

MAR 11 1994

B/L: 389.00
SYS: 250-TON
BRIDGE
CRANE, VAB

Critical Item: Generator Field DC Input Controller,
Trolley (2 Total, 1/Crane)
Find Number: 4FC
Criticality Category: 2

SAA No: 09FY12-005	System/Area: 250-Ton Bridge Crane (#1 & #2)/VAB
NASA Part No: NA	PMN/ Name: K60-0533, K60-0534/ 250-Ton Bridge Crane (#1 & #2)/VAB
Mfg/ Part No: Reflex/ URRK-VIII	Drawing/ Sheet No: 69-K-L-11388/ 27

Function: A solid state assembly which provides DC excitation to the generator field of the motor-generator set (M6-G2). The excitation is proportional to the input supplied from the control potentiometer (RPOT) and is used to drive the DC motors which control the trolley.

Critical Failure Mode/Failure Mode No:

- High output (not inverted)/09FY12-005.083
- High output (inverted)/09FY12-005.084

Failure Cause:

- Board component short, board component open, loss of voltage feedback from the DC drive motor loop.
- Board component short.

Failure Effect:

- Increasing speed of the DC motors controlling the trolley. The worst case scenario would be moving a critical load (SRB segment, Orbiter, or ET) in the slow coarse speed mode (maximum coarse speed is 50 ft/min), the failure occurring, causing a sudden increase to full coarse speed and the effect being the critical load striking a VAB wall or work platform resulting in possible damage to a vehicle system. Time to effect: seconds.
- Increasing speed, in the opposite direction than commanded, of the DC motors controlling the trolley. The worst case scenario would be moving a critical load (SRB segment, Orbiter, or ET) in the slow coarse speed mode (maximum coarse speed is 50 ft/min), the failure occurring, causing a sudden increase to full coarse speed and the effect being

the critical load striking a VAB wall or work platform resulting in possible damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

Design:

- Voltage feedback from the DC motor armature loop maintains a constant output to the drive motors at $\pm 2\%$. This prevents an overvoltage condition from driving the crane faster than is commanded by the operator.
- Current feedback from the DC motor armature loop prevents the crane from being driven faster than is allowable in maximum coarse speed.
- Current feedback from the generator field winding maintains the proper gating for output to the generator field.
- Output can be regulated and will remain constant each time the crane is being used. This allows for uniformity in expected crane reactions to inputs from the operator.
- Output to the generator field is supplied up to positive or negative 109 volts in response to an input of positive or negative 6 volts.
- Rated power: 4K watts
- Actual power: 2K watts
- Rated temperature: 0 to 50° C.
- Actual temperature: Ambient.

Test:

- a. OMRSD file VI requires verification of proper performance of the trolley operational test annually.
- b. OMI Q3008, Operating Instructions, requires all crane systems be operated briefly in all speeds to verify satisfactory operation before lifting operations.

Inspection:

- OMI Q6003, Maintenance Instructions, requires an annual visual inspection of the solid state circuit board assemblies for evidence of burning, discoloration caused by overheating, contamination or corrosion.

Failure History:

- The PRACA database was researched and no failure data was found on this component in the critical failure mode.
- The GIDEP failure data interchange system was researched and no failure data was found on this component in the critical failure mode.

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Operational Use:

• **Correcting Action:**

- 1) The failure can be recognized via the ammeter (increase in current) and the Selsyn (positions change) that is in view of both operators.
- 2) When the failure indication is noticed, the operator can stop all crane operations by returning the Master Control Switch to neutral or pressing the E-Stop button.
- 3) When the failure occurs in the fine speed mode of operation, the motor generator set will be shut down by an overvoltage protection relay when the voltage in the DC motor loop reaches 115% of the full fine voltage output.
- 4) Operators are trained and certified to operate these cranes and know and understand what to do if a failure indication is present.
- 5) During all critical lifts, there is at least one remote Emergency Stop (E-Stop) operator observing the load lift, and can stop the crane if a failure indication is noticed.
- 6) Operationally, the crane must be operated in the fine speed mode if a critical load is within 10 feet of any structure in the direction of travel.

• **Timeframe:**

- Estimated operator reaction time is 3 to 10 seconds.