MIT Kavli Institute

Chandra X-Ray Center

MEMORANDUM
January 22, 2007

To:	Jonathan McDowell, SDS Group Leader
From:	Glenn E. Allen, SDS
Subject:	acis_build_badpix
Revision:	1.1
URL:	http://space.mit.edu/CXC/docs/docs.html#abb
File:	/nfs/cxc/h2/gea/sds/docs/memos/memo_acis_build_badpix_1.1.tex

To make it easier to customize observation-specific bad-pixel files, the tool acis_build_badpix includes two enhancements. One enhancement permits users to ignore selected bad-pixel criteria. For example, a user can choose not to include cosmic-ray afterglows, hot pixels, and/or node boundaries in the output bad-pixel file. This functionality is embodied in the parameter bitflag. The same parameter can be used to prevent the code from identifying the neighbors of bad pixels as bad. For example, it is possible to prevent the code from flagging the columns next to bad columns as bad, but still flag pixels next to other bad pixels as bad.

A second enhancement enables users to include or exclude specific regions from the output file by preparing an ASCII list of the regions of interest. The name of the ASCII file is specified via the parameter usrfile.

1 Changes to acis_build_badpix

1.1 Additional Parameters

1. usrfile,f,h,"none",,,"User-specified supplemental bad-pixel file (NONE — none — <filename>)"
2. bitflag,s,h,"00000000000000022221100120022222",,,"A 32-character string where 0=exclude pixel, 1=include pixel, but not its neighbors and 2=include pixel and its neighbors"

1.2 Additional Input

The user has the option of specifying an ASCII input file which includes one row for each pixel, column or region. Each row has exactly nine columns that are tab or space delimited. The columns are, from left to right along a row,

1. CCD_ID,
2. CHIPX_LO,
3. CHIPX_HI,
4. CHIPY_LO,
5. CHIPY_HI,

6. TIME,
7. TIME_STOP,
8. BIT and
9. ACTION

1.3 Processing

1.3.1 usrfile

If the parameter usrfile is not "none" or "NONE" and specifies an existing ASCII file, then read each row of the file. If an error is detected in any row of the file, then write a warning message, ignore the entire file and continue processing. The possible error conditions include a row that

- does not have nine input values,
- has a CCD_ID that is not one of the CCD_IDs included in the list of active CCDs in the "PBK" extension of the parameter-block file,
- has a chip coordinate < 1 or > 1024,
- has a lower chip coordinate $>$ the corresponding upper chip coordinate,
- has a beginning or ending time < 0,
- has a beginning time $>=$ the ending time,
- has BIT < 0 or > 31 or
- has an ACTION other than "include" or "exclude."

Note that the tool is not sensitive to the case of ACTION. If ACTION = "include," then modify the output bad-pixel file to include a region with the following attributes.

- The input CCD_ID determines which extension is modified.
- The SHAPE is "point" if CHIPX_LO = CHIPX_HI and CHIPY_LO = CHIPY_HI. Otherwise, SHAPE = "rectangle."
- The value of COMPONENT is determined in the usual manner.
- The two values in the double-valued vector column CHIPX are CHIPX_LO and CHIPX_HI.
- The two valued in the double-valued vector column CHIPY are CHIPY_LO and CHIPY_HI.
- The value of TIME is the same as the input value unless the input values of TIME and TIME_STOP are both zero. In this case, set TIME equal to the time associated with the beginning of the observation.
- The value of TIME_STOP is the same as the input value unless the input values of TIME and TIME_STOP are both zero. In this case, set TIME_STOP equal to the time associated with the end of the observation.
- The specified BIT of STATUS is set to one. Note that other bits may be set to one for the region, if it is bad for other reasons.

If ACTION = "exclude," then modify the output bad-pixel file so that any pixel in the region specified by CCD_ID, CHIPX_LO, CHIPX_HI, CHIPY_LO and CHIPY_HI is not regarded as bad for the time interval from TIME to TIME_STOP. (The output may become complicated if the time interval is only a subset of the observation.) Note that the rules about TIME = 0 and TIME_STOP = 0 also apply if ACTION = "exclude." Although a row must include a valid value for BIT if ACTION = "exclude," this information is ignored.

1.3.2 bitflag

Verify that the contents of the parameter bitflag are valid. This parameter should be a thirty-two character string, where the characters correspond to STATUS bits 0–31 from right to left. The acceptable and default values for each character are listed below.

Bit	Default value	Valid values	Comments
0–4, 13–16	2	0–2	
5–6, 9–10	0	0–1	A "2" doesn't make sense.
7	2	1–2	Zero would be confusing if a usrfile is specified.
8	1	1	Adjacent pixels
11–12	1	0–2	
17–31	0	0	Unused

The action associated with each character are

0: Ignore a bad pixel or column. Do not write such regions to the output file unless they satisfy another condition. If they do satisfy another condition, then the STATUS bit(s) for which bitflag = "0" are set to zero. For example, if the characters in the bitflag associated with STATUS bits 14 (hot pixels) and 15 (afterglows) are "0," then exclude hot pixels and afterglows from the output bad-pixel file and do not set STATUS bits 14 and 15 to one for any pixels.

1: Include a bad pixel or column, but not the pixels or columns adjacent to it. For example, if the character in the bitflag associated with STATUS bit 1 (bad columns) is "1," then the bad columns at CHIPX = 66, 496–8 and 738 for CCD_ID = 7 are marked as bad in the output file, but not the columns at CHIPX = 65, 67, 495, 499, 737 and 739. STATUS bit 8 is set to zero for the columns at CHIPX = 66, 496–8 and 738.

2: Include a bad pixel or column and the pixels or columns adjacent to it. For example, if the character in the bitflag associated with STATUS bit 1 (bad columns) is "2," then the bad columns at CHIPX = 66, 496–8 and 738 for CCD_ID = 7 are marked as bad in the output file. In addition, the columns at CHIPX = 65–67, 495–499 and 737–739 have STATUS bit 8 set to one.

After the input in the usrfile and other files has been processed, set the adjacent bits using the standard rules, within the constraints of the parameter bitflag.