

**CRITICAL ITEM LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: DEC PANEL

SYSTEM: DEC SUBSYSTEM  
 ASS'Y P/N: 51109301

SHEET: 1

ITEM REF.	REV.	NAME BY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RCMR / PORG. / I / I / CRITICALITY	RATIONALE FOR ACCEPTANCE
1160	0	DIRECT DRIVE COMMAND OFF-1 REF. SIGNAL CIRCUIT ED01215	MODE: LOSS OF CCV COMMANDS.  CAUSE(S): (1) O/C OF "LOWER ZENER".	ALL COMMANDS WILL BE +.  12.6V SIGNAL BECOMES 20V. 6.2V SIGNAL BECOMES 22V.  WORST CASE ----- UNEXPECTED POSITION. WRONG JOINT DIRECTION. UNANNUNCIATED. CREW ACTION REQ.  REMANDANT PRIMS REMAINING ----- N/A		DESIGN FEATURES -----  THE REQUIRED SIGNALS ARE DERIVED FROM TWO 6.2 VOLT ZENER DIODES. THE DIODES ARE SERIES CONNECTED WITH A 750 OHM RESISTOR ACROSS THE 28VDC POWER SUPPLY. THE DIODES ARE PROTECTED AGAINST VOLTAGE TRANSIENTS BY A 0.1 UF CERAMIC CAPACITOR. WORST CASE POWER STRESS LEVEL IN EACH DIODE IS APPROX. 32 PER CENT OF RATED. POWER DISSIPATION IN THE RESISTOR IS APPROX. 46 PER CENT OF RATED. VOLTAGE STRESS LEVEL FOR THE CAPACITOR IS 28 PER CENT OF RATED.  EEE PARTS HAVE BEEN SELECTED AND CONTROLLED IN ACCORDANCE WITH SPAR-RMS-PA.005. THIS DOCUMENT DEFINES THE PROGRAM REQUIREMENTS FOR MONITORING AND CONTROLLING EEE PARTS. THE REQUIREMENTS INCLUDE PARTS SELECTION TO AT LEAST "ESTABLISHED RELIABILITY" LEVELS, AND ADEQUATE OPERATING CYCLE STRESS LEVELS. PROCEDURES AND ACTIVITIES ARE SPECIFIED TO ENSURE AT LEAST EQUIVALENT QUALITY FOR NONSTANDARD AND IRREGULAR PARTS. RELIABILITY ANALYSIS HAS CONFIRMED NO PARTS WITH GENERALLY HIGH FAILURE RATES. AEROSPACE DESIGN STANDARDS FOR DETAILING ELECTRONIC PARTS PACKAGING, MOUNTING AND STRUCTURAL/MECHANICAL/INTEGRITY OF ASSEMBLIES ARE APPLIED. SUCH DESIGN HAS BEEN REVIEWED AND FOUND SATISFACTORY THROUGH THE DESIGN AID'S PROCESS, INCLUDING THE USE OF RELIABILITY MAINTAINABILITY AND SAFETY CHECKLISTS. MATERIAL SELECTION AND USAGE CONFORMS TO SPAR-SG.548 WHICH IS EQUIVALENT TO THE NASA MATERIALS USAGE REQUIREMENTS. WORST CASE ANALYSIS HAS BEEN CONDUCTED TO ENSURE THAT PERFORMANCE CAN BE MET UNDER WORST CASE TEMPERATURE AND AGING EFFECTS. EEE PARTS STRESS ANALYSIS HAS BEEN COMPLETED AND CONFIRMS THAT THE PARTS MEET THE OPERATING REQUIREMENTS.  PRINTED CIRCUIT BOARD DESIGNS HAVE BEEN REVIEWED TO ENSURE ADEQUATE CIRCUIT PATTERN WIDTH AND SEPARATION AND TO CONFIRM APPROPRIATE DIMENSIONS OF CIRCUIT SOLDER PADS AND OF COMPONENT HOLE PROVISIONS.  PARTS MOUNTING METHODS ARE CONTROLLED IN ACCORDANCE WITH RSC-618-156 AND CME 9093609. THESE DOCUMENTS REQUIRE APPROVED MOUNTING METHODS, STRESS RELIEF, AND COMPONENT SECURITY.  WHERE APPLICABLE, DESIGN DRAWINGS AND DOCUMENTATION GIVE CLEAR IDENTIFICATION OF HANDLING PRECAUTIONS FOR ESD SENSITIVE PARTS.  BOARD ASSEMBLY DRAWINGS INCLUDE THE REQUIREMENT FOR SOLDERING STANDARDS IN ACCORDANCE WITH NHD 5300.4(3A) AND JSC 08600R.

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM  
 ASS'Y P/N: 31140E391

SHEET: 2

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. I / I CRITICALITY	RATIONALE FOR ACCEPTANCE
1160	0	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT E087315	MODE: LOSS OF CCM COMMANDS.  CAUSE(S): (?) O/C OF "LOWER ZENER".	ALL COMMANDS WILL BE +.  12.4V SIGNAL BECOMES 28V. 6.2V SIGNAL BECOMES 22V.  WORST CASE  UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNANNOUNCED, CREW ACTION REQ.  REDUNDANT PATHS REMAINING  N/A		<p>ACCEPTANCE TESTS</p> <p>THE HARDWARE ITEM IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS PART OF THE D&amp;C PANEL.</p> <p>D VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 1</p> <p>D THERMAL: +180 DEGREES F TO +10 DEGREES F 2 CYCLES (9.5 HRS PER CYCLE)</p> <p>THE D&amp;C PANEL ASSEMBLY IS FURTHER TESTED AS PART OF THE RMS SYSTEM (DPS10 RMS STRONGBACK TEST AND TP352 FLAT FLOOR TEST) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS</p> <p>THE D&amp;C PANEL HAS BEEN SUBJECTED TO THE FOLLOWING QUALIFICATION TEST ENVIRONMENT:</p> <p>D VIBRATION: LEVEL AND DURATION - REFERENCE TABLE 9</p> <p>D SHOCK: 20G/11MS - 3 AXES (6 DIRECTION)</p> <p>D THERMAL: 130 DEGREES F TO -23 DEGREES F (12 HRS PER CYCLE) (6 CYCLES)</p> <p>D HUMIDITY: 95% (120 DEGREES F TO 82 DEGREES F CYCLE IN 16 HRS) 10 CYCLES TOTAL</p> <p>D EMC: MIL-STD-461 AS MODIFIED BY EL-E-0002 (TEST C001, 1E C003, C001(DC/AC), C002, C004, REQ2 (R/W), R002, R003, R004)</p> <p>REQ2 (R/W) R002, 03, 04)</p> <p>FLIGHT CHECKOUT</p> <p>PORS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>

PREPARED BY: MFM

SUPERSEDING DATE: 11 SEP 85

APPROVED BY:

DATE:

**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASSY NOMENCLATURE: DBC PANEL

SYSTEM: DBC SUBSYSTEM  
 ASSY P/N: 51224 101

SHEET: 3

P/NK REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1160	0 *	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT E087315	MODE: LOSS OF CCM COMMANDS.  CAUSE(S): (1) D/C OF "LOWER ZENER".	ALL COMMANDS WILL BE *.  12.4V SIGNAL BECOMES 20V. 6.2V SIGNAL BECOMES 22V.  WORST CASE ----- UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNMANUFACTURED. CREW ACTION REQ.  REDUNDANT PATHS BEHAVING ----- N/A	DA/INSPECTIONS -----	<p>EEE PARTS INSPECTION IS PERFORMED AS REQUIRED BY SPAR-RMS-PA.003. EACH EEE PART IS QUALIFIED AT THE PART LEVEL TO THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION. ALL EEE PARTS ARE 100% SCREENED AND BURNED IN, AS A MINIMUM, AS REQUIRED BY SPAR-RMS-PA.003, BY THE SUPPLIER. ADDITIONALLY, EEE PARTS ARE 100% RE-SCREENED IN ACCORDANCE WITH REQUIREMENTS, BY AN INDEPENDENT SPAR APPROVED TESTING FACILITY. BPA IS PERFORMED AS REQUIRED BY PA.003 ON A RANDOMLY SELECTED 5% OF PARTS, MAXIMUM 5 PIECES, MINIMUM 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED.</p> <p>WIRE IS PROCURED TO SPECIFICATION MIL-U-22759 OR MIL-U-81581 AND INSPECTED AND TESTED TO NASA JSC08000 STANDARD NUMBER 95A.</p> <p>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 IDENTIFIED ACCEPTABLE PARTS.</p> <p>PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED, THESE INSPECTIONS INCLUDE,</p> <p>PRINTED CIRCUIT BOARD INSPECTION FOR FRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES,</p> <p>COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA HQ 5300.4(3a) STANDARD, AS MODIFIED BY JSC 0800A.</p> <p>CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLET LIGHT TECHNIQUES.</p> <p>POST P.C. BD. INSTALLATION INSPECTION, CLEANLINESS AND WORKMANSHIP (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT)</p> <p>P.C. BD. INSTALLATION INSPECTION, CHECK FOR CORRECT BOARD INSTALLATION, ALIGNMENT OF BOARDS, PROPER CONNECTION CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ETC.,</p> <p>PRE-TEST INSPECTION OF DBC PANEL ASSY INCLUDES AN AMOUNT OF LOWER TIER INSPECTION COMPLETION, AS BUILD CONFIGURATION VERIFICATION TO AS DESIGN ETC. (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT)</p> <p>A TEST READINESS REVIEW (TRM) WHICH INCLUDES VERIFICATION OF TEST PERSONNEL, TEST DOCUMENTS, TEST EQUIPMENT CALIBRATION/VALUATION 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).</p> <p>ACCEPTANCE TESTING (ATP) INCLUDES AMBIENT PERFORMANCE,</p>

PREPARED BY: MFC

SUPPLEMENTING DATE: 11 SEP 66

APPROVED BY

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**CRITICAL ITEMS LIST**

PROJECT: SRMS  
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM  
 ASS'Y P/N: 517420391

SHEET: 4

P/N & REF.	REV.	PART, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HOW / FUNC. / 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
1140	d	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT EBB7595	MODE: LOSS OF CCM COMMANDS.  CAUSE(S): (1) D/C OF "LOWER ZEMER".	ALL COMMANDS WILL BE +.  12.4V SIGNAL BECOMES 28V. 6.2V SIGNAL BECOMES 22V.  WORST CASE ..... UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNANNUNCIATED. CREW ACTION REQ.  RECOMMANT PATHS REMAINING ..... N/A	1/1	<p>THERMAL AND VIBRATION TESTING, (SPAR/GOVERNMENT REF. - MANDATORY INSPECTION POINT).</p> <p>INTEGRATION OF D&amp;C PANEL, RMC, TMC AND MC10, INSPECTIONS ARE PERFORMED AT EACH STAGE OF INTEGRATION, WHICH INCLUDES GROUNDING CHECKS, INTER CONNECT CABLE VERIFICATION, CONNECTOR INSPECTION FOR BLUNT OR PUSHBACK CONTACTS ETC.</p> <p>SLB SYSTEM PERFORMANCE TESTING (APP), INCLUDES AN AMBIENT PERFORMANCE TEST. (MANDATORY INSPECTION POINT).</p> <p>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 BERT OR PUSH BACK CONTACTS ETC.</p> <p>SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT PERFORMANCE TEST. (SPAR/GOVERNMENT REF. - MANDATORY INSPECTION POINT)</p>

PREPARED BY: HTMG

SUPPLEMENTING DATE: 17 SEP 86

APPROVED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: RMS  
 ASS'Y NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM  
 ASS'Y P/N: SITC0591

SHEET: 5

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOW / FUNC. IZI CRITICALITY	RATIONALE FOR ACCEPTANCE
1140	0	DIRECT DRIVE COMMANDS QTY: 1 REF. SIGNAL CIRCUIT ED07315	NOTE: LOSS OF EDW COMMANDS.  CAUSE(S): (1) O/C OF "LOWER ZENER".	ALL COMMANDS WILL BE *.  12.4V SIGNAL BECOMES 20V. 6.2V SIGNAL BECOMES 22V.  WORSE CASE ..... UNEXPECTED MOTION. WRONG JOINT DIRECTION. INANNUNCIATED. CREW ACTION REQ.  REDUNDANT PARTS REMAINING ..... N/A		FAILURE HISTORY ..... NO SEE PARTS FAILURES HAVE OCCURRED SUBSEQUENT TO ASSEMBLY OF PARTS.

PREPARED BY: RMWG

SUPERSEDING DATE: 15 SEP 86

APPR

DATE: \_\_\_\_\_

**CRITICAL ITEMS LIST**

PROJECT: SENS  
 ASSY NOMENCLATURE: D&C PANEL

SYSTEM: D&C SUBSYSTEM  
 ASSY P/N: 511G0E191

SHEET: 6

PMA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	HARM / FURT. I/O CRITICALITY	RATIONALE FOR ACCEPTANCE
1160	0	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT ED87315	MODE: LOSS OF CCM COMMANDS.  CAUSE(S): (1) O/C OF "LOWER ZENER".	ALL COMMANDS WILL BE +.  12.4V SIGNAL BECOMES 28V. 6.2V SIGNAL BECOMES 22V.  WORST CASE  UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNANNUNCIATED. CREW ACTION REQ.  REBUNDANT PATHS REMAINING  N/A	OPERATIONAL EFFECTS  JOINT DOES NOT RESPOND PROPERLY TO COMMANDS IN DIRECT MODE.  CREW ACTION  REMOVE COMMAND.  CREW TRAINING  THE CREW SHOULD BE TRAINED TO ALWAYS DOUBLE CHECK WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, THE COMMAND SHOULD BE REMOVED.  MISSION CONSTRAINT  OPERATE AT LESS THAN VERMIER RATES WITHIN 10 FT OF STRUCTURE BY CYCLING SWITCH. 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  DMRD OFFLINE  EXERCISE DIRECT DRIVE SWITCH VERIFY VOLTAGE ON DIRECT DRIVE HARDWARE LINES AT D&C PANEL OUTPUT  DMRD ONLINE INSTALLATION  EXERCISE DIRECT DRIVE SWITCH VERIFY VOLTAGE ON DIRECT DRIVE HARDWARE LINES AT LONGERON INTERFACE  DMRD ONLINE TURNAROUND  EXERCISE DIRECT DRIVE COMMANDS VERIFY CORRECT JOINT MOTION RESPONSES	

PREPARED BY: MEM

SUPERSEDING DATE: 11 SEP 86

APPROVED BY: \_\_\_\_\_

DATE: \_\_\_\_\_