

MAR 11 1994

B/L: 389.00

SYS: 250-TON

BRIDGE

CRANE, VAB

**Critical Item:** Relay, Main Hoist (4 Total, 2/Crane)  
**Find Number:** HCR RUN, LCR RUN (1 ea./Crane)  
**Criticality Category:** 2

**SAA No:** 09FY12-005**System/Area:** 250-Ton Bridge Crane  
(#1 & #2)/VAB**NASA****PMN/****Part No:** NA**Name:**K60-0533, K60-0534/  
250-Ton Bridge Crane  
(#1 & #2)/VAB**Mfg/**

Cutler Hammer/

**Drawing/**

69-K-L-11388/

**Part No:** 9575H2068A Model: 6-2-3**Sheet No:**

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**Function:** Controls relay 1RUN for energizing the generator field winding during hoisting, lowering or float operations.

**Critical Failure Mode/Failure Mode No:**

- a. Fails deactivated (coil fails open)/
  - 09FY12-005.010 (HCR RUN)
  - 09FY12-005.013 (LCR RUN)
- b. N.O. contact fails open/
  - 09FY12-005.011 (HCR RUN)
  - 09FY12-005.014 (LCR RUN)
- c. N.C. contact fails closed/
  - 09FY12-005.012 (HCR RUN)
  - 09FY12-005.015 (LCR RUN)

**Failure Cause:**

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

**Failure Effect:** (For all three failures) Relay 1RUN N.O. contact will not close and generator field winding 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 0.25 ft/min (0.05 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 segment, Orbiter, or ET) 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.

### ACCEPTANCE RATIONALE

#### Design:

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

<u>Coil Ratings</u>	<u>Actual</u>
120 volts	120 volts

- Contacts - Weld resistant, dome shaped, self wiping, silver cadmium oxide, double break operation.
- Coils - Bobbin wound coils are varnish impregnated under vacuum to prevent corrosion due to moisture.
- Armature - Balanced armature to minimize bounce for maximum contact life.
- Shock and vibration resistant construction.
- This relay was off-the-shelf hardware selected by the crane manufacturer for this application.

#### Test:

- OMRSD Item 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 Q5003 Maintenance Instructions, require annual inspection of relay 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:**

• **Corrective Action:**

- 1) The failure can be recognized via the ammeter (lack of 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 pressing the E-Stop button, returning the Master Control Switch to neutral, or releasing the brake switch if in the float mode.
- 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.
- 6) During final SRB mate, all crane operations are ceased and final mate is accomplished by use of the 250-Ton Hydra-Sel.

• **Timeframe:**

- Estimated operator reaction time is 3 to 10 seconds.

Attachment  
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