB, use the ESD kit (Code 405 50 63-95/4) to prevent electrostatic discharge damage the circuit board see SB No. 599 72 08-09

Document Revisions

Revision	Date	Description	Approved by
0.0	06/2016	Document creation	Ulrich Häutle

2 PURPOSE OF THIS MANUAL

The purpose of this Manual is to provide information on "Leopard Induction Powerboard"

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4 OVERVIEW OF POWERBOARDS

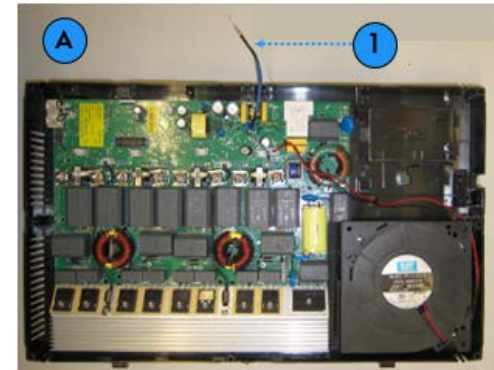
Technical variants:

4.1 LEOPARD

The Leopard POB is a family of induction Power board to drive 4 coils per phase.

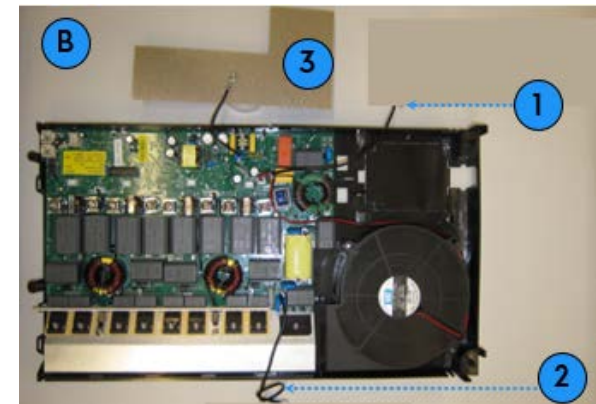
Each coil can drive booster power. The power management shares the 3kw/phase on the four coils. These

1. The Black Wire is connected to the Coil Carrier



4.2 SNOW LEOPARD

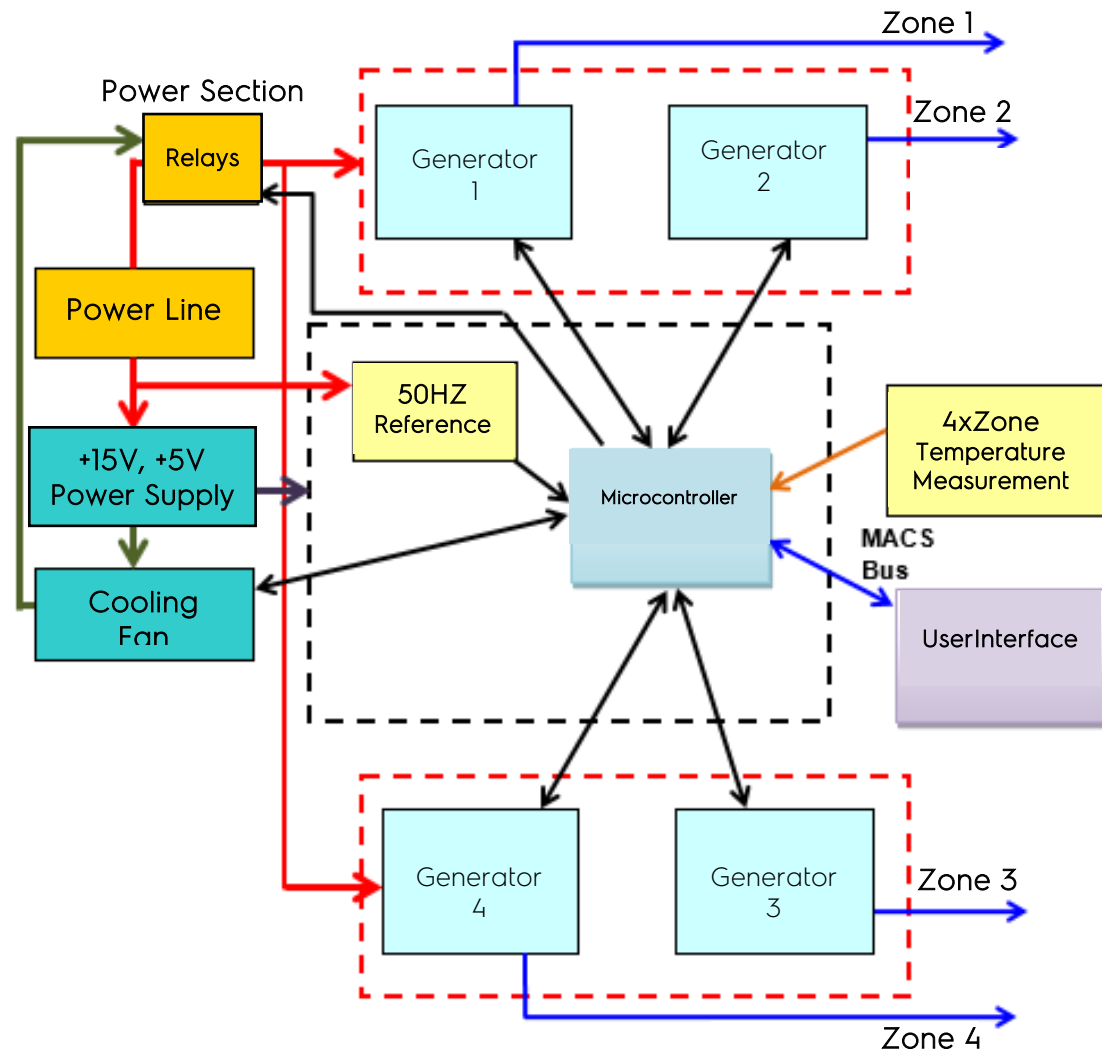
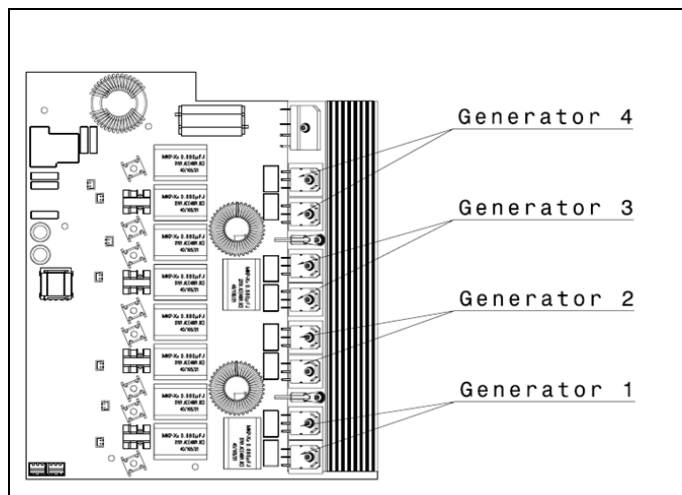
1. The metal protection box (Tiger) with flat electronic components , flat fan
2. The black wire connected to the coil plate (screw)
3. EMC Shield ; L shape Mica



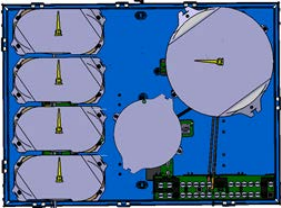
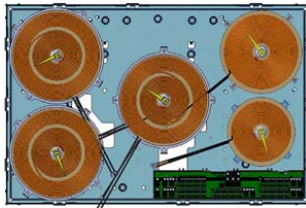
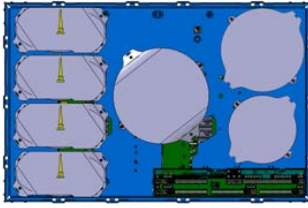
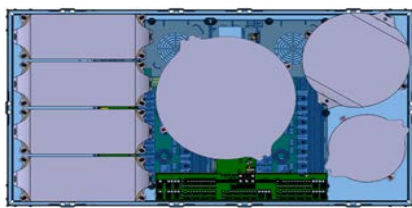





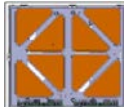

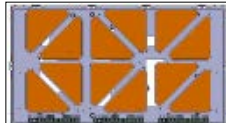
4.3 ARCHECTURE OF LEOPARD POB

Leopard is an induction module (POB) that can drive up to 4 coils:

- 4 zones (generators) on POB;
- single-phase: 200V - 230V, 240V 50Hz/60Hz, 16A total current limit (per module)
- 400V-tolerant in standby mode only
- Booster power function on each zone(time limited)
- MACS protocol and Macs Cable
- Click noise suppression at low power level
- Cooling fan with speed variation, for each module
- Coil has Red and Black connectors
- NTC per each Coil
- Jumper and Dummy are present
- Same Error Codes (E0...E9)



4.4 POWERBOARD COMBINATIONS

Hob Configuration				
	Leopard - Cheetah	Cheetah - Leopard	Leopard - Leopard	Leopard - Cheetah - Cheetah
Power Boards				
Snow Leopard → Maxima III		 		 

5 POB SCHEMATICS

5.1 OPERATING VOLTAGE & INSTALLATION

The induction board is specified 200V /240V; but it is works ~ 180V

Hint:

The net situation can have impact on the performance. Zones with **High Boost** power can have a significant power reduction (see table).

Zone	Pot	Power @230V	Power in W @210V		Power in W @240V	
			Power	%	Power	%
210Plus, P	210mm, Stainless Steel	3500	2850	-19%	3600	3%
210Plus, P	210mm, Silargan	3300	2700	-18%	3450	5%
210Plus, L14	210mm, Stainless Steel	2300	2200	-4%	2300	0%
210Plus, L15	210mm, Silargan	2300	2200	-4%	2300	0%
180	180mm, Stainless Steel	2800	2450	-13%	2850	2%
140	145mm, Stainless Steel	2400	2300	-4%	2450	2%

5.2 MACS CONNECTORS

1. Leopard

The traditional macs sockets in the front; parallel connected

2. Snow Leopard

There is an additional Rast 2,5 connector:

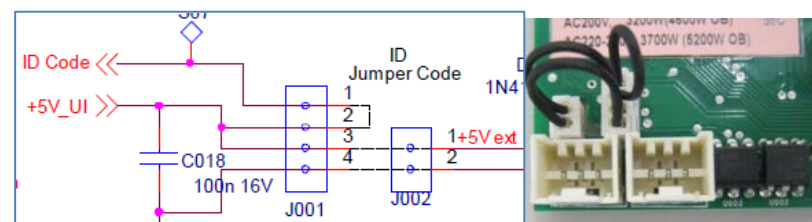
This third connector provides 5V/14 V for Raven UI. It's not related to MACS connector.



5.3 ID, MASTER - SLAVE: COMBINATIONS WITH LEOPARD AND CHEETAH

The jumper can have several functions:

- The Macs-Bus communication requires a clear identification of all components (Board ID1, Board ID2...; User interface). The bridge PIN1-PIN2 tells the board = ID1&ID2
- The 5V power supply for the UI is not isolated. Only one board allowed to generate the supply voltage for the interface. The bridge PIN 3+4 == PIN1+2 is supplying the 5V to the bus.



Leopard is seen from the UI as 2 Hob Controllers (like two Cheetah boards).

If the jumper is mounted then Leopard survives as ID1 & ID2

The Leopard without Jumper interpreted as ID3 & ID4.

Cheetah has to use a ID which is not used from Leopard (see the examples)

Power boards				
Master (ID1) Slave:	Leopard = ID1&2 with Jumper Cheetah = ID3 reprogramed	Cheetah:= ID1 with Jumper Leopard: = Slave ID 3&4	Leopard Left = ID1&2 with Jumper Leopard Right = Slave ID 3&4	Leopard Left = Slave ID3&4 Cheetah Center = Slave ID 2 Cheetah Right = ID1 with Jumper

5.4 MASTER - SLAVE: COMBINATIONS WITH THREE LEOPARD

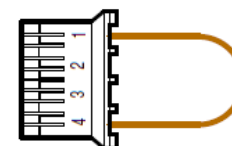
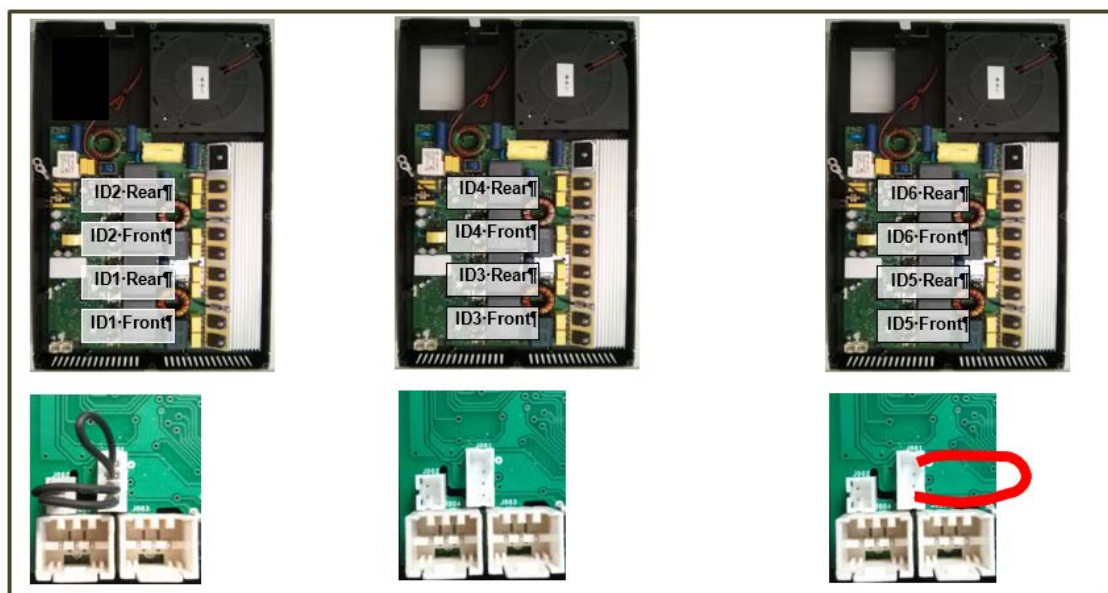
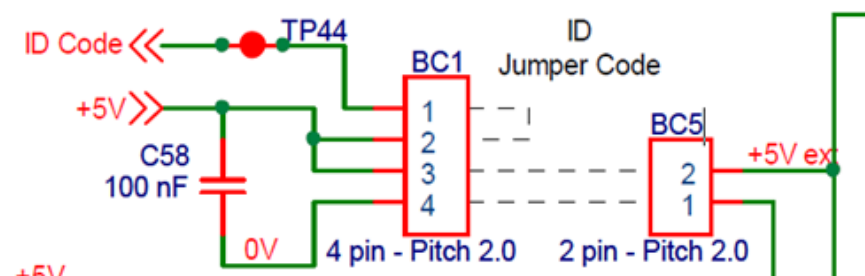
Leopard is seen from the UI as 2 Hob Controllers (like two Tiger boards).

If ID code jumper wire is mounted (bridge between Pin 1&2) then Leopard is seen as ID1 and ID2, and the User Interface and MACS bus will be powered from this POB.

If the ID code jumper wire is **not** mounted then Leopard is seen as ID3 and ID4.

With 3 Leopard in the hob there are two possibilities: reprogrammed to ID 5/6 or with a special jumper (bridge between Pin1&4); see the sketch

Left board is with Jumper: ID1&2
 Center board without Jumper: ID3&4
 Right board with **special Jumper**: ID5&6



5.5 SPECIAL SOFTWARE LOADED

In some cases, a special software is loaded on the power board. (See programming label). This special software needed, due to specific components (for example illuminated coils; special temperature sensors...)

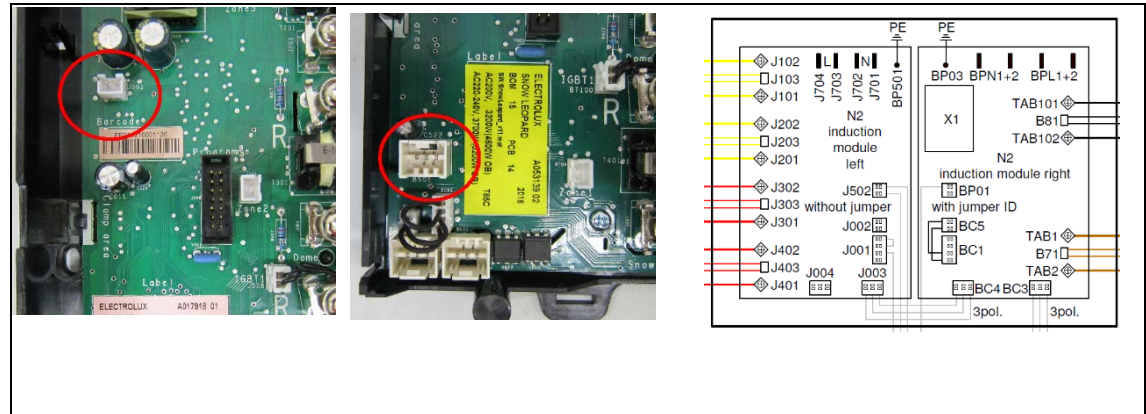
The system with the ID is the same. Special spare parts will be needed.

5.6 ADDITIONAL POWER SUPPLY 14V

For user interfaces and optional boards with higher power consumption, the 5V on the MACS bus cannot provide enough power. In such case, the internal 14V is used.

- Leopard with 2 pol connector (GND -14V);
- Snow leopard with three pol connector (GND -5V-14V)

In some cases the 14V from both boards are used; this is possible due to a galvanic coupling on the interface.

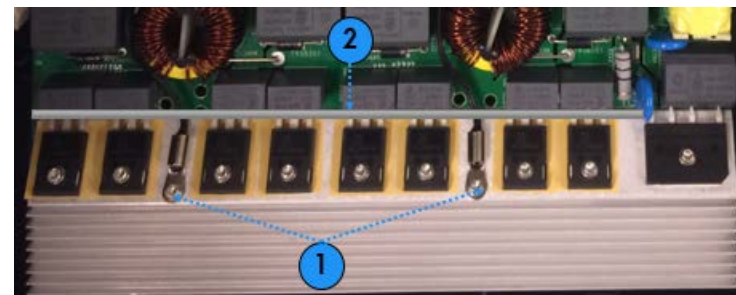


5.7 INSTALLATION AND COOLING

These compressed electronics needs a good cooling of the heatsink.

1. Two Sensors mounted to get optimal performance
2. An air guide mounted on some variants.

POB installation is different for different models, check product based SM.

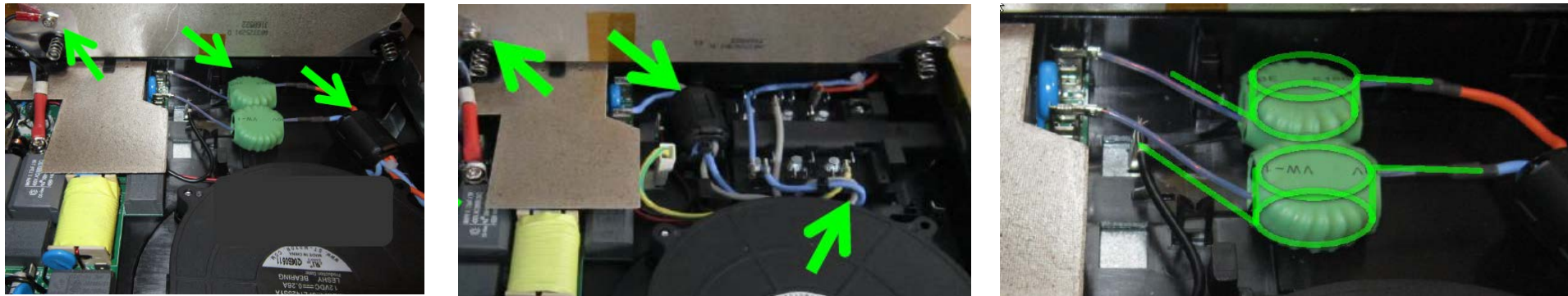


5.9 WIRING & EMC

Due to the complex electronics, many EMC components (Ferrites, cores...) installed. They can be in the powerlines (L/N/PE) or connected to extra components.

Important: After repair put them back at the same place. The orientation of the component is important as well

Hint: make pictures with the smartphone/camera



5.10 WIRING TO THE COIL CARRIER

The black **EMC cables** (see green arrows) connected with screws on top of the coil carrier.

Do not forget them - otherwise you have the risk that the cable could get in contact with the L / N taps.

If these cables are not correctly connected (see right sketch) the interface can be disturbed and you can get E8 error.



5.11 CLICK NOISE

Induction generators have some restrictions about the power that it is possible to provide to a load. In particular, there is a minimum continuous power that cannot be furthermore reduced to guarantee correct functionality of the generator itself. Power requests lower than this threshold are managed with ON/OFF cycles, using duty cycle to match between requested power and average power provided to a load.

In this pulse mode (typically lower than Level 8/14) a short current peak in the coil/pan system produces an acoustic noise at position 1

Solution : Usage of

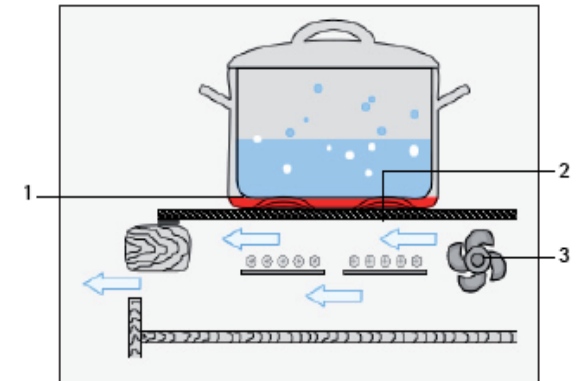
- Heavy pots; with thick bottom
- Steel pots with enamel

Can avoid the Click Sound.

At medium power level (Level 1...Level 8) the induction module is running in a pulse mode, short current peaks produces acoustic noise.

The customer can hear this when he/she is using stainless steel pots.

In Leopard Power board a click noise reduction is implemented. If Leopard is paired with Cheetah the click noise reduction is only on the Leopard side.



5.12 PROGRAMMING THROUGH MACS CONNECTOR

Leopard POB cannot be programmed through MACS. Programming data for sidekick are not available. The programming is only possible in the factory.

6 INDUCTION POWER BOARD RELATED ERROR CODES

6.1 400V PROTECTION

In case of 400V (missing N) the interface will send a permanent beep; please **remove immediately the hob from the net**.

6.2 E4

NTC

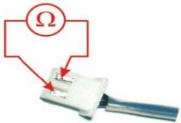
The coil connection and corresponding sensor are located in a group (see sketch)

E4 can appear when the customer is overheating the cookware. After cooling down the hob the E4 disappears.

The only reason for a hardware related and a permanent Error E4:

- Not plugged NTC
- Damaged NTC.

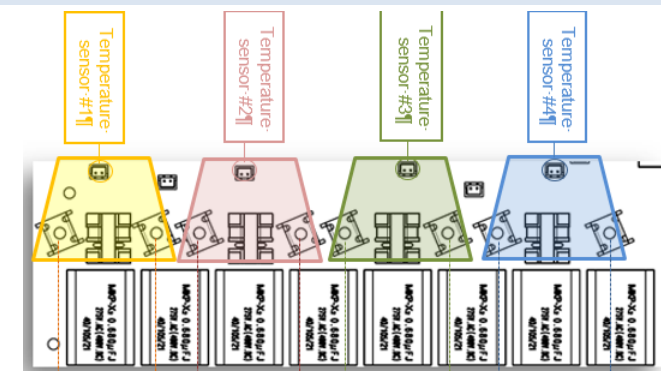
The correct resistor value of the sensor can be measured. (see the table)

18°	~140 kOhm	
25°	~100 kOhm	
30°	~80 kOhm	

Hint:

The hob needs time to detect Errors: ~ 35 sec

After a repair on the coils please wait and let the hob run to be sure that everything is fine.



6.3 E6

Hardware Error

Internal failures of the power board are shown with the Code E6. Boards with E6 cannot be repaired in the field and must be exchanged.

The detailed code is stored in the internal memory and be read out from quality organisation.

The power board detects with E6

- broken IGBT or blown fuses (see chapter before)
- problems on the internal bus between the both micro;
- if the main relays is glued
- some problems on the 14V; which supports UI and Fan

The power board cannot detect:

- damage on the power supply; if 5V is not available the microprocessor cannot start the selfcheck, the UI cannot show the error
- damage on the pot detection; the hardware cannot detect the difference if the pot is missing or a broken component in the circuit

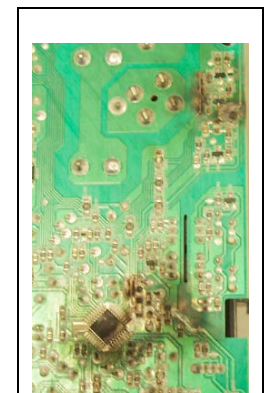
6.3.1 5V AREA LINES BLOWN

The internal 5V bus (Macs-Bus) is not isolated to ground.

If the Bus-cables have contact to ground its like a shortcut;all 5V connections can be destroyed. There is a high possibility that **both** power boards **and** the user interface are destroyed.

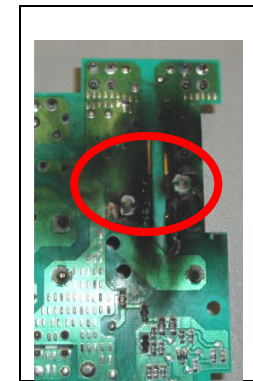
-> Exchange electronic and the bus-cables

-> and check why this shortcut could happen (squeezed cable, sharp edges)



6.3.2 COPPER FUSE BLOWN

In some conditions the software and the circuits on the board cannot limit the IGBT current fast enough. If this happens the fuses of the board are burned and the IGBT/Diode are maybe destroyed. Exchange the damaged board.



6.3.3 IGBT DESTROYED

The IGBT is protected by software and hardware circuit to avoid too high current and too high temperature. High current can be created with strange pot materials (too less effective current in the coil). Too high temperature is possible if the cooling is not sufficient enough (fresh air...).

IGBT cannot be repaired; If you like you can verify the resistance of the IGBT's between:

how check IGBT:
Pin3:

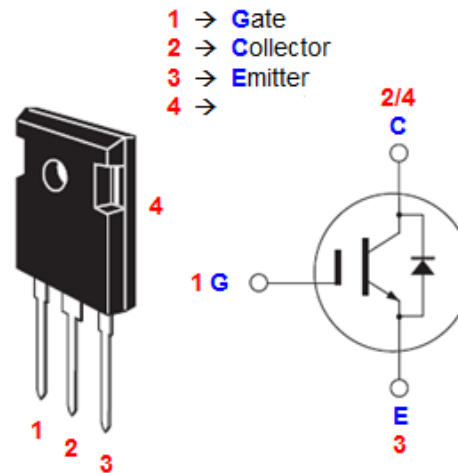
→ Okay

→ defect

measure between Pin1-Pin2 **or** Pin2-Pin3:

high impedance (kOhm...MOhm)

low impedance (<50 Ohm)



6.4 E7

Fan Defect

The fan has a variable speed (PWM): Max Speed ~1500rpm. fan speed is determined taking into account ; power, heat sink temperature and cooking zones temperature.

E7 appears, when cooling fan is blocked. Its current consumption is outside nominal range

1. The Cooling fan for Leopard is 100% compatible with the Puma/ Panther fan.
2. The Cooling fan for Snow Leopard is larger and thinner.



6.5 E8

Communication between UI and POB

The Macs bus the Elux communication protocol.

The outer wires are 5V/GND, the **middle wire is the serial bus**.

Some plugs are inverted (see example Kite).



If the UI is dark: please check the powersupply and all wires from the POB to the Userinterface:

- Phase is connected, L and N available
- Macs wire not squeezed
- All connectors in place and not damaged (PIN 1 and Pin 3)
- Powerboard or UI can be damaged

E8 is error between UI and powerboards:

- Right side without connected phase
- Wrong software on the Powerboard
- Wrong ID connectors (see ID)
- wrong configuration in the UI