MOVE Type D & DL Keyset Retrofit Implementation Plan

Network Support Group Splinter

JSC

10/19/11

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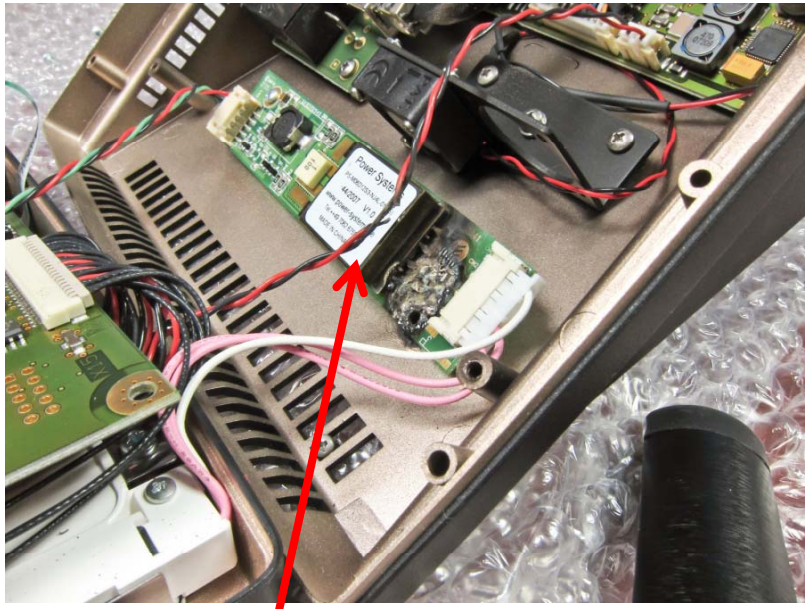
Background

- **A fire hazard associated with the Type D and DL Keysets has been identified that needs to be fixed.**
- **The hazard is based on a potential for electrical arcing to occur on the backlight power inverter board. This arcing causes parts on the inverter board to burn up which may also cause the keyset housing to burn/melt.**
- **Since June 10, 2011, there have been five cases of Keyset failures due to power inverter board arcing**
  - WSC (twice)
  - JPL (twice)
  - JSC (once)
- **A NASA Advisory was issued by NASA HQ August 30, 2011**
- **A Mishap Warning Action Response (MWAR) was issued by the NASA Safety Center on August 31, 2011 to all NASA Centers.**

Background Cont.

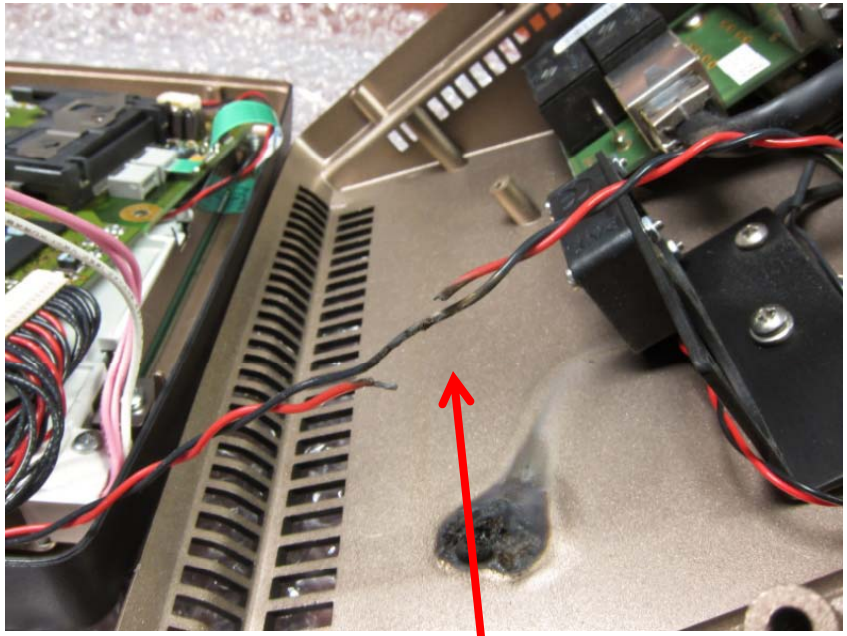
Burn mark on back of Keyset



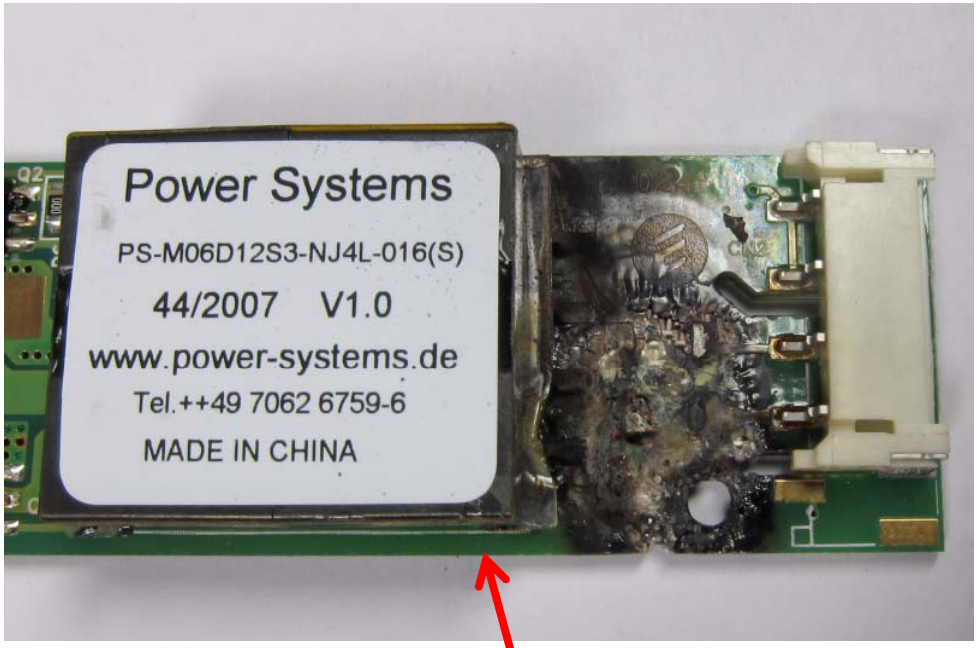
Power Inverter Board

Pictures of JSC Failed Keyset after 20 hours of arcing

Background Cont.



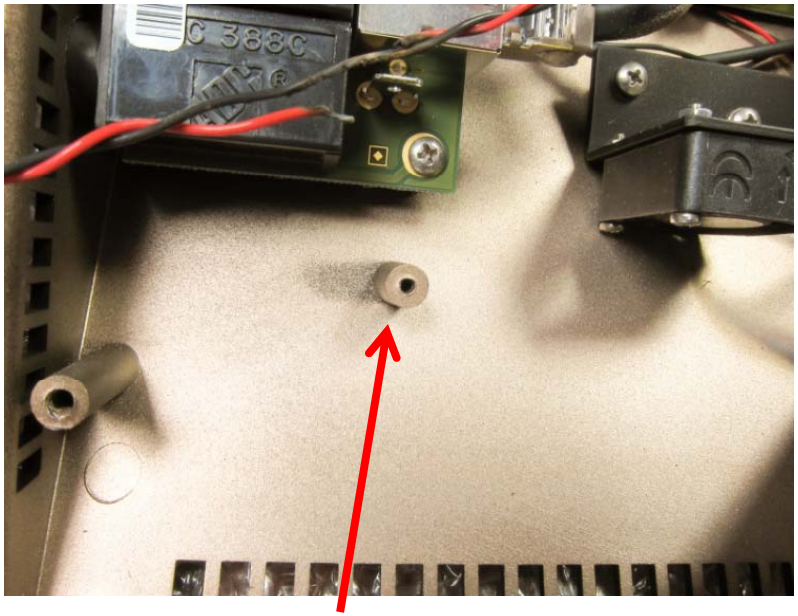
Speaker wire consumed by arcing



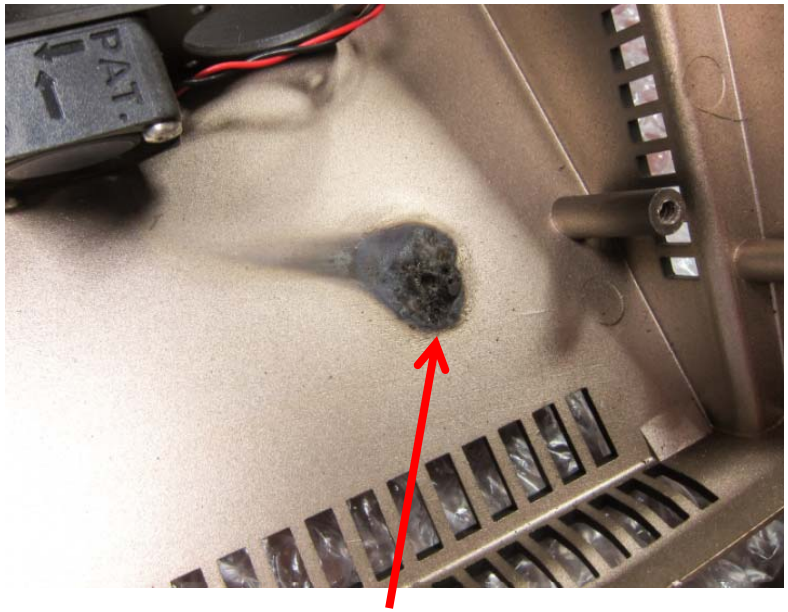
Power Inverter Board, High Voltage side

Pictures of JSC Failed Keyset after 20 hours of arcing

Background Cont.



Keyset housing power Inverter Board mounting standoff (Low Voltage side)



Keyset housing power Inverter Board mounting standoff (High Voltage side) consumed by arcing

Pictures of JSC Failed Keyset after 20 hours of arcing

Background Cont.

Power Inverter Board mounting screw
Low voltage side

Power Inverter Board mounting hardware
High voltage side

Pictures of JSC Failed Keyset after 20 hours of arcing

Failure Investigation

- **Three independent failure investigations were performed to determine possible causes and solutions.**
  - FUSA
  - Technical University – Vienna
  - GSFC Mishap Investigation Team
    - NASA Engineering and Safety Center (NESC) representatives
    - NASA Safety Center (NSC) representatives
- **Findings**
  - Arcing could be caused by or be aggravated by the following conditions:
    - Speaker wire routed too close to the high voltage side of the power inverter board
    - Metal screw/washer used to secure the high voltage side of the power inverter board
    - Material (dust, dirt, etc.) on the high voltage side of the power inverter board.

Failure Investigation (Cont.)

- **Findings (Cont.)**
  - Recommended solutions
    - Reroute the speaker wire away from the high voltage side of the power inverter board and ensure it has an insulation ≥1,200 v rated dielectric material.
    - Replace the metal screw/washer nearest the inverter output pin with a fire retardant rated plastic screw/washer
    - Coat the entire power Inverter Board High Voltage section with an insulating conformal coating compound. This will prevent material (dust, dirt, etc.) from shorting. The areas to be covered are the transformer high voltage output pins, associated circuit tracks, associated capacitors, and the connector pins for the high voltage cable.
    - Fuse the power Inverter board input. This will ensure that even if the arcing were ever to reoccur, the inverter board will not be allowed to continue to arc because the fuse would blow.

Type D and DL Retrofit

- **The retrofit will be performed on all Type D & DL Keysets.**
- **The retrofit includes the following Keyset modifications:**
  1. Replace the metal screw/washer nearest the power inverter output pin with a fire retardant rated plastic screw/washer.
  2. Enclose the speaker wire with ≥1,200 v rated dielectric material. (Not required on DL Keysets).
  3. Reroute and clamp the speaker wire pair away from the high voltage area of the power inverter board. (Not required on DL Keysets).
  4. Replace the power inverter board with one that has the high voltage section coated.
  5. Fuse the power inverter board input.
- **FUSA will travel to GSFC, JSC, WSC, JPL, WFF, MSFC, KSC, & ARC to perform the retrofit.**

NASA's Part in the Retrofit Effort

- **NASA Centers will be required to support the retrofit effort with personnel and facilities to ensure that all Keysets are upgraded in a quick time thus minimizing NASA's risk of Keyset inverter board arcing.**
- **NASA Facility requirements**
  - Provide an ESD work area where the retrofit and keyset testing can take place.
  - Provide a Keyset interface cable to the MOVE switch for Keyset testing.
  - Provide a staging area where keysets can be temporarily stored prior to and after the retrofit.
- **NASA Personnel requirements**
  - Provide escorts for the FUSA technician (if required by the Center)
  - Provide adequate staff to ensure that operational Keysets are replaced with retrofitted keysets so the FUSA technician is never waiting on NASA to supply them with Keysets to be retrofitted.
  - For centers with VoIP Keysets, NASA personnel will also be required to configure Keyset IP address prior to swapping out the Keysets.
  - FUSA is willing to train NASA technicians to assist with the retrofit if the center is willing to make them available (not required but desirable).

Retrofit Time

- For estimation purposes assume that the Keyset retrofit will take 45 minutes per Keyset.
- 10 keysets will be retrofitted per day per technician.
- FUSA will provide one technician per site.
- Therefore, center personnel must be prepared to swap out 10 operational keysets per day to keep up.
- If NASA provides an additional technician to help with the retrofit, as many as 20 Keysets per day may need to be swapped out.

Retrofit Status

- **FUSA will travel to NASA Centers and perform the retrofit in either one or two phases.**
- **Retrofit schedule is dependent on parts being available.**
- **Parts required for Retrofit Kits (~3,000 Kits):**
  - New Inverter Board with High Voltage side conformal coated - 250 boards are due on Oct 17, 2011. FUSA has requested the remainder of boards to be delivered on Oct 31, 2011. However, the vendor, Power Systems, has not committed to this date.
  - New Speaker wire assembly – FUSA expects to receive a sample of the assembly on 10/21/11. Production of assembly is expected to start on 10/31/11 at a rate of 75 per day.
    - Speaker – 468 speakers have been delivered to the cable manufacture. FUSA is working with the speaker distributer for the remainder of the speakers. FUSA hasn't been able to get a delivery commitment date.
    - Wire – No issues
    - Capacitor – No issues
    - Heat shrink tubing – Tubing is due the week of October 17, 2011.
    - Connector – No issues
  - New inverter board input cable assembly with fuse – Production is expected to start on 10/17/11 at a rate of 75 per day.
    - Wire – No issues
    - Fuse – No issues
    - Connectors – No issues

Retrofit Status Cont.

- **Due to the material ordering lead times for the retrofit kits, the earliest possible retrofit start time is the second week of November and at this time FUSA will only be able to retrofit 250 Keysets.**
- **Once FUSA has a better understanding of when all the parts will be delivered, the MOVE Project and FUSA will coordinate with the NASA centers and finalize the Retrofit schedule.**