

## Recalibration of Multi-extension FITS image files

Calibrated data from the WFPC2 static archive have been processed using the best-available reference files and are ready for analysis. However, there may be occasions where a user may need calibrated data processed with non-default reference files or calibration switches; in these instances, the raw data can be recalibrated with the desired reference files and switches using the WFPC2 pipeline calibration task, *calwp2*.

### Background

The default data format for images retrieved from the WFPC2 static archive is the **Multi-extension FITS (MEF)** format. If you prefer to use **Generic Edited Information Set (GEIS)** images, you need to specifically request **waiver FITS (wFITS)** images from the archive and convert them to GEIS using the STSDAS task *strfits*.

Users who wish to run *calwp2* using different reference files have the option of using either GEIS or MEF raw images. For GEIS images, there are no changes to running *calwp2*. But for MEF images, please follow the procedures outlined below.

### Dealing with wFITS WFPC2 Reference Files

For historical reasons, most WFPC2 reference files are only available from the archive as wFITS files. Therefore, even though your image data are in the MEF format, *calwp2* must use GEIS format reference files.

This is an example of how the reference files are specified in your image header (excerpted from image ub080101m\_d0m.fits):

```
MASKFILE= 'uref$f8213081u.r0h' / name of the input DQF of known bad pixels
ATODFILE= 'uref$dbu1405fu.r1h' / name of the A-to-D conversion file
WF4TFILE= 'uref$t721550cu.r7h' / name of the WF4 correction reference file
BLEVFILE= 'ucal$sub080101m.x0h' / Engineering file with extended register da
BLEVDFIL= 'ucal$sub080101m.q1h' / Engineering file DQF
BIASFILE= 'uref$t7d1506ou.r2h' / name of the bias frame reference file
BIASDFIL= 'uref$t7d1506ou.b2h' / name of the bias frame reference DQF
DARKFILE= 'uref$t6h10308u.r3h' / name of the dark reference file
DARKDFIL= 'uref$t6h10308u.b3h' / name of the dark reference DQF
FLATFILE= 'uref$m3c10041u.r4h' / name of the flat field reference file
FLATDFIL= 'uref$m3c10041u.b4h' / name of the flat field reference DQF
SHADFILE= 'uref$e371355eu.r5h' / name of the reference file for shutter sha
```

PHOTTAB = ' / name of the photometry calibration table  
 GRAPHTAB= 'mtab\$t2605492m\_tmg.fits' / the HST graph table  
 COMPTAB = 'mtab\$t6i1714pm\_tmc.fits' / the HST components table  
 IDCTAB = 'uref\$sad1946fu\_idc.fits' / Distortion correction table  
 OFFTAB = 'uref\$s9518396u\_off.fits' / Drift correction table  
 DGEOFILE= 'uref\$s8f1222cu\_dxy.fits' / Distortion correction image

Filenames ending with \*h are only available from the archive in the wFITS format, and need to be converted to the GEIS format using *strfits*. The GRAPHTAB, COMPTAB, IDCTAB, OFFTAB, and DGEOFILE reference files do not require any conversions.

### Steps for running *calwp2* on MEF images

1) Retrieve the reference files you need, and the raw image data from the archive. Most of the reference files will arrive in the wFITS format and by default, your image data will arrive in MEF format.

Using ub080101m as an example, this is a list of your raw data in MEF format:

ub080101m\_d0m.fits (raw image data)  
 ub080101m\_q0m.fits (raw image data quality file)  
 ub080101m\_x0m.fits (overscan image, used as the bias level reference file)  
 ub080101m\_q1m.fits (data quality file for the overscan data)

2) Convert wFITS format reference files to GEIS format

As an example, listed below are the default reference files in wFITS format for ub080101m. Place them in a separate subdirectory (e.g. /user/myname/data/ref/).

f8213081u_r0f.fits	Mask Reference File
dbu1405fu_r1f.fits	A-to-D Conversion Reference File
t721550cu_r7f.fits	WF4 Correction Reference File
t7d1506ou_r2f.fits, t7d1506ou_b2f.fits	Bias Reference File & Data Quality File.
t6h10308u_r3f.fits, t6h10308u_b3f.fits	Dark Reference File & Data Quality File.
m3c10041u_r4f.fits, m3c10041u_b4f.fits	Flat Field Reference File & Data Quality File
e371355eu_r5f.fits	Shutter Shading Reference File

Run *strfits* on them.

```
unlearn strfits
strfits *r?f.fits "" ""
```

These are the resulting GEIS files.

```
f8213081u.r0d f8213081u.r0h
dbu1405fu.r1d dbu1405fu.r1h
t721550cu.r7d t721550cu.r7h
t7d1506ou.r2d t7d1506ou.r2h t7d1506ou.b2d t7d1506ou.b2h
t6h10308u.r3d t6h10308u.r3h t6h10308u.b3d t6h10308u.b3h
m3c10041u.r4d m3c10041u.r4h m3c10041u.b4d m3c10041u.b4h
e371355eu.r5d e371355eu.r5h
```

Create a backup directory to store those wFITS reference files, in case you need them later. This is necessary because if wFITS and GEIS reference files are in the same directory, *calwp2* will try to read the wFITS files and will fail because it does not recognize the wFITS format.

```
mkdir ref_fits
mv *r?f.fits *b?f.fits ref_fits/
```

3) Set up pointers for reference and image data.

Set pointers to the reference files so *calwp2* knows their location. For instance,

```
set uref = /user/myname/data/ref/
set mtab = /user/myname/data/ref/
```

The *ucal* pointer shows the location of the overscan reference files (*x0m.fits*, *q1m.fits*) that are part of your raw dataset. Therefore, it points to your working directory that has the rest of your raw data files.

```
set ucal = ./
```

4) Rename the MEF data images to a naming convention recognized by *calwp2*.

Using dataset *ub080101m* as an example, these are the MEF format raw data files from the archive:

```
ub080101m_d0m.fits (raw image data)
ub080101m_q0m.fits (raw data quality file)
ub080101m_x0m.fits (overscan data, used as the bias level reference file)
ub080101m_q1m.fits (data quality file for the overscan data)
```

For historical reasons, *calwp2* is only able to recognize FITS files with suffix *\*f.fits*. Therefore, the raw dataset has to be temporarily renamed from *\*m.fits* to *\*f.fits*.

After making a backup copy of the original raw data, rename the files:

```
mv ub080101m_d0m.fits ub080101m_d0f.fits
mv ub080101m_q0m.fits ub080101m_q0f.fits
mv ub080101m_x0m.fits ub080101m_x0f.fits
mv ub080101m_q1m.fits ub080101m_q1f.fits
```

5) recalibrate your images using *calwp2*

Run *calwp2*.

```
calwp2 ub080101m "" ""
```

The resulting calibrated files are in MEF format.

ub080101m.cgr (a text file)

ub080101m\_c0f.fits

ub080101m\_c1f.fits

ub080101m\_c3t.fits

To maintain the naming convention for MEF format files (and to avoid confusion!), rename \*.fits calibrated image files to \*.m.fits.

```
mv ub080101m_c0f.fits ub080101m_c0m.fits
mv ub080101m_c1f.fits ub080101m_c1m.fits
mv ub080101m_x0f.fits ub080101m_x0m.fits
mv ub080101m_q1f.fits ub080101m_q1m.fits
mv ub080101m_c3t.fits ub080101m_c3m.fits
```