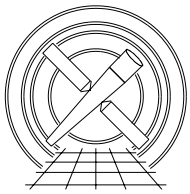

**MIT**
**Center for Space Research** **Chandra X-Ray Center**

**MEMORANDUM**
October 18, 2002

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|---|---|
| **To:** | Martin Elvis, SDS Group Leader |
| **From:** | Glenn Allen, SDS ACIS Scientist |
| **Subject:** | ACIS Event Data STATUS Bits |
| **Revision:** | 1.6 |
| **URL:** | http://space.mit.edu/CXC/docs/docs.html#evtbits |
| **File:** | /nfs/cxc/h2/gea/sds/docs/memos/memo_event_status_bits_1.6.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. |
| 2 | 4 | One or more of the nine pixels of a $3 \times 3$-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 $3 \times 3$-pixel event island that are $\geq$ the split threshold $\geq 32767$ (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 $3 \times 3$-pixel event island (or the outer twenty-four pixels of a $5 \times 5$-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 $3 \times 3$-pixel event island $< -4095$. |
| 12 | 4096 | Bits 12 and 13 are used to indicate the number of pixels that were included in the computation of the mean PHA value of the four corner pixels of a $3 \times 3$-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. |
| 13 | 8192 | See STATUS bit 12. |
| 14 | 16384 | The mean value of the four corner pixels of a $3 \times 3$-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 $\geq 15$ events at the same CHIPX and CHIPY location, respectively. |
| 17–19 | — | See STATUS bit 16. |
| 20 | 1048576 | The CTI-adjustment algorithm (if used) did not converge. |

| STATUS Bit | Integer Representation | Condition(s) for which the STATUS bit is set to one |
|---|---|---|
| 21–22 | — | Unused. |
| 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. |