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SECTION 1. SYSTEM DESCRIPTION, FWD MDM or EMDM

A. Power Distribution

The MDM or EMDM is designed so that each Core power source is separate from, and redundant to, the opposite side. Design of the circuitry is such that a failure in either Core power source will not affect the other source. Electrical isolation is accomplished by having isolated power supply grounds which are verified as part of continuity and isolation testing. Only the wiring harness crossovers penetrate the central partition through small openings at the bottom of the partition. An extensive analysis of the effects of possible circuit failures involving the crossover wires was performed by Honeywell and reported in their report "Failure Effects of Cross Strap Wiring for SRB-MDM" dated July 15, 1977. In addition to the electrical isolation, physical isolation is accomplished by a metal partition which forms part of the chassis. The partition separates the Core Power Supply Modules, the IOM Power Supply Modules, and the motherboards from the units of the other side.

In flight configuration, power to the MDM or EMDM is provided separately by its associated IOM Power Module which in turn is supplied through each Core Power Supply from SRB power buses A or B. The power supply in the forward MDM (EMDM) is commanded to separate in flight configuration and power is not cross strapped. The MDM was designed to Contract End Item (CEI) specification EB4027348 Part I (the EMDM to X8259535 Part I) and incorporates printed circuit board layout to accommodate "stress free" solder joint construction to the requirements of EB4029777 and EB4021936 or M825969 (EMDM) (NHB5300.4[3A/3A-1])

B. SRM Ignition Safe and Arm Assembly Circuit

The SRM Ignition Safe and Arm (S&A) Assembly Safe 1 and Safe 2 commands are on separate output modules located on opposite sides of the MDM (EMDM) and separated by a metal wall. No single failure can cause both safe commands to turn on after MDM (EMDM) Lockout. Lockout occurs 38 seconds prior to launch for the Forward MDM (EMDM), and the position of the S&A Assembly is monitored as a LOC redline every 200 milliseconds from 5 minutes before launch until SRM ignition.

C. Range Safety System Power Circuit

The ET RSS A and B power OFF commands are on separate output modules located on opposite sides of the MDM and separated by a metal wall. No single failure can cause both Power OFF commands to turn on after MDM (EMDM) Lockout. Lockout occurs 38 seconds prior to launch for the Forward MDM (EMDM), and the ET RSS power is turned on 5 minutes before launch and monitored until launch.

D. Rate Gyro Command Circuit

The positive or negative RGA torque commands are on separate bits in the Forward MDM (EMDM). Although the bit number outputs come from one hybrid, the outputs have separate driver circuits inside the hybrid. No single failure can turn on both outputs after lockout. (Lockout occurs 38 seconds prior to launch).

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E. Discrete Output Limiter (DOL)

The SRB MDM (EMDM) is designed to provide lockout on channels 0 and 1 of (0, 1 and 2 for EMDM) each DOL module to prevent unscheduled output responses to "phantom" commands. At lockout, the control circuitry for changing the status of outputs on these channels is disabled.

F. Qualification

The MDM and EMDM have been verified by analysis and test to assure that the design goals have been met.

The MDM and EMDM is qualified as part of the IEA per the environments listed in the Components Test Requirements Specification SE-019-107-2H and certified by the IEA COQs.

SECTION 2. COMPONENT DESIGN

Each MDM (EMDM) is designed and built using high reliability parts, including gate arrays, procured, screened and derated to the levels as specified in MSFC 85M03936 or MIL-STD-975. Hybrid microcircuit screening includes 100 percent precap visual inspection and Particle Impact Noise Detection (PIND) testing per M4027078. Reliability was enhanced for the SRB MDM (EMDM) hybrids by limiting the number of rework cycles allowed, not allowing delidding and not allowing particle removal through a punched hole. Also, except for the hybrids on each MIA, all hybrids were fabricated in the Honeywell Hybrid Facility. (BI-1524 R3)

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SECTION 3. TESTING

A. Vendor

Power transistors of 4 watts and greater have received 100 percent PIND testing since the implementation of Change Order No. 7 to contract NAS8-36100. The effectivity of this requirement started at new build MDM S/N 66 and is for all subsequent MDMs and EMDMs.

Fwd MDM/EMDM's will be removed from the IEA and tested per 10REQ-0056.

Insertable/removable connector pins are push tested for proper insertion to 3.0 +/-0.5 pounds per Note 9 on drawing 8000758-901. Connector pins in the EMDM are push tested to the requirements of 10STD-0013.

DCN032

B. Acceptance Test - New MDMs

Each new build MDM (EMDM) is acceptance tested, including vibration and thermal test, per Honeywell Acceptance Test Procedure TP4027152 or T8259634 (EMDM)

Repaired MDMs (EMDMs) are tested to the level required to verify the repair per the Acceptance Test Procedure TP4027152 or T8259634 (EMDM)

Prior to installation in the IEA, each MDM (EMDM) gets bench tested at room temperature prior to installation per IEA vendor Test Procedure 5136116-GTSP.

After installation in the IEA, the MDM (EMDM) is subjected to Forward IEA Acceptance Test, including vibration and thermal, per IEA vendor Procedure 5135105-GTSP.

C. Recertification - Fwd MDMs or EMDMs (Reused)

As part of the Forward IEA, Forward MDM's are recertified for reuse by USBI Florida Operations per 10SPC-0131 and 10REQ-0051.

If anomalies are noted, the Forward IEA's are returned to the vendor for repair and acceptance testing.

D. ESD Protection

ACO OMRS 10REQ-0021, Para 4.11 requires that grounding wrist straps be worn at all times when electrical connector pins are being contacted with anything other than the mating connector and/or the component is being handled with covers removed. In addition, LRU connectors shall have metal caps or non-metallic ESD protective caps installed when not mated to cables, and prior to removing the LRU connector protective caps for cable mating. The shell of the mating connector shall be grounded. Interconnecting cables terminated on one end to an LRU are considered an extension of the LRU and are handled in accordance with the specified procedures.

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SECTION 4. VENDOR INSPECTIONS

All Honeywell built hybrids in each MDM and EMDM is subjected to in-process vendor inspections per the requirements of MIL-STD-833 and Honeywell Manufacturing Specification M-4027078. Precap visual inspection for all the hybrids is conducted by the vendor. Higher level assemblies such as modules, harnesses, and the box are all inspected by the vendor/and USBI quality representative inspectors. (DOL Module)

Applicable Mandatory Inspection and Manufacturing Checkout (MCO) Points

- o 100 percent Precap visual inspection of hybrids is performed by Vendor Quality per QCD F84-7, MEB 1118, MEB 1152, and MEB 1203 or QCD F84-7 and QEB 122 (EMDM).
- o 100 percent visual inspection of multi-layer printed wiring boards is performed by Vendor Quality and verified by USBI Quality.
- o Vendor Quality and USBI Quality inspect each Shop Replaceable Unit (SRU) for solder and component mounting prior to conformal coating and module closure per SIP 1198 or 1477 (EMDM).
- o Vendor Quality and USBI Quality inspect all chassis (LRU) units after installation of SRU modules for preclose inspection per SIP 1198 or 1477 (EMDM).
- o MDM harness wires are inspected 100 percent with 7X minimum scope by Vendor Quality per Q.C.D. S1675-1 or QCD SO336-2 (EMDM).
- o Each wire shall be individually inspected for damage with a 7X minimum scope by Vendor Quality per Q.C.D. S1675-1 or Q.C.D. SO336-2 (EMDM)
- o Final acceptance test is witnessed by Vendor Quality. Test set-up and test data is verified by USBI Quality per SIP 1198 or 1477 (EMDM).

Refurbishment

The same inspections and tests are applicable to refurbished units, depending on the degree of refurbishment required per SIP 1198 or SIP 1477 (EMDM).

IEA Vendor Inspection

MDM (EMDM) visual inspection is performed per 5136116.

Critical Processes

Wire Wrapping per M4004453 or M8259658 (EMDM)

X-ray laminography per EB 8259664 (EMDM only)

Soldering per EB4021936 or M8259659 (EMDM)

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SECTION 5. LRU (MDM or EMDM) FIELD INSPECTIONS

The MDM (EMDM) is inside the Sealed IEA at this point in the process and is not accessible for visual inspection.

Inspection and buyoff of data for Fwd IEA (Data Pack) and OMRSD Required test listed in Section 3 for each Failure Mode constitutes the only inspections applicable at this time in the process.