

Critical Item: Bus Test Card (BTC)
Total Quantity: 1
Find Number: 83K08175
Criticality Category: 1S

SAA No: 09IT09-001	System/Area: LPS CCMS/FR1/FR2/OR3/OR4
NASA Part No: 83K08175	PMN/ Name: L72-0400-14/ HIM-II
Mfg/ Part No: Data Products New England (DNE) Technologies/ 830081750	Drawing/ Sheet No: 83K01102/ 8-94

Function: Provides HIM level monitoring capabilities of chassis temperatures, VMEbus backplane voltages, power supply input source, VMEbus backplane integrity, and chassis front panel key switch selection. On detection of certain faults, state changes, or out-of-range conditions, the BTC generates a VMEbus interrupt.

Critical Failure Mode/Failure Mode No: Loss of output/09IT09-001.516. Erroneous output/09IT09-001.517. Loss of card input power/09IT09-001.518.

Failure Cause: Piece part failure.

Failure Effect: Loss of output. Loss of HIM health status (temperatures, voltages, etc.) data. The FEP status checks will detect failure of the BTC and stop further processing with that HIM. For the Hypergol Vapor Detection System (HIM 6397) this results in loss of capability to detect leaks during hazardous operations at Pads A and B. Possible loss of life/vehicle in the event of a hazardous condition. Detection method: System status checks will detect failure. Time to effect: Immediate.

Erroneous output to the GICC (example; erroneous multi acknowledge) would result in an I/O card being marked down in the GICC presence table and when the FEP requests that I/O card it would receive a Not Available message. This loss for the HVDS, HIM 6397, could result in loss of the capability to detect leaks during hazardous operations at Pad A and B. Possible loss of life/vehicle in the event of a hazardous condition. Detection method: System status checks will detect failure. Time to effect: Immediate.

Loss of card input power. The FEP will stop further processing with that HIM. For the HVDS, HIM 6397, this results in loss of the capability to detect leaks during hazardous operations at Pads A and B. Possible loss of life/vehicle in the event of a hazardous condition. Detection method: System status checks will detect failure. Time to effect: Immediate.

ACCEPTANCE RATIONALE**Design:**

- The HIM-II design requirements are defined in 83K01101 "Hardware Requirements for the Hardware Interface Module (HIM) HWCI P200-HW".
- The Bus Test Card assembly design supports reliability and maintainability requirements associated with fault detection and isolation, accessibility, test points, and diagnostics. The mean time between failure (MTBF) per MIL-HDBK-217F is 200,000 hours.
- The card (PCB) is fabricated on a double height VME card using eight layers. The eight layers are comprised of four signal planes, three power planes, and a ground plane.
- The card assembly is designed with the constraint of ruggedization. Careful component placement, and use of a stiffeners, has been implemented to comply with this constraint.
- BTC design provides for error detection and handling. Error conditions are latched in status registers which are accessible both locally (front panel) or remotely via the VMEbus.
- Power fuses provide fuse protection for VMEbus connections to the card.
- Signal traces on adjoining signal planes are routed perpendicular to one another to minimize crosstalk.

Test:

- OMRSD File VI Volume I, Baseline 12/13, "LOA MMH/N204 Servicing System" requires a sensor functional test prior to each flow. OMI V3542 "Hypergol Vapor Detection System Operations Support (LPS)" provides this end-to-end verification of the system (LPS/HVDS). This functional test verifies system sensors and HIM operations.
- During hypergol loading operations, personnel (in scope) are positioned on the RSS to provide visual monitor capability.

Inspection:

- LPS system integrity is continuously monitored by on-line software programs (i.e. HWMON, EMON, etc.). These programs provide health and status data to systems operators. FEPs poll the HIMs and their Input/Output Cards on a cyclic basis (1, 10, or 100 times/second) verifying the communication link with HIMs assigned. Along with status and health checks, exception monitoring provides operators notification of any change of state of HIM measurement cards.

Failure History:

- Current data on test failures, unexplained anomalies, and other failures experienced during ground processing activities can be found in the PRACA database. Since no units were installed at the time this analysis was performed no PRACA data was available.
- The GIDEP failure data interchange was researched and no failure data was found on this component in the critical failure mode.

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Operational Use:

- **Correcting Action:**

For the Hypergol Vapor Detection System, loss of the HIM during loading operations would result in termination of loading. Once terminated the faulty HIM card would be replaced. Loss of HIM at any other time would have no critical effect.

- **Timeframe:**

Replacing a failed component or card would take approximately 30 to 59 minutes.