FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: 05-5-B03-7 -X

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

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5410 4020534-944
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5410 4020534-964

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

FAILURE MODES EFFECTS ANALYSIS FMEA – CIL FAILURE MODE
NUMBER: 05-5-B03-7-01

REVISION#: 10 04/01/96

SUBSYSTEM NAME: DATA PROCESSING SYSTEM (DPS)
LRU: MULTIPLEXER-DEMULTIPLEXER
ITEM NAME: MULTIPLEXER-DEMULTIPLEXER

CRITICALITY OF THIS FAILURE MODE: 1R2

FAILURE MODE:
LOSS OF OUTPUT

MISSION PHASE:

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

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
PIECE PART FRACTURE, VIBRATION, CONTAMINATION, TEMPERATURE, CHEMICAL REACTION, FAILED MDM PORT - SEQUENCE CONTROL UNIT (SCU), MULTIPLEXER INTERFACE ADAPTER (MIA), POWER SUPPLY OR I/O CARD/CHANNEL FAILURES.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

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LOSS OF MDM.

(B) INTERFACING SUBSYSTEM(S):
LOSS OF ONE DATA PATH ASSOCIATED WITH THE FAILED MDM.

(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:

EXISTING CHANNELIZATION ALLOWS A SINGLE "OA" MDM FAILURE TO CAUSE THE LOSS OF ALL APU FUEL TANK INSTRUMENTATION FOR A SINGLE SYSTEM. A FUEL LEAK IS A POSSIBLE CRITICALITY 1 FAILURE RESULTING IN LOSS OF CREW/VEHICLE. IF THERE IS A FUEL LEAK BETWEEN THE TANK AND THE ISOLATION VALVES, IT IS UNLIKELY THAT IT WILL BE DETECTED WITHOUT FUEL TANK PRESSURE AND/OR TEMPERATURE MEASUREMENTS. RESULTS IN LOSS OF THE OPPORTUNITY TO MINIMIZE THE DELETERIOUS EFFECTS OF LEAK.

-DISPOSITION RATIONALE-

(A) DESIGN:
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 (T4025783) 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.

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.

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(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	: R.	:
EDITORIALLY APPROVED	: JSC	: 8-1-96
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-013_05-5