

MAR 11 1994

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

Critical Item: Relay, Auxiliary Hoist (4 Total, 2/Crane)
Find Number: 2HCR, 2LCR (1 ea/Crane)
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: General Electric/ CR120A06002AA	Drawing/ Sheet No: 69-K-L-11388/ 17

Function: Provides power to brake relays to release brakes during hoisting, lowering, float operations, and provides power to start the sequence to energize the generator field winding.

- a. N.O. contact closes to energize HCR RUN (2HCR) or LCR RUN (2LCR) which energizes relay 2RUN.
- b. N.O. contact closes to energize relay 2XR, which releases the brakes, and relay 2XR1, which enables the generator field DC input controller.

Critical Failure Mode/Failure Mode No:

- a. N.O. contact fails open/
 - 09FY12-005.037 (2HCR)
 - 09FY12-005.039 (2LCR)
- b. N.O. contact fails closed/
 - 09FY12-005.038 (2HCR)
 - 09FY12-005.040 (2LCR)

Failure Cause:

- a. Corrosion, binding mechanism.
- b. Welded contacts, binding mechanism

Failure Effect:

- a. Relay 2RUN N.O. contact will not close and generator field will not be energized. No output from the generator. No hoist motor torque while the command is being given to raise, lower or float the load and the brakes are released. The load will descend with

regenerative braking at 1.7 ft/min (0.34 in/sec) max (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to lift or float a critical load (SRB forward assembly) from the stop position, releasing the brakes, the failure occurring, and the effect being the critical load descending and striking the VAB floor, transporter, work platforms, MLP, or Shuttle Stack resulting in possible damage to a vehicle system. Time to effect: seconds.

- b. Brake relays will remain energized and the brakes will not set when the hoist motors are commanded to stop (in normal operation). The load will descend with regenerative braking at 1.7 ft/min (0.34 in/sec) max (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to bring a critical load (SRB forward assembly) to a stop while hoisting or lowering, the failure occurring, and the effect being the critical load descending and striking the VAB floor, transporter, work platforms, MLP, or Shuttle Stack resulting in possible damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

Design:

<u>Contact Ratings</u>	<u>Actual</u>
300 volts	120 volts
10 amps	Testing required

- Contact Material: Silver Cadmium Oxide, Self-cleaning
- Mechanical life expectancy is 10 million operations.
- This relay was off-the-shelf hardware selected by the crane manufacturer for this application.

Test:

- OMRSD file VI requires verification of proper performance of hoist operational test annually.
- 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 annual inspection of contacts and contact members for burning, pitting, proper alignment, and discoloration caused by overheating; visual check of closing coils for deteriorated insulation and evidence of overheating or burning.

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:

- **Correcting Action:**

- 1) The failure can be recognized via the ammeter (lack of current) and the Selsyn (positions change) (for both failures), or the failure of the brake set light to illuminate (for the N.O. contact fails closed failure only). that are in view of both operators.
- 2) When the failure indication is noticed, the operator can stop all crane operations by pressing the E-Stop button (for both failures), returning the Master Control Switch to neutral, or releasing the brake switch if in the float mode (for the N.O. contact fails open failure only).
- 3) Operators are trained and certified to operate these cranes and know and understand what to do if a failure indication is present.
- 4) 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.
- 5) Operationally, the crane must be operated in the fine or float 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.