CRITICAL ITEMS LIST

PROJECT: SRMU
ASS'Y NOMENCLATURE: D&C PANEL
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 21150E191
SHEET: 1

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	FAULT / TIME, R/R CRITICALITY	RATIONALE FOR ACCEPTANCE
1150	0	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT E867315	MODE: LOSS OF 12.4 AND 6.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZENER".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD,S ARE LOST. 12.4V SIGNAL (+ DRIVE) IS SET TO 6.2V (-DRIVE). WORST CASE --------- UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS 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 20 PER CENT OF RATED. EEE PARTS HAVE BEEN SELECTED AND CONTROLLED IN ACCORDANCE WITH SPAR-EMS-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 DERATING OF PART 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 GENERICALLY 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 AUDIT PROCESS, INCLUDING THE USE OF RELIABILITY, MAINTAINABILITY AND SAFETY CHECKLISTS. MATERIAL SELECTION AND USAGE CONFORMS TO SPAR-EE.360 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 DERATING REQUIREMENTS. PRINTED CIRCUIT BOARD DESIGNS HAVE BEEN REVIEWED TO ENSURE ADEQUATE CIRCUIT PATH 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 MSFC-STD-136 AND CAE P095409. 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 NHB 5300.4(3A) AND JSC 08780A.

PREPARED BY: MEMG
SUPERCEDING DATE: 18 SEP 86
APPROVED
DATE:

RMS/D&C 220

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: D&C PANEL
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 51T500291
SHEET: 2

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1150	0	DIRECT DRIVE COMMANDS Q31-1 REF. SIGNAL CIRCUIT ED87515	MODE: LOSS OF 12.4 AND 6.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZENER".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD,S ARE LOST. 12.4V SIGNAL (+ DRIVE) IS SET TO 6.2V (-DRIVE). WORST CASE --------- UNEXPECTED MOTION, WRONG JOINT DIRECTION, UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING ---------- N/A		ACCEPTANCE TESTS ---------- THE HARDWARE ITEM IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS PART OF THE D&C PANEL. D VIBRATION: LEVEL AND DURATION - REFERENCE TABLE I D 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 (TP51B 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: D VIBRATION: LEVEL AND DURATION - REFERENCE TABLE I D SHOCK: 20G/11MS - 3 AXES (6 DIRECTION) D THERMAL: 130 DEGREES F TO -25 DEGREES F (12 HRS PER CYCLE) (6 CYCLES) D HUMIDITY: 95% (120 DEGREES F TO 82 DEGREES F CYCLE IN 16 HRS) 10 CYCLES TOTAL D EMC: MIL-STD 461 AS MODIFIED BY SL-E-0002 (TEST CE01, CE 003, CS01(DC/AC), CS02, CS06, RE02 (D/H), RS02, RS03, RS04) RE02 (B/H) RS02, 05, 04) FLIGHT CHECKOUT ---------- PRCS OPS CHECKLIST (ALL VEHICLES) JSC 16987

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

CRITICAL ITEMS LIST

PROJECT: SAMS
ASS'Y NOMENCLATURE: D&C PANEL
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 51TK0E391
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
1150	D	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT EQUIP315	MODE: LOSS OF 12.4 AND 6.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZENER".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD.S ARE LOST. 12.4V SIGNAL (+ DRIVE) IS SET TO 6.2V (-DRIVE). WORST CASE --- UNEXPECTED MOTION, WRONG JOINT - DIRECTION, UNANNUNCIATED, CREW ACTION REQ. REDUNDANT PATHS REMAINING --- N/A	QA/INSPECTIONS --- 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. DPA 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. WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSC08080 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, PRINTED CIRCUIT BOARD INSPECTION FOR TRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES, COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA NHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 08800A. CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLET LIGHT TECHNIQUES. POST P.C. BD. INSTALLATION INSPECTION, CLEANLINESS AND WORKMANSHIP (SPAR/GOVERNMENT REP. MANDATORY INSPECTION POINT) P.C. BD. INSTALLATION INSPECTION, CHECK FOR CORRECT BOARD INSTALLATION, ALIGNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ETC., PRE-TEST INSPECTION OF D&C PANEL ASSY INCLUDES AN AUDIT OF LOWER ITEM 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,

PREPARED BY: MEMG
SUPERCEDING DATE: 31 SEP 86
APPROVED BY
E:

CRITICAL ITEMS LIST

PROJECT: SRMS SYSTEM: D&C SUBSYSTEM
ASS'Y NOMENCLATURE: D&C PANEL ASS'Y P/N: 51T20E391 SHEET: 4

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/3 CRITICALITY	RATIONALE FOR ACCEPTANCE
1150	B	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT ED87315	MODE: LOSS OF 12.4 AND 6.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZENER".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD,S ARE LOST. 12.4V SIGNAL (+ DRIVE) IS SET TO 6.2V (-DRIVE). WORST CASE --- UNEXPECTED MOTION. WRONG JOINT DIRECTION, UNANNUNCIATED. CREW ACTION REQ. SECONDARY FAIL REMAINING --- N/A	THERMAL AND VIBRATION TESTING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). INTEGRATION OF D&C PANEL, RHC, PBC AND MCIU, INSPECTIONS ARE PERFORMED AT EACH STAGE OF INTEGRATION, WHICH INCLUDES GROUNDING CHECKS, HARN 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, HARN 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: MEWG SUBMITTING DATE: 19 SEP 86 APPROVED BY: DATE:

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: DEC PANEL
SYSTEM: DEC SUBSYSTEM
ASS'Y P/N: 51TC0E301
SHEET 5

FMEA REF.	REV.	NOMEN, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1150	0	DIRECT DRIVE COMMANDS QTY-1 REF. SIGNAL CIRCUIT EDB7315	MODE: LOSS OF 12.4 AND 4.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZENER".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD'S ARE LOST. 12.4V SIGNAL (+ DRIVE) IS SET TO 4.2V (-DRIVE). WORST CASE --- UNEXPECTED MOTION. WRONG JOINT DIRECTION. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING --- N/A		FAILURE HISTORY --- NO EEE PARTS FAILURES HAVE OCCURRED SUBSEQUENT TO ASSEMBLY OF PARTS.

PREPARED BY: MWG
SUPERCEDING DATE: 11 SEP 86
APPROVE
DATE:

CRITICAL ITEMS LIST

PROJECT: SAMS — SYSTEM: D&C SUBSYSTEM
ASS'Y NOMENCLATURE: D&C PANEL — ASS'Y P/N: ST7L0 507 — SHEET: 6

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	MAJOR FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1150	D	DIRECT DRIVE COMMANDS QTY 1 REF. SIGNAL CIRCUIT E0073I5	MODE: LOSS OF 12.6 AND 6.2 V SIGNAL. CAUSE(S): (1) S/C OF "LOWER ZERO".	'POS' CMDS WILL BE 'NEG' 'NEG' CMD.S ARE LOST. 12.6V SIGNAL (+ DRIVE) IS SET TO 6.2V (-DRIVE). WORST CASE UNEXPECTED MOTION, WRONG JOINT DIRECTION, UNANNUNCIATED. CREW ACTION REQ. REDUNDANT 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 OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, THE COMMAND SHOULD BE REMOVED. MISSION CONSTRAINT OPERATE AT LESS THAN VERNIER 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 ORBSO OFFLINE EXERCISE DIRECT DRIVE SWITCH VERIFY VOLTAGES ON DIRECT DRIVE HARDWIRE LINES AT D&C PANEL OUTPUT ORBSO ONLINE INSTALLATION EXERCISE DIRECT DRIVE SWITCH VERIFY VOLTAGE ON DIRECT DRIVE HARDWIRE LINES AT LONGERON INTERFACE ORBSO ONLINE TURNAROUND EXERCISE DIRECT DRIVE COMMANDS VERIFY CORRECT JOINT MOTOR RESPONSES

PREPARED BY: MFMG — SUPERSEDING DATE: 11 SEP 84 — APPROVED BY: — DATE: