

DEAD AND NOISY CHANNEL SUMMARY

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I. Introduction

Several sets of dark exposures, with the voltage either on or off were taken after the installation and calibration of the FOS detectors in February and March 1988. These include one set taken specifically to test some proposed discriminator changes. Based primarily on these tests, we make recommendations on an initial list of channels to disable during FOS operations. We emphasize that the current set of disabled channels and discriminator settings is not correct as is.

II. Data

We have examined 21 dark exposures, taken between 26 February and 14 September, 1988 with the F7 Blue detector. These include 11 with the high voltage off. We have also examined 11 dark exposures taken during the same period with the F12 Red detector. These include 5 with the high voltage off. All exposures were composed of 24 slices, of 42 seconds each, for a total per exposure of 1008 seconds, except for one exposure of 504 seconds. Tables 1 and 2 list the relevant parameters of all exposures. The discriminator reference DAC was set to 184 for all exposures. All numberings are from YLOG version 4.0. The exposures taken on or after 24 March 1988 included changes in the discriminator settings listed in the FOS Calibration Report CAL/FOS-50, "Discriminator Settings" as changes and uniformity corrections (Tables 5, 7, and 8 of CAL/FOS-50). Some exposures also included changes listed as tentative changes (Tables 11 and 12 of CAL/FOS-50) and were taken specifically to see if these changes would reduce the noise discovered in the 0V dark exposures of 11 and 14 March 1988. The changes listed in Table 3, below, were also included as part of those tests. The exposures which included these tentative changes are noted in Tables 1, 2, 4 and 5 herein. The discriminator for channel 177 on the Blue side was set incorrectly in these tests. The temperatures listed are from the standard header packet closest in time to the relevant exposures.

In this report, Tables 4 and 5 show all counts recorded in the 0V darks. Note that in the 0V darks it is to be expected statistically that a few channels will show one or two counts. Additionally, when several counts occur in one slice of an exposure, and none in the other slices of that exposure, they are likely to be due to a particle hit and are not considered evidence of a noisy channel. In Tables 6 and 7 we show the number of counts recorded in the darks with the high voltage on for those channels with more than one count in Table 4 or 5, for those which were indicated in "Discriminator Settings" as suspicious in any way (except for dead channels), and for those which had a statistically significant excess of counts in one of the high voltage darks themselves. We define a channel with a statistically significant

excess as follows: if the probability from Poisson statistics of detecting the given number of counts in a channel or a greater number, from a population with the same mean as the dark exposure, multiplied by the number of good channels, is less than 0.5, the channel is noisy. We also show the mean number of counts per channel, excluding bad channels. For the purpose of the tabulation, we relaxed this somewhat if there were several marginally acceptable channels. While this is not strictly statistically valid, we are trying to identify suspicious channels for further scrutiny. From these data we make recommendations on which channels to turn off, including dead channels for completeness.

TABLE 1

Tape/Scan	Blue F7 Detector, Dark Exposures			
	Date	Voltage (HDAC)	Cathode Temp. (PCBTMP)	Preamplifier Temp. (PAMBTMP)
1075 0526	Feb. 1988	18.6kV	23.42	29.23
1075 0527	Feb. 1988	22.5kV	23.92	29.23
1077 0418	14 March 1988	Off	18.31	22.92
1077 1283	24 March 1988	Off	21.91	26.37
1077 1284	24 March 1988	Off	21.91	27.81
1078 0001	13 April 1988	18.6kV	19.34	23.92
1078 0002	13 April 1988	Off	19.34	25.40
1078 0003 ^a	13 April 1988	Off	20.37	26.37
1078 0004	13 April 1988	Off	20.89	27.33
1078 0006 ^a	13 April 1988	Off	21.91	27.33
1078 0007	13 April 1988	Off	21.91	27.33
1078 0008 ^a	13 April 1988	Off	22.41	28.28
1078 0009	13 April 1988	Off	22.41	28.76
1078 0010 ^a	13 April 1988	Off	22.41	28.76
1078 0011	13 April 1988	Off	22.92	29.23
1081 0005 ^b	11 May 1988	0.2kV	22.41	27.33
1081 0006 ^b	11 May 1988	16.3kV	22.41	27.81
1081 0007 ^b	11 May 1988	18.6kV	22.92	28.28
1091 0002 ^b	14 Sept. 1988	0.2kV	18.31	23.42
1091 0003 ^b	14 Sept. 1988	16.3kV	18.31	24.41
1091 0004 ^b	14 Sept. 1988	18.6kV	18.82	25.40

^a includes tentative changes to discriminator settings per Table 3 and CAL/FOS-050

^b FOS in the HST

TABLE 2

Tape/Scan	Date	Voltage (HDAC)	Cathode Temp. (PCATMP)	Preamp Temp. (PAMATMP)
1075 0275	Feb. 1988	21.6	23.42	29.23
1077 0222	11 March 1988	Off	20.37	24.40
1078 0012	13 April 1988	Off	20.37	24.41
1078 0013 ^a	13 April 1988	Off	20.37	25.88
1078 0014	13 April 1988	21.6kV	20.37	26.85
1082 0049 ^b	12 May 1988	0.2kV	21.91	27.33
1082 0050 ^b	12 May 1988	16.3kV	21.91	27.81
1082 0051 ^b	12 May 1988	19.0kV	22.41	28.28
1091 0066 ^b	14 Sept. 1988	0.2kV	18.82	23.92
1091 0067 ^b	14 Sept. 1988	16.3kV	19.34	24.91
1091 0068 ^b	14 Sept. 1988	19.0kV	19.86	25.88

^a includes tentative changes to discriminator settings per Table 3 and CAL/FOS-050

^b FOS in the HST

TABLE 3

Additional Tentative Changes
Blue F7 Detector

Channel	Prom Value	New Value
170	205	219
273	188	200
497	201	211

TABLE 4
Blue F7 Detector, 0V Dark Exposures

Channel	1077 0418	1077 1283	1077 1284	1078 0002	1078 0004	1078 0007	1078 0009	1078 0011	1078 ^a 0003	1078 ^a 0006	1078 ^a 0008	1078 ^a 0010	1081 0005	1091 0002
1		4c					9	8				27		
2														
4								1						1
9						1								
16										1				
30												1		
31	b	187	3	19	69			4	8		1	3	Off	Off
38		1												
41													1	
47													Off	Off
49													Off	Off
51					1									
55													Off	Off
62														
73	b			2	1				2	1			Off	Off
76							1							
82										1				
91						1								
94													Off	Off
101	1			1	1	1								
108									1					
112							1							
115		1	1											
116		1												
117		1												
122														1
133		1						1						
151				1										
169							1							
170		4	6	6									Off	Off
189	1													
201	2538	1947	1684	2125	1762	1666	1578	1547	1862	1738	1683	1544	Off	Off
218	330	288	292	299	309	302	331	317	324	308	334	344	Off	Off
221										1				
222	3	3	1	3	3	1	2				1		Off	Off
223													Off	Off
225			17c		10	1	6	55						
228		1												
234										1				
235														
241												1		1
250						1								
251	1													
255									1					
256	1				1				1	1			1	
257													1	
268	b	b	b	b	b	b	b	b	b	b	b	b	Off	Off

TABLE 4
Blue F7 Detector, 0V Dark Exposures

Channel	1077 0418	1077 1283	1077 1284	1078 0002	1078 0004	1078 0007	1078 0009	1078 0011	1078 ^a 0003	1078 ^a 0006	1078 ^a 0008	1078 ^a 0010	1081 0005	1091 0002
273		19	11		97						6			
278														
280							1						1	
282						1								1
284													Off	Off
290													1	
306					1									
313		1												
320									1					
338														
342					1									3
344														
348							1				1			
366				1										
368													1	
372											1			
409													Off	Off
410	42c												Off	Off
414			1											
419								1						
420	1													
422	20	13							3	1				19
427	b				1	1		1					Off	Off
429	1										19			
431			1											
433			1											
434			1											
435			1											
442						1								
447			1											
448			1											
451	4528	2779	2057	2852	2230	1908	1639	1595	2363	2106	1775	1669	Off	Off
452													1	
462									1					
464													1	
465	6	29	36	61	45	34	45	56	50	35	35	36	Off	Off
472	2	2	1	7	4	2	4	4	2			2	Off	Off
479											1			
497		3											2	1
508												1		
511									1					

a includes tentative changes to discriminator settings per Table 3 and CAL/FOS-050

b >10⁴ counts

c all in one slice

TABLE 5

Red F12 Detector, 0V Dark Exposures

Channel	1077 0222	1078 0012 ^d	1078 0013 ^a	1082 0049	1091 0066
13				1	
29		1			
38				1	
39				1	
40				1	
51		1			
55	1				
57	1				
61					1
89					1
102					1
115				1	
134				1	
138				1	
149				1	
154		1			
167					1
182	55		1	Off	Off
190		1			
218	1	2		1	
219					1
233			23		181
235					1
245				2	
261	5	407	4	Off	Off
263	2	6			
280	3			Off	Off
281	1				
344				802	
352		1			
355		1			
361				1	
378			1		
381		1333			28
384	1				
389				1	
405	b	b	b	Off	Off
409	b	b	b	Off	Off
450	2c				
453					1
458					1
492		1			
500					1
506					1
508					1

a includes tentative changes to discriminator settings per Table 3 and CAL/FOS-050

b >10⁴ counts

c all in one slice

d 504s

TABLE 6
Blue F7 Detector, High Voltage Dark Exposures

Channel	1075 0527	1075 0526	1078 0001	1081 0007	1081 0006	1091 0004	1091 0003
Mean	13.5	3.40	0.470	5.02	2.22	2.03	0.60
1 ^b	1 ^b	0 ^b	0	7	1	2	0
31	13	1	16	Off	Off	Off	Off
57	15	5	1	6	1	2	2
73	12	11	0	Off	Off	Off	Off
94	13	2	2	Off	Off	Off	Off
101	16	5	0	2	3	3	0
110	14	4	0	5	4	2	1
115	15	5	0	5	5	1	2
129	15	0	1	11	1	2	1
133	18	5	1	5	2	1	0
134	14	4	1	6	1	7	0
170	14	2	4	Off	Off	Off	Off
201	1480	1463	2549	Off	Off	Off	Off
218	848	503	557	Off	Off	Off	Off
219	11	2	0	267	943	1	0
222	20	9	4	Off	Off	Off	Off
225	57	23	2	4	8	0	0
249	8	5	1	1	4	3	0
256	32	10	1	5	1	2	1
268	Off	Off	a	Off	Off	Off	Off
273	12	3	0	Off	Off	Off	Off
280	10	6	1	8	1	2	0
301	10	3	0	5	2	2	1
338	23	5	0	6	1	2	0
357	11	0	0	1	5	3	0
410	15	2	0	6	1	2	2
415	27	2	0	4	2	3	2
422	16	3	2	2	2	2	31
427	20	4	0	Off	Off	Off	Off
431	13	10	0	1	3	6	0
439	12	10	0	5	2	2	0
451	1496	1594	3691	Off	Off	Off	Off
465	76	82	23	Off	Off	Off	Off
472	22	7	11	Off	Off	Off	Off
497	14	5	1	0 ^b	1 ^b	119 ^b	30 ^b

a $>10^4$ counts

b The diodes see the inconel metal mask, not the 20x30 mm active area of the photocathode.

TABLE 7

Red F12 Detector, High Voltage Dark Exposures

Channel	1075 0275	1078 0014	1082 0051	1082 0050	1091 0068	1091 0067
Mean	25.7	7.32	17.1	14.4	11.1	8.99
21	25	17	11	13	12	11
47	26	6	35	11	11	2
49	21	6	19	11	10	8
93	32	5	34	17	17	13
150	34	17	19	20	13	6
151	17	18	19	6	14	8
158	31	3	13	14	15	7
182	28	3	Off	Off	Off	Off
218	30	10	19	16	13	7
230	29	9	11	9	15	11
233	30	10	15	21	11	8
245	29	5	20	18	12	11
261	32	7	Off	Off	Off	Off
263	19	11	24	16	12	18
280	22	6	Off	Off	Off	Off
344	31	165	528	472	14	7
381	27	5	16	8	6	61
405	Off	a	Off	Off	Off	Off
409	Off	a	Off	Off	Off	Off
450	14	9	10	11	16	11

a $>10^4$ counts

III. Suspicious Channel Summary

In Section IIIa we give recommendations for all channels on the Blue side which appear with more than one count in either Table 4 or Table 6 or in Table 13 of CAL/FOS-50, "Discriminator Settings". In Section IIIb we make similar recommendations for all channels on the Red side which appear in either Table 5 or Table 7 or in Table 14 of CAL/FOS-50. Our main criteria for recommending that apparently noisy channels be turned off are a count rate greater than 0.002 counts/second/diode in the 0V darks, or a statistically high count rate in the high voltage darks, unless these effects appeared to go away after the discriminators were changed. Channels noticed as bad in other tests are also discussed. Since some very drastic noise bursts occurred only one time per channel, they may be anomalous events related to the laboratory test environment. Conversely, even less frequent, but persistent, noise events may have been missed. Only extended operation will yield certain results. Channels are labeled "On" or "Off" if we feel there will be little debate, and "recommendation: On" or "recommendation: Off" for channels where the decision is not as clear cut. This list and the discriminator settings from CAL/FOS-50 and Table 3 herein is the best "initial guess" for disabled channels and discriminator settings.

IIIa. Blue Detector Recommendation Summary

Channel 1 - This channel showed noisy performance in 4 of 13 0V darks. (In one, all four counts were in the one slice.) All high voltage darks were normal. Recommendation: On. While this violates our criterion, it appears to be temperature sensitive, and probably will not be noisy at operating temperatures.

Channel 31 - This channel showed noisy or very noisy performance in most 0V darks, including those with the tentative changes as well as 1 of 3 high voltage darks. Off.

Channel 47 - Cross-wired with Channel 55. Off. (As determined by G. Hartig and explained in a memo to the IDT dated 23 October 1985.)

Channel 49 - Dead (showed 1 count in one dark). Off.

Channel 55 - Cross-wired with Channel 47. Off.

Channel 57 - This channel showed a broad peak in the discriminator tests. The 0V and high voltage darks are normal. On.

Channel 73 - This channel showed very noisy performance in 1 of 12 0V darks and slightly noisy, but acceptable performance in 4 others, 2 of which (3 counts) had the tentative changes. One of 3 high voltage darks is marginally high. This channel was also intermittently quite noisy during the run of YCAPDF(B) on 14 March 1988, prior to the tentative changes. Recommendation: On, but monitor very closely because of the extreme number of counts in the first 0V dark and the intermittent noise during other tests.

Channel 94 - This channel has one bad bit (the "8" bit) in the discriminator DAC, but has performed flawlessly. On.

Channel 101 - This channel showed 1 count in each of 4 of the 14 0V darks. All high voltage darks were normal. This is a candidate for fixing by varying the discriminator setting. Recommendation: On.

Channel 110 - This channel showed low S/N in the discriminator tests, but it is otherwise normal. On.

Channel 115 - This channel showed 1 count in each of 2 of the 14 0V darks. All high voltage darks were normal. On.

Channel 129 - This channel showed low S/N and a broad peak in the discriminator tests, but it is otherwise normal. On. (One high voltage dark is marginally high.)

Channel 133 - This channel showed 1 count in each of 2 of the 14 0V darks. All high voltage darks were normal. On.

Channel 134 - This channel showed low S/N and a broad peak in the discriminator tests, but it is otherwise normal. On.

Channel 170 - This channel showed 16 counts in 3 of 12 0V darks; none occurred in the darks with the tentative changes. High voltage darks were normal. This may be fixed. Recommendation: On, but monitor.

Channel 201 - Always very noisy. Off.

Channel 218 - Always very noisy. Off.

Channel 219 - This channel showed 2 of 7 high voltage darks as very noisy. No other problems. Recommendation: Off.

Channel 222 - This channel has a high 0 crossing. It showed a total of 17 counts in 8 of 12 0V darks. Only one of these counts occurred during the 4 0V darks with the tentative changes. Performance on all 3 high voltage darks was normal. It should be noted, however, that the expectation of the number of channels with the counts seen in these darks was 0.6, 3, and 10; the discriminator value was changed for the third high voltage dark. Recommendation: On.

Channel 223 - Intermittently dead. Off.

Channel 225 - This channel had a low S/N and high 0 crossing. It was noisy in 5 of 14 0V darks (In one, all 17 counts were in one slice.) and 2 of 7 high voltage darks. The discriminator was changed after these high voltage darks, and both 0V and high voltage darks were normal. Recommendation: On.

Channel 249 - This channel had a high 0 crossing and broad peak, but is otherwise normal. On.

Channel 256 - This channel has a low S/N and a high 0 crossing. It showed a total of 5 counts in 5 of 14 0V darks, all of which occurred after changing the discriminator setting (the change was based on the high voltage darks, one of which was noisy prior to changing the discriminator settings). Recommendation: On.

Channel 268 - Always very noisy. Off.

Channel 273 - This channel was noisy in 4 of 14 0V darks, including one with the tentative changes. The 3 high voltage darks were normal. Recommendation: On, but monitor very carefully. Although the count rate in the 4 0V darks with the tentative changes meets our criteria for a good diode, the appearance of 6 counts in one exposure (three times the specification) makes this suspect.

Channel 280 - This channel had a total of 2 counts in 2 of 14 0V darks. On.

Channel 284 - Dead to light: Off.

Channel 301 - This channel had a high S/N but is otherwise normal. On.

Channel 338 - This channel had 3 counts in 1 of 14 0V darks. All high voltage darks were normal. Recommendation: On, but monitor carefully.

Channel 357 - This channel had a high S/N but is otherwise normal. On.

Channel 409 - Dead. Off.

Channel 410 - This channel had 42 counts in one slice in one 0V dark and was otherwise normal. On.

Channel 415 - This channel showed 27 counts in the first 22kV dark; this value has an expectation of 0.2. After this, the discriminator was changed, and the performance was normal. It was later noted that the 27 counts occurred in a single slice, which would have been taken to mean that the counts occurred as a result of a particle hit, except that during one of the 10 second integrations, during the slow high voltage turn-on of 2 March 1989 (using the new discriminator setting), 329 counts were recorded in this channel. Recommendation: Off.

Channel 422 - This channel had a total of 52 counts in 3 of 10 0V darks with the old discriminator settings, and a total of 4 counts in 2 of 4 0V darks with the tentative settings. It was noisy in 1 of 7 high voltage darks (this did not include the tentative changes). Recommendation: On. It appears as if this channel might be further improved by additional discriminator changes.

Channel 427 - This channel had a high 0 crossing. There was one extremely noisy 0V dark, and 4 others (of a total 12) which showed counts, including one with 19 counts and the tentative changes. This channel was also intermittently quite noisy during the run of YCAPDF(B) on 14 March 1988, prior to the tentative changes. Off.

Channel 431 - This channel had one marginally high count in one high voltage dark, and one count in one 0 voltage dark. On.

Channel 439 - This channel has one bad bit in the discriminator DAC. The only evidence of bad performance is one marginally high count in one 0 voltage dark. On.

Channel 451 - Always very noisy (and intermittently dead on 22 March 1988). Off.

Channel 465 - Always very noisy. Off.

Channel 472 - This channel has a low S/N and a high 0 crossing. One of 3 high volt-

age darks was noisy. Most 0V darks show several counts including those with the tentative changes. Based on this we would recommend leaving this channel on; however, other tests have been very noisy. Off.

Channel 497 - This channel shows a total of 6 counts in 3 of 10 0V darks without the tentative changes, and 0 counts in the 4 0V darks with the tentative changes. However, it is quite noisy in two of the high voltage darks; these did not have discriminator changes. Recommendation: On. Using only the 0V darks with discriminator changes to make the determination, this channel would clearly be left on; however, one of the high voltage darks (no discriminator change) is so bad, it is quite suspect.

IIIb. Red Detector Recommendation Summary

Channel 2 - Dead - Off

Channel 6 - Dead - Off

Channel 21 - This channel showed marginally high counts in one of 6 high voltage dark exposures. On.

Channel 47 - This channel showed marginally high counts in one of 6 high voltage dark exposures. On.

Channel 49 - This channel has a high 0 crossing, and otherwise normal behavior. On.

Channel 93 - This channel showed marginally high counts in one high voltage dark exposure. On.

Channel 150 - This channel showed marginally high counts in one high voltage dark exposure. On.

Channel 151 - This channel showed marginally high counts in one high voltage dark exposure. On.

Channel 158 - This channel has a high 0 crossing, and otherwise normal behavior. On.

Channel 182 - This channel showed 55 counts in one of 2 0V dark exposures with the default discriminators. In the 0V exposure with the tentative changes, it showed 1 count, which could occur in a good channel. Both high voltage dark exposures were normal. Recommendation: On, but monitor very closely.

Channel 212 - Dead. Off.

Channel 218 - In addition to a high 0 crossing, this channel showed a total of 4 counts in 3 of 5 0V darks. All high voltage dark exposures were normal. Because the first 0 volt

dark showed only 1 count, no tentative changes were made. Recommendation: On; it may be possible to improve this diode.

Channel 230 - This channel has a high 0 crossing, and otherwise normal behavior. On.

Channel 233 - This channel showed noisy performance in 2 of 5 0V darks. All high voltage dark exposures were normal. Recommendation: Off.

Channel 245 - This channel shows 2 counts in one of 5 0V darks. On.

Channel 261 - This channel showed noisy performance in all 0V darks in which it was on, including one with the tentative changes. Both high voltage dark exposures were normal. Off.

Channel 263 - This channel showed 8 counts in two 0V dark exposures, and 0 in three, including one with the tentative discriminator change. All high voltage dark exposures were normal. Recommendation: On with the change, but monitor closely.

Channel 280 - Showed 3 counts in one 0V dark exposure, and 0 in two, including one with the tentative discriminator change. All high voltage dark exposures were normal. Recommendation: On with the change, but monitor closely.

Channel 285 - Dead to light. Off.

Channel 344 - This channel showed very noisy performance in one of 5 0V darks, and noisy performance in 3 of 6 high voltage darks. Off.

Channel 381 - This channel showed noisy or very noisy performance in 2 of 5 0V darks and noisy performance in 1 of 6 high voltage darks. Off.

Channel 405 - Always very noisy. Off.

Channel 409 - Always very noisy. Off.

Channel 450 - This channel shows 2 counts in one of 5 0V darks, but as both one in the same slice, it is assumed that this is due to a particle hit. On.

Channel 486 - Intermittently dead. Off

IV. Results of Discriminator Changes

Tables 8 and 9 summarize, for the Blue and Red detectors, the results of the changes and tentative changes from the PROM discriminator settings suggested in CAL/FOS-50, "Discriminator Settings" and in Table 3. In these tables "fix" refers to these suggested discriminator changes.

TABLE 8
Blue F7 Detector Changes

Channel	Result
22	OK
31 ^a	Fix didn't work; off.
73 ^a	May be fixed, but not secure; on.
170 ^a	May be fixed, but not secure; on.
177	This has been set incorrectly in all recent tests, put it back.
222 ^a	May be fixed, but not secure; on.
225	May be fixed, but not secure; on.
256	May be fixed, but not secure; on.
273 ^a	May be fixed, but not secure; on.
410 ^a	OK, probably no need for tentative change.
415	Fix didn't work; off.
422 ^a	May be fixed, but not secure; on.
427 ^a	Fix didn't work; off.
439	OK
465 ^a	Fix didn't work; off.
472 ^a	Fix didn't work; off.
497 ^a	May be fixed, but not secure; on.

^a tentative changes were used

TABLE 9
Red F12 Detector Tentative Changes

Channel	Result
182	May be fixed, but not secure; on.
261	Fix did not work; off.
263	Probably fixed; on.
280	Probably fixed, on.

V. Final Recommendations

Tables 10 and 11 give the recommendations for all problem channels, based on the above data. The column labeled old indicates qualitatively the status of the channel prior to the change of the preamps on the Blue detector and the replacement of the Red detector. These codes are as follows: 3=dead, 2=noisy, and 1=intermittently noisy.

TABLE 10
Blue F7 Detector Summary

Channel	On	Suggest On	Suggest Off	Off	Old
1		✓			
31				✓	
47				✓	3
49				✓	
55				✓	3
57	✓				
73		✓			
94	✓				3
101		✓			
110	✓				
115	✓				
129	✓				
133	✓				
134	✓				
170		✓			2
201				✓	2
218				✓	2
219			✓		
222		✓			2
223				✓	2
225		✓			2
249	✓				
256		✓			
268				✓	
273		✓			2
280	✓				2
284				✓	
301	✓				
338		✓			
357	✓				
409				✓	
410	✓				
415			✓		2
422		✓			2
427				✓	
431	✓				
439	✓				
451				✓	
465				✓	
472				✓	
497		✓			

TABLE 11
Red F12 Detector Summary

Channel	On	Suggest On	Suggest Off	Off	Old
2				✓	3
6				✓	3
21	✓				
47	✓				
49					2
93	✓				
150	✓				
151	✓				
158	✓				
182		✓			
212				✓	
218		✓			
230	✓				
233			✓		
245	✓				
261				✓	1
263		✓			
280		✓			1
285				✓	
344				✓	
381				✓	1
405				✓	
409				✓	
450	✓				
486			✓		

VI. Caveats

1. The noise in the channels can be temperature sensitive. The channels may change from bad to good or good to bad at the lower operating temperature of $\sim -10^{\circ}\text{C}$. Since a thermal vacuum test has not been run on the refurbished FOS (preamp reworked F7 and new F12 tube), the dead and noisy diode list needs to be updated at the beginning of in-orbit HST operation. Note, for example, how the counts in channel 1 during the series of 0V darks on 13 April 1988 are clustered at the end of the series, when the temperature had risen slightly. The temperatures then were considerably higher than the expected operating temperature. The FOS OV program allows for some testing to search for dead and noisy channels under actual operating conditions. Those tests should be used to make final determinations of the list of disabled channels. If, for some reason, those tests cannot be performed or are inconclusive, then the channels listed here should be disabled. It may also be prudent to disable those labeled "Recommendation: On".
2. On the Blue detector, 5 of 8 channels between 218 and 225 are noisy or possibly noisy. Perhaps 1 of these has been saved by varying discriminator settings, and another one perhaps can be. Testing for this should be done.
3. There are 16 channels we would turn off on the Blue side and 11 channels we would turn off on the Red side. There are an additional 11 channels on the Blue side and 4 on the Red side which we recommended leaving on, although there remains some question as to their reliability. Particularly on the Blue side, some of the channels listed as "Recommendation: On" require careful monitoring.
4. Where it is possible to do so without degrading the data (exposures with no overscan), all channels *should be left on* during test exposures, particularly dark exposures, both on the ground, and in orbit. This requires the transmission of only 6 NSSC1 words. There are few enough noisy channels, and they count at a low enough rate, that this should not cause the oversight limit to be exceeded.

