PROJECT: SRHS ASS'Y NOMENCLATURE: <u>ROTATIONAL HAND CONTROLLER</u> SYSTEM: DEC SUBSYSTEM ASS'Y P/N: 51155E117

REF. REV.	NAME, GTY, & DRAWING REF.	AND	ON	1/1	414
	DESIGNATION	CAUSE	END LIEM	CRITICALITY	SCREENS: N/A
1520 2	CAPTURE/ RELEASE SWITCH OTY-1 P/M MS 27717-27	MODE: LOSS OF ABILITY TO AUTOMA- TICALLY CAPTURE AND RELEASE. CAUSE(S): (1) 10V POLE FAILURE TO OFF POSITION. (2) 10V POLE FAIL IN CAPTURE POSITION. (3) 10V CAPTURE CONTACT FAILS SHORT. (4) 10V POLE FAILURE IM RELEASE TONTACT FAILS SHORT.	CAUSE (1) AUTO MODE LOST. IN 'MANUAL' ARM WILL HOT LIMP FOR CAPTURE. ARM WILL LIMP FOR RIGIOIZE. CAUSE (2 & 3) PERMANENT FLAG TO GPC. WHEN EE AUTO SELECTED EE WILL PERFORM AUTO CAPTURE SEQUENCE. WHEN EE MANUAL SELECTED ARM WILL BE LIMPED. ARM MAY TAKE UNEXPECTORY. WHEN EEEASE CHECK WILL BE INORPERATIVE. CAUSE (4 & 5) EE WILL RELEASE PAYLOAD LIMEADOT REGUIRED. REDUNDANT PATHS REMAINING N/A	MS27747-27, OF REPRESENTATIVE SRMS USE. THIS TEST WAS REPRESENTATIVE VIBRATION TO CYCLES (5000 CONTACT RESIS SWITCH OPERATION STRAIN RELIEF	ELEASE SWITCH IS A TOGGLE - ACTUATED SWITCH, TYPE UALIFIED TO WIL-C-83731. E SWITCHES AND ACTUATORS MERE LIFE TESTED FOR CONDUCTED BY MOUNTING THE SWITCHES IN A E HAND GRIP FRAME. TESTING INCLUDED - RANDOM OVI (LEVELS AND OPERATING LIFE TESTS TO 10000 BEFORE VIBRATION, AND 5000 POST-VIBRATION) TANCE, AND ACTUATOR OPERATING FORCES. FOR IONAL CYCLES REFER TO TABLE 13. ECTIONS TO THE SWITCHES ARE POTTED TO AFFORD, AND PROTECTION AGAINST SHORT CIRCUIT. HT SPECIFICATION FOR THE SWITCH INCLUDES THE OR OPA ON SAMPLES FROM EACH DELIVERED LOT.

PREPARED BY:

HENG

PROJECT: SRMS ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER

SYSTEM: D&C SUBSYSTEM ASS'Y P/N: 51155E117

SHEET:

FHEA NAME, QTY, & FAILURE MODE FAILURE EFFECT HDWR / FUNC. RATIONALE FOR ACCEPTANCE DRAWING REF. REF. REV. AND ON DESIGNATION CAUSE END THEM CRITICALITY SCREENS: N/A 1520 5 CAPTURE/ MODE: CAUSE (1) AUTO HODE LOST. ACCEPTANCE TESTS RELEASE LOSS OF SWITCH QTY-1 ABILITY TO IN 'MANUAL' ARM THE RHC IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL WILL NOT LIMP FOR CAPTURE. ARM WILL LIMP P/N MS 27717-27 AUTOHA-TESTING AS AN SRU. TICALLY CAPTURE AND O VIBRATION: LEVEL AND DURATION REFERENCE TABLE 1 RELEASE. FOR RIGIDIZE. +120 DEGREES F TO 20 DEGREES F (12 HRS PER O THERMAL: CAUSE(S): (1) 10V POLE FAILURE TO CAUSE (2 & 3) PERMANENT FLAG CYCLE) 2 CYCLES TOTAL. TO GPC. WHEN EE THE RHC IS TESTED AS PART OF THE DAG SUBSYSTEM; WHICH CONSIST OF DAG PANEL, THE AND RHC; PER TP 347. AUTO SELECTED POSITION. EE WILL PERFORM THE TOTAL DEC SUBSYSTEM UNDERGOES RMS SYSTEM TESTING, (TP 518 RMS STRONGBACK, AND TP552 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. AUTO CAPTURE (2) TOV POLE SECUENCE. WHEN EE MANUAL SELECTED ARH WILL BE LIMPED, ARN MAY TAKE CAPTURE POSITION. QUALIFICATIONS TESTS (3) 10V CAPTURE UNEXPECTED TRAJECTORY. THE RHC IS CERTIFIED BY SIMILARITY TO THE ORBITER USED RHC EXCEPT FOR FINGER OPERATED SWITCHES. THE BASIC DIFFERENCES CONTACT UNCOMMANDED IS THAT THE ORBITER RHC IS TRIPLE REDUNDANT AND THE RHS RHC RELEASE CHECK WILL BE FAILS SHORT. IS SINGLE STRING. INORPERATIVE. POLE FAILURE FLIGHT CHECKOUT CAUSE (4 & 5) EE WILL RELEASE IN RELEASE POSITION. PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987 PAYLOAD (5) 10V IMMEDIATELY IF RELEASE EE AUTO MODE CONTACT SELECTED. FAILS SHORT. WORST CASE UNCOMMANDED RELEASE UNANHUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING N/A

SUPERCEDING DATE: 06 OCT 87

CIL REV: 3

DATE: 24 JUL 91

APPROVED BY: ____

FHEA

REV.

2

FMEA

1520

HAME, OTY, &

DRAWING REF.

DESIGNATION

SULTCH QTY-1

CAPTURE/

RELEASE

P/N HS

27717-27

FAILURE HODE

CAUSE

MODE:

LOSS OF

AUTOMA-

TICALLY

RELEASE.

CAUSE(S):

FAILURE TO

(1) TOV POLE

ABILITY TO

CAPTURE AND

PROJECT: SRMS
ASS'Y NOMERCLATURE: ROTATIONAL HAND CONTROLLER

FAILURE EFFECT

ON

END LIEM

AUTO MODE LOST.

WILL HOT LIMP

ARM WILL LIMP

FOR RIGIDIZE.

CAUSE (2 & 3)

PERMANENT FLAG

TO GPC. WHEN EE

FOR CAPTURE.

IN 'MANUAL' ARM

CAUSE (1)

SHEET: _ ASS'Y P/N: 51155E117 ⇒ 7 FUNC. RATIONALE FOR ACCEPTANCE 1/1 CRITICALITY SCREENS: N/A **QA/INSPECTIONS** TOGGLE SWITCHES ARE PROCURED TO MS27717 AS REQUIRED BY HONEYWELL DRAWING NO. 10067199. SWITCHES ARE QUALIFIED AND SCREENED TO THE REQUIREMENTS OF MIL-S-83731 AND DRAWING NO. 10067199, QUALIFICATION TESTING OF SWITCHES WAS PERFORMED TO THE REQUIREMENTS OF HONEYWELL TEST PROCEDURE NO. SW-QIP-01. THE SWITCH MECHANISMS AND SWITCHES SUCCESSFULLY COMPLETED 10.000 CYCLES OF LIFE CYCLING. IN ADDITION TO THE 10,000 LIFE CYCLES, THE SWITCH MECHANISMS AND SWITCHES WERE SUBJECTED TO THE GAVE AND FLIGHT VIBRATION REQUIREMENTS OF CAE SPECIFICATION PS 67827.51. PRIOR TO ANY SWITCH CYCLING OR VIBRATION, SWITCH MECHANISH SUB ASSEMBLIES WERE GIVEN A FUNCTIONAL PERFORMANCE TEST ON THE SSHC TEST CONSOLE. DETAILED TEST RESULTS ARE COVERED IN HONEYWELL TEST REPORT NO. AEX-77-059, MASA APPROVAL OF SWITCHES IS UNDER MSPAR 4092 AND HSPAR 4093. WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO HASA JSCHBOBO STANDARD NUMBER 95A. 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 INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO MASA WHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 08800A. PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEANLINESS (CAE/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 GOVENMENT REPRESENTATIVE, PRIOR TO THE START OF ANY FORMAL TESTING (ACCEPTANCE OR QUALIFICATION). ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL TESTING (CAE/GOVERNMENT REP. - MANDATORY INSPECTION POINT) INTEGRATION OF DAC PANEL, RHC, THC AND MCIU, INSPECTIONS ARE PERFORMED AT EACH STAGE OF INTEGRATION, WHICH INCLUDES

SYSTEM: D&C_SUBSYSTEM

AUTO SELECTED POSITION. EE WILL PERFORM **AUTO CAPTURE** SEQUENCE. WHEN (2) 10V POLE EE MANUAL FAIL IN SELECTED ARM CAPTURE WILL BE LIMPED. POSITION. ARM MAY TAKE (3) 10V CAPTURE UNEXPECTED TRAJECTORY. CONTACT UNCOMMANDED FAILS SHORT. RELEASE CHECK WILL BE INORPERATIVE. (4) 10V POLE FAILURE CAUSE (4 & 5) EE WILL RELEASE IN RELEASE POSITION. PAYLOAD (5) 10V IMMEDIATELY IF EE AUTO MODE RELEASE SELECTED. CONTACT FAILS SHORT. WORST CASE UNCOMMANDED RELEASE UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING H/A 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 INSPECT ON POINT). DATE: 24 JUL 91 CIL REV: 3 SUPERCEDING DATE: 06 OCT 87 APPROVED BY: _ PREPARED BY: MFMG

PREPARED BY:

MFUG

PROJECT: SRMS ASS'Y HOHENCLATURE: ROTATIONAL HAND CONTROLLER

SYSTEM: DEC SUBSYSTEM ASS'Y P/N: 31153E117

DATE: 24 JUL 91

CIL REV: 3

- SHEEF: _ MAME, OTT, & DRAWING REF. FHEA FHEA FAILURE MODE FAILURE EFFECT HDWR / FUNC. RATIONALE FOR ACCEPTANCE REF. REV. AND ON DESIGNATION CAUSE END ITEM CRITECALITY SCREENS: N/A 1520 2 CAPTURE/ HODE: CAUSE (1) RELEASE LOSS OF AUTO HODE LOST. IN 'MANUAL' ARM 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 SWITCH OTY-1 ABILITY TO P/N MS AUTOMA-WILL NOT LIMP 27717-27 FOR CAPTURE. TICALLY INCLUDES GROUNDING CHECKS, THRU VIRING CHECKS, VIRING ROUTING, CAPTURE AND ARM WILL LIMP IN' TRACE CONNECTORS FOR BENT OR PUSH BACK CONTACTS ETC. RELEASE. FOR RIGIDIZE. SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT CAUSE (2 & 3) PERMANENT FLAG CAUSE(S): PERFORMANCE TEST. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION (1) TOV POLE POINT) FAILURE TO TO GPC. WHEN EE AUTO SELECTED POSITION. EE WILL PERFORM AUTO CAPTURE (2) TOV POLE SEQUENCE. WHEN EE MANUAL CAPTURE SELECTED ARM POSITION. WILL BE LIMPED. ARM NAY TAKE (3) 10V CAPTURE UMEXPECTED TRAJECTORY. CONTACT UNCOMMANDED RELEASE CHECK FAILS SHORT. VILL BE (4) 10V INORPERATIVE. POLE FAILURE IN RELEASE CAUSE (4 & 5) POSITION. EE WILL RELEASE PAYLOAD (5) 10V IMMEDIATELY IF RELEASE EE AUTO HODE CONTACT SELECTED. FAILS SHORT. WORST CASE UNCOMMANDED RELEASE UNANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING N/A

RMS/D&C - 386

APPROVED BY:

SUPERCEDING DATE: 06 OCT 87

CRITICAL ITEMS LIST HOLL

MEA IEF.	FMEA REV.	NAME, QTY, & Drawing Ref. Designation	FATLURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: N/A	
1520 2	CAPTURE/ RELEASE SWITCH GTY-1 P/N MS 27717-27	HODE: LOSS OF ABILITY TO AUTOMA- TICALLY CAPTURE AND RELEASE.	CAUSE (1) AUTO HODE LOST. IN 'MANUAL' ARM WILL NOT LIMP FOR CAPTURE. ARM WILL LIMP FOR RIGIDIZE.	FAILURE HISTORY THERE HAVE BEEN MODE ON THE SR	NO FAILURES ASSOCIATED WITH THIS FAILURE		
			CAUSE(S): (1) 10V POLE FAILLURE TO OFF POSITION. (2) 10V POLE FAIL IN CAPTURE POSITIOM. (3) 10V CAPTURE CONTACT FAILS SHORT. (4) 10V POLE FAILURE IN RELEASE POSITION. (5) 10V RELEASE CONTACT FAILS SHORT.	CAUSE (2 & 3) PERMANENT FLAG TO GPC. WHEN EE AUTO SELECTED EE WILL PERFORM AUTO CAPTURE SEQUENCE. WHEN EE MANUAL SELECTED ARM WILL BE LIMPED. ARN MAY TAKE UNEXPECTED TRAJECTORY. UNCOMMANDED RELEASE CHECK WILL BE IHORPERATIVE. CAUSE (4 & 5) EE WILL RELEASE PAYLOAD INMEDIATELY IF EE AUTO MODE SELECTED. WORST CASE UHANNUNCIATED. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING			
			j				
	1						

PROJECT: SAMS
ASS'Y MOMENCLATURE: ROTATIONAL HAND CONTROLLER

SYSTEM: DEC SUBSYSTEM ASS'Y P/N: 51155E117

SHEET: __6

REF. I	REV.	NAME, OTY, & DRAWING RÉF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOUR / FUNC. RATIONALE FOR ACCEPTANCE 1/1 CRITICALITY SCREENS: N/A
1520		CAPTURE/ RELEASE SWITCH GIY-1 P/N MS 27717-27	MODE: LOSS OF : ABILITY TO AUTOMA- TICALLY CAPTURE AND RELEASE. CAUSE(S): (1) 10V POLE FAILURE TO OFF POSITION. (2) 10V POLE FAIL IN CAPTURE POSITION. (3) 10V CAPTURE CONTACT FAILS SHORT. (4) 10V POLE FAILURE IN RELEASE POSITION. (5) 10V RELEASE CONTACT FAILS SHORT.	CAUSE (1) AUTO MODE LOST. IN "MANUAL" ARM WILL NOT LIMP FOR REDITE. ARM WILL LIMP FOR RIGIDIZE. CAUSE (2 & 3) PERMANENT FLAG TO GPC. WHEN EE AUTO SELECTED EE WILL PERFORM AUTO CAPTURE SEQUENCE. WHEN EE MANUAL SELECTED ARM WILL BE LIMPED. ARM MAY TAKE UNEXPECTED TRAJECTORY. UNCOMMANDED RELEASE CHECK WILL BE IMORPERATIVE. CAUSE (4 & 5) EE WILL RELEASE PAYLOAM INMEDIATELY 1F EE AUTO MODE SELECTED. WORST CASE UNCOMMANDED RELEASE UNANNUNCIATED. CREM ACTION REQUIRED. REDUNDANT PATHS REMAINING N/A	OPERATIONAL EFFECTS LOSS OF EE AUTO MODE. ARM WILL NOT LIMP IN EE MANUAL MODE ARM JOINTS WILL NOT CONFORM TO PAYLOAD DURING A CAPTURE SEQUENCE. IF THERE IS ANY MISALIGNMENT WITH THE GRAPPLE FIXTURE, THE PAYLOAD WILL CHANGE ITS ATTITUDE DURING A FREE FLYING CAPTURE, OR THE ARM WILL BE PRELOADED IF THE PAYLOAD IS BERTHED. IT MAY TAKE LONGER TO COMPLETE A CAPTURE SEQUENCE. OR WITH MANUAL MODE SELECTED ARM GOES LIMP UNEXPECTEDLY AND REMAINS LIMP UNTIL EE MODE SW. IS SET TO THE OFF POSITION OR WITH AUTO SELECTED AND PAYLOAD CAPTURED, PAYLOAD MILL BE RELEASED UNANNUNICATED. MANUAL MODE STILL OPERATIVE. OPERATOR WILL DETECT OFF NOMINAL EE OPERATIONS. CREW ACTION USE MANUAL MODE. CREW TRAINING CREW WILL BE TRAINED TO DETECT OFF NOMINAL OPERATION OF THE EE, AND TO OBITAIN MINIMUM ALIGNMENT ERRORS PRIOR TO CAPTURE OF A PAYLOAD. CREW WILL BE TRAINED TO SELECT EE MANUAL OR AUTO WHEN ARM IS STOPPED PRIOR TO MANEUVERING TO CAPTURE POSITION. IF PAYLOAD CAPTURED, SELECT EE MANUAL OR AUTO MODE AFTER PAYLOAD EAPTURED, SELECT EE MANUAL OR AUTO MODE AFTER PAYLOAD IS STABILIZED AND AT ITS RELEASE POSITIOM. MISSION CONSTRAINT WHEN CAPTURING A FREE FLYER, THE EE MUST BE FAR ENOUGH AWAY FROM STRUCTURE TO PROHIBIT CONTACT REGARDLESS OF PAYLOAD ROTATIONS. OMRSD OFFLIME EXERCISE CAPTURE/RELEASE SWITCH VERIFY CONTINUITY OF AUTO CONTACTS OMRSD ONLINE INSTALLATION HONE OMRSD ONLINE TURNARQUIND EXERCISE CAPTURE/RELEASE SWITCH VERIFY CAPTURE RELEASE BITS ON DATA BUS