### 4.22_V2.0 Flight Software Event Histogram and CC 3x3 Patch Revision B

*Last Revised: January 3, 2000*
**Filename: sw_evhcc3x3b**

**BRIEF FUNCTIONAL DESCRIPTION:**

This procedure is modified from the procedure 1.12_V2.0 Flight Software Event Histogram and CC 3x3 Patch which loads the standard patches and two optional patches. The text describing the purpose of those patches is included below in italics:

*This patch loads two new science modes to the ACIS Flight Software. The first, the Event Histogram Mode patch, allows the ACIS software to produce histograms of detected X-ray events. The second, the Continuous Clocking 3x3 patch, allows the software to use 3x3 pixel islands for event detection and telemetry while performing Continuous Clocking mode. The ACIS Flight SW team recommends that the optional patches be loaded together with the standard patches; therefore this procedure first removes any patches which may have been installed and then proceeds to load the standard patches followed by the optional patches.*

*NOTE on MIT version identifiers: Numeric revision identifiers are preliminary, and, although logged and controlled, have not been subjected to peer review and sign-off. Letter revision identifiers reflect items which have undergone peer review and sign-off. This procedure loads "standard Rev. A" and optional patches from "optional Rev. A". Refer to the release notes for standard patches, optional patches, and patch combination certification (see references below).*

The patches have been modified to included additional changes to the ACIS Flight Software. The changes to the Standard Patches include the overclock conditioning patch, the FEP bias parity error patch, and the corner mean patch. The change to the CC3x3 patch modifies the default grade selection available in Continuous Clocking 3x3 mode (see http://space.mit.edu/ fkb/acis/grade_table.html). There are no changes to the Event Histogram mode patch. Refer to the release notes for standard patches, optional patches, and patch combination Revision B certification for more detail (see references below).

The FOT should implement the loading of the patches (steps 2.1 and 2.2) as a realtime command load in order to maximize the uplink efficiency. The command system should be configured with a blocking factor of 90 and a minimum time delay of 3 s.

The following procedure loads the Standard and Event Histogram/CC3x3 option set of patches into the ACIS instrument, and dumps the load to the ground for verification.

This procedure implements the following basic operations:

1. Reset the contents of the patch list to remove any existing patches, dump the contents of the patch list to verify that the list is empty
2. Load the "standard Rev. B" patch load
3. Load the Event Histogram patch (part of "optional Rev. B")
4. Load the CC3x3 patch (part of "optional Rev. B")
5. Load the patch load version number

6. Dump the contents of the patch list to verify the load
7. Warm boot the DPA to activate the new load and verify proper BEP boot

Refer to the Option Patch Release Notes, for MIT 36-58020 Rev. B for a detailed description of the effects of this patch load.

The verifiers for the procedure will be:

1. A command echo for the reset patch list command
2. A command echo for the 1st dumpPatchlist command
3. A single bepReadReply packet for the 1st empty dump
4. A series of command echoes for the addPatch commands
5. A command echo for the dumpPatchlist command
6. A series of bepReadReply packets for the dump command
7. A bepStartupMessage packet with a modified "version == 30" field

ACIS flight software personnel will review the contents of the various dumps after the procedure has been run.

**ASSUMED INSTRUMENT STATE:**
This assumes that at least one side of the DPA is on and the flight SW is running on one BEP.

**SPECIAL INITIAL CONDITIONS:**
The OCC command system must be configured with "Minimum Time Delay of 3 s" and a "Blocking Factor" of 90.
Spacecraft telemetry should be in Format 2 when the patches are loaded in order to ensure that all command verifiers can be included in the telemetry stream.

**OPERATIONAL CONSTRAINTS/CAUTIONS:**
In order to avoid truncating a dump, each dumpPatchlist command must be followed by at least a 10 second delay.

**REFERENCES:**

1. MIT 36-58010, Standard Patch Release, Rev. A
2. MIT 36-58010, Optional Patch Release, Rev. A
3. MIT 36-58021.01, certification of patch combination cc3x3+eventhist, Rev. A
4. MIT 36-58020, Standard Patch Release, Rev. B
5. MIT 36-58020, Optional Patch Release, Rev. B
6. MIT 36-58021.01, certification of patch combination cc3x3+eventhist, Rev. B

**CHANGE HISTORY:**

**V1.0**

- Initial version, copied from 1.12_V2.0 Flight Software Event Histogram and CC 3x3 Patch

**V1.1**

- Inserted correct version number of 1.1 into Table and LaTeX files (thanks Peter).
- Updated the expected Flight SW version number in steps 5.1, 7.4, and 7.5 to be 30.

**V2.0**

- ACIS Team signed-off version
- modified steps 2.1, 3.1, and 4.1 to include the sizes of the loads in the "Description" column
- modified step 6.1 to contain the reference file in the description column

Table 1: **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B**

| Step # | Title (Revision 4.22_V2.0) | Time Req | Command Description | Command Mnemonic | Telemetry Description | Telemetry Mnemonic | Expected Value | Units |
|---|---|---|---|---|---|---|---|---|
| 1 | Reset the Patchlist | | | | | | | |
| 1.1 | Empty the Patchlist | 1 | removePatches | AUALLPATCH | | | | |
| 1.2 | Read the empty Patchlist | 1 | dumpPatchlist | RU_0000001 | | | | |
| 2 | Load Standard Patches | | | | | | | |
| 2.1 | Load "standard Rev. B" patches | 1 | addPatch | WUSTANDB01<br>WUSTANDB02<br>WUSTANDB03<br>WUSTANDB04<br>WUSTANDB05<br>WUSTANDB06<br>WUSTANDB07<br>WUSTANDB08<br>WUSTANDB09<br>WUSTANDB10<br>WUSTANDB11<br>WUSTANDB12<br>WUSTANDB13<br>WUSTANDB14<br>WUSTANDB15<br>WUSTANDB16<br>WUSTANDB17<br>WUSTANDB18<br>WUSTANDB19<br>WUSTANDB20<br>WUSTANDB21<br>WUSTANDB22<br>WUSTANDB23<br>WUSTANDB24 | | | | |
| 3 | Load the Event Histogram Patch | | | | | | | |
| 3.1 | Load opt_eventhist patches | 5 | addPatch | WUEVHSTB01 | | | | |

Table 2: (CONT) **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B**

| Step # | Telemetry EGSE | Other Verifier | Crit | Description | Notes | RT Con | Tlm Fmt | Min Alt | SIM Pos |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 1.1 | Check cmdResult == 1 | | A | | | Y | 1or2 | | |
| | commandEcho 326 | | | | | | | | |
| 1.2 | Check cmdResult == 1 | | B | bepReadReply, ACIS EGSE verifies | | Y | 1or2 | | |
| | commandEcho 65 | | | single packet reply | | | | | |
| 2 | | | | | | | | | |
| 2.1 | commandEcho 2375 | | A | Expect to send 24 packets. Total load size 1596 bytes. | | Y | 1or2 | | |
| | commandEcho 2376 | | A | | | | | | |
| | commandEcho 2379 | | A | | | | | | |
| | commandEcho 2381 | | A | | | | | | |
| | commandEcho 2382 | | A | | | | | | |
| | commandEcho 2384 | | A | | | | | | |
| | commandEcho 2387 | | A | | | | | | |
| | commandEcho 2389 | | A | | | | | | |
| | commandEcho 2390 | | A | | | | | | |
| | commandEcho 2393 | | A | | | | | | |
| | commandEcho 2394 | | A | | | | | | |
| | commandEcho 2396 | | A | | | | | | |
| | commandEcho 2399 | | A | | | | | | |
| | commandEcho 2400 | | A | | | | | | |
| | commandEcho 2403 | | A | | | | | | |
| | commandEcho 2405 | | A | | | | | | |
| | commandEcho 2406 | | A | | | | | | |
| | commandEcho 2409 | | A | | | | | | |
| | commandEcho 2410 | | A | | | | | | |
| | commandEcho 2412 | | A | | | | | | |
| | commandEcho 2415 | | A | | | | | | |
| | commandEcho 2417 | | A | | | | | | |
| | commandEcho 2418 | | A | | | | | | |
| | commandEcho 2420 | | A | | | | | | |
| 3 | | | | | | | | | |
| 3.1 | commandEcho 2424 | | A | Expect to send 15 packets. | | Y | 1or2 | | |

Table 1: **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B(Page 2)**

| Step<br>\# | Title<br>(Revision 4.22_V2.0) | Time<br>Req | Command<br>Description | Command<br>Mnemonic | Telemetry<br>Description | Telemetry<br>Mnemonic | Expected<br>Value | Units |
|---|---|---|---|---|---|---|---|---|
| | part of “optional Rev. B” | | | WUEVHSTB02<br>WUEVHSTB03<br>WUEVHSTB04<br>WUEVHSTB05<br>WUEVHSTB06<br>WUEVHSTB07<br>WUEVHSTB08<br>WUEVHSTB09<br>WUEVHSTB10<br>WUEVHSTB11<br>WUEVHSTB12<br>WUEVHSTB13<br>WUEVHSTB14<br>WUEVHSTB15 | | | | |
| 4 | Load CC3x3 Mode Patch | | | | | | | |
| 4.1 | Load opt_cc3x3 patches<br>part of “optional Rev. B” | 5 | addPatch | WUCC3X3B01<br>WUCC3X3B02<br>WUCC3X3B03<br>WUCC3X3B04<br>WUCC3X3B05<br>WUCC3X3B06<br>WUCC3X3B07<br>WUCC3X3B08<br>WUCC3X3B09<br>WUCC3X3B10<br>WUCC3X3B11<br>WUCC3X3B12<br>WUCC3X3B13 | | | | |
| 5 | Patch the version number | | | | | | | |
| 5.1 | Load the version number patch | 1 | addPatch | WUFSV0001E | | | | |
| 6 | Dump Installed Patches | | | | | | | |

Table 2: (CONT) **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B(Page 2)**

| Step # | Telemetry EGSE | Other Verifier | Crit | Description | Notes | RT Con | Tlm Fmt | Min Alt | SIM Pos |
|---|---|---|---|---|---|---|---|---|---|
| | commandEcho 2427 | | A | Total load size 6340 bytes. | | | | | |
| | commandEcho 2429 | | A | | | | | | |
| | commandEcho 2430 | | A | | | | | | |
| | commandEcho 2433 | | A | | | | | | |
| | commandEcho 2434 | | A | | | | | | |
| | commandEcho 2436 | | A | | | | | | |
| | commandEcho 2439 | | A | | | | | | |
| | commandEcho 2440 | | A | | | | | | |
| | commandEcho 2443 | | A | | | | | | |
| | commandEcho 2445 | | A | | | | | | |
| | commandEcho 2446 | | A | | | | | | |
| | commandEcho 2448 | | A | | | | | | |
| | commandEcho 2451 | | A | | | | | | |
| | commandEcho 2453 | | A | | | | | | |
| 4 | | | | | | | | | |
| 4.1 | commandEcho 2454 | | A | Expect to send 13 packets. | | Y | 1or2 | | |
| | commandEcho 2457 | | A | Total load size 4620 bytes. | | | | | |
| | commandEcho 2458 | | A | | | | | | |
| | commandEcho 2460 | | A | | | | | | |
| | commandEcho 2463 | | A | | | | | | |
| | commandEcho 2464 | | A | | | | | | |
| | commandEcho 2467 | | A | | | | | | |
| | commandEcho 2469 | | A | | | | | | |
| | commandEcho 2470 | | A | | | | | | |
| | commandEcho 2473 | | A | | | | | | |
| | commandEcho 2474 | | A | | | | | | |
| | commandEcho 2476 | | A | | | | | | |
| | commandEcho 2479 | | A | | | | | | |
| 5 | | | | | | | | | |
| 5.1 | commandEcho 2481 | | | Expect to send 1 packet. Total load size 16 bytes. Sets the version number to 30. | | Y | 1or2 | | |
| 6 | | | | | | | | | |

Table 1: **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B(Page 3)**

| Step # | Title (Revision 4.22_V2.0) | Time Req | Command Description | Command Mnemonic | Telemetry Description | Telemetry Mnemonic | Expected Value | Units |
|---|---|---|---|---|---|---|---|---|
| 6.1 | Dump Patchlist | 1 | dumpPatchlist | RU_0000001 | | | | |
| 7 | Activate Patches | | | | | | | |
| 7.1 | Set Boot Modifier off | 0.1 | DPA FS Boot Modifier | 1BMODIBM(0) | | | | |
| 7.2 | Set Warm Boot Flag on | 0.1 | DPA Warm Boot | 1WRMBTSB(1) | | | | |
| 7.3 | Halt BEP | 0.1 | Halt BEP | 1RSETIRT(1) | | | | |
| 7.4 | Restart BEP | 1 | Restart BEP | 1RSETIRT(0) | | | | |
| 7.5 | Check BEP Boot | 2.0 | | | | | | |
| 7.6 | Check HW LEDs | 2.0 | | | BEP Select | 1STAT4ST | 0or1 | |
| | | | | | BEP FIFO Not Full | 1STAT6ST | 1 | |
| | | | | | BEP FIFO Not Empty | 1STAT7ST | 0 | |
| 7.7 | Check SW LEDs | 2.0 | | | BEP initialization | 1STAT3ST | 0 | |
| | | | | | Watchdog boot | 1STAT2ST | 1 | |
| | | | | | Science run status | 1STAT1ST | 1 | |
| | | | | | | 1STAT0ST | 0or1 | |
| | Total Time | 22.3 | | | | | | |

Table 2: (CONT) **ACIS Event Histogram and CC 3x3 Flight Software Patch Revision B(Page 3)**

| Step # | Telemetry EGSE | Other Verifier | Crit | Description | Notes | RT Con | Tlm Fmt | Min Alt | SIM Pos |
|---|---|---|---|---|---|---|---|---|---|
| 6.1 | check cmdResult = 1 | | | bepReadReply, ACIS EGSE verifies reply | | Y | 2 | | |
| | commandEcho 65 | | | against file wujehc3b.dumpedPatches.txt. | | | | | |
| 7 | | | | | | | | | |
| 7.1 | | | | disables uplink boot | | Y | 1or2 | | |
| 7.2 | | | | | | Y | 1or2 | | |
| 7.3 | | | | | | Y | 1or2 | | |
| 7.4 | bepStartupMessage | | | ACIS EGSE verifies “version” field == 30 decimal | | Y | 1or2 | | |
| 7.5 | Check bepStartupMessage: | | A | | | Y | 1or2 | | |
| | bepTickCounter < 10; version =30; | | A | | | | | | |
| | watchdogFlag = 0, patchValidFlag =1 | | A | | | | | | |
| | warmbootFlag = 1 | | A | | | | | | |
| | Check swHousekeeping messages: | | | | | | | | |
| | startingBepTickCounter < 10; | | B | | | | | | |
| | endingBepTickCounter= | | B | | | | | | |
| | =startingBepTickCounter+640 | | | | | | | | |
| | version =30 | | A | | | | | | |
| 7.6 | | | 2 | 0/1 indicates BEP A/B is selected | | Y | 1or2 | | |
| | | | 2 | 1 means FIFO not full | | | | | |
| | | | 2 | 1 means not FIFO empty | | | | | |
| 7.7 | | | 1 | 0 means BEP SW is running | | Y | 1or2 | | |
| | | | 2 | 1 means no watchdog boot | | | | | |
| | | | 2 | 1 means science idle | | | | | |
| | | | 2 | this bit toggles to indicate BEP is running | | | | | |
| | | | | | | | | | |