CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: **D3 AND D4** | PROJECT: **C&W CONTINGENCY POWER CABLES** | SUBSYSTEM: **N/A**
NAME/QUANTITY: **DIODES/2** | LRU NAME/QUANTITY: **C&W CONTINGENCY POWER CABLES/2** | EFFECTIVITY: **All Orbiters**
DRAWING REFERENCE: **JANTXV1N5811** | LRU PART NUMBER: **528-20216**

FAILURE MODE NUMBER	CRITICALITY	FAILURE EFFECT	RETENTION RATIONALE
35	3/1RB		

FUNCTION

D3 and D4 isolate the IFM breakout box from the Orbiter essential bus

FAILURE MODE AND CAUSE

(B) Mode: Diode D3 or D4 fails shorted
Cause:
- Manufacturing defect
- Overstress

REDUNDANCY SCREENS	REMAINING PATHS
A – Pass B – Fail C – Pass	Use other C&W contingency power cable

MISSION PHASE	TIME TO EFFECT	TIME TO CORRECT
Orbit	Minutes ~~Immediate~~	Immediate ~~TBD~~

FAILURE EFFECT

END ITEM

Could result in current flow between Orbiter essential bus and Orbiter main A bus

MISSION

None

CREW/VEHICLE

Short of D3 or D4 followed by a short of the Orbiter main A bus would result in a time-critical fuel cell emergency due to loss of fuel cell coolant pump (IFM breakout box 5A fuse would open prior to the Orbiter 5A circuit breaker)

INTERFACE

See "End Item" and "Crew/Vehicle"

RETENTION RATIONALE

A. DESIGN – The diode design uses axial lead, has a hermetically sealed case, and is metallurgically bonded. The part is designed to meet the requirements of military standard MIL-S-19500/477. The application of the part is analyzed to ensure compliance to the 25 percent derating criteria of the Orbiter project. The current load when powering the C&W system is a nominal .7 A.

B. TESTS –

Manufacturing

Tests and inspections performed on the entire product check the room temperature parameters, high temperature parameters (100 °C), low temperature parameters (-65 °C), acceleration (20,000 G), hermetic seal (fine and gross), and burn-in (150 °C, 96 hr). An internal visual inspection is also done. Tests and inspections performed on a sample from each lot are done to check solderability,

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NAME/QUANTITY: DIODES/2
DRAWING REFERENCE: JANTXV1N5811

PROJECT: C&W CONTINGENCY POWER CABLES
LRU NAME/QUANTITY: C&W CONTINGENCY POWER CABLES/2
LRU PART NUMBER: 528-20216

SUBSYSTEM: N/A
EFFECTIVITY: All Orbiters

RETENTION RATIONALE (Continued)

resistance to solvents, thermal cycling (100 to 10 °C), hermetic seal (fine and gross), operational life (25 °C, 340 hr), destructive physical analysis, thermal resistance, junction temperature rise, high temperature life (nonoperating), and final electrical function. Tests and inspections done on a periodic basis for qualification check physical dimensions, thermal shock (200 to -65 °C), terminal strength, hermetic seal (fine and gross), moisture resistance, shock, vibration, acceleration, salt atmosphere, operational life, and final electrical function. An external visual inspection is also performed.

Acceptance

Each diode pair is load tested at 4 A. Each diode is tested for continuity prior to installation. The entire cable assembly is tested for continuity.

C. INSPECTION – The part is inspected according to the requirements of military standard MIL-S-19500/477 which includes visual inspections, burn-in, and screening tests as described in item B. In addition, the device manufacturer is required to prepare and maintain a product assurance program that shall ensure that the design, processing assembly, inspection, and testing of semiconductor devices are adequately controlled and comply with the requirements of military standard MIL-S-19500, appendix D. The manufacturer will maintain adequate documentation control to provide assurance in areas of documentation changes and approval authority and will define responsibility to evaluate quality problems and to provide solutions. The controls defined and documented must control, at a minimum, areas of personnel training; inspection of incoming materials, utilities, and work in progress; quality operations; design, processing, manufacturing, equipment, and materials documentation; design material, process change control, test equipment maintenance, and calibration procedures; failure and defect analysis and evaluation; and inventory control. These controls are periodically audited and evaluated by the appropriate Government purchasing agency (Defense Electronic Supply Center).

D. FAILURE HISTORY – There has been one documented issue of this diode type in the history of the Orbiter program. This was documented on the ALERT YA-A-84-01. The ALERT warns of slow recovery time (4 to 15 ns slower) that would be an issue only in high speed switching applications. In this caution and warning systems contingency power cable application, proper operation of the system would not be affected. The diode is applied as a blocking/isolation diode, and the marginally slower recovery time is not an issue.

E. OPERATIONAL USE – The second failure, loss of the main A bus, would be annunciated. The crew would have 5 to 10 min (9 min nominal) to shut down the affected fuel cell.

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