ALSEP

QUALIFICATION STATUS LIST (QSL PACKAGE) FLIGHT 4 CONFIGURATION ATM-859

Revision B

24 June 1970



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In compliance with the requirements of NASA contract NAS 9-5829, this document provides a Qualification Status List (QSL) for use as Section 3 of the ALSEP Flight 4 Acceptance Data Package (ADP).

As of the date of publication, the information herein reflects the status of qualification following the systems level tests which have been completed on the ALSEP Qual-C system configuration. Array C Failure Analysis Reports which are possible constraints to the close out of qualification status are discussed in Section 1.2.

As of the date of publication, the information herein reflects the status of the Array C Qualification and the ASE EMI/TV/Vibration requalification which followed.

This "B" Revision of ATM-859 is an update to the "A" Revision issued 24 April 1970. See footnote below.

The purpose of this update is to report the ASE Crystal Filter Tests completed, to provide current FR/FAR open item status as of this date, and to reference the most recent change list review memo. The pages modified by Revision B are 1, 5, 7 and 9.

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Note: The Initial Release and "A" revision of this ATM were prepared for the Array C Flight 4 Acceptance Data Package use only. The "B" revision of this ATM is the first issue given full ATM distribution.



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APPENDIX B

Qualification Status List ALSEP Array C Configuration

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1.0 INTRODUCTION

The QTRR for Array C qualification was held at BxA on 12, 13 December as reported by Minutes 9702-525. Section 1.1 describes the Flight 4 configuration items which were reviewed and identified as previously qualified by Qual SA or Qual SB Program versus those items to be qualified in the Qual C Program.

Five (5) QTRR chits against the Qual C Test Plan details were closed as recorded by Table 3-3 in Addendum 2 of the ALSEP TM-342 "Qualification Test Plan (Array C)," dated 6-9-69.

The QAR for the Array C qualification was held at BxA on 11, June 1969 as reported in the Minutes 970-100-33, the day following the completion of tests per ALSEP-TM-342. The Qual C QAR Board Meeting established that, "all S/P 1 and 2 Qual considerations show no constraint on Qual." Chit 2-1 was written requesting analysis of the Qual C vibration test results to verify the rationale substantiating qual of the Flight 4 hardware not subjected to Qual C mechanical environments. Chit 2-1 was closed as a result of the publication of Addendum 1 to ATR-215, "ALSEP Qualification C Test Summary Report," 6-23-69.

A Flight 4 EMI Status Meeting (Minutes 9703-139) was held at BxA on 27 August 1969 due to EMI problems experienced by the ASE/CSE on Flight 4. The fixes required and plans for the ASE EMI/TV/Vibration requalification were presented by Bendix. See Section 2.3, herein.

A Flight 4 Delta FTRR Meeting was held at BxA on 20, 21 October 1969 as reported by Minutes 9703-171. All action items (10) from the 27 August EMI status meeting were closed and the ASE EMI requalification proceded as agreed upon at the Flight 4 Delta FTRR Meeting. A new action Item E required rationale for Crystal Filter qualification without performing T/V Test on the filter.

Action Item E was completed by BxA Memo to Distribution 9721-1443, "ASE Filter Qualification," dated 31 October 1969. No other chits or action items to constrain Array C were identified or carried over from previous meetings.

The Array C EMI requalification proceded per Flight 4 FTRR agreements and completion was accomplished as follows:



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10-19-69 - ASE EMI Test Procedure TP 2338180, Crystal Filter Test was completed as the final EMI Test for Array C Qual. DR's AB 6031 and AB 6032 open at the time of test were later closed out as O/T conditions which had no effect on performance.

10-31-69 - The ASE Thermal Vacuum Verification of the EMI fixes was completed per TP 2341497 with no open items.

2-5-70 - The ASE Vibration Verification Tests of the EMI fixes was completed with the TP 2344948 Post Vibration Functional Test with no open items.

McCoy Crystal Filter qualification tests were completed as the final open qual test item against Array C. The qual test report for the BxA 2340326 Rev. F. Crystal Filters per BxA p.o. K 2496 was released. Moisture resistance, temperature cycling, physical shock, vibration and post environment functional tests were all successfully completed.

Changes to Array C hardware previously qualified by the ALSEP Qual SA and/or Qual SB Program are reviewed in Section 2.0, and other comments concerning qualification by similarity are provided in Section 3.0.

1.1 HARDWARE LIST FOR FLIGHT 4/ARRAY C

The following is a hardware list for the Flight 4 Array C configuration that was reviewed by the Qual C QTRR as the basis for establishing the hardware to be qualified in the Qual C Program versus configuration items considered qualified by Qual SA and/or Qual SB Programs. The asterisks (*) identify configuration items which were later included in ASE EMI requalification.

Subpackage #1	Qualified As:
Central Station	Qual SB *
Thermal Plate	By similarity to Qual SB st
Thermal Bag	Qual SA *
Command Receiver	Qual SA *
Multiplexer Converter	Qual SA *
Diplexer Filter	Qual SA *
Diplexer Switch	Qual SA *
Transmitters	Qual SA *
Harness Assembly	By similarity to Qual SB *

Out life of As.



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Subpackage #1 (cont.)	Qualified As: (cont.)
Battery/Timer Assembly	Qual SA *
PCU	Qual SA *
Command Decoder	Qual SA *
PCU	Qual SA *
Data Processor	Qual SA *
PSE Electronics	Qual SA *
ASE Electronics	Qual C *
Primary Structure	Qual SA *
Switch Actuator	Qual C *
Thermal Curtains	Qual SA
Reflector Assembly	Qual SA
Sunshield Assembly	Qual C
Dust Detector	Qual SA
PSE Sensor	Qual SA *
PSE Shroud Assembly	Qual SA
Mortar Package Assembly	Qual C *
GLA Package Assembly	Qual C *
Thermal Bag	Qual C *
Mortar Box	Qual C *
Geophone/Thumper Assembly	Qual C *
Helical Antenna	Qual SA
CPLE Experiment	Qual SB *
Subpackage #2	Qualified As:
Primary Structure	Qual SA
RTG Generator Assembly	Qual SA
RTG Shorting Plug	Qual SA
SIDE/CCGE Experiment	Qual SA *
ALHT	Qual SA

1.2 OUTSTANDING FAILURE ANALYSIS REPORTS

The below listed FRs against the Flight 4 ALSEP configuration are being processed for Failure Analysis Reporting as of the date of Publication for this QSL. All previous failure analysis reports against ALSEP Qual SA, Qual SB, Qual C and Flight 4 ALSEP hardware have been closed by MSC review and approval actions.



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FAR 258 - Flt 4

An interim report has been published. This item cannot be closed out until acceptance test of the receiver SN/11 can successfully be completed.

FAR 281 - Flt 4

A crack in the mirror was noted on SIDE SN/5. MSC to provide BxA with the failure analysis.

FAR 287 - Flt 4

A yellow discoloration of thermal paint was noted on the outer case of SIDE SN/5. MSC to provide BxA with the failure analysis.

FAR 282 - Flt Spare

The current in the ASE/CSE SN/4 was out of tolerance. Trouble-shooting currently underway to establish the correct thermal vacuum test procedure.

FAR 286 - Flt Spare

During test, calibrating pulse of ASE-CSE/SN4 was out of tolerance. The test set will be modified to simulate the Thumper and thus document the test results. Expected completion date is 6/26/70.

FAR - A-6 - Flt A2

Flatpack in command decoder SN/3 failed and analyzed at White Sands for cause of failure - analysis delayed until scanning electron microprobe can be tuned. Expected completion data 15 July 1970.



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2.0 HARDWARE CHANGES, QUAL VS FLIGHT 4

2.1 GENERAL

This section reviews changes that were made to Flight 4 hardware after the pertinent hardware items completed Qual SA or Qual SB configuration tests, or between Qual C and the Flight 4 models.

2.2 CENTRAL STATION THERMAL MODIFICATIONS

The original ALSEP specification required that ALSEP be placed within 5 degrees of the lunar equator. The Flight 4 requirement redefined the placement to ± 45 degrees. The required thermal modifications provided for the addition of a third (rear) thermal curtain and a slight modification of the masking format. The original thermal control configuration was qualified by Qual SA program testing and the Flight 4 modifications described were verified by Flight 4 thermal vacuum acceptance tests. The Flight 4 tests were within the required design limits for Central Station thermal control. See change comments, Section 2.5, second paragraph.

2.3 ASE EMI MODIFICATIONS

The ASE configuration hardware for Array C and Flight 4 was modified to reduce EMI experienced in the Qual C test program and during subsequent Flight 4 EMI tests per TP 2338180. The change summary was reviewed with MSC at the Flight 4 Delta FTRR held at BxA 20 Oct., 1969, Minutes 9703-171; the changes were as follows:

- 1. The addition of a 30 MHz crystal filter with a matching 3 dB attenuator pad mounted on the Central Station in series with the ASE Receiver RF coax cable.
- 2. Modification of the ASE Receiver tracking bandwidth to ± 200 kHz and modification of the ASE Receiver detector circuitry to eliminate the detection of spike or pulse noise.
- 3. The addition of 2 ferrite filters to each Mortar Pockage Assembly and Thumper lines at inputs to flat cables to filter Central Station noise.
- 4. Added shielding to 4 Central Station harness wires.



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5. The addition of eight A/D Converter output line chokes to eliminate 2 kHz modulated noise.

The described changes were requalified for EMI, Vibration and T/V by the Array C qualification test configuration and procedures defined in BxA letters 9703-160, 9703-167 and 9703-169 published in October 1969.

2.4 MULTIPLEXER RETROFIT

The 16 Channel Multiplexer in the Flight 4 ASE Central Station Electronics is the S/N-8 unit retrofitted with hermetically sealed semiconductors. Repeated failures of 16 Channel Multiplexers during the ALSEP development were due to PNP transistors and J-FETs used in the analog gate and gate driver circuits. These failures were caused by epoxy encapaulant which made the semiconductor devices susceptible to chip surface contamination, leakage and short failures. The hermetically sealed direct replacement devices are qualified by electrical and mechanical form factor similarity at the device and assembly level, plus the full regime of Flight 4 functional/environmental testing from the multiplexer level through Flight 4 system level tests.

2.5 OTHER HARDWARE CHANGES

All hardware changes between the Flight 4 FTRR held on 30 January 1969 and the Flight 4 Delta FTRR held on 20, 21 October 1969 were reviewed per item 15 of the Delta FTRR Minutes 9703-171. Only the EMI requalification changes in paragraph 2.3 herein were cited as significant by the review board.

All hardware changes issued after the Delta FTRR have been reviewed by ALSEP Reliability to assure that they do not violate Array C qualification. A summary of these changes and the qualification rationale is scheduled for presentation and review by the Flight 4 CARR Review Board. These changes are covered in Memo 9721-1598.

3.0 QUAL TEST HISTORY

3.1 SUBPACKAGE #1 ASSEMBLY



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3.1.1 Central Station

Central Station Electronics 2330399-5, S/N 7 on Flight 4 is qualified by similarity to 2330399-2, S/N 4 which was qualified in the Qual SA program and S/N 2 used in EMI requalification.

3.1.1.1 Thermal Plate Assembly

Thermal Plate Assembly 2335823-2, S/N 6 on Flight 4 is qualified by similarity to 2330351-2, S/N 1 which was qualified in the Qual SB program.

3.1.1.2 Thermal Bag

Thermal Bag, 2330333, S/N 7 on Flight 4 is qualified by similarity to S/N 2 which was qualified in the Qual SB program and for the ASE EMI requalification.

3.1.1.3 Command Receiver

Command Receiver S/N 9 on Flight 4 is qualified by similarity to S/N 3 used for the Qual SB program for the ASE EMI requalification.

3.1.1.4 Multiplexer Converter, 90 Channel

90 channel multiplexer converter 2330524 S/N 14 on Flight 4 is qualified by similarity to S/N 8, qualified during the Qual SA program and S/N 5 used in the ASE EMI requalification.

3.1.1.5 Diplexer Filter

Diplexer Filter 2330525 S/N 11 on Flight 4 is qualified by similarity to S/N 5 used in the Qual SA program and S/N 3 used in the ASE EMI requalification.

3.1.1.6 Diplexer Switch

Diplexer Switch, 2330526, S/N 8 on Flight 4 is qualified by similarity to S/N 5 which was qualified in the Qual SA Program and S/N 2 used in ASE EMI requalification.



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3.1.1.7 Transmitters

Transmitters, 2330527 S/N 19 and 20 used on Flight 4 are qualified by similarity to S/N 7 and 9 which were qualified in the Qual SA program and units S/N 5 and 6 used in the ASE EMI requalification.

3.1.1.8 Harness Assembly

Harness Assembly 2334794-2, S/N 10 on Flight 4 is qualified by identity to S/N 4 which was used in the ASE EMI requalification.

3.1.1.9 Central Station Timer

Central Station Timer 2330626 S/N E44014 on Flight 4 is qualified by identicality to S/N A23344 qualified in the Qual SB program.

3.1.1.10 Power Conditioning Unit (PCU)

Power Conditioning Unit 2330000-3, S/N 7 on Flight 4 is qualified by identity to S/N 3 qualified in the Qual SA Program and S/N 1 used in the ASE EMI requalification.

3.1.1.11 Command Decoder

Command Decoder, 2330509, S/N 7 on Flight 4 is qualified by identity to S/N 2 in the Qual SA program and to S/N 1 used in the ASE EMI requalification.

3.1.1.12 Power Distribution Unit (PDU)

Power Distribution Unit 2330450-2, S/N 9 on Flight 4 is qualified by identity to S/N 4 qualified in the Qual SA program and S/N 2 used in the ASE EMI requalification.

3.1.1.13 Data Processor

Data Processor 2330521, S/N 9 on Flight 4 is qualified by identity to S/N 3 qualified in the Qual SA program and S/N 2 used in the ASE EMI requalification.



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3.1.1.14 Passive Seismic Experiment Electronics

Passive Seismic Experiment Electronics 2334670, S/N 3 on Flight 4 is qualified by identity to S/N 2 qualified in the Qual SA program and S/N P2 used in the ASE EMI requalification.

3.1.1.15 Active Seismic Experiment Electronics

Active Seismic Experiment Central Station Electronics 2334468, S/N 3 on Flight 4 is qualified by identity with S/N 5 used on ASE EMI requalification. The EMI modifications were added to S/N 5 and 3. S/N 5 was successfully requalified for EMI, thermal vacuum, and mounting configuration vibration, shock and acceleration.

3.1.2 Primary Structure

Primary Structure, 2335815, S/N 7 on Flight 4 is qualified by similarity to 233514, S/N 2 qualified in the Qual C program and used for T/V and vibration of the Array C EMI modification requalification.

3.1.2.1 Switch Actuator

Switch Actuator, 2335825, S/N 5 on Flight 4 is qualified as a result of successful testing of S/N 8 during the Qual C Program and in the ASE EMI requalification.

3.1.2.2 Thermal Curtain Right

Thermal Curtain Right 2335582 S/N 5 on Flight 4 is qualified by similarity to S/N 3 qualified in the Qual SA program.*

3.1.2.3 Thermal Curtain Left

Thermal Curtain Left 2335609, S/N 7 on Flight 4 is qualified by similarity to S/N 3 qualified in the Qual SA Program.*

*NOTE: Qual rationale for the thermal modifications made to the flight hardware are covered in paragraph 2.2 herein.



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3.1.3 Sunshield Assembly

Sunshield Assembly, 2335830, S/N 10 on Flight 4 was qualified by identity with the successful completion of tests of S/N 9 during the Qual C program.

3.1.3.1 Dust Detector

Dust Detector 2341440, S/N 8 on Flight 4 was qualified by identity with the successful completion of testing of S/N 1 during the Qual C Program. S/N 3 had previously been qualified in the Qual SA program.

3.1.3.2 Passive Seismic Experiment Sensor and Shroud Assembly

PSE Sensor and Shroud Assembly, 2338460-2, S/N 3 on Flight 4 is qualified by identity to S/N P2 qualified in the Qual SB Program and S/N P2 used in the ASE EMI requalification.

3.1.3.3 Mortar Package Assembly

Mortar Package Assembly 2334500-5, S/N 3 on Flight 4 was qualified by identity to following successful testing of S/N 5 during the Qual C Program and in the ASE EMI requalification. The GLA Package 2338507-2, S/N 2 and the Thermal Bag 2330803-2, S/N 6 were also qualified as a result of successful testing of GLA Package 2338507-1, S/N 1 and Thermal Bag 2330803-2, S/N 4 during the Qual C Program.

3.1.3.4 Mortar Box

Mortar Box 2334499-4, S/N 6 on Flight 4 was qualified by identity as a result of successful testing of S/N 7 in the Qual C Program and S/N 5 Mortar Package Assembly in the ASE EMI requalification.



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3.1.3.5 Geophone Thumper Assembly

Geophone Thumper Assembly, 2334772-4, S/N 3 on Flight 4 was qualified by identity as a result of successful testing of S/N 5 in the Qual C Program and in the ASE EMI requalification.

3.1.3.6 Helical Antenna

Helical Antenna, 2330307, S/N 6 on Flight 4 is qualified by identity to S/N qualified in the Qual SA Program.

3.1.3.7 Charged Particle Lunar Environment Experiment (CPLEE)

CPLEE, 2330662, S/N 5 on Flight 4 is qualified by identity to S/N 2 qualified in the Qual SB Program. S/N 1 was successfully tested during Qual C and the ASE EMI requalification.

3.2 SUBPAKCAGE #2 ASSEMBLY

Subpackage #2 Assembly 2334849-3, S/N 5 in Flight 4 is identical to S/N 3 which was fully qualified in the Qual SA Program.

3.2.1 RTG Generator Assembly

The Module 23 RTG Assembly S/N 6320013 used on Flight 4 is qualified by similarity to the Module 21 S/N 632011 assembly qualified in the Bendix Qual SA Program. The Assembly was also qualified by previous tests at G. E. Valley Forge as indicated by the QSL Summary Sheet B-24.

3.2.2 RTG Shorting Plug Assembly

The Shorting Plug Assembly 2338017 S/N 3 used in Flight 4 is qualified by identity in the Qual SA Program. The BxA 2335520, Revision C assembly tested in Qual SA is identical to the BxA 2338017 configurations.

3.2.3 SIDE/CCGE Experiment

The System 5 S/N 5 configuration of the SIDE/CCGE used on 1 Flight 4 is qualified by similarity with the S/N 4 configuration tested in the Qual SA Program and S/N 2 used in EMI requalification.



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3.2.4 Apollo Lunar Handling Tools (ALHT)

ALHT configurations similar to Flight 4 allocated hardware have been used as mass simulators for qualification and acceptance physical environment testing.

The ALHT Equipment are qualified by MSC at the ALHT assembly level.

3.3 FUEL CASK ASSEMBLY (REFERENCE)

The ALSEP Fuel Cask Assembly for Flight 4 is separately tested and delivered from G.E. facilities at Valley Forge, Pennsylvania. The ADP for this hardware separately identified Fuel Cask Assembly qualification status.

4.0 QUAL C TEST REPORTS LIST

ATR	Subject
171	Baseline Functional
172	Thermal Vacuum Design Limit
174	ASE Mass Properties
175	Pre-Induced Environments
176	Induced Environments
177	Post-Induced Environments
186	ASE EMI
216	System EMI



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APPENDIX A

QSL SHEET COMPARISON CRITERIA

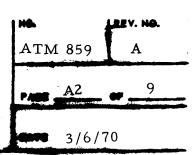
The qualification status defined in the Appendix B QSL Sheets (BxA format 970-12) is presented in a manner to compare ALSEP equipment specified environment or parametric requirements to the stress levels achieved during Qual C or previous programs.

The qualification status has been established by the qualification testing accomplished at BxA and is reflected on the applicable QSL sheets by the listing of the appropriate test procedure, test reports and remarks relative to each test or to prior qualification tests.

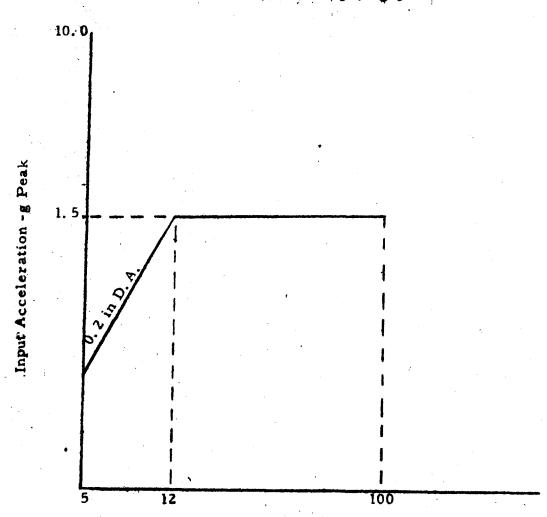
Qualification testing of ALSEP for vibration shock, and acceleration was required at the system level only. That is, all equipments that comprise ALSEP were subjected to design limit levels for a stowed configuration, simulating the mounting of ALSEP into the LM compartment. The qualification vibration levels are depicted in Figures 1 through 5. These levels are in accordance with those specified by NASA Letter TD3/LO23/68/B-26 (JAC).

The qualification testing of Qual C required testing to qualify the ASE, the Array C sunshield and astronaut switches. For the induced environments test, a Subpackage #1 was employed with mass simulators used for the previously qualified experiments. Vibration levels for the ASE requalification were derived from Subpackage #1 design limit tests and applied at the levels specified on Tables I, II and III of this Appendix.





Sweep Rate = 3/4 Octave/Minute (5-100-5 cps), g-peak Tolerance +10%

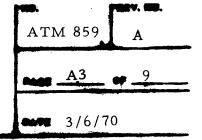


Frequency - Hz

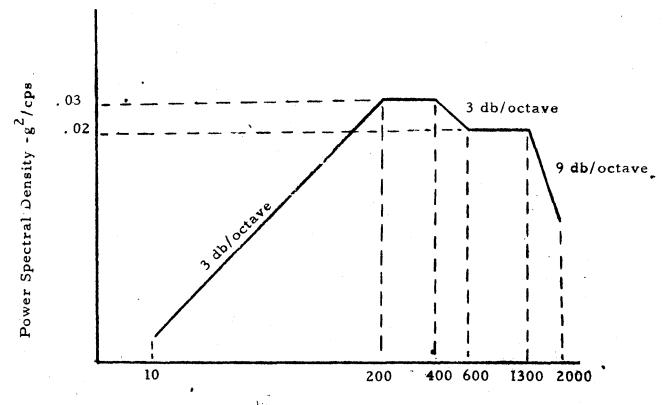
Subpackage 1 & 2
Launch Boost & Lunar Descant, Sine
Vibration Design Limit. All-Axes

Figure 1





Test duration 2.5 minutes power spectral density tolerance 43 db

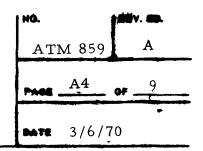


Frequency - Hz

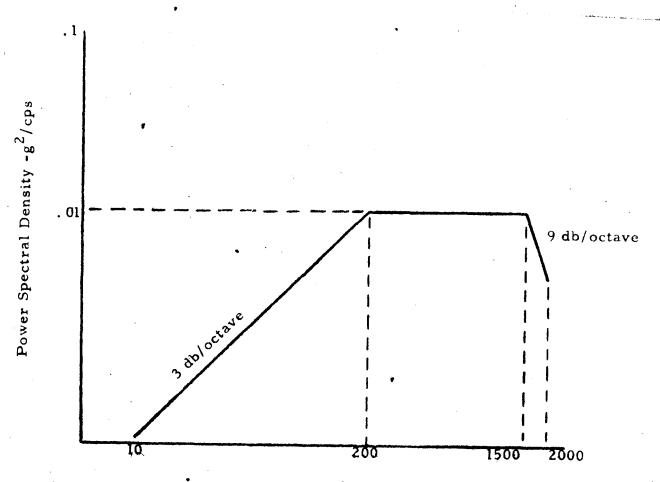
Subpackage 1
Earth Launch Boost Phase Random
Vibration Spectrum Design Limit.
X-Axis only

Figure 2





Test Duration 2.5 Minutes
Power Spectral Density tolerance
+3 db



Frequency -Hz

Subpackage 1 & 2
Earth Launch Boost Phase Random Vibration
Spectrum Design Limit. Y -Axis only

Figure 3

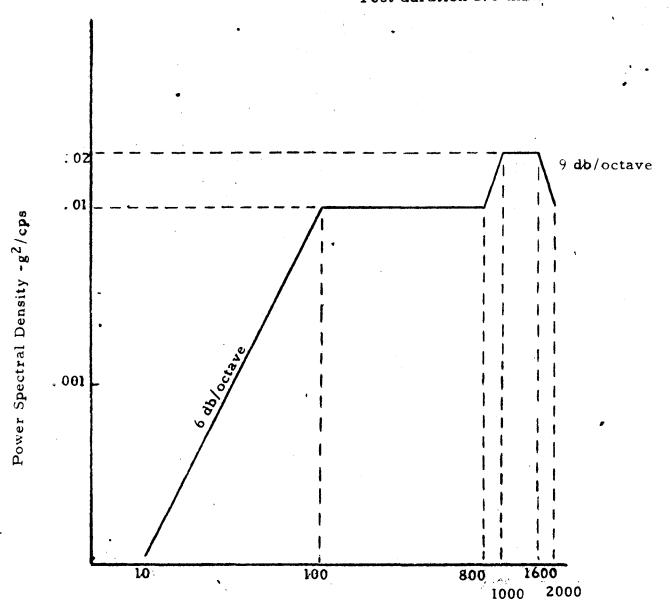


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Power Spectral Density Tolerance → 3 db
Test duration 2.5 minutes



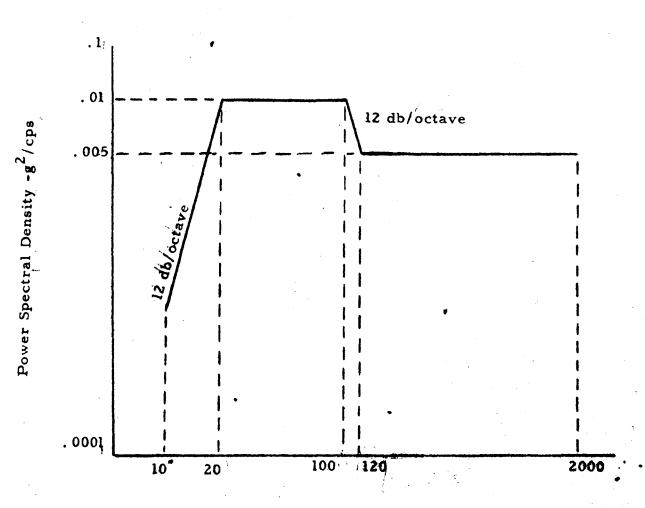
Frequency/-Hz

Subpackage 1 & 2
Earth Launch Boost Phast Random Vibration
Spectrum Level, Z-Axis only



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Test Duration 12. 5 minutes Power Spectral Density +3 db



Frequency -Hz

Subpackage # & 2
Lunar Descent Random Vibration Spectrum
Design Limit. All Axes

Figure 5



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TABLE 1

Sinusoidal Vibration Levels for ASE-CSE Qualification Tests

Sweep Rate

3/4 Oct/Min

Sweep

5-100-5 Hz

Tolerances

<u>+</u> 10%

Axis	Freq. <u>Range</u>	Dbl. Ampl.	O-Peak Acc.
x	5-13 Hz	0.30 in	· -
	13-29	-	2.5 g
	29-45	0.06	-
	45-100	-	6.0
у	5-12	0.35	-
	12-100	- -	2.7
z	5-10	0.35	-
	10-43	-	2.0
	43-55	0.02	-
	55-100	-	3.2



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TABLE 2

L&B Random Vibration Levels for ASE-CSE Qualification Tests

Duration

2.5 min.

Tolerances

 \pm 3dB , PSD

<u>+</u> 10%

, RMS acceleration (G-RMS)

		Freq.	PSD LEV	/EL
$\frac{Axis}{}$	G-RMS	Range	Slope	Constant
x	7.0	10-100 Hz	+3dB/oct	-
		100-250	-	$0.068 \mathrm{g}^2/\mathrm{Hz}$
		250-2000	- 3	-
У	5.5	10-60	+6	-
		60-150	-	0.060
		150-2000	- 3	-
\mathbf{z}	5.7	10-60	+9	-
		60-90	-	0.060
		90-185	-6	-
		185-2000	-	0.014



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TABLE 3

Lunar Descent Random Vibration Levels for ASE-CSE Qualification Tests

Duration

12.5 min.

Tolerances

 \pm 3dB , PSD

 \pm 10% , G-RMS

		Freq.	PSD LEVEL		
$\frac{Axis}{}$	G-RMS	Range	Slope	Constant	
x	4.8	10-30 Hz	+3dB/oct	-	
		30-100	-	$0.60 \text{ g}^2/\text{Hz}$	
		100-2000	- 3	-	
у	3.8	10-60	+3	-	
		60-70	-	0.050	
		70-2000	- 3	-	
${f z}$	3.2	10-50	+6	_	
		50-70	-	0.060	
		70-310	- 6	-	
		310-2000	-	0.003	



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APPENDIX B

Sheet	Subject
B-1	Subpackage #1
B-2	Command Receiver
B-3,4	90 Channel Multiplex/Converter
B-5	Filter, Diplexer
B-6	Diplexer Switch
B-7	Transmitter
B-8	Timer, Central Station
B-9	Power Conditioning Unit (PCU)
B-10	Command Decoder
B-11	Power Distribution Unit
B-12	Data Processor
B-13	PSE Central Electronics
B-14	ASE Central Electronics
B-15	Primary Structure
B-16	Switch Actuator
B-17	PSE Sensor Assembly
B-18	Mortar Package Assembly
B-19	Geophone Thumper Assembly
B-20	Antenna Assembly
B-21	CPLEE
B-22	Subpackage #2
B-23	RTG Generator
B-24	RTG Shorting Plug
B-25	SIDE/CCGE
B-26	ALHT

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Item Nomenclature	Environment and/or Parameter	Stress	Level	Veri	fication of Stress			
		Requirement	Capability	Agent	Location	Document Reference	Date	Remarks See Note 1.
Subpackage #1 BxA 2334845	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon		-300 ⁰ F to +250 ⁰ F External SP #1 Conditions	BxA	Ann Arbor, Mich	TP 2333026 TP 2337912 TP 2334389 ATR 172 BSR 2588	3/1/69	Applies to ASE and related Array C Central Station components only. See Note 1.
	Pressure Operating Non-Operating	10 ⁻¹² Torr SL to 10 ⁻¹² Torr	Tested to 5 x 10 ⁻⁶ Torr	BxA	Same	Same as above	3/1/69	Test level limited by test equipment capabilities
	Humidity Operating Non-Operating	N/A 15-100%	Designed to meet Requirements	BxA	Same	N/A	N/A	N/A
	Vibration Operating (N/A) Non-Operating Launch & Flight Lunar Landing	See appendix A herein.	Tested to Design Limtt V:b I evels indicated in Figures 1-5	ВжА	Same	TP 2334322A ATR-176 BSR-2592	5/21/69	Applies to ASE and the related Array C SP #1. Other items were mass simulated.
	Acceleration Operating Non-Operating	N/A 14g-axis	Tested to 14.5g l minute duration each axis.	BxA	Same	TP 2334323 ATR-176 BSR-2592	5/22/69	Same as above
	Shock Operating Non-Operating	N/A 15g-11 ms	Tested to 15± 2g 11 ms saw- tooth each axis	ВжА	Same	TP 2334324 ATR-176 BSR-2592	5/16/69	Same as above
	Salt Spray	N/A						No Test Required
	Sand & Dust	Not defined						No Test Required
	Fungus	N/A						No Test Required
	Acoustical Noise	Not defined						No Test Required
	Rain	N/A						No Test Required
	Radiation	LED-520	130W/ft ²	BxA	Ann Arbor, Mich	TP 2337912	3/1/69	See Operating Temperature
	Explosion Proof	N/A						No Test Required
	PARAMETRIC Functional Performance ALSEP TM-342	Tested as part of the integrated system in space simulation chamber	Capable of start- up and operation lunar surface	BxA	Ann Arbor, Mich	See operating ter pressure above. TP 2333025D 6/	ι-	Deployed performance was verified by tests cites in line during T/V qualification and after physical tests.
	NOTE 1:			ns are As-Run TP and bpackage #1 is recorde				
	2:	See comments, p	aragraphs 3.1.1, E requal applies	3,1.1.1, 3,1.1.2, 3, to ASE and related EMI	1.1.8, 3.1.2, 3. fixes cited on con	1.2.2, 2.1.2.3, ponent QSL's.		3.1.3.1 and
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	Environment	Stress	Level	Ve	rification of	Stress	1		
Item and/or Nomenclature Parameter		Requirement Capability		Agent	Loca	ıtion	Document Reference	Date	Remarks
Command Receiver BxA # 23305 23	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon		-10°F to +140°F -65°F to +160°F	Philco-Ford	Palo Alt Californ	ia	Qualification Test Report RN-DA1664	March 1968	Also qualified to S/P # requir ments in Qual SA test
	Pressure Operating Non-Operating	1 x 10 ⁻¹² mm Sea Level-10 ⁻⁸ n	lx10 ⁻⁵ mmHg nm lx10 ⁻⁵ mmHg						Quadfied in System to 5 x 10 ⁻⁶ Torrs
	Humidity Operating Non-Operating	15% - 100%	15% - 100%						No testing required at system level. Qualified as a sub-assembly.
	Vibration Operating N/A Non-Operating Launch & Flight Lunar Landing	See Appendix A	N/A .0G - peak 20 - 100 cps						Qualified as part of system for S/P #1 Design Limit Test in the Stowed Configuration Qual SA
	Acceleration Operating Non-Operating	N/A ATR-16, Add. #	N/A 14G - 1 min. 1 each of 3 axes						11
	Shock Operating Non-Operating	N/A ATR-16, Add. #1	N/A 20G - ¹0ms rise each of 3 axes	\ ,		/	\		11
	Salt Spray Sand & Dust Fungus	N/A Not Defined N/A	N/A N/A N/A						No testing required
	Acoustical Noise Rain Radiation	Not Defined N/A N/A	N/A N/A N/A						No testing required
	Explosion Proof PARAMETRIC Performance Specification	N/A Per AL310700	N/A	Philco-Ford	Palo de Califo		Qualification Test Report RN-DA 1664	March 1968	Philco Ford Qual
	Functional Performance		ct of Integrated pace Simulation	BxA	Ann A Michi	Arbor, igan	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qual SA test
	EMI Performance	Tested As p System	art of Integrated	BxA			TP 2333087 ATR-27, 33 BSR-2300, 2320		Qual SA test

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UALIFICATION STA	TUS LIST-ALSEP PR	OGRAM CENT	RAL STATION EL	ECTRONICS COMPON	ENTS		Date 3/6/70	No. ATM-859 Rev. No. A	
····						Analyst R. Dillard	Page _ of _ Pages		
	Environment	Stress Level		Ver	fication of Stress	Level Capability			
Item Nomenclature	and/or Parameter	Requirement	Capability Agent		Location	Document Reference	Date	Remarks	
90 Channel Analog Multiplexer/Con- verter BxA 2330524	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-22°F to +158°F -65°F to +185°F	Tested to Same	Dynatronics	Orlando, Qualification Florida Test Report 90 Channel Ana log Mult/Conv.		7 March 1967	 Qualification verified in SP#1 Qual SA test 	
	Pressure Operating Non-Operating	Sea Level to 10 ⁻¹² mm Hg	Tested to 10 ⁻⁵ mm Hg @ +158 ^o F					See Remark l	
	Humidity Operating Non-Operating	15% - 100% R.H. Random 7g RMS	Tested to 72 Hr @ 95% RH During Temp. Cycle +25°C to +70°C						
	Vibration Operating N/A Non-Operating Launch & Flight	20 min Sinusoidal 0.4 ir DA 5-20cps, 8g 20-100cps 2cy at	Random - Same Sinusoidal - same plus 9g 50-100 cps for 2 min					See Remark 1	
	Lunar Landing Acceleration Operating Non-Operating	1 oct/min ATR-16 Adden 1	Tested to 14 ± 1g 1 Min Duration 5 times ea. Axis.	Bendix Aerospace	Ann Arbor, Michigan	TP2334343 ATR-90, 91 BSR-2412, 2413	July 1968	Verified at S/P #1 Level Qualification, Qual SA	
	Shock Operating Non-Operating	N/A 20g for 11 ms	N/A Same	Dynatronics, Inc.	Orlando, Florida	Qualification Test Report 90 ch. Mult/Conv	7 March 1967	See Remark 1	
	Salt Spray Sand & Dust Fungus	N/A N/A N/A	N/A N/A N/A						
	Acoustical Noise Rain Radiation	N/A N/A N/A	N/A N/A N/A						
	Explosion Proof PARAMETRIC Multiplexer Analog Input Volt. Analog Accuracy Crosstalk (F. Scale)	N/A 0 - 5.0 v 0.33%	N/A -0.0196 to 5.0190 0.33% ±0.1%	Dynatronics, Inc.	Orlando, Florida	Qualification Test Report 90 Ch. Analog Mult/Converter	7 March 1967	See Remark 1	
	Leakage Current: ON OFF Input Impedance:	<0.5 µa <0.2 µa >50 Megohms	<20 nano amp < 2.3 nano amp >100 Megohms						
	OFF Analog Overvoltage: Operating Non Operating Power Consumption	>1 Megohms See Remarks ±12 v (max)	>1 Megohms Same ± 12 Same	V	V		and definition of the second	Ch. 6, 7, 26, 52, 67, 70:+8v, - Ch. 21, 36, 45, 80:+8v, -6.5v All remaining Chs:+8v, -5	

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Note: See sheet 2 of 2 on 90 Channel Multiplexer

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				Verification of Stress Level Capability						Anary		Page 2-0	f Page
	Environment	Stress	Level		Verii	cation	or Stress	Level C.	apability			-	
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent		Lo	ocation		cument erence		Date	Rei	marks
Multiplexer/ Converter A/D Convert Resolution	PARAMETRIC A/D Converter Resolution Quantizing Error	8 bits ± 1/2 bit	8 bits ± 1/2 bit	Dynatronics		Orlando, Florida		Qualification Test Report 90 Channel Analog Multi- plexer/Converte		7 March 1967		See remark 1 on sheet 1 of 2	
	Output Signal Level Logical "1" Logical "0"	0 to +0.4 v +2.5 to 5.5v	Same									Same as above	•
	Data Availability (After Encode Pulse)	165 µ sec	118 µu sec									Same as above	•
	Power Consumption	593.3 mw	Same									Same as above	
		·····						 	<u>Y</u>		<u>Y</u>		
	Multiplexer/Conv. Operating Life	l Year	l Year with Probability of 0.953							1 N	March		
	Storage Life	2 Years	0,953 Unit does not contain parts or material with known age limitations	Y		\	1	chan	nel System		п		
								-				<u> </u>	
								 					
	Functional Performance	Tested as part of System in space Chamber		BxA		Ann A Michi		ATR-	TP2333032 ATR-60,70 BSR, 2367, 2376		7, -June 968	Qualified as integrated sy	
	EMI Performance **	Tested as part of System to AL770		BxA	***	Ann A Michi	-	TP233 ATR-2 BSR-2	3087 27, 33 300, 2320	ł .	May 1968	Same as abov	e
	**					·····							

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				COMPONENTS			Analyst Rantec	Page of Pages
		Stress	Level	Ve	rification of Stress			
Item Nomenclature	Environment and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
Filter, Diplexer BxA #2330525	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-25°F to +160°F -65°F to +160°F	OK per reqm	Rantec Wyle Labs	Calabasas, Calif	#66279-QTP		1. Qualification verified in SP#1 Qual SA test
	Pressure Operating Non-Operating	∠10-12 Torr 30 to 1.3 Torr	l x 10 ⁻⁵ Torr OK	Wyle Labs	El Segundo, Calif		2/20/67	(Qualified in system to 5 x 10 ⁻⁶ Torrs)
	Humidity Operating Non-Operating	15 to 100% R. H.	100% RH at 160°F 100% RH at 120°F				2/8/67	NA
	Vibration-Operating	Random: 15 to 150 cps, 0.2g ² /c Sine:5 to 20 cps 0.4 in. D. A. 20	P⁵OK per reqm.				2/13/67	See remark 1
	Acceleration Non-Operating	to 100 cps 8g's N/A 25 g's ea. axis	OK per reqm				2/10/67	See remark l
	Shock Operating Non-Operating	N/A 20 g's ea. axis	OK per reqm.	↓ ·	1	1	2/9/67	See remark 1
	Salt Spray	N/A	N/A					
	Sand & Dust	N/A	N/A	,		 	<u> </u>	
	Fungus	N/A	N/A					
	Acoustical Noise	N/A	N/A					
	Rain	N/A	N/A					
	Radiation EMI	Radiated at fo=**		Bunker Ramo	Canoga Park Cali	f 66279-QTP	2/22/67	
	Explosion Proof	N/A	N/A					
	PARAMETRIC VSWR	1.36:1 Max all ports	1.22:1 max 33 Mc Min	Rantec	Calabasas, Calif.	66279-PTP-D	Before and after each environmental test	Qualified as part of an integrated system in the space simulation chambe during Qual S/A
	Insertion Loss	0.8 db Max	0.73 db max	Rantec	Calabasas, Calif.		1/16/67 to 2/23/67	TP 2333032 ATR-60,70 June 1968
	Isolation between Channels	50 db f _r to f _{LO} 80 db f _t to f _r	90 db min > 100 db min	Rantec	Calabasas, Calif.	66279-PTP-D	1/16/67 to 2/23/67	

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Note: 1. See paragraph 3.1.1.5 comments

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	Environment	Stress Level		v				
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
Diplexer Ten Switch Op BxA #2330526 No	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-25 ^o F to -160 ^o F	OK per reqm. OK per reqm.	Rantec Wyle Labs	Calabasas, Cali		2/19/67 2/6/67	 Qualification verified in SP#1 Qual SA test.
	Pressure Operating Non-Operating	10-12 Torr 30 to 1.3 Torr	l x 10 ⁻⁵ Torr OK	Wyle Labs	El Segundo Cali	66279-QTP	2/20/67	Qualified in system to 5 x 10 ⁻⁶ Torrs
	Humidity Operating Non-Operating	15 to 100% R.H.	100% RH at 160°F 100% RH at 120°F		-		2/8/67	
	Vibration -Operatin Non-Operating	g N/A Random: 15 to 150 cps, 0.2g ² /c Sine: 5 to 20 cps 0.4 in. D.A. 20 to 100 cps. 8 gs	ps OK per reqm				2/13/67	See remark l
	Acceleration Operating Non-Operating	N/A 25g's ea axis	OK per reqm.				2/10/67	See remark l
	Shock Operating Non-Operating	N/A 20 g's ea axis	OK per reqm				2/9/67	See remark 1
	Salt Spray	N/A	N/A					
	Sand & Dust	N/A	N/A					
	Fungus	N/A	N/A					
	Acoustical Noise	N/A	N/A	·				
	Rain	N/A	N/A			<u> </u>		
	Radiation	Radiated at fo=**		Bunker Ramo	Canoga Park Ca	lif 66279-QTP	2/22/67	
	Explosion Proof	N/A	N/A					
	PARAMETRIC VSWR	1.36:1 Max	1, 21:1 max (130 Mc min)	R antec	Calabasas, Calif	66279-PTP-S	Before and after each environmental test	
	Insertion Loss	0.7 db Max	0. 63 db max	Rantec	Calabasas, Cali	66279-PTP-S	1/16/67 to 2/23/67	Qualified as part of an integrated system in the space simulation chamber during Qual SA
	Isolation between Channels	20 db Min Port A to Port B or vice versa	22 db min	Rantec	C alabasas, Cali	66279-PTP-S	1/16/67 to 2/23/67	

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Note: See comments, paragraph 3.1.1.6

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Environment	Stress Level		Vei	rification of Stress			
and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon		· ·	Philco-Ford	Palo Alto California	Qualification Test Report RN-DA-1795		1. Qualification verified Qual SA SP#1 test
Pressure Operating Non-Operating	l x 10 ⁻¹² mm Sea Level-10 ⁻⁸ n	lx10 ⁻⁵ mmHg nm 1x10 ⁻⁵ mmHg					See remark l
Humidity Operating Non-Operating	15% - 100%	15% - 100%			7.		Ţ
Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to ATR-16 Addendum #1	N/A 9.0G - peak 20 - 100 cps					Qualified at S/P #1 Design Limit Test Level for a Stowed Configuration Test Levels per figures
Acceleration Operating Non-Operating	N/A ATR-16, Add. #	N/A 1 ¹ 4G - 1 min. each of 3 axes					See remark l
Operating Non-Operating	N/A ATR-16, Add. #1				↓		See remark 1
			· · · · · · · · · · · · · · · · · · ·				
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						· · · · · · · · · · · · · · · · · · ·	
					 	· · · · · · · · · · · · · · · · · · ·	
					 	 	
PARAMETRIC Functional Performance EMI Performance	Tested as part of	f Integrated	BxA	Ann Arbor, Michigan	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	See remark l
			B×A	Ann Arbor, Michigan	TP 2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	See remark l
	·						
	Parameter ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon Pressure Operating Non-Operating Humidity Operating Non-Operating Vibration Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Shock Operating Non-Operating Shock Operating Non-Operating Shock Operating Non-Operating Salt Spray Sand & Dust Fungus Acoustical Noise Rain Radiation Explosion Proof PARAMETRIC Functional Performance	ENVIRONMENTAL Temperature: Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Acceleration Operating Non-Operating Non-Operating Non-Operating N/A Sand & Dust N/A Fungus N/A Rain N/A Radiation N/A Radiation N/A Explosion Proof PARAMETRIC Functional Performance EMI Performance Tested as part	ENVIRONMENTAL Temperature: Operating Non-Operating Acceleration Operating Non-Operating Acceleration Operating Non-Operating Shock Operating Non-Operating Acceleration Operating Non-Operating Shock Operating Non-Operating Non-Operating Non-Operating Shock Operating Non-Operating No	Environment and/or Parameter Requirement Capability Agent ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon Pressure Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-O	Environment and/or Parameter Requirement Capability Agent Location ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon Pressure Operating Non-Operating Humidity Operating Non-Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Shock Operating Non-Operating Shock Operating Non-Operating Non-Operat	ENVIRONMENTAL Temperature: Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Non-Operating Non-Operating ATR-16, Add. #14G-1 min. Cach of 3 axes Shock Operating Non-Operating Non-Operat	Environment and/or Parameter Requirement Capability Agent Location Document Reference Date

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	Environment	Stress Level		Verification of Stress Level Capability				
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
Timer, Central Station P/N 2330626	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-30°C to +80°C -55°C to 100°C -30°C to +80°C	-30°C to +80°C -55°C to +100°C -30°C to +80°C	Bendix Aerospace Systems Division (BxA)	Ann Arbor, Michigan	TP2334335 ATR-60,70 BSR-2367,2376	May-June 1968]	Qualification of the Timer has been accomplished at the System Level in Qual SA
	Pressure Operating Non-Operating	lx10 ⁻¹² Torrs lx10 ⁻⁸ Torrs	Verified to 5x10 Torrs in space Simulation Cham	BxA ber	Same	Same	Same	See remark l
	Humidity Operating Non-Operating	N/A 50% to 100% RH	Designed to Meet Humidity Requirements	N/A	N/A	N/A	N/A	Test Not Required
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to ATR-16 Addendum 1	See Fig 1 thru 5	BxA	Ann Arbor, Michigan	TP2334346 ATR-82,83 BSR-2402,2403	July-Aug. 1968	Qualification of the Timer was accomplished at the System Level in Qual SA
	Acceleration Operating Non-Operating	N/A ATR-16, Add. 1	Tested at 14+1g 1 Min Duration each Axis	BxA	Same	TP2334343 ATR-90,91 BSR-2412,2413	July 1968	Qualified to S/P#1 Design Limit Test for a Stowed Configuration
+	Shock Operating Non-Operating	N/A ATR-16, Add, 1	Tested to 15 <u>+</u> 2g 11 ms Sawtooth each Axis	BxA	Same	TP2334328 ATR-86,87 BSR-2406-2407	July 1968	Same as above
	Salt Spray Sand & Dust Fungus	N/A	N/A					
	Acoustical Noise Rain Radiation							
	Explosion Proof PARAMETRIC Power Requirements Volts Current Start Mode Stop Mode	N/A 1.2 to 1.5 VDC 12μ amp max 7μ amp max	N/A 1.2 to 1.5 VDC 12μ amp max 7μ amp max	BxA	Same	TP2334335	August 1968	See remark l
	Switch Closures; Repetitive Non-Repetitive	1 Minute 12 Hr 720 Day	1 Minute 12 Hr 720 Day	BxA	Same	Same	Same	See remark l
970-12				Note: See comme	eta in paragraph 3	1 1 0		Sheet B8 of 26

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			COr	MPONENTS			Analyst J. T.	Page of Pages
Environment	Stress Level		Verification of Stress Level Capability					
Item Nomenclature	and/or Parameter	Requirement AL 410100	Capability	Agent	Location	Document Reference	Date	Remarks
Power Conditioning Unit (P. C. U.) ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-22°F to+158°F -65°F to+160°F	-22°F to+158°F -65°F to+160°F	Bendix Aerospace Systems Division	Ann Arbor, Mich.	T. P. 2334335 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qualified in Subpackage #1 system level tests performed on Qual SA	
	Pressure Operating Non-Operating	Sea Level to lx10 ⁻¹² Torr	Tested to 5x10 ⁻⁶ Torr		;	T. P. 2334335 ATR-60, 70 BSR-2367, 2376		Test level limited by Test Equipment Capability
	Humidity Operating Non-Operating	15 to 100%	Designed to meet humidity requirements			N/A	N/A	Testing Not Required
9	Operating Non-Operating Launch & Flight Lunar Landing	ATR-16 Adden.#1	Tested to S/P#1 Design Limits Test Levels(Refer to Fig I thru 5)			T. P. 2334346 ATR-82, 83 BSR-2402, 2403	July 1968	Qualified at Subpackage #1 Design Limit Test Levels for a stowed configuration in Qual SA
	Operating Non-Operating	ATR-16 Adden.#I	Tested to 14±1g, 1 min duration, 5 times per axis	6		T. P. 2334343 ATR-90, 91 BSR-2412, 2413	July 1968	Verified at Subpackage #1 Design Limit Test and for a stowed configuration
	Operating Non-Operating	ATR-16 Adden. #1	Tested to 15±2g, 11 ms 3 times each axis	Ų.		T. P. 2334328 ATR-86, 87 BSR-2406, 2407	July 1968	Verified at Subpackage #1 Design Limit Test and for a stowed configuration
	Salt Spray Sand & Dust	N/A Not Defined	N/A N/A					No Test Required
Rain Radiati Explosi PARAME	Acoustical Noise	N/A Not Defined N/A	N/A NYD N/A					No Test Fequired
	Radiation Explosion Proof	Not Defined Not Defined	NYD N/A					
	PARAMETRIC		-					
	Functional Performance	Tested as part of tem in Space Sin	Integrated Sys- ulation Chamber	BxA	Ann Arbor, Mich.	T. P. 23333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	See first remark
	EMI Performance	Tested as part of System to AL770		BxA	Ann Arbor, Mich.	T.P. 2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	See first remark

Date 3/6/70 No. ATM-859 Rev. No. QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS Analyst J.M. Page. Pages Verification of Stress Level Capability Stress Level Environment Item and/or Document Remarks Location Nomenclature Agent Date Parameter Capability Requirement Reference ENVIRONMEN TAL Temperature: Command Decoder TP 2334335 Qualified in SP#1 during 22°F to +158°F -22°F to +158°F Operating Bendix Aerospace Ann Arbor, Mich ATR-60,70 May-June BxA #2330509 Qual SA test Non-Operating BSR-2363, 2376 1968 -65⁰F to +160⁰F .65°F to +160°F Earth Moon Test Level Limited by Pressure Tested in Spare May-June 1 x 10 - 12 mmHg BSR-2363, 2376 Ann Arbor, Mich Operating Sim. Chamber to Bendix Aerospace 1968 Equipment Capability 5x10-6 Torr Non-Operating S/L to 1 x 10mmHg Humidity Designed to meet No testing required. Operating Bendix Aerospace Ann Arbor, Mich. N/A Humidity Re-N/A N/A Non-Operating 15% to 100% quirements Vibration Tested to S/P#1 Qualified to Design Limit Bendix Aerospace Ann Arbor, Mich TP2334346 Operating N/A Design Limit Test June Test Levels for Subpackage #1 Non-Operating Refer to ATR-16 Levels Refer to ATR-82, 83 1968 (in the stowed configuration) Launch & Flight Addendum I figures 1 through BSR-2402, 2403 during Qual SA Lunar Landing Acceleration Tested to TP 2334343 Qualified to Design Limit Bendix Aerospace Ann Arbor, Mich ATR-90, 91 Operating N/A 14 ± lgl Min Dur July Test Levels for Subpackage #1 ATR-16, Add. 1 ation 5 times in Axis BSR-2414, 2413 1968 Non-Operating (in the stowed configuration) Shock TP 2334328 Tested to 15 Qualified to Design Limit July Bendix Aerospace Operating N/A ±2gllms Saw-Ann Arbor, Mich ATR-86, 87 Test Levels for Subpackage #1 1968 Non-Operating ATR-16, Add. 1 tooth 3 times in Ax BSR-2406, 2407 (in the stowed configuration Bendix Aerospace Ann Arbor, Mich Salt Spray N/A N/A Ann Arbor, Mich Sand & Dust Not Defined Designed to Meet Bendix Aerospace Fungus Ann Arbor, Mich N/A N/A Bendix Aerospace Acoustical Noise Not Defined Bendix Aerospace Ann Arbor, Mich Rain N/A N/A Ann Arbor, Mich Bendix Aerospace I. R. 130 w/ft² Ann Arbor, Mich TP 2334335 Radiation Not Defined May-June 1968 Bendix Aerospace Explosion Proof Ann Arbor, Mic N/A N/A Bendix Aerospace PARAMETRIC May-June 1968 Qualified via Integrated System Ann Arbor, Mich TP 2333032 Tested as part of Integrated Bendix Aerospace Thermal Vacuum Test for a System in space Simulation Functional Simulated Lunar Mission during Chamber ATR-60,70 Performance Oual SA BSR-2367, 2376 TP2333087 Ann Arbor, Mich Bendix Aerospace May-June Tested as part of Integrated ATR-27, 33 EMI Same as above 1968 System to AL770 000 BSR-2300, 2320 Performance

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CENTRAL STATION ELECTRONICS

Date 3/6/70 No. ATM-859 Analyst J.M. COMPONENTS Page _ Pages Verification of Stress Level Capability Stress Level Environment Item and/or Document Remarks Nomenclature Location Agent Parameter Capability Date Requirement Reference ENVIRONMENTAL Temperature: TP 2334335 Power Distribution ATR-60,70 -22°F to +158°F -22⁰F to +158⁰F Unit (PDU) Operating Bendix Aerospace Ann Arbor, May-June BSR-2367, 2376 Non-Operating BxA 2330450-2 1. Qualified in SP#1 Systems Division Michigan 1968 -65°F to +160°F -65⁰F to +160⁰F Earth during Qual SA Moon Tested in Space Pressure TP 2334335 Bendix Aerospace Ann Arbor, May-June lx10⁻¹²mmHg S/Lto lx10⁻¹²mm Simul. Chamber to 5x10-6 Torrs Operating Systems Division Michigan ATR-60,70 1968 Test Level Limited by Non-Operating BSR-2367, 2376 Equipment Capability Humidity Hg Designed to meet No testing required Humidity Re-Operating N/A N/A N/A Non-Operating 15% to 100% quirements Vibration Tested to S/P#1 Design Limit Test N/A Operating TP 2334346 Qualified at Subpackage(S/P)#1 Levels Refer to Non-Operating Refer to ATR-16 ATR-82, 83 Design Limit Test Levels for July fig I thru 5 Launch & Flight Addendum 1 BSR-2402, 2403 1968 a Stowed Configuration Lunar Landing during Qual SA Acceleration Tested to 14 TP 2334343 Operating ± lg I Min. Dur-N/A ATR-90, 91 July ation, 5 times ea Non-Operating ATR-16, Add. 1 BSR-2412, 2413 1968 Shock Tested to 15 TP 2334328 ±2g, 11 mo Saw-Operating N/A ATR-86, 87 July-Aug tooth 3 times ea Non-Operating ATR-16, Add. I BSR-2406, 2407 1068 Salt Spray N/A N/A Not Defined Designed to Meet Sand & Dust No testing required N/A N/A Fungus Acoustical Noise Not Defined No testing required N/A Rain N/A Not Defined tested to 130w/ft2 IR Radiation Explosion Proof N/A N/A PARAMETRIC Functional Tested as part of Integrated Ann Arbor. TP 2333032 May-June BxAPerformance System in Space Simulation Michigan ATR-60,70 1968 See first remark BSR-2367, 2376 Chamber Ann Arbor, TP 2333097 EMITested as part of Integrated BxAATR-27, 33 Performance System to AL770 000 Michigan See first remark BSR-2300, 2320

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QUALIFICATION	STATUS	LIST-ALSEP	PROGRAM

UALIFICATION ST	ATUS LIST-ALSEP PR	OGRAM CENT	RAL STATION E	LECTRONICS COMPO	NENTS		Date 3/6/70 Analyst J. M.	No. ATM-859 Rev. No. A
				1	: 6::	. 10 111	imarystj. M.	Pageof Pages
	Environment	Stress	Level	V e	rification of Stress	Level Capability		4
Item Nomenclature	and/or Parameter	Requirement AL 310900	Capability	Agent	Location	Document Reference	Date	Remarks
Data Processor BxA #2330521	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	TTAL -22°F to +158°F		Bendix Aerospace Systems Division	Ann Arbor, Mich	T.P. 2334335 ATR-60,70 BSR-2367,2376	May-June 1968	Successfully tested model on Qual SA model
		lx 10 ⁻¹² mm Hg AMB to bxl0 ⁻¹² mm Hg	Tested is spare chamber to 5 x 10-6 Torr				V	Test level limited by Equipment Capability.
	Humidity Operating Non-Operating		Designed to meet humidity requirements			N/A	N/A	No testing required
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	NA Refer to ATR-16 Addendum 1	Tested to S/P #1 Design Limit Test Levels. Refer to figures 1 thru 5.			T.P. 2334346 ATR-82,83 BSR-2402,2403	June-July 1968	Qualified at Subpackage #1 Design Limit Test Levels for a stowed configuration.
	Acceleration Operating Non-Operating Shock Operating	N/A ATR-16,Add. 1 N/A	Tested to 14 ± 1g 1 Min Duration 5 times ea. Axis. Tested to 15 ± 2g 11 ms sawtooth			T.P. 2334843 ATR-90,91 BSR-2412,2413 T.P. 2334328 ATR-86,87	i	
	Non-Operating Salt Spray Sand & Dust		3 times ea. Axis. N/A			BSR - 2406, 2407	\	
	Fungus Acoustical Noise Rain	N/A Not Defined N/A	N/A N/A					
	Radiation Explosion Proof	Not Defined N/A	130 w/ft ² IR Lamp N/A			T.P. 2334335	May-June''68	
	PARAMETRIC See Table I Sheet B-9	Tested as part of System in Space Chamber				T.P. 2333032 ATR-60,70 BSR-2367,2376	May-June 1968	Qualified via Integrated Syste Thermal Vacuum Test for a simulated lunar mission.dur- ing Qual SA
	EMI Performance	Tested as part				TP2333087 ATR-27,33 BSR-2300,2320	May-June 1968	Same as above

QUALIFICATION	STATUS	LIST-ALSEP	PROGRAM
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PASSIVE SEISMIC EXPERIMENT

No. ATM-859 Rev. No. Date 3/6/70 Analyst Page ____of __ _ Pages Verification of Stress Level Capability

	Environment Stress Level Verification of Stress Level Capability							
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
PSE Central Station Electronics	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	107°F to 125°F -65°F to 160°F Same as Operating	Tested is Space Simulation Chamber for Temperature	Bendix Aerospace Systems Division	Ann Arbor, Michigan	TP2334335 ATR-60,70 BSR-2367,2376	June 10 1968	Successfully tested on BxA Qual SA model
BxA #2334670	Pressure Operating Non-Operating	1 x 10 ⁻¹² mm Hg 1 x 10 ⁻⁸ mm Hg	Verified to 5 x 10 ⁻⁵ Torrs in Space Sim. Cham				V	
	Humidity Operating Non-Operating	Not Applicable	Designed to Meet Humidity Requirements			N/A	N/A	N/A
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	Not Applicable Refer to ATR-16 Addendum 1	Tested in Stowed Configuration to Vibration Design Limits Indicated in Figs. 1 Thru 5.			TP2334346 ATR-82, 83 BSR-2402, 2403	6/28/68	Successfully Tested, Qual Sa
	Acceleration Operating Non-Operating	Not Applicable ATR-16, Add. 1	Tested in Stowed Configuration to 14 ± 1g. 1 Min.			TP2334343 ATR-90,91 BSR-2412,2413	7/4/68	Successfully Tested, Qual S
	Shock Operating Non-Operating	Not Applicable ATR-16, Add. 1	Tested in Stowed Configuration to 15 ± 2g 11ms 3 Times Ea. Axis	V	V	TP2334328 ATR-86,87 BSR-2406,2407	6/24/68	Successfully Tested, Qual S.
	Salt Spray Sand & Dust	Not Applicable LED-520	Not Applicable Designed To Meet				<u> </u>	
	Fungus Acoustical Noise	Not Applicable Not Applicable	Not Applicable Not Applicable					
	Rain	Not Applicable Not Applicable	Not Applicable Not Applicable					
	Radiation	LED-520	Designed to Meet					
	Explosion Proof PARAMETRIC Functional Performance		Not Applicable of the integrated pace simulation	BxA	Ann Arbor, Michigan	TP 2333032 ATR-60-70 BSR-2367,2376	June 10, 1968	See first remark
	EMI Performance	Tested as part system	of the integrated	BxA	Ann Arbor, Michigan	TP 2333087 ATR-27, 33 BSR-2300, 2320	April 1968	See first remark
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WELLICKTION 314	NTUS LIST-ALSEP PR	UGKAM					Analyst	ATM-859 ATM-859
	1			Vorit	ication of Stress	Lovel Camphility	111141951	Pageof Pages
	Environment	Stress	Level	Vern	ication of Stress	Level Capability		
Item and/or Nomenclature Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks	
	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	2000	(External SP #1 -300°F to +250°F -4°F to +140°F; ASE mounted in CSE	BxA	Ann Arbor, Mich.	TP 2333026 TP 2337912 TP 2334389 ATR-172 BSR-2588	3/1/69	EMI fixes requal completed 10-31-69 per T/V TP 2341497
	Pressure Operating Non-Operating	10- ¹² Torr SL to 10- ¹² Torr	Tested to 5 x 10 ⁻⁶ Torr	BxA	Ann Arbor, Mich	Same as above	3/1/69	Same as above.
	Humidity Operating Non-Operating	N/A 15% to 100%	Designed to meet requirements			N/A		No Test Required.
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to NASA	Tested to design Limit Vibration Levels indicated in Figures 1-5 & Tables I, II, III	BxA	Ann Arbor, Mich	TP 2334322A ATR-176 BSR-2592	5/21/69	EMI fixes requalified in vibration per TP 2344948 completed 2/5/70.
	Acceleration Operating Non-Operating	N/A 14g - x axis	Tested to 14.5g 1 minute dura- tion x axis	BxA	Ann Arbor, Mich.	TP 2334323 ATR-176 BSR-2592	5/22/69	Same as above
	Shock Operating Non-Operating	N/A 15g - 11 ms	Tested to 15±2g 11 ms sawtooth each axis	BxA	Ann Arbor, Mich	TP 2334324 ATR-176 BSR-2592	5/16/69	Same as above
	Salt Spray	N/A						No Test Required
	Sand & Dust	Not defined						No Test Required
	Fungus	N/A						No Test Required
	Acoustical Noise	Not defined						No Test Required
	Rain	N/A						No Test Required
	Radiation	LED-520	130 W/ft ²	BxA	Ann Arbor, Mich	TP 2337912	3/1/69	See Operating Temperature
	Explosion Proof	N/A						No Test Required
	PARAMETRIC EMI	AL-770-000 .	Tested to design Requirements	BxA	Ann Arbor, Mich.	TP 2333076A ATR-186 BSR-2614	6/10/69	EMI fixes requalified per TP 2338180 and completed 10/19/69.
	Functional Performance	ALSEP TM-342	Capable of start- up and operation on Lunar Surface		Ann Arbor, Mich	TP 2333025D TP 2333025A	6/3/69 3/1/69	Deployed performance verified by line I T/V qual and requal functional tests.
	NOTE 1:	As noted in Secti	on 1.0 on page 5 o heduled for comp	f ATM 859, the ASE Cr etion at McCoy Electro	ystal Filter, Bend nics, 15 May 1970	ix Specification 2	340326 remains	to be qualified for physical
	i	1	L		<u> </u>	1	1	B14

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Note: See comments, paragraph 3.1.1.15 and sections 2.3 and 2.4, and Introduction page 5.

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Item	Environment	Stress	Lawel	v	erification of Stress	Lovel Conshilit	_	1
		ł	Pener -		T Diress	Level Capability		4
Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-300°F to +250°F -65°F to +160°F	-300°F to +250°F	BxA	Ann Arbor, Mich	TP 2333026 TP 2337912 TP 2334389 ATR-172 BSR-2588	3/1/69	Qual C Array
	Pressure Operating Non-Operating	10 ⁻¹² Torr SL to 10 ⁻¹² Torr	Tested to 5 x 10 Torr	BxA	Same	Same as above	3/1/69	Test level limited by test equipment capabilities
	Humidity Operating Non-Operating	N/A 15% to 100%	Designed to meet require- ments			N/A	N/A	No Test Required
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to NASA	Tested to design Limit Vibration Levels indicated in Figures 1-5	ВжА	Same	TP 2334322A ATR-176 BSR-2592	5/21/69	Mass simulators and proto hardware used for other than ASE and Array C units.
	Acceleration Operating Non-Operating	N/A 14g-x axis	Tested to 14+1g l minute dura- tion x axis	BxA	Same	TP 2334323 ATR-176 BSR-2592	5/22/69	Same as above
	Shock Operating Non-Operating	N/A 15g-11 ms	Tested to 15±2g 11 ms sawtooth each axis	BxA	Same	TP 2334324 ATR-176 BSR-2592	5/16/69	Same as above
	Salt Spray	N/A						No Test Required
	Sand & Dust	Not defined						No Test Required
	Fungus	N/A						No Test Required
	Acoustical Noise	Not defined						No Test Required
	Rain	N/A					I	No Test Required
	Radiation	LED-520	130 W/ft ²	BxA	Same		3/1/69	See Operating Temp.
	Explosion Proof	N/A						No Test Required
	PARAMETRIC Functional Performance ALSEP TM-342	Tested as part of an integrated system following induced environ- ments	Capble of deployment and operation on Lunar Surface	BxA	Same	TP 233025D ATR-177 BSR-2593	6/3/69	Qualified as part of integrated system following induced environments

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Note: See comments, paragraph 3.1.2.

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Date 3-6-70 Rev. No. No. ATM-859 QUALIFICATION STATUS LIST-ALSEP PROGRAM Analyst Pages Verification of Stress Level Capability Stress Level Environment Item and/or Document Remarks Nomenclature Agent Location Parameter Date Requirement Capability Reference ENVIRONMENTAL TP 2333026 Switch Actuator 3/1/69 Used in ASE EMI requal test Temperature: BxA 2335825 TP 2337912 -300°F to +250°F -300°F to +250°F completed per T/V post test Operating (Astro Sw. Assy.) BxAAnn Arbor, Mich TP 2334389 TP 2341497 on 10/31/69. Non-Operating -65°F to +250°F -300°F to +250°F ATR-172 Earth BSR-2588 Moon Pressure Tested to 10⁻¹² Torr SL to 10⁻¹² Tor 5 x 10⁻⁶ Torr Same Same as above 3/1/69 Operating BxASame as above Non-Operating Humidity Designed to Operating N/A BxAN/A meet require-No test required Non-Operating 15% to 100% ments Vibration Tested to design Operating TP 2334322A 5/21/69 N/A Qual C Array limit Vibration Non-Operating ATR-176 Refer to NASA BxASame levles indicated Launch & Flight TD3/L023/68-BSR-2592 in Figures 1-5 Lunar Landing B-26/(JAC) TP 2334323 5/22/69 Acceleration Tested to 14+1g Qual C Array Operating N/A 1 minute dura-BxASame ATR-176 Non-Operating 14g-x axis BSR-2592 tion x axis TP 2334342 Shock Tested to 15+2g 5/16/69 Qual C Array Operating N/A ll ms sawtooth BxASame ATR-176 Non-Operating 15g-11 ms BSR-2592 each axis Salt Spray N/A No Test Required Sand & Dust No Test Required Not defined Fungus No Test Required N/A Acoustical Noise Not defined No Test Required Rain N/A No Test Required 130 W/ft² 3/1/69 See Operating Temperature Radiation LED-520 BxASame TP 2337912 Explosion Proof N/A No Test Required PARAMETRIC Qualified During Capable of Tested during TP 2335643 Functional operation on 5/29/69 partial integrated partial integrat ATM-177 Performance Lunar surface BxASame System test in ed systems test BSR-2593 ALSEP TM-342 Space Simulation in space simu-Chamber, TP 2333026. lation chamber.

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Note: See comments, paragraph 3.1.2.1.

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ALIFICATION STA	ATUS LIST-ALSEP PR	OGRAM PASSIVI	E SEISMIC EXPER	IMENT			Date 3/6/70	No.ATM-859 Rev. No.
							Analyst	Page of Pages
	Environment	Stress	Level	Ver	ification of Stress	Level Capability		
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
PSE ensor Assembly PN 233425 BXA #2338460-2		107 ⁰ to 125 ⁰ F -65 ⁰ F to 160 ⁰ F Same as Operating	Tested is Space Simulation Chamber for Temperature	Bendix Aerospace Systems Division	Ann Arbor, Michigan	T13022 TP2334335 ATR-60,70 BSR-2367,2376	11 Jan 69 June 10, 1968	
	Pressure Operating Non-Operating	1 x 10 ⁻¹² mm Hg 1 x 10 ⁻⁸ mm Hg	5 x 10 ⁻⁵ Torrs in Space Sim. Cham.			V		Test level limited by test equipment capability
		Not applicable 50-100% R.H.	Designed to Meet Humidity Requirement			N/A	N/A	N/A
	Vibration	Not Applicable Refer to ATR-16 Addendum 1	Tested in Stowed Configuration to Vibration Design Limits Indicated in Fig. 1 Thru 5			TP2334346 ATR-82, 83 BSR-2402,2403	6/28/68	See first remark
	Operating	Not Applicable ATR-16, Add.1	Tested in Stowed Configuration to 14 ± 1g, 1 Min.			TP2334343 ATR-90, 91 BSR-2412,2413	7/4/68	See first remark
	Operating Non-Operating	Not Applicable ATR-16, Add 1	Tested in Stowed Configuration to 15 ± 2g llms 3 Times Ea. Axis	٧	V	TP2334328 ATR-86,87 BSR-2406,2407	6/24/68	See first remark
	Salt Spray Sand & Dust	Not Applicable LED-520	Not Applicable Designed to Meet					
	Fungus	Not Applicable	Not Applicable					
	Acoustical Noise Rain	Not Applicable Not Applicable	Not Applicable Not Applicable					
	Radiation Explosion Proof	LED-520 Not Applicable	Designed to Meet Not Applicable					
]	PARAMETRIC Functional Performance	Tested as part of System in Space Chamber		BxA		TP 2333032 ATR-60,70 BSR-2367,2376	June 10 1968	See first remark
	EMI Performance	Tested as part of system	f integrated	BxA		TP 2333087 ATR-27, 33 BSR-2300,2320	April 1968	See first remark

Note: See comments, paragraph 3.1.3.2

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QUALIFICATION STA	TUS LIST-ALSEP PR	OGRAM					Date 3-6-70	No. ATM-859 Rev. No. A
	T			Tr.	· (C)	1.0 1	Analyst	Page of Pages
	Environment	Stress Level		ve	rification of Stress	,	4	
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
Mortar Package Assembly BxA 2334500-5 S/N-3 Grenade Launcher Assembly	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-300°F to -250°F -65°F to +160°F -300°F to +250°F	-300°F to+280°F	BxA	Ann Arbor, Mich	TP 2333026 TP 2337912 TP 2334389 ATR-172 BSR-2588	3/1/69	EMI fixes requalified 10-31-69 with completion of TV TP2341497
BxA 2338507-2 S/N-2 Thermal Bag	Pressure Operating Non-Operating	10 ⁻¹² Torr SL to 10 ⁻¹² Torr	Tested to 5 x 10-6 Torr	BxA	Same	Same as above	3/1/69	Same as above
BxA 2330803-2 S/N-6 Mortar Box	Humidity Operating Non-Operating	N/A 15% to 100%	Designed to meet require- ments			N/A		No Test Required
Assembly BxA 2334499-4 S/N-6	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to NASA TD3/L023/68 B-26/(JAC)	Tested to design Limit Vibration Levels indicated in Figures 1-5	ВжА	Same	TP 2334322A ATR-176 BSR-2592	5/21/69	Qual C Array
	Acceleration Operating Non-Operating	N/A 14g - 11 ms	Tested to 14+1g 1 minute dura- tion each axis	ВжА	Same	TP 2334323 ATR-176 BSR-2592	5/22/69	Qual C Array
	Shock Operating Non-Operating	N/A 15g - 11 ms	Tested to 15 <u>+</u> 2g 11 ms sawtooth each axis	BxA	Same	TP 2334324 ATR-176 BSR-2592	5/16/69	Qual C Array
	Salt Spray	N/A						No Test Required
	Sand & Dust	Not defined						No Test Required
	Fungus	N/A						No Test Required
	Acoustical Noise	Not defined					<u> </u>	No Test Required
	Rain	N/A		·		<u> </u>	<u> </u>	No Test Required
	Radiation	LED-520	130 W/ft ²	B x A	Same	<u> </u>	4/23/59	See Operating Temp.
	Explosion Proof PARAMETRIC EMI	N/A AL 770 000	Tested to design requirements	BxA	Same	TP 2333076A ATR-18C BSR-2614	6/10/69	Requalification test of ASE performed per TP2338180 completed 10-19-69
	Functional Performance	ALSEP TM-342	Capable of deployment and operation on Lunar surface	BxA	Same	TP 2333025D ATR 177 BSR-2593	6/3/69	Qualified during Partial Integrated Systems Test in Space Simulation Chamber

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	Environment	Stress	Level	Ve	rification of Stress	Level Capability		_]
Item Nomenclature	and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
Geophone Thumper Assembly BxA 2334772-4 S/N-3	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-300°F to +250°F -65°F to +160°F -300°F to +250°F	-300°F to +280°F	BxA	Ann Arbor, Mich	TP 2333026 TP 2337912 TP 2334381 ATR-172 BSR-2588	3/1/69	EMI fixes requalified by T/V and functional retest per TP2341497 completed 10-31-69
	Pressure Operating Non-Operating	10-12 Torr SL to 10-12 Torr	Tested to 5 x 10 ⁻⁶ Torr	BxA	Same	Same as above	3/1/69	Same as above
-	Humidity Operating Non-Operating	N/A 15% to 100%	Designed to meet require- ments	BxA	Same	N/A	N/A	No Test Required
:	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to NASA TD3/L023/68- B-26/(JAC)	Tested to design Limit Vibration Levels indicated in Figures 1-5	ВжА	Same	TP 2334322A ATR-176 BSR-2592	5/21/69	EMI fixes requalified in vibration per TP2344948 completed 2-5-70
	Acceleration Operating Non-Operating	N/A 14g-x axis	Tested to 14+1g 1 minute dura- tion x-Axis	BxA	Same	TP 2334323 ATR-176 BSR-2592	5/22/69	Same as above
	Shock Operating Non-Operating	N/A 15g-11 ms	Tested to 15±2g 11 ms sawtooth each axis	B∗A	Same	TP 2334324 ATR-176 BSR-2592	5/16/69	Same as above
	Salt Spray	N/A						No Test Required
	Sand & Dust	Not defined						No Test Required
	Fungus	N/A						No Test Required
	Acoustical Noise	Not defined					 	No Test Required
	Rain	N/A	100 717 / 0.7				2/11//2	No Test Required
	Radiation	LED-520	130 W/ft ²	BxA	Same	TP2337912	3/1/69	See Operating Temp.
	Explosion Proof	N/A					ļ	No Test Required
	<u>PARAMETRIC</u> EMI	AL770 000	Tested to design Requirements	B x A	Same	TP 2333076A ATR-186 BSR-2614 ATR-125	6/10/69	EMI fixes requalified per TP2338780 and completed 10-19-69
	Functional Performance	ALSEP TM-342	Capable of deployment and operation on Lunar Surface	BxA	Same	TP2333025D TP2333025A	6/3/69 3/1/69	Qualified during Partial Integrated Systems Test in Space; Simulation Chamber and requa
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Note: See comments, paragraph 3.1.3.5, and section 2.3.

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TUS LIST-ALSEP PR	OGRAM SUBPAC	CKAGE I, ANTEN	NA ASSEMBLY	Revised 1/	31/69	Date 3/6/70	No. ATM-859 Rev. No. A
	Strass	Level	Verif		<u> </u>	R. O. J.	Page of Pages
and/or			Agent	Location	Document	Date	Remarks
1 arameter	Requirement	Саравину			Reference		
ENVIRONMENTAL Temperature: Operating Non-Operating	-250°F to+300°F	Tested in Space Simulation Chamber for	Bendix Aerospace Systems	Ann Arbor, Mich		May-June 1968	Qualification of the Antenna Assy has been accomplished at system level during
Earth Moon	-65°F to +160°F N/A	of -300°F to +250°F		· 	BSR-2367, 2376		Qual SA.
Pressure Operating Non-Operating	1x10 ⁻¹² mmHg Sea L to 10 ⁻⁸ mmHg	Verified to 5x10 ⁻⁶ Torrs in Space Sim Cham	Bendix Aerospace S y stems	Ann Arbor, Mich	TP2334335 ATR-60,70 BSR-2367,2376		Test level limited by test equipment capabilities
Humidity Operating Non-Operating	N/A 15% to 100% RH	Designed to meet Humidity Req'mt	Bendix Aerospace Systems	Ann Arbor, Mich	N/A	N/A	No Testing required
Non-Operating	N/A Refer to ATR-16 Addendum 1	Tested in stowed configuration to vibration design limits indicated in Figs I thru 5	Bendix Aerospace Systems	Ann Arbor, Mich	T. P. 2334346 ATR-82, 83 BSR-2402, 2403	June-July 1968	In stowed configuration, the aiming mechanism is mounted on S/P#2. Refer to ATM-776 for x-Axis Random Vibration Qual level for Earth Launch
Acceleration Operating Non-Operating	N/A ATR-16, Add. 1	configuration 14 ±1g, 1 min 5 tests ea axis	Bendix Aerospace Systems		ATR-90, 91 BSR-2412, 2413	July 1968	Boost Phase Successfully qualified (See note)
Operating Non-Operating	N/A ATR-16, Add. 1	Tested in stowed configuration 15g±2, 11 ms 3 times ea axis	Bendix Aerospace Systems	Ann Arbor, Mich	TP 2334328 ATR-86, 87 2406, 2407	July 1968	
		Exceeds Req	Bendix Research Labs	Southfield, Mich	Design Verif.	June 1967	Verified by Analysis
			_ , , _ , _ , _ , _ , _ , _ , _ , _ , _	6 06 11 16 1		+ - 10/2	77
		Exceeds Req	Bendix Research Labs	Southfield, Mich	Design verii.	June, 1967	Verified by Analysis
PARAMETRIC Radiated Power (Eff. Beamwidth	42.5 dbm 27°@ 11.7 db 27°@11.0 db	42.5 dbm 29°@ 11.7 db 31°@11.0 db	Bendix Research Labs	Southfield, Mich	Design Verif. Report #4028	June 1967	Past environmental functional tests sucessfully performed on the antenna assembly at Bx Research
Input VSWR @Transmitter f _o @Receiver f _o	1. 25:1 1. 5:1	1. 25:1 1. 50:1	Bendix Research Labs	Southfield, Mich.	Design Verif. Report #4028		on 9/12/68 per TP2338629 and documented by Report BRL #4620
Minimum Power Handling Capability Maximum Aiming	1.5w CW @Transmitter for 1.16° RMS	1.5w CW @Transmitter f 0.75° RMS	Bendix Research Labs	Southfield, Mich	Design Verif.		
	Environment and/or Parameter ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon Pressure Operating Non-Operating Humidity Operating Non-Operating Vibration Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Shock Operating Non-Operating Shock Operating Non-Operating Shock Operating Ron-Operating Salt Spray Sand & Dust Fungus Acoustical Noise Rain Radiation Explosion Proof PARAMETRIC Radiated Power (Eff. Beamwidth Transmit/Receive) Input VSWR @Transmitter fo @Receiver fo Minimum Power Handling Capability	Environment and/or Parameter Requirement ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon N/A Pressure Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating N/A Non-Operating N/A Non-Operating N/A Non-Operating N/A Non-Operating N/A ATR-16, Add. 1 Shock Operating N/A Sand & Dust LED-520 Fungus N/A Acoustical Noise Rain N/A Radiation LED-520 Explosion Proof N/A PARAMETRIC Radiated Power (Eff. Beamwidth Transmit/Receive) Input VSWR @Transmitter fo @Receiver fo 1. 25:1 Minimum Power Handling Capability Maximum Aiming 1. 16 RMS	Environment and/or Parameter Requirement Capability ENVIRONMENTAL Temperature: Operating Earth Moon Pressure Operating Non-Operating Humidity Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Shock Operating Acceleration Operating Non-Operating Acceleration Operating Shock Operating Non-Operating Acceleration Operating Non-Operating Acceleration Operating Non-Operating Acceleration Operating Acceleration Operating Non-Operating ATR-16, Add. 1 Shock Operating Non-Operating Non-Ope	Environment and/or Parameter Requirement Capability Agent ENVIRONMENTAL Temperature: Operating Non-Operating Sea L to 10-8 mmHg Humidity Operating Non-Operating Non-Operating Non-Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non-Operating Shock Operating Non-Operating Non-Operating Non-Operating Shock Operating Non-Operating Non-Op	Environment and/or Parameter Requirement Capability Agent Location Stress Level	Environment and/or Parameter Requirement Requirement Requirement Requirement Capability Requirement Requirement Requirement Capability Agent Location Agent Location Agent Location Agent Location Reference Systems Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 ATR-60, 70 BSR-2367, 2376 ATR-60, 70 BSR-2367, 2376 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 N/A Designed to meet Refer to ATR-16 Addendum 1 In Figs 1 thru 5 Rendix Aerospace Systems Ann Arbor, Mich TP 2334335 ATR-60, 70 BSR-2367, 2376 Ann Arbor, Mich TP 2334334 N/A ATR-16, Add. 1 ATR-16	Environment and/or Parameter Requirement Capability Agent Location Document Reference Date Reference Date Reference Date Repair Reference Date Da

Note: See comments, paragraph 3.1.3.6.

CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT

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	-	Stress	Level	Ve	rification of Stress	Level Capability		T
Item Nomenclature	Environment and/or Parameter	Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
CPLEE Charged particle Lunar Environment	ENVIRONMENTAL Temperature: Operating Non-Operating Earth	-65°F to +160°F	-300°F to +250°F	Bendix Aerospace Systems Division	Ann Arbor, Michigan	TP2334387 TP2337912 ATR160/BSR2570	12/30/68	Qualified in SP #1 Qual SB tests
Experiment BxA 2330662	Moon Pressure Operating Non-Operating	10 ⁻¹² torr 10 ⁻¹² torr	Tested to 10 ⁻⁶ torr 10 ⁻⁶ torr	II .	11	TP2334387 and TP2337912 ATR160/BSR2570	12/30/68	Qualified during Qual SB Therma Vac. in part and during the Re- Qual Thermal Vac in part
	Humidity Operating Non-Operating	NA 15% to 100% Relative	Designed to meet Humidity Requirements	п	11	NA	NA	No testing required.
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	NA Design Limit vib. Defined in figures 1-5	Tested to Design Limit vib. Levels indicated in figures 1-5	n	н	TP2337905C ATR149/BSR254 TP2338640 ATR163/BSR2573	1/13/69	Capability to meet require- ment verified by system level qualification testing.
	Acceleration Operating Non-Operating	NA 14g±1g min in the +X Direction	Tested to 14±1g 1 min in the +X Direction	BMSD	Mishawauka, Indiana	TP2337915A ATR149/BSR2546 TP2338640 ATR163/BSR2573	12/19/68 1/13/69	,
	Shock Operating Non-Operating	NA 15g±2g, 11ms Sawtooth ea axis	Tested to 15g±2g 11ms Sawtooth ea axis	Bendix Aerospace Systems Division	Ann Arbor, Michigan	TP2337917A ATR161/BSR2571 TP2338640 ATR163/BSR2573	1/7/69 1/13/69	J.
	Salt Spray Sand & Dust Fungus	NA NA NA						
	Acoustical Noise Rain Radiation	NA NA NA LED 520	130W/ft ²	BxA	Ann Arbor, Mich			See first remark
	Explosion Proof PARAMETRIC Functional Performance	Tested as part of system in Space Chamber.		tt .	11	TP2334375 ATR167/BSR2577	1/15/69	See First Remark.
	Note: See Sec	tion 2.6 discussion	n.					
70-12		mments paragra	1 2 1 2 7			<u> </u>		Sheet B21 of 26

Note: See comments, paragraph 3.1.3.7.

QUALIFICATION STATUS LIST-ALSEP PROGRAM - ASSEMBLY, SUBPACKAGE #2

Environment and/or Parameter	Stress	Level	V	erification of Stress	Level Capability		Į.		
and/or						4			
1	Requirement	Capability	Agent	Location	Location Document Reference		Remarks		
ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-300°F to +250°F -65°F to +160°F -300°F to 250°F	-300°F to +270°F (See note 1)	В х А	Ann Arbor, Michigan	TP2334335(ENV) TP2333032(IST) ATR-60,70 BSR-2367,2376	6/10/68	Qualified in Qual SA test program		
	10 ⁻¹² Torr SL to 10 ⁻¹² Torr	Tested to 5x10 ⁻⁶ Torr	B×A	Ann Arbor, Michigan	Same as above	6/10/68	Test level limited by test equipment capabilities.		
Operating Non-Operating	N/A 15-100%	Designed to Meet Humidity Requirement	вхА	Ann Arbor, Michigan	N/A	N/A			
Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to CP 100001	Tested in Stowell Configuration to Design Limit Levels Indicated in Figures 1-5	ВжА	Ann Arbor, Michigan	TP2334348 ATR-84, 85 BSR 2404, 2405	6/28/68	See first remark		
Acceleration Operating Non-Operating	N/A CP100001	Tested to 14+ 1g each axis	BxA	Ann Arbor, Michigan	TP2334330 ATR-92,93	7/6/68	See first remark		
Shock Operating Non-Operating	N/A CP100001	Test to 15 ± 2g each axis	BxA	Ann Arbor, Michigan	TP2334331 ATR-88,89 BSR-2408, 2409	6/30/68			
	N/A						No Test Required		
							No Test Required		
							No Test Required		
			<u> </u>				No Test Required		
		2					No Test Required		
		130 w/ft I.R.	BxA		See first item ab	ove	See first remark		
				Michigan			No Test Required		
Functional Performance	an integrated sys	- ployment and	BxA	Ann Arbor, Michigan	See first item ab	bve	See first remark		
						,			
	Non-Operating Earth Moon Pressure Operating Non-Operating Humidity Operating Non-Operating Vibration Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Shock Operating Non-Operating Shock Operating Non-Operating Shoro Fungus Acoustical Noise Rain Radiation Explosion Proof PARAMETRIC	Earth Moon Pressure Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Non-Operating Launch & Flight Lunar Landing Acceleration Operating Non-Operating Non	Non-Operating Farth Moon Amount Amount Moon Amount Moon Amount Moon Amount Moon M	Solution Comparison Compa	Solution	Same as above Same as abov	Same as above Same as abov		

Note: See comments, Section 3.2

Date 4/24/70

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SUBPACKAGE II, RTG ASSEMBLY

							Analyst F. W	Pageof Pages	
	Environment and/or Parameter	Stress Level		Ver	ification of Stress	Level Capability		[
Item Nomenclature		Requirement	Capability	Agent	Location	Document Reference	Date	Remarks	
Radioisotope Thermoelectric Generator (R. T. G)	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	1000°F to 1140°F		BxA	Ann Arbor, Michigan	TP 2334335 May-June ATR-60 1968 BSR-2387		Qualification at assembly level was performed by G. E. Refer to test reports ANSQ Doc. No. 6300-281, ANSQ Doc. No. 6300-288	
G.E.#47E300779 Mod. 21 632011	Pressure Operating Non-Operating	Sea Level to	5x10 ⁻⁵ torr 16x10 ⁻⁸ toor	BxA	Ann Arbor, Michigan		+	Test level limited by test equipment capability	
	Humidity Operating Non-Operating	15 to 100%	Designed to meet humidity require- ments		N/A	N/A N/A		No testing required	
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	ATR-16 Addendum 1	Refer to Table l	General Electric Valley Forge Technology Center Philadelphia, Pa.	General Electric	GE Doc. #6300 Doc. #6300-288 Jan 1968		Qualified at Subpackage #2 Design limit level in the stowed configuration, Qual SA Refer to ATR-84, 85	
	Acceleration Operating Non-Operating	ATR-16 Addendum 1	7. SG 3 to 4 min each axis	BxA	Ann Arbor, Michigan	TP 2334330 ATR-92, 93 June 1968		Successfully Tested, Qual SA	
	Shock Operating Non-Operating	ATR-16 Addendum 1	15 G each axis 11 msec± 10%	BxA		TP 2334331 ATR-88, 89 BSR-2408, 2409	June 1968	11 11	
	Salt Spray	N/A	N/A	N/A	N/A	N/A			
	Sand & Dust	NYD	G.E.	Phil. Penn.	NYD	NYD			
	Fungus	N/A	N/A	N/A	N/A	N/A			
	Acoustical Noise	NYD	NYD	G.E.	Phil. Penn.	NYD			
	Rain	N/A	N/A	N/A	N/A	N/A			
	Radiation	ДҮЙ	NYD	G. E	Phil. Penn.	NYD	ļ	See line 1	
	Explosion Proof PARAMETRIC	NYD	NYD	G.E.	Phil. Penn.	NYD			
	FARAMETRIC	·							
		<u> </u>					<u> </u>		

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Note: See comment in paragraph 3.2.1

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ALIFICATION STATUS LIST-ALSEP PROGRAM				GE II, RTG SHORTING PLUG						Date 3/6/70 Analyst	No _{ATM-85}		Pages
		_		Verification of Stress Level Capability					hility	1	rage		rage
Item Nomenclature	Environment	Stress Level		verification of others hever Capability					1				
	and/or Parameter	Requirement	Capability	Agent		Location		Document Reference Date		Remarks		•	
RTG Shorting Plug Assy BxA 2338017	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-300°F to +50°F -60°F to +160°F	-300°F to +250°F -60°F to +160°F	1 1		Ann Arbor Michigan		TP2334335 TP2333032 ATR-60,70 BSR-2367,2376		June 1968	Successfully tested on Qual SA model.		
See Note 1.	Pressure Operating Non-Operating	lx10 ⁻¹² Toors SL to 1x10 ⁻¹²	Tested to 5x10 ⁻⁶ Torrs				1				Capability 1 Equipment (•
	Humidity Operating Non-Operating	N/A	Designed to meet Humidity Requirements			N/A		N/A]	N/A	No testing	require	ed
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	N/A Refer to Fig. 1-5	Tested in stowed configuration to Design Limit levels indicated by Fig. 1-5			Ann A Michig		TP2334348 ATR-84, 89 BSR-2404,	5	July 1968	Successfully	Tested,	Qual S.
	Acceleration Operating Non-Operating	N/A LTA-3D/R	Tested to 14± lg l min duration 5 times @ axis					TP2334330 ATR-92, 93	,	June 1968	!!	11	
	Shock Operating Non-Operating	N/A LTA-3D/R	Tested to 15 ± 2g 11 ms sawtooth 5 times @axis.	,	1		V	TP2334331 ATR-88, 89 BSR-2408,	19	June 1968	11	Iŧ	"
	Salt Spray	N/A											
	Sand & Dust	Not Defined		 _		└		ļ				_	
	Fungus	N/A				<u> </u>		_					
	Acoustical Noise	Not Defined				├							***
	Rain Radiation	N/A Not Defined	IR 130W/ft ²			 		 					
	Explosion Proof	N/A	IR 130 W/IL						 +		-		
	PARAMETRIC	IN/A				 		 			1		
						ł			l l				
									l				
		•				1			1				
						<u> </u>							
		Note 1: Qualifi which i	d on Qual SA con s identical to BxA	figuration a 2338017 As	s BxA 23355 ssembly use	20 Asse on Ar	embly Rev ray B and	ision C C					

Note: See comment in paragraph 3.2.2

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Analyst Page ___ _ of _ Pages Verification of Stress Level Capability Stress Level Environment Item and/or Document Remarks Nomenclature Agent Location Date Parameter Requirement Capability Reference ENVIRONMENTAL Suprathermal TP 2333032 Temperature: Ion Detector and -300°F to +250°F -65°F to +160°F -300°F to +250°F -300°F to +250° ATR-60, 70 May 1968 Operating Cold Cathode Ann Arbor, Mich BSR-2367, 2376 June 1968 Qual SA Test Subpackage Non-Operating BxAGauge Experiment -300°F to +250° Earth BxA 2330660 Moon TP 233032 Test level limited by Pressure Tested to 10-12 Torr Operating BxASame ATR-60.70 June 1968 test equipment capacity 5×10^{-6} Torr SL-10-12 Torr Non-Operating BSR-2367, 2376 Designed to Humidity No testing planned N/A meet humidity BxASame N/A Operating to 100% level Non-Operating 15% to 100% requirements TP 2334348 Vibration Tested in stowe ATR-84, 85 Operating N/A configuration to Non-Operating design limit BxASame BSR-2404, 2405 June 1968 Qual SA Test Subpackage #2 Launch & Flight IC 314105 levels indicated Lunar Landing in Figures 1-5 Acceleration Tested to 14+1g TP-2334330 N/A 1 minute dura-BxASame July 1968 Qual SA Test Subpackage Operating ATR-92, 93 IC 314105 Non-Operating tion TP 2334331 Tested to 15+2g Shock June 1968 Qual SA Test Subpackage Operating N/A ll ms sawtooth BxASame ATR-88, 89 BSR-2408, 2409 Non-Operating IC 314105 each axis Salt Spray N/A No Testing Planned Sand & Dust N/A Not defined Fungus N/A Acoustical Noise No Testing Planned Not defined Rain N/ARadiation LED-520 130 W/ft² (IR) BxASame TP 2334335 May 1968 Qual SA Test Subpackage #2 Explosion Proof N/A PARAMETRIC Refer to RAS 100 (Rice University CEI Specification) SIDE S/N 2, Proto used TP 2333087 Tested as part of Integrated in ASE EMI requal ATR-27, 33 EMI Performance April 1968 BxASame System completed 10-19-69 per BSR-2300, 2320 TP 2338180 TP 2333032 Per RICE Tested as part May-June TP 2333035 Functional of Integrated Specification 1968 See first remark ATR-60, 70 BxASame Performance System BSR-2367, 2376

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Note: See comments, paragraph 3.2.3.

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No. ATM-859

Rev. No. A

SUBPACKAGE #2, APOLLO LUNAR HANDLING TOOL (ALHT)

Date: 3/6/70

Item Nomenclature	Environment and/or Parameter	Stress Level		Verit	ication of Stress I			
		Requirement	Capability	Agent	Location	Document Reference	Date	Remarks
A LHT	ENVIRONMENTAL Temperature:							See Notes Below
EB39101165	Operating							gee Hotes Below
E 137101103	Non-Operating				İ		İ	
	Earth	1						\(\begin{array}{cccccccccccccccccccccccccccccccccccc
	Moon				İ			İ
	Pressure							
	Operating				1		l	
	Non-Operating							
	Humidity							
	Operating							
	Non-Operating			* 1			i	1
	Vibration							
	Operating							
	Non-Operating						l i	
	Launch & Flight							
	Lunar Landing							
	Acceleration							
	Operating	1	i				1	
	Non-Operating	İ			-			!
	Shock							
	Operating					·		İ
	Non-Operating							· V
	Salt Spray							
	Sand & Dust							
	Fungus							
	Acoustical Noise							
	Rain							
	Radiation							
	Explosion Proof							
	PARAMETRIC	1					1	
	Note 1: The A	LHT mass simulat	or rather than a f	light configuration mod	l was used for th	•		
	BxA O	ual SB system leve	d dynamic tests.	3			1	
	1	1 1					ŀ	
	Note 2: Refer	o SP#2 QSL Shee	for shock,	vibration and accelerat	on environment			
	levels	which apply to the	interface qualific	ation.				
		1						
	Note 3: See co	mments, paragrap	n 3.4.4.					
	i							
		 					 	
							1	
	1	1						
0-12		<u> </u>			<u></u>	<u> </u>	<u> </u>	Sheet B26 of 2