MIT
Center for Space Research

Chandra X-Ray Center

MEMORANDUM
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To:	Martin Elvis, SDS Group Leader
From:	Glenn E. Allen, SDS ACIS Scientist
Subject:	ACIS Bad-pixel STATUS Bits
Revision:	1.4
URL:	http://space.mit.edu/CXC/docs/docs.html#bpixbits
File:	/nfs/cxc/h2/gea/sds/docs/memos/memo_bpix_status_bits_1.4.tex

The thirty-two bits of the column STATUS of an ACIS bad-pixel file (e.g. *_bpix1.fits) are used to describe why a pixel or column is designated as "bad." Events that occur on a bad pixel have a STATUS bit set to one in the Level 1 event data file and are excluded from the Level 2 event data file. Since a bad-pixel file for an observation is the union of pixels and columns identified as bad for many observations in a bad-pixel ARD file and pixels that are identified as bad for the observation (e.g. are identified as such by acis_find_hotpix and acis_classify_hotpix), the Level 1 bad-pixel file (not the bad-pixel ARD file in the CALDB) should be used to produce an instrument map and an imaging or grating ARF for the observation.

Unless otherwise indicated, the descriptions in the table below apply to TIMED mode observations. For continuous-clocking mode observations, bad pixels (and columns) are considered bad columns.

1 STATUS bits

STATUS Bit	Integer Representation†	Condition(s) for which the STATUS bit is set to one
0	1	The pixel is identified as bad in the CALDB bad-pixel ARD file.
1	2	The column is identified as bad in the CALDB bad-pixel ARD file.
2	4	A bias-parity error occurred for the pixel.
3	8	The bias value for the pixel is 4095. This condition indicates that the pixel is identified as bad in the onboard bad-pixel list or is outside the region for which events can be reported.

† This integer representation is appropriate for machines that use the "big-endian" convention for byte strings, where the first byte of the string is assumed to contain the highest-order bits.

STATUS Bit	Integer Representation	Condition(s) for which the STATUS bit is set to one
4	16	The bias value for the pixel is 4094, which indicates that a bias-parity error occurred for the pixel.
5	32	This bit is used to identify the columns along the outer edge of a CCD at CHIPX = 1 and 1024. No events can be reported for these columns.
6	64	For TIMED mode observations, this bit is used to identify the rows along the outer edge of a CCD at CHIPY = 1 and 1024. No events can be reported for these rows.
7	128	This bit is reserved for users to identify pixels that they want to exclude.
8	256	For TIMED FAINT, TIMED VFAINT, and continuous clocking mode observations, this bit is used to identify the eight pixels that surround a bad pixel (and a pixel in a bad column). This condition does not apply to a pixel or column if only one (or more) of the bad-pixel STATUS bits 0, 1, 5, 6, 11, 12, 13, 14 or 15 is set to one.
9	512	For TIMED VFAINT mode observations, this bit is used to identify the rows and columns that are immediately adjacent to the outer edge of a CCD. (i.e. CHIPX = 2 and 1023 and CHIPY = 2 and 1023).
10	1024	This bit is used only for TIMED VFAINT mode observations. It is used in a similar fashion as bit 8. For a bad pixel (or a pixel in a bad column), this bit is set to one for the sixteen pixels that surround the eight pixels for which bit 8 is set to one. This condition does not apply to a pixel or column if only one (or more) of the bad-pixel STATUS bits 0, 1, 5, 6, 11, 12, 13, 14 or 15 is set to one.
11	2048	This bit is used to identify the columns at the mid-chip node boundary (i.e. CHIPX = 512 and 513). The events reported for these columns are often produced by cosmic rays instead of X rays.
12	4096	This bit is used to identify the columns at the quarter-chip node boundaries (i.e. CHIPX = 256, 257, 768, and 769). The events reported for these columns are often produced by cosmic rays instead of X rays.
13	8192	This bit is used to identify the region affected by the "FEP0" problem.
14	16384	This bit is used to identify pixels that are found to be "hot" for the entire duration of an observation.
15	32768	This bit is used to identify pixels that are unusable for part of an observation because the pixel had a cosmic-ray "afterglow." The start and stop times of the afterglow are recorded in the bad-pixel file.
16	65536	This bit is used to identify a pixel which the tool acis_build_badpix found to have a bias value that is either too low or too high compared to the median bias value of the column in which the pixel is located.
17–31	...	Unused.