

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
NUMBER: 05-5-803-7 -X

SUBSYSTEM NAME: DATA PROCESSING SYSTEM (DPS)
REVISION: 9 **01/10/94**

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5410 4020534-944
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5410 4020534-954

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
OPERATIONAL INSTRUMENTATION AFT MDM: "OA1", "OA2", AND "OA3".

REFERENCE DESIGNATORS: 54V75A13
 55V75A14
 56V75A15

QUANTITY OF LIKE ITEMS: 3
THREE

FUNCTION:

UPON REQUEST, PROVIDES DIGITIZED AND PROCESSED DATA TO THE PULSE CODE MODULATION (PCM) MASTER UNIT FOR OPERATIONAL INSTRUMENTATION WHERE IT IS INTERLEAVED WITH ALL OTHER DATA INTO ONE SERIAL PCM STREAM. PROVIDES AUXILIARY POWER UNITS (APU) TEST LINE, FUEL LINE, FUEL PUMP DRAIN LINE, AND FUEL ISOLATION VALVE TEMPERATURE STATUS TO PREVENT HYDRAZINE DETONATION, PLUS FUEL TANK LEAK MONITORING CAPABILITIES. OA MDMS ARE ALSO USED TO MONITOR AND TRANSMIT MPS HELIUM SYSTEM SAFETY DATA FOR LCC

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REVISION#: 10 04/01/96

SUBSYSTEM NAME: DATA PROCESSING SYSTEM (DPS)

LRU: MULTIPLEXER-DEMULTIPLEXER

CRITICALITY OF THIS

ITEM NAME: MULTIPLEXER-DEMULTIPLEXER

FAILURE MODE: 1R2

FAILURE MODE:

ERRONEOUS OUTPUT

MISSION PHASE:

PL PRE-LAUNCH
 LO LIFT-OFF
 OO ON-ORBIT
 DO DE-ORBIT
 LS LANDING/SAPING

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
 103 DISCOVERY
 104 ATLANTIS
 105 ENDFAVOUR

CAUSE:

PIECE PART FAILURE, VIBRATION, CONTAMINATION, TEMPERATURE, CHEMICAL REACTION, ADDRESS CHECK FAILURE, DATA ERROR TO MDM MODULE, MDM MODULE/ CHANNEL SELECT FAILURE, OR ANALOG/DIGITAL (A/D) CONVERTER FAILURES.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) PASS
 B) FAIL
 C) PASS

PASS/FAIL RATIONALE:

A)

B)

FAILS SCREEN B BECAUSE SOURCE OF ERRONEOUS OUTPUT CANNOT BE IDENTIFIED AND MAY BE ACCEPTED AS A VALID DATA

C)

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- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF MDM.

(B) INTERFACING SUBSYSTEM(S):
TRANSMISSION OF ERRONEOUS DATA BY THE FAILED MDM MAY RESULT IN NUMEROUS MASTER ALARMS AND SYSTEM MANAGEMENT (SM) ALERTS.

(C) MISSION:
POSSIBLE LOSS OF MISSION.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF CREW/VEHICLE AFTER SECOND FAILURE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
CRITICALITY 1R2 BECAUSE OF THE FOLLOWING REASON:

- 1) OA1 MDM FAILS GIVING ERRONEOUS OUTPUT VALUES FOR THE MPS HELIUM PRESSURE LCC LIMITS.
- 2) ASSOCIATED REGULATOR FAILS OPEN AFTER TERMINATION OF AFT COMPARTMENT HELIUM HGDS (HAZARDOUS GAS DETECTION SYSTEM) LCC (T-9 MINUTES) AND HELIUM SUPPLY PRESSURE LCC (T-13 SECONDS); THE FAILURE IS NOT REFLECTED IN THE FAILED MDM OUTPUT TO TLM/GROUND. REGULATOR OUTLET PRESSURE LCC LIMITS CONTINUES UNTIL T-10 SECONDS. THE HELIUM OUTPUT PRESSURE MEASUREMENTS (MPS E1-REG B, MPS E2-REG A, MPS E3-REG B) ARE CHANNELIZED THROUGH OA1. THE FAILED MDM WILL NOT REFLECT THE FAILED OPEN REGULATOR CONDITION. IF AN OA1 CHANNELIZED HELIUM REGULATOR FAILS OPEN AFTER T-13 SECONDS AND THE MDM HAS FAILED SUCH THAT REGULATORS PRESSURE ARE MASKED, THE RESULTS ARE AN LCC DECEPTION AND LIFT OFF WITH FAILED OPEN REGULATOR. FLIGHT WITH THIS CONDITION MAY RESULT IN OVERPRESSURIZATION OF THE AFT COMPARTMENT (REF. 03-1CB-0743-01).

-DISPOSITION RATIONALE-

(A) DESIGN:

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- ALL PARTS SELECTED FROM MF0004-400 ORBITER PROJECT PARTS LIST (OPPL) WHICH CALLS FOR JANTXV LEVEL PARTS, OR HAVE ADEQUATE DERATING FACTORS OF 25-50% ON HYBRIDS & TRANSISTORS, 25-30% ON RESISTORS, CAPACITORS AND OTHER COMPONENTS. PARTS THAT DID NOT MEET ORBITER PROJECT PARTS LIST REQUIREMENTS FOR QUALIFICATION, TRACEABILITY SCREENING OR BURN-IN WERE REVIEWED AND WERE FOUND ACCEPTABLE FOR THEIR GIVEN FUNCTIONS. REDUNDANT COMMAND/SIGNALS FOR CRITICAL FUNCTIONS ROUTED THROUGH SEPARATE MDM'S. DESIGN ALSO INCORPORATES RELIABILITY, MAINTAINABILITY, ENVIRONMENTAL AND TRANSPORTABILITY REQUIREMENTS AND OTHER DESIGNS AND CONSTRUCTION PER SPECIFICATION MC615-0004.

(B) TEST:

EACH UNIT SUBJECTED TO ACCEPTANCE TEST PROCEDURE (ATP) TEST (T4025545) AT HONEYWELL INCLUDING CONTINUITY, FULL FUNCTIONAL, ACCEPTANCE VIBRATIONAL TEST (AVT), ACCEPTANCE THERMAL TEST (ATT), EXAMINATION OF PRODUCT, INSULATION RESISTANCE TEST, DIELECTRIC STRENGTH TEST, PERFORMANCE, AND POWER VARIATION TEST.

QUALIFICATION TEST (T4025763) COMPLETED AT HONEYWELL INCLUDING FULL FUNCTIONAL, POWER, ELECTROMAGNETIC COMPATIBILITY (EMC), HUMIDITY, THERMAL VIBRATION, THERMAL VACUUM, LIGHTNING, SHOCK, SALT/FOG, 1000 ON/OFF CYCLE LIFE TEST, ACCELERATION, AND EXPLOSIVE/CORROSIVE ATMOSPHERE.

GROUND TURNAROUND TEST: ALL TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

RECEIVING INSPECTION

CERTIFICATIONS & SOURCE INSPECTION TEST REPORTS ARE ON FILE. CASES AND FLATPACKS ARE ENVIRONMENTALLY SCREENED, INCLUDING LOOSE PARTICLE DETECTION IN RECEIVING INSPECTION. ALL HYBRID COMPONENTS ARE LOT SAMPLED IN RECEIVING INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO CLASS 100,000 LEVEL IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

VISUAL INSPECTION IS PERFORMED AT KIT RELEASE. PRINTED WIRING BOARD MICROSECTION ANALYSIS IS PERFORMED AND MONITORED BY INSPECTION. QUALITY CONTROL VERIFIES AND WITNESSES TORQUE OPERATIONS. QUALITY CONTROL VERIFIES SOLDERED CONNECTIONS AND ASSEMBLY OF PARTS. TOOL CERTIFICATION AND TENSILE TESTS ARE MAINTAINED. QUALITY CONTROL PERFORMS PRE-CAP VISUAL INSPECTION FOR CLEANLINESS. QUALITY CONTROL VERIFIES CONVEYOR FURNACE PROFILE/TEMPERATURE EVERY 90 DAYS. QUALITY CONTROL VERIFIES ALL FLATNESS & SURFACE ROUGHNESS FOR PROPER HEAT TRANSFER. THERMAL PROTECTION CONTROLS EXIST FOR ALL SOLDERED CONNECTIONS.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION OF SELECTED COMPONENTS, I.E., TANTALUM CAPACITORS, IS PERFORMED.

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CRITICAL PROCESSES

INSPECTION VERIFIES CRIMPING OPERATIONS AND CERTIFICATION. SOLDERING REQUIREMENTS PER NHB5300.4(3A) ARE VERIFIED BY INSPECTION.

TESTING

ATP IS OBSERVED AND VERIFIED BY QUALITY CONTROL, INCLUDING AVT AND ATT.

HANDLING/PACKAGING

PROPER GROUNDING OF ELECTRICALLY STATIC SENSITIVE DEVICES WHEN HANDLING IS PERFORMED. PACKAGING AND PROTECTION VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE

(E) OPERATIONAL USE:

PORT MODING TO RECOVER MDM FUNCTIONALITY IS AVAILABLE DURING ALL MISSION PHASES.

- APPROVALS -

EDITORIALLY APPROVED	: RI	<u><i>[Signature]</i></u>
EDITORIALLY APPROVED	: JSC	<u><i>[Signature]</i></u> 5-1-96
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-013_08-5