

SAA09FY12-006
REV. BB/L: 389.00
SYS: 175-TON
BRIDGE
CRANE, VAB

Critical Item: Generator Field DC Input Controller, Trolley
Find Number: 4FC
Criticality Category: 2

AUG 20 1993

SAA No: 09FY12-006	System/Area: 175-Ton Bridge Crane/VAB
NASA	PMN/ K6D-052B/
Part No: NA	Name: 175-Ton Bridge Crane/VAB
Mfg/ Reflex/	Drawing/ 67-K-L-11348/
Part No: URRK-VIII	Sheet No: 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 (R POT) and is used to drive the DC motors which control the trolley.

Critical Failure Mode/Failure Mode No:

- High output (not inverted)/09FY12-006.076
- High output (Inverted)/09FY12-006.077

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 would be attempting to move the ET or the orbiter to the east or west in the slow coarse mode of operation, while suspended above the VAB transfer aisle, the failure occurring causing a sudden increase to full coarse speed resulting in the ET or the orbiter striking the wall of the transfer aisle at a velocity of 50 ft/min causing possible damage to a vehicle system. Time to affect: seconds.
- Increasing speed, in the opposite direction than commanded, of the DC motors controlling the trolley. The worst case would be attempting to move the ET or the orbiter to the east or west in the slow coarse mode of operation, while suspended above the VAB transfer aisle, the failure occurring causing a sudden increase to full coarse speed resulting in the ET or the orbiter striking the wall of the transfer aisle at a velocity of 50 ft/min causing possible damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

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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.
- c. OMI Q3008, Pre-Operation Setup Instructions, requires a verification of proper operation of the overvoltage protection relay prior to all critical lifts.

Inspection:

- OMI Q6003, Maintenance Instructions, will require 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.

Operational Use:

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• **Correcting Action:**

- 1) The failure can be recognized via 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, the motor generator set will be shut down by an overvoltage protection relay when the voltage in the DC motor loop reaches 115% of full fine voltage (see Test item c for operational verification information).
- 4) Operationally, the crane must be operated in the fine speed mode if a critical load is within 10 feet of any structure.
- 5) Operators are trained and certified to operate these cranes and know and understand what to do if a failure indication is present.
- 6) 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.

• **Timeframe:**

- Estimated operator reaction time is 3 to 10 seconds.

Attachment
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