Bendix
Aerospace
Systems Division

	NO.	REV. NO.
LEAM Reliability Numerical Analysis	ATM 1030	
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INTRODUCTION

Presented herein are the results of the reliability numerical analysis conducted on the LEAM experiment. This analysis was conducted in accordance with the requirements of "Failure Rate Data for ALSEP" ATM 605A.

Prepared by: G. R. Van Hoorde
LEAM Reliability P. E.

Approved by: S. J. Ellison, Manager
ALSEP Reliability

MISSION DEFINITION

The reliability analysis presented herein was performed in accordance with the following definition of mission:

> Total functioning of East, up and West Sensors for six months plus functioning of East, up and West sensors without microphones or time of flight for 18 months. The housekeeping or engineering data will not be part of the mission success calculation.

RESULTS

Based on the above mission success definition the following were the results of this reliability analysis

1) Reliability for 6 months .98092
   Ref: Figure I and Table I

2) Reliability for 18 months .96443
   Ref: Figure II and Table I

3) Reliability items 1) times item 2) for 24 months .94603
   Ref: Table I

Reliability Design goal .90

SUMMARY

Table I presents the LEAM equipment with corresponding reliabilities for 6 months, 18 months and 24 months.
Figure I presents the LEAM reliability block diagram based on the first 6 months of operation.
Figure II presents the LEAM reliability block diagram based on the last 18 months of operation.
Operating temperature is 45° C. Failure rates for the reliability calculations were based on catastrophic failures of component parts due to shorts and opens.
The stress levels shown below were determined on the basis of the electric piece parts operating at their worst case values of resistance, capacitance, etc., and worst case application of voltage and current levels.

Components	Derating
IC's Digital	40 to 60% of fan out
Transistors	1 to 10% of rated PWR
Capacitors	1 to 50% of rated voltage
Resistors	1 to 35% of rated PWR
Diodes	1 to 20% of rated PWR

TABLE I

SUMMARY OF LEAM RELIABILITY NUMERICAL ANALYSIS

Equipments	Reliability First 6 Months Mission	Reliability Last 18 Months Mission
1) Power Supply	.99750	.99262
2) Peak Detector	.99970	.99930
3) PHA Threshold Detector	.99970	.99920
4) T of F Converter	.99550	
5) Heater Control	.99940	.99810
6) Clock Oscillator	.99980	.99950
7) Collector Amplifier	.99870	
8) MIC. BP Filter	.99970	
9) Main Mic. TD	.99960	
10) Film Amplifier	.99980	.99950
11) ID Threshold Detector	.99980	.99950
12) Film Amplifier SS	.99980	.99950
13) Collect Amplifier SS	.99980	.99950
14) Th. Det. SS	.99960	.99880
15) Noise Mic. TD	.99970	
16) Mic. PD	.99999	
17) Filter Networks Dual Sensor	.99980	.99930
18) Filter Networks Single Sensor	.99999	.99990
19) ALSEP Interface	.99910	.99730
20) Clock Power on Reset	.99980	.99930
21) Logic Film Dual Sensor	.99870	.99610
22) Logic Collector	.99920	.99760
23) Time of Flight Logic	.99900	
24) Mic & Data Trans. No. 1	.99820	
25) Mic & Data Trans. No. 2	.99820	
26) Logic Film SS	.99860	.99580
27) SS Logic	.99850	.99541
28) Control SS	.99940	.99810
29) Main Mic	.99980	
Total 6 Months Mission	.98092	
Total 18 Months Mission		.96443
Total Reliability for 24 Months Mission	.94603	

Figure I

LEAM Reliability Block Diagram
(Based on Equipments Operating Continuously for First 6 Months)

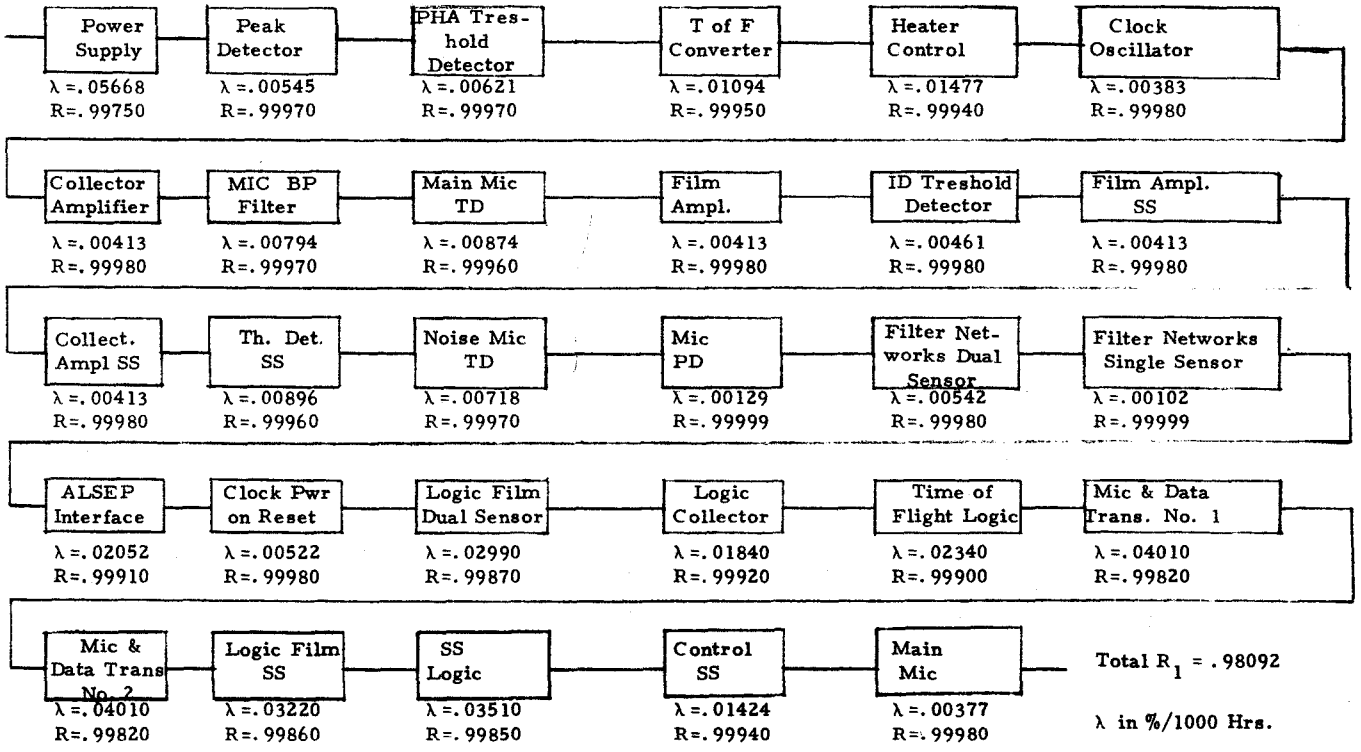
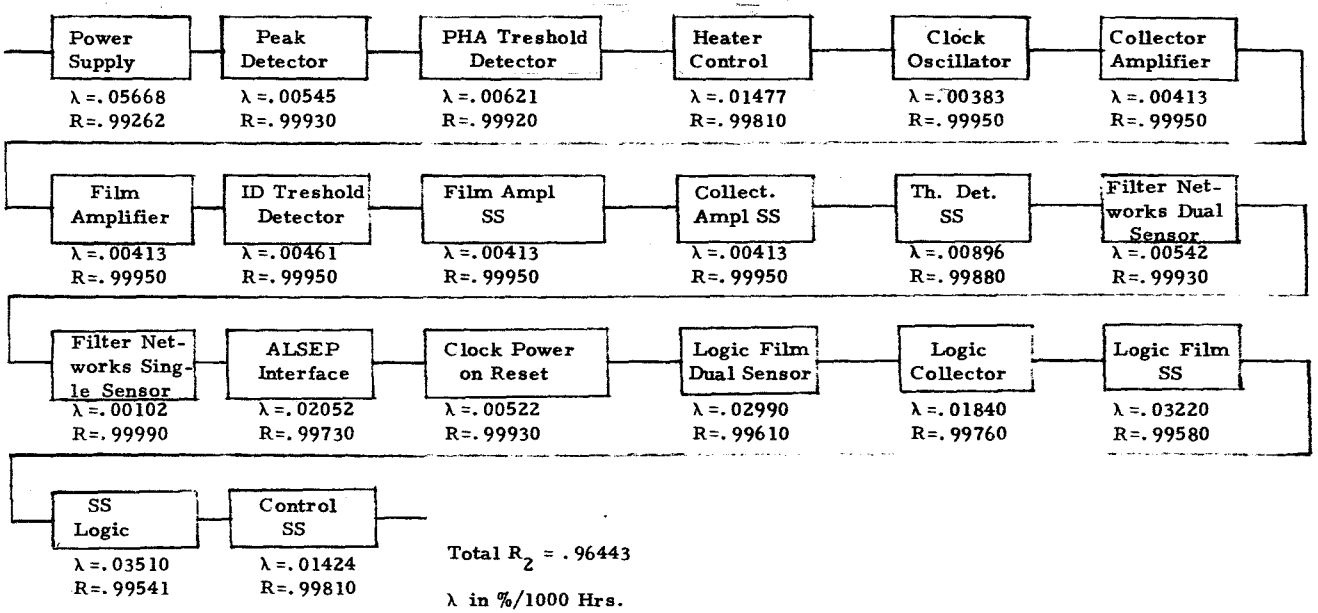


Figure II

LEAM Reliability Block Diagram
(Based on Equipments Operating Continuously for Last 18 Months)



Total R_2 = .96443

λ in %/1000 Hrs.