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Creating a WFPC2 Yearly Superbias

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ABSTRACT

This TIR describes the process for producing a superbias file from one hundred and twenty of the individual bias images taken during the year as part of the WFPC2 calibration plan. This file is used for pipeline calibration of WFPC2 data taken throughout the year.

Introduction

A superbias is produced yearly, using a selection of the bias images from the previous twelve months. The superbias is a cosmic ray rejected and averaged combination of one hundred and twenty biases chosen to be free of severe bias jumps and visual anomalies. It is used in the pipeline calibration of WFPC2 observations taken throughout the year.

Procedure

I. CREATING FILES

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1) Retrieve a year's worth of uncalibrated bias files from the archive.

There should be more than 120 biases available.[1] In Starview choose Searches, HST, Instruments, WFPC2, and WFPC2 Instrument from the pull-down menu. Set the search criteria to the following:

Image Type = bias
Start Time = dd/mm/yr..dd/mm/yr, or >dd/mm/yr
Gain = 7,15

Select *Uncalibrated Data* for delivery.

You will be making 2 superbiases, one for gain=7 and one for gain=15. You may want to make two separate directories and two separate archive requests. Dividing these requests into smaller groups may allow you get data more quickly.

Once you have the data you can delete all *shf.fits* and *trl.fits* images.

*rm *shf.fits *trl.fits*

---

2) Convert fits files to geis format.

set imtype=hhh
*strfits * oldiraf=yes*

Delete fits files or save them in a different directory. They will confuse the calibration tasks if they are present in the working directory.

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3) Recalibrate raw bias files using *chcalpar* and *calwp2*.

Chcalpar is used to set the mask correction, a-to-d correction, and bias level correction switches to on. You should make sure the parameters are all set to *perform*.

*chcalpar *h*

MASKCORR=PERFORM

1. Herein, lines starting with "#" represent comments, and text in *italics* represent commands to be typed in.

ATODCORR=PERFORM
BLEVCORR=PERFORM.

Calwp2 recalibrates the bias files. Create a file called *cal.cl* that has lines like the following:
calwp2 u43l2801r u43l2801r
calwp2 u43l2802r u43l2802r
calwp2 u43l2803r u43l2803r

stsdas
hst_calib
wfpc
*ls *d0h >> list.txt*
!nawk '{sub(/.d0h/," "); if ($0 !~/xxx/) print}' list.txt >> roots.txt
!awk '{print "calwp2 "$1" "$1}' roots.txt >> cal.cl
cl < cal.cl

Note: if you encounter "Error Opening Reference File: uref$f8213081u.r0h", or a similar error message you may need to process data on a different system.

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4) After recalibration, find out which bias images had bias jumps. The jumps are found by *calwp2*, and documented in the history section of the calibrated header file (.c0h). You will be eliminating the images with the largest jumps.

*!grep level *.c0h > temp1.txt*
!grep HISTORY temp1.txt > temp2.txt

Reformat columns with warnings

!nawk '{sub(/WARNING: /," "); if ($0 !~/xxx/) print}' temp2.txt >> temp3.txt
!nawk '{sub(/h:HISTORY/,"h"); if ($0 !~/xxx/) print}' temp3.txt >> bjumps.txt
!rm temp[1-3].txt

bjumps.txt may have images that are listed more than once (because those images had a bias jump in more than one chip). Before proceeding you need to identify these lines and remove the line[s] (i.e. chip[s]) with the lower bias jump for any repeated images. So in

the end, we want a list of all the bias images with the largest bias jump in each image being noted. The following steps will accomplish this:

!grep PC1: bjumps.txt >> bjumps1.txt
!grep WF2: bjumps.txt >> bjumps2.txt
!grep WF3: bjumps.txt >> bjumps3.txt
!grep WF4: bjumps.txt >> bjumps4.txt

tjoin bjumps1.txt bjumps2.txt match1.txt c1 c1 extraro=first
tjoin bjumps1.txt bjumps3.txt match2.txt c1 c1 extraro=first
tjoin bjumps1.txt bjumps4.txt match3.txt c1 c1 extraro=first
tjoin bjumps2.txt bjumps3.txt match4.txt c1 c1 extraro=first
tjoin bjumps2.txt bjumps4.txt match5.txt c1 c1 extraro=first
tjoin bjumps3.txt bjumps4.txt match6.txt c1 c1 extraro=first

ls match?.txt >> matchfiles.txt
!awk '{print "new_"$1}' matchfiles.txt >> new_matchfiles.txt

epar tselect

Edit lines to match following:

```
ntable =      @matchfiles.txt  Input tables
outtable=  @new_matchfiles.txt  Output tables
expr    =        c2_2 .ne. ""  Expression used for selection
(mode   =                  a)
```

:g

grep bias new_match?.txt >> doubles_temp.txt

tselect doubles_temp.txt doubles1.txt "c6 .gt. c12"
tselect doubles_temp.txt doubles2.txt "c6 .le. c12"

tproject doubles1.txt doubles3.txt c1,c8,c12
tproject doubles2.txt doubles4.txt c1,c2,c6

cat doubles[3-4].txt >> doubles5.txt

doubles.txt has the names of lines you want to remove from *bjumps.txt*

Edit *bjumps.txt* (by hand, or by other method)
Anything with more than two entries on the bjumps list will be repeated in the doubles list, so be sure to check for more than two copies. For these cases you will need to delete more than one of the lines, leaving only the line with the largest bjump value.

!nawk '{sub(/new_match/," "); if ($0 !~/xxx/) print}' doubles5.txt >> doubles6.txt
!nawk '{sub(/1.txt:/," "); if ($0 !~/xxx/) print}' doubles6.txt >> doubles7.txt
!nawk '{sub(/2.txt:/," "); if ($0 !~/xxx/) print}' doubles7.txt >> doubles8.txt
!nawk '{sub(/3.txt:/," "); if ($0 !~/xxx/) print}' doubles8.txt >> doubles9.txt
!nawk '{sub(/4.txt:/," "); if ($0 !~/xxx/) print}' doubles9.txt >> doubles10.txt
!nawk '{sub(/5.txt:/," "); if ($0 !~/xxx/) print}' doubles10.txt >> doubles11.txt
!nawk '{sub(/6.txt:/," "); if ($0 !~/xxx/) print}' doubles11.txt >> doubles.txt

Note: you may need to do the last group of commands separately, not copying all lines to command line at once.

tsort doubles.txt c1
tsort bjumps.txt c1

!nedit doubles.txt&
!nedit bjumps.txt&

!rm bjumps[1-4].txt doubles[1-9].txt doubles1[0-1].txt match[1-6].txt new_match[1-6].txt
!rm matchfiles.txt new_matchfiles.txt doubles_temp.txt

Check that you have gotten all the doubles or triples in *bjumps.txt*. One check that can be run is to verify that where *doublescheck.txt* has repeated rootnames the lines all have the same chip name. If this condition is not met, you know there is a line that has not yet been deleted in *bjumps.txt* which should be.

!awk '{print "!grep "$1" bjumps.txt >> doublescheck.txt"}' doubles.txt >> grep.cl

Add images with no recorded bias jumps to the list of usable images (they were not on the original bjumps list because *calwp2* had no reason to add a line to those images' headers).

tjoin listfiles.txt bjumps.txt bjumps2.txt c1 c1 extraro=first

Check that there are the same number of lines in *listfiles.txt* as in *match.txt*

wc listfiles.txt bjumps2.txt

Sort the list according to bias jump value with the lowest bias jumps at top of list

!nawk '{gsub(/""/,"0"); if ($0 !~/xxx/) print}' bjumps2.txt >> bjumps_sorted_all.txt

Verify that the bias jump levels are in the sixth column (c6) *bjumps_sorted_all.txt* before proceeding.

tsort bjumps_sorted_all.txt c6
tproject bjumps_sorted_all.txt bjumps_sorted.txt c1
!rm bjumps2.txt

The list is now sorted in order of severity of bias jumps. You will use only the 120 biases with the lowest bias jumps, minus any disqualified in the visual review. Generally, it's OK to use images with bias jumps less than about 1 DN. If you do not have 120 images with bias jump less than 1 DN, which is unexpected, then you may have to look into other options.

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5) Display each image using the task *display_all.cl* to look for missing data, residual images, or other anomalies.

The script can be found in /data/snap4/mrichard/wfpc2/superbias_repository/scripts
Make a list of the files to be displayed (just names, no extensions). If you need to change the z1 and z2 values you can do so with the *display_all.cl* text.

*ls -1 *c0h >> listfiles.txt*
cp listfiles.txt anomalies_#.txt #fill in gain value for #
nedit anomalies_#.txt

Run display_all.cl from IRAF:

set stdimage=imt1024
ximtool&
cd
cd iraf
cl
cd /[working directory]/gain[#]

images
tv
display_all listfiles.txt

When using *display_all* for the 1st time, add this line to your *login.cl* file:

```
task   $display_all="/data/snap4/mrichard/wfpc2/superbias_repository/scripts/display_all.cl"
```

Keep track of anomalies in a text file:

nedit anomalies_#.txt

You can expect to see some or all of the following:

a) horizontal lines, bands, jumps of varying width and location:

These will mostly be caught with the bias jump list you've already compiled. As long as the difference is low level it is not a concern. This is especially common on WF4.

b) some images with a much higher than normal number of cosmic rays and/or uncommonly severe CRs:

You can eliminate these images.

c) a light leak / partial illumination anomaly:

This was seen in earlier biases (S. Gonzaga), but not in the 2003-2004 data. This problem should be noted and images that are affected should not be used.

d) persistence (an area of higher signal that may appear for a time after imaging a bright object)

You can eliminate these images if there is a significant difference in levels.

---

6) Once you have identified large bias jumps and visual anomalies you can choose the 120 best biases to use in the superbias. Make a list of the images you plan to use (with .c0h extensions).

cp bjumps_sorted.txt temp.txt

Delete any images you decided to eliminate during visual inspection.

!nedit temp.txt&
!nedit anomalies_7.txt&

Delete lines below 120.

tselect temp.txt filesused.txt "row() .le. 120"

filesused.txt should have 120 lines.

wc filesused.txt
!rm temp.txt

---

7). For each chip, create plots for "biaseven vs date" and "biasodd vs. date" to check for anomalies in the global bias level, and make sure the scatter looks reasonable. You can do this for both the full year's worth of biases and for just the 120 that you plan to use. You will want to repeat this for each gain setting (7,15).

In IRAF:

*hselect *c0h[1] "rootname,expstart,biasodd,biaseven" yes > bias1.txt*
*hselect *c0h[2] "rootname,expstart,biasodd,biaseven" yes > bias2.txt*
*hselect *c0h[3] "rootname,expstart,biasodd,biaseven" yes > bias3.txt*
*hselect *c0h[4] "rootname,expstart,biasodd,biaseven" yes > bias4.txt*

!awk '{print "hselect "$1"[1] rootname,expstart,biasodd,biaseven yes >>
bias1used_7.txt"}' filesused.txt >> hselect.cl
!awk '{print "hselect "$1"[2] rootname,expstart,biasodd,biaseven yes >>
bias2used_7.txt"}' filesused.txt >> hselect.cl
!awk '{print "hselect "$1"[3] rootname,expstart,biasodd,biaseven yes >>
bias3used_7.txt"}' filesused.txt >> hselect.cl
!awk '{print "hselect "$1"[4] rootname,expstart,biasodd,biaseven yes >>
bias4used_7.txt"}' filesused.txt >> hselect.cl

cl < hselect.cl

Using Supermongo to plot:

nedit bias1.sm

The following is a template for creating plots for the PC. You will need to update a number of parameters, including the limits, ticksize, relocate positions, and titles for other plots. See SuperMongo help online if more explanation is needed, or use a different plotting program of your choice.

```
**************************************
DATA bias1.txt
LINES 1 300
READ {dte 2 bsodd 3 bseven 4}

LOCATION 4000 28000 4000 15000
LIMITS 52865. 53246. 295. 300.
TICKSIZE 100. 100. 1. 1.
BOX 1 2
PTYPE 10 3

EXPAND 1
LWEIGHT 1

POINTS dte bsodd

XLABEL MJD DATE
YLABEL BIASODD

LOCATION 4000 28000 17000 28000

LIMITS 52865 53246 295. 300.
TICKSIZE 100. 100. 1. 1.
BOX 1 2
PTYPE 10 3

EXPAND 1
LWEIGHT 1

POINTS dte bseven

YLABEL BIASEVEN

RELOCATE 53186. 299.3
LABEL PC(1), Gain 15

LOCATION  4000 28000 28500 31000
```

LIMITS 0 100 0 100

RELOCATE 4 50
LABEL Date Vs. BIASODD & BIASEVEN For 2003-2004 Superbias
****

After you have created a file use the following commands to view the resulting plots and create postscript files for saving and printing.

To view:
sm
device x11
input bias1.sm
erase

To create Postscript files:
sm
device postfile bias1.ps
input bias1_??.sm (fill in gain)
hardcopy

---

8) Combine each group of forty biases using the IRAF *mkdark* task, creating three new bias files and three new dqf files.

For Gain=15

tselect filesused.txt list1_15 "row() .gt. 0 .and. row() .le. 40"
tselect filesused.txt list2_15 "row() .gt. 40 .and. row() .le. 80"
tselect filesused.txt list3_15 "row() .gt. 80 .and. row() .le. 120"

epar noisepar
(readnoi= 0.33) Read noise (in DN) from noise model
(gain = 15.) Detector gain in electrons/DN
(scaleno= 0.) Multiplicative term (in percent) from noise model
(mode = al)

mkdark @list1_15 bias15_1.c0h bias15_1.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"
mkdark @list2_15 bias15_2.c0h bias15_2.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"

mkdark @list3_15 bias15_3.c0h bias15_3.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"

For Gain=7

tselect filesused.txt list1_7 "row() .gt. 0 .and. row() .le. 40"
tselect filesused.txt list2_7 "row() .gt. 40 .and. row() .le. 80"
tselect filesused.txt list3_7 "row() .gt. 80 .and. row() .le. 120"

epar noisepar

```
(readnoi=          0.71) Read noise (in DN) from noise model
(gain   =          7.0) Detector gain in electrons/DN
(scaleno=            0.) Multiplicative term (in percent) from noise model
(mode   =            al)
```

mkdark @list1_7 bias7_1.c0h bias7_1.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"
mkdark @list2_7 bias7_2.c0h bias7_2.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"
mkdark @list3_7 bias7_3.c0h bias7_3.c1h "6,5,5,4" 1 0.5 4096.0 -99 "med"

---

9) Combine the three files created in the previous *mkdark* steps into the superbias, incorporating all 120 bias files.

For Gain=15
imcalc bias15_1.c0h,bias15_2.c0h,bias15_3.c0h bias15.c0h "(im1+im2+im3)/3"

For Gain=7
imcalc bias7_1.c0h,bias7_2.c0h,bias7_3.c0h bias7.c0h "(im1+im2+im3)/3"

---

10) Use the .c1h files created when *mkdark* was run on the groups of forty biases (Section 8) to make data quality file for the superbias.

#The .c1h files created as a by-product of *mkdark* indicate the following: Pixel values indicate the number of individual bias files used to create the corresponding pixel in the combined bias image. If the value of a pixel in the mask file is thirty, it means that the pixel values from thirty images were used to determine the final pixel value in the combined image (and the pixel was rejected in the remaining ten images).

Add the three mask files:

For Gain=15
imcalc bias15_1.c1h,bias15_2.c1h,bias15_3.c1h bias15_123.c1h "im1+im2+im3"

For Gain=7
imcalc bias7_1.c1h,bias7_2.c1h,bias7_3.c1h bias7_123.c1h "im1+im2+im3"

---

11) To create a data quality file for the superbias, determine a cut-off for the number of pixels from 120 bias files that must have been combined for a given pixel for it to be considered good in the superbias. A superbias pixel created from one hundred or more individual biases is flagged as good (value=0). All other pixels are set to bad (value=2).

For Gain=15
imcalc bias15_123.c1h bias15.c1h "if im1 .lt. 100. then 2. else 0."

For Gain=7
imcalc bias7_123.c1h bias7.c1h "if im1 .lt. 100. then 2. else 0."

II. FORMATTING FILES

Before continuing, compare the newly-created superbias and associated data quality files with previous files and verify that the superbias looks as expected.

1) Generate the header file. The strategy will be to copy the header from the previous superbias and merely change the parameters related to the new superbias image we just created. Specifically, we will combine the header of the previous year's superbias files (c0h and c1h) with the pixel file of the newly-created superbias or supermask file, respectively. The previous year's superbias you should use are the fully processed and ready to deliver superbias with endings .b2h and b2d for the DQF and .r2h and .r2d for the pixel data file. (An example header file is shown in Appendix A.)

Gain=7
moveheader m8r1536ou.r2h bias7.c0h superbias7.c0h
moveheader m8r1536ou.b2h bias7.c1h superbias7.c1h

Gain=15
moveheader m8r1536pu.r2h bias15.c0h superbias15.c0h
moveheader m8r1536pu.b2h bias15.c1h superbias15.c1h

---

2) The parameters in the superbias header file and maskfile need to be edited. C. Ritchie wrote a task called *dohedit2.cl* to do this.

copy *dohedit2.cl* into your working directory
cd [workding directory]
cp /data/snap4/mrichard/wfpc2/superbias_repository/scripts/dohedit2.cl .

define the task:
task dohedit2 = dohedit2.cl

to start task, type:
dohedit2

Run the task on the superbias file (.c0h) the supermask file (.c1h)
Enter the following as prompted:

Input images: [*name of superbias file, or superbias mask file*]
Input image type (MASK, ATOD, BIAS, SHAD, DARK, FLAT): *BIAS*
Input atodgain: [*7 or 15*]
Input shutter (A, B, or ' '): *' '*
Input date (dd/mm/yy): [*date file was created*]

Gain=7
dohedit2
Input images (*.r?h): superbias7.c0h
Input image type (MASK, ATOD, BIAS, SHAD, DARK, FLAT): BIAS
Input atodgain: 7
Input shutter (A, B, or ' '): ' '
Input date (dd/mm/yy): ??/??/??

dohedit2
Input images (*.r?h): superbias7.c1h
Input image type (MASK, ATOD, BIAS, SHAD, DARK, FLAT): BIAS
Input atodgain (7.): 7

Input shutter (A, B, or ' '): ' '
Input date (dd/mm/yy): ??/??/??

Gain=15
dohedit2
Input images (*.r?h): superbias15.c0h
Input image type (MASK, ATOD, BIAS, SHAD, DARK, FLAT): BIAS
Input atodgain: 15
Input shutter (A, B, or ' ') ( ): ' '
Input date (dd/mm/yy): ??/??/??

dohedit2
Input images (*.r?h): superbias15.c1h
Input image type (MASK, ATOD, BIAS, SHAD, DARK, FLAT): BIAS
Input atodgain : 15
Input shutter (A, B, or ' ') ( ): ' '
Input date (dd/mm/yy): ??/??/??

---

3) Each pipeline bias file has a history appended to the header, as well as appropriate pedigree, useafter, and descrip keywords. Edit the headers of your DQF and pixel files:

!nedit superbias7.c0h&
!nedit superbias7.c1h&

Delete all lines beginning with any of the following:

PEDIGREE=
USEAFTER=
DESCRIP =
HISTORY

Create a new HISTORY to be appended. A history template is shown below. You will edit dates, last year's superbias rootname, the list of files used, and your name. The task *stfhistory* is used to add the history to the file header.

To create a compact list of files:

!nawk '{sub(/.c0h/," "); if ($0 !~/xxx/) print}' filesused.txt >> for_hist.txt
!nedit hist_temp.txt

Edit the list to the appropriate width, as shown below.

Now create a file called *h_comment.txt* to contain the updated HISTORY you will use.

!nedit h_comment.txt

****
This superbias file was created from the following 120 on-orbit
bias frames taken between August 2003 and August 2004.
It is not significantly different than superbias m8r1536pu (Aug 2003).

u8v70709m u8v70809m u8v7080am u8v70707m u8v70909m u8v70908m
u8v7060am u8v71809m u8v70408m u8v70308m u8v70507m u8v70509m
u8v70609m u8v70607m u8v7090am u8v71409m u8v71509m u8v71407m
u8v71807m u8v71608m u8v7130am u8v71008m u8v7110am u8v71009m
u8v71209m u8v71307m u8v71309m u8v71308m u8v70307m u8gxkf03m
u8gxhf03m u8gt500am u8u5b203m u8gt5007m u8gt5009m u8u5b204m
u8v70208m u8u5df04m u8u5f203m u8u5df03m u8u5d204m u8u5cf03m
u8u5d203m u8gt4809m u8v70107m u8v70108m u8v7010am u8u5gf04m
u8v70207m u8v7410am u8u5gf03m u8gt4808m u8gt4709m u8gt470am
u8gt4707m u8u5ff04m u8u5g204m u8u5g203m u8v7140am u8v72907m
u8v73007m u8v7310am u8v73307m u8v7320am u8v73208m u8v72808m
u8v72508m u8v72509m u8v7260am u8v72807m u8v7270am u8v71907m
u8v73308m u8v73907m u8v73908m u8v73909m u8v73808m u8v74109m
u8v74009m u8v7370am u8v7240am u8v73408m u8v73309m u8v73508m
u8v73509m u8v73707m u8v7360am u8v72707m u8v72209m u8v7220am
u8v72407m u8v72408m u8v7210am u8v71908m u8v72007m u8v72009m
u8v72109m u8v72207m u8v71208m u8v7180am u8gt4807m u8v71707m
u8v7020am u8v71108m u8u5e303m u8v7340am u8v70209m u8v73108m
u8v71508m u8v7200am u8gt480am u8u5bf04m u8v72108m u8v73109m
u8v72308m u8gt4909m u8v71107m u8v73507m u8v71609m u8v7280am

The raw images were retrieved from the archive and
recalibrated (mask, atod, and bias level corrections) using
CALWP2 Version 1.3.5.2, which removes separate bias levels
for the even and odd data columns based on values in columns
9-14 of the extracted engineering datafile (x0h).

The STSDAS wfpc "mkdark" task (identical to a version of
"crrej" previously used to make reference bias files) was
used to combine the calibrated frames and remove cosmic rays.
The task was run with four iterations, using sigmas set to
6,5,5,and 4; Pixels are rejected if they are N sigma above or

below the initial guess image. The first initial guess image was taken to be the median of the stack; subsequent iterations use the computed average image as the initial guess. In addition, pixels within 1 pixel of a rejected pixel (in a '+' pattern) were discarded if they deviated by more than 2,2,1.5, and 1 sigmas, respectively for each iteration. Pixels using less than 100 input images were marked in the DQF.

On-orbit file was generated and formatted for CDBS installation Jan 25, 2005 at STScI.

Superbias for observations taken after Aug 1, 2003.
****

a) Append the new HISTORY to your superbias headers.

Gain=7
stfhistory superbias7.c0h @h_comment.txt
stfhistory superbias7.c1h @h_comment.txt

Gain=15
stfhistory superbias15.c0h @h_comment.txt
stfhistory superbias15.c1h @h_comment.txt

b) Add PEDIGREE keyword values (update dates to first and last date of the biases used in creating the superbias).

hedit superbias7.c0h PEDIGREE 'INFLIGHT 18/08/03 - 23/08/04' add+ verify-
hedit superbias7.c1h PEDIGREE 'INFLIGHT 18/08/03 - 23/08/04' add+ verify-
hedit superbias15.c0h PEDIGREE 'INFLIGHT 18/08/03 - 23/08/04' add+ verify-
hedit superbias15.c1h PEDIGREE 'INFLIGHT 18/08/03 - 23/08/04' add+ verify-

c) Add the USEAFTER keyword, based on the start date intended for the superbias.

hedit superbias7.c0h useafter ' Aug 01 2003 00:00:00' add+ verify-
hedit superbias7.c1h useafter ' Aug 01 2003 00:00:00' add+ verify-
hedit superbias15.c0h useafter ' Aug 01 2003 00:00:00' add+ verify-
hedit superbias15.c1h useafter ' Aug 01 2003 00:00:00' add+ verify-

d) Add a keyword called DESCRIP. Use the name of the previous year's superbias rootname (where is says "not significantly different from....") and the correct dates:

hedit superbias7.c0h DESCRIP 'Aug 2003-04 yearly superbias, not significantly different from m8r1536ou' add+ verify-
hedit superbias7.c1h DESCRIP 'Aug 2003-04 yearly superbias,not significantly different from m8r1536ou' add+ verify-
hedit superbias15.c0h DESCRIP 'Aug 2003-04 yearly superbias, not significantly different from m8r1536pu' add+ verify-
hedit superbias15.c1h DESCRIP 'Aug 2003-04 yearly superbias, not significantly different from m8r1536pu' add+ verify-

e) Add a keyword called COMMENT, using your own name.

hedit superbias7.c0h comment ' WFPC2 Yearly Superdark created by [your name]' add+ verify-
hedit superbias7.c1h comment 'WFPC2 Yearly Superdark created by [your name]' add+ verify-
hedit superbias15.c0h comment ' WFPC2 Yearly Superdark created by [your name]' add+ verify-
hedit superbias15.c1h comment ' WFPC2 Yearly Superdark created by [your name]' add+ verify-

---

4) Some additional fixes need to be made to the header file before proceeding:

a) Change the data & filetype of the DQF files.

They should be:

```
< BITPIX  =                  16 /
< DATATYPE= 'INTEGER*2'         /
< FILETYPE= 'DQF     '          / shp, ext, edq, sdq, sci
```

But will originally be:

```
< BITPIX  =                  32 /
< DATATYPE= 'REAL*4  '          /
< FILETYPE= 'BAS     '          / shp, ext, edq, sdq, sci
```

Filetype can be set with *hedit*.

hedit superbias7.c1h FILETYPE DQF add+ verify-

hedit superbias15.c1h FILETYPE DQF add+ verify-

The datatype and bitpix are changed using the task *chpixtype*.

chpixtype superbias7.c1h newsuperbias7.c1h[1/4] short
chpixtype superbias7.c1h[2] newsuperbias7.c1h[2] short
chpixtype superbias7.c1h[3] newsuperbias7.c1h[3] short
chpixtype superbias7.c1h[4] newsuperbias7.c1h[4] short

!mv superbias7.c1h oldsuperbias7.c1h
!mv superbias7.c1d oldsuperbias7.c1d
!mv newsuperbias7.c1h superbias7.c1h
!mv newsuperbias7.c1d superbias7.c1d

chpixtype superbias15.c1h newsuperbias15.c1h[1/4] short
chpixtype superbias15.c1h[2] newsuperbias15.c1h[2] short
chpixtype superbias15.c1h[3] newsuperbias15.c1h[3] short
chpixtype superbias15.c1h[4] newsuperbias15.c1h[4] short

!mv superbias15.c1h oldsuperbias15.c1h
!mv superbias15.c1d oldsuperbias15.c1d
!mv newsuperbias15.c1h superbias15.c1h
!mv newsuperbias15.c1d superbias15.c1d

d) Change the extensions (c0h -> r2h & c1h -> b2h).

!mv superbias7.c0h superbias7.r2h
!mv superbias7.c0d superbias7.r2d
!mv superbias7.c1h superbias7.b2h
!mv superbias7.c1d superbias7.b2d
!mv superbias15.c0h superbias15.r2h
!mv superbias15.c0d superbias15.r2d
!mv superbias15.c1h superbias15.b2h
!mv superbias15.c1d superbias15.b2d

e) Update the GPIXELS keyword in both the .r2h and .b2h files to reflect the number of good pixels (obtained from running *wstat* on your files):

Example:

wstat superbias7.r2h usedqf=yes datextn=r2h dqfextn=b2h

Image statistics for superbias7.r2h with mask superbias7.b2h look like the following:

```
****************************************
# GROUP    NPIX       MIN       MAX      MEAN    MIDPT     MODE    STDDEV
[    1]  639964 -0.0170853    35.8422   0.344861   0.34093    0.339   0.14087
[    2]  639969 -0.0262258    127.852   0.336202   0.33187   0.3479   0.26658
[    3]  639938 -0.0593255    396.414   0.329967   0.32438  0.32093   0.53272
[    4]  639941     -0.24    153.379   0.350995   0.34517  0.34855   0.38754
****************************************
```

Using the values from the statistics as shown above:

hedit superbias7.?2h[1] gpixels 639964 verify-
hedit superbias7.?2h[2] gpixels 639969 verify-
hedit superbias7.?2h[3] gpixels 639938 verify-
hedit superbias7.?2h[4] gpixels 639941 verify-

wstat superbias15.r2h usedqf=yes datextn=r2h dqfextn=b2h

Image statistics for superbias15.r2h with mask superbias15.b2h look like the following:

```
 ****************************************
# GROUP    NPIX       MIN       MAX      MEAN    MIDPT     MODE    STDDEV
[    1]  639967 -0.0567898    18.4494   0.188359   0.18729   0.18142  0.081293
[    2]  639954 -0.0932142     64.571   0.162198   0.16033   0.15253   0.13739
[    3]  639912   -0.11065     198.71    0.15443   0.15229   0.15132   0.26709
[    4]  639921  -0.119712    79.2189   0.181118   0.17826   0.16965   0.20457
****************************************
```

hedit superbias15.?2h[1] gpixels 639967 verify-
hedit superbias15.?2h[2] gpixels 639954 verify-
hedit superbias15.?2h[3] gpixels 639912 verify-
hedit superbias15.?2h[4] gpixels 639921 verify-

g) Change some keyword values (so fitsverify will work)

To start, expect to see:

```
  moonangl "" [instead of 0.]
  fgslock  "" [instead of UNKNOWN]
```

```
time-obs "" [instead of "'       '"]
expflag  "" [instead of "'       '"]
seqname  "" [instead of "'       '"]
date-obs [date of last bias observed]
```

hedit superbias7.?2h moonangl "" ver- update+
hedit superbias7.?2h fgslock "" ver- update+
hedit superbias7.?2h time-obs "" ver- update+
hedit superbias7.?2h expflag "" ver- update+
hedit superbias7.?2h seqname "" ver- update+
hedit superbias7.?2h date-obs '2004-08-23' ver- update+

hedit superbias15.?2h moonangl "" ver- update+
hedit superbias15.?2h fgslock "" ver- update+
hedit superbias15.?2h time-obs "" ver- update+
hedit superbias15.?2h expflag "" ver- update+
hedit superbias15.?2h seqname "" ver- update+
hedit superbias15.?2h date-obs '2004-08-23' ver- update+

See Appendix A for an example of a completed superbias header file.

III. CERTIFYING AND DELIVERING FILES

After you have created the superbiases, they need to be delivered to the archive to be used in the pipeline calibration of WFPC2 data. The requirements for delivery quality are described in CDBS TIR 2005-01 "Assessment and Delivery of Reference Files" and the group can be contacted with questions (cdbs@stsci.edu).

---

1) Perform all necessary steps as described in the CDBS TIR, including:

*stwfits *.r2? *.b2?*
*/data/cdbs1/tools/bin/certify *fits*
*fitsverify *fits*
*hselect *fits "pedigree,useafter,descrip,comment,history" yes*

Check with the CDBS group for updated requirements

2) Send an email to cdbs@stsci.edu with the completed CDBS template:

#The current template:

****

1-Name of deliverer:
(other e-mail addresses)
2-Date of delivery:
3-Instrument:
4-Type of file (bias,pht,etc.):
5-History section in header [0] complete? (yes/no):
6-USEAFTER, PEDIGREE, DESCRIP, and COMMENT have been checked? (yes/no)
7-CDBS Verification complete? (fitsverify,certify,etc.):
8-Should these files be ingested in the OPUS, DADS and CDBS databases?
(if not indicate it clearly which ones):
9-Files run through CALXXX or SYNPHOT? (yes/no):
10-Does it replace an old reference file? (yes/no):
10a-If yes, which one?
11- What is the level of change of the file? (e.g. compared to old file it
could be: SEVERE, MODERATE, TRIVIAL, 1‰, 5‰ etc.):
12-Description of how the files were "tested" for correctness:
13-Disk location and name of files

****

Conclusions

The process described here produces a yearly superbias to be used in the pipeline calibration of WFPC2 data taken throughout the year.

Acknowledgements

Previous work by S. Gonzaga and procedures by K. Rudloff were used in writing this report.

References

http://www.stsci.edu/hst/observatory/cdbs/documents/TIR-CDBS-2005-01.pdf
http://www.stsci.edu/hst/observatory/cdbs/deliveries/delivery_form.html
Scripts: /data/snap4/mrichard/wfpc2/superbias_repository/scripts
Old superbiases: /data/snap4/mrichard/wfpc2/superbias_repository/superbias*

Appendix A: Sample Header File for Superbias Reference File

```
SIMPLE  =                    F /
BITPIX  =                   32 /
DATATYPE= 'REAL*4  '           /
NAXIS   =                    2 /
NAXIS1  =                  800 /
NAXIS2  =                  800 /
GROUPS  =                    T /
GCOUNT  =                    4 /
PCOUNT  =                   38 /
PSIZE   =                 1760 /
PTYPE1  = 'CRVAL1  '          /right ascension of reference pixel
PDTYPE1 = 'REAL*8  '           /
PSIZE1  =                   64 /
PTYPE2  = 'CRVAL2  '          /declination of reference pixel
PDTYPE2 = 'REAL*8  '           /
PSIZE2  =                   64 /
PTYPE3  = 'CRPIX1  '          /x-coordinate of reference pixel
PDTYPE3 = 'REAL*4  '           /
PSIZE3  =                   32 /
PTYPE4  = 'CRPIX2  '          /y-coordinate of reference pixel
PDTYPE4 = 'REAL*4  '           /
PSIZE4  =                   32 /
PTYPE5  = 'CD1_1   '          /partial of the right ascension w.r.t. x
PDTYPE5 = 'REAL*4  '           /
PSIZE5  =                   32 /
PTYPE6  = 'CD1_2   '          /partial of the right ascension w.r.t. y
PDTYPE6 = 'REAL*4  '           /
PSIZE6  =                   32 /
PTYPE7  = 'CD2_1   '          /partial of the declination w.r.t. x
PDTYPE7 = 'REAL*4  '           /
PSIZE7  =                   32 /
PTYPE8  = 'CD2_2   '          /partial of the declination w.r.t. y
PDTYPE8 = 'REAL*4  '           /
PSIZE8  =                   32 /
PTYPE9  = 'DATAMIN '          /minimum value of the data
PDTYPE9 = 'REAL*4  '           /
PSIZE9  =                   32 /
PTYPE10 = 'DATAMAX '          /maximum value of the data
PDTYPE10= 'REAL*4  '           /
PSIZE10 =                   32 /
PTYPE11 = 'MIR_REVR'          /is the image mirror reversed?
PDTYPE11= 'LOGICAL*4'          /
PSIZE11 =                   32 /
PTYPE12 = 'ORIENTAT'          /orientation of the image in degrees
```

```
PDTYPE12= 'REAL*4  '          /
PSIZE12 =                   32 /
PTYPE13 = 'FILLCNT '         /number of segments containing fill
PDTYPE13= 'INTEGER*4'         /
PSIZE13 =                   32 /
PTYPE14 = 'ERRCNT  '         /number of segments containing errors
PDTYPE14= 'INTEGER*4'         /
PSIZE14 =                   32 /
PTYPE15 = 'FPKTTIME'         /time of the first packet
PDTYPE15= 'REAL*8  '          /
PSIZE15 =                   64 /
PTYPE16 = 'LPKTTIME'         /time of the last packet
PDTYPE16= 'REAL*8  '          /
PSIZE16 =                   64 /
PTYPE17 = 'CTYPE1  '         /first coordinate type
PDTYPE17= 'CHARACTER*8'       /
PSIZE17 =                   64 /
PTYPE18 = 'CTYPE2  '         /second coordinate type
PDTYPE18= 'CHARACTER*8'       /
PSIZE18 =                   64 /
PTYPE19 = 'DETECTOR'         /CCD detector: PC 1, WFC 2-4
PDTYPE19= 'INTEGER*4'         /
PSIZE19 =                   32 /
PTYPE20 = 'DEZERO  '         /Mean bias level from EED extended register
PDTYPE20= 'REAL*4  '          /
PSIZE20 =                   32 /
PTYPE21 = 'BIASEVEN'         /Bias level for even-numbered columns
PDTYPE21= 'REAL*4  '          /
PSIZE21 =                   32 /
PTYPE22 = 'BIASODD '         /Bias level for odd-numbered columns
PDTYPE22= 'REAL*4  '          /
PSIZE22 =                   32 /
PTYPE23 = 'GOODMIN '         /minumum value of the "good" pixels
PDTYPE23= 'REAL*4  '          /
PSIZE23 =                   32 /
PTYPE24 = 'GOODMAX '         /maximum value of the "good" pixels
PDTYPE24= 'REAL*4  '          /
PSIZE24 =                   32 /
PTYPE25 = 'DATAMEAN'         /mean value of the "good" pixels
PDTYPE25= 'REAL*4  '          /
PSIZE25 =                   32 /
PTYPE26 = 'GPIXELS '          /number of "good" pixels           (DQF=0)
PDTYPE26= 'INTEGER*4'         /
PSIZE26 =                   32 /
PTYPE27 = 'SOFTERRS'          /number of "soft error" pixels     (DQF=1)
PDTYPE27= 'INTEGER*4'         /
PSIZE27 =                   32 /
PTYPE28 = 'CALIBDEF'         /number of "calibration defect" pixels (DQF=2)
PDTYPE28= 'INTEGER*4'         /
PSIZE28 =                   32 /
```

```
PTYPE29 = 'STATICD '      /number of "static defect" pixels     (DQF=4)
PDTYPE29= 'INTEGER*4'         /
PSIZE29 =                  32 /
PTYPE30 = 'ATODSAT '     /number of "AtoD saturated" pixels    (DQF=8)
PDTYPE30= 'INTEGER*4'         /
PSIZE30 =                  32 /
PTYPE31 = 'DATALOST'     /number of "data lost" pixels         (DQF=16)
PDTYPE31= 'INTEGER*4'         /
PSIZE31 =                  32 /
PTYPE32 = 'BADPIXEL'     /number of "generic bad" pixels       (DQF=32)
PDTYPE32= 'INTEGER*4'         /
PSIZE32 =                  32 /
PTYPE33 = 'OVERLAP '     /number of "image overlap" pixels     (DQF=64)
PDTYPE33= 'INTEGER*4'         /
PSIZE33 =                  32 /
PTYPE34 = 'PHOTMODE'         /Photometry mode
PDTYPE34= 'CHARACTER*48'      /
PSIZE34 =                 384 /
PTYPE35 = 'PHOTFLAM'         /Inverse Sensitivity
PDTYPE35= 'REAL*4  '          /
PSIZE35 =                  32 /
PTYPE36 = 'PHOTZPT '         /Zero point
PDTYPE36= 'REAL*4  '          /
PSIZE36 =                  32 /
PTYPE37 = 'PHOTPLAM'         /Pivot wavelength
PDTYPE37= 'REAL*4  '          /
PSIZE37 =                  32 /
PTYPE38 = 'PHOTBW  '        /RMS bandwidth of the filter
PDTYPE38= 'REAL*4  '          /
PSIZE38 =                  32 /
DADSFILE= 'U2OL0G01T.D0F'      /
DADSCLAS= 'CAL     '          /
DADSDATE= '13-DEC-1995 16:20:35' /
DADSFILE= 'U2OL0A01T.D0F'      /
DADSCLAS= 'CAL     '          /
DADSDATE= '16-OCT-1995 19:09:38' /
                          / GROUP PARAMETERS: OSS
                          / GROUP PARAMETERS: PODPS
                               / GROUP PARAMETERS: DATA QUALITY FILE
SUMMARY
                         / GROUP PARAMETERS: PHOTOMETRY
                         / WFPC2 DATA DESCRIPTOR KEYWORDS
INSTRUME= 'WFPC2   '         / instrument in use
ROOTNAME= 'p1p1510lu'        / rootname of the observation set
FILETYPE= 'BAS     '         / shp, ext, edq, sdq, sci
                        / SCIENCE INSTRUMENT CONFIGURATION
MODE    = 'FULL    '     / instr. mode: FULL (full res.), AREA (area int.)
SERIALS = 'OFF     '       / serial clocks: ON, OFF
                         / IMAGE TYPE CHARACTERISTICS
IMAGETYP= 'CDBS    '      / DARK/BIAS/IFLAT/UFLAT/VFLAT/KSPOT/EXT/ECAL
```

```
CDBSFILE= 'BIAS    '         / GENERIC/BIAS/DARK/FLAT/MASK/NO
PKTFMT  = '0       '         / packet format code
                            / FILTER CONFIGURATION
FILTNAM1= '        '         / first filter name
FILTNAM2= '        '         / second filter name
FILTER1 =                  0 / first filter number (0-48)
FILTER2 =                  0 / second filter number (0-48)
FILTROT =           0.000000 / "ramp" filter rotation angle (deg)
LRFWAVE =           0.000000 / linear ramp filter wavelength
                            / INSTRUMENT STATUS USED IN DATA PROCESSING
UCH1CJTM=                 0. / TEC cold junction #1 temperature (Celcius)
UCH2CJTM=                 0. / TEC cold junction #2 temperature (Celcius)
UCH3CJTM=                 0. / TEC cold junction #3 temperature (Celcius)
UCH4CJTM=                 0. / TEC cold junction #4 temperature (Celcius)
UBAY3TMP=                 0. / Bay 3 A1 temperature (Celcius)
KSPOTS  = 'OFF     '         / Status of Kelsall spot lamps: ON, OFF
SHUTTER = '        '       / Shutter in place during preflash or IFLAT (A,B)
ATODGAIN=                 7.0 /
                            / RSDP CONTROL KEYWORDS
MASKCORR= '        '       / Do mask correction: PERFORM, OMIT, COMPLETED
ATODCORR= '        '       / Do A-to-D correction: PERFORM, OMIT, COMPLETED
BLEVCORR= '        '       / Do bias level correction: PERFORM, OMIT, COMPLE
BIASCORR= '        '       / Do bias correction: PERFORM, OMIT, COMPLETED
DARKCORR= '        '       / Do dark correction: PERFORM, OMIT, COMPLETED
FLATCORR= '        '       / Do flat field correction: PERFORM, OMIT, COMPLE
SHADCORR= '        '       / Do shaded shutter correction: PERFORM, OMIT, CO
DOSATMAP= '        '       / Output saturated pixel map: PERFORM, OMIT, COMP
DOPHOTOM= '        '       / Fill photometry keywords: PERFORM, OMIT, COMPLE
OUTDTYPE= '        '       / Output image datatype: REAL, LONG, SHORT
                            / CALIBRATION REFERENCE FILES
MASKFILE= '       '         / name of the input DQF of known bad pixels
ATODFILE= '        '         / name of A-to-D conversion file
BLEVFILE= '        '       / Engineering file with extended register data
BLEVDFIL= '        '         / Engineering file DQF
BIASFILE= '       '         / name of the bias frame reference file
BIASDFIL= '       '         / name of the bias frame reference DQF
DARKFILE= '       '         / name of the dark reference file
DARKDFIL= '       '         / name of the dark reference DQF
FLATFILE= '       '         / name of the flat field reference file
FLATDFIL= '       '         / name of the flat field reference DQF
SHADFILE= '        '       / name of the reference file for shutter shading
PHOTTAB = '       '         / name of the photometry calibration table
GRAPHTAB= '        '
COMPTAB = '        '
                            / DEFAULT KEYWORDS SET BY STSCI
SATURATE=              4095 / Data value at which saturation occurs
USCALE  =                 1. / Scale factor for output image
UZERO   =                 0. / Zero point for output image
                            / READOUT DURATION INFORMATION
READTIME=                  0 / Length of time for CCD readout in clock ticks
```

```
                          / PLANETARY SCIENCE KEYWORDS
PA_V3   =                0. / position angle of v3 axis of HST
RA_SUN  =                0. / right ascension of the sun
DEC_SUN =                0. / declination of the sun
EQNX_SUN=                0. / epoch of the sun
MTFLAG  =                 F / moving target flag
EQRADTRG=                0. / equatorial radius of target
FLATNTRG=                0. / flattening of target
NPDECTRG=                0. / north pole declination of target
NPRATRG =                0. / north pole right ascension of target
ROTRTTRG=                0. / rotation rate of target
LONGPMER=                0. / longitude of prime meridian
EPLONGPM=                0. / epoch of longitude of prime meridian
SURFLATD=                0. / surface feature latitude
SURFLONG=                0. / surface feature longitude
SURFALTD=                0. / surface feature altitude
                           / PODPS FILL VALUES
PODPSFF =                0 / 0=(no podps fill), 1=(podps fill present)
STDCFFF =                0 / 0=(no st dcf fill), 1=(st dcf fill present)
STDCFFP = '        '       / st dcf fill pattern (hex)
RSDPFILL=             -100 / bad data fill value for calibrated images
                           / EXPOSURE TIME AND RELATED INFORMATION
UEXPODUR=               0. / Commanded duration of exposure (seconds)
NSHUTA17=                0 / Number of AP17 shutter B closes
DARKTIME=               0. / Dark time (seconds)
UEXPOTIM=              0. / Major frame pulse preceding exposure start
PSTRTIME= '        '     / Predicted observation start time  (yydddhhmmss)
PSTPTIME= '        '     / Predicted observation stop  time  (yydddhhmmss)

                           / EXPOSURE INFORMATION
EQUINOX = '2000.0  '       / equinox of the celestial coordinate system
SUNANGLE=               0. / angle between the sun and V1 axis (deg)
MOONANGL= '       '         / angle between the moon and V1 axis (deg)
SUN_ALT =            0. / altitude of the sun above the Earth's limb(deg)
FGSLOCK = '         '    / commanded FGS lock (FINE,COARSE,GYROS,UNKNOWN)
DATE-OBS= '2004-08-23'    / UT date of start of observation (dd/mm/yy)
TIME-OBS= '        '       / UT time of start of observation (hh:mm:ss)
EXPSTART=              0. / exposure start time (Modified Julian Date)
EXPEND  =               0. / exposure end time (Modified Julian Date)
EXPTIME =               0. / exposure duration (seconds) -- calculated
EXPFLAG = 'NORMAL  '         / Exposure interruption indicator
                           / TARGET & PROPOSAL ID
TARGNAME= 'BIAS    '         / proposer's target name
RA_TARG =  0.000000000000E+00 / right ascension of target
DEC_TARG=  0.000000000000E+00 / declination of target
PROPOSID= '        '         / PEP proposal identifier
PEP_EXPO= '       '       / PEP exposure identifier including sequence
LINENUM =                0. / PEP proposal line number
SEQLINE =               0. / PEP line number of defined sequence
SEQNAME = '       '         / PEP define/use sequence name
```

```
HISTORY  This superbias file was created from the following 120 on-orbit
HISTORY   bias frames taken between Aug 18, 2003 and Aug 23, 2004.
HISTORY  It is not significantly different than superbias m8r1536ou (Aug
2003).
HISTORY
HISTORY  u8v71602m u8v71603m u8v73803m u8v72301m u8v71902m u8v71604m
HISTORY  u8v73102m u8gt4802m u8gt4704m u8gt4703m u8v73902m u8gt4701m
HISTORY  u8gt4702m u8v72303m u8v73504m u8v73403m u8v73002m u8v74101m
HISTORY  u8v73003m u8v71501m u8v72804m u8gt4804m u8v72503m u8v72402m
HISTORY  u8v73704m u8v72601m u8v73702m u8v72702m u8v71504m u8v70503m
HISTORY  u8v70501m u8v70502m u8gt4903m u8v70403m u8v70401m u8v74002m
HISTORY  u8v70504m u8v70903m u8v71301m u8v71403m u8v70804m u8v70702m
HISTORY  u8v70801m u8v70802m u8v70204m u8v70404m u8u5e301m u8u5df02m
HISTORY  u8u5df01m u8v73904m u8u5bf01m u8u5c201m u8u5ef02m u8u5g201m
HISTORY  u8v70102m u8v70103m u8v70104m u8v72803m u8v74104m u8v73503m
HISTORY  u8v70304m u8v73001m u8v73203m u8v72302m u8v70402m u8v72201m
HISTORY  u8v73204m u8v70301m u8v72101m u8v71601m u8v73804m u8v72404m
HISTORY  u8u5d201m u8v73304m u8v73401m u8v72203m u8gxk202m u8v71503m
HISTORY  u8u5bf02m u8gt4902m u8v70604m u8v71702m u8v71404m u8v70803m
HISTORY  u8v71204m u8v72502m u8v74001m u8u5ef01m u8u5gf01m u8v71502m
HISTORY  u8u5ff02m u8v74103m u8v70202m u8v71002m u8gxhf02m u8v71402m
HISTORY  u8gt4901m u8v72701m u8v72202m u8v74102m u8v72104m u8v73404m
HISTORY  u8v71203m u8v74003m u8v70302m u8v70704m u8v70901m u8v72504m
HISTORY  u8v71804m u8v72403m u8v72903m u8gt5002m u8v72602m u8v72401m
HISTORY  u8u5e302m u8v72501m u8v73701m u8v73202m u8v71401m u8v71001m
HISTORY
HISTORY   The raw images were retrieved from the archive and
HISTORY  recalibrated (mask, atod, and bias level corrections) using
HISTORY  CALWP2 Version 1.3.5.2, which removes separate bias levels
HISTORY  for the even and odd data columns based on values in columns
HISTORY   9-14 of the extracted engineering datafile (x0h).
HISTORY
HISTORY   The STSDAS wfpc "mkdark" task (identical to a version of
HISTORY   "crrej" previously used to make reference bias files) was
HISTORY  used to combine the calibrated frames and remove cosmic rays.
HISTORY   The task was run with four iterations, using sigmas set to
HISTORY  6,5,5,and 4; Pixels are rejected if they are N sigma above or
HISTORY  below the initial guess image. The first initial guess image
HISTORY  was taken to be the median of the stack; subsequent iterations
HISTORY   use the computed average image as the initial guess. In
HISTORY  addition, pixels within 1 pixel of a rejected pixel (in a '+'
HISTORY  pattern) were discarded if they deviated by more than 2,2,1.5,
HISTORY  and 1 sigmas, respectively for each iteration. Pixels using
HISTORY   less than 100 input images were marked in the DQF.
HISTORY
HISTORY  On-orbit file was generated and formatted for CDBS installation
HISTORY   Jan 25, 2005.
HISTORY
HISTORY   Superbias for observations taken after Aug 18, 2003.
```

```
PEDIGREE= 'INFLIGHT 18/08/03 - 23/08/04'
USEAFTER= 'Aug 01 2003 00:00:00'
DESCRIP = 'Reference Superbias for 08/2003-08/2004'
DATE    = '2005-01-25'
HISTORY  superbias7.r2h renamed to p1p1510lu.r2h on Jan 25 2005
COMMENT = 'Superbias created by M. Richardson 01/2005'
END
```