

National Radio Astronomy Observatory
Socorro, New Mexico

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To: VLBA Project
From: Paul Rhodes
Subject: Temperature Stability Tests.

Since Larry D'Addario's visit to Pie Town and his comments on the temperature control in rooms #103 and #104 we have made some modifications and tests. The HVAC system consists of two Contempo heating, cooling and humidity control units. For the present we plan to use only one unit at a time, conditioning room #103 and #104 with the same unit. The other will act as a spare in case of failure. With the present design the supply side of both units uses the computer floor as a plenum. The return air from both rooms uses a common duct and the return air temperature is sensed at the top of each Contempo unit. With the existing system configuration I made some temperature stability measurements.

MODIFICATIONS

1. All under floor duct work was removed (computer floor used as plenum).
2. All floor registers were removed in room #103, thus the only supply outlets for this room are the small cable access holes and the supply air ducted through the computer.
3. Three outlet registers were installed in the floor of room #104 in addition to the outlet ducts through the C rack, D rack, and maser rack
4. The humidity was set at 35% and the temperature set at 22.7 C.

TEST #1

We tested the temperature rise time in case the commercial power failed for an extended period. These units are NOT connected to the Emergency Generator Power and would remain off during the time of a commercial power failure. With outside temperatures varying from 16.0 C to 19.5 C it took about two hours for the room temperature to reach 27.0 C, which is where the maser temperature stabilization circuits shutdown. During summer months when the outside temperatures are higher I believe the time period would be significantly shortened.

TEST #2

We measured the temperatures in room #104 and the top and bottom of the C rack over several days. These measurements were made from 1600 MST until 0930 MST the following morning. The ambient outside temperatures were not extreme and average from 3 to 8 C. All doors were kept closed and no entries were made into rooms #103 or #104 during the measurements. The heat load of the existing equipment is approximately 1500 watts. The addition of two recorders and a formatter will add approximately 1500 to 2000 watts. Drift values are for the total 18 hour test period. The peak to peak measurements were the maximums during a 2 hour period.

Room #104 temperature was measured near the return air duct and had a maximum drift of 1.3 C with a P-P maximum of 1.7 C and average temperature was 22.6 C.

The rack temperatures were measured simultaneously with the above measurement. Top of C rack maximum drift of 1.68 C with a maximum P-P of .5 C. with an average temperature of 21.3 C.

Bottom of C rack maximum drift of 1.30 C with a maximum P-P of 1.3 C with an average temperature of 23.5 C.

The cycle rate for the air conditioning compressor was approximately 2 hours. When a temporary cover on the supply duct of the Contempo unit not in use was removed the cycle time for the compressor shortened to 1.2 hours.

CONCLUSIONS

1. With the present heat load and with NO entry into rooms #103 or #104 we are meeting the specifications set in the VLBA Project Book section 2.1.3.2.3. We do not meet the specifications quoted in D'Addario's memo
2. The spare Contempo unit should be wired to come on automatically in the case of a failure of the primary unit.
3. The present system of sensing the room temperature at the end of the return air duct which is common to both rooms #103 and #104 is incorrect. Personnel working in room #103 changing tapes or monitoring the status via the computer screens will affect the temperature stability in room #104. An example was when people entered room #103 at the end of the test. The temperature changed in room #104 in approximately 30 minutes by the following amounts: room #104 by 1.6 C, bottom of C rack by 1.6 C, and top of C rack by .8 C.
4. Some type of back flow damper needs to be installed on both Contempo supply ducts to prevent back flow through the unit not in service. The blocking panel in use does not allow automatic switch over.
5. More tests should be made when all equipment is installed in the station. These should include some temperature rise tests during the summer months. These tests might indicate that the Contempo units should be hooked up to the Emergency power via a time delay relay, to allow the antenna to get to the stow position.