4.32_V2.1 Flight Software Standard Patch G Optional Patch H

Last Revised: January 27, 2020
Filename: sw_stdgopth

BRIEF FUNCTIONAL DESCRIPTION:

This procedure loads the standard G patches and six optional H patches. The changes from sw_stdfoptg consist of one updated standard patch and one new optional patch. The text that describes the changes in the patches in this procedure is included 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.

Patches eventhist, ctireport1, and ctireport2 require 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. H". Refer to the release notes for standard patches, optional patches, and patch combination certification (see references below).

The standard *buscrash* patch has been updated to revision B to force a science run to end when it is commanded to do so, *e.g.*, by an SCS107 from the OBC, while it is waiting for the *biasthief* task to complete. This fixes a bug that was introduced by revision C of the *buscrash2* patch. The optional *deahktrip* patch monitors DPA component temperatures and, if an anomalous value occurs, optionally stops a science run, powers down FEP and video boards, and sets S/W bilevels. The default behavior is to set the S/W bilevels and not do anything else. The other *deahktrip* response options can be enabled through a writeBep command.

This procedure will change the flight software version from 53 to version 56. 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. H")

5. Load the cc3x3 patch (part of "optional Rev. H")
6. Load the eventhist patch (part of "optional Rev. H")
7. Load the compressall patch (part of the "optional Rev. H")
8. Load the txings patch (part of the "optional Rev. H")
9. Load the deahktrip patch (part of the "optional Rev. H")
10. Load the patch load version number (56)
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 the Standard Patch Release Notes, for MIT 36-58010 Rev. H, MIT 36-58030.30 Rev B, and MIT 36-58030.34, for a detailed description of the effects of this patch load.

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 = 56" field.
10. A verification that DEA housekeeping is being reported.

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 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. Soon after completion of this SOP, the optimal parameters can be uploaded in the weekly load through a SAR.

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_STDFOPTG to reload version 53 patches (SOT Procedure 4.28_V2.2, sw_stdfoptg).

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_STDFOPTG to reload version 53 patches (SOT Procedure 4.28_V2.2, sw_stdfoptg).

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 36-58010 Rev H (ECO 36-1053) Flight Software Patch Release G, Optional Release H.
2. MIT 36-58021.04 Rev I (ECO 36-1054) Flight Software Patch Release G-H-I Certification.
3. MIT 36-58030.30 Rev B (ECO 36-1051) *buscrash* patch to force SCIENCE_IDLE when all FEPs powered off.
4. MIT 36-58030.34 Rev A (ECO 36-1052) *deahktrip* patch to respond to anomalous DPA board temperatures.

CHANGE HISTORY:

V0.1

- Initial version, revised from 4.28_V2.2 Flight Software Standard Patch F Optional Patch G.

V1.0

- Minor text edits; ready to send to full ACIS team.

V2.0

- Text edits after team review

V2.1

- Text edits after first upload

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

Step #	Title (Revision 4.32_V2.1)	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 BEP Not in Reset BEP FIFO Not Full BEP FIFO Not Empty	1STAT4ST 1STAT5ST 1STAT6ST 1STAT7ST	0 or 1 1 1 0
1.2	Verify SW LEDs	2.0			BEP is running Science run status Watchdog boot BEP initialization	1STAT0ST 1STAT1ST 1STAT2ST 1STAT3ST	0 or 1 1 1 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	1	addPatch	WUSTANDG01 WUSTANDG02 WUSTANDG03 WUSTANDG04 WUSTANDG05 WUSTANDG06 WUSTANDG07 WUSTANDG08 WUSTANDG09 WUSTANDG10			

Table 1: **ACIS Flight Software Standard Patch G Optional Patch H 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 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		
1.2				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		
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 commandEcho 16925 commandEcho 16926 commandEcho 16929 commandEcho 16930 commandEcho 16932 commandEcho 16935 commandEcho 16936 commandEcho 16939 commandEcho 16941		A A A A A A A A A A	Expect to send 35 packets. Total load size: 3812 bytes. Verify cmdResult == 1 for each packet		Y	2		

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

Step #	Title (Revision 4.32_V2.1)	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 H 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 H and FIXFIFO command (Page 3)**

Step #	**Title (Revision 4.32_V2.1)**	**Time Req**	**Command Description**	**Command Mnemonic**	**Telemetry Description**	**Telemetry Mnemonic**	**Expected Value**
4.1	Load opt_smtl patches part of optional Rev. H	5	addPatch	WUSTMLUH01 WUSTMLUH02 WUSTMLUH03 WUSTMLUH04 WUSTMLUH05 WUSTMLUH06 WUSTMLUH07 WUSTMLUH08 WUSTMLUH09 WUSTMLUH10 WUSTMLUH11 WUSTMLUH12			
5	**Load cc3x3 patch**						
5.1	Load opt_cc3x3 patches part of optional Rev. H	5	addPatch	WUCC3X3H01 WUCC3X3H02 WUCC3X3H03 WUCC3X3H04 WUCC3X3H05 WUCC3X3H06 WUCC3X3H07 WUCC3X3H08 WUCC3X3H09 WUCC3X3H10 WUCC3X3H11 WUCC3X3H12 WUCC3X3H13			

Table 1: **ACIS Flight Software Standard Patch G Optional Patch H 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 16995 commandEcho 16997 commandEcho 16998 commandEcho 17001 commandEcho 17002 commandEcho 17004 commandEcho 17007 commandEcho 17009 commandEcho 17010 commandEcho 17012 commandEcho 17015 commandEcho 17016		A A A A A A A A A A A A	Expect to send 12 packets. Total load size: 3696 bytes. Verify cmdResult == 1 for each packet		Y	2		
5										
5.1		commandEcho 17021 commandEcho 17022 commandEcho 17025 commandEcho 17026 commandEcho 17028 commandEcho 17031 commandEcho 17032 commandEcho 17035 commandEcho 17037 commandEcho 17038 commandEcho 17040 commandEcho 17043 commandEcho 17045		A A A A A A A A A A A A A	Expect to send 13 packets. Total load size: 4620 bytes. Verify cmdResult == 1 for each packet		Y	2		

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

Step #	Title (Revision 4.32_V2.1)	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. H	5	addPatch	WUEVHSTH01 WUEVHSTH02 WUEVHSTH03 WUEVHSTH04 WUEVHSTH05 WUEVHSTH06 WUEVHSTH07 WUEVHSTH08 WUEVHSTH09 WUEVHSTH10 WUEVHSTH11 WUEVHSTH12 WUEVHSTH13 WUEVHSTH14 WUEVHSTH15			
7	**Load compressall patch**						
7.1	Load opt_compressall patches part of optional Rev. H	5	addPatch	WUCMPRSH01 WUCMPRSH02 WUCMPRSH03 WUCMPRSH04 WUCMPRSH05 WUCMPRSH06 WUCMPRSH07 WUCMPRSH08			

Table 1: **ACIS Flight Software Standard Patch G Optional Patch H 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 17049		A	Expect to send 15 packets.		Y	2		
		commandEcho 17050		A	Total load size: 5892 bytes.					
		commandEcho 17052		A	Verify cmdResult == 1 for each packet					
		commandEcho 17055		A						
		commandEcho 17056		A						
		commandEcho 17059		A						
		commandEcho 17061		A						
		commandEcho 17062		A						
		commandEcho 17065		A						
		commandEcho 17066		A						
		commandEcho 17068		A						
		commandEcho 17071		A						
		commandEcho 17073		A						
		commandEcho 17074		A						
		commandEcho 17076		A						
7										
7.1		commandEcho 17080		A	Expect to send 8 packets.		Y	2		
		commandEcho 17083		A	Total load size: 2352 bytes.					
		commandEcho 17085		A	Verify cmdResult == 1 for each packet					
		commandEcho 17086		A						
		commandEcho 17088		A						
		commandEcho 17091		A						
		commandEcho 17093		A						
		commandEcho 17094		A						

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

Step #	Title (Revision 4.32_V2.1)	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. H	5	addPatch	WUTXINGH01 WUTXINGH02 WUTXINGH03 WUTXINGH04 WUTXINGH05 WUTXINGH06 WUTXINGH07 WUTXINGH08 WUTXINGH09 WUTXINGH10 WUTXINGH11 WUTXINGH12 WUTXINGH13			
9	**Load deahktrip patch**						
9.1	Load opt_deahktrip patches part of optional Rev. H	5	addPatch	WUDHKTPH01 WUDHKTPH02 WUDHKTPH03 WUDHKTPH04 WUDHKTPH05 WUDHKTPH06 WUDHKTPH07			
10	**Patch the version number**						
10.1	Load the version number patch	1	addPatch	WUFSV00038			

Table 1: **ACIS Flight Software Standard Patch G Optional Patch H 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 17098 commandEcho 17100 commandEcho 17103 commandEcho 17105 commandEcho 17106 commandEcho 17108 commandEcho 17111 commandEcho 17112 commandEcho 17115 commandEcho 17117 commandEcho 17118 commandEcho 17121 commandEcho 17122		A A A A A A A A A A A A A	Expect to send 13 packets. Total load size: 3160 bytes. Verify cmdResult == 1 for each packet		Y	2		
9										
9.1		commandEcho 17127 commandEcho 17128 commandEcho 17131 commandEcho 17133 commandEcho 17134 commandEcho 17136 commandEcho 17139		A A A A A A A	Expect to send 7 packets. Total load size: 1924 bytes. Verify cmdResult == 1 for each packet		Y	2		
10										
10.1		Verify cmdResult == 1 commandEcho 17146			Expect to send 1 packet. Total load size 16 bytes. Sets the version number to 56.		Y	2		

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

Step #	Title (Revision 4.32_V2.1)	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 H 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/ wughi_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 == 56 decimal		Y	2		
12.5		Check bepStartupMessage: bepTickCounter < 10; version=56; watchdogFlag = 0 patchValidFlag =1 warmbootFlag = 1 Check swHousekeeping messages: startingBepTickCounter < 10; endingBepTickCounter= startingBepTickCounter+ ∼645; version = 56		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 H and FIXFIFO command (Page 7)**

Step #	Title (Revision 4.32_V2.1)	Time Req	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value
12.7	Verify SW LEDs	2.0			BEP is running Science run status Watchdog boot BEP initialization	1STAT0ST 1STAT1ST 1STAT2ST 1STAT3ST	0 or 1 1 1 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	XDZ0000005			
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 BEP FIFO Empty	1STAT6ST 1STAT7ST	1 0
	Total Time:	51.3					

Table 1: **ACIS Flight Software Standard Patch G Optional Patch H 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					