CRITICAL ITEMS LIST

ASSY NOMENCLATURE: *RMS IFM D&C KIT* SYSTEM: *REMOTE MANIPULATOR SYSTEM* REVISION: *B*

ASSY P/N: *SED33803306-304* SUBSYSTEM: *RMS IFM D&C KIT*

FMEA REF	FMEA REV	NAME, QTY & DRAWING REF DESIGNATION	CRIT'Y/ REDUND SCREENS	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
6080	B	CAPTURE/RELEASE SWITCH MS90310-271	1/1 A - N/A B - N/A C - N/A	Mode: Fails closed, premature close Cause: • structural failure • contamination • mechanical shock • vibration	Will have a capture or release command to end effector as soon as dc utility power is applied to the IFM kit. Cannot change command to the end effector. Worst Case Uncommanded payload release Crew action required	1. DESIGN The toggle switch is manufactured by Cutler-Hammer to meet MIL specification requirements and is qualified to MIL-S-8834. The toggle switch is a double pole, positive break, miniature, sealed, solder lug toggle switch. 2. TEST a MANUFACTURING. The part is screened and qualified to the requirements of MIL-S-8834. Tests and inspections done on a sample from each lot are: sealing, examination of product, switching characteristics, dielectric withstanding voltage (DWV), contact voltage drop, marking permanency, solderability, mechanical endurance, electrical overload, endurance (electrical), life (20,000 cycles at rated current and rated load), low level, dry circuit and intermediate current, switching and temperature rise, overload, inductive load, resistive load, shock, and salt spray. Tests performed on a sample of devices for qualification are: examination of product, marking permanency, solderability, resistance to soldering heat, switching characteristics, strength of terminals, strength of toggle actuating lever, pivot and lever stop, strength of mounting bushing, mechanical endurance, contact voltage drop, electrical overload, endurance, low level dry circuit and intermediate current switching, and temperature rise, resistive load, inductive load, lamp load, intermediate current, life, low level temperature rise, overvoltage, contact voltage drop, short circuit closure (overload capability demonstration test), vibration, shock, salt spray, moisture resistance, toggle ice, sand and dust, thermal shock, DWV, sealing, explosion, flammability, and examination of product. All (100%) of the switches purchased for the RMS IFM D&C Kit are subjected to the following tests and inspections: 1. Sealing, examination of product, switching characteristics dielectric withstanding voltage, and voltage drop (reference MIL-S-8834F, Table III, Group A) 2. Radiographic inspected for particle contamination 3. "Run-in" of 250 cycles with nominally equal on-off times with a contact load of 1/10 the rated or 1 ampere maximum at 28 +/-3 volts DC at temperature of 25°C using the setup criteria described in MIL-S-8834F, para 4.8.12, items a through e All screening data will be delivered with the switches

PREPARED BY: *L.P. Gotham* SUPERSEDING DATE: *10/89* APPROVED BY: *R.L. Moore* DATE: *9/90*

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6080	B	CAPTURE/RELEASE SWTICH MS90318-271	1/1 A - N/A B - N/A C - N/A	**Mode:** Fails closed, premature close **Cause:** • structural failure • contamination • mechanical shock • vibration	Will have a capture or release command to end effector as soon as dc utility power is applied to the IFM kit. Cannot change command to the end effector. Worst Case Uncommanded payload release. Crew action required.	b. QUALIFICATION/CERTIFICATION The switch, while installed in the RMS IFM D&C kit, has been subjected to the following qualification environmental tests: Vibration: X, Y, and Z axes - duration 15 min/axis. Spectrum: 20 to 80 Hz +3 db/Oct. 80 to 350 Hz 0.067 g^2/Hz 350 to 2000 Hz -3 db/Oct. Shock: 20 g sawtooth pulse, 11 ms duration, 3 axes (6 directions). c. ACCEPTANCE The switch, while installed in the RMS IFM D&C kit, has been subjected to the following acceptance environmental tests: Vibration: X, Y, and Z axes - duration 3 min/axis. Spectrum: 20 to 80 Hz +3 db/Oct. 80 to 350 Hz 0.04 g^2/Hz 350 to 2000 Hz -3 db/Oct Shock: 20 g sawtooth pulse, 11 ms duration, 3 axes (6 directions) d. TURNAROUND The RMS IFM D&C kit is visually inspected for damage between missions and will be functionally tested before every mission to assure readiness for use. 3. INSPECTION. a The part is inspected to the requirements of MIL-S-8834, which includes visual inspections, and screening tests as described in paragraph 8. The device manufacturer is not required to prepare and maintain a product assurance program. Government source inspection is required. b Receiving inspection verifies: (1) that the switches received are as identified in the procurement documents, (2) that no physical damage has occurred to the switches during shipment, (3) that the receiving documents provide adequate traceability information, and (4) acceptance test data identify acceptable parts. c Parts are inspected throughout manufacture and assembly as appropriate to the manufacturing stage completed. These inspections include: (1) component mounting to the front panel of the kit, (2) soldering of contacts to switch connector, (3) wire routing, (4) stress relief of wires, etc.

SD40207H
ATTACHMENT
Page 75 of 93

SUPERSEDING DATE 10/89 PREPARED BY R E Moore DATE 9/90

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6080	B	CAPTURE/RELEASE SWITCH MS90310-271	1/1 A - N/A B - N/A C - N/A	Mode: Fails closed, premature close Cause: • structural failure • contamination • mechanical shock • vibration	Will have a capture or release command to end effector as soon as dc utility power is applied to the IFM kit. Cannot change command to the end effector. Worst Case Uncommanded payload release. Crew action required.	d. A test readiness review, which includes verification of test personnel, test documents, test equipment calibration/validation status, and hardware configuration, is convened by the Quality Assurance and Engineering Division in conjunction with the Engineering Directorate and Reliability and Maintainability Division e. Acceptance Test Procedure (ATP) is observed and verified per procedure 4. FAILURE HISTORY. There have been no failures associated with this failure mode on the RMS IFM D&C kit program. NSTS Program part failure history indicates no reported failures for this device. A review of GIDEP prior military part failure history reveals that no uncorrected generic issues exist 5. OPERATIONAL EFFECTS. With the IFM kit connected to the dc utility power outlet, a capture or release command will occur when the dc utility power is turned on. 6. CREW ACTION. If a payload is captured and the switch fails in the capture position, then turn dc utility power off and release payload using backup release or jettison arm/payload combination. If switch fails in the release position resulting, payload being released, maneuver arm and Orbiter away from payload. 7. CREW TRAINING. Crew will be trained to detect off nominal EE operations. Crew will be trained to maneuver the Orbiter away from a free payload at any time during arm operations. 8 MISSION CONSTRAINT. The crew must be able to detect whether the arm is responding properly to commands via window and/or CCTV views during all arm operations. When a payload is captured an Orbiter pilot will always be available to perform a collision avoidance maneuver should an uncommanded release occur.

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