1.30_V2.0 INTERNAL CALIBRATION SOURCE AND BACKGROUND MEASUREMENT

Last Revised: August 3, 1999

BRIEF FUNCTIONAL DESCRIPTION:
ACIS contains an Fe55 source inside its camera housing which continually illuminates the focal plane when the ACIS door is closed. The source is highly collimated so that most of the events occur on the S2 and S3 CCDs. The Mn L line strength will be compared to the Mn K line complex strength to judge any differences in sensitivity, compared to ground calibrations. The count rate for the Mn L line on the S3 chip will be 0.4 counts s^{-1} given an August 1999 launch date. The requirement is to acquire 10,000 counts in the Mn L line; therefore an integration time of 25 ks is required. Since the other CCDs will not see a significant number of Mn X-ray, we will use this time to collect background data on them. Half of the time will be spent on the I array and the other half on the S array. There are four science runs in the procedure. The first collects I array data in Faint mode with a g7 grade filter and no event amplitude cutoff. The second collects S array data in Faint mode with a g7 grade filter and no event amplitude cutoff. The third collects I array data in Faint mode with a b255 grade filter and a 3700 ADU event amplitude cutoff. It also employs a window block to reject events from I1 abd I2. The fourth collects S array data in Faint mode with a b255 grade filter and a 3700 ADU event amplitude cutoff. It also employs a window block to reject events from S4 and S5.

The sequence of actions will be:

1. warm boot and start DEA housekeeping if necessary
2. configure the instrument to collect imaging array data
3. execute the faint mode science run (no g7, no event amplitude cutoff)
4. configure the instrument to collect spectroscopy array data
5. execute the faint mode science run (no g7, no event amplitude cutoff)
6. configure the instrument to collect imaging array data
7. execute the faint mode science run (no b255, event amplitude cutoff at 3750 ADU, window out I1 and I2)
8. configure the instrument to collect spectroscopy array data
9. execute the faint mode science run (no b255, event amplitude cutoff at 3750 ADU, window out S4 and S5)
10. return to thermal standby mode if necessary

ASSUMED INSTRUMENT STATE:
Assumes that the instrument is in the cannonical thermal standby mode.
Assumes that the ACIS door is closed.
Assumes that the standard patches have been loaded either the standard patches alone or the standard patches bundled with the optional patches.

SPECIAL INITIAL CONDITIONS:

OPERATIONAL CONSTRAINTS/CAUTIONS:

REFERENCES:

CHANGE HISTORY:

V2.0 Original version, edited from procedure 1.23_V2.1.

- step 7.1, changed the SW command mnemonic from "WT00144014" to "WT00146014" and the command identifier
- step 7.2, changed the SW command mnemonic from "W200009014" to "W20001A014" and the command identifier
- step 9.1, changed the SW command mnemonic from "WT000CE014" to "WT000148014" and the command identifier
- step 9.2, changed the SW command mnemonic from "W200009014" to "W20001A014" and the command identifier

Table 1: **Internal Calibration Source and Background Measurements**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
1	Warm Boot and Start DEA HKP if needed							
1.1	Set Boot modifier off	1	DPA FS Boot Mod	1BMODIBM(0)				
1.2	Set warm boot flag on	1	DPA Warm Boot	1WRMBTSB(1)				
1.3	Halt BEP	1	DPA Cmd Reset	1RSETIRT(1)				
1.4	Restart BEP	1		1RSETIRT(0)				
1.5	Check BEP A Boot	2.0						
1.6	Check HW LEDs	2.0			BEP Select	1STAT4ST	0	
					BEP FIFO Not Full	1STAT6ST	1	
					BEP FIFO Not Empty	1STAT7ST	0	
1.7	Check SW LEDs	2.0			BEP initialization	1STAT3ST	0	
					Watchdog boot	1STAT2ST	1	
					Science run status	1STAT1ST	1	
						1STAT0ST	0or1	
1.8	Load Board 11 DEA HK	1	loadDeaBlock	WD00001024				
1.9	Start DEA Hkp run	1	startDEA	XDZ0000005				
2	Configure for imaging							
2.1	Power up imaging video boards & FEPs	1	changeConfigSetting	WSPOW0CF3F				
					DEA Input V A	1DE28AVO	28.0–34.0	V
					DEA Input I A	1DEICACU	1.2–1.5	A
					DPA Input V A	1DP28AVO	28.0-34.0	V
					DPA Input I A	1DPICACU	1.1–1.4	A
					DPA Input V B	1DP28BVO	28.0–34.0	V

Table 2: (CONT) **Internal Calibration Source and Background Measurements**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
1									
1.1				disables boot from uplink		Y	1or2		
1.2				enable Warm boot		Y	1or2		
1.3				Hold active BEP reset line		Y	1or2		
1.4				Release BEP reset line		Y	1or2		
1.5	Check bepStartupMessage:		A			Y	1or2		
	bepTickCounter < 10; version=26 or 27;		A	Either version includes standard patches.					
	warmBootFlag = 1, patchValidFlag =1		A						
	Check swHousekeeping messages:								
	startingBepTickCounter < 10;		B						
	endingBepTickCounter=		B						
	=startingBepTickCounter+640								
	version = 26 or 27		A	Either version includes standard patches.					
1.6			2	0 indicates BEP A is selected		Y	1or2		
			2	1 means FIFO not full					
			2	1 means FIFO not empty					
1.7			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					
1.8	Check cmdResult == OK		B	Load Fullhouse DEA housekeeping		Y	1or2		
	commandEcho 225			parameter block into slot 4					
1.9	deaHousekeepingData		B	get FP temp, should be stable and		Y	1or2		
	commandEcho 18			± 2 C of desired value					
2									
2.1	Check cmdResult == OK		A			Y	2	60k	
	commandEcho 359		2	Expect DEA side A = 42 ± 3 W.					
			2	Current is noisy, so an average is needed.					
			2	Expect DPA Side A = 38 ± 2 W.					
			2						
			2	Expect DPA Side B = 33 ± 2 W.					

Table 1: **Internal Calibration Source and Background Measurements(Page 2)**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
					DPA Input I B	1DPICBCU	1.0–1.2	A
3	Collect ACIS-I data							
3.1	Load parameter block	1	loadTeBlock	WT000DC014				
3.2	Start science	1	startScience	XTZ0000005				
3.3	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
3.4	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
3.5	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
3.6	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
3.7	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
3.8	dump system config.	0.1	dumpSysConfig	RS_0000001				
3.9	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
3.10	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
3.11	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				
3.12	dump Huffman tables	0.5	dumpHuffman	RH_0000001				
3.13	dump patches	2	dumpPatchlist	RU_0000001				
3.14	Wait for data acquisition	265						
3.15	Stop Science	5	stopScience	AA00000000				
4	Configure for spectro							

Table 2: (CONT) **Internal Calibration Source and Background Measurements(Page 2)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
			2						
3									
3.1	Check cmdResult == OK commandEcho 822		B	collect data with ACIS-I		Y	2	60k	
3.2	Check cmdResult == OK commandEcho 58		B	run I0–I3,S2,S3		Y	2	60k	
3.3	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding "truncated blocks" for any of these dumps.	Y	2	60k	
3.4	Check cmdResult == OK commandEcho 75		B			Y	2	60k	
3.5	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
3.6	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
3.7	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
3.8	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
3.9	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
3.10	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
3.11	Check cmdResult == OK commandEcho 77		B			Y	2	60k	
3.12	Check cmdResult == OK commandEcho 68		B			Y	2	60k	
3.13	Check cmdResult == OK commandEcho 65		B			Y	2	60k	
3.14						N	2	60k	
3.15	Check cmdResult == OK commandEcho 1539	scienceReport	B			Y	2	60k	
4									

Table 1: **Internal Calibration Source and Background Measurements(Page 3)**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
4.1	Power up spectro video	1	changeConfigSetting	WSPOW3F03F				
5	Collect ACIS-S data							
5.1	Load parameter block	1	loadTeBlock	WT000E4014				
5.2	Start science	1	startScience	XTZ0000005				
5.3	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
5.4	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
5.5	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
5.6	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
5.7	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
5.8	dump system config.	0.1	dumpSysConfig	RS_0000001				
5.9	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
5.10	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
5.11	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				
5.12	dump Huffman tables	0.5	dumpHuffman	RH_0000001				
5.13	dump patches	2	dumpPatchlist	RU_0000001				
5.14	Wait for data acquisition	265						
5.15	Stop Science	5	stopScience	AA00000000				

Table 2: (CONT) **Internal Calibration Source and Background Measurements(Page 3)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
4.1	Check cmdResult == OK commandEcho 360		A			Y	2	60k	
5									
5.1	Check cmdResult == OK commandEcho 839		B	collect data with ACIS-S		Y	2	60k	
5.2	Check cmdResult == OK commandEcho 58		B	run S0–S6 CCDs		Y	2	60k	
5.3	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding "truncated blocks" for any of these dumps.	Y	2	60k	
5.4	Check cmdResult == OK commandEcho 75		B			Y	2	60k	
5.5	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
5.6	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
5.7	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
5.8	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
5.9	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
5.10	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
5.11	Check cmdResult == OK commandEcho 77		B			Y	2	60k	
5.12	Check cmdResult == OK commandEcho 68		B			Y	2	60k	
5.13	Check cmdResult == OK commandEcho 65		B			Y	2	60k	
5.14						N	2	60k	
5.15	Check cmdResult == OK commandEcho 1539	scienceReport	B			Y	2	60k	

Table 1: **Internal Calibration Source and Background Measurements(Page 4)**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
6	Configure for imaging							
6.1	Power up imaging video	2	changeConfigSetting	WSPOW0CF3F				
7	Collect ACIS-I data							
7.1	Load parameter block	1	loadTeBlock	WT00146014				
7.2	Load window block	1	load2dBlock	W20001A014				
7.3	Start science	1	startScience	XTZ0000005				
7.4	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
7.5	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
7.6	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
7.7	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
7.8	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
7.9	dump system config.	0.1	dumpSysConfig	RS_0000001				
7.10	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
7.11	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
7.12	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				
7.13	dump Huffman tables	0.5	dumpHuffman	RH_0000001				
7.14	dump patches	2	dumpPatchlist	RU_0000001				

Table 2: (CONT) **Internal Calibration Source and Background Measurements(Page 4)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
6									
6.1	Check cmdResult == OK commandEcho 359		A			Y	2	60k	
7									
7.1	Check cmdResult == OK commandEcho 1229		B	faint_i_nob255_3700adu_win		Y	2	60k	
7.2	Check cmdResult == OK commandEcho 1235		B	Reject events from I1,I2,S4,S5		Y	2	60k	
7.3	Check cmdResult == OK commandEcho 58		B	run I0–I3,S2,S3		Y	2	60k	
7.4	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding “truncated blocks” for any of these dumps.	Y	2	60k	
7.5	Check cmdResult == OK commandEcho 75		B			Y	2	60k	
7.6	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
7.7	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
7.8	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
7.9	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
7.10	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
7.11	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
7.12	Check cmdResult == OK commandEcho 77		B			Y	2	60k	
7.13	Check cmdResult == OK commandEcho 68		B			Y	2	60k	
7.14	Check cmdResult == OK commandEcho 65		B			Y	2	60k	

Table 1: **Internal Calibration Source and Background Measurements(Page 5)**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
7.15	Wait for data acquisition	165						
7.16	Stop Science	5	stopScience	AA00000000				
8	Configure for spectro							
8.1	Power up spectro video	1	changeConfigSetting	WSPOW3F03F				
9	Collect ACIS-S data							
9.1	Load parameter block	1	loadTeBlock	WT00148014				
9.2	Load window block	1	load2dBlock	W20001A014				
9.3	Start science	1	startScience	XTZ0000005				
9.4	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
9.5	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
9.6	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
9.7	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
9.8	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
9.9	dump system config.	0.1	dumpSysConfig	RS_0000001				
9.10	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
9.11	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
9.12	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				
9.13	dump Huffman tables	0.5	dumpHuffman	RH_0000001				

Table 2: (CONT) **Internal Calibration Source and Background Measurements(Page 5)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
7.15						N	2	60k	
7.16	Check cmdResult == OK commandEcho 1539	scienceReport	B			Y	2	60k	
8									
8.1	Check cmdResult == OK commandEcho 360		A			Y	2	60k	
9									
9.1	Check cmdResult == OK commandEcho 1230		B	faint_s_nob255_3750adu_win		Y	2	60k	
9.2	CheckcmdResult == OK commandEcho 1235		B	reject events from I1,I2,S4,S5		Y	2	60k	
9.3	Check cmdResult == OK commandEcho 58		B	run S0–S6 CCDs		Y	2	60k	
9.4	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding "truncated blocks" for any of these dumps.	Y	2	60k	
9.5	Check cmdResult == OK commandEcho 75		B			Y	2	60k	
9.6	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
9.7	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
9.8	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
9.9	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
9.10	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
9.11	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
9.12	Check cmdResult == OK commandEcho 77		B			Y	2	60k	
9.13	Check cmdResult == OK		B			Y	2	60k	

Table 1: **Internal Calibration Source and Background Measurements(Page 6)**

Step #	Title (Revision 1.30_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
9.14	dump patches	2	dumpPatchlist	RU_0000001				
9.15	Wait for data acquisition	165						
9.16	Stop Science	5	stopScience	AA00000000				
10	Return to Thermal Standby Only if necessary.							
10.1	Power down video boards and FEPs	1	changeConfigSetting	WSPOW00000				
10.2	dump system config.	0.1	dumpSysConfig	RS_0000001				
10.3	Check DPA and DEA pwr				DPA Input V A	1DP28AVO	28.0–34.0	V
					DPA Input I A	1DPICACU	0.35–0.43	A
					DPA Input V B	1DP28BVO	28.0–34.0	V
					DPA Input I B	1DPICBCU	0.26–0.32	A
					DEA Input I A	1DEICACU	0.62–0.75	A
					DEA Input V A	1DEP3AVO	28.0-34.0	V
	Total Time	923.3						

Table 2: (CONT) **Internal Calibration Source and Background Measurements(Page 6)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
	commandEcho 68								
9.14	Check cmdResult == OK		B			Y	2	60k	
	commandEcho 65								
9.15						N	2	60k	
9.16	Check cmdResult == OK	scienceReport	B			Y	2	60k	
	commandEcho 1539								
10									
10.1	Check cmdResult == OK		A			Y	2	60k	
	commandEcho 773			return to thermal standby state					
10.2	Check cmdResult == OK		B	verify FEPs and video boards are off.		Y	1or2		
	commandEcho 66								
10.3			2	Expect 12 W for side A, power consumption		Y	1or2		
			2	should be more stable than I or V.					
			2	Expect 9 W for side B, power consumption					
			2	should be more stable than I or V.					
			2	DEA A Power should be 21 ± 3 W,					
				current is noisy so an average is needed					