JUNO UVS
EXPERIMENT DATA RECORD (EDR)
DATA VOLUME
SOFTWARE INTERFACE SPECIFICATION

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Revision 12 Change 1

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REVISION NOTICE

Change	Date	Affected Portions
Initial draft	10 Dec 2009	
Revision 1: Responded to PDS comments	06 Aug 2010	Title page; Applicable Documents; Sections 1, 3.2, 4; Appendix A; Appendix C
Revision 2 : Added Appendix E	08 Oct 2010	Appendix E
Revision 3 : Added sections on volume generation, revised label in Appendix E	04 Mar 2011	Section 6 and 7; Appendix E
Revision 4: Editorial changes based on PDS feedback	07 Apr 2011	Sections 6 and 7; Appendix E
Revision 5: Added extension 9 and corrected frame data description	20 Oct 2011	Sections 3 and 4; Appendix A; Appendix E
Revision 6: Added new PHD extensions and incorporated team editorial suggestions	17 May 2012	Sections 3.2 and 4.2
Revision 7: Editorial changes based on PDS feedback, updated Appendices A and E	05 Oct 2012	Sections 3.2 and 7.6; Appendix A; Appendix E
Revision 7, Change 1: Corrected a typo in Appendix A	24 Oct 2012	Appendix A
Revision 8: Updated Appendix A to match current data product	02 Nov 2012	Appendix A
Revision 9: Updated DATA directory information	14 Jan 2013	Section 7.6
Revision 10: Removed CALIB directory information	19 Apr 2013	Section 7.5
Revision 11: Minor appendix updates	10 May 2013	Appendix A, Appendix E
Revision 12: Update of FITS Objects	01 May 2015	Updated FITS 3-D array images to be defined as QUBE Object types
Revision 12 change 1: PDF/A format for SIS	19 Jan 2017	Changed to say we will provide a copy of the SIS in PDF/A rather than ASCII format

1. PURPOSE AND SCOPE OF DOCUMENT

The purpose of this Data Product SIS is to provide users of the UVS EDR (CODMAC Level 2) data product with a detailed description of the product and a description of how it was generated, including data sources and destinations. The EDR product contains time-tagged sequences of uncalibrated photon detections and histograms created from those sequences. Housekeeping data, which will be used to interpret the raw data, are also included. This SIS is intended to provide enough information to enable users to read and understand the data product. The users for whom this SIS is intended are the scientists who will analyze the data, including those associated with the Juno project, and those in the general planetary science community.

This Data Product SIS describes how the data in the EDR data product are acquired by the UVS instrument, and how they are processed, formatted, labeled, and uniquely identified. The document discusses standards used in generating the product and software that may be used to access the product. The data product structure and organization are described in sufficient detail to enable a user to read the product.

2. APPLICABLE DOCUMENTS

This Data Product SIS is intended to be consistent with the following documents:

1. Planetary Data System Standards Reference, version 3.8
2. Planetary Science Data Dictionary Document, revision E, August 28, 2002, JPL Document D-7116.
3. Definition of the Flexible Image Transport System (FITS), version 2.1b, December 9, 2005, IAU FITS Working Group (http://fits.gsfc.nasa.gov/iaufwg/).
4. Planetary Data System Archive Preparation Guide

3. DATA PRODUCT CHARACTERISTICS AND ENVIRONMENT

This section describes the UVS EDR data product in greater detail, including how the data are acquired, the types of data in the EDR, and how the data are processed and validated.

3.1 Instrument Overview

The Juno-UVS instrument will be based on the Alice instrument launched on the New Horizons mission to Pluto and the Lyman Alpha Mapping Project (LAMP) instrument on the Lunar Reconnaissance Orbiter (LRO). The instrument is being developed by SwRI and will be delivered to JPL for integration onto the Juno spacecraft. The instrument consists of two main assemblies, a shoebox-sized detector, which includes the optical system, and an electronic part that will be housed in the spacecraft vault. In addition to this changed configuration (LAMP and Alice each consisted of a single assembly), a number of small changes are incorporated to adapt the instrument to the specific mission. A main design driver is the radiation environment which resulted in the separation of the instrument into two assemblies. Another major change is the addition of a scan mirror that allows the selection of an area of interest when the spinning spacecraft is close to Jupiter.

The instrument is a Rowland-circle imaging spectrograph that uses state-of-the-art MCP detector and UV optics technology. The telescope section focuses light entering the entrance apertures onto the entrance slit of the spectrograph section. Light that passes through the slit strikes a concave holographic toroidal diffraction grating, which focuses the UVS passband wavelengths onto the MCP detector. Photoelectrons are created by the photocathode material on the front surface of the MCP Z-Stack and are multiplied by

the Z-Stack to create an amplified charge cloud of ~10^7 electrons per event that is accelerated across a narrow gap to the XDL 2-D anode array. When this charge cloud exceeds a specified amplitude level set by the detector threshold, it will result in a valid detected event. In response to the event, the anode outputs signals that are converted by the detector electronics into a pixel location on the array. Thus, the use of the word pixel refers to the resolved location where the charge cloud hits the anode. The detector electronics encodes 2048 spectral pixel columns and 256 spatial pixel rows. For each event, the detector also reports the amplitude of each charge pulse as a five-bit number which indicates the pulse-height gain. The field-of-view (FOV) of the instrument is such that six of the spatial rows (3 top/3 bottom) and 400 spectral columns (200 left/200 right) are not in the active field of view of the instrument. The STIM pulses fall in this area and the remaining not illuminated region may be used for detector health monitoring.

3.2 Data Product Overview

The sources of the data contained in the UVS EDR data product are files containing (1) the UVS instrument low-speed housekeeping telemetry and (2) the UVS science data. These files may be processed when both science and housekeeping data files are present, or if one is present without the other then a partial product will be created and that file will be flagged for later reprocessing. The UVS EDR data product combines these files into a single FITS formatted file containing the following types of data:

1. Spectral vs. Spatial Image: This is a reconstructed histogram generated from the pixel list data in the science data file. Photon acquisition events will be binned according to their spectral and spatial components. This summary image is used as a "quick-look" check on data quality. [Extension 0 = primary FITS header and data unit (HDU)]
2. Spatial vs. Time Image: This is similar to the first dataset, but the data are binned based on spatial and temporal parameters. The 360° histogram will be split into 5 panels of 72°. A new histogram will be started every time the scan mirror moves, as determined from the housekeeping data. This summary image is used as a "quick-look" check on data quality. [Extension 1]
3. Frame List: This dataset contains a list of the generated frame acquisitions. The list includes, for each frame, the instrument frame sequence number, start and stop times, tag bytes, quality factor and other instrument state information. The frame acquisition times and instrument state data contained in this list are used to cross-reference with the pixel list mode data for purposes of selecting data and checking timing consistency. [Extension 2]
4. Scan Mirror Data: This dataset contains a listing of all scan mirror positions and information on when the mirror entered and exited each position. These data are taken from the housekeeping packets. [Extension 3]
5. Raw Frame Data: This dataset contains all of the raw data from the science data file except for the file header. [Extension 4]
6. Analog Count Rate: This dataset contains a sequence of time ordered photon count rates read from the housekeeping data packets. [Extension 5]
7. Digital Count Rate: Similar to the previous dataset, this will contain the count rate as determined from the raw science data. These data will be shown as counts/second. [Extension 6]
8. Pulse Height Distribution (Lyman Alpha): This is one of three histograms where the bins are arranged as pulse height vs. time. One histogram will be created per spin. This histogram contains photons whose spectra are recorded on detector columns numbered between 850 and 930. [Extension 7]

9. Pulse Height Distribution (Stellar): This is one of three histograms where the bins are arranged as pulse height vs. time. One histogram will be created per spin. This histogram contains photons whose spectra are recorded on detector columns numbered between 931 and 1770. [Extension 8]
10. Pulse Height Distribution (Stim): This is one of three histograms where the bins are arranged as pulse height vs. time. One histogram will be created per spin. This histogram contains photons whose spectra are recorded on detector columns numbered between 0 - 149 and 1950 – 2047. [Extension 9]
11. Housekeeping Data: This dataset contains the complete housekeeping dataset, both in raw format and, where applicable, in calibrated engineering units. HK data are included here to assist with joint instrument and data quality trending analyses (foreseen and unforeseen). [Extension 10]
12. Parameter List: This table records the known values of the instrument parameter table, as reported in the housekeeping data. [Extension 11]

The primary data in the UVS EDR product files will be contained in the raw data frames in Extension 4 of the FITS files. Data frames will contain a series of time-tagged UV photon detection events. The histogram image in the primary FITS header and data unit (HDU) will simply be these photon events histogrammed into the 2048 spectral by 256 spatial bins. These histograms are included up front because most FITS viewers expect image data in the primary HDU and because they can give at a glance an indication of the data quality and an average spectrum. The Frame List is simply a list of each UVS data frame's start and stop times, tag bytes, and other header information (Extension 2).

Detailed specifications for the UVS EDR data product can be found in Section 5 and Appendix A of this document.

3.3 Data Processing

Data format is described in Section 5, Detailed Data Product Specifications. Data volume will vary because it is a function of the UV photon detection rate. The exact number of science data frames will vary from file to file.

3.3.1 Data Processing Level

The UVS EDR data product contains raw UV photon detections/spectra and associated data corresponding to CODMAC Level 2 (see Appendix D).

3.3.2 Data Product Generation

The UVS-generated science and housekeeping telemetry files will be retrieved from the spacecraft by and then transferred to the primary UVS SOC pipeline computer. The UVS SOC pipeline "executive" program will execute once per day and detect the newly delivered data files. After cataloging the received files, the "executive" program will initiate execution of the UVS SOC data processing pipeline. The first element (nicknamed "Lima") of the pipeline will be responsible for converting the data files into the EDR data products whose format is described in this SIS. No calibrations will be applied to the science data at this stage. As mentioned previously, raw telemetry values will be converted to engineering units where applicable; however, both raw and converted values will be included in the EDR data product. Multiple versions of the output EDR products may be made available if software bugs affecting the output data are uncovered and corrected. In the event of an error whose correction alters released data, the data will be reprocessed by the revised software and made available.

3.3.3 Data Flow

The original source of the data contained in each UVS EDR data product will be the UVS instrument itself. UVS-generated data files will be retrieved from the Juno spacecraft and then transferred to the UVS SOC for further processing. After the UVS EDR data products are produced by the UVS SOC, they will be archived and transferred to the PDS for permanent storage and public access.

3.4 Standards Used in Generating Data Products

3.4.1 PDS Standards

The UVS EDR data product complies with Planetary Data System standards for file formats and labels, as specified in the PDS Standards Reference [1].

3.4.2 Coordinate Systems

The UVS EDR data product is a CODMAC Level 2 product. As such, the data contained therein have not been calibrated or located in space. Thus, it is not currently planned to include spatial coordinate information in the UVS EDR data product itself.

3.4.3 Data Storage Conventions

The UVS EDR data product complies with the FITS standard for file formats and data storage conventions, as specified in the Definition of the Flexible Image Transport System (FITS) [8].

3.5 Data Validation

UVS EDR data products will be validated by the UVS Team for science content and for compliance with PDS archive standards [1].

4. DETAILED DATA PRODUCT SPECIFICATIONS

The UVS EDR data products shall be grouped into directories with one directory per flight day. Flight day is defined to be midnight-to-midnight UTC. Within each directory shall be labels containing pointers to the corresponding individual data products.

4.1 Data Product Structure and Organization

The structure of the DATA directory is TBD and will be based on mission-wide standards.

4.2 Data Format Descriptions

The nine types of data included in the UVS EDR data product are listed in Section 3.2. All of these data are stored in a single FITS file with a detached PDS label. Each data type within the FITS file is stored in a separate HDU (Header and Data Unit). Three data types, the reconstructed histograms, will be stored as FITS images within their HDUs, the acquisition list will be stored as a FITS ASCII table, and the remaining data types will be stored as FITS binary tables. A detailed listing of the proposed FITS format of the UVS EDR data product is given in Appendix A.

A discussion of the interpretation of the frame data (FITS Extension 2) is warranted here. As described in the sample PDS header in Appendix E of this document, the binary frame data table consists of two

columns. The first column gives the generation time of the frame as an 8-byte double precision value expressing the number of integral and fractional seconds elapsed since the epoch used for SCUT. The second column contains the 32766 24-bit words of the data frame itself.

In order to identify the science data frames (packets), a single 48-bit header starts the frames. The header is generated by the acquisition hardware and includes the information listed in Table 4-1.

Table 4-1: UVS Science Frame Header

Field	Size in bits	Description
Hack Rate	4	0 = 1 ms, 1 = 2 ms, 3 = 4 ms, … 9 = 512 ms
Frame Size	2	0 = 16k entry, 1 = 32k entry, 2 = 64k entry
Memory	1	0 = ping (side A) 1 = pong (side B)
Final frame	1	0 = intermediate frame 1 = last frame (acquisition cycle terminated)
Frame counter	16	Frame number since instrument powered on
Quality Number	8	Periodically (100 ms) calculated Quality Number, last one calculated is reported
Tag Byte 2	8	Operations defined functionality, specified as parameters of the start acquisition command.
Tag Byte 3	8	

Each 24-bit word in the remainder of the frame either describes a photon event or a time hack. The least significant five bits distinguish these. When their value is 0, the entry is a time hack. Any other value indicates a pulse height (amplitude) of a photon event. A photon event encodes the location of the detected event consisting of an 11-bit encoded spectral location and an 8-bit encoded spatial location in the remaining 19 data bits. The time hack is used to provide temporal information about the photon events. The acquisition hardware will generate and insert time hacks in the frame on a periodic basis (configurable for each acquisition in a range of 4 – 512 msec). In the remaining 19 bits, the time hack contains an incrementing counter that counts the number of 4 msec periods. This value allows for data recovery in case of lost frames (packets).

4.3 Label and Header Descriptions

Each UVS EDR data file is described by a PDS label in a separate file with the same root name, but with the extension ".LBL." The label file is stored in the same directory as the FITS data file that it describes. The contents of the PDS label file are derived in part from the FITS header information contained in the HDU headers of the data file itself.

The data files themselves do not contain any embedded PDS headers, but do contain FITS headers according to the FITS standard [8].

An example of the FITS header is given in Appendix A.

5. APPLICABLE SOFTWARE

The format of the UVS EDR data product is standard FITS. There are a number of different software libraries available that enable the reading and writing of standard FITS files. These libraries are written in a number of different languages and are available for a variety of different computing platforms. A list of these libraries can be found at the FITS Support Office web site (http://fits.gsfc.nasa.gov/). Commonly used FITS libraries include the IDL Astronomy Library (http://idlastro.gsfc.nasa.gov/fitsio.html) and the CFITSIO/FITSIO library (http://heasarc.gsfc.nasa.gov/docs/software/fitsio/fitsio.html). For this reason,

no additional special software will be included in the EDR archive to parse and interpret the data files.

5.1 Utility Programs

No utility programs are planned at this time. However, they may be included in future revisions.

5.2 Applicable PDS Software Tools

PDS archive products should be able to be displayed with the program NASAVIEW, developed by the PDS and available free of charge for a variety of computer platforms from the PDS web site (http://pds.jpl.nasa.gov/tools/software_download.cfm).

5.3 Software Distribution and Update Procedures

Any developed software specific to UVS EDR data products will be distributed with the EDR archive. Version numbers and a CHANGELOG document will describe updates. At this time, however, no need for any such software is anticipated.

6. ARCHIVE VOLUME GENERATION

6.1 Archive Structure and Identification

PDS data set names shall conform to the following format: JUNO <target> UVS <data type> <calibration state> DATA V<major version>.<minor version>. For example, version one of the UVS science data set will be named JUNO J UVS 2 EDITED RAW DATA V1.0

PDS data set identifiers (DSID) will be abbreviated versions of the data set names formed according to the PDS formation rule for the DATA_SET_ID keyword. For example, the DSID for the data set above would be JNO-J-UVS-2-EDR-V1.0.

Each archive volume has the same general structure, consisting of a set of fixed top-level directories; INDEX, DOCUMENT, CATALOG, CALIB, and DATA. Archive volumes may optionally include BROWSE and EXTRAS directories. The BROWSE directory is contains browse data products intended to permit quick-look evaluation of the data. The EXTRAS directory contains files that are helpful but not required for interpretation of the archived data. The contents of each directory will be described below. The INDEX, DOCUMENT, CATALOG, EXTRAS, and CALIB directories will exist **only** on the first physical volume of a data set to avoid the requirement to redistribute all physical volumes if the contents of either the EXTRAS or CALIB directories change.

6.2 Data Production and Transfer Methods

The instrument operations team (IOT) produces the individual data files and the associated PDS labels for each of the standard data products defined in the data product SISs. Data files will contain all data of the appropriate type for the time interval contained in the data product. Data products will be transferred via secure FTP to the JSOC. Upon receipt at the JSOC, the data files and their corresponding labels will be checked for consistency and compliance with the PDS standards. Files and labels that pass this check will be placed in directories that mirror the archive organization. The JSOC will return a positive or negative acknowledgement via email to the IOT. Upon receipt of a negative acknowledgement, the IOT will diagnose and correct the errors and resubmit the data.

The JSOC transfers data products to the PDS discipline node. Data products will be compressed (Gzipped) and transferred via secure FTP to the PDS node. Each data transfer is logged. Upon notification of the data transfer, the PDS node decompresses the transfer and compares its contents against the transfer information. Each data file is validated against the MD5 checksum contained in the corresponding detached label. The PDS node will post a positive or negative acknowledgement of the data receipt. If the acknowledgement is positive, no further action is required on the part of JSOC. If the acknowledgement is negative, the transfer is repeated after diagnosis and correction of the cause of the transfer error.

6.3 Volume Creation

The PDS node collects the data files and labels provided by the JSOC team onto archive volumes. Each archive volume contains all instrument data available for the time interval covered by the archive volume.

6.4 Volume Validation Methods

Validation of the instrument data archive is completed in two phases. The first phase is performed by the PDS node and consists of reviewing a sample, pathfinder data set for compliance with the PDS standards. The instrument team will submit a set of data files following the procedure of section 6.2 above. Upon receipt, the PDS node will confirm the structure of the files and labels. Once the sample data are validated, the instrument team will develop software to generate subsequent data sets in an automated fashion.

The second phase of the validation consists of a peer review to ensure usability and completeness. The peer review panel will consist of members of the instrument team, the PDS discipline node and Engineering Nodes of the PDS, and at least two outside scientists actively working in the field. The PDS personnel will be responsible for validating that the archive volume(s) are fully compliant with PDS standards. The instrument team and outside science reviewers will be responsible for verifying the content of the data set, the completeness of the documentation, and the usability of the data in its archive format. Any deficiencies in the archive volume will be recorded as liens against the product by the review panel. After all liens placed against the product or the product generation software are resolved, automated production and validation can begin.

Once automated production begins, the data file content will be spot checked by members of the instrument team. The data will be used by team members to perform their analysis. Any discrepancies in the data noted during these activities will be investigated. If the discrepancy is a data error, the response will depend on the source of the error. If the error is in the software producing the data product, the error will be corrected and the data products affected will be reproduced. If there is a correctable error in a data file, the file will be replaced. If an error in a data file is uncorrectable, the error will be described in the cumulative errata file included on each volume in the volume set. The structure of data files and labels will be spot checked by the PDS discipline node for compliance with PDS standards and this SIS.

7. ARCHIVE VOLUME CONTENTS

This section describes the contents of the standard product archive collection volumes, including the file names, file contents, file types, and organizations responsible for providing the files. The complete directory structure is shown in Figure 1, below.

7.1 Root Directory Contents

The following files are contained in the root directory, and are produced by the instrument team. All of these files are required by the PDS Archive Volume organization standards.

Table 7-1: Root Directory Contents		
File Name	**File Contents**	**Provided By**
AAREADME.TXT	This file completely describes the Volume organization and contents (PDS label attached).	IOT
ERRATA.TXT	A cumulative listing of comments and updates concerning all Standard Data Products on all Volumes in the Volume set published to date.	IOT
VOLDESC.CAT	A description of the contents of this Volume in a PDS format readable by both humans and computers.	IOT

7.2 INDEX Directory Contents

The following files are contained in the index directory and are produced by the instrument team. The INDEX.TAB file contains a listing of all data products on the archive volume. In addition, there is a cumulative index file (CUMINDEX.TAB) that lists all data products in the archive volume set to date. The index and index information (INDXINFO.TXT) files are required by the PDS volume standards. The index tables include both required and optional columns. The cumulative index file is also a PDS requirement; however, this file is not reproduced on each data volume. An online and web accessible cumulative index file is maintained at the PDS discipline node while archive volumes are being produced. Only the last archive volume in the volume series will contain a cumulative index file.

Table 7-2: Index Directory Contents		
File Name	**File Contents**	**Provided By**
INDXINFO.TXT	A description of the contents of this directory	IOT
INDEX.TAB	A table listing all Data Products on this Volume	IOT
INDEX.LBL	A PDS detached label that describes INDEX.TAB	IOT

7.3 DOCUMENT Directory Contents

The document directory contains documentation that is considered to be either necessary or simply useful for users to understand the archive data set. Documents may be included in multiple forms (ASCII, PDF, MS Word, HTML with image file pointers, etc.). PDS standards require that any documentation deemed required for use of the data be available in some ASCII format. Clean HTML is acceptable as ASCII formats in addition to plain text. The following files are contained in the DOCUMENT directory and are produced or collected by the PDS discipline node.

Table 7-3: Document Directory Contents		
File Name	**File Contents**	**Provided By**
DOCINFO.TXT	A description of the contents of this directory	IOT
12029-EDRDP_SIS-01.DOC	The Archive Volume SIS (this document) in Microsoft Word format	IOT
12029-EDRDP_SIS-01.PDF	The Archive Volume SIS (this document) in PDF/A format	IOT
12029-EDRDP_SIS-01.LBL	A PDS detached label that describes 12029-EDRDP_SIS-01.ASC and 12029-EDRDP_SIS-01.DOC.	IOT
Other Documents	Additional documents describing data processing, calibration etc.	IOT
Other Document labels	Detached PDS labels for any additional documents	IOT

7.4 CATALOG Directory Contents

The completed PDS catalog files in the catalog directory provide a top-level understanding of the Juno mission and its data products.

Each file in the catalog directory contains an individual PDS catalog object. These objects provide a top-level understanding of the Juno mission, the instrument, and its data products. The data set catalog files will be provided by the instrument team.

Table 7-4: Catalog Directory Contents		
File Name	**File Contents**	**Provided By**
CATINFO.TXT	A description of the contents of this directory	IOT
UVS_EDR_DS.CAT	PDS Data Set catalog description as appropriate to the data set	IOT
INSTHOST.CAT	PDS instrument host (spacecraft) catalog description of the Juno spacecraft	Juno Project
UVS_INST.CAT	PDS instrument catalog description of the instrument	IOT

Table 7-4: Catalog Directory Contents		
File Name	**File Contents**	**Provided By**
MISSION.CAT	PDS mission catalog description of the Juno mission	Juno Project
PERSON.CAT	PDS personnel catalog description of instrument Team members and other persons involved with generation of Data Products	IOT
REF.CAT	Instrument-related references mentioned in other *.CAT files Additional bibliographic references, as appropriate	IOT

7.5 DATA (Standard Products) Directory Contents and Naming Conventions

The data directory contains the actual data products produced by the instrument. The data directory will be divided into a subdirectory for each perijove pass, containing data for the entire orbit containing that perijove. The data directory will also have separate directories for cruise, approach, and capture phases. The cruise directory will be divided into subdirectories based on activity.

7.5.1 Required Files

Every file in the data path of an Archive Volume must be described by a PDS label. All labels will be detached, having the same root name as the file they describe with the suffix ".LBL." In directories where there are multiple data files with the same internal format, the format description may be included in a single format file (.FMT) that is referenced by a pointer within each PDS label file. This prevents the needless repetition of information that is not changing within the PDS label files.

7.5.2 DATA Directory Contents

The data directory contains a separate subdirectory for each orbit. The subdirectories will be named with the number of the perijove contained in the orbit. There may be more than one data file in each subdirectory, depending on what events take place in a given orbit. For example, there may be a file containing the perijove pass data, a file containing the science data collected during the calibration period of the instrument, and one for the remainder of the orbit.

Table 7-7: Data Directory Contents		
File Name	**File Contents**	**Provided By**
UVS_ ENG_SSSSSSSSS _ CCYYDDD_ SSSSSS_Vvv.FIT	Data file.	IOT
UVS_ ENG_SSSSSSSSS _ CCYYDDD_ SSSSSS_Vvv.LBL	PDS label for data files of same base name.	IOT

7.5.3 File Naming Convention

File names are formed by concatenating descriptive elements. These elements include dates, time, and versions. Tokens representing each of these elements are listed in Table 7-8. The extension indicates the type of data found in the file and is specified in Table 7-9.

Data file names are formed according to the following conventions:

ins_string_ccyyddd_ string _V##.ext

Tokens in *italics* are replaced by the appropriate file name element. Items in **bold** are included exactly as is. Alternates are enclosed in brackets, with each alternative separated by a vertical bar as follows: [a|b|c]. Optional elements are enclosed in brackets, [*opt*]. Each instrument has a 3 character mnemonic used for identification, as specified in Table 7-10 below.

Table 7-8: Filename Convention Elements	
token	description
cc	The century portion of a date, 19 or 20
yy	The year of century portion of a date, 00-99
ddd	The day of year, 001-366
T	delimiter between date and time
hh	The hour portion of time, 00-23
mm	The minutes portion of time, 00-59
ss	The seconds portion of time, 00-60
fff	The thousandths of a second portion of the time 000-999
ins	The three character instrument abbreviation
string	An arbitrary alphanumeric character string
oo	Perijove number, 00-40.
l	CODMAC data level, 2, 3,…,8
##	A numeric string with as many digits as characters in the token, padded with leading zeros
ext	A file name extension indicating the contents of the file. See table xxx for extensions
I F C	Time stamp identifiers, **I**nitial time, **F**inal time, and **C**reation time, which prefix a date/ time string.

Table 7-9: Filename Extensions	
Extension	description
ASC	Plain ASCII documentation file
CAT	Catalog object
CSV	Spreadsheet (comma-separated value)
DAT	Binary data, not otherwise specified
FIT	Flexible Image Transport System files (preferred)
FTS	Flexible Image Transport System files (deprecated)
FMT	Include file for describing data objects, normally referred to by labels
GIF	GIF image
IMG	Image data
JPG	JPEG image data
LBL	Detached label
PDF	Portable document format data
PNG	Portable network graphics data
QUB	Spectral image QUBE data
TIF	Tagged Image File data
TXT	Plain text documents

Table 7-10: Instrument Mnemonic	
Instrument Name	mnemonic
Advanced Stellar Compass	ASC
Fluxgate Magnetometer	FGM
Gravity Science	GRV
Jovian Auroral plasma Distributions Experiment	JAD
Jupiter Energetic-Particle Detector Instrument	JED
Jovian Infrared Auroral Mapper	JIR
Juno EPO Camera	JNC
Microwave Radiometer	MWR
Ultraviolet Spectrometer	UVS
Radio and Plasma Waves Instrument	WAV

7.6 EXTRAS Directory Contents

The EXTRAS directory contains files that are helpful, but are not required to interpret the INSTRUMENT data. Files in the EXTRAS directory are exempt from labeling requirements. Subdirectories are used to organize the items into groups of related files. The EXTRAS directory, if present must contain the EXTRAINFO.TXT file that identifies the function or purpose of each file in the directory.

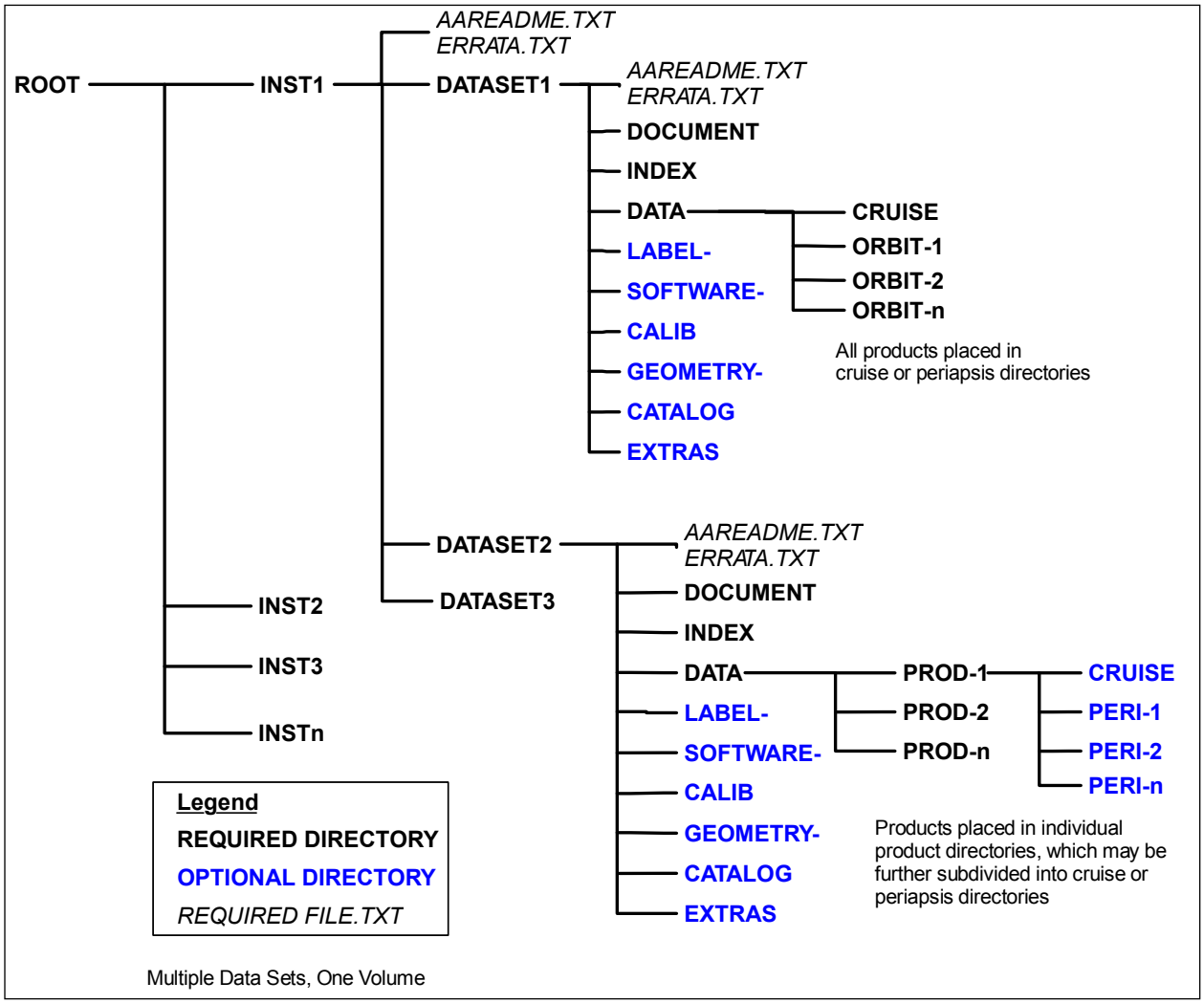

Figure 1, Directory and Volume Structure. This diagram shows the directory structure at the JSOC, which mirrors the PDS volume structure.

APPENDIX A – DETAILED UVS EDR FITS FILE SPECIFICATIONS

For each of the FITS HDUs described in Section 4.2 of this document, this Appendix lists and describes the specific header keywords and provides details on the format and layout of the data. Values followed by an asterisk (*) are variable on a per-file basis and are examples only.

FITS Header Keyword	Value	Description
FITS File Header	Primary HDU	
SIMPLE	T	conforms to FITS standard
BITPIX	32	array data type
NAXIS	2	number of array dimensions
NAXIS1	2048	number of spectral channels
NAXIS2	256	number of spatial channels
EXTEND	T	FITS extensions present
BZERO	0	no offset
BSCALE	1	default scaling factor
MISSION	‘JUNO’	
HOSTNAME	‘JUNO’	Host name (PDS terminology)
INSTRUME	‘UVS’	Ultraviolet Spectrograph
FILETIME	‘2012-146T20:46:00’*	Time file was created (UTC)
ORIGIN	‘SwRI’	Southwest Research Institute
HKSTRSEC	376985155.720*	HK data file start time (SCLK, sec)
HKENDSEC	377013535.720*	HK data file stop time (SCLK, sec)
HKSTRTIM	‘2011-346T18:04:52.720’*	HK data file start time (approximate UTC)
HKENDTIM	‘2011-347T01:57:52.720’*	HK data file stop time (approximate UTC)
SCSTRSEC	376986296.062*	Sci data file start time (SCLK, sec)
SCENDSEC	377013457.738*	Sci data file stop time (SCLK, sec)
SCSTRTIM	‘2011-346T18:23:52.062’*	Sci data file start time (approximate UTC)
SCENDTIM	‘2011-347T01:56:34.737’*	Sci data file stop time (approximate UTC)
NUMGAPS	16327*	Number of gaps in pixel data
GAPFRAME	5*	Number of frames containing gaps
DATATYPE	‘varies’*	Data type for all frames
PHASENUM	‘varies’*	Phase number for all frames
PHASE	‘varies’*	Phase for all frames
FRAMESEQ	‘varies’*	Frame sequence for all frames
MINCTR	0.000000*	Minimum countrate (Hz)
AVRCNTR	2120.257580*	Average countrate (Hz)
MAXCNTR	180000.000000*	Maximum countrate (Hz)
PACKETS	14191*	Number of packets
HKDROPEN	1*	Setting state for dropping startup HK packets
HKDROP	2*	Number of startup HK packets dropped
TEMPSFTY	‘none’*	Temperature safety
CYCLSFTY	‘none’*	Cycle safety
ANODSFTY	‘none’*	Anode safety
STRPSFTY	‘none’*	Strip safety
HVSFTY	‘none’*	High Voltage safety
BRTSFTY	‘none’*	Bright Object Safety
HVSET	-4.177488*	Stable HV Set Voltage
MCPVMIN	-4.191646*	Minimum MCP Voltage (kVolt)

FITS Header Keyword	Value	Description
MCPVMAX	0.000000*	Maximum MCP Voltage (kVolt)
ANOVMAX	0.000000*	Maximum Anode Voltage (kVolt)
STPIMIN	0.000000*	Minimum Strip Current (kVolt)
STPIMAX	8.832249*	Maximum Strip Current (kVolt)
MINDISC	1*	Low Discriminator Value
MAXDISC	31*	High Discriminator Value
EVCNTLO	1*	Lowest value of 24 bit HW raw event counter
EVCNTHI	16776798*	Highest value of 24 bit HW raw event counter
EVCOUNTS	16776797*	Total number of raw events reported
APDOOR	'varies'*	Aperture door status
MINMIRAT	1.864194*	Scan Mirror A Minimum Temperature
AVRMIRAT	3.428284*	Scan Mirror A Average Temperature
MAXMIRAT	3.772501*	Scan Mirror A Maximum Temperature
MINMIRBT	1.864191*	Scan Mirror B Minimum Temperature
AVRMIRBT	3.393853*	Scan Mirror B Average Temperature
MAXMIRBT	3.772501*	Scan Mirror B Maximum Temperature
MINOAPAT	0.340716*	OAP Mirror A Minimum Temperature
AVROAPAT	4.091866*	OAP Mirror A Average Temperature
MAXOAPAT	5.298464*	OAP Mirror A Maximum Temperature
MINOBPAT	0.340716*	OAP Mirror B Minimum Temperature
AVROBPAT	4.069183*	OAP Mirror B Average Temperature
MAXOBPAT	4.917215*	OAP Mirror B Maximum Temperature
MINGRTAT	3.390757*	Grating A Minimum Temperature
AVRGRTAT	4.640272*	Grating A Average Temperature
MAXGRTAT	5.679482*	Grating A Maximum Temperature
MINGRTBT	3.390757*	Grating B Minimum Temperature
AVRGRTBT	4.759841*	Grating B Average Temperature
MAXGRTBT	6.060231*	Grating B Maximum Temperature
MINCDHAT	6.820777*	C&DH A Minimum Temperature
AVRCDHAT	14.516661*	C&DH A Average Temperature
MAXCDHAT	16.192519*	C&DH A Maximum Temperature
MINHVPST	6.820777*	HVPS Minimum Temperature
AVRHVPST	14.137295*	HVPS Average Temperature
MAXHVPST	16.192519*	HVPS Maximum Temperature
MINLVPST	6.440674*	LVPS Minimum Temperature
AVRLVPST	17.182114*	LVPS Average Temperature
MAXLVPST	18.818156	LVPS Maximum Temperature
MINDETHT	1.482907*	Detector Body Minimum Temperature
AVRDETHT	4.330044*	Detector Body Average Temperature
MAXDETHT	5.298464*	Detector Body Maximum Temperature
MINDETET	-0.039287*	Detector Elc Minimum Temperature
AVRDETET	10.614455*	Detector Elc Average Temperature
MAXDETET	11.721900*	Detector Elc Maximum Temperature
MINSMIBT	6.440674*	SMIB Minimum Temperature
AVRSMIBT	14.542425*	SMIB Average Temperature
MAXSMIBT	16.192519*	SMIB Maximum Temperature
MINCHAST	1.482907*	Chassis Minimum Temperature

FITS Header Keyword	Value	Description
AVRCHAST	3.676146*	Chassis Average Temperature
MAXCHAST	4.535776*	Chassis Maximum Temperature
DETDOOR	'open'*	Detector door status
SPINRATE	30*	Number of seconds per spin
HACKCLCK	0.000999993322*	Instrument actual hack clock
HACKOFFS	376985151.649*	Instrument hack clock offset
HACKCORR	1.000000*	Instrument hack clock correlation
SL1PROC	'UVS-LIMA'	SOC pipeline level 1 software
SL1REV	'15658'*	SOC pipeline level 1 software revision
SL1DATE	'2012-05-23'*	SOC pipeline level 1 software date
END		
Primary HDU Data	**Spectral vs. Spatial Histogram**	**2-D array 2048x256 of 32 bit event counts**
XTENSION	'IMAGE'	Extension 1: Space vs. Time Histogram
BITPIX	32	array data type, 32 bit words
NAXIS	3	number of array dimensions
NAXIS1	300	300 0.1 second bins
NAXIS2	256	256 bins of spatial information
NAXIS3	100*	Number of histogram images
BZERO	0	no offset
BSCALE	1	default scaling factor
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
EXTNAME	'Extension 1: Space vs. Time Histogram'	Extension name
EXTVER	1	Extension version number
END		
Extension 1 HDU Data	**Spatial vs. Time Histogram**	**256x300xN array of 32 bit event counts**
XTENSION	'TABLE'	Extension 2: Frame List
BITPIX	8	array data type, 8-bit ASCII characters
NAXIS	2	number of array dimensions
NAXIS1	185	number of characters per line
NAXIS2	2573 (*)	number of acquisitions
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
TFIELDS	20	Number of element fields per line
EXTNAME	'Frame List'	Frames from science data
EXTVER	1	Extension version number
TFORM1	'I5'	Format of field 1
TFORM2	'D14.3'	Format of field 2
TFORM3	'I10'	Format of field 3
TFORM4	'I10'	Format of field 4
TFORM5	'D14.3'	Format of field 5
TFORM6	'D14.3'	Format of field 6
TFORM7	'I3'	Format of field 7

FITS Header Keyword	Value	Description
TFORM8	'I5'	Format of field 8
TFORM9	'I1'	Format of field 9
TFORM10	'I3'	Format of field 10
TFORM11	'I1'	Format of field 11
TFORM12	'I2'	Format of field 12
TFORM13	'I5'	Format of field 13
TFORM14	'I8'	Format of field 14
TFORM15	'I8'	Format of field 15
TFORM16	'I2'	Format of field 16
TFORM17	'I10'	Format of field 17
TFORM18	'I5'	Format of field 18
TFORM19	'I1'	Format of field 19
TFORM20	'A64'	Format of field 20
TBCOL1	1	Start column for field 1
TBCOL2	6	Start column for field 2
TBCOL3	20	Start column for field 3
TBCOL4	30	Start column for field 4
TBCOL5	40	Start column for field 5
TBCOL6	54	Start column for field 6
TBCOL7	68	Start column for field 7
TBCOL8	71	Start column for field 8
TBCOL9	76	Start column for field 9
TBCOL10	77	Start column for field 10
TBCOL11	80	Start column for field 11
TBCOL12	81	Start column for field 12
TBCOL13	83	Start column for field 13
TBCOL14	88	Start column for field 14
TBCOL15	96	Start column for field 15
TBCOL16	104	Start column for field 16
TBCOL17	106	Start column for field 17
TBCOL18	116	Start column for field 18
TBCOL19	121	Start column for field 19
TBCOL20	122	Start column for field 20
TTYPE1	'FRAME_COUNTER'	Frame counter value (0-65535)
TTYPE2	'SC_RCVD_TIME'	Spacecraft received time
TTYPE3	'FIRST_TIMEHACK'	First timehack
TTYPE4	'LAST_TIMEHACK'	Last timehack
TTYPE5	'SC_TIME_FIRST_HACK'	Spacecraft time of the first timehack
TTYPE6	'SC_TIME_LAST_HACK'	Spacecraft time of the last timehack
TTYPE7	'TAG_BYTE_1'	Tag byte 1
TTYPE8	'TAG_BYTE_2'	Tag byte 2
TTYPE9	'TAG_BYTE_3'	Tag byte 3
TTYPE10	'QUALITY_FLAG'	Quality flag
TTYPE11	'MEMORY_SIDE'	Memory side (0=A, 1=B)
TTYPE12	'HACK_RATE'	Hack rate (0=1ms, 1=2ms, 3=4ms, … 9=512ms)
TTYPE13	'NUM_TIMEHACKS'	Number of timehacks
TTYPE14	'FRMSUM'	Computed frmsum
TTYPE15	'CHKSUM'	Computed chksum

FITS Header Keyword	Value	Description
TTYPE16	'TYPE'	Computed frame type
TTYPE17	'CLOCK_PERIOD'	Clock period assigned to frame
TTYPE18	'NUM_ACQS'	Number of actual acquisitions
TTYPE19	'EXPECTED'	Was frame counter 1 + previous frame counter?
TTYPE20	'FILE'	Source file name
TDISP10	'Z2.2'	Use hex display format for quality
TDISP15	'Z6.6'	Use hex display format for chksum
END		
Extension 2 HDU Data	**Frame List**	**ASCII Data Table with number of entries matching number of acquisitions, empty if no acquisitions reported in housekeeping data**
XTENSION	'TABLE'	Extension 3, Scan mirror positions
BITPIX	8	array data type, 8-bit bytes
NAXIS	2	number of array dimensions
NAXIS1	17	number of characters per line
NAXIS2	220 (*)	number of position records
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
TFIELDS	2	Number of element fields per line
EXTNAME	'Scan Mirror Positions'	Extension name
EXTVER	1	Extension version number
TFORM1	'I3'	Format of field 1
TFORM2	'D14.3'	Format of field 2
TBCOL1	1	Start of column for field 1
TBCOL2	4	Start of column for field 2
TTYPE1	'POSITION_NUM'	Scan mirror position number
TTYPE2	'TIME'	Position start/end (alternating) time (seconds)
END		
Extension 3 HDU Data	**Scan Mirror Positions**	**ASCII data table with number of entries matching number of mirror positions recorded, empty if no housekeeping data is available**
XTENSION	'BINTABLE'	Extension 4, Raw frame data
BITPIX	8	array data type, 8-bit bytes
NAXIS	2	number of array dimensions
NAXIS1	98304	Number of bytes per frame
NAXIS2	12498 (*)	Number of science frames
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
TFIELDS	2	Number of element fields per line
EXTNAME	'Raw Frame Data'	Extension name
EXTVER	1	Extension version number
TTYPE1	'RECV_TIME'	Frame spacecraft received time
TTYPE2	'FRAME_DATA'	Raw frame data
TFORM1	'D'	8 byte double
TFORM2	'98298B'	98298 bytes

FITS Header Keyword	Value	Description
TDISP1	'D14.3'	Preferred display format for time
END		
Extension 4 HDU Data	**Raw frame data**	**Binary data table with frame received time in seconds, subseconds, and data**
XTENSION	'BINTABLE'	Extension 5, Analog count rates
BITPIX	8	array data type, 8-bit bytes
NAXIS	2	number of array dimensions
NAXIS1	12	Number of bytes per entry
NAXIS2	283822 (*)	Number of count rate entries
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
TFIELDS	2	Number of element fields per line
EXTNAME	'Analog count rates'	Extension name
EXTVER	1	Extension version number
TTYPE1	'SCLK_TIME'	Spacecraft clock (seconds)
TTYPE2	'COUNT_RATE'	Count rate for the interval (Hz/10)
TFORM1	'D'	8 byte double
TFORM2	'J'	4 byte int
TDISP1	'D14.3'	Preferred display format for time
TUNIT2	'Hz'	Unit for countrate
END		
Extension 5 HDU Data	**Analog Count Rates**	**Data table with 3 values per entry: seconds, subseconds, and count rate**
XTENSION	'BINTABLE'	Extension 6, Digital count rates
BITPIX	8	array data type, 8-bit bytes
NAXIS	2	number of array dimensions
NAXIS1	16	Number of bytes per entry
NAXIS2	26995077 (*)	Number of count rate entries
PCOUNT	0	extension size parameter
GCOUNT	1	extension size parameter
TFIELDS	3	Number of element fields per line
EXTNAME	'Digital Count Rates'	Extension name
EXTVER	1	Extension version number
TTYPE1	'HACK_TIME'	Hack time at the start of interval
TTYPE2	'SCLK_TIME'	Spacecraft clock (seconds)
TTYPE3	'COUNT_RATE'	Count rate for the interval (Hz)
TFORM1	'J'	4 byte integer
TFORM2	'D'	8 byte double
TFORM3	'J'	4 byte integer
TDISP2	'D14.3'	Preferred display format for time
TUNIT2	's'	Unit for spacecraft UTC
TUNIT3	'Hz'	Unit for count rate
END		
Extension 6 HDU Data	**Digital Count Rates**	**HK data table, including both the raw values and the values converted into engineering units where applicable.**

FITS Header Keyword	Value	Description
XTENSION	'IMAGE'	Pulse Height Distribution (Lyman Alpha)
BITPIX	32	Number of bits per pixel
NAXIS	3	Number of array dimensions
NAXIS1	300	0.1 second bins
NAXIS2	17	17 bins of pulse height information
NAXIS3	904 (*)	Number of histogram images
PCOUNT	0	Extension size parameter
GCOUNT	1	Extension size parameter
BZERO	0	No offset
BSCALE	1	Extension scaling parameter
EXTNAME	'Pulse Height Distribution (Lyman Alpha)'	Extension name
EXTVER	1	Extension version
AMPERR	2*	Number of amplitude values out of range (0-16)
SPECTYPE	'Lyman Alpha'	Spectral range type
SPECCNT	1	Number of SPECMIN/SPECMAX ranges
SPECMIN1	850	Minimum spectral value #1
SPECMAX1	930	Maximum spectral value #1
END		
Extension 7 HDU Data	**Pulse Height Distribution (Lyman Alpha) histograms**	**300x17xN array of 32 bit event counts**
XTENSION	'IMAGE'	Pulse Height Distribution (Stellar)
BITPIX	32	Number of bits per pixel
NAXIS	3	Number of array dimensions
NAXIS1	300	0.1 second bins
NAXIS2	17	17 bins of pulse height information
NAXIS3	904 (*)	Number of histogram images
PCOUNT	0	Extension size parameter
GCOUNT	1	Extension size parameter
BZERO	0	No offset
BSCALE	1	Extension scaling parameter
EXTNAME	'Pulse Height Distribution (Stellar)'	Extension name
EXTVER	1	Extension version
AMPERR	2*	Number of amplitude values out of range (0-16)
SPECTYPE	'Stellar'	Spectral range type
SPECCNT	1	Number of SPECMIN/SPECMAX ranges
SPECMIN1	931	Minimum spectral value #1
SPECMAX1	1770	Maximum spectral value #1
END		
Extension 8 HDU Data	**Pulse Height Distribution (Stellar) histograms**	**300x17xN array of 32 bit event counts**
XTENSION	'IMAGE'	Pulse Height Distribution (Stim)
BITPIX	32	Number of bits per pixel
NAXIS	3	Number of array dimensions

FITS Header Keyword	Value	Description
NAXIS1	300	0.1 second bins
NAXIS2	17	17 bins of pulse height information
NAXIS3	904 (*)	Number of histogram images
PCOUNT	0	Extension size parameter
GCOUNT	1	Extension size parameter
BZERO	0	No offset
BSCALE	1	Extension scaling parameter
EXTNAME	‘Pulse Height Distribution (Stim)’	Extension name
EXTVER	1	Extension version
AMPERR	2*	Number of amplitude values out of range (0-16)
SPECTYPE	‘Stim	Spectral range type
SPECCNT	2	Number of SPECMIN/SPECMAX ranges
SPECMIN1	0	Minimum spectral value #1
SPECMAX1	149	Maximum spectral value #1
SPECMIN2	1950	Minimum spectral value #2
SPECMAX2	2047	Maximum spectral value #2
END		
Extension 9 HDU Data	**Pulse Height Distribution (Stim) histograms**	**300x17xN array of 32 bit event counts**
XTENSION	'BINTABLE'	Extension 8: Housekeeping Data
BITPIX	8	Array data type: 8-bit bytes
NAXIS	2	Number of array dimensions
NAXIS1	766	Number of bytes per entry
NAXIS2	14191 (*)	Number of HK packets
PCOUNT	0	
GCOUNT	1	
TFIELDS	144	Number of element fields per line
EXTNAME	'Housekeeping Data'	Full contents of all HK packets
EXTVER	1	Extension version number
CSUMERRS	0*	Number of HK packets with chksum errors
FILE1	‘UVS_2011346180519000_20113461835 11999.sfdu’*	Source HK file name
TTYPE1	'SCLK_TIME'	Spacecraft clock (seconds since epoch)
TTYPE2	'HACK_TIME'	Instrument hack time
TTYPE3	'PACK_CNT'	16-bit packet counter
TTYPE4	'PACKET_DATA'	Raw HK packet (340 bytes)
TTYPE5	'INST_STATE'	Instrument State (0=off; 1=checkout; 2=safe; 3=acq; 4=decon)
TTYPE6	'SAFETY_ACTIVE'	1=safety active
TTYPE7	'LAST_SAFETY'	Last safety (0=none)
TTYPE8	'LVPS_STATUS'	Power status for each LVPS; 1=active
TTYPE9	'HVPS_STATUS'	Power status for each HVPS; 1=active
TTYPE10	'DETECTOR_PWR'	Power status of detector; 1=on
TTYPE11	'TURN_OFF_REQ'	1=request instrument shutdown by s/c
TTYPE12	'WPA_DRIVEN'	1=WPA activated
TTYPE13	'WPA_SWITCH'	1=WPA stroke switch activated

FITS Header Keyword	Value	Description
TTYPE14	'HVPS_SAFE'	Safing status for each HVPS; 1=safing plug installed
TTYPE15	'RST_ACT_SAFE'	Resettable actuator safing plug status; 1=installed
TTYPE16	'NON_RST_ACT_SAFE'	Non-resettable actuator safing plus status; 1=installed
TTYPE17	'SCAN_MRR_HTR'	Status of scan mirror heater; 1=on
TTYPE18	'OAP_MRR_HTR'	Status of the OAP mirror heater; 1=on
TTYPE19	'GRT_MRR_HTR'	Status of the grating mirror heater; 1=on
TTYPE20	'CMD_LAST_CYCLE'	1=command received during last cycle
TTYPE21	'T_SYNC_MSG'	1=valid time sync message received during last cycle
TTYPE22	'T_SYNC_PULSE'	1=valid time sync pulse received during last cycle
TTYPE23	'CRIT_TC_PEND'	1=critical telecommand pending
TTYPE24	'PRIMARY_TC_STAT'	1=enabled
TTYPE25	'REDUNDANT_TC_STAT'	1=enabled
TTYPE26	'CMDS_ACCEPTED'	Modulo 2^8 count of commands accepted
TTYPE27	'CMDS_REJECTED'	Modulo 2^8 count of commands rejected
TTYPE28	'CMDS_EXECUTED'	Modulo 2^8 count of commands executed
TTYPE29	'TIME_MSGS_RECVD'	Modulo 2^8 count of time messages received
TTYPE30	'TIME_PULSES_RECVD'	Modulo 2^8 count of time pulses received
TTYPE31	'NADIR_MSGS_RECVD'	Modulo 2^8 count of nadir messages received
TTYPE32	'LAST_ACCEPT_CMD'	Opcode of last accepted command
TTYPE33	'LAST_FAILED_CMD'	Opcode of last failed command
TTYPE34	'LAST_FAILURE'	Last failure code command/execution
TTYPE35	'CRIT_CMD_TIMEOUT'	Remaining timeout for a critical command
TTYPE36	'SCI_PKT_HDR'	Header of the most recently acquired science packet
TTYPE37	'SCI_QUALITY'	Quality byte of the most recent science acquisition
TTYPE38	'SCI_PKT_TAG'	Tag bytes of most recent science acquisition
TTYPE39	'DETECTOR_DOOR_POS'	0=illegal; 1=not open; 2=open; 3=illegal
TTYPE40	'APERTURE_DOOR_POS'	0=error; 1=closed; 2=open; 3=between
TTYPE41	'HACKRATE'	0=1ms; 1=2ms; ... 9=512ms
TTYPE42	'HVPS_COMMANDED'	Commanded state of HVPS 1 and 2; 1=on
TTYPE43	'HVPS_LIMITED'	1=HVPS limited due to high countrate
TTYPE44	'HOT_PIXEL_MASKING'	1=hot pixel masking (hardware) active
TTYPE45	'SCI_OVERFLOW'	1=overflow occurred in high speed science transfer
TTYPE46	'ACQ_MEM'	0=side A; 1=side B
TTYPE47	'DETECTOR_STIM'	0=STIM off; 1=STIM on
TTYPE48	'ACQ_EVT_POINTER'	Most recent value of the h/w pixel list pointer
TTYPE49	'FIRST_COUNT_HACK'	Value of the timehack counter at the first countrate entry

FITS Header Keyword	Value	Description
TTYPE50	'RAW_EVENT_COUNT'	Current value of the hardware detector analog event counter
TTYPE51	'MAX_EVENT_RATE'	Maximum digital unmasked event rate in the last HK cycle
TTYPE52	'MAX_MASK_RATE'	Maximum digital masking rate in the last HK cycle
TTYPE53	'ACQ_TIMEOUT'	Remaining time (sec) of acquisition timeout counter
TTYPE54	'LAST_ACQ_COMPLETE_TIME'	Time of last acquisition completion
TTYPE55	'LOWER_DISCRIMINATOR'	Pulse height (0-31)
TTYPE56	'UPPER_DISCRIMINATOR'	Pulse height (0-31)
TTYPE57	'HVPS_SETPOINT'	DAC counts
TTYPE58	'HVPS_LIMIT_TIMEOUT'	Remaining HVPS limit timeout in cycles
TTYPE59	'MAX_MCP_VOLTAGE'	Maximum MCP voltage in this HK reporting period
TTYPE60	'MIN_MCP_VOLTAGE'	Minimum MCP voltage in this HK reporting period
TTYPE61	'MAX_ANODE_VOLTAGE'	Maximum anode voltage in this HK reporting period
TTYPE62	'MIN_ANODE_VOLTAGE'	Minimum anode voltage in this HK reporting period
TTYPE63	'MAX_STRIP_CURRENT'	Maximum strip current in this HK reporting period
TTYPE64	'MIN_STRIP_CURRENT'	Minimum strip current in this HK reporting period
TTYPE65	'P7_VOLT'	ADC counts; range matching measure voltage
TTYPE66	'N7_VOLT'	ADC counts; range matching measure voltage
TTYPE67	'P5_VOLT'	ADC counts; range matching measure voltage
TTYPE68	'N5_VOLT'	ADC counts; range matching measure voltage
TTYPE69	'P3_3_VOLT'	ADC counts; range matching measure voltage
TTYPE70	'P1_8_VOLT'	ADC counts; range matching measure voltage
TTYPE71	'P1_5_VOLT'	ADC counts; range matching measure voltage
TTYPE72	'REF_0_3_VOLT'	ADC counts; range matching measure voltage
TTYPE73	'REF_2_7_VOLT'	ADC counts; range matching measure voltage
TTYPE74	'SEQUENCER_ACTIVE'	1=scan mirror sequencer active
TTYPE75	'CURRENT_POSITION'	Current scan mirror position
TTYPE76	'END_SWTICHES_STAT'	1=switch closed
TTYPE77	'TIME_TO_ZENITH'	Remaining time to zenith in sec*2
TTYPE78	'CURRENT_PHASE'	Current phase within scan table
TTYPE79	'REM_PHASE_TIME'	Time remaining in current phase in sec*2
TTYPE80	'ACT_SEQ_OFFSET'	Offset within the current sequence phase

FITS Header Keyword	Value	Description
TTYPE81	'ACT_SEQ_STEP'	Step within the current sequence phase
TTYPE82	'ACT_SEQ_CYCLE'	Cycles within the current sequence step phase
TTYPE83	'REM_DWELL'	Remaining number of dwell cycles at the current position
TTYPE84	'SCAN_MRR_HTR_SETPOINT'	ADC counts
TTYPE85	'OAP_MRR_HTR_SETPOINT'	ADC counts
TTYPE86	'GRATING_HTR_SETPOINT'	ADC counts
TTYPE87	'SCAN_MRR_PRIMARY_TMP'	ADC counts
TTYPE88	'SCAN_MRR_SECONDARY_TMP'	ADC counts
TTYPE89	'OAP_MRR_PRIMARY_TMP'	ADC counts
TTYPE90	'OAP_MRR_SECONDARY_TMP'	ADC counts
TTYPE91	'GRATING_PRIMARY_TMP'	ADC counts
TTYPE92	'GRATING_SECONDARY_TMP'	ADC counts
TTYPE93	'CDH_ELEC_TMP'	ADC counts
TTYPE94	'HVPS_TEMP'	ADC counts
TTYPE95	'LVPS_TEMP'	ADC counts
TTYPE96	'DETECTOR_BDY_TMP'	ADC counts
TTYPE97	'DETECTOR_ELEC_TMP'	ADC counts
TTYPE98	'SMIB_TEMP'	ADC counts
TTYPE99	'CHASSIS_TEMP'	ADC counts
TTYPE100	'HVPS_LIMIT_CYCLES'	Number of remaining cycles in this acquisition
TTYPE101	'TEMP_SAFETY'	1=safety in effect
TTYPE102	'CYCLE_SAFETY'	1=safety in effect
TTYPE103	'ANODE_SAFETY'	1=safety in effect
TTYPE104	'STRIP_SAFETY'	1=safety in effect
TTYPE105	'HV_SAFETY'	1=safety in effect
TTYPE106	'BRIGHT_SAFETY'	1=safety in effect
TTYPE107	'UNSAFE_TIMER'	Remaining unsafe period in seconds; 0=no safety active
TTYPE108	'SAFETY_OVERRIDE'	1=all safety handling is overridden (deactivated)
TTYPE109	'TEMP_SAFETY_MASK'	1=masked
TTYPE110	'CYCLE_SAFETY_MASK'	1=masked
TTYPE111	'ANODE_SAFETY_MASK'	1=masked
TTYPE112	'STRIP_SAFETY_MASK'	1=masked
TTYPE113	'HV_SAFETY_MASK'	1=masked
TTYPE114	'BRIGHT_SAFETY_MASK'	1=masked
TTYPE115	'EXECUTING_CODE'	0=illegal; 1=PROM; ...; 5=RAM; ...; 11-14=EEPROM_1-4
TTYPE116	'HW_VERSION'	Board version ID
TTYPE117	'SW_MAJOR_VER'	Build Number
TTYPE118	'SW_MINOR_VER'	Version Number
TTYPE119	'TC_INT_OFF'	Interrupt disable for each TC receiver; 1=disabled
TTYPE120	'SYNC_RECVD'	TSP received in last second for each TC receiver; 1=received
TTYPE121	'TC_FRAME_ERR'	Latched H/W frame error status for each TC receiver; 1=error

FITS Header Keyword	Value	Description
TTYPE122	'TC_OVERRUN_ERR'	Latched H/W frame error status for each TC rcvr; 1=overrun
TTYPE123	'MEM_CHKSUM'	Checksum calculated in response to last issued check mem cmd
TTYPE124	'RTX_IDLE'	Count of passes through the scheduler idle loop
TTYPE125	'RTX_SCHEDULER'	Count of calls to scheduler
TTYPE126	'DEBUG_ARRAY'	Various debug information fields
TTYPE127	'MIN_FREE_STACK'	Minimum amount of free stack space detected
TTYPE128	'FIRST_DELETED'	Task number of the first deleted task
TTYPE129	'RAM_EDAC_RECOVER'	Number of recovered RAM errors
TTYPE130	'RAM_EDAC_FAIL'	Number of detected RAM errors
TTYPE131	'EEPROM_EDAC_RECOVER'	Number of recovered EEPROM errors
TTYPE132	'EEPROM_EDAC_FAIL'	Number of detected EEPROM errors
TTYPE133	'TEST_STATUS'	Test result of commanded self test
TTYPE134	'SCRUBBER_CYCLES'	Number of EDAC scrubber cycles completed
TTYPE135	'SLOW_TASK_STATUS'	0=start;1=idle;2=mem chk;3=mem dump;4=mem load;5=acq;6=test
TTYPE136	'WATCHDOG_CNT_MAXED'	Watchdog expiration count above 15
TTYPE137	'WATCHDOG_EXP_COUNT'	Number of watchdog expirations since last power-on; mod16
TTYPE138	'PARAMETER_INDEX'	Last requested parameter index
TTYPE139	'PARAMETER_VALUE'	Current value of last requested parameter
TTYPE140	'HK_PKT_CHKSUM'	Calculated checksum before sending HK data to S/C
TYPE141	‘CLOCK_PERIOD’	Clock period assigned to HK packet
TYPE142	‘CHKSUM_ERROR’	Difference between computed and expected packet chksum
TYPE143	‘AVR_RAW_RATE’	Average raw countrate in Hz
TYPE144	‘AVR_EVENT_RATE’	Average event rate in Hz
TFORM1	'D '	8 byte double
TFORM2	'J '	4 byte integer
TFORM3	'I '	2 byte integer
TFORM4	'340B '	340 bytes
TFORM5	'B '	1 byte
TFORM6	'B '	1 byte
TFORM7	'B '	1 byte
TFORM8	'B '	1 byte
TFORM9	'B '	1 byte
TFORM10	'B '	1 byte
TFORM11	'B '	1 byte
TFORM12	'B '	1 byte
TFORM13	'B '	1 byte
TFORM14	'B '	1 byte
TFORM15	'B '	1 byte
TFORM16	'B '	1 byte
TFORM17	'B '	1 byte
TFORM18	'B '	1 byte

FITS Header Keyword	Value	Description
TFORM19	'B '	1 byte
TFORM20	'B '	1 byte
TFORM21	'B '	1 byte
TFORM22	'B '	1 byte
TFORM23	'B '	1 byte
TFORM24	'B '	1 byte
TFORM25	'B '	1 byte
TFORM26	'B '	1 byte
TFORM27	'B '	1 byte
TFORM28	'B '	1 byte
TFORM29	'B '	1 byte
TFORM30	'B '	1 byte
TFORM31	'B '	1 byte
TFORM32	'B '	1 byte
TFORM33	'B '	1 byte
TFORM34	'B '	1 byte
TFORM35	'B '	1 byte
TFORM36	'J '	4 bytes
TFORM37	'B '	1 byte
TFORM38	'I '	2 bytes
TFORM39	'B '	1 byte
TFORM40	'B '	1 byte
TFORM41	'B '	1 byte
TFORM42	'B '	1 byte
TFORM43	'B '	1 byte
TFORM44	'B '	1 byte
TFORM45	'B '	1 byte
TFORM46	'B '	1 byte
TFORM47	'B '	1 byte
TFORM48	'I '	2 bytes
TFORM49	'I '	2 byte int
TFORM50	'J '	4 byte int
TFORM51	'I '	2 byte int
TFORM52	'I '	2 byte int
TFORM53	'I '	2 byte int
TFORM54	'J '	4 byte int
TFORM55	'B '	1 byte
TFORM56	'B '	1 byte
TFORM57	'B '	1 byte
TFORM58	'B '	1 byte
TFORM59	'B '	1 byte
TFORM60	'B '	1 byte
TFORM61	'B '	1 byte
TFORM62	'B '	1 byte
TFORM63	'B '	1 byte
TFORM64	'B '	1 byte
TFORM65	'B '	1 byte
TFORM66	'B '	1 byte
TFORM67	'B '	1 byte

FITS Header Keyword	Value	Description
TFORM68	'B '	1 byte
TFORM69	'B '	1 byte
TFORM70	'B '	1 byte
TFORM71	'B '	1 byte
TFORM72	'B '	1 byte
TFORM73	'I '	2 byte int
TFORM74	'B '	1 byte
TFORM75	'B '	1 byte
TFORM76	'B '	1 byte
TFORM77	'B '	1 byte
TFORM78	'B '	1 byte
TFORM79	'I '	2 byte int
TFORM80	'B '	1 byte
TFORM81	'B '	1 byte
TFORM82	'B '	1 byte
TFORM83	'B '	1 byte
TFORM84	'D '	8 byte
TFORM85	'D '	8 byte
TFORM86	'D '	8 byte
TFORM87	'D '	8 byte
TFORM88	'D '	8 byte
TFORM89	'D '	8 byte
TFORM90	'D '	8 byte
TFORM91	'D '	8 byte
TFORM92	'D '	8 byte
TFORM93	'D '	8 byte
TFORM94	'D '	8 byte
TFORM95	'D '	8 byte
TFORM96	'D '	8 byte
TFORM97	'D '	8 byte
TFORM98	'D '	8 byte
TFORM99	'D '	8 byte
TFORM100	'B '	1 byte
TFORM101	'B '	1 byte
TFORM102	'B '	1 byte
TFORM103	'B '	1 byte
TFORM104	'B '	1 byte
TFORM105	'B '	1 byte
TFORM106	'B '	1 byte
TFORM107	'I '	2 byte int
TFORM108	'B '	1 byte
TFORM109	'B '	1 byte
TFORM110	'B '	1 byte
TFORM111	'B '	1 byte
TFORM112	'B '	1 byte
TFORM113	'B '	1 byte
TFORM114	'B '	1 byte
TFORM115	'B '	1 byte
TFORM116	'B '	1 byte

FITS Header Keyword	Value	Description
TFORM117	'B '	1 byte
TFORM118	'B '	1 byte
TFORM119	'B '	1 byte
TFORM120	'B '	1 byte
TFORM121	'B '	1 byte
TFORM122	'B '	1 byte
TFORM123	'I '	2 bytes
TFORM124	'I '	2 byte int
TFORM125	'I '	2 byte int
TFORM126	'10B '	10 bytes
TFORM127	'B '	1 byte
TFORM128	'B '	1 byte
TFORM129	'B '	1 byte
TFORM130	'B '	1 byte
TFORM131	'B '	1 byte
TFORM132	'B '	1 byte
TFORM133	'I '	2 bytes
TFORM134	'I '	2 byte int
TFORM135	'B '	1 byte
TFORM136	'B '	1 byte
TFORM137	'B '	1 byte
TFORM138	'B '	1 byte
TFORM139	'B '	1 byte
TFORM140	'I '	2 bytes
TFORM141	‘J ‘	4 byte integer
TFORM142	‘I ‘	2 byte integer
TFORM143	‘J ‘	4 byte integer
TFORM144	‘J ‘	4 byte integer
TDISP1	‘D14.3’	format
TDISP57	‘F6.3’	format
TDISP59	‘F6.3’	format
TDISP60	‘F6.3’	format
TDISP61	‘F4.0’	format
TDISP62	‘F4.0’	format
TDISP63	‘F5.2’	format
TDISP64	‘F5.2’	format
TDISP65	‘F5.2’	format
TDISP66	‘F5.2’	format
TDISP67	‘F5.2’	format
TDISP68	‘F5.2’	format
TDISP69	‘F5.2’	format
TDISP70	‘F5.2’	format
TDISP71	‘F5.2’	format
TDISP72	‘F5.2’	format
TDISP73	‘F5.2’	format
TDISP84	‘F5.2’	format
TDISP85	'F5.1'	format
TDISP86	'F5.1'	format
TDISP87	'F5.1'	format

FITS Header Keyword	Value	Description
TDISP88	'F5.1'	format
TDISP89	'F5.1'	format
TDISP90	'F5.1'	format
TDISP91	'F5.1'	format
TDISP92	'F5.1'	format
TDISP93	'F5.1'	format
TDISP94	'F5.1'	format
TDISP95	'F5.1'	format
TDISP96	'F5.1'	format
TDISP97	'F5.1'	format
TDISP98	'F5.1'	format
TDISP99	'F5.1'	format
TUNIT143	'Hz'	
TUNIT144	'Hz'	
TZERO3	32768	
TZERO38	32768	
TZERO49	32768	
TZERO123	32768	
TZERO133	32768	
TZERO134	32768	
TZERO140	32768	
END		
Extension 10	**Housekeeping Table**	**HK data table, including both the raw values and the values converted into engineering units where applicable.**
XTENSION	'BINTABLE'	Extension 9: Parameter List Data
BITPIX	8	Array data type, 8-bit bytes
NAXIS	2	Number of array dimensions
NAXIS1	392	Number of bytes per entry
NAXIS2	9*	Number of parameter lists
PCOUNT	0	Extension size parameter
GCOUNT	1	Extension size parameter
TFIELDS	114	Number of element fields per line
EXTNAME	'Parameter Lists'	Parameter lists vs. time
EXTVER	1	Extension version number
TTYPE1	'SCLK_TIME'	Spacecraft clock (seconds since epoch)
TTYPE2	'TABLE_ID'	Ident used to distinguish redundant table copies
TTYPE3	'DetPwrEnable'	Enable Detector power switch (1 = on in ACQUIRE and CHECKOUT state)
TTYPE4	'DoorEnable'	Enable door close on safety (1 = close on safety)
TTYPE5	'Edac2enable'	Enable dual EDAC error restart
TTYPE6	'WpaSensorEnable'	Enable wax pellet actuator sensor feedback (1 = enabled)
TTYPE7	'AutoEnable'	0 = both disabled; 1 = enable A; 2 = enable B

FITS Header Keyword	Value	Description
TTYPE8	'HtrSenseGrating'	Optics heater sensor select; 0 = primary, 1 = secondary
TTYPE9	'HtrSenseOapMirror'	Optics heater sensor select; 0 = primary, 1 = secondary
TTYPE10	'HtrSenseScanMirror'	Optics heater sensor select; 0 = primary, 1 = secondary
TTYPE11	'GratingHtr1Enable'	Optics heater control enabled; 1 = enabled
TTYPE12	'GratingHtr2Enable'	Optics heater control enabled; 1 = enabled
TTYPE13	'OapMirrorHtr1Enable'	Optics heater control enabled; 1 = enabled
TTYPE14	'OapMirrorHtr2Enable'	Optics heater control enabled; 1 = enabled
TTYPE15	'ScanMirrorHtr1Enable'	Optics heater control enabled; 1 = enabled
TTYPE16	'ScanmirrorHtr2Enable'	Optics heater control enabled; 1 = enabled
TTYPE17	'CRIT_CMD_TIMEOUT'	Critical command timeout period in seconds (min value is automatically limited to 5 seconds)
TTYPE18	'TC_MAX_ERROR'	Number of errors allowed on any Tc channels before disabling channel (0 = not active)
TTYPE19	'WPA_TIMEOUT'	Wax pellet actuator timeout in seconds*10
TTYPE20	'TINI_CONTROL'	Aperture door shape metal actuators control time
TTYPE21	'SCAN_CONTROL'	Scan mirror shape metal actuators control time
TTYPE22	'DOOR_CONTROL'	Aperture door motion control time in seconds=10.
TTYPE23	'HK_PACKET_RATE'	Hk packet generation rate in cycles (0=each cycle)
TTYPE24	'REPORT_PARAM'	Current parameter value reported in housekeeping
TTYPE25	'REPORT_SUB_PARAM'	Number of sub-sample reporting cycles for the parameter reporting process
TTYPE26	'HW_VERSION_ID'	H=W Board Version Id included in HK Tm packet
TTYPE27	'STIM_ENABLE'	Enable Pixel STIM at start of acquisition
TTYPE28	'HVPS_ENABLE'	Enable Primary=Secondary HVPS when commanded (1 = enabled)

FITS Header Keyword	Value	Description
TTYPE29	'UP_DISCRIMINATOR'	Upper discriminator set level (1-31)
TTYPE30	'LO_DISCRIMINATOR'	Lower discriminator set level (1-31)
TTYPE31	'HV_LEVEL'	High voltage operating level
TTYPE32	'HV_STEP_FRACTION'	High voltage step fraction
TTYPE33	'HV_STEP_TIME'	High voltage step duration
TTYPE34	'HV_SAFE_LEVEL'	Safe High voltage operating level when HV backoff is in progress
TTYPE35	'HV_SAFE_TIMEOUT'	HV backoff timeout
TTYPE36	'PIXEL_LIST_HACK'	Time hack used for Pixellist acquisitions
TTYPE37	'ACQ_TIMEOUT'	Acquisition timeout, defines backup acquisition termination, specifies maximum acquisition duration
TTYPE38	'TEST_FRAME_TIME'	Duration of one test frame
TTYPE39	'HSEG1_SPEC_LL'	Hot segment 1; each hot segment specification masks out detector events in a rectangular area
TTYPE40	'HSEG1_SPEC_UL'	Hot segment 1; each hot segment specification masks out detector events in a rectangular area
TTYPE41	'HSEG1_SPATIAL_UL'	Hot segment 1; each hot segment specification masks out detector events in a rectangular area
TTYPE42	'HSEG1_SPATIAL_LL'	Hot segment 1; each hot segment specification masks out detector events in a rectangular area
TTYPE43	'HSEG2_SPEC_LL'	Hot segment 2; each hot segment specification masks out detector events in a rectangular area
TTYPE44	'HSEG2_SPEC_UL'	Hot segment 2; each hot segment specification masks out detector events in a rectangular area
TTYPE45	'HSEG2_SPATIAL_UL'	Hot segment 2; each hot segment specification masks out detector events in a rectangular area
TTYPE46	'HSEG2_SPATIAL_LL'	Hot segment 2; each hot segment specification masks out detector events in a rectangular area
TTYPE47	'HSEG3_SPEC_LL'	Hot segment 3; each hot segment specification masks out detector events in a rectangular area
TTYPE48	'HSEG3_SPEC_UL'	Hot segment 3; each hot segment specification masks out detector events in a rectangular area

FITS Header Keyword	Value	Description
TTYPE49	'HSEG3_SPATIAL_UL'	Hot segment 3; each hot segment specification masks out detector events in a rectangular area
TTYPE50	'HSEG3_SPATIAL_LL'	Hot segment 3; each hot segment specification masks out detector events in a rectangular area
TTYPE51	'HSEG4_SPEC_LL'	Hot segment 4; each hot segment specification masks out detector events in a rectangular area
TTYPE52	'HSEG4_SPEC_UL'	Hot segment 4; each hot segment specification masks out detector events in a rectangular area
TTYPE53	'HSEG4_SPATIAL_UL'	Hot segment 4; each hot segment specification masks out detector events in a rectangular area
TTYPE54	'HSEG4_SPATIAL_LL'	Hot segment 4; each hot segment specification masks out detector events in a rectangular area
TTYPE55	'HSEG5_SPEC_LL'	Hot segment 5; each hot segment specification masks out detector events in a rectangular area
TTYPE56	'HSEG5_SPEC_UL'	Hot segment 5; each hot segment specification masks out detector events in a rectangular area
TTYPE57	'HSEG5_SPATIAL_UL'	Hot segment 5; each hot segment specification masks out detector events in a rectangular area
TTYPE58	'HSEG5_SPATIAL_LL'	Hot segment 5; each hot segment specification masks out detector events in a rectangular area
TTYPE59	'HSEG6_SPEC_LL'	Hot segment 6; each hot segment specification masks out detector events in a rectangular area
TTYPE60	'HSEG6_SPEC_UL'	Hot segment 6; each hot segment specification masks out detector events in a rectangular area
TTYPE61	'HSEG6_SPATIAL_UL'	Hot segment 6; each hot segment specification masks out detector events in a rectangular area
TTYPE62	'HSEG6_SPATIAL_LL'	Hot segment 6; each hot segment specification masks out detector events in a rectangular area
TTYPE63	'HSEG7_SPEC_LL'	Hot segment 7; each hot segment

FITS Header Keyword	Value	Description
		specification masks out detector events in a rectangular area
TTYPE64	'HSEG7_SPEC_UL'	Hot segment 7; each hot segment specification masks out detector events in a rectangular area
TTYPE65	'HSEG7_SPATIAL_UL'	Hot segment 7; each hot segment specification masks out detector events in a rectangular area
TTYPE66	'HSEG7_SPATIAL_LL'	Hot segment 7; each hot segment specification masks out detector events in a rectangular area
TTYPE67	'HSEG8_SPEC_LL'	Hot segment 8; each hot segment specification masks out detector events in a rectangular area
TTYPE68	'HSEG8_SPEC_UL'	Hot segment 8; each hot segment specification masks out detector events in a rectangular area
TTYPE69	'HSEG8_SPATIAL_UL'	Hot segment 8; each hot segment specification masks out detector events in a rectangular area
TTYPE70	'HSEG8_SPATIAL_LL'	Hot segment 8; each hot segment specification masks out detector events in a rectangular area
TTYPE71	'MAX_SPIN_TIME'	Maximum spin duration in cycles (1 = pure spin no timeout)
TTYPE72	'NADIR_OFFSET'	Mirror start offset angle: 0-2pi (0 disables Nadir message processing)
TTYPE73	'SMIB_MAX_POS'	Maximum scan mirror position in steps
TTYPE74	'SCAN_MODE_SELECT'	
TTYPE75	'ACTIVE_DUTY_CYCLE'	Active Hold duty cycle (0-100%)
TTYPE76	'PHASE_0_DUTY'	
TTYPE77	'PHASE_1_DUTY'	
TTYPE78	'PHASE_2_DUTY'	
TTYPE79	'PHASE_3_DUTY'	
TTYPE80	'INITIAL_QUAL_FACT'	Initial quality number
TTYPE81	'QUAL_DURATION'	Quality duration weight factor
TTYPE82	'QUAL_OPT_CR'	Quality optimal countrate
TTYPE83	'QUAL_DEVIATION'	Quality deviation weight factor
TTYPE84	'MAX_CNT_RATEI'	Maximum Countrate that triggers a countrate safety
TTYPE85	'CR_FAIL_BRIGHT'	Bright Light max fail count
TTYPE86	'HIGH_CNT_RATE'	High Countrate
TTYPE87	'HV_MAX_CYCLES'	Maximum HV backoff cycles per

FITS Header Keyword	Value	Description
		acquisition
TTYPE88	'HV_LOW_SAFETY'	HV lowest voltage setting above which the safety checking can be activated.
TTYPE89	'DAC_ADC_FACTOR'	Conversion from to DAC setting to ADC read back used in HVPS checking
TTYPE90	'HV_MAX_HV_SET'	Maximum allowed HV setpoint voltage
TTYPE91	'HV_MCP_TOL'	MCP voltage tolerance
TTYPE92	'HV_FAIL_MCP'	MCP voltage max fail count
TTYPE93	'HV_MAX_STRIP_I'	Maximum allowed strip current
TTYPE94	'HV_FAIL_STRIP'	Strip current max fail count
TTYPE95	'HV_MIN_ANODE_V'	Minimum allowed anode voltage
TTYPE96	'HV_MAX_ANODE_V'	Maximum allowed anode voltage
TTYPE97	'HV_FAIL_ANODE'	Anode voltage max fail count
TTYPE98	'MAX_SCANMIR1TEMP'	Maximum allowed temperature
TTYPE99	'MAX_SCANMIR2TEMP'	Maximum allowed temperature
TTYPE100	'MAX_OAP_MIR1TEMP'	Maximum allowed temperature
TTYPE101	'MAX_OAP_MIR2TEMP'	Maximum allowed temperature
TTYPE102	'MAX_GRATING1TEMP'	Maximum allowed temperature
TTYPE103	'MAX_GRATING2TEMP'	Maximum allowed temperature
TTYPE104	'MAX_CDH_TEMP'	Maximum allowed temperature
TTYPE105	'MAX_HVPS_TEMP'	Maximum allowed temperature
TTYPE106	'MAX_LVPS_TEMP'	Maximum allowed temperature
TTYPE107	'MAX_DET_B_TEMP'	Maximum allowed temperature
TTYPE108	'MAX_DET_E_TEMP'	Maximum allowed temperature
TTYPE109	'MAX_SMIB_TEMP'	Maximum allowed temperature
TTYPE110	'MAX_CHASSIS_TEMP'	Maximum allowed temperature
TTYPE111	'SAFETY_MASK'	Initial startup value for the safety mask and override
TTYPE112	'SAFETY_TIMEOUT'	Safety timeout
TTYPE114	'DEBUG_TEST'	Debug=Test setting
TTYPE114	'WRITE_CYCLES'	Accumulated count of changes made to the parameter memory in EEPROM
TFORM1	'D '	8 byte double
TFORM2	'B '	1 byte
TFORM3	'B '	1 byte
TFORM4	'B '	1 byte
TFORM5	'B '	1 byte
TFORM6	'B '	1 byte
TFORM7	'B '	1 byte
TFORM8	'B '	1 byte
TFORM9	'B '	1 byte
TFORM10	'B '	1 byte

FITS Header Keyword	Value	Description
TFORM11	'B '	1 byte
TFORM12	'B '	1 byte
TFORM13	'B '	1 byte
TFORM14	'B '	1 byte
TFORM15	'B '	1 byte
TFORM16	'B '	1 byte
TFORM17	'I '	2 byte integer
TFORM18	'B '	1 byte
TFORM19	'I '	2 byte integer
TFORM20	'D '	8 byte double
TFORM21	'D '	8 byte double
TFORM22	'D '	8 byte double
TFORM23	'I '	2 byte integer
TFORM24	'B '	1 byte
TFORM25	'B '	1 byte
TFORM26	'B '	1 byte
TFORM27	'B '	1 byte
TFORM28	'B '	1 byte
TFORM29	'B '	1 byte
TFORM30	'B '	1 byte
TFORM31	'D '	8 byte double
TFORM32	'D '	8 byte double
TFORM33	'I '	2 byte integer
TFORM34	'D '	8 byte double
TFORM35	'I '	2 byte integer
TFORM36	'I '	2 byte integer
TFORM37	'J '	4 byte integer
TFORM38	'D '	8 byte double
TFORM39	'I '	2 byte integer
TFORM40	'I '	2 byte integer
TFORM41	'B '	1 byte
TFORM42	'B '	1 byte
TFORM43	'I '	2 byte integer
TFORM44	'I '	2 byte integer
TFORM45	'B '	1 byte
TFORM46	'B '	1 byte
TFORM47	'I '	2 byte integer
TFORM48	'I '	2 byte integer
TFORM49	'B '	1 byte
TFORM50	'B '	1 byte
TFORM51	'I '	2 byte integer
TFORM52	'I '	2 byte integer

FITS Header Keyword	Value	Description
TFORM53	'B '	1 byte
TFORM54	'B '	1 byte
TFORM55	'B '	1 byte
TFORM56	'I '	2 byte integer
TFORM57	'I '	2 byte integer
TFORM58	'B '	1 byte
TFORM59	'I '	2 byte integer
TFORM60	'I '	2 byte integer
TFORM61	'B '	1 byte
TFORM62	'B '	1 byte
TFORM63	'I '	2 byte integer
TFORM64	'I '	2 byte integer
TFORM65	'B '	1 byte
TFORM66	'B '	1 byte
TFORM67	'I '	2 byte integer
TFORM68	'I '	2 byte integer
TFORM69	'B '	1 byte
TFORM70	'B '	1 byte
TFORM71	'I '	2 byte integer
TFORM72	'D '	8 byte double
TFORM73	'B '	1 byte
TFORM74	'5A '	5 bytes
TFORM75	'B '	1 byte
TFORM76	'4A '	4 bytes
TFORM77	'4A '	4 bytes
TFORM78	'4A '	4 bytes
TFORM79	'4A '	4 bytes
TFORM80	'B '	1 byte
TFORM81	'D '	8 byte double
TFORM82	'J '	4 byte integer
TFORM83	'D '	8 byte double
TFORM84	'D '	8 byte double
TFORM85	'B '	1 byte
TFORM86	'D '	8 byte double
TFORM87	'B '	1 byte
TFORM88	'D '	8 byte double
TFORM89	'D '	8 byte double
TFORM90	'D '	8 byte double
TFORM91	'D '	8 byte double
TFORM92	'B '	1 byte
TFORM93	'D '	8 byte double
TFORM94	'B '	1 byte

FITS Header Keyword	Value	Description
TFORM95	'D '	8 byte double
TFORM96	'D '	8 byte double
TFORM97	'B '	1 byte
TFORM98	'D '	8 byte double
TFORM99	'D '	8 byte double
TFORM100	'D '	8 byte double
TFORM101	'D '	8 byte double
TFORM102	'D '	8 byte double
TFORM103	'D '	8 byte double
TFORM104	'D '	8 byte double
TFORM105	'D '	8 byte double
TFORM106	'D '	8 byte double
TFORM107	'D '	8 byte double
TFORM108	'D '	8 byte double
TFORM109	'D '	8 byte double
TFORM110	'D '	8 byte double
TFORM111	'B '	1 byte
TFORM112	'I '	2 byte integer
TFORM113	'B '	1 byte
TFORM114	'I '	2 byte integer
TDISP1	'F14.3'	format
TDISP20	'F7.3'	format
TDISP21	'F7.3'	format
TDISP22	'F4.1'	format
TDISP29	'Z2.2'	format
TDISP30	'Z2.2'	format
TDISP31	'F5.2'	format
TDISP32	'F3.2'	format
TDISP34	'F5.2'	format
TDISP38	'F4.1'	format
TDISP41	'Z2.2'	format
TDISP42	'Z2.2'	format
TDISP45	'Z2.2'	format
TDISP46	'Z2.2'	format
TDISP49	'Z2.2'	format
TDISP50	'Z2.2'	format
TDISP53	'Z2.2'	format
TDISP54	'Z2.2'	format
TDISP57	'Z2.2'	format
TDISP58	'Z2.2'	format
TDISP61	'Z2.2'	format
TDISP62	'Z2.2'	format

FITS Header Keyword	Value	Description
TDISP65	'Z2.2'	format
TDISP66	'Z2.2'	format
TDISP69	'Z2.2'	format
TDISP70	'Z2.2'	format
TDISP72	'F5.1'	format
TDISP73	'Z2.2'	format
TDISP81	'F5.2'	format
TDISP83	'F5.2'	format
TDISP84	'F5.1'	format
TDISP86	'F5.1'	format
TDISP87	'Z2.2'	format
TDISP88	'F5.2'	format
TDISP89	'F4.2'	format
TDISP90	'F5.2'	format
TDISP91	'F5.1'	format
TDISP93	'F5.2'	format
TDISP95	'F5.2'	format
TDISP96	'F5.2'	format
TDISP98	'F5.1'	format
TDISP99	'F5.1'	format
TDISP100	'F5.1'	format
TDISP101	'F5.1'	format
TDISP102	'F5.1'	format
TDISP103	'F5.1'	format
TDISP104	'F5.1'	format
TDISP105	'F5.1'	format
TDISP106	'F5.1'	format
TDISP107	'F5.1'	format
TDISP108	'F5.1'	format
TDISP109	'F5.1'	format
TDISP110	'F5.1'	format
TDISP111	'F5.1'	format
TUNIT17	's'	
TUNIT19	's'	
TUNIT20	's'	
TUNIT21	's'	
TUNIT22	's'	
TUNIT23	's'	
TUNIT31	'kV'	
TUNIT33	's'	
TUNIT34	'kV'	
TUNIT35	's'	

FITS Header Keyword	Value	Description
TUNIT36	'ms'	
TUNIT37	's'	
TUNIT38	's'	
TUNIT71	's'	
TUNIT72	'degrees'	
TUNIT75	'%'	
TUNIT76	'%'	
TUNIT77	'%'	
TUNIT78	'%'	
TUNIT79	'%'	
TUNIT81	'#/64'	
TUNIT82	'Hz'	
TUNIT83	'#/256'	
TUNIT84	'kHz'	
TUNIT75	'%'	
TUNIT76	'%'	
TUNIT77	'%'	
TUNIT78	'%'	
TUNIT79	'%'	
TUNIT81	'#/64'	
TUNIT82	'Hz'	
TUNIT83	'#/256'	
TUNIT84	'kHz'	
TUNIT86	'kHz'	
TUNIT88	'kV'	
TUNIT90	'kV'	
TUNIT91	'V'	
TUNIT93	'uA'	
TUNIT95	'V'	
TUNIT96	'V'	
TUNIT97	'C'	
TUNIT98	'C'	
TUNIT99	'C'	
TUNIT100	'C'	
TUNIT101	'C'	
TUNIT102	'C'	
TUNIT103	'C'	
TUNIT104	'C'	
TUNIT105	'C'	
TUNIT106	'C'	
TUNIT107	'C'	
TUNIT108	'C'	

FITS Header Keyword	Value	Description
TUNIT109	'C'	
TUNIT110	'C'	
TUNIT112	'C'	
TZERO37	2147483648	
TZERO39	32768	
TZERO40	32768	
TZERO43	32768	
TZERO44	32768	
TZERO47	32768	
TZERO48	32768	
TZERO51	32768	
TZERO52	32768	
TZERO55	32768	
TZERO56	32768	
TZERO59	32768	
TZERO60	32768	
TZERO63	32768	
TZERO64	32768	
TZERO67	32768	
TZERO68	32768	
TZERO114	32768	
END		
Extension 11	**Parameter List**	**This table records the known values of the instrument parameter table, as reported in this housekeeping data.**

APPENDIX B – GLOSSARY

Archive – An archive consists of one or more data sets along with all the documentation and ancillary information needed to understand and use the data. An archive is a logical construct independent of the medium on which it is stored.

Archive Volume, Archive Volume Set – A volume is a unit of media on which data products are stored; for example, one CD-ROM or DVD-ROM. An *archive volume* is a volume containing all or part of an archive; that is, data products plus documentation and ancillary files. When an archive spans multiple volumes, they are called an *archive volume set*. Usually the documentation and some ancillary files are repeated on each volume of the set, so that a single volume can be used alone.

Catalog Information – Descriptive information about a data set (e.g. mission description, spacecraft description, instrument description), expressed in Object Description Language (ODL) which is suitable for loading into a PDS catalog.

Data Product – A labeled grouping of data resulting from a scientific observation, usually stored in one file. A product label identifies, describes, and defines the structure of the data. An example of a data product is a planetary image, a spectrum table, or a time series table.

Data Set – An accumulation of data products. A data set together with supporting documentation and ancillary files is an archive.

Standard Data Product – A data product generated in a predefined way using well-understood procedures, processed in "pipeline" fashion. Data products that are generated in a nonstandard way are sometimes called *special data products*.

APPENDIX C – ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
C&DH	Command and Data Handling
CODMAC	Committee on Data Management, Archiving and Computing
DVD-ROM	Digital Video Disk – Read-Only Memory
EDR	Experiment Data Record
FITS	Flexible Image Transport System
HDU	Header and Data Unit (FITS)
HK	Housekeeping
HVPS	High-Voltage Power Supply
HW	Hardware
IAU	International Astronomical Union
ICD	Interface Control Document
IDL	Interactive Data Language
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
LAMP	Lyman Alpha Mapping Project
LRO	Lunar Reconnaissance Orbiter
MCP	Microchannel Plate
MOC	Mission Operations Center
MSB	Most Significant Bit
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
PDS	Planetary Data System
SCLK	Spacecraft Clock (SPICE kernel)
SCUT	Spacecraft Universal Time
SIS	Software Interface Specification
SOC	Science Operations Center
SPICE	Spacecraft, Planet, Instrument, C-matrix (pointing), and Events
STIM	Smart Transducer Interface Module
TBD	To Be Determined
TBS	To Be Supplied
UTC	Coordinated Universal Time
UV	Ultraviolet
UVS	Ultraviolet Spectrograph
XDL	Cross Delay Line

APPENDIX D – NASA AND CODMAC DATA LEVEL DEFINITIONS

NASA	CODMAC	Description
Packet data	Raw - Level 1	Telemetry data stream as received at the ground station, with science and engineering data embedded.
Level 0	Edited - Level 2	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed.
Level 1A	Calibrated - Level 3	NASA Level 0 data that have been located in space and may have been transformed (e.g., calibrated, rearranged) in a reversible manner and packaged with needed ancillary and auxiliary data (e.g., radiances with the calibration equations applied).
Level 1B	Resampled - Level 4	Irreversibly transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances, magnetic field strength).
Level 1C	Derived - Level 5	NASA Level 1A or 1B data that have been resampled and mapped onto uniform space-time grids. The data are calibrated (i.e., radiometrically corrected) and may have additional corrections applied (e.g., terrain correction).
Level 2	Derived - Level 5	Geophysical parameters, generally derived from Level 1 data, and located in space and time commensurate with instrument location, pointing, and sampling.
Level 3	Derived - Level 5	Geophysical parameters mapped onto uniform space-time grids.

APPENDIX E – SAMPLE UVS LABEL FILE

Below is an example PDS label for the UVS EDR data product

```
PDS_VERSION_ID               = PDS3
DD_VERSION_ID                = PDSCAT1R65
LABEL_REVISION_NOTE          = "2010-08-09, Brad Trantham (SwRI), V1.0;"

/* FILE CHARACTERISTIC DATA ELEMENTS */

DATA_FORMAT                  = FITS
FILE_NAME                    = "UVS_ENG_434589840_2013282_efbobs_V01.FIT"
FILE_RECORDS                 = 366309
RECORD_BYTES                 = 2880 /* FITS standard record length */
RECORD_TYPE                  = FIXED_LENGTH

/* DATA OBJECT POINTERS */

^SPECTRAL_VS_SPATIAL_HEADER             =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 1)
^SPECTRAL_VS_SPATIAL_IMAGE              =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 5)
^SPATIAL_VS_TIME_HEADER                 =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 734)
^SPATIAL_VS_TIME_IMAGE                  =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 735)
^FRAME_LIST_HEADER                      =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101535)
^FRAME_LIST_TABLE                       =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101538)
^SCAN_MIRROR_HEADER                     =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101712)
^SCAN_MIRROR_TABLE                      =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101713)
^RAW_FRAME_HEADER                       =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101714)
^RAW_FRAME_TABLE                        =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 101715)
^ANALOG_COUNT_RATE_HEADER               =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 194014)
^ANALOG_COUNT_RATE_TABLE                =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 194015)
^DIGITAL_COUNT_RATE_HEADER              =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 195242)
^DIGITAL_COUNT_RATE_TABLE               =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 195243)
^PULSE_HEIGHT_DISTRIBUTION_LA_HEADER    =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 342281)
^PULSE_HEIGHT_DISTRIBUTION_LA_TABLE     =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 342282)
^PULSE_HEIGHT_DISTRIBUTION_STELLAR_HEADER=
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 348976)
^PULSE_HEIGHT_DISTRIBUTION_STELLAR_TABLE =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 348977)
^PULSE_HEIGHT_DISTRIBUTION_STIM_HEADER   =
```

```
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 355671)
^PULSE_HEIGHT_DISTRIBUTION_STIM_TABLE    =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 355672)
^HOUSEKEEPING_HEADER                     =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 362366)
^HOUSEKEEPING_TABLE                      =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 362377)
^PARAMETER_LIST_HEADER                   =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 366292)
^PARAMETER_LIST_TABLE                    =
  ("UVS_ENG_434589840_2013282_efbobs_V01.FIT", 366304)

/* IDENTIFICATION DATA ELEMENTS */

DATA_SET_ID                  = "JNO-J-UVS-2-EDR-V1.0"
INSTRUMENT_HOST_NAME         = "JUNO"
INSTRUMENT_NAME              = "ULTRAVIOLET SPECTROGRAPH"
PRODUCT_CREATION_TIME        = 2014-112T18:01:05
PRODUCT_ID                   = "UVS_ENG_434589840_2013282_efbobs_V01.FIT"
STANDARD_DATA_PRODUCT_ID     = "UVS_ENG"
MD5_CHECKSUM                 = "7fa0b988db9b70321b4d8ccaf4df5e1d"
SPACECRAFT_CLOCK_START_COUNT = "434589949.564"
SPACECRAFT_CLOCK_STOP_COUNT  = "434619259.734"
START_TIME                   = 2013-282T11:24:45.564
STOP_TIME                    = 2013-282T19:33:16.733
TARGET_NAME                  = "JUPITER"

/* DESCRIPTIVE DATA ELEMENTS */

DATA_SET_NAME                = "
  JUNO JUPITER UVS 2 EXPERIMENT DATA RECORD V1.0"
PROCESSING_LEVEL_ID          = "2"
INSTRUMENT_ID                = "UVS"
INSTRUMENT_TYPE              = "ULTRAVIOLET SPECTROMETER"
PRODUCER_FULL_NAME           = "BRAD TRANTHAM"
PRODUCER_ID                  = "JUNO_UVS"
PRODUCER_INSTITUTION_NAME    = "SOUTHWEST RESEARCH INSTITUTE"
PRODUCT_TYPE                 = "EDR" /* CODMAC Data Level 2 */
SOFTWARE_NAME                = "UVS-LIMA"
SPACECRAFT_NAME              = "JUNO"
TARGET_TYPE                  = "PLANET"

/* DATA OBJECT DEFINITIONS */

OBJECT                       = SPECTRAL_VS_SPATIAL_HEADER
  BYTES                      = 11520 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 4
  DESCRIPTION                = "
    FITS header for JUNO UVS uncalibrated (CODMAC Data Level 2) observation."
END_OBJECT                   = SPECTRAL_VS_SPATIAL_HEADER

OBJECT                       = SPECTRAL_VS_SPATIAL_IMAGE
  SAMPLE_BITS                = 32
```

```
  SAMPLE_TYPE                = MSB_INTEGER
  AXIS_ORDER_TYPE            = FIRST_INDEX_FASTEST
  LINE_DISPLAY_DIRECTION     = UP
  SAMPLE_DISPLAY_DIRECTION   = RIGHT
  LINE_SAMPLES               = 2048
  LINES                      = 256
  INTERCHANGE_FORMAT         = BINARY
  OFFSET                     = 0
  SCALING_FACTOR             = 1.00000
  DESCRIPTION                = "
    This is a reconstructed histogram generated from the pixel list data in
    the science data file. Photon acquisition events will be binned according
    to their spectral and spatial components. This summary image is used as a
    quick-look check on data quality."
END_OBJECT                   = SPECTRAL_VS_SPATIAL_IMAGE

OBJECT                       = SPATIAL_VS_TIME_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 1, FITS extension
name
    = SPATIAL_VS_TIME_IMAGE"
END_OBJECT                   = SPATIAL_VS_TIME_HEADER

OBJECT                       = SPATIAL_VS_TIME_IMAGE
  SAMPLE_BITS                = 32
  SAMPLE_TYPE                = MSB_INTEGER
  AXIS_ORDER_TYPE            = FIRST_INDEX_FASTEST
  LINE_DISPLAY_DIRECTION     = UP
  SAMPLE_DISPLAY_DIRECTION   = RIGHT
  LINE_SAMPLES               = 300
  LINES                      = 256
  INTERCHANGE_FORMAT         = BINARY
  OFFSET                     = 0
  SCALING_FACTOR             = 1.00000
  DESCRIPTION                = "
    This is similar to the first dataset, but the data are binned based on
    spatial and temporal parameters. The 360 degree histogram will be split
    into 5 panels of 72 degrees. A new histogram will be started every time
    the scan mirror moves, as determined from the housekeeping data. This
    summary image is used as a quick-look check on data quality."
END_OBJECT                   = SPATIAL_VS_TIME_IMAGE

OBJECT                       = FRAME_LIST_HEADER
  BYTES                      = 8640 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 3
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 2, FITS extension
name
    = FRAME_LIST"
```

```
END_OBJECT                    = FRAME_LIST_HEADER

OBJECT                        = FRAME_LIST_TABLE
  INTERCHANGE_FORMAT          = ASCII
  ROWS                        = 2704
  COLUMNS                     = 20
  ROW_BYTES                   = 185
  OBJECT                      = COLUMN
    NAME                      = "FRAME_COUNTER"
    COLUMN_NUMBER             = 1
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 1
    BYTES                     = 5
    DESCRIPTION               = "Frame counter value (0-65535)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "SC_RCVD_TIME"
    COLUMN_NUMBER             = 2
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 6
    BYTES                     = 14
    DESCRIPTION               = "Spacecraft received time"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "FIRST_TIMEHACK"
    COLUMN_NUMBER             = 3
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 20
    BYTES                     = 10
    DESCRIPTION               = "First timehack"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "LAST_TIMEHACK"
    COLUMN_NUMBER             = 4
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 30
    BYTES                     = 10
    DESCRIPTION               = "Last timehack"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "SC_TIME_FIRST_HACK"
    COLUMN_NUMBER             = 5
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 40
    BYTES                     = 14
    DESCRIPTION               = "Spacecraft time of the first timehack"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "SC_TIME_LAST_HACK"
    COLUMN_NUMBER             = 6
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 54
    BYTES                     = 14
    DESCRIPTION               = "Spacecraft time of the last timehack"
  END_OBJECT                  = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "FRAME_QUALITY"
    COLUMN_NUMBER             = 7
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 68
    BYTES                     = 3
    DESCRIPTION               = "Frame quality"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "FRAME_TAG"
    COLUMN_NUMBER             = 8
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 71
    BYTES                     = 5
    DESCRIPTION               = "Frame tag"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "FINAL_FRAME"
    COLUMN_NUMBER             = 9
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 76
    BYTES                     = 1
    DESCRIPTION               = "Final frame flag"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "QUALITY_FLAG"
    COLUMN_NUMBER             = 10
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 77
    BYTES                     = 3
    DESCRIPTION               = "Quality flag"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "MEMORY_SIDE"
    COLUMN_NUMBER             = 11
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 80
    BYTES                     = 1
    DESCRIPTION               = "Memory side (0=A,1=B)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HACK_RATE"
    COLUMN_NUMBER             = 12
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 81
    BYTES                     = 2
    DESCRIPTION               = "Hack Rate (0=1ms, 1=2ms, 3=4ms, ... 9=512ms)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "NUM_TIMEHACKS"
    COLUMN_NUMBER             = 13
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 83
    BYTES                     = 5
    DESCRIPTION               = "Number of timehacks"
```

```
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "FRMSUM"
    COLUMN_NUMBER             = 14
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 88
    BYTES                     = 8
    DESCRIPTION               = "Computed frmsum"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "CHKSUM"
    COLUMN_NUMBER             = 15
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 96
    BYTES                     = 8
    DESCRIPTION               = "Computed chksum"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "TYPE"
    COLUMN_NUMBER             = 16
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 104
    BYTES                     = 2
    DESCRIPTION               = "Computed frame type"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "CLOCK_PERIOD"
    COLUMN_NUMBER             = 17
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 106
    BYTES                     = 10
    DESCRIPTION               = "Clock period assigned to frame"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "NUM_ACQS"
    COLUMN_NUMBER             = 18
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 116
    BYTES                     = 5
    DESCRIPTION               = "Number of actual acquisitions"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "EXPECTED"
    COLUMN_NUMBER             = 19
    DATA_TYPE                 = ASCII_INTEGER
    START_BYTE                = 121
    BYTES                     = 1
    DESCRIPTION                     = "Was frame counter 1 + previous frame
counter?"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "FILE"
    COLUMN_NUMBER             = 20
    DATA_TYPE                 = CHARACTER
    START_BYTE                = 122
```

```
    BYTES                    = 64
    DESCRIPTION              = "Source filename"
  END_OBJECT                 = COLUMN
END_OBJECT                   = FRAME_LIST_TABLE

OBJECT                       = SCAN_MIRROR_POSITIONS_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 3, FITS extension
name
    = SCAN_MIRROR_POSITIONS"
END_OBJECT                   = SCAN_MIRROR_POSITIONS_HEADER

OBJECT                       = SCAN_MIRROR_POSITIONS_TABLE
  INTERCHANGE_FORMAT         = ASCII
  ROWS                       = 62
  COLUMNS                    = 2
  ROW_BYTES                  = 17
  DESCRIPTION                = "
    ASCII data table with number of entries matching number of mirror
    positions recorded, empty if no housekeeping data is available"
  OBJECT                     = COLUMN
    NAME                     = "POSITION_NUM"
    COLUMN_NUMBER            = 1
    DATA_TYPE                = ASCII_INTEGER
    START_BYTE               = 1
    BYTES                    = 3
    DESCRIPTION              = "Scan mirror position number"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "TIME"
    COLUMN_NUMBER            = 2
    DATA_TYPE                = ASCII_REAL
    START_BYTE               = 4
    BYTES                    = 14
    DESCRIPTION              = "
      Position start/end (alternating) time (seconds)"
  END_OBJECT                 = COLUMN
END_OBJECT                   = SCAN_MIRROR_POSITIONS_TABLE

OBJECT                       = FRAME_DATA_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 3, FITS extension
name
    = RAW_FRAME_DATA"
END_OBJECT                   = FRAME_DATA_HEADER

OBJECT                       = FRAME_DATA_TABLE
```

```
  INTERCHANGE_FORMAT         = BINARY
  ROWS                       = 2704
  COLUMNS                    = 2
  ROW_BYTES                  = 98306
  DESCRIPTION                = "
    Binary data table with frame received time in seconds, subseconds, and
    data"
  OBJECT                     = COLUMN
    NAME                     = "RECV_TIME"
    COLUMN_NUMBER            = 1
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 1
    BYTES                    = 8
    DESCRIPTION              = "
      Frame generation time (seconds since 00:00 UTC, 01 Jan 2001)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "FRAME_DATA"
    COLUMN_NUMBER            = 2
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 9
    BYTES                    = 98298
    ITEMS                    = 32766
    ITEM_BYTES               = 3
    DESCRIPTION              = "Frame generation time (subseconds)"
  END_OBJECT                 = COLUMN
END_OBJECT                   = FRAME_DATA_TABLE

OBJECT                       = ANALOG_COUNTRATE_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 5, FITS extension
name
    = ANALOG_COUNT_RATES"
END_OBJECT                   = ANALOG_COUNTRATE_HEADER

OBJECT                       = ANALOG_COUNTRATE_TABLE
  INTERCHANGE_FORMAT         = BINARY
  ROWS                       = 294341
  COLUMNS                    = 2
  ROW_BYTES                  = 12
  OBJECT                     = COLUMN
    NAME                     = "SCLK_TIME"
    COLUMN_NUMBER            = 1
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 1
    BYTES                    = 8
    DESCRIPTION              = "Spacecraft clock (seconds)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "COUNT_RATE"
    COLUMN_NUMBER            = 2
```

```
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 9
    BYTES                    = 4
    DESCRIPTION              = "Count rate for the interval (Hz)"
  END_OBJECT                 = COLUMN
END_OBJECT                   = ANALOG_COUNTRATE_TABLE

OBJECT                       = DIGITAL_COUNTRATE_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 6, FITS extension
name
    = DIGITAL_COUNT_RATES"
END_OBJECT                   = DIGITAL_COUNTRATE_HEADER

OBJECT                       = DIGITAL_COUNTRATE_TABLE
  INTERCHANGE_FORMAT         = BINARY
  ROWS                       = 26466758
  COLUMNS                    = 3
  ROW_BYTES                  = 16
  OBJECT                     = COLUMN
    NAME                     = "HACK_TIME"
    COLUMN_NUMBER            = 1
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 1
    BYTES                    = 4
    DESCRIPTION              = "Hack time at the start of the interval"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCLK_TIME"
    COLUMN_NUMBER            = 2
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 5
    BYTES                    = 8
    DESCRIPTION              = "Spacecraft clock (seconds)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "COUNT_RATE"
    COLUMN_NUMBER            = 3
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 13
    BYTES                    = 4
    DESCRIPTION              = "Count rate for the interval (Hz)"
  END_OBJECT                 = COLUMN
END_OBJECT                   = DIGITAL_COUNTRATE_TABLE

OBJECT                       = PULSE_HEIGHT_DISTRIBUTION_LA_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
```

```
    This is the FITS header for FITS extension number = 7, FITS extension
name
    = PULSE_HEIGHT_DISTRIBUTION_QUBE"
END_OBJECT                    = PULSE_HEIGHT_DISTRIBUTION_LA_HEADER

OBJECT                        = PULSE_HEIGHT_DISTRIBUTION_LA_QUBE
  AXES                        = 3
  AXIS_NAME                   = (SPATIAL, TIME, NUMBER_OF_IMAGES)
  COMMENT                     = "
    (0.1 second bins, 17 bins of pulse height information, Number of
histogram
    images)"
  CORE_ITEMS                  = ( 300 ,  256 ,  945 )
  CORE_ITEMS_BYTES            = 4
  CORE_ITEM_TYPE              = UNSIGNED_INTEGER
  CORE_BASE                   = 0.0
  CORE_MULTIPLIER             = 1.0
  SUFFIX_BYTES                = 4
  SUFFIX_ITEMS                = (0,0,0)
  CORE_VALID_MINIMUM          = 0
  CORE_NULL                   = -1
  CORE_LOW_INSTR_SATURATION   = "N/A"
  CORE_HIGH_INSTR_SATURATION  = "N/A"
  CORE_LOW_REPR_SATURATION    = "N/A"
  CORE_HIGH_REPR_SATURATION   = "N/A"
  DESCRIPTION                 = "
    This is similar to the first dataset, but the data are binned based on
    spatial and temporal parameters. The 360 degree histogram will be split
    into 5 panels of 72 degrees. A new histogram will be started every time
    the scan mirror moves, as determined from the housekeeping data. This
    summary image is used as a quick-look check on data quality. This
    histogram contains photons whose spectra are recorded on detector column
    numbers between 850 and 930."
END_OBJECT                    = PULSE_HEIGHT_DISTRIBUTION_LA_QUBE

OBJECT                        = PULSE_HEIGHT_DISTRIBUTION_STELLAR_HEADER
  BYTES                       = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                 = FITS
  INTERCHANGE_FORMAT          = ASCII
  RECORDS                     = 1
  DESCRIPTION                 = "
    This is the FITS header for FITS extension number = 8, FITS extension
name
    = PULSE_HEIGHT_DISTRIBUTION_QUBE"
END_OBJECT                    = PULSE_HEIGHT_DISTRIBUTION_STELLAR_HEADER

OBJECT                        = PULSE_HEIGHT_DISTRIBUTION_STELLAR_QUBE
  AXES                        = 3
  AXIS_NAME                   = (SPATIAL, TIME, NUMBER_OF_IMAGES)
  COMMENT                     = "
    (0.1 second bins, 17 bins of pulse height information, Number of
histogram
    images)"
  CORE_ITEMS                  = ( 300 ,  256 ,  945 )
  CORE_ITEMS_BYTES            = 4
```

```
  CORE_ITEM_TYPE             = UNSIGNED_INTEGER
  CORE_BASE                  = 0.0
  CORE_MULTIPLIER            = 1.0
  SUFFIX_BYTES               = 4
  SUFFIX_ITEMS               = (0,0,0)
  CORE_VALID_MINIMUM         = 0
  CORE_NULL                  = -1
  CORE_LOW_INSTR_SATURATION  = "N/A"
  CORE_HIGH_INSTR_SATURATION = "N/A"
  CORE_LOW_REPR_SATURATION   = "N/A"
  CORE_HIGH_REPR_SATURATION  = "N/A"
  DESCRIPTION                = "
    This is similar to the first dataset, but the data are binned based on
    spatial and temporal parameters. The 360 degree histogram will be split
    into 5 panels of 72 degrees. A new histogram will be started every time
    the scan mirror moves, as determined from the housekeeping data. This
    summary image is used as a quick-look check on data quality. This
    histogram contains photons whose spectra are recorded on detector columns
    numbered between 931 and 1770."
END_OBJECT                   = PULSE_HEIGHT_DISTRIBUTION_STELLAR_QUBE

OBJECT                       = PULSE_HEIGHT_DISTRIBUTION_STIM_HEADER
  BYTES                      = 2880 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = ASCII
  RECORDS                    = 1
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 9, FITS extension
name
    = PULSE_HEIGHT_DISTRIBUTION_QUBE"
END_OBJECT                   = PULSE_HEIGHT_DISTRIBUTION_STIM_HEADER

OBJECT                       = PULSE_HEIGHT_DISTRIBUTION_STIM_QUBE
  AXES                       = 3
  AXIS_NAME                  = (SPATIAL, TIME, NUMBER_OF_IMAGES)
  COMMENT                    = "
    (0.1 second bins, 17 bins of pulse height information, Number of
histogram
    images)"
  CORE_ITEMS                 = ( 300 ,  256 ,  945 )
  CORE_ITEMS_BYTES           = 4
  CORE_ITEM_TYPE             = UNSIGNED_INTEGER
  CORE_BASE                  = 0.0
  CORE_MULTIPLIER            = 1.0
  SUFFIX_BYTES               = 4
  SUFFIX_ITEMS               = (0,0,0)
  CORE_VALID_MINIMUM         = 0
  CORE_NULL                  = -1
  CORE_LOW_INSTR_SATURATION  = "N/A"
  CORE_HIGH_INSTR_SATURATION = "N/A"
  CORE_LOW_REPR_SATURATION   = "N/A"
  CORE_HIGH_REPR_SATURATION  = "N/A"
  DESCRIPTION                = "
    This is similar to the first dataset, but the data are binned based on
    spatial and temporal parameters. The 360 degree histogram will be split
```

```
    into 5 panels of 72 degrees. A new histogram will be started every time
    the scan mirror moves, as determined from the housekeeping data. This
    summary image is used as a quick-look check on data quality. This
    histogram contains photons whose spectra are recorded on detector columns
    numbered between 0 - 149 and 1950 - 2047."
END_OBJECT                    = PULSE_HEIGHT_DISTRIBUTION_STIM_QUBE

OBJECT                        = HOUSEKEEPING_HEADER
  BYTES                       = 31680 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                 = FITS
  INTERCHANGE_FORMAT          = ASCII
  RECORDS                     = 11
  DESCRIPTION                 = "
    This is the FITS header for FITS extension number = 10, FITS extension
    name = HOUSEKEEPING"
END_OBJECT                    = HOUSEKEEPING_HEADER

OBJECT                        = HOUSEKEEPING_TABLE
  INTERCHANGE_FORMAT          = BINARY
  ROWS                        = 14717
  COLUMNS                     = 144
  ROW_BYTES                   = 766
  OBJECT                      = COLUMN
    NAME                      = "SCLK_TIME"
    COLUMN_NUMBER             = 1
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 1
    BYTES                     = 8
    DESCRIPTION               = "Spacecraft clock (seconds since epoch)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HACK_TIME"
    COLUMN_NUMBER             = 2
    DATA_TYPE                 = LSB_INTEGER
    START_BYTE                = 9
    BYTES                     = 4
    DESCRIPTION               = "Instrument hack time"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "PACK_CNT"
    COLUMN_NUMBER             = 3
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 13
    BYTES                     = 2
    DESCRIPTION               = "16-bit packet counter"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "PACKET_DATA"
    COLUMN_NUMBER             = 4
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 15
    BYTES                     = 340
    DESCRIPTION               = "Raw HK packet (340 bytes)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
```

```
    NAME                       = "INST_STATE"
    COLUMN_NUMBER              = 5
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 355
    BYTES                      = 1
    DESCRIPTION                = "
      Instrument State (0=off, 1=checkout, 2=safe, 3=acq, 4=decon)"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "SAFETY_ACTIVE"
    COLUMN_NUMBER              = 6
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 356
    BYTES                      = 1
    DESCRIPTION                = "1=safety active"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "LAST_SAFETY"
    COLUMN_NUMBER              = 7
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 357
    BYTES                      = 1
    DESCRIPTION                = "Last safety (0=none)"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "LVPS_STATUS"
    COLUMN_NUMBER              = 8
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 358
    BYTES                      = 1
    DESCRIPTION                = "Power status for each LVPS, 1=active"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "HVPS_STATUS"
    COLUMN_NUMBER              = 9
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 359
    BYTES                      = 1
    DESCRIPTION                = "Power status for each HVPS, 1=active"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "DETECTOR_PWR"
    COLUMN_NUMBER              = 10
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 360
    BYTES                      = 1
    DESCRIPTION                = "Power status of detector, 1=on"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "TURN_OFF_REQ"
    COLUMN_NUMBER              = 11
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 361
    BYTES                      = 1
    DESCRIPTION                = "1=request instrument shutdown by s/c"
```

```
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "WPA_DRIVEN"
    COLUMN_NUMBER             = 12
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 362
    BYTES                     = 1
    DESCRIPTION               = "1=WPA activated"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "WPA_SWITCH"
    COLUMN_NUMBER             = 13
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 363
    BYTES                     = 1
    DESCRIPTION               = "1=WPA stroke switch activated"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HVPS_SAFE"
    COLUMN_NUMBER             = 14
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 364
    BYTES                     = 1
    DESCRIPTION               = "
      Safing status for each HVPS, 1=safing plug installed"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "RST_ACT_SAFE"
    COLUMN_NUMBER             = 15
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 365
    BYTES                     = 1
    DESCRIPTION               = "
      Resettable actuator safing plug status, 1=installed"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "NON_RST_ACT_SAFE"
    COLUMN_NUMBER             = 16
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 366
    BYTES                     = 1
    DESCRIPTION               = "
      Non-resettable actuator safing plus status, 1=installed"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "SmInit"
    COLUMN_NUMBER             = 17
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 367
    BYTES                     = 1
    DESCRIPTION               = "
      Scan Mirror movement control initialized: 1 = initialized"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "SCAN_MRR_HTR"
```

```
    COLUMN_NUMBER            = 18
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 368
    BYTES                    = 1
    DESCRIPTION              = "Status of scan mirror heater, 1=on"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "OAP_MRR_HTR"
    COLUMN_NUMBER            = 19
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 369
    BYTES                    = 1
    DESCRIPTION              = "Status of the OAP mirror heater, 1=on"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "GRT_MRR_HTR"
    COLUMN_NUMBER            = 20
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 370
    BYTES                    = 1
    DESCRIPTION              = "Status of the grating mirror heater, 1=on"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CMD_LAST_CYCLE"
    COLUMN_NUMBER            = 21
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 371
    BYTES                    = 1
    DESCRIPTION              = "1=command received during last cycle"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "T_SYNC_MSG"
    COLUMN_NUMBER            = 22
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 372
    BYTES                    = 1
    DESCRIPTION              = "
      1=valid time sync message received during last cycle"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "T_SYNC_PULSE"
    COLUMN_NUMBER            = 23
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 373
    BYTES                    = 1
    DESCRIPTION              = "
      1=valid time sync pulse received during last cycle"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CRIT_TC_PEND"
    COLUMN_NUMBER            = 24
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 374
    BYTES                    = 1
    DESCRIPTION              = "1=critical telecommand pending"
```

```
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "TC_STATUS"
  COLUMN_NUMBER             = 25
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 375
  BYTES                     = 1
  DESCRIPTION               = "
    Instrument commanding input wait status: 1 - prime first byte, 2 -
    redundant first byte, 3 - either first byte, 5 - prime next byte, 6 -
    redundant next byte"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "CMDS_ACCEPTED"
  COLUMN_NUMBER             = 26
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 376
  BYTES                     = 1
  DESCRIPTION               = "Modulo 2^8 count of commands accepted"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "CMDS_REJECTED"
  COLUMN_NUMBER             = 27
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 377
  BYTES                     = 1
  DESCRIPTION               = "Modulo 2^8 count of commands rejected"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "CMDS_EXECUTED"
  COLUMN_NUMBER             = 28
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 378
  BYTES                     = 1
  DESCRIPTION               = "Modulo 2^8 count of commands executed"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "TIME_MSGS_RECVD"
  COLUMN_NUMBER             = 29
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 379
  BYTES                     = 1
  DESCRIPTION               = "Modulo 2^8 count of time messages received"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "TIME_PULSES_RECVD"
  COLUMN_NUMBER             = 30
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 380
  BYTES                     = 1
  DESCRIPTION               = "Modulo 2^8 count of time pulses received"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "NADIR_MSGS_RECVD"
  COLUMN_NUMBER             = 31
```

```
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 381
    BYTES                    = 1
    DESCRIPTION              = "Modulo 2^8 count of nadir messages received"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "LAST_ACCEPT_CMD"
    COLUMN_NUMBER            = 32
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 382
    BYTES                    = 1
    DESCRIPTION              = "Opcode of last accepted command"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "LAST_FAILED_CMD"
    COLUMN_NUMBER            = 33
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 383
    BYTES                    = 1
    DESCRIPTION              = "Opcode of last failed command"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "LAST_FAILURE"
    COLUMN_NUMBER            = 34
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 384
    BYTES                    = 1
    DESCRIPTION              = "Last failure code command/execution"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CRIT_CMD_TIMEOUT"
    COLUMN_NUMBER            = 35
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 385
    BYTES                    = 1
    DESCRIPTION              = "Remaining timeout for a critical command"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCI_PKT_HDR"
    COLUMN_NUMBER            = 36
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 386
    BYTES                    = 4
    DESCRIPTION              = "
      Header of the most recently acquired science packet"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCI_QUALITY"
    COLUMN_NUMBER            = 37
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 390
    BYTES                    = 1
    DESCRIPTION              = "
      Quality byte of the most recent science acquisition"
  END_OBJECT                 = COLUMN
```

```
  OBJECT                       = COLUMN
    NAME                       = "SCI_PKT_TAG"
    COLUMN_NUMBER              = 38
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 391
    BYTES                      = 2
    DESCRIPTION                = "Tag bytes of most recent science acquisition"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "DETECTOR_DOOR_POS"
    COLUMN_NUMBER              = 39
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 393
    BYTES                      = 1
    DESCRIPTION                = "0=illegal, 1=not open, 2=open, 3=illegal"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "APERTURE_DOOR_POS"
    COLUMN_NUMBER              = 40
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 394
    BYTES                      = 1
    DESCRIPTION                = "0=error, 1=closed, 2=open, 3=between"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "HACKRATE"
    COLUMN_NUMBER              = 41
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 395
    BYTES                      = 1
    DESCRIPTION                = "0=1ms, 1=2ms, ... 9=512ms"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "HVPS_COMMANDED"
    COLUMN_NUMBER              = 42
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 396
    BYTES                      = 1
    DESCRIPTION                = "Commanded state of HVPS 1 and 2, 1=on"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "HVPS_LIMITED"
    COLUMN_NUMBER              = 43
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 397
    BYTES                      = 1
    DESCRIPTION                = "1=HVPS limited due to high countrate"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "HOT_PIXEL_MASKING"
    COLUMN_NUMBER              = 44
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 398
    BYTES                      = 1
    DESCRIPTION                = "1=hot pixel masking (hardware) active"
```

```
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "SCI_OVERFLOW"
  COLUMN_NUMBER             = 45
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 399
  BYTES                     = 1
  DESCRIPTION               = "
    1=overflow occured in high speed science transfer"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "ACQ_MEM"
  COLUMN_NUMBER             = 46
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 400
  BYTES                     = 1
  DESCRIPTION               = "0=side A, 1=side B"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "DETECTOR_STIM"
  COLUMN_NUMBER             = 47
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 401
  BYTES                     = 1
  DESCRIPTION               = "0=STIM off, 1=STIM on"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "ACQ_EVT_POINTER"
  COLUMN_NUMBER             = 48
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 402
  BYTES                     = 2
  DESCRIPTION               = "
    Most recent value of the h/w pixel list pointer"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "FIRST_COUNT_HACK"
  COLUMN_NUMBER             = 49
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 404
  BYTES                     = 2
  DESCRIPTION               = "
    Value of the timehack counter at the first countrate entry"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "RAW_EVENT_COUNT"
  COLUMN_NUMBER             = 50
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 406
  BYTES                     = 4
  DESCRIPTION               = "
    Current value of the hardware detector analog event counter"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "MAX_EVENT_RATE"
```

```
    COLUMN_NUMBER            = 51
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 410
    BYTES                    = 4
    DESCRIPTION              = "
      Maximum digital unmasked event rate in the last HK cycle"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_MASK_RATE"
    COLUMN_NUMBER            = 52
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 414
    BYTES                    = 4
    DESCRIPTION              = "
      Maximum digital masking rate in the last HK cycle"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ACQ_TIMEOUT"
    COLUMN_NUMBER            = 53
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 418
    BYTES                    = 4
    DESCRIPTION              = "
      Remianing time (sec) of acquisiton timeout counter"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "LAST_ACQ_COMPLETE_TIME"
    COLUMN_NUMBER            = 54
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 422
    BYTES                    = 4
    DESCRIPTION              = "Time of last acquisition completion"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "LOWER_DISCRIMINATOR"
    COLUMN_NUMBER            = 55
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 426
    BYTES                    = 1
    DESCRIPTION              = "Pulse height (0-31)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "UPPER_DISCRIMINATOR"
    COLUMN_NUMBER            = 56
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 427
    BYTES                    = 1
    DESCRIPTION              = "Pulse height (0-31)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HVPS_SETPOINT"
    COLUMN_NUMBER            = 57
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 428
    BYTES                    = 8
```

```
    DESCRIPTION              = "DAC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HVPS_LIMIT_TIMEOUT"
    COLUMN_NUMBER            = 58
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 436
    BYTES                    = 1
    DESCRIPTION              = "Remaining HVPS limit timeout in cycles"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_MCP_VOLTAGE"
    COLUMN_NUMBER            = 59
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 437
    BYTES                    = 8
    DESCRIPTION              = "
      Maximum MCP voltage in this HK reporting period"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MIN_MCP_VOLTAGE"
    COLUMN_NUMBER            = 60
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 445
    BYTES                    = 8
    DESCRIPTION              = "
      Minimum MCP voltage in this HK reporting period"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_ANODE_VOLTAGE"
    COLUMN_NUMBER            = 61
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 453
    BYTES                    = 8
    DESCRIPTION              = "
      Maximum anode voltage in this HK reporting period"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MIN_ANODE_VOLTAGE"
    COLUMN_NUMBER            = 62
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 461
    BYTES                    = 8
    DESCRIPTION              = "
      Minimum anode voltage in this HK reporting period"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_STRIP_CURRENT"
    COLUMN_NUMBER            = 63
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 469
    BYTES                    = 8
    DESCRIPTION              = "
      Maximum strip current in this HK reporting period"
  END_OBJECT                 = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "MIN_STRIP_CURRENT"
    COLUMN_NUMBER             = 64
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 477
    BYTES                     = 8
    DESCRIPTION               = "
      Minimum strip current in this HK reporting period"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "P7_VOLT"
    COLUMN_NUMBER             = 65
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 485
    BYTES                     = 8
    DESCRIPTION               = "ADC counts, range matching measure voltage"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "N7_VOLT"
    COLUMN_NUMBER             = 66
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 493
    BYTES                     = 8
    DESCRIPTION               = "ADC counts, range matching measure voltage"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "P5_VOLT"
    COLUMN_NUMBER             = 67
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 501
    BYTES                     = 8
    DESCRIPTION               = "ADC counts, range matching measure voltage"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "N5_VOLT"
    COLUMN_NUMBER             = 68
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 509
    BYTES                     = 8
    DESCRIPTION               = "ADC counts, range matching measure voltage"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "P3_3_VOLT"
    COLUMN_NUMBER             = 69
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 517
    BYTES                     = 8
    DESCRIPTION               = "ADC counts, range matching measure voltage"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "P1_8_VOLT"
    COLUMN_NUMBER             = 70
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 525
    BYTES                     = 8
```

```
    DESCRIPTION              = "ADC counts, range matching measure voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "P1_5_VOLT"
    COLUMN_NUMBER            = 71
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 533
    BYTES                    = 8
    DESCRIPTION              = "ADC counts, range matching measure voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "REF_0_3_VOLT"
    COLUMN_NUMBER            = 72
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 541
    BYTES                    = 8
    DESCRIPTION              = "ADC counts, range matching measure voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "REF_2_7_VOLT"
    COLUMN_NUMBER            = 73
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 549
    BYTES                    = 8
    DESCRIPTION              = "ADC counts, range matching measure voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SEQUENCER_ACTIVE"
    COLUMN_NUMBER            = 74
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 557
    BYTES                    = 1
    DESCRIPTION              = "1=scan mirror sequencer active"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CURRENT_POSITION"
    COLUMN_NUMBER            = 75
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 558
    BYTES                    = 1
    DESCRIPTION              = "Current scan mriror position"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "END_SWTICHES_STAT"
    COLUMN_NUMBER            = 76
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 559
    BYTES                    = 1
    DESCRIPTION              = "1=switch closed"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "TIME_TO_ZENITH"
    COLUMN_NUMBER            = 77
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 560
```

```
    BYTES                    = 1
    DESCRIPTION              = "Remaining time to zenith in sec*2"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CURRENT_PHASE"
    COLUMN_NUMBER            = 78
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 561
    BYTES                    = 1
    DESCRIPTION              = "Current phsae within scan table"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "REM_PHASE_TIME"
    COLUMN_NUMBER            = 79
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 562
    BYTES                    = 2
    DESCRIPTION              = "Time remaining in current phase in sec*2"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ACT_SEQ_OFFSET"
    COLUMN_NUMBER            = 80
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 564
    BYTES                    = 1
    DESCRIPTION              = "Offset within the current sequence phase"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ACT_SEQ_STEP"
    COLUMN_NUMBER            = 81
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 565
    BYTES                    = 1
    DESCRIPTION              = "Step within the current sequence phase"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ACT_SEQ_CYCLE"
    COLUMN_NUMBER            = 82
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 566
    BYTES                    = 1
    DESCRIPTION                   = "Cycles within the current sequence step
phase"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "REM_DWELL"
    COLUMN_NUMBER            = 83
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 567
    BYTES                    = 1
    DESCRIPTION              = "
      Remaining number of dwell cycles at the current position"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCAN_MRR_HTR_SETPOINT"
```

```
    COLUMN_NUMBER            = 84
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 568
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "OAP_MRR_HTR_SETPOINT"
    COLUMN_NUMBER            = 85
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 576
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "GRATING_HTR_SETPOINT"
    COLUMN_NUMBER            = 86
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 584
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCAN_MRR_PRIMARY_TMP"
    COLUMN_NUMBER            = 87
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 592
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SCAN_MRR_SECONDARY_TMP"
    COLUMN_NUMBER            = 88
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 600
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "OAP_MRR_PRIMARY_TMP"
    COLUMN_NUMBER            = 89
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 608
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "OAP_MRR_SECONDARY_TMP"
    COLUMN_NUMBER            = 90
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 616
    BYTES                    = 8
    DESCRIPTION              = "ADC counts"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
```

```
    NAME                    = "GRATING_PRIMARY_TMP"
    COLUMN_NUMBER           = 91
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 624
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "GRATING_SECONDARY_TMP"
    COLUMN_NUMBER           = 92
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 632
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "CDH_ELEC_TMP"
    COLUMN_NUMBER           = 93
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 640
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "HVPS_TEMP"
    COLUMN_NUMBER           = 94
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 648
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "LVPS_TEMP"
    COLUMN_NUMBER           = 95
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 656
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "DETECTOR_BDY_TMP"
    COLUMN_NUMBER           = 96
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 664
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "DETECTOR_ELEC_TMP"
    COLUMN_NUMBER           = 97
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 672
    BYTES                   = 8
    DESCRIPTION             = "ADC counts"
  END_OBJECT                = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "SMIB_TEMP"
    COLUMN_NUMBER             = 98
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 680
    BYTES                     = 8
    DESCRIPTION               = "ADC counts"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "CHASSIS_TEMP"
    COLUMN_NUMBER             = 99
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 688
    BYTES                     = 8
    DESCRIPTION               = "ADC counts"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HVPS_LIMIT_CYCLES"
    COLUMN_NUMBER             = 100
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 696
    BYTES                     = 1
    DESCRIPTION               = "
      Number of remaining cycles in this acquisition"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "TEMP_SAFETY"
    COLUMN_NUMBER             = 101
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 697
    BYTES                     = 1
    DESCRIPTION               = "1=safety in effect"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "CYCLE_SAFETY"
    COLUMN_NUMBER             = 102
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 698
    BYTES                     = 1
    DESCRIPTION               = "1=safety in effect"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "ANODE_SAFETY"
    COLUMN_NUMBER             = 103
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 699
    BYTES                     = 1
    DESCRIPTION               = "1=safety in effect"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "STRIP_SAFETY"
    COLUMN_NUMBER             = 104
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 700
    BYTES                     = 1
```

```
    DESCRIPTION              = "1=safety in effect"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_SAFETY"
    COLUMN_NUMBER            = 105
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 701
    BYTES                    = 1
    DESCRIPTION              = "1=safety in effect"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "BRIGHT_SAFETY"
    COLUMN_NUMBER            = 106
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 702
    BYTES                    = 1
    DESCRIPTION              = "1=safety in effect"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "UNSAFE_TIMER"
    COLUMN_NUMBER            = 107
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 703
    BYTES                    = 2
    DESCRIPTION              = "
      Remaining unsafe period in seconds, 0=no safety active"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SAFETY_OVERRIDE"
    COLUMN_NUMBER            = 108
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 705
    BYTES                    = 1
    DESCRIPTION              = "
      1=all safety handling is overridden (deactivated)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "TEMP_SAFETY_MASK"
    COLUMN_NUMBER            = 109
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 706
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CYCLE_SAFETY_MASK"
    COLUMN_NUMBER            = 110
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 707
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ANODE_SAFETY_MASK"
    COLUMN_NUMBER            = 111
```

```
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 708
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "STRIP_SAFETY_MASK"
    COLUMN_NUMBER            = 112
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 709
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_SAFETY_MASK"
    COLUMN_NUMBER            = 113
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 710
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "BRIGHT_SAFETY_MASK"
    COLUMN_NUMBER            = 114
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 711
    BYTES                    = 1
    DESCRIPTION              = "1=masked"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "EXECUTING_CODE"
    COLUMN_NUMBER            = 115
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 712
    BYTES                    = 1
    DESCRIPTION              = "
      0=illegal, 1=PROM, ..., 5=RAM, ..., 11-14=EEPROM_1-4"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HW_VERSION"
    COLUMN_NUMBER            = 116
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 713
    BYTES                    = 1
    DESCRIPTION              = "Board version ID"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SW_MAJOR_VER"
    COLUMN_NUMBER            = 117
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 714
    BYTES                    = 1
    DESCRIPTION              = "Build Number"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
```

```
    NAME                    = "SW_MINOR_VER"
    COLUMN_NUMBER           = 118
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 715
    BYTES                   = 1
    DESCRIPTION             = "Version Number"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "TC_INT_OFF"
    COLUMN_NUMBER           = 119
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 716
    BYTES                   = 1
    DESCRIPTION             = "
      Interrupt disable for each TC receiver, 1=disabled"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "SYNC_RECVD"
    COLUMN_NUMBER           = 120
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 717
    BYTES                   = 1
    DESCRIPTION             = "
      TSP received in last second for each TC receiver, 1=received"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "TC_FRAME_ERR"
    COLUMN_NUMBER           = 121
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 718
    BYTES                   = 1
    DESCRIPTION             = "
      Latched H/W frame error status for each TC receiver, 1=error"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "TC_OVERRUN_ERR"
    COLUMN_NUMBER           = 122
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 719
    BYTES                   = 1
    DESCRIPTION             = "
      Latched H/W frame error status for each TC rcvr, 1=overrun"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "MEM_CHKSUM"
    COLUMN_NUMBER           = 123
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 720
    BYTES                   = 2
    DESCRIPTION             = "
      Checksum calculated in response to last issued check mem cmd"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "RTX_IDLE"
    COLUMN_NUMBER           = 124
```

```
    DATA_TYPE               = LSB_INTEGER
    START_BYTE              = 722
    BYTES                   = 2
    DESCRIPTION             = "
      Count of passes through the scheduler idle loop"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "RTX_SCHEDULER"
    COLUMN_NUMBER           = 125
    DATA_TYPE               = LSB_INTEGER
    START_BYTE              = 724
    BYTES                   = 2
    DESCRIPTION             = "Count of calls to scheduler"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "DEBUG_ARRAY"
    COLUMN_NUMBER           = 126
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 726
    BYTES                   = 10
    DESCRIPTION             = "Various debug information fields"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "MIN_FREE_STACK"
    COLUMN_NUMBER           = 127
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 736
    BYTES                   = 1
    DESCRIPTION             = "Minimum amount of free stack space detected"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "FIRST_DELETED"
    COLUMN_NUMBER           = 128
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 737
    BYTES                   = 1
    DESCRIPTION             = "Task number of the first deleted task"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "RAM_EDAC_RECOVER"
    COLUMN_NUMBER           = 129
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 738
    BYTES                   = 1
    DESCRIPTION             = "Number of recovered RAM errors"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "RAM_EDAC_FAIL"
    COLUMN_NUMBER           = 130
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 739
    BYTES                   = 1
    DESCRIPTION             = "Number of detected RAM errors"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
```

```
    NAME                        = "EEPROM_EDAC_RECOVER"
    COLUMN_NUMBER               = 131
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 740
    BYTES                       = 1
    DESCRIPTION                 = "Number of recovered EEPROM errors"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "EEPROM_EDAC_FAIL"
    COLUMN_NUMBER               = 132
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 741
    BYTES                       = 1
    DESCRIPTION                 = "Number of detected EEPROM errors"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "TEST_STATUS"
    COLUMN_NUMBER               = 133
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 742
    BYTES                       = 2
    DESCRIPTION                 = "Test result of commanded self test"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "SCRUBBER_CYCLES"
    COLUMN_NUMBER               = 134
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 744
    BYTES                       = 2
    DESCRIPTION                 = "Number of EDAC scrubber cycles completed"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "SLOW_TASK_STATUS"
    COLUMN_NUMBER               = 135
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 746
    BYTES                       = 1
    DESCRIPTION                 = "
      0=start,1=idle,2=mem chk,3=mem dump,4=mem load,5=acq,6=test"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "WATCHDOG_CNT_MAXED"
    COLUMN_NUMBER               = 136
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 747
    BYTES                       = 1
    DESCRIPTION                 = "Watchdog expiration count above 15"
  END_OBJECT                    = COLUMN
  OBJECT                        = COLUMN
    NAME                        = "WATCHDOG_EXP_COUNT"
    COLUMN_NUMBER               = 137
    DATA_TYPE                   = LSB_UNSIGNED_INTEGER
    START_BYTE                  = 748
    BYTES                       = 1
    DESCRIPTION                 = "
```

```
    Number of watchdog expirations since last power-on, mod16"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "PARAMETER_INDEX"
  COLUMN_NUMBER             = 138
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 749
  BYTES                     = 1
  DESCRIPTION               = "Last requested parameter index"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "PARAMETER_VALUE"
  COLUMN_NUMBER             = 139
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 750
  BYTES                     = 1
  DESCRIPTION               = "Current value of last requested parameter"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HK_PKT_CHKSUM"
  COLUMN_NUMBER             = 140
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 751
  BYTES                     = 2
  DESCRIPTION               = "
    Calculated checksum before sending HK data to S/C"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "CLOCK_PERIOD"
  COLUMN_NUMBER             = 141
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 753
  BYTES                     = 4
  DESCRIPTION               = "Clock period assigned to HK"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "CHKSUM_ERROR"
  COLUMN_NUMBER             = 142
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 757
  BYTES                     = 2
  DESCRIPTION               = "
    Difference between computed and expected packet chksum"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "AVR_RAW_RATE"
  COLUMN_NUMBER             = 143
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 759
  BYTES                     = 4
  DESCRIPTION               = "Average raw countrate in Hz"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "AVR_EVENT_RATE"
  COLUMN_NUMBER             = 144
```

```
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 763
    BYTES                    = 4
    DESCRIPTION              = "Average event rate in Hz"
  END_OBJECT                 = COLUMN
END_OBJECT                   = HOUSEKEEPING_TABLE

OBJECT                       = PARAMETER_LIST_HEADER
  BYTES                      = 34560 /* RECORD_BYTES x RECORDS */
  HEADER_TYPE                = FITS
  INTERCHANGE_FORMAT         = BINARY
  RECORDS                    = 12
  DESCRIPTION                = "
    This is the FITS header for FITS extension number = 11, FITS extension
    name = PARAMETER LISTS"
END_OBJECT                   = PARAMETER_LIST_HEADER

OBJECT                       = PARAMETER_LIST_TABLE
  INTERCHANGE_FORMAT         = BINARY
  ROWS                       = 32
  COLUMNS                    = 114
  ROW_BYTES                  = 392
  OBJECT                     = COLUMN
    NAME                     = "SCLK_TIME"
    COLUMN_NUMBER            = 1
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 1
    BYTES                    = 8
    DESCRIPTION              = "Spacecraft clock (seconds since epoch)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "TABLE_ID"
    COLUMN_NUMBER            = 2
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 9
    BYTES                    = 1
    DESCRIPTION              = "
      Ident used to distinguish redundant table copies"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "DetPwrEnable"
    COLUMN_NUMBER            = 3
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 10
    BYTES                    = 1
    DESCRIPTION              = "
      Enable Detector power switch (1 = on in ACQUIRE and CHECKOUT state)"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "DoorEnable"
    COLUMN_NUMBER            = 4
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 11
    BYTES                    = 1
    DESCRIPTION              = "
```

```
      Enable door close on safety (1 = close on safety)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "Edac2enable"
    COLUMN_NUMBER             = 5
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 12
    BYTES                     = 1
    DESCRIPTION               = "Enable dual EDAC error restart"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "WpaSensorEnable"
    COLUMN_NUMBER             = 6
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 13
    BYTES                     = 1
    DESCRIPTION               = "
      Enable wax pellet actuator sensor feedback (1 = enabled)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "AutoEnable"
    COLUMN_NUMBER             = 7
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 14
    BYTES                     = 1
    DESCRIPTION                 = "0 = both disabled; 1 = enable A; 2 = enable
B"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HtrSenseGrating"
    COLUMN_NUMBER             = 8
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 15
    BYTES                     = 1
    DESCRIPTION               = "
      Optics heater sensor select; 0 = primary, 1 = secondary"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HtrSenseOapMirror"
    COLUMN_NUMBER             = 9
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 16
    BYTES                     = 1
    DESCRIPTION               = "
      Optics heater sensor select; 0 = primary, 1 = secondary"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HtrSenseScanMirror"
    COLUMN_NUMBER             = 10
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 17
    BYTES                     = 1
    DESCRIPTION               = "
      Optics heater sensor select; 0 = primary, 1 = secondary"
  END_OBJECT                  = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "GratingHtr1Enable"
    COLUMN_NUMBER             = 11
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 18
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "GratingHtr2Enable"
    COLUMN_NUMBER             = 12
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 19
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "OapMirrorHtr1Enable"
    COLUMN_NUMBER             = 13
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 20
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "OapMirrorHtr2Enable"
    COLUMN_NUMBER             = 14
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 21
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "ScanMirrorHtr1Enable"
    COLUMN_NUMBER             = 15
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 22
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "ScanmirrorHtr2Enable"
    COLUMN_NUMBER             = 16
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 23
    BYTES                     = 1
    DESCRIPTION               = "Optics heater control enabled; 1 = enabled"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "CRIT_CMD_TIMEOUT"
    COLUMN_NUMBER             = 17
    DATA_TYPE                 = LSB_INTEGER
    START_BYTE                = 24
    BYTES                     = 2
    DESCRIPTION               = "
```

```
    Critical command timeout period in seconds (min value is automatically
    limited to 5 seconds)"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "TC_MAX_ERROR"
  COLUMN_NUMBER             = 18
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 26
  BYTES                     = 1
  DESCRIPTION               = "
    Number of errors allowed on any Tc channels before disabling channel (0
    = not active)"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "WPA_TIMEOUT"
  COLUMN_NUMBER             = 19
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 27
  BYTES                     = 2
  DESCRIPTION               = "Wax pellet actuator timeout in seconds"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "TINI_CONTROL"
  COLUMN_NUMBER             = 20
  DATA_TYPE                 = IEEE_REAL
  START_BYTE                = 29
  BYTES                     = 8
  DESCRIPTION               = "
    Aperture door shape metal actuators control time"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "SCAN_CONTROL"
  COLUMN_NUMBER             = 21
  DATA_TYPE                 = IEEE_REAL
  START_BYTE                = 37
  BYTES                     = 8
  DESCRIPTION               = "
    Scan mirror shape metal actuators control time"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "DOOR_CONTROL"
  COLUMN_NUMBER             = 22
  DATA_TYPE                 = IEEE_REAL
  START_BYTE                = 45
  BYTES                     = 8
  DESCRIPTION               = "
    Aperture door motion control time in seconds/10."
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HK_PACKET_RATE"
  COLUMN_NUMBER             = 23
  DATA_TYPE                 = LSB_INTEGER
  START_BYTE                = 53
  BYTES                     = 2
  DESCRIPTION               = "
```

```
      Hk packet generation rate in cyles (0=each cycle)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "REPORT_PARAM"
    COLUMN_NUMBER             = 24
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 55
    BYTES                     = 1
    DESCRIPTION               = "
      Current parameter value reported in housekeeping"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "REPORT_SUB_PARAM"
    COLUMN_NUMBER             = 25
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 56
    BYTES                     = 1
    DESCRIPTION               = "
      Number of sub-sample reporting cycles for the parameter reporting
      process"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HW_VERSION_ID"
    COLUMN_NUMBER             = 26
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 57
    BYTES                     = 1
    DESCRIPTION                    = "H/W Board Version Id included in HK Tm
packet"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "STIM_ENABLE"
    COLUMN_NUMBER             = 27
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 58
    BYTES                     = 1
    DESCRIPTION               = "Enable Pixel STIM at start of acquisition"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HVPS_ENABLE"
    COLUMN_NUMBER             = 28
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 59
    BYTES                     = 1
    DESCRIPTION               = "
      Enable Primary/Secondary HVPS when commanded (1 = enabled)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "UP_DISCRIMINATOR"
    COLUMN_NUMBER             = 29
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 60
    BYTES                     = 1
    DESCRIPTION               = "Upper discriminator set level (1-31)"
  END_OBJECT                  = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "LO_DISCRIMINATOR"
    COLUMN_NUMBER             = 30
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 61
    BYTES                     = 1
    DESCRIPTION               = "Lower discriminator set level (1-31)"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HV_LEVEL"
    COLUMN_NUMBER             = 31
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 62
    BYTES                     = 8
    DESCRIPTION               = "High voltage operating level"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HV_STEP_FRACTION"
    COLUMN_NUMBER             = 32
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 70
    BYTES                     = 8
    DESCRIPTION               = "High voltage step fraction"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HV_STEP_TIME"
    COLUMN_NUMBER             = 33
    DATA_TYPE                 = LSB_INTEGER
    START_BYTE                = 78
    BYTES                     = 2
    DESCRIPTION               = "High voltage step duration"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HV_SAFE_LEVEL"
    COLUMN_NUMBER             = 34
    DATA_TYPE                 = IEEE_REAL
    START_BYTE                = 80
    BYTES                     = 8
    DESCRIPTION               = "
      Safe High voltage operating level when HV backoff is in progress"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HV_SAFE_TIMEOUT"
    COLUMN_NUMBER             = 35
    DATA_TYPE                 = LSB_INTEGER
    START_BYTE                = 88
    BYTES                     = 2
    DESCRIPTION               = "HV backoff timeout"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "PIXEL_LIST_HACK"
    COLUMN_NUMBER             = 36
    DATA_TYPE                 = LSB_INTEGER
    START_BYTE                = 90
    BYTES                     = 2
```

```
    DESCRIPTION              = "Time hack used for Pixellist acquisitions"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "ACQ_TIMEOUT"
    COLUMN_NUMBER            = 37
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 92
    BYTES                    = 4
    DESCRIPTION              = "
      Acquisition timeout, defines backup acquisition termination, specifies
      maximum acquisition duration"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "TEST_FRAME_TIME"
    COLUMN_NUMBER            = 38
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 96
    BYTES                    = 8
    DESCRIPTION              = "Duration of one test frame"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG1_SPEC_LL"
    COLUMN_NUMBER            = 39
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 104
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 1; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG1_SPEC_UL"
    COLUMN_NUMBER            = 40
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 106
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 1; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG1_SPATIAL_UL"
    COLUMN_NUMBER            = 41
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 108
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 1; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG1_SPATIAL_LL"
    COLUMN_NUMBER            = 42
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 109
```

```
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 1; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG2_SPEC_LL"
    COLUMN_NUMBER            = 43
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 110
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 2; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG2_SPEC_UL"
    COLUMN_NUMBER            = 44
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 112
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 2; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG2_SPATIAL_UL"
    COLUMN_NUMBER            = 45
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 114
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 2; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG2_SPATIAL_LL"
    COLUMN_NUMBER            = 46
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 115
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 2; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG3_SPEC_LL"
    COLUMN_NUMBER            = 47
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 116
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 3; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
```

```
OBJECT                      = COLUMN
  NAME                      = "HSEG3_SPEC_UL"
  COLUMN_NUMBER             = 48
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 118
  BYTES                     = 2
  DESCRIPTION               = "
    Hot segment 3; each hot segment specification masks out detector events
    in a rectangular area"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HSEG3_SPATIAL_UL"
  COLUMN_NUMBER             = 49
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 120
  BYTES                     = 1
  DESCRIPTION               = "
    Hot segment 3; each hot segment specification masks out detector events
    in a rectangular area"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HSEG3_SPATIAL_LL"
  COLUMN_NUMBER             = 50
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 121
  BYTES                     = 1
  DESCRIPTION               = "
    Hot segment 3; each hot segment specification masks out detector events
    in a rectangular area"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HSEG4_SPEC_LL"
  COLUMN_NUMBER             = 51
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 122
  BYTES                     = 2
  DESCRIPTION               = "
    Hot segment 4; each hot segment specification masks out detector events
    in a rectangular area"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HSEG4_SPEC_UL"
  COLUMN_NUMBER             = 52
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 124
  BYTES                     = 2
  DESCRIPTION               = "
    Hot segment 4; each hot segment specification masks out detector events
    in a rectangular area"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
  NAME                      = "HSEG4_SPATIAL_UL"
  COLUMN_NUMBER             = 53
  DATA_TYPE                 = LSB_UNSIGNED_INTEGER
  START_BYTE                = 126
```

```
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 4; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG4_SPATIAL_LL"
    COLUMN_NUMBER            = 54
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 127
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 4; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG5_SPEC_LL"
    COLUMN_NUMBER            = 55
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 128
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 5; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG5_SPEC_UL"
    COLUMN_NUMBER            = 56
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 130
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 5; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG5_SPATIAL_UL"
    COLUMN_NUMBER            = 57
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 132
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 5; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG5_SPATIAL_LL"
    COLUMN_NUMBER            = 58
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 133
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 5; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
```

```
  OBJECT                      = COLUMN
    NAME                      = "HSEG6_SPEC_LL"
    COLUMN_NUMBER             = 59
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 134
    BYTES                     = 2
    DESCRIPTION               = "
      Hot segment 6; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HSEG6_SPEC_UL"
    COLUMN_NUMBER             = 60
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 136
    BYTES                     = 2
    DESCRIPTION               = "
      Hot segment 6; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HSEG6_SPATIAL_UL"
    COLUMN_NUMBER             = 61
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 138
    BYTES                     = 1
    DESCRIPTION               = "
      Hot segment 6; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HSEG6_SPATIAL_LL"
    COLUMN_NUMBER             = 62
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 139
    BYTES                     = 1
    DESCRIPTION               = "
      Hot segment 6; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HSEG7_SPEC_LL"
    COLUMN_NUMBER             = 63
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 140
    BYTES                     = 2
    DESCRIPTION               = "
      Hot segment 7; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                  = COLUMN
  OBJECT                      = COLUMN
    NAME                      = "HSEG7_SPEC_UL"
    COLUMN_NUMBER             = 64
    DATA_TYPE                 = LSB_UNSIGNED_INTEGER
    START_BYTE                = 142
```

```
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 7; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG7_SPATIAL_UL"
    COLUMN_NUMBER            = 65
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 144
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 7; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG7_SPATIAL_LL"
    COLUMN_NUMBER            = 66
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 145
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 7; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG8_SPEC_LL"
    COLUMN_NUMBER            = 67
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 146
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 8; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG8_SPEC_UL"
    COLUMN_NUMBER            = 68
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 148
    BYTES                    = 2
    DESCRIPTION              = "
      Hot segment 8; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HSEG8_SPATIAL_UL"
    COLUMN_NUMBER            = 69
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 150
    BYTES                    = 1
    DESCRIPTION              = "
      Hot segment 8; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                 = COLUMN
```

```
  OBJECT                       = COLUMN
    NAME                       = "HSEG8_SPATIAL_LL"
    COLUMN_NUMBER              = 70
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 151
    BYTES                      = 1
    DESCRIPTION                = "
      Hot segment 8; each hot segment specification masks out detector events
      in a rectangular area"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "MAX_SPIN_TIME"
    COLUMN_NUMBER              = 71
    DATA_TYPE                  = LSB_INTEGER
    START_BYTE                 = 152
    BYTES                      = 2
    DESCRIPTION                = "
      Maximum spin duration in seconds (2 = pure spin no timeout)"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "NADIR_OFFSET"
    COLUMN_NUMBER              = 72
    DATA_TYPE                  = IEEE_REAL
    START_BYTE                 = 154
    BYTES                      = 8
    DESCRIPTION                = "
      Mirror start offset angle: 0-2pi (0 disables Nadir message processing)"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "SMIB_MAX_POS"
    COLUMN_NUMBER              = 73
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 162
    BYTES                      = 1
    DESCRIPTION                = "Maximum scan mirror position in steps"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "SCAN_MODE_SELECT"
    COLUMN_NUMBER              = 74
    DATA_TYPE                  = CHARACTER
    START_BYTE                 = 163
    BYTES                      = 5
    DESCRIPTION                = ""
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "ACTIVE_DUTY_CYCLE"
    COLUMN_NUMBER              = 75
    DATA_TYPE                  = LSB_UNSIGNED_INTEGER
    START_BYTE                 = 168
    BYTES                      = 1
    DESCRIPTION                = "Active Hold duty cycle (0-100%)"
  END_OBJECT                   = COLUMN
  OBJECT                       = COLUMN
    NAME                       = "PHASE_0_DUTY"
    COLUMN_NUMBER              = 76
```

```
    DATA_TYPE               = CHARACTER
    START_BYTE              = 169
    BYTES                   = 4
    DESCRIPTION             = ""
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "PHASE_1_DUTY"
    COLUMN_NUMBER           = 77
    DATA_TYPE               = CHARACTER
    START_BYTE              = 173
    BYTES                   = 4
    DESCRIPTION             = ""
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "PHASE_2_DUTY"
    COLUMN_NUMBER           = 78
    DATA_TYPE               = CHARACTER
    START_BYTE              = 177
    BYTES                   = 4
    DESCRIPTION             = ""
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "PHASE_3_DUTY"
    COLUMN_NUMBER           = 79
    DATA_TYPE               = CHARACTER
    START_BYTE              = 181
    BYTES                   = 4
    DESCRIPTION             = ""
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "INITIAL_QUAL_FACT"
    COLUMN_NUMBER           = 80
    DATA_TYPE               = LSB_UNSIGNED_INTEGER
    START_BYTE              = 185
    BYTES                   = 1
    DESCRIPTION             = "Initial quality number"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "QUAL_DURATION"
    COLUMN_NUMBER           = 81
    DATA_TYPE               = IEEE_REAL
    START_BYTE              = 186
    BYTES                   = 8
    DESCRIPTION             = "Quality duration weight factor"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "QUAL_OPT_CR"
    COLUMN_NUMBER           = 82
    DATA_TYPE               = LSB_INTEGER
    START_BYTE              = 194
    BYTES                   = 4
    DESCRIPTION             = "Quality optimal countrate"
  END_OBJECT                = COLUMN
  OBJECT                    = COLUMN
    NAME                    = "QUAL_DEVIATION"
```

```
    COLUMN_NUMBER            = 83
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 198
    BYTES                    = 8
    DESCRIPTION              = "Quality deviation weight factor"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_CNT_RATE"
    COLUMN_NUMBER            = 84
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 206
    BYTES                    = 8
    DESCRIPTION              = "
      Maximum Countrate that triggers a countrate safety"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "CR_FAIL_BRIGHT"
    COLUMN_NUMBER            = 85
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 214
    BYTES                    = 1
    DESCRIPTION              = "Bright Light max fail count"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HIGH_CNT_RATE"
    COLUMN_NUMBER            = 86
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 215
    BYTES                    = 8
    DESCRIPTION              = "High Countrate"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MAX_CYCLES"
    COLUMN_NUMBER            = 87
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 223
    BYTES                    = 1
    DESCRIPTION              = "Maximum HV backoff cycles per acquisition"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_LOW_SAFETY"
    COLUMN_NUMBER            = 88
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 224
    BYTES                    = 8
    DESCRIPTION              = "
      HV lowest voltage setting above which the safety checking can be
      activated."
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "DAC_ADC_FACTOR"
    COLUMN_NUMBER            = 89
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 232
    BYTES                    = 8
```

```
    DESCRIPTION              = "
      Converstion from to DAC setting to ADC read back used in HVPS checking"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MAX_HV_SET"
    COLUMN_NUMBER            = 90
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 240
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed HV setpoint voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MCP_TOL"
    COLUMN_NUMBER            = 91
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 248
    BYTES                    = 8
    DESCRIPTION              = "MCP voltage tolerance"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_FAIL_MCP"
    COLUMN_NUMBER            = 92
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 256
    BYTES                    = 1
    DESCRIPTION              = "MCP voltage max fail count"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MAX_STRIP_I"
    COLUMN_NUMBER            = 93
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 257
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed strip current"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_FAIL_STRIP"
    COLUMN_NUMBER            = 94
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 265
    BYTES                    = 1
    DESCRIPTION              = "Strip current max fail count"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MIN_ANODE_V"
    COLUMN_NUMBER            = 95
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 266
    BYTES                    = 8
    DESCRIPTION              = "Minimum allowed anode voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_MAX_ANODE_V"
    COLUMN_NUMBER            = 96
    DATA_TYPE                = IEEE_REAL
```

```
    START_BYTE               = 274
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed anode voltage"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "HV_FAIL_ANODE"
    COLUMN_NUMBER            = 97
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 282
    BYTES                    = 1
    DESCRIPTION              = "Anode voltage max fail count"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_SCANMIR1TEMP"
    COLUMN_NUMBER            = 98
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 283
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_SCANMIR2TEMP"
    COLUMN_NUMBER            = 99
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 291
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_OAP_MIR1TEMP"
    COLUMN_NUMBER            = 100
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 299
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_OAP_MIR2TEMP"
    COLUMN_NUMBER            = 101
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 307
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_GRATING1TEMP"
    COLUMN_NUMBER            = 102
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 315
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_GRATING2TEMP"
    COLUMN_NUMBER            = 103
```

```
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 323
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_CDH_TEMP"
    COLUMN_NUMBER            = 104
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 331
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_HVPS_TEMP"
    COLUMN_NUMBER            = 105
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 339
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_LVPS_TEMP"
    COLUMN_NUMBER            = 106
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 347
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_DET_B_TEMP"
    COLUMN_NUMBER            = 107
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 355
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_DET_E_TEMP"
    COLUMN_NUMBER            = 108
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 363
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_SMIB_TEMP"
    COLUMN_NUMBER            = 109
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 371
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "MAX_CHASSIS_TEMP"
```

```
    COLUMN_NUMBER            = 110
    DATA_TYPE                = IEEE_REAL
    START_BYTE               = 379
    BYTES                    = 8
    DESCRIPTION              = "Maximum allowed temperature"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SAFETY_MASK"
    COLUMN_NUMBER            = 111
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 387
    BYTES                    = 1
    DESCRIPTION              = "
      Initial startup value for the safety mask and override"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "SAFETY_TIMEOUT"
    COLUMN_NUMBER            = 112
    DATA_TYPE                = LSB_INTEGER
    START_BYTE               = 388
    BYTES                    = 2
    DESCRIPTION              = "Safety timeout"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "DEBUG_TEST"
    COLUMN_NUMBER            = 113
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 390
    BYTES                    = 1
    DESCRIPTION              = "Debug/Test setting"
  END_OBJECT                 = COLUMN
  OBJECT                     = COLUMN
    NAME                     = "WRITE_CYCLES"
    COLUMN_NUMBER            = 114
    DATA_TYPE                = LSB_UNSIGNED_INTEGER
    START_BYTE               = 391
    BYTES                    = 2
    DESCRIPTION              = "
      Accumulated count of changes made to the parameter memory in EEPROM"
  END_OBJECT                 = COLUMN
END_OBJECT                   = PARAMETER_LIST_TABLE

END
```