VLBA Electronics Memo No. 131

National Radio Astronomy Observatory

VLB Array Program

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B Rack Interface

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Subject: M102 Modification

Intro: The M102 module has been plagued with two complaints. This memo will discuss the problems and the proposed solutions.

I. Address 4003-500 MHz LO Receiver output power monitor.

This signal comes directly from a power detector without any buffering or amplification. As such it is low level (≈ -.25v) and high impedance (≥ 10KΩ). The correct reading is changed by crosstalk from other analog signals in the M102 monitor circuit. There appears to be two sources of this crosstalk. The first is in the standard interface card op amp circuit. This is being corrected by changing the op amp in all SI cards. The second source is in the multiplexer (3C) on the wire wrap card in the M102. The enable to the multiplexer is on all the time which allows some cross talk from channel 2 to channel 3. The fix is to add a hex inverter to the card and pick up an enable signal (5B - 15) that is true only during the active read operation. This change requires only simple wirewrap change (2 deletes & 5 adds). We have modified some M102s for testing. With both changes in place the crosstalk drops down to the 10 mV range which should give satisfactory performance. A change order will be generated to update the wirewrap card.

II. Temp monitoring in Vertex room.

The second problem associated with the M102 is its temperature monitor functions. I understand that there are 8 temperatures monitored in the Vertex room. Six are buffered, amplified and read via the M102 module. Because of the phase - temp characteristics of some of the cables it is desired to monitor some of these temps to a accuracy higher than currently possible. The system currently uses AD590 current sources as the temp sensors. Paying higher prices for a more accurate sensor is not reasonable since the current to voltage circuit in the M102 is not accurate. It is possible to put in a more accurate current to voltage converter but it would be a formitable physical problem and setting of the offset and gains would be a real problem. I propose to substitute an adjustable temperature sensor - LM234. With the proper adjustment it can directly substitute for the AD590 - ie 1μa/°K output current. As such no change would be necessary in the current to voltage circuit. I would propose that the station techs would calibrate the new sensors at a normal room temperature, using the Fluke Thermometer available at each station. The M102 reading would easily be within 0.2°C of actual over a

20°C span. As I understand the problem, this should be accurate enough to indicate phase problems due to temperature. This depends on the accuracy of the Fluke model 52 Thermometer at each site. For confidence we might need to check their sensors in an ice bath. A change order will be generated to implement this change at the stations. If the temp sensors in the ped room and station building are compatible I would recommend that they be replaced also.