

CIL  
EMU CRITICAL ITEMS LIST

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ANALYST:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
CAUTION AND WARNING SYSTEM SWITCH, ITEM 350 3V767792-2 (1)	2/1R	368FN04: Electrical short to ground, program advance position.  CAUSE: Shorting due to contamination.	END ITEM: Loss of program advance switch function.  GPE INTERFACE: Shutdown of DC/DC converter when switch is placed in program position. Loss of CMS, tones, DCM display.  MISSION: None for single failure. Terminate EVA with loss of DCM display, CMS and ability to monitor the operational integrity of the EMU. Loss of use of one EMU.  CREW/VEHICLE: None for single failure. Possible loss of crewman with loss of O <sub>2</sub> , oxygen, or low vent flow.	A. Design - The stationary contacts are part of the external terminal lugs. No interconnecting wiring to fail. Each switch position has dual contacts for redundancy. Switching mechanism and contacts are encased in a hermetically sealed case backfilled with dry nitrogen. Contact is accomplished via a roller type contact. This minimizes switching forces. Operating force is +/- 2 lbs. The switch is designed to withstand a toggle force of 25 lbs, without degradation. The lead wires (M22750/12) are soldered to the external switch terminals per MHS300.4 (3A-1). This area is then potted with stycaast to provide strain relief for the leads. The wire bundle is designed to withstand a pull force of 8 lbs, without damage or degradation.  B. Test - Component Acceptance: Vendor acceptance tests include 500 actuation cycles, contact resistance, and dielectric withstanding voltage tests.  In-Process: Switch operation and continuity are verified during in-process tests during DCM item 350 assembly.  PDA: Proper operation is verified during BOM PDA which includes continuity, functional, and operating torque tests. The switch is vibrated (6.1 gms) and exposed to thermal cycles (70 to 130 F) during PDA as part of the DCM.  Certification: The item completed the 15 year structural vibration and shock certification requirement during 10/83. The item was cycle certified for 127,000 cycles during 8/85 for the shuttle program. No Class I engineering changes have been issued since this configuration was certified.  C. Inspection - The external lead wires are inspected for damage as part of the source inspection for the part and again during assembly of the DCM. To preclude failure due to internal contamination, the switches are assembled by the vendor in a

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2/1R 368FND4:

Class 100,000 clean room. The switches are flushed internally using chloroethane BE and Kanosolve D to remove contaminants prior to case welding. After welding the switches are vacuum baked and back filled with GN2 to a pressure of 3-5 psig and sealed. Leak checks are performed during subsequent processing to verify seal integrity. Two X-ray inspections are performed, prior to run-in cycling and after vibration, to verify absence of weld splatter and loose pieces, and to verify contact alignment.

D. Failure History -  
None.

E. Ground Turnaround -  
Tested per FEMU-R-001, OCM Display verification.

F. Operational Use -  
 Crew Response -  
 Pre-EVA : If detected during EMU checkout or programmed leak check, discontinue use of EMU. Use third EMU if available.  
 EVA : If program function used during normal periodic status list check and crew or ground notes loss of data, terminate EVA.  
 Special Training -  
 Standard EMU training covers this failure mode.  
 Operational Considerations -  
 RMA checklist procedures verify hardware integrity and systems operational status prior to EVA.  
 Flight rules define operational EMU CWS as at least able to monitor a valid status list Real time data system allows ground monitoring of EMU systems.