

CIL
EMI CRITICAL ITEMS LIST

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ANALYST:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
LIQUID CRYSTAL DISPLAY MODULE, ITEM 351 ----- SV792526-5 (1)	3/288	351FM02; BITE indicator falls OFF. CAUSE: Semiconductor failure, broken connection.	END ITEM: No visual BITE indication of a CWS failure. OFF INTERFACE: None for single failure. If a subsequent CWS internal malfunction occurred, no BITE indication would be displayed. Warning tone is unaffected. MISSION: None for single failure. Terminate EVA if subsequent CWS failure occurs, issuing a warning tone unaccompanied by a failure message. CREW/VEHICLE: None for single failure of BITE circuit or subsequent CWS internal malfunction. Terminate if tone sounds.	A. Design - Item 351 utilizes small ceramic circuit boards with surface mounted electronic components. The chip resistors are per MIL-R-55342 Level A. The chip capacitors are per MIL-C-55681 Level A. The microcircuits conform to MIL-H-38510 and MIL-B-19390 including pre-encapsulated visual inspection and PIND testing to detect loose particles. The assembled boards are conformal coated per MIL-A-46146. All hand soldering is per MILB5300.4 (3A-1) and crimping of the external connector contacts is per SVHS 4909. The display consists of 2 pieces of etched glass sandwiched together with the liquid crystal material sealed in between. The liquid crystal material is UV stabilized to eliminate bleach out during long exposure to sunlight. The 12 alphanumeric characters are provided in a 14-segment format plus a specialized 13th character which acts as the BITE indicator. Five incandescent bulbs provide backlighting for the display for visibility in dark environments. The backlighting is activated by the DCN only when a message is displayed or the BITE indicator is on. The backlighting brightness is controlled by the Display Intensity Control (Item 361). The bulbs used are MS98451-7132 per MIL-L-6363. The bulbs are subsequently burned-in and vibration tested prior to use. Interconnections between the circuit boards and the display are made using elastomeric connectors which meet the requirements of MIL-S10-4542. The module housing and rear cover are anodized aluminum. An optically coated Lexan lens is assembled in front of the display to provide impact protection and enhanced visibility in bright sunlight. B. Test - Component Acceptances: Vendor acceptance includes vibration (14.0 gms), thermal vacuum, thermal cycling (-15 degrees C to +70 degrees C; 30 min. minimum dwell 30 minutes, 5 cycles), optical and functional testing prior to shipment to Hamilton Standard.

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	3/2RM	351FM02:		<p>In-process: Functioning of the item is verified at three separate times during Item 350 assembly; after board interconnection, after assembly into the BCM housing, and after installation of the front cover.</p> <p>PDA: Item 351 undergoes PDA testing as part of Item 350. Testing includes vibration thermal vacuum and functional operation.</p> <p>Certification: The LCD, as a component, has completed all certification testing per SEMU-45-002 appendix 6B and included structural vibration (Paragraph 6.2), shock (Paragraph 6.3 & 6.4), qualification vibration (Paragraph 6.1), thermal vacuum (Paragraph 6.5), and EMI (Paragraph 6.8).</p> <p>C. Inspection - Soldering on the boards and lead wires are inspected per WH8300.4 (3A-1) prior to module assembly. The lens and display are inspected to insure no defects exist which could affect visibility. The lead wires and connector are inspected during source inspection for the part and again during BCM assembly.</p> <p>D. Failure History - None for this display configuration.</p> <p>For LED display configuration: J-EMU-150-002 (3-2-61) The BITE light failed to come on when required during manned testing. It was determined that the BITE logic circuitry within the CMS was overly sensitive to triggering via electrical noise and switching transients. EC42803-499 was issued to desensitize the BITE light status from normally on to normally off.</p> <p>J-EMU-300-006 (10-18-83) The BITE light failed to turn on upon power switchover during PIA tests. The outage was found to be caused by a mechanical failure of the Power Mode Switch (364) which prevented proper power switchover. EC42806-386 added a pull test to the 364 vendor tests to insure the switch toggle arm</p>

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3/288

351FMD2:

would not come loose during normal use.

E. Ground Turnaround -
Tested per FEMU-R-001, Site Light Verification.

F. Operational Use -
Crew Response -
Pre-EVA : When detected during EMU power cycling, activate EMU RF data downlink to MCC to verify failure. Consider use of third EMU if available. Otherwise, continue EVA operations relying on warning tone indication of future actual BITE failure.
EVA : No response, single failure undetectable by crew or ground. Terminate EVA when tone sounds.
Special Training -
No training specifically covers this failure mode.
Operational Considerations -
For single failure, no constraints.