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## Appendix 8 - Prototype cool-down report

As part of an infrared detecting instrument the BSM must be cooled down to 5K to prevent it from emitting radiation that would interfere with the detectors. This document summarises the results of the first cool-downs of the single axis prototype.

### **8.1 Procedure**

The cool down was performed in two stages. After evacuating the cryogenic chamber, liquid nitrogen was used to cool the prototype down to 77K. Once the mirror had cooled to this temperature liquid Helium was added to complete the cool-down to 4.6K (base-plate) / 5.2K (mirror).

### **8.2 Results**

A Servigor 102 Temperature monitor was used to record the process, the output of which can be viewed in figures 1,2 and 3 (pages 2,3,4). It was found as expected that the mirror was cooling significantly slower than the base-plate of the mechanism. The reasons for this are:

- the flex pivots are poor heat conductors and so the mirror was taking far longer to cool than the rest of the prototype.
- the mirror was being heated by the radiation shield which is only cooled to 77K (and in practice has a temperature gradient across it with a mean temperature close to 85K).

This radiation load issue was resolved by placing a radiation shield attached to the 4K base-plate over the entire prototype, thus preventing it from being heated by other parts of the cryostat.

Total cool-down time was 9 hours.

### **8.2 Conclusions**

From these tests it was concluded that the single axis prototype was cooled down well within the required time (12 hours).

Figure 1 - Temperature monitor output, part 1

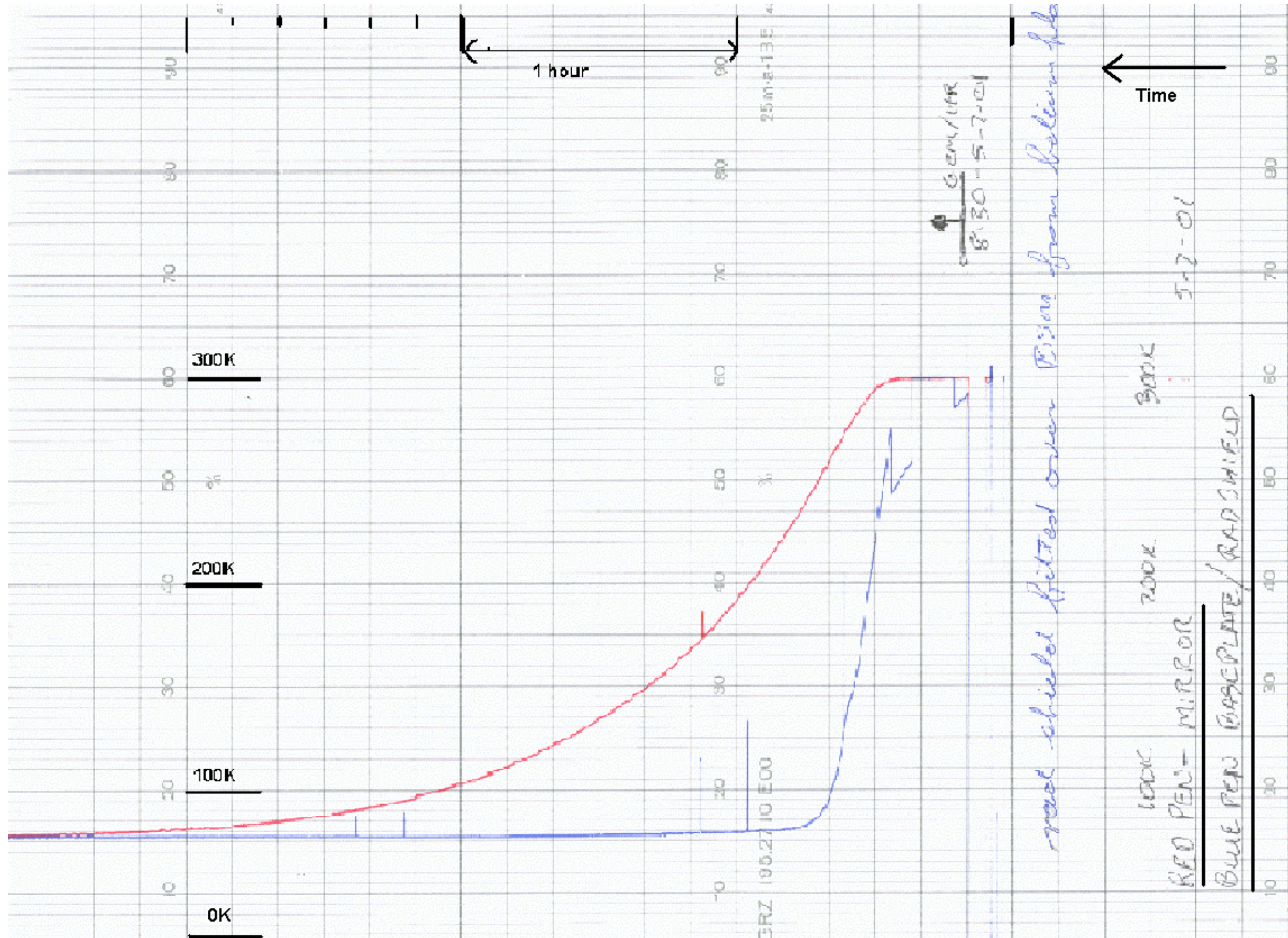
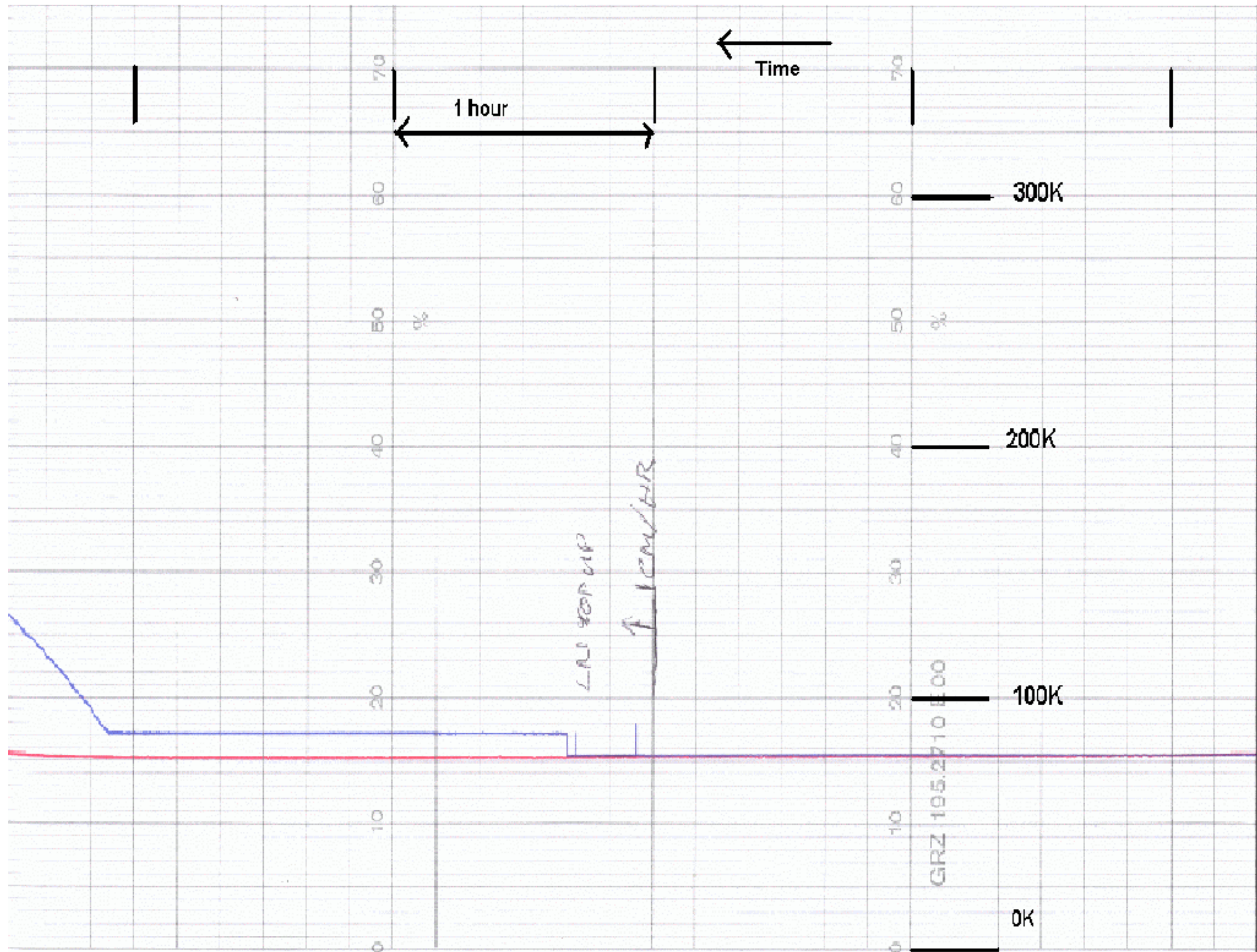
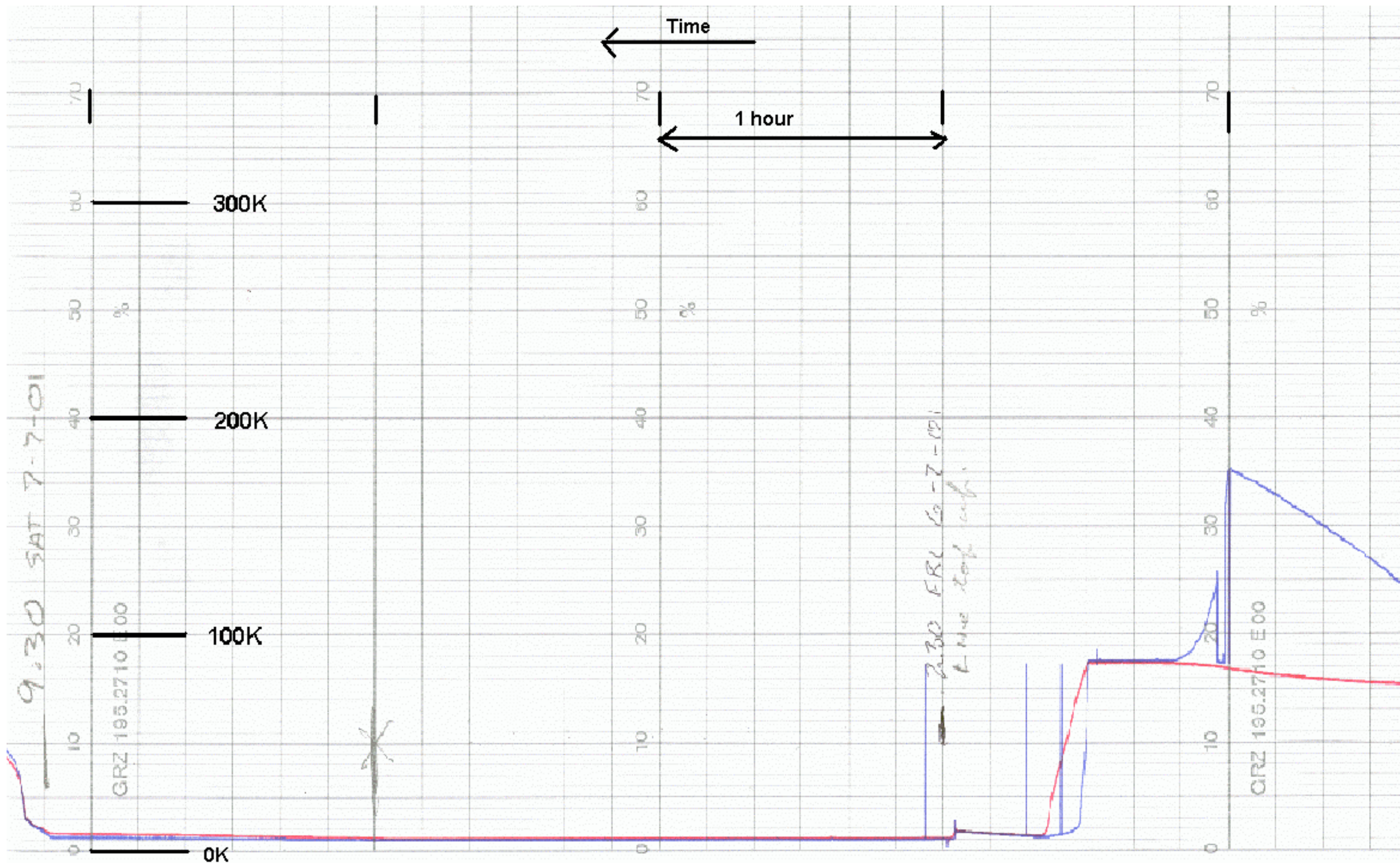


Figure 2 - Temperature monitor output, part 2



**Figure 3 - Temperature monitor output, part 3**





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