

**CRITICAL ITEMS LIST**

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

SYSTEM: O&C SUBSYSTEM  
 ASS'Y P/N: 51160E391

SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 2/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
235	0	SAFING SW, QTY-1 P/H CAE 87838 ED 92020 SHEET 2	<p>MODE: INABILITY TO CANCEL OR INITIATE MCIU SAFING.</p> <p>CAUSE(S):                      (1) 10V POLE FAIL TO AUTO.                      (2) SWITCH FAIL TO AUTO.</p>	<p>FOR CAUSE (1) &amp; (2) CANNOT CANCEL MCIU SAFING VIA D&amp;C PANEL SWITCH CANNOT INITIATE MCIU SAFING, LOSS OF LIMPING DURING EVD EFFECTOR CAPTURE.</p> <p>FOR CAUSE (2) CANNOT SELECT MCIU OR HARDWIRE SAFING.</p> <p>WORST CASE                      -----                      LOSS OF MISSION, LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING                      -----                      DIRECT AND BACKUP.</p>	<p>DESIGN FEATURES</p> <p>TOGGLE SWITCHES USED ON THE O&amp;C PANEL ARE HERMETICALLY SEALED, AND OF A MATURE AND PROVEN DESIGN. THESE SWITCHES ARE IN COMMON USE ON THE ORBITER VEHICLE.</p> <p>THE SWITCHES ARE CONTROLLED BY ROCKWELL INTERNATIONAL SPECIFICATION MC 652-0102 AND HAVE BEEN QUALIFIED TO THE REQUIREMENTS OF THIS SPECIFICATION.</p> <p>ELECTRICAL CONNECTIONS TO THE SWITCH ARE ACHIEVED BY MEANS OF SOLDERABLE TERMINALS.</p> <p>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.</p> <p>THE WIRING HARNESS IS DESIGNED TO BE CAPABLE OF SEPARATE TESTING (FOR INSULATION RESISTANCE, DIELECTRIC STRENGTH, AND CONTINUITY).</p> <p>MOUNTING OF THE SWITCH TO THE D&amp;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.</p> <p>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&amp;C PANEL ASSEMBLY.</p> <p>APPLICATION ANALYSIS HAS CONFIRMED THAT ADEQUATE ELECTRICAL STRESS MARGINS ARE ACHIEVED.</p> <p>AT THE PART LEVEL, QUALIFICATION/CERTIFICATION TESTING IS DEFINED BY ROCKWELL INTERNATIONAL SPECIFICATION MC652-0102. 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.</p> <p>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.</p>	

COMPLETE PROCESSING

PREPARED BY: MFHG SUPERSEDING DATE: NONE

DATE: 11 JUL 91 CIL REV: 0

**CRITICAL ITEMS LIST**

PROJECT: SRMS (1-5 NCIU INSTALLED)  
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM  
 ASS'Y P/N: 514DE391

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 2/184 CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
235	0	SAFING SW, Q1Y-1 P/W CAE 87838 ED 92020 SHEET 2	<p>MODE: INABILITY TO CANCEL OR INITIATE NCIU SAFING.</p> <p>CAUSE(S):                      (1) 10V POLE FAIL TO AUTO.                      (2) SWITCH FAIL TO AUTO.</p>	<p>FOR CAUSE (1) &amp; (2) CANNOT CANCEL NCIU SAFING VIA D&amp;C PANEL SWITCH CANNOT INITIATE NCIU SAFING. LOSS OF LUMPING DURING END EFFECTOR CAPTURE.</p> <p>FOR CAUSE (2) CANNOT SELECT NCIU OR HARDWARE SAFING.</p> <p>WORST CASE                      LOSS OF MISSION, LOSS OF COMPUTER SUPPORTED MODES.                      REDUNDANT PARTS REMAINING</p> <p>DIRECT AND BACKUP.</p>	<p>ACCEPTANCE TESTS                      -----                      THE HARDWARE ITEM IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTS AS PART OF THE D&amp;C PANEL ASSEMBLY.</p> <p>0 VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1                      0 THERMAL: +110 DEGREES F TO PLUS 10 DEGREES F 12 CYCLES - 9.5 HRS/CYCLE.)</p> <p>THE D&amp;C PANEL ASSEMBLY IS FURTHER TESTED AS PART OF THE RMS SYSTEM TESTS (1P510 RMS STRONGBACK TEST AND 1P552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS                      -----                      THE SWITCH ITEM HAS BEEN QUALIFIED FOR ORBITER USE. THE D&amp;C PANEL ASSEMBLY HAS BEEN SUBJECTED TO THE FOLLOWING QUALIFICATION TEST ENVIRONMENTS.</p> <p>0 VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1                      0 SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS)                      0 THERMAL: 130 DEGREES F TO -25 DEGREES F (12 HRS PER CYCLE) (6 CYCLES)                      0 HUMIDITY: 95% (120 DEGREES F TO 82 DEGREES F CYCLE IN 16 HRS) 10 CYCLES TOTAL.                      0 EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TEST CE01, CE02, CE03, CS01 (DC/AC), CE03, CS01 (DC/AC), CS02, CS06, RE02 (B/W), RS02, RS03, RS04)</p> <p>FLIGHT CHECKOUT                      -----                      PORS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>

PREPARED BY:

MFWG

SUPERSEDING DATE: NONE

RMS/D&C - 55

DATE: 11 1987

SDC237A  
 ATTACHMENT  
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**CRITICAL ITEMS LIST**

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

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

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOMR / FUNC. 2/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
235	0	SAFENG SW. QTY-1 P/N CAE 07835 EO 92020 SHEET 2	MODE: INABILITY TO CANCEL OR INITIATE MC(U) SAFING.  CAUSE(S): (1) 10V POLE FAIL TO AUTO.  (2) SWITCH FAIL TO AUTO.	FOR CAUSE (1) & (2) CANNOT CANCEL MC(U) SAFING VIA D&C PANEL SWITCH CANNOT INITIATE MC(U) SAFING. LOSS OF LAMPING DURING END EFFECTOR CAPTURE.  FOR CAUSE (2) CANNOT SELECT MC(U) OR HARDWARE SAFING.  WORST CASE ----- LOSS OF MISSION, LOSS OF COMPUTER SUPPORTED MODES.  REUNDANT PATHS REMAINING ----- DIRECT AND BACKUP.	QA/INSPECTIONS ----- HERMETICALLY SEALED TOGGLE SWITCHES ARE PROCURED TO ROCKWELL SPECIFICATION MC452-0102. AS REQUIRED BY CAE SPECIFICATION PS07835. CAE PART NO. PS07835. QUALIFICATION AND ACCEPTANCE TESTING OF SWITCHES IS PERFORMED TO R1 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 NHB 3300.413A) STANDARD, AS MODIFIED BY JSC08B00A.  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, RMC, TMC AND MC(U), 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 WRITING, 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)	

PREPARED BY: NEMO SUPERSEDING DATE: NONE

DATE: 11 JUL 91 CIL REV: 0

**CRITICAL ITEMS LIST**

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

SYSTEM: D&C SUBSYSTEM  
 ASS'Y P/N: 51242E391

SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	NOVR / FUNC. 2/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
235	0	SAFING SW. QTY-1 P/M CAE 07838 EO 92020 SHEET 2	<p>MODE: INABILITY TO CANCEL OR INITIATE NCIU SAFING.</p> <p>CAUSE(S): (1) 10V POLE FAIL TO AUTO.  (2) SWITCH FAIL TO AUTO.</p>	<p>FOR CAUSE (1) &amp; (2) CANNOT CANCEL NCIU SAFING VIA D&amp;C PANEL SWITCH CANNOT INITIATE NCIU SAFING. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.</p> <p>FOR CAUSE (2) CANNOT SELECT NCIU OR HARDWIRE SAFING.</p> <p>WORST CASE ----- LOSS OF MISSION, LOSS OF COMPUTER SUPPORTED MODES.</p> <p>REDUNDANT PATHS REMAINING ----- DIRECT AND BACKUP.</p>	<p>FAILURE HISTORY -----</p>	<p>THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.</p>

EXPEDITE PROCESSING

**CRITICAL ITEMS LIST**

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

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	MDMR / FUNC. 2/1RB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-FAIL, C-PASS
235	0	SAFING SW. Q17-1 P/W C&E 87838 ED 92020 SHEET 2	MODE: INABILITY TO CANCEL OR INITIATE MCIU SAFING.  CAUSE(S): (1) 10V POLE FAIL TO AUTO.  (2) SWITCH FAIL TO AUTO.	FOR CAUSE (1) & (2) CANNOT CANCEL MCIU SAFING VIA D&C PANEL SWITCH CANNOT INITIATE MCIU SAFING. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.  FOR CAUSE (2) CANNOT SELECT MCIU OR HARDWARE SAFING.  WORST CASE  LOSS OF MISSION, LOSS OF COMPUTER SUPPORTED MODES.  REDUNDANT PATHS REMAINING  DIRECT AND BACKUP.		OPERATIONAL EFFECTS ----- FOR INABILITY TO INITIATE: MOME SWITCH ACTIVATED SAFING FUNCTION LOST. OPERATOR CANNOT STOP SUBSEQUENT RUNAWAY FAILURES WITH THE SAFING SWITCH, AUTO SAFING STILL AVAILABLE. SAFING IS NOT OPERATIONAL METHOD OF STOPPING ARM.  CREW ACTION ----- NO ACTION IS REQUIRED FOR THE CAUSE WHICH RESULTS IN LOSS OF SWITCH ACTUATED MCIU SAFING. IF MCIU SAFING CANNOT BE CANCELLED, USE DIRECT DRIVE.  CREW TRAINING ----- THE CREW SHOULD BE TRAINED TO USE THE BRAKES AND NOT THE SAFING SWITCH TO STOP THE ARM.  MISSION CONSTRAINTS ----- USE THE BRAKES, NOT SAFING TO STOP THE ARM.  SCREEN FAILURES ----- B: NO ORBITER ANNUNCIATION OR DISPLAY.  OMRSD OFFLINE ----- EXERCISE D&C SAFING SWITCH. VERIFY SAFING DATA BITS.  OMRSD ONLINE INSTALLATION ----- NONE.  OMRSD ONLINE TURNAROUND ----- EXERCISE SAFING SWITCH. VERIFY OPERATION OF SAFING BITS (CANCEL, INITIATE, AUTO)

PREPARED BY: NIMG

SUPERSEDED DATE: NONE

DATE: 11 JUL 91

CIL REV: 0