4.33_V2.0 Flight Software Standard Patch G Optional Patch I

Last Revised: May 17, 2022
Filename: sw_stdgopti

BRIEF FUNCTIONAL DESCRIPTION:

This procedure loads the standard G patches and six optional I patches. The changes from sw_stdgopth consist of one updated optional patch. The text that describes the changes in the patches in this procedure follows below the italic note:

The set of standard release G patches is loaded into a common address space so that each optional patch can be loaded independently of the others, provided the load order defined in the patch combination certification is maintained.

The eventhist patch requires that smtimedlookup is also loaded.

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.

This procedure loads "standard Rev. G" and "optional Rev. I". Refer to the release notes for standard patches, optional patches, and patch combination certification (see references below).

The optional patch load now includes *txings* Revision B, which contains improvements to the radiation monitoring algorithm.

This procedure will change the flight software version from 56 to version 58. 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 9.1) as seven 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 G and smtimedlookup / cc3x3 / eventhist / compressall / txings / deahktrip optional set of patches into the ACIS instrument, and dumps the load to the ground for verification. It then executes a warm boot and loads and starts DEA housekeeping.

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. G" patch load

4. Load the smtimedlookup patch (part of "optional Rev. I")

5. Load the cc3x3 patch (part of "optional Rev. I")

6. Load the eventhist patch (part of "optional Rev. I")

7. Load the compressall patch (part of the "optional Rev. I")

8. Load the txings patch (part of the "optional Rev. I")

9. Load the deahktrip patch (part of the "optional Rev. I")

10. Load the patch load version number (58)

11. Dump the contents of the patch list to verify the load

12. Warm boot the BEP to activate the new load and verify proper BEP boot

13. Start the DEA housekeeping and verify proper reporting

Refer to ECO-1059 for the contents and review status of the patch load, and to ECO-1060 for the certified combinations of optional patches. Refer to ECO-1058 for a detailed description of the new release of the optional *txings* patch

The telemetry verifiers for the procedure will be:

1. ACIS Ops will confirm the current status of 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 comparison of the dumped patchlist to expected values.

9. A bepStartupMessage packet with a modified "version = 58" field.

10. A verification that DEA housekeeping is being reported.

11. ACIS flight software personnel will review the contents of the patchlist dump while the procedure is running.

ASSUMED INSTRUMENT STATE:
This assumes that DPA-A and/or DPA-B is on and the flight SW is running on 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.

The warmboot will set the parameters of the *txings* patch to their defaults. Immediately upon completion of this SOP, the optimal parameters should be uploaded via a CAP.

As each patch is uploaded, 1STAT7ST will switch from 0 to 1 and then back to 0 as the BEP input FIFO is filled and then cleared. Some versions of PMON will show 1STAT7ST=1 in red, and some software may send alerts. It is best to wait for 1STAT7ST to go back to zero between steps. If it does not clear after a reasonable period, see the contingency plans for how to clear a stuck FIFO.

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, ACIS flight software personnel will visually determine, via bi-levels, if the ACIS FIFO needs to be cleared (1STAT7ST = 1, FIFO Not Empty). If it does, the FIFO will be cleared via step 14. If the FIFO does not need to be cleared, ACIS Ops has the discretion to restart the procedure at step 2, or to continue on from this point.

   Should the FIFO clear procedure be executed and is successful, the ACIS operator will observe the following responses. First, in PMON, the operator will see the correct command echo from the stuck command. Next, also in PMON, the "Serial Command" column will show "UNUSED", and the "Result Code" column will show "NO_HANDLER". Lastly, the bilevels will return to their nominal values. 1STAT7ST will read 0 indicating FIFO Empty, and 1STAT6ST will read 1, indicating FIFO Not Full.

   If the FIFO does not need to be cleared and the problem cannot be determined, a full ACIS system dump will be executed, using SOP_ACIS_FSW_DUMP to obtain the ACIS diagnostic information. The patchlist will be cleared, if necessary, and the present version of software will continue to run. Should ACIS reboot, however, it will revert to Version 11 of the ACIS software.

2. If there is a failure to confirm the patch list dump (step 11), first repeat step 11, dumping the patch list, to confirm that there wasn't a downlink corruption. If the list is confirmed, continue to step 12, otherwise, restart from step 2 and reload the patches. If SOT cannot confirm telemetry verifiers for reasons other than telemetry corruption, run SOP_ACIS_FSW_DUMP (SOT Procedure 1.10_V2.2, sw_dump) to obtain ACIS diagnostic information and then run SOP_ACIS_SW_STDGOPTH to reload version 56 patches (SOT Procedure 4.32_V2.1, sw_stdgopth).

3. If the warm boot of the BEP fails (step 12), retry the reboot (step 12). If this continues to fail, run SOP_ACIS_FSW_DUMP to dump additional information for diagnostic purposes (SOT Procedure 1.10_V2.2, sw_dump) and SOP_ACIS_SW_STDGOPTH to reload version 56 patches (SOT Procedure 4.32_V2.1, sw_stdgopth).

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 10). If the BEP then rebooted spontaneously, it would return to version 11 flight software.

REFERENCES:

1. MIT 36-58020 Rev I (ECO 36-1059) Flight Software Patch Release G, Optional Release I.

2. MIT 36-58021.04 Rev J (ECO 36-1060) Flight Software Patch Release G-I-J Certification.

3. MIT 36-58030.33 Rev B (ECO 36-1058) *txings* patch to report high background radiation levels.

CHANGE HISTORY:

V0.1

- Initial version, revised from 4.32_V2.1 Flight Software Standard Patch G Optional Patch H.

V1.0

- First pass-through of reviews complete; ready to send to full ACIS team.

V2.0

- Text edits after team review.

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Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 1)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
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. G patches	5	addPatch	WUSTANDG01			
				WUSTANDG02			
				WUSTANDG03			
				WUSTANDG04			
				WUSTANDG05			
				WUSTANDG06			
				WUSTANDG07			
				WUSTANDG08			
				WUSTANDG09			
				WUSTANDG10			

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 1)

Step #	Units	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	0 means 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 commandEcho 326		A			Y	2		
2.2		Verify cmdResult == 1 commandEcho 65		B	bepReadReply, ACIS EGSE verifies single packet reply		Y	2		
3										
3.1		commandEcho 16923		A	Expect to send 35 packets.		Y	2		
		commandEcho 16925		A	Total load size: 3812 bytes.					
		commandEcho 16926		A	Verify cmdResult == 1 for each packet					
		commandEcho 16929		A						
		commandEcho 16930		A						
		commandEcho 16932		A						
		commandEcho 16935		A						
		commandEcho 16936		A						
		commandEcho 16939		A						
		commandEcho 16941		A						

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 2)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
				WUSTANDG11			
				WUSTANDG12			
				WUSTANDG13			
				WUSTANDG14			
				WUSTANDG15			
				WUSTANDG16			
				WUSTANDG17			
				WUSTANDG18			
				WUSTANDG19			
				WUSTANDG20			
				WUSTANDG21			
				WUSTANDG22			
				WUSTANDG23			
				WUSTANDG24			
				WUSTANDG25			
				WUSTANDG26			
				WUSTANDG27			
				WUSTANDG28			
				WUSTANDG29			
				WUSTANDG30			
				WUSTANDG31			
				WUSTANDG32			
				WUSTANDG33			
				WUSTANDG34			
				WUSTANDG35			
4	Load smtimedlookup patch						

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 2)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
		commandEcho 16942		A						
		commandEcho 16944		A						
		commandEcho 16947		A						
		commandEcho 16949		A						
		commandEcho 16950		A						
		commandEcho 16953		A						
		commandEcho 16954		A						
		commandEcho 16956		A						
		commandEcho 16959		A						
		commandEcho 16961		A						
		commandEcho 16962		A						
		commandEcho 16964		A						
		commandEcho 16967		A						
		commandEcho 16968		A						
		commandEcho 16971		A						
		commandEcho 16973		A						
		commandEcho 16974		A						
		commandEcho 16976		A						
		commandEcho 16979		A						
		commandEcho 16981		A						
		commandEcho 16982		A						
		commandEcho 16985		A						
		commandEcho 16986		A						
		commandEcho 16988		A						
		commandEcho 16991		A						
4										

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 3)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
4.1	Load opt_smtl patches part of optional Rev. I	5	addPatch	WUSTMLUI01 WUSTMLUI02 WUSTMLUI03 WUSTMLUI04 WUSTMLUI05 WUSTMLUI06 WUSTMLUI07 WUSTMLUI08 WUSTMLUI09 WUSTMLUI10 WUSTMLUI11 WUSTMLUI12			
5	**Load cc3x3 patch**						
5.1	Load opt_cc3x3 patches part of optional Rev. I	5	addPatch	WUCC3X3I01 WUCC3X3I02 WUCC3X3I03 WUCC3X3I04 WUCC3X3I05 WUCC3X3I06 WUCC3X3I07 WUCC3X3I08 WUCC3X3I09 WUCC3X3I10 WUCC3X3I11 WUCC3X3I12 WUCC3X3I13			

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 3)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
4.1		commandEcho 18515		A	Expect to send 12 packets.		Y	2		
		commandEcho 18517		A	Total load size: 3696 bytes.					
		commandEcho 18518		A	Verify cmdResult == 1 for each packet					
		commandEcho 18521		A						
		commandEcho 18522		A						
		commandEcho 18524		A						
		commandEcho 18527		A						
		commandEcho 18528		A						
		commandEcho 18531		A						
		commandEcho 18533		A						
		commandEcho 18534		A						
		commandEcho 18537		A						
5										
5.1		commandEcho 18540		A	Expect to send 13 packets.		Y	2		
		commandEcho 18543		A	Total load size: 4620 bytes.					
		commandEcho 18545		A	Verify cmdResult == 1 for each packet					
		commandEcho 18546		A						
		commandEcho 18548		A						
		commandEcho 18551		A						
		commandEcho 18552		A						
		commandEcho 18555		A						
		commandEcho 18557		A						
		commandEcho 18558		A						
		commandEcho 18561		A						
		commandEcho 18562		A						
		commandEcho 18564		A						

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 4)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
6	**Load eventhist patch**						
6.1	Load opt_eventhist patches part of optional Rev. I	5	addPatch	WUEVHSTI01 WUEVHSTI02 WUEVHSTI03 WUEVHSTI04 WUEVHSTI05 WUEVHSTI06 WUEVHSTI07 WUEVHSTI08 WUEVHSTI09 WUEVHSTI10 WUEVHSTI11 WUEVHSTI12 WUEVHSTI13 WUEVHSTI14 WUEVHSTI15			
7	**Load compressall patch**						
7.1	Load opt_compressall patches part of optional Rev. I	5	addPatch	WUCMPRSI01 WUCMPRSI02 WUCMPRSI03 WUCMPRSI04 WUCMPRSI05 WUCMPRSI06 WUCMPRSI07 WUCMPRSI08			

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 4)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
6										
6.1		commandEcho 18568		A	Expect to send 15 packets.		Y	2		
		commandEcho 18571		A	Total load size: 5892 bytes.					
		commandEcho 18573		A	Verify cmdResult == 1 for each packet					
		commandEcho 18574		A						
		commandEcho 18576		A						
		commandEcho 18579		A						
		commandEcho 18581		A						
		commandEcho 18582		A						
		commandEcho 18585		A						
		commandEcho 18586		A						
		commandEcho 18588		A						
		commandEcho 18591		A						
		commandEcho 18592		A						
		commandEcho 18595		A						
		commandEcho 18597		A						
7										
7.1		commandEcho 18601		A	Expect to send 8 packets.		Y	2		
		commandEcho 18602		A	Total load size: 2352 bytes.					
		commandEcho 18604		A	Verify cmdResult == 1 for each packet					
		commandEcho 18607		A						
		commandEcho 18609		A						
		commandEcho 18610		A						
		commandEcho 18612		A						
		commandEcho 18615		A						

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 5)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
8	**Load txings patch**						
8.1	Load opt_txings patches part of optional Rev. I	5	addPatch	WUTXINGI01 WUTXINGI02 WUTXINGI03 WUTXINGI04 WUTXINGI05 WUTXINGI06 WUTXINGI07 WUTXINGI08 WUTXINGI09 WUTXINGI10 WUTXINGI11 WUTXINGI12 WUTXINGI13			
9	**Load deahktrip patch**						
9.1	Load opt_deahktrip patches part of optional Rev. I	5	addPatch	WUDHKTPI01 WUDHKTPI02 WUDHKTPI03 WUDHKTPI04 WUDHKTPI05 WUDHKTPI06 WUDHKTPI07			
10	**Patch the version number**						
10.1	Load the version number patch	1	addPatch	WUFSV0003A			

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 5)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
8										
8.1		commandEcho 18619		A	Expect to send 13 packets. Total load size: 3432 bytes. Verify cmdResult == 1 for each packet		Y	2		
		commandEcho 18621		A						
		commandEcho 18622		A						
		commandEcho 18624		A						
		commandEcho 18627		A						
		commandEcho 18629		A						
		commandEcho 18630		A						
		commandEcho 18633		A						
		commandEcho 18634		A						
		commandEcho 18636		A						
		commandEcho 18639		A						
		commandEcho 18641		A						
		commandEcho 18642		A						
9										
9.1		commandEcho 18647		A	Expect to send 7 packets. Total load size: 1924 bytes. Verify cmdResult == 1 for each packet		Y	2		
		commandEcho 18648		A						
		commandEcho 18651		A						
		commandEcho 18653		A						
		commandEcho 18654		A						
		commandEcho 18657		A						
		commandEcho 18658		A						
10										
10.1		Verify cmdResult == 1 commandEcho 18664			Expect to send 1 packet. Total load size 16 bytes. Sets the version number to 58.		Y	2		

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 6)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
11	**Dump Installed Patches**						
11.1	Dump Patchlist	1	dumpPatchlist	RU_0000001			
12	**Activate Patches**						
12.1	Set Boot Modifier off	0.1	DPA FS Boot Mod.	1BMODIBM(0)			
12.2	Set Warm Boot Flag on	0.1	DPA Warm Boot	1WRMBTSB(1)			
12.3	Halt BEP	0.1	Halt BEP	1RSETIRT(1)			
12.4	Restart BEP	1	Restart BEP	1RSETIRT(0)			
12.5	Verify BEP Boot	2.0					
12.6	Verify HW LEDs	2.0			BEP Select BEP Not in Reset BEP FIFO Not Full BEP FIFO Not Empty	1STAT4ST 1STAT5ST 1STAT6ST 1STAT7ST	0 or 1 1 1 0

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 6)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
11										
11.1		Verify cmdResult == 1 commandEcho 65			bepReadReply ACIS EGSE verifies reply against file /home/jennyg/Data/Reference/PatchDumps/ wugij_bcom.compare.dumpedPatches.1.dat		Y	2		
12										
12.1					disables uplink boot		Y	2		
12.2							Y	2		
12.3							Y	2		
12.4		bepStartupMessage			ACIS EGSE verifies "version" field == 58 decimal		Y	2		
12.5		Check bepStartupMessage: bepTickCounter < 10; version=58; watchdogFlag = 0 patchValidFlag =1 warmbootFlag = 1 Check swHousekeeping messages: startingBepTickCounter < 10; endingBepTickCounter= startingBepTickCounter+ ~645; version = 58		A A A A A B B A			Y	2		
12.6				2 2 2 2	0/1 indicates BEP A/B is selected 1 means BEP not in reset 1 means FIFO not full 0 means FIFO empty		Y	2		

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 7)

Step #	Title (Revision 4.33_V2.0)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
12.7	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
13.0	**Execute DEA HK run**						
13.1	Load Board 11 DEA HK	1	loadDeaBlock	WD00001024			
13.2	Start DEA Hkp run	1	startDEA	XIDZ0000005			
14	**Contingency FIFO Clear**						
14.1-C	Fix FIFO Command	1	clearFIFO	FF_FIXFIFO			
14.2-C	Verify HW LEDs	2.0			BEP FIFO Not Full	1STAT6ST	1
					BEP FIFO Empty	1STAT7ST	0
	Total Time:	55.3					

Table 1: ACIS Flight Software Standard Patch G Optional Patch I and FIXFIFO command (Page 7)

Step #	Units	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
12.7				2 2 2 1	this bit toggles to indicate BEP is running 1 means science idle 1 means no watchdog boot 0 means BEP SW is running		Y	2		
13.0										
13.1		Verify cmdResult == 1 commandEcho 225		B	Load Fullhouse DEA housekeeping parameter block into slot 4			1or2		
13.2		Verify cmdResult == 1 commandEcho 18 confirm DEAhk values		B				1or2		
14										
14.1-C		Verify: cmdResult = NO_HANDLER commandEcho 0 UNUSED		A 2 2	Expect to send 1 packet of 512 bytes		Y Y Y	2 2 2		
14.2-C				2 2	1 means FIFO not full 0 means FIFO empty					