MIT Kavli Institute

Chandra X-Ray Center

MEMORANDUM

March 29, 2006

To: Jonathan McDowell, SDS Group Leader

From: Glenn Allen, SDS ACIS Scientist

Subject: ACIS Event Data STATUS Bits

Revision: 1.9

URL: http://space.mit.edu/CXC/docs/docs.html#evtbits

File: /nfs/cxc/h2/gea/sds/docs/memos/memo_event_status_bits_1.9.tex

The thirty-two bits of the column STATUS of an ACIS event file (e.g. evt1 or evt1a) are used to indicate various potential problems with the events. If one or more of the bits is set to a value of one for an event, the event may have a problem and is excluded from the Level 2 ACIS event file (i.e. evt2). This memo describes the potential problems associated with each of the thirty-two STATUS bits.

1 STATUS bits

STATUS Bit	Integer Representation†	Condition(s) for which the STATUS bit is set to one
0	1	The CHIPX and CHIPY coordinates of an event are invalid (e.g. the coordinates are outside a window, are on an inactive CCD, or are in the top-half of a CCD experiencing a “FEP0” problem).
1	2	The PHA value of the central pixel of an event island is less than (or, in some cases, less than or equal to) one or more of PHA values of the eight surrounding pixels in the event island (before the CTI adjustment is applied) or is less than the split threshold (not the event threshold).
2	4	One or more of the nine pixels of a 3×3-pixel event island has a PHA value $>$ 4095 after the bias and the delta overclock values have been subtracted.
3	8	The sum of the PHA values of the nine pixels of a 3×3-pixel event island that are $\geq$ the split threshold ≥ 32767 (i.e. $\gtrsim 130$ keV).

† 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 CHIPX and CHIPY coordinates of an event are the coordinates of a pixel that is identified as “bad” in the associated bpix1 file.
5	32	The CHIPX and CHIPY coordinates of one or more of the outer eight pixels of a 3×3-pixel event island (or the outer twenty-four pixels of a 5×5-pixel event island) are the coordinates of a pixel that is identified as “bad” in the associated bpix1 file.
6	64	The bias value associated with the CHIPX and CHIPY coordinates of an event = 4095. This condition occurs if the pixel is indentified as “bad” or if the pixel is not on the active region of a sub array.
7	128	The bias value associated with the CHIPX and CHIPY coordinates of an event is unknown (e.g. telemetry was lost).
8	256	The bias value associated with the CHIPX and CHIPY coordinates of an event = 4094. This condition indicates that the pixel has a bias-parity error.
9	512	The overclock value associated with an event is unknown.
10	1024	The overclock value associated with an event is not in the nominally-expected range of overclock values.
11	2048	The mean PHA value of the four corner pixels of a 3×3-pixel event island < -4095.
12	4096	Bits 12 and 13 are used for TIMED GRADED mode observations to indicate the number of pixels that were included in the computation of the mean PHA value of the four corner pixels of a 3×3-pixel event island. Bits (12,13) have values of (0,0), (1,0), (0,1), or (1,1) to indicate that 4, 3, 2, or 1 pixels were used to compute the mean value of the corner pixels, respectively. Pixels are excluded from the computation if they are indentified “bad” or have bias-parity errors. [Obsolete. The use of this bit has been discontinued.]
13	8192	See STATUS bit 12. [Obsolete. The use of this bit has been discontinued.]
14	16384	The mean value of the four corner pixels of a 3×3-pixel event island = 4095. This condition indicates that all four of the corner pixels are “bad” or have bias-parity errors.
15	32768	The event is associated with a horizontal “streak” on a CCD. Streaks are associated with spurious signals in the read-out electronics.
16	65536	Bits 16–19 are used to indicate that an event may be part of a “cosmic-ray afterglow.” The bits enumerate the number of consecutive frames (including the frame associated with the event) in which events have been reported at the same CHIPX and CHIPY location as the given event. For example, if bits 16–19 are 1100, 1010, or 1111, the event is part of a sequence of 3, 5, or ≥ 15 events at the same CHIPX and CHIPY location, respectively.

STATUS Bit	Integer Representation	Condition(s) for which the STATUS bit is set to one
17–19	—	See STATUS bit 16.
20	1048576	The CTI-adjustment algorithm (if used) did not converge.
21	2097152	An event in a read-out streak is identified as a source event.
22	4194304	An event in a read-out streak is identified as a background event.
23	8388608	The event is identified as a potential cosmic-ray background event. This bit can be set to one only for TIMED VFAINT mode data that was processed using the optional acis_process_events parameter check_vf_pha=yes.
24–31	—	Unused.

STATUS Bit	Tool which sets the bit
0	acis_format_events
1	acis_process_events
2	acis_process_events
3	acis_process_events
4	acis_process_events
5	acis_process_events
6	acis_format_events
7	acis_format_events
8	acis_format_events
9	acis_format_events
10	acis_format_events
11	
12	acis_process_events
13	acis_process_events
14	acis_process_events
15	destreak
16	acis_process_events
17	acis_process_events
18	acis_process_events
19	acis_process_events
20	acis_process_events
21	acisreadcorr
22	acisreadcorr
23	acis_process_events