



**Space
Systems Division**

Array E - ALSEP Component Qual/Flight
Differences and Rationale

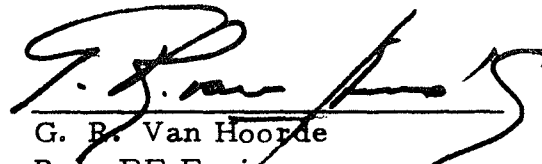
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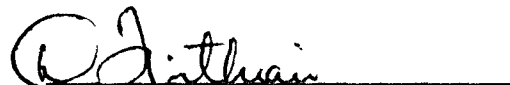
Presented herein are the Qual/Flight Components Differences and Rationale. These component differences are presented in more detail in ATM 1054. The reason to present this information in this manner and format is to expedite the ALSEP Array E certification.

Screening levels for EEE parts in flight, are in some cases greater than in Qual, and have been identified in ATM 1054; this document does not include these levels.


G. B. Van Hoorde
Rel. PE Engineer

Approved:


S. J. Ellison, Manager
ALSEP Reliability

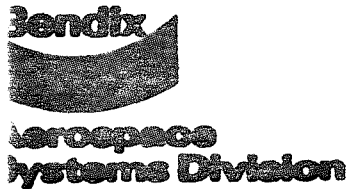

D. Fithian, Manager
ALSEP Engineering



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Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
1) Sub Package I	2348700-501 Rev AC	2348700-502 Rev Y	1. Qual/Flight differences at the Subpackage I level include the following in addition to those differences defined herein in lower level assemblies: a) Qual SPI assembly included no dust covers - Qual rationale - Dust covers being of flexible material do not affect mechanical testing (vibration and shock) Mass is distributed over complete assembly and does not affect CG or I_m significantly. b) Flight model includes installation of final decals and pull ring ID paint - No affect to certification.
2) Primary Structure (Subpackage I)	2348620-101 Rev J	2348620 Rev G	Two thermistors were omitted on Qual Primary structure. Flight Qualified by similarity with previous arrays and the two thermistors on the qual primary structure.
3) Central Station Assy/Wiring Har-ness	2362852 Rev N	2362852 Rev M	Flight has microdot connectors J23, J24, J26, J27 potted per FTRR chit #700. Flight has added design margin over configuration qualified; potting has been tested per AER 543.
4) Transmitter	2362877	2362877	Some of the flt. EEE parts have additional burn-in or screening. Same Manufacturers, and part.



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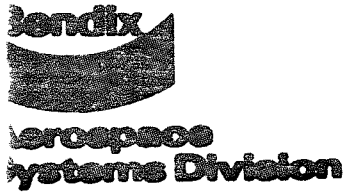
Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
5) Command Decoder	2367600-502 Rev D	2367600-503 Rev D	<p>a) Qual has jumper wires in the data demod. board; flight was new board with corrected art work (Ref: Deviation DA0017). Qual by similarity.</p> <p>b) Some of the flt. EEE parts have additional burn-in or screening. Same manufacturer and part.</p>
6) Data Processor (DDP/ADP)	2349400-503 Rev G	2349400-502 Rev G	<p>a) Qual has jumper wires in the command sequencer board; flight has new board with corrected art work. (Ref Deviation DA0016). Qual by similarity.</p> <p>b) Flight has H-film tape over sharp edge of motherboard to prevent cutting insulation of wiring from interface connector to motherboard (Ref FIAR E-49). Flight has added design margin over configuration qualified; tape has negligible mass.</p> <p>c) Qual has one hardwire to correct A/D board deficiency. Qual by similarity.</p> <p>d) Qual motherboard has clock lines tied together. Flight has new board with artwork modified to eliminate potential system single point failure source. Qual by similarity.</p> <p>e) Some of the EEE parts have additional burn-in or screening. Same manufacturer and part.</p>



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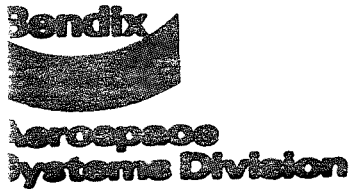
Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
7) Power Conditioning Unit	2368101-503 Rev H	2368101-503 Rev G	<p>a) Flight has counter-bored mounting holes for modules in housing to accept tapered washers; qual has pre-drilled mounting holes. Flight design eases multiple interface alignment problems and reduces undesirable stresses at module/motherboard interfaces. The mounting interfaces are mechanically equivalent. Qual rationale: Stress analysis was performed on flight design (Memo 9712-946) to show adequate design margin in counterbored PCU base-plate.</p> <p>b) Flight has added damper pad in strain relief clamp inside unit. (Ref FIAR E-49). Flight has added design margin over configuration qualified; pad has negligible mass.</p>
8) Power Distribution Unit	2362200-503 Rev H	2362200-502 Rev H	<p>a) Qual +5V delay module has two sided PWB #1 without 15 plated thru holes and with solder added on one critical hole; flight has similar board with all plated thru holes. Flight has NASA preferred design; boards are functionally identical; no affect on qualification.</p> <p>b) Flight has added damper pad in strain relief clamp inside unit. (Ref FIAR E-49). Flight has added design margin over configuration qualified; pad has negligible mass.</p>



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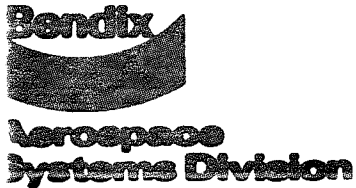
Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
9) LSG Electronics Package	2362199 Rev L	2362499 Rev N	Some of the flt. EEE parts have additional burn-in or screening. Same manufacturer and part.
10) LSG Heater Box	2345855 Rev B	2345872 Rev K	a) Flight has a shim spacer on top of heater box to give added clearance between pre-amp and mounting screw; qual does not. The addition of shim does not significantly alter the mechanical design and therefore the designs are considered mechanically equivalent. b) Flight has a helicoil insert repair for tapped hole. The addition of the helicoil is an acceptable means of repair which does not significantly alter mechanical integrity and which has been employed elsewhere on previous ALSEP applications.
11) LSG	2345856 Rev C	2345875 Rev B	Flight has strain relief Mod Kit added for flat conductor cable. Flight has added safety margin over configuration qualified. The extensive static and dynamic (impulse) tests to which the strain relief devices have been subjected were much more severe, in terms of structural loading, than the design limit shock and vibration tests associated with the qualification program. Hence, the strain relief hardware can be considered qualified by virtue of having survived an environment in excess of minimum requirements. For details see BxA response to ALSEP Action Item No. 761.



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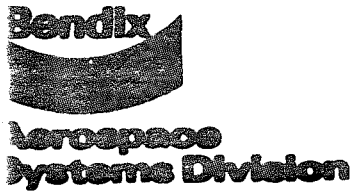
	Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
12)	LMS	2347400-103 Rev N	2347400-101 Rev L	<p>a) Some of the flt. EEE parts have additional burn-in or screening. Same manufacturer and part.</p> <p>b) Flight has strain relief Mod Kit added for flat conductor cable. Flight has added safety margin over configuration qualified. The extensive static and dynamic (impulse) tests to which the strain relief devices have been subjected were much more severe, in terms of structural loading, than the design limit shock and vibration tests associated with the qualification program. Hence, the strain relief hardware can be considered qualified by virtue of having survived an environment in excess of minimum requirements. For details see BxA response to ALSEP Action Item No. 761.</p>
13)	LMS Analyzer Assy	151-405-03	151-405-02 Rev E	Flight has a Multi-Mode emission control; qual has a single level emission. Design change was qualified in a test sequence performed on the Proto Model.
14)	LMS Radiator Plate	2347607-101 Rev B	2347607 Rev A	Flight has radiator area increased to 40 square inches. Qual had 34 square inches. This reduced the nominal temperature sensing by approximately 10°F; qual by similarity.
15)	LMS Multiplexer	2347555-101 Rev E	2347555 Rev C	Flight has a diode added in the housekeeping MUX to eliminate a -8V spurious bias voltage which appears when turning the ion pump off. Design change was qualified in the proto model during the multimode emission control board qualification.



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	Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
16)	LMS Analyzer Assy	2347555-101 Rev E	2347555 Rev C	Flight EM tubes have a G.E. vac sealant for added leakage protection. Flight has added design margin over configuration qualified.
17)	LMS Power Supply Module	2347480-102 Rev H	2347480-101 Rev H	Flight design incorporates Power Supply required for Multi-mode emission function. Prototype LMS qual test program verified qualification status of this new design.
18)	LSPE Geophone Module	2348321-101 Rev D	2348321 Rev C	Flight has strain relief Mod Kit added. Flight has added safety margins over configuration qualified. The extensive static and dynamic (impulse) tests to which the strain relief devices have been subjected were much more severe, in terms of structural loading, than the design limit shock and vibration tests associated with the qualification program. Hence, the strain relief hardware can be considered qualified by virtue of having survived an environment in excess of minimum requirements. For details see BxA response to ALSEP Action Item No. 761.
19)	Power Dissipation Module	2348636-503 Rev H	2348636-502 Rev H	Qual has aerospace sealant on resistor terminals; Flight has thermofit tubing. Qual by similarity to resistor on the Central Station thermal plate.
20)	HFE (Qualified for Array D, and verified at Array E System level)	2345430-102 S/N 7 Rev C	2345430 S/N 2 Rev B	a) Some of the flt. EEE parts have additional burn-in or screening. Same manufacturer and part.



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Nomenclature Flt Part No. Qual Part No. Qual Rationale - Diff.

- b) Qual and Flight have different power dissipation capacity in the thermal plate to improve thermal control. Heaters are functionally and physically similar; no affect on qualification.
- c) Flight has ferrite beads added to pulse power supply to prevent oscillation. Flight design is qualified by similarity with ALSEP transmitter applications.
- d) Flight has middle radiation shields added in the Stage 3 assembly. Flight has added design margin; no affect on qualification.
- e) Flight model has a cable strain relief Mod Kit incorporated. The extensive static and dynamic (impulse) tests to which the strain relief devices have been subjected were much more severe, in terms of structural loading, than the design limit shock and vibration tests associated with the qualification program. Hence, the strain relief hardware can be considered qualified by virtue of having survived an environment in excess of minimum requirements.
For details see BxA response to ALSEP Action Item No. 761.

21) HFE Probe
Package
(Qualified partially
at the experiment
level and partially
at the system
level).

2333127
S/N F4B

2333127
S/N SQ2B

Flight model has thermal control tape on probe cables and a wider "crows-foot" grip. Flight has added design margin; no affect on qualification.



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	Nomenclature	Flt Part No.	Qual Part No.	Qual Rationale - Diff.
22)	HFE Astromate Connector	2339160 Rev C	2339160 Rev C	Flight model has Hysol 901/91 added to connector and a cable strain relief Mod Kit incorporated. Flight has added design margin; no affect on qualification. Ref: ECP 026, CRN 70680, ECN 2348800 Rev H.
23)	LEAM	2347700-102 Rev F	2347700-101 Rev E	Flight model has a cable strain relief Mod Kit incorporated. The extensive static and dynamic (impulse) tests to which the strain relief devices have been subjected were much more severe, in terms of structural loading, than the design limit shock and vibration tests associated with the qualification program. Hence, the strain relief hardware can be considered qualified by virtue of having survived an environment in excess of minimum requirements. For details see BxA response to ALSEP Action Item No. 761.
24)	Shorting Plug Assy.	2364057-501 Rev J	2364057 Rev G	Flight has a #20 and a #18 wire from pin 2 of J22A to pin 2 of P22A; the #18 wire is tied common to SW #1. Qual has only a #24 wire from pin 2 of J22A to the common of SW #1 to pin 2 of P22A. Flight has added design margin; no affect on qualification.