

**2013 Cassini/CAPS
Cassini Plasma Spectrometer**

**CAPS STANDARD DATA PRODUCTS
AND ARCHIVE VOLUME
SOFTWARE INTERFACE SPECIFICATION**

**(CAPS Archive Volumes SIS)
SIS ID: IO-AR-017**

Version 3.0
rev. June 24, 2013

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1. Preface

This document describes the contents and types of volumes belonging to all of the CAPS data sets.

1.1. Distribution List

<i>Table 1: Distribution List</i>	
Name	Email
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1.2. Document Change Log

<i>Table 2: Document Change History</i>		
Change	Date	Affected Portions
Update version 1.17	05/2010	All
Updates include Missing Constant values and a change to TOF format.	05/2010	All
Included Higher Order Data Products. Updated sections for missing constants, etc	3/2013	

1.3. TBD Items

Items that are currently still to be specified:

<i>Table 3: TBD Items</i>		
Item	Section	Page(s)
Resubmission of higher order files	Section 2.1	7
Description of calibrated data set	Section 2.1	7
Size & type of calibrated data	Table 5 in Section 2.1	7/8
Description of calibrated data	Section 3.1	10
Types & names of calibrated data	Table 6 in Section 3.3	12/13
Directory structure	Section 4.5	17
Detached FMT or not?	Section 4.5.1	17/18
File naming convention	Section 4.5.2	18

1.4. Acronyms and Abbreviations

<i>Table 4: Acronyms and Abbreviations</i>	
Acronym	Definition
ASCII	American Standard Code for Information Interchange
CAPS	CASSINI Plasma Spectrometer
CD-R	Compact Disc - Recordable Media
CD-ROM	Compact Disc - Read-Only Memory
DVD	Digital Versatile Disc
ELS	Electron Spectrometer
ELS 3DMOMT	Electron Moment
EVT	Ion Mass Spectrometer Event Mode Data Product
GB	Gigabyte(s)
IBS	Ion Beam Spectrometer
ION MOMT	Ion Moment – made from Singles Data (SNG)
IMS	Ion Mass Spectrometer
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
LOG	Ion Mass Spectrometer's Logical Data Product
MB	Megabyte(s)

Table 4: Acronyms and Abbreviations

Acronym	Definition
NSSDC	National Space Science Data Center
PDB	Project Database
PDS	Planetary Data System
PNG	Portable Network Graphic. A bit-mapped graphics format
PPI	Planetary Data System, Planetary Plasma Interactions Node
SCPOT	Electron Spectrometer Spacecraft Potential
SDVT	Science Data Validation Team
SNG	Ion Mass Spectrometer Singles Data Product
SIS	Software Interface Specification
TBD	To Be Determined
TOF – LEF	Time of Flight – Linear Electric Field
TOF – ST	Time of Flight – Straight Through

1.5. 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 - An Archive Volume is a single physical media (CDROM, DVD, 9-track tape, etc.) used to permanently store files within the PDS archive. Archive Volumes may only be created on media approved by the PDS as meeting archive quality standards.

Archive Volume Set – A collection of one or more Archive Volumes used to store a single Data Set or collection of related Data Sets.

Catalog Information – High-level 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 spectral table, or a time series table.

Data Set – A Data Set is a collection of Data Products from a single instrument that have a common data processing level, together with supporting documentation and ancillary files.

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 non-standard way are sometimes called *special Data Products*.

2. Introduction

2.1. Content Overview

The Cassini Plasma Spectrometer (CAPS) aboard the Cassini spacecraft is an instrument comprised of three different sensors: the Electron Spectrometer (ELS), the Ion Mass Spectrometer (IMS), and the Ion Beam Spectrometer (IBS). The primary focus of CAPS's mission is Saturn science, but data was taken at Earth and Jupiter as well as interplanetary space.

The CAPS instrument is a complex instrument that produces large amounts of data. We archive un-calibrated, calibrated, and higher order data files to the PDS.

CAPS is archiving three data sets: un-calibrated, calibrated, and higher-order. Each data set is archived on a separate volume. The un-calibrated data set is archived with some very basic calibration procedures. These procedures may be updated, but the higher order data volume and files contain the very latest in calibration information. There are several different types of data products in each data set. The ELS and IBS sensors each produce their own data product. The IMS sensor generates several different data products including Event Mode (EVN), two Time of Flight data products that are archived in the same file (TOF), a singles data product (SNG), a logicals data product (LOG), and an ion data product (ION). In addition, we have an actuator data product (ACT) and an ancillary data product (ANC). The calibrated data set is currently being defined, but will include calibrated files for the electron spectrometer and the ion neutral mass spectrometer. Full details of the contents of volume and individual descriptions of the file types will be included TBD (soon). Higher order data are derived quantities from the electron spectrometer and the IMS sensor singles and TOF data products. These products are electron and ion moments and spacecraft potential.

Most CAPS data products are collected on 32-second cycles (called A-cycles). IMS Time-of-Flight (TOF) data products are a collection of A-cycles (called B-cycles). Each B-cycle represents one-full time of flight – energy spectrum. The number of A-cycles per B-cycle varies depending upon the data rate of the instrument, due to data volume limitations. In version 4.0 (and later) of CAPS flight software, the IBS sensor data are collected on a fixed 8 A-cycle collection period (called a C-cycle). One goal with our archive format is for the differences in data rate and flight software version to be transparent to the end user.

The data products mentioned are briefly described in Table 5 below, including the data set in which they are included and the maximum data volume of each different data type (per day). Each sensor's data is written to a separate file, and the format of each file will be discussed in detail in section 5.2, and Table 20 through Table 28.

Sensor	Data Set Type	Maximum (MB / Day)	Sensor Total (MB / Day)
ELS	Un-calibrated	103.821	106.321
	Calibrated	TBD	

<i>Table 5: Spacecraft Science Data Products in CAPS Data Sets</i>			
Sensor	Data Set Type	Maximum (MB / Day)	Sensor Total (MB / Day)
	Higher Order (3DMOMT)	0.4	
	Higher Order (SCPOT)	2.1	
IBS	Un-calibrated	315.170	315.170
IMS TOF	Un-calibrated	1.32544	1.32544
	Calibrated	TBD	
IMS ION	Un-calibrated	381.541	381.541
	Calibrated	TBD	
IMS SNG	Un-calibrated	51.9104	51.9104
	Calibrated	TBD	
ACT	Un-calibrated	0.360489	0.360489
ANC	Un-calibrated	0.37594	0.37594
IMS LOG	Un-calibrated	46.7194	46.7194
EVN	Un-calibrated	12.198	12.198
IMS SNG & IMS TOF	Higher Order (ION_MOMT)	0.2	0.2

2.2. Scope

This specification applies to all archive volumes containing CAPS data products for the duration of its mission.

2.3. Applicable Documents

Planetary Science Data Dictionary Document, August 28, 2002, Planetary Data System, JPL D-7116, Rev. E.

Planetary Data System Data Preparation Workbook, February 1995, JPL D-7669, Part 1, Version 3.1.

Planetary Data System Standards Reference, August 1, 2003, JPL D-7669, Part 2, Version 3.6.

Cassini/Huygens Program Archive Plan for Science Data, PD 699-068, JPL D-159576

Young, David T., et al., *Cassini Plasma Spectrometer Investigation, Space Science Reviews*, **114**, 1-112 (2004).

2.4. Audience

This specification is intended for researchers and analysts who wish to understand the format and content of the CAPS PDS data product archive collection. Typically, these individuals would be software engineers, data analysts, or planetary scientists.

3. Archive Volume Generation

3.1. Data Production and Transfer Methods

The CAPS standard product archive collections are produced by the CAPS instrument team in cooperation with the PDS Planetary Plasma Interactions (PPI) Node at the University of California, Los Angeles (UCLA). The CAPS team is funded by NASA through the Cassini Project office and the PPI activities are funded by the NASA Planetary Data System.

The CAPS team has produced the individual data files and the associated detached PDS labels for each of the standard data products defined in section 2.1 above. For the un-calibrated data, there are up to 4 files per product, per day. The files are split into 6 hour periods, with full B-cycles appearing in the file in which the B-cycle starts. This implies that a few A-cycles at the start of each file may be in the previous 6-hour block file. However, this implies multi-sensor analysis by assuring that all the data obtained at a given time is in the file with the same time stamp. The A and B cycle numbers are the same for all data products, i.e. if an A-cycle of ELS data is missing, the A-cycle numbers in the ELS file will skip the appropriate number. Additionally, if there are no A-cycles for a given time period then there is **not** a gap in the A-cycle number count.

Un-calibrated data files are flat, binary data files, with a fixed series of values repeated as many times as necessary. The files contain data taken at all rates during the period. If data are collapsed in elevation, counts are given for the lowest elevation of the collapsed sample and all other elevations contain fill values. The fill values as specified in the label files are different for the data products due to differences in maximum values. If the data are collapsed in energy or azimuth, this are indicated by the first and last energy step and azimuth values. This implies that an A-cycle of data contains a variable number of rows, depending on the data rate. The format of the data can be found in section 5.2, and Table 20 through Table 28.

Data are ftp'd to an agreed to location within the PDS ftp system. PPI assembles the data products into archive volumes so that each volume contains the interval of data from each data set in multiples of 5 day periods (or only 1 day if 5 days will not fit). The CAPS team delivers data to PDS/PPI on a quarterly basis.

Higher Order data consists of electron and ion moments, each in separate files. Each file has a corresponding detached label, which contains the format of the data. Additionally, a separate file is submitted for spacecraft potential that has been generated from the Cassini CAPS ELS sensor. Data is delivered in separate folders within the higher order directory. Higher Order data files are fixed length ASCII files. Electron moments and spacecraft potential are supplied at a 32 second cadence, which is the cadence of an instrument cycle (called an A-cycle). Ion moment data is supplied on a B-cycle cadence (either 256, 512, or 1024 seconds – predefined multiples of a single instrument cycle). The format of the higher order data can be found in section 5.3, and Table 29 through Table 31.

Calibrated data will consist of electron spectrometer and ion mass spectrometer files. Additional information regarding the volume and its contents will be supplied within TBD.

3.2. Archive Volume Creation and Validation Methods

The archive validation procedure described in this section applies to volumes generated during all phases of the mission. PPI collects the data files and labels provided by the CAPS team onto archive volumes. Each archive volume contains all CAPS data available (either un-calibrated or higher order) for the time interval covered by the archive volume. Once all of the data files, labels, and ancillary data files are organized onto an archive volume, PPI adds all of the PDS required files (AAREADME, INDEX, ERRATA, etc.) and produces the physical media, which are then validated.

Data is validated using the PDS peer review process. The peer review panel consists of members of the instrument team, the PPI and Central Nodes of the PDS, and at least two outside scientists actively working in the field of magnetospheric physics, especially those working with low energy ion and electron measurements. The PDS personnel are responsible for validating that the archive volume(s) are fully compliant with PDS standards. The instrument team and outside science reviewers are responsible for verifying the content of the data set, the completeness of the documentation, and the usability of the data in its archive format. Because of the large volume of the CAPS data, the peer review panel seeks to validate the process by which the data products are produced rather than the data products themselves. This is accomplished in two phases. First, a specimen volume is created and manually reviewed for proper structure and completeness of documentation along with the current reference volume. Once the specimen volume is validated, PPI develops software to validate that subsequent data volumes comply with PDS standards. After the volume creation software is complete, a volume created by this process is reviewed again, this time considering all facets of volume usefulness. Any deficiencies in the archive volume are 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. Peer review is performed on both CAPS archive volumes.

All of the archive files contained on these volumes are verified through the use of the data by the instrument team. Archive un-calibrated data products are used on a daily basis to generate browse spectrograms. In addition, selected periods in all modes are examined in depth by the science team as part of science and research activities. If an error is found, the response will depend on the source of the error. If the error is in the automation software that produced the data product, the error will be fixed and the data product will be reproduced. If there is a correctable error in a data file, the file will be replaced and a new archive volume will be created. If an error in a data file is uncorrectable (i.e., an error in the downlink data file) the error will be described in the cumulative errata file that is included on each volume in the volume set.

3.3. Labeling and Identification

Each CAPS standard data product archive volume bears a unique volume identifier (volume_id) of the form COCAPS_1nnn for CAPS un-calibrated data with calibration information, COCAPS_2kkk for CAPS calibrated data, and COCAPS_5mmm for CAPS higher order data

where CO identifies the spacecraft (Cassini Orbiter), CAPS identifies the instrument, and kkkk, nnn, and mmm are sequential numbers assigned to each volume. The volume_id is used as the label for the physical medium on which the data are stored.

CAPS PDS data set names will conform to the format: CASSINI ORBITER EARTH/JUP/SAT/SW CAPS UNCALIBRATED V<major version>.<minor version> for uncalibrated data. For calibrated data, the data set name will be CASSINI ORBITER EARTH/JUP/SAT/SW CAPS CALIBRATED V<major version>.<minor version>. For higher order data the data set name for ion moments will be CASSINI ORBITER SAT/SW CAPS DERIVED ION MOMENTS V<major version>.<minor version>, for electron moments it will be CASSINI ORBITER SAT/SW CAPS DERIVED ELECTRON MOMENTS V<major version>.<minor version>, and for spacecraft potential it will be CASSINI ORBITER SAT/SW CAPS DERIVED SC POTENTIAL V<major version>.<minor version>.

PDS data set identifiers (dsid) are abbreviated versions of the data set names formed according to the PDS formation rule for the DATA_SET_ID keyword (see Section 6 of the PDS Standards Reference). For example, the dsids for the 1.0 version of the CAPS data sets are CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.0, CO-E/J/S/SW-CAPS-3-CALIBRATED-V1.0, CO-S/SW-CAPS-5-DDR-ION-MOMENTS-V1.0, CO-S/SW-CAPS-5-DDR-ELE-MOMENTS-V1.0, and CO-S/SW-CAPS-5-DDR-SC-POTENTIAL-V1.0.

Table 6: Relationship Between Data Sets, Standard Data Product Types, and Archive Volumes

Data Set ID	Product Type	Product Volume Files
CO-E/J/S/SW-2-UNCALIBRATED-V1.0	ELS	ELS_199923000_U1.DAT
	IBS	IBS_199923000_U1.DAT
	IMS Ions (ION)	ION_199923000_U1.DAT
	IMS Singles (SNG)	SNG_199923000_U1.DAT
	IMS Logicals (LOG)	LOG_199923000_U1.DAT
	IMS TOF (TOF)	TOF_199923000_U1.DAT
	Actuator (ACT)	ACT_199923000_1.DAT
	Ancillary (ANC)	ANC_199923000_U1.DAT
	IMS Event Mode (EVN)	EVN_199923000_U1.DAT
CO-E/J/S/SW-3-CALIBRATED-V1.0	ELS	TBD
	IMS TOF	TBD
	IMS Singles	TBD
	TBD	TBD

CO-S/SW-CAPS-5- DDR-ELE-MOMENTS- V1.0	ELS Electron Moments	ELS_3DMOMT_YYYYDOY_00.TAB
CO-S/SW-CAPS-5- DDR-SC-POTENTIAL- V1.0	ELS Spacecraft Potential	ELS_SCPOT_YYYYDOY_00.TAB
CO-S/SW-CAPS-5- DDR-ION-MOMENTS- V1.0	Singles Ion Moments	ION_MOMT_YYYYDOY_01.TAB

4. Archive Volume Contents

This section describes the contents of the CAPS 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 Appendix A. All the ancillary files described herein appear on each CAPS archive volume, except where noted. Based on the type of archive volume, the DATA contents will be contain either un-calibrated data, calibrated data, or higher order data. All other directory contents will remain the same, though the higher order data volume will have the most up-to-date calibration documentation and will not contain the ancillary data.

4.1. Root Directory Contents

The following files are contained in the root directory (for either volume), and are produced by the PPI Node at UCLA. With the exception of the hypertext file and its label, all of these files are required by the PDS Archive Volume organization standards.

<i>Table 7: Root Directory Contents</i>		
File Name	File Contents	Provided By
AAREADME.TXT	This file completely describes the Volume organization and contents (PDS label attached).	PPI
AAREADME.HTM	Hypertext version of AAREADME.TXT (top level of HTML interface to the Archive Volume).	PPI
AAREADME.LBL	A PDS detached label that describes AAREADME.HTM.	PPI
ERRATA.TXT	A cumulative listing of comments and updates concerning all CAPS Standard Data Products on all CAPS Volumes in the Volume set published to date.	PPI
VOLDESC.CAT	A description of the contents of this Volume in a PDS format readable by both humans and computers.	PPI

4.2. INDEX Directory Contents

The following files are contained in the INDEX directory and are produced by the PDS PPI Node. 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) file that lists all data products in the CAPS 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 may not be reproduced on each data volume if its size grows so large as to affect where volume boundaries lie. An online and web accessible cumulative index file will be maintained at the PPI Node while archive volumes are being produced.

Table 8: Index Directory Contents

File Name	File Contents	Provided By
INDXINFO.TXT	A description of the contents of this directory	PPI
INDEX.TAB	A table listing all CAPS Data Products on this Volume	PPI
INDEX.LBL	A PDS detached label that describes INDEX.TAB	PPI

4.3. 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. These documents are not necessarily appropriate for inclusion in the PDS catalog. 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. HTML and PostScript are acceptable as ASCII formats in addition to plain text.

There is a separate directory for each document that is to be archived. Each of the document directories includes the document in hypertext (ASCII) and the document in another format (i.e. .DOC or .PDF). There is also a single label file that describes all the different formats of the included documents.

The following files are contained in the DOCUMENT directory and are produced or collected by the PPI Node.

Table 9: Document Directory Contents

File Name	File Contents	Provided By
DOCINFO.TXT	A description of the contents of this directory and all subdirectories.	PPI
CAPS_SIS	Directory containing the CAPS archive SIS	CAPS
CAPS_CALIB	Directory containing information regarding calibration	CAPS
Other Documents	Additional documents describing data processing, etc.	CAPS, PPI
Other Document labels	Detached PDS labels for any additional documents	CAPS, PPI

The following files are contained in the DOCUMENT/CAPS_SIS directory.

Table 10: Document/CAPS_SIS Directory Contents

File Name	File Contents	Provided By
CAPS_ARCHIVE_SIS.HTM	The Archive Volume SIS (this document) as hypertext	CAPS, PPI
CAPS_ARCHIVE_SIS.DOC	The Archive Volume SIS (this document) in Microsoft Word format	CAPS
CAPS_ARCHIVE_SIS.ASC	The Archive Volume SIS (this document) in ASCII format	CAPS, PPI
CAPS_ARCHIVE_SIS.LBL	A PDS detached label that describes VOLSIS.ASC, VOLSIS.HTM and VOLSIS.DOC.	CAPS, PPI

The following files are contained in the DOCUMENT/CAPS_CALIB directory.

Table 11: Document/CAPS_CALIB Directory Contents

File Name	File Contents	Provided By
CAPS_BASIC_CALIB_PROCEDURES.HTM	The CAPS Basic Calibration Procedures document as hypertext	CAPS, PPI
CAPS_BASIC_CALIB_PROCEDURES.DOC	The CAPS Basic Calibration Procedures document in Microsoft Word format	CAPS
CAPS_BASIC_CALIB_PROCEDURES.ASC	The CAPS Basic Calibration Procedures document in ASCII format	CAPS, PPI
CAPS_BASIC_CALIB_PROCEDURES.LBL	A PDS detached label that describes VOLSIS.ASC, VOLSIS.HTM and VOLSIS.DOC.	CAPS, PPI

4.4. CATALOG Directory Contents

The completed PDS templates in the CATALOG directory provide a top-level understanding of the Cassini/CAPS mission and its data products. The information necessary to create the files is provided by the CAPS team and formatted into standard template formats by the PPI Node. The files in this directory are coordinated with PDS data engineers at both the PPI and the PDS Central Nodes.

Table 12: Catalog Directory Contents

File Name	File Contents	Provided By
CATINFO.TXT	A description of the contents of this directory	PPI
CO_CAPS_UNCALIBRATED_DS.CAT	PDS Data Set catalog description of all the CAPS un-calibrated level 2 data files	CAPS
CO_CAPS_CALIBRATED_DS.CAT	PDS Data Set catalog description of all the CAPS calibrated level 3 data files	CAPS
CO_CAPS_DERIVED_DS.CAT	PDS Data Set catalog description of all the CAPS higher order level 5 data files	CAPS
INSTHOST.CAT	PDS instrument host (spacecraft) catalog description of the Cassini spacecraft	Cassini Project
CO_CAPS_INST.CAT	PDS instrument catalog description of the CAPS instrument	CAPS
MISSION.CAT	PDS mission catalog description of the Cassini mission	Cassini Project
CO_CAPS_PERS.CAT	PDS personnel catalog description of CAPS Team members and other persons involved with generation of CAPS Data Products	CAPS
CO_CAPS_REF.CAT	CAPS-related references mentioned in other *.CAT files	CAPS
PROJREF.CAT	Mission-related references mentioned in other *.CAT files	Cassini Project

4.5. DATA (Standard Products) Directory Contents and Naming Conventions

The DATA directory contains the following sub-directories, based upon the archive volume: UNCALIBRATED, CALIBRATED, or HIGHERORDER. For un-calibrated data products, there are sub-directories of the form YYYYDDD. Each YYYYDDD subdirectory contains 1 day of data, for all data types. For higher order data products, the HIGHERORDER directory contains three (3) subdirectories, one for each type of data: SCPOT, ELEMOMT, and IONMOMT. In each of these subdirectories, data are broken down into YYYY directories. For calibrated data products, the directory structure is still TBD.

4.5.1. Required Files

The DATA directory contains a file named DATAINFO.TXT that is an ASCII text description of the directory and subdirectory contents. Every file in the DATA path of an Archive Volume must be described by a PDS label, hence all files in the DATA directory have external (detached) labels. Detached PDS label files have the same root name as the file they describe but have the suffix ".LBL". In the UNCALIBRATED/YYYYDDD subdirectories, an external

format file (.FMT) is included for each data type. In the HIGHERORDER/YYYY subdirectories, the format information is contained within the detached label file itself. In the CALIBRATED subdirectories, it has not yet been decided if there will be an attached or detached labels.

4.5.2. File Naming Conventions

Un-calibrated data products have names of the following form:

<sensor>_YYYYDDDHH_<DataType><V>.DAT

where

YYYYDDDHH is the start year, day of year, and hour of the data

sensor is the 3 letter code chosen from the following list:

ELS, IBS, ION, SNG, TOF, LOG, ACT, EVN, and ANC

DataType is a one (1) letter descriptor for the type of data, where C = calibrated and U = un-calibrated.

V is the data version number of the data product.

HH has valid values of 00, 06, 12, and 18, as data files are 6 hours in duration.

There is one exception to the un-calibrated data naming convention listed above. Given that the actuator (ACT) data product is both calibrated and un-calibrated, the <DataType> identifier is dropped. Actuator files conform to the following naming convention: ACT_YYYYDDDDHHH_<V>.DAT.

Not every combination of sensor and DataType is a valid filename. Valid combinations can be determined by using the information contained in Table 5.

When data is updated within a specific type of format the data version number is incremented. When more than nine versions are required, the characters a-z are used to represent further versions.

Higher order data files have the following form:

<ProductType>_YYYYDOY_<vv>.TAB

where

YYYYDOY is the start year and day of year of the data

ProductType is ELS_3DMOMT, ELS_SCPOT, or ION_MOMT, and

vv is the version number.

The naming convention for calibrated data products is still TBD.

4.5.3. DATA/UNCALIBRATED/YYYYDDD Directory Contents

Un-calibrated data files starting on YYYYDDD from all sensors are stored in the DATA/UNCALIBRATED/YYYYDDD directory. Each directory will contain one day of data. Each sensor can have up to 4 files for the day and each sensor file can contain up to 6 hours of data. The file naming convention is described in Section 4.5.2. Every data file in the directory has a detached PDS label with the same root name as the file they describe but have the suffix “.LBL”. In addition, there is a brief ASCII text file (INFO.TXT) that describes the DATA/UNCALIBRATED/YYYYDDD directory contents, which are listed in Table 13. In addition, each YYYYDDD directory has its own set of format files. NOTE: Files are only be available if data from of the appropriate type (during the 6 hour block in question) is available. Also, we do not take very much event mode data (EVN), so these files are not available very frequently.

Table 13: YYYYDDD UNCALIBRATED Data Directory Contents

File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
ELS*.DAT	ELS sensor data files.	CAPS
ELS*.LBL	PDS label for ELS sensor files of same base name.	CAPS
IBS*.DAT	IBS sensor data files.	CAPS
IBS*.LBL	PDS label for IBS sensor files of same base name.	CAPS
SNG*.DAT	IMS Singles (SNG) sensor data files.	CAPS
SNG*.LBL	PDS label for SNG files of same base name.	CAPS
LOG*.DAT	IMS Logicals (LOG) data files.	CAPS
LOG*.LBL	PDS label for LOG files of same base name.	CAPS
ION*.DAT	IMS Ions (ION) data files.	CAPS
ION*.LBL	PDS label for ION files of same base name.	CAPS
TOF*.DAT	IMS Time of Flight (TOF) data files.	CAPS
TOF*.LBL	PDS label for TOF files of same base name.	CAPS
ACT*.DAT	Actuator (ACT) data files.	CAPS
ACT*.LBL	PDS label for ACT files of same base name.	CAPS
ANC*.DAT	Ancillary (ANC) data files.	CAPS
ANC*.LBL	PDS label for ANC files of same base name.	CAPS
EVN*.DAT	Event Mode (EVN) data files.	CAPS
EVN*.LBL	PDS label for EVN files of same base name.	CAPS

ELS_U3.FMT	PDS format file containing the data file structure for the ELS file format.	CAPS
IBS_U3.FMT	PDS format file containing the data file structure for the IBS file format.	CAPS
SNG_U3.FMT	PDS format file containing the data file structure for the SNG file format.	CAPS
LOG_U3.FMT	PDS format file containing the data file structure for the LOG file format.	CAPS
ION_U3.FMT	PDS format file containing the data file structure for the ION file format.	CAPS
TOF_U3.FMT	PDS format file containing the data file structure for the TOF file format.	CAPS
ACT_3.FMT	PDS format file containing the data file structure for the ACT file format.	CAPS
ANC_U3.FMT	PDS format file containing the data file structure for the ANC file format.	CAPS
EVN_U3.FMT	PDS format file containing the data file structure for the EVN file format.	CAPS

4.5.4. DATA/HIGHERORDER/SCPOT/YYYY Directory Contents

Higher order data files for spacecraft potential starting within the year, YYYY, are stored in the DATA/HIGHERORDER/SCPOT/YYYY directory. Each directory contains one year of data. Each type of higher order file can have only 1 file for a given day and can contain up to 24 hours of data. The file naming convention is described in Section 4.5.2. Every data file in the directory has a detached PDS label with the same root name as the file they describe but have the suffix “.LBL”. The detached label file includes the format of the file. In addition, there is a brief ASCII text file (DATAINFO.TXT) that describes the DATA/HIGHERORDER/SCPOT/YYYY directory contents, which are briefly listed in Table 14.

<i>Table 14: HIGHERORDER/SCPOT/YYYY Data Directory Contents</i>		
File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
ELS_SCPOT*.TAB	ELS spacecraft potential files.	CAPS
ELS_SCPOT*.LBL	PDS label for ELS spacecraft potential files of same base name.	CAPS

4.5.5. DATA/HIGHERORDER/ELEMOMT/YYYY Directory Contents

Higher order data files for ELS moments starting within the year, YYYY, are stored in the DATA/HIGHERORDER/ELEMOMT/YYYY directory. Each directory contains one year of data. Each type of higher order file can have only 1 file for a given day and can contain up to 24 hours of data. The file naming convention is described in Section 4.5.2. Every data file in the directory has a detached PDS label with the same root name as the file they describe but have the suffix “.LBL”. The detached label file includes the format of the file. In addition, there is a brief ASCII text file (INFO.TXT) that describes the DATA/HIGHERORDER/ELEMOMT/YYYY directory contents, which are briefly listed in Table 15.

<i>Table 15: HIGHERORDER/ELEMOMT/YYYY Data Directory Contents</i>		
File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
ELS_3DMOMT*.TAB	ELS Moments files.	CAPS
ELS_3DMOMT*.LBL	PDS label for ELS Moments files of same base name.	CAPS

4.5.6. DATA/HIGHERORDER/IONMOMT/YYYY Directory Contents

Higher order data files for ion moments starting within the year, YYYY, are stored in the DATA/HIGHERORDER/IONMOMT/YYYY directory. Each directory contains one year of data. Each type of higher order file can have only 1 file for a given day and can contain up to 24 hours of data. The file naming convention is described in Section 4.5.2. Every data file in the directory has a detached PDS label with the same root name as the file they describe but have the suffix “.LBL”. The detached label file includes the format of the file. In addition, there is a brief ASCII text file (INFO.TXT) that describes the DATA/HIGHERORDER/IONMOMT/YYYY directory contents, which are briefly listed in Table 16.

<i>Table 16: HIGHERORDER/IONMOMT/YYYY Data Directory Contents</i>		
File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
ION_MOMT*.TAB	IMS Singles ion moment files.	CAPS
ION_MOMT*.LBL	PDS label for IMS Singles ion moment files of same base name.	CAPS

4.5.7. DATA/CALIBRATED Directory Contents

The DATA/CALIBRATED directory contents are still TBD, but will include calibrated data products, their label files, and a DATAINFO.TXT file.

<i>Table 17: DATA/CALIBRATED Directory Contents</i>		
File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
*.DAT or *.TAB	Calibrated Data Products.	CAPS
*.LBL	Label files for Calibrated Data Products.	CAPS

4.6. CALIB Directory Contents

Given that we are archiving data to 2 different volumes, the contents of the CALIB directory include the following information for the un-calibrated archive volume. Please note that the documentation for CAPS basic calibration procedures can be found in the DOCUMENT/CAPS_CALIB directory.

<i>Table 18: CALIB Directory Contents</i>		
File Name	File Contents	Provided By
CALINFO.TXT	A description of the contents of this directory and all subdirectories.	PPI
SAMPLE_DATA	A directory that contains a sample input data file, additional files needed for the calibration process, and a sample output file.	CAPS
ELS_ENERGY_ARRAY.TAB	The ELS Sweep Table calibration data	CAPS
ELS_ENERGY_ARRAY.LBL	A PDS detached label that describes ELS_ENERGY_ARRAY.TAB	CAPS
ELS_GEOM_FACTOR.TAB	The ELS Geometric Factor matrix (see label for full description)	CAPS
ELS_GEOM_FACTOR.LBL	A PDS detached label that describes ELS_GEOM_FACTOR.TAB	CAPS

ELS_SWEEP_TABLE_ALL_VER.TAB	The ELS Sweep Table for all CAPS data	CAPS
ELS_SWEEP_TABLE_ALL_VER.LBL	A PDS detached label that describes ELS_SWEEP_TABLE_ALL_VER.TAB	CAPS
IBS_SWEEP_V0_V1_V2.TAB	The IBS Sweep Table for versions 0, 1, and 2 of the CAPS data	CAPS
IBS_SWEEP_V0_V1_V2.LBL	A PDS detached label that describes IBS_SWEEP_V0_V1_V2.TAB	CAPS
IBS_SWEEP_V3.TAB	The IBS Sweep Table for version 3 of the CAPS data	CAPS
IBS_SWEEP_V3.LBL	A PDS detached label that describes IBS_SWEEP_V3.TAB	CAPS
IMS_SWEEP_TABLE_0_V0_V1_V2.TAB	The IMS Sweep Table number 0 for versions 0, 1, and 2 of the CAPS data	CAPS
IMS_SWEEP_TABLE_0_V0_V1_V2.LBL	A PDS detached label that describes IMS_SWEEP_TABLE_0_V0_V1_V2.TAB	CAPS
IMS_SWEEP_TABLE_16.TAB	The IMS Sweep Table number 16 for all versions of CAPS data. The sweep table has been used for calibrations.	CAPS
IMS_SWEEP_TABLE_16.LBL	A PDS detached label that describes IMS_SWEEP_TABLE_16.TAB	CAPS
IMS_SWEEP_TABLE_15.TAB	The IMS Sweep Table number 15 for all versions of CAPS data. This sweep table is used only during some Titan flyby periods (less than 1400km)	CAPS
IMS_SWEEP_TABLE_15.LBL	A PDS detached label that describes IMS_SWEEP_TABLE_15.TAB	CAPS
IMS_SWEEP_TABLE_255.TAB	The IMS Sweep Table number 255 for all versions of CAPS data. This sweep table was used only once, and has been replaced by #15.	CAPS
IMS_SWEEP_TABLE_255.LBL	A PDS detached label that describes IMS_SWEEP_TABLE_255.TAB	CAPS
ION_AND_GROUPTABLE_NAMING.DOC	Contains the definitions of the group table naming and ion naming in Microsoft Word format	CAPS
ION_AND_GROUPTABLE_NAMING.PDF	Contains the definitions of the group table naming and ion naming in Adobe Acrobat format	CAPS

ION_AND_GROUPTABLE_NAMING.LBL	A PDS detached label that describes the documents ION_AND_GROUPTABLE_NAMING.*	CAPS
-------------------------------	--	------

4.6.1. CALIB/SAMPLE_DATA Directory Contents

This directory contains a sample input file, any additional files necessary for the calibration process, and a sample output file. The goal of files in this directory is to provide data users an example against which to test their calibration routines, which were developed according to the CAPS BASIC CALIB PROCEDURES document (which can be found in DOCUMENT/CAPS_CALIB). Please note that the output includes first order calibration, and not the second order corrections that are currently being worked.

4.7. EXTRAS Directory Contents

The EXTRAS directory contains an EXTRINFO.TXT file that contains a description of the contents of this directory. Additional files include example software to read the CAPS uncalibrated data files, open the necessary calibration files, calibrate the data, and write them out. Example software for generating the CAPS browse spectrograms is also provided.

4.8. BROWSE Directory Contents

The BROWSE directory contains browse spectrogram plots that are not intended for publication. Browse spectrograms starting on YYYYDDDD from all sensors are stored in the BROWSE/YYYYDDDD directory. Each directory contains one day of data. Each sensor can have up to 4 spectrograms for the day and can contain up to 6 hours of data. The file naming convention is described in Section 4.5.2, with a .PNG extension to specify the file format. Every data file in the directory has a detached PDS label with the same root name as the file they describe but have the suffix “.LBL”. In addition, there is a brief ASCII text file (INFO.TXT) that describes the BROWSE/YYYYDDDD directory contents, which are listed in Table 19: YYYYDDDD BROWSE Directory Contents. NOTE: Files are only available if data from the appropriate type (during the 6 hour block in question) is available. We do not plot ancillary data.

Table 19: YYYYDDDD BROWSE Directory Contents

File Name	File Contents	Provided By
DATAINFO.TXT	Brief description of directory contents and naming conventions.	PPI
ACT*.PNG	Actuator plot in PNG format	CAPS
ACT*.LBL	PDS label for actuator PNG formatted file of same base name	PPI
ELS*.PNG	ELS plot in PNG format	CAPS
ELS*.LBL	PDS label for ELS PNG formatted file of same base name	PPI

IBS*.PNG	IBS plots in PNG format	CAPS
IBS*.LBL	PDS label for IBS PNG formatted file of same base name	PPI
ION*.PNG	IMS ION plots in PNG format	CAPS
ION*.LBL	PDS label for IMS ION PNG formatted file of same base name	PPI
LOG*.PNG	IMS logicals plot in PNG format	CAPS
LOG*.LBL	PDS label for IMS Logicals PNG formatted file of same base name	PPI
SNG*.PNG	IMS singles plot in PNG format	CAPS
SNG*.LBL	PDS label for IMS Singles PNG formatted file of same base name	PPI
TOF*.PNG	IMS TOF plot in PNG format	CAPS
TOF*.LBL	PDS label for IMS TOF PNG formatted file of same base name	PPI

Since we will archive our calibrated files on a separate volume, the UNCALIBRATED volume does not contain a DATA/CALIBRATED directory. When ready, the calibration data will be available in the DATA/CALIBRATED directory. On the calibrated archive volume, the CALIB directory contains files that are used in the calibration process. The files include only text files and tables. Any other calibration files are included in the DOCUMENT/CAPS_CALIB directory. Contents are still **TBD** and will be specified under Section 4.5.7 when the calibration volume is ready.

5. Archive Volume Format

This section describes the format of CAPS standard product archive volumes. Data that comprise the CAPS standard product archives are formatted in accordance with Planetary Data System specifications [Planetary Science Data Dictionary, 2002; PDS Data Preparation Workbook, 1995; PDS Standards Reference, 2002].

5.1. File Formats

The following section describes file formats for the kinds of files contained on Archive Volumes. For more information, see the PDS Standards Reference.

5.1.1. Document File Formats

Document files with the .TXT suffix exist in all directories. They are ASCII files with embedded PDS labels. All document files contain variable-length, 80-byte maximum records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the MacOS, DOS, Windows, UNIX, OS2, and VMS operating systems.

However, the documents in the reference volume contain formatting and figures that cannot be rendered as pure ASCII text. These documents are provided in formats that support graphics, such as HTML, MS Word, PDF, etc. The PDS requirement that all documentation critical to the understanding of the data set be provided in ASCII text form is met by the inclusion of HTML formatted documents.

5.1.2. Catalog File Formats

Catalog files (suffix .CAT) exist in the Root and Catalog directories. They are formatted in an object-oriented structure consisting of sets of 'keyword = value' declarations. All files are ASCII and conform to the same structure standards (line length, line terminator) as the PDS label files described in the previous section.

5.1.3. PDS Label File Formats

All data files in the CAPS Standard Product Archive Collection have PDS labels [Planetary Science Data Dictionary; PDS Standards Reference]. These labels are all detached from the data files (same file name prefix, .LBL suffix).

A PDS label, whether embedded or detached from its associated file, provides descriptive information about the associated file. The PDS label is an object-oriented structure consisting of sets of 'keyword = value' declarations. The object that the label refers to (e.g., TABLE, STRUCTURE, etc.) is denoted by a statement of the form:

^object = location

in which the caret character (^, also called a pointer in this context) indicates where to find the object. In a PDS label, the location denotes the name of the file containing the object, along with the starting record or byte number, if there is more than one object in the file. For example:

```
^HEADER = ("98118.TAB",1)
```

```
^TABLE = ("98118.TAB",1025 <BYTES>)
```

indicates that the HEADER object begins at record 1 and that the TABLE object begins at byte 1025 of the file 98118.TAB. The file 98118.TAB must be located in the same directory as the detached label file.

Below is a list of the possible formats for the ^object definition in labels in this product.

```
^object = n
```

```
^object = n <BYTES>
```

```
^object = "filename.ext"
```

```
^object = ("filename.ext", n)
```

```
^object = ("filename.ext", n <BYTES>)
```

where

n is the starting record or byte offset of the object, counting from the beginning of the file (record 1, byte 1),

<BYTES> indicates that the number given is in units of bytes (the default is records),

filename is the up-to-8-character, alphanumeric upper-case file name,

ext is the up-to-3-character upper-case file extension.

All CAPS detached labels conform to the requirement of less than 80-byte per line, including the carriage return character (ASCII 13) and the line feed character (ASCII 10). The RECORD_TYPE of all the labels is STREAM.

5.1.4. DATA/UNCALIBRATED File Formats – Binary Tables

All of the un-calibrated data files for CAPS are binary tables of data (.DAT suffix). Data files can be found in the YYYYDDD directories, which are located in DATA/UNCALIBRATED. Missing data are filled with appropriate (and documented) fill values. The table format for each sensor is described by a detached PDS label of the same base name as the file, but with an .LBL extension. A description of the data file contents and structure for the standard data set data products can be found Section 5.2. The format for the detached labels and format files can be found in Appendix B. PDS Labels & Format Files for Standard UNCALIBRATED Data Products.

5.1.5. DATA/HIGHERORDER File Formats – Fixed Field ASCII

All of the HIGHERORDER data files for CAPS are fixed-field ASCII files with a .TAB suffix. Data files can be found in the YYYY directories, which are located in DATA/HIGHERORDER/ELEMOMT, DATA/HIGHERORDER/IONMOMT, or DATA/HIGHERODRER/SCPPT. Missing data are filled with appropriate (and documented) fill values. The table format for each higher order product is described by a detached PDS label of the same base name as the file, but with an .LBL extension. The format file for each type of higher order product is included in the detached label. A description of the data file contents and structure for the standard data set data products can be found in Section 5.3. The format for the detached label and format file can be found in Appendix C. PDS Labels & Format Files for Standard HIGHERORDER Data Products.

5.2. CAPS Standard UNCALIBRATED Data Product Descriptions

The following sections describe the content and structure of each of the standard data products within the UNCALIBRATED level 2 CAPS data set.

5.2.1. CAPS ELS Data Product Format

The data product format for ELS is listed in Table 20 below. The fill value for ELS data is 65535 (hex value FFFF).

<i>Table 20: CAPS ELS UNCALIBRATED Data File Contents and Structure</i>				
Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day. Fill Value: 65535
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time). Fill Value: 10×10^9
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill Value: 255
Collapse flag	Unsigned Integer	1	[0,131]	Collapse flag indicates collapse by average (0), sum (1), average with in-flight dead-time correction (2), sum with in-flight dead-time correction (3), or snapshot portion (4). For snapshot, full collapse information is

Table 20: CAPS ELS UNCALIBRATED Data File Contents and Structure

				gained by adding to 4 (so snapshot portion can be 4, 5, 6, or 7 depending upon the collapse). If the most significant bit is 1 (giving a starting value of 128), it will indicate no HK was available. Fill Value: 255
Offset time	Unsigned Integer	2	[0,32000]	Milliseconds from start of A cycle. Fill Value: 65535
First Energy Step	Unsigned Integer	2	[1,63]	Min energy step in collapsed data. Fill Value: 65535
Last Energy Step	Unsigned Integer	2	[1,63]	Max energy step in collapsed data. Fill Value: 65535
First Azimuth Value	Unsigned Integer	2	[1,16]	Min azimuth value in collapsed data. Fill Value: 65535
Last Azimuth Value	Unsigned Integer	2	[1,16]	Max azimuth value in collapsed data. Fill Value: 65535
Data, Elevation 1	Unsigned Integer	2	[0,65504]	Counts in elevation 1: Fill: 65535
Data, Elevation 2	Unsigned Integer	2	[0,65504]	Counts in elevation 2: Fill: 65535
Data, Elevation 3	Unsigned Integer	2	[0,65504]	Counts in elevation 3: Fill: 65535
Data, Elevation 4	Unsigned Integer	2	[0,65504]	Counts in elevation 4: Fill: 65535
Data, Elevation 5	Unsigned Integer	2	[0,65504]	Counts in elevation 5: Fill: 65535
Data, Elevation 6	Unsigned Integer	2	[0,65504]	Counts in elevation 6: Fill: 65535
Data, Elevation 7	Unsigned Integer	2	[0,65504]	Counts in elevation 7: Fill: 65535
Data, Elevation 8	Unsigned Integer	2	[0,65504]	Counts in elevation 8: Fill: 65535

5.2.2. CAPS IBS Data Product Format

The data product format for CAPS IBS is listed in Table 21 below. The fill value for IBS data is 65535 (hex value FFFF).

Table 21: CAPS IBS UNCALIBRATED Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day. Fill: 65535
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of C cycle, sec. from J2000 (barycentric dynamic time). Fill: 10×10^9

Table 21: CAPS IBS UNCALIBRATED Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255
IBS mode/submode	Unsigned Integer	1	[0,254]	IBS mode and submode flag: 0 = Standard Sweep Collapse, 1 = Standard Sweep Snapshot, 2 = Solar Wind Search, 3 = Solar Wind Track, 4 = Magnetosphere Search, 5 = Magnetosphere Survey, 6 = Calibration Mode, 7-255 = spare. Fill: 255
Offset time	Unsigned Integer	4	[1,256000]	Milliseconds from start of C cycle Fill: 400000
First Energy Step	Unsigned Integer	2	[1,852]	Min energy step in collapsed data (index into the energy table) Fill: 65535
Last Energy Step	Unsigned Integer	2	[1,852]	Max energy step in collapsed data (index into the energy table) Fill: 65535
First Azimuth Value	Unsigned Integer	2	[1,128]	Min azimuth value in collapsed data Fill: 65535
Last Azimuth Value	Unsigned Integer	2	[1,128]	Max azimuth value in collapsed data Fill: 65535
Data, Fan 1	Unsigned Integer	2	[1,65504]	Counts in fan 1. Fill: 65535
Data, Fan 2	Unsigned Integer	2	[1,65504]	Counts in fan 2. Fill: 65535
Data, Fan 3	Unsigned Integer	2	[1,65504]	Counts in fan 3. Fill: 65535

5.2.3. CAPS IMS ION Data Product Format

The data product format for CAPS IMS ION is listed in Table 22 below. The fill value for IMS Ion data is 28671 (hex value 6FFF).

Table 22: CAPS UNCALIBRATED IMS ION Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from start of day, a

Table 22: CAPS UNCALIBRATED IMS ION Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
				value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day, a value of 65535 indicates that no A-cycle header information was available
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255
Spare	Unsigned Integer	1	0	Spare bits to keep on even byte boundaries. Fill: 0
Offset time	Unsigned Integer	2	[1,32000]	Milliseconds from start of A cycle Fill: 65535
First Energy Step	Unsigned Integer	2	[1,63]	Min energy step in collapsed data Fill: 65535
Last Energy Step	Unsigned Integer	2	[1,63]	Max energy step in collapsed data Fill: 65535
First Azimuth Value	Unsigned Integer	2	[1,8]	Min azimuth value in collapsed data Fill: 65535
Last Azimuth Value	Unsigned Integer	2	[1,8]	Max azimuth value in collapsed data Fill: 65535
Sam Ion number	Unsigned Integer	2	[0,65534]	SAM ion number ¹ . Fill: 65535
Data, Elevation 1	Integer	2	[-32,27650]	Counts in elevation 1 (**):Fill 28671
Data, Elevation 2	Integer	2	[-32,27650]	Counts in elevation 2 (**):Fill 28671
Data, Elevation 3	Integer	2	[-32,27650]	Counts in elevation 3 (**):Fill 28671
Data, Elevation 4	Integer	2	[-32,27650]	Counts in elevation 4 (**):Fill 28671
Data, Elevation 5	Integer	2	[-32,27650]	Counts in elevation 5 (**):Fill 28671
Data, Elevation 6	Integer	2	[-32,27650]	Counts in elevation 6 (**):Fill 28671
Data, Elevation 7	Integer	2	[-32,27650]	Counts in elevation 7 (**):Fill 28671

¹ The SAM Ion number shall uniquely identify the ion and the group table used by SAM. This shall be based on a table generated and kept on the ground, and will not be the ion number used inside SAM software (which represents different species in different group tables) nor the ion number in the current CDF files (which represents the order in which ions are selected and passed on by CPU2, and which depends on the group table and ion selection index.)

Table 22: CAPS UNCALIBRATED IMS ION Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
Data, Elevation 8	Integer	2	[-32,27650]	Counts in elevation 8 (**):Fill 28671

(**): Note that due to on-board spacecraft de-convolution routines used to estimate the number of counts from a particular species, a combination of low counts and background noise can cause the de-convolution routine to give negative numbers.

5.2.4. CAPS IMS SNG Data Product Format

The data product format for CAPS IMS Singles (SNG) is listed in Table 23 below. The fill value for Singles data is 65535 (hex value FFFF).

Table 23: CAPS UNCALIBRATED IMS Singles Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day, a value of 65535 indicates that no A-cycle header information was available
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255
Spare	Unsigned Integer	1	0	Spare byte to have even byte boundaries. Fill: 0
Offset time	Unsigned Integer	2	[1,32000]	Milliseconds from start of A cycle Fill: 65535
First Energy Step	Unsigned Integer	2	[1,63]	Min energy step in collapsed data Fill: 65535
Last Energy Step	Unsigned Integer	2	[1,63]	Max energy step in collapsed data Fill: 65535

Table 23: CAPS UNCALIBRATED IMS Singles Data File Contents and Structure

First Azimuth Value	Unsigned Integer	2	[1,8]	Min azimuth value in collapsed data Fill: 65535
Last Azimuth Value	Unsigned Integer	2	[1,8]	Max azimuth value in collapsed data Fill: 65535
Data, Elevation 1	Unsigned Integer	2	[0,27500]	Counts in elevation 1. Fill 65535
Data, Elevation 2	Unsigned Integer	2	[0,27500]	Counts in elevation 2. Fill 65535
Data, Elevation 3	Unsigned Integer	2	[0,27500]	Counts in elevation 3. Fill 65535
Data, Elevation 4	Unsigned Integer	2	[0,27500]	Counts in elevation 4. Fill 65535
Data, Elevation 5	Unsigned Integer	2	[0,27500]	Counts in elevation 5. Fill 65535
Data, Elevation 6	Unsigned Integer	2	[0,27500]	Counts in elevation 6. Fill 65535
Data, Elevation 7	Unsigned Integer	2	[0,27500]	Counts in elevation 7. Fill 65535
Data, Elevation 8	Unsigned Integer	2	[0,27500]	Counts in elevation 8. Fill 65535

5.2.5. CAPS IMS LOG Data Product Format

The data product format for CAPS IMS Logicals (LOG) is listed in Table 24 below. The fill value for Logical Data is 65535 (hex FFFF).

Table 24: CAPS IMS Logicals UNCALIBRATED Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day, a value of 65535 indicates that no A-cycle header information was available
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255
TDC log selection	Unsigned Integer	1	[0,3]	TDC selectable logical definition 0 = (Logical 13: Start CFD Singles, Logical 14: Stop CFD Singles), 1 = (Logical 13: Acquisition, Logical 14: Deadtimes), 2 = (Logical 13: Single

<i>Table 24: CAPS IMS Logicals UNCALIBRATED Data File Contents and Structure</i>				
				TOF events, Logical 14: Double TOF events), 3 = (Logical 13: Data strobes, Logical 14: Resets). Fill: 255
Offset time	Unsigned Integer	2	[1,32000]	Milliseconds from start of A cycle Fill: 65535
First Energy Step	Unsigned Integer	2	[1,63]	Min energy step in collapsed data Fill: 65535
Last Energy Step	Unsigned Integer	2	[1,63]	Max energy step in collapsed data Fill: 65535
First Azimuth Value	Unsigned Integer	2	[1,8]	Min azimuth value in collapsed data Fill: 65535
Last Azimuth Value	Unsigned Integer	2	[1,8]	Max azimuth value in collapsed data Fill: 65535
LEF Stops	Unsigned Integer	2	[0,27500]	LEF stop counts: Fill: 65535
ST Stops	Unsigned Integer	2	[0,27500]	ST stop counts: Fill: 65535
Timeouts	Unsigned Integer	2	[0,27500]	Timeout events: Fill: 65535
Total Events	Unsigned Integer	2	[0,27500]	Total events (generated by SAM for dead time). Fill: 65535
Logical 13	Unsigned Integer	2	[0,27500]	TDC selectable logical 13. Fill: 65535
Logical 14	Unsigned Integer	2	[0,27500]	TDC selectable logical 14. Fill: 65535

5.2.6. CAPS IMS TOF Data Product Format

The data product format for CAPS IMS Time of flight (TOF) is listed in Table 25 below. The fill value for IMS TOF and ST data is 4294967295 (hex value FFFFFFFF).

<i>Table 25: CAPS IMS TOF UNCALIBRATED Data File Contents and Structure</i>				
Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of B cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Telemetry mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255

Table 25: CAPS IMS TOF UNCALIBRATED Data File Contents and Structure

Collapse Flag	Unsigned Integer	1	[0,5]	Flags indicating collapse and Bicycle Duration. 0=average, 256s duration; 1=sum, 256s duration; 2=average, 512s duration; 3=sum, 512s duration; 4=average, 1024s duration, 5=sum, 1024s duration. Fill: 255
ST start channel	Unsigned Integer	2	[0,1535]	Start ST TOF channel Fill value: 2048
ST interval	Unsigned Integer	1	[1,4]	ST TOF bin interval 1 = each word is taken starting at the Start channel. 2 = Every other word is taken starting at the Start channel. 4 = Every fourth word is taken starting at the Start Channel. 0 = Fill Value implying housekeeping is not available
ST energy collapse	Unsigned Integer	1	[0,3]	ST energy collapse option 0 = sum adjacent energies, 1 = take even energies, 2 = take odd energies, 3 = TBA. Fill: 255
LEF start channel	Unsigned Integer	2	[0,1535]	Start LEF TOF channel Fill value: 2048
LEF interval	Unsigned Integer	1	[1,4]	LEF TOF bin interval 1 = each word is taken starting at the Start channel. 2 = Every other word is taken starting at the Start channel. 4 = Every fourth word is taken starting at the Start Channel. 0 = Fill Value implying housekeeping is not available
LEF energy collapse	Unsigned Integer	1	[0,3]	LEF energy collapse option 0 = sum adjacent energies, 1 = take even energies, 2 = take odd energies, 3 = TBA. Fill: 255
Energy Step	Unsigned Integer	2	[1,32]	Energy step in collapsed data Fill: 65535
Data, ST TOF bin 1	Unsigned Integer	4	[0, 3268027]	Counts in ST TOF bin 1. Fill 4294967295
Data, ST TOF bin 2	Unsigned Integer	4	[0, 3268027]	Counts in ST TOF bin 2 Fill 4294967295
...	Unsigned Integer	4x509	[0, 3268027]	Counts in ST TOF bins 3 – 511 Fill 4294967295
Data, ST TOF bin 512	Unsigned Integer	4	[0,	Counts in ST TOF bin 512

Table 25: CAPS IMS TOF UNCALIBRATED Data File Contents and Structure

<i>Table 25: CAPS IMS TOF UNCALIBRATED Data File Contents and Structure</i>				
			3268027]	Fill 4294967295
Data, LEF TOF bin 1	Unsigned Integer	4	[0, 3268027]	Counts in LEF TOF bin 1 Fill 4294967295
Data, LEF TOF bin 2	Unsigned Integer	4	[0, 3268027]	Counts in LEF TOF bin 2 Fill 4294967295
...	Unsigned Integer	4x509	[0, 3268027]	Counts in LEF TOF bins 3 – 511 Fill 4294967295
Data, LEF TOF bin 512	Unsigned Integer	4	[0, 3268027]	Counts in LEF TOF bin 512 Fill 4294967295

5.2.7. CAPS ACT Data Product Format

The data product format for the CAPS actuator is listed in Table 26 below. The fill value for actuator data is -999.0. Actuator data products are considered to be both calibrated and uncalibrated data products. In order to accommodate this, we lose the <DataType> in the filename (as described in section 4.5.2).

Table 26: CAPS ACT Data File Contents and Structure (both Calibrated & Un-calibrated)

<i>Table 26: CAPS ACT Data File Contents and Structure (both Calibrated & Un-calibrated)</i>				
Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day Fill: 65535
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Data, Actuator angle 1	Float	4	[-115,115]	Actuator angle at time + 0 sec Fill: -999
Data, Actuator angle 2	Float	4	[-115,115]	Actuator angle at time + 1 sec Fill: -999
...	Float	4x29	[-115,115]	Actuator angle (offset times of 2 – 30 sec) Fill: -999
Data, Actuator angle 32	Float	4	[-115,115]	Actuator angle at time + 31 sec Fill: -999

5.2.8. CAPS ANC Data Product Format

The data product format for the ancillary data product is listed in Table 27 below. There are no standard fill values for these items.

Table 27: CAPS ANC UNCALIBRATED Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day Fill: 65535
Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of A cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
SCLK	Unsigned Integer	4	$[0, 3.0 \times 10^9]$	Start time of A cycle, spacecraft clock Fill: 10×10^9
Spacecraft/Saturn position [x]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Saturn-centered Fill: 10×10^{12}
Spacecraft/Saturn position [y]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Saturn-centered Fill: 10×10^{12}
Spacecraft/Saturn position [z]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Saturn-centered Fill: 10×10^{12}
Spacecraft/Saturn velocity v_x	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: relative to Saturn Fill: 5×10^5
Spacecraft/Saturn velocity v_y	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: relative to Saturn Fill: 5×10^5
Spacecraft/Saturn velocity v_z	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: relative to Saturn Fill: 5×10^5
Spacecraft/Sun position [x]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Sun-centered Fill: 10×10^{12}
Spacecraft/Sun position [y]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Sun-centered. Fill: 10×10^{12}
Spacecraft/Sun position [z]	Float	4	$[-9.46 \times 10^{12}, 9.46 \times 10^{12}]$	J2000 [km]: Sun-centered Fill: 10×10^{12}
Spacecraft/Sun velocity v_x	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: Relative to the Sun Fill: 5×10^5
Spacecraft/Sun velocity v_y	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: Relative to the Sun Fill: 5×10^5
Spacecraft/Sun velocity v_z	Float	4	$[-3 \times 10^5, 3 \times 10^5]$	J2000 [km/s]: Relative to the Sun Fill: 5×10^5
Spacecraft orientation [xx]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [xy]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.

Table 27: CAPS ANC UNCALIBRATED Data File Contents and Structure

Spacecraft orientation [xz]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [yx]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [yy]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [yz]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [zx]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [zy]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
Spacecraft orientation [zz]	Float	4	[-1,1]	Component of rotation matrix to J2000. Fill value = 2.
ELS quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IBS quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IMS Ion quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IMS TOF LEF quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IMS TOF ST quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IMS Logicals quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
IMS Singles quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2

Table 27: CAPS ANC UNCALIBRATED Data File Contents and Structure

				= Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
Actuator quality flag	Unsigned Integer	1	[0,7]	Missing data and good/bad checksum 0=Everything OK, 1 = Missing Data, 2 = Bad Checksum, 3 = Missing Data & Bad Checksum, 7 = No Data (4,5,6 not valid)
Actuator Status Bits (all 32 of them)	Unsigned Integer	32	[0,8]	Status bits for the actuator data product. These are represented as 32 bytes with the following values: 0 = Everything is OK 4 = Limit Switch has been hit at +108 degrees 8 = Limit Switch has been hit at -108 degrees 16 = Data not available (data is only available in 16, 8, 4, and 2 kbps modes)
TLM Version	Unsigned Integer	1	[0,15]	Telemetry Mode version number Fill: 255
FSW Major version	Unsigned Integer	1	[0,255]	To build the flight software version number: Major.SubMajor.Minor.SubMinor. For example: 3.1.0.2. Fill: 255
FSW Sub-Major version	Unsigned Integer	1	[0,255]	See description for FSW Major version Fill: 255
FSW Minor version	Unsigned Integer	1	[0,255]	See description for FSW Major version Fill: 255
FSW Sub-Minor version	Unsigned Integer	1	[0,255]	See description for FSW Major version Fill: 255
Spacecraft pointing type	Unsigned Integer	1	[0,2]	0 = no pointing available, 1 = pointing based on predicts, 2 = pointing based on reconstructs
Telemetry rate and mode	Unsigned Integer	1	[1,136]	Logical telemetry rate and mode: 1 = 250bps, 2 = 500bps, 4 = 1kbps, 8 = 2kbps, 16 = 4kbps, 32 = 8kbps, 64 = 16kbps, 130 = 500bps solar wind, 132 = 1 kbps solar wind, 136 = 2kbps solar wind. Fill: 255
IBS Sweep Table & Index Table Numbers	Unsigned Integer	1	[0,250]	The upper 4 bits are the IBS index table, and the lower 4 bits are the IBS sweep table number. (fill 0xFF)
IBS Background, Fan 1	Unsigned Integer	2	[0,60000]	IBS Background counts in fan 1 (fill 0xFFFF)
IBS Background, Fan 2	Unsigned Integer	2	[0,60000]	IBS Background counts in fan 2 (fill 0xFFFF)

Table 27: CAPS ANC UNCALIBRATED Data File Contents and Structure

IBS Background, Fan 3	Unsigned Integer	2	[0,60000]	IBS Background counts in fan 3 (fill 0xFFFF)
IBS starting energy	Unsigned Integer	2	[1,852]	IBS starting energy step number (fill 0xFFFF)
IBS Subcycle	Unsigned Integer	1	[0,7]	IBS subcycle counter (A cycle in C cycle) (fill 0xFF)
IBS compression ratio	Unsigned Integer	1	[1,32]	Uncompressed/compressed length. This ratio is calculated on the ground from information in the IBS header and rounded down to the nearest integer. (fill 0x0)
IBS Peak Fan	Unsigned Integer	1	[1,3]	Fan containing the IBS peak (1 st in the C cycle). (fill 0x4)
IBS Peak A cycle	Unsigned Integer	1	[1,8]	A cycle number (1 st in the C cycle). (fill 0x9)
IBS Peak Sweep	Unsigned Integer	1	[1,16]	IBS peak energy sweep or azimuth (1 st in the C cycle). (fill 0x0)
IBS Peak Energy Step	Unsigned Integer	1	[0,255]	IBS peak energy step (1 st in the C cycle). (fill 0x0)
IBS Threshold Run Length	Unsigned Integer	2	[0,255]	Run length compression threshold (fill 0xFFFF)
IMS sweep table number	Unsigned Integer	1	[0,255]	IMS Sweep table number Fill: 240
TDC Single Select	Unsigned Integer	1	[0,3]	Determines how singles 13 and 14 are set (these are also Logical 13 and Logical 14): Value: Single 13 Single 14 0 Start CFD Stop CFD 1 Acquisition Error Deadtimes 2 Single TOF's Double TOF's 3 Data Stobes Resets Fill: 255
IMS logicals selection	Unsigned Integer	2	[4096,27416]	The TDC logicals selection is a bitmap: Bits 15-13: IMS Logical 1 Bits 12-10: IMS Logical 2 Bits 9-7: IMS Logical 3 Bits 6-4: IMS Logical 4 Bits 3-0: Unused Logical selection decoder: 0 = Unused 1 = LEF Stop 2 = ST Stop 3 = Timeouts 4 = Total Events (As used in SAM dead time correction) 5 = Logical 13 6 = Logical 14

Table 27: CAPS ANC UNCALIBRATED Data File Contents and Structure

				7 = Unused NOTE: Logical 13 and 14 are set with 82TDC_ENG_SING. See previous column. Fill: 65535
SAM/CPU2 status flags	Unsigned Integer	1	[0,255]	Bitmap: Bit 7 is most significant bit. 7 = CPU2/SAM mode change 6 = Background data 5 = Ion deadtime compensation 4 = SAM LEF enable 3 = SAM molecule enable 2 = SW/HW binning 1-0 = HW binning LUT index.
SAM Ion selection index	Unsigned Integer	1	[0,255]	SAM ion selection index
SAM Ion group table	Unsigned Integer	2	[0,65534]	SAM group table ID number Fill or missing: 65535
ELS_MCP_ADJ	Float	4	[0.0,3700.0]	ELS High voltage adjust (Volts). FILL value is -1.0
IBS_CEM_DAC	Float	4	[-4000.0,0.0]	IBS CEM High Voltage Digital to Analog Converter (Volts). FILL value is 1.0
HVU1_RET_DAC	Float	4	[0,16.0]	HVU1 Retarding High Voltage Digital to Analog Converter (kVolts). FILL is -1.0
HVU1_ACC_DAC	Float	4	[-16.0,0.0]	HVU1 Accelerating High Voltage Digital to Analog Converter (kVolts). FILL is 1.0
HVU2_ST_DAC	Float	4	[-3600.0,0.0]	HVU2 ST MCP Digital to Analog Converter (Volts). FILL is 1.0
HVU2_LEF_DAC	Float	4	[-2400.0,0.0]	HVU2 LEF MCP Digital to Analog Converter (Volts). FILL is 1.0

5.2.9. CAPS EVN Data Product Format

The data product format for the CAPS IMS event mode data is listed in Table 28 below. No fill values are necessary. Data rows exist only if data are present.

Table 28: CAPS EVN UNCALIBRATED Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
B cycle number	Unsigned Integer	2	[1,340]	B cycle number from the start of day, a value of 65535 indicates no B-cycle data is available
A cycle number	Unsigned Integer	2	[1,2732]	A cycle number from the start of day Fill: 65535

Table 28: CAPS EVN UNCALIBRATED Data File Contents and Structure

Time	Float	8	$[-7.1 \times 10^7, 1.5 \times 10^9]$	Start time of B cycle, sec. from J2000 (barycentric dynamic time) Fill: 10×10^9
Offset time	Unsigned Integer	2	[0,32000]	Milliseconds from start of A cycle Fill: 65535
Energy Step	Unsigned Integer	2	[1,63]	Energy Step. Fill: 65535
Azimuth Value	Unsigned Integer	2	1	Azimuth Value. In this case, the value is always 1 (CPU2 samples the first sweep of every other A cycle. Included here for clarity and useful when used in combination with ION data). Fill: 65535
Elevation	Unsigned Integer	1	[1,8]	Elevation or Sector ID. Fill: 255
TOF type	Unsigned Integer	1	[0,254]	ST/LEF and single/dual event flag 0 = ST, first or single event 1 = LEF, first or single event 2 = ST, second event of a dual event 3 = LEF, second event of a dual event 4 – 254 = Spare Fill: 255
TOF	Unsigned Integer	2	[1,2048]	Event's Time of Flight. The particle's TOF channel. Fill: 65535

5.3. CAPS Standard HIGHERORDER Data Product Descriptions

The following sections describe the content and structure of each of the standard data products within the HIGHERORDER level 5 CAPS data set. The format of each different type of higher order data product is included in the following sections.

5.3.1. CAPS ELS Electron Moment Data Product Format

The data product format for the ELS electron moment data is listed in Table 29 below. There are no standard fill values for these items, however, fill values are listed for each value. Data are in fixed field, ascii format.

Table 29: CAPS ELS Electron Moment HIGHERORDER Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
Start_Time	Time	17	[1997-228T10:43:00,	Start of the sampling period, spacecraft event time, UTC,

			2025-001T00:00:00]	in ISOD format to second resolution. ISOD format is: YYYY-DOYTHH:MM:SS. Fill is 2030-001T00:00:00.
End_Time	Time	17	[1997-228T10:43:00, 2025-001T00:00:00]	End of the sampling period, spacecraft event time, UTC, in ISOD format to second resolution. ISOD format is: YYYY-DOYTHH:MM:SS. Fill is 2030-001T00:00:00.
Anode_Used	Integer	1	[1,9]	Anode used to calculate moments. A value of 9 implies multiple anodes were used. Fill value is 0.
Signal_to_Noise	Real	5	[0.00, 10.00]	Signal to noise ratio threshold. Only data values above this threshold go into the moments calculation. Fill is -9.99.
SC_Potential	Real	7	[-100.00, 100.00]	Spacecraft potential (V) during the time period given. The fill value is -999.99.
Density	Real	13	[1.000000E+03, 1.000000E+10]	Density in units of electrons/m ³ , summed over all energies. The fill value used is -9.000000E+00.
Temperature	Real	12	[1.000000, 99999.999999]	Temperature (eV), summed over all energies. Fill value used is -9999.000000.
Quality_Factor	Real	7	[0.000, 100.000]	The number of standard deviations, assuming Poisson counting statistics, that the peak of the Maxwellian corresponding to the determined moments lies above the ELS one-count level. The larger the value, the better. The fill value used is -99.000.
SC_Charge_State	Integer	1	[0, 1]	Indicates whether the data is likely to be from a region in which the spacecraft is negatively charged. 0: likely positively charged 1: likely negatively charged Fill is 9.

Penetrating_Radiation	Integer	1	[0,1]	Indicates whether the data is probably from a region in which there is penetrating radiation present. 0: not likely to be present 1: likely to be present Fill is 9.
Density with Penetrating Radiation removed	Real	13	[1.000000E+03, 1.000000E+10]	Density in units of electrons/m ³ , summed over all energies, but with penetrating radiation subtracted from the data before moments calculations were made. Fill is -9.000000E+00.
Temperature with Penetrating Radiation removed	Real	12	[1.000000, 99999.999999]	Temperature (eV), summed over all energies, but with penetrating radiation subtracted from the data before moments calculations were made. Fill value used is -9999.000000.
Quality factor with penetrating radiation removed	Real	7	[0.000, 100.000]	The number of standard deviations, assuming Poisson counting statistics, that the peak of the Maxwellian corresponding to the determined moments lies above the ELS one-count level, but with penetrating radiation subtracted from the data before moments calculations were made. The larger the value, the better. The fill is -99.000.

5.3.2. CAPS ELS Spacecraft Potential Data Product Format

The data product format for the ELS spacecraft potential data is listed in Table 30 below. There are no standard fill values for these items, however, fill values are assigned for each variable. Data are in fixed field, ascii format.

Table 30: CAPS ELS Spacecraft Potential HIGHERORDER Data File Contents and Structure

Column Name	Type	Length (bytes)	Range	Description
-------------	------	----------------	-------	-------------

Start_Time	Time	17	[1997-228T10:43:00, 2025-001T00:00:00]	Start of the sampling period, spacecraft event time, UTC, in ISOD format to second resolution. ISOD format is: YYYY-DOYTHH:MM:SS. Fill is 2030-001T00:00:00.
End_Time	Time	17	[1997-228T10:43:00, 2025-001T00:00:00]	End of the sampling period, spacecraft event time, UTC, in ISOD format to second resolution. ISOD format is: YYYY-DOYTHH:MM:SS. Fill is 2030-001T00:00:00.
Anode_Used	Integer	1	[1,8]	Anode used to assign potential. Fill value is 0.
SC_Potential	Real	7	[-100.0, 100.0]	Spacecraft potential (V) during the time period given. Fill value is -999.99.
Accuracy_Flag	Integer	2	[0,2]	0 = Accurate value derived from ELS data. Value will be accurate to +/- 8.5% as the dE/E of ELS is 17%. 1 = Potential below ELS lowest energy, therefore estimated, use with care. 2 = Accurate value derived from non-ELS data, ie. RPWS at periapsis or PE at moon encounters.

5.3.3. CAPS Ion Moments Data Format

The data product format for the ion moments is listed in Table 31 below. There are no standard fill values for these items, however, fill values are assigned for each item. Data are in fixed field, ascii format.

<i>Table 31: CAPS Ion Moments HIGHERORDER Data File Contents and Structure</i>				
Column Name	Type	Length (bytes)	Range	Description
Time	Time	17	[1997-228T10:43:00, 2025-001T00:00:00]	Start of the sampling period, spacecraft event time, UTC, in ISOD format to second resolution. ISOD format is: YYYY-DOYTHH:MM:SS. Fill

				is 2030-001T00:00:00.
ION_Method_Flag	Integer	2	[1,4]	Ion Method Flag for calculation of numerical ion moments. Value: meaning 1 : SNG data, TOF-based partition 2 : SNG data, E-based partition 3 : SNG data, hard-wired partition 4 : ION data Fill value is -1.
H+ Density	Real	8	[0.000, 999.9999]	H+ density (ions/cm ³). Please note the difference between a value of 0.000 and -1. The 0.000 corresponds to a valid determination that is just extremely low (and there is no confidence in the actual quantitative value, other than that it is very low), whereas the fill value corresponds to an invalid determination, usually caused by problems in the integration process.
H+ Temperature	Real	9	[0, 99999.999]	H+ temperature (eV). Fill value is -1.
H2+ Density	Real	8	[0.000, 999.9999]	H2+ density (ions/cm ³). Please note the difference between a value of 0.000 and -1. The 0.000 corresponds to a valid determination that is just extremely low (and there is no confidence in the actual quantitative value, other than that it is very low), whereas the fill value corresponds to an invalid determination, usually caused by problems in the integration process.
H2+ Temperature	Real	9	[0, 99999.999]	H2+ temperature (eV). Fill value is -1.
W+ Density	Real	8	[0.000, 999.9999]	W+ density (ions/cm ³). Water-group ions, W+, includes O ⁺ , OH ⁺ , H ₂ O ⁺ , and H ₃ O ⁺ . Please note the difference between a value of 0.000 and -1. The 0.000

				corresponds to a valid determination that is just extremely low (and there is no confidence in the actual quantitative value, other than that it is very low), whereas the fill value corresponds to an invalid determination, usually caused by problems in the integration process.
W+ Temperature	Real	9	[0, 99999.999]	W+ temperature (eV). Fill value is -1.
Ave V_r	Real	9	[-3000.000, 3000.000]	Weighted average flow velocity (km/s), r component, in Saturn centered spherical coordinates. Fill is -9999.999
Ave V_ϕ	Real	9	[-3000.000, 3000.000]	Weighted average flow velocity (km/s), phi component, in Saturn centered spherical coordinates. Fill is -9999.999
Ave V_θ	Real	9	[-3000.000, 3000.000]	Weighted average flow velocity (km/s), theta component, in Saturn centered spherical coordinates. Fill is -9999.999
Average Flow Speed	Real	9	[0, 3000.000]	Weighted average flow speed. Fill is -9999.999.
Quality_Flag	Integer	2	[0, 2]	Value: meaning 0: Not-bad; corotation direction is in the Field of View (FOV) 1: Not-bad; corotation direction not in FOV 2: Bad (the spacecraft is rolling and/or CAPS is not actuating)

5.4. CAPS Standard CALIBRATED Data Product Descriptions

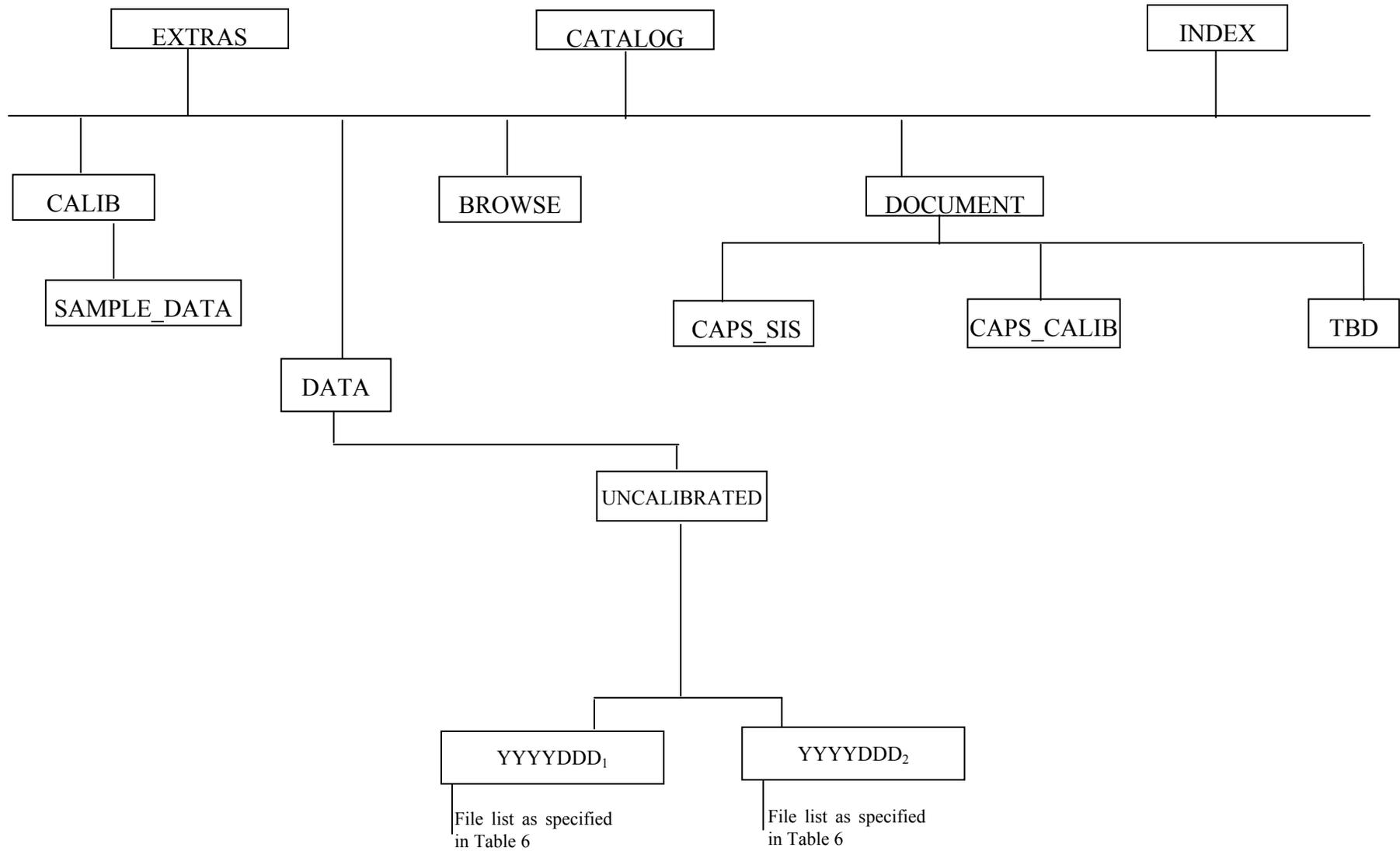
The following section will describe the content and structure of each of the standard data products within the CALIBRATED level 3 CAPS data set. The format of the calibrated data set is currently TBD.

6. Support Staff and Cognizant Persons

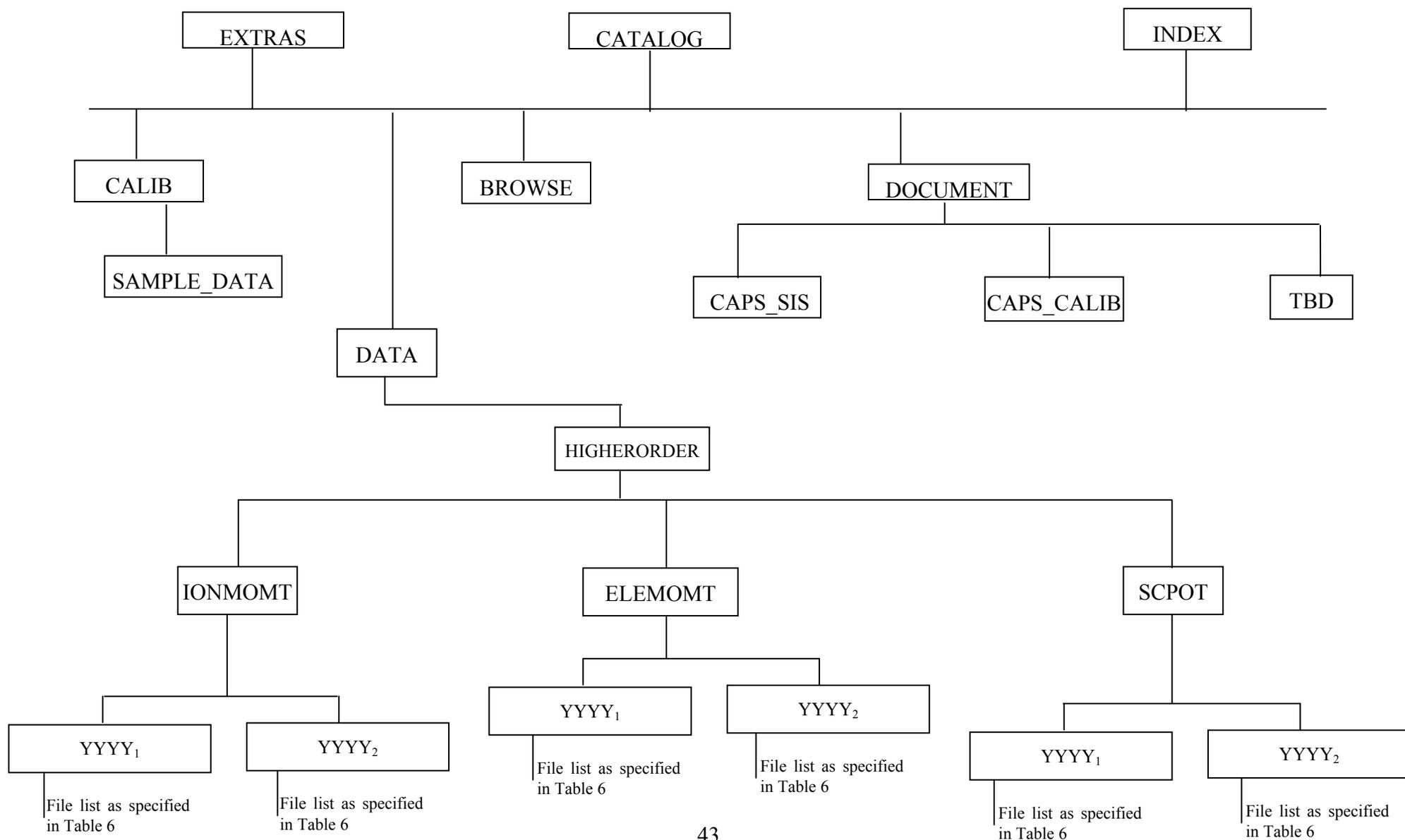
Table 32: CAPS Archive Collection Support Staff

<i>CAPS Team</i>			
Judith D Furman	Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228	210-522-6040	jfurman@swri.edu
Frank Crary	University of Colorado at Boulder Laboratory for Atmospheric and Space Science, Boulder, CO	303-735-2120	frank.crary@lasp.colorado.edu
Rob Wilson	University of Colorado at Boulder Laboratory for Atmospheric and Space Science, Boulder, CO	303-492-5476	rob.wilson@lasp.colorado.edu
Michelle Thomsen	Los Alamos National Laboratory Los Alamos, NM 87545	505-667-1210	mthomsen@lanl.gov
UCLA			
Mr. Steven P. Joy PPI Operations Manager	UCLA-IGPP 405 Hilgard Ave Los Angeles, CA 90095-1567	310-825-3506	sjoy@igpp.ucla.edu

Appendix A. Directory Structure for Archive Volume, COCAPS_1nnn



Directory Structure for Archive Volume, COCAPS_5mm



Appendix B. PDS Labels & Format Files for Standard UNCALIBRATED Data Products

ELS_U3.FMT File

```

/* ELS_U3.FMT */
/* Description of the electron spectrometer data table */
OBJECT      = COLUMN
  NAME      = B_CYCLE_NUMBER
  DATA_TYPE = MSB_UNSIGNED_INTEGER
  START_BYTE = 1
  BYTES     = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 340
  MISSING_CONSTANT = 65535
  DESCRIPTION = "B cycle number from the start of the day,
                a value of 65535 indicates no B-cycle data
                is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME      = A_CYCLE_NUMBER
  DATA_TYPE = MSB_UNSIGNED_INTEGER
  START_BYTE = 3
  BYTES     = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 2732
  MISSING_CONSTANT = 65535
  DESCRIPTION = "A cycle number from the start of day"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME      = TIME
  DATA_TYPE = IEEE_REAL
  START_BYTE = 5
  BYTES     = 8
  VALID_MINIMUM = -7.1x10^7
  VALID_MAXIMUM = 1.5x10^9
  MISSING_CONSTANT = 10x10^9
  UNIT      = SECOND
  DESCRIPTION = "Start time of the A cycle, seconds from J2000
                (barycentric dynamic time). An A-cycle is the
                32 second instrument collection cycle."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME      = TELEMETRY_MODE
  DATA_TYPE = MSB_UNSIGNED_INTEGER
  START_BYTE = 13
  BYTES     = 1
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 136
  MISSING_CONSTANT = 255
  DESCRIPTION = "Logical telemetry rate and mode:
                1 = 250 bps
                2 = 500 bps
                4 = 1 kbps
                8 = 2 kbps
                16 = 4 kbps
                32 = 8 kbps
                64 = 16 kbps
                130 = 500 bps solar wind
                132 = 1 kbps solar wind"

```

```

136 = 2 kbps solar wind"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = COLLAPSE_FLAG
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 14
BYTES           = 1
VALID_MINIMUM   = 1
VALID_MAXIMUM   = 131
MISSING_CONSTANT = 255
DESCRIPTION     = "Flag indicating how data is collapsed:
0: average
1: sum
2: average with in-flight deadtime correction
3: sum with in-flight deadtime correction
4: snapshot portion
NOTE: For snapshot, full collapse information is
gained by adding 4 (so snapshot portion can be
4, 5, 6, or 7 depending upon the collapse.
The upper bit will be set to 1 when
housekeeping is missing."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = OFFSET_TIME
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 15
BYTES           = 2
VALID_MINIMUM   = 0
VALID_MAXIMUM   = 32000
MISSING_CONSTANT = 65535
UNIT            = MILLISECOND
DESCRIPTION     = "Milliseconds from start of A cycle"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = FIRST_ENERGY_STEP
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 17
BYTES           = 2
VALID_MINIMUM   = 1
VALID_MAXIMUM   = 63
MISSING_CONSTANT = 65535
DESCRIPTION     = "Minimum energy step in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = LAST_ENERGY_STEP
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 19
BYTES           = 2
VALID_MINIMUM   = 1
VALID_MAXIMUM   = 63
MISSING_CONSTANT = 65535
DESCRIPTION     = "Maximum energy step in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = FIRST_AZIMUTH_VALUE
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 21
BYTES           = 2
VALID_MINIMUM   = 1

```

```
VALID_MAXIMUM = 16
MISSING_CONSTANT = 65535
DESCRIPTION = "Minimum azimuth value in collapsed data"
END_OBJECT = COLUMN
```

```
OBJECT = COLUMN
NAME = LAST_AZIMUTH_VALUE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 23
BYTES = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 16
MISSING_CONSTANT = 65535
DESCRIPTION = "Maximum azimuth value in collapsed data"
END_OBJECT = COLUMN
```

```
OBJECT = COLUMN
NAME = DATA
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 25
UNIT = COUNTS
ITEMS = 8
ITEM_BYTES = 2
BYTES = 16
MISSING_CONSTANT = 65535
VALID_MINIMUM = 0
VALID_MAXIMUM = 65504
DESCRIPTION = "Counts in elevations 1 through 8"
END_OBJECT = COLUMN
```

Sample ELS Label File: ELS_YYYYDDDHH_U3.LBL

```
PDS_VERSION_ID = PDS3
DATA_SET_ID = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"
```

```
STANDARD_DATA_PRODUCT_ID = "ELS UNCALIBRATED"
PRODUCT_ID = "ELS_201001000_U3"
PRODUCT_TYPE = "DATA"
PRODUCT_CREATION_TIME = 2010-141T20:48
```

```
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 40
FILE_RECORDS = 113664
```

```
START_TIME = 2010-010T00:08:07
STOP_TIME = 2010-010T06:05:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1641797381.000"
```

```
INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID = "CO"
TARGET_NAME = {"SATURN"}
INSTRUMENT_NAME = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID = "CAPS"
DESCRIPTION = "
```

```
  This file contains Cassini CAPS data from the ELS sensor
  acquired at SATURN between
  2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."
```

```
MD5_CHECKSUM = "94d3f6a361ea4712658758b776aac2ca"
```

```

NOTE          = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0x5A20"

^TABLE        = "ELS_201001000_U3.DAT"
OBJECT        = TABLE
INTERCHANGE_FORMAT = "BINARY"
ROWS          = 113664
COLUMNS      = 11
ROW_BYTES     = 40
^STRUCTURE    = "ELS_U3.FMT"
DESCRIPTION    = "
    The file ELS_U3.FMT describes the column structure and content
    of the data file."
END_OBJECT    = TABLE
END

```

IBS_U3.FMT File

```

/* IBS_U3.FMT */
/* describes the structure of the IBS Data Table*/
OBJECT        = COLUMN
NAME          = B_CYCLE_NUMBER
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 1
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 340
MISSING_CONSTANT = 65535
DESCRIPTION    = "B cycle number from the start of the day,
    a value of 65535 indicates no B-cycle data
    is available"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = A_CYCLE_NUMBER
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 3
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION    = "A cycle number from the start of day"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = TIME
DATA_TYPE     = IEEE_REAL
START_BYTE    = 5
BYTES         = 8
UNIT          = SECOND
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9
DESCRIPTION    = "Start time of the A cycle, seconds from J2000
    (barycentric dynamic time). An A-cycle is the
    32 second instrument collection cycle."
END_OBJECT    = COLUMN

```

OBJECT = COLUMN
 NAME = TELEMETRY_MODE
 DATA_TYPE = MSB_UNSIGNED_INTEGER
 START_BYTE = 13
 BYTES = 1
 VALID_MINIMUM = 1
 VALID_MAXIMUM = 136
 MISSING_CONSTANT = 255
 DESCRIPTION = "Logical telemetry rate and mode:
 1 = 250 bps
 2 = 500 bps
 4 = 1 kbps
 8 = 2 kbps
 16 = 4 kbps
 32 = 8 kbps
 64 = 16 kbps
 130 = 500 bps solar wind
 132 = 1 kbps solar wind
 136 = 2 kbps solar wind"
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = IBS_MODE_SUBMODE
 DATA_TYPE = MSB_UNSIGNED_INTEGER
 START_BYTE = 14
 BYTES = 1
 VALID_MINIMUM = 0
 VALID_MAXIMUM = 254
 MISSING_CONSTANT = 255
 DESCRIPTION = "IBS mode and submode flag:
 0 = Standard Sweep Collapse
 1 = Standard Sweep Snapshot
 2 = Solar Wind Search
 3 = Solar Wind Track
 4 = Magnetosphere Search
 5 = Magnetosphere Survey
 6 = Calibration Mode
 7-254 = spare
 255 = Fill"
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = OFFSET_TIME
 DATA_TYPE = MSB_UNSIGNED_INTEGER
 START_BYTE = 15
 BYTES = 4
 UNIT = MILLISECOND
 VALID_MINIMUM = 0
 VALID_MAXIMUM = 256000
 MISSING_CONSTANT = 400000
 DESCRIPTION = "Milliseconds from start of the IBS collection cycle.
 An IBS data product is constructed from 16 to 128
 azimuths of data, with each azimuth representing 2
 seconds of instrument data collection."
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = FIRST_ENERGY_STEP
 DATA_TYPE = MSB_UNSIGNED_INTEGER
 START_BYTE = 19
 BYTES = 2
 VALID_MINIMUM = 1
 VALID_MAXIMUM = 852
 MISSING_CONSTANT = 65535

```

DESCRIPTION    = "Minimum energy step in collapsed data.
                This is an index into the energy table."
END_OBJECT     = COLUMN

OBJECT         = COLUMN
NAME           = LAST_ENERGY_STEP
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 21
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 852
MISSING_CONSTANT = 65535
DESCRIPTION    = "Maximum energy step in collapsed data
                This is an index into the energy table."
END_OBJECT     = COLUMN

OBJECT         = COLUMN
NAME           = FIRST_AZIMUTH_VALUE
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 23
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 128
MISSING_CONSTANT = 65535
DESCRIPTION    = "Minimum azimuth value in collapsed data"
END_OBJECT     = COLUMN

OBJECT         = COLUMN
NAME           = LAST_AZIMUTH_VALUE
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 25
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 128
MISSING_CONSTANT = 65535
DESCRIPTION    = "Maximum azimuth value in collapsed data"
END_OBJECT     = COLUMN

OBJECT         = COLUMN
NAME           = DATA
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 27
UNIT          = COUNTS
ITEMS         = 3
ITEM_BYTES    = 2
BYTES         = 6
VALID_MINIMUM = 1
VALID_MAXIMUM = 65504
MISSING_CONSTANT = 65535
DESCRIPTION    = "Counts in fans 1 through 3"
END_OBJECT     = COLUMN

```

Sample IBS Label File: IBS_YYYYDDDDHH_U3.LBL

```

PDS_VERSION_ID = PDS3
DATA_SET_ID    = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"

STANDARD_DATA_PRODUCT_ID = "IBS UNCALIBRATED"
PRODUCT_ID         = "IBS_201001000_U3"
PRODUCT_TYPE       = "DATA"
PRODUCT_CREATION_TIME = 2010-141T20:48

```

```

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 32
FILE_RECORDS         = 224145

START_TIME           = 2010-010T00:08:07
STOP_TIME            = 2010-010T05:57:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/1641796901.000"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID   = "CO"
TARGET_NAME          = {"SATURN"}
INSTRUMENT_NAME      = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID        = "CAPS"
DESCRIPTION           = "
    This file contains Cassini CAPS data from the IBS sensor
    acquired at SATURN between
    2010-010T00:08:07.000 and 2010-010T05:57:59.000 (orbit 124)."
```

```

MD5_CHECKSUM         = "d009ac30bdfda29b1d361fd4937ea863"

NOTE                  = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0x2A46"

^TABLE                = "IBS_201001000_U3.DAT"
OBJECT                = TABLE
INTERCHANGE_FORMAT    = "BINARY"
ROWS                  = 224145
COLUMNS              = 11
ROW_BYTES             = 32
^STRUCTURE            = "IBS_U3.FMT"
DESCRIPTION           = "
    The file IBS_U3.FMT describes the column structure and content
    of the data file."
END_OBJECT            = TABLE
END
```

ION_U3.FMT File

```

/* ION_U3.FMT */
/* describes the structure of the IMS ION Data Table*/
OBJECT          = COLUMN
  NAME          = B_CYCLE_NUMBER
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 1
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 340
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "B cycle number from the start of the day,
    a value of 65535 indicates no B-cycle data
    is available"
END_OBJECT      = COLUMN
```

```

OBJECT      = COLUMN
NAME        = A_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 3
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION = "A cycle number from the start of day,
              a value of 65535 indicates that no A-cycle
              header information is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = TIME
DATA_TYPE   = IEEE_REAL
START_BYTE  = 5
BYTES       = 8
UNIT        = SECOND
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9
DESCRIPTION = "Start time of the A cycle, seconds from J2000
              (barycentric dynamic time). An A-cycle is the
              32 second instrument collection cycle."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = TELEMETRY_MODE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 13
BYTES       = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 136
MISSING_CONSTANT = 255
DESCRIPTION = "Logical telemetry rate and mode:
1 = 250 bps
2 = 500 bps
4 = 1 kbps
8 = 2 kbps
16 = 4 kbps
32 = 8 kbps
64 = 16 kbps
130 = 500 bps solar wind
132 = 1 kbps solar wind
136 = 2 kbps solar wind"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = SPARE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 14
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 0
MISSING_CONSTANT = 0
DESCRIPTION = "Will contains zeroes"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = OFFSET_TIME
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 15
BYTES       = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 32000
MISSING_CONSTANT = 65535
UNIT        = MILLISECOND
DESCRIPTION  = "Milliseconds from start of A cycle"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = FIRST_ENERGY_STEP
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 17
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 63
MISSING_CONSTANT = 65535
DESCRIPTION  = "Minimum energy step in collapsed data"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = LAST_ENERGY_STEP
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 19
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 63
MISSING_CONSTANT = 65535
DESCRIPTION  = "Maximum energy step in collapsed data"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = FIRST_AZIMUTH_VALUE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 21
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 8
MISSING_CONSTANT = 65535
DESCRIPTION  = "Minimum azimuth value in collapsed data"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = LAST_AZIMUTH_VALUE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 23
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 8
MISSING_CONSTANT = 65535
DESCRIPTION  = "Maximum azimuth value in collapsed data"
END_OBJECT  = COLUMN

OBJECT      = COLUMN

```

```

NAME          = SAM_ION_NUMBER
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 25
BYTES         = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 65535
DESCRIPTION   = "SAM ion number (identifies ion and group
                table)"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = DATA
DATA_TYPE     = MSB_INTEGER
START_BYTE    = 27
UNIT          = COUNTS
ITEMS         = 8
ITEM_BYTES    = 2
BYTES         = 16
VALID_MINIMUM = -32
VALID_MAXIMUM = 27650
MISSING_CONSTANT = 28671
DESCRIPTION   = "Counts in elevations 1 through 8 (signed
                value)"
END_OBJECT    = COLUMN

```

Sample IMS ION Label File: ION_YYYYDDDHH_U3.LBL

```

PDS_VERSION_ID = PDS3
DATA_SET_ID     = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"

STANDARD_DATA_PRODUCT_ID = "ION UNCALIBRATED"
PRODUCT_ID         = "ION_201001000_U3"
PRODUCT_TYPE       = "DATA"
PRODUCT_CREATION_TIME = 2010-141T20:49

RECORD_TYPE       = FIXED_LENGTH
RECORD_BYTES      = 42
FILE_RECORDS      = 42336

START_TIME        = 2010-010T00:08:07
STOP_TIME         = 2010-010T06:05:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/1641797381.000"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID   = "CO"
TARGET_NAME          = {"SATURN"}
INSTRUMENT_NAME      = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID        = "CAPS"
DESCRIPTION           = "
    This file contains Cassini CAPS Ion data from the IMS sensor
    acquired at SATURN between
    2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."

MD5_CHECKSUM        = "c91403bfde0888687e420949f56e2a30"

```

```

NOTE          = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0x7DAC"

^TABLE        = "ION_201001000_U3.DAT"
OBJECT        = TABLE
INTERCHANGE_FORMAT = "BINARY"
ROWS          = 42336
COLUMNS      = 12
ROW_BYTES     = 42
^STRUCTURE    = "ION_U3.FMT"
DESCRIPTION   = "
    The file ION_U3.FMT describes the column structure and content
    of the data file."
END_OBJECT    = TABLE
END

```

SNG_U3.FMT File

```

/* SNG_U3.FMT */
/* describes the structure of the IMS Singles (SNG) Data Table*/
OBJECT      = COLUMN
NAME        = B_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 1
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 340
MISSING_CONSTANT = 65535
DESCRIPTION = "B cycle number from the start of the day,
              a value of 65535 indicates no B-cycle data
              is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = A_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 3
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION = "A cycle number from the start of day,
              a value of 65535 indicates that no A-cycle
              header information is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = TIME
DATA_TYPE   = IEEE_REAL
START_BYTE  = 5
BYTES       = 8
UNIT        = SECOND
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9

```

DESCRIPTION = "Start time of the A cycle, seconds from J2000
(barycentric dynamic time). An A-cycle is the
32 second instrument collection cycle."

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = TELEMETRY_MODE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 13
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 136
MISSING_CONSTANT = 255

DESCRIPTION = "Logical telemetry rate and mode:

1 = 250 bps
2 = 500 bps
4 = 1 kbps
8 = 2 kbps
16 = 4 kbps
32 = 8 kbps
64 = 16 kbps
130 = 500 bps solar wind
132 = 1 kbps solar wind
136 = 2 kbps solar wind"

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SPARE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 14
BYTES = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 0
MISSING_CONSTANT = 0

DESCRIPTION = "Contains zeroes"

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = OFFSET_TIME
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 15
BYTES = 2
UNIT = MILLISECOND
VALID_MINIMUM = 1
VALID_MAXIMUM = 32000
MISSING_CONSTANT = 65535

DESCRIPTION = "Milliseconds from start of A cycle"

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = FIRST_ENERGY_STEP
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 17
BYTES = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 63
MISSING_CONSTANT = 65535

DESCRIPTION = "Minimum energy step in collapsed data"

```

END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = LAST_ENERGY_STEP
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 19
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 63
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "Maximum energy step in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = FIRST_AZIMUTH_VALUE
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 21
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 8
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "Minimum azimuth value in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = LAST_AZIMUTH_VALUE
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 23
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 8
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "Maximum azimuth value in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = DATA
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 25
  UNIT          = COUNTS
  ITEMS         = 8
  ITEM_BYTES    = 2
  BYTES         = 16
  MISSING_CONSTANT = 65535
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 27500
  DESCRIPTION   = "Counts in elevations 1 through 8"
END_OBJECT      = COLUMN

```

Sample IMS Singles (SNG) Label File: SNG_YYYYDDDDHH_U3.LBL

PDS_VERSION_ID = PDS3
 DATA_SET_ID = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"

STANDARD_DATA_PRODUCT_ID = "SNG UNCALIBRATED"
 PRODUCT_ID = "SNG_201001000_U3"
 PRODUCT_TYPE = "DATA"
 PRODUCT_CREATION_TIME = 2010-141T20:49

RECORD_TYPE = FIXED_LENGTH
 RECORD_BYTES = 40
 FILE_RECORDS = 42273

START_TIME = 2010-010T00:08:07
 STOP_TIME = 2010-010T06:05:59
 SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
 SPACECRAFT_CLOCK_STOP_COUNT = "1/1641797381.000"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
 INSTRUMENT_HOST_ID = "CO"
 TARGET_NAME = {"SATURN"}
 INSTRUMENT_NAME = "CASSINI PLASMA SPECTROMETER"
 INSTRUMENT_ID = "CAPS"
 DESCRIPTION = "

This file contains Cassini CAPS Singles data from the IMS sensor
 acquired at SATURN between
 2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."

MD5_CHECKSUM = "df02aa1879e3237b51ef412f960d05b5"

NOTE = "
 The end around carry checksum, with seed 0x55AA,
 of this file is 0xA5FA"

^TABLE = "SNG_201001000_U3.DAT"
 OBJECT = TABLE
 INTERCHANGE_FORMAT = "BINARY"
 ROWS = 42273
 COLUMNS = 11
 ROW_BYTES = 40
 ^STRUCTURE = "SNG_U3.FMT"
 DESCRIPTION = "

The file SNG_U3.FMT describes the column structure and content
 of the data file."

END_OBJECT = TABLE
 END

LOG_U3.FMT File

```
/* LOG_U3.FMT */
```

```
/* describes the structure of the IMS Logicals (LOG) Data Table*/
```

```
OBJECT      = COLUMN
NAME        = B_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 1
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 340
MISSING_CONSTANT = 65535
DESCRIPTION = "B cycle number from the start of the day,
              a value of 65535 indicates no B-cycle data
              is available"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = A_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 3
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION = "A cycle number from the start of day,
              a value of 65535 indicates that no A-cycle
              header information is available"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = TIME
DATA_TYPE   = IEEE_REAL
START_BYTE  = 5
BYTES       = 8
UNIT        = SECOND
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9
DESCRIPTION = "Start time of the A cycle, seconds from J2000
              (barycentric dynamic time). An A-cycle is the
              32 second instrument collection cycle."
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = TELEMETRY_MODE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 13
BYTES       = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 136
MISSING_CONSTANT = 255
DESCRIPTION = "Logical telemetry rate and mode:
              1 = 250 bps
              2 = 500 bps"
```

```

4 = 1 kbps
8 = 2 kbps
16 = 4 kbps
32 = 8 kbps
64 = 16 kbps
130 = 500 bps solar wind
132 = 1 kbps solar wind
136 = 2 kbps solar wind"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = TDC_LOG_SELECTION
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 14
BYTES         = 1
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 3
MISSING_CONSTANT = 255
DESCRIPTION    = "TDC selectable logical definition, where
Value: Logical 13:      Logical 14:
0  Start CFD singles   Stop CFD Singles
1  Acquisition Errors  Deadtimes
2  Single TOF events   Double TOF events
3  Data strobes        Resets"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = OFFSET_TIME
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 15
BYTES         = 2
VALID_MINIMUM  = 1
VALID_MAXIMUM  = 32000
MISSING_CONSTANT = 65535
UNIT           = MILLISECOND
DESCRIPTION    = "Milliseconds from start of A cycle"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = FIRST_ENERGY_STEP
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 17
BYTES         = 2
VALID_MINIMUM  = 1
VALID_MAXIMUM  = 63
MISSING_CONSTANT = 65535
DESCRIPTION    = "Minimum energy step in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = LAST_ENERGY_STEP
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 19
BYTES         = 2
VALID_MINIMUM  = 1
VALID_MAXIMUM  = 63
MISSING_CONSTANT = 65535
DESCRIPTION    = "Maximum energy step in collapsed data"

```

```

END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = FIRST_AZIMUTH_VALUE
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 21
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 8
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "Minimum azimuth value in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = LAST_AZIMUTH_VALUE
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 23
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 8
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "Maximum azimuth value in collapsed data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = LEF_STOPS
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 25
  UNIT          = COUNTS
  BYTES         = 2
  MISSING_CONSTANT = 65535
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 27500
  DESCRIPTION   = "LEF stop counts"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = ST_STOPS
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 27
  UNIT          = COUNTS
  BYTES         = 2
  MISSING_CONSTANT = 65535
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 27500
  DESCRIPTION   = "ST stop counts"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = TIMEOUTS
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 29
  UNIT          = COUNTS
  BYTES         = 2
  MISSING_CONSTANT = 65535
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 27500
  DESCRIPTION   = "Timeout events"

```

```

END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = TOTAL_EVENTS
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 31
UNIT           = COUNTS
BYTES          = 2
MISSING_CONSTANT = 65535
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 27500
DESCRIPTION    = "Total events (generated by SAM for dead time)"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = LOGICAL_13
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 33
UNIT           = COUNTS
BYTES          = 2
MISSING_CONSTANT = 65535
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 27500
DESCRIPTION    = "TDC selectable logical 13, see variable,
                  TDC_LOG_SELECTION to determine which logical
                  is represented in the data."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = LOGICAL_14
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 35
UNIT           = COUNTS
BYTES          = 2
MISSING_CONSTANT = 65535
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 27500
DESCRIPTION    = "TDC selectable logical 14, see variable,
                  TDC_LOG_SELECTION to determine which logical
                  is represented in the data."
END_OBJECT      = COLUMN

```

Sample IMS Logicals (LOG) Label File: LOG_YYYYDDDHH_U3.LBL	
PDS_VERSION_ID	= PDS3
DATA_SET_ID	= "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"
STANDARD_DATA_PRODUCT_ID	= "LOG UNCALIBRATED"
PRODUCT_ID	= "LOG_201001000_U3"
PRODUCT_TYPE	= "DATA"
PRODUCT_CREATION_TIME	= 2010-141T20:49
RECORD_TYPE	= FIXED_LENGTH
RECORD_BYTES	= 36
FILE_RECORDS	= 141057

```

START_TIME          = 2010-010T00:08:07
STOP_TIME           = 2010-010T06:05:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/1641797381.000"

INSTRUMENT_HOST_NAME    = "CASSINI ORBITER"
INSTRUMENT_HOST_ID     = "CO"
TARGET_NAME             = {"SATURN"}
INSTRUMENT_NAME        = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID          = "CAPS"
DESCRIPTION             = "
    This file contains Cassini CAPS Logicals data from the IMS sensor
    acquired at SATURN between
    2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."

MD5_CHECKSUM          = "c5074119ad07eb2d59c77daf3e1681c8"

NOTE                  = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0x0571"

^TABLE                = "LOG_201001000_U3.DAT"
OBJECT                = TABLE
INTERCHANGE_FORMAT    = "BINARY"
ROWS                  = 141057
COLUMNS              = 16
ROW_BYTES             = 36
^STRUCTURE            = "LOG_U3.FMT"
DESCRIPTION            = "
    The file LOG_U3.FMT describes the column structure and content
    of the data file."
END_OBJECT            = TABLE
END

```

TOF_U3.FMT File

```

/* TOF_U3.FMT */
/* describes the structure of the IMS TOF Data Table*/
OBJECT          = COLUMN
  NAME          = B_CYCLE_NUMBER
  DATA_TYPE    = MSB_UNSIGNED_INTEGER
  START_BYTE    = 1
  BYTES         = 2
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 340
  MISSING_CONSTANT = 65535
  DESCRIPTION   = "B cycle number from the start of the day,
    a value of 65535 indicates that there is
    a problem with archive generation"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = TIME
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 3
  BYTES         = 8

```

VALID_MINIMUM = -7.1x10⁷
VALID_MAXIMUM = 1.5x10⁹
MISSING_CONSTANT = 10x10⁹
UNIT = SECOND
DESCRIPTION = "Start time of the B cycle, seconds from J2000
(barycentric dynamic time). A B-cycle is the
collection cycle of the Time of Flight data.
The duration of the collection cycle is dependant
upon the flight software version. A collection
is 256 seconds, 512 seconds, or 1024 seconds.
During each 32 second instrument cycle, data is
transmitted and then recombined on the ground.
For more information, please see the
CO_CAPS_UNCALIBRATED_DS.CAT in the CATALOG
directory."

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = TELEMETRY_MODE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 11
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 136
MISSING_CONSTANT = 255
DESCRIPTION = "Logical telemetry rate and mode:
Telemetry mode when data was downlinked. Gives
information regarding how data is currently
collapsed.
1 = 250 bps
2 = 500 bps
4 = 1 kbps
8 = 2 kbps
16 = 4 kbps
32 = 8 kbps
64 = 16 kbps
130 = 500 bps solar wind
132 = 1 kbps solar wind
136 = 2 kbps solar wind"

END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = COLLAPSE_FLAG
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 12
BYTES = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 1
MISSING_CONSTANT = 255
DESCRIPTION = "Flag indicating collapse in TOF:
0: average, 256s Bcycle duration
1: sum, 256s Bcycle duration
2: average, 512s Bcycle duration
3: sum, 512s Bcycle duration
4: average, 1024s Bcycle duration
5: sum, 1024s Bcycle duration"

END_OBJECT = COLUMN

```

OBJECT      = COLUMN
NAME        = ST_START_CHANNEL
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 13
BYTES       = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 1535
MISSING_CONSTANT = 2047
DESCRIPTION = "Start ST TOF Channel. NOTE: There are a total
              of 2048 channels in flight."
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = ST_INTERVAL
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 15
BYTES       = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 4
MISSING_CONSTANT = 0
DESCRIPTION = "ST TOF bin interval:
              0 = FILL value implying housekeeping information
                is unavailable. Check previous of following
                Becycle for this information.
              1 = every word taken starting at the
                ST_START_CHANNEL
              2 = every other word is taken starting at the
                ST_START_CHANNEL
              4 = every 4th word is taken starting at the
                ST_START_CHANNEL"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = ST_ENERGY_COLLAPSE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 16
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 3
MISSING_CONSTANT = 255
DESCRIPTION = "ST energy collapse option:
              0 = sum adjacent energies
              1 = take even energies
              2 = take odd energies
              3 = TBA (to be assigned)"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = LEF_START_CHANNEL
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 17
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 1535
MISSING_CONSTANT = 2047
DESCRIPTION = "Start LEF TOF Channel. NOTE: There are a total
              of 2048 channels in flight."
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = LEF_INTERVAL
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 19
BYTES       = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 4
MISSING_CONSTANT = 0
DESCRIPTION = "LEF TOF bin interval:
                0 = FILL value implying housekeeping information
                  is unavailable. Check previous of following
                  Bicycle for this information.
                1 = every word taken starting at the
                  LEF_START_CHANNEL
                2 = every other word is taken starting at the
                  LEF_START_CHANNEL
                4 = every 4th word is taken starting at the
                  LEF_START_CHANNEL"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = LEF_ENERGY_COLLAPSE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 20
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 3
MISSING_CONSTANT = 255
DESCRIPTION = "LEF energy collapse option:
                0 = sum adjacent energies
                1 = take even energies
                2 = take odd energies
                3 = TBA (to be assigned)"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = ENERGY_STEP
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 21
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 32
MISSING_CONSTANT = 65535
DESCRIPTION = "Energy step in collapsed data"
END_OBJECT  = COLUMN

```

```

OBJECT      = COLUMN
NAME        = DATA_ST
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 23
ITEMS       = 512
ITEM_BYTES  = 4
BYTES       = 2048
VALID_MINIMUM = 0
VALID_MAXIMUM = 3268027
MISSING_CONSTANT = 4294967295
UNIT        = COUNTS

```

```

DESCRIPTION = "Counts in ST TOF bins 1 through 512"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME       = DATA_LEF
DATA_TYPE  = MSB_UNSIGNED_INTEGER
START_BYTE = 2071
ITEMS      = 512
ITEM_BYTES = 4
BYTES      = 2048
VALID_MINIMUM = 0
VALID_MAXIMUM = 3268027
MISSING_CONSTANT = 4294967295
UNIT       = COUNTS
DESCRIPTION = "Counts in LEF TOF bins 1 through 512"
END_OBJECT  = COLUMN

```

```

Sample IMS TOF Label File: TOF_YYYYDDDDHH_U3.LBL

PDS_VERSION_ID = PDS3
DATA_SET_ID    = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"

STANDARD_DATA_PRODUCT_ID = "TOF UNCALIBRATED"
PRODUCT_ID            = "TOF_201001000_U3"
PRODUCT_TYPE          = "DATA"
PRODUCT_CREATION_TIME = 2010-141T20:49

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 4118
FILE_RECORDS         = 448

START_TIME           = 2010-010T00:25:10
STOP_TIME            = 2010-010T05:57:58
SPACECRAFT_CLOCK_START_COUNT = "1/1641776932.000"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1641796900.000"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID   = "CO"
TARGET_NAME           = {"SATURN"}
INSTRUMENT_NAME       = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID         = "CAPS"
DESCRIPTION            = "
    This file contains Cassini CAPS Time of Flight data from the IMS sensor
    acquired at SATURN between
    2010-010T00:25:10.000 and 2010-010T05:57:58.000 (orbit 124)."
```

```

MD5_CHECKSUM        = "d4016b866ca45e497c893392fe6261c8"

NOTE                = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0xEE70"

^TABLE              = "TOF_201001000_U3.DAT"
OBJECT              = TABLE
INTERCHANGE_FORMAT  = "BINARY"
ROWS                = 448

```

```

COLUMNS          = 13
ROW_BYTES         = 4118
^STRUCTURE        = "TOF_U3.FMT"
DESCRIPTION        = "
    The file TOF_U3.FMT describes the column structure and content
    of the data file."
END_OBJECT        = TABLE
END

```

ACT_3.FMT File

```

/* ACT_3.FMT */
/* describes the structure of the Actuator Data Table*/
OBJECT            = COLUMN
  NAME            = B_CYCLE_NUMBER
  DATA_TYPE      = MSB_UNSIGNED_INTEGER
  START_BYTE      = 1
  BYTES           = 2
  VALID_MINIMUM   = 1
  VALID_MAXIMUM   = 340
  MISSING_CONSTANT = 65535
  DESCRIPTION      = "B cycle number from the start of the day,
    a value of 65535 indicates no B-cycle data
    is available"
END_OBJECT        = COLUMN

OBJECT            = COLUMN
  NAME            = A_CYCLE_NUMBER
  DATA_TYPE      = MSB_UNSIGNED_INTEGER
  START_BYTE      = 3
  BYTES           = 2
  VALID_MINIMUM   = 1
  VALID_MAXIMUM   = 2372
  MISSING_CONSTANT = 65535
  DESCRIPTION      = "A cycle number from the start of day"
END_OBJECT        = COLUMN

OBJECT            = COLUMN
  NAME            = TIME
  DATA_TYPE      = IEEE_REAL
  START_BYTE      = 5
  BYTES           = 8
  VALID_MINIMUM   = -7.1x10^7
  VALID_MAXIMUM   = 1.5x10^9
  MISSING_CONSTANT = 10x10^9
  UNIT            = SECOND
  DESCRIPTION      = "Start time of the A cycle, seconds from J2000
    (barycentric dynamic time). An A-cycle is the
    32 second instrument collection cycle"
END_OBJECT        = COLUMN

OBJECT            = COLUMN
  NAME            = DATA
  DATA_TYPE      = IEEE_REAL
  START_BYTE      = 13
  UNIT            = ANGLE
  ITEMS           = 32
  ITEM_BYTES      = 4
  BYTES           = 128
  MISSING_CONSTANT = -999

```

```

VALID_MINIMUM   = -115
VALID_MAXIMUM   = 115
DESCRIPTION     = "Actuator angle at start + (item #) seconds,
                 where item # is between 0 and 31.
                 TIME"
END_OBJECT      = COLUMN

```

Sample Actuator (ACT) Label File: ACT_YYYYDDDHH_3.LBL

```

PDS_VERSION_ID   = PDS3
DATA_SET_ID      = {"CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1",
                   "CO-E/J/S/SW-CAPS-3-CALIBRATED-V1.1"}
STANDARD_DATA_PRODUCT_ID = "ACT"
PRODUCT_ID       = "ACT_201001000_3"
PRODUCT_TYPE     = "DATA"
PRODUCT_CREATION_TIME = 2010-141T20:48

RECORD_TYPE      = FIXED_LENGTH
RECORD_BYTES     = 140
FILE_RECORDS     = 671

START_TIME       = 2010-010T00:08:07
STOP_TIME        = 2010-010T06:05:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/1641797381.000"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID   = "CO"
TARGET_NAME          = {"SATURN"}
INSTRUMENT_NAME      = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID        = "CAPS"
DESCRIPTION           = "
  This file contains Cassini CAPS actuator data
  acquired at SATURN between
  2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."

MD5_CHECKSUM       = "b0d1329c7a43c48fd3b1fb32ff411264"

NOTE               = "
  The end around carry checksum, with seed 0x55AA,
  of this file is 0x2E7E"

^TABLE             = "ACT_201001000_3.DAT"
OBJECT             = TABLE
INTERCHANGE_FORMAT = "BINARY"
ROWS              = 671
COLUMNS          = 4
ROW_BYTES         = 140
^STRUCTURE        = "ACT_3.FMT"
DESCRIPTION        = "
  The file ACT_3.FMT describes the column structure and content
  of the data file."
END_OBJECT         = TABLE
END

```

EVN_U3.FMT File

```

/* EVN_U3.FMT */
/* describes the structure of the Event Mode Data Table*/
OBJECT      = COLUMN
NAME        = B_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
FORMAT      = I2
START_BYTE  = 1
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 340
MISSING_CONSTANT = 65535
DESCRIPTION = "B cycle number from the start of the day,
              a value of 65535 indicates no B-cycle data
              is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = A_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
FORMAT      = I2
START_BYTE  = 3
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION = "A cycle number from the start of day,
              a value of 65535 indicates that no A-cycle
              header information is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = TIME
DATA_TYPE   = IEEE_REAL
FORMAT      = F8
START_BYTE  = 5
BYTES       = 8
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9
UNIT        = SECOND
DESCRIPTION = "Start time of the A cycle, seconds from J2000
              (barycentric dynamic time). An A-cycle is the
              32 second instrument collection cycle."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = OFFSET_TIME
DATA_TYPE   = MSB_UNSIGNED_INTEGER
FORMAT      = I2
START_BYTE  = 13
BYTES       = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 32000
MISSING_CONSTANT = 65535
UNIT        = MILLISECOND

```

DESCRIPTION = "Milliseconds from start of A cycle"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = ENERGY_STEP
DATA_TYPE = MSB_UNSIGNED_INTEGER
FORMAT = I2
START_BYTE = 15
BYTES = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 63
MISSING_CONSTANT = 65535
DESCRIPTION = "Energy step"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = AZIMUTH_VALUE
DATA_TYPE = MSB_UNSIGNED_INTEGER
FORMAT = I2
START_BYTE = 17
BYTES = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 1
MISSING_CONSTANT = 1
DESCRIPTION = "Azimuth value (always 1)"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = ELEVATION
DATA_TYPE = MSB_UNSIGNED_INTEGER
FORMAT = I1
START_BYTE = 19
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 8
MISSING_CONSTANT = 255
DESCRIPTION = "Elevation"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = TOF_TYPE
DATA_TYPE = MSB_UNSIGNED_INTEGER
FORMAT = I1
START_BYTE = 20
VALID_MINIMUM = 0
VALID_MAXIMUM = 254
MISSING_CONSTANT = 255
BYTES = 1
DESCRIPTION = "ST/LEF and single/dual event flag
0 = ST, first or single event
1 = LEF, first or single event
2 = ST, second event of a dual event
3 = LEF, second event of a dual event
4 - 255 = spare"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = TOF

```

DATA_TYPE      = MSB_UNSIGNED_INTEGER
FORMAT         = I2
START_BYTE     = 21
BYTES          = 2
VALID_MINIMUM  = 1
VALID_MAXIMUM  = 2048
MISSING_CONSTANT = 65535
DESCRIPTION    = "Event's Time of Flight Data.
                  The particle's TOF channel."
END_OBJECT     = COLUMN

```

Sample EVN Label File: EVN_YYYYDDDDHH_U3.LBL

NOT AVAILABLE YET, AS NO FILES EXIST

ANC_U3.FMT File

```

/* ANC_U3.FMT */
/* describes the structure of the Ancillary Data Table*/
OBJECT      = COLUMN
NAME        = B_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 1
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 340
MISSING_CONSTANT = 65535
DESCRIPTION  = "B cycle number from the start of the day,
                a value of 65535 indicates no B-cycle data
                is available"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = A_CYCLE_NUMBER
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 3
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 2732
MISSING_CONSTANT = 65535
DESCRIPTION  = "A cycle number from the start of day"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = TIME
DATA_TYPE   = IEEE_REAL
START_BYTE  = 5
BYTES       = 8
VALID_MINIMUM = -7.1x10^7
VALID_MAXIMUM = 1.5x10^9
MISSING_CONSTANT = 10x10^9
UNIT        = SECOND
DESCRIPTION  = "Start time of the A cycle, seconds from J2000"

```

```

                (barycentric dynamic time). An A-cycle is the
                32 second instrument collection cycle."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = TIME_SCLK
DATA_TYPE       = MSB_UNSIGNED_INTEGER
START_BYTE      = 13
BYTES           = 4
VALID_MINIMUM   = 0
VALID_MAXIMUM   = 3.0x10^9
MISSING_CONSTANT = 10x10^9
UNIT            = SECOND
DESCRIPTION     = "Start time of the A cycle, spacecraft clock"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = SC_SATURN_POS_X
DATA_TYPE       = IEEE_REAL
START_BYTE      = 17
BYTES           = 4
VALID_MINIMUM   = -9.46x10^12
VALID_MAXIMUM   = 9.46x10^12
MISSING_CONSTANT = 10x10^12
UNIT            = KILOMETER
DESCRIPTION     = "J2000[km]: Saturn-centered Spacecraft X Position"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = SC_SATURN_POS_Y
DATA_TYPE       = IEEE_REAL
START_BYTE      = 21
BYTES           = 4
VALID_MINIMUM   = -9.46x10^12
VALID_MAXIMUM   = 9.46x10^12
MISSING_CONSTANT = 10x10^12
UNIT            = KILOMETER
DESCRIPTION     = "J2000[km]: Saturn-centered Spacecraft Y Position"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = SC_SATURN_POS_Z
DATA_TYPE       = IEEE_REAL
START_BYTE      = 25
BYTES           = 4
VALID_MINIMUM   = -9.46x10^12
VALID_MAXIMUM   = 9.46x10^12
MISSING_CONSTANT = 10x10^12
UNIT            = KILOMETER
DESCRIPTION     = "J2000[km]: Saturn-centered Spacecraft Z Position"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = SC_SATURN_VELOCITY_VX
DATA_TYPE       = IEEE_REAL
START_BYTE      = 29
BYTES           = 4
VALID_MINIMUM   = -3x10^5

```

```

VALID_MAXIMUM = 3x10^5
MISSING_CONSTANT = 5x10^5
DESCRIPTION = "J2000 [km/s]: Relative to Saturn"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SATURN_VELOCITY_VY
DATA_TYPE = IEEE_REAL
START_BYTE = 33
BYTES = 4
VALID_MINIMUM = -3x10^5
VALID_MAXIMUM = 3x10^5
MISSING_CONSTANT = 5x10^5
DESCRIPTION = "J2000 [km/s]: Relative to Saturn"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SATURN_VELOCITY_VZ
DATA_TYPE = IEEE_REAL
START_BYTE = 37
BYTES = 4
VALID_MINIMUM = -3x10^5
VALID_MAXIMUM = 3x10^5
MISSING_CONSTANT = 5x10^5
DESCRIPTION = "J2000 [km/s]: Relative to Saturn"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_POS_X
DATA_TYPE = IEEE_REAL
START_BYTE = 41
BYTES = 4
VALID_MINIMUM = -9.46x10^12
VALID_MAXIMUM = 9.46x10^12
MISSING_CONSTANT = 10x10^12
UNIT = KILOMETER
DESCRIPTION = "J2000[km]: Sun-centered Spacecraft X Position."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_POS_Y
DATA_TYPE = IEEE_REAL
START_BYTE = 45
BYTES = 4
VALID_MINIMUM = -9.46x10^12
VALID_MAXIMUM = 9.46x10^12
MISSING_CONSTANT = 10x10^12
UNIT = KILOMETER
DESCRIPTION = "J2000[km]: Sun-centered Spacecraft Y Position."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_POS_Z
DATA_TYPE = IEEE_REAL
START_BYTE = 49
BYTES = 4
VALID_MINIMUM = -9.46x10^12
VALID_MAXIMUM = 9.46x10^12

```

MISSING_CONSTANT = 10x10¹²
UNIT = KILOMETER
DESCRIPTION = "J2000[km]: Sun-centered Spacecraft Z Position."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_VELOCITY_VX
DATA_TYPE = IEEE_REAL
START_BYTE = 53
BYTES = 4
VALID_MINIMUM = -3x10⁵
VALID_MAXIMUM = 3x10⁵
MISSING_CONSTANT = 5x10⁵
DESCRIPTION = "J2000 [km/s]: Relative to the Sun"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_VELOCITY_VY
DATA_TYPE = IEEE_REAL
START_BYTE = 57
BYTES = 4
VALID_MINIMUM = -3x10⁵
VALID_MAXIMUM = 3x10⁵
MISSING_CONSTANT = 5x10⁵
DESCRIPTION = "J2000 [km/s]: Relative to the Sun"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_SUN_VELOCITY_VZ
DATA_TYPE = IEEE_REAL
START_BYTE = 61
BYTES = 4
VALID_MINIMUM = -3x10⁵
VALID_MAXIMUM = 3x10⁵
MISSING_CONSTANT = 5x10⁵
DESCRIPTION = "J2000 [km/s]: Relative to the Sun"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_ORIENT_XX
DATA_TYPE = IEEE_REAL
START_BYTE = 65
BYTES = 4
VALID_MINIMUM = -1
VALID_MAXIMUM = 1
MISSING_CONSTANT = 2
DESCRIPTION = "XX component of rotation matrix to J2000"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = SC_ORIENT_XY
DATA_TYPE = IEEE_REAL
START_BYTE = 69
BYTES = 4
VALID_MINIMUM = -1
VALID_MAXIMUM = 1
MISSING_CONSTANT = 2
DESCRIPTION = "XY component of rotation matrix to J2000"

```

END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = SC_ORIENT_XZ
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 73
  BYTES         = 4
  VALID_MINIMUM = -1
  VALID_MAXIMUM = 1
  MISSING_CONSTANT = 2
  DESCRIPTION   = "XZ component of rotation matrix to J2000"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = SC_ORIENT_YX
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 77
  BYTES         = 4
  VALID_MINIMUM = -1
  VALID_MAXIMUM = 1
  MISSING_CONSTANT = 2
  DESCRIPTION   = "YX component of rotation matrix to J2000"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = SC_ORIENT_YY
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 81
  BYTES         = 4
  VALID_MINIMUM = -1
  VALID_MAXIMUM = 1
  MISSING_CONSTANT = 2
  DESCRIPTION   = "YY component of rotation matrix to J2000"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = SC_ORIENT_YZ
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 85
  BYTES         = 4
  VALID_MINIMUM = -1
  VALID_MAXIMUM = 1
  MISSING_CONSTANT = 2
  DESCRIPTION   = "YZ component of rotation matrix to J2000"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  NAME          = SC_ORIENT_ZX
  DATA_TYPE    = IEEE_REAL
  START_BYTE    = 89
  BYTES         = 4
  VALID_MINIMUM = -1
  VALID_MAXIMUM = 1
  MISSING_CONSTANT = 2
  DESCRIPTION   = "ZX component of rotation matrix to J2000"
END_OBJECT      = COLUMN

OBJECT          = COLUMN

```

```
NAME      = SC_ORIENT_ZY
DATA_TYPE = IEEE_REAL
START_BYTE = 93
BYTES     = 4
VALID_MINIMUM = -1
VALID_MAXIMUM = 1
MISSING_CONSTANT = 2
DESCRIPTION = "ZY component of rotation matrix to J2000"
END_OBJECT = COLUMN
```

```
OBJECT    = COLUMN
NAME      = SC_ORIENT_ZZ
DATA_TYPE = IEEE_REAL
START_BYTE = 97
BYTES     = 4
VALID_MINIMUM = -1
VALID_MAXIMUM = 1
MISSING_CONSTANT = 2
DESCRIPTION = "ZZ component of rotation matrix to J2000"
END_OBJECT = COLUMN
```

```
OBJECT    = COLUMN
NAME      = ELS_QUALITY_FLAG
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 101
BYTES     = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION = "Missing data and good/bad checksum
              0 = Everything is OK
              1 = Missing Data
              2 = Bad Checksum
              3 = Both Missing Data & Bad Checksum
              4,5,6 = Not used
              7 = No Data"
END_OBJECT = COLUMN
```

```
OBJECT    = COLUMN
NAME      = IBS_QUALITY_FLAG
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 102
BYTES     = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION = "Missing data and good/bad checksum
              0 = Everything is OK
              1 = Missing Data
              2 = Bad Checksum
              3 = Both Missing Data & Bad Checksum
              4,5,6 = Not used
              7 = No Data"
END_OBJECT = COLUMN
```

```
OBJECT    = COLUMN
NAME      = ION_QUALITY_FLAG
DATA_TYPE = MSB_UNSIGNED_INTEGER
```

```

START_BYTE    = 103
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION   = "Missing data and good/bad checksum
                0 = Everything is OK
                1 = Missing Data
                2 = Bad Checksum
                3 = Both Missing Data & Bad Checksum
                4,5,6 = Not used
                7 = No Data"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = TOF_LEF_QUALITY_FLAG
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 104
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION   = "Missing data and good/bad checksum
                0 = Everything is OK
                1 = Missing Data
                2 = Bad Checksum
                3 = Both Missing Data & Bad Checksum
                4,5,6 = Not used
                7 = No Data"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = TOF_ST_QUALITY_FLAG
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 105
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION   = "Missing data and good/bad checksum
                0 = Everything is OK
                1 = Missing Data
                2 = Bad Checksum
                3 = Both Missing Data & Bad Checksum
                4,5,6 = Not used
                7 = No Data"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = LOG_QUALITY_FLAG
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 106
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 6
MISSING_CONSTANT = 7
DESCRIPTION   = "Missing data and good/bad checksum
                0 = Everything is OK

```

```

    1 = Missing Data
    2 = Bad Checksum
    3 = Both Missing Data & Bad Checksum
    4,5,6 = Not used
    7 = No Data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = SNG_QUALITY_FLAG
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 107
BYTES          = 1
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 6
MISSING_CONSTANT = 7
DESCRIPTION    = "Missing data and good/bad checksum
    0 = Everything is OK
    1 = Missing Data
    2 = Bad Checksum
    3 = Both Missing Data & Bad Checksum
    4,5,6 = Not used
    7 = No Data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = ACT_QUALITY_FLAG
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 108
BYTES          = 1
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 6
MISSING_CONSTANT = 7
DESCRIPTION    = "Missing data and good/bad checksum
    0 = Everything is OK
    1 = Missing Data
    2 = Bad Checksum
    3 = Both Missing Data & Bad Checksum
    4,5,6 = Not used
    7 = No Data"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = ACT_STATUS_BITS
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 109
ITEMS          = 32
ITEM_BYTES     = 1
BYTES          = 32
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 8
MISSING_CONSTANT = 16
DESCRIPTION    = "Actuator Status Bits:
    0 = Everything is OK
    4 = Hit the Limit Switch at +108
    8 = Hit the Limit Switch at -108
    16 = Data Not Available"
END_OBJECT      = COLUMN

```

```
OBJECT      = COLUMN
NAME        = TLM_VERSION
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 141
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 3
MISSING_CONSTANT = 255
DESCRIPTION = "Telemetry mode version number"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = FSW_MAJOR_VERSION
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 142
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 4
MISSING_CONSTANT = 255
DESCRIPTION = "Flight software major version number.
              To build the full flight software version:
              Major.SubMajor.Minor.SubMinor
              For example: 3.1.0.2"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = FSW_SUBMAJOR_VERSION
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 143
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 16
MISSING_CONSTANT = 255
DESCRIPTION = "Flight software sub-major version number.
              To build the full flight software version:
              Major.SubMajor.Minor.SubMinor
              For example: 3.1.0.2"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = FSW_MINOR_VERSION
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 144
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 16
MISSING_CONSTANT = 255
DESCRIPTION = "Flight software minor version number.
              To build the full flight software version:
              Major.SubMajor.Minor.SubMinor
              For example: 3.1.0.2"
END_OBJECT  = COLUMN
```

```
OBJECT      = COLUMN
NAME        = FSW_SUBMINOR_VERSION
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 145
BYTES       = 1
```

```

VALID_MINIMUM = 0
VALID_MAXIMUM = 16
MISSING_CONSTANT = 255
DESCRIPTION = "Flight software sub-minor version number.
              To build the full flight software version:
              Major.SubMajor.Minor.SubMinor
              For example: 3.1.0.2"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = POINTING_TYPE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 146
BYTES = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 2
MISSING_CONSTANT = 0
DESCRIPTION = "Describes the type of pointing we have:
              0 = no pointing available
              1 = pointing based on predicts
              2 = pointing based on reconstructs."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = TELEMETRY_MODE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 147
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 136
MISSING_CONSTANT = 255
DESCRIPTION = "Logical telemetry rate and mode:
              1 = 250 bps
              2 = 500 bps
              4 = 1 kbps
              8 = 2 kbps
              16 = 4 kbps
              32 = 8 kbps
              64 = 16 kbps
              130 = 500 bps solar wind
              132 = 1 kbps solar wind
              136 = 2 kbps solar wind"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IBS_SWEEP_TABLE_NUMBER
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 148
BYTES = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 240
MISSING_CONSTANT = 255
DESCRIPTION = "IBS sweep table and index table numbers:
              Upper 4 bits are the IBS index table
              Lower 4 bits are the IBS sweep table number
              Fill: 0xFF"
END_OBJECT = COLUMN

```

```

OBJECT      = COLUMN
NAME        = DATA_IBS_BKGD
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 149
UNIT        = COUNTS
ITEMS       = 3
ITEM_BYTES  = 2
BYTES       = 6
VALID_MINIMUM = 0
VALID_MAXIMUM = 65534
MISSING_CONSTANT = 65535
DESCRIPTION  = "IBS background counts in fans 1 through 3.
                Fill is 0xFFFF"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = IBS_STARTING_ENERGY
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 155
BYTES       = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 852
MISSING_CONSTANT = 65535
DESCRIPTION  = "IBS starting energy step number.
                Fill is 0xFFFF"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = IBS_SUBCYCLE
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 157
BYTES       = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 7
MISSING_CONSTANT = 255
DESCRIPTION  = "IBS subcycle counter.
                Fill is 0xFF"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = IBS_COMPRESSION_RATIO
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 158
BYTES       = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 32
MISSING_CONSTANT = 0
DESCRIPTION  = "ratio: (uncompressed length/compressed length).
                Calculated on ground from info in the IBS header
                and rounded down to the nearest integer.
                Fill is 0"
END_OBJECT  = COLUMN

OBJECT      = COLUMN
NAME        = IBS_PEAK_FAN
DATA_TYPE   = MSB_UNSIGNED_INTEGER
START_BYTE  = 159
BYTES       = 1

```

```

VALID_MINIMUM = 1
VALID_MAXIMUM = 3
MISSING_CONSTANT = 4
DESCRIPTION = "Fan containing the IBS peak.
              Fill is 4"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IBS_PEAK_ACYCLE
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 160
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 8
MISSING_CONSTANT = 9
DESCRIPTION = "A cycle number containing the IBS peak
              Fill is 9"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IBS_PEAK_SWEEP
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 161
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 16
MISSING_CONSTANT = 0
DESCRIPTION = "IBS peak energy sweep.
              Fill is 0"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IBS_PEAK_STEP
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 162
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 255
MISSING_CONSTANT = 0
DESCRIPTION = "IBS peak energy step.
              Fill is 0"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IBS_THRESHOLD_RL
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 163
BYTES = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 255
MISSING_CONSTANT = 65535
DESCRIPTION = "IBS Run length compression threshold.
              Fill is 0xFFFF"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = IMS_SWEEP_TABLE_NUMBER
DATA_TYPE = MSB_UNSIGNED_INTEGER

```

```

START_BYTE    = 165
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 255
MISSING_CONSTANT = 240
DESCRIPTION   = "IMS sweep table number.
                Number 240 will be reserved as a fill value"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = TDC_SINGLE_SELECT
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 166
BYTES         = 1
VALID_MINIMUM = 0
VALID_MAXIMUM = 3
MISSING_CONSTANT = 255
DESCRIPTION   = "TDC Singles Selection:
                Value:  Single 13      Single 14
                0   Start CFD      Stop CFD
                1   Acquisition Error Deadtimes
                2   Single TOF's   Double TOF's
                3   Data Strokes   Resets"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = IMS_LOGICALS_SELECTION
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 167
BYTES         = 2
VALID_MINIMUM = 4096
VALID_MAXIMUM = 27416
MISSING_CONSTANT = 65535
DESCRIPTION   = "TDC logicals selection:
                Bits 15-13: IMS Logical 1
                Bits 12-10: IMS Logical 2
                Bits 9-7:  IMS Logical 3
                Bits 6-4:  IMS Logical 4
                Bits 3-0:  Unused

                Logical selection decoder:
                0 = Unused
                1 = LEF Stop
                2 = ST Stop
                3 = Timeouts
                4 = Total Events (As used in SAM deadtime correction)
                5 = Logical 13
                6 = Logical 14
                7 = Unused
                NOTE: Logical 13 and 14 are set with 82TDC_ENG_SING.
                See OBJECT name TDC_SINGLE_SELECT."
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = SAM_CPU2_STATUS_FLAGS
DATA_TYPE     = MSB_UNSIGNED_INTEGER
START_BYTE    = 169
BYTES         = 1

```

```

VALID_MINIMUM   = 0
VALID_MAXIMUM   = 255
DESCRIPTION     = "Bit 7 = CPU2/SAM mode change
                  6 = Background data
                  5 = Ion deadtime compensation
                  4 = SAM LEF enable
                  3 = SAM molecule enable
                  2 = SW/HW binning
                  1-0 = HW binning LUT index"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = SAM_ION_SELECTION_INDEX
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 170
BYTES          = 1
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 255
DESCRIPTION    = "SAM Ion selection index number"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
NAME           = SAM_ION_GROUP_TABLE
DATA_TYPE      = MSB_UNSIGNED_INTEGER
START_BYTE     = 171
BYTES          = 2
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 65534
MISSING_CONSTANT = 65535
DESCRIPTION    = "SAM group table ID number"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
NAME           = ELS_MCP_ADJ
DATA_TYPE      = IEEE_REAL
START_BYTE     = 173
BYTES          = 4
UNIT           = VOLTS
VALID_MINIMUM  = 0.0
VALID_MAXIMUM  = 3700.0
MISSING_CONSTANT = -1.0
DESCRIPTION    = "ELS High Voltage Adjust. converted using:
                  V = DAC * 58.73. Where DAC is the digital to
                  analog value transmitted by the instrument in
                  housekeeping."
END_OBJECT     = COLUMN

OBJECT          = COLUMN
NAME           = IBS_CEM_DAC
DATA_TYPE      = IEEE_REAL
START_BYTE     = 177
BYTES          = 4
UNIT           = VOLTS
VALID_MINIMUM  = -4000.0
VALID_MAXIMUM  = 0.0
MISSING_CONSTANT = 1.0
DESCRIPTION    = "IBS CEM (channel-electron multiplier) High Voltage.
                  Converted using: V = DAC * (-15.68627451). DAC is

```

```

the digital to analog value transmitted by the
instrument in housekeeping."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = HVU1_RET_DAC
DATA_TYPE      = IEEE_REAL
START_BYTE     = 181
BYTES          = 4
UNIT           = KILOVOLTS
VALID_MINIMUM  = 0.0
VALID_MAXIMUM  = 16.0
MISSING_CONSTANT = -1.0
DESCRIPTION    = "HVU1 (high voltage unit 1) Retarding High Voltage,
                  converted using: kV = DAC * 0.0627451
                  Where DAC is the digital to analog value transmitted
                  by the instrument in housekeeping."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = HVU1_ACC_DAC
DATA_TYPE      = IEEE_REAL
START_BYTE     = 185
BYTES          = 4
UNIT           = KILOVOLTS
VALID_MINIMUM  = -16.0
VALID_MAXIMUM  = 0.0
MISSING_CONSTANT = 1.0
DESCRIPTION    = "HVU1 (high voltage unit 1) Accelerating High Voltage,
                  converted using: kV = DAC * -0.0627451
                  Where DAC is the digital to analog value transmitted
                  by the instrument in housekeeping."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = HVU2_ST_DAC
DATA_TYPE      = IEEE_REAL
START_BYTE     = 189
BYTES          = 4
UNIT           = VOLTS
VALID_MINIMUM  = -3600.0
VALID_MAXIMUM  = 0.0
MISSING_CONSTANT = 1.0
DESCRIPTION    = "HVU2 (high voltage unit 2) Straight Through MCP
                  (multichannel plate), converted using:
                  V = DAC * -14.1176
                  Where DAC is the digital to analog value transmitted
                  by the instrument in housekeeping."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME           = HVU2_LEF_DAC
DATA_TYPE      = IEEE_REAL
START_BYTE     = 193
BYTES          = 4
UNIT           = VOLTS
VALID_MINIMUM  = -2400.0
VALID_MAXIMUM  = 0.0

```

```

MISSING_CONSTANT = 1.0
DESCRIPTION      = "HVU2 (high voltage unit 2) Linear Electric Field MCP
                  (multichannel plate), converted using:
                  V = DAC * -9.4118
                  Where DAC is the digital to analog value transmitted
                  by the instrument in housekeeping."
END_OBJECT      = COLUMN

```

```

Sample Ancillary (ANC) Label File: ANC_YYYYDDDDHH_U3.LBL
PDS_VERSION_ID = PDS3
DATA_SET_ID    = "CO-E/J/S/SW-CAPS-2-UNCALIBRATED-V1.1"

STANDARD_DATA_PRODUCT_ID = "ANC UNCALIBRATED"
PRODUCT_ID             = "ANC_201001000_U3"
PRODUCT_TYPE           = "DATA"
PRODUCT_CREATION_TIME  = 2010-141T20:48

RECORD_TYPE           = FIXED_LENGTH
RECORD_BYTES          = 196
FILE_RECORDS          = 671

START_TIME             = 2010-010T00:08:07
STOP_TIME              = 2010-010T06:05:59
SPACECRAFT_CLOCK_START_COUNT = "1/1641775909.000"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1641797381.000"

INSTRUMENT_HOST_NAME  = "CASSINI ORBITER"
INSTRUMENT_HOST_ID    = "CO"
TARGET_NAME           = {"SATURN"}
INSTRUMENT_NAME       = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID         = "CAPS"
DESCRIPTION            = "
    This file contains Cassini CAPS ancillary data and some
    spacecraft pointing information
    acquired at SATURN between
    2010-010T00:08:07.000 and 2010-010T06:05:59.000 (orbit 124)."
MD5_CHECKSUM          = "120bd2983382c76702046cccf611869f"

NOTE                  = "
    The end around carry checksum, with seed 0x55AA,
    of this file is 0xB62E"
SPICE_FILE_NAME       = {"SPK: 100209R_SCPSE_10003_10021.bsp",
    "00: 10006_10011ra.bc",
    "06: 10006_10011ra.bc",
    "12: 10006_10011ra.bc",
    "18: 10011_10016ra.bc",
    "18: 10006_10011ra.bc"}

^TABLE                = "ANC_201001000_U3.DAT"

```

```
OBJECT          = TABLE
INTERCHANGE_FORMAT  = "BINARY"
ROWS            = 671
COLUMNS        = 63
ROW_BYTES       = 196
^STRUCTURE      = "ANC_U3.FMT"
DESCRIPTION     = "
  The file ANC_U3.FMT describes the column structure and content
  of the data file."
END_OBJECT      = TABLE
END
```

Appendix C. PDS Labels & Format Files for Standard HIGHERORDER Data Products

Sample ELS Moment (ELS_3DMOMT) Format & Label File: ELS_3DMOMT_YYYYDDD_VV.LBL

PDS_VERSION_ID = PDS3
DATA_SET_ID = "CO-S/SW-CAPS-5-DDR-ELE-MOMENTS-V1.0"

STANDARD_DATA_PRODUCT_ID = "ELECTRON MOMENTS"
PRODUCT_ID = "ELS_3DMOMT_2005283_00"
PRODUCT_TYPE = "DATA"
PRODUCT_CREATION_TIME = 2013-079T22:12
PRODUCT_VERSION_ID = "1"

RECORD_TYPE = "FIXED_LENGTH"
RECORD_BYTES = 127
FILE_RECORDS = 2695
COLUMNS = 13

START_TIME = 2005-283T00:00:20
STOP_TIME = 2005-283T23:59:47
SPACECRAFT_CLOCK_START_COUNT = "1/1507595334.252"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1507681702.137"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID = "CO"
TARGET_NAME = {"SATURN"}
INSTRUMENT_NAME = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID = "CAPS"
DESCRIPTION = "

This file contains Cassini CAPS electron moments data,
acquired at SATURN between
2005-283T00:00:20.000 and 2005-283T23:59:47.000 (orbit 016)."

MD5_CHECKSUM = "c0bbc8061d86617ec607f0dfefdbf62cb"

^TABLE = "ELS_3DMOMT_2005283_00.TAB"

OBJECT = TABLE
INTERCHANGE_FORMAT = "ASCII"
ROWS = 2695
COLUMNS = 13
ROW_BYTES = 127
DESCRIPTION = "Electron Moments. A description of how
moments are generated can be found in the
archive SIS."

/* Description of the electron moment data */

OBJECT = COLUMN
NAME = "START_TIME"
DATA_TYPE = "TIME"
START_BYTE = 1
BYTES = 17
VALID_MINIMUM = 1997-288T10:43:00
VALID_MAXIMUM = 2025-001T00:00:00
MISSING_CONSTANT = 2030-001T00:00:00

UNIT = "N/A"
DESCRIPTION = "Start of the sampling period, spacecraft event time,
UTC, in ISOD format to second resolution. ISOD
format is as follows: YYYY-DOYTHH:MM:SS"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "END_TIME"
DATA_TYPE = "TIME"
START_BYTE = 19
BYTES = 17
VALID_MINIMUM = 1997-288T10:43:00
VALID_MAXIMUM = 2025-001T00:00:00
MISSING_CONSTANT = 2030-001T00:00:00
UNIT = "N/A"
DESCRIPTION = "End of the sampling period, spacecraft event time,
UTC, in ISOD format to second resolution. ISOD
format is as follows: YYYY-DOYTHH:MM:SS"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "ANODE_USED"
DATA_TYPE = "ASCII_INTEGER"
START_BYTE = 37
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 9
MISSING_CONSTANT = 0
DESCRIPTION = "Anode used to calculate moments. A value of 9
implies that multiple anodes were used."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "SIGNAL_TO_NOISE"
DATA_TYPE = "ASCII_REAL"
START_BYTE = 39
BYTES = 5
VALID_MINIMUM = 0.00
VALID_MAXIMUM = 10.00
MISSING_CONSTANT = -9.99
UNIT = "N/A"
DESCRIPTION = "Signal to noise ratio threshold. Only data values
above this threshold go into the moments
calculation."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "SC_POTENTIAL"
DATA_TYPE = "ASCII_REAL"
START_BYTE = 45
BYTES = 7
VALID_MINIMUM = -100.00
VALID_MAXIMUM = 100.00
MISSING_CONSTANT = -999.99
UNIT = "V"
DESCRIPTION = "Spacecraft potential during the time period given"
END_OBJECT = COLUMN

```

OBJECT      = COLUMN
NAME        = "DENSITY"
DATA_TYPE   = "ASCII_REAL"
START_BYTE  = 53
BYTES       = 13
VALID_MINIMUM  = 1.000000E+03
VALID_MAXIMUM  = 1.000000E+10
MISSING_CONSTANT = -9.000000E+00
UNIT        = "ELECTRONS/M^3"
DESCRIPTION  = "Density, summed over all energies."
END_OBJECT   = COLUMN

OBJECT      = COLUMN
NAME        = "TEMPERATURE"
DATA_TYPE   = "ASCII_REAL"
START_BYTE  = 67
BYTES       = 12
VALID_MINIMUM  = 1.000000
VALID_MAXIMUM  = 99999.999999
MISSING_CONSTANT = -9999.000000
UNIT        = "eV"
DESCRIPTION  = "Temperature, summed over all energies"
END_OBJECT   = COLUMN

OBJECT      = COLUMN
NAME        = "QUALITY_FACTOR"
DATA_TYPE   = "ASCII_REAL"
START_BYTE  = 80
BYTES       = 7
VALID_MINIMUM  = 0.000
VALID_MAXIMUM  = 100.000
MISSING_CONSTANT = -99.000
UNIT        = "N/A"
DESCRIPTION  = "The number of standard deviations, assuming Poisson
                counting statistics, that the peak of the Maxwellian
                corresponding to the determined moments lies above
                the ELS one-count level. The larger the value, the
                better."
END_OBJECT   = COLUMN

OBJECT      = COLUMN
NAME        = "SC_CHARGE_STATE"
DATA_TYPE   = "ASCII_INTEGER"
START_BYTE  = 88
BYTES       = 1
VALID_MINIMUM  = 0
VALID_MAXIMUM  = 1
MISSING_CONSTANT = 9
UNIT        = "N/A"
DESCRIPTION  = "Indicates whether the data is likely to be from a
                region in which the spacecraft is negatively
                charged.
                0: likely positively charged
                1: likely negatively charged"
END_OBJECT   = COLUMN

OBJECT      = COLUMN
NAME        = "PENETRATING_RADIATION"

```

DATA_TYPE = "ASCII_INTEGER"
 START_BYTE = 90
 BYTES = 1
 VALID_MINIMUM = 0
 VALID_MAXIMUM = 1
 MISSING_CONSTANT = 9
 UNIT = "N/A"
 DESCRIPTION = "Indicates whether the data is probably from a region in which there is penetrating radiation present.
 0: not likely to be present
 1: likely to be present"
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = "DENSITY_WITH_PEN_RAD"
 DATA_TYPE = "ASCII_REAL"
 START_BYTE = 92
 BYTES = 13
 VALID_MINIMUM = 1.000000E+03
 VALID_MAXIMUM = 1.000000E+10
 MISSING_CONSTANT = -9.000000E+00
 UNIT = "ELECTRONS/M^3"
 DESCRIPTION = "Density, summed over all energies, but with penetrating radiation subtracted from the data before moments calculations were made."
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = "TEMPERATURE_WITH_PEN_RAD"
 DATA_TYPE = "ASCII_REAL"
 START_BYTE = 106
 BYTES = 12
 VALID_MINIMUM = 1.000000
 VALID_MAXIMUM = 99999.999999
 MISSING_CONSTANT = -9999.000000
 UNIT = "eV"
 DESCRIPTION = "Temperature, summed over all energies, but with penetrating radiation subtracted from the data before moments calculations were made."
 END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = "QUALITY_FACTOR_WITH_PEN_RAD"
 DATA_TYPE = "ASCII_REAL"
 START_BYTE = 119
 BYTES = 7
 VALID_MINIMUM = 0.000
 VALID_MAXIMUM = 100.000
 MISSING_CONSTANT = -99.000
 UNIT = "N/A"
 DESCRIPTION = "The number of standard deviations, assuming Poisson counting statistics, that the peak of the Maxwellian corresponding to the determined moments lies above the ELS one-count level, but with penetrating radiation subtracted from the data before moments calculations were made. The larger the value, the better."

```
END_OBJECT = COLUMN
END_OBJECT = TABLE
END
```

Sample ELS Spacecraft Potential (ELS_SCPOT) Format & Label File:
ELS_SCPOT_YYYYDDD_VV.LBL

```
PDS_VERSION_ID = PDS3
DATA_SET_ID = "CO-S/SW-CAPS-5-DDR-SC-POTENTIAL-V1.0"
```

```
STANDARD_DATA_PRODUCT_ID = "SPACECRAFT POTENTIAL"
PRODUCT_ID = "ELS_SCPOT_2005283_00"
PRODUCT_TYPE = "DATA"
PRODUCT_CREATION_TIME = 2013-079T22:13
PRODUCT_VERSION_ID = "1"
```

```
RECORD_TYPE = "FIXED_LENGTH"
RECORD_BYTES = 50
FILE_RECORDS = 12099
COLUMNS = 5
```

```
START_TIME = 2005-283T00:00:00
STOP_TIME = 2005-284T00:00:03
SPACECRAFT_CLOCK_START_COUNT = "1/1507595314.252"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1507681718.137"
```

```
INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID = "CO"
TARGET_NAME = {"SATURN"}
INSTRUMENT_NAME = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID = "CAPS"
DESCRIPTION = "
```

```
  This file contains Cassini CAPS spacecraft potential data,
  acquired at SATURN between
  2005-283T00:00:00.000 and 2005-284T00:00:03.000 (orbit 016)."
```

```
MD5_CHECKSUM = "7c28c97775314f5a45167a7d62d016d"
```

```
^TABLE = "ELS_SCPOT_2005283_00.TAB"
```

```
OBJECT = TABLE
INTERCHANGE_FORMAT = "ASCII"
ROWS = 12099
COLUMNS = 5
ROW_BYTES = 50
DESCRIPTION = "Spacecraft Potential. A description of how
spacecraft potentials are generated by CAPS
can be found in our archived SIS."
```

```
/* Description of the CAPS-ELS spacecraft potential data */
```

```
OBJECT = COLUMN
NAME = "START_TIME"
DATA_TYPE = "TIME"
START_BYTE = 1
BYTES = 17
VALID_MINIMUM = 1997-288T10:43:00
VALID_MAXIMUM = 2025-001T00:00:00
```

MISSING_CONSTANT = 2030-001T00:00:00
UNIT = "N/A"
DESCRIPTION = "Start of the sampling period, spacecraft event time,
UTC, in ISOD format to second resolution. ISOD
format is as follows: YYYY-DOYTHH:MM:SS"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "END_TIME"
DATA_TYPE = "TIME"
START_BYTE = 19
BYTES = 17
VALID_MINIMUM = 1997-288T10:43:00
VALID_MAXIMUM = 2025-001T00:00:00
MISSING_CONSTANT = 2030-001T00:00:00
UNIT = "N/A"
DESCRIPTION = "End of the sampling period, spacecraft event time,
UTC, in ISOD format to second resolution. ISOD
format is as follows: YYYY-DOYTHH:MM:SS"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "ANODE_USED"
DATA_TYPE = "ASCII_INTEGER"
START_BYTE = 37
BYTES = 1
VALID_MINIMUM = 1
VALID_MAXIMUM = 8
MISSING_CONSTANT = 0
DESCRIPTION = "Anode used to assign potential."
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "SC_POTENTIAL"
DATA_TYPE = "ASCII_REAL"
START_BYTE = 39
BYTES = 7
VALID_MINIMUM = -100.00
VALID_MAXIMUM = 100.00
MISSING_CONSTANT = -999.99
UNIT = "V"
DESCRIPTION = "Spacecraft potential during the time period given"
END_OBJECT = COLUMN

OBJECT = COLUMN
NAME = "ACCURACY_FLAG"
DATA_TYPE = "ASCII_INTEGER"
START_BYTE = 47
BYTES = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 2
MISSING_CONSTANT = -1
UNIT = "N/A"
DESCRIPTION = "0 = Accurate value derived from ELS data.
Value will be accurate to +/- 8.5% as the dE/E
of ELS is 17%.
1 = Potential below ELS lowest energy, therefore
estimated, use with care.

2 = Accurate value derived from non-ELS data, ie.
RPWS at periapsis or PE at moon encounters."

END_OBJECT = COLUMN
END_OBJECT = TABLE
END

Sample ION Moment (ION_MOMT) Format & Label File: ION_MOMT_YYYYDDD_VV.LBL

PDS_VERSION_ID = PDS3
DATA_SET_ID = "CO-S/SW-CAPS-5-DDR-ION-MOMENTS-V1.0"

STANDARD_DATA_PRODUCT_ID = "ION MOMENTS"
PRODUCT_ID = "ION_MOMT_2005283_01"
PRODUCT_TYPE = "DATA"
PRODUCT_CREATION_TIME = 2013-079T22:00
PRODUCT_VERSION_ID = "1"

RECORD_TYPE = "FIXED_LENGTH"
FILE_RECORDS = 189
RECORD_BYTES = 122
COLUMNS = 13
ROW_BYTES = 122

START_TIME = 2005-283T00:03:00
STOP_TIME = 2005-283T23:48:03
SPACECRAFT_CLOCK_START_COUNT = "1/1507595494.252"
SPACECRAFT_CLOCK_STOP_COUNT = "1/1507680998.136"

INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_HOST_ID = "CO"
TARGET_NAME = {"SATURN"}
INSTRUMENT_NAME = "CASSINI PLASMA SPECTROMETER"
INSTRUMENT_ID = "CAPS"
DESCRIPTION = "

This file contains Cassini CAPS ion moments data,
acquired at SATURN between
2005-283T00:03:00.000 and 2005-283T23:48:03.000 (orbit 016)."

MD5_CHECKSUM = "270041152131aff72b4326796c64461a"

^TABLE = "ION_MOMT_2005283_01.TAB"

OBJECT = TABLE
INTERCHANGE_FORMAT = "ASCII"
ROWS = 189
COLUMNS = 13
ROW_BYTES = 122
DESCRIPTION = "

Moments are generated from Cassini CAPS data and are partially
described in the CAPS guide for users found at the PDS web site:

http://ppi.pds.nasa.gov/search/view/?f=yes&id=pds://PPI/COCAPS_1SAT/DOCUMENT

A brief description of the columns follows."

/* Description of the ion moment data */

OBJECT = COLUMN
NAME = "TIME"
DATA_TYPE = "TIME"
START_BYTE = 1

```

BYTES          = 17
VALID_MINIMUM  = 1997-288T10:43:00
VALID_MAXIMUM  = 2025-001T00:00:00
MISSING_CONSTANT = 2030-001T00:00:00
UNIT           = "N/A"
DESCRIPTION    = "Time, spacecraft event time, UTC, in ISOD format
                to second resolution. ISOD format is as follows:
                YYYY-DOYTHH:MM:SS"
END_OBJECT     = COLUMN

OBJECT        = COLUMN
NAME          = "ION_METHOD_FLAG"
DATA_TYPE     = "ASCII_INTEGER"
START_BYTE    = 19
BYTES         = 2
VALID_MINIMUM = 1
VALID_MAXIMUM = 4
MISSING_CONSTANT = -1
DESCRIPTION   = "Ion Method Flag for calculation of numerical ion
                moments. Value: meaning
                1 : SNG data, TOF-based partition
                2 : SNG data, E-based partition
                3 : SNG data, hard-wired partition
                4 : ION data"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "H+_DENSITY"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 22
BYTES         = 8
VALID_MINIMUM = 0.000
VALID_MAXIMUM = 999.9999
MISSING_CONSTANT = -1
UNIT          = "IONS/CM^3"
DESCRIPTION   = "H+ density. Please note the difference between a
                value of 0.000 and -1. The 0.000 corresponds to a
                valid determination that is just extremely low (and
                there is no confidence in the actual quantitative
                value, other than that it is very low), whereas the
                fill value corresponds to an invalid determination,
                usually caused by problems in the integration
                process."
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "H+_TEMP"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 31
BYTES         = 9
VALID_MINIMUM = 0
VALID_MAXIMUM = 99999.999
MISSING_CONSTANT = -1
UNIT          = "eV"
DESCRIPTION   = "H+ temperature"
END_OBJECT    = COLUMN

OBJECT        = COLUMN

```

```

NAME          = "H2+_DENSITY"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 41
BYTES         = 8
VALID_MINIMUM = 0
VALID_MAXIMUM = 999.9999
MISSING_CONSTANT = -1
UNIT          = "IONS/CM^3"
DESCRIPTION   = "H2+ density. Please note the difference between a
                value of 0.000 and -1. The 0.000 corresponds to a
                valid determination that is just extremely low (and
                there is no confidence in the actual quantitative
                value, other than that is is very low), whereas the
                fill value corresponds to an invalid determination,
                usually caused by problems in the integration
                process."
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "H2+_TEMP"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 50
BYTES         = 9
VALID_MINIMUM = 0
VALID_MAXIMUM = 99999.999
MISSING_CONSTANT = -1
UNIT          = "eV"
DESCRIPTION   = "H2+ temperature"
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "W+_DENSITY"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 60
BYTES         = 8
VALID_MINIMUM = 0
VALID_MAXIMUM = 999.9999
MISSING_CONSTANT = -1
UNIT          = "IONS/CM^3"
DESCRIPTION   = "W+ density. Water-group ions, W+, includes O+, OH+,
                H2O+, and H3O+ (where the 2 and 3 are subscripts).
                Please note the difference between a value of 0.000
                and -1. The 0.000 corresponds to a valid
                determination that is just extremely low (and there
                is no confidence in the actual quantitative value,
                other than that is is very low), whereas the fill
                value corresponds to an invalid determination,
                usually caused by problems in the integration
                process."
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "W+_TEMP"
DATA_TYPE     = "ASCII_REAL"
START_BYTE    = 69
BYTES         = 9
VALID_MINIMUM = 0
VALID_MAXIMUM = 99999.999

```

```

MISSING_CONSTANT = -1
UNIT             = "eV"
DESCRIPTION      = "W+ temperature, where W+ are water group ions.
                   W+ includes ions: O+, OH+, H2O+, and H3O+."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = "AVE_V_R"
DATA_TYPE       = "ASCII_REAL"
START_BYTE      = 79
BYTES           = 9
VALID_MINIMUM   = -3000.000
VALID_MAXIMUM   = 3000.000
MISSING_CONSTANT = -9999.999
UNIT            = "KILOMETER/SECOND"
DESCRIPTION      = "Weighted average flow velocity, r component, in
                   Saturn centered spherical coordinates."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = "AVE_V_PHI"
DATA_TYPE       = "ASCII_REAL"
START_BYTE      = 89
BYTES           = 9
VALID_MINIMUM   = -3000.000
VALID_MAXIMUM   = 3000.000
MISSING_CONSTANT = -9999.999
UNIT            = "KILOMETER/SECOND"
DESCRIPTION      = "Weighted average flow velocity, phi component, in
                   Saturn centered spherical coordinates."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = "AVE_V_THETA"
DATA_TYPE       = "ASCII_REAL"
START_BYTE      = 99
BYTES           = 9
VALID_MINIMUM   = -3000.000
VALID_MAXIMUM   = 3000.000
MISSING_CONSTANT = -9999.999
UNIT            = "KILOMETER/SECOND"
DESCRIPTION      = "Weighted average flow velocity, theta component, in
                   Saturn centered spherical coordinates."
END_OBJECT      = COLUMN

OBJECT          = COLUMN
NAME            = "AVE_FLOW_SPEED"
DATA_TYPE       = "ASCII_REAL"
START_BYTE      = 109
BYTES           = 9
VALID_MINIMUM   = 0
VALID_MAXIMUM   = 3000.000
MISSING_CONSTANT = -9999.999
UNIT            = "KILOMETER/SECOND"
DESCRIPTION      = "Weighted average flow speed."
END_OBJECT      = COLUMN

OBJECT          = COLUMN

```

```
NAME      = "QUALITY_FLAG"
DATA_TYPE = "ASCII_INTEGER"
START_BYTE = 119
BYTES     = 2
VALID_MINIMUM = 0
VALID_MAXIMUM = 2
MISSING_CONSTANT = -1
DESCRIPTION = "Value: meaning
              0: Not-bad; corotation direction is in the Field of
              View (FOV)
              1: Not-bad; corotation direction not in FOV
              2: Bad (the spacecraft is rolling and/or CAPS is not
              actuating)"
END_OBJECT = COLUMN
END_OBJECT = TABLE
END
```