

DIL
EMU CRITICAL ITEMS LIST

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ANALYST:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
DCM ELECTRONICS, ITEM 350 ----- SV792291-27 (1)	3/1RB	350FMS4: All secondary voltages drift high. CAUSE: Semiconductor failure.	END ITEM: Secondary voltages increase above design limits. GFE INTERFACE: Reduced life due to overstress of CMS and DCM electronic components. MISSION: None for single failure. Possible loss of display and tones if subsequent failures of overstressed CMS and DCM components occur. CREW/VEHICLE: None for single or double failure. Possible loss of crewman with loss of COC, oxygen, or low vent flow.	A. Design - Semiconductor failure is minimized through the use of high reliability components. Established reliability capacitors (Level S) and resistors (Level R) are used and are qualified to the requirements their respective MIL. specs and thermal shocked per condition B of MIL-STD-202 Method 107. The transistors and diodes are qualified to the requirements of MIL-8-19500 and receive the burn-in of JARTIV Level 61 per the applicable methods, 1038, 1039, and 1040, of MIL-810-750. The electronic components are operating within the power derating requirements of SVRS 7304. The printed circuit boards are polyimida per MIL-P-13949 type 61 and manufactured per SN-P0006. Parts mounting and soldering is per MSFC-STD-136 and NH85300. 4 (3A-1). The board assemblies are hard mounted to the DCM 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 (Dow Corning RTV 3140) for environmental protection. All wiring used in the DCM is M22759/11 (teflon insulated). Soldering is per NH85300. 4 (3A-1) and wire crimping is per SVRS 4909 (based on MSC-spec-0-1A). All wires are strain relieved. Electrical connectors are environmentally sealed to prevent damage due to contamination and humidity. B. Test - In-Process: The DCM electronics assembly is tested 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 DCM electronics. The tests insure proper operation of the DCM electronics. POA: 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 DCM. The random

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3/1RB 350FM34:

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 BP-1-0023).

Thermal vacuum testing followed by full functional electrical testing per SEMU-60-015 also verifies the solder joints as well as the acceptability of the components. The DCM is placed in a vacuum chamber 1×10^{-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 at between 130 and 135 degree F for 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.

Certification:

The Liquid Crystal Display version of the DCM electronics Assembly (Item 350, SV792291-7), as part of the full DCM Item 300 (Items 350 and 385 combined), was successfully subjected to levels of vibration and shock equivalent to those experienced over a fifteen (15) year life.

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

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 EMC 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 (7.8 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.

C. Inspection -

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	J/108	350FM16:		<p>100% inspection of all soldering (PC boards and wiring) by Hamilton Standard GA and DEAS GA. All board assemblies are inspected for damage and contamination. All wiring is inspected for damage, nicks in the insulation wear, and strain relief.</p> <p>The DCM is internally inspected after installation of the circuit boards and wiring to insure no damage has occurred during assembly.</p> <p>D. Failure History - None for this failure mode. Related failures: H-EMU-350-A003 (8-12-86) during DCM acceptance testing, the 18V line (presently unused) was measured above the high limit of 20V (actual 20.6). The outage was caused by improper input voltage to the DCM from the test rig and excessive loading of the 5.0V secondary line EC 42B07-118 was issued to update the DCM S/AD to clarify the loading requirements.</p> <p>E. Ground Turnaround - Tested per FEMU-R-001, Transducer and DCM Gage Calibration Check.</p> <p>F. Operational Use - Crew Response - Pre-EVA : No response, single failure undetectable by crew or ground. EVA : If detected by ground, MCC and crew monitor status frequently. Be prepared for EVA termination. Special Training - No training specifically covers this failure mode. Operational Considerations - for single failure, no constraints.</p>