

*AHELP for CIAO 3.4*

ardlib

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Synopsis

Analysis Reference Data Library

Syntax

```
Example:
pset ardlib AXAF_ACIS7_BADPIX_FILE = \
"/data/ObsID1843/primary/acisf01843_000N001_bpix1.fits[BADPIX7]"
```

Description

ARDLIB is a software library that provides a mission independent interface to instrument-specific calibration data. Tools such as ``mkarf'`, ``mkwarf'`, ``mkinstmap'`, ``mkgrmf'`, and ``mkexpmap'` use this library to compute effective areas, detector efficiencies, and so on.

Currently the only mission supported by ARDLIB is Chandra. The following Chandra instruments are supported:

- Mirrors: HRMA
- Detectors: ACIS-[0-9], ACIS-I[0-3], ACIS-S[0-5], HRC-S[1-3], HRC-I
- Gratings: HEG, MEG, LEG

Some instruments supported by ARDLIB allow the specification of one or more qualifiers. The use of qualifiers allows the user to influence the calculation performed by ARDLIB for the corresponding instrument. For instance, an exposure map representing the total amount of time spent observing a point in the sky may be easily constructed by using a uniform detector QE of 1.0 (e.g., `detsubsys="ACIS-I3;QE=1;UNIFORM;CONTAM=NO"`) and a mirror effective area of 1.0 (e.g., `mirror="HRMA;area=1"`). Qualifiers allow one to specify these constraints in a simple way. Further details on the use of these parameter qualifiers are given in the help files for individual tools, such as `mkinstmap`, which use the ARDLIB interface.

Generic qualifiers:

Option
HELP

This option causes the calling program to halt with a message specifying the options for the associated parameter. For example, to get a listing of the options for the `detsubsys` parameter of `mkarf`, one can use `detsubsys="ACIS-S3;HELP"`. This causes `mkarf` to exit, displaying a summary of the valid options for the ACIS-S3 subsystem.

HRMA qualifiers:

Option	Details
AREA=value	
SHELL=n	n=1,3,4, or 6
BITMAP=xxxx	x=0 or 1

For example, to specify HRMA shells 1 and 3, which correspond to the bitmap "1100", use "HRMA;bitmap=1100". To compute using a mirror area of 1, use "HRMA;AREA=1".

ACIS-S/I qualifiers:

Option	Details
QE=value	
UNIFORM	forces QE to be uniform
CONTAM=yes no	if yes (the default), correct for ACIS QE changes due to the buildup of contamination on the optical blocking filter.
IDEAL	equivalent to "QE=1;UNIFORM;CONTAM=NO"
CHIP=value	CHIP=4 means ACIS-4, which is also known as ACIS-S0
WINDOW=xmin,ymin,xmax,ymax	
REGION=BOX(xcenter,ycenter,xsize,ysize)	
REGION=RECTANGLE(xmin,xmax,ymin,ymax)	
BPMASK=value	BPMASK=0 means ignore the bad pixel file
TIME=value	Units are seconds since MJDREF

By default, the time dependence of the ACIS QE, due to the buildup of contamination on the optical blocking filter, is accounted for automatically (CONTAM=yes). The QE correction factor is computed for the observation start time, TSTART, taken from the FITS header. For more information about the ACIS filter contamination model, see the ACIS calibration web page at http://cxc.harvard.edu/cal/Acis/WWWacis_cal.html.

If the Observation Information file, e.g., obsfile as specified in mkarf.par, has CTI_CORR=yes, then the CALDB lookups will specify CTI-corrected files.

Note that "QE=xxx" affects the mean QE only; the QE uniformities (QEU) are still applied.

Explicit use of the TIME parameter is normally unnecessary because most tools automatically obtain the observation time from the FITS header. However, if necessary, this option may be used to specify time-dependent instrument parameters such as the ACIS QE. For example, to obtain the value of the correction factor used to account for ACIS-S3 contamination in observations carried out in Jan 2003, one may compute an ARF using the detector subsystem parameter set to:

```
detsubsys="ACIS-7;QE=1;UNIFORM;TIME=1.57788e+08"
```

HEG, MEG, LEG qualifiers:

Option	Details
SHELL=n	n=1,3,4, or 6
BITMAP=xxxx	x=0 or 1

The SHELL and BITMAP parameters allow the computation of a grating efficiency for the corresponding rings of the LETG or HETG grating assembly.

HRC–S/I qualifiers:

Option	Details
QE=value	
UNIFORM	forces QE to be uniform
IDEAL	equivalent to "QE=1;UNIFORM"

ARDLIB has many parameters that specify calibration data for the various missions that it supports. Currently, the only mission that is supported is Chandra. If a parameter value is set to CALDB, the library will query the calibration database (ie CALDB) to find the best file: if you wish to specify a specific file – such as the bad–pixel file that is supplied for each ACIS observation – then you change the parameter to point to that file. Further details are available at the [CIAO threads web page](#).

Parameters

name	type	def
<u>ArdlibDataPath</u>	string	\$ASCDS_CALIB
<u>GENERIC EFFAREA FILE</u>	string	xrt_ea_v2_0.fits
<u>GENERIC VIGNET FILE</u>	string	/dev/null
<u>AXAF EFFAREA FILE 0001</u>	string	CALDB
<u>AXAF EFFAREA FILE 0010</u>	string	CALDB
<u>AXAF EFFAREA FILE 0100</u>	string	CALDB
<u>AXAF EFFAREA FILE 1000</u>	string	CALDB
<u>AXAF EFFAREA FILE 1111</u>	string	CALDB
<u>AXAF VIGNET FILE 0001</u>	string	CALDB
<u>AXAF VIGNET FILE 0010</u>	string	CALDB
<u>AXAF VIGNET FILE 0100</u>	string	CALDB
<u>AXAF VIGNET FILE 1000</u>	string	CALDB
<u>AXAF VIGNET FILE 1111</u>	string	CALDB
<u>AXAF ACIS0 QE FILE</u>	string	CALDB
<u>AXAF ACIS1 QE FILE</u>	string	CALDB
<u>AXAF ACIS2 QE FILE</u>	string	CALDB

<u>AXAF ACIS3 QE FILE</u>	string	CALDB
<u>AXAF ACIS4 QE FILE</u>	string	CALDB
<u>AXAF ACIS5 QE FILE</u>	string	CALDB
<u>AXAF ACIS6 QE FILE</u>	string	CALDB
<u>AXAF ACIS7 QE FILE</u>	string	CALDB
<u>AXAF ACIS8 QE FILE</u>	string	CALDB
<u>AXAF ACIS9 QE FILE</u>	string	CALDB
<u>AXAF ACIS0 OEU FILE</u>	string	CALDB
<u>AXAF ACIS1 OEU FILE</u>	string	CALDB
<u>AXAF ACIS2 OEU FILE</u>	string	CALDB
<u>AXAF ACIS3 OEU FILE</u>	string	CALDB
<u>AXAF ACIS4 OEU FILE</u>	string	CALDB
<u>AXAF ACIS5 OEU FILE</u>	string	CALDB
<u>AXAF ACIS6 OEU FILE</u>	string	CALDB
<u>AXAF ACIS7 OEU FILE</u>	string	CALDB
<u>AXAF ACIS8 OEU FILE</u>	string	CALDB
<u>AXAF ACIS9 OEU FILE</u>	string	CALDB
<u>AXAF ACIS0 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS1 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS2 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS3 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS4 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS5 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS6 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS7 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS8 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS9 BADPIX FILE</u>	string	CALDB
<u>AXAF ACIS0 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS1 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS2 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS3 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS4 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS5 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS6 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS7 CONTAM FILE</u>	string	CALDB
<u>AXAF ACIS8 CONTAM FILE</u>	string	CALDB

<u>AXAF ACIS9 CONTAM FILE</u>	string	CALDB
<u>AXAF HRC-I QE FILE</u>	string	CALDB
<u>AXAF HRC-I QEU FILE</u>	string	CALDB
<u>AXAF HRC-I BADPIX FILE</u>	string	NONE
<u>AXAF HRC-S1 QE FILE</u>	string	CALDB
<u>AXAF HRC-S2 QE FILE</u>	string	CALDB
<u>AXAF HRC-S3 QE FILE</u>	string	CALDB
<u>AXAF HRC-S1 QEU FILE</u>	string	CALDB
<u>AXAF HRC-S2 QEU FILE</u>	string	CALDB
<u>AXAF HRC-S3 QEU FILE</u>	string	CALDB
<u>AXAF HRC-S BADPIX FILE</u>	string	NONE
<u>AXAF HETG 1000 FILE</u>	string	CALDB
<u>AXAF HETG 0100 FILE</u>	string	CALDB
<u>AXAF HETG 0010 FILE</u>	string	CALDB
<u>AXAF HETG 0001 FILE</u>	string	CALDB
<u>AXAF LETG 1000 FILE</u>	string	CALDB
<u>AXAF LETG 0100 FILE</u>	string	CALDB
<u>AXAF LETG 0010 FILE</u>	string	CALDB
<u>AXAF LETG 0001 FILE</u>	string	CALDB
<u>AXAF HETG 1100 LSF FILE</u>	string	CALDB
<u>AXAF HETG 0011 LSF FILE</u>	string	CALDB
<u>AXAF LETG 1111 LSF FILE</u>	string	CALDB
<u>AXAF RMF FILE</u>	string	CALDB
<u>AXAF GAIN FILE</u>	string	CALDB

Detailed Parameter Descriptions

Parameter=ArdlibDataPath (string default=\$ASCDS_CALIB)

Directory containing data files

A colon delimited list of pathnames to search for data files. If the first character of the string is a '\$', then the value represents the name of an environment variable.

Parameter=GENERIC_EFFAREA_FILE (string default=xrt_ea_v2_0.fits)

Effective area file

For generic mission support.

Parameter=GENERIC_VIGNET_FILE (string default=/dev/null)

Vignetting file

For generic mission support.

Parameter=AXAF_EFFAREA_FILE_0001 (string default=CALDB)

AXAF eff-area file 0001

These parameters specify the name of the FITS file and extension number for the on-axis Chandra HRMA effective area for the appropriate shell. The numerical suffixes specify the mirror shell as a shell-bitmap. For instance, _0001 refers to shell 6, _0100 refers to shell 3, and _1111 refers to shells 1,3,4,6.

Parameter=AXAF_EFFAREA_FILE_0010 (string default=CALDB)

AXAF eff-area file 0010

Parameter=AXAF_EFFAREA_FILE_0100 (string default=CALDB)

AXAF eff-area file 0100

Parameter=AXAF_EFFAREA_FILE_1000 (string default=CALDB)

AXAF eff-area file 1000

Parameter=AXAF_EFFAREA_FILE_1111 (string default=CALDB)

AXAF eff-area file 1111

Parameter=AXAF_VIGNET_FILE_0001 (string default=CALDB)

AXAF vignet file 0001

These parameters specify the off-axis vignetting curves for the mirror shells, as described above. The off-axis HRMA effective area is represented as the product of an on-axis effective area with the off-axis vignetting function.

Parameter=AXAF_VIGNET_FILE_0010 (string default=CALDB)

AXAF vignet file 0010

Parameter=AXAF_VIGNET_FILE_0100 (string default=CALDB)

AXAF vignet file 0100

Parameter=AXAF_VIGNET_FILE_1000 (string default=CALDB)

AXAF vignet file 1000

Parameter=AXAF_VIGNET_FILE_1111 (string default=CALDB)

AXAF vignette file 1111

Parameter=AXAF_ACIS0_QE_FILE (string default=CALDB)

ACIS-0 Mean QE File

These parameters specify the ACIS mean QE files for each of the 10 ACIS chips. The QE is given as the product of a mean QE with the uniformity function. The values represented in these files must include the filters.

Parameter=AXAF_ACIS1_QE_FILE (string default=CALDB)

ACIS-1 Mean QE File

Parameter=AXAF_ACIS2_QE_FILE (string default=CALDB)

ACIS-2 Mean QE File

Parameter=AXAF_ACIS3_QE_FILE (string default=CALDB)

ACIS-3 Mean QE File

Parameter=AXAF_ACIS4_QE_FILE (string default=CALDB)

ACIS-4 Mean QE File

Parameter=AXAF_ACIS5_QE_FILE (string default=CALDB)

ACIS-5 Mean QE File

Parameter=AXAF_ACIS6_QE_FILE (string default=CALDB)

ACIS-6 Mean QE File

Parameter=AXAF_ACIS7_QE_FILE (string default=CALDB)

ACIS-7 Mean QE File

Parameter=AXAF_ACIS8_QE_FILE (string default=CALDB)

ACIS-8 Mean QE File

Parameter=AXAF_ACIS9_QE_FILE (string default=CALDB)

ACIS-9 Mean QE File

Parameter=AXAF_ACIS0_QEU_FILE (string default=CALDB)

ACIS-0 Uniformity file

Parameter=AXAF_VIGNET_FILE_1111 (string default=CALDB)

These parameters specify the ACIS detector uniformity files for each of the 10 ACIS chips.

Parameter=AXAF_ACIS1_QEU_FILE (string default=CALDB)

ACIS-1 Uniformity file

Parameter=AXAF_ACIS2_QEU_FILE (string default=CALDB)

ACIS-2 Uniformity file

Parameter=AXAF_ACIS3_QEU_FILE (string default=CALDB)

ACIS-3 Uniformity file

Parameter=AXAF_ACIS4_QEU_FILE (string default=CALDB)

ACIS-4 Uniformity file

Parameter=AXAF_ACIS5_QEU_FILE (string default=CALDB)

ACIS-5 Uniformity file

Parameter=AXAF_ACIS6_QEU_FILE (string default=CALDB)

ACIS-6 Uniformity file

Parameter=AXAF_ACIS7_QEU_FILE (string default=CALDB)

ACIS-7 Uniformity file

Parameter=AXAF_ACIS8_QEU_FILE (string default=CALDB)

ACIS-8 Uniformity file

Parameter=AXAF_ACIS9_QEU_FILE (string default=CALDB)

ACIS-9 Uniformity file

Parameter=AXAF_ACIS0_BADPIX_FILE (string default=CALDB)

ACIS-0 Bad Pixel File

These parameters specify the bad pixel files for each of the 10 ACIS chips. A value of "NONE" may be used if no data is available.

At present, the ardlib does not support the use of time-dependent bad-pixel files. This applies to the creation of instrument maps for merged observations, when the number and distribution of bad pixels changes between observations. Typically the changes in bad pixels are small enough that a single bad-pixel file may be used.

Parameter=AXAF_ACIS1_BADPIX_FILE (string default=CALDB)

ACIS-1 Bad Pixel File

Parameter=AXAF_ACIS2_BADPIX_FILE (string default=CALDB)

ACIS-2 Bad Pixel File

Parameter=AXAF_ACIS3_BADPIX_FILE (string default=CALDB)

ACIS-3 Bad Pixel File

Parameter=AXAF_ACIS4_BADPIX_FILE (string default=CALDB)

ACIS-4 Bad Pixel File

Parameter=AXAF_ACIS5_BADPIX_FILE (string default=CALDB)

ACIS-5 Bad Pixel File

Parameter=AXAF_ACIS6_BADPIX_FILE (string default=CALDB)

ACIS-6 Bad Pixel File

Parameter=AXAF_ACIS7_BADPIX_FILE (string default=CALDB)

ACIS-7 Bad Pixel File

Parameter=AXAF_ACIS8_BADPIX_FILE (string default=CALDB)

ACIS-8 Bad Pixel File

Parameter=AXAF_ACIS9_BADPIX_FILE (string default=CALDB)

ACIS-9 Bad Pixel File

Parameter=AXAF_ACIS0_CONTAM_FILE (string default=CALDB)

ACIS-0 Contamination File

Parameter=AXAF_ACIS1_CONTAM_FILE (string default=CALDB)

ACIS-1 Contamination File

Parameter=AXAF_ACIS2_CONTAM_FILE (string default=CALDB)

ACIS-2 Contamination File

Parameter=AXAF_ACIS3_CONTAM_FILE (string default=CALDB)

ACIS-3 Contamination File

Parameter=AXAF_ACIS4_CONTAM_FILE (string default=CALDB)

ACIS-4 Contamination File

Parameter=AXAF_ACIS5_CONTAM_FILE (string default=CALDB)

ACIS-5 Contamination File

Parameter=AXAF_ACIS6_CONTAM_FILE (string default=CALDB)

ACIS-6 Contamination File

Parameter=AXAF_ACIS7_CONTAM_FILE (string default=CALDB)

ACIS-7 Contamination File

Parameter=AXAF_ACIS8_CONTAM_FILE (string default=CALDB)

ACIS-8 Contamination File

Parameter=AXAF_ACIS9_CONTAM_FILE (string default=CALDB)

ACIS-9 Contamination File

Parameter=AXAF_HRC-I_QE_FILE (string default=CALDB)

HRC-I Mean QE file

The HRC-I mean detector efficiency file.

Parameter=AXAF_HRC-I_QEU_FILE (string default=CALDB)

HRC-I QE Uniformity file

The HRC-I QE Uniformity file.

Parameter=AXAF_HRC-I_BADPIX_FILE (string default=NONE)

HRC-I Bad Pixel File

Parameter=AXAF_HRC-S1_QE_FILE (string default=CALDB)

HRC-S1 Mean QE file

These parameters specify the HRC-S mean QE files for each MCP.

Parameter=AXAF_HRC-S2_QE_FILE (string default=CALDB)

HRC-S2 Mean QE file

Parameter=AXAF_HRC-S3_QE_FILE (string default=CALDB)

HRC-S3 Mean QE file

Parameter=AXAF_HRC-S1_QEU_FILE (string default=CALDB)

HRC-S1 QE Uniformity file

These parameters specify the HRC-S uniformity files for each MCP.

Parameter=AXAF_HRC-S2_QEU_FILE (string default=CALDB)

HRC-S2 QE Uniformity file

Parameter=AXAF_HRC-S3_QEU_FILE (string default=CALDB)

HRC-S3 QE Uniformity file

Parameter=AXAF_HRC-S_BADPIX_FILE (string default=NONE)

HRC-S Bad Pixel File

Parameter=AXAF_HETG_1000_FILE (string default=CALDB)

HETG 1000 efficiency file

These parameters specify the HETG grating efficiency files for the specified mirror shell bitmap.

Parameter=AXAF_HETG_0100_FILE (string default=CALDB)

HETG 0100 efficiency file

Parameter=AXAF_HETG_0010_FILE (string default=CALDB)

HETG 0010 efficiency file

Parameter=AXAF_HETG_0001_FILE (string default=CALDB)

HETG 0001 efficiency file

Parameter=AXAF_LETG_1000_FILE (string default=CALDB)

LETG 1000 efficiency file

These parameters specify the LETG grating efficiency files for the specified mirror shell bitmap.

Parameter=AXAF_LETG_0100_FILE (string default=CALDB)

LETG 0100 efficiency file

Parameter=AXAF_LETG_0010_FILE (string default=CALDB)

LETG 0010 efficiency file

Parameter=AXAF_LETG_0001_FILE (string default=CALDB)

LETG 0001 efficiency file

Parameter=AXAF_HETG_1100_LSF_FILE (string default=CALDB)

MEG LSFARM file

Parameter=AXAF_HETG_0011_LSF_FILE (string default=CALDB)

HEG LSFARM file

Parameter=AXAF_LETG_1111_LSF_FILE (string default=CALDB)

LEG LSFARM file

Parameter=AXAF_RMF_FILE (string default=CALDB)

CCD RMF p3resp file

Parameter=AXAF_GAIN_FILE (string default=CALDB)

Gain File

CHANGES IN CIAO 3.4

A new parameter, "AXAF_GAIN_FILE", has been added to the parameter file.

CHANGES IN CIAO 3.2

The filter contamination model accounts for the time and spatial dependence of the QE. For more information about the ACIS filter contamination model, see [the ACIS calibration web page](#).

Bugs

See the [bugs page for the ARDLIB library](#) on the CIAO website for an up-to-date listing of known bugs.

See Also

calibration
[caldb](#)

modules

caldb, pixlib

tools

acis_bkgrnd_lookup, acis_fef_lookup, acis_set_ardlib, acispec, add_grating_orders, add_grating_spectra, asphist, dither_region, dmarfadd, dmfilth, dmregrid, fullgarf, mkacisrmf, mkarf, mkexpmap, mkgarf, mkgrmf, mkinstmap, mkpsf, mkrmf, mkwarf, psextract, psf_project_ray, quizcaldb, rmfimg, specextract

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