

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	HOWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 85511	<p>MODE: LOSS OF 28V DC.</p> <p>CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).</p>	<p>WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE.</p> <p>LOSS OF EE PRIMARY DRIVE MODES.</p> <p>WORST CASE</p> <p>LOSS OF MISSION LOSS OF PRIMARY MODES.</p> <p>REDUNDANT PATHS REMAINING</p> <p>BACKUP</p>		<p>DESIGN FEATURES</p> <p>ROTARY 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.</p> <p>THE SWITCHES ARE CONTROLLED BY ROCKWELL INTERNATIONAL SPECIFICATION MC 452-0049 AND HAVE BEEN QUALIFIED TO THE REQUIREMENTS OF THIS SPECIFICATION.</p> <p>ELECTRICAL CONNECTIONS TO THE SWITCH ARE ACHIEVED BY MEANS OF A MATING PAIR OF NB TYPE CIRCULAR CONNECTORS USING CRIMP STYLE CONTACTS. WIRING TO SWITCH CONNECTOR UTILIZES NICKEL PLATED CONDUCTORS WITH A POLYAMIDE INSULATION. THE WIRING HARNESS IS DESIGNED TO BE CAPABLE OF SEPARATE TESTING (FOR INSULATION RESISTANCE DIELECTRIC STRENGTH, AND CONTINUITY).</p> <p>THIS SWITCH IS MOUNTED TO THE D&C PANEL BY MEANS OF THREE 6-32 FASTENERS. AFTER INSTALLATION AND TORQUING EACH SCREW HEAD IS STAKED TO THE PANEL USING A BLOB OF EPOXY ADHESIVE. A DOWEL PIN, INTEGRAL TO THE SWITCH BODY, ENGAGES WITH THE PANEL TO PROVIDE ROTATION RESTRAINT. 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.</p> <p>AT THE PART LEVEL, QUALIFICATION/CERTIFICATION TESTING IS DEFINED BY ROCKWELL INTERNATIONAL SPECIFICATION MC452-0049. THIS TEST REQUIREMENT INCLUDES: INSULATION RESISTANCE, CONTACT DROP AT RATED CURRENT, RANDOM VIBRATION (48 MINUTES PER AXIS), SHOCK (20G-3 AXES), 25000 CYCLES ACTIVATION AT RATED DC CURRENT, LEAKAGE AT ONE ATMOSPHERE DIFFERENTIAL PRESSURE. FOR SWITCH OPERATIONAL CYCLES REFER TO TABLE 13.</p> <p>ALL UNITS ARE SUBJECTED TO ACCEPTANCE TESTS WHICH INCLUDE PRE-ACCEPTANCE RUN-IN, DIELECTRIC WITHSTANDING VOLTAGE, CONTACT RESISTANCE, ACCEPTANCE VIBRATION, SEAL TEST, VISUAL EXAMINATION AND FINAL PERFORMANCE TEST.</p> <p>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.</p> <p>THE SWITCHES ARE CONTROLLED BY ROCKWELL INTERNATIONAL SPECIFICATION MC 452-0102 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</p>

PREPARED BY: MFWG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 3

CRITICAL ITEMS LIST

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

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

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
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 85511	<p>MODE: LOSS OF 28V DC.</p> <p>CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).</p>	<p>WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE.</p> <p>LOSS OF EE PRIMARY DRIVE MODES.</p> <p>WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES.</p> <p>REDUNDANT PATHS REMAINING ----- BACKUP</p>		<p>TESTING (FOR INSULATION RESISTANCE, DIELECTRIC STRENGTH, AND CONTINUITY).</p> <p>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.</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&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 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.</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>

PREPARED BY: MFNG

SUPERSEDING DATE: 06 OCT 87

RMS/D&C - 318

DATE: 24 JUL 91

CIL REV: 3

CRITICAL ITEMS LIST

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

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 51120E391

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
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 85511	MODE: LOSS OF 28V DC. CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).	WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE. LOSS OF EE PRIMARY DRIVE MODES. WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES. REDUNDANT PATHS REMAINING ----- BACKUP		ACCEPTANCE TESTS ----- THE HARDWARE ITEM IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS PART OF THE D&C PANEL. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1 O THERMAL: +100 DEGREES F TO +10 DEGREES F 2 CYCLES (9.5 HRS PER CYCLE) THE D&C PANEL ASSEMBLY IS FURTHER TESTED AS PART OF THE RMS SYSTEM (TP518 RMS STRONGBACK TEST AND TP552 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATION TESTS ----- THE D&C PANEL HAS BEEN SUBJECTED TO THE FOLLOWING QUALIFICATION TEST ENVIRONMENT: O VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1 O SHOCK: 20G/11MS - 3 AXES (6 DIRECTION) 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, CE CE03, CS01(DC/AC), CS02, CS06, RE02 (B/N), RS02, RS03, RS04) RE02 (B/N) RS02, 03, 04) FLIGHT CHECKOUT ----- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY:

MFVG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 3

CRITICAL ITEMS LIST

PROJECT: (S MCIU III) (10)
 ASS'Y NAME: D&C PANEL

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

SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	NDWR / FUNC. 2/1R CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 85511	MODE: LOSS OF 28V DC. CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).	WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES 1/0. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE. LOSS OF EE PRIMARY DRIVE MODES. WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES. REDUNDANT PATHS REMAINING ----- BACKUP	QA/INSPECTIONS -----	HERMETICALLY SEALED TOGGLE SWITCHES ARE PROCURED TO ROCKWELL SPECIFICATION MC452-0102. ROCKWELL PART NO. ME452-0102-.... QUALIFICATION AND ACCEPTANCE TESTING OF SWITCHES IS PERFORMED TO R.I. SPEC. MC452-0102. HERMETICALLY SEALED ROTARY SWITCHES ARE PROCURED TO ROCKWELL SPEC MC452-0049, AS REQUIRED BY THE APPLICABLE CAE SPECIFICATION. QUALIFICATION AND ACCEPTANCE TESTING OF SWITCHES PERFORMED TO RI SPEC MC452-0049. WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSC8080 STANDARD NUMBER 95A. RECEIVING INSPECTION VERIFIES THAT ALL PARTS RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS, THAT NO PHYSICAL DAMAGE HAS OCCURRED TO PARTS DURING SHIPMENT, THAT THE RECEIVING DOCUMENTS PROVIDE ADEQUATE TRACEABILITY INFORMATION AND SCREENING DATA CLEARLY 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, IHC 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

PREPARED BY:

MFVG

SUPERCEDING DATE: 06 OCT 87

APPROVED BY:

DATE: 26 JUL 91

CIL REV: 3

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 OR END ITEM	HWR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 05511	MODE: LOSS OF 28V DC. CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).	WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE. LOSS OF EE PRIMARY DRIVE MODES. WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES. REDUNDANT PATHS REMAINING ----- BACKUP	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)

PREPARED BY: MFVG SUPERSEDING DATE: 06 OCT 87 APPROVED BY: _____ DATE: 26 JUL 91 CIL REV: 3

CRITICAL ITEMS LIST

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

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/N: 51140E191

SHEET: 6

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
1400	3	28V POWER SUPPLY QTY-1 (ORBITER SYSTEM). PS 90128. WL 90128. ED 85511	MODE: LOSS OF 28V DC. CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).	WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE. LOSS OF EE PRIMARY DRIVE MODES. WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES. REDUNDANT PATHS REMAINING ----- BACKUP	FAILURE HISTORY ----- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.	

PREPARED BY: MFVG

SUPERSEDING DATE: 06 OCT 87

DATE: 24 JUL 91

CIL REV: 3

CRITICAL ITEMS LIST

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

SYSTEM: D&C SUBSYSTEM
 ASS'Y P/R: 51120111

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/1R CRITICALITY RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
1400	3	28V POWER SUPPLY Q11-1 (ORBITER SYSTEM), PS 90128, WL 90128, ED 85511	MODE: LOSS OF 28V DC. CAUSE(S): (1) ANY 28V SWITCH CONTACT SHORTS TO CASE (MODE, BRAKE, SAFING).	WILL BLOW 2 AMP FUSE. LOSS OF PRIMARY POWER. GPC TERMINATES I/O. MCIU SHUTS DOWN. ARM WILL BE HARDWIRE SAFED AND BRAKES WILL BE APPLIED. LIMPING LOST DURING END EFFECTOR CAPTURE. LOSS OF EE PRIMARY DRIVE MODES. WORST CASE ----- LOSS OF MISSION LOSS OF PRIMARY MODES. REDUNDANT PATHS REMAINING ----- BACKUP	OPERATIONAL EFFECTS ----- PRIMARY MODES CANNOT BE USED TO COMPLETE THE MISSION. BACKUP MODE AVAILABLE. IF PAYLOAD ATTACHED ARM SHOULD BE MANEUVERED TO A SAFE POSITION FOR PAYLOAD RELEASE. IF SUBSEQUENT FAILURE OCCURS ALL DRIVE MODES ARE LOST. THE ARM MAY BE JETTISONED. CREW ACTION ----- USE BACKUP. CREW TRAINING ----- NONE MISSION CONSTRAINT ----- NONE OMRSD OFFLINE ----- WITH SAFING SWITCH IN 'AUTO' VERIFY VOLTAGE AT D&C PANEL OUTPUT. OMRSD ONLINE INSTALLATION ----- WITH SAFING SWITCH IN 'AUTO' VERIFY VOLTAGE AT LONGERON INTERFACE. OMRSD ONLINE TURNAROUND ----- WITH SAFING SWITCH IN 'AUTO' SELECT SINGLE AND DRIVE ANY JOINT. VERIFY TACHOMETER SIGNATURE.

PREPARED BY: MFVG SUPERSEDING DATE: 06 OCT 87 APPROVED BY: _____ DATE: 24 JUL 91 CIL REV: 3