

12/26/94 SUPERSEDES 12/24/93

ANALYST:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
DCM ELECTRONICS, ITEM 350 ----- BV792291-27 (1)	2/1R	350F03: Electrical short to ground input to primary EVC, secondary EVC, CLIV or feedwater valve current limiters, or in the input to the DC/DC converter CAUSE: Contamination in the electrical connector, faulty wiring, or electronic component failure.	END ITEM: Battery 490 shorted to ground. Condition will cause fusing open of P.C. trace to DCM current shunt (EMU Battery power return line). SFE INTERFACE: EMU electrical components, fan/pump (123), sensors, CMS etc., inoperative. Unable to power EMU from either SCU or battery. MISSION: Terminate EVA. Loss of use of one EMU. CREW/VEHICLE: None for single failure. Possible loss of crewman with loss of SDP.	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 qualified to the requirements of 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 JANIKV level parts per the applicable methods, 103B, 103P and 106D, of MIL-STD-750. The electronic components are operating within the power derating requirements of SVHS 7604. PC boards are polyimide per MIL-P-13949 Type B1 and manufactured per EN-P-0006. Parts mounting and soldering is per NSFC-STD-136 and NHB5300.4 (3A-1). The board assemblies are hard mounted to the DCM case to provide a thermal transfer path between the board heatinks 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 NHB5300.4 (3A-1) and wire crimping is per SVHS 4909 (based on NSC 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 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 all electronic components. PDA Test - Vibration testing per SEMU-60-015 followed by continuity and full functional testing verifies the integrity of the solder

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2/IR 350FN03:

joints and crimp connections in the DCM. The random 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-0023) Thermal Vacuum testing followed by full functional electrical testing per EMU-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 at between 130 and 135 degrees 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.

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 350 and 365 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 Vibration	1 grms	5-35 Hz ea. axis
Design Shock	6.5 grms	11 ms/peak

The LED display version of the DCM Electronics Assembly (item 350, SV792291-3) was subjected to certification of EMI which occurred in September of 1985. The testing verified the basic integrity and flight workiness of the redesigned DCM configuration (item 300, SV792296). 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 365). 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 I EC's have been incorporated into this version of the DCM since certification was completed.

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2/PR 350FH03:

C. Inspection -
 100% inspection of all soldering (PC boards and wiring) by
 Hamilton Standard QA and DEAS 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 -
 DCM operation is verified per FEMU-R-001, Orbiter Turnaround
 System Functional Check (V1103-02).

F. Operational Use -
 Crew Response -
 Pre/PostEVA: Troubleshoot problem. If no success, consider
 third EMU if available. EMU no go for EVA.
 EVA: Deactivate EMU battery power, open helmet purge valve,
 terminate EVA.
 Training -
 Standard EMU training covers this failure mode.
 Operational Considerations -
 EVA checklist procedures verify hardware integrity and
 systems operational status prior to EVA. Flight rules
 define go/no go criteria related to battery power. Real
 Time Data System allows ground monitoring of EMU systems.