1.16_V2.0 DARK CURRENT MEASUREMENT

Last Revised: June 27,1999
Filename: dark_cur

BRIEF FUNCTIONAL DESCRIPTION:
It is useful to measure the dark current of the CCDs at a slightly elevated temperature (T=-90 C) since the dark current of the ACIS CCDs at the operational temperature (T=-120 C) is so low that it is difficult to measure with the existing sensitivity. In order to measure the dark current, we will compute and telemeter bias maps with 9.9 s and 3.3 s exposures. By examining the difference between these maps, one can derive the dark current. If time allows, this measurement may also be made with the CCD temperature at -110 C.

The sequence of actions will be:

1. start a DEA HKP run if necessary
2. configure the instrument to collect imaging array data
3. execute the 9.9 and 3.3 s bias computations with the imaging array include the full configuration dumps
4. configure the instrument to collect spectroscopy array data
5. execute the 9.9 and 3.3 s bias computations with the spectroscopy array include the full configuration dumps
6. power down the video boards and FEPs and return to thermal standby state if necessary

The sequence above will be repeated at the desired temperatures.

ASSUMED INSTRUMENT STATE:
Assumes the focal plane temperature is regulating at the desired temperature.
Assumes that both DPAs and side A of the DEA are on and the flight SW is running.
Assumes that the standard patches are loaded.

SPECIAL INITIAL CONDITIONS:

OPERATIONAL CONSTRAINTS/CAUTIONS:
This procedure does not include a warm boot at the beginning in order to preserve the focal plane temperature setting. If a warm boot is needed, the atomic procedure should be executed, followed by the appropriate procedure to set the focal plane temperature.

REFERENCES:

CHANGE HISTORY:

V1.2

- changed filenames from "ccd_dark" to "dark_cur"

V1.3

- changed step 1 to include a warm boot and start DEA HKP run if necessary
- edited step 2 to include the configuration for data acquisition with imaging array
- edited step 3 to include all the dumps

- edited step 5 to include all the dumps
- added step 6 to put the instrument back into the thermal standby state
- added value of commandEcho for all SW command packets

V1.4

- removed the warm boot which was in the old step 1
- changed the expected value of the DPA A & B and DEA A input voltage and changed the expected values of the DPA A & B and DEA A input currents in steps 2.1 and 6.3
- changed the start science command to "XTZ0000005" in steps 3.2, 3.17, 5.2, and 5.17
- changed the expected time duration of steps 3.29 and 5.29 to 30 m from 45 m
- used command "WSPOW00000" in step 12.1 to power-down the video boards and FEPs

V2.0

- ACIS team signed-off version.
- edited the "Sequence of Actions"
- added comment in step 6.2 to verify that FEPs and video boards are off

Table 1: **Dark Current Measurement**

Step #	Title (Revision 1.16_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
1	Start DEA HKP if necessary							
1.1	Load Board 11 DEA HK	1	loadDeaBlock	WD00001024				
1.2	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
					DPA Input I B	1DPICBCU	1.0–1.2	A
3	Collect ACIS-I biases							
3.1	Load parameter block	1	loadTeBlock	WT000AA014				
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				

Table 2: (CONT) **Dark Current Measurement**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
1									
1.1	Check cmdResult == OK commandEcho 225		B	Load Fullhouse DEA housekeeping parameter block into slot 4		Y	1or2		
1.2	deaHousekeepingData commandEcho 18		B	get FP temp, should be stable and ± 2 C of desired value		Y	1or2		
2									
2.1	Check cmdResult == OK commandEcho 359		A			Y	2	60k	
			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.					
			2						
3									
3.1	Check cmdResult == OK commandEcho 693		A	compute bias with $t_e = 9.9$ s		Y	2	60k	
3.2	Check cmdResult == OK commandEcho 58		A	run I0–I3,S2,S3 CCDs		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	

Table 1: **Dark Current Measurement(Page 2)**

Step #	Title (Revision 1.16_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
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	45						
3.15	Stop Science	1	stopScience	AA00000000				
3.16	Load parameter block	1	loadTeBlock	WT000A8014				
3.17	Start science	1	startScience	XTZ0000005				
3.18	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
3.19	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
3.20	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
3.21	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
3.22	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
3.23	dump system config.	0.1	dumpSysConfig	RS_0000001				
3.24	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
3.25	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
3.26	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				

Table 2: (CONT) **Dark Current Measurement(Page 2)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
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			A	wait for last bias packet		Y	2	60k	
3.15	Check cmdResult == OK commandEcho 1539		A	scienceReport		Y	2	60k	
3.16	Check cmdResult == OK commandEcho 688		A	compute bias with $t_e = 3.3$ s		Y	2	60k	
3.17	Check cmdResult == OK commandEcho 58		A	run I0–I3,S2,S3 CCDs		Y	2	60k	
3.18	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding “truncated blocks” for any of these dumps.	Y	2	60k	
3.19	Check cmdResult == OK commandEcho 75		B			Y	2	60k	
3.20	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
3.21	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
3.22	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
3.23	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
3.24	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
3.25	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
3.26	Check cmdResult == OK		B			Y	2	60k	

Table 1: **Dark Current Measurement(Page 3)**

Step #	Title (Revision 1.16_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
3.27	dump Huffman tables	0.5	dumpHuffman	RH_0000001				
3.28	dump patches	2	dumpPatchlist	RU_0000001				
3.29	Wait for Data Acquisition	30						
3.30	Stop Science	1	stopScience	AA00000000				
4	Configure for spectro							
4.1	Power up spectro video	1	changeConfigSetting	WSVIDSTD_S				
5	Collect ACIS-S biases							
5.1	Load parameter block	1	loadTeBlock	WT000AE014				
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				

Table 2: (CONT) **Dark Current Measurement(Page 3)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
	commandEcho 77								
3.27	Check cmdResult == OK commandEcho 68		B			Y	2	60k	
3.28	Check cmdResult == OK commandEcho 65		B			Y	2	60k	
3.29			A	wait for last bias packet		Y	2	60k	
3.30	Check cmdResult == OK commandEcho 1539		A	scienceReport		Y	2	60k	
4									
4.1	Check cmdResult == OK commandEcho 92		A			Y	2	60k	
5									
5.1	Check cmdResult == OK commandEcho 700		A	compute bias with $t_e = 9.9$ s		Y	2	60k	
5.2	Check cmdResult == OK commandEcho 58		A	run S0-S5 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	

Table 1: **Dark Current Measurement(Page 4)**

Step #	Title (Revision 1.16_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
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	45						
5.15	Stop Science	1	stopScience	AA00000000				
5.16	Load parameter block	1	loadTeBlock	WT000AC014				
5.17	Start science	1	startScience	XTZ0000005				
5.18	dump default TE PBs	0.1	dumpParameterSlots	RT_0000001				
5.19	dump default CC PBs	0.1	dumpParameterSlots	RC_0000001				
5.20	dump default 2D PBs	0.1	dumpParameterSlots	R2_0000001				
5.21	dump default 1D PBs	0.1	dumpParameterSlots	R1_0000001				
5.22	dump default DeaHk PBs	0.1	dumpParameterSlots	RD_0000001				
5.23	dump system config.	0.1	dumpSysConfig	RS_0000001				
5.24	dump bad pixel list	0.5	dumpBadPixels	RP_0000001				
5.25	dump bad TE columns	0.1	dumpBadTeColumn	R4_0000001				
5.26	dump bad CC columns	0.1	dumpBadCcColumn	R3_0000001				
5.27	dump Huffman tables	0.5	dumpHuffman	RH_0000001				

Table 2: (CONT) **Dark Current Measurement(Page 4)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
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			A	wait for last bias packet		Y	2	60k	
5.15	Check cmdResult == OK commandEcho 1539		A	scienceReport		Y	2	60k	
5.16	Check cmdResult == OK commandEcho 697		A	compute bias with $t_e = 3.3$ s		Y	2	60k	
5.17	Check cmdResult == OK commandEcho 58		A	run S0–S5 CCDs		Y	2	60k	
5.18	Check cmdResult == OK commandEcho 78		B		*psci* should not indicate any errors regarding	Y	2	60k	
5.19	Check cmdResult == OK commandEcho 75		B		"truncated blocks" for any of these dumps.	Y	2	60k	
5.20	Check cmdResult == OK commandEcho 72		B			Y	2	60k	
5.21	Check cmdResult == OK commandEcho 71		B			Y	2	60k	
5.22	Check cmdResult == OK commandEcho 63		B			Y	2	60k	
5.23	Check cmdResult == OK commandEcho 66		B			Y	2	60k	
5.24	Check cmdResult == OK commandEcho 83		B			Y	2	60k	
5.25	Check cmdResult == OK commandEcho 80		B			Y	2	60k	
5.26	Check cmdResult == OK commandEcho 77		B			Y	2	60k	
5.27	Check cmdResult == OK		B			Y	2	60k	

Table 1: **Dark Current Measurement(Page 5)**

Step #	Title (Revision 1.16_V2.0)	Time Req (m)	Command Description	Command Mnemonic	Telemetry Description	Telemetry Mnemonic	Expected Value	Units
5.28	dump patches	2	dumpPatchlist	RU_0000001				
5.29	Wait for Data Acquisition	30						
5.30	Stop Science	1	stopScience	AA00000000				
6	Power down VDs and FEPs							
6.1	Power down video boards & FEPs	2	changeConfigSetting	WSPOW00000				
6.2	dump system config.	0.1	dumpSysConfig	RS_0000001				
6.3	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	183.3						

Table 2: (CONT) **Dark Current Measurement(Page 5)**

Step #	Telemetry EGSE	Other Verifier	Crit	Description	Notes	RT Con	Tlm Fmt	Min Alt	SIM Pos
	commandEcho 68								
5.28	Check cmdResult == OK		B			Y	2	60k	
	commandEcho 65								
5.29			A	wait for last bias packet		Y	2	60k	
5.30	Check cmdResult == OK		A	scienceReport		Y	2	60k	
	commandEcho 1539								
6									
6.1	Check cmdResult == OK		A			Y	2	60k	
	commandEcho 773			return to thermal standby state					
6.2	Check cmdResult == OK		B	verify FEPs and video boards off.		Y	1or2		
	commandEcho 66								
6.3			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 avg. is needed					