

SAA09FY12-006  
REV. B

B/L: 389.00  
SYS: 175-TON  
BRIDGE  
CRANE, VAB

AUG 20 1993

**Critical Item:** Relay, Main Hoist (2 total)  
**Find Number:** 1HCR, 1LCR (1 ea)  
**Criticality Category:** 2

<b>SAA No:</b> 09FY12-006	<b>System/Area:</b> 175-Ton Bridge Crane/VAB
<b>NASA</b>	<b>PMN/</b> K60-052B/
<b>Part No:</b> NA	<b>Name:</b> 175-Ton Bridge Crane/VAB
<b>Mfg/</b> General Electric/	<b>Drawing/</b> 67-K-L-1134B/
<b>Part No:</b> CR120A06002AA	<b>Sheet No:</b> 13

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

- a. N.O. contact closes to energize HCR RUN (1HCR) or LCR RUN (1LCR) which energizes relay 1RUN.
- b. N.O. contact closes to energize relay 1XR, which releases the brakes, and relay 1XR1, which enables the generator field DC input controller.

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

- a. N.O. contact fails open/
  - 09FY12-006.006 (1HCR)
  - 09FY12-006.008 (1LCR)
- b. N.O. contact fails closed/
  - 09FY12-006.007 (1HCR)
  - 09FY12-006.009 (1LCR)

**Failure Cause:**

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

**Failure Effect:**

- a. Relay 1RUN 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 0.25 ft/min (0.05 in/sec) max (based on maximum load capacity

WORKSHEET 5312-013  
930615ccPS0099

of the hoist, in reality this would descend slower). The worst case would be attempting to lift or float an External Tank (ET) or the aft end of the orbiter from the stop position, releasing the brakes, the failure occurring, and the effect being the ET or the aft end of the orbiter descending and striking the VAB floor or transporter, 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 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 bring an ET or the aft end of the orbiter to a stop while lowering, the failure occurring, and the effect being the ET or the aft end of the orbiter continuing to lower, 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.

AUG 20 1993

**Operational Use:**

• **Correcting Action:**

- 1) The failure can be recognized via the brake set light or 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 (releasing the brake switch 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.

• **Timeframe:**

- Estimated operator reaction time is 3 to 10 seconds.