

CEL
EMU CRITICAL ITEMS LIST

Pages: 1
Date: 11/15/95

12/24/94 SUPERSEDES 12/24/93

ANALYST:

NAME P/W QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
OCM ELECTRONICS, ITEM 330 ----- SV792291-27 (1)	2/2	350FM19: Tone control interface fails in "TONE ON" state. CAUSE: Electrical wiring or electrical component failure.	END ITEM: Warning, status or thruater. Tones continuously activated. GFE INTERFACE: Crew discomfort from hearing continuous tone. MISSION: Terminate EVA based on crew discomfort. CREW/VEHICLE: None.	A. Design - Semiconductor failure is minimized through the use of high reliability components. Established reliability capacitors (Level B) and resistors (Level R) are used and are qualified to the requirements of their respective MIL specs and thermal shocked per condition 8 of MIL-STD-202 Method 107. The transistors and diodes are qualified to the requirements of MIL-S-19500 and receive the burn-in of JANTXV level parts per the applicable methods, 1038, 1039, and 1040, of MIL-STD-750. The electronic components are operating within the power derating requirements of SVHS 7804. The printed circuit boards are polyimide per MIL-P-13949 Type G1 and manufactured per SN-P-006. Parts mounting and is per MSFC-STD-136 and NHB5300. 4 (3A-1). The board assemblies are hard mounted to the DCN case to provide a thermal transfer path between the board heat sinks and the case to direct heat away from the electronic components. The board assemblies are also conformal coated per MIL-A-46146 (Box forming R1V 3140) for environmental protection. All wiring used in the DCN is N22759/11 (teflon insulated). Soldering is per NHB5300. 4 (3A-1) and wire crimping is per SVHS 4909 (based on MSC-SPEC-Q-1A). All wires are strain relieved. Electrical connectors are environmentally sealed to prevent damage due to contamination and humidity. B. Test - In-Process Test - The OCM electronics assembly is tested at 4 separated times during initial build-up; at the board assembly level, after the PC boards have been interwired, after installation of the boards and wiring, and after installation of the front cover. These tests consist of continuity through the switches and wiring, voltage checks, functional check of all current limiters, and full operation of the OCM electronics. The tests insure proper operation of the OCM electronics. The tests insure proper operation of all electronic components. PDR Test - Vibration testing per SEMU-60-015 followed by continuity and full function testing verifies the integrity of the solder joints and crimp connections in the DCN. The random

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	2/2	350FH19:		<p>vibration level for this test is 6.6 grms for a duration of 1 minute per axis for each of the three orthogonal axes.(JSC SPEC SP-T-8023).</p> <p>Thermal vacuum testing followed by full functional electrical testing per SEMU-60-015 also verifies the health of the solder joints as well as the acceptability of the components. The DCM is placed in a vacuum chamber at 1 x 10⁻³ torr. The DCM case temperature is cycled 3 times from 70 to 130 degree F. At the end of the third cycle, the temperature is held between 130 and 135 degree F for a minimum of four hours. The DCM display must remain on throughout the test. This verifies proper transfer of heat from the electronics to the DCM case to prevent overheating of components.</p> <p>Certification Test - The Liquid Crystal Display version of the DCM electronics assembly (Item 350, SV792291-7), as part of the full DCM Item 300 (Items 390 and 385 combined), was successfully subjected to levels of vibration and shock equivalent to those experienced over a fifteen (15) year life.</p> <p>Random Flight Vibration 1.625 grms. 48 min/axis Sinusoidal Flight 1 grms. 5-35 Hz. ea. Vibration axis Design Shock 6.5 grms. 11 ms/peak</p> <p>The LED display version of the DCM electronics Assembly (Item 350, SV792291-5) was subjected to certification testing between June and August of 1986 with the exception of EMI which occurred in September of 1985. The testing verified the basic integrity and flight worthiness of the redesign DCM configuration (Item 300, SV792294). The item 350 completed qualification vibration (7.6 grms, 6 minutes per axis) as a separate item, and structural vibration (1.625 grms, 48 minutes per axis), and shock testing as part of the full DCM Item 300 (item 350 combined with item 385). The DCM/300 also completed the four hour thermal vacuum certification at 135 degree F and storage temperature testing at 35 degree F. No class 1 EC's have been incorporated into this version of the DCM since certification was completed.</p>

CIL
 EMI CRITICAL ITEMS LIST

Page: 3
 Date: 11/10/94

12/24/94 SUPERSEDES 12/24/93

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2/2 350FH19:

C. Inspection -
 100% inspection of all soldering (PC boards and wiring) by Hamilton Standard QA and BCAS QA.
 All board assemblies are inspected for damage and contamination.
 All wiring is inspected for damage, nicks in the insulation, wear, and strain relief.
 The DCM is internally inspected after installation of the circuit boards and wiring to insure no damage has occurred during assembly.

D. Failure History -
 None.

E. Ground Turnaround -
 Proper operation of the tones is verified per FEMU-R-001, Tones Test.

F. Operational Use -
 Crew Response - PreEVA: Trouble shoot problem, if no success, consider third EMI if available. EMI go for SCU ops if noise is acceptable to EV crewmember.
 EVA: Terminate EVA. EMI go for SCU ops if noise is acceptable to EV crewmember.
 PostEVA: Off EMI nominally.
 Training -
 No training specifically covers this failure mode.
 Operational Considerations -
 EVA checklist procedures verify hardware integrity and system operational status prior to EVA. Real Time Data System allows ground monitoring of EMI systems.