

SYSTEM: Electrical  
 SUBSYSTEM: Shuttle Observation Camera System  
 REV & DATE: K, 6-29-01  
 DCN & DATE: 003, 10 18 02  
 ANALYSTS: A. Greconia/ H. Claybrook

FUNCTIONAL CRIT: 1R  
 PHASE(S): b  
 HAZARD REF: Safety Analysis Report ET Camera System

FAILURE MODE: Fails Short

FAILURE EFFECT: b) Loss of mission and vehicle/crew due to fire/explosion. Connector deadface requirements at GUCP are violated if diodes fail short. Electrical arcing at separation could potentially ignite GH2 trapped in vent line.

TIME TO EFFECT: Immediate

FAILURE CAUSE(S): Manufacturing Defect

REDUNDANCY SCREENS: Screen A: FAIL - Can only verify one diode is functional  
 Screen B: N/A  
 Screen C: PASS

FUNCTIONAL DESCRIPTION: Rectifier Diode #1N4001 is used as a "blocking diode" in the charging circuit to prevent the energy stored in the ET Camera batteries from "leaking" back out of GUCP connector.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
3.14.1.1	1N4001	Rectifier Diode	2	ET-115

REMARKS:

CRITICAL ITEMS LIST (CIL)  
CONTINUATION SHEET

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FMEA ITEM CODE(S): 3.14.1.1

RATIONALE FOR RETENTION

DESIGN:

The batteries for the Space Shuttle Observation Camera are charged through a connector located at the GUCP. GUCP deadface requirements are maintained at lift-off by circuitry between the GUCP and the battery pack. This circuit contains two diodes connected in series. These blocking diodes prevent current flow from the battery pack to the GUCP. These diodes normally operate at 28 volts / 0.3 amps and are rated for 50 volts / 1 amps. A reliability analysis was performed on the diode with a mean time between failure of 41,946,000 hours. The reliability for 24 hours of operation is 0.9999994.

Operations at KSC assures continuous monitoring of deadfacing capability via console laptops, and procedural controls are in place to verify no voltage is present at interface.

Redundancy Description

This failure mode is only credible after T-31 seconds in the countdown. Prior to T-31 seconds there is visibility that at least one diode is functional due to the fact that there is no indication of health monitoring in the firing room. A launch scrub can be called prior to T-31 seconds if health monitoring circuit is visible (indication of two diodes failed short).

FAILURE

1 diode failed short  
2 diodes failed short

EFFECT

No effect  
Potential for failure effect described above

TEST:

The camera battery charging circuit containing the two diodes is certified. Reference COQ MMC-ET-TM06-127

Vendor:

Diodes are tested during circuit board assembly

Perform connector deadfacing test (Acceptance Test Procedure for Camera Electronics Box 020088)

MAF:

None

Launch Site:

Perform pre-installation bench testing? (TP-80931017072)

Perform post-installation functional test (TP-80931017072)

CRITICAL ITEMS LIST (CIL)  
CONTINUATION SHEET

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RATIONALE FOR RETENTION

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INSPECTION:

Vendor:

Surveillance by Lockheed Martin Procurement Quality is performed to ensure compliance with specifications.

Witness connector deadfacing test (Acceptance Test Procedure for Camera Electronics Box 020088)

MAF Quality Inspection:

None

Launch Site:

Witness pre-installation bench testing (TP-80931017072)

Witness post-installation functional test (TP-80931017072)

FAILURE HISTORY:

Current data on test failures, unexplained anomalies and other failures experienced during ground processing activity can be found in the PRACA data base.