CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: BACK-UP
SYSTEM: BACK-UP
ASS'Y P/N:
SHEET: 1

FMEA REF.	REV.	NOMN, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
4490	0	BACKUP JOINT SELECT SWITCH QTY-1 P/N PS-87841-01	MODE: INCORRECT SELECTION OF JOINT. CAUSE(S): (1) MECHANICAL FAILURE.	JOINT OTHER THAN SELECTED WILL DRIVE. WORST CASE --- UNEXPECTED MOTION. WRONG JOINT DRIVES. UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A		DESIGN FEATURES --- 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. THE SWITCHES ARE CONTROLLED BY ROCKWELL INTERNATIONAL SPECIFICATION MC 452-0049 AND HAVE BEEN QUALIFIED TO THE REQUIREMENTS OF THIS SPECIFICATION. ELECTRICAL CONNECTIONS TO THE SWITCH ARE ACHIEVED BY MEANS OF A MATING PAIR OF MB 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). 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. 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. 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.

PREPARED BY: MFWG
SUPERCEDING DATE: 11 SEP 86
APPROVED BY:
DATE:

CRITICAL ITEMS LIST

PROJECT: SRMS SYSTEM: BACK-UP
ASS'Y NOMENCLATURE: BACK-UP ASS'Y P/N: _____ SHEET: 2

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
4490	0	BACKUP JOINT SELECT SWITCH QTY-1 P/N PS-87841-01	MODE: INCORRECT SELECTION OF JOINT. CAUSE(S): (1) MECHANICAL FAILURE.	JOINT OTHER THAN SELECTED WILL DRIVE. WORST CASE --- UNEXPECTED MOTION. WRONG JOINT DRIVES. UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A		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 (TP518 RMS STRONGBACK TEST AND TP552 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 (B/W), RS02, RS03, RS04) FLIGHT CHECKOUT --- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

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CRITICAL ITEMS LIST

PROJECT: SRMS SYSTEM: BACK-UP
ASS'Y NOMENCLATURE: BACK-UP ASS'Y P/N: _____ SHEET: 3

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
4490	0	BACKUP JOINT SELECT SWITCH QTY-1 P/N PS-87841-01	MODE: INCORRECT SELECTION OF JOINT. CAUSE(S): (1) MECHANICAL FAILURE.	JOINT OTHER THAN SELECTED WILL DRIVE. WORST CASE ---------- UNEXPECTED MOTION. WRONG JOINT DRIVES. UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING ---------- N/A		QA/INSPECTIONS ---------- HERMETICALLY SEALED ROTARY SWITCHES ARE PROCURED TO ROCKWELL SPECIFICATION MC452-0049, AS REQUIRED BY CAE SPEC. PS87841. CAE PART NO. PS87841-1. QUALIFICATION AND ACCEPTANCE TESTING OF SWITCHES IS PERFORMED TO R1. SPEC. MC452-0049. 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 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)

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ASS'Y P/N: _____
SHEET: 4

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
4490	0	BACKUP JOINT SELECT SWITCH QTY-1 P/N PS-87841-01	MODE: INCORRECT SELECTION OF JOINT. CAUSE(S): (1) MECHANICAL FAILURE.	JOINT OTHER THAN SELECTED WILL DRIVE. WORST CASE ---------- UNEXPECTED MOTION. WRONG JOINT DRIVES. UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING ---------- N/A		FAILURE HISTORY ---------- NO EEE PARTS FAILURES HAVE OCCURRED SUBSEQUENT TO ASSEMBLY OF PARTS. THE FOLLOWING FAILURE ANALYSIS REPORT(S) ARE RELEVANT: FAR 1010: S/N 201 NOV 81 DESCRIPTION ---------- SJ YAW FAILED TO OPERATE IN BACK-UP MODE. FOUND DEFECTIVE D&C PANEL CABLE. CORRECTIVE ACTION ---------- REPAIR CABLE

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ASS'Y P/N: _____
SHEET: 5

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY — RATIONALE FOR ACCEPTANCE
4490	0	BACKUP JOINT SELECT SWITCH QTY-1 P/N PS-87841-01	MODE: INCORRECT SELECTION OF JOINT. CAUSE(S): (1) MECHANICAL FAILURE.	JOINT OTHER THAN SELECTED WILL DRIVE. WORST CASE --- UNEXPECTED MOTION. WRONG JOINT DRIVES. UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A	OPERATIONAL EFFECTS --- WHEN ATTEMPTING TO DRIVE A JOINT IN BACKUP MODE, A JOINT OTHER THAN THAT SELECTED WILL DRIVE. CREW ACTION --- REMOVE THE DRIVE COMMAND. CREW TRAINING --- THE CREW WILL BE TRAINED TO AL WAYS OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, THE COMMAND SHOULD BE REMOVED. MISSION CONTRAINT --- THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS. SCREEN FAILURES --- N/A OMRSD OFFLINE --- OPERATE BACKUP DIRECT DRIVE SWITCH TO + OR -. EXERCISE JOINT SELECT SWITCH IN ALL POSTIONS. VERIFY ENABLE COMMAND VOLTAGES AT D&C PANEL OUTPUT. OMRSD ONLINE INSTALLATION --- OPERATE BACKUP DIRECT DRIVE SWITCH TO + OR -. EXERCISE JOINT SELECT SWITCH IN ALL POSTIONS. VERIFY ENABLE COMMAND VOLTAGES AT LONGERON INTERFACE. OMRSD ONLINE TURNAROUND --- IN BACK UP MODE,DRIVE EACH JOINT. VERIFY 10 KHZ AUDIBLE FOR SELECTED JOINT.

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