4.23_V2.3 Flight Software Event Histogram, CC 3x3, Compress All, and Timed Lookup Patch Revision C

Last Revised: May 26, 2004
Filename: sw_evhcc3x3_catl

BRIEF FUNCTIONAL DESCRIPTION:

This procedure loads the standard patches and four optional patches. This procedure is modified from 4.22_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 the four optional patches in this procedure is included below in italics:

This patch loads the standard flight patches and adds two new optional patches in addition to the current optional patches. The first new patch (known as the smTimedLookup patch) allows the submode of Timed Exposure Mode to be read from dynamic tables. In addition, a Compress All patch is added to allow all rows of compressed raw mode data to be transmitted, even when compression fails for some rows. The current optional patches, Event Histogram Mode and Continuous Clocking 3X3 Mode, had to be modified in order to be consistent with the new smTimedLookup patch. The functionality of the Event Histogram Mode and Continuous Clocking 3X3 Mode is identical to that contained in the Revision B patch, but the patches in Revision C are distinct from those in Revision B. Under no circumstances should optional patches from different Revisions be used together as this will certainly lead to a hardware reset of the BEP. 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. B" and optional patches from "optional Rev. C". Refer to the release notes for standard patches, optional patches, and patch combination certification (see references below).

The patches have been modified to include additional changes to the ACIS Flight Software. The CC3x3 patch uses new memory addresses and must be reloaded. In addition, the Event Histogram patch has been altered to use a lookup table. The CompressAll patch contains changes to allow for a more complete transmission of compressed raw data. The smTimedLookup patch is used in conjunction with the Event Histogram Mode patch and allows for a dynamic timed exposure mode selection via a lookup table. Refer to the release notes for standard patches, optional patches, and patch combination Revision C certification for more detail (see references below).

This procedure will change the flight software version from 30 to version 31. Ground software should be changed to reflect the version change once this procedure is executed.

The FOT should implement the loading of the patches (steps 3.1 through step 7.1) as four realtime command loads 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/SmTimedLookup/CompressAll optional set of patches into the ACIS instrument, and dumps the load to the ground for verification.

This procedure implements the following basic operations:

1. Confirm the current state of ACIS by verifying BEP HW and SW LEDs
2. 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
3. Load the "standard Rev. B" patch load
4. Load the smTimedLookup patch (part of "optional Rev. C")
5. Load the Event Histogram patch (part of "optional Rev. C")
6. Load the CC3x3 patch (part of "optional Rev. C")
7. Load the compressAll patch (part of the "optional Rev. C")
8. Load the patch load version number
9. Dump the contents of the patch list to verify the load
10. 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. C for a detailed description of the effects of this patch load.

The verifiers for the procedure will be:

1. ACIS Ops will confirm the current status on the BEP
2. A command echo for the reset patch list command
3. A command echo for the 1st dumpPatchlist command
4. A single bepReadReply packet for the 1st empty dump
5. A series of command echoes for the addPatch commands. The SOT will verify that each Result field of each commandEcho packet has a value of 1.
6. A command echo for the dumpPatchlist command
7. A series of bepReadReply packets for the dump command
8. A bepStartupMessage packet with a modified "version == 31" 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 DPA-A and/or DPA-B is on and the flight SW is running either BEP-A or BEP-B.

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 30 second delay.

CONTINGENCY PLANS:
In case of a problem that may arise during the procedure, the following contingencies may be followed:

1. If there is a failure to confirm a telemetry verifier, there are two courses of action. If we have not yet loaded the event histogram patch, we will restart from step 2.1 and reload the patches. If we have already loaded the event histogram patch, we will proceed to step 9 and dump the patch list. If the dump of the patches verifies against the reference file, we will proceed with the warm boot in step 10. If the patch list does not verify, we will dump the patches one more time. If the same discrepancy exists, we will return to step 2.1 and load the patches again. If the patch list verifies, we will proceed with the warm boot in step 10.

2. If there is a failure to confirm the patch list dump(step 9), first repeat step 9, dumping the patch list, to confirm that there wasn't a downlink corruption. If the list is confirmed, continue to the next step(10), otherwise, restart from step 2.1 and reload the patches.

3. If the warm boot of the BEP fails(step 10), retry the reboot (step 10). If this continues to fail, dump additional information for diagnostic purposes (SOT Procedure 1.10, v 2.1 sw_dump, FOT SOP_61055) and load version 30 patches (SOT Procedure 4.22, v. 2.0, sw_evhcc3x3b, FOT SOP_61083).

4. If there is a comm loss during the procedure, request a new comm. The time at which the new comm is needed depends on the point of loss of signal. The only vulnerability would occur if comm was dropped before the complete patch set was loaded (completion of step 7). If the BEP then rebooted spontaneously, it would return to version 11 flight software.

REFERENCES:

1. MIT 36-58020, Standard Patch Release, Rev. B

2. MIT 36-58020, Optional Patch Release, Rev. C

3. MIT 36-58021.02, certification of patch combination cc3x3+eventhist+smtimedlookup+compressall, Rev. C

CHANGE HISTORY:

V1.0

- Initial version, copied from 4.22_V2.0 Flight Software Event Histogram and CC 3x3 Patch

V1.1

- Edited to reflect changes per Peter Ford's suggestions.

- Both the tex file and the tables were updated to move the location of the smTimedLookup patch.

V1.2

- Edited to reflect changes per Peter Ford's suggestions.

- Updated tables to add command verifiers and change telemetry format.

V2.0

- ACIS team signed-off version

V2.1

- Added more specific BEP/DPA initial states in the "Assumed Instrument State" section.
- Modified HW LED states to be verified in step 9.6 . Added 1STAT5ST to the list to be verified. Changed expected state of 1STAT4ST to be "0", indicating BEP A is active.

V2.2

- Allowed for BEP A or BEP B to be active for the initial state in the "Assumed Instrument State" section.
- Added a new step to verify the status of ACIS before starting the uplink of patches.
- Changed expected state of 1STAT4ST to be "0 or 1", indicating BEP A or BEP B is active.
- Added Contingency Plans section.

V2.3

- Changed TLM verifier in step 9.1 from "wubcc_bcom.dumpedPatches.1.dat" to "/nfs/benz/h1/beavis/wubcc_bcom.dumpedPatches.1.dat"

Table 1: **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C**

Step #	Title (Revision 4.23_V2.3)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
1	Verify current ACIS status							
1.1	Verify HW LEDs	2.0			BEP Select	1STAT4ST	0 or 1	
					BEP Not in Reset	1STAT5ST	1	
					BEP FIFO Not Full	1STAT6ST	1	
					BEP FIFO Not Empty	1STAT7ST	0	
1.2	Verify SW LEDs	2.0			BEP is running	1STAT0ST	0 or 1	
					Science run status	1STAT1ST	1	
					Watchdog boot	1STAT2ST	1	
					BEP initialization	1STAT3ST	0	
2	Reset the Patchlist							
2.1	Empty the Patchlist	1	removePatches	AUALLPATCH				
2.2	Read the empty Patchlist	1	dumpPatchlist	RU_0000001				
3	Load Standard Patches							
3.1	Load "standard Rev. B" patches	1	addPatch	WUSTANDB01 WUSTANDB02 WUSTANDB03 WUSTANDB04 WUSTANDB05 WUSTANDB06 WUSTANDB07 WUSTANDB08 WUSTANDB09 WUSTANDB10 WUSTANDB11 WUSTANDB12 WUSTANDB13 WUSTANDB14 WUSTANDB15 WUSTANDB16 WUSTANDB17				

Table 2: (CONT) **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
1									
1.1			2	0/1 indicates BEP A/B is selected		Y	2		
			2	1 means BEP not in reset					
			2	1 means FIFO not full					
			2	1 means not FIFO empty					
1.2			2	this bit toggles to indicate BEP is running					
			2	1 means science idle					
			2	1 means no watchdog boot					
			1	0 means BEP SW is running		Y	2		
2									
2.1	Verify cmdResult == 1		A			Y	2		
	commandEcho 326								
2.2	Verify cmdResult == 1		B	bepReadReply, ACIS EGSE verifies		Y	2		
	commandEcho 65			single packet reply					
3									
3.1	commandEcho 2375		A	Expect to send 24 packets.		Y	2		
	commandEcho 2376		A	Total load size: 1596 bytes.					
	commandEcho 2379		A	Verify cmdResult == 1 for each packet					
	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						

Table 1: **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 2)**

Step #	Title (Revision 4.23_V2.3)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
				WUSTANDB18 WUSTANDB19 WUSTANDB20 WUSTANDB21 WUSTANDB22 WUSTANDB23 WUSTANDB24				
4 4.1	Load SM Timed Lookup Patch Load opt_smtl patches part of "optional Rev. C"	 5	 addPatch	 WUSMTMLU01 WUSMTMLU02 WUSMTMLU03 WUSMTMLU04 WUSMTMLU05 WUSMTMLU06 WUSMTMLU07 WUSMTMLU08 WUSMTMLU09 WUSMTMLU10 WUSMTMLU12 WUSMTMLU13				
5 5.1	Load the Event Histogram Patch Load opt_eventhist patches part of "optional Rev. C"	 5	 addPatch	 WUEVHSTC01 WUEVHSTC02 WUEVHSTC03 WUEVHSTC04 WUEVHSTC05 WUEVHSTC06 WUEVHSTC07 WUEVHSTC08 WUEVHSTC09 WUEVHSTC10 WUEVHSTC11				

Table 2: (CONT) **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 2)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
	commandEcho 2409		A						
	commandEcho 2410		A						
	commandEcho 2412		A						
	commandEcho 2415		A						
	commandEcho 2417		A						
	commandEcho 2418		A						
	commandEcho 2420		A						
4									
4.1	commandEcho 5117		A	Expect to send 12 packets.		Y	2		
	commandEcho 5118		A	Total load size 3696 bytes.					
	commandEcho 5120		A	Verify cmdResult == 1 for each packet					
	commandEcho 5123		A	NOTE WUSMTMLU11 was intentionally omitted					
	commandEcho 5125		A						
	commandEcho 5126		A						
	commandEcho 5129		A						
	commandEcho 5130		A						
	commandEcho 5132		A						
	commandEcho 5135		A						
	commandEcho 5137		A						
	commandEcho 5138		A						
5									
5.1	commandEcho 5140		A	Expect to send 15 packets.		Y	2		
	commandEcho 5143		A	Total load size 5892 bytes.					
	commandEcho 5144		A	Verify cmdResult == 1 for each packet					
	commandEcho 5147		A						
	commandEcho 5149		A						
	commandEcho 5150		A						
	commandEcho 5153		A						
	commandEcho 5154		A						
	commandEcho 5156		A						
	commandEcho 5159		A						
	commandEcho 5160		A						

Table 1: **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 3)**

Step #	Title (Revision 4.23_V2.3)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
				WUEVHSTC12 WUEVHSTC13 WUEVHSTC14 WUEVHSTC15				
6	Load CC3x3 Mode Patch							
6.1	Load opt_cc3x3 patches part of “optional Rev. C”	5	addPatch	WUCC3X3C01 WUCC3X3C02 WUCC3X3C03 WUCC3X3C04 WUCC3X3C05 WUCC3X3C06 WUCC3X3C07 WUCC3X3C08 WUCC3X3C09 WUCC3X3C10 WUCC3X3C11 WUCC3X3C12 WUCC3X3C13				
7	Load Compress All Patch							
7.1	Load opt_compressall patches	5	addPatch	WUCOMPRS01 WUCOMPRS02 WUCOMPRS03 WUCOMPRS04 WUCOMPRS05 WUCOMPRS06 WUCOMPRS07 WUCOMPRS08				
8	Patch the version number							
8.1	Load the version number patch	1	addPatch	WUFSV0001F				
9	Dump Installed Patches							

Table 2: (CONT) **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 3)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
	commandEcho 5163		A						
	commandEcho 5165		A						
	commandEcho 5166		A						
	commandEcho 5168		A						
6									
6.1	commandEcho 5171		A	Expect to send 13 packets.		Y	2		
	commandEcho 5173		A	Total load size 4620 bytes.					
	commandEcho 5174		A	Verify cmdResult == 1 for each packet					
	commandEcho 5177		A						
	commandEcho 5178		A						
	commandEcho 5180		A						
	commandEcho 5183		A						
	commandEcho 5185		A						
	commandEcho 5186		A						
	commandEcho 5188		A						
	commandEcho 5191		A						
	commandEcho 5192		A						
	commandEcho 5195		A						
7									
7.1	commandEcho 5197		A	Expect to send 8 packets.		Y	2		
	commandEcho 5198		A	Total load size 2352 bytes.					
	commandEcho 5200		A	Verify cmdResult == 1 for each packet					
	commandEcho 5203		A						
	commandEcho 5205		A						
	commandEcho 5206		A						
	commandEcho 5209		A						
	commandEcho 5210		A						
8									
8.1	Verify cmdResult == 1			Expect to send 1 packet.		Y	2		
	commandEcho 5212			Total load size 16 bytes.					
				Sets the version number to 31.					
9									

Table 1: **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 4)**

Step #	Title (Revision 4.23_V2.3)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
9.1	Dump Patchlist	1	dumpPatchlist	RU_0000001				
10	Activate Patches							
10.1	Set Boot Modifier off	0.1	DPA FS Boot Modifier	1BMODIBM(0)				
10.2	Set Warm Boot Flag on	0.1	DPA Warm Boot	1WRMBTSB(1)				
10.3	Halt BEP	0.1	Halt BEP	1RSETIRT(1)				
10.4	Restart BEP	1	Restart BEP	1RSETIRT(0)				
10.5	Verify BEP Boot	2.0						
10.6	Verify HW LEDs	2.0			BEP Select	1STAT4ST	0 or 1	
					BEP Not in Reset	1STAT5ST	1	
					BEP FIFO Not Full	1STAT6ST	1	
					BEP FIFO Not Empty	1STAT7ST	0	
10.7	Verify SW LEDs	2.0			BEP is running	1STAT0ST	0 or 1	
					Science run status	1STAT1ST	1	
					Watchdog boot	1STAT2ST	1	
					BEP initialization	1STAT3ST	0	
	Total Time	36.3						

Table 2: (CONT) **ACIS Event Histogram, CC 3x3, smTimedLookup and CompressAll Flight Software Patch Revision C(Page 4)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
9.1	Verify cmdResult == 1 commandEcho 65			bepReadReply, ACIS EGSE verifies reply against file /nfs/benz/h1/beavis/ wubcc_bcom.dumpedPatches.1.dat		Y	2		
10									
10.1				disables uplink boot		Y	2		
10.2						Y	2		
10.3						Y	2		
10.4	bepStartupMessage			ACIS EGSE verifies “version” field == 31 decimal		Y	2		
10.5	Verify bepStartupMessage:		A			Y	2		
	bepTickCounter $<$ 10; version =31;		A						
	watchdogFlag = 0, patchValidFlag =1		A						
	warmbootFlag = 1		A						
	Verify swHousekeeping messages:								
	startingBepTickCounter $<$ 10;		B						
	endingBepTickCounter=		B						
	=startingBepTickCounter+ $\sim$645								
	version =31		A						
10.6			2	0/1 indicates BEP A/B is selected		Y	2		
			2	1 means BEP not in reset					
			2	1 means FIFO not full					
			2	1 means not FIFO empty					
10.7			2	this bit toggles to indicate BEP is running					
			2	1 means science idle					
			2	1 means no watchdog boot					
			1	0 means BEP SW is running		Y	2		