

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 51140E391

SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
205	0	SAFING SW. QTY-1 P/N CAE B7838 ED 92020 SHEET 2	MODE: INABILITY TO CANCEL MCIU SAFING. CAUSE(S): (1) 10V CANCEL CONTACT O/C.	UNABLE TO CANCEL MCIU SAFING WITH DC PANEL SWITCH. ALL COMPUTER SUPPORTED MODES LOST IF MCIU SAFING HAS BEEN INITIATED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- LOSS OF MISSION. LOSS OF COMPUTER SUPPORTED MODES. REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP		DESIGN FEATURES ----- TOGGLE SWITCHES USED ON THE D&C PANEL ARE HERMETICALLY SEALED, AND OF A MATURE AND PROVEN DESIGN. THESE SWITCHES ARE IN COMMON USE ON THE ORBITER VEHICLE. THE SWITCHES ARE CONTROLLED BY ROCKWELL INTERNATIONAL SPECIFICATION MC 452-0102 AND HAVE BEEN QUALIFIED TO THE REQUIREMENTS OF THIS SPECIFICATION. ELECTRICAL CONNECTIONS TO THE SWITCH ARE ACHIEVED BY MEANS OF SOLDERABLE TERMINALS. WIRING TO SWITCH TERMINALS UTILIZES NICKEL PLATED CONDUCTORS WITH A POLYAMID INSULATION. SOLDERING OF THE NICKEL PLATED WIRE TO THE SWITCH TERMINALS IS CONTROLLED BY CAE PROCESS SPECIFICATION PD 91059. THE WIRING HARNESS IS DESIGNED TO BE CAPABLE OF SEPARATE TESTING (FOR INSULATION RESISTANCE, DIELECTRIC STRENGTH, AND CONTINUITY). MOUNTING OF THE SWITCH TO THE D&C PANEL IS BY MEANS OF A 15/32 NUT WHICH ENGAGES A THREADED BUSHING ON THE SWITCH. A KEYED WASHER PROVIDES ROTATION RESTRAINT. AFTER INSTALLATION AND TORQUING, THE NUT IS STAKED TO THE PANEL BY A BLOB OF EPOXY ADHESIVE. A STAINLESS STEEL GUARD PROTECTS THE SWITCH LEVER AGAINST DAMAGE OR INADVERTENT OPERATION. ANALYSIS OF THE BASIC PANEL STRUCTURE HAS DEMONSTRATED THAT THERE ARE NO RESONANCES IN THE RELEVANT VIBRATION FREQUENCY SPECTRUM. THIS ANALYSIS HAS BEEN VERIFIED BY VIBRATION TESTING OF THE D&C PANEL ASSEMBLY. APPLICATION ANALYSIS HAS CONFIRMED THAT ADEQUATE ELECTRICAL STRESS MARGINS ARE ACHIEVED. AT THE PART LEVEL, QUALIFICATION/CERTIFICATION TESTING IS DEFINED BY ROCKWELL INTERNATIONAL SPECIFICATION MC452-0102. THIS TEST REQUIREMENT INCLUDES: INSULATION RESISTANCE, DIELECTRIC STRENGTH, CONTACT RESISTANCE, RANDOM VIBRATION (48 MINUTES PER AXIS), LEAKAGE AT ONE ATMOSPHERE DIFFERENTIAL PRESSURE, TOGGLE STRENGTH. FOR SWITCH OPERATIONAL CYCLES REFER TO TABLE 13. ALL UNITS ARE SUBJECTED TO ACCEPTANCE TESTS WHICH INCLUDE PRE-ACCEPTANCE RUN-IN, DIELECTRIC STRENGTH, INSTALLATION RESISTANCE, CONTACT RESISTANCE, ACCEPTANCE VIBRATION, SEAL TEST, VISUAL EXAMINATION, AND RADIOGRAPHIC INSPECTION.

PREPARED BY:

MFVG

SUPERCEDING DATE: NONE

DATE: 11 JUL 91

CIL REV: 0

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 5114DE391

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
205	0	SAFING SW. QTY-1 P/N CAE 87838 ED 92020 SHEET 2	MODE: INABILITY TO CANCEL MCIU SAFING. CAUSE(S): (1) 10V CANCEL CONTACT O/C.	UNABLE TO CANCEL MCIU SAFING WITH DC PANEL SWITCH. ALL COMPUTER SUPPORTED MODES LOST IF MCIU SAFING HAS BEEN INITIATED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- LOSS OF MISSION. LOSS OF COMPUTER SUPPORTED MODES. REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP		ACCEPTANCE TESTS ----- THE HARDWARE ITEM IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTS AS PART OF THE D&C PANEL ASSEMBLY. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1 O THERMAL: +110 DEGREES F TO PLUS 10 DEGREES F (2 CYCLES - 9.5 HRS/CYCLE.) THE D&C PANEL ASSEMBLY IS FURTHER TESTED AS PART OF THE RMS SYSTEM TESTS (1P518 RMS STRONGBACK TEST AND 1P552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATION TESTS ----- THE SWITCH ITEM HAS BEEN QUALIFIED FOR ORBITER USE. THE D&C PANEL ASSEMBLY HAS BEEN SUBJECTED TO THE FOLLOWING QUALIFICATION TEST ENVIRONMENTS. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1 O SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS) O THERMAL: 130 DEGREES F TO -23 DEGREES F (12 HRS PER CYCLE) (6 CYCLES) O HUMIDITY: 95% (120 DEGREES F TO 82 DEGREES F CYCLE IN 16 HRS) 10 CYCLES TOTAL. O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TEST CE01, CE02, CE03, CS01 (DC/AC), CE03, CS01 (DC/AC), CS02, CS06, RE02 (R/N), RS02, RS03, RS04) FLIGHT CHECKOUT ----- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 169B7

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RMS/D&C - 44

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5040237A
 ATTACHMENT -
 PAGE 25 OF 471

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED)
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 51140E391

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
205	0	SAFING SW. QTY-1 P/N CAE 87838 ED 92020 SHEET 2	MODE: INABILITY TO CANCEL MCIU SAFING. CAUSE(S): (1) 10V CANCEL CONTACT O/C.	UNABLE TO CANCEL MCIU SAFING WITH DC PANEL SWITCH. ALL COMPUTER SUPPORTED MODES LOST IF MCIU SAFING HAS BEEN INITIATED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- LOSS OF MISSION. LOSS OF COMPUTER SUPPORTED MODES. REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP	QA/INSPECTIONS ----- HERMETICALLY SEALED TOGGLE SWITCHES ARE PROCURED TO ROCKWELL SPECIFICATION MC452-0102. AS REQUIRED BY CAE SPECIFICATION PS87838. CAE PART NO. PS87838. QUALIFICATION AND ACCEPTANCE TESTING OF SWITCHES IS PERFORMED TO RI SPECIFICATION MC452-0102. RECEIVING INSPECTION VERIFIES THAT SWITCHES RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS, THAT NO PHYSICAL DAMAGE HAS OCCURRED TO SWITCHES DURING SHIPMENT, THAT THE RECEIVING DOCUMENTS PROVIDE ADEQUATE TRACEABILITY INFORMATION AND ACCEPTANCE TEST DATA IDENTIFIES ACCEPTABLE PARTS. PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE, COMPONENT MOUNTING TO FRONT PANEL INSPECTION, SOLDERING OF WIRES TO SWITCH CONTACTS, WIRE ROUTING, STRESS RELIEF OF WIRES ETC., OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA MHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC08800A. PRE-TEST INSPECTION OF D&C PANEL ASSY INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILD CONFIGURATION VERIFICATION TO AS DESIGN ETC. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT) A TEST READINESS REVIEW (TRR) WHICH INCLUDES VERIFICATION OF TEST PERSONNEL, TEST DOCUMENTS, TEST EQUIPMENT CALIBRATION/ VALIDATION STATUS AND HARDWARE CONFIGURATION IS CONVENED BY QUALITY ASSURANCE IN CONJUNCTION WITH ENGINEERING, RELIABILITY, CONFIGURATION CONTROL, SUPPLIER AS APPLICABLE, AND THE GOVERNMENT REPRESENTATIVE, PRIOR TO THE START OF ANY FORMAL TESTING (ACCEPTANCE OR QUALIFICATION). ACCEPTANCE TESTING (ATP) INCLUDES AMBIENT PERFORMANCE, THERMAL AND VIBRATION TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). INTEGRATION OF D&C PANEL, RHC, THC AND MCIU, INSPECTIONS ARE PERFORMED AT EACH STAGE OF INTEGRATION, WHICH INCLUDES GROUNDING CHECKS, INTER CONNECT CABLE VERIFICATION, CONNECTOR INSPECTION FOR BENT OR PUSHBACK CONTACTS ETC. SUB-SYSTEM PERFORMANCE TESTING (ATP), INCLUDES AN AMBIENT PERFORMANCE TEST. (MANDATORY INSPECTION POINT). SRMS SYSTEMS INTEGRATION - THE INTEGRATION OF MECHANICAL ARM SUBASSEMBLIES AND THE FLIGHT CABIN EQUIPMENT TO FORM THE SRMS. INSPECTIONS ARE PERFORMED AT EACH PHASE OF INTEGRATION WHICH INCLUDES GROUNDING CHECKS, THRU WIRING CHECKS, WIRING ROUTING INTERFACE CONNECTORS FOR BENT OR PUSH BACK CONTACTS ETC. SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT PERFORMANCE TEST. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)	

EXPEDITE
 FOR REVIEW

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 ASS'Y NOMENCLATURE: D&C PANEL

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SHEET: 4

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205	0	SAFING SW. QTY: 1 P/N CAE 07838 EO 92020 SHEET 2	MODE: INABILITY TO CANCEL MCIU SAFING. CAUSE(S): (1) 10V CANCEL CONTACT O/C.	UNABLE TO CANCEL MCIU SAFING WITH DC PANEL SWITCH. ALL COMPUTER SUPPORTED MODES LOST IF MCIU SAFING HAS BEEN INITIATED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- LOSS OF MISSION. LOSS OF COMPUTER SUPPORTED MODES. REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP	FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

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RMS/D&C - 46

DATE: 11 JUL 91

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5040237A
 ATTACHMENT
 PAGE 27 OF 471

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PROJECT: SRMS (-5 MCIU INSTALLED)
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SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 51140E391

SHEET: 5

FMEA REF.	FMEA REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/TR CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
205	0	SAFING SW. QTY-1 P/N CAE 87838 ED 92020 SHEET 2	MODE: INABILITY TO CANCEL MCIU SAFING. CAUSE(S): (1) 10V CANCEL CONTACT O/C.	UNABLE TO CANCEL MCIU SAFING WITH DC PANEL SWITCH. ALL COMPUTER SUPPORTED MODES LOST IF MCIU SAFING HAS BEEN INITIATED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- LOSS OF MISSION. LOSS OF COMPUTER SUPPORTED MODES. REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP		OPERATIONAL EFFECTS ----- COMPUTER SUPPORTED MODES CANNOT BE USED TO COMPLETE THE MISSION. DIRECT DRIVE AND BACK-UP REMAIN. IF PAYLOAD ATTACHED, THE ARM SHOULD BE MANEUVERED TO A SAFE POSITION FOR PAYLOAD RELEASE. LOSS OF NEXT REDUNDANT PATH RESULTS IN BEING ONE FAILURE AWAY FROM INABILITY TO CRADLE ARM. IF WITH SUBSEQUENT FAILURES ALL DRIVE MODES ARE LOST, THE ARM MAY BE JETTISONED. CREW ACTION ----- USE DIRECT DRIVE. CREW TRAINING ----- NONE MISSION CONSTRAINTS ----- NONE OMRSD OFFLINE ----- EXERCISE D&C SAFING SWITCH. VERIFY CORRECT OPERATION OF SAFING BIT. OMRSD ONLINE INSTALLATION ----- NONE OMRSD ONLINE TURNAROUND ----- EXERCISE D&C SAFING SWITCH. VERIFY CORRECT OPERATION OF SAFING BIT. CANCEL SAFING. VERIFY ONE JOINT MOVES IN SINGLE DRIVE.

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