ALSEP

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

Revision B

24 June 1970

Bendix

Aerospace Systems Division

Qualification Status List
ALSEP Array C Configuration

NO.	REV. NO.
ATM-859	B

PAGE 1 OF 15

DATE Revised 6/24/70

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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Approved by: S. J. Ellison
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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.

CONTENTS

CONTENTS (Continued)

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:

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 *
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 *

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.

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.

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 $\pm$ 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 $\pm$ 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.

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

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.

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.

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.

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.

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.

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

APPENDIX A

QSL SHEET COMPARISON CRITERIA

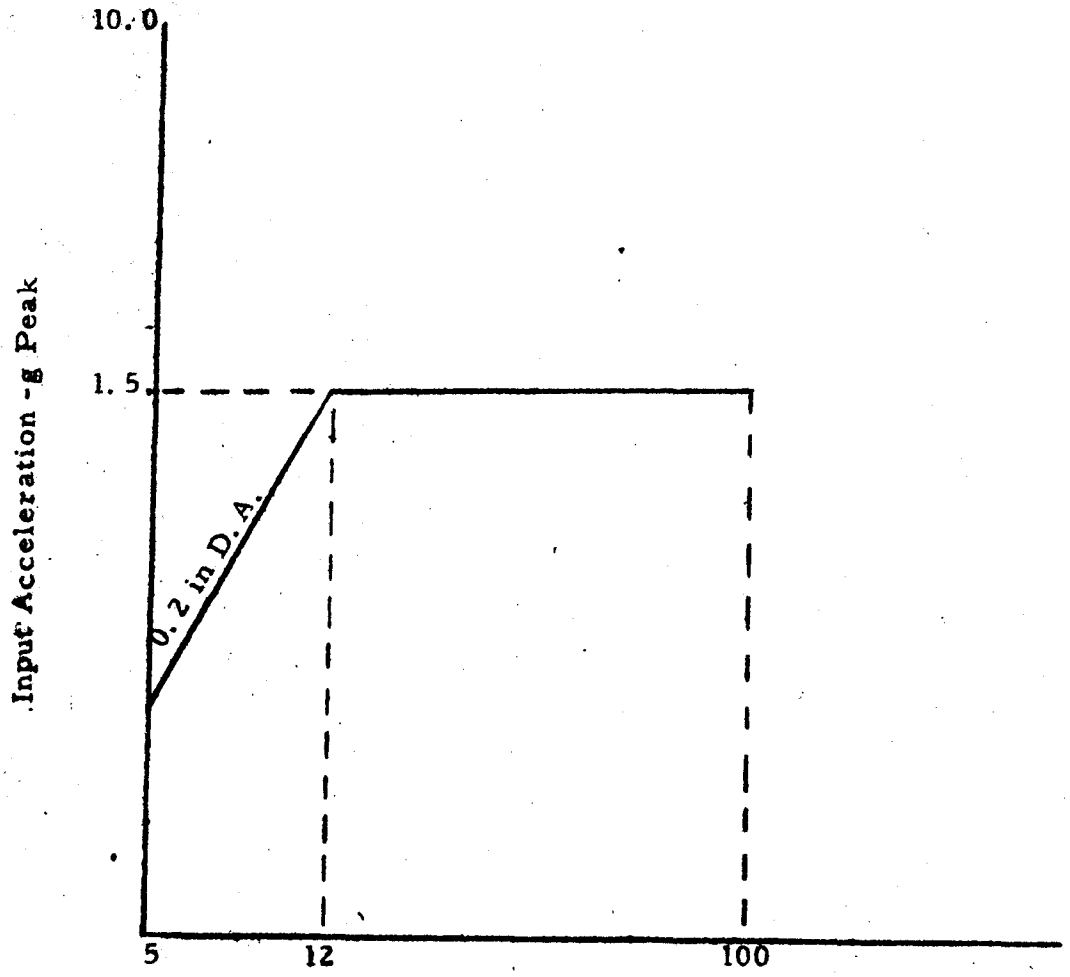
The qualification status defined in the Appendix B QSL Sheets (BxA format 970-12) is presented in a manner to compare ALSEP equipment specified environment or parametric requirements to the stress levels achieved during Qual C or previous programs.

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.

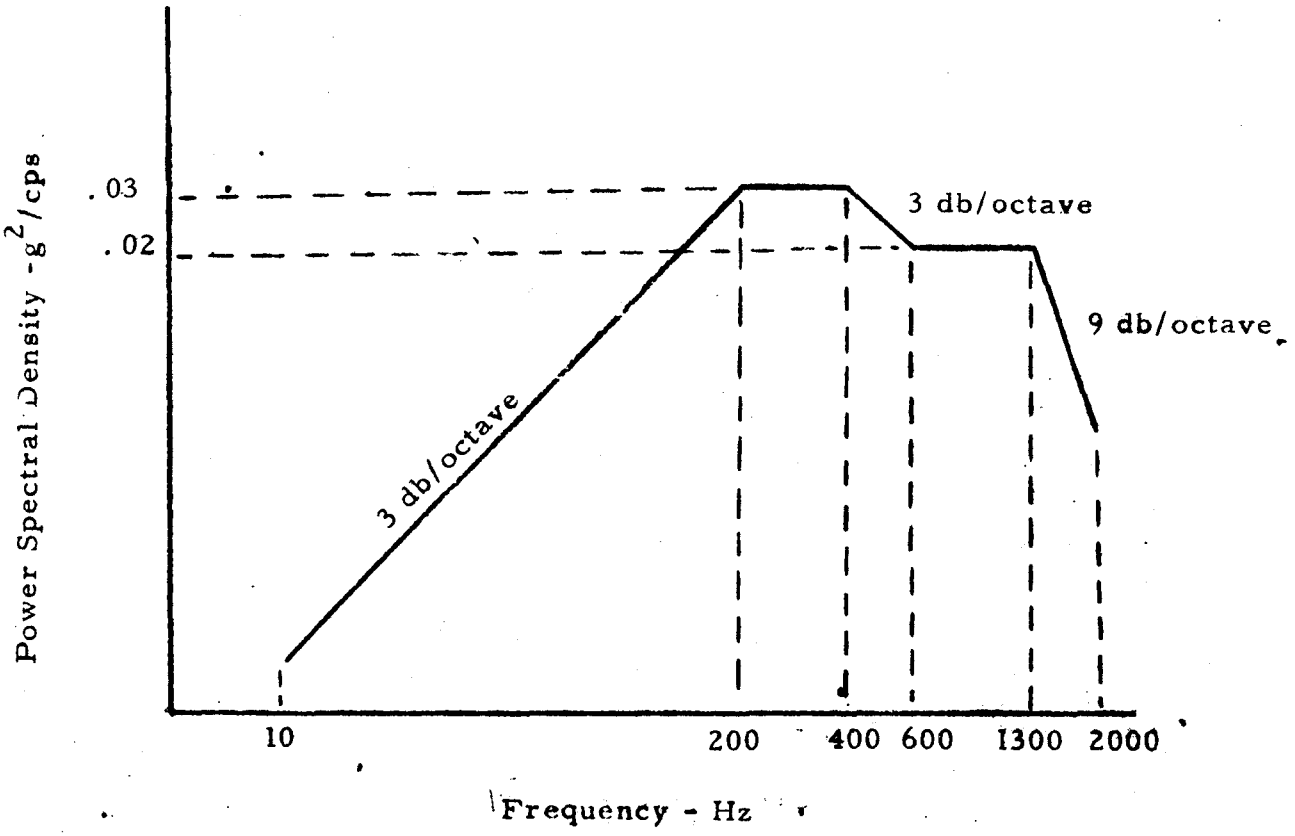
Sweep Rate = 3/4 Octave/Minute
(5-100-5 cps), g-peak Tolerance ±10%



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

Figure 1

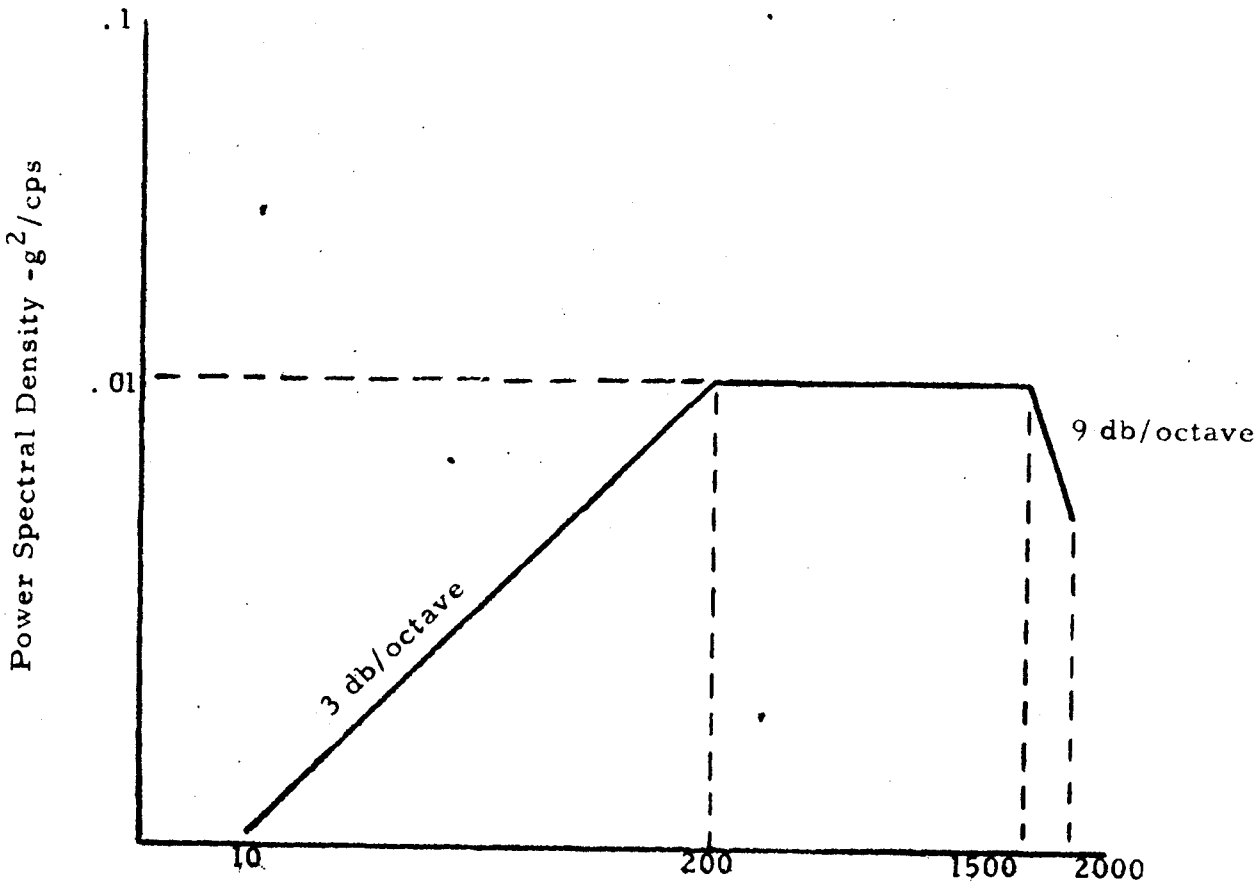
Test duration 2.5 minutes power spectral density tolerance ±3 db



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

Figure 2

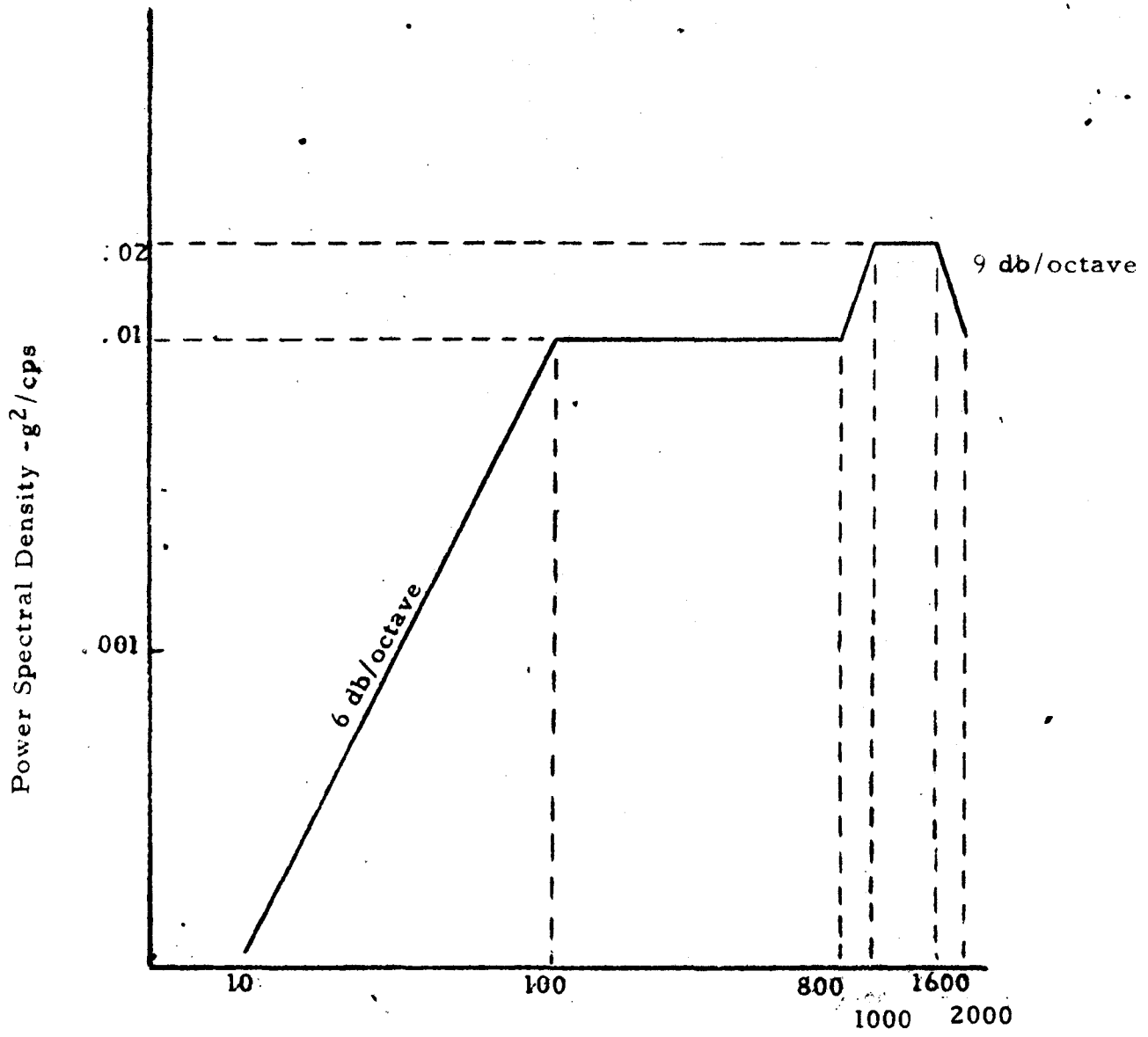
Test Duration 2.5 Minutes
Power Spectral Density tolerance
±3 db



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

Figure 3

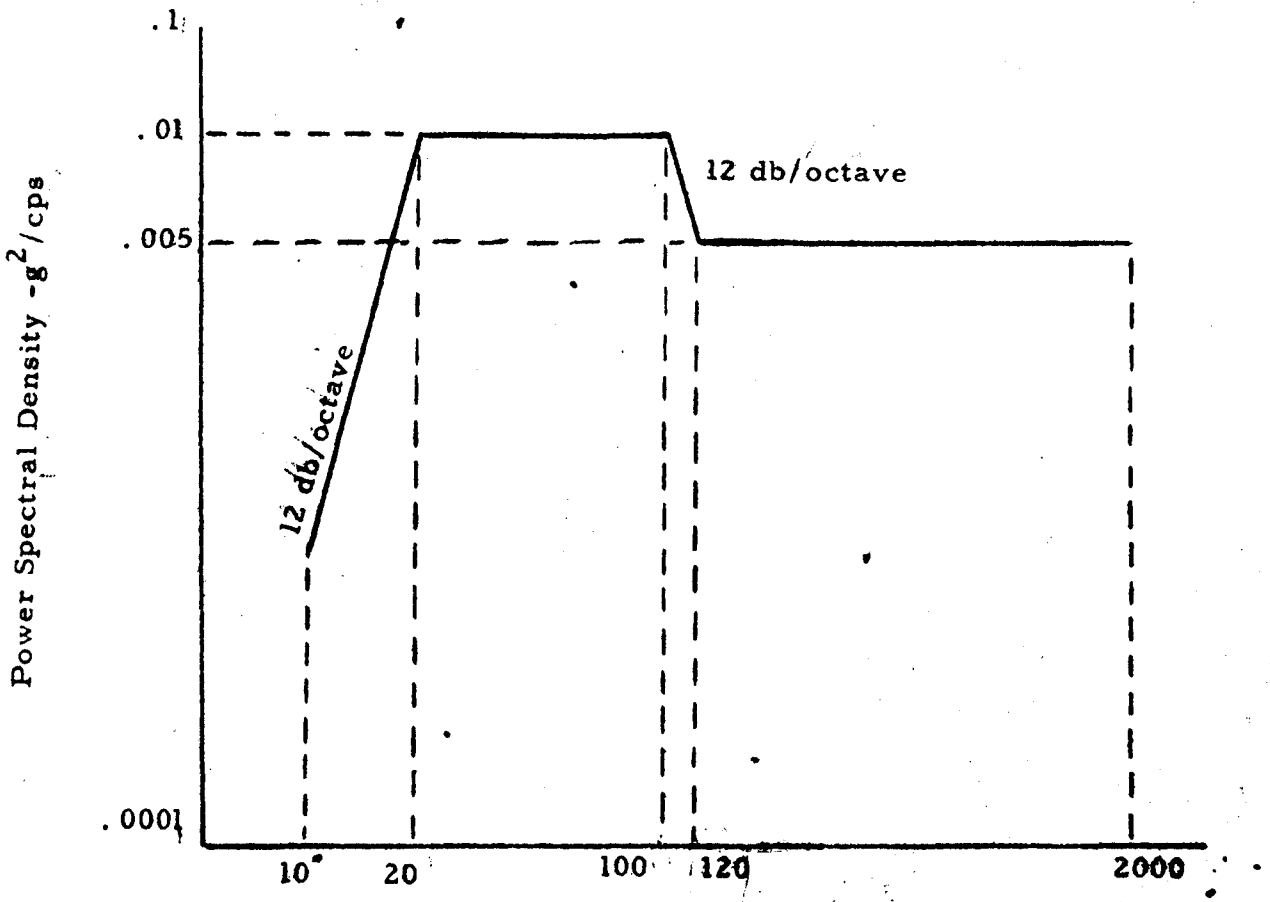
Power Spectral Density Tolerance ± 3 db
Test duration 2.5 minutes



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

Figure 4

Test Duration 12.5 minutes Power Spectral Density ±3 db



Subpackage 1 & 2
Lunar Descent Random Vibration Spectrum
Design Limit. All Axes

Figure 5

TABLE 1

Sinusoidal Vibration Levels for ASE-CSE Qualification Tests

Sweep Rate	3/4 Oct/Min
Sweep	5-100-5 Hz
Tolerances	± 10%

Axis	Freq. Range	LEVEL Dbl. Ampl.	LEVEL O-Peak Acc.
x	5-13 Hz	0.30 in	-
	13-29	-	2.5 g
	29-45	0.06	-
	45-100	-	6.0
y	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

TABLE 2

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

Duration	2.5 min.
Tolerances	± 3dB , PSD
	± 10% , RMS acceleration (G-RMS)

Axis	G-RMS	Freq. Range	PSD LEVEL Slope	PSD LEVEL Constant
x	7.0	10-100 Hz	+3dB/oct	-
		100-250	-	0.068 g^2/Hz
		250-2000	-3	-
y	5.5	10-60	+6	-
		60-150	-	0.060
		150-2000	-3	-
z	5.7	10-60	+9	-
		60-90	-	0.060
		90-185	-6	-
		185-2000	-	0.014

TABLE 3

Lunar Descent Random Vibration Levels for ASE-CSE Qualification Tests

Duration	12.5 min.
Tolerances	± 3dB , PSD
	± 10% , G-RMS

Axis	G-RMS	Freq. Range	PSD LEVEL Slope	PSD LEVEL Constant
x	4.8	10-30 Hz	+3dB/oct	-
		30-100	-	0.60 g^2/Hz
		100-2000	-3	-
y	3.8	10-60	+3	-
		60-70	-	0.050
		70-2000	-3	-
z	3.2	10-50	+6	-
		50-70	-	0.060
		70-310	-6	-
		310-2000	-	0.003

APPENDIX B

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 2-24-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks See Note 1.
		Requirement	Capability	Agent	Location	Document Reference	Date	
Subpackage #1 BxA 2334845	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 +250°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 Limit V:b Levels indicated in Figures 1-5	BxA	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 1 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	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						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 temperature and pressure above. TP 2333025D 6/3/69.		Deployed performance was verified by tests cites in line 1 during T/V qualification and after physical tests.
	NOTE 1:	The above recorded test verifications are As-Run TP and report references for the Flight 4 Array C configuration. Initial qualification history for Qual SA Subpackage #1 is recorded in ATM-766A sumitted with the Flight 1 ADP, October 1968.						
	2:	See comments, paragraphs 3.1.1, 3.1.1.1, 3.1.1.2, 3.1.1.8, 3.1.2, 3.1.2.2, 2.1.2.3, 3.1.3.1 and Section 2.2. ASE requal applies to ASE and related EMI fixes cited on component QSL's.						

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS
COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst R O Jones	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Command Receiver BxA # 23305 23	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -10°F to +140°F -65°F to +160°F N/A	 -10°F to +140°F -65°F to +160°F	Philco-Ford	Palo Alto, California	Qualification Test Report RN-DA1664	March 1968	Also qualified to S/P # requirements in Qual SA test
	Pressure Operating Non-Operating	1 x 10^{-12} mm Sea Level-10^{-8} mm	1x10^{-5} mmHg 1x10^{-5} mmHg					Qualified 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. #1	N/A 14G - 1 min. each of 3 axes					"
	Shock Operating Non-Operating	N/A ATR-16, Add. #1	N/A 20G - 10ms rise each of 3 axes					"
	Salt Spray	N/A	N/A					
	Sand & Dust	Not Defined	N/A					No testing required
	Fungus	N/A	N/A					
	Acoustical Noise	Not Defined	N/A					
	Rain	N/A	N/A					No testing required
	Radiation	N/A	N/A					
	Explosion Proof	N/A	N/A					
	PARAMETRIC Performance Specification	Per AL310700		Philco-Ford	Palo Alto, California	Qualification Test Report RN-DA 1664	March 1968	Philco Ford Qual
	Functional Performance	Tested aspect of Integrated System in Space Simulation Chamber.		BxA	Ann Arbor, Michigan	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qual SA test
	EMI Performance	Tested As part of Integrated System		BxA		TP 2333087 ATR-27, 33 BSR-2300, 2320		Qual SA test

970-12

Note: See comments in paragraph 3.1.1 and 3.1.1.3

QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70 | No. ATM-859 | Rev. No. A

Analyst R. Dillard | Page 1 of 2 Pages

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
90 Channel Analog Multiplexer/Converter BxA 2330524	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -22°F to +158°F -65°F to +185°F	 Tested to Same	Dynatronics	Orlando, Florida	Qualification Test Report 90 Channel Analog Mult/Conv.	7 March 1967	1. 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°F					See Remark 1
	Humidity Operating Non-Operating	15% - 100% R.H.	Tested to 72 Hr @ 95% RH During Temp. Cycle +25°C to +70°C					
	Vibration Operating N/A Non-Operating Launch & Flight Lunar Landing	Random 7g RMS 20 min Sinusoidal 0.4 in DA 5-20cps, 8g 20-100cps 2cy at 1 oct/min	Random - Same Sinusoidal - same plus 9g 50-100 cps for 2 min					See Remark 1
	Acceleration Operating Non-Operating	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	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					
	Radiation	N/A	N/A					
	Explosion Proof	N/A	N/A					
	PARAMETRIC Multiplexer Analog Input Volt. Analog Accuracy Crosstalk (F. Scale)	 0 - 5.0 v 0.33% ±0.1% (max)	 -0.0196 to 5.0196v 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: ON	 <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) 738 mw	>1 Megohms Same ±12 Same					Ch. 6, 7, 26, 52, 67, 70: +8v, -9v Ch. 21, 36, 45, 80: +8v, -6.5v All remaining Chs: +8v, -5v

970-12

Note: See sheet 2 of 2 on 90 Channel Multiplexer

QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst	Page 2 of 2 Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
90 Channel Multiplexer/ Converter (cont.)	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 Multiplexer/Converter	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 μsec	118 μsec	↓	↓	↓	↓	Same as above
	Power Consumption	593.3 mw	Same	↓	↓	↓	↓	Same as above
	Multiplexer/Conv. Operating Life	1 Year	1 Year with Probability of 0.953	↓	↓	Reliability Analysis Report for 90 channel System	1 March 1967	
	Storage Life	2 Years	Unit does not contain parts or material with known age limitations	↓	↓	"	"	
	Functional Performance	Tested as part of Integrated System in space Chamber	Simulation	BxA	Ann Arbor, Michigan	TP2333032 ATR-60, 70 BSR, 2367, 2376	May, -June 1968	Qualified as part of an integrated system, Qual SA
	EMI Performance **	Tested as part of Integrated System to AL770 000		BxA	Ann Arbor, Michigan	TP2333087 ATR-27, 33 BSR-2300, 2320	May 1968	Same as above

970-12

**See paragraph 3.1.1.4 comments

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS
COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst Rantec	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Filter, Diplexer BxA #2330525	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -25°F to +160°F -65°F to +160°F ---	 OK per reqm OK per reqm	Rantec Wyle Labs	Calabasas, Calif El Segundo, Calif	Rantec #66279-QTP	2/19/67 2/6/67	1. Qualification verified in SP#1 Qual SA test
	Pressure Operating Non-Operating	 <10-12 Torr 30 to 1.3 Torr	 1×10^{-5} Torr OK	Wyle Labs	El Segundo, Calif		2/20/67	(Qualified in system to 5×10^{-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 Non-Operating	N/A Random: 15 to 150 cps, $0.2g^2$/cps Sine: 5 to 20 cps 0.4 in. D.A. 20 to 100 cps 8g's	OK per reqm.	↓	↓	↓	2/13/67	See remark 1
	Acceleration Non-Operating	 N/A 25 g's ea. axis	 OK per reqm	↓	↓	↓	2/10/67	See remark 1
	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					
	Radiation EMI	Radiated at fo=**52db		Bunker Ramo	Canoga Park Calif	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 chamber during Qual S/A
	Insertion Loss	0.8 db Max	0.73 db max	Rantec	Calabasas, Calif.	66279-PTP-D	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	

970-12

Note: 1. See paragraph 3.1.1.5 comments

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS
COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst Rantec	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Diplexer Switch BxA #2330526	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -25°F to -160°F -65°F to -160°F ---	 OK per reqm. OK per reqm.	Rantec Wyle Labs	Calabasas, Calif El Segundo Calif	66279-QTP	2/19/67 2/6/67	1. Qualification verified in SP#1 Qual SA test.
	Pressure Operating Non-Operating	10-12 Torr 30 to 1.3 Torr	1×10^{-5} Torr OK	Wyle Labs	El Segundo Calif	66279-QTP	2/20/67	Qualified in system to 5×10^{-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 -Operating Non-Operating	N/A Random: 15 to 150 cps, $0.2g^2$/cps Sine: 5 to 20 cps 0.4 in. D.A. 20 to 100 cps. 8'gs	OK per reqm	↓	↓	↓	2/13/67	See remark 1
	Acceleration Operating Non-Operating	N/A 25g's ea axis	OK per reqm.	↓	↓	↓	2/10/67	See remark 1
	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					
	Radiation	Radiated at fo=**	50 db	Bunker Ramo	Canoga Park Calif	66279-QTP	2/22/67	
	Explosion Proof	N/A	N/A					
	PARAMETRIC VSWR	1.36:1 Max	1.21:1 max (130 Mc min)	Rantec	Calabasas, Calif	66279-PTP-S	Before and after each environmental test	
	Insertion Loss	0.7 db Max	0.63 db max	Rantec	Calabasas, Calif	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	Calabasas, Calif	66279-PTP-S	1/16/67 to 2/23/67	

970-12

** 2119 mc and 2277 mc

Note: See comments, paragraph 3.1.1.6

QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst R. O. Jones	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Transmitter BxA #2330527	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -10°F to +140°F -65°F to +160°F N/A	 -10°F to +140°F -65°F to +160°F	Philco-Ford	Palo Alto California	Qualification Test Report RN-DA-1795		1. Qualification verified in Qual SA SP#1 test
	Pressure Operating Non-Operating	1 x 10^{-12} mm Sea Level-10^{-8}mm	lx10^{-5}mmHg 1x10^{-5}mmHg					See remark 1
	Humidity Operating Non-Operating	15% - 100%	15% - 100%					
	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 1-5
	Acceleration Operating Non-Operating	N/A ATR-16, Add. #1	N/A 14G - 1 min. each of 3 axes					See remark 1
	Shock Operating Non-Operating	N/A ATR-16, Add. #1	N/A 20G - 10 ms rise each of 3 axes					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					
	Radiation	N/A	N/A					
	Explosion Proof	N/A	N/A					
	PARAMETRIC Functional Performance	Tested as part of Integrated System in Space Simulation Chamber		BxA	Ann Arbor, Michigan	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	See remark 1
	EMI Performance	Tested as part of Integrated System to AL770 000		BxA	Ann Arbor, Michigan	TP 2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	See remark 1

970-12

Note: See comments, paragraph 3.1.1.7

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS COMPONENTS

Date 4/24/70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
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	 $1x10^{-12}$ Torrs $1x10^{-8}$ Torrs	Verified to $5x10^{-6}$ Torrs in space Simulation Chamber	BxA	Same	Same	Same	See remark 1
	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±2g 11 ms Sawtooth each Axis	BxA	Same	TP2334328 ATR-86, 87 BSR-2406-2407	July 1968	Same as above
	Salt Spray	N/A	N/A					
	Sand & Dust							
	Fungus							
	Acoustical Noise							
	Rain							
	Radiation							
	Explosion Proof	N/A	N/A					
	PARAMETRIC Power Requirements Volts Current Start Mode Stop Mode	1.2 to 1.5 VDC 12μ amp max 7μ amp max	1.2 to 1.5 VDC 12μ amp max 7μ amp max	BxA	Same	TP2334335	August 1968	See remark 1
	Switch Closures: Repetitive Non-Repetitive	1 Minute 12 Hr 720 Day	1 Minute 12 Hr 720 Day	BxA	Same	Same	Same	See remark 1

970-12

Note: See comments in paragraph 3.1.1.9

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70 | No. ATM-859 | Rev. No. A

Analyst J. T. | Page ____ of ____ Pages

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement AL 410100	Capability	Agent	Location	Document Reference	Date	
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 $1x10^{-12}$ 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
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	ATR-16 Adden. #1	Tested to S/P#1 Design Limits Test Levels(Refer to Fig 1 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
	Acceleration Operating Non-Operating	ATR-16 Adden. #1	Tested to 14±1g, 1 min duration, 5 times per axis			T. P. 2334343 ATR-90, 91 BSR-2412, 2413	July 1968	Verified at Subpackage #1 Design Limit Test and for a stowed configuration
	Shock Operating Non-Operating	ATR-16 Adden. #1	Tested to 15±2g, 11 ms 3 times each axis			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	N/A	N/A					
	Sand & Dust	Not Defined	N/A					No Test Required
	Fungus	N/A	N/A					
	Acoustical Noise	Not Defined	NYD					No Test Required
	Rain	N/A	N/A					
	Radiation	Not Defined	NYD					
	Explosion Proof	Not Defined	N/A					
	PARAMETRIC							
	Functional Performance	Tested as part of System in Space Simulation Chamber	Integrated System	BxA	Ann Arbor, Mich.	T. P. 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	See first remark
	EMI Performance	Tested as part of System to AL770000	Integrated	BxA	Ann Arbor, Mich.	T. P. 2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	See first remark

970-12

Note: See comments, paragraph 3.1.1.10

QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst J. M.	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Command Decoder BxA #2330509	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -22°F to +158°F -65°F to +160°F N/A	 -22°F to +158°F -65°F to +160°F N/A	Bendix Aerospace	Ann Arbor, Mich.	TP 2334335 ATR-60, 70 BSR-2363, 2376	May-June 1968	Qualified in SP#1 during Qual SA test
	Pressure Operating Non-Operating	 1×10^{-12} mmHg S/L to 1 x 10mmHg	 Tested in Spare Sim. Chamber to 5×10^{-6} Torr	Bendix Aerospace	Ann Arbor, Mich	BSR-2363, 2376	May-June 1968	Test Level Limited by Equipment Capability
	Humidity Operating Non-Operating	 N/A 15% to 100%	 Designed to meet Humidity Requirements	Bendix Aerospace	Ann Arbor, Mich.	N/A	N/A	No testing required.
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	 N/A Refer to ATR-16 Addendum 1	 Tested to S/P#1 Design Limit Test Levels Refer to figures 1 through 5	Bendix Aerospace	Ann Arbor, Mich.	TP2334346 ATR-82, 83 BSR-2402, 2403	June 1968	Qualified to Design Limit Test Levels for Subpackage #1 (in the stowed configuration) during Qual SA
	Acceleration Operating Non-Operating	 N/A ATR-16, Add. 1	 Tested to 14 ± 1 g 1 Min Duration 5 times in Axis	Bendix Aerospace	Ann Arbor, Mich.	TP 2334343 ATR-90, 91 BSR-2414, 2413	July 1968	Qualified to Design Limit Test Levels for Subpackage #1 (in the stowed configuration)
	Shock Operating Non-Operating	 N/A ATR-16, Add. 1	 Tested to 15 ± 2 g 11 ms Saw-tooth 3 times in Axis	Bendix Aerospace	Ann Arbor, Mich.	TP 2334328 ATR-86, 87 BSR-2406, 2407	July 1968	Qualified to Design Limit Test Levels for Subpackage #1 ~~(in the stowed configuration)~~
	Salt Spray	N/A	N/A	Bendix Aerospace	Ann Arbor, Mich.			
	Sand & Dust	Not Defined	Designed to Meet	Bendix Aerospace	Ann Arbor, Mich.			
	Fungus	N/A	N/A	Bendix Aerospace	Ann Arbor, Mich.			
	Acoustical Noise	Not Defined		Bendix Aerospace	Ann Arbor, Mich.			
	Rain	N/A	N/A	Bendix Aerospace	Ann Arbor, Mich.			
	Radiation	Not Defined	I. R. 130 w/ft^2	Bendix Aerospace	Ann Arbor, Mich.	TP 2334335	May-June 1968	
	Explosion Proof	N/A	N/A	Bendix Aerospace	Ann Arbor, Mich.			
	PARAMETRIC Functional Performance	Tested as part of Integrated System in space Chamber	Simulation	Bendix Aerospace	Ann Arbor, Mich.	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qualified via Integrated System Thermal Vacuum Test for a Simulated Lunar Mission during Qual SA
	EMI Performance	Tested as part of Integrated System to AL770 000		Bendix Aerospace	Ann Arbor, Mich	TP2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	Same as above

970-12

Note: See comments, paragraph 3.1.1.11

QUALIFICATION STATUS LIST-ALSEP PROGRAM

CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst J. M.	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Power Distribution Unit (PDU) BxA 2330450-2	ENVIRONMENTAL							
	Temperature:							
	Operating	-22°F to +158°F	-22°F to +158°F	Bendix Aerospace Systems Division	Ann Arbor, Michigan	TP 2334335 ATR-60, 70 BSR-2367, 2376	May-June 1968	1. Qualified in SP#1 during Qual SA
	Non-Operating							
	Earth	-65°F to +160°F	-65°F to +160°F					
	Moon	N/A						
	Pressure		Tested in Space Simul. Chamber to 5×10^{-6} Torrs	Bendix Aerospace Systems Division	Ann Arbor, Michigan	TP 2334335 ATR-60, 70 BSR-2367, 2376	May-June 1968	Test Level Limited by Equipment Capability
	Operating	1×10^{-12} mmHg						
	Non-Operating	S/L to 1×10^{-12} mm Hg						
	Humidity		Designed to meet Humidity Requirements	↓	↓	N/A	N/A	No testing required
	Operating	N/A						
	Non-Operating	15% to 100%						
	Vibration		Tested to S/P #1 Design Limit Test Levels Refer to fig 1 thru 5	↓	↓	TP 2334346 ATR-82, 83 BSR-2402, 2403	July 1968	Qualified at Subpackage(S/P)#1 Design Limit Test Levels for a Stowed Configuration during Qual SA
	Operating	N/A						
	Non-Operating	Refer to ATR-16						
	Launch & Flight	Addendum 1						
	Lunar Landing							
	Acceleration		Tested to 14 ± 1g 1 Min. Duration, 5 times ea Axis	↓	↓	TP 2334343 ATR-90, 91 BSR-2412, 2413	July 1968	↓
	Operating	N/A						
	Non-Operating	ATR-16, Add. 1						
	Shock		Tested to 15 ± 2g, 11 mo Sawtooth 3 times ea Axis	↓	↓	TP 2334328 ATR-86, 87 BSR-2406, 2407	July-Aug 1068	↓
	Operating	N/A						
	Non-Operating	ATR-16, Add. 1						
	Salt Spray	N/A	N/A					
	Sand & Dust	Not Defined	Designed to Meet					No testing required
	Fungus	N/A	N/A					
	Acoustical Noise	Not Defined						No testing required
	Rain	N/A	N/A					
	Radiation	Not Defined	tested to 130w/ft² IR					
	Explosion Proof	N/A	N/A					
	PARAMETRIC							
	Functional Performance	Tested as part of Integrated System in Space Simulation Chamber		BxA	Ann Arbor, Michigan	TP 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	See first remark
	EMI Performance	Tested as part of Integrated System to AL770 000		BxA	Ann Arbor, Michigan	TP 2333087 ATR-27, 33 BSR-2300, 2320		See first remark

970-12

Note: See comments, paragraph 3.1.1.12

QUALIFICATION STATUS LIST-ALSEP PROGRAM CENTRAL STATION ELECTRONICS COMPONENTS

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst J. M.	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement AL 310900	Capability	Agent	Location	Document Reference	Date	
Data Processor BxA #2330521	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -22°F to +158°F -65°F to +185°F N/A	 -22°F to +158°F -65°F to +185°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
	Pressure Operating Non-Operating	 1×10^{-12} mmHg AMB to 1×10^{-12} mmHg	Tested is spare chamber to 5 x 10-6 Torr					Test level limited by Equipment Capability.
	Humidity Operating Non-Operating	 N/A 15% to 100%	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	 N/A ATR-16, Add. 1	Tested to 14 ± 1g 1 Min Duration 5 times ea. Axis.			T.P. 2334343 ATR-90, 91 BSR-2412, 2413		
	Shock Operating Non-Operating	 N/A ATR-16, Add. 1	Tested to 15 ± 2g 11 ms sawtooth 3 times ea. Axis.			T.P. 2334328 ATR-86, 87 BSR-2406, 2407		
	Salt Spray	N/A	N/A					
	Sand & Dust	Not Defined						
	Fungus	N/A	N/A					
	Acoustical Noise	Not Defined	--					
	Rain	N/A	N/A					
	Radiation	Not Defined	130 w/ft² IR Lamp			T.P. 2334335	May-June '68	
	Explosion Proof	N/A	N/A					
	PARAMETRIC See Table I Sheet B-9	Tested as part of Integrated System in Space Simulation Chamber				T.P. 2333032 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qualified via Integrated System Thermal Vacuum Test for a simulated lunar mission during Qual SA
	EMI Performance	Tested as part of Integrated System				TP2333087 ATR-27, 33 BSR-2300, 2320	May-June 1968	Same as above

970-12

Note: See comments, paragraph 3.1.1.13

QUALIFICATION STATUS LIST-ALSEP PROGRAM PASSIVE SEISMIC EXPERIMENT

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
PSE Central Station Electronics BxA #2334670	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
	Pressure Operating Non-Operating	1×10^{-12} mm Hg 1×10^{-8} mm Hg	Verified to 5×10^{-5} Torrs in Space Sim. Cham					
	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 SA
	Shock Operating Non-Operating	Not Applicable ATR-16, Add. 1	Tested in Stowed Configuration to 15 ± 2g 11ms 3 Times Ea. Axis			TP2334328 ATR-86, 87 BSR-2406, 2407	6/24/68	Successfully Tested, Qual SA
	Salt Spray	Not Applicable	Not Applicable					
	Sand & Dust	LED-520	Designed To Meet					
	Fungus	Not Applicable	Not Applicable					
	Acoustical Noise	Not Applicable	Not Applicable					
	Rain	Not Applicable	Not Applicable					
	Radiation	LED-520	Designed to Meet					
	Explosion Proof	Not Applicable	Not Applicable					
	PARAMETRIC Functional Performance	Tested as part of the integrated system in the space simulation chamber		BxA	Ann Arbor, Michigan	TP 2333032 ATR-60-70 BSR-2367, 2376	June 10, 1968	See first remark
	EMI Performance	Tested as part of the integrated system		BxA	Ann Arbor, Michigan	TP 2333087 ATR-27, 33 BSR-2300, 2320	April 1968	See first remark

970-12

Note: See comments, paragraph 3.1.1.14

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Active Seismic Experiment (ASE) Central Station Electronics BxA 2334772-5	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -300°F to +250°F -65°F to +250°F -300°F to +250°F	(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 TD3/L023/68-B-26/ (JAC)	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 duration 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/ft2	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	BxA	Ann Arbor, Mich	TP 2333025D TP 2333025A	6/3/69 3/1/69	Deployed performance verified by line 1 T/V qual and requal functional tests.
	NOTE 1:	As noted in Section 1.0 on page 5 of ATM 859, the ASE Crystal Filter, Bendix Specification 2340326 remains to be qualified for physical environments, scheduled for completion at McCoy Electronics, 15 May 1970.						

970-12

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

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Primary Structure BxA 2335815	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 $5 \times 10^{-}$ 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 TD3/L023/68-B-26/(JAC)	 Tested to design Limit Vibration Levels indicated in Figures 1-5	BxA	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 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	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						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

970-12

Note: See comments, paragraph 3.1.2 .

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Switch Actuator BxA 2335825 (Astro Sw. Assy.)	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -300°F to +250°F -65°F to +250°F -300°F to +250°F	 -300°F to +250°F	BxA	Ann Arbor, Mich.	TP 2333026 TP 2337912 TP 2334389 ATR-172 BSR-2588	3/1/69	Used in ASE EMI requal test completed per T/V post test TP 2341497 on 10/31/69.
	Pressure Operating Non-Operating	 10^{-12} Torr SL to 10^{-12} Torr	 Tested to 5×10^{-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 requirements	BxA		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 levles indicated in Figures 1-5	BxA	Same	TP 2334322A ATR-176 BSR-2592	5/21/69	Qual C Array
	Acceleration Operating Non-Operating	 N/A 14g-x axis	 Tested to 14±1g 1 minute duration x axis	BxA	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±2g 11 ms sawtooth each axis	BxA	Same	TP 2334342 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						No Test Required
	Rain	N/A						No Test Required
	Radiation	LED-520	130 W/ft^2	BxA	Same	TP 2337912	3/1/69	See Operating Temperature
	Explosion Proof	N/A						No Test Required
	PARAMETRIC Functional Performance ALSEP TM-342	Tested during partial integrated systems test in space simulation chamber.	Capable of operation on Lunar surface	BxA	Same	TP 2335643 ATM-177 BSR-2593	5/29/69	Qualified During partial integrated System test in Space Simulation Chamber, TP 2333026.

970-12

Note: See comments, paragraph 3.1.2.1 .

QUALIFICATION STATUS LIST-ALSEP PROGRAM PASSIVE SEISMIC EXPERIMENT

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
PSE Sensor Assembly P/N 233425 BxA #2338460-2	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	107° 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	T13022 TP2334335 ATR-60, 70 BSR-2367, 2376	11 Jan 69 June 10, 1968	
	Pressure Operating Non-Operating	1×10^{-12} mm Hg 1×10^{-8} mm Hg	Verified to 5×10^{-5} Torrs in Space Sim. Cham.					Test level limited by test equipment capability
	Humidity Operating Non-Operating	Not applicable 50-100% R.H.	Designed to Meet Humidity Requirement			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 Fig. 1 Thru 5.			TP2334346 ATR-82, 83 BSR-2402, 2403	6/28/68	See first remark
	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	See first remark
	Shock Operating Non-Operating	Not Applicable ATR-16, Add. 1	Tested in Stowed Configuration to 15 ± 2g 11ms 3 Times Ea. Axis			TP2334328 ATR-86, 87 BSR-2406, 2407	6/24/68	See first remark
	Salt Spray	Not Applicable	Not Applicable					
	Sand & Dust	LED-520	Designed to Meet					
	Fungus	Not Applicable	Not Applicable					
	Acoustical Noise	Not Applicable	Not Applicable					
	Rain	Not Applicable	Not Applicable					
	Radiation	LED-520	Designed to Meet					
	Explosion Proof	Not Applicable	Not Applicable					
	PARAMETRIC Functional Performance	Tested as part of System in Space Chamber	Integrated Simulation	BxA		TP 2333032 ATR-60, 70 BSR-2367, 2376	June 10 1968	See first remark
	EMI Performance	Tested as part of system	integrated	BxA		TP 2333087 ATR-27, 33 BSR-2300, 2320	April 1968	See first remark

970-12

Note: See comments, paragraph 3.1.3.2

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Mortar Package Assembly BxA 2334500-5 S/N-3 Grenade Launcher Assembly BxA 2338507-2 S/N-2 Thermal Bag BxA 2330803-2 S/N-6 Mortar Box Assembly BxA 2334499-4 S/N-6	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
	Pressure Operating Non-Operating	 10^{-12} Torr SL to 10^{-12} Torr	Tested to 5×10^{-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 requirements			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	BxA	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 duration each axis	BxA	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±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						No Test Required
	Rain	N/A						No Test Required
	Radiation	LED-520	130 W/ft^2	BxA	Same		4/23/59	See Operating Temp.
	Explosion Proof	N/A						No Test Required
	PARAMETRIC EMI	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

970-12

Note: See comments, paragraphs 3.1.3.3, 3.1.3.4, 3.1.3.5 and Section 3.4.

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. A No.
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
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 5×10^{-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 requirements	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	BxA	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 duration 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						No Test Required
	Radiation	LED-520	130 W/ft^2	BxA	Same	TP2337912	3/1/69	See Operating Temp.
	Explosion Proof	N/A						No Test Required
	PARAMETRIC EMI	 AL770 000	 Tested to design Requirements	BxA	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 requal

970-12

Note: See comments, paragraph 3.1.3.5, and section 2.3 .

QUALIFICATION STATUS LIST-ALSEP PROGRAM SUBPACKAGE I, ANTENNA ASSEMBLY

Revised 1/31/69

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst R. O. J.	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Antenna Assembly Helical Antenna BxA 2330307	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 -250°F to +300°F -65°F to +160°F N/A	Tested in Space Simulation Chamber for temp excursions of -300°F to +250°F	Bendix Aerospace Systems	Ann Arbor, Mich	TP 2334335 ATR-60, 70 BSR-2367, 2376	May-June 1968	Qualification of the Antenna Assy has been accomplished at system level during Qual SA.
	Pressure Operating Non-Operating	 1×10^{-12} mmHg Sea L to 10^{-8} mmHg	Verified to 5×10^{-6} Torrs in Space Sim Cham	Bendix Aerospace Systems	Ann Arbor, Mich	TP2334335 ATR-60, 70 BSR-2367, 2376		Test level limited by test equipment capabilities
Antenna Cable Bx. 2330309	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
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	 N/A Refer to ATR-16 Addendum 1	Tested in stowed configuration to vibration design limits indicated in Figs 1 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	Tested in stowed configuration 14 ±1g, 1 min 5 tests ea axis	Bendix Aerospace Systems	Ann Arbor, Mich	TP 2334343 ATR-90, 91 BSR-2412, 2413	July 1968	Boost Phase Successfully qualified (See note)
Antenna Gimbal Package BxA 2335765	Shock 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	↓
	Salt Spray	N/A						
	Sand & Dust	LED-520	Exceeds Req	Bendix Research Labs	Southfield, Mich	Design Verif.	June 1967	Verified by Analysis
	Fungus	N/A						
	Acoustical Noise	N/A						
	Rain	N/A						
	Radiation	LED-520	Exceeds Req	Bendix Research Labs	Southfield, Mich	Design Verif.	June 1967	Verified by Analysis
	Explosion Proof	N/A						
	PARAMETRIC Radiated Power (Eff. Beamwidth Transmit/Receive)	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 Error	1.5w CW @Transmitter f_o 1.16° RMS	1.5w CW @Transmitter f_o 0.75° RMS	Bendix Research Labs	Southfield, Mich	Design Verif. Design Verif. Report #4037		

970-12

Note: See comments, paragraph 3.1.3.6.

QUALIFICATION STATUS LIST-ALSEP PROGRAM CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT

Date 3/6/70 | No. ATM-859 | Rev. No. A

Analyst J. T. | Page ____ of ____ Pages

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
CPLEE Charged particle Lunar Environment Experiment BxA 2330662	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 +250°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
	Pressure Operating Non-Operating	10^{-12} torr 10^{-12} torr	Tested to 10^{-6} torr 10^{-6} torr	"	"	TP2334387 and TP2337912 ATR160/BSR2570	12/30/68	Qualified during Qual SB Thermal 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	"	"	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	"	"	TP2337905C ATR149/BSR2546 TP2338640 ATR163/BSR2573	12/19/68 1/13/69	Capability to meet requirement 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	
	Salt Spray	NA						
	Sand & Dust	NA						
	Fungus	NA						
	Acoustical Noise	NA						
	Rain	NA						
	Radiation	NA LED 520	130W/ft^2	BxA	Ann Arbor, Mich			See first remark
	Explosion Proof	NA						
	PARAMETRIC Functional Performance	Tested as part of integrated system in Space Simulation Chamber.		"	"	TP2334375 ATR167/BSR2577	1/15/69	See First Remark.
	Note: See Section 2.6 discussion.							

970-12

Note: See comments, paragraph 3.1.3.7.

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

Date 4/24/70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Subpackage #2 BxA 2334844	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) -300°F to +250°F	BxA	Ann Arbor, Michigan	TP2334335(ENV) TP2333032(IST) ATR-60, 70 BSR-2367, 2376	6/10/68	Qualified in Qual SA test program
	Pressure Operating Non-Operating	 10^{-12} Torr SL to 10^{-12} Torr	 Tested to $5x10^{-6}$ Torr	BxA	Ann Arbor, Michigan	Same as above	6/10/68	Test level limited by test equipment capabilities.
	Humidity Operating Non-Operating	 N/A 15-100%	 Designed to Meet Humidity Requirement	BxA	Ann Arbor, Michigan	N/A	N/A	
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	 N/A Refer to CP 100001	 Tested in Stowed Configuration to Design Limit Levels Indicated in Figures 1-5.	BxA	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	
	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 I.R.	BxA	Ann, Arbor	See first item above		See first remark
	Explosion Proof	N/A			Michigan			No Test Required
	PARAMETRIC Functional Performance	Tested as part of an integrated system in space simulation chamber	Capable of Deployment and operation on Lunar Surface	BxA	Ann Arbor, Michigan	See first item above		See first remark

970-12

Note: See comments, Section 3.2

QUALIF'CATION STATUS LIST-ALSEP PROGRAM

SUBPACKAGE II, RTG ASSEMBLY

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst F. W	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Radioisotope Thermoelectric Generator (R. T. G) G. E. #47E300779 Mod. 21 632011	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	 1000°F to 1140°F -380°F to 440°F	 1170° F 500°F	BxA	Ann Arbor, Michigan	TP 2334335 ATR-60 BSR-2387	May-June 1968	Qualification at assembly level was performed by G. E. Refer to test reports ANSQ Doc. No. 6300-281, ANSQ Doc. No. 6300-288
	Pressure Operating Non-Operating	Sea Level to $1x10^{-12}$ torr	$5x10^{-5}$ 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 requirements	N/A	N/A	N/A	N/A	No testing required
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	ATR-16 Addendum 1	Refer to Table 1	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	" "
	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	NYD	NYD	G. E	Phil. Penn.	NYD		See line 1
	Explosion Proof	NYD	NYD	G. E.	Phil. Penn.	NYD		
	PARAMETRIC							

970-12

Note: See comment in paragraph 3.2.1

QUALIFICATION STATUS LIST-ALSEP PROGRAM

SUBPACKAGE II, RTG SHORTING PLUG

Date 3/6/70	No ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
RTG Shorting Plug Assy BxA 2338017 See Note 1.	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	Bendix Aerospace System	Ann Arbor Michigan	TP2334335 TP2333032 ATR-60, 70 BSR-2367, 2376	June 1968	Successfully tested on Qual SA model.
	Pressure Operating Non-Operating	$1x10^{-12}$ Toors SL to $1x10^{-12}$	Tested to $5x10^{-6}$ Torrs					Capability limited by test Equipment Capability
	Humidity Operating Non-Operating	N/A	Designed to meet Humidity Requirements		N/A	N/A	N/A	No testing required
	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 Arbor Michigan	TP2334348 ATR-84, 85 BSR-2404, 2405	July 1968	Successfully Tested, Qual SA
	Acceleration Operating Non-Operating	N/A LTA-3D/R	Tested to 14 ± 1g 1 min duration 5 times @ axis			TP2334330 ATR-92, 93	June 1968	" "
	Shock Operating Non-Operating	N/A LTA-3D/R	Tested to 15 ± 2g 11 ms sawtooth 5 times @ axis.			TP2334331 ATR-88, 89 BSR-2408, 2409	June 1968	" "
	Salt Spray	N/A						
	Sand & Dust	Not Defined						
	Fungus	N/A						
	Acoustical Noise	Not Defined						
	Rain	N/A						
	Radiation	Not Defined	IR 130W/ft^2					
	Explosion Proof	N/A						
	PARAMETRIC							
		Note 1: Qualified on Qual SA configuration as BxA 2335520 Assembly Revision C which is identical to BxA 2338017 Assembly used on Array B and C						

970-12

Note: See comment in paragraph 3.2.2

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 3-6-70	No. ATM-859	Rev. No. A
Analyst	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Suprathermal Ion Detector and Cold Cathode Gauge Experiment BxA 2330660	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 +250°F -300°F to +250°F	BxA	Ann Arbor, Mich.	TP 2333032 ATR-60, 70 BSR-2367, 2376	May 1968 June 1968	Qual SA Test Subpackage #2
	Pressure Operating Non-Operating	 10^{-12} Torr SL-10^{-12} Torr	 Tested to 5 x 10^{-6} Torr	BxA	Same	TP 233032 ATR-60, 70 BSR-2367, 2376	June 1968	Test level limited by test equipment capacity
	Humidity Operating Non-Operating	 N/A 15% to 100%	 Designed to meet humidity requirements	BxA	Same	N/A		No testing planned to 100% level
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	 N/A IC 314105	 Tested in stowed configuration to design limit levels indicated in Figures 1-5	BxA	Same	TP 2334348 ATR-84, 85 BSR-2404, 2405	June 1968	Qual SA Test Subpackage #2
	Acceleration Operating Non-Operating	 N/A IC 314105	 Tested to 14±1g 1 minute duration	BxA	Same	TP-2334330 ATR-92, 93	July 1968	Qual SA Test Subpackage #2
	Shock Operating Non-Operating	 N/A IC 314105	 Tested to 15±2g 11 ms sawtooth each axis	BxA	Same	TP 2334331 ATR-88, 89 BSR-2408, 2409	June 1968	Qual SA Test Subpackage #2
	Salt Spray	N/A						
	Sand & Dust	N/A Not defined						No Testing Planned
	Fungus	N/A						
	Acoustical Noise	Not defined						No Testing Planned
	Rain	N/A						
	Radiation	LED-520	130 W/ft^2 (IR)	BxA	Same	TP 2334335	May 1968	Qual SA Test Subpackage #2
	Explosion Proof	N/A						
	PARAMETRIC Refer to RAS 100 (Rice University CEI Specification)							
	EMI Performance	Tested as part of System	Integrated	BxA	Same	TP 2333087 ATR-27, 33 BSR-2300, 2320	April 1968	SIDE S/N 2, Proto used in ASE EMI requal completed 10-19-69 per TP 2338180
	Functional Performance	Per RICE Specification	Tested as part of Integrated System	BxA	Same	TP 2333032 TP 2333035 ATR-60, 70 BSR-2367, 2376	May-June 1968	See first remark

970-12

Note: See comments, paragraph 3.2.3 .

QUALIFICATION STATUS LIST-ALSEP PROGRAM

SUBPACKAGE #2, APOLLO LUNAR HANDLING TOOL (ALHT)

Date 3/6/70	No. ATM-859	Rev. No. A
Analyst JTS	Page ____ of ____ Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
ALHT SEB39101165	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon							See Notes Below
	Pressure Operating Non-Operating							
	Humidity Operating Non-Operating							
	Vibration Operating Non-Operating Launch & Flight Lunar Landing							
	Acceleration Operating Non-Operating							
	Shock Operating Non-Operating							
	Salt Spray							
	Sand & Dust							
	Fungus							
	Acoustical Noise							
	Rain							
	Radiation							
	Explosion Proof							
	PARAMETRIC Note 1: The ALHT mass simulator rather than a flight configuration model was used for the BxA Qual SB system level dynamic tests. Note 2: Refer to SP#2 QSL Sheet for shock, vibration and acceleration environment levels which apply to the interface qualification. Note 3: See comments, paragraph 3.2.4.							

970-12