2002 Cassini/INMS
Ion and Neutral Mass Spectrometer

INMS STANDARD DATA PRODUCTS AND ARCHIVE VOLUME SOFTWARE INTERFACE SPECIFICATION (INMS Archive Volumes SIS)

SIS ID: IO-AR-016

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Version 1.0
July 1, 2005

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Approved:

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J. H. Waite — Date
Team Leader

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Diane Conner — Date
Cassini Archive Data Engineer

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Ray Walker — Date
PDS Discipline Node Manager

Table of Contents

1. PREFACE

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

1.1 Distribution List

Table 1: Distribution List	
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1.2 Document Change Log

Table 2: Document Change History		
Change	**Date**	**Affected Portions**
• Initial Draft	01/20/2003	All
• updates based on review by J. Mafi • Added L1A, and TTN data products • Replaced target identifier E/J/S by S in data set names. No Earth or Jupiter Data • Changed directory content tables to reflect the fact that all data is stored in a directories by day of year	12/01/2004	
• Changed document number to reflect draft status, first approved version will be 1.0 • updates based on review by D. Conner • omit event table product. • detailed database schema deleted as unneeded • Improve description of electronic data transfer • Extensive changes based on discussions with discipline node, • Deleted Geometry directory - unneeded	02/15/05	
• Extensive changes based on discussions with discipline node, • Update signature page, reflecting new PDS Project manager • Update reference page to reflect current PDS documentation versions • Expanded descriptions of volume structure • Added map of PKT archive volume to appendices • Simplification of production volume validation	3/1/05	
• Add mission and instrument prefixes to CAT file names • Correct typo's in Data Set Ids. • Add instrument prefix to standard data product Ids • Add PPI Spot check of production file structure • Add EXTRA directory to L1A archive files • Modify volume Ids to permit sequential runs of more than 1000 volumes • Add calibration summary directory to reference volume • Indicate that INMS_L1A volumes will contain calibration summaries valid at the time of volume creation.	3/16/05	
• Move contents of reference volume to EXTRAS Directory on volume COINMS_3000 • Minor editorial changes • Estimate of L1A data volume • Added Appendix D, the L1A Structure	3/31/2005	
• Reflects sample volume delivery • changed specialty of outside peer reviewers	4/15/2005	
• Peer review completed, changed target in data set names to S from SSA	7/1/2005	

1.3 TBD Items

Items that are currently TBD or not finalized, but will be defined in the next few months:

Table 3: TBD Items		
Item	**Section**	**Pages**
Monthly Data Volumes	1.6	9

1.4 Acronyms and Abbreviations

Table 4: Acronyms and Abbreviations	
Acronym	**Definition**
ASCII	American Standard Code for Information Interchange
CD-R	Compact Disc - Recordable Media
CD-ROM	Compact Disc - Read-Only Memory
CSN	INMS ion source, Closed Source Neutral
DVD	Digital Versatile Disc
GB	Gigabyte(s)
GSFC	Goddard Space Flight Center
INMS	Ion and Neutral Mass Spectrometer
ISO	International Standards Organization
JHU/APL	Johns Hopkins University / Applied Physics Laboratory
JPL	Jet Propulsion Laboratory
MB	Megabyte(s)
NSSDC	National Space Science Data Center
OSI	INMS ion source, Open Source Ion
OSNB	INMS ion source, Open Source Neutral Beam
OSNT	INMS ion source, Open Source Neutral Thermal
PDB	Project Database
PDS	Planetary Data System
PPI	Planetary Data System, Planetary Plasma Interactions Node
SDVT	Science Data Validation Team
SIS	Software Interface Specification
TBD	To Be Determined
UCLA	University of California, Los Angeles

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*.

1.6 Content Overview

The Ion and Neutral Mass Spectrometer (INMS) aboard the Cassini spacecraft consists of a closed ion source and an open ion source; various focusing lenses; an electrostatic quadrupole switching lens; a radio frequency quadrupole mass analyzer; two secondary electron multiplier detectors; and the associated supporting electronics and power supply systems. The INMS will be operated in three different modes: a closed source neutral mode (CSN), for the measurement of non-reactive neutrals such as N_2 and CH_4; an open source neutral (OSN) mode, for reactive neutrals such as atomic nitrogen; and an open source ion (OSI) mode, for positive ions with energies less than 100 eV. The primary focus of the INMS investigation is on the composition and structure of Titan’s upper atmosphere and its interaction with Saturn’s magnetospheric plasma. Note that the INMS ‘Closed Source’ mode only measures neutral particles so ‘neutral’ is redundant when referring to this mode. However CSN is used throughout this document so that file naming conventions are the same number of characters for all modes.

INMS is a complex instrument, and will be taking data continuously throughout the tour phase of the mission (the exception being the release of the Huygens Probe and the associated quiet period, during which most instruments on Cassini will be turned off). This complexity, coupled with tracking the minute changes in the characteristics of the instrument over time, mean calibration data and calibration techniques will be dynamic. For this reason it will be impractical to redeliver data volumes as calibration improves. The solution is to deliver a data set that has scaling factors applied (i.e. converted to engineering units), and provide the calibration data as a separate ancillary volume. Thus, as calibrations improve, only the reference volume will need to be redistributed.

Each of the three modes of the INMS will produce packets containing total counts per sample. The number of integration periods that are co-added to form a packet depends on the rate at which the instrument is taking data.

INMS data will be divided into three data sets, one containing telemetry packet contents converted from data numbers to engineering units, one containing detector data annotated with instrument state and geometric data, and a third containing higher level data produced from the lower level data. The data sets may contain one or more product types, which correspond to collections of related data in files of specific organization. The two high level data sets contain one product type apiece, whilst the low level data set contains one product type for each telemetry packet. The data set identification, CODMAC levels, and product types are enumerated in Table 5.

Table 5: Relationship Between Data Sets and Standard Data Products

Data Set ID	CODMAC Level	Standard Data Product ID	Description
CO-S-INMS-5-TTN-C-V1.0	5	INMS_TTN	Profiles of species densities
CO-S-INMS-3-L1A-U-V1.0	3	INMS_L1A	Annotated instrument output
CO-S-INMS-2-PKT-U-V1.0	2	INMS_PKT_SCI	Telemetry Packets with contents converted from data numbers to dimensional quantities
		INMS_PKT_HKG	
		INMS_PKT_HMD	
		INMS_PKT_SMD	
		INMS_PKT_OTS	Operational table description

The data set CO-S-INMS-2-PKT-U-V1.0 contains the contents of the INMS telemetry packets, with each variety of packet forming a product type. INMS produces 4 packet types, Science (SCI), Housekeeping (HKG), Science Memory Dumps (SMD), and Housekeeping memory Dumps (HMD). An additional data type, OTS, is included in this data set which contains information describing the operational table set controlling the data collection.

The data set CO-S-INMS-3-L1A-U-V1.0 contains annotated detector signals as a single data type. The data is aggregated from the science and housekeeping telemetry, spacecraft ephemeris and attitude data, Saturnian system ephemeris, and operations table contents. This data is provided as the fundamental data from which to produce higher level products. Besides the data files, this data set includes graphical browse products and a calibration summary valid at the time of volume creation.

It is anticipated that the data set CO-S-INMS-5-TTN-C-V1.0 containing altitude profiles of atmospheric species abundances, will be produced from data analysis preformed by the INMS science team and archived on a best-effort basis. The contents of this data set is related to Titan's atmosphere and will contain profiles of both neutral and ion species, included in Table 6 and Table 7, along with derived temperature profiles. Additional data product types may be added to this data set as the analysis results merit. Possibilities include magnetospheric ion and neutral flux as a function of look direction, space, and energy for each species. Magnetospheric constituents which INMS is capable of detecting, consist largely of water products: For the inner magnetosphere, ions such as H_3O^+, H_2O^+, O^+, H^+, OH^+, and neutrals such as H_2O, H, OH, O (though OH and O are both highly reactive neutrals, and thus may not be present at detectable levels). For the outer magnetosphere, ions such as H^+, N^+, N_2^+, H_2CN^+ and/or $C_2H_5^+$, and neutrals such as N, and N_2. At the icy satellites, INMS expects to detect species similar to those in the inner magnetosphere, along with additional trace species.

Table 6: Most Abundant Ion Species in Titan's Ionosphere		
Mass Group	**Mass Number**	**Species**
Light	1	H^+
	2	H_2^+
	3	H_3^+
Medium	14	N^+, CH_2^+
	15	CH_3^+, NH^+
	16	CH_4^+
	17	CH_5^+
Heavy	27	$C_2H_3^+$
	28	N_2^+, $C_2H_4^+$, $HCNH^+$
	29	N_2H^+, $C_2H_5^+$
Very Heavy	39	$C_3H_3^+$
	41	$C_3H_5^+$, H5+
	51	$C_4H_4^+$
	52	$C_3H_2N^+$
	53	$C_4H_5^{+,}$ $C_5H_5^+C_5H_5^+$
	65	$C_5H_5^+$
	67	$C_5H_7^+$
	69	$C_5H_9^+$
	77	$C_6H_5^+$
	79	$C_6H_7^+$, $C_5H_5N^+$
	91	$C_7H_7^+$

Table 7: Expected Neutral Species in Titan's Upper Atmosphere		
Mass Number	**Closed Source**	**Open Source Neutral**
2	H_2	
3	HD	
4	He	
14		N
15		NH
16	CH_4	CH_4, O
17	$^{13}CH_4$	OH
18	H_2O	H_2O
26	C_2H_2	
27	HCN	HCN
28	N_2, C_2H_4, CO	N_2, C_2H_4, CO
29	$^{15}N^{14}N$, $^{13}C_2H_4$	
30	C_2H_6	
36	(^{36}Ar)	
39		CHCN
44	CO_2, C_3H_8	
50		C_3N
51	CH_3CN, HC_3N	
52	C_2N_2	
74		C_6H_2
76	C_4N_2	
78	C_6H_6	

Table 8 contains a list of targeted flybys for which INMS is currently prime. When INMS is the prime instrument, the spacecraft pointing design was specified by the INMS team to support INMS data collection goals. The inner magnetosphere passes are still being determined in the science planning process, thus this list stops at Rev 46 (where the planning process is at the time this document was written). However, since these types of encounters are typically on the order of 90 minutes to two hours, this will be a relatively small subset of the INMS data.

Table 8: INMS Targeted Flybys			
Target	**FLYBY**	**REV**	**Alt (Km)**
Titan	A	A	1200
Titan	T5	6	951
Titan	T17	28	950
Titan	T18	29	950
Titan	T21	35	950
Titan	T26		
Titan	T27	41	952
Titan	T32	46	950
Titan	T36	50	950
Titan	T37	52	950
Titan	T39	54	952
Titan	T40	55	950
Enceladus	E61	61	TBD
Inner Mag		25	
Inner Mag		26	
Inner Mag		29	
Inner Mag		31	
Inner Mag		34	
Inner Mag		43	
Inner Mag		46	

In addition to the data sets outlined above, INMS will be producing and archiving a reference volume. This volume will contain the documentation that describes the INMS instrument and investigation. It will also contain the detailed calibration report. This report, contained in the CALIBRATION directory is the structured collection of document files, data files, command sequences and programs used to perform the characterizations of the flight and engineering model. Additional engineering model characterization activities are possible. In that event, the calibration report will be extended and the reference volume re-issued.

Table 9 contains estimates of the INMS monthly deliverable data volume, as well as a maximum possible. The L1A volume is computed based on INMS operating at full telemetry rate approximately 3 days per month and at reduced rate for the remainder of the period. Browse product files are negligible in volume compared with the data files.

Table 9: Deliverable Products and Their Approximate Size			
Data Set Identifier / Volume	**Standard Data Product Type**	**Delivery Frequency**	**Estimated Size**
CO-S-INMS-2-PKT-U-V1.0	INMS_PKT_SCI INMS_PKT_HKG INMS_PKT_HMD INMS_PKT_SMD INMS_PKT_OTS	monthly	tbd tbd tbd tbd tbd
CO-S-INMS-3-L1A-U-V1.0	INMS_L1A	monthly	3.2GB

1.7 Scope

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

1.8 Applicable Documents

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

Planetary Data System Archive Preparation Guide, January 20, 2005, JPL D-31224, Version 0.050120.

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

The Cassini Ion and Neutral Mass Spectrometer, To appear in Space Science Review 2003, J. H. Waite et al.

Cassini/Huygens Program Archive Plan for Science Data, PD 699-068, JPL D-15976

1.9 Audience

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

2. Archive Volume Generation

2.1 Archive Structure and Identification

PDS data set names shall conform to the following format: CASSINI <target> INMS <data type> <calibration state> DATA V<major version>.<minor version>. For example, version one of the L1A science data set will be named CASSINI S INMS L1A UNCALIBRATED DATA V1.0.

PDS data set identifiers (dsid) will be abbreviated versions of the data set names formed according to the PDS formation rule for the DATA_SET_ID keyword. For example, the dsid for the data set above would be CO-S-INMS-3-L1A-U-V1.0.

Each data set making up the INMS archive is contained in a distinct set of physical volumes. At the PPI node, each data set is maintained on-line. The off-line archive for each data set consists of a series of volumes, each bearing a unique volume identifier. The volume identifiers consist of the mission and instrument prefix and a volume identification number as follows:

COINMS_Dnnn

where COINMS is the instrument prefix, D indicates the data set to which the volume belongs and nnn is a sequential number assigned to each volume. The values for the data set indicator are specified in the Table 10.

Table 10: Volume Identifiers

Data Set ID	Data Set Indicator *D*	Example
CO-S-INMS-2-PKT-U-V1.0	0	COINMS_0001
CO-S-INMS-3-L1A-U-V1.0	3	COINMS_3001
CO-S-INMS-5-TTN-C-V1.0	6	COINMS_6001

Data file names are formed from the date and type of the data according to the convention in Table 11. The names of INMS_SCI, INMS_L1A, and INMS_TTN type files, which contain one hour of data contain the hour in the file names. The names of the remaining data types, produced once per day, have “00” in the hour field of the name. All file names include a version number, which is a sequentially assigned number, beginning at 01. The version number is incremented when the contents or format of the file is changed. The relationship between the various identifiers is illustrated in Table 12.

Table 11: Data File Naming Convention
Filename format: yyyydddhh_ttt_ vv.CSV

Identifier	Description	Options
yyyydddhh	Start time of data file	yyy - Year ddd - Day of Year hh - Hour
ttt	Data type	L1A - Science data annotated with ancillary data TTN - Titan atmosphere profiles SCI - Science Data Packet contents, scaled HKG - Housekeeping Data Packet contents, scaled HMD - Housekeeping Memory Dump Packet Contents, scaled SMD - Science Memory Dump Packet Contents, scaled OTS - Operational Table Descriptions
vv	Version number of data	01, 02, ..., etc.

Each archive volume has the same general structure, consisting of a set of fixed top level directories, INDEX, DOCUMENT, CATALOG, CALIB, DATA, BROWSE and optionally

EXTRAS, the contents of which will be described in detail below. The BROWSE directory is only part of the CO-S-INMS-3-L1A-U-V1.0 data set. The EXTRAS directory contains files that are helpful but not required for interpretation of the archived data. Only the INDEX, DOCUMENT, CATALOG, EXTRAS and CALIB directories will exist only on the first physical volume of a data set to avoid the requirement to redistribute all physical volumes if the contents of either the EXTRA or CALIB directories change.

The relationship between the data set, standard data product identifiers and file names are illustrated in Table 12. The data structures for the archive volumes for data set are shown in the Appendixes.

Table 12: Relationship Between Data Sets, Standard Data Product Types, and File Names

Data Set ID	CODMAC Level	Standard Data Product ID	Example File Name
CO-S-INMS-5-TTN-C-V1.0	5	INMS_TTN	200430015_TTN_01.CSV
CO-S-INMS-3-L1A-U-V1.0	3	INMS_L1A	200430015_L1A_01.CSV
CO-S-INMS-2-PKT-U-V1.0	2	INMS_PKT_SCI	200430000_SCI_01.CSV
		INMS_PKT_HKG	200430000_HKG_01.CSV
		INMS_PKT_OTS	200430000_OTS_01.CSV
		INMS_PKT_SMD	200430000_SMD_01.CSV
		INMS_PKT_HMD	200430000_HMD_01.CSV

2.2 Data Production and Transfer Methods

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

The INMS team produces the individual data files and the associated PDS labels for each of the standard data products defined in section 1.6 above. Data files will all be comma-separated value, ASCII files containing all data of the appropriate type for the time interval contained in the data product. Data products will be compressed (Gzipped) and transferred via secure FTP to the PPI node. Each data transfer is logged in the Cassini Archive Tracking System, CATS. Upon notification of the data transfer provided by the CATS, the PPI node decompresses the transfer and compares its contents against the CATS transfer information. Each data file is validated against the MD5 checksum contained the corresponding detached label. The PPI node will post a positive or negative acknowledgement of the data receipt on CATS. If the acknowledgement is positive, no further action is required on the part of INMS. If the acknowledgement is negative, the transfer is repeated.

2.3 Archive Volume Creation

PPI collects the data files and labels provided by the INMS team onto archive volumes. Each archive volume contains all INMS data available 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.

2.4 Volume Validation Methods

Validation of the INMS data archive is completed in two phases. The first phase is performed by the PPI node and consists of reviewing a sample data set for compliance with the PDS standards. The INMS team will submit a set of data files following the procedure of section 2.2 above. Upon receipt, the PPI node will confirm the structure of the files and labels. Once the sample data is validated, PPI will develop software to generate subsequent data volumes in an automated fashion.

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

Once automated production begins, the data file content will be spot checked by members of the INMS team. Browse products corresponding to the L1A product will be produced routinely and examined by members of the INMS team. In addition, the data will be actively used by team members to perform their analysis. Any discrepancies in the data noted during these activities will be investigated. If the discrepancy is a data error, the response will depend on the source of the error. If the error is in the software producing the data product, the error will be corrected and the data products affected will be reproduced. If there is a correctable error in a data file, the file will be replaced. If an error in a data file is uncorrectable, the error will be described in the cumulative errata file included on each volume in the volume set. The structure of data files and labels will be spot checked by the PPI node for compliance with PDS standards and this SIS.

3. ARCHIVE VOLUME CONTENTS

This section describes the contents of the INMS standard product archive collection volumes, including the file names, file contents, file types, and organizations responsible for providing the files. The complete directory structures are shown in Appendix A, B, and C. All directories and ancillary files described herein appear on each INMS archive volume, except where noted.

3.1 Root Directory Contents

The following files are contained in the root directory, 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.

Table 13: Root Directory Contents		
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 INMS Standard Data Products on all INMS 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

3.2 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) that lists all data products in the INMS archive volume set to date. The index and index information (INDXINFO.TXT) files are required by the PDS volume standards. The index tables include both required and optional columns. The cumulative index file is also a PDS requirement; however, this file is not reproduced on each data volume. An online and web accessible cumulative index file is maintained at the PPI Node while archive volumes are being produced. Only the last archive volume in the volume series will contain a cumulative index file.

Table 14: 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 INMS Data Products on this Volume	PPI
INDEX.LBL	A PDS detached label that describes INDEX.TAB	PPI

3.3 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. Clean HTML is acceptable as ASCII formats in addition to plain text. The following files are contained in the DOCUMENT directory and are produced or collected by the PPI Node.

Table 15: Document Directory Contents		
File Name	**File Contents**	**Provided By**
DOCINFO.TXT	A description of the contents of this directory	PPI
VOLSIS.DOC	The Archive Volume SIS (this document) in Microsoft Word format	INMS, PPI
VOLSIS.ASC	The Archive Volume SIS (this document) in ASCII format	INMS, PPI
VOLSIS.LBL	A PDS detached label that describes VOLSIS.ASC, VOLSIS.HTM and VOLSIS.DOC.	PPI
Other Documents	Additional documents describing data processing, calibration etc.	INMS
Other Document labels	Detached PDS labels for any additional documents	PPI

3.4 CATALOG Directory Contents

The completed PDS catalog files in the catalog directory provide a top-level understanding of the Cassini/INMS mission and its data products. The data set catalog files (e.g. CO_INMS_PKT_DS.CAT) will be provided by the INMS team, and the CATINFO.TXT by the PPI Node.

Table 16: Catalog Directory Contents		
File Name	**File Contents**	**Provided By**
CATINFO.TXT	A description of the contents of this directory	PPI
CO_INMS_PKT_DS.CAT *or* CO_INMS_L1A_DS.CAT *or* CO_INMS_TTN_DS.CAT	PDS Data Set catalog description of appropriate to the data set	INMS
CO_INSTHOST.CAT	PDS instrument host (spacecraft) catalog description of the Cassini spacecraft	Cassini Project
CO_INMS_INST.CAT	PDS instrument catalog description of the INMS instrument	INMS
CASSINI_MISSION.CAT	PDS mission catalog description of the Cassini mission	Cassini Project
CO_INMS_PERSON.CAT	PDS personnel catalog description of INMS Team members and other persons involved with generation of INMS Data Products	INMS
CO_INMS_REF.CAT	INMS-related references mentioned in other *.CAT files Additional bibliographic references, as appropriated	INMS
PRJREF.CAT	Cassini-relative references mentioned in other *.CAT files.	Cassini Project

3.5 CALIB Directory Contents and Naming Conventions

The calibration directory, included in the CO-S-INMS-3-L1A-U-V1.0 data set only, contains one or more spreadsheets of instrument calibration data. An additional file will be added when the instrument characteristics have either changed or been more precisely determined. The files will be named according to their time range of applicability. For example, if it is determined that the calibration after 2007-030 is sufficiently changed, a file incorporating that date in its name will be added. The naming convention is defined in Table 17, below. To avoid the requirement of redistributing all physical media data volumes in the event of a calibration update, the CALIB directory will be present on only the first physical volume COINMS_3000, and a note to that effect will be placed in the AAREADME file on all physical volumes.

Detailed documentation of the preflight characterization is contained in the EXTRAS directory.

Table 17: Calibration Summary File Naming Convention
Filename format: yyyyddd_CAL_ vv.CSV

Identifier	Description	Options
yyyyddd	Date of validity	yyy - Year ddd - Day of Year
vv	Version number of data	01, 02, ..., etc.

3.5.1 Required Files

The calibration directory contains a file named INFO.TXT that is an ASCII text description of the CALIB directory contents. The calibration summary files will be described by detached PDS labels. The label files will have the same root name as the calibration file that they describe with the suffix ".LBL" replacing the ".CSV" suffix.

3.5.2 CALIB Directory Contents

The calibration data is organized in a flat directory structure, with the CALIB directory containing all of the calibration summary files and their labels.

Table 18:Calibration Summary Directory Contents

File Name	File Contents	Provided By
INFO.TXT	Brief description of directory contents and naming conventions.	PPI
CAL.CSV	Calibration summary file.	INMS
CAL.LBL	PDS label for CAL file of same base name.	INMS

3.6 DATA (Standard Products) Directory Contents and Naming Conventions

The data directory contains the actual data products produced by the INMS team. The CO-S-INMS-2-PKT-U-V1.0 archive volumes will have SCI, HKG, OTS, EVT, SMD, and HMD files in daily subdirectories The CO-S-INMS-3-L1A-U-V1.0 archive volumes will have L1A files in daily subdirectories. (see 3.6.2. for details description of this directory structure).

3.6.1 Required Files

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

3.6.2 DATA Directory Contents

The data directory contains a separate subdirectory for each day. The daily subdirectories are grouped by year into yearly directories. The structure may be seen in Appendix A. The yearly directories will be named for the year, 2004, 2005, and so forth. The daily subdirectories will be named with the ordinal day-of-year, 001, 002,...366. There may be more than one SCI, or L1A data file in each subdirectory, depending on what events take place on a given day. For HKG, OTS, SMD and HMD only one file will be produced per day. In addition to the data files there will be a brief text file (INFO.TXT) that describes the directory contents.

Table 19: Daily Data Directory Contents

File Name	File Contents	Provided By
INFO.TXT	Brief description of directory contents and naming conventions.	PPI
yyyydddhh_*ttt*_vv.CSV	Data file.	INMS
yyyydddhh_*ttt*_vv.LBL	PDS label for data files of same base name.	INMS
*ttt*_STRUCT_VV.FMT	PDS format file containing the data file structure portion of the PDS label for all of the INMS_L1A and INMS_SCI data files.	INMS
ttt is replaced with L1A on the CO-S-INMS-3-L1A-U-V1.0 data set volumes SCI,HKG, OTS, SMD, and HMD on the CO-S-INMS-2-PKT-U-V1.0 data set volumes There are no structure files for standard data products INMS_HKG, INMS_OTS, INMS_SMD, or INMS_HMD		

3.7 BROWSE Directory Contents and Naming Conventions

The browse directory contains images of INMS summary data and is included only on CO-S-INMS-3-L1A-U-V1.0 data set volumes. Two type of images are included, mass-time spectra and time series data. Each image spans six hours beginning at 0h, 6h, 12h, and 18h. (examples to be added). The image files are all portable network graphics files. The files are named in accordance with the convention in Table 20.

Table 20: Browse Product File Naming Convention ***Filename format: yyyydddhh_ttt_ vv.PNG***		
Identifier	**Description**	**Options**
yyyydddhh	Start date file	yyy - Year ddd - Day of Year hh - Hour of Day
ttt	Plot type	SPECTRA - mass-time spectra LINE - mass time series
vv	Version number of data	01, 02, ..., etc.

3.7.1 Required Files

Every subdirectory beneath the browse directory contains a file named INFO.TXT which contains a description of the directory contents in ASCII text. Every file in the browse path is described by a PDS label. All labels will be detached, having the same root name as the file they describe with the suffix '.LBL' replacing the suffix of the file name.

3.7.2 BROWSE Directory Contents

The browse directory contains a separated subdirectory for each day. The daily subdirectories are grouped by year into yearly directories. The structure may be seen in Appendix A. The yearly directories will be named for the year, 2004, 2005, and so forth. The daily subdirectories will be named with the ordinal day-of-year, 001, 002,...366. Each daily directory contains eight files, four mass-time spectra and four mass time series. In addition there will be a brief text file (INFO.TXT) that describes the directory contents.

Table 21: Daily Browse Product Directory Contents		
File Name	**File Contents**	**Provided By**
INFO.TXT	Brief description of directory contents and naming conventions.	PPI
yyyydddhh_SPECTRA_vv.PNG	Mass-time spectra browse plots	INMS
yyyydddhh_SPECTRA_vv*.LBL	PDS label for SPECTRA plot file of same base name.	PPI
yyyydddhh_LINE_vv.PNG	Time series browse plots	INMS
yyyydddhh_LINE_vv.LBL	PDS label for LINE plot file of same base name	PPI

3.8 EXTRAS Directory Contents

The EXTRAS directory contains files that are helpful, but are not required to interpret the INMS data. Files in the EXTRAS directory are exempt from labeling requirements. An EXTRAS directory is included in the CO-S-INMS-3-L1A-U-V1.0 archive. Subdirectories are used to organize the items into groups of related files. The EXTRAS directory will contain two subdirectories, SOFTWARE and CALREPORT. To avoid the requirement of redistributing all physical media data volumes in the event that the EXTRAS contents changes, this directory will be present on only the first physical volume COINMS_3000, and a note to that effect will be placed in the AAREADME file on all physical volumes.

3.8.1 SOFTWARE Directory Contents

The SOFTWARE directory contains a library of IDL routines that may be used to read, manipulate and display the contents of the L1A data files. In addition to the IDL source code files, the directory will contain a user's guide and an HTML help file.

3.8.2 CALREPORT Directory Contents

The calibration report directory in the EXTRAS directory contains the complete report of the pre-launch instrument characterization. The report is in the form of a structured series of files containing data from one characterization test. These files are the source for the initial calibration summary file included in the archive volume. The organization of this directory is shown in Appendix C.

4. ARCHIVE VOLUME FORMAT

This section describes the format of the INMS standard product archive volumes. Data that comprise the INMS standard product archives will be formatted in accordance with Planetary Data System specifications.

4.1 Disk Format

Disk formats for the archive volumes will conform to the PDS standard for the applicable media. At present, the plan is to archive INMS data on DVD-R media.

4.2 File Formats

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

4.2.1 Document File Formats

Document files with the .TXT suffix exist in all directories. They are ASCII files with attached 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, some of the documents in the reference volume contain formatting and figures that cannot be rendered as pure ASCII text. These documents will be 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 will be met by the inclusion of CLEAN HTML formatted documents.

4.2.2 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 labels described in the next section.

4.2.3 PDS Label File Formats

All data files in the INMS Standard Product Archive Collection have PDS labels. INMS is producing ASCII comma separated value files for all products. Each file will have an detached label, whose name is identical to the data file name with the .CSV suffix replaced by .LBL.

A PDS label, whether attached 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.

All detached labels contain 80-byte fixed-length 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.

4.2.4 Data File Formats – Comma Separated Value Files

Delimited field, ASCII data files (.CSV suffix) exist in the DATA directories. These files are formatted for direct reading into many database management systems on various computers. In the INMS application of the delimited field format, fields are separated by commas. Records vary in length in bytes but will have a fixed number of fields. Missing data are represented by empty fields. All fields are described by detached PDS labels.

4.3 General Data Product Format

All INMS data products are CSV files that contain a series of homogenous records. Records are delimited by the end-of-line characters, the carriage return character (ASCII 13) followed by the line feed character (ASCII 10). Each file contains one or more lines of column headers. The starting location of the data is indicated in the label by the spreadsheet pointer. The column headers are the same as the field name in the tables below, additional header rows contain the units and strings to use as axis labels in plots. Blank fields indicate that the field is not applicable in the context of the record, the data is not available, is out of nominal range, or is otherwise not suitable for archiving. The following sections describe the content and structure of each of the standard data products within the INMS data sets, as described in Table 12 in Section 2.1.

4.3.1 INMS SCI Data Product Formats

Table 22, below, describes the contents and ranges of the SCI data files. These files contain the contents of the science data packets, converted to dimensional quantities. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 22: SCI Data File Contents and Structure

Field Name	Type	Units	Range
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
AssocSciPacketID	integer		

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	integer		0 ≤ x ≤ 1
MiniPktID	integer		0 ≤ x ≤ 65535
ElapsedSeqTime	integer		0 ≤ x ≤ 65535
ScanIndex	integer		0 ≤ x ≤ 31
SeqTable	integer		0 ≤ x ≤ 31
CycleNum	integer		0 ≤ x ≤ 63
IL1DAC	integer		0 ≤ x ≤ 255
C6DAC	integer		0 ≤ x ≤ 15
ThPresDAC	integer		0 ≤ x ≤ 15
CF1DAC	integer		0 ≤ x ≤ 15
BADAC	integer		0 ≤ x ≤ 15
DT1DAC	integer		0 ≤ x ≤ 15
DT2DAC	integer		0 ≤ x ≤ 15
EM1DAC	integer		0 ≤ x ≤ 255
EM2DAC	integer		0 ≤ x ≤ 255
TmModeIndex	integer		0 ≤ x ≤ 31
MassTable	integer		0 ≤ x ≤ 2047
IP1C1	real		0 ≤ x ≤ 33711902.01
IP1C2	real		0 ≤ x ≤ 33711902.01
IP2C1	real		0 ≤ x ≤ 33711902.01
IP2C2	real		0 ≤ x ≤ 33711902.01
• | • | •	• • •	• • •	0 ≤ x ≤ 33711902.01
IP67C1	real		0 ≤ x ≤ 33711902.01
IP67C2	real		0 ≤ x ≤ 33711902.01
IP68C1	real		0 ≤ x ≤ 33711902.01
IP68C2	real		0 ≤ x ≤ 33711902.01
Spare	integer		0 ≤ x ≤ 65536
Loop	integer		0, 1
Sthi	integer		0, 1

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
DCONState	integer		0 ≤ x ≤ 63
CycleIndex	integer		0 ≤ x ≤ 255
SequenceRecord	string		
CycleRecord	string		
FilCmd4On	integer		0, 1
FilCmd3On	integer		0, 1
FilCmd2On	integer		0, 1
Fil4Cmd1On	integer		0, 1
Fil6On	integer		0, 1
Fil4On	integer		0, 1
Fil3On	integer		0, 1
Fil2On	integer		0, 1
Fil1On	integer		0, 1
FilCollision	integer		0, 1
FilEmissAdjust	integer		0, 1
USeqFilError	integer		0, 1
Spare	integer		0 ≤ x ≤ 511
SciRTICounter	integer		0 ≤ x ≤ 65535
SciDTCounter	integer		0 ≤ x ≤ 65535
SciSTMCounter	integer		0 ≤ x ≤ 65535
CPUIdleCounter	integer		0 ≤ x ≤ 15
Disc0Reset	integer		0, 1
AllSysGo	integer		0, 1
AllSysGoLatched	integer		0, 1
ExcNoHandler	integer		0, 1
SafeMode	integer		0, 1
ForcedSleep	integer		0, 1
BIU_Auto_Init	integer		0 ≤ x ≤ 7
GSETest	integer		0, 1
SystemInitialized	integer		0, 1
SystemConfigured	integer		0, 1
INMSBitFail	integer		0, 1
TMBuffOverflow	integer		0, 1
AlfBoot	integer		0, 1
AlfError	integer		0, 1
BIUMemError	integer		0, 1

Table 22: SCI Data File Contents and Structure

Field Name	Type	Units	Range
ODBfrOverflow	integer		0, 1
USeqoOfflinew	integer		0, 1
USeqiOffline	integer		0, 1
USeqError	integer		0, 1
1750ME	integer		0, 1
AmuxError	integer		0, 1
CDSoOffline	integer		0, 1
CDSiOnline	integer		0, 1
CDSError	integer		0, 1
RTEError	integer		0, 1
bSpare	integer		0, 1
Imon1	real	A	0.087772 ≤ x ≤ 1.646842
BACollector	real	V	-0.04 ≤ x ≤ 5.06
Imon2	real	A	0.087772 ≤ x ≤ 1.646842
BACurrent	real	A RMS	-0.010828 ≤ x ≤ 1.369742
BAEmission	real	µA	103.302002 ≤ x ≤ 193.595596
RFAGC	real	V	-0.04 ≤ x ≤ 5.06
MultAna1	real	µA	-0.08 ≤ x ≤ 10.12
MultAna2	real	µA	0.258 ≤ x ≤ 1.518
Imon3	real	A	0.087772 ≤ x ≤ 1.646842
ThermPressInt	real	V	-0.04 ≤ x ≤ 5.06
1Emission	real	µA	5.8812 ≤ x ≤ 25.6542
3Emission	real	µA	-0.2022 ≤ x ≤ 25.5783
EM1Current	real	µA	-0.30072 ≤ x ≤ 38.04108
EM2Current	real	µA	7.518 ≤ x ≤ 38.04108
CmdsRec	integer		0 ≤ x ≤ 65535
CmdsRej	integer		0 ≤ x ≤ 65535
AlfsRec	integer		0 ≤ x ≤ 65535
AlfsRej	integer		0 ≤ x ≤ 65535
CmdSerNo1	integer		0 ≤ x ≤ 255
Time1	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time2	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time3	integer		0 ≤ x ≤ 16777215

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
CRC	integer		n/a

4.3.2 INMS L1A Data Product Formats

The L1A files contain the annotated science data. These files contain data abstracted from the science and housekeeping packets along with derived ancillary quantities. The data contained in these files is the basic data from which higher order products are derived. The structure file, included as Appendix D, further describes these records.

4.3.3 INMS HKG Data Product Formats

The HKG files contain the complete contents of the housekeeping telemetry packets. Table 23 below describes the contents and ranges of the HKG data files. These files contain the contents of the housekeeping data packets, converted to dimensional quantities. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 23: HKG Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
AssocSciPacketID	integer		
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	integer		0, 1
InstMode	integer		0 ≤ x ≤ 7
SequenceTable	integer		0-31
CycleIndex	integer		0, 15
ScanIndex	integer		0, 15
ElapsedTime	integer	s	0 ≤ x ≤ 65535
CycleTable	integer		0 ≤ x ≤ 63
Spare1	integer		n/a
DataSumN	integer		0 ≤ x ≤ 255
ThermStatus	integer		0 ≤ x ≤ 3
ThermDelta	integer		-512 ≤ x ≤ 512

Table 23: HKG Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
Spare2	integer		n/a
BAStatus	integer		0 ≤ x ≤ 3
BAStep	integer		0 ≤ x ≤ 15
BAValue	integer		0 ≤ x ≤ 15
TCReceived	integer		0 ≤ x ≤ 255
BIU_Bus_Fault	integer		0 ≤ x ≤ 255
Machine_Error	integer		0 ≤ x ≤ 15
TCRejected	integer		0 ≤ x ≤ 15
InstTMMode	integer		0 ≤ x ≤ 255
BIUSpare	integer		0 ≤ x ≤ 3
TGORDT	integer		0, 1
AlfOverrideInhibit	integer		0, 1
AlfBootEnable	integer		0, 1
DefSciEnable	integer		0, 1
BIUSleep	integer		0, 1
BIUPOR	integer		0, 1
HKFull	integer		0, 1
HKSSysF	integer		0, 1
HKMsgError	integer		0, 1
TMSCError	integer		0, 1
StTb1Error	integer		0, 1
AncBCError	integer		0, 1
BIUSpare2	integer		0, 1
RTIsFail	integer		0, 1
Fil1On	integer		0, 1
Fil2On	integer		0, 1
Fil3On	integer		0, 1
Fil4On	integer		0, 1
DconSpare1	integer		0, 1
Fil6On	integer		0, 1
DconSpare2	integer		0-3
BIUWDX	integer		0, 1
BIUFT	integer		0, 1
FCFt	integer		0, 1
FCTgo	integer		0, 1
FCIllad	integer		0, 1

Table 23: HKG Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
FCNPU	integer		0, 1
FCSuren	integer		0, 1
BIUDTsLoaded	integer		0, 1
1Emission	real	μA	-0.2028 ≤ x ≤ 25.6542
2Emission	real	μA	-0.20204 ≤ x ≤ 25.55806
Imon1	real	A	0.087772 ≤ x ≤ 1.646842
Ground1	real	V	-0.04 ≤ x ≤ 5.06
1Current	real	A	-0.01154 ≤ x ≤ 1.45981
2Current	real	A	-0.01174 ≤ x ≤ 1.4846
1Target	real	μA	-0.20388 ≤ x ≤ 25.79082
2Target	real	μA	-0.2042 ≤ x ≤ 25.8313
1Bias50	real	V	-0.04 ≤ x ≤ 5.06
1Bias70	real	V	-0.04 ≤ x ≤ 5.06
2Bias70	real	V	-0.04 ≤ x ≤ 5.06
Ground2	real	V	-0.04 ≤ x ≤ 5.06
AMString	real	V	-642.0128 ≤ x ≤ 5.0752
FBString	real	V	-512.4768 ≤ x ≤ 4.0512
BACollector	real	V	-0.04 ≤ x ≤ 5.06
FBControl	real	V	-0.04 ≤ x ≤ 5.06
3Emission	real	μA	-0.2022 ≤ x ≤ 25.5783
4Emission	real	μA	-0.20224 ≤ x ≤ 25.58336
Imon2	real	A	0.087772 ≤ x ≤ 1.646842
EB4-4	real	V	-0.04 ≤ x ≤ 5.06
3Current	real	A	-0.01156 ≤ x ≤ 1.46234
4Current	real	A	-0.01152 ≤ x ≤ 1.45728
4Anode	real	μA	-0.08036 ≤ x ≤ 10.16554
3Anode	real	μA	-0.08036 ≤ x ≤ 10.16554
3Bias50	real	V	-0.04 ≤ x ≤ 5.06
3Bias70	real	V	-0.04 ≤ x ≤ 5.06
4Bias70	real	V	-0.04 ≤ x ≤ 5.06
RFSupplyTemp	real	°C	13.541332 ≤ x ≤ 26.187338
FBSupplyTemp	real	°C	14.413488 ≤ x ≤ 31.997969
EMSupplyTemp	real	°C	13.100821 ≤ x ≤ 32.385525
Plus5FB	real	V	-0.04 ≤ x ≤ 5.06
BAGrid	real	μA	-1.1992 ≤ x ≤ 151.6988
OL1	real	μA	-0.05333 ≤ x ≤ 6.7465

Table 23: HKG Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OL2	real	μA	-0.05333 ≤ x ≤ 6.7465
BACurrent	real	A RMS	-0.010828 ≤ x ≤ 1.369742
BAEmission	real	μA	-1.5304 ≤ x ≤ 193.5956
Ground3	real	V	-0.04 ≤ x ≤ 5.06
BABias	real	V	-0.04 ≤ x ≤ 5.06
RFAGC	real	V	-0.04 ≤ x ≤ 5.06
Minus5_7	real	V	-6.9031 ≤ x ≤ 5.1537
FCTemp	real	°C	18.625172 ≤ x ≤ 36.680908
LVPSTemp	real	°C	23.445826 ≤ x ≤ 31.223598
EM1Current	real	KV	-0.3007 ≤ x ≤ 38.0411
EM2Current	real	KV	-0.3007 ≤ x ≤ 38.0411
Imon3	real	A	0.087772 ≤ x ≤ 1.646842
Multana1	real	μA	-0.08 ≤ x ≤ 10.12
Multana2	real	μA	-0.012 ≤ x ≤ 1.518
Plus5R	real	V	-0.08 ≤ x ≤ 10.12
ThermPressInt	real	V	-0.04 ≤ x ≤ 5.06
ThermPressExt	real	V	-0.04 ≤ x ≤ 5.06
Plus13	real	V	-0.1163 ≤ x ≤ 14.7094
Index	integer		0 ≤ x ≤ 255
RFFreq.	real		0 ≤ x ≤ 2.107
CPUIdleCounter	integer		0, 15
Disc0Reset	integer		0, 1
AllSystemGo	integer		0, 1
AllSysGoLatched	integer		0, 1
ExcNoHandler	integer		0, 1
SafeMode	integer		0, 1
ForcedSleep	integer		0, 1
BIU_Auto_Init	integer		0, 1
GSETest	integer		0, 1
SystemInitialized	integer		0, 1
SystemConfigured	integer		0, 1
TgoDetect	integer		0, 1
BIUResetOccured	integer		0, 1
ICError	integer		0, 1
TGOToggle	integer		0, 1
SubmoduleID	integer		0, 15

Table 23: HKG Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
TrapFlag	integer		0 ≤ x ≤ 3
ModuleID	integer		0 ≤ x ≤ 63
INMSBitFail	integer		0, 1
TMBuffOverflow	integer		0, 1
ALFBoot	integer		0, 1
ALFError	integer		0, 1
BIUMemError	integer		0, 1
ODBufferOverflow	integer		0, 1
USeqoOffline	integer		0, 1
USeqiOffline	integer		0, 1
USeqError	integer		0, 1
1750ME	integer		0, 1
AMUXError	integer		0, 1
CDSoOffline	integer		0, 1
CDSiOffline	integer		0, 1
CDSError	integer		0, 1
RTEError	integer		0, 1
MemoryChecksum	integer		0, 1
STMCounter	integer		0 ≤ x ≤ 255
RTICounter	integer		0 ≤ x ≤ 255
MassTable	integer		0 ≤ x ≤ 255
ConfigNumber	integer		0 ≤ x ≤ 255
CRC			n/a

4.3.4 INMS OTS Data Product Formats

The OTS is the Operations Table Set that was in instrument memory when the data was taken. Table 24 below describes the contents of the OTS data files. Each row in the file contains the description of a table set and its period of use. If more than one table set was in use during a day, this file will have multiple records.

Table 24: OTS Data File Contents and Structure	
Field Name	**Type**
TABLESETID	Integer
OPSTABLESTYPEID	Integer
CREATEID	Integer
CREATEDATE	Date/Time

Table 24: OTS Data File Contents and Structure	
Field Name	**Type**
UPDATEID	Integer
UPDATEDATE	Date/Time
INSTRUMENT	String
ACTIVE	Integer
ACTIVEDATE	Date/Time
INACTIVEDATE	Date/Time
LOCKED	Integer
TITLE	String
DESCRIPTION	String

5.3.5 INMS SMD Data Product Formats

The SMD files contain the complete contents of the science memory dump telemetry packets. The INMS team uses this file to verify the state of the instrument. Table 25 below describes the contents and ranges of the SMD data files. These files contain the contents of the memory dump telemetry packets, converted to dimensional quantities, where appropriate. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 25: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	integer		0, 1
MiniPacketID	integer		0 ≤ x ≤ 65535
DumpSource	integer		0 ≤ x ≤ 7
NumberofWords	integer		0 ≤ x ≤ 255
DumpAddress	string		0 ≤ x ≤ 65535
IL1DAC	integer		0 ≤ x ≤ 255
C6DAC	integer		0 ≤ x ≤ 15
ThPressDAC	integer		0 ≤ x ≤ 15
CF1DAC	integer		0 ≤ x ≤ 15

Table 25: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
BADAC	integer		0 ≤ x ≤ 15
DT1DAC	integer		0 ≤ x ≤ 15
DT2DAC	integer		0 ≤ x ≤ 15
EM1DAC	integer		0 ≤ x ≤ 255
EM2DAC	integer		0 ≤ x ≤ 255
TMModeIndex	integer		0 ≤ x ≤ 31
MassTable	integer		0 ≤ x ≤ 2047
Word0	integer		0 ≤ x ≤ 0xFFFF
• • •	• • •		0 ≤ x ≤ 0xFFFF
Word170	integer		0 ≤ x ≤ 0xFFFF
WordSpare	string		
CPUIdleCounter	integer		0 ≤ x ≤ 15
Disc0Reset	integer		0, 1
AllSysGo	integer		0, 1
AllSysGoLatched	integer		0, 1
ExcNoHandler	integer		0, 1
Safemode	integer		0, 1
ForcedSleep	integer		0, 1
BIU_Auto_Init	integer		0, 1
GSETest	integer		0, 1
SystemInitialized	integer		0, 1
SystemConfigured	integer		0, 1
INMSBitFail	integer		0, 1
TMBuffOverflow	integer		0, 1
AlfBoot	integer		0, 1
AlfError	integer		0, 1
BIUMemError	integer		0, 1
ODBfrOverflow	integer		0, 1
USeqoOffline	integer		0, 1
USeqiOffline	integer		0, 1
USeqError	integer		0, 1
1750ME	integer		0, 1
AmuxError	integer		0, 1
CDSoOffline	integer		0, 1
CDSiOnline	integer		0, 1

Table 25: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
CDSError	integer		0, 1
RTEError	integer		0, 1
Spare	integer		0, 1
Imon1	real	A	0.087772 ≤ x ≤ 1.646842
BaCollector	real	V	-0.04 ≤ x ≤ 5.06
Imon2	real	A	0.087772 ≤ x ≤ 1.646842
BaCurrent	real	A RMS	-0.010828 ≤ x ≤ 1.369742
BaErrission	real	μA	103.302002 ≤ x ≤ 193.595596
RFAGC	real	V	-0.04 ≤ x ≤ 5.06
MultAna1	real	μA	-0.08 ≤ x ≤ 10.12
MultAnal2	real	μA	0.258 ≤ x ≤ 1.518
Imon3	real	A	0.087772 ≤ x ≤ 1.646842
ThermPressInt	real	V	-0.04 ≤ x ≤ 5.06
1Emission	real	μA	5.8812 ≤ x ≤ 25.6542
3Emission	real	μA	-0.2022 ≤ x ≤ 25.5783
EM1Current	real	μA	-0.30072 ≤ x ≤ 38.04108
EM2Current	real	μA	7.518 ≤ x ≤ 38.04108
CmdsRec	integer		0 ≤ x ≤ 65535
CmdsRej	integer		0 ≤ x ≤ 65535
AlfsRec	integer		0 ≤ x ≤ 65535
AlfsRej	integer		0 ≤ x ≤ 65535
ConfigNum	integer		0 ≤ x ≤ 255
Time1	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time2	integer		0 ≤ x ≤ 16777215
CmdSerNo3	integer		0 ≤ x ≤ 255
Time3	integer		0 ≤ x ≤ 16777215
CRC			n/a

4.3.5 INMS HMD Data Product Formats

The HMD files contain the complete contents of the housekeeping memory dump telemetry packets. As with the SMD the INMS team uses this file to verify the state of the instrument. Table 26 below describes the contents and ranges of the HMD data files. These files contain the contents of the housekeeping memory dump packets, converted to dimensional quantities, where appropriate. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 26 :HMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	boolean		
InstMode	integer		0-7
SequenceTable	integer		0-31
CycleIndex	integer		0, 15
ScanIndex	integer		0, 15
ElapsedTime	integer	s	0-65535
CycleTable	integer		0-63
Spare	integer		n/a
MemoryType	integer		0-7
NumberofWords	integer		(1-32)
StartAddress	integer		0-65535
TCReceived	integer		0-255
BIU_Bus_Fault	integer		0-255
Machine_Error	integer		0, 15
TCRejected	integer		0, 15
InstTMMode	integer		0-255
BIUSpare	integer		0-3
TGORDT	boolean		0, 1
AlfOverrideInhibit	boolean		0, 1
AlfBootEnable	boolean		0-255
DefSciEnable	boolean		0-3
BIUSleep	boolean		0, 1
BIUPORD0	boolean		0, 1
HKFull	boolean		0, 1
HKSSysF	boolean		0, 1
HKMSGError	boolean		0, 1
TMSCError	boolean		0, 1
StTblError	boolean		0, 1

Table 26 :HMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
AncBCError	boolean		0, 1
BIUSpare2	boolean		0, 1
RTIsFail	boolean		0, 1
Fil1ON	boolean		0, 1
Fil2ON	boolean		0, 1
Fil3ON	boolean		0, 1
Fil4ON	boolean		0, 1
DconSpare1	boolean		0, 1
Fil6ON	boolean		0, 1
DconSpare2	integer		0-3
BIUWDX	boolean		0, 1
BIUFT	boolean		0, 1
FCFT	boolean		0, 1
FCTgo	boolean		0, 1
FCIllad	boolean		0, 1
FCNPU	boolean		0, 1
FCSuren	boolean		0-3
BIUDTsLoaded	boolean		0, 1
Word0	integer		0 ≤ x ≤ 0xFFFF
• • •	• • •		0 ≤ x ≤ 0xFFFF
Word31	integer		0 ≤ x ≤ 0xFFFF
TgoDetect	boolean		0, 1
BIUResetOcc	boolean		0, 1
ICError	boolean		0, 1
TGOToggle	boolean		0, 1
SubmoduleID	integer		0, 15
TrapFlag	integer		0-3
ModuleID	integer		0-63
CRC			n/a

APPENDIX A: DIRECTORY STRUCTURE FOR VOLUMES OF THE CO-S-INMS-3-L1A-U-V1.0 DATA SET

```
+-INDEX ----+---INDXINFO.TXT
|           +---INDEX.TAB
|           \---INDEX.LBL
|
+-DOCUMENT--+
|           +---DOCINFO.TXT
|           +---VOLSIS.DOC
|           +---VOLSIS.ASC
|           +---VOLSIS.LBL
|           \---additional documentation files and labels
|
+-CATALOG --+---CATINFO.TXT
|           +---CO_INMS_L1A_DS.CAT
|           +---CO_INSTHOST.CAT
|           +---CO_INMS_INST.CAT
|           +---CASSINI_MISSION.CAT
|           +---CO_INMS_PERSION.CAT
|           \---CO_INMS_REF.CAT
|
+-CALIB-----+---yyyyddd_CAL_vv.CSV
|           \---yyyyddd_CAL_vv.CSV
|
+-DATA-------+----yyyy----+---ddd-----+---yyyyddd00_L1A_vv.CSV
|            |            |           +---yyyyddd01_L1A_vv.CSV
|            |            |           +---yyyyddd02_L1A_vv.CSV
|            |            |           +---yyyyddd03_L1A_vv.CSV
|            |            |           +---up to 20 additional L1A files
|            |            |           +---yyyyddd00_L1A_vv.LBL
|            |            |           +---yyyyddd01_L1A_vv.LBL
|            |            |           +---yyyyddd02_L1A_vv.LBL
|            |            |           +---yyyyddd03_L1A_vv.LBL
|            |            |           +---up to 20 additional L1A labels
|            |            |           +---L1A_STRUCT_vv.FMT
|            |            +---ddd-----+
|            \----yyyy---+---ddd-----+
|
v
```

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```
^
|
+-BROWSE----+----yyyy---+---ddd-----+---yyyddd00_SPECTRA_vv.PNG
|           |           |           +---yyyddd00_SPECTRA_vv.LBL
|           |           |           +---yyyddd00_LINE_vv.PNG
|           |           |           +---yyyddd00_LINE_vv.LBL
|           |           |           +---up to 5 more browse product sets
|           |           +---ddd-----+
|           \----yyyy---+---ddd-----+
|
\-EXTRAS----+--SOFTWARE-+---INFO.TXT
            |           +---DISCLAMER.TXT
            |           +---INMS_*.PRO     idl v6.1 source code files
            |           +---SPRL_*.PRO     idl v6.1 source code files
            |           +---USERGUIDE.DOC  user's guide to routines
            |           \---INMS_ANALYSIS_HELP.HTL     online help
            |
            \-CALREPORT--> see APENDIX C
```

APPENDIX B: DIRECTORY STRUCTURE FOR VOLUMES OF THE CO-S-INMS-2-PKT-U-V1.0 DATA SET

```
+-INDEX ----+---INDXINFO.TXT
|           +---INDEX.TAB
|           \---INDEX.LBL
|
+-DOCUMENT--+
|           +---DOCINFO.TXT
|           +---VOLSIS.DOC
|           +---VOLSIS.ASC
|           +---VOLSIS.LBL
|           \---additional documentation files and labels
|
+-CATALOG --+---CATINFO.TXT
|           +---CO_INMS_PKT_DS.CAT
|           +---CO_INSTHOST.CAT
|           +---CO_INMS_INST.CAT
|           +---CASSINI_MISSION.CAT
|           +---CO_INMS_PERSION.CAT
|           \---CO_INMS_REF.CAT
|
\-DATA------+----yyyy---+---ddd-----+---yyyyddd00_SCI_vv.CSV
            |           |           +---up to 23 additional SCI files
            |           |           +---yyyyddd00_SCI_vv.LBL
            |           |           +---up to 23 additional L1A Labels
            |           |           +---yyyyddd00_HKG_vv.CSV
            |           |           +---yyyyddd00_OTS_vv.CSV
            |           |           +---yyyyddd00_SMD_vv.CSV
            |           |           +---yyyyddd00_HMD_vv.CSV
            |           |           +---yyyyddd00_SCI_vv.LBL
            |           |           +---yyyyddd00_HKG_vv.LBL
            |           |           +---yyyyddd00_OTS_vv.LBL
            |           |           +---yyyyddd00_SMD_vv.LBL
            |           |           +---yyyyddd00_HMD_vv.LBL
            |           +---ddd-----+
            |           +---ddd-----+
            \----yyyy---+---ddd-----+
```

Appendix C: CALIBRATION REPORT Directory Structure

```
CALREPORT->
+---INMS_FU_Characterization
|   +---1-Directory
|   +---2-General
|   |   +---2.1-Document_status
|   |   +---2.2-Data_flow
|   |   +---2.3-Data_programs
|   |   +---2.4-Data_program_ouput
|   |   |   +---2.4.01-0130n2pri
|   |   |   +---2.4.02-0131n2sec
|   |   |   +---2.4.03-0131arsec
|   |   |   +---2.4.04-0201arpri
|   |   |   +---2.4.05-0201ch4sec
|   |   |   +---2.4.06-0202ch4pri
|   |   |   +---2.4.07-0202hepri
|   |   |   +---2.4.08-0202hesec
|   |   |   +---2.4.09-0204h2pri
|   |   |   +---2.4.10-0204h2sec
|   |   |   +---2.4.11-0205krpri
|   |   |   +---2.4.12-0205krsec
|   |   |   +---2.4.13-0208ar02.8ev
|   |   |   +---2.4.14-0209ar08.0ev
|   |   |   +---2.4.15-0209ar14.0ev
|   |   |   +---2.4.16-0210kr02.8ev
|   |   |   +---2.4.17-0210kr08.0ev
|   |   |   +---2.4.18-0210kr14.0ev
|   |   |   +---2.4.19-0211he02.8ev
|   |   |   +---2.4.20-0213c2h2sec
|   |   |   +---2.4.21-0213c2h2pri
|   |   |   +---2.4.22-0213c2h4pri
|   |   |   +---2.4.23-0213c2h4sec
|   |   |   \---2.4.24-0213noble
|   |   \---2.5-Miscellaneous_files
|   +---3-GSE_files
|   |   +---3.1-ATOL_sequences
|   |   +---3.2-ATOL_serial_numbers
|   |   +---3.3-SUN_files
|   |   |   +---3.3.4-GSE_data_therm_ion
|   |   |   \---3.3.5-GSE_phd_summary
|   |   +---3.4-Programs
|   |   |   +---3.4.1-avghk
|   |   |   \---3.4.2-avgscience_sp1
|   |   \---3.5-Misc_files
|   |       +---3.5.1-Commands
|   |       |   \---Commands
|   |       |       +---bak
|   |       |       \---tmp
|   |       \---3.5.2-Scripts
|   |           \---Scripts
v   v
```

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```
^   ^
|   |
|   +---4-Ions
|   |   +---4.1-Description
|   |   \---4.2-Data
|   |       +---4.2.1-Ion_energy
|   |       \---4.2.2-Other
|   |           +---4.2.2.1-INMS_quad_lens_setup
|   |           |   +---4.2.2.1.2.02-thermal_gas
|   |           |   +---4.2.2.1.2.03-2.8ev_ions
|   |           |   +---4.2.2.1.2.04-3.8ev_ions
|   |           |   +---4.2.2.1.2.05-6ev_ions
|   |           |   +---4.2.2.1.2.06-7.8ev_ions
|   |           |   +---4.2.2.1.2.07-10ev_ions
|   |           |   +---4.2.2.1.2.08-12ev_ions
|   |           |   +---4.2.2.1.2.09-14.3ev_ions
|   |           |   +---4.2.2.1.2.10-16.5ev_ions
|   |           |   +---4.2.2.1.2.11-20.15ev_ions
|   |           |   \---4.2.2.1.2.13-switch_lens_plots
|   |           +---4.2.2.2-Ion_ang_amp_plots
|   |           +---4.2.2.3-ion_sens
|   |           \---4.2.2.4-18_dalton_sweep
|   +---5-Thermal_gas
|   |   +---5.1-Description
|   |   \---5.2-Data
|   |       +---5.2.1-Gas_filament
|   |       |   +---5.2.1.1-Thermal_gas_plots
|   |       |   |   +---5.2.1.1.1-Therm_gas_18_swp
|   |       |   |   |   +---5.2.1.1.1-Therm_gas_18_swp.html
|   |       |   |   |   +---5.2.1.1.1-Therm_gas_18_swp.p65
|   |       |   |   |   \---5.2.1.1.1-Therm_gas_18_swp.pdf
|   |       |   |   \---5.2.1.1.2-Therm_gas_Hi_Lo
|   |       |   \---5.2.1.2-Thermal_gas_data
|   |       |       +---5.2.1.2.1-Initial_th_gas_data
|   |       |       \---5.2.1.2.1-Rev_th_gas_data
|   |       |           +---5.2.1.2.1_rev_1
|   |       |           +---5.2.1.2.1_rev_2
|   |       |           \---5.2.1.2.1_rev_3
|   |       |               +---0130n2pri_r3
|   |       |               +---0131arsec_r3
|   |       |               +---0131n2sec_r3
|   |       |               +---0201arpri_r3
|   |       |               +---0201ch4sec_r3
|   |       |               +---0202ch4pri_r3
|   |       |               +---0202hepri_r3
|   |       |               +---0202hesec_r3
|   |       |               +---0204h2pri_r3
|   |       |               +---0204h2sec_r3
|   |       |               +---0205krpri_r3
v   v       v               v
```

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```
^   ^       ^               ^
|   |       |               +---0205krsec_r3
|   |       |               +---0213c2h2pri_r3
|   |       |               +---0213c2h2sec_r3
|   |       |               +---0213c2h4pri_r3
|   |       |               +---0213c2h4sec_r3
|   |       |               \---FU_Thermal_Summary_r3
|   |       |                   +---FU_description_r3
|   |       |                   \---FU_files_r3
|   |       \---5.2.2-Other
|   |           +---5.2.2.1-N2_tracking
|   |           |   +---5.2.2.1.1-N2_tracking_descript
|   |           |   +---5.2.2.1.2-N2_tracking_data
|   |           |   +---5.2.2.1.3-N2_tracking_GSE_files
|   |           |   \---5.2.2.1.4-N2_tracking_plots
|   |           +---5.2.2.2-SRG_Baratron
|   |           +---5.2.2.3-Sensitivity_summary
|   |           \---5.2.2.4-Noble_gas_scan
|   |               \---5.2.2.4.2-noble_plots
|   \---6-Miscellaneous
|       +---6.1-Ion_defl_V
|       |   \---6.1.2-defl_dac_plots
|       +---6.2-INMS_volts
|       +---6.3-Chacterization_system
|       |   +---6.3.1-system_description
|       |   +---6.3.2-procedures
|       |   |   \---6.3.2.2-Therm_gas_inlet_dia
|       |   \---6.3.3-system_pictures
|       +---6.4-SEM_gain
|       |   +---6.4.2-SEM_gain_data
|       |   +---6.4.2.1_SEM_gain_descript
|       |   \---6.4.3-Sem_gain_plots
|       +---6.5-Open_source_quad_bias
|       +---6.6-INMS_trend_analysis
|       \---6.7-INMS_sensor
|           +---6.7.1-sensor_schematic
|           \---6.7.2-sensor_on_char_sys
v
```

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```
^
|
\---INMS_EU_Characterization
|   +---General
|   +---Ions
|   |   +---Argon_Ions
|   |   |   +---1998-0917-ArgonIons10V
|   |   |   +---1998-0917-ArgonIons13_5V
|   |   |   +---1998-0917-ArgonIons20V
|   |   |   \---1998-0917-ArgonIons6_5V
|   |   +---Helium_Ions
|   |   |   +---1998-0916-HeliumIons10V
|   |   |   +---1998-0916-HeliumIons13_5V
|   |   |   +---1998-0916-HeliumIons20V
|   |   |   \---1998-0916-HeliumIons6_5V
|   |   +---Hydrogen_Ions
|   |   |   +---1998-0917_HydrogenIons13_5V
|   |   |   +---1998-0917_HydrogenIons10V
|   |   |   +---1998-0917_HydrogenIons20V
|   |   |   \---1998-0917_HydrogenIons6_5V
|   |   +---KryptonIons
|   |   |   +---1998-0918-KryptonIons10V
|   |   |   +---1998-0918-KryptonIons13_5V
|   |   |   +---1998-0918-KryptonIons20V
|   |   |   \---1998-0918-KryptonIons6_5V
|   |   +---Neon_Ions
|   |   |   +---1998-0918-NeonIons10V
|   |   |   +---1998-0918-NeonIons13_5V
|   |   |   +---1998-0918-NeonIons20V
|   |   |   \---1998-0918-NeonIons6_5V
|   |   +---Nitrogen_Ions
|   |   |   +---1998-0910-NitrogenIons20V
|   |   |   +---1998-0911-NitrogenIons13_5V
|   |   |   +---1998-0914-NitrogenIons10V
|   |   |   +---1998-0915-NitrogenIons6_5V
|   |   |   \---1998-0928-NitrogenIons6_5V
|   |   +---Switching Lens
|   |   \---X_Ion_Summary
|   |       +---EU_FU_6_5ev_Compare
|   |       \---ion_fit
|   |           +---10ev_L1_30v
|   |           +---13_5ev_L1_30v
|   |           +---20ev_L1_30v
|   |           \---6.5ev_L1_30v
v   v
```

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```
^   ^
|   +---Neutral Beam
|   |   +---1998-0919_NeutralBeamTest
|   |   +---1998-0921-MoreBeaming
|   |   +---1998-0922-NeutralBeamArKrInH2
|   |   \---X_Neutral_Beam_Summary.xls
|   +---Nitrogen_Tracking
|   +---Thermal_Gas
|   |   +---Acetylene
|   |   |   \---1998-0720-AcetyleneCal
|   |   +---Argon
|   |   |   \---1998-0629-Argon
|   |   +---Argon in Helium
|   |   |   \---1998-0824-ArgonInHelium
|   |   +---Benzene
|   |   |   \---1998-1001-Benzene
|   |   +---Carbon Dioxide
|   |   |   \---1998-0729-CarbonDioxideCal
|   |   +---Carbon Monoxide in Helium
|   |   |   +---1998-0723-COinHelium
|   |   |   \---1998-0819-COinHelium
|   |   +---CarbonMonoxide
|   |   |   \---1998-0925-ThermalCO
|   |   +---Ethane
|   |   |   \---1998-0723-EthaneCal
|   |   +---Ethylene
|   |   |   \---1998-0722-EthyleneCal
|   |   +---Helium
|   |   |   \---1998-0715-Helium
|   |   +---Hydrogen
|   |   |   \---1998-0716-HydrogenCal
|   |   +---HydrogenCyanide in Helium
|   |   |   +---1998-0930-HCNinHelium_run_1
|   |   |   \---1998-0930-HCNinHelium_run_2
|   |   +---Krypton
|   |   |   \---1998-0716-KryptonCal
|   |   +---Methane
|   |   |   \---1998-0629_Methane
|   |   +---Methylacetylene (Propyne) in Helium
|   |   |   +---1998-0824-MethylacetyleneInHelium_run_1
|   |   |   \---1998-0824-MethylacetyleneInHelium_run_2
|   |   +---Neon
|   |   |   \---1998-0717-NeonCal
|   |   +---Nitrogen
|   |   |   \---1998-0629-Nitrogen
|   v
```

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```
/   ^
|   |   +---Oxygen
|   |   |   +---1998-0727-OxygenCal
|   |   |   \---1998-0728-OxygenCal
|   |   +---Propadiene (Allene) in Helium
|   |   |   +---1998-0820-PropadieneInHelium
|   |   |   \---1998-0821-PropadieneInHelium
|   |   +---Propane
|   |   |   \---1998-0717-Propane
|   |   \---X_Thermal_Summary
|   |       \---EU_FU_Thermal_Summary
|   |           +---EU_save
|   |           +---FU_description_r3
|   |           +---FU_save
|   |           \---V _Anicich_Communications
|   \---Miscellaneous
|
+---Other
```

APPENDIX D: L1A STRUCTURE FILE CONTENTS

```
OBJECT          = FIELD
  FIELD_NUMBER  = 1
  BYTES         = 21
  DATA_TYPE     = TIME
  NAME          = "SCLK"
  FORMAT        = "A21"
  DESCRIPTION   = "Spacecraft
     event time in the UTC time
     scale expressed as a PDS
     compliant date-time
     string."
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 2
  BYTES         = 8
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "UTTIME"
  FORMAT        = "I8"
  DESCRIPTION   = "Time of
     measurement expressed in
     msec since midnight UTC."
  UNIT          = "ms"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 86400001
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 3
  BYTES         = 26
  DATA_TYPE     = CHARACTER
  FORMAT        = "A26"
  NAME          = "TARGET"
  DESCRIPTION   = "Name of
     target body."
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 4
  BYTES         = 8
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "TIME_CA"
  FORMAT        = "I8"
  DESCRIPTION   = "Time since
     closest approach."
  UNIT          = "ms"
  VALID_MINIMUM = -86400000
  VALID_MAXIMUM = 86400000
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 5
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_X"
  FORMAT        = "F9.0"
  DESCRIPTION   = "X component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 6
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_Y"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Y component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 7
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_Z"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Z component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD
```

```
OBJECT          = FIELD
  FIELD_NUMBER  = 8
  BYTES         = 4
  DATA_TYPE     = CHARACTER
  NAME          = "SOURCE"
  FORMAT        = "A4"
  DESCRIPTION   = "Ion source
     used for this measurement,
     Open Source Ion (osi)
     Closed Source Neutral(csn)
     Open Source Neutral Beam
     (osnb)
     Open Souce Neutral Thermal
     (osnt)"
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 9
  BYTES         = 4
  DATA_TYPE     = ASCII_INTEGER
  NAME          =
     "DATA_RELIABILITY"
  FORMAT        = "I4"
  DESCRIPTION   = "This value is
     set to a non-zero value
     during scans in which an
     instrument transition may
     cause data reliability
     concerns. (Not implemented
     in Version 05 data files)"
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 10
  BYTES         = 8
  DATA_TYPE     = CHARACTER
  NAME          = "TABLE_SET_ID"
  FORMAT        = "A8"
  DESCRIPTION   = "Table set
     Identifier, consisting of
     an ID and revision number,
     TTTT-rrr."
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 11
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "COADD_CNT"
  FORMAT        = "I3"
  DESCRIPTION   = "Specifies the
     number of integration
     periods added together. A
     value of 1 indicates no
     coadding, 255 indicates
     maximum coadding - minimum
     data rate."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 12
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "OSP_FIL_1_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Open source
     primary filament status
     (fil_1), OFF, LOW-EV (25eV)
     HIGH-EV (70eV)"
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 13
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "OSS_FIL_2_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Open source
     secondary filament status
     (fil_2), OFF, LOW-EV (25eV)
     HIGH-EV (70eV)"
END_OBJECT    = FIELD

OBJECT          = FIELD
  FIELD_NUMBER  = 14
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "CSP_FIL_3_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Closed source
     primary filament (fil_3)
     status, OFF, LOW-EV (27eV)
     HIGH-EV (71eV)"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 15
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "CSS_FIL_4_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Closed source
     secondary filament (fil_4)
     status, OFF, LOW-EV (27eV)
     HIGH-EV(71eV)"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 16
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SEQ_TABLE"
  DESCRIPTION   = "Number of the
     sequence table controlling
     the instrument  operation.
     This table lists a set of
     cycle tables, each  one of
     which specifies one or more
     mass scans."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 64
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 17
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "CYC_NUM"
  FORMAT        = "I2"
  DESCRIPTION   = "The number of
     the cycle within the
     sequence, indexes in this
     sequence table."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
 END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 18
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "CYC_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the cycle table controlling
     the current mass scan. This
     table selects the mass,
     focus, trap, switching and
     D/A table used to operate
     the instrument for mass
     scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 64
 END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 19
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SCAN_NUM"
  DESCRIPTION   = "The number of
     the scan within the cycle,
     indexes the cycle table."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
 END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 20
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "TRAP_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the trap table specifying
     collimator, deflector, top
     plate and OL4 voltages
     used in the mass scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 21
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SW_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the Switching table
     specifying the quadrupole
     rod voltages."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
 END_OBJECT    = FIELD
```

```
OBJECT         = FIELD
  FIELD_NUMBER  = 22
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "MASS_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the mass table specifying
     the 68 mass/charge values
     making up a mass scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 96
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 23
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "FOCUS_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the focus table specifying
     OL1, OL2, OL3, endplate,
     ion lens, and quadrupole
     bias voltages."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 24
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  NAME          = "DA_TABLE"
  DESCRIPTION   =
     "Identification number of
     the D/A table specifying
     the electron multiplier and
     detector threshold
     settings."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 16
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 25
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "VELOCITY_COMP"
  FORMAT        = "F6.3"
  DESCRIPTION   = "Compensation
     velocity used in onboard
     computation of lens and
     deflector voltages"
  UNIT          = "km/s"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 50.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 26
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "IPNUM"
  FORMAT        = "I2"
  DESCRIPTION   = "Integration
     period number, indexes the
     mass, trap  switching and
     focus tables."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 68
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 27
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "MASS"
  FORMAT        = "F6.3"
  DESCRIPTION   = "Mass per unit
     charge detected during
     current integration period"
  UNIT          = "AMU/Z"
  VALID_MINIMUM = 0.125
  VALID_MAXIMUM = 99.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 28
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS2"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 2 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 29
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS1"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 1 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 30
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS4"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 4 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 31
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS3"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 3 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 32
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS2"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Quadrapole
     lens 2 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 33
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS1"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Quadrupole
     lens 1 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 34
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS4"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Quadrupole
     lens 4 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 35
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS3"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Quadrupole
     lens 3 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 36
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_BIAS"
  DESCRIPTION   = "Quadrupole
     bias voltage."
  FORMAT        = "F7.3"
  UNIT          = "v"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD
```

```
OBJECT         = FIELD
  FIELD_NUMBER  = 37
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL2"
  FORMAT        = "6.2"
  DESCRIPTION   = "Ion deflector
     2 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 38
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL1"
  FORMAT        = "6.2"
  DESCRIPTION   = "Ion deflector
     1 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 39
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL4"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Ion deflector
     4 voltage."
  UNIT          = "v"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 40
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL3"
  DESCRIPTION   = "Ion deflector
     3 voltage."
  FORMAT        = "F6.2"
  UNIT          = "v"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 41
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "TOP_PLATE"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Top plate
     lens voltage."
  UNIT          = "v"
  VALID_MINIMUM = -30.0
  VALID_MAXIMUM = 30.0
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 42
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "P_ENERGY"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Particle
     Energy."
  UNIT          = "ev"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 50.
END_OBJECT    = FIELD

OBJECT         = FIELD
  FIELD_NUMBER  = 43
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "ALT_T"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Altitude of
     the spacecraft above the
     surface of the named target
     body, included within 1
     hour of closest approach"
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 44
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_T_X"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the  UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 45
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_T_Y"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 46
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  NAME          = "VIEW_DIR_T_Z"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 47
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_X"
  FORMAT        = "F9.2"
  DESCRIPTION   = "X-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 48
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_Y"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Y-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 49
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_Z"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Z-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 50
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_X"
  FORMAT        = "F7.3"
  DESCRIPTION   = "X-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 51
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_Y"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Y-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 52
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_Z"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Z-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 53
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCX"
  FORMAT        = "F7.3"
  DESCRIPTION   = "X-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 54
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCY"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Y-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach"
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 55
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCZ"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Z-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach"
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 56
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "LST_T"
  FORMAT        = "F6.3"
  DESCRIPTION   = "The local
     solartime at the sub-
     spacecraft point    on the
     target body, included
     within 1 hour of    closest
     approach."
  UNIT          = "hr"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 24.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 57
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SZA_T"
  FORMAT        = "F7.3"
  DESCRIPTION   = "The solar
     zenith angle at the sub-
     satellite point on the
     target body, included
     within 1 hour of    closest
     approach"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 180.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 58
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "SS_LONG_T"
  FORMAT        = "F6.2"
  DESCRIPTION   = "The west
     longitude of the sub-solar
     point on the target body,
     included within 1 hour of
     closest approach"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 360.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 59
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "DISTANCE_S"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Distance of
     the spacecraft from
     Saturn's center"
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 60
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_X"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the   UNIT vector in the
     direction of the  INMS
     aperture outward normal in
     the Saturn centered IAU
     coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 61
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_Y"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the   UNIT vector in the
     direction of the  INMS
     aperture outward normal in
     the Saturn centered IAU
     coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 62
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_Z"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the   UNIT vector in the
     direction of the  INMS
     aperture outward normal in
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      the Saturn centered IAU
      coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 63
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_X"
  FORMAT        = "F9.0"
  DESCRIPTION   = "X-component
      of spacecraft position in
      the Saturn centered IAU
      coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 64
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_Y"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Y-component
      of spacecraft position in
      the Saturn centered IAU
      coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 65
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_Z"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Z-component
      of spacecraft position in
      the Saturn centered IAU
      coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD
OBJECT        = FIELD
  FIELD_NUMBER  = 66
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_X"
  FORMAT        = "F7.3"
  DESCRIPTION   = "X-component
      of spacecraft velocity in
      the Saturn centered IAU
      coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 67
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_Y"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Y-component
      of spacecraft velocity in
      the Saturn centered IAU
      coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 68
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_Z"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Z-component
     of spacecraft velocity in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 69
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "LST_S"
  FORMAT        = "F6.3"
  DESCRIPTION   = "The local
     solar time at the sub-
     spacecraft point on Saturn"
  UNIT          = "hr"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 24.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 70
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SZA_S"
  FORMAT        = "F7.3"
  DESCRIPTION   = "The solar
     zenith angle at the sub-
     satellite point on Saturn"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 180.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 71
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "SS_LONG_S"
  FORMAT        = "F6.2"
  DESCRIPTION   = "The west
     longitude of the sub-solar
     point on Saturn"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 360.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 72
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_RA"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Right
     ascension of spacecraft z
     axis."
  UNIT          = "rad"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 6.283185
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 73
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_DEC"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Declination
     of spacecraft z axis."
  UNIT          = "rad"
  VALID_MINIMUM = -1.5708
  VALID_MAXIMUM = 1.5708
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 74
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_TW"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Rotation of
     spacecraft about z axis."
  UNIT          = "rad"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 6.283185
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 75
  BYTES         = 6
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "C1COUNTS"
  FORMAT        = "I6"
  DESCRIPTION   = "High
     sensitivity counts."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 76
  BYTES         = 6
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "C2COUNTS"
  FORMAT        = "I6"
  DESCRIPTION   = "Low
     sensitivity counts."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD
```