OGIP Calibration Memo CAL/SA2/95-006

SAS-2
CALIBRATION FILES IN THE OGIP CALDB

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Last Update: 1995 Feb 24
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SUMMARY

The *SAS-2* calibration datasets currently in the OGIP caldb are described. Intended audience: HEASARC Support Scientists, OGIP programmers and authors of data analysis s/w.

LOG OF SIGNIFICANT CHANGES

Release Date	**Sections Changed**	**Brief Notes**
1995 Feb 24	All	First Public Version

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Chapter 1

INTRODUCTION

1.1 Overview

This document is intended to provide notes on the origin, format, limitations *etc* of all *SAS-2* calibration datasets within the OGIP calibration database (caldb)..

In the rest of this chapter, the location and structure of the OGIP caldb at NASA/GSFC at is briefly described, along with references to other relevant documentation.

All *SAS-2* Spark Chamber (SC) datasets within the caldb at NASA/GSFC are then summarized in Chapters 2, with non-instrument specific datasets summarized in Chapter 3.

1.2 The OGIP Caldb at NASA/GSFC

The location, organization and contents of the OGIP caldb 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 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 some sections 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.

1.4 Acknowledgments

The information within this document is based upon that in Appendix A of versions of the *SAS-2 Calibration Guide* prior to 1994 Feb 23. The *SAS-2 Calibration Guide* was written by Paul Barrett, Brenadan Perry & Ian M George, and is available on-line as postscript and html versions. Appendix A has been removed from the *SAS-2 Calibration Guide* and is effectively replaced by this document.

Chapter 2

SAS-2 SC CALIBRATION FILES

2.1 Summary of Available Files

The SC calibration files available under the

`/caldb/data/sas2/sc/`*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 *SAS-2* SC calibration files available within the OGIP Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
None		
Calibration Product Files (*type* = `cpf`)		
ebounds.rmf	EBOUNDS dataset	2.5.1
effarea#.ear	Effective Area Datasets	2.3.1
redist#.rmf	Redistribution Matrices	2.2.1
psf.rmf	Point Spread Function	2.4.1

2.2 CPF: SC Detector Redistribution Matrices

2.2.1 redist#.rmf

Location

caldb/data/sas2/cpf

Summary of Files

The *SAS-2* redistribution matrix file is in the standard redistribution matrix FITS format for X-ray astronomy (see the document CAL/GEN/92-002). There are 7 input and 8 output energy channels. The input channels span the energy range from 20 MeV to 500 MeV, though the channel from 200 MeV to 500 MeV is the integral above 200 MeV.

Unlike most X-ray detectors where the redistribution matrix does not depend on its position in the detector, the redistribution matrix for a sparkchamber can, as it is does for the *COS-B* Spark Chamber. In the case of *SAS-2*, only one redistribution matrix is given, because the statistics are not sufficient to be able to distinguish between two or more matrices at different zenith angles.

Delivered to CALDB by:

Brenden Perry (HEASARC)

File Format

HDUDOC/VERS = `CAL/GEN/92-002/1.0.0`
(see CAL/GEN/92-002, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supplied to the CALDB other than that above.

Points to Note

- None

2.3 CPF: SC Effective Areas

2.3.1 effarea#.ear

Location

caldb/data/sas2/cpf

Summary of Files

The *COS-B* effective area matrix file is in the standard effective area matrix FITS format for X-ray astronomy (see the document CAL/GEN/92-019). The effective area is given for 7 energy channels and out to an zenith angle of 30 degrees in 0.5 degree increments.

No dependence on pair angle is made

Delivered to CALDB by:

Brenden Perry (HEASARC)

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 other than that above.

Points to Note

- None

2.4 CPF: SC Point Spread Functions

2.4.1 psf.rmf

Location

caldb/data/sas2/cpf

Summary of Files

The *SAS-2 psf* file is in the standard *psf* FITS format for X-ray astronomy (see the document CAL/GEN/92-018). Columns 1, 2, and 5 have the same definition as in that document. The exception is columns 3 and 4. Though the column names (RAD_LO and RAD_HI) are the same, their meanings differ significantly from that of X-ray imaging detectors where the X-ray is given as a position on a 2-dimensional grid. For the detection of high energy γ-rays where a sparkchamber is used, such a grid does not exist and therefore the concept of radial distance is undefined. Instead the zenith and azimuth angles of the event with respect to the telescope's z-axis is recorded and therefore the probability of detecting an event depends upon zenith angle.

The *psf* of sparkchamber depends on zenith angle and strongly on energy, since high energy γ-rays have their direction more accurately know. The direction of the γ-ray cannot generally be determined to better than 0.1 degree. The *psf* is given for seven energy ranges and two zenith angles.

Delivered to CALDB by:

Brenden Perry (HEASARC)

File Format

HDUDOC/VERS = `CAL/GEN/92-018/1.0.0`
(see CAL/GEN/92-018).

Input Datasets, Assumptions, *etc*

No information supllied to the CALDB other than that above.

Points to Note

- None

2.5 CPF: SC EBOUNDS dataset

2.5.1 ebound.rmf

Location

caldb/data/sas2/cpf

Summary of Files

The *SAS-2* energy bounds matrix file is in the standard energy bounds matrix FITS format for X-ray astronomy (see the document CAL/GEN/92-002). There are 8 energy channels are defined for the *SAS-2* detector.

Delivered to CALDB by:

Brenden Perry (HEASARC)

File Format

HDUDOC/VERS = `CAL/GEN/92-002/1.0.0`
(see CAL/GEN/92-002, available on-line as postscript and html versions).

Input Datasets, Assumptions, *etc*

No information supllied to the CALDB other than that above.

Points to Note

- None

Chapter 3

SAS-2 MISCELLANEOUS CALIBRATION FILES

3.1 Summary of Available Files

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

`/caldb/data/sas2/mis/`*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.

Table 3.1: Summary of SAS-2 MIS calibration files available within the OGIP Caldb

Filename Description Section
Basic Calibration Files (*type* = `bcf`) *None* **Calibration Product Files** (*type* = `cpf`) *None*