



MULTIPLE MIRROR TELESCOPE OBSERVATORY

Smithsonian Astrophysical Observatory and Steward Observatory, University of Arizona

Reply to: MMT Observatory
University of Arizona
Tucson, Arizona 85721
(602) 621-1558

MMTO INTERNAL TECHNICAL MEMORANDUM 88-2

Subject: Report of the Building Drive Tests (7-30-88)

From: R. Holleman

Date: August 17, 1988

This is a report of the tests run to ascertain the performance of the Building Drive System under various fault conditions.

The tests were conducted by Bob Holleman and Clint Janes, with assistance from Carol Heller.

The tests were run approximately as described in the Building Drive Controller Test Plan dated July 4, 1988.

Original plans to monitor the tachometer input were canceled when it was determined that the "red line" drawings and the physical observation showed that this function had been disabled.

The building position, the armature currents, and the motor voltage were monitored by a six-channel strip recorder. It was determined that the strip recorder was unable to record the motor current information, due to the dither. Voltages were also checked with a multimeter.

A communication link was established with the control room to provide commands to the telescope and thus the building.

The building was operated under normal conditions to verify its performance and to establish baseline voltages for the strip recorder.

One fuse was physically removed from the circuit of motor #1. The "caution light" appeared "on" on the operator's console in the control room. The building appeared to follow the telescope with no apparent problems.

The one fuse was restored in the circuit of motor #1, and two fuses were removed from the circuit of motor #2. Again the "caution light" turned "on" on the operator's console, but the building appeared to follow the commands of the telescope with no apparent problems.

The two fuses were restored to motor #2 and all three fuses were removed from the circuit of motor #1. The drive attempted to follow the telescope commands; however, the building began to oscillate, which was detected by and was uncomfortable for some of the building's occupants. The cause of the oscillations was not determined but was probably related to the absence of current feedback from the totally disabled motor.

The building drive circuits were restored to normal.

The connection from one fuse to the SCR in the circuit to motor #1 was opened, leaving the fuse intact in the circuit and maintaining the link from the fuse to the "fuse good detection" circuit. This did not seem to change the characteristics, except that the "caution" light on the operator's console did not "turn-on."

The building was exercised in this manner, gradually increasing the slew rate until the telescope was driven into the building. This occurred at a slew rate of about 50 arcminutes per second. The automatic "shut-off" functioned when the telescope hit the building stop and one of the remaining fuses in the circuit of motor #1 blew. The cause of the fuse blow was not determined.

The building drive circuits were restored to "normal" and we used the computer to determine the increased diameter of the zenith "forbidden zone." The table below shows the results of those calculations.

<u>Elevation</u>	<u>Azimuth</u>	<u>Azimuth Velocity (arcminute/sec)</u>
80	140	1
85	141	2
87	143	3.5
89	150	12
89 15	180	16.5
89 30	180	29
89 35	180	39

Conclusions: The building can be safely operated with either one fuse "open" in one motor circuit if the azimuth slew velocity is reduced to below 50 arcminutes per second. The "caution" light on the operator's console will alert the operator that at least one fuse is "open." The building can be operated with more than one fuse blown but at a slower speed.

The building will not function properly if all three fuses to a single motor are "open." The observing will have to be discontinued until the fuses are replaced (and the cause of their opening determined and repaired if they continue to "open" after being replaced).

If an SCR fails by shorting, at least one fuse will probably "open," isolating the defective SCR. The "caution" light will notify the operator of the problem and the observing can continue, providing the maximum azimuth slew rate is reduced to 50 arcminutes per second or less.

If an SCR fails as an open circuit, the fuse will probably not "open" and the operator would probably not be aware that a reduction of the slew rate was necessary until the telescope hit the building stop. At that point, a fuse may "open," as it did during the test. Operation could continue after restarting the drives and reducing the azimuth slew velocity.