



**Space
Systems Division**

Gross Hazard Analysis Report, LMS

ATM 1018

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DATE 6/12/71

This ATM documents the Gross Hazard Analysis of the LMS experiment.

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1.0 INTRODUCTION

This is a report of the Gross Hazard Analysis of the Lunar Mass Spectrometer (LMS) experiment. This analysis has been conducted to identify the nature and extent of all potential hazards which might be apparent during assembly, testing, storage, transportation and operation of the experiment and to provide an approach or solution to reduce the level of any hazard to a "safety negligible" condition.

2.0 ANALYSIS

2.1 Hazard Analysis Sheet (Figure 1)

The Hazard Analysis sheet was used as a checklist to ascertain whether any of the listed hazards exist and at what point in the life cycle these hazards are apparent.

2.2 LMS Functional Schematic (Figure 2)

A functional schematic of the LMS electronics was drawn to determine if there existed any hazardous voltages or the possibility of performing electrical function which could cause hazardous events.

2.3 System Safety Record Sheet (Figure 3)

Hazards identified on the Hazard Analysis sheet and the LMS functional schematic were listed on the System Safety Record sheet. The Hazard Potential was determined and a technical approach to eliminate the hazard or a solution of the problem was given.

3.0 RESULTS

The drawing of the functional schematic revealed that there are high voltages in the LMS experiment (up to 3500v). It was determined that this voltage was a hazard only during manufacture and test of the experiment. When the experiment is fully assembled there are no exposed high voltages. The hazard was listed on the System Safety Record sheet and an analysis was conducted on the three power supplies involved. It was determined that all three power supplies were current limited to less than one milliamp and, therefore, constitutes a negligible safety hazard.



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CONCLUSIONS

The LMS experiment exhibits no significant safety hazards.

HAZARD ANALYSIS SHEET
ALSEP ARRAY E

SUBSYSTEM LMS BY Sys. Supt.

DETAIL/ASSEMBLY/OPERATION N/A DATE 6-9-71

HAZARD	PHASE	MANUF & TEST	FIELD TEST	KSC	LAUNCH & LANDING	LUNAR SURFACE	REMARKS
ACCELERATION		No	No	No	No	No	
CHEMICAL							
CONTAMINATION							
CORROSION							
DEBRIS							
ELECTRICAL-INADVERTENT ACTIVATION							
ELECTRICAL-POWER SOURCE FAILURE		No					
ELECTRICAL SHOCK		Yes					Internal High Voltage 1450; 3000; 3500vdc BxA & UTD
ENDURANCE LIMIT EXCEEDED		No					
ENVIRONMENTAL STRESS							
EQUIPMENT FAILURE							
EXPLOSION							
FIRE							
FRAGMENTATION							
HEAT & TEMPERATURE							
IMPACT							
LEAKAGE							
MOISTURE							
OXIDATION							
PERSONNEL ERROR							
PERSONNEL ILLNESS							
PRESSURE							
RADIATION							
SHOCK							
EXPLOSIVE DEVICES							
STRESS CONCENTRATIONS							
STRUCTURAL FAILURE							
TOXICITY							
VIBRATION AND NOISE							
WEATHER		No	No	No	No	No	

FIGURE 1

LMS FUNCTIONAL SCHEMATIC

LMS EXPERIMENT

- ① +3500 VDC
- ② -2200 TO 3000VDC
- ③ +1450 VDC MAX.

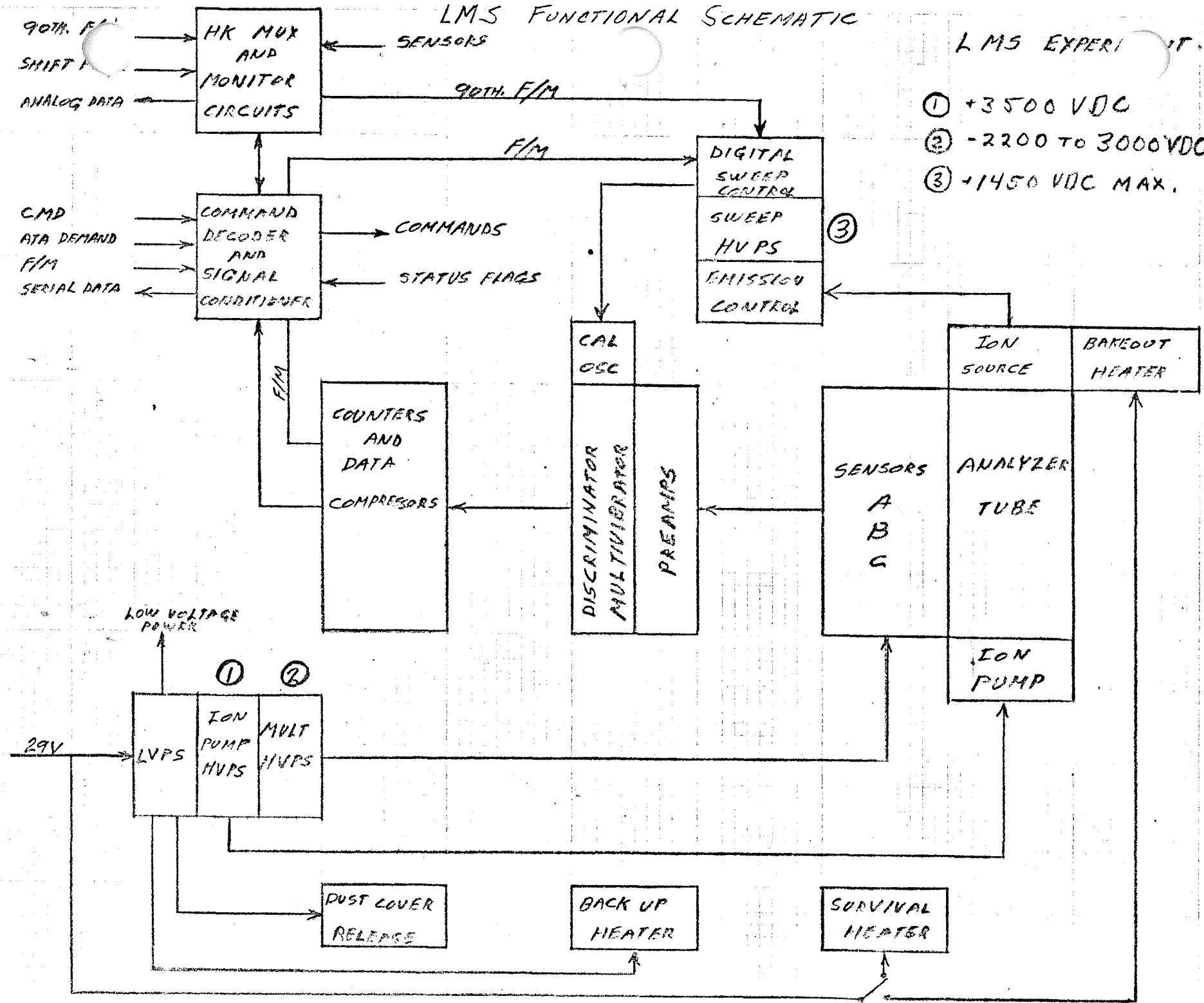


FIGURE 2



SYSTEM SAFETY RECORD SHEET

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 Program ALSEP ARRAY "E"
 System LMS
 Phase N/A

SUBSYSTEM/TASK	SAFETY CONSIDERATION	HAZARD POTENTIAL	TECHNICAL APPROACH OR SOLUTION	CONTROL POINTS
Manufacture and Test of the Ion Pump Power Supply, Electronic Multipliers Power Supply and Sweep, High Voltage Power Supply.	Inadvertent physical contact with one or more high voltages (-2200 to .3500V.).	Negligible	Power supply design will current limit the output to less than 1 ma. At this current level the hazard is negligible.	BxA 2347570, Ion Pump HVPS BxA 2347571, Mult. HVPS UTD 151-686A, Sweep HVPS