CRITICAL ITEMS LIST

THEA REV.

1

MAME DIT & DRAWING REF. DESIGNATION

ENCODER DATA PROCESSOR OTY-6 SCHEMATIC 2563723 2563722

FMEA REF.

2650

ASS'T NOMENCLATURE: FARIURE HODE FAILURE EFFECT ON CAUSE END 1TEM	HOUR / FUNC. RATIONALE FOR ACCEPTANCE CRITICALITY SCREENS: A-PASS, B-PASS, C-PASS
PROBETALSE TALSE TALSE POSTFTOM PATA. TAUSE(S): TAUSE(S): TAMBELLI TAMBELL	DESIGN FEATURES THE DESIGN UTILIZES PROVEN CIRCUIT TECHNIONES AND IS IMPLEMENTED USING CMOS LOGIC DEVICES. CMOS DEVICES OPERATE AT LOW POWER AND HENCE DO NOT EXPERIENCE SIGNIFICANT OPERATING STRESSES. THE TECHNOLOGY IS MATURE, AND DEVICE RELIABILITY HISTORY IS WELL DOCUMENTED. ALL STRESSES ARE ADDITIONALLY REDUCED BY DERAYING THE APPROPRIATE PARAMETERS IN ACCORDANCE MITH SPAR-RNS-PA.003. SPECIAL HAMDLING PRECAUTIONS ARE USED AT ALL STAGES OF MANUFACTURE TO PRECLUDE DAMAGE/STRESS DUE TO ELECTROSIATIC DISCHARGE. ALL RESISTORS AND CAPACITORS USED IN THE DESIGN ARE SELECTED FROM ESTABLISHED RELIABILITY (ER) TYPES. LEFE EMPECIANCY IS INCREASED BY ENSURING THAT ALL ALLOWABLE STRESS LEVELS ARE DERATED IN ACCORDANCE MITH SPAR-RNS-PA.003. ALL CERAMIC AND ELECTROLYTIC CAPACITORS ARE ROUTINELY SUBJECTED TO RADITOGRAPHIC INSPECTION.

ARED BY:	HI NG	Silbsacralva				
	<u>'U = 4</u>	SUPERCEDING DA	TE: 11 SEP 86	APPROVED BY:	DATE: 24 JUL 91	CIL REV:

CRITICAL	ITEHB	LIST
C. 31 E E E		

MEA ET.	THEA REV.	NAME OIT, & DRAWING RET. DESEGNATION	FAILURE MODE AND CAUSE	FAILURE FFFECT	HDVA / FUNC. 2/18 CRITICALTIY	RATIONALE FOR ACCEPTANCE SCREEMS: A-PASS, B-PASS, C-PASS
2650		ENELDER DATA PROCESSOR OIT-6 SCHEMATIC 2563723 2563722	HODE: FALSE POSITION DATA. CAUSE(S): (1) PARTS TAILURE IN SERIAL TO PARALLEL CONVERTER. EEE PARTS, WIRING OR P.C. BOARD. (2) ERROR IN GRAT TO BINARY CONVERTER. (3) PARTIAL FAILURE OF OP FILTER.	THALLITRATE JOINT POSTTION DATA IS TRANSMITTED TO GPC WHICH COULD RESULT IN ERROHEOUS COMMANDS. COMSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. EMCODER CHECK WILL ANHUNCHATE CHECK CAT. LOSS OF LIMPING DURING END EFFECIOR CAPTURE. WORST CASE WHENPECTED HIGHOM. INCORRECT POSITION DATA. AUTO BRAKES. REDUNDANT PATHS REMAINING AUTOBRAKES	AN SRU. O VIBRATION: O THERMAL: THE SPA 1S THEN (VIBRATEON AND THE SPA'S/JOINI SIRONGBACK AND ABSENCE OF THE OUALIFICATION. THE SPA 1S SUB ENVIRONMENTS. OUALIFICATION O VIBRATEON: O SHOCK: O THERMAL VACO O HUMIDITY: O EMC:	LEVEL AND DURATION - REFERENCE TABLE 4 PLUS 70 DEGREES C 10 -25 DEGREES C DURATION - 1 1/2 CYCLES N 1ESTED AS PART OF THE JOINTS ACCEPTANCE TESTS THERMAL VACUUM TEST). IS UNDERGO ANS SYSTEM TESTS (TPS18 RMS TPS52 FLAT FLOOR TESTS) WHICH VERIFLES THE FAILURE MODE. TESTS JECTED TO THE FOLLOWING SRU QUALIFICATION TEST THE SPA WAS ALSO TESTED AS PART OF THE JOINT TESTS. LEVEL AND DURATION - REFERENCE TABLE 4 20G/11 MS/3 AXES (6 DIRECTIONS) 1 *81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1X10**6 TORN TESTED WITH THE SHOULDER JOINT HLL-SID-461 AS MODIFIED BY SL-E-0002 (TEST CEO1, CEO3, CSO1, CSO2, CSO6, REO1, REO2 (N/8), RSO1)

CRITICAL ITEMS LIST

FROJECT: SAMS
ASS'T MUMERICATURE: SERVO POWER ARPLIFIES ASS'Y P/N: 51120F1177 SHEET:

FAILURE EFFECT HOWR / FUNC. RATIONALE FOR ACCEPTANCE

2650	PMEA REV.	MAME OTT & DRAWING REF. DESTGMATION ENCODER DATA PROCESSOR OTT & SCHEMATIC 2563723 2563723	FAILURE MODE AND CAUSE MODE: FALSE POSITION DATA. CAUSE(3): (1) PARTS FAILURE IN SERIAL TO PARALLEL CONVENTER. EEE PARTS, WIRTING OR P.C. BOARD. (2) ERROR IN GRAY TO BINARY CONVERTER. (3) PARTIAL FAILURE OF OP FILTER.	FAILURE FIFECT OW END FIFM IMACCURATE JUINT POSITION DATA IS IRANSMITTED TO GPC WHICH COMED RESULT IN ERRONEOUS COMMANDS. CONSISTEMCY CHECK (TACH DATA) WILL DETECT AND INTITATE AUTO URAKES. ENCODER CHECK WILL ANNUNCIATE CHECK CAT. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. UNDERST CASE UNEMPECTED MOTION. INCORRECT POSITION DATA.	HDWR / FUNC. RATIONALE FOR ACCEPTANCE 2/18 CRITICALITY SCREENS: A-PASS, B-PASS, C-PASS OA/INSPECTIONS UNITS ARE MAMUFACTURED UNDER DOCUMENTED QUALITY CONTROLS. HESE COMEROLS ARE EXERCISED THREADHOUT DESIGN PROCUREMENT, PLANNING, RECEIVING, PROCESSING, FABRICATION, ASSEMBLY, IESTING AND SHIPPING OF THE UNITS. MANDADORY INSPECTION POINTS ARE EMPLOYED AT VARIOUS STACES OF FABRICATION ASSEMBLY AND TEST. GOVERNMENT SOURCE INSPECTION IS INVOKED AT VARIOUS CONTROL LEVELS. 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 100X SCREENED AND BURNED IN, AS A MINIMUM, AS REQUIRED BY SPAR-RMS-PA.003. BY THE SUPPLIER. ADDITIONALLY, EEE PARTS ARE 100X RE-SCREENED IN ACCORDANCE WITH REQUIREMENTS, BY AN INDEPENDENT SPAR APPROVED TESTING FACILITY. DA IS PERFORMED AS REQUIRED BY PA.003 ON A RANDOMLY SELECIED 5X OF PARTS, MAXIMUM S PIECES, MINIMUM 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED. UTRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSCH8080 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 SHIEMENT TOTAL
PREPARED BY	: ME	V G	UIRTHG OR P.C. BOARD. (2) ERROR IM GRAY TO BIHARY CONVERTER. (3) PARTIAL FATLURE OF OP FILTER.	INTIJATE AUTO BRAKES, ENCODER CHECK WILL ANNUHCIATE CHECK WILL ANNUHCIATE CHECK CRT. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE UNEXPECTED HOTION INCORNECT POSITION DATA. AUTO BRAKES, REDUNDANT PATHS REMAINING AUTOBRAKES	TO THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION. ALL EEE PARTS ARE 100X SCREENED AND BURNED IN, AS A MINIMUM, AS REQUIRED BY SPAR-MRS-PA.003, BY THE SUPPLIER. ADDITIONALLY, EEE PARTS ARE 100X RE-SCREENED IN ACCORDANCE WITH REQUIREMENTS. BY AN INDEPPRIBENT SPAR APPROVED TESTING FACILITY. DPA IS PERFORMED AS REQUIRED BY PA.003 ON A RAMDOMLY SELECTED 3X OF PARTS, MAXIMUM 5 PIECES, MINIMUM 3 PIECES FOR EACH LOT NUMBER/DATE CODE OF PARTS RECEIVED. UTRE 1S PROCURED TO SPECIFICATION MIL-U-22759 OR MIL-U-01301 AND INSPECTED AND TESTED TO MASA JSCHBOBO STANDARD MUMBER 95A. RECEIVING INSPECTION VERIFIES THAT ALL PARTS RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS, THAT NO PHYSICAL DAMAGE MAS OCCURRED TO PARTS DURING SHIPMENT, THAT THE RECEIVING DOCUMENTS PROVIDE ADEQUATE TRACEABILITY INFORMATION AND SCREENING DATA CLEARLY IDENTIFIES ACCEPTABLE PARTS. PARTS ARE IMSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE IMSPECTIONS INCLUDE, PRINTED CIRCUIT BOARD INSPECTION FOR TRACK SEPARATION, DAMAGE AND ADEQUACY OF PLATED THROUGH HOLES, COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, MIRE LOOPING, STRAPPING, ETC., OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO MASA NHB 5300.4(3A) STANDARD, AS MODIFIED CONFORMAL COATING INSPECTION FOR ADEQUATE PROCESSING IS PERFORMED USING ULTRAVIOLEF LIGHT TECHNIQUES. POST P.C. BD. INSTALLATION INSPECTION, CLEAKLINESS AND UORKMANSHIP (SPAR/GOVERNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRE FILE. PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEAKLINESS (SPAR/GOVERNMENT OF BOARDS, PROPER CONNECTOR CONTACT MATING, WIRE ROUTING, STRAPPING OF WIRES ELC., PRE-CLOSURE INSPECTION COMPLETION, AS BUILT CONFIGURATION VERTIFICATION TO AS DESIGNET., MANDATORY INSPECTION POINT) PRE-ACCEPTANCE IEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOURE TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERTIFICATION TO AS DESIGNET., MANDATORY INSPECTION POINT.

IMEA Aft.	THEA REV.	MAME OFF & DRAWING BEF. DESIGNATION	FAILURE MIDE AND CAUSE	FAILLIRE EFFECF CM END LIEM	HOUR / FUNC. 2/18 CRITECALETY	RATIONALE FOR ACCEPTANCE SCREENS: A-PASS, B-PASS, C-PASS
7650		ENCODER DATA PROCESSOR 017-6 SCHEMATIC 2563723 2563722	MODE: FALSE POSITION DATA. CAUSE(S): (1) PARIS FAILURE IN SERIAL TO PARRALLEL CONVERTER. EEE PARTS, MIRTING OR P.C. BOARD. (2) ERROR IN GRAY TO BINARY CONVERTER. (3) PARTIAL FAILURE OF OP FILTER.	INACCURATE JOINT POSITION DATA IS TRANSMITTED TO GPC WHICH COULD RESULT IN ERRONEOUS COMMANDS. COMSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK WILL ANNUNCEATE CHECK CRT. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE UNEXPECTED MOTION. INCORRECT POSITION DATA. AUTO BRAKES. REDUNDANT PATHS RENATIVING AUTOGRAKES	A TEST READITY OF PERSONN V/I FORION SOUALITY ASSINET AND THE GOVE FORMAL TEST! ACCEPTANCE THERMAL AND MANDATORY IN ENTERNATION GROUNDING CHOOMER UP TEST PROCEDURE (1) JOINT LEVEL AUDIT OF LOW CONFIGURATION AND CONFIGURATION CONFIGU	SCREEMS: A PASS, B-PASS, C-PASS INFESS REVIEW (TRR) WHICH INCLUDES VERIFICATION OF JEL, TEST DOCUMENTS, TEST EQUIPMENT CALIBRATION/ STATUS AND HARDWARE CONFIGURATION IS CONVENED BY JRANCE IN CONJUNCTION WITH ENGINEERING, CONFIGURATION CONTROL, SUPPLIER AS APPLICABLE, HMENT REPRESENTATIVE PRIOR TO THE START OF ANY ING (ACCEPTANCE OR OUALIFICATION). JESTING (ATP) INCLUDES ANBIENT PERFORMANCE, VIBRATION TESTING, (SPAR/GOVERNMENT REP ISPECTION POINT). OF UNIT TO JOINT SRU - INSPECTIONS INCLUDE JECKS, CONNECTORS FOR BENT OR PUSHBACK SUMAL, ELEANLINESS, INTERCONNECT WIRING AND IST TO THE APPROPRIATE JOINT INSPECTION TEST ITD) EIG. PRE-ACCEPTANCE TEST INSPECTION, INCLUDES AN JERT IST INSPECTION CONFLETION, AS BUILT ON VERIFICATION TO AS DESIGN ETC. ACCEPTANCE TESTING (AIP) INCLUDES AMBINET, ON THERMAL-VAC TESTING. INTEGRATION THE INTEGRATION OF MECHANICAL ARM IS AND THE FLIGHT CABIN EQUIPMENT TO FORM THE SAMS. ARE PERFORMED AT EACH PHASE OF INTEGRATION WHICH SINDING CHECKS, THRU WIRING CHECKS, WIRING ROUTING, OWNECTORS FOR BENT OR PUSH BACK CONTACTS ETC. S TESTING - STRONGBACK AND FLAT FLOOR AMBIENT TEST. (SPAR/GOVERNMENT REP MANDATORY INSPECTION TEST. (SPAR/GOVERNMENT REP MANDATORY INSPECTION

HEF, FINEA.	BANG BIT & DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END TIEN	HOUR / FUNC. RATIONALE FOR ACCEPTANCE CRITICAL IN
2650 1	ENCODER DATA PROCESSOR 011-6 SCHEMATIC 2363773 2563772	MODE: FALSE POSITION DATA. CAUSE(S): (1) PARTS FAILURE IR SERIAL TO PARALLEL CONVERTER. EEE PARTS, WIRING OR P.C. BOARD. (2) ERROR IN GRAY TO BINARY CONVERTER. (3) PARTIAL FAILURE OF OP FELTER.	INACCURATE JOINT POSITION DATA 18 IRANSHITTD TO GPC WHICH COULD PESULT IN ERROWEOUS COMMANDS. CONSISTENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO PRAKES, ENCODER CHECK WILL ANNUNCIATE CHECK CRI, LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE UNEMPECTED MOTION INCORRECT POSITION DATA. AUTO BRAKES. REDUNDANT PATHS REMAINING AUTOBRAKES	FAILURE MISTORY INERE MAYE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

CRITICAL ITEMS LIST

ASS'T WORRESTEEL SURSYSTEM
ASS'T WORRESTEEL SURSYSTEM
ASS'T PART STRUCT TOUTH THPLTTER ASS'T PART STRUCT SURSYSTEM
ASS'T PART STRUCT SURSYSTEM

III. REV.	DESIGNATION	AND SELLES	FAILURE FFFECF CM FND 178M	HDMR / FUNC. RATIONALE FOR ACCEPTANCE 2/1R CRITICALITY SCREENS: A-PASS, B-PASS, C-PASS
2650 1	THE COPER DATA PRICESSOR OFF 6 SCHEMATEC 2563723 2563722	MODE: FALSE POSITION DATA. CAUSE(S): (7) PARTS FAILURE IN SERIAL TO PARALLEL CONVERTER. EEE PARTS, WIRING OR P.C. BOARD. (2) ERROR IN GRAY TO BINARY CONVERTER. (3) PARTIAL FAILURE OF OP FILTER.	THACTIRATE JOHT POSTITOM DATA 1S TRANSMITTED TO GPC MHICH COULD RESULT IN ERRONEOUS COMMISSIENCY CHECK (TACH DATA) WILL DETECT AND INITIATE AUTO BRAKES. ENCODER CHECK CRI. LOSS OF LIMPING DURING END ETFECTOR CAPTURE. WORST CASE UNEMPECTED MOTION. INCORRECT POSITION DATA. AUTO BRAKES. REDUNDANT PATHS REMAINING AUTOBRAKES	OPERATIONAL EFFECIS ARN DOES NOT RESPOND CORRECTLY TO H/C INPUIS. AUTOBRAKES. CANNOT USE COMPUTER SUPPORTED MODES OF OPERATION. DIRECT DRIVE AND BACKUP AVAILABLE. ARM WILL NOT STOP AUTOMATICALLY IF AM THROETECTED FAILURE OF THE AUTO BRAKES SYSTEM WAS PREVIOUSLY OCCURRED. ANNUNCIATED. BRAKES CAN BE APPLIED MANUALLY. CREW ACTION APPLY BRAKES. USE DIRECT DRIVE. CREW TRAINING THE CREW WILL BE TRAINED TO ALWAYS DESERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T, APPLY BRAKES. MISSION CONSTRAINT OPERATE UNDER VERNIER RATES WITHIN TO FT OF STRUCTURE, THE OPERATOR MISSI BE ABLE TO DETECT THAT THE ARM/PAYLOAD IS RESPONDING PROPERLY TO COMMANDS VIA MINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS. OMRSD OFFLINE DRIVE EACH JOINT, VERIFY ACTUAL MOTOR RATE AGREES WITH ENCODER CHANGE. OMRSD OMLINE INSTALLATION NOME OMRSD OMLINE INSTALLATION WERIFY CORRECT JOINT BIASES.