

ASSY NOMENCLATURE: RMS IFM D&C KIT

SYSTEM: REMOTE MANIPULATOR SYSTEM

REVISION: B

ASSY P/N: SED331R3305-304

SUBSYSTEM: RMS IFM D&C KIT

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CRITICAL ITEMS LIST

| FMEA | | NAME, QTY & DRAWING REF DESIGNATION | CRITV/ REDUND SCREENS | FAILURE MODE AND CAUSE | FAILURE EFFECT ON END ITEM | RATIONALE FOR ACCEPTANCE |
|------|-----|---|---|---|--|--|
| REF | REV | | | | | |
| 5010 | B | <p>JOINT SELECT SWITCH</p> <p>51MD30-01-1-AJN</p> | <p>1/1</p> <p>A - N/A</p> <p>B - N/A</p> <p>C - N/A</p> | <p>Mode:</p> <p>Contact-to-contact short</p> <p>Cause:</p> <ul style="list-style-type: none"> • structural failure • contamination • mechanical shock • vibration | <p>Two joints will drive simultaneously</p> <p><u>Worst Case</u></p> <p>Unexpected motion. Two joints will drive unannounced. Crew action required</p> | <p>1. DESIGN</p> <p>The rotary switch is manufactured by Grayhill to meet MIL specification requirements and is qualified to MIL-S-3786. This switch has 1 deck, 1 pole, and 12 positions with adjustable stops. In this application six switch positions are used. The switch panel seal is by an "O" ring at the base of the bushing, and the shaft is sealed by an "O" ring inside the bushing.</p> <p>2. TEST</p> <p>a. MANUFACTURING</p> <p>The part is procured to meet the requirements of MIL-S-3786. Tests and inspections done on a sample from each lot are: visual and mechanical examination (design and construction), marking, workmanship, circuit configuration, rotational torque, dielectric withstanding voltage (DWV), contact resistance. Tests performed on a sample of devices for qualification are: thermal shock, strength of mounting bushing, vibration, shock, sand and dust, rotational torque, terminal strength, DWV, insulation resistance, contact resistance, bushing and shaft seal, life (25,000 cycles at rated current and rated load), temperature rise (-25°C to +85°C), rotational torque, moisture resistance, corona, explosion, salt spray, and solderability.</p> <p>All (100%) of the switches purchased for the RMS IFM D&C Kit are subjected to the following tests and inspections:</p> <p>1 a. Visual and Mechanical examination (design and construction, marking, workmanship) and circuit configuration (reference MIL-S-3786, Group A).</p> <p>1 b. Torque, dielectric withstanding voltage, and contact resistance (reference MIL-S-3786, Group B)</p> <p>2. Insulation resistance (reference MIL-S-3786).</p> <p>3. "Run in" of 250 cycles at a rate not to exceed 20 cycles per minute at 50% of rated resistance load with MIL-S-3786, Group B performed after "run-in"</p> <p>All screening data will be delivered with the switches</p> |

PREPARED BY: J.P. Grisham

SUPERSEDING DATE: 10/89

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VFDBY: B.L. Moore

DATE: 9/80

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CRITICAL ITEMS LIST

ASSY NOMENCLATURE: RMS IFM D&C KIT

SYSTEM: REMOTE MANIPULATOR SYSTEM

REVISION: 8

ASSY P/N: 5ED33793306-304

SUBSYSTEM: RMS IFM D&C KIT

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| FMEA | | NAME, QTY & DRAWING REF DESIGNATION | CRIT'Y/ REDUND SCREENS | FAILURE MODE AND CAUSE | FAILURE EFFECTION END ITEM | RATIONALE FOR ACCEPTANCE |
|------|-----|---|--------------------------------------|---|--|--|
| REF | REV | | | | | |
| 5010 | B | JOINT SELECT SWITCH S1MDD30-03-1-AJN | 1/1 A - N/A B - N/A C - N/A | <p>Mode: Contact-to-contact short</p> <p>Cause: • structural failure • contamination • mechanical shock • vibration</p> | <p>Two joints will drive simultaneously</p> <p><u>Worst Case</u> Unexpected motion. Two joints will drive Unannunciated Crew action required</p> | <p>b. QUALIFICATION/CERTIFICATION.</p> <p>The switch, while installed in the RMS IFM D&C kit, has been subjected to the following qualification environmental tests:</p> <p>Vibration: X, Y, and Z axes - duration 15 min /axis. Spectrum: 20 to 80 Hz +3 db/Oct. 80 to 350 Hz 0.067 g²/Hz 350 to 2000 Hz -3 db/Oct</p> <p>Shock: 20 g sawtooth pulse, 11 ms duration, 3 axes (6 directions).</p> <p>c. ACCEPTANCE</p> <p>The switch, while installed in the RMS IFM D&C kit, has been subjected to the following acceptance environmental tests:</p> <p>Vibration: X, Y, and Z axes - duration 3 min /axis Spectrum: 20 to 80 Hz +3 db/Oct. 80 to 350 Hz 0.04 g²/Hz 350 to 2000 Hz -3 db/Oct</p> <p>Shock: 20 g sawtooth pulse, 11 ms duration, 3 axes (6 directions)</p> <p>d. TURNAROUND</p> <p>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.</p> |

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ASSY NOMENCLATURE RMS IFM D&C KIT

SYSTEM: REMOTE MANIPULATOR SYSTEM

REVISION: B

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SUBSYSTEM: RMS IFM D&C KIT

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CRITICAL ITEMS LIST

| FMEA | | NAME, QTY & DRAWING REF DESIGNATION | CRITY/ REDUND SCREENS | FAILURE MODE AND CAUSE | FAILURE EFFECT ON END ITEM | RATIONALE FOR ACCEPTANCE |
|------|-----|--|--------------------------------------|--|---|--|
| REF | REV | | | | | |
| 5010 | B | JOINT SELECT SWITCH 51MD30-01-1-AJM | 1/1 A - N/A B - N/A C - N/A | <p>Mode: Contact-to-contact short</p> <p>Cause: <ul style="list-style-type: none"> • structural failure • contamination • mechanical shock • vibration </p> | <p>Two joints will drive simultaneously</p> <p><u>Worst Case</u> Unexpected motion Two joints will drive. Unannounced Crew action required</p> | <p>3. <u>INSPECTION.</u></p> <p>a. The part is inspected to the requirements of MIL-S-3785 which includes visual inspections and screening tests as described in paragraph B. The device manufacturer is not required to prepare and maintain a product assurance program. Government source inspection is required.</p> <p>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</p> <p>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.</p> <p>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.</p> <p>e. Acceptance Test Procedure (ATP) is observed and verified per procedure.</p> |

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CRITICAL ITEMS LIST

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| FMEA | | NAME, QTY & DRAWING REF DESIGNATION | CRITY/ REDUND SCREENS | FAILURE MODE AND CAUSE | FAILURE EFFECT DN FNO ITEM | RATIONALE FOR ACCEPTANCE |
|------|-----|--|-------------------------------------|---|---|---|
| REF | REV | | | | | |
| 5010 | B | JOINT SELECT SWITCH S1MD30-B1-1-AJN | VI A - N/A B - N/A C - N/A | <p>Mode: Contact-to-contact short</p> <p>Cause: • structural failure • contamination • mechanical shock • vibration</p> | <p>Two joints will drive simultaneously</p> <p><u>Worst Case</u> Unexpected motion. Two joints will drive. Unannounced Crew action required</p> | <p>4. <u>FAILURE HISTORY.</u> 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</p> <p>5. <u>OPERATIONAL EFFECTS.</u> When attempting to drive a joint in direct drive, the joint selected plus one other joint will drive</p> <p>6. <u>CREW ACTION.</u> Remove the drive command. Select backup to perform single joint operations.</p> <p>7. <u>CREW TRAINING.</u> The crew will be trained to always observe whether the arm is responding properly to commands. If it is not, the command will be removed</p> <p>8. <u>MISSION CONSTRAINT.</u> 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</p> |

PREPARED BY: J P Grisham

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DATE: 9/98

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