FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: 05-5-B03-6 -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	MC615-0004-5300 4020534-913
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5310 4020534-943
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5500 4020534-915
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5510 4020534-964
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5310 4020534-963
LRU	: MULTIPLEXER-DEMULTIPLEXER HONEYWELL	MC615-0004-5510 4020534-965

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
OPERATIONAL INSTRUMENTATION FORWARD MDM: "OF1", "OF2", "OF3" AND "OF4".

REFERENCE DESIGNATORS: 81V75A10
82V75A11
83V75A12
30V75A9

QUANTITY OF LIKE ITEMS: 4
FOUR

FUNCTION:
UPON REQUEST, PROVIDES DIGITIZED AND FORMATTED 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 DELTA SUB STACK VOLTAGE MEASUREMENTS ON THE FUEL CELLS DETECTING HYDROGEN/OXYGEN CROSS OVER TO PREVENT DETONATION. "OF3" MDM PROVIDES CURRENT MEASUREMENTS FOR ALL THREE FUEL CELLS. "OF4" PROVIDES APU DRAIN LINE PRESSURE MONITORING FOR DETECTION.

FAILURE MODES EFFECTS ANALYSIS FMEA – CIL FAILURE MODE

NUMBER: 05-5-B03-6-01

REVISION#: 9 - 03/29/96

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) CORE POWER SUPPLY.

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:

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- OIL FAILURE MODE
NUMBER: 05-5-B03-6-01

LOSS OF "OF" MDM AND ASSOCIATED MEASUREMENTS.

(B) INTERFACING SUBSYSTEM(S):
OF1, OF2, OF3 - LOSS OF ALL MEASUREMENTS ASSOCIATED WITH THAT MDM.
OF4 - LOSS OF APU DRAIN LINE PRESSURE MONITORING FOR ALL THREE APUS.

(C) MISSION:
NO EFFECT FIRST FAILURE.

(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:

BOTH MEASUREMENTS (FUEL PUMP DRAIN LINE PRESSURE 1 AND 2) FOR ALL THREE APUS ARE CHANNELIZED THROUGH "OF4" MDM ONLY, SUCH THAT THE FAILURE OF THIS MDM WOULD CAUSE THE LOSS OF FUEL DRAIN LINE PRESSURE VISIBILITY FOR ALL THREE APUS. THE FUEL PUMP DRAIN LINE PRESSURE, WHEN TOO HIGH, COULD BE AN INDICATION OF A GROSS FUEL OR OIL LEAK. LOSS OF BOTH MEASUREMENTS FOR A SINGLE APU WOULD OBSCURE INDICATIONS OF A POTENTIALLY CATASTROPHIC FUEL LEAK, A 1/R2 FAILURE. AN APU IN THIS PREDICAMENT WOULD BE STARTED AS A LAST RESORT.

-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 AND 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.

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 AND 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 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 AND 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.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: 05-5-B03-6-01

(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	: R. Stell
EDITORIALLY APPROVED	: JSC	: [illegible] 7-31-96
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-013_05-5