OGIP Calibration Memo CAL/ASD/92-006

ASCA
CALIBRATION FILES IN THE OGIP CALDB

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SUMMARY

The *ASCA* calibration datasets currently in the OGIP calibration database are described.
Intended audience: *ASCA* hardware & GOF teams, OGIP programmers, authors of data analysis s/w and remote caldb-managers.

LOG OF SIGNIFICANT CHANGES

Release Date	**Sections Changed**	**Brief Notes**
1994 Jun 29	All	First Review
1995 Jan 31	All	Made compatible with `LaTeX2HTML` software
1995 Feb 15	Sections 2.5.3 & 3.12.1	Added 2-D PSF datasets
1995 Feb 22	Sections 3.9.6	Added gis#_ano_on_flf_180295.fits files
1995 Mar 07	Section 3.13.5	Added gis#v4_0.rmf files
1995 Jul 27	Section 4.9.1	Added sisph2pi_140795.fits file
1995 Sep 01	Section 2.2.6	Added xrt_ea_v1_1.fits file
1995 Sep 22	Section 2.7.1	Added xrt_psf_v1_0.fits file
1995 Dec 08	Sections 4.10.1, 4.10.2 & 4.10.3	Files reorganized & renamed
1996 Feb 13	Section 3.13.5	Added gis3v4_0_128ch.rmf
	Section 3.13.8	Files added
1996 Feb 26	Sections 2.2.7 & 2.7.2	Files added

Contents

Chapter 1

INTRODUCTION

1.1 Overview

This document is intended to provide a notes on the origin, format, limitations *etc* of all *ASCA* calibration datasets within the OGIP calibration database (caldb). By its nature, it is therefore very much a 'live' document and is expected to expand rapidly throughout the PVC and early AO phases of the mission.

In the rest of this chapter, the location and structure of the OGIP caldb at NASA/GSFC is briefly described, along with references to other relevant documentation. All *ASCA* XRT, GIS & SIS datasets within the caldb at NASA/GSFC are then summarized in Chapters 2, 3 & 4 respectfully, with non-instrument specific datasets summarized in Chapter 5

1.2 The OGIP Caldb at NASA/GSFC

The location, organization and contents of the OGIP calibration database on-line at NASA/GSFC is summarized in OGIP Calibration Memo CAL/GEN/93-006 (available on-line as postscript and html versions).

1.2.1 Location

The OGIP calibration database (caldb) is physically located on the (ultrix) `legacy` machine within the LHEA at NASA/GSFC:

- Internet: `legacy.gsfc.nasa.gov` (128.183.8.233) within the `caldb` directory tree. The entire caldb directory tree is available to remote users via anonymous ftp or gopher. Within the OGIP, the caldb has been remote mounted on all other machines and the symbolic links `/caldb` & `/CALDB` created to point to the above top level directory. An identical copy of the caldb is also available on the (VMS) LHEA vax cluster at NASA/GSFC (see CAL/GEN/93-006, available on-line as postscript and html versions).

1.2.2 Basic Structure

The contents of the `/caldb` area is sub-divided between the following sub-directory trees:

- `data` - containing the calibration dataset directory tree.
- `software` - containing the `caltools` software tasks, the `callib` subroutine library and a number of other software-related items.
- `docs` - containing related calibration documentation

Here we only consider the `data` tree. It should be noted that access to certain caldb directory trees is also available from other areas of the `legacy` anonymous ftp account via symbolic links (see CAL/GEN/93-006, available on-line as postscript and html versions).

1.2.3 Calibration Data File Classes

The OGIP caldb classifies files as 'Primary Calibration Files', 'Basic Calibration Files' and 'Calibration Product Files' (PCFs, BCFs & CPFs respectively; see also CAL/GEN/91-001, available on-line as postscript and html versions). PCFs are 'raw' ground and in-orbit calibration datasets not of immediate interest to most users as they are not directly required for (all but the most specialized) scientific data analysis tasks. These dataset are not considered here. BCFs contain the lowest level calibration datasets potentially required by downstrem software, and can be considered the 'atomic units' of the instrument calibration. CPFs contain 'convolutions' of the information stored within BCFs customized for a specific analysis task and/or scientific observation.

All BCF & CPF calibration files are organized using the scheme

`/caldb/data/`*mission*`/`*inst*

where *mission* & *inst* are the OGIP-standard names for the mission and instrument. For internal management purposes, a further division into *inst*/`bcf` and *inst*/`cpf` sub-directories is made in most cases. Non-instrument specific calibration datasets, including general spacecraft housekeeping information *etc*, can be found in the `/caldb/data/`*mission*`/mis` sub-directory.

1.3 Conventions used within this Document

Throughout this document, the hash (#) symbol is used as a wild-card in filenames to indicate several files are available with slightly different names. In all cases the detailed naming scheme, along with the characters which can be used to replace the # are described in the detailed description of the file set.

PLEASE NOTE: The filenames and locations of the calibration datasets described within this document were chosen by the ASCA GOF at NASA/GSFC in collaboration with the instrument teams and ISAS. Please dont complain to the CALDB if you consider them confusing, inappropriate *etc.*

1.4 Acknowledgments

The information within this document obviously could not have been compiled without the help of very many people within the *ASCA* XRT, GIS & SIS instrument teams, to whom we owe an enormous debt. Wherever possible we acknowledge the direct source of the information within the text, but undoubtedly this may often under-represent the collective effort involved. We apologise to anybody who has inadvertently not been credited, and will be happy to add their name in the appropriate place(s).

Chapter 2

ASCA XRT CALIBRATION FILES

2.1 Summary of Available Files

The XRT calibration files available under the

`/caldb/data/asca/xrt/`*type*

directory tree are listed in Table 2.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 2.1: Summary of *ASCA* XRT calibration files available within the OGIP Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
astrod_image_#_#.fits	XRT 2-D psfs from ray tracing simulations	2.5.2
on_axis_eff_area_010193.fits	on-axis effective area	2.2.1
psf_sm2_#_#.fits	XRT 2-D psfs from Cyg X-1 observations	2.5.3
xrt_alum_trans_05.fits	Al transmission	2.3.1
xrt_ea.fits	Effective areas	2.2.4
xrt_ea_110494.fits	Effective areas	2.2.5
xrt_ea_v1_1.fits	Effective areas	2.2.6
xrt_ea_v2_0.fits	Effective areas	2.2.7
xrt_eef_220693.fits	Encircled Energy Fractions from ray tracing	2.6.1
xrt_kunieda930507.ear	Effective areas	2.2.3
xrt_lalit930330.ear	Effective areas	2.2.2
xrt_psf_isas1.fits	Virtual file for ISAS 2-d psf parameterization	2.5.1
xrt_psf_v1_0.fits	Radial Point Spread Function dataset	2.7.1
xrt_psf_v2_0.fits	Radial Point Spread Function dataset	2.7.2
xrt_vignet1.fits	Virtual file for theoret vignetting function	2.4.1
Calibration Product Files (*type* = `cpf`)		
None		

2.2 BCF: XRT Effective Areas

2.2.1 on_axis_eff_area_010193.fits

Location

caldb/data/asca/xrt/bcf

Status

SUPERSEDED (see Section 2.2.2)

Summary of File

Pre-flight XRT (only) on-axis effective area produced by Hisamitsu Awaki from his ray-tracing simulations, and reformatted by Chales Day.

Delivered to CALDB by:

Charles Day (NASA/GSFC *ASCA* GOF) 1993 Jan 01.

File Format

Close to HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions), but needs a number of keyword values to be altered.

Input Datasets, Assumptions, *etc*

The ray-tracing code was tuned to match optical constant, and to match ground calibration data (WSMR) on Au edges.

No further information available.

Points to Note

- Similar (but vastly larger) datasets listed in Sections 2.2.2 & 2.2.3.
  This dataset is assumed to be out-of-date

2.2.2 xrt_lalit930330.ear

Location

caldb/data/asca/xrt/bcf

Status

SUPERSEDED (see Section 2.2.3)

Summary of File

XRT effective area dataset constructed by the OGIP Calibration Database on 1993 May 10 from a series of ASCII files provided by Lalit Jalota of the NASA/GSFC ASCA mirror team from his ray tracing calculations of 1993 Feb/March.

The effective area dataset consists of a regular (6x6) 2-dimensional grid in `ALPHA`–`BETA` space, where `ALPHA` & `BETA` are cartesian coordinates in the focal plane, with 4 arcmin spacing. Due to the symmetry of the telescopes, only one quadrant of one telescope is mapped.

Delivered to CALDB by:

Lalit Jalota (NASA/GSFC XRT Team) as ASCII files, reformatted to OGIP standard by Ian M George.

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- **WARNING:** This dataset is known to have the following problems:
  - One of the original ASCII files was missing (at `ALPHA`=4, `BETA`=8 arcmin)
    This FITS dataset was therefore created using the symmetric `ALPHA`=8,`BETA`=4 arcmin dataset it its place.
  - One of the original ASCII files (at `ALPHA`= 20, `BETA`=16 arcmin) contained `NAN` (not a number) values throughout.
    This dataset contains the value -99 within the FITS file
    EXTREME CAUTION IS THEREFORE REQUIRED AROUND THESE COORDS

  Lalit has promised to re-supply copies of the relevant ASCII files and the dataset will be updated asap

- No s/w currently exists to automatically access these datasets should an effective area for off-axis position in one of the other 3 quadrants be required.
  A Virtual calibration file & associated task is required.

- Similar datasets listed in Sections 2.2.1 & 2.2.3.

2.2.3 xrt_kunieda930507.ear

Location

caldb/data/asca/xrt/bcf

Status

SUPERSEDED (see Section 2.2.4)

Summary of File

This dataset is a FITS version of the results of the ray-tracing simulations of the Nagoya group, supplied to the HEASARC in ASCII format by the NASA/GSFC *ASCA* GOF on 1993 May 11.

Follows is an abridged version of the accompanying text file:

> Asuka XRT response functions Ver.0.0
>
> These response functions were made by raytracing simulations which was accordance with results of only on ground calibration. But note that these have about 10% error. Effective area was calculated from photons integrated in 12mm dia. circle at focal plan., 0.1keV to 10.0keV (0.1keV interval), and for zenith angle from 0' to 15'(1' interval).
>
> The original ASCII datasets are from:
>
> - `satsuki/h1/kunieda/xrt/p000`, and
> - `satsuki/h1/kunieda/xrt/p045`,
>
> where `p000` and `p045` represent phase angle of off-axis sources. The phase angle is measured from the boundary of quadrants.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) as ASCII files, reformatted to OGIP standard by Ron Zellar.

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No further information supplied to the CALDB beyond that given above.

Points to Note

- Similar datasets listed in Sections 2.2.1 & 2.2.2.

2.2.4 xrt_ea.fits

Location

caldb/data/asca/xrt/bcf

Status

SUPERSEDED (see Section 2.2.5)

Summary of File

Unknown

Delivered to CALDB by:

Unknown

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- Status of this dataset is unclear **USE AT YOUR OWN RISK**

2.2.5 xrt_ea_110494.fits

Location

caldb/data/asca/xrt/bcf

Status

Assumed SUPERSEDED (see Section 2.2.6)

Summary of File

Unknown

Delivered to CALDB by:

Unknown

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- Status of this dataset is unclear **USE AT YOUR OWN RISK**

2.2.6 xrt_ea_v1_1.fits

Location

caldb/data/asca/xrt/bcf

Status

SUPERSEDED (see Section 2.2.7)

Summary of File

XRT effective area from Nagoya ray-tracing (version 1.2)

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC ASCA GOF) 1995 Aug 31

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No further information supplied to the CALDB.

Points to Note

- None

2.2.7 xrt_ea_v2_0.fits

Location

caldb/data/asca/xrt/bcf

Status

CURRENT

Summary of File

No information supplied to the CALDB

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC ASCA GOF) 1996 Feb 23

File Format

HDUDOC/VERS = `CAL/GEN/92-019/1.0.0`
(see CAL/GEN/92-019, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No further information supplied to the CALDB.

Points to Note

- None

2.3 BCF: XRT Window Transmissions

2.3.1 xrt_alum_trans_05.fits

Location

caldb/data/asca/xrt/bcf

Status

Current

Summary of File

XRT window transmission dataset converted to OGIP standard format from the file `alum_trans_0.5.fits` supplied by Eric Gotthelf.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) as ASCII file, reformatted to OGIP standard by Ian M George.

File Format

OGIP format FLTVERSN = 1992a

Input Datasets, Assumptions, *etc*

Transmission computed by interpolating tabulated atomic photo-electric cross-section data from Veigele (1973)

No further information supplied to the CALDB.

Points to Note

- *None*

2.4 BCF: XRT Vignetting Function

2.4.1 xrt_vignet1.fits

Location

caldb/data/asca/xrt/bcf

Status

Current

Summary of File

Virtual calibration file for a FORTRAN task to construct the XRT vignetting function based on a pre-launch the parameterization supplied by ISAS.

Delivered to CALDB by:

Unknown.

File Format

... section incomplete

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- A Virtual calibration file & associated task do not exist, although algorithm has been supplied.

2.5 BCF: XRT 2-D Point Spread Function Images

2.5.1 xrt_psf_isas1.fits

Location

caldb/data/asca/xrt/bcf/psf/isas

Status

SUPERSEDED (see Section 2.5.2)

Summary of File

Virtual calibration file for a FORTRAN task to construct a 2-d psf for the XRT based on a pre-launch the parameterization supplied by ISAS.

Delivered to CALDB by:

Unknown.

File Format

... *section incomplete*

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- A Virtual calibration file & associated task do not exist, although algorithm has been supplied.

2.5.2 astrod_image_#_#.fits

Location

caldb/data/asca/xrt/bcf/psf/ray_trace

Status

SUPERSEDED (see Section 2.5.3)

Summary of Files

A series of images from the Ray Tracing Experiments performed by Lalit Jalota at NASA/GSFC in 1993 Jan – Mar. There are a total of 34 files, each containing a single calculated 2-dimensional point spread function image for different off-axis positions in the focal plane. Due to the symmetry of the telescopes, only one quadrant of one telescope is mapped. The grid is regular in `ALPHA`–`BETA` space, where `ALPHA` & `BETA` are cartesian coordinates in the focal plane, with 4 arcmin spacing.

The file naming convention used is: `astrod_image_`i`_`j`.fits`

where

- i represents α (in arcmin) and has values i = 00, 04, 08, 12, 16, 20, and
- j represents β (in arcmin) and has values j = 00, 04, 08, 12, 16, 20.

Delivered to CALDB by:

Lalit Jalota (NASA/GSFC XRT Team).

File Format

HDUDOC/VERS = `CAL/GEN/92-027/1.0.0`
(see CAL/GEN/92-027, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- The following files are **NOT** available:
  - `astrod_image_04_00.fits`
  - `astrod_image_20_20.fits`
- We assume the `ALPHA` = 0 & `BETA` = 0 vectors intersect the physical joins between mirror quadrants.
- No s/w currently exists to automatically access these datasets should an off-axis position in one of the other 3 quadrants be required.
  A Virtual calibration file & associated task is required.

2.5.3 psf_sm2_#_#.fits

Location

caldb/data/asca/xrt/bcf/psf

Status

Current

Summary of Files

A total of 11 files representing 11 pointings at Cyg X-1 carried out during the AO phase of the mission. Each file consists of a 10 2-dimensional (63x63) Point Spread Function images, one at each of 10 energy ranges.

The file naming convention used is: `psf_sm2_`*i*`_`*j*`.fits` where

- *i* represents the off-axis angle (`THETA` in arcmins) of the pointing.
- *j* represents the azimuthal angle (`PHI` in degrees) of the pointing.

It should be noted that the set of pointing positions do not form a regular grid.

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC ASCA GOF) 1995 Feb 14.

File Format

HDUDOC/VERS = `CAL/GEN/92-027/1.0.0`
(see CAL/GEN/92-027, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

These files were converted to OGIP format by Keith Arnaud (NASA/GSFC ASCA GOF) from an original file (`allpsf.sm2.fits`) provided by Maxim Markevitch (ISAS). As stated above, the datasets were generated from observations of Cyg X-1 using the GIS instruments. The background was subtracted, the images were then normalized to have 1 photon within the 6 arcmin off-peak radius, and then smoothed before binning with the energy-dependent, position-independent Gaussian to compensate for the GIS energy-dependent detector resolution.

Points to Note

- The peak brightness is at the center of the pixel (32,32). in all cases.

2.6 BCF: XRT Encircled Energy Fractions

2.6.1 xrt_eef_220693.fits

Location

caldb/data/asca/xrt/bcf/psf/isas

Status

Unknown - assumed out-of-date

Summary of File

This dataset is a FITS version of the results of the ray-tracing simulations of the Nagoya group, supplied to the HEASARC in ASCII format by the NASA/GSFC ASCA GOF on 1993 May 11. Below is an abridged version of the accompanying text file:

Asuka XRT response functions Ver.0.0

These response functions were made by raytracing simulations which was accordance with results of only on ground calibration. But note that these have about 10% error. These Encircled Energy Functions (EEF) have integration values for:

- diameters between 1.0mm and 60mm (1mm interval), and for an infinitely large diameter
- energies between 0.1keV and 10.0keV (0.1keV interval)
- zenith angles between 0' and 15' (1' interval)
- phase angles 0 and 45 deg.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) 1993 Jan, converted to FITS by Ian M George.

File Format

OGIP format EEFVERSN = 1992a

Input Datasets, Assumptions, *etc*

The original ASCII datasets are from `satsuki/h1/kunieda/xrt/p000` and `satsuki/h1/kunieda/xrt/p045`, where `p000` and `p045` represent phase angle of off-axis sources. The phase angle is measured from the boundary of quadrants.

Points to Note

- These EEFs are normalized to a radius of 12mm, **NOT** infinity

- For convenience, a radius of 1000 mm is stored within the RAD_LO and RAD_HI columns to represent the EEF for an infinite diameter circle. Since such a circle will always include the entire ASCA focal plane, this should cause no confusion.

2.7 BCF: XRT Radial Point Spread Functions

2.7.1 xrt_psf_v1_0.fits

Location

caldb/data/asca/xrt/bcf/

Status

SUPERSEDED (Section 2.7.2)

Summary of File

This dataset is a FITS version of the results of the ray-tracing simulations of the Nagoya group.

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC *ASCA* GOF) 1995 Sep 21

File Format

HDUDOC/VERS = `CAL/GEN/92-020/1.0.0`
(see CAL/GEN/92-020, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

Dataset constructed by the Nagoya Group from the results of the ray-tracing simulations. No further information supplied to the CALDB

Points to Note

- These RPSF datasets are normalized to one count out to a radius of 6 arcmin, **NOT** infinity

2.7.2 xrt_psf_v2_0.fits

Location

caldb/data/asca/xrt/bcf/

Status

Current

Summary of File

No information supplied to the CALDB

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC *ASCA* GOF) 1996 Feb 23

File Format

HDUDOC/VERS = `CAL/GEN/92-020/1.0.0`
(see CAL/GEN/92-020, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No further information supplied to the CALDB

Points to Note

- None

Chapter 3

ASCA GIS CALIBRATION FILES

3.1 Summary of Available Files

The *ASCA* GIS calibration files available under the

`/caldb/data/asca/gis/`*type*

directory tree are listed in Table 3.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

3.2 BCF: GIS Detector Efficiency

3.2.1 detector_efficiency.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

Pre-flight theoretical GIS detector efficiency vs energy from Tokyo Univ., supplied to the HEASARC by Eric Gotthelf.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF).

File Format

A number of Caldb keyword values need changing.

Input Datasets, Assumptions, *etc*

Only information is:

> *Calculated from atomic cross sections. Assumed configuration is Be 10 micron + Xe 1.15 cm with 1.15 atom at 0 degree + He 1.15 cm with 0.05 atom at 0 degree.*

Points to Note

- None

3.3 BCF: GIS Window Thickness

3.3.1 s#bev#.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of File

Two files which specify the thickness of the GIS Beryllium windows as a function of position, using the naming convention `s`i`bev`n`.fits` where

- i is the GIS for which the dataset is valid (i = `2` or `3`)
- n indicates the release version of the file

Delivered to CALDB by:

GIS team, University of Tokyo through Masayuki Itoh, ISAS.

File Format

No OGIP format version specified

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

3.4 BCF: GIS Window Transmissions

3.4.1 gis_alum_trans_05.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

Transmission for 0.3 micrometer mylar with 0.05 Al coating. Converted to OGIP FITS format from file `alum_trans_0.5.fits` supplied by Eric Gotthelf.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) as ASCII file, reformatted to OGIP standard by Ian M George.

File Format

OGIP format FLTVERSN = 1992a

Input Datasets, Assumptions, *etc*

Transmission computed by interpolating tabulated atomic photo-electric cross-section data from Veigele (1973), and assuming ρ(mylar) = 1.39, ρ(Al) = 2.694.

Points to Note

- None

3.5 BCF: GIS Grid Transmissions

3.5.1 s#gridv#.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

Two files which specify the transmission for the GIS window grids, using the naming convention `s`i`gridv`n`.fits` where

- i is the GIS for which the dataset is valid (i = 2 or 3)
- n indicates the release version of the file

Delivered to CALDB by:

GIS team, University of Tokyo through Masayuki Itoh, ISAS.

File Format

No OGIP format version specified

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

3.6 BCF: GIS Coordinate Transformation

3.6.1 gis_fcoord_290393.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of File

Input required for `FCOORD` transfomation for GIS physical to equatorial coordinate frames, assumin design (pre-launch) specifications.

Delivered to CALDB by:

Emily Greene (NASA/GSFC s/w Team)

File Format

(No OGIP multi-mission standard)

Dataset stored in a 7 column BINTABLE extension, with column names `detector`, `rotation`, `deltax`, `deltay`, `focal-length`, `pixel-X-size`, `pixel-Y-size`.

Some keyword values (unit strings) need to be changed.

Input Datasets, Assumptions, *etc*

Pre-launch values assumed. No further information supplied to the CALDB.

Points to Note

- None

3.6.2 gis_g2d2p_1.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of File

Virtual calibration file for a FORTRAN task to perform the Raw to physical coordinate transformation for the GISs. Nothing else known.

Delivered to CALDB by:

Unknown.

File Format

Some keyword values need to be changed.

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- Virtual Task does not exist, assumed abandoned by author

3.7 BCF: GIS Housekeeping Parameter Transformations

3.7.1 gishkconv110892.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of File

Input parameters required for conversion of `GIS2` & `GIS3` housekeeping.

Taken from the *Item list for the GIS FITS file I & II* K Ebisawa, T. Ohashi, T. Tsuru, T. Mihara, M. Ishisaki Mar. 13, 1992 and Oct. 7,1992

Delivered to CALDB by:

Jim Ingham (NASA/GSFC s/w Team).

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB other than above.

Points to Note

- None

3.8 BCF: GIS Invariant Rise-Time Windows

3.8.1 rti_gis_1024_040693.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

This file should be used to reject GIS background events based on their invariant rise-time (RTI) values. (RTI values are RT values which have been corrected for any intrinsic position dependent fluctuations by the `GISLIN` task.) Therefore, this file should only be applied to corrected science extension data.

The values in the `RTI_MIN` and `RTI_MAX` columns represent the maximum and minimum allowable RTI values for events which occur within the PHA channel specified by the `CHANNEL` column.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF), reformatted by Ron Zellar.

File Format

RTIVERSN = 1993a

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

3.8.2 rti_gis_256_200494.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

This file should be used to reject GIS background events based on their invariant rise-time (RTI) values. (RTI values are RT values which have been corrected for any intrinsic position dependent fluctuations by the `gisrti` task.) Therefore, this file should only be applied to corrected science extension data.

The values in the `RTI_MIN` and `RTI_MAX` columns represent the maximum and minimum allowable RTI values for events which occur within the PHA channel specified by the `CHANNEL` column.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF)

File Format

RTIVERSN = 1993a

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

3.8.3 rti_gis_128_190594.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of File

This file should be used to reject GIS background events based on their invariant rise-time (RTI) values. (RTI values are RT values which have been corrected for any intrinsic position dependent fluctuations by the `gisrti` task.) Therefore, this file should only be applied to corrected science extension data.

The values in the `RTI_MIN` and `RTI_MAX` columns represent the maximum and minimum allowable RTI values for events which occur within the PHA channel specified by the `CHANNEL` column.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF)

File Format

RTIVERSN = 1993a

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

3.9 BCF: GIS 'Telescope Definition Files'

NOTE: The term 'Telescope Definition File' is not a recognized term used by the CALDB.

3.9.1 g#_teldef_#_030893.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

Four files, with a naming scheme `g`n`_teldef_`xxx`_030893.fits`, one with each of:

- $n = 2, 3$ applicable to GIS2 and GIS3 respectively
- xxx = FLF indicating that the data was calculated using the Fast Lorentz Method (FLF) method of centroiding the position of a IPMT event.
- xxx = POW2 indicating that the data was calculated using the Power of 2 method of centroiding the position of a IPMT event.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF), keywords modified by Ron Zellar.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- 1993 Jun 07 (Eric Gotthelf, ASCA GOF, NASA/GSFC).
  - These extensions contain the GIS gain maps and a set of x, y position error maps created from the University of Tokyo GIS table calibration file data. These maps model the spatial gain and position distortions of the GIS.
  - The gain map gives, for any detector X, Y coordinate, the expected PHA for a given input energy and operating parameters. The gain map is produced by interpolating the gain values mea- sured over the face of the detector at uniformly spaced, but incompletly sampled intervals onto a finer square mesh at the full resolution of the detector electronic ADC.

- The position distortions are given in terms of error maps, i.e, for a given measured X and Y, what is the value needed to add to this number to describe the physical location of this measur- ement on the face of the detector. Thus the error maps are used to determine the true detector location of a measured photon.
- First, the measured positions are transformed by minimizing the mean deviation from their expected (physical) locations via a global least-square fit. The transformation coefficiencs are then used to rotate, translate, and scale the measured locations into detector coordinates. The residule errors are them inter- polated over the detector face in a similar manner as with the gain map. These error maps are then written out to this FITS file with the the transformation coefficiences and other scale information in the headers. A set of X, Y maps is created for each of the GIS position measurment algorithms.
- For both the spatial gain and the position distortion, two sets of maps are available. One for which the data is interpolated onto physical space and the other onto the measured space.
- The GIS position and gain linerization over the active area (r ¡ 20 mm) is currently of the order of 1-2 percent. This should improve.
- The region outside a radius of approx. 20 mm is considered unreliable.
- A more optimal GIS detector plate scale may be used (currently 0.25 mm/pixel) to compliment the new anode offset settings.
- The current GIS3 calibration file data does not match the GIS3 flight image, the cause needs to determined.

3.9.2 gis#_ano_#_#_190194.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

Eight files with a naming scheme `gis`i`_ano_`xxx`_`yyy`_190194.fits` where

- i is the GIS for which the dataset is valid (i = `2` or `3`)
- xxx indicating that the file should be used with observations made after/before the spread descriminator was turned on (xxx = `on` or `off` respectively)
- yyy indicating that the data was calculated using the fast lorentz method or the Power of 2 method for centroiding the position of a IPMT event (yyy = `flf` or `pow2` respectively)

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF)

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- These files include the updated optical axis position keywords supplied by the GIS team.
- The pre-flight rti map in the last extension was updated to contain the flight rti map.

3.9.3 gis#_ano_#_#_200494.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

Eight files with a naming scheme

gis$i$_ano_xxx_yyy_200494.fits

where

- i is the GIS for which the dataset is valid (i = `2` or `3`)
- xxx indicating that the file should be used with observations made after/before the spread descriminator was turned on (xxx = `on` or `off` respectively)
- yyy indicating that the data was calculated using the fast lorentz method or the Power of 2 method for centroiding the position of a IPMT event (yyy = `flf` or `pow2` respectively)

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF)

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- These files include the updated optical axis position keywords supplied by the GIS team.
- The pre-flight rti map in the last extension was updated to contain the flight rti map.

3.9.4 gis3_phnew_tbl_flf_190194.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

This file contains in-flight calibration data which properly corrects GIS3 images. The previous ground cal images were insufficient in removing the pin cushion effect. The CALDB has no real idea what this file is - we suggest interested users contact the ASCA GOF.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF)

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- The updated optical axis position keywords supplied by the GIS team are included
- The pre-flight rti map in the last extension was updated to contain the flight rti map.

3.9.5 gis3_phnew_tbl_flf_200494.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

This file contains in-flight calibration data which properly corrects GIS3 images. The previous ground cal images were insufficient in removing the pin cushion effect. The CALDB has no real idea what this file is - we suggest interested users contact the ASCA GOF.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF)

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- The updated optical axis position keywords supplied by the GIS team are included
- The pre-flight rti map in the last extension was updated to contain the flight rti map.

3.9.6 gis#_ano_on_flf_180295.fits

Location

caldb/data/asca/gis/bcf

Status

Unknown

Summary of Files

...section incomplete

Delivered to CALDB by:

Eric Gotthelf & Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1995 Feb 21.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

3.10 BCF: GIS Gain History

3.10.1 gainhistory_071493.fits

Location

MISSING

Status

Unknown

Summary of Files

The file contains gain corrections as a function of time for the GIS2 and GIS3 instruments. To be used with the GISLIN software. Valid from date of ASCA launch onward.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF).

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

The file is generated by fitting the calibration source in 20 minuet segaments, and calculating the corrections needed to the gain parameters.

Points to Note

- This file is assumed to have been SUPERSEDED by gainhist_v1.fits (Section 3.10.2

3.10.2 gainhist_v1.fits

Location

MISSING

Status

Unknown

Summary of Files

The file contains gain corrections as a function of time for the GIS2 and GIS3 instruments. To be used with the GISLIN software. Valid from date of ASCA launch onward.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) 1993 Aug 23.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

The file is generated by fitting the calibration source in 20 minute segaments, and calculating the corrections needed to the gain parameters.

Points to Note

- None

3.10.3 gainhist.fits

Location

caldb/data/asca/gis/bcf

Status

Current

Summary of Files

The file contains gain corrections as a function of time for the GIS2 and GIS3 instruments. To be used with the GISLIN software. Valid from for observations made over the period 1993 March 18 11:06:20 UT to 1993 July 5 10:20:21 UT **ONLY**.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1993 Jul 01.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- CAL PH is the PHA channel of the Mn K-alpha line (5.94 keV), which is the cal source attached to the detector.

3.11 BCF: GIS Background Datasets

3.11.1 blanksky_g#_#cor#.evt

Location

caldb/data/asca/gis/bcf/bgd/94apr

Status

Current - But Warning (see below)

Summary of Files

These files contain GIS background datasets. Each file is a superposition of 13 blank sky fields observed during the ASCA PV phase (1993 May – Nov). Since the GIS internal background increases as the magnetic cut-off rigidity (COR) decreases, the files are sorted by COR values (in units of MeV/c). Like the AO data, these background data were taken after the Spread Discriminator was turned on (1993 May 27).

The naming scheme used is:

`blanksky_g`i`_`j`cor`k`.evt`

where

- i is the GIS sensor (i=`2` or `3`)
- j is the lower value of the magnetic cut-off rigidity (COR) used to construct the dataset (j = `4`, `6`, `8`, `10`, `12`, `14`, or can be missing)
- k is the upper value of the magnetic cut-off rigidity (COR) used to construct the dataset (k = `4`, `6`, `8`, `10`, `12`, `14`, or can be missing)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1994 Mar 30.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Ken Ebisawa (ASCA GOF NASA/GSFC) 1994 Mar 30:
  - In order to prevent the extraction of astrophysical information, all the `X` & `Y` values (sky pixel) are set to 1, and the `TIME` values are made constant. Furthermore, events are sorted in ascending order of `DETX`.
  - These event files do not have the RTI (rise time invariance) values so the PH dependent Rise Time discriminator cannot be applied. ASCA GOF will soon supply the background event files with the RTI column filled. Additionally, the ASCA GOF is planning to supply event lists of night Earth data. Such data may be used for the study of X- ray background.
- Ken Ebisawa (ASCA GOF NASA/GSFC) 1994 Dec 14:
  - There are a number of moderately bright sources in these 'blank sky' fields which are not completely averaged out by the summation of many fields. The `DETX,DETY` coords of the 3 most significant sources are:
    1. (113,118) in SIS2, and (120,118) in SIS3
    2. (122,142) in SIS2, and (128,141) in SIS3
    3. (98,142) in SIS2, and (104,143) in SIS3

    The GOF advises that GOs take extra care when using background data near these positions. In particular, sources (1) and (2) are NGC6552, which is known to have a very strong iron emission line (Fukazawa *et al.* 1994, PASJ, 46, L141; Reynolds *et al.* 1994, MNRAS, 268, L55.).

3.11.2 blanksky_g#_#_v2.evt

Location

caldb/data/asca/gis/bcf/bgd/94may

Status

Current - But Warning (see below)

Summary of Files

These files contain GIS background datasets. Each file is a superposition of 13 blank sky fields observed during the ASCA PV phase (1993 May – Nov). Since the GIS internal background increases as the magnetic cut-off rigidity (COR) decreases, the files are sorted by COR values (in units of MeV/c). Like the AO data, these background data were taken after the Spread Discriminator was turned on (1993 May 27).

The naming scheme used is:

`blanksky_g`i`_`xxx`_v2.evt`

where

- i is the GIS sensor (i=`2` or `3`)
- xxx is a character string denoting which values of the magnetic cut-off rigidity (COR) were used to construct the dataset The character string can either be `all`, indicating no filtering on COR has been made, or has the form j`cor`k, where
  - j is the lower value of the magnetic cut-off rigidity (COR) used to construct the dataset (j = `4`, `6`, `8`, `10`, `12`, `14`, or can be missing)
  - k is the upper value of the magnetic cut-off rigidity (COR) used to construct the dataset (k = `4`, `6`, `8`, `10`, `12`, `14`)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1994 Apr 18.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Ken Ebisawa (ASCA GOF NASA/GSFC)
  The difference from old blank sky files, (Section 3.11.1):
  - Addition of the two more blank sky fields, then total exposure time increased from 300 ksec to 350 ksec.
  - RTI (Rise Time Invariance) column is correctly filled, thus particle background is efficiently removed with the `gisclean` command in XSELECT.
- In order to prevent the extraction of astrophysical information, all the `X` & `Y` values (sky pixel) are set to 1, and the `TIME` values are made constant. Furthermore, events are sorted in ascending order of `DETX`.
- Ken Ebisawa (ASCA GOF NASA/GSFC) 1994 Dec 14:
  - These background files include data taken during 1994 Mar when an onboard computer error caused the GIS3 PHA spectra to be quantized to 128 channels rather than the designed/expected 1024 channels. These GIS3 observations should not have been included prior to delivery of the calibration files. However their effect is considered likely to be insignificant since (1) the bad datasets will be "smoothed' using random numbers when converted from PHA to PI, (2) the bad data is only ∼7% of the total.

3.11.3 night_earth_g#_#.evt

Location

caldb/data/asca/gis/bcf/bgd/night_earth

Status

Unknown

Summary of Files

These files contain GIS night earth event files taken between 1993 May 28 (GIS Spread Discriminator ON) and 1994 Feb 08 (just before problems developed with the CPU of GIS3).

The naming scheme used is:

`night_earth_g`i`_`xxx`.evt`

where

- i is the GIS sensor (i=2 or 3)
- xxx is a character string denoting which values of the magnetic cut-off rigidity (COR) were used to construct the dataset The character string can either be `all`, indicating no filtering on COR has been made, or has the form j`cor`k, where
  - j is the lower value of the magnetic cut-off rigidity (COR) used to construct the dataset (j = 4, 6, 8, 10, 12, 14, or can be missing)
  - k is the upper value of the magnetic cut-off rigidity (COR) used to construct the dataset (k = 4, 6, 8, 10, 12, 14)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1994 Aug 02.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Ken Ebisawa (ASCA GOF NASA/GSFC)

– The PHA dependent RTI (Rise Time Invariance) filter HAS BEEN APPLIED to these data (with the `gisclean` command in `XSELECT`. When these data are used for background subtraction, the data also should be filtered with `gisclean`.

3.11.4 blanksky_g#_sp_off_#.evt

Location

caldb/data/asca/gis/bcf/bgd/sp_off

Status

Unknown

Summary of Files

The files in this directory, listed below, contain GIS background data (blank sky observations) taken during the early PV phase when the GIS Spread Discriminator was off. **Warning:** Note that the GIS background during this period is very different from the nominal, background when the Spread Discriminator is ON. These files therefore complement the current set of background datasets.

The naming scheme used is:

`blanksky_g`i`_sp_off_`xxx`.evt`

where

- i is the GIS sensor (i=`2` or `3`)
- xxx is a character string denoting which values of the magnetic cut-off rigidity (COR) were used to construct the dataset The character string can either be `all`, indicating no filtering on COR has been made, or has the form j`cor`k, where
  - j is the lower value of the magnetic cut-off rigidity (COR) used to construct the dataset (j = `4`, `6`, `8`, `10`, `12`, `14`, or can be missing)
  - k is the upper value of the magnetic cut-off rigidity (COR) used to construct the dataset (k = `4`, `6`, `8`, `10`, `12`, `14`)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) 1994 Nov 16.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Ken Ebisawa (ASCA GOF NASA/GSFC)

  - In the early phase of the ASCA mission the GIS was operated, experimentally, with the Spread Discriminator OFF. This condition is shown with the FITS keyword `S_DSCR='OFF'` in the event file primary header.
    The Spread Discriminator was off for the following sequences, times and targets:
    - ALL the observations up to 1993 May 28 (80015000, Hydra A).
    - Seq. 40007000, 1993 June 11-12, Cyg X-3,
    - Seq. 60038000, 1993 June 12-13, NGC 253
    - Seq. 20000000, 1993 June 13-14, 30 Dor
      (though part of this observation was carried out with `S_DSCR=ON`).

    All subsequent observations were carried out with `S_DSCR=ON`. The first observation of this period is 80016000, 1993 June 14, Coma Cluster.
  - The `RTI` (Rise Time Invariance) column is filled, thus particle background is efficiently removed with the **`gisclean`** command in `XSELECT`, which applies a PHA dependent RTI window to the event lists.

3.12 BCF: GIS 2-D Point Spread Function Images

3.12.1 psf_#_#.fits

Location

caldb/data/asca/gis/bcf/psf

Status

Unknown

Summary of Files

A total of 11 files representing 11 pointings at Cyg X-1 carried out during the AO phase of the mission. Each file consists of a 10 2-dimensional (63x63) Point Spread Function images, one at each of 10 energy ranges.

The file naming convention used is: `psf_`*i*`_`*j*`.fits` where

- *i* represents the off-axis angle (`THETA` in arcmins) of the pointing.
- *j* represents the azimuthal angle (`PHI` in degrees) of the pointing.

It should be noted that the set of pointing positions do not form a regular grid.

Delivered to CALDB by:

Keith Arnaud (NASA/GSFC ASCA GOF) 1995 Feb 14.

File Format

HDUDOC/VERS = `CAL/GEN/92-027/1.0.0`
(see CAL/GEN/92-027, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

These files were converted to OGIP format by Keith Arnaud (NASA/GSFC ASCA GOF) from an original file (`allpsf.fits`) provided by Maxim Markevitch (ISAS). The background was subtracted, the images were then normalized to have 1 photon within the 6 arcmin off-peak radius.

Points to Note

- The peak brightness is at the center of the pixel (32,32). in all cases.

3.13 CPF: GIS Detector Redistribution Matrices

3.13.1 gis_center256.rmf

Location

caldb/data/asca/gis/cpf

Status

SUPERSEDED (see Section 3.13.2)

Summary of File

Pre-launch 256 channel detector response matrix (including the effective area of the optics *etc* folded in), created from an (old-style) SF RSP file (gis_center256.rsp) supplied by Ken Ebisawa.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in SF format, reformatted to OGIP standard by Ian M George.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

- XRT on-axis effarea is from Awaki,
- GIS response is from Ishisaki.
- Thermal and Plasma sheild =0.5 micron milar 300 A Al.
- Set Geometrical Area of PHA file as 1 cm2.
- Associated EBOUNDS extension also present

Points to Note

- Dataset is valid on-axis only & for simulation purposes

3.13.2 mn500v1_#.fits

Location

caldb/data/asca/gis/cpf

Status

SUPERSEDED (see Section 3.13.3)

Summary of Files

(Ken Ebisawa (ASCA GOF, NASA/GSFC), May 24, 1993)

Two 1024 channel response matrices of ASCA GIS created by the GIS team in the University of Tokyo. Original files are DEC binary files in the old XSPEC format, and they are transferred to NASA/GSFC by Ken Ebisawa and converted to the FITS format. The FITS files has a naming scheme `mn500v1_`*xxx*`.fits` explained below.

Following is a summary of the explanation for the response matrices orginally written by Y. Ishisaki (Univ. of Tokyo) in Japanese.

mn500v1-gis.fits:
This is a response of the GIS including the XRT thermal sheild and GIS plasma sheild transmission. XRT effective area is not included.

mn500v1-r5.fits:
Additionally, this includes the XRT effective area. For XSPEC spectral analysis, this matrix should be used. The XRT effective area is supplied by the Nagoya XRT team (version 0.0). The effective area at the center encircled within 5 mm radius is adopted.

These are preliminery matrices, so up to about 10% systematic errors may be expected. Particularly, response values under 1 keV may not be reliable. PHAs below 70ch and above 800ch should be discarded so as to eliminate effects of lower/upper discriminators.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

See above

Points to Note

To carry out spectrl fitting correctly with these matrices, the following are required for the PHA files.

- there are 1024 PHA channels.
- temperaure/position dependent gains are corrected so that 500 ch corresponds to 5.894 keV (Mn Kα). (this will be carried out with the gislin task – eventually –.)

3.13.3 gis#v2_4.rmf

Location

caldb/data/asca/gis/cpf/93dec20

Status

SUPERSEDED (see Section 3.13.4)

Summary of Files

A detector redistribution matrix (only) `gis`*i*`v2_4.rmf` for each GIS, i (i = `2` or `3`), produced by Ken Ebisawa (ASCA GOF, NASA/GSFC) using `gisrmf` version 2_4.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1993 Dec 22.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- These are detector redistribution matrices. The effective area of the XRT *etc* have NOT be included (but see Section 3.13.6).
- These matrices are being recommended for use in the GO phase.

3.13.4 gis#v3_1.rmf

Location

caldb/data/asca/gis/cpf/94apr20

Status

SUPERSEDED (see Section 3.13.5)

Summary of Files

A detector redistribution matrix (only) `gis`*i*`v3_1.rmf` for each GIS, i (i = `2` or `3`), produced by GIS Team (University of Tokyo) using `gisrmf` version 3.1.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1994 Apr 20.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- These are detector redistribution matrices. The effective area of the XRT *etc* have NOT be included (but see Section 3.13.7).
- There appears to be a problem with the energy energy response (above ∼4 keV) in these datasets which results in systematic residuals at around 6 keV and above 8 keV. These residuals are estimated to be at about the 5% level, and hence not significant for sources with several counts/s, dominated by statistical errors.
- These matrices were found to underestimate the low energy tails of the pulse-height distribution resulting in an artificial 'soft-excess' for spectra with high absorption and low energy photons. These datasets were therefore **SUPERSEDED** by those described in Section 3.13.5 on 1995 Mar 07.

3.13.5 gis#v4_0.rmf and gis3v4_0_128ch.rmf

Location

caldb/data/asca/gis/cpf/95mar06

Status

CURRENT

Summary of Files

A 1024 channel detector redistribution matrix (only) `gis`*i*`v4_0.rmf` for each GIS, i ($i = 2$ or 3), produced by GIS Team (University of Tokyo) using `gisrmf` version 4.0.

In addition, the file `gis3v4_0_128ch.rmf` is also available, representing `gis3v4_0.rmf` rebinned by a factor of 8 (to 128 channels). This file is recommended for use with data acquired in PH mode between 1994 Feb 10 and 1994 Apr 06 which suffered severe problems due to an on-board software bug. Further information on both the problem and now to analysis GIS3 data taken over this period is available via the URL:
http://heasarc.gsfc.nasa.gov/docs/asca/abc_gis3_bitfix.html

Delivered to CALDB by:

`gis`*i*`v4_0.rmf` – Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1995 Mar 07.

`gis3v4_0_128ch.rmf` – Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1996 Feb 13

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

No further information supplied to the CALDB.

Points to Note

- These are detector redistribution matrices. The effective area of the XRT *etc* have NOT be included
- These datasets supercede all previous versions (Sections 3.13.1, 3.13.2, 3.13.3, 3.13.4) and are recommended for use in the GO phase.
- The previous version of these datasets (`gis`*i*`v3_1.rmf`, Section 3.13.4) low energy tails of the pulse-height distribution were underestimated, and artificial 'soft-excess' had appeared for spectra with high absorption and low energy photons. In these new RMFs, the low energy response was modified taking account of ground calibration results and new theoretical calculations, and such soft-excesses disappeared..

- The energy energy response (above ∼4 keV) is the same as for the previous version of these datasets (`gis`i`v3_1.rmf`, Section 3.13.4). Thus the high energy response problems (systematic residual at around 6 keV and above 8 keV) remain These residuals are estimated to be at about the 5% level, and hence not significant for sources with several counts/s, dominated by statistical errors.

- See the important notes on the use of `gis3v4_0_128ch.rmf` in the Summary above.

3.13.6 g#v2_4_#.rsp

Location

caldb/data/asca/gis/cpf/93dec20

Status

SUPERSEDED (see Section 3.13.7)

Summary of Files

A set of **full** response matrices (ie including the detector redistribution matrix and the effective area of the XRT *etc*) each GIS, at a series of standard pointing positions. The naming scheme used is

`g`*i*`v2_4_`*xx*`.rsp`

where:

- *i* is the GIS for which the dataset is valid (*i* = `2` or `3`)
- *xx* is a 2 character encoding of the pointing position. The first character denotes the nominal GIS pointing position with:
  - `1` indicating that used whilst the SIS is operating in 1-CCD mode,
  - `2` that used during 2-CCD mode, and
  - `4` that used during 4-CCD mode.

  The second character denotes the phase of the mission, with:
  - `p` indicating the PV phase, and
  - `a` the AO phase.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1993 Dec 22.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

The following i/p files were used:

- The detector redistribution matrices gis#v2_4.rmf (Section 3.13.3).

- The ARFs g#_*xx*.arf (Section 3.14.1).

Points to Note

- These files have been SUPERSEDED (see Section 3.13.7)

3.13.7 g#v3_1_#.rsp

Location

caldb/data/asca/gis/cpf/94apr20

Status

PARTIALLY SUPERSEDED (Points to Note below) see Section 3.13.8)

Summary of Files

A set of **full** response matrices (ie including the detector redistribution matrix and the effective area of the XRT *etc*) each GIS, at a series of standard pointing positions. The naming scheme used is

`g`*i*`v3_1_`*xx*`.rsp`

where:

- *i* is the GIS for which the dataset is valid (*i* = `2` or `3`)
- *xx* is a 2 character encoding of the pointing position. The first character denotes the nominal GIS pointing position with:
  - `1` indicating that used whilst the SIS is operating in 1-CCD mode,
  - `2` that used during 2-CCD mode, and
  - `4` that used during 4-CCD mode.

  The second character denotes the phase of the mission, with:
  - `p` indicating the PV phase, and
  - `a` the AO phase.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1994 Apr 20.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

The following i/p files were used:

- The detector redistribution matrices gis#v3_1.rmf (Section 3.13.4).

- The ARFs g#_#.arf (Section 3.14.2).

Points to Note

- These files have been PARTIALLY SUPERSEDED:
  - more recent versions of the files `g2v3_1_`x`a.rsp`, reflecting an update to `gis2v3_1.rmf` are available within the CALDB (see Section 3.13.8)
  - updates to the corresponding files appropriate for `GIS3`, or the nominal PV pointing positions (for either `GIS2` or `GIS3`) have not been delivered to the CALDB

3.13.8 gis2v4_0_#ccd.rsp

Location

caldb/data/asca/gis/cpf/95mar06

Status

Current, but for simulations ONLY

Summary of Files

A set of **full** response matrices (ie including the detector redistribution matrix and the effective area of the XRT *etc*) each GIS, assuming a circular cell of radius 6 arcmin centered at each of various nominal pointing positions.

The naming scheme used is

`gis`i`v4_0_`n`ccd.rsp`

where:

- i is the GIS for which the dataset is valid (i = 2 or 3)
- n is the SIS readout mode, and hence the nominal GIS pointing position (n = 1, 2 or 4)

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1996 Feb 13.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

The following i/p files were used:

- The detector redistribution matrices gis#v4_0.rmf (Section 3.13.5).
- The ARFs g#_#.arf (Section 3.14.2), which represent 6 arcmin extraction cells.

Points to Note

- These response files are made only for simulation purposes. For real data analsyis, users should make ARFs appropriate for the extraction cell used to construct their source PHA data.

3.14 CPF: Standard GIS Ancillary Response Files

3.14.1 g#_#.arf

Location

caldb/data/asca/gis/cpf/94apr20

Status

Unknown

Summary of Files

A set of ARFs for each GIS, at a series of standard pointing positions. The naming scheme used is

g*i*_*xx*.arf

where:

- *i* is the GIS for which the dataset is valid (i = 2 or 3)
- *xx* is a 2 character encoding of the pointing position. The first character denotes the nominal GIS pointing position with:
  - 1 indicating that used whilst the SIS is operating in 1-CCD mode,
  - 2 that used during 2-CCD mode, and
  - 4 that used during 4-CCD mode.

  The second character denotes the phase of the mission, with:
  - p indicating the PV phase, and
  - a the AO phase.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1993 Dec 22.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

These files were generated using `jbldarf` version 0.45, using a circular extraction cell of 6 mm radius.

No further information

$\boxed{\text{Points to Note}}$

No information supplied

3.14.2 g#_#.arf

Location

caldb/data/asca/gis/cpf/94apr20

Status

Unknown

Summary of Files

A set of ARFs for each GIS, i, at a series of standard pointing positions. The naming scheme used is

`g`i`_`xx`.arf`

where:

- i is the GIS for which the dataset is valid (i = `2` or `3`)
- xx is a 2 character encoding of the pointing position. The first character denotes the nominal GIS pointing position with:
  - `1` indicating that used whilst the SIS is operating in 1-CCD mode,
  - `2` that used during 2-CCD mode, and
  - `4` that used during 4-CCD mode.

  The second character denotes the phase of the mission, with:
  - `p` indicating the PV phase, and
  - `a` the AO phase.

Delivered to CALDB by:

Ken Ebisawa (NASA/GSFC *ASCA* GOF) in OGIP standard format, 1994 Apr 20.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

These files were generated using `jbldarf` version 0.50, using a circular extraction cell of 6 mm radius.

No further information

Points to Note

No information supplied

Table 3.1: Summary of *ASCA* GIS calibration files available within the OGIP Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
detector_efficiency.fits	Pre-launch detector efficiency	3.2.1
blanksky_g#_#cor#.evt	GIS Background datasets	3.11.1
blanksky_g#_#_v2.evt	GIS Background datasets	3.11.2
blanksky_g#_sp_off_#.evt	GIS Background datasets	3.11.4
gainhist.fits	GIS Gain History	3.10.3
gainhistory_071493.fits	GIS Gain History	3.10.1
gainhistory_v1.fits	GIS Gain History	3.10.2
g#_teldef_#_030893.fits	GIS Telescope Def Files	3.9.1
gis#_ano_#_#_190194.fits	GIS Telescope Def Files	3.9.2
gis#_ano_#_#_200494.fits	GIS Telescope Def Files	3.9.3
gis#_ano_on_flf_180295.fits	GIS Telescope Def Files	3.9.6
gis3_phnew_tbl_flf_190194.fits	GIS Telescope Def Files	3.9.4
gis3_phnew_tbl_flf_200494.fits	GIS Telescope Def Files	3.9.5
gis_alum_trans_05.fits	Al window transmission	3.4.1
gis_fcoord_290393.fits	I/p for FCOORD phys to equatorial coord transform	3.6.1
gis_g2d2p_1.fits	Virtual file for raw to phys coord transform	3.6.2
gishkconv110892.fits	I/p for HK parameter conversion routine	3.7.1
night_earth_g#_#.evt	GIS Background datasets	3.11.3
psf_#_#.fits	2-D psfs from Cyg X-1 observations	3.12.1
rti_gis_1024_040693.fits	Invariant rise-time values	3.8.1
rti_gis_256_200494.fits	Invariant rise-time values	3.8.2
rti_gis_128_190594.fits	Invariant rise-time values	3.8.3
s#gridv#.fits	GIS Grid transmission	3.5.1
s#bev#.fits	GIS Window thickness	3.3.1
Calibration Product Files (*type* = `cpf`)		
gis_center256.rmf	Pre-launch detector response matrix	3.13.1
gis#v2_4.rmf	1st set of GO-phase redist. matrices	3.13.3
gis#v3_1.rmf	2nd set of GO-phase redist. matrices	3.13.4
gis#v4_0.rmf	3rd set of GO-phase redist. matrices	3.13.5
gis3v4_0_128ch.rmf	128 channel version of gis3v4_0.rmf	3.13.5
gis2v4_0_#ccd.rsp	g#v4_0.rmf convolved with g#_#.arf	3.13.8
g#v2_4_#.rsp	gis#v2_4.rmf convolved with g#_#.arf	3.13.6
g#v3_1_#.rsp	gis#v3_1.rmf convolved with g#_#.arf	3.13.7
g#_#.arf	1st set of GO-phase ARFs	3.14.1
g#_#.arf	2nd set of GO-phase ARFs	3.14.2
mn500v1_#.fits	1st (preliminary) post launch matrices	3.13.2

Chapter 4

ASCA SIS CALIBRATION FILES

4.1 Summary of Available Files

The *ASCA* SIS calibration files available under the

`/caldb/data/asca/sis/`*type*

directory tree are listed in Table 4.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 4.1: Summary of *ASCA* SIS calibration files available within the OGIP Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
sis_alum_trans_03.fits	Al window transmission	4.2.1
sis_deteff1.fits	Virtual file for theoretical detector efficiency calc	4.3.1
sis_fcoord_290393.fits	I/p for FCOORD phys to equatorial coord transform	4.4.1
sisph2pi_140795.fits	Gain History parameters for PHA to PI conversion	4.9.1
sishkconv110892.fits	I/p for HK parameter conversion routine	4.5.1
s#_alignment_190194.fits	'Alignment' Files	4.7.1
s#_teldef_030893.fits	'Telescop Definition' Files	4.6.1
s#_teldef_070294.fits	'Telescop Definition' Files	4.6.2
s#bgd_#.evt	SIS Background datasets	4.8.1
s#bgd_#i.evt	SIS Background datasets	4.8.2
Calibration Product Files (*type* = `cpf`)		
sis_small.rsp	Pre-launch detector response matrix	4.10.1
s#c#_512.rsp	512 channel matrices for each sensor/chip	4.10.2
s#c#_1024.rsp	1024 channel version of the above	4.10.2
s#c#g#p#e#_#.rmf	1st set of GO-phase redist. matrices	4.10.3
s#c#g##e#_#_#.rsp	1st set of GO-phase full resp matrices	4.10.3
s#c#g#p#e#_#v0_6.rmf	2nd set of GO-phase redist. matrices	4.10.4
s#c#g#p#e#_#v0_6#.rsp	2nd set of GO-phase full resp matrices	4.10.4
s#c#g#p#e#_#v0_8.rmf	3rd set of GO-phase redist. matrices	4.10.5
s#c#g#p#e#_#v0_8#.rsp	3rd set of GO-phase full resp matrices	4.10.5

4.2 BCF: SIS Window Transmissions

4.2.1 sis_alum_trans_05.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of File

Transmission for 0.3 micrometer mylar with 0.03 Al coating. Converted to OGIP FITS format from file alum_trans_0.3.fits supplied by Eric Gotthelf.

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF) 1993 Jan, converted to FITS by Ian M George.

File Format

OGIP format FLTVERSN = 1992a

Input Datasets, Assumptions, *etc*

Transmission computed by interpolating tabulated atomic photo-electric cross-section data from Veigele (1973), and assuming ρ(mylar) = 1.39, ρ(Al) = 2.694.

Points to Note

- None

4.3 BCF: Detector Efficiencies

4.3.1 sis_deteff1.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of File

Virtual calibration file for a FORTRAN task to calculate theoretical SIS detector efficiency. Nothing else known.

Delivered to CALDB by:

Unknown

File Format

... *section incomplete*

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- Virtual Task does not exist, assumed abandoned by author

4.4 BCF: SIS Coordinate Transformation

4.4.1 sis_fcoord_290393.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of File

Input required for FCOORD transfomation for SIS physical to equatorial coordinate frames, assumin design (pre-launch) specifications.

Delivered to CALDB by:

Unknoww

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

Pre-launch values assumed. No further information supplied to the CALDB.

Points to Note

- None

4.5 BCF: SIS Housekeeping Parameter Transformations

4.5.1 sishkconv110892.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of File

Input parameters required for conversion of SIS housekeeping. No further information supplied to the CALDB.

Delivered to CALDB by:

Jim Ingham (NASA/GSFC *ASCA* s/w Team)

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB other than above.

Points to Note

- None

4.6 BCF: SIS 'Telescope Definition Files'

NOTE: The term 'Telescope Definition File' is not a recognized term used by the CALDB.

4.6.1 s#_teldef_030893.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of Files

Two files, with a naming convention `sn_teldef_030893.fits` where:

- $n = 0, 1$ applicable to SIS0 and SIS1 respectively

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF), keywords modified by Ron Zellar.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- 1993 Jun 07 (Eric Gotthelf, ASCA GOF, NASA/GSFC).
  - This SIS telescope definition file defines the detector address space along with the tranformation needed to reconstruct the focal plane location of the individual SIS CCD chips. Further data parameterizes the telescope optics and boresight alignment.
  - All data is contained within the keywords of the Primary Header. There is no data in the Primary Array.
  - These calibration files contain nominal values for the chip locations; an update is needed.

4.6.2 s#_teldef_070294.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of Files

Two files, with a naming convention `sn_teldef_070294.fits` where:

- $n = 0, 1$ applicable to SIS0 and SIS1 respectively

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF), keywords modified by Ron Zellar.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- 1993 Jun 07 (Eric Gotthelf, ASCA GOF, NASA/GSFC).
  - This SIS telescope definition file defines the detector address space along with the tranformation needed to reconstruct the focal plane location of the individual SIS CCD chips. Further data parameterizes the telescope optics and boresight alignment.
  - All data is contained within the keywords of the Primary Header. There is no data in the Primary Array.
  - These calibration files contain nominal values for the chip locations; an update is needed.

4.7 BCF: SIS 'Alignment Files'

NOTE: The term 'Alignment File' is not a recognized term used by the CALDB.

4.7.1 s#_alignment_190194.fits

Location

caldb/data/asca/sis/bcf

Status

Unknown

Summary of Files

Two files, with a naming convention `s`n`_alignment_190194.fits` where:

- n = 0, 1 applicable to SIS0 and SIS1 respectively

Delivered to CALDB by:

Eric Gotthelf (NASA/GSFC *ASCA* GOF), keywords modified by Ron Zellar.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- None

4.8 BCF: SIS Background Datasets

4.8.1 s#bgd_#.evt

Location

caldb/data/asca/sis/bcf/bgd/94apr

Status

Unknown

Summary of Files

These files contain events from 3 deep field observations without any obvious sources and with a total exposure of about 120 ks. The events were cleaned using the `select mkf` command in `XSELECT` (with `ELV_MIN` greater than 20 and `SAA` = 0). Hot and flickering pixels were removed using the `sisclean` command in `XSELECT` (`sisclean` method 2, with cell size 5, log probability -5.24, background level 3). Finally, any spurious events which remained were removed by manual cleaning based on the light curve (i.e. excluding spikes and drop- outs).

The naming scheme used is:

s*i*_*xxx*.evt

where

- *i* is the SIS sensor (*i*=`0` or `1`)
- *xxx* is a character string denoting which value was used as the lowere limit of the magnetic cut-off rigidity (COR) during the construction of the dataset. (*xxx* = `06`, `08`, `10`, `12`, `14`, or `all`)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Koji Mukai (NASA/GSFC *ASCA* GOF) 1994 Jul 14.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Koji Mukai (ASCA GOF NASA/GSFC) 1994 Jul 14:
  - In order to prevent the extraction of astrophysical information, the files have a spurious pointing direction of `RA`=0, `DEC`=0. This means that `X` = `DETX` and `Y`=`DETY`. `TIME` is set to `DBLE(PHA)` and the events are sorted in ascending order of`DETX`

4.8.2 s#bgd_#i.evt

Location

caldb/data/asca/sis/bcf/bgd/94nov

Status

Current

Summary of Files

These files contain events from 3 deep field observations without any obvious sources and with a total exposure of about 120 ks. The events were cleaned using the `select mkf` command in `XSELECT` (with `ELV_MIN` greater than 20 and `SAA` = 0). Hot and flickering pixels were removed using the `sisclean` command in `XSELECT` (`sisclean` method 2, with cell size 5, log probability -5.24, background level 3). Finally, any spurious events which remained were removed by manual cleaning based on the light curve (i.e. excluding spikes and drop- outs).

The naming scheme used is:

s*i*_*xxx*i.evt

where

- *i* is the SIS sensor (*i*=`0` or `1`)
- *xxx* is a character string denoting which value was used as the lowere limit of the magnetic cut-off rigidity (COR) during the construction of the dataset. (*xxx* = `06`, `08`, `10`, `12`, `14`, or `all`)

Further information regarding the construction and use of these dataset can be obtained from the README file in the above directory.

Delivered to CALDB by:

Koji Mukai (NASA/GSFC *ASCA* GOF) 1994 Nov 09.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

See above, and the README file in the above directory.

Points to Note

- Koji Mukai (ASCA GOF NASA/GSFC) 1994 Nov 09:
  - All the PI columns have been filled using the best available calibration (as of late Oct) to a uniform 3.65 eV/channel scale.
  - In order to prevent the extraction of astrophysical information, the files have a spurious pointing direction of `RA`=0, `DEC`=0. This means that `X` = `DETX` and `Y`=`DETY`. `TIME` is set to `DBLE(PHA)` and the events are sorted in ascending order of`DETX`

4.9 BCF: SIS Gain-History Parameters

4.9.1 sisph2pi_140795.fits

Location

caldb/data/asca/sis/bcf/

Status

Current

Summary of Files

This dataset conatins the coefficients required as a function of time to convert between SIS PHA channel and PI channel.

Delivered to CALDB by:

Koji Mukai (NASA/GSFC *ASCA* GOF) 1995 Jul 25.

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No further information available to CALDB

Points to Note

No further information available to CALDB

4.10 CPF: SIS Detector Redistribution Matrices

4.10.1 sis_small.rsp

Location

caldb/data/asca/sis/cpf/93mar05

Status

Unknown

Summary of File

... *section incomplete*

Delivered to CALDB by:

Koji Mukai (NASA/GSFC *ASCA* GOF) in SF format, reformatted to OGIP standard by Ian M George.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB.

Points to Note

- Ian M George (HEASARC) 1993 Mar 05
  - Dataset is valid on-axis only & for simulation purposes
- Ian M George (HEASARC) 1995 Dec 08
  - Dataset **renamed** from `sis\_small.rmf` and **moved** to current location at the request of the ASCA GOF at NASA/GSFC

4.10.2 s#c#_#.rsp

Location

caldb/data/asca/sis/cpf/93apr22

Status

Unknown

Summary of Files

(Andy Rasmussen, MIT, 1993 Apr 22)

A total of 16 files using a naming convention `s`i`c`j`_`xxx`.rsp` where

- i represents the SIS sensor ($i =$ `0` or `1`)
- j represents the CCD chip ($j =$ `0`, `1`, `2` or `3`)
- xxx gices the number of detector channels in the matrix ($xxx =$ `512` or `1024`)

These response matrices include chip-to-chip differences in gain and also in readout noise (all ground-measured values). It has be noticed that these gains are often off by 1-2% when attempting to fit sources seen with ASUKA using XSPEC. .. So don't be surprised if you have to use the 'gain' task to adjust the gain and yield a better fit. Chip-to-chip differences in 'chip architecture' have not been employed on these matrices; therefore they should be considered correct to 'first order. More precise matrices will be made available as soon as the CRAB data analysis is completed.

Supplementary explanation:
(Koji Mukai, NASA/GSFC Asuka GOF, 1993 Apr 22)

These files seem to use effective area curve for 2 telescopes, even though each file is for a single CCD chip. Also the area used is on-axis values, no vignetting is included. Both 512 and 1024 channel files have equal sized pha bins. Note that the bright & fast mode data are compressed into 2048 bins where higher energy channels are compressed more. Real data files have a threshold below which 0 is output. Use ignore 1-12 or thereabout (with the 512 matrices).
SUMMARY:
files includes 2 XRT effective area; CCD QE for photon event grades 0-4; Thermal Shield transmission; Read-out-noise and other factors that determines spectral resolution, including fluorescence...

Delivered to CALDB by:

Koji Mukai (NASA/GSFC *ASCA* GOF) in SF format, reformatted to OGIP standard by Ian M George.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

See above

Points to Note

- Ian M George (HEASARC) 1993 Apr 22
  - (see above)
- Ian M George (HEASARC) 1995 Dec 08
  - Dataset **renamed** from `sic`j_xxx`.rmf` and **moved** to current location at the request of the ASCA GOF at NASA/GSFC

4.10.3 s#c#g#p#e#_#.rmf & s#c#g#p#e#_#_#.rsp

Location

caldb/data/asca/sis/cpf/93dec20

Status

Unknown

Summary of Files

A total of 312 files containing various redistribution & response matrices for the SIS. The SIS, CCD chip, and data-selection *etc* for which each matrix is valid is encoded within the filename (as well as by internal keywords) as follows:

$$s i c j \mathrm{g} X \mathrm{p} k \mathrm{e} m\_nn.\mathrm{rmf} \ \& \ s i c j \mathrm{g} X \mathrm{p} k \mathrm{e} m\_nn\_xx.\mathrm{rsp}$$

- i is the SIS sensor (i =`0` or `1`)
- j is the CCD chip (j = `0`,`1`,`2` or `3`)
- X is the grade(s) which have been combined (X = `0`, `02` or `0234`)
- k is the split threshold in use (k = `20` or `40`)
- m is a flag indicating whether the echo effect has (m = `0`) or has not (m = `1`) been corrected
- nn is the number of channels (nn = `512` or `1024`).

The files ending in `.rmf` are detector redistribution matrices only; the files ending in `.rsp` are detector redistribution matrices which have been multiplied by an ARF (ie include the XRT effective area *etc*). In the latter case, the location for which the ARF was constructed is encoded using 2 characters, xx, where:

- The first character denotes the nominal SIS pointing position, with `1` indicating that used whilst operating in 1-CCD mode, `2` that used during 2-CCD mode, and `4` that used during 4-CCD mode.
- The second character denotes the phase of the mission, with `p` indicating the PV phase, and `a` the AO phase.

Delivered to CALDB by:

Geoff Crewe (MIT) in OGIP format, 1993 Dec 17.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

- All the above matrices were generated using `sisrmg` version 0.4
- A circular extraction cell of 4 arcmin radius was used to generate the ARFs

Points to Note

- **CAUTION:** The following matrices contain an erroneous 'spike' at 11 keV which can severely effect data analysis.
  `s1c2g`#`p40e1`#.# where # represents a wild-card.
  - The spike is at an energy not usually used in data analysis
  - NO other files are thought to be effected.
  - The ASCA GOF at NASA/GSFC is currently deciding what should be done regarding these files.

  Geoff Crewe (MIT) reports:
  .... there is indeed an evil bug at 11keV in all the `s1c2p40e1` response matrices. The files are probably ok if you toss all photons above 10 keV (which is customary for a variety of reasons).

User Comments & Potential Problems

The following comments & potential problems associated with these datasets have been reported by users. The points are currently under investigation by the GOF & h/w teams, and have not been officially confirmed/denied. Users who suspect they see these effects should contact the GOF for further information.

- Nick White (1994 Jan 22): For SIS0 there is a strong line feature at 2.2 keV which appears to be caused by a mirror M edge not being modelled correctly in the ARF file. The feature is also evident in SIS1 but is a factor of 2–3 times weaker. Keith Gendrau has created his own response matrices not using JBLDARF (from Kunieda's areas) and using these matrices the 2.2 keV feature is not seen in SIS0. I suspect a problem in JBLDARF in the interpolation of the mirror effective area.
- Nick White (1994 Jan 22): As a matter of policy the mirror team are delivering the areas with a 100 eV resolution. This does not seem fine enough, especially around the Gold M-edges. An energy step of at least 10 eV would be better at critical energies, such as around the Gold M-edges.
- Nick White (1994 Jan 22): The silicon fluorescence line for the SIS detector is too big in the current response matrix. Adding a negative line at 1.74 keV with an EW of 10 eV (s0) and 7 eV (S1) gives a better fit.

- Nick White (1994 Jan 22): There is still the problem of the increased effective mirror area above 6–7 keV, causing excesses in sources. This makes it impossible to fit sources like Cyg X-1, to see if their is a broad iron line. This excess was calibrated out for *BBXRT*, can this calibration be applied to *ASCA* ?

- Nick White (1994 Jan 22): There seems to be a problem with the low energy (less than 1 keV) response of SIS1. For joint fits of S1 and S0, there seems to be an excess which translates to lower column densities given by S1. The S0 column densities seem to be better.

- Richard Mushotzky (1994 Apr 12): The s1c2p40e1 matrices have problems at energies greater than 7 keV – not just at energies greater than 11 keV. This is most likely an analysis artifact of the 11 keV spike reported above.

4.10.4 s#c#g#p#e#_#v0_6.rmf & s#c#g#p#e#_#v0_6#.rsp

Location

caldb/data/asca/sis/cpf/94jun20

Status

Unknown

Summary of Files

A total of 104 files containing various redistribution & response matrices for the SIS. The SIS, CCD chip, and data-selection *etc* for which each matrix is valid is encoded within the filename (as well as by internal keywords) as follows:

s*i*c*j*g*X*p*k*e*m*_*nn*v0_6.rmf & s*i*c*j*g*X*p*k*e*m*_*nn*v0_6*xx*.rsp

- i is the SIS sensor (i =`0` or `1`)
- j is the CCD chip (j = `0`,`1`,`2` or `3`)
- X is the grade(s) which have been combined (X = `0`, `02` or `0234`)
- k is the split threshold in use (k = `20` or `40`)
- m is a flag indicating whether the echo effect has (m = `0`) or has not (m = `1`) been corrected
- nn is the number of channels (nn = `512` or `1024`).

The files ending in `.rmf` are detector redistribution matrices only; the files ending in `.rsp` are detector redistribution matrices which have been multiplied by an ARF (ie include the XRT effective area *etc*). In the latter case, the location for which the ARF was constructed is encoded using 2 characters, xx, where:

- The first character denotes the nominal SIS pointing position, with `1` indicating that used whilst operating in 1-CCD mode, `2` that used during 2-CCD mode, and `4` that used during 4-CCD mode.
- The second character denotes the phase of the mission, with `p` indicating the PV phase, and `a` the AO phase.

Delivered to CALDB by:

Ron Zellar (GSFC) 1994 June 20 using `sisrmg` version 0.6.

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

- All the above matrices were generated using `sisrmg` version 0.6

Points to Note

- These matrices supersede the previous set (93dec20). Although there is not a one-to-one correspondence between the 93dec20 matrices and these, the 93dec20 matrices should not necessarily be used.
- These matrices properly include incomplete charge collection. Unless compensated for, this effect leads to a slight excess of counts at energies below about 5 keV. However, the effect is small and depends on source spectrum. For example, if a 20,000-count spectrum from a "typical" soft- excess AGN is analyzed, all the error bars derived by fitting with the new matrices overlap with those derived with the old matrices. However, despite the overlapping error bars, the flux of the best-fitting soft excess is 45 per cent higher with the new matrices.
- As before, the RSP files correspond to the "standard" extraction radius of 4 arcmin (38 pixels with the default, factor-of-four rebinning) and to the standard pointing positions.
- Weird spike near 11keV has been removed

4.10.5 s#c#g#p#e#_#v0_8.rmf & s#c#g#p#e#_#v0_8#.rsp

Location

caldb/data/asca/sis/cpf/94nov9

Status

Unknown

Summary of Files

A total of 54 files containing various redistribution & response matrices for the SIS. The SIS, CCD chip, and data-selection *etc* for which each matrix is valid is encoded within the filename (as well as by internal keywords) as follows:

$s i c j$gXp$k e m$_nnv0_8.rmf & $s i c j$gXp$k e m$_nnv0_8xx.rsp

- i is the SIS sensor (i =`0` or `1`)
- j is the CCD chip (j = `0`,`1`,`2` or `3`)
- X is the grade(s) which have been combined (X = `0`, `02` or `0234`)
- k is the split threshold in use (k = `20` or `40`)
- m is a flag indicating whether the echo effect has (m = `0`) or has not (m = `1`) been corrected
- nn is the number of channels (nn = `512` or `1024`).

The files ending in `.rmf` are detector redistribution matrices only; the files ending in `.rsp` are detector redistribution matrices which have been multiplied by an ARF (ie include the XRT effective area *etc*). In the latter case, the location for which the ARF was constructed is encoded using 2 characters, xx, where:

- The first character denotes the nominal SIS pointing position, with `1` indicating that used whilst operating in 1-CCD mode, `2` that used during 2-CCD mode, and `4` that used during 4-CCD mode.
- The second character denotes the phase of the mission, with `p` indicating the PV phase, and `a` the AO phase.

Delivered to CALDB by:

Ron Zellar (GSFC) 1994 Nov 09 using `sisrmg` version 0.8

File Format

OGIP format RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

- All the above matrices were generated using `sisrmg` version 0.8

Points to Note

- These matrices properly include incomplete charge collection. Unless compensated for, this effect leads to a slight excess of counts at energies below about 5 keV. However, the effect is small and depends on source spectrum. For example, if a 20,000-count spectrum from a "typical" soft- excess AGN is analyzed, all the error bars derived by fitting with the new matrices overlap with those derived with the old matrices. However, despite the overlapping error bars, the flux of the best-fitting soft excess is 45 per cent higher with the new matrices.
- As before, the RSP files correspond to the "standard" extraction radius of 4 arcmin (38 pixels with the default, factor-of-four rebinning) and to the standard pointing positions.

Chapter 5

ASCA MISCELLANEOUS CALIBRATION FILES

5.1 Summary of Available Files

The miscellaneous non-instrument specific & s/c-related calibration files available under the

`/caldb/data/asca/mis/`*type*

directory tree are listed in Table 5.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 5.1: Summary of *ASCA* MIS calibration files available within the OGIP Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
inshkconv110892.fits	I/p required for COMMON HK conversion routine	5.2.1
Calibration Product Files (*type* = `cpf`)		
None		

5.2 BCF: MIS Housekeeping Parameter Transformations

5.2.1 inshkconv110892.fits

Location

caldb/data/asca/mis/bcf

Status

Unknown

Summary of File

Input parameters required for conversion of COMMON housekeeping data. No information supplied to the CALDB.

Delivered to CALDB by:

Jim Ingham (NASA/GSFC *ASCA* s/w Team).

File Format

(No OGIP multi-mission standard)

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB other than above.

Points to Note

- None