Chandra X-ray Center

AHELP for CIAO 3.4　　　　　**axbary**　　　　　Context: tools

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Synopsis

Apply barycentric corrections to event times, GTIs, and header values.

Syntax

```
axbary  infile orbitfile outfile [ra] [dec] [refframe] [clobber]
```

Description

axbary is a multi−mission tool that applies barycenter corrections to HEASARC−compliant FITS files. It currently recognizes the missions CHANDRA (or AXAF), XTE, and Geocenter.

The script copies the infile to the outfile, applying barycenter corrections to all times in the process. In all tables, the values in the TIME (case−insensitive) column will be corrected, as will the START and STOP columns in the GTI blocks. Time−related header keywords are also corrected (see list below).

The correction is based on either of the JPL solar system ephemerides −− DE200 and DE405. DE405 is consistent with the ICRS reference system (as are Chandra coordinates) and is more accurate. However, many pulsar timing ephemerides are based on DE200 (which uses FK5). If your results are to be compared with data derived with DE200, this must be specified in the refFrame parameter.

axbary searches for the principal HDU in the input FITS file to determine the conversion parameters and then updates the following keywords in all HDUs:

Keyword	Value
TIMESYS	"TDB"
TIMEREF	"SOLARSYSTEM"
RA_NOM	Right Ascension used for barycentering
DEC_NOM	Declination used for barycentering
RADECSYS	Reference frame used ("FK5" or "ICRS")
PLEPHEM	JPL ephemeris used
TSTART	barycenter−corrected

TSTOP	barycenter–corrected
DATE–OBS	barycenter–corrected
DATE–END	barycenter–corrected
TIERRELA	relative clock error
TIERABSO	absolute clock error
TIMEZERO	set to 0.0; previous value will be incorporated in times
CREATOR	"axbary;"
DATE	creation date (UTC)

If needed, axbary applies the best clock correction available, provided that it is defined for the mission. The decision is based on the value of TIERABSO (Currently, this is only the case for RXTE data). The code in axbary is the same as used in the Ftool faxbary.

Example 1

```
axbary event.fits orbit.fits corrected.fits
```

Applies barycenter correction to times in event.fits, using orbit.fits as orbit ephemeris file, and writing output in corrected.fits. RA_NOM and DEC_NOM will be used for the reference position.

Example 2

```
axbary event_1.fits orbit_file_1.fits barycentered.fits ra=278.132
dec=-10.586
```

Uses orbit_file_1.fits to apply barycenter correction to times in event_1.fits. Output is written to barycentered.fits. The RA and DEC for the correction are defined explicitly.

Example 3

```
axbary events.fits orbit_file.fits test_out.fits refframe=FK5
```

Applies barycenter correction to times in events.fits, using orbit_file.fits as the orbit ephemeris file, and writing output in test_out.fits. The FK5 (DE200) solar system ephemeris is used.

Parameters

name	type	ftype	def	reqd
infile	file	input		yes
orbitfile	file	input		yes
outfile	file	output		yes
ra	float		INDEF	
dec	float		INDEF	

                                                                 Example 1

refframe	string		INDEF	
clobber	boolean		no	

Detailed Parameter Descriptions

Parameter=infile `(file required filetype=input)`

Input event file

The input event file should already have any desired GTI/time filtering completed. If you correct the times and then use a GTI filter from the pipeline, you will be filtering out the wrong intervals since those times are not barycentered.

Parameter=orbitfile `(file required filetype=input)`

Input orbit ephemeris file

The Chandra orbit ephemeris file is of the form "orbitf051004864N002_eph1.fits." A complete collection of orbit ephemeris files are available via FTP at ftp://cda.harvard.edu/pub/arcftp/bary/ephem.

If you can't find a level=1 orbit ephemeris file on the server, the level=0 one may be used. The L1 files are the definitive orbit ephemeris files which become available about a week after the dates they cover. In addition to that information, the L0 files contain an extrapolation into the future and are thus always available when the data become available. The file with the the latest start time that is still earlier than the start time of the observation should be used.

Parameter=outfile `(file required filetype=output)`

Output file

The correction can be done in situ by setting the outfile to the same name as the infile and specifying clobber=yes.

Parameter=ra `(float default=INDEF)`

RA in decimal degrees to be used for barycenter corrections.

Values must be J2000 coordinates. If set to INDEF, axbary looks for the value in the header of infile; if the RA_NOM keyword is unavailable, RA_PNT is used. The user is strongly encouraged to provide this value explicitly.

Parameter=dec `(float default=INDEF)`

DEC in decimal degrees to be used for barycenter corrections.

Values must be J2000 coordinates. If set to INDEF, axbary looks for the value in the header of infile; if the DEC_NOM keyword is unavailable, DEC_PNT is used. The user is strongly encouraged to provide this value explicitly.

Parameter=refframe `(string default=INDEF)`

Reference frame to be used for barycenter corrections.

The allowed values for refframe are "FK5" (DE200) or "ICRS" (DE405). If set to INDEF, axbary uses the value of the RADECSYS keyword in the header of infile. As Chandra files have RADECSYS equal to "ICRS", the JPL DE405 solar system ephemeris would then be used. However, if the results are to be compared with data derived with the DE200 ephemeris, the user is advised to specify "FK5."

Parameter=clobber `(boolean default=no)`

If clobber=no, the tool exits instead of overwriting the existing file. Must be set to "yes" for in situ corrections.

CHANGES IN CIAO 3.3

Parameter File

Two parameter names were changed to match parameter naming conventions: orbitfile (was orbitFile) and refframe (was refFrame).

Bugs

See the bugs page for this tool on the CIAO website for an up−to−date listing of known bugs.

See Also

chandra
> eventdef

tools
> acis_process_events, acisreadcorr, hrc_process_events, lightcurve, reproject_aspect, reproject_events, sso_freeze, tg_resolve_events, wcs_match

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Parameter=refframe (string default=INDEF)