NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		362FM08		
EVC MODE SELECTOR SWITCH, ITEM 362 ---------- SV767786-2 (1)	2/2	Fails in OFF position. Jamming; contact weld caused by arcing, knob or shaft failure, bearing seizure.	END ITEM: Switch stuck in OFF position. GFE INTERFACE: Loss of all SSER communication. MISSION: Terminate EVA with loss of all radio communication. CREW/VEHICLE: None. TIME TO EFFECT /ACTIONS: Seconds. TIME AVAILABLE: N/A TIME REQUIRED: N/A REDUNDANCY SCREENS: A-N/A B-N/A C-N/A	A. Design - Switching mechanism ball bearing and contacts are encased in a hermetically sealed case backfilled with dry nitrogen. The design of the DCM incorporates current limiters in the SSER power circuit rated at 1.65 amps. B. Test - Component Acceptance Test - Continuity test through switch and leads and a contact resistance test are performed as part of the vendor acceptance tests for the item. DCM In-Process Test - Switch continuity and output voltage are checked during two In Process tests performed during DCM assembly. PDA Test - Switch continuity and output voltage are checked after completion of Vibration Acceptance testing (VAT) and again upon completion of Thermal Vacuum Acceptance testing. These tests verify the integrity of the switch wiring and connections. PDA is per SEMU-60-015. Certification Test - Certified for a useful life of 15 years. Checkout Test - EVC mode selector switch operation is verified during PIA per FEMU-R-001, para. 4.10,SEMU Communication and Biomed Check. C. Inspection - To preclude failure due to internal contamination, the switches are assembled by the vendor in a class 100,000 clean room. The switches are flushed internally using chlorothane BG and Genesolve D to remove contaminants prior to case welding. After welding the switches are vacuum baked and backfilled with GN2 to a presure of 3-6 psig and sealed. Leak checks are performed to ensure 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 - B-EMU-300-A003 (3/20/92) - The knob came loose from the shaft of the EVC Mode Selector Switch because the locking set screw stepdown sheared and retracted into the hex socket bore when torque was applied to the set screw during assembly. EC 163402-666 controls the set screw hex bore depth to preclude future thin wall conditions. H-EMU-362-A002 (11/06/95) - Switch S/N 2012 failed acceptance test 100 cycle endurance rotational torque test high over limit (84 in-lb vs. spec of 55 +/- 20 in-lb). Found high torque due to surface damage from wear/galling of detent mechanism and shaft support bearing. Tested all other switches in same lot with acceptable results. Switch design is obsolete and no longer available. No corrective action taken. B-EMU-362-A004 (01/22/99) - DCM Electronic Assembly EVC Mode Selector Switches

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		362FM08		failed torque tests per AT-E-350. Actual torque (1st switch) when moved from "BU" to Mode "B" was 85 in. oz., Spec: 55 +/- 20 in. oz. Actual torque (2nd switch) when moved from mode "B" to mode "A" position was 84 in. oz., Spec: 55 +/- 20 in. oz. High torque caused by eccessive wear of the star-shaped detent mechanism. New switch design utilizes cylindrical rollers within an upper and lower arm to contact the star-shaped detent, resulting in less detent wear. NASA crew selected 90 in. oz as desirable operating torque. Engineering Change 182135-225 increases switch operating torque to 35 - 90 in. oz. Ref. CCBD H6906. E. Ground Turnaround - Tested for non-EET processing per FEMU-R-001, Final Pre-Flight Communications. FEMU-R-001 Para 8.2 EMU Preflight KSC Checkout for EET processing. F. Operational Use - Crew Response - PreEVA: Trouble shoot problem, if no success, consider third EMU if available. Otherwise, EMU go for SCU standby. EVA: Terminate EVA. Training - Standard training covers this failure mode. Operational Considerations - Flight rule A15.1.2-2 of "Space Shuttle Operational Flight Rules", NSTS-12820, requires that EVA be terminated if two-way communication between each EV crewmember and orbiter, either direct or through relay, is unavailable. Generic EVA Checklist, JSC-48023, procedures Section 3 (EMU Checkout) and 4 (EVA prep) verify hardware integrity and systems operational status prior to EVA. Real Time Data System allows ground monitoring of EMU systems.

EXTRAVEHICULAR MOBILITY UNIT

SYSTEMS SAFETY REVIEW PANEL REVIEW

FOR THE

I-362 EVC MODE SELECTOR SWITCH

CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

Prepared by: _____ 3/27/02
HS - Project Engineering

Approved by: _____ 6/25/02
NASA – [redacted]/SSM
ESS

_____
HS - Reliability

_____
NASA – EMU/SSM

_____
HS - Engineering Manager

_____ 6/26/02
NASA - S & MA

_____ 6/27/02
NASA - MOD

_____ 7/1/02
NASA - Crew

_____ 7.2.02
NASA - Program Manager