

MAR 11 1994

B/L: 389.00

SYS: 250-TON

BRIDGE

CRANE, VAB

**Critical Item:** Foot Switch, Main Hoist (2 Total, 1/Crane)**Find Number:** 52**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:** Allen Bradley/  
805A-40**Drawing/  
Sheet No:** 69-K-L-11388/  
15**Function:**

- a. Switch contact located between RPOT and the Generator Field DC Input Controller, arranged to disable the RPOT input when operating in the float mode.
- b. Contact closes to energize relay 1HCR to operate the crane in the float mode.
- c. Contact opens to enable the operator to control the brakes with brake switch S1 for float mode operations.

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

- a. N.C. contact fails open/09FY12-005.023
- b. N.O. contact fails closed/09FY12-005.116
- c. N.C. contact fails closed/09FY12-005.117

**Failure Cause:**

- a. Corrosion, mechanical failure.
- b. Corrosion, welded contact, mechanical failure.
- c. Corrosion, welded contact, mechanical failure.

**Failure Effect:**

- a. No RPOT Generator Field DC Input Controller excitation voltage and the resulting output to the generator field winding. No output from generator. No hoist motor torque while the command is being given, via the Master Control Switch to raise or lower 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 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.

- b. Relay THCR will remain energized. The brake relays, 1BR & 1BR1, will remain energized and the brakes will be released while no command is being initiated to move the load. 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 floating a critical load (SRB segment, Orbiter, or ET), releasing the foot switch to stop the float, 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.
- c. The brakes will be released when the foot switch is engaged. 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 engaging the foot switch to begin float operations for a critical load (SRB segment, Orbiter, or ET), the failure occurring prior to the operator supplying an input to the generator field DC input controller from FPOT, 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:

Contact Ratings	Actual
600 volts	120 volts

- Silver, double-break contacts.
- Internal parts enclosed for protection.
- This switch was off-the-shelf hardware selected by the crane manufacturer for this application.

##### Test:

- OMRSD file ~~V4~~ requires verification of the 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 switch contacts and contact members for burning, pitting, proper alignment, and discoloration caused by overheating.

**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 all failures), or the failure of the brake set light to illuminate (for the N.C. contact fails closed or the N.C. contact fails closed failures 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 all failures), returning the Master Control Switch to neutral (for N.C. contact fails open only), or disengage the foot switch (for the N.C. contact fails closed 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.
- 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 1 to 10 seconds.