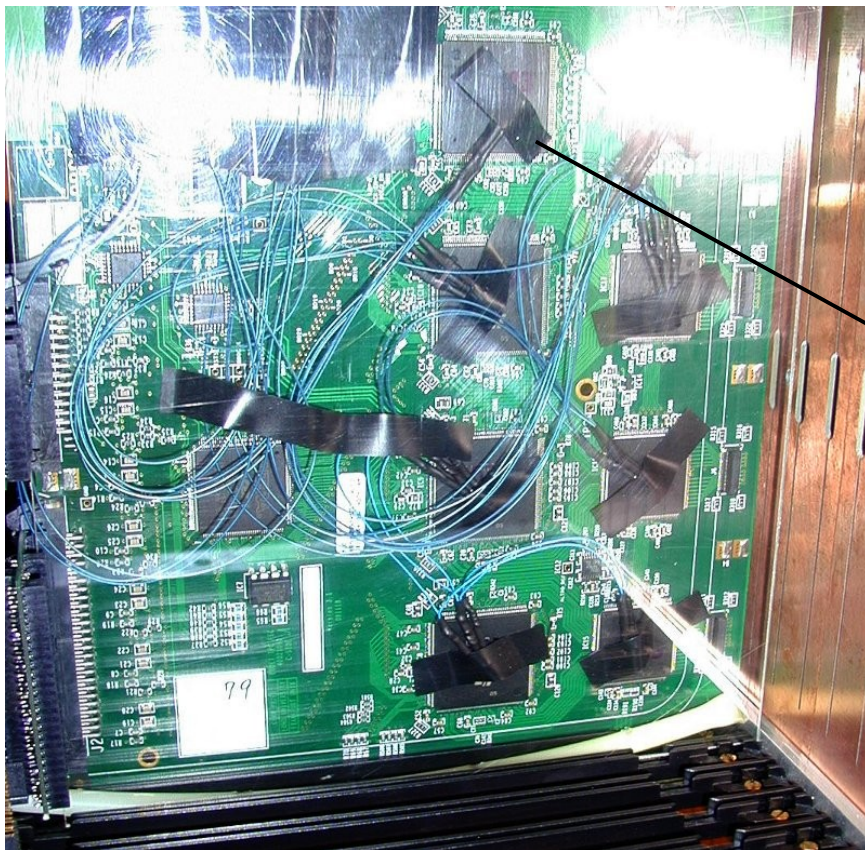
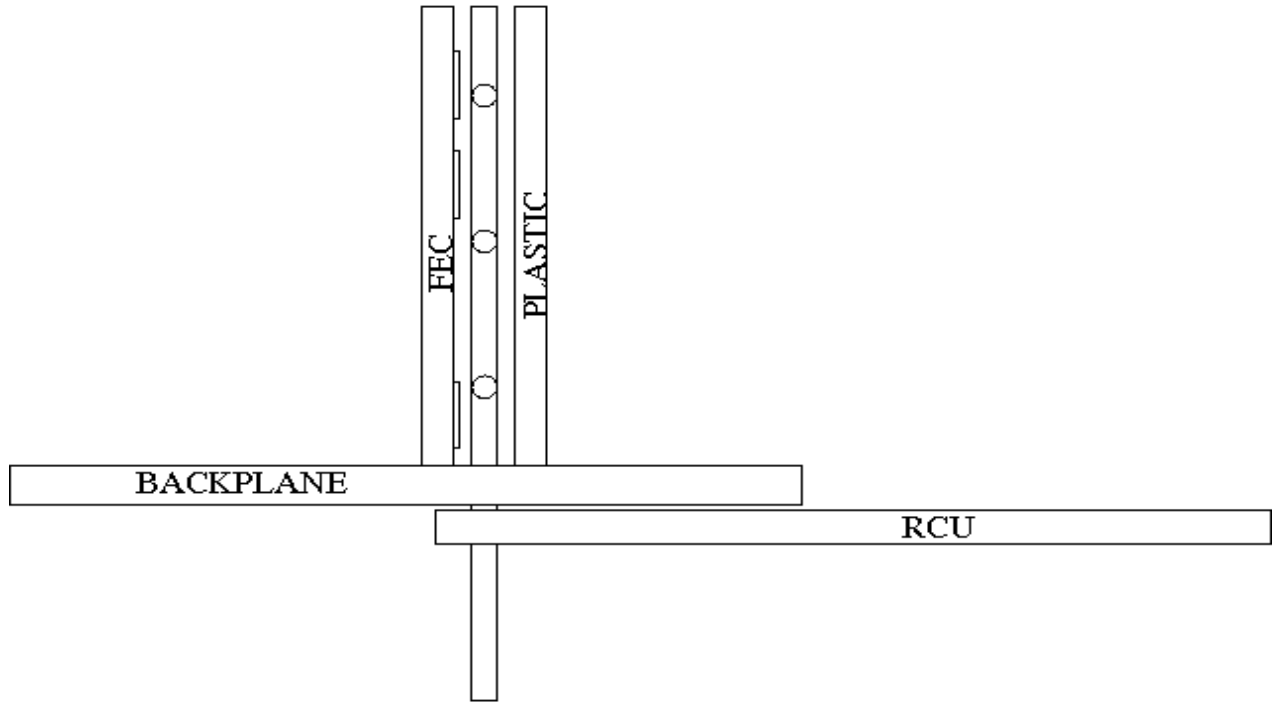


This is a first test and try of measuring the temperature on a FEC.

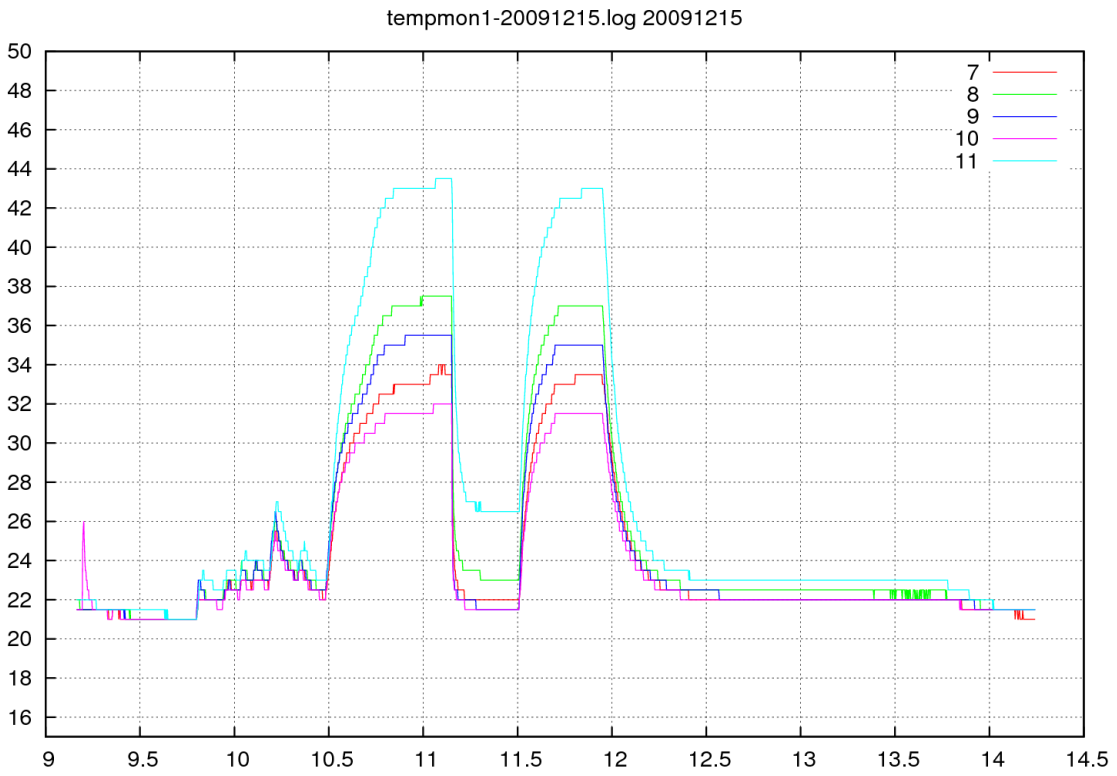
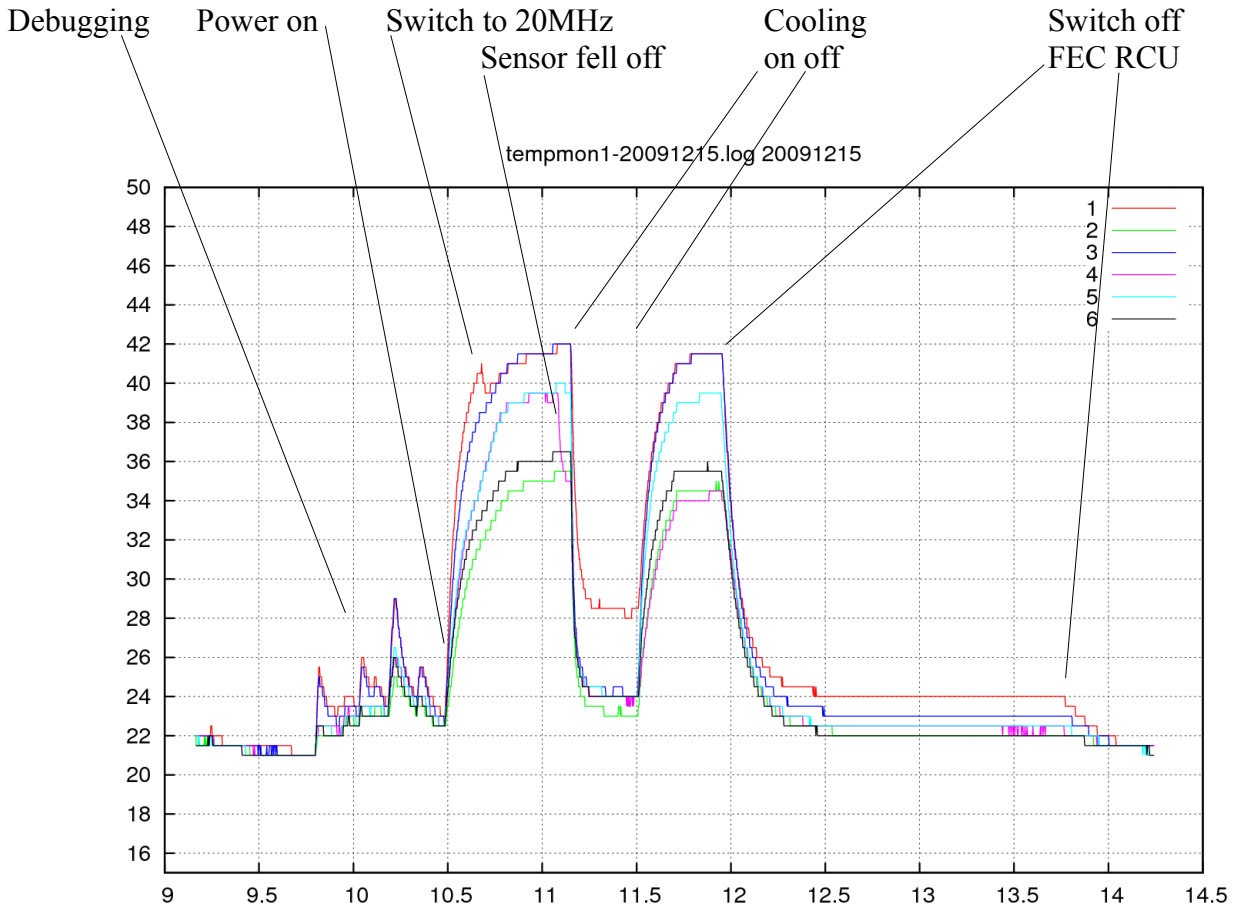
Setup in the “TPC” ring: 1 FEC, 1 RCU, plastic tube with compressed air at the bottom and in between the FEC and plastic faked FEC. Air flow is blocked at bottom and top with aluminium plates. The FEC was in normal vertical position.

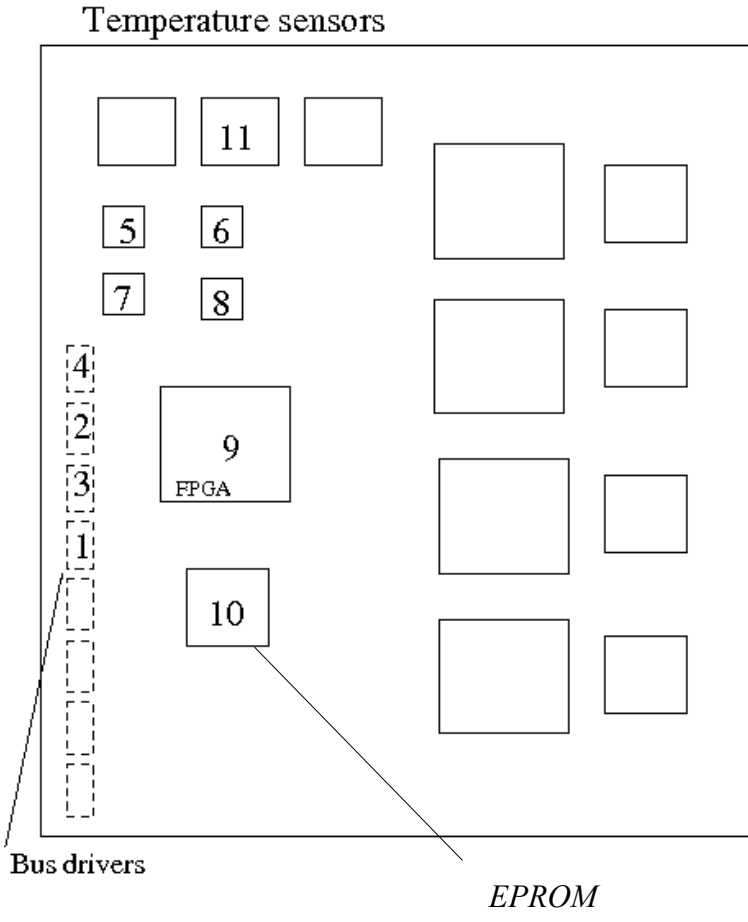
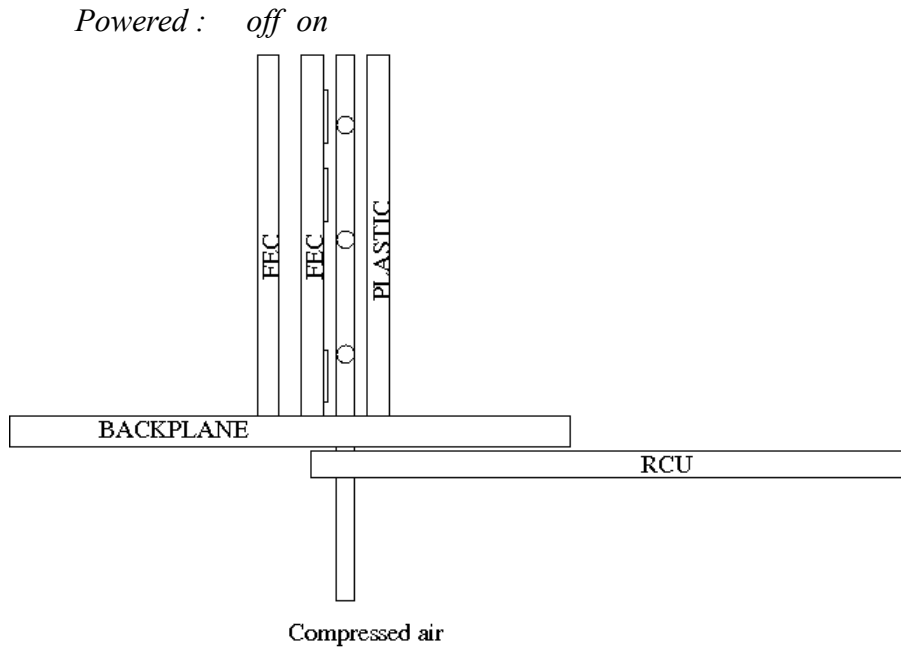
Sensor numbering and placement as in the drawing above. At the end is a list of the sensors used.



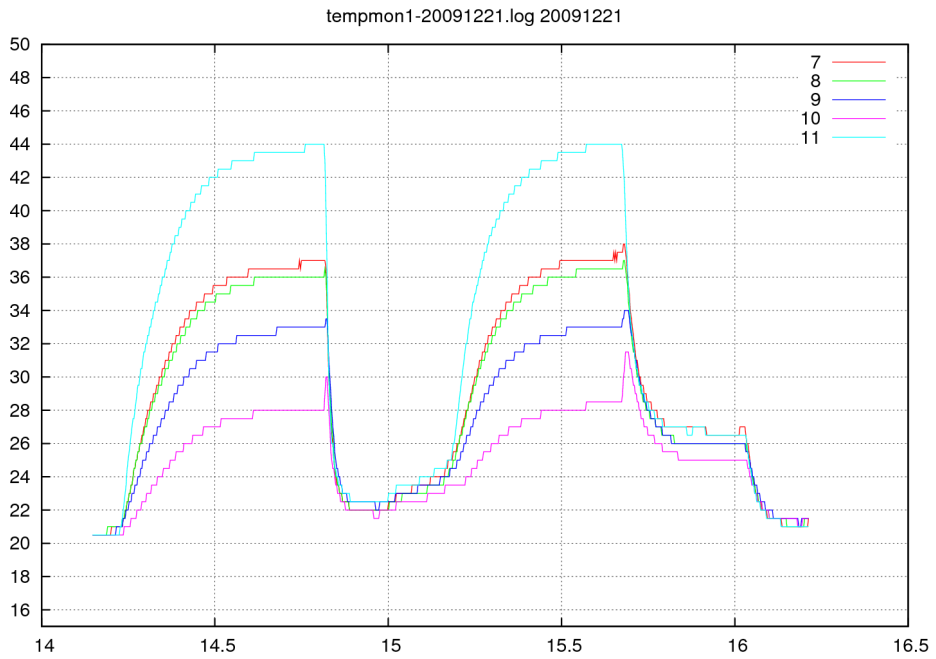
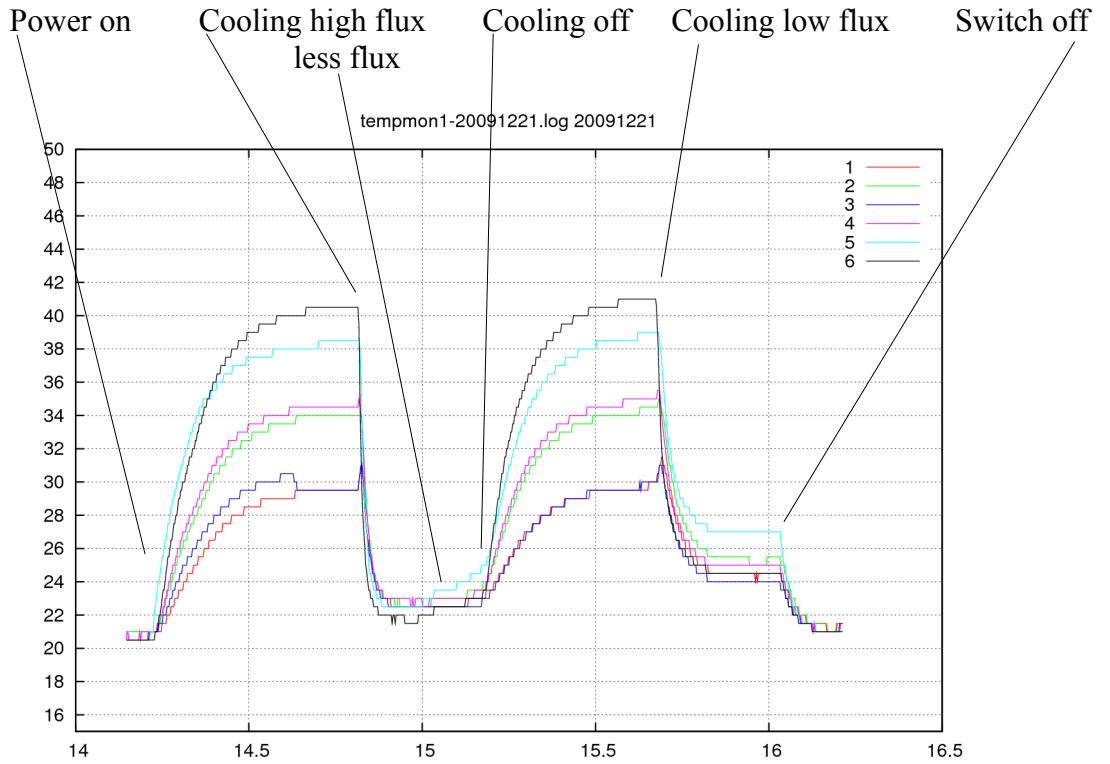
↑ VERTICAL UP
Sensors are put in contact with the chips with a piece of black isolation tape.
Sensor which "fell off"

Below are temperature plots, y-axis temperature, x-axis time (hour). Legend is for sensor numbers in FEC drawing.





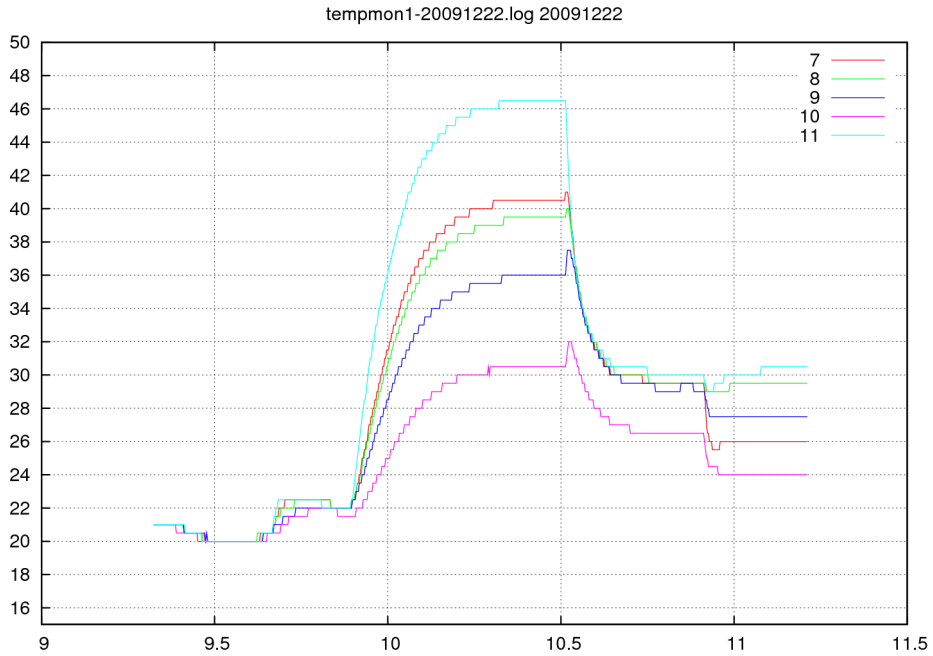
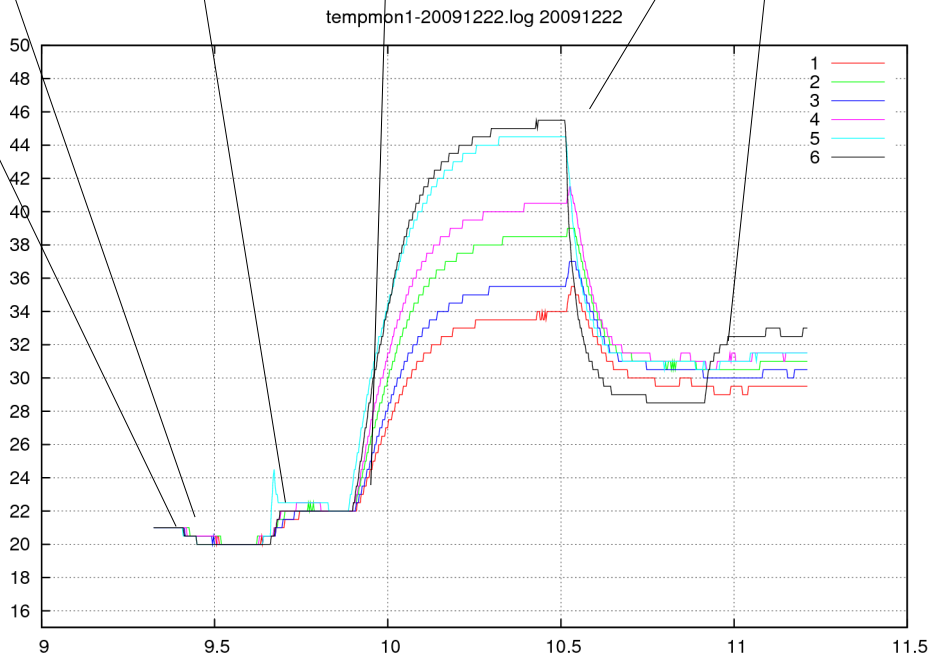
- 10 : Loose
- 5: Only partly in connection with chip (at a corner)
- 3: Fell off
- 1: Loose



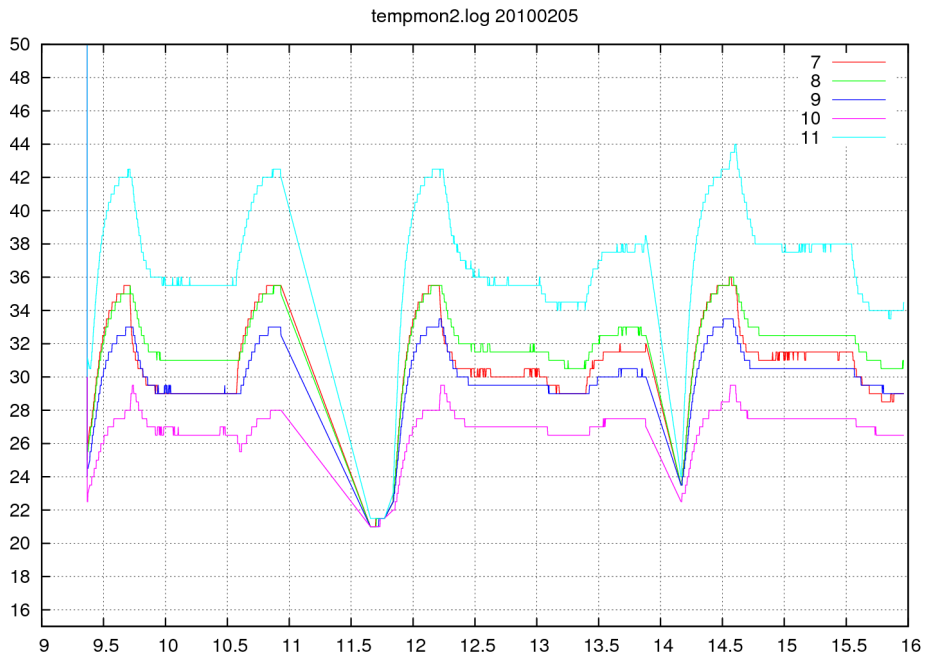
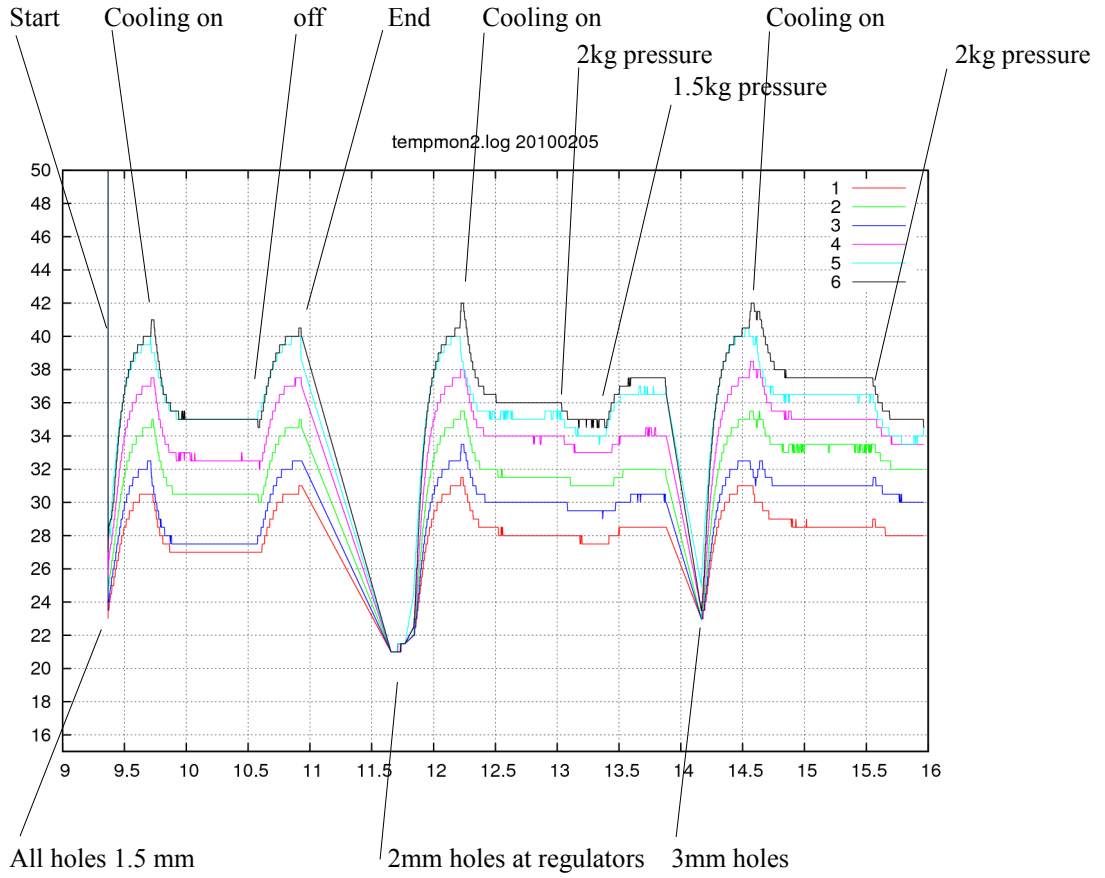
Note that also the bus drivers (opposite side of card to where the tube is) are cooled.

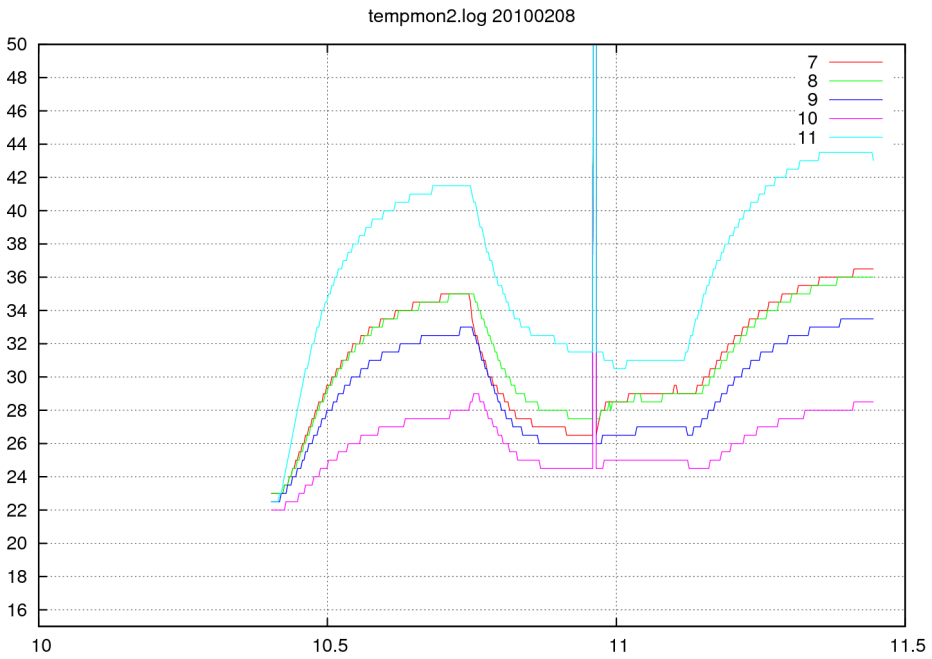
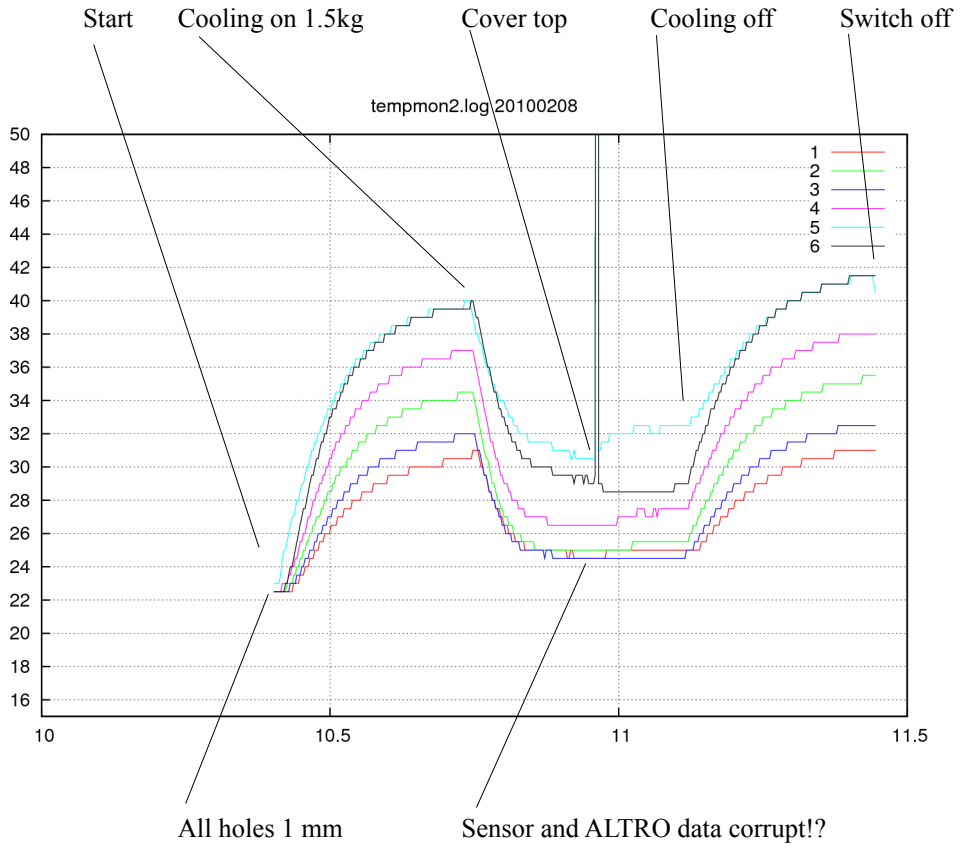
Redo previous setting – now both FECs powered on. Low flux cooling

Start Cooling on !&”#□!#! Cooling off On Remove top cover



Prototype cooling box





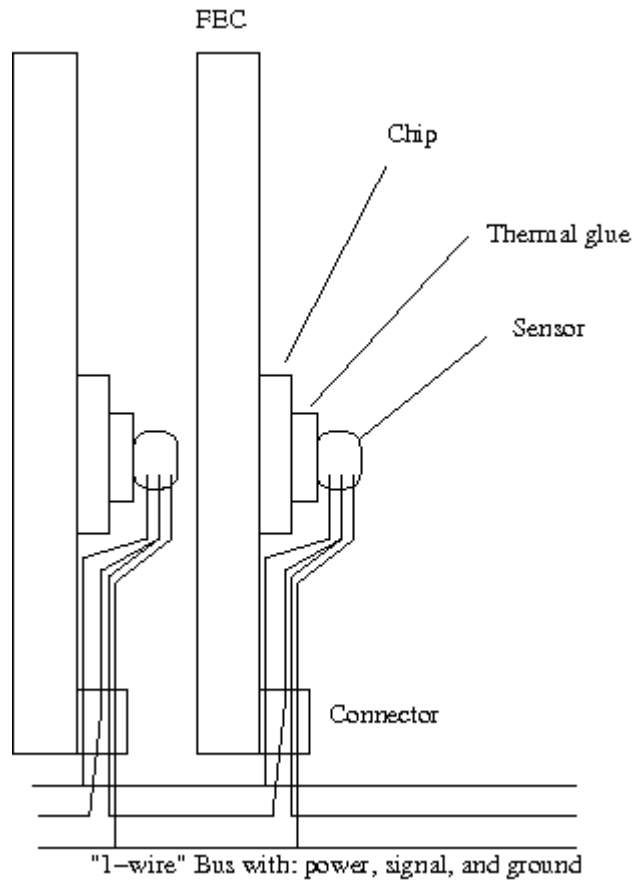
Sensors configuration file used:

```

#FILE: sensors-cooling.cfg
#FORMAT:
#for each sensor:
#TEMP.ID      <sensor ID>
#TEMP.ROMCODE <rom code: 8 bytes hex coded 11:22:33:44:55:66:77:88>
#TEMP.STATUS  0 - not active, 1 - active
TEMP.ID      1
TEMP.ROMCODE 10:B3:CC:ED:01:08:00:AF
TEMP.STATUS  1
#
TEMP.ID      2
TEMP.ROMCODE 10:28:EA:ED:01:08:00:82
TEMP.STATUS  1
#
TEMP.ID      3
TEMP.ROMCODE 10:F0:AF:ED:01:08:00:DC
TEMP.STATUS  1
#
TEMP.ID      4
TEMP.ROMCODE 10:F0:B5:ED:01:08:00:1D
TEMP.STATUS  1
#
TEMP.ID      5
TEMP.ROMCODE 10:E8:D3:ED:01:08:00:6A
TEMP.STATUS  1
#
TEMP.ID      6
TEMP.ROMCODE 10:5A:D7:ED:01:08:00:1C
TEMP.STATUS  1
#
TEMP.ID      7
TEMP.ROMCODE 10:08:F3:ED:01:08:00:BB
TEMP.STATUS  1
#
TEMP.ID      8
TEMP.ROMCODE 10:C8:BF:ED:01:08:00:EC
TEMP.STATUS  1
#
TEMP.ID      9
TEMP.ROMCODE 10:74:DC:ED:01:08:00:C9
TEMP.STATUS  1
#
TEMP.ID      10
TEMP.ROMCODE 10:1E:DE:ED:01:08:00:46
TEMP.STATUS  1
#
TEMP.ID      11
TEMP.ROMCODE 10:BC:DC:ED:01:08:00:F7
TEMP.STATUS  1

```

Possible way to implement sensor readout. Sensors glued to a chip. Several sensors on one card can be connected in series.

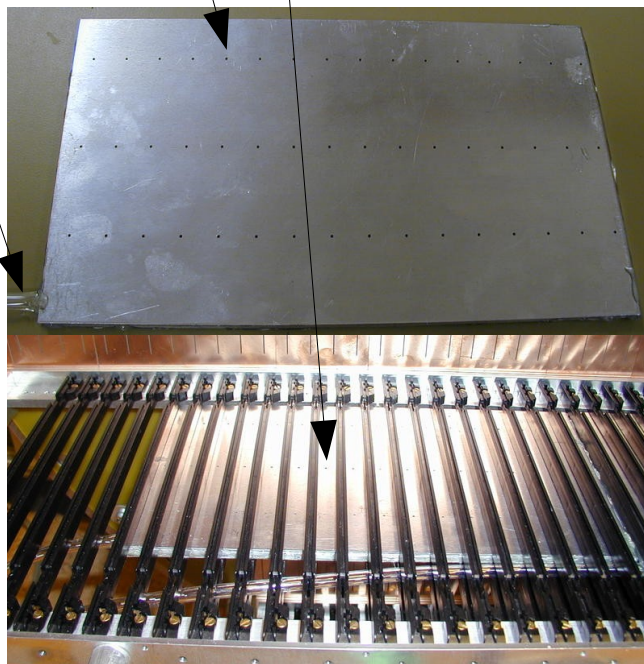


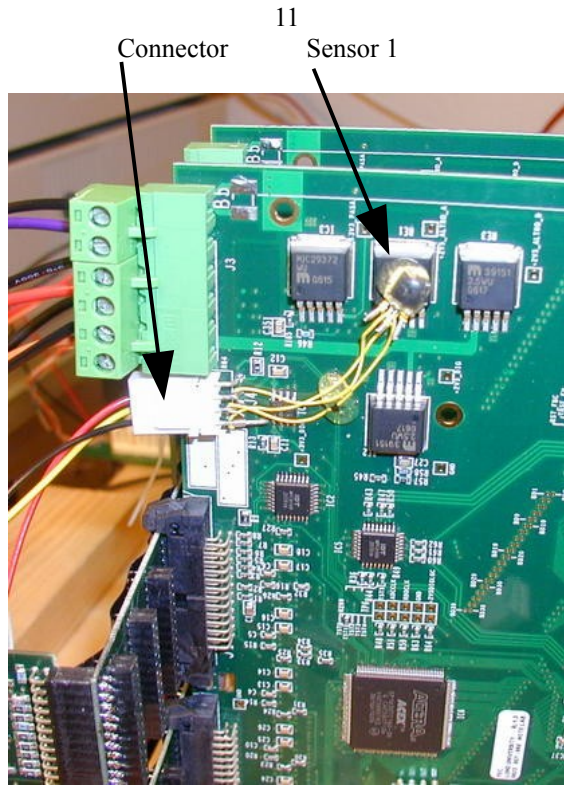
Below is a measurement with one sensor mounted on a FEC with final cooling plates using compressed air as cooling.

Tube for compressed air

Holes in between FECs

Cooling plate in Al





Three FECs was powered on, the central with a sensor (number 1). Sensor 2 was hanging in the air.

