5.12_V1.0 BAKEOUT: FP to -60 C, DH to $+20$ C

Last Revised: September 30, 2003
Filename: bake_FPm60_DHp20

BRIEF FUNCTIONAL DESCRIPTION:

It has been determined that the ACIS optical-blocking filter (OBF) and/or CCDs have developed a layer of contamination over the first four years of the mission. Ground tests at NGST indicate that the contaminant is likely to release at temperatures at or above 0 C. Thermal models from LMA indicate that the center of the ACIS-S OBF can be raised to 0 C and the center of the ACIS-I OBF can be raised to -7.5 C if the Detector Housing (DH) or Camera Body (CB) is heated to room temperature and the focal plane is heated to -60.0 C. The edges of both OBFs will be close to room temperature in such a scenario. Ground tests also indicate that the relevant timescales for the contaminant release are on the order of a few hours. The exact release temperature and time constants are *not known* because the exact composition of the contaminant on-orbit is not known.

Current thinking states that ACIS must be in the focal position for this activity. It is expected that this activity will take an entire orbit or a large fraction of it, including the heating phase, the hot, stable phase and the cooling phase. The activity should start outside of the radiation belts and should have the FP cold again by the time *Chandra* re-enters the radiation belts.

NOTE: It is important that the CCDs should stay as cold as possible during this activity. The CCD temperature should not be allowed to exceed -60.0 C.

The sequence of actions will be:

1. verify the initial Camera Body, Warm & Cold Radiators and FP temperatures
2. enable FP bakeout and start heating FP to -60.0 C
3. Enable and turn on the DA housing bakeout heater once the FP temperature has approached -60 C, heat DA housing to +25 C
4. Wait for the Camera Body temperature to stabilize at +25 C

ASSUMED INSTRUMENT STATE:

Assumes the instrument is in the canonical thermal standby state (the FEPs and video boards must be off !!!!).
Assumes that the SIM is at the ACIS-S position (SIM step # = 75624).

SPECIAL INITIAL CONDITIONS:

OPERATIONAL CONSTRAINTS/CAUTIONS:

THIS PROCEDURE LEAVES THE INSTRUMENT IN BAKEOUT MODE, IT MUST BE ROUTINELY MONITORED DURING THIS TIME.
The little and large vent valves must already be open.
The turning off of the FEPs and analog electronics should be verified before the heaters are turned on.
CARD ACIS-002
CARD ACIS-007

REFERENCES:

ACIS Long Form Functional Test Procedure (36-01301.01)
SOT procedure 2.9_V2.0 “Full Bakeout”

FOT procedure SAP_61005 "Full Bakeout"

CHANGE HISTORY:

V1.0

- adapted from SOT procedure 2.9_V2.0 "Full Bakeout", corresponding FOT procedure is SAP_61005.

Table 1: **Full Bakeout Procedure**

Step #	Title (Revision 5.12_V1.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
1.0	Verify Initial Temperatures							
1.1	Verify SIM position	1			SIM TT Position	3TSCPOS	75624	
1.2	Verify HW Temperatures	1			Camera Body T A	1CBAT	-62.4	C
					Camera Body T B	1CBBT	-59.9	C
					Cold Radiator T A	1CRAT	~ -127.9	C
					Cold Radiator T B	1CRBT	~ -127.9	C
					Warm Radiator T A	1WRAT	~ -82.0	C
					Warm Radiator T B	1WRBT	~ -82.0	C
1.3	Load Board 11 DEA HK *if necessary*	1	loadDeaBlock	WD00001024				
1.4	Start DEA Hkp run *if necessary*	1	startDEA	XDZ0000005				
1.5	verify FP temperature	2			FP Temp		~ -119.7	C
2.0	Start heating FP to -60.0 C							
2.1	verify power consumption	10			DEA Input I	1DEICACU	0.60–0.78	A
					DEA Input V	1DE28AVO	27.0-35.0	V
2.2	Set warm boot flag off	1	DPA Cold Boot	1WRMBTSB(0)				
2.3	Upload bakeout patch	1	writeBep	WBBOEN_ENB				
2.4	Enable the FP BO htr	1	changeConfigSetting	WSBAKENABL				
2.5	Set FP temp to -60.0 C	1	changeConfigSetting	WSFTNEG_60				
2.6	dump system config.	0.1	dumpSysConfig	RS_0000001				
2.7	wait for FP temp rise	30			FP Temp		-60.0	C
					Cold Radiator T A	1CRAT	~ -87.0	C
					Cold Radiator T B	1CRBT	~ -87.0	C
3.0	Start heating DH to +25 C							
3.1	Housing Bakeout Enb B	2	Housing B.O. Ena B	1HBOBEN	DA BO B Enb/Dis	1DABOBEN	ENB	
3.2	Housing Bakeout On B	2	Housing B.O. On B	1HBOBON	DA BO B On/Off	1DABOBON	ON	
					DA Htr Output V B	1DAHBVO	28.0–34.0	V

Table 2: (CONT) **Full Bakeout Procedure**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
1.0									
1.1			1	should be at ACIS-S		Y	1or2		
1.2			2	should be at -62.4 C		Y	1or2		
			2	should be at -59.9 C					
				depends on starting point of FP temp.					
			2						
			2						
1.3	Check cmdResult == OK commandEcho 225		B	Load Fullhouse DEA housekeeping parameter block into slot 4		Y	1or2		
1.4	deaHousekeepingData commandEcho 18		B	get FP temp, should be stable and ± 5 C of desired value.		Y	1or2		
1.5	deaHousekeepingData		A	verify FP temp stable at desired temp.		Y	1or2		
2.0									
2.1			2	DEA A Power should be 21 ± 3 W,		Y	1or2		
				current is noisy so an avg. is needed		Y	1or2		
2.2				disable Warm boot if BEP watchdogs		Y	1or2		
2.3	Check cmdResult == OK commandEcho 101		A	Enable the "enable"		Y	1or2		
2.4	Check cmdResult == OK commandEcho 114		A	enable the FP bakeout heater	If *psci* indicates a SWSTAT_DEAMAN_BADCNTLREG	Y	1or2		
2.5	Check cmdResult == OK commandEcho 742		A	Set desired FP temp to -60.0 C, FP bakeout htr comes on.	or SWSTAT_DEABOARD_ERROR, bakeout enabled failed.	Y	1or2		
2.6	Check cmdResult == OK commandEcho 66		B	get data to verify bakeout enable	run *psci -a -l* to examine SysConfig packets.	Y	1or2		
2.7	deaHousekeepingData		A	wait for FP temp to reach -60.0 C cold radiator temp should increase	Time depends on starting T	P	1or2		
3.0									
3.1						Y	1or2		
3.2						Y	1or2		
			2						

Table 1: **Full Bakeout Procedure (Page 2)**

Step #	Title (Revision 5.12_V1.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
					DA Htr Current B	1DAHBCU	~ 2.0	A
3.3	monitor Camera Body temp	60			Camera Body T A	1CBAT	> -60	C
					Camera Body T B	1CBBT	> -60	C
4.0	Verify FP and Camera Body Temp Stable							
4.1	wait for stabilization	480			FP Temp		-60.0	C
					Camera Body T A	1CBAT	$+22.8 \pm 2$	C
					Camera Body T B	1CBBT	$+17.8 \pm 2$	C
					Cold Radiator T A	1CRAT	~ -50.0	C
					Cold Radiator T B	1CRBT	~ -47.5	C
					Warm Radiator T A	1WRAT	~ -37.6	C
					Warm Radiator T B	1WRBT	~ -37.6	C
	Total Time	594.1						

Table 2: (CONT) **Full Bakeout Procedure (Page 2)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
3.3			2 2 2	wait for temp to rise significantly above -60.0 C		P	1or2		
4.0 4.1	deaHousekeepingData		A 2 2 2 2 2 2	verify FP temp stable at -60.0 C should be at +22.8 C should be at +17.8 C cold radiator temp should increase	Time depends on starting T	P	1or2		