2.11_V2.2 CCD ORBITAL BACKGROUND MEASUREMENT WITH THE ACIS DOOR OPEN

Last Revised: August 8, 1999
Filename: bkg_doorop

BRIEF FUNCTIONAL DESCRIPTION:
This procedure is executed after the ACIS door has been opened, but while the HRMA sunshade and aft contamination cover are still closed. It is designed to acquire the necessary data to characterize the ACIS particle-induced background as a function of orbital position. Consequently, *Chandra* must be in nearly its final orbit (apogee $> 120,000$ km) before this procedure is run. This procedure consists of 6 science runs of 28.8 ks each, 3 with the ACIS-I array and 3 with the ACIS-S array. Steps 2–5 of the procedure execute two science runs, one with the ACIS-I array and the other with the ACIS-S array. Step 6 merely states to repeat steps 2–5 two times. This procedure should span the 54 hours that *Chandra* is above 60,000 km, with about 6 hours to spare. During this time spacecraft telemetry will be switched between format 2 and format 1 every hour. Each ACIS science run must start in format 2 and remain there for at least ∼35 min to permit the bias maps to be telemetered down. In addition, the telemetry must be in format 2 when the stop science run command is issued so the telemetry buffers can be emptied before the instrument is configured for the next science run. ACIS should be placed in the canonical thermal standby mode at the end of this procedure.

The sequence of actions will be:

1. warm boot and start DEA HKP if necessary
2. configure the instrument to collect imaging array data
3. execute the science run with the ACIS-I array, including a dump of the complete configuration information
4. configure the instrument to collect spectroscopy array data
5. execute the science run with the ACIS-S array, including a dump of the complete configuration information
6. repeat steps 2–5 two times
7. return to thermal standby mode

ASSUMED INSTRUMENT STATE:
Assumes the ACIS door is open.
Assumes the standard patches are loaded.
Assumes ACIS is in the canonical thermal standby mode.

SPECIAL INITIAL CONDITIONS:
Assumes the HRMA sunshade and aft contamination cover are closed.
Assumes *Chandra* is in nearly its final orbit (apogee $> 120,000$ km).

OPERATIONAL CONSTRAINTS/CAUTIONS:

REFERENCES:

CHANGE HISTORY:

V1.2

- changed filenames from "ccd_orbbkg2" to "bkg_doorop"

V1.3

- changed the phrase "Door Open" to "ACIS Door Open" in the procedure title
- updated description
- split the old step 1 into two steps: the new step 1 performs a warm boot and start DEA HKP run, while the new step 2 configures the instrument for the imaging array
- moved dump configuration and dump patches commands into steps 3 and 5
- changed command mnemonics and echo values in steps 3.1, 3.2, 5.1, and 5.2
- changed time required parameter in steps 3.14, 3.15, 5.14, and 5.15 so each science run takes a total of 8 hours
- changed telemetry format requirement in steps 3.14 and 5.14 from format 2 to formats 1 or 2
- added note to wait until in telemetry format 2 to stop science runs in steps 3.15 and 5.15
- swapped sequence of steps 6 and 7
- changed all SW verifier criteria from A to B
- changed all HW verifier criteria from 1 to 2
- added more items to Assumed Instrument State
- added more items to Special Initial Conditions

V1.4

- changed expected values of DPA and DEA input voltages and currents in steps 2.1 and 7.4
- expanded step 6 to include more text description

V2.0

- ACIS Team signed-off version
- changed expected version number of flight SW to either 26 or 27 since either would be acceptable
- changed expected value of "1STAT7ST" in step 1.6
- changed title of step 7 to "Return to Thermal Standby"
- replaced steps 7.1 and 7.2 with a new step 7.1 containing the command "WSPOW00000"
- added last sentence in "Brief Functional Description" and changed last step in sequence of actions

V2.1

- Added comment "Only if necessary" to the title field in step 1.

- Changed the command mnemonic from “WT000BE014” to “????” and the command Id from “729” to “????” in step 3.1.
- Changed the command mnemonic from “WT000C0014” to “????” and the command Id from “732” to “????” in step 5.1.

V2.2

- Changed the command mnemonic from “WT000BE014” to “WT0016A014” and the command Id from “729” to “1352” in step 3.1.
- Changed the command mnemonic from “WT000C0014” to “WT0016C014” and the command Id from “732” to “1357” in step 5.1.

Table 1: **CCD Orbital Background Measurement With the ACIS Door Open**

Step #	Title (Revision 2.11_V2.2)	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 Modifier	1BMODIBM(0)				
1.2	Set warm boot flag on	1	DPA Warm Boot	1WRMBTSB(1)				
1.3	Halt BEP	1	DPA Command 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	1	loadDeaBlock	WD00001024				
1.9	Start DEA HKP run	1	startDEA	XDZ0000005				
2	Configure for Imaging							
2.1	Power up imaging vid	1	changeConfigSetting	WSPOW0CF3F				
	boards & FEPs				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) **CCD Orbital Background Measurement With the ACIS Door Open**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
1									
1.1				disables boot from uplink			1or2		
1.2				enable Warm boot			1or2		
1.3				Hold active BEP reset line			1or2		
1.4				Release BEP reset line			1or2		
1.5	Check bepStartupMessage:		B				1or2		
	bepTickCounter $<$ 10; version=26or27;		B	Either version contains the standard patches.					
	warmBootFlag = 1, patchValidFlag =1		B						
	Check swHousekeeping messages:								
	startingBepTickCounter $<$ 10;		B						
	endingBepTickCounter=		B						
	=startingBepTickCounter+640								
	version=26or27		B	Either version contains the standard patches.					
1.6			2	0 indicates BEP A is selected			1or2		
			2	1 means FIFO not full					
			2	1 means FIFO not empty					
1.7			2	0 means BEP SW is running			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			1or2		
	commandEcho 225			parameter block into slot 4					
1.9	deaHousekeepingData		B	get FP temp, should be stable and			1or2		
	commandEcho 18			± 2 C of desired value					
2									
2.1	Check cmdResult == OK		B				2	60k	
	commandEcho 359		2	Expect DEA side A					
			2	power = 42 ± 3 W					
			2	Expect DPA Side A					
			2	= 38 ± 2 W					
			2	Expect DPA Side B					

Table 1: **CCD Orbital Background Measurement With the ACIS Door Open(Page 2)**

Step #	Title (Revision 2.11_V2.2)	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 events							
3.1	Load parameter block	1	loadTeBlock	WT0016A014				
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	465						
3.15	Stop Science	8	stopScience	AA00000000				
4	Configure for spectro							

Table 2: (CONT) **CCD Orbital Background Measurement With the ACIS Door Open(Page 2)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
			2	$= 33 \pm 2$ W					
3									
3.1	Check cmdResult == OK commandEcho 1352		B	collect events with ACIS-I			2	60k	
3.2	Check cmdResult == OK commandEcho 58		B	run I0–I3,S2,S3			2	60k	
3.3	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding		2	60k	
3.4	Check cmdResult == OK commandEcho 75		B		“truncated blocks” for any of these dumps.		2	60k	
3.5	Check cmdResult == OK commandEcho 72		B				2	60k	
3.6	Check cmdResult == OK commandEcho 71		B				2	60k	
3.7	Check cmdResult == OK commandEcho 63		B				2	60k	
3.8	Check cmdResult == OK commandEcho 66		B				2	60k	
3.9	Check cmdResult == OK commandEcho 83		B				2	60k	
3.10	Check cmdResult == OK commandEcho 80		B				2	60k	
3.11	Check cmdResult == OK commandEcho 77		B				2	60k	
3.12	Check cmdResult == OK commandEcho 68		B				2	60k	
3.13	Check cmdResult == OK commandEcho 65		B				2	60k	
3.14			B				1or2	60k	
3.15	Check cmdResult == OK commandEcho 1539		B	scienceReport	Wait until in Tlm Fmt 2		2	60k	
4									

Table 1: **CCD Orbital Background Measurement With the ACIS Door Open(Page 3)**

Step #	Title (Revision 2.11_V2.2)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
4.1	Power up spectro video	1	changeConfigSetting	WSVIDSTD_S				
5	Collect ACIS-S events							
5.1	Load parameter block	1	loadTeBlock	WT0016C014				
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	465						
5.15	Stop Science	8	stopScience	AA00000000				

Table 2: (CONT) **CCD Orbital Background Measurement With the ACIS Door Open(Page 3)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
4.1	Check cmdResult == OK commandEcho 92		B				2	60k	
5									
5.1	Check cmdResult == OK commandEcho 1357		B	collect events with ACIS-S			2	60k	
5.2	Check cmdResult == OK commandEcho 58		B	run S0-S5 CCDs			2	60k	
5.3	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding “truncated blocks” for any of these dumps.		2	60k	
5.4	Check cmdResult == OK commandEcho 75		B				2	60k	
5.5	Check cmdResult == OK commandEcho 72		B				2	60k	
5.6	Check cmdResult == OK commandEcho 71		B				2	60k	
5.7	Check cmdResult == OK commandEcho 63		B				2	60k	
5.8	Check cmdResult == OK commandEcho 66		B				2	60k	
5.9	Check cmdResult == OK commandEcho 83		B				2	60k	
5.10	Check cmdResult == OK commandEcho 80		B				2	60k	
5.11	Check cmdResult == OK commandEcho 77		B				2	60k	
5.12	Check cmdResult == OK commandEcho 68		B				2	60k	
5.13	Check cmdResult == OK commandEcho 65		B				2	60k	
5.14			B				1or2	60k	
5.15	Check cmdResult == OK commandEcho 1539		B	scienceReport	Wait until in Tlm Fmt 2		2	60k	

Table 1: **CCD Orbital Background Measurement With the ACIS Door Open(Page 4)**

Step #	Title (Revision 2.11_V2.2)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
6	Execute 4 more science runs							
6.1	Repeat steps 2–5 two times	1920						
7.0	Return to Thermal Standby **Only if necessary**							
7.1	Power down video boards and FEPs	1	changeConfigSetting	WSPOW00000				
7.2	dump system config.	0.1	dumpSysConfig	RS_0000001				
7.3	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	2892.7						

Table 2: (CONT) **CCD Orbital Background Measurement With the ACIS Door Open(Page 4)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
6									
6.1				4 more science runs are executed,			1or2	60k	
				while sharing TLM FMT as specified in steps 2–5					
7.0									
7.1	Check cmdResult == OK		A			Y	2	60k	
	commandEcho 773			return to thermal standby state					
7.2	Check cmdResult == OK		B				1or2		
	commandEcho 66								
7.3			2	Expect 12 W for side A, power consumption			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					