Critical Item: Analog Input Card

Total Quantity: 13

Find Number: 83K01154

Criticality Category: 1S

SAA No:	09IT09-001	**System/Area:**	LPS CCMS/FR1/FR2/CR3/CR4
NASA Part No:	83K01154	**PMN/ Name:**	L72-0400-14/ HIM-II
Mfg/ Part No:	Data Products New England (DNE) Technologies/ 830011540	**Drawing/ Sheet No:**	83K01102/ 8-245

Function: Provides 4 or 8-bit analog voltage and current input interface for monitoring GSE. The card filters and converts the analog input to a digital value and stores it in registers. The measurement registers can be read across the HIM-II VMEbus.

Critical Failure Mode/Failure Mode No: Loss of card input power/09IT09-001.512.

Failure Cause: Piece part failure.

Failure Effect: Loss of card input power. The FEP will detect a power failure 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.

ACCEPTANCE RATIONALE

Design:

- The HIM-II design requirements are defined in 83K01101 "Hardware Requirements for the Hardware Interface Module (HIM) HWCI P200-HW".
- The Analog Input Card assembly design supports reliability and maintainability requirements associated with fault detection and isolation, accessibility, tests points, and diagnostics. The mean time between failure (MTBF) per MIL-HDBK-217F is 85,000 hours.
- The card (PCB) is fabricated on a double height VME card using six layers. The six layers are comprised of four signal planes, a 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.
- Card design provides latching type common status registers to indicate card error conditions. This status is accessible locally, via visual observation or remotely via the VMEbus.
- Power fuses protect the card from over current conditions.

- Card isolation is provided by isolation amplifiers, and DC-to DC converters. This isolation is provided to ensure that the external GSE I/O User interface signals are electrically isolated from the common VMEbus and other input channels.
- Overvoltage/current protection is provided for each of the analog input channels. The DC-to-DC converters protect the card circuitry from overvoltages applied across channels.
- Transient suppressor protect the input circuitry from transients on the inputs.

Test:

OMRSD File VI Volume I, Baseline 12/13, "LOA MMN/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 scape) 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.

Operational Use:

- Corrective 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 the HIM at any other time would have no critical effect.

- Timeframe:

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