SAA09FY12-006
REV. B

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

AUG 2 0 1993

Critical Item: Relay, Auxiliary Hoist

Find Number: 2XR1

Criticality Category: 2

SAA No:	09FY12-006	**System/Area:**	175-Ton Bridge Crane/VAB
NASA Part No:	NA	**PMN/ Name:**	K60-0528/ 175-Ton Bridge Crane/VAB
Mfg/ Part No:	Allen Bradley/ 700-P400A1	**Drawing/ Sheet No:**	67-K-L-11348/ 17, 19

Function: Enables the generator field DC input controller, 2FC, when relay 2HCR or 2LCR is energized.

Critical Failure Mode/Failure Mode No:

a. Coil fails open/09FY12-006.080

b. N.O. contact fails open/09FY12-006.081

c. N.O. contact fails open/09FY12-006.082

d. N.O. contact fails open/09FY12-006.083

Failure Cause:

a. Corrosion, fatigue

b. Corrosion, binding mechanism

c. Corrosion, binding mechanism

d. Corrosion, binding mechanism

Failure Effect:

a. The contacts will remain deenergized. No DC excitation voltage to the generator field winding. No output from the generator. No hoist motor torque when the command is given to raise, lower, or float the load while the brakes are released. The load will descend with regenerative braking at 1.7 ft/min (0.34 in/sec) (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to lift an SRB forward assembly from the stop position, releasing the brakes, the failure occurring, and the effect being the forward assembly descending striking the VAB floor or platform, resulting in possible damage to a vehicle system. Time to effect: seconds.

b. The speed regulator in the generator field DC input controller will not be enabled. No DC excitation voltage to the generator field winding. No output from the generator. No hoist motor torque when the command is given to raise, lower, or float the load while the brakes are released. The load will descend with regenerative braking at 1.7 ft/min (0.34 in/sec) (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to lift an SRB forward assembly from the stop position, releasing the brakes, the failure occurring, and the effect being the forward assembly descending striking the VAB floor or platform, resulting in possible damage to a vehicle system. Time to effect: seconds.

c. The bi-directional amplifier in the generator field DC input controller will not be enabled. No DC excitation voltage to the generator field winding. No output from the generator. No hoist motor torque when the command is given to raise, lower, or float the load while the brakes are released. The load will descend with regenerative braking at 1.7 ft/min (0.34 in/sec) (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to lift an SRB forward assembly from the stop position, releasing the brakes, the failure occurring, and the effect being the forward assembly descending striking the VAB floor or platform, resulting in possible damage to a vehicle system. Time to effect: seconds.

d. The firing circuit in the generator field DC input controller will not be enabled. No DC excitation voltage to the generator field winding. No output from the generator. No hoist motor torque when the command is given to raise, lower, or float the load while the brakes are released. The load will descend with regenerative braking at 1.7 ft/min (0.34 in/sec) (based on maximum load capacity of the hoist, in reality this would descend slower). The worst case would be attempting to lift an SRB forward assembly from the stop position, releasing the brakes, the failure occurring, and the effect being the forward assembly descending striking the VAB floor or platform, resulting in possible damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

Design:

- Contact Voltage Rating: 600 VDC
- Contact Voltage Actual: 15 VDC
- Contact Material: Nickel Silver (Ni Ag)
- Coil Voltage Rating: 600 VAC
- Coil Voltage Actual: 120 VAC
- Coil Power Rating: 20 VA 60 Hz (sealed), 138 VA 60 Hz (inrush)
- Pickup Time: 20 msec
- Dropout Time: 20 msec
- Rated Operating Temperature: -20°C to +40°C
- Actual Operating Temperature: Ambient
- UL (Underwriters Laboratory) listed

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.
- OMI Q3008, Pre-Operation Setup Instructions, requires current limit checks prior to all major lifts of flight hardware (verifies motor, generator, generator field DC input controller, float control loop and DC power loop components are operational).

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 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.