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| **CAP** | ***CHANDRA*** |

**Command Action Procedure**

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| **CAP #** | 1541 | **Originator:** | Ken Gage/Dan Patnaude |
| **Date:** | XXX | **Commands Checked By:** | HRC Ops |
| **Participants**  **Required for**  **Execution:** | OC  CC, HRC | **Time of CAP execution:** | (OC to write in) |

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| **Title:**  HRC Side A +/-15V LVPS controlled power on. | | | | | | |
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| **Description/Rationale:**  At the DOY 237 09:45 EDT pass, an anomaly was discovered with the HRC +/- 15V LVPS. The problem was identified as several MSIDs showed to be well outside their nominal operating range, and the +/-15V LVPS was reading ~ +4 and -2 V. As a result, on 2020:237:15:07:26z, we requested that the instrument be safed and that the 5V power be turned off. This CAP is to bring the HRC instrument side A electronics back online in a controlled manner. The CAP commands power on for the +5V LVPS, sets the HRC-I/S, PMT1 and 2 to 0 volts, and disables mechanisms. At this point, the commands to power on the +/-15V LVPS are sent. A decision tree follows - after the HRC team has evaluated telemetry to check the state of the LVPS and CEA-A, the CAP resumes with turning on the +24V HVPS. If telemetry indicates that the anomaly with the +/-15V LVPS persists, then the CAP is halted and SCS41 is called to power the HRC back down. | | |  |  |  | |
| **Restrictions/Warnings/Notes**   * Even after the FIFO reset, some HRC telemetry will be unreliable until the +/-15 V LVPS is powered on. This is due to the CEA not processing the housekeeping data properly. * A definitive criterion for success is the +/- 15V LVPS showing its nominal operating voltages. Some SSC may persist due to the thermal profile. This is normal and expected. * Contingency steps #6 and #7 can be called at anytime after step #5, if the HRC team notes problems appearing after the +/- 15V LVPS is powered on.   **Yes ☐ No x** **CAP requires enabling of a disabled command? If yes, provide a list of**  **Disabled Commands** | | |  |  |  | |
| **CARD Items:** | | |  |  |  | |
| **Schedule Requirements/Load Interaction:**   * The CAP execution window is during the DSS-26 support at 2020:240:00:05:00 UT. * The HRC team estimates that the planned activity will take 1 hour to complete. * The only commands in mission loads during the comm are the transmitter turn-on at the original comm start time of 01:05Z. We will want to avoid any critical activities at this time, due to the expected comm interruption.   **Yes x No** **☐** Daily load commands exist during execution window of CAP  **Yes x No** ☐ CAP requires specific DSN comm. or timing requirements  **Yes ☐ No x** CAP will be run concurrently with another CAP  **Yes ☐ No x** CAP requires commanding in the load to be executed to ensure success  **Yes ☐ No x** Daily load requires the CAP to be completed to ensure success  **Yes x No** ☐ CAP uses SCS slots. If yes, performs SCS cleanup  **Comments:**  The CAP uses SCS 135 | | |  |  |  | |
| **Initial Conditions/Spacecraft Configuration:**  CAP expects that RADMON will be disabled and SCS107 might be disabled. The CAP also expects the SIM to be at the HRC-S position.  **CAP depends upon or changes the state of:** | | |  |  |  | |
| ☐ Telemetry Format  x Safing Monitor En\Dis State (inc. RadMon) ☐ OBSID  ☐ Momentum State  ☐ Attitude  ☐ PCAD Mode  **☐** S/C Unit Configuration (H/W or S/W)  ☐ Ground System Configuration/Settings  ☐ S/C Clock (VCDU) | ☐ SIM Table Position  ☐ Grating Positions  ☐ SI Mode  ☐ ACIS Parameter Blocks  x HRC Configuration  **x** SCS States or Contents  ☐ Dither State  ☐ FSW Element | |  |  |  | |
| **Comments:**   * The CAP sends commands to switch to FMT2. The commands for format change are to ensure a FIFO reset to synchronize HRC telemetry to the S/C. Since we are not acquiring science data, a switch to FMT1 is not required. * The CAP changes the HRC configuration from power OFF to ON. * If successful, the CAP will leave the HRC in a state that is safe for RADZONE entry. * if not successful, the CAP will leave the HRC in a state that is safe for RADZONE entry. * The CAP makes use of SCS 135 and as a contingency, SCS 41 | | |  |  |  | |
| **Risk/Comm. Loss/Worst Case Scenario:**  Worst case scenario is that LVPS does not come up cleanly. In the event of this scenario, we do not expect any damage to single stream components (MCPs, crossed grid, etc.). If this happens, we will follow contingency steps #6 and #7 to power down the instrument.  **What happens if comm. is lost during CAP execution?**  The HRC is left partially activated and we are unable to monitor the health and safety of the side A electronics. When comm is restored we will resume CAP execution. There is no additional risk to the HRC single-strung components if the power up is completed but not in the desired state, and comm is lost before SCS 41 can be run. Power down activities can resume when comm is reestablished.  **What is the worst case scenario for CAP execution? (Assuming the CAP is executed correctly)**  The worst case scenario is that when the commands are issued to turn on the +/-15V LVPS, the electronics return to a similar state that they were in prior to activating SCS 41. In this event, the contingency steps will need to be run. | | |  |  |  | |
| **Required Products (Scripts, Displays, SOPs, etc.):**   |  |  |  | | --- | --- | --- | | **Product Name** | **Version** | **On-Console** | | C\_SET\_FORMAT.ssc | 3.4 | **☐** | | O\_SCSCTRL.ssc | 3.4 | **☐** | | F\_HRC\_ALL.dec | 2.1 | **☐** | | O\_PROT\_SCSCTRL.ssc | 3.2 | **☐** | | T\_3FA6PADS.ssc | 3.1 | **☐** |  |  |  |  | | --- | --- | --- | | **Command Load Name** | **Checksum (if applicable)** | **In ODB** | | 2A\_PWRUP\_SET\_135.CLD | 3E9EB0F | **☐** | |  |  | **☐** | | | |  |  |  | |

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| **Instructions:**   1. Uplink Command Load **2A\_PWRUP\_SET\_135.CLD** Checksum = 3E9EB0F 2. On HRC Go: Uplink command **205VAON**   HRC Verify 2PS5AON=ON  WAIT for HRC to verify stable operation   1. Use script **C\_SET\_FORMAT** to re-command FMT 2 and EPS subformat (**FMT2**, **EPS**)   Format commanding required to recycle HRC FIFO   1. Use script **O\_SCSCTRL** to Enable and Activate **SCS 135**   SCS 135 will command (all commands are doubled):  2SPHVOF  2SPTTHV, 2SPTTHV2=0  2SPTBHV, 2SPTBHV2=0  2SPCLEN  Delay 2 minutes  2S1HVOF  2S1STHV, 2S1STHV2=0  Delay 2 minutes  2IMHVOF  2IMTTHV, 2IMTTHV2=0  2IMTBHV, 2IMTBHV2=0  2IMCLEN  Delay 2 minutes  2S2HVOF  2S2STHV, 2S2STHV2=0  Delay 2 minutes  2MDRVADI  2MCMRASL  2ALMTADS   1. On HRC Go: Uplink command **215PCAON**   HRC Verify 215PCAST=ON  WAIT for HRC to verify stable operation  **CONTINGENCY STEPS**  If the HRC team does not or cannot verify nominal operation of the 15V Power Supply,  the following Optional steps may be requested in order to power the instrument back down.  If 15V operation is nominal, commanding will continue with step 8.   1. **(OPTIONAL)** On HRC Go: Uplink command **215PCAOF**   HRC Verify 215PCAST=OFF   1. **(OPTIONAL)** On HRC Go: Use script **O\_PROT\_SCSCTRL** to Activate **SCS 41**   Skip to Cleanup at step 12  **CONTINUE NOMINAL STEPS**   1. On HRC Go: Uplink command **224PCAON**   HRC Verify 224PCAST=ON  WAIT for HRC to verify stable operation   1. On HRC Go: Uplink command **2PRA2SL**   HRC Verify 2ELEASS=PMT2  Ties PMT2 to Side A pre-amp   1. Uplink command **2PRB1SL**   HRC Verify 2ELEBSS=PMT1  Ties PMT1 to side B pre-amp   1. Use script **T\_3FA6PADS** to disable the Primary FA6 Abort Heater     **CLEANUP**   1. Use script **O\_SCSCTRL** to Clear **SCS 135** | | | |
| **SOT Manager/Lead:** |  | **Mission Planning Manager:** |  |
| **OC or Ops Manager:** |  | **FOM:** |  |
| **Sys. Engineer:** |  | **Flight Director:** |  |