

**Critical Item:** 16 Channel Discrete Input Card  
**Total Quantity:** 4  
**Find Number:** 83K01146  
**Criticality Category:** 1S

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<b>SAA No:</b> 09IT09-001	<b>System/Area:</b> LPS CCMS/FR1/FR2/CR3/CR4
<b>NASA</b>	<b>PMN/</b> L72-0400-14/
<b>Part No:</b> 83K01146	<b>Name:</b> HIM-II
<b>Mfg/</b> Data Products New England	<b>Drawing/</b> 83K01102/
<b>Part No:</b> (DNE) Technologies/ 830011460	<b>Sheet No:</b> 8-182

**Function:** Provides 16 different inputs to measure DC input signals from GSE. Each input represents a unique discrete interpretation of an input discrete on/off function. The input signal levels are translated into a logic "1" for a discrete on and a logic "0" for a discrete off.

**Critical Failure Mode/Failure Mode No:** Loss of card input power/09IT09-001.506

**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 and/or 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 16 Channel Discrete 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 200,000 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 plane, and a ground plane.
- The card assembly is designed with the constraint of ruggedization. Careful component placement, and use of a stiffener, has been implemented to comply with this constraint.
- Latching type status registers to indicate error conditions, accessible locally (front panel LEDs) or remotely via the VMEbus.

- Power fuses provide on-card circuit protection, as well as HIM card-to-card protection, by isolating the VMEbus power connections through fuses.
- External GSE I/O user interface signals are isolated from the internal VMEbus, so that one card's user interface problem does not cause a fault to any other cards in the system via the VEMbus baokplane.
- Input fuses provide protection for all the GSE I/O user interface signals. The purpose for the fuse is to ensure that the internal VMEbus signals are protected from the external GSE I/O user interface signals as well as to prevent considerable damage to card input circuitry
- Transient protection. This card provides input protection of +/- 40 volts continuously for all discrete inputs. It also provides input protection of 1 millisecond duration for a single event pulse every second.

**Test:**

- OMRSD File VI Volume I, Baseline 12/13, "LOA MMHN204 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 soape) are positioned on the RSS to provide visual monitor oapability.

**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 oyolic 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:**

- 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 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.