

MAR 11 1994

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

Critical Item: Relay, Main Hoist (2 Total, 1/Crane)

Find Number: 1FW

Criticality Category: 1

SAA No: 09FY12-005

System/Area: 250-Ton Bridge Crane
(#1 & #2)/VAB

**NASA
Part No:** NA

**PMN/
Name:** K60-0539, K60-0534/
250-Ton Bridge Crane
(#1 & #2)/VAB

**Mfg/
Part No:** Westinghouse/
cat. # 15825K2CNN,
mech style # 453D263G02

**Drawing/
Sheet No:** 69-K-L-11388/
12, 13

Function: The relay energizes when power is applied to the crane, closing the three normally open (N.O.) contacts. The two series arranged contacts bypass resistor 1FWR to allow an increase in current to the DC motor field windings to strengthen the field. The third enables, but does not energize relay 1SRX.

The relay is deenergized while in the high speed mode, which opens the contacts, to place resistors 1FWR and RES A in series with the field windings to reduce the current and weaken the field.

Critical Failure Mode/Failure Mode No:

- a. Fails deactivated (coil fails open)/09FY12-005.098
- b. N.O. contact fails open (1 of 3)/09FY12-005.099.

Failure Cause:

- a. Corrosion, fatigue
- b. Corrosion, birding mechanism.

Failure Effect:

- a. The N.O. contacts will be opened placing resistors 1FWR and RES A in series with the DC motor field windings. The field will be weakened by the reduction of current through the windings. The hoist will be in the high speed mode configuration. The worst case scenario would be lowering a critical load (SRB segment, Orbiter, or ET) in the coarse speed mode (maximum coarse speed is 10 ft/min), the failure occurring causing the hoist speed to increase to approximately three times the commanded speed, and the effect being the critical load descending and striking the VAB floor, transporter, work

platforms, MLP, or Shuttle Stack resulting in a potential loss of life and/or vehicle, or damage to a vehicle system. Time to effect: seconds.

- b. The N.O. contacts (1 of 3) will be opened placing resistor 1FWR or RES A in series with the DC motor field windings. The field will be weakened by the reduction of current through the windings. The hoist will descend at a higher rate of speed than expected (speed will be approximately double of the commanded input). The worst case scenario would be lowering a critical load (SRB segment, Orbiter, or ET) in the coarse speed mode (maximum coarse speed is 10 ft/min), the failure occurring causing the hoist speed to increase to approximately two times the commanded speed, and the effect being the critical load descending and striking the VAB floor, transporter, work platforms, MLP, or Shuttle Stack resulting in a potential loss of life and/or vehicle, or damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

Design:

<u>Contact Ratings</u>	<u>Actual</u>
600 volts	183 volts
50 amps	14 amps

<u>Coil Ratings</u>	<u>Actual</u>
550 volt-amps	Testing required

- Contact material: silver.
- 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 to 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.

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Operational Use:

• **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 pressing the E-Stop button.
- 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 line or float speed mode if a critical load is within 10 feet of any structure in the direction of travel.
- 6) During final SRB mate, all crane operations are ceased and final mate is accomplished by use of the 250-Ton Hydra-Set.

• **Timeframe:**

- Estimated operator reaction time is 3 to 10 seconds.