



MULTIPLE MIRROR TELESCOPE OBSERVATORY

Smithsonian Astrophysical Observatory and Steward Observatory, University of Arizona

MMTO Technical Memorandum 84-12

Subject: Chiller System Controls

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We will soon make changes on the chiller system control box (located in the MMT control room). These changes are intended to provide adequate safeguards so that the MMT SG detector can be cooled with the Davison chiller (AKA Big Chill, Ultima Cool, etc.).

The major change will be the addition of a thermal shock alarm. This alarm goes off when the temperature difference between the detector and coolant exceeds a settable threshold.

The modified control box will have the following general features (those with asterisk are already part of the system):

- * 1) Control power switch - powers the temperature sensors, display, and thermal shock alarm. It also enables the start/reset button, pump, and heater functions.
- 2) Start/reset button - momentary contact switch starts the chilling unit in the pit.
- * 3) High/low stage indicators - show which of the two chiller compressors are running.
- * 4) Pump switch - starts methanol circulating pump.
- * 5) Heater - starts methanol heating coils in pit.
- * 6) Temperature display - 3 place digital display with sign (the same that's there now).

- 7) Display select switch - selects which of at least six temperature values will be displayed. These include:
 - a) set point - desired methanol temperature ($^{\circ}\text{C}$)
 - b) ACTUAL - methanol temperature at pit ($^{\circ}\text{C}$)
 - c) T_m - methanol temperature at OSS ($^{\circ}\text{K}$)
 - d) T_d - detector temperature ($^{\circ}\text{K}$)
 - e) $|\Delta T|$ - absolute value of $T_m - T_d$ ($^{\circ}\text{K}$ or $^{\circ}\text{C}$)
 - f) Alarm set - the threshold value of $|\Delta T|$ which sets off the thermal shock alarm.
- 8) Alarm set adjust - pot to adjust alarm threshold temperature
- * 9) Set Point Adjust - pot to adjust the desired methanol temperature in pit.
- 10) Audible alarm - sounds when ΔT exceeds the alarm set temperature.
- 11) Audible alarm switch - defeats or enables the audible alarm.
- 12) Audible alarm test - momentarily sounds the alarm.
- 13) Thermal shock alarm indicator - lights when the alarm is triggered.
- * 14) High temperature alarm indicator and shutdown - if the pit methanol temperature exceeds 27°C (80°F) the chiller automatically shuts down and the high temperature indicator lights up.

There are some aspects of this system that are expedient, not our druthers. The 4 new temperature values are all displayed in Kelvins. This is due to only +5 volts being available for the electronics. We could have converted to Celsius if the operating range never went negative. We don't feel the detector boys would

accept this compromise. Another fallout from the single supply is a rather soft representation of $|\Delta T|$ near zero values. Interest in ΔT should grow as $|\Delta T|$ gets large however, and the readout is much more accurate in that case. The Mark II version, built with infinite money, can have temperatures displayed in Fahrenheit and Rankine as well!

Any constructive criticisms of these changes will be welcomed before April 20. After that, we'll do it our way.