

NATIONAL RADIO ASTRONOMY OBSERVATORY  
Green Bank, West Virginia

MEMORANDUM

January 11, 1985

To: VLBA Electronics Group  
From: R. Norrod  
Subj: Report on CTI Model 22 Refrigerator Test

1.0 Introduction

This is an update on the status of the refrigerator tests described in VLBA Electronics Memo No. 22. Four units continue to run, but several events have occurred that seem worthy of note.

2.0 Dewar Status

The cumulative hours on the four refrigerators as of January 1, 1985 are:

<u>Dewar No.</u>	<u>Refrigerator Serial No.</u>	<u>Cumulative Hours</u>
0	11E43294	3661
1	11G43342	3053
2	11D43246	2778
3	11E43289	2340

We are still waiting for delivery of a refrigerator from CTI for the fifth test dewar.

3.0 Problems

The temperature of Dewar #0 began to increase notably in early December (Figure 1), until it reached an unacceptably high value with large variations. We also noted that the refrigerator motor had a difficult time in starting after it was turned off momentarily. On December 14, we cycled the refrigerator to room temperature and back. The temperature returned to a normal value and the motor starting problem disappeared. However, the temperature continues to exhibit occasional large variations (Figure 2).

Dewar #3 continues to show the occasional large temperature variations noted in the previous memo (Figure 3).

The dewar vacuum sensor card in Dewar #2 drifted far enough to produce a false pump request signal while the dewar was cold. The card was replaced, and it was found to exhibit a larger than normal temperature sensitivity. The circuit is being investigated further.

#### 4.0 Other Tests

We investigated the compressor coupling, noted in the previous memo, by installing a standard helium bottle in series with the helium lines in order to increase the gas volume. This did tend to smooth either the supply or return pressure, depending upon which side of the compressor the tank was installed. The tank on the supply side tended to do a better job of smoothing the refrigerator temperature, although a small temperature change could still be observed. Unless the amplifiers are extremely sensitive to temperature, though, it does not seem necessary to install any buffer tanks.

The cooldown times of the dewars and the times required to recover from a power outage have shown small variations, but no trends have been spotted.

We have rotated two of the dewars by 90 degrees so that their displacers are moving horizontally. No change in their operation has been observed as yet.

#### 5.0 Conclusions

We suspect that the problem with Dewar #0 was caused by some type of contamination in the cold head that was flushed out and dispersed in the rest of the system when the unit was warmed up. We will probably send a sample of the helium gas from this system off to be analyzed.

None of the problems described would have caused a "system failure", with the possible exception of the Dewar #0 temperature increase, and the fix we used for that could have been accomplished from the array central site. However, the rather large temperature variations which we are now seeing in two of the four units are still worrisome.

RDN/cjd

Attachments

Figures 1, 2 and 3

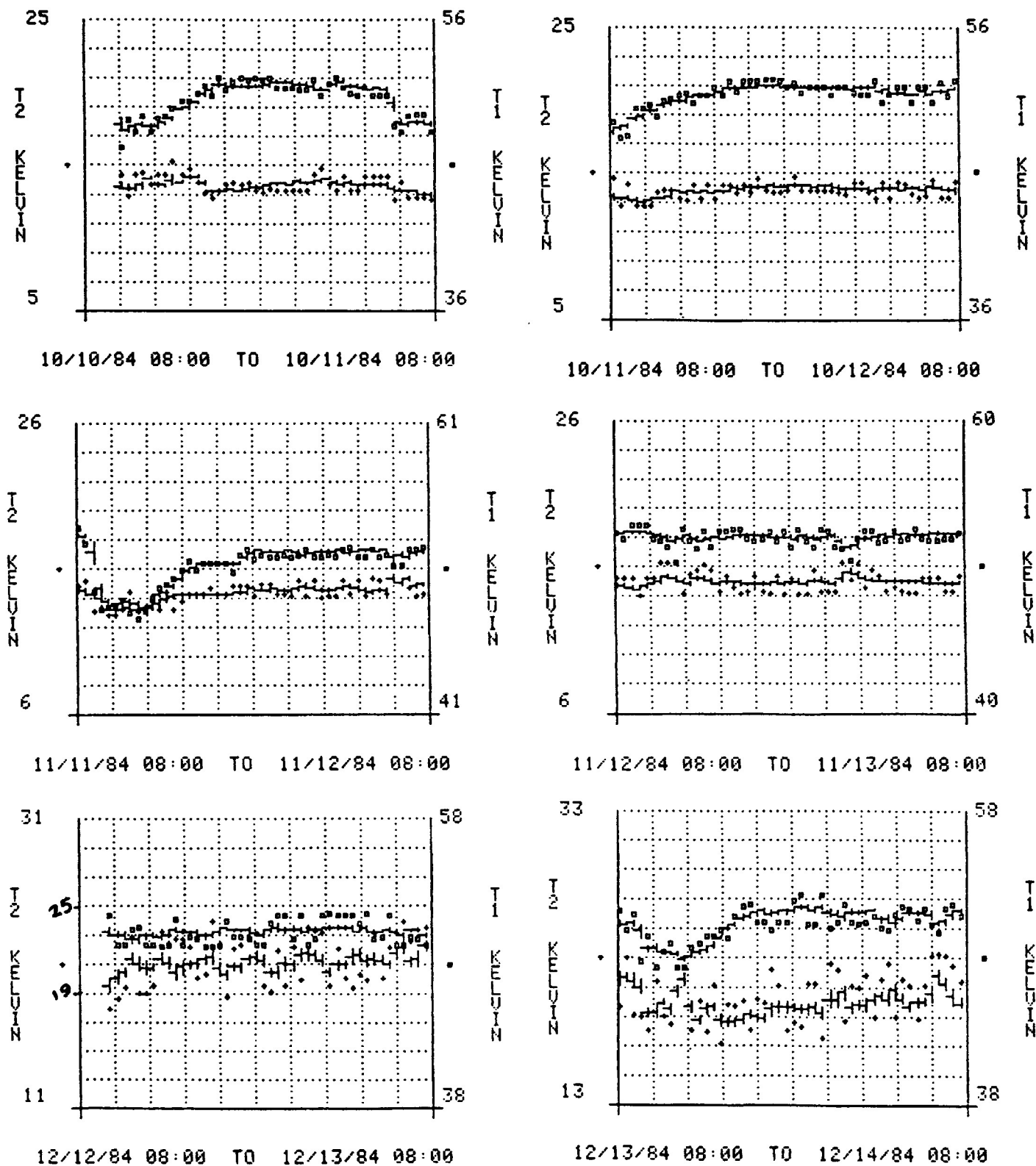
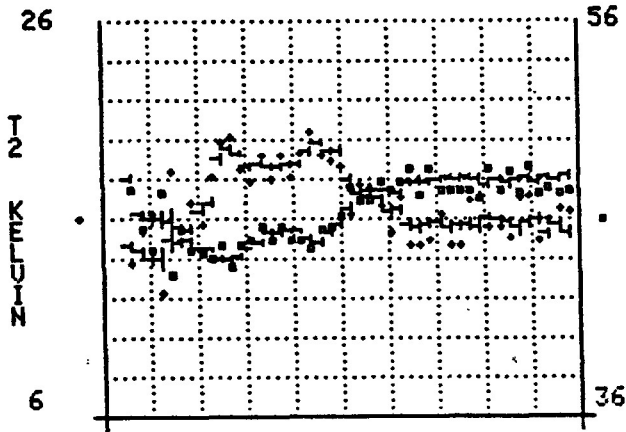
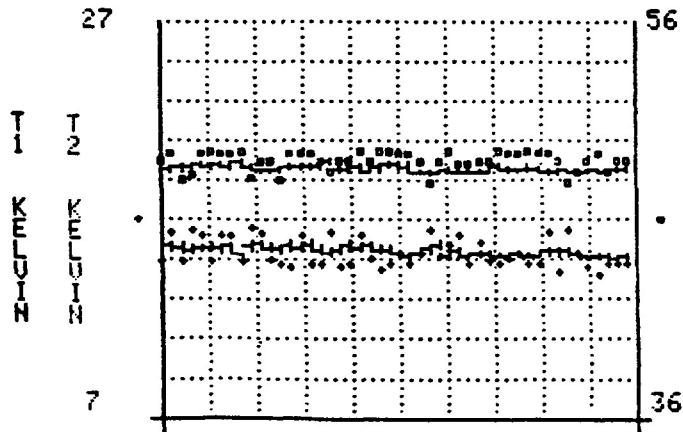


FIGURE 1

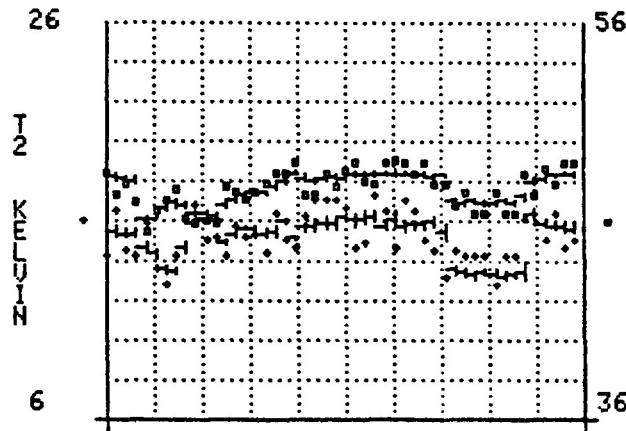
Typical temperature records of Dewar #0 over a three month period, showing the deterioration in performance. Note the shifts in the temperature scales. The deterioration first became noticeable on about December 1, 1984.



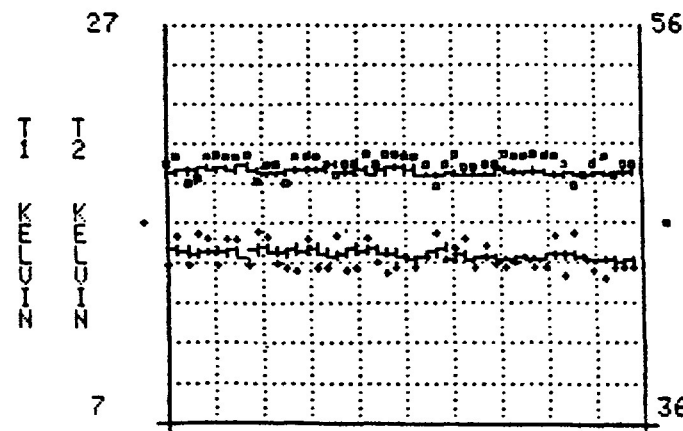
12/27/84 08:00 TO 12/28/84 08:00



12/30/84 08:00 TO 01/01/85 08:00



12/29/84 08:00 TO 12/30/84 08:00



12/30/84 08:00 TO 01/01/85 08:00

FIGURE 2

Temperature records of Dewar #0, after cycling the refrigerator to room temperature on December 14 for the first time since August 30. Note that the average temperatures have returned to reasonable values, but that the second stage is still exhibiting larger than desirable temperature variations.

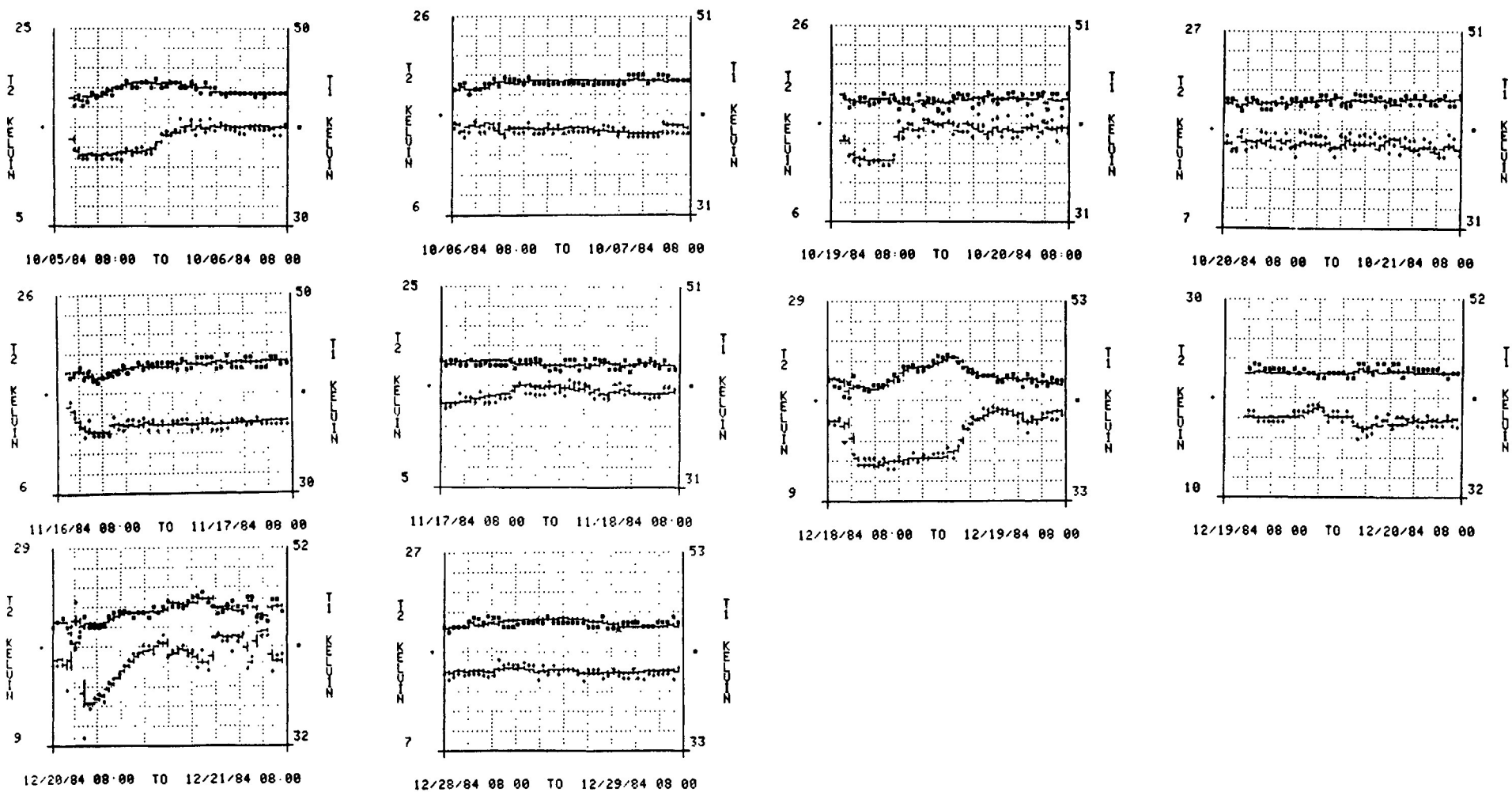


FIGURE 3

Temperature records of Dewar #3 showing its inconsistent performance.