CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 51140JT219 SHEET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RAB CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE --- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING --- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	DESIGN FEATURES --- FUSES USED IN THE SHOULDER FUSE PLUG ASSEMBLIES ARE OF THE DESIGN DEFINED BY MSFC SPECIFICATION 40M38259. FOR SRMS APPLICATION, DESIGN AND PROCESS IMPROVEMENTS HAVE BEEN NEGOTIATED WITH, AND IMPLEMENTED BY, THE MANUFACTURER. THESE INCLUDE: - IMPROVED ATTACHMENT OF END CAPS. - CONTROL OF FUSE ELEMENT LENGTH AND DISPOSITION WITHIN THE FUSE BODY TUBE. - CONTROL SOLDERING BETWEEN FUSE ELEMENT AND THE END CAPS. PRIOR TO ASSEMBLY IN THE FUSE PLUG ASSEMBLY, A CONNECT PIN IS SOLDERED TO EACH OF THE FUSE LEAD WIRES. THIS PROCESS IS CONTROLLED BY ESTABLISHED PROCEDURES WHICH INCLUDE THE REQUIREMENT OF A "METERED" QUALITY OF SOLDER FOR EACH SOLDER JOINT. THE FUSE BODY AND LEAD WIRES ARE SLEEVED TO PRECLUDE SHORT CIRCUITS. EACH FUSE AND ALL SOLDERED JOINTS ARE SUBJECTED TO RADIOGRAPHIC INSPECTION. THE FUSE PLUG ASSEMBLY INCLUDES AN ALUMINUM POTTING SHELL. FOLLOWING INTEGRATION OF THE FUSES, THE CONNECTOR ASSEMBLY IS POTTED USING A SEMI-RESILIENT (RTV) COMPOUND. THE POTTING MEDIUM PROVIDES GOOD HEAT TRANSFER AND ENSURES MECHANICAL STABILITY OF THE INDIVIDUAL FUSES.

PREPARED BY: MFWG SUPERCEDING DATE: NONE DATE: 11 JUL 91 CIL REV: 0

EXPEDITE PROCESSING

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CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 51140J1219 SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RAB CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE --- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING --- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	ACCEPTANCE TESTS --- THE SHOULDER, ELBOW AND WRIST JOINTS ARE SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING. O VIBRATION: LEVEL AND DURATION - REFERENCE TABLES 9, 10 AND 11. O THERMAL: +70 DEGREES C TO -25 DEGREES C (2 CYCLES) 1 X 10**6 TORR. THE JOINTS ARE INTEGRATED INTO THE RMS SYSTEM (PER TP532) , WHICH IS FURTHER TESTED IN (TP518 RMS STRONGBACK AND TP552 FLAT FLOOR). THESE TESTS VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATION TESTS --- THE SHOULDER AND WRIST JOINTS WERE SUBJECTED TO THE LISTED BELOW ENVIRONMENTS. THE ELBOW JOINTS WAS NOT EXPOSED THE QUALIFICATION ENVIRONMENTS WAS CERTIFIED BY SIMILARITY TO THE SHOULDER JOINT. O VIBRATION: LEVEL AND DURATION REFERENCE TABLES 9 AND 10 O SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS) O THERMAL VACUUM: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10**6 TORR. O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE02 (N/B). O HUMIDITY: ONLY SHOULDER JOINT WAS TESTED, 95% RH (65 DEGREES C MAINTAINED FOR 6 HRS.) (65 DEGREES C TO 30 DEGREES C IN 16 HRS) 10 CYCLES 240 HRS. O LOAD TEST: SHOULDER JOINT STRUCTURAL LOAD TEST REFERENCE TABLE 12. NOTE: ELBOW JOINT (S/N 302 AND UP) INCORPORATES NON-WELDED TRANSITIONS WHICH WAS LOAD TESTED TO LOAD IN REFERENCE TABLE TBS. FLIGHT CHECKOUT --- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY: MFWG SUPERCEDING DATE: NONE DATE: 11 JUL 91 CIL REV: 0

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 51140J1219 SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1R4B CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE --------- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING --------- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	QA/INSPECTIONS --------- FUSES ARE PROCURED AS A EEE PART TO SPAR SPECIFICATION SPAR-SG459/023, WHICH INCORPORATES SPECIFICATION MSFC40M38259 AS REQUIRED BY SPAR-RMS-PA.003. QUALIFICATION, ACCEPTANCE TESTING AND RELIABILITY LIFE TESTING OF FUSE PLUG ASSEMBLIES WAS PERFORMED TO THE REQUIREMENTS OF THE SPAR-RMS-TP.952. 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 EGE 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 JSCM8080 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, 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. PRIOR TO POTTING, THE SOLDERED CONTACTS OF THE FUSE ASSEMBLY ARE SUBJECTED TO RADIOGRAPHIC INSPECTION TO CHECK FOR POROSITY AND INTERNAL FLAWS. PRE AND POST POTTING INSPECTIONS TO SPAR-ITP 257 VERIFY VOLTAGE DROP (RESISTANCE) AT HIGH AND LOW TEMPERATURE (-38 DEGREES C AND +116 DEGREES C) (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). FUSES ARE ACCEPTANCE TESTED TO SPAR-ITP 257 WHICH INCLUDES AMBIENT TESTING AND THERMAL CYCLING, (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). PRIOR TO MATING FUSE PLUG WITH RECEPTICLE ON SHOULDER CONNECTOR BOX, INSPECTIONS INCLUDE VISUAL, CLEANLINESS, WORKMANSHIP, IDENTIFICATION, CHECK FOR BENT OR PUSHED BACK CONTACTS ETC. JOINT LEVEL PRE-ACCEPTANCE TEST INSPECTION, INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC.

PREPARED BY: MFWG SUPERCEDING DATE: NONE APPROVED BY: _____ DATE: 11 JUL 91 CIL REV: 0

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLLD) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 51140J1219 SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RAB CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE ---------- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING ---------- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	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). JOINT LEVEL ACCEPTANCE TESTING (ATP) INCLUDES AMBINET, VIBRATION AND THERMAL-VAC TESTING. (SPAR/GOVERNMENT REP. - 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)

PREPARED BY: MFWG SUPERCEDING DATE: NONE DATE: 11 JUL 91 CIL REV: 0

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 5T140J1219 SHEET: 5

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RAB CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE --- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING --- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	FAILURE HISTORY --- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

PREPARED BY: MFMG SUPERCEDING DATE: NONE DATE: 11 JUL 91 CIL REV: 0

EARLIEST PROCESSING

CRITICAL ITEMS LIST

PROJECT: SRMS (-5 MCIU INSTALLED) SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y NOMENCLATURE: SHOULDER ASS'Y P/N: 51140J1219 SHEET: 6

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 2/1RAB CRITICALITY — RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-FAIL, C-PASS
4605	0	SHOULDER FUSING. 45 PRIME CHANNEL FUSES. 16 BACK UP CHANNEL FUSES. WIRING SCHEMATIC 51140E316 REVISION C.	MODE: LOSS OF WRIST JPC FUSE. CAUSE(S): (1) MECHANICAL SHOCK, VIBRATION MATERIALS (FUSE 13 AND 14).	28V TO JPC CARRIED BY 1 WIRE INSTEAD OF 2. JPC INPUT VOLTAGE WILL BE REDUCED DUE TO INCREASED VOLTAGE DROP IN THE WIRE. JPC MAY TURN OFF DUE TO AN UNDER VOLTAGE CONDITION. "GOOD" JOINTS WILL BE SAFED DUE TO AUTOBRAKING ON DETECTION OF ABE - COMM. FAILURE. FAILED JOINTS WILL BE "FREE" UNTIL BRAKES APPLIED. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. IF WRIST JPC: END EFFECTOR AUTO DRIVE MODE MAY NOT FUNCTION CORRECTLY. WORST CASE --- UNEXPECTED MOTION. FREE JOINTS. AUTO BRAKES. REDUNDANT PATHS REMAINING --- 1) AUTOBRAKES (TO SAFE THE SYSTEM) 2) BACK-UP DRIVE AND END EFFECTOR DRIVE MODES. (TO SECURE ORBITER)	OPERATIONAL EFFECTS --- NONE. WITH A SUBSEQUENT FAILURE, CANNOT USE COMPUTER SUPPORTED MODES OF OPERATION. ARM WILL NOT STOP AUTOMATICALLY IF AN UNDETECTED FAILURE OF THE AUTO BRAKES SYSTEM HAS PREVIOUSLY OCCURRED. IF JPC TURNS OFF, LOSS OF COMPUTER SUPPORTED MODES. CREW ACTION --- CREW CAN ATTEMPT TO COMPLETE THE MISSION IN DIRECT DRIVE. THIS CAN BE ACCOMPLISHED UNDER CERTAIN CONDITIONS WHICH MUST BE EVALUATED ON A CASE BY CASE BASIS. APPLY BRAKES TO STOP ARM IF AUTO BRAKES DOESN'T STOP THE UNEXPECTED MOTION. 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. IF REMOVAL OF THE COMMAND DOES NOT STOP THE ARM, THE BRAKES SHOULD BE APPLIED. IF THE BRAKES DON'T STOP THE ARM, THEN THE RMS POWER SWITCH SHOULD BE TURNED OFF. MISSION CONSTRAINT --- AUTO BRAKES FUNCTION IS CHECKED OUT DURING GROUND TURNAROUND AND JUST PRIOR TO ANY ARM OPERATIONS ON ORBIT. THE CREW SHOULD BE TRAINED TO OPERATE UNDER VERNIER RATES WITHIN 10 FT OF STRUCTURE. THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM/PAYLOAD IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL ARM OPERATIONS. SCREEN FAILURES --- A: JPC OPERATES NORMALLY. INDEPENDENT PATHS ARE NOT INSTRUMENTED. B: JPC OPERATES NORMALLY. INDEPENDENT PATHS ARE NOT INSTRUMENTED. OMRSD OFFLINE --- NONE OMRSD ONLINE INSTALLATION --- NONE OMRSD ONLINE TURNAROUND --- NONE

PREPARED BY: MFWG SUPERCEDING DATE: NONE

DATE: 11 JUL 91 CPL. REV: 0