



MULTIPLE MIRROR TELESCOPE OBSERVATORY

Smithsonian Astrophysical Observatory and Steward Observatory, University of Arizona

Technical Memorandum 84-14

Subject: Pre-Limit/Emergency Stop of Telescope Drives

From: F. Sharp

Date: May 8, 1984

In order to minimize the possibility of hitting various hardstops, it is necessary to implement a "Pre-limit" system that is independent of the computer system. Indeed, one of many failure modes which could cause the hardstop is failure of the computer with A/D left at some output voltage. It is, therefore, necessary to ramp down the analog signal delivered to the drive system. Since the building drive ramp would have to be very closely matched with the AZ ramp on the telescope, I feel that the building is best left to track the AZ drive. It should be noted that the deceleration rate does not exceed the building drive deceleration capabilities.

The system should have the following attributes:

- 1) Independent of drive computer system
- 2) Inter-connected with present relay logic at the 24V level
- 3) Use simplest possible logic to minimize failure
- 4) Allow an independent (but shorter) ramp line for "Emergency Stop"
- 5) Incorporate "Watch Dog" timer on computer system
- 6) Provide method to drive back inside acceptable limits

The simplest solution to the ramp down requirement seems to be a complimentary bipolar transistor circuit with R/C control to provide a variable shunt on the input to the drive compensation circuit. Various digital and hybrid circuits were investigated, but all fail the "Simple Approach" test by

several orders of magnitude. At the end of the ramp a small drift in the opposite direction is applied. The circuit provides control with a minimum of components and isolation with opto-isolators. The proposed circuit is available to those interested.

The control logic will be 24 volt relays and diodes. When the emergency stop is implemented, it will force the drive to "OFF" after the "Emergency Stop" ramp time. Present data calls for a ramp time of approximately 10 seconds on "Pre-limit". The timing for "Emergency Stop" has not been determined. System cost is expected to be less than \$400.00 plus in-house labor cost.

Please respond as soon as possible (by 6/1) with comments on any problems this system might cause with existing systems or those in process.