This ATM presents the results of a detailed thermal analysis of the Dust Detector.

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The preliminary analysis presented in ATM-482 recommended that the electronics be housed in the Central Station. Therefore, this analysis predicts only the temperature of the photocells, thermistors and their housing.

The Dust Detector experiment is shown on drawing BxS 4956 and associated details. There is no electrical power dissipated in the unit and the temperature limits of the photocells are -380°F. to $+300^\circ$F. Also, since photocells are being used, the unit must be exposed to the lunar environment and therefore, a sunshield can not be used.

The analysis considered four cases.

1. Lunar noon with no degradation

    (Solar cells $\alpha_s = .7$ $\epsilon_{IR} = .9$
    Teflon housing $\alpha_s = .35$ $\epsilon_{IR} = .7$)

2. Lunar noon with degradation

    (Solar cells $\alpha_s = .9$ $\epsilon_{IR} = .9$
    Teflon housing $\alpha_s = .9$ $\epsilon_{IR} = .9$)

3. 45° Solar Angle

    (Solar cells $\alpha_s = .7$ $\epsilon_{IR} = .9$
    Teflon housing $\alpha_s = .35$ $\epsilon_{IR} = .7$)

4. Lunar nite.

The results show the following:

A. The photo cells do not exceed their temperature limits.

B. The analysis will be continued to reflect the use of fiberglass and the new cell mounting arrangement.

C. At lunar noon, the cell temperature will increase from $\sim 205^\circ$F to $\sim 260^\circ$F if 100% degradation occurs during the year.

D. At lunar noon in the un-graded condition, the temperature difference between the top cell and the side cells is $\sim 40^\circ$F.

E.   At a solar angle of 45°, the cell temperatures are as shown below:

Solar

164°F

186°F 127°F